The Spectrum Monitor®

Amateur, Shortwave, AM/FM/TV, WiFi, Scanning, Satellites, Vintage Radio and More

Volume 4 **Number 10** **October 2017**

Sputnik Remembered

Plus:

European DX Council at 50

Tokyo Ham Fair Visual Tour

Trans-Equatorial Propagation

Digitech Portable SW Receiver

The Spectrum Monitor®

Amateur, Shortwave, AM/FM/TV, WiFi, Scanning, Satellites, Vintage Radio and More

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By Richard Fisher KI6SN

Listening and peering into the night sky on October 4, 1957, hams, shortwave listeners, scientists, military personnel and ordinary citizens became eye and ear-witnesses to an epic moment in human existence—the dawn of the Space Age. Richard has collected the thoughts and memories of those who were among the first to hear and see the original man-made moon known as "Sputnik-1." The historic event not only changed the course of human history, but also changed the lives of many of the individuals who heard those first beeps from space.

A Visual Tour of the Tokyo Ham Fair **16**
By Keith Baker KB1SF/VA3KSF

In early September, Keith had the distinct honor of being an ambassador for the Dayton Amateur Radio Association (DARA) at the big Tokyo Ham Radio Fair in Tokyo, Japan. He writes, "Our mission was to personally invite Japanese hams to join us in Dayton, Ohio, for next year's big Dayton Hamvention. However, unlike the Dayton Hamvention, which is sponsored by a local (albeit large!) amateur radio club (DARA), the Japan Amateur Radio League (JRRL), the Japanese equivalent of our American Radio Relay League (ARRL), conducts the Tokyo Ham Fair each year." Keith also visits the Akihabara section of Tokyo known as "Electric Town" and presents a visual tour of both.

TSM Reviews: Digitech AR1780 **20**
By Thomas Witherspoon K4SWL

Regular contributor, Thomas Witherspoon, is always on the lookout for interesting, unheralded shortwave radios. This month he takes a look at the Digitech AR1780, a relatively unknown, inexpensive portable shortwave radio that covers longwave through shortwave, FM and even the Air-band and, while it has some quirks, it has more than a few features in its favor. Find out why Thomas says, "For $129.00 AUD (roughly $103 USD), you're getting a full-featured radio that is, by and large, a pleasure to operate."

The European DX Council at 50 **25**
By Chrissy Brand

It was 50 years ago, in 1967, that the first conference of the European DX Council was held. The EDXC, an organization of leading DXers, is still going strong after all these decades. This is testified by the continued success of its annual conference and through the projects and information sharing that it still carries out. Chrissy reports on this year's conference held in August in the Finnish city of Tampere.

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By John Piliounis SV1OCS

Most radio communications at VHF frequencies happens between different locations in line-of-sight propagation and, more rarely, either through the E or F2 layers' ionospheric refraction during periods of intense sunspots, or through tropospheric ducting. But Mother Nature has provided VHF communication links that also happen between symmetrical locations to the geomagnetic equator. Propagation of this type has been named Trans-Equatorial Propagation (TEP). John looks at the theory behind this phenomenon and the historic experiments to prove its existence to skeptics.

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Cover Story:

Russia launched the first man-made moon, known as Sputnik-1, October 4, 1957. It weighed 184 lbs., housed three silver-zinc batteries, two D-200 radio transmitters, pressure and temperature transmitters, a DTK-34 temperature control system and was launched on a variant of the Russian R-7 intercontinental ballistic missile. It had an orbital period of 96.17 minutes, an apogee of 588 miles, a perigee of 142 miles and an orbital inclination of 65.6 degrees to the equator. This replica is displayed at the National Museum of the United States Air Force in Dayton, Ohio. (US Air Force photo)

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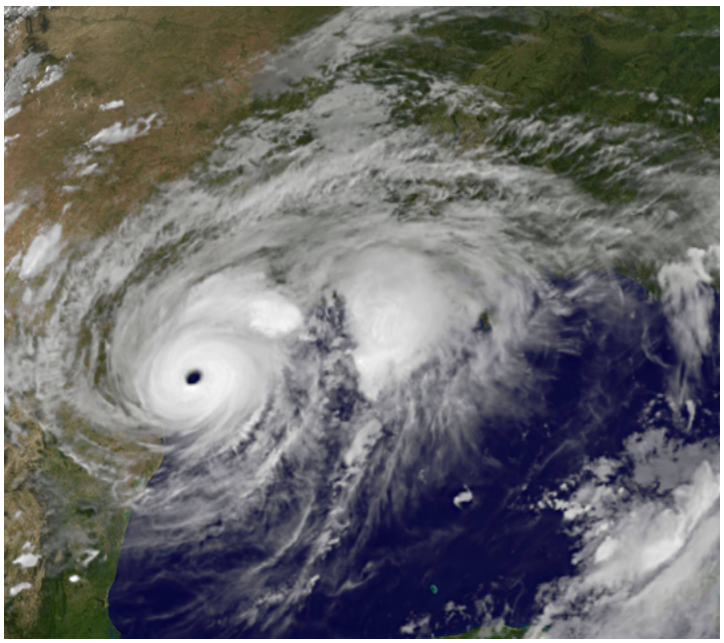
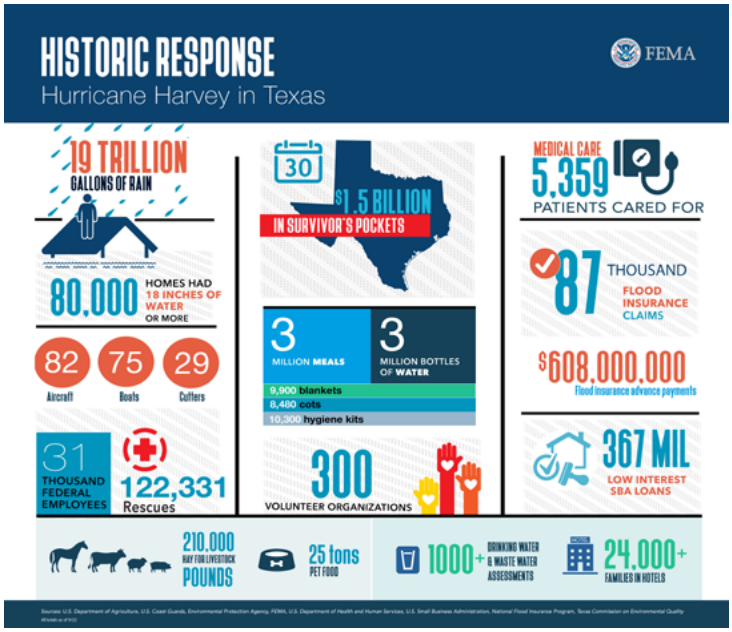


At 6 pm CDT Aug 25, as Harvey prepared to make landfall in south Texas, the National Hurricane Center noted that the hurricane had strengthened to a Category 4 Hurricane on the Saffir-Simpson Hurricane Wind Scale. Harvey's winds had increased to 130 mph (215 kph). (NASA/NOAA GOES Project)



Infographic shows the results of Hurricane Harvey on Texas. (Courtesy: FEMA)

Hurricanes and Communications

"Of the many relevant articles that are sure to follow the current emergencies, I suggest an in depth look at interagency and inter-governmental communications. Just last year DHS released its current version of the extensive National Interoperability Field Operations Guide, described as: a technical reference for emergency communications planning…that will be used in disaster response. I cannot envision a more appropriate model for application of NAFOG than the evolving disaster in Texas. For those of us outside of VHF/ UHF range, we're limited to HF networks, over the air or on WebSDR, so we don't get the full picture." – Les Polt K3JTP

"Good article by Kirk Kleinschmidt in the September issue. I think that he is totally correct in what he wrote. Most telling to me is his statement about the relevance of ham radio today when it comes to emergency response. In the days before hurricane Harvey, I monitored the frequencies listed on the ARRL website. All I heard were some net check-ins and then even before the hurricane hit, total silence. After it hit...nothing! What kind of response to a disaster was that?

"What struck me as just as bad, was the insistence by everyone involved to use voice mode, with numerous requests for repeats. We have all of these nice data modes these days and this is what we do, just like we did 30 years ago? CW would have been much better, but voice only? C'mon guys, what the heck? Why not use the better modes like Olivia or MFSK-16? Where is AMTOR Mode A when you need it? Have we degenerated into wallpaper collecting contest operators so much that we've forgotten the serious stuff? If voice conditions are bad, are we just going to give up or will we transition to data or CW? Working split frequencies with multiple dedicated outgoing stations with only one or two incoming stations (into the disaster area) would go a long way toward getting communications going.

"One area that I think would be worth exploring is radio assistance for the National Disaster Medical System (NDMS). When the hospital in Beaumont was evacuated, it was similar to what would happen if, say, there was an overwhelming earthquake in California and patients had to be evacuated out of state. This is where the voluntary NDMS system comes in to play. If there is a lack of normal communications, hospitals have to know what to expect and where each patient is located. There is no reason the National Traffic System or some similar system in principle couldn't be developed.

"SHIPCOM is petitioning to use some maritime frequencies for disasters. They are already using WLO on 8,471.3 (my receive) for broadcasts in 45.5 Baudot and

SITOR B. We need a plan!

"Two meter voice will probably always be the big gun for local use (I lean towards GMRS as well for another asset) but for the real serious point-to-point stuff or a general communicating of regional status, HF's where it's at. – John Harazda N5AZO and WQYX855

***TSM* Utility Planet columnist, Hugh Stegman, responds:**

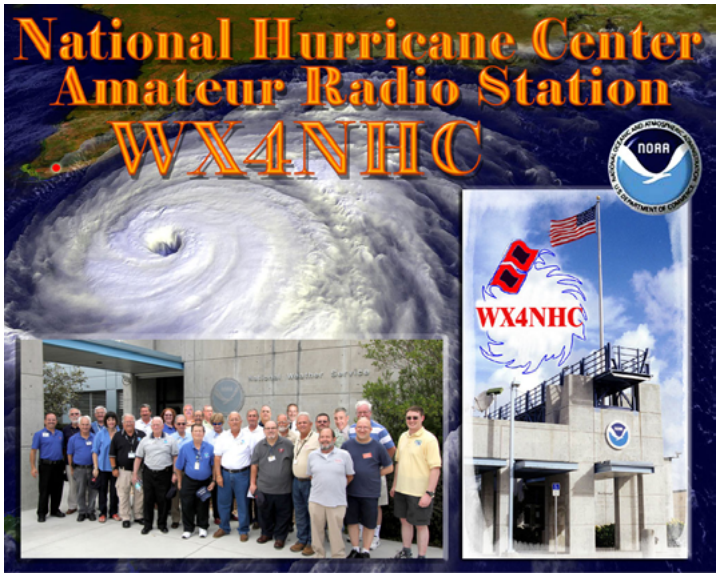
"You are absolutely right about Harvey. A lot of amateur nets activated and then just had nothing to do, apparently. I can't say for Irma, because I didn't even hear the activations, despite trying remote SDRs all over the US. Yes, there was an unfortunately timed solar flare that took HF down all afternoon the day Irma came into south Florida. No excuse. HF came back, and conditions were actually pretty good on the higher frequencies, but still, there was nothing. Huh? Hurricane comm didn't used to be this bad.

"I'm really kind of dismayed about the situation in the Virgin Islands and some of the worst hit Florida Keys. In past storms there have been HF in and out of the affected areas. The US Virgin Islands in particular have seen absolute devastation there before, with the same kind of anarchy and looting afterward. Somehow, though, someone always managed to get on the air from there. I guess that's too old fashioned now. So this time, we don't get anything at all in or out for two days. The news media are bemoaning the lack of cellular or Internet, which are only starting to come back as this is written. Once the media would have tuned right to 14325 kHz, along with everyone else, and broadcast damage reports live on their air. Now—no news at all. Oh dear, there's no Twitter, people can't even take selfies in front of the ruins, how are we EVER going to communicate?

"That is not effective emergency comm. What happened to amateur radio being the go-to guys in these situations?

"As far as voice nets go, MARS and SHARES are way ahead of normal ham radio here. They use voice for check-ins, and MT63 or MIL-STD-188-110A to pass traffic. 110A is a bit iffy on amateur software and platforms, but the point remains that digital is the way to go for a lot of reasons. As you say, MFSK16 can get through some pretty nasty conditions. It has a 100 percent duty cycle like RTTY, but it's a much more modern system. If you need to go 15 dB below the noise, there's always MFSK8. Or, what's wrong with CW? Sure, you need skilled operators, but isn't that what we're supposed to be? The maritime service saved lives with CW right up until the turn of the century, when shippers wanted to cut costs by eliminating expensive radio officers. It sounds hopelessly old fashioned, but is that really a problem?

"It's interesting that you should mention ShipCom. They have that FCC waiver post-Katrina that lets some of their frequencies be used in land-mobile rather than maritime for bona fide emergencies and monthly drills. Rockwell Collins has incorporated it, sort of, into a mini version of



Composite Pictures of Hurricane Floyd 1999, WX4NHC Operators 2012 and NHC Building. Photos by NOAA and Julio Ripoll WD4R. (Courtesy: WX4NHC)

COTHEN for non-federal agencies. This seems like a real good idea, but nothing ever seems to come of it. I know ShipCom has asked for more waiver channels and that's before the FCC. Otherwise I'd have guessed it was stillborn—I mean, here are two absolutely catastrophic hurricanes, and no one's using it. Meanwhile COTHEN carries the freight for the US Coast Guard, so we know that, even with the blackouts, HF is working for them. But everyone else waits for cell phones to come back. This is bizarre, and more than a little disappointing.

"Yes VHF is the workhorse close-in. Two-meter FM seems to carry most of the freight. The GMRS is definitely hugely underused. HF isn't used at all. Is everyone really that convinced it's too old-fashioned? Amateur radio used to have a valuable role here, and far as I can tell, no one is doing that now. Twitter and Facebook sure can't do it. They can't even get rid of fake news."

Welcome. Larry Van Horn N5FPW

"Wow, I got a very pleasant surprise, opening my September 2017 edition of *The Spectrum Monitor* and seeing a column called 'Milcom.' It got even better when it indicated that Larry Van Horn N5FPW would be writing the monthly column! I'm glad he re-entered the monthly writing market, as he has a wealth of milcom monitoring experience and I'm sure his columns will be filled with great tips to make this portion of the monitoring hobby productive and fun!" – Ken Windyka, Springfield, MA.

For those new to TSM, Larry has written over a dozen books on the subject of military communications from HF to satellite as well as countless columns and reviews on related topics for Monitoring Times magazine for decades, for which he was also the Associate Editor. He has previously written several feature articles for TSM and maintains a blog devot-

The September Movie Mystery Radio remains a mystery. No one could ID the microphone or whether the radio was an actual radio or a prop. The screen shot is from the 1930s-era series "Scouts to the Rescue." (Courtesy of Eric Beheim's collection)

A still image of October's Movie Mystery Radio from an episode in the 1941 Republic serial, "Dick Tracy vs. Crime, Inc." This close-up of a frame may help readers better identify this radio. (Courtesy of Eric Beheim's collection)

ed to the subject at ***http://mt-milcom.blogspot.com****. A brief bio can be seen in the "About Us" pages at the back of each issue. – Editor*

Lack of Funding for Public Radio Stations that are Coping with Repack Costs

"Mike Kohl states in his article ['Impact of FCC's TV Band Repack,' September 2017 *TSM*], 'This is especially critical for any public radio stations caught in these events as they may not have any dollars to spend, given a hostile President and Republican dominated Congress that would like them off the air.' I am writing to challenge this statement. He should prove it." – Whit Reeve

The issue of federal funding for both the Corporation for Public Broadcasting (CPB) and National Public Radio (NPR) is a perennial one as each new budget is introduced. Over the last three administrations, Congress has sought drastic cuts in funding for both CPB and NPR, but bipartisan support in Congress inevitably restores most of the cuts after the posturing subsides.

Such funding, though, is becoming less and less of an actual issue. This past March, when the latest budget was announced, threatening once again to eliminate what was left of public broadcasting funding, Fox News reported that, "[The] Heritage Foundation issued a report that said without federal funding, the CPB could make up 'the lost money by increasing revenues from corporate sponsors, foundations and members.'" In fact, according to the Fox News report, "Federal funds provide about 15 percent of public TV stations' overall funding." – Editor

Commuting Material Down Under

"Just finished reading my August edition of your publication. As usual, full of fascinating information and news. Very convenient format as I just download the editions to my Kindle and I am usually engrossed in it on my way to and from work on the train. Keep up the good work! Cheers". – Duncan VK3DRX

September/October Movie Mystery Radios

Not surprisingly, there were no takers on the September Movie Mystery Radio. But, that never stops our vintage radio guru, Rich Post KB8TAD, from hazarding a guess:

"No positive ID on the ball mike. I thought it might be an early PA mike by University Sound. General Radio also used a similar one in their early sound-pressure-level instrumentation. The large piece of radio gear in picture #2 (above left) is obscured by the carbon candle-stick mike but the equipment looks to be a collection of test gear pieces. The wooden case of the large piece in the center would be unusual for communications gear in that time-frame but General Radio and others still used wood cases for laboratory gear."

TSM vintage radio/movie enthusiast, Eric Beheim, presents October's Movie Mystery Radio (above right), which appears in the 1941 Republic serial, "Dick Tracy vs. Crime, Inc."

Eric writes, "The radio in question is used by a master criminal known as 'The Ghost.' When not wearing his mask, 'The Ghost' is a member of the 'Secret Council of Eight,' a group of prominent businessmen who are assisting Dick Tracy in his relentless pursuit of lawbreakers. A closeup frame shows the radio with microphone. The radio provided the Ghost and his chief lieutenant, Lucifer, a method of instructing his henchmen to carry out some nefarious deed that will ultimately bring about the cliffhanger ending that week's chapter."

RF Current

News from the World of Communications

RF Current is compiled and edited by Ken Reitz KS4ZR from various news sources and links supplied by TSM readers. If you find an interesting story pertaining to amateur, shortwave, scanning, broadcasting or satellites, send a link to editor@thespectrummonitor.com

Irma damage: (Left)Collapsed tower at WRMI shortwave antenna farm. (Right) One of many feed line support poles that fell during Irma. (Courtesy: Jeff White, WRMI)

Damage Report from WRMI Shortwave

Jeff White, *TSM* contributing editor and General Manager of shortwave station, WRMI, kept a diary of events that happened at the transmitter site in Okeechobee, Florida, which is north of Miami, as Hurrican Irma moved inland. Here are excerpts that he posted on the WRMI Facebook page during the storm.

WRMI Hurricane Irma Diary
By Jeff White

1423 UTC Wednesday, September 6 - Thank you to all of our listeners who have inquired about our hurricane plans. At the moment, it appears that the eye of Hurricane Irma will come right over or very close to Okeechobee by Sunday or Monday. We will stay on the air as long as possible and as long as it's safe. Our transmitter building is prepared to withstand most hurricanes, and our antennas have survived many hurricanes in the past with little damage. However, electrical power generally goes out during or after most strong hurricanes, and our generator will only power our lights, computers and air conditioning. Unfortunately we don't have enough generator power to operate 14 x 100-kilowatt transmitters. So if the power goes out, we are off the air.

0400 UTC Sunday, September 10 - Here in Okeechobee the winds are starting to pick up as Hurricane Irma heads to Florida. The exact path of the hurricane continues to change somewhat, but it appears that the eye of Hurricane Irma will be passing a bit to the west of us, but we will still receive tropical storm force winds which are to the east-northeast of the storm. We will remain on the air with all of our transmitters as long as possible. However, once the winds get to a certain strength, our transmission lines will start flapping around and arcing, which could cause serious damage to the transmitters and components. If that occurs, we will probably shut the transmitters down in order to avoid equipment damage until after the storm passes. After the hurricane passes and winds die down, we would hope to be able to resume transmissions if we have electricity. If our Internet service remains functional, we should be able to maintain our live stream. This is the programming that is on 9955 kHz shortwave.

2045 UTC Sunday, September 10 - About 15 minutes ago we had sudden tropical storm force winds at the WRMI transmitter site and our electrical power went down. We have a generator to power the control room and essential operations, but all transmitters are off the air. However, you can still hear our 9955 kHz programming on the audio player on our webpage.

2140 UTC Sunday, September 10 - The winds are extremely strong here in Okeechobee. Our generator went out twice, but is back on at the moment. Our live stream is still working at www.wrmi.net. It is still light outside, and we can see that several poles holding our transmission lines have fallen down or are leaning downward. There could be some major damage in the antenna field, but we won't know until the

Left: WRMI transmitter building prior to hurricane Irma's arrival. Right: Snapped antenna support tower. (Courtesy: Jeff White, WRMI)

storm passes and the morning light arrives tomorrow.

1430 UTC Monday, September 11 - Hurricane Irma has done extensive damage at WRMI in Okeechobee. Two antenna towers are down and many poles holding transmission lines are also down. Power went out at around 2030 UTC Sunday, and it may not be restored for days. Meanwhile, all transmitters are off the air. Our Internet service is also down, which means that our live stream is down as well. All of our staff are OK.

1620 UTC Tuesday, September 12 - There is still no power at our site, nor any idea when it will be restored. We're sorry for this situation, and we hope that things will improve soon.

1730 UTC Tuesday, September 12 - Florida Power & Light has announced that most customers in our part of Florida should have their power restored by the end of this coming weekend—that is, by Sunday, September 17. So there is light at the end of the tunnel!

2315 UTC Tuesday, September 12 - WRMI is now operating on one frequency at very low power: 9395 kHz. We will leave this on 24 hours with regular programming.

0300 UTC Friday, September 15 - I went with our Facility Manager, Pat Travers, on a drive through our antenna field today. It was rough driving through the swampy, wet, muddy terrain which reminded me of the safari game drives I took in South Africa a couple of weeks ago. I saw why it is so difficult to repair the damage from Hurricane Irma in the field. There are transmission lines down all over the place, and many of the poles that hold them up need to be repaired or replaced. It is a big project, and our engineers are working on it one by one. Our telephone and Internet service are still down.

0320 UTC Friday, September 15 - Oh no, our power went out again. The only frequency we still have on the air is 9395 kHz at very low power using our generator.

1712 UTC Friday, September 15 - Our power came back on last night about an hour after it went off. This morning we repaired the transmission lines for Transmitter 2 (5985 kHz) and it is working fine, so it will be on the air on its regular schedule from 0300-0500 UTC. Now we have just put Transmitter 9 (11580 kHz) back on the air. So right now we have the following frequencies back on according to their normal schedule: 5985, 9955, 9455, 9395 (low power), 21525 and 11580 kHz.

1830 UTC Friday, September 15 - We are still without telephone lines and Internet service at our transmitter site. The telephone company which provides our telephone and Internet service tells us that they estimate service should be restored by September 25--at 7:00 pm!

1915 UTC Friday, September 15, 2017 - We're on a roll. We now have Transmitter 1 (7780 kHz) on the air with full power.

1615 UTC Sunday September 17 - It's been almost a week since Hurricane Irma arrived here at Okeechobee. We now have 10 of our 14 transmitters on the air again with their normal power:

We will continue working to put the others on the air during the next few days. We cannot put Transmitter 3 on 15770 kHz again on the same antenna because the hurricane destroyed the 44-degree European antenna that this transmitter was using. But we may use Transmitter 3 with another antenna in the near future.

It seems that our Internet service is finally come back, so we are hoping that Monday we can have our audio live stream working normally again, and that our customers can

again send us their programs via Internet.

Thanks to our Facility Manager Pat Travers and his team for their hard work over the last week repairing all of the transmission lines in the antenna field, we have been able to return to the air on so many transmitters so fast.

The hurricane has been a bad experience, but we have overcome it and we are on the air again to serve you.

During the Hurricane Irma crisis, we received dozens of messages from listeners via Facebook and e-mail. Here's just one of them:

Rawad Hamwi, Khobar, Saudi Arabia - "WRMI is my best shortwave station! Going to miss the 15770 kHz transmission. However, 11580 kHz is an excellent performer here in northern KSA. Just finished decoding some images from the Shortwave Radiogram program on 11580 kHz @ 2030-2100 UTC on my Sony ICF-7600GR. You did a great job!!"

Rescuers used Cellphone PTT in Harvey Disaster

The two most recent natural disasters to hit the US provided a good study of various forms of communications that can be monitored. During Hurricane Harvey, a predominantly rain-driven disaster, cellphone service was robust enough to allow the flotilla of impromptu water-rescuers, known as the Cajun Navy, to employ an app that gave their cellphones push-to-talk (PTT) capabilities among up to 1,000 people at the same time. Among the most popular such apps is Zello (**http://zello.com/app**), a free app that, according to news sources, became the number one app in both iTunes and Google Play in the run up to the landfall of Hurricane Irma. Zello apps are available for Android, iPhone, Windows Phone or Blackberry devices and work over Wi-Fi, 3G, 4G, GPRS (General Packet Radio Service) and EDGE (Microsoft's Web browser for Windows 10).

AT&T's PTT app allows communications with up to 250 members that can be integrated with a Land Mobile Radio service to provide interoperability between the two platforms and works with Android and iOS devices. AT&T's service also provides a full-featured console that connects dispatchers to whatever workforce you are using, "and provides real-time operational awareness and location information," according to company promotional material.

The Zello app allows non-participants to monitor those in the network, as was done by many during Hurricane Harvey.

Report: 22-Million Cord-Cutters in 2017

Entertainment industry newspaper *Variety* reported September 13 that research shows Americans are cutting the cable/satellite-TV cord faster than anticipated. According to the article, the firm, eMarketer, expects "a total of 22.2 million US adults will have cut the cord on cable, satellite or telco TV service to date—up to 33 percent from 16.7 million in 2016." The firm had earlier predicted 15.4 million would cut the cord in 2017. Interestingly, the article reports the number of "cord-nevers," viewers who have never subscribed to any form of pay-TV, "will rise 5.8 percent this year to 34.4 million." This doesn't mean people have stopped watching TV, far from it. It means there is a monumental shift away from traditional pay-TV options to Internet-based viewing. These viewers will likely convert to new wireless broadband services that will be offered as early as December of this year using the former TV-band frequencies bought by various companies, including Dish Network, during the FCC's spectrum auction.

Mama, Don't Let Your Babies Grow up to be Radio News Directors

The Radio-Television Digital News Association (RTDNA) released its annual survey this past June, which was done in association with Hofstra University. The survey looked at salaries in the broadcast industry and the tale is not encouraging for anyone wanting to have a career in journalism and make money at the same time—though it's always better at the top. For example, the average TV news director makes over $100,000 while the average TV sports reporter makes just over $36,000, according to the report.

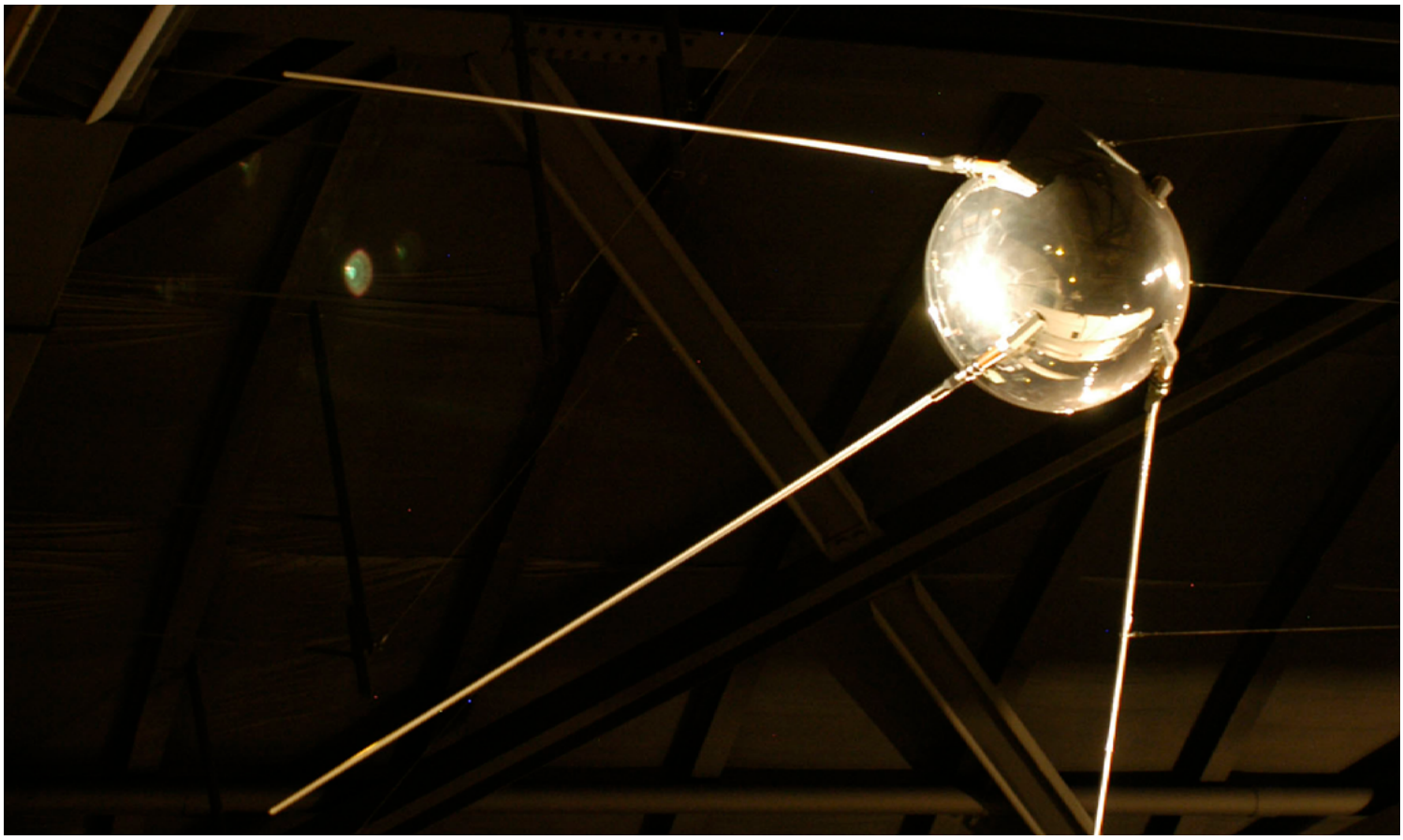
One disturbing finding was that newsroom jobs haven't been able to keep up with inflation. The author, Bob Papper, Professor Emeritus at Hofstra, wrote, "Overall, TV news lags the last 5 years of inflation by more than 3 points; it lags behind the 10 year numbers by more than 2. That's significant slippage from just a year ago, when both comparisons were running ahead."

Location is everything, according to the survey. For instance, a news director in a top 25 market makes $191,000 per year while the same job in the 151st market makes just $60,000. A "multi-media journalist" (known as an MMJ), makes $58,000 in a top 25 market station, but just $24,500 in the 151st market. The bottom rung on the newsroom ladder? Web/mobile writer/producer: $50,000 in a top 25 market station; $23,000 in the 151st market.

To help indicate TV's dominance over radio, the survey found the average radio news director makes $42,600 per year (almost $60,000 less per year than his TV counterpart) while the average radio news reporter makes $36,400. The lowest paying job in the radio news department? Sports anchor at $34,400 on average but can make as little as $12,000 per year.

Radio news anchor, sports anchor and sports reporter categories all saw negative gains over the last five years. Imagine getting started in radio news as a news director with your newly minted communications degree and $30,000 in student loan debt (US national average) getting $25,100 per year in salary. As Papper noted, "…radio starting pay rose enough this year that the minimums reported are really starting to approach (but not quite get up to) the minimum wage."

TSM



Sputnik-1 weighed 184 lbs., housed three silver-zinc batteries, two D-200 radio transmitters, pressure and temperature transmitters, DTK-34 temperature control system and was launched on a variant of the R-7 intercontinental ballistic missile. It had an orbital period of 96.17 min., an apogee of 588 miles, and perigee of 142 miles and an orbital inclination of 65.6 degrees to the equator. This replica is displayed at the National Museum of the US Air Force in Dayton, Ohio. (US Air Force photo)

October 4, 1957: The Beep Heard Around the World

SWLers and Radio Amateurs Remember Hearing Sputnik-1 from 60 Years Ago

By Richard Fisher KI6SN

Listening and peering into the night sky on October 4, 1957, Colin Brock G3ISB, was an ear- and eye-witness to one of the epic moments in human existence—the dawn of the Space Age.

Sixty years ago this month from his listening post at Hillmorton, near Rugby in Warwickshire, England, Brock "heard the beeping tones of Sputnik-1 slightly above 20 MHz on its first orbit of Earth. Together, with eight colleagues at Rugby Radio Station (call letters GBR), we heard it on the Marconi CR.100 monitor receiver.

"We then rushed excitedly outside to see it pass over very clearly in the night sky. One of our colleagues then informed the National Physical Laboratory of our sighting."

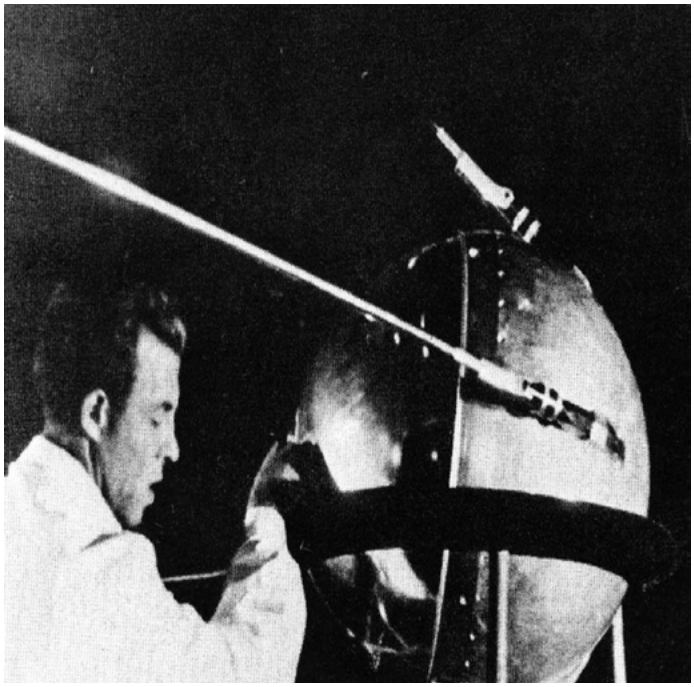
The Soviet satellite was a tiny thing, about the size of a beach ball. But its impact was Earth shattering. Man's first artificial satellite weighed 184 pounds and orbited every 96 minutes. The event shocked U.S. aeronautics engineers who wanted America to be first-out-of-the-gate in space. Sputnik-1 struck both fear and excitement across America. It was the height of the Cold War.

Its payload included small, one-watt transmitters sending non-stop beeps in telemetry on 20 and 40 MHz. Each beep lasted three-tenths of a second, followed by three-tenths-second of silence, then the next beep, silence, beep, silence. . .

Sputnik-1 was tailor made for radio enthusiasts. The Soviet government welcomed reports of reception. C.M. Stanbury was one of the shortwave listeners to receive a Sputnik-1 confirmation card from Moscow. No easy task.

Brock and his colleagues were among the first of a legion of radio amateurs, shortwave listeners, station monitors and communications hobbyists whose curiosity drove them to their radios and backyards to experience this historic moment.

The mission lasted 21 days—1,440 Earth orbits. Sputnik-1 went silent when its batteries died. The satellite burned up on re-entry January 4, 1958. But what excitement for radio enthusiasts around the world, young and old!



On Oct. 4, 1957, Sputnik 1 successfully launched and entered Earth's orbit. Thus, began the Space Age. The successful launch shocked the world, giving the former Soviet Union the distinction of putting the first human-made object into space. The word 'Sputnik' originally meant 'fellow traveler,' but has become synonymous with 'satellite' in modern Russian. This historic image shows a technician putting the finishing touches on Sputnik 1, humanity's first artificial satellite. The pressurized sphere made of aluminum alloy had five primary scientific objectives: Test the method of placing an artificial satellite into Earth orbit; provide information on the density of the atmosphere by calculating its lifetime in orbit; test radio and optical methods of orbital tracking; determine the effects of radio wave propagation though the atmosphere; and, check principles of pressurization used on the satellites. (Image Credit: NASA/Asif A. Siddiqi)

Listen to an SWLer chase down Sputnik-1 on 20 MHz

The 60th anniversary of Sputnik-1 prompted Roger Davis G3IUZ, "to root through some ancient reel-to-reel tapes long stowed away in the loft as I vaguely recalled recording that historic occasion. I hoped the recording might have survived being, like most in our hobby, a bit of a hoarder!

"I was delighted to find that the tape had indeed survived, and further, was able to transcribe it to digital format (mp3) having acquired a vintage Ferrograph machine a year or so ago for another transcription job that came my way.

"If it is of interest, I attach the mp3 recording as transcribed straight from the reel-to-reel tape and unedited. (LISTEN: Davis's recording, at **http://bit.ly/2ybiPWs**, shows the tenacity and patience often needed to bring in Sputnik-1.)

"As far as I can recall, it was recorded originally with my homebrew tape machine built whilst doing National Service teaching at No. 2 Radio School, RAF

Oct. 7th 1957
Menlo Park, Calif.

Log of Satellite reception, Oct. 6th 1957
R.E.Leo, W6PBV
3361 Waverley Street, Palo Alto, Calif. DA 32265

Hammarlund Super-Pro Receiver
20+ Mc.
Random length antenna wire.

7:10 PM	Estimate of when Satellite would have been heard.
7:20	First heard Satellite. Strength slightly greater than that of WWV.
7:24:05	Signal went off. Aprox. 23 "beeps" in 10 seconds.
7:27:25	Signal on again.
7:29:55	Suddendly a bit louder.
7:31	Fades out.
7:37	Can hear again, very weak.
7:40	Fades out.
8:20	Unheard. Spot check.
8:40	Unheard. Beginning a new listening cycle.
8:44:10	Heard weakly.
8:50	Fades out.
8:56	Heard again.
9:00:10	Variation momentarily in beep pattern, an extra beep.
9:02	Sudden fade.
9:04	Raspy note.
9:10	Still being heard. Note better now.
9:10:55	Peak of signal strength.
9:14	Signal below noise or off. Gradual decline of strength since 9:11.
9:17:35	Heard again but weaker than before.
9:20	Slight signal peak.
9:23	Unheard.
10:28	Unheard. Beginning a new listening cycle.
10:29	Key down for about 3 seconds, twice within about a minute.
10:29:55	Sending raspy sound. The raspy sounds did not sound like transmitter
10:30:15	Off or faded out. trouble, but sounded as if they came on and off
10:32:52	Raspy note on again. deliberately. They were of a somewhat FM type as
10:34:50	Shifts over to beep-beep. the use of the BFO gave hardly any beat note.
10:38½	Fades out. Line surges caused enough receiver
10:41:45	Beep-beep on again. Loud. instability to prevent detection of
10:42:55	Very loud. Key down until next entry. any doppler shifts.
10:43:12	Has beep again.
10:45	Louder yet - S2 on meter of receiver. (Loudest previous signal S1 or less).
10:45⅝	Louder yet - more than S4 on meter of receiver!
10:50:15	Fades out.
10:53	End of listening cycle.

This Sputnik-1 SWL log was compiled by R.E. Leo W6BPV, from his listening post at Palo Alto, California two days after the Soviet satellite was launched. Leo's documentation is now among the items in a Sputnik-1 display at the Scott Polar Museum in Cambridge, England, in its International Geophysical Year 1957-1958 Exhibition. (Courtesy of Elaine Richards G4LFM, editor of RSGB's RadCom magazine)

Yatesbury. It would have been done with the microphone in front of the receiver loudspeaker. It would have been my AR88D, but I have no recollection of what aerial I would have been using—certainly nothing very elaborate. The recording is not of today's quality and is just over three-and-a-half minutes long. The distinctive regular beep of Sputnik-1 becomes clear about one minute into the recording but does go up and down a bit in the noise, as might be expected."

Arnie Coro CO2KK Remembers Sputnik

World-renowned DXer and Cuban shortwave radio broadcast personality, Arnie Coro CO2KK, was 15 years old the night the Space Age began.

"On October 4, 1957, and a few days after, we kept on several receivers capable of picking up 20 MHz, plus or minus 5 kHz" – the Sputnik-1 HF calling frequency.

"I operated several of my friends' ham stations as a 'second operator' because I had passed the Amateur Radio Operator Ministry of Communications examination.

"The radios most used were the Hammarlund Super Pro SP400, and its World War II surplus clone with an identical circuit," he recalled. "We found a Super Pro that went all the way up to 40.000 MHz, but I do not remember if we heard Sputnik-1 on or near that frequency."

He copied Sputnik-1 "many times and my amateur radio mentors recorded it on a WEBCOR quarter-inch tape recorder, hearing the satellite's 'beep, beep, beep.' Later we learned about the Doppler frequency shift and that the satellite's tumbling caused the sudden, deep fading!

"Among those involved in the monitoring were Oscar Morales CO2OM, and Michael Enciso ex-CO2CT (SK). We installed several 15-meter-band half-wave dipoles."

"Informacion," a prestigious city newspaper, wrote about Coro's Sputnik-1 experience for its many thrilled and fascinated readers.

Sputnik Teen vs. Skeptical High School Physics Teacher

Bill Jones KD7S, "most certainly copied Sputnik as a 16-year-old kid with a three-year-old General class ham radio ticket sitting on the shelf. I had a National NC-98 receiver, connected to an off-center-fed wire antenna about 35 feet off the ground and about 75 feet long.

"I reported my Sputnik monitoring to my high school physics teacher who called me everything but a liar. Later he realized the signal could indeed be heard quite well on an amateur-grade receiver and acknowledged he might be wrong, but he never apologized.

"Sometime later I brought in a shoe box full of QSL cards from every corner of the world to prove to him that long distance communication was indeed possible, even for an impoverished 16 year old."

Code Practice from Space

Bob Cutter KI0G, was at New Mexico Military Institute in Roswell during the Sputnik-1 mission. "The ham club—I was not a ham at the time—built a converter that allowed reception of the signal," he said.

"I added two more letters to my limited Morse vocabulary, H and I. Until that time my vocabulary consisted of S and O, for SOS and Q."

W6BPV Sputnik SWL Log

Martin Atherton G3ZAY received an SWL log kept by R.E. Leo W6PBV (SK) that is now on display at the Scott Polar Museum in Cambridge, England. It is part of an International Geophysical Year 1957-1958 exhibition. Atherton is a co-curator. He notes, "We also found information on 'Moonwatch' run by Fred Whipple at the Smithsonian, and on activities by Martin Ryle and Bernard Lovell at Cambridge and Jodrell Bank."

Sowing the seeds for 'Close Encounters'

"J. Allen Hynek got the call at 6:30 p.m., October 4, 1957," notes the Smithsonian Institution. "The associate director of the Smithsonian Astrophysical Observatory, near Boston, hung up and told a colleague: 'There's a Russian satellite up.'

Getting a QSL card for reception of Sputnik-1's signal from space represented a whole new frontier for communications hobbyists. Popular Electronics magazine carried a story about it in its November 1958 edition. C.M. Stanbury, II, offered SWLs tips on how to break through "the red divide" to obtain a confirmation card from Moscow. It wasn't as easy as you might think. (Courtesy: americanradiohistory.com)

"Sputnik's launch shocked the public: scientists were surprised only that the Russians did it first – earlier that year, researchers worldwide had agreed their countries would send up satellites to study the planet.

"In anticipation, observatory director Fred Whipple had summoned amateur astronomers – to be called Moonwatchers – to track any satellites. After Sputnik, 83 teams formed in 20 countries. By 1959, some 230 teams were tracking two dozen satellites. The teams' data led to an accurate measure of the Earth's size and shape.

"Cameras replaced the Moonwatchers by 1975. J. Allen Hynek, who died in 1986, went on to study UFOs. In 1972 he coined the phrase 'close encounters of the third kind'."

A special road trip to hear the USSR's satellite

Wilford "Doc" Lindsey K0EVZ, "was a high school

student from Richmond, Missouri" at the time of Sputnik-1.

"A friend drove me to William Jewell College in Liberty, where on an upper floor of the science building was a setup with twin Collins 75A4 receivers, fed from antennas on the roof at either end of the long narrow building. It was totally quiet in the radio room.

"Oh, there was some quiet chatter during the times when the satellite had left our area. Then someone would say to be quiet, and believe me, we got quiet!

"What always surprised me was how loud and clear the beeps were. They were not faint and hard to detect. No, they were quite loud and distinct.

"I will never forget the extreme excitement I felt – and still feel, in retrospect! – of hearing Sputnik for myself. I almost went to this college, but ended up going to Baylor University, Waco, Texas, for my undergraduate studies. I believe I learned about Sputnik-1 from television news and at science studies at Richmond High School.

"I happened to be in Washington, D.C., the day the brand new Smithsonian Air and Space Museum opened. I was blown away when I got to see the mock-up of Sputnik suspended from the ceiling. Our six-year-old son was along, hardly able to contain himself. To be honest, I felt the same way."

An exciting birthday present during the IGY

David Bixler W0CH writes: "Yes, I remember quite well hearing Sputnik-1 back in October of 1957. It was launched just three days before my 14th birthday.

"At the time, I was a Novice class licensee living in northern Ohio and the launch was big news at our high school. This was the IGY (International Geophysical Year) and the importance of science was being emphasized at school.

"The launch was covered on television and the newspaper, and much of the discussion was about how the Russians beat America into space!

"Sputnik's 20 MHz signal was easy to hear just above WWV's 20 MHz time signal on our family's ham station which I shared with my dad and mother – all three of us were licensed. Our station receiver was a Hammarlund HQ-140X hooked to an end-fed long wire in the garden.

"The station was located in the kitchen, so I could monitor the frequency while having breakfast and waiting for the school bus. After school, the receiver was left on the frequency during the evening and we were able to hear it many times during October."

A Sputnik-1 Surprise in Cyprus

As a National Service man from 1956 to 1958, I was employed as a Wireless Operator Class A, RAF 264 Signals Unit in Ayios Nikolaos, Cyprus, at the time Sputnik-1 was launched," writes Tom Hughes G0MYN.

"Whilst searching the bands on B-Watch for relevant

Colin Brock G3ISB, was among the first people to hear and see Sputnik-1 on its launch night in 1957. He and his colleagues tuned in from a listening post at Hillmorton, near Rugby in Warwickshire, England. (Wikimedia Commons)

Russian Morse traffic, myself and other Watch members picked up an unusual signal on 20 MHz. We duly reported it to the senior Sergeant in Charge.

"The signals, as far as I can remember, continued intermittently for several weeks. These were later confirmed to be signals transmitted from Sputnik-1. Our 'listening' compound was relatively small – about 50 meters square (about 165 feet). There were several huts and a generator mounted on a Bedford truck. Quite a large aerial farm was located a short distance from the enclosure.

"The 'Watch' system operated on a two-days on, then two off (regimen). In the summer of 1958, the complete operation was moved from Ayios Nikolaos to a permanent location in RAF Pergamos – a purpose-built station with a much larger aerial farm."

A Driving Influence Leading to Kennedy Space Center

"I was living at home in Niles, Northeastern Ohio, preparing to graduate high school. I used a Hallicrafters SX99 receiver, 40 meter dipole and heard the signal from Sputnik many times when it passed over our home," writes Dr. Don Sanders W4BWS. "I was K8AZW at that time.

"I was fortunate to have a recorder and recorded the

signal and gave several talks at school and other places about ham radio and communications both terrestrial and in space. I wish I still had those recordings, along with many items lost over the years.

"I had built my own 2-meter moon bounce station and included that in my talks. Yes, I remember Sputnik-1 well as it was a driving influence in my learning more about electronics and ultimately working 25 years in the aerospace industry, including Kennedy Space Center."

Sputnik-1 Makes the Playlist at KDEC

"In October of 1957 I was the new Chief Engineer for a small AM radio station, KDEC in Decorah, Iowa, besides being a student at Luther College," writes Don Jackson AE5K.

"I had my old, decrepit Hallicrafters S-40A in the studio during the Sputnik era and recorded a bunch of passes of the signal.

"They were later used on several local newscasts on KDEC to let people in the area hear what the Soviet satellite sounded like. Unfortunately, my S40A was so unstable on those higher frequencies that just walking around in the same room seemed to make the frequency wobble or shake. . .

"Sputnik was heard on many orbits, but my listening and recordings were done on the early ones. Decorah is located in the very northeast corner of Iowa. Reception was witnessed by several station staff members including then announcer W1AZN (SK) in addition to the public in news broadcasts of the recordings. My call at the time was W9BQC."

'It Hissed and Beeped and warbled out of focus . . .'

Leslie Gornall GI1BZT, writes, "I was playing, 7 years old, when my father, Syd Gornall, ex-RAF signals and G4OFS (SK), called me into the garden shed, a 12-foot by 8-foot structure that smelled of cedar wood, burning dust from the electric heater, solder flux, charred plastic and rubber coatings on copper wire and oily missile junk.

"Oxo tins contained bits of rocket, old motors from guidance systems in need of a rewind but containing powerful permanent magnets we extracted and played with until they chipped away to dust, and half-built electronics with valves (tubes).

"The bench was dominated by an AVO 8 analog meter and several sets of connecting black and red leads terminated in points, crocodile clips and spring-loaded grabbers, and a huge shortwave radio receiver fed with a long wire antenna to the old hornbeam tree that had such pretty leaves in the spring.

"Syd had made our TVs on this bench, writing the circuits, testing them and building sets with the best tuners. The pictures were purple and white. All the radios were 'modified.' He called me with an instance I could not resist. 'Quickly now, listen to this.'

"It hissed and beeped and warbled in and out of focus

This commemorative plaque recognizes the historic work of the Moonwatch Team in Cincinnati, Ohio from the earliest years of the Space Age. One of many units, this group's members observed and documented satellites from 1957 to 1964. "The Moonwatch Team and the Cincinnati Astronomical Society were recognized by the S.A.O. (Smithsonian Astronomical Observatory) as one of its leading teams worldwide." (Wikimedia Commons)

as the Doppler effect of motion made it difficult to 'hold' the radio on frequency. Then with hushed reverence Syd said, 'This is the Russian Sputnik. This is the most important sound you may ever hear.' It was October 4, 1957.

"'How did you know what frequency to look on?' I asked some decades later. 'Oh, that was easy,' he said. The Russians used to boast about how big the satellite was – and they used resonant antennas so if you know the length you know the frequency. Ah, yes, resonance. Life is all about resonance . . ."

Sputnik-mania: from WBOW to the Department Store Roof

"In 1957 I was a comparatively new 24-year-old ham with a shiny new Technician license – K9VMI," writes Keeth Miller N4ZZZ. "Also, I had become a member of a very active Wabash Valley Radio Club in Terre Haute, Indiana. It had a bunch of really capable old timers and men who were really hands-on builders, modifiers and operators.

"Because of the club activity, communications links were often furnished for the local chapter of the Red Cross – headed by Ellen Church, Administrator of Union Hospital and for the local district of the Boy Scouts and the local Vigo County (Indiana) Office of Civil Defense. Incidentally, in 1930 she was the first-ever airline 'stewardess,'

"I was appointed Deputy Director of Civil Defense because of my activity with the Ground Observer Corps.

"Because of (the club's Civil Defense connection, we were made aware of Sputnik-1 on the day it was put into

orbit. The word went out so several of us went to the home of Bill Siebenmorgan W9IHO (SK). We watched as he tuned to the Sputnik frequency and recorded it on tape. We rushed it to WBOW, the local AM station, so it could be played over the air for all to hear. Big time, heady stuff, at the time. The radio station played the tape several times a day for the next few days. Ham radio got some nice publicity, as well.

"After a short time, we saw Sputnik-1 on an early pass. Wow! It was hard to believe that something (about the size of beach ball) could be seen so distinctly – bright and shiny – and moving so majestically through that cloudless and silent nighttime sky.

"Since I worked at a local department store that stayed open on Monday nights, I would often take some of the other employees up on the store roof for show and tell, so others could share that wonderful experience."

Teen becomes a Radio Amateur, Thanks to Sputnik-1

"As a teenager I was mildly aware of amateur radio by visits to an unrelated 'uncle' – Ralph Cathles G3NDF who lived in Great Bookham, Surrey," writes Alan Baker G4GNX, of West Sussex, England. "He used to operate from a small spare bedroom at his QTH, but later moved into a very large purpose-built shed and, of course, his radio equipment was on display.

"He operated an old Hallicrafters S19R general coverage receiver and various homebrew transmitters. The main HF antenna I was aware of was a multi-band vertical, situated right next to an electricity sub-station cabinet, in his garden.

"One day on a visit to Great Bookham, Ralph told Dad and myself that Sputnik-1 was due to fly over. True to his word, the satellite was duly received on the Hallicrafters and I remember hearing the 'beeps,' although I wasn't aware of them as Morse code at that time.

"We visited many times after that first encounter and I think that Sputnik was the main reason for my increased interest in amateur radio and a wish to take it further.

"Ralph built me a valve (tube) TRF receiver and I heard many QSOs on it, but unfortunately not Sputnik-1, from my (then) home in southwest London. But I am forever grateful to the Russians through Sputnik-1, for inspiring my strong interest in amateur radio.

On a Personal Note . . .

In October 1957, I was a seven-year-old, newly minted SWLer at my listening post in Goose Bay, Labrador, on the Canadian east coast. My father, W3TPT/VO2, had been assigned there by the U.S. government and he brought the family along. His amateur radio station was nestled in a corner of the basement of our duplex.

I don't recall what gear he had, but there was a receiver and transmitter that were most decidedly "boat anchors." In the back yard we had a 15-meter, two-element quad nearly up to its bamboo struts in the snow.

Our area in Goose Bay was pretty RF quiet and the Sputnik-1 signal was as clear as my memory of the satellite's reception. We tuned in on several passes. The thought of receiving a man-made signal from space was almost too much for a kid to grasp. The notion of a Russian space satellite overhead scared my 11-year-old sister Mary Margaret and her friends. They were sure an attack on Goose Bay was imminent.

My experience with the first man-made object to fly in space would ultimately lead to my very own Hallicrafters S-38D multiband shortwave receiver, a burgeoning interest in the thrill of radio communications and 50+ years as a radio amateur. Sputik-1 represented the dawn of my "radio age" and a world of excitement hard to put into words.

Finis and Appreciation

Lots of shortwave listeners and radio amateurs took time to contribute their Sputnik-1 recollections for this article. They come from two major sources.

First, we thank the many people who responded to *The Spectrum Monitor's* call for their recollections of the nights of Sputnik-1.

Additionally, we give special thanks to Elaine Richards G4LFM, editor of the Radio Society of Great Britain's RadCom and Radcom Plus, **http://www.rsgb.org/radcom**, who generously shared remembrances, images and audio recordings sent to her from communications hobbyists around the United Kingdom.

General information from the beginning of the Space Age was gleaned from Paul Dickson's "Sputnik, Shock of the Century," published in 2001. In it he quotes Lloyd V. Berkner, renowned physicist and engineer, **https://en.wikipedia.org/wiki/Lloyd_Berkner**, who describes Sputnik-1 as part of the Big Picture:

"From the vantage point of 2100 A.D., the year of 1957 will most certainly stand in history as the year of man's progression from a two-dimensional to a three-dimensional geography . . . The Earth satellite is a magnificent expression of man's intellectual growth – of his ability to manipulate to his own purposes the very laws that govern his universe." And many of us were there.

TSM

Left: Dayton Hamvention members at our booth at the show included (from left) Michael Kalter W8CI, DARA Treasurer, Tim Duffy K3LR, your author and Jay Slough K4ZLE. We came "armed" with well over 1600 Hamvention-themed giveaway items, all of which were given away during the show. Right: The Icom booth also attracted its share of passersby. (Courtesy: Author)

A Visual Tour of the Tokyo Ham Fair 2017

By Keith Baker KB1SF/VA3KSF

In early September, I had the distinct honor of being an "ambassador" for the Dayton Amateur Radio Association (DARA) at the big Tokyo Ham Radio Fair in Tokyo, Japan. Our mission was to personally invite Japanese hams to join us in Dayton, Ohio, for next year's big Dayton Hamvention.

However, unlike the Dayton Hamvention, which is sponsored by a local (albeit large!) amateur radio club (DARA), the Japan Amateur Radio League (JARL), the Japanese equivalent of our American Radio Relay League (ARRL), conducts the Tokyo Ham Fair each year.

And the two venues couldn't be more different. While Hamvention recently moved from its long-time home at Dayton's Hara Arena (which is now closed) to new "digs" at the Greene County Fairgrounds in Xenia, Ohio, the Tokyo Ham Fair is held in a HUGE convention complex called the "Tokyo Big Sight." In fact, the complex is so massive that the Ham Fair occupied only one of many large convention areas at the venue. And all of it was conducted under a single, massive roof.

Needless to say, our booth at the 2017 Ham Fair was very busy. We spoke with hundreds of Japanese hams, posed with scores of them for countless pictures (and gave away all of the 1600 Hamvention "trinkets" that we brought along!) during the two-day event.

I've since learned that this year's Ham Fair attendance was somewhat increased from previous years, with over 39,000 hams from all over the world in attendance. Clearly, like the Dayton Hamvention, it's a world-class event for radio amateurs as well as shortwave listeners and scanner enthusiasts.

The Akihabara

Just prior and just after the event, members of our Dayton Hamvention team and I also visited the Akihabara section of downtown Tokyo. Called "Electric Town," it's the district in Tokyo where one can find all manner of electronic equipment being offered. On my two previous trips to Japan, there were upwards of 9 amateur radio shops located within a 3-block area within the Akihabara. However, this time, that number had dropped to only three or four, with all manner of other electronic offerings (including cell phone accessories and computers) in countless other shops in the district.

One of the largest ham radio stores in the Akihabara (called "Rocket") even has its own song that is posted as an MP3 on their website and is continuously played on speakers within the store as you visit. The song can be found at: **rocket-co.jp**. Scroll down to the photo of the old phonograph and click on "Welcome to Rocket" and then the MP3 icon. While most of the words are in Japanese, the title "Welcome To Rocket" appears a couple of times in English while the song plays.

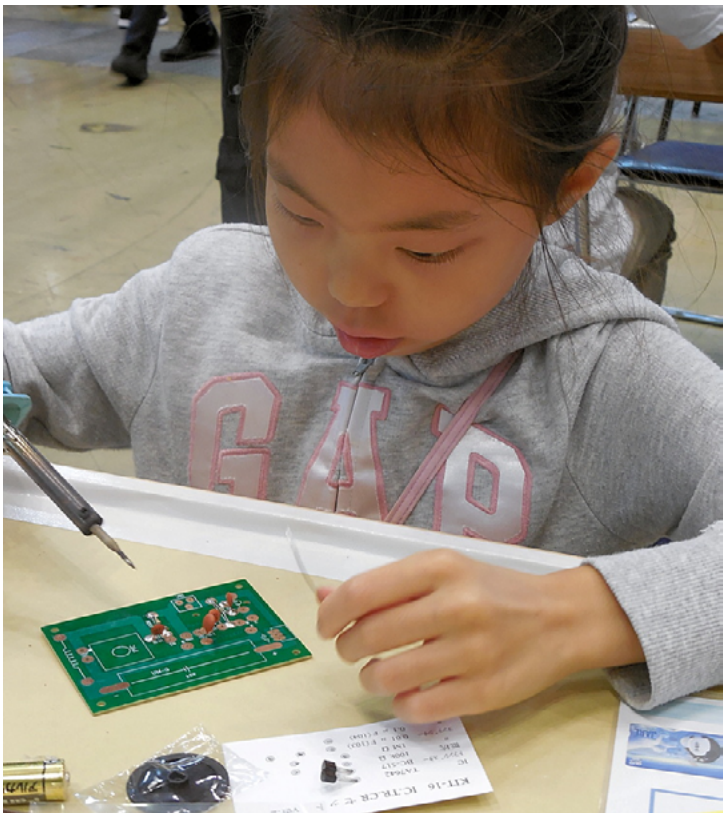
One of the other features of the Akihabara district are the numerous small electronic parts kiosks located within several of the buildings. These little vendor areas are often

One of the new radios featured at the show was the ICOM IC-9700, a VHF/UHF, all-mode, and satellite-capable radio. It features variable power output of 50W for VHF and UHF and 10W output on 1.2 GHz. Despite my questions, no word was given on price or North American availability. (Courtesy: Author)

The Alinco Radio booth at the Ham Fair. The major manufacturer booths were all located in the same general location, labeled as the "JAIA area." The JAIA, also known as the Japan Amateur Industry Association, is a consortium of major amateur radio manufacturers in Japan. (Courtesy: Author)

so small that one can barely see the proprietor tucked away behind their vast array of specialized electronic parts. In fact, these merchants are often so specialized that one will sell only electronic switches. Another offers only resistors, while another vendor's specialty is every kind of electronic plug that you can imagine. And it's all located within one or two (often multi-floored) buildings in the Akihabara.

Clearly, the Akihabara is a radio hamfest on steroids… and it happens every single day of the week! Any visit to Tokyo for a ham radio or shor-wave enthusiast should include at least one morning or afternoon of browsing around the Akihabara on your itinerary!



Clearly, the Japanese are very interested in getting their youngsters into radio construction at an early age. Here, a budding Japanese radio enthusiast assembles one of the many radio kits that were made available to youngsters in a construction area set aside exclusively for that purpose at the show. (Courtesy: Author)

Another radio featured at the show was a new receiver from AOR. Based on the information provided in the display, it will receive a number of digital modes from 100 KHz to 1300 MHz. (Courtesy: Author)

Being the AMSAT-North America Treasurer, I took some time out to stop by and visit with our Japanese compatriots at their JAMSAT booth. (Courtesy: Author)

Yaesu was well represented by its large booth at the show. (Courtesy: Author)

If this looks a lot like what many of us may remember as a Tokyo High Power amplifier (a provider that went out of business a few years back)…it is. I was also informed that another large Japanese amateur radio manufacturer…Azden…has since picked up at least one of THP's designs and is now marketing it under the AZDEN name. Again, despite my questions, I got no information on North American availably or price. (Courtesy: Author)

Hams are hams the world over…always on the lookout for a bargain! (Courtesy: Author)

Many amateur radio dealers wrap their display items in plastic so as to keep the items clean of oily fingerprints for a later, actual sale. (Courtesy: Author)

Unless you have visited Japan, you really have no idea how tightly packed their living conditions are. As a result, many Japanese hams must limit their outside antenna access to apartment rooftops and/or balconies. That's why several Japanese antenna manufacturers offer HF and VHF antennas that are designed specifically for that restricted antenna environment. (Courtesy: Author)

Your author pauses in front of one of the larger amateur radio shops (the "Rocket" store) in the Akihabara area of Tokyo. (Courtesy: DARA)

While the Rocket store caters primarily to amateur radio enthusiasts, the scanner and shortwave listener's equipment needs are also well addressed in the Rocket Store's offerings. (Courtesy: Author)

Throughout the Akihabara section of Tokyo, I found the prices for equipment …even those so-called "tax free" prices for export…were significantly higher than those of the North American market. As the Japanese Yen is now running at about 100 Yen to the US Dollar, I found a quick cost comparison could be made simply by dropping the last two zeros in the advertised Japanese price. (Courtesy: Author)

All manner of VHF/UHF hand held radios are available in Tokyo's Rocket store. However, I did not see any Chinese handhelds (such as the very popular Baofeng radios that we can buy here in the USA and Canada) on the shelf. (Courtesy: Author)

The more expensive amateur base stations were also on display at the Rocket Store in Tokyo's Akihabara. (Courtesy: Author)

Clearly, a walk through the Akihabara section of Tokyo should be on every ham radio and shortwave listener's itinerary when they visit Tokyo, Japan. (Courtesy: Author)

TSM

Digitech AR1780 (K4SWL photo)

TSM Reviews: Digitech AR1780

By Thomas Witherspoon K4SWL

Earlier this year one of my readers in Australia noted the addition of the Digitech AR1780 to the product offerings of the Australia and New Zealand-based retailer Jaycar.

One thing I've learned over the years is that there are few in-country sources of shortwave radios in both Australia and (especially) New Zealand. Jaycar, in a sense, represents what Radio Shack and The Source have offered in the US and Canada—a more accessible electronics retailer with some shortwave radio selection.

Jaycar sells radios badged with the name Digitech. Unfortunately, none of Jaycar's recent additions—and there have been a few—have been enormous hits among serious radio enthusiasts. The company currently offers five Digitech models: the AR1736 ($18.95 AUD), AR1721 ($25.95 AUD) AR1748 ($129.00 AUD), AR1945 ($159.00 AUD), and now the AR1780 ($129.00 AUD).

The Jaycar models are either very cheap sub-$30AUD digital portables, or pricier large portables with a form factor similar to the Grundig S350DL and S450DLX, or the C.Crane CCRadio-SW. The new AR1780 fits somewhere between—a compact portable that promises a compliment of features tailored for the radio enthusiast.

In this review, we'll take a close look at the AR1780, starting with its feature set.

Features

What appeals to me about the Digitech AR1780 is the amount of features provided by such a compact, traveller-friendly form factor.

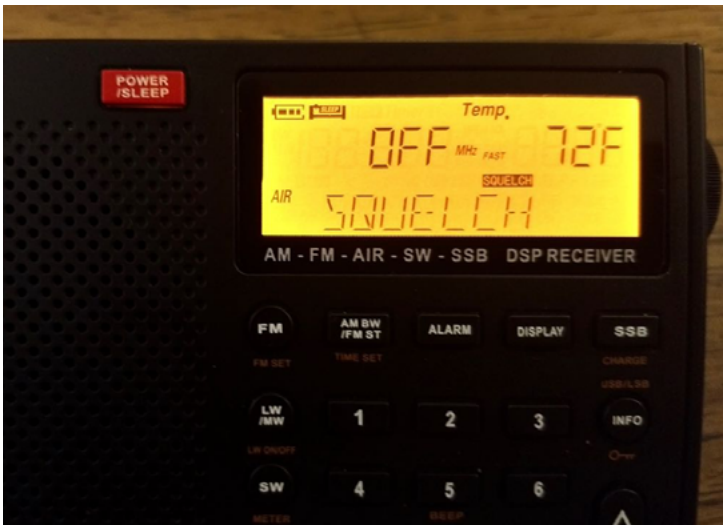
Here's a comprehensive list of the AR1780's features and specs:

Frequency coverage:
- FM 87.5 - 108 MHz
- MW 522 - 1620 kHz or 520 - 1710 kHz
- SW 1711 - 29,999 kHz
- LW 150 - 450 kHz
- AIR 118 - 137 MHz

Modes:
- FM (including RDS)
- AM
- Single Sideband

Selectable Bandwidths:
- AM mode: 6, 4, 3, 2.5, 2, & 1.81 kHz)

FM RDS information has a dedicated scrolling line on the back-lit LCD display. (K4SWL photo)



Squelch is engaged by pressing and holding the tuning knob on the right side of the display.. (K4SWL photo)

- SSB mode: (4, 3, 2.2, 1.2, 1 & 0.5 kHz)

Convenient features:
- Sleep timer
- Clock/Alarm
- Thermometer
- Signal strength meter
- Squelch control
- Voice/Music selectable audio filter
- Dedicated fine tune control
- Headphone jack (3.5 mm)
- Key lock button
- Key beep on/off
- Tuning knob and tuning step up/down buttons
- Display button cycles through alarm, time, temperature, and signal strength
- FM mono/stereo selection
- Backlight button
- Selectable 9/10 kHz regional MW tuning steps
- Flip-out backstand

Power source: 7 VDC or 4 x AA cells (not included, can be internally charged if NiMH cells)Antenna: Built-in telescopic and 3.5mm socket for external antenna
Weight: 253g/0.56 lbs (excluding batteries)
Dimensions: 150(W) x 95(H) x 30(D)mm

Operation Manual

The Digitech AR1780 ships with a small user manual. In fact, other than the hand strap, the user manual is the only additional item in the box besides the radio itself.

The manual is quite thin—slightly smaller in height and width than the AR1780—and only contains about eight front-and-back mini pages. Although readable, it's littered with grammatical and punctuation errors. While a manual is certainly a welcome reference item with this feature-packed radio, this manual comes up short, lacking detailed explanations of features and even leaving some out altogether: it does not, for example, offer any explanation on the use of the excellent squelch control, nor does it fully explain the station memory set on multiple memory pages—! Rather unfortunate, as these features deserve a clear explanation.

First Impressions

I really appreciate the modest, portable form factor of the AR1780, so it had that going for it before I even opened the box. I travel with portable radios a lot, so the compact body of the AR1780 is very appealing. It's not as compact as the C. Crane CC Skywave series, or the Grundig G6, but is much smaller than my Tecsun PL-660 and PL-880, or my Sony ICF-SW7600GR.

Unlike the radios mentioned above, the AR1780 does not include some sort of protective case or bag. I believe this is an omission for a radio aimed squarely at the traveler.

Fortunately, the plastic chassis of the AR1780 feels substantial enough. With the key lock engaged, the only likely problem that could arise from having no protective case is damage to the display, such as scratching.

The buttons all have a tactile feedback and seem to respond quickly enough, save powering up the radio, engaging the SSB mode, or changing bands, each of which takes a couple of seconds to engage.

I especially like the fact the AR1780 has, on the right, a dedicated multi-function tuning knob. One can turn the tuning knob to scan frequencies or press it to cycle through fast or slow tuning steps (or to turn off this knob's function entirely).

The AR1780 also has a dedicated fine tune control—a tuning wheel just beneath the main tuning knob also on the right side of the radio. The only odd quirk about this is that this is where most radios have a volume control. Being a creature of habit, many times I've inadvertently shifted frequencies when I simply wanted to turn up or down the

Like many DSP receivers, the AR-1780 can display the temperature in Celsius or Fahrenheit. A handy feature when camping! (K4SWL photo)

Both the main tuning encoder and the Fine Tune control are on the right side of the AR1780. (K4SWL photo)

volume! The volume control, meanwhile, is in the same position on the left side panel of the radio between the antenna and earphone jack.

Speaking of volume, the AR1780 can provide plenty of it-—almost room-filling audio—via the internal speaker. Best yet, I like its balanced fidelity: mellow, with notes of bass, but ample treble when listening at moderate volume. The audio response curve is almost ideal for such a small package.

Something else worth noting: the AR1780 fits nicely in the hand. In general, it's a great size for portable listening.

On the downside, however, one negative I noted shortly after beginning use: muting between frequency steps. In AM mode, this is not as distracting as in SSB mode. Muting makes band scanning a more tedious and fatiguing experience. Unfortunately, in this era of DSP-chip-based receivers, it seems muting has resurfaced.

Also, as with many other DSP portables, you can often hear "input" noise when pressing buttons. In other words, if while listening to one frequency I decide to key in another, I'll hear a little clicking or buzz in the audio as each button is pressed. This is a very minor annoyance since it only happens when buttons are pressed, nonetheless, I thought it worth mentioning. I often wonder if it's a result of poor shielding, something from which similar models suffer.

Performance

Over the past two weeks, I've had the AR1780 on the air almost every day. I've compared it with a number of receivers, but mainly The C. Crane CC Skywave, The County-Comm GP5-SSB, and even the Grundig G6. Below, I break down my notes by band.

AIR band

Let's start with the "bonus" band: the VHF aviation band. I'm sure there a number of readers who'll never use this band, but I am not one of them. Personally, I really enjoy listening to aviation traffic, especially when I travel by air. Since the advent of the AIR band on ultra-compact radios, I no longer feel like I have to lug an additional scanner or receiver just to listen to the local air traffic control; that's a plus.

Performance-wise, the AR1780 seems to be equal with the CC Skywave on the AIR band. Like the CC Skywave, the AR1780 has a squelch control—a fantastic feature, indeed. Simply tune the radio to your favorite aviation frequency, press and hold in the tuning knob on the side, and then use the tuning knob to adjust the squelch level. I find level 3 or 4 works well.

Note that unlike the squelch on the CC Skywave, the squelch control on the AR1780 actually carries over to the shortwave band. If you have squelch set on the AIR band, then switch to another band where squelch isn't needed, you will need to turn it off. I never use squelch on the shortwave or mediumwave/AM bands; normal fading (QSB) can trick the squelch to open and close while tuned to a frequency.

Another convenient feature: press and hold the AIR button to start an automatic scan of the entire band. It'll run through the AIR band once, saving any active frequencies. This is an ATS feature, so only makes one pass. I wish you could set it to continuously scan the aviation band in a loop, much as a traditional scanner would.

FM

The AR1780 does a fine job on the FM band. It easily received my benchmark FM stations and even decoded the RDS from one broadcaster about 110 miles from my home base.

What's more, the internal speaker is exceptional at handling music—reasonably full fidelity given the limitations of the speaker size.

Longwave/Mediumwave

I'll be the first to admit that longwave is not an easy band for me to evaluate. Here in North America, there are so few opportunities in the summer to log trans-Atlantic longwave stations. Indeed, unless I'm traveling to New England or the Canadian Maritime provinces, I never try to do so on a portable. I leave TA longwave DXing to my SDRs and tabletops back home where I can listen with the assistance of

Unlike most portables, the AR1780 volume control is on the right side of the radio. (K4SWL photo)

Very pleased the AR1780 uses standard AA cells. Note that the frequency coverage silk screened on the back stand is incorrect. (K4SWL photo)

a large antenna.

But when I travel to Europe, longwave is a must, so my travel radio needs this capability. Based on my ability to receive benchmark LW airport beacons, I'm going to assume the AR1780 will do a fine job receiving European longwave stations while in Europe.

Likewise, the AR1780 should serve you well for both daytime and nighttime reception on mediumwave. Fortunately, switching between 10 and 9 kHz steps is simple: with the radio powered off, simply press and hold the "0" button to toggle between these steps.

On longwave and mediumwave, you can also use SSB mode (both upper and lower sideband). This could come in handy to reject adjacent signal interference on MW.

Likely an oversight on the part of the manufacturer, you can even engage the squelch feature, though why you would on LW and MW, I'm not sure.

Of course, with the fine-tuning control, you can navigate both bands in 1 kHz steps should you desire.

In short: the AR1780 is adequately sensitive on mediumwave and likely on longwave, as well. I wouldn't rely on it for any serious DXing, but for a travel radio, it will serve you well.

Shortwave

Being first and foremost an avid shortwave listener, I spent the bulk of my AR1780 evaluation time on the shortwave bands and I'm overall very pleased with its performance.

In almost all of my comparisons on the shortwave bands, the AR1780 had a slight edge over its competition, namely, the CountyComm GP5-SSB, the Grundig G6, and the C. Crane CC Skywave.

To be clear, though, it was a very slight performance edge which I think may be attributed to the fact the AR1780's telescopic antenna is longer, giving it a bit of gain over its competitors. For example, the AR1780's antenna is about 17.7 cm (7 inches) longer than that of the smaller CC Skywave.

Still, placed on a table and not held in the hand, the AR1780 was able to pull in weak signals better than its competitors. I also compared it with the Tecsun PL-680—one of my most sensitive shortwave portables—and, not surprisingly, the PL-680 outperformed the AR1780.

Again, I should stress that the sound from the AR1780's internal speaker is more pleasant to listen to for extended periods than that of its smaller competitors.

SSB

Single sideband reception on the AR1780 is pretty impressive for a radio in this price class. On my particular unit, I found that the fine-tuning control was almost always needed to budge the frequency a few tenths of a kilohertz, even when I knew a particular signal was exactly on frequency. My Grundig G6 always had the same problem—indeed, sometimes in SSB mode, I had to listen "up" as much as 2 kHz on the G6.

The fine-tuning control works very effectively in SSB mode, nonetheless. Audio is quite pleasant, although the noise floor is not quite as low as it is on my larger portables like the Tecsun PL-680, PL-880, and S-8800. In my comparison tests, the AR1780 was slightly more sensitive than the CountyComm GP5-SSB, and about equal to that of the Grundig G6.

In short? SSB is a welcome, capable addition on this compact portable.

Summary

Every radio has its pros and cons, of course. When I begin a review of a radio, I take notes from the very beginning so that I don't forget my initial impressions. Following is the list I've formed over the time I've been evaluating the Digitech AR1780:

Pros:

- Display is clear and easy to read
- Time is always present via display button
- RDS info scrolls on lower line
- Backlit display easy to read

- Viewing angle good, save from top
- Dedicated fine-tuning control (even on FM)
- External antenna jack
- 9/10 kHz selectable MW steps
- Time set is simple
- Adjustable bandwidth in AM and SSB
- Decent battery life from four standard AA cells
- Audio from the built-in speaker has better fidelity than other radios in this size

Cons:

- No bag or carry case
- DC input voltage is an odd 7V
- Muting between frequency changes, especially annoying in SSB
- Sometimes keylock activates backlit display permanently
- Scan function on AIR band doesn't loop, it's an ATS pass only
- My AR1780 had incorrect information on the back regarding frequency coverage
- Minor: sluggish response when switching bands or modes

Conclusion

Is the Digitech AR1780 worth the price? I think so. For $129.00 AUD (roughly $103 USD), you're getting a full-featured radio that is, by and large, a pleasure to operate. It has its quirks, but so do so many ultra-compact portables in this price bracket. It's certainly worth considering if you live in Australia or New Zealand. I'd like the AR1780 to be a little more refined:

- No muting while band scanning in AM or SSB modes
- A proper scan function to accompany squelch on the AIR band
- Squelch that doesn't carry over when bands are switched

What I do think is impressive for this price:

- Overall smooth audio from the internal speaker
- Dedicated external antenna port
- Dedicated tuning and fine-tuning controls
- Useful screen which displays time and even RDS information
- Sturdy, relatively long telescoping whip antenna

These are features that make the AR1780 stand out among radios in its price class.

Is it a benchmark performer? No. But it does the job rather well for the price, and frankly, I think I'll use this during travel occasionally, even though I have several other smaller portables.

Why? Well, for one thing, this radio has better audio fidelity from the internal speaker than most of my ultra-compact portables. When I'm in a hotel and listening to a local radio station or even a shortwave broadcaster that's punching

Comparing size: The Tecsun PL-680 (top), Digitech AR1780 (middle), and the C. Crane CC Skywave (bottom). (K4SWL photo)

through typical hotel RFI, I'll appreciate the richer, mellower audio. Many of my smaller portables are lacking in this respect, thus I usually end up listening through headphones.

In fact, the only thing this little receiver lacks for us here in North America is NOAA weather/Environment Canada radio frequencies—but it's no wonder it's not included, as it was never intended for this market. But I'm glad the step size on the AM broadcast band can be switched to our 10 kHz spacing, which makes it useful here in North America.

In short, the AR1780 has exceeded my expectations—though admittedly, it may be because it was my first experience with a Digitech radio and I had heard so many lukewarm reviews of previous models.

Regardless, I'm happy I paid a small premium to order this little rig from Down Under.

If you're a radio enthusiast in Australia or New Zealand who wants the best performance in a portable, and doesn't mind a larger radio, then do splurge for the Tecsun PL-660, PL-880, or Grundig Satellite. There is a dedicated Tecsun distributor in New South Wales (**https://www.tecsunradios.com.au/store**) and there are always, of course, retailers on eBay and one of my favorites, Anon-Co (**http://www.anon-co.com**) in Hong Kong.

And if you'd like to order a Digitech AR1780 outside of Australia or New Zealand, you can purchase from this eBay seller, as I did: **https://goo.gl/pa1QbL**

TSM

Inside the current DX cabin at Lemmenjoki looking at the older cabin used from the 1980s. (Photo: Chrissy Brand)

The European DX Council at 50

By Chrissy Brand

Established to foster close contact with other DX organizations throughout the world and to improve contacts between DX listeners, radio stations and other organizations in the field of radio and telecommunications, EDXC still thrives in 2017.

It was 50 years ago, in 1967, that the first conference of the European DX Council was held. The EDXC, an organization of leading DXers, is still going strong after all these decades. This is testified by the continued success of its annual conference and through the projects and information sharing that it still carries out.

1967, a Summer of DX

The EDXC came into being through the dedication and enthusiasm of a small group of European DXers. Much credit must go to Norwegian Ellmann Ellingsen, who proposed the idea in 1966. He suggested basing a European-wide DX body on the model that had been used to form the Council of Europe (the continent's human rights legislator).

In the mid 1960s, with the DX hobby at the height of the golden age of shortwave, this need for an umbrella organization was recognized by several of the keenest European DXers. There were thousands of medium wave and shortwave broadcasters operating worldwide and a huge number of DXers. I often feel in that era, to some degree, shortwave was the equivalent of what the Internet is today. There were hundreds of millions of people across the globe who relied on AM radio for their news, information and entertainment. Among those were the many individuals who pursued the technical challenges. These DXers specialized in hunting out distant signals, more likely to try to hear low-powered tropical stations than the big hitters of the international broadcasting world such as the VOA and BBC.

And so it came to pass that, in order to strengthen ties between fellow DXers and the radio stations, the idea of a European-wide DX organization was born. Many national radio clubs were already well established (such as the Danish Short Wave Club International) and the formation of the EDXC enabled these to come together as a stronger lobbying and information sharing entity. DXers could use the forum to share news, tips more widely than before, as well as to take the chance to meet socially. Simultaneously, a more powerful single voice could liaise with and speak to the broadcasters about what was, after all, their main listening audience.

On the 3rd and 4th of June, 1967, DXers met at the home of Anker Petersen in Skovlunde near Copenhagen, in order to decide exactly what form this DX body should take. The countries of Denmark, Finland, Germany, the Nether-

Some of the ten participants on the terrace in Skovlunde in 1967. From left: Ellmann Ellingsen (Norway), Kaj Bredahl Jörgensen (Denmark), Heinrich Kobsch (Germany), Göran Svensson (Sweden) and Anker Petersen (Denmark). (Photo: Anker Petersen)

A group photo of the 1968 EDXC Conference, with most of the 13 participants from six countries. (Photo: Anker Petersen)

lands, Norway and Sweden were represented. The gentlemen present (and it was only males, with no females at that stage) at this historic occasion were Torre Ekblom (Finland), the late Heinrich Kobsch (the Federal Republic of Germany), the late Wouter Franken, Bob Grevenstuck and Maarten van Delft (The Netherlands), the late Ellmann Ellingsen (Norway), Claës-W. Englund and Göran Svensson (Sweden), Kaj Bredahl Jørgensen and Anker Petersen (Denmark).

As well as regular meetings, the EDXC set up a number of committees that helped to standardize key elements of the hobby. These included a Reception Report Committee, which, over several years, consulted with DXers and broadcasters to ascertain what information and format worked best when hobbyists requested QSL cards from broadcasters' engineering departments. The other committees set up covered a wide range of related topics and were labeled technical, land lists, contests, statutes and information.

The Conferences

A key part of the EDXC has always been its annual conference. These provide an exciting opportunity for hobbyists (and their significant others) to meet and discuss developments in the world of radio. Topics other than radio are also merrily thrown into the mix as well, and a lively social program is arranged for each conference. This comprises sightseeing, cultural events, visits to radio stations and transmitter sites plus much eating, drinking and partying for those who want to indulge.

Due to the wonderful diversity of the many European countries (there were over 50 at the last count), each conference is inevitably unique. Even if an EDXC conference has been held in a country before, then there are always different regional and local customs and delicacies to discover.

The 50 conferences have been held in Finland the most often (six times), Denmark (five), with France, Germany and Sweden hosting four each, so far. They have been held all over the Europe and even beyond. In 2010, it took place in the Turkish capital of Ankara, when it was hosted by TRT, the Voice of Turkey; in 1993 it was in the Canary Isles. Eighteen different countries have played host over the decades, from Bulgaria to Portugal and from the Czech Republic to the Republic of Ireland.

I had wanted to attend for several years but it was only when my children became independent and I could financially and emotionally afford to go, in 2014, that I dipped my toe into these wonderfully warm waters.

An important part of each conference, in the little downtime that I have is, of course, scanning the FM and AM dials to tune to radio stations in languages and dialects that are often new to me. Highlights for me included a YLE sign-on that I heard daily in Tampere in August. This was at 0555 local time and consisted of a few minutes of ducks quacking followed by the YLE interval signal.

In Saint Petersburg in 2015, I was amazed by what seemed an unholy radio alliance between Christian Orthodox Pravoslavnoye Radio and communist station Radiogazeta Slovo. They share a studio and a frequency! I experienced this in perfect listening conditions. Sitting on a sofa in the spacious hallway of Saint Petersburg DX club member Omar Cheishvili, I had a lovely view of the large suburban garden in its autumn colors. I was surrounded by about 15 vintage Soviet radios, all lovingly restored by Omar. He tuned two of these, one at each end of the room, to 828 kHz and I was regaled by powerful speeches broadcast live on Radiogazeta Slovo booming out with deep resonance. It was a full Soviet Union radio experience but without any of the discomfort or persecution.

The 2014 conference, held in the French mountain village of Tende and the city of Nice, was my first. In Nice we visited to two community radio stations, Radio Chalom and Radio Chretiennes de France. Sessions at that conference

Some of the delegates in Tampere, Finland, at EDXC 17. (Photo courtesy: FDXA)

included a presentation of the radio scene in New Zealand and the South Pacific, given by David Ricquish who runs the Radio Heritage website; DXing on a cruise ship in the Caribbean, which was the enjoyable task of Anker Petersen. The history of Radio Monte Carlo was presented by local host Christian Ghibaudo; and Roberto Pavenello and Dario Monferini described their 2013 visit to dozens of Brazilian radio stations.

I was proud to be the local organizer for the 2016 conference, which was held in my then hometown of Manchester. As well as showing off the heritage of the world's first industrial city, I was pleased to be able to talk about the many community radio stations that are based in and around Greater Manchester. There are more than in any other UK city and we enjoyed a visit to one of them, Gaydio.

The 2017 conference took place in August in the Finnish city of Tampere. It was organized by the Finnish DX Association and the Tampereen DX-Kuuntelijat, who were celebrating their sixtieth and fiftieth anniversaries respectively. Around 120 delegates enjoyed a packed conference program and busy social calendar thats included a talk on and visit to Pipsalan Radio (a low-powered station in Tampere heard on FM and medium wave). YLE correspondent and top Finnish DXer, Mika Mäkeläinen spoke on how to obtain QSL cards from Chinese radio stations. He interacted through FaceTime with Chinese presenter, Liu Hengyi, from Anhui Radio. Jon Hudson gave the latest news about SDRplay Ltd, of which he is a director, and their RSP products. Jukka Kotovirta is an FM DXer and rounded up the 2017 summer season FM, including some new research on Sporadic E.

The conference is a fun and sociable affair, with enough delegates' significant others in attendance to warrant the running of a separate social program. In 2017 there was also an optional road trip to Nordkapp in Norway. It was organized by this year's local host and former EDXC Secretary General, Risto Vähäkainu.

A total of twelve of us hit the road north to Lapland, seeing some beautiful landscapes of forest, lakes and coast along the way. We also stopped off at the NRK and YLE Sami stations and paid a visit to FM DXer, Lars Lahti. EDXC Assistant Secretary General, Jan-Mikael Nurmela, told me that, as far as it is known, Lars is the world's northernmost serious FM DXer. Other highlights included a visit to Scandinavian Weekend Radio and the legendary DX cabins at Lemmenjoki and Aihkiniemi. SWR started as a free radio station before gaining a license in 2000. It broadcasts for 24 hours on the first Saturday of each month. The frequencies used are 94.9 MHz on FM, 1602 kHz on medium wave and shortwave frequencies of 5980, 6170, 11690 and 11720 kHz.

Although fewer international broadcasters take part in the EDXC Conferences than once did, broadcasters in general are still well represented. Smaller, community radio stations are eager to talk about their organizations. A good example of this was at the EDXC 2016 Conference in Manchester, where Ed Connole, manager at community station ALL FM gave a presentation. ALL stands for the Mancunian suburbs it broadcasts to, Ardwick, Levenshulme and Longsight).

At the 2015 conference in Saint Petersburg, Russia, university station Radio Bonch interviewed some of the delegates. This included EDXC Secretary General Kari Kivekäs and that year's conference host, Alexander Beryozkin. Radio Bonch is named after Russian radio pioneer MA Bonch-Bruyevich. Housed in the St. Petersburg Bonch-Bruyevich State University of Telecommunications, the station made and aired a program devoted to the EDXC conference, which went out on a loop on 1593 kHz for several hours. However, my favorite station in the city was the enchanting Detskoe Radio children's station, with stories and fairy tales by day and chill-out music overnight.

EDXC Secretary General Kari Kivekäs being interviewed on Radio Bonch at EDXC 2015. (Photo: Chrissy Brand)

EDXC at 50

I can happily report that the EDXC celebrated its 50th anniversary in a healthy condition. Currently, its three main aims are: to achieve common objectives to support the European DX-listeners; to advocate the interests of European DX-listeners and DX-Clubs in international organizations in the field of radio and telecommunications; to support an annual EDXC Conference as the venue for European DX-listeners, DX-Clubs and others interested in the DX-hobby.

Other aims are: to promote co-operation between European DX listeners and between European DX organizations; to establish and foster close contact with other DX organizations throughout the world; and to improve contacts between DX listeners, radio stations and other organizations in the field of radio and telecommunications.

The EDXC has had thirteen secretary-generals over the past 50 years, with representatives from Denmark, Finland, Germany, Hungary, Italy, Sweden and the UK. Since 2013, the posts of Secretary General and Assistant Secretary General have been held by two Finns, Kari Kivekäs and Jan-Mikael Nurmela. The EDXC member organizations still consist of many national and regional radio clubs, including the Saint Petersburg DX Club in Russia, the Rheine-Main Radio Club in Germany and the British DX Club.

The conference typically takes place for three or four days and is packed with presentations from leading DXers, broadcasters, scientists, manufacturers and academics. People come from further afield than Europe, for instance, veteran DXer Toshimichi Ohtake from Japan is a regular. I would encourage North American DXers to join us in 2018! The location will be decided by a vote from member organizations. There have been three bids from representatives in Monaco, San Marino and a joint one from Bratislava and Vienna. Come to an EDXC conference where friendships are formed and renewed and delegates leave with happy memories of places that they might not otherwise have visited.

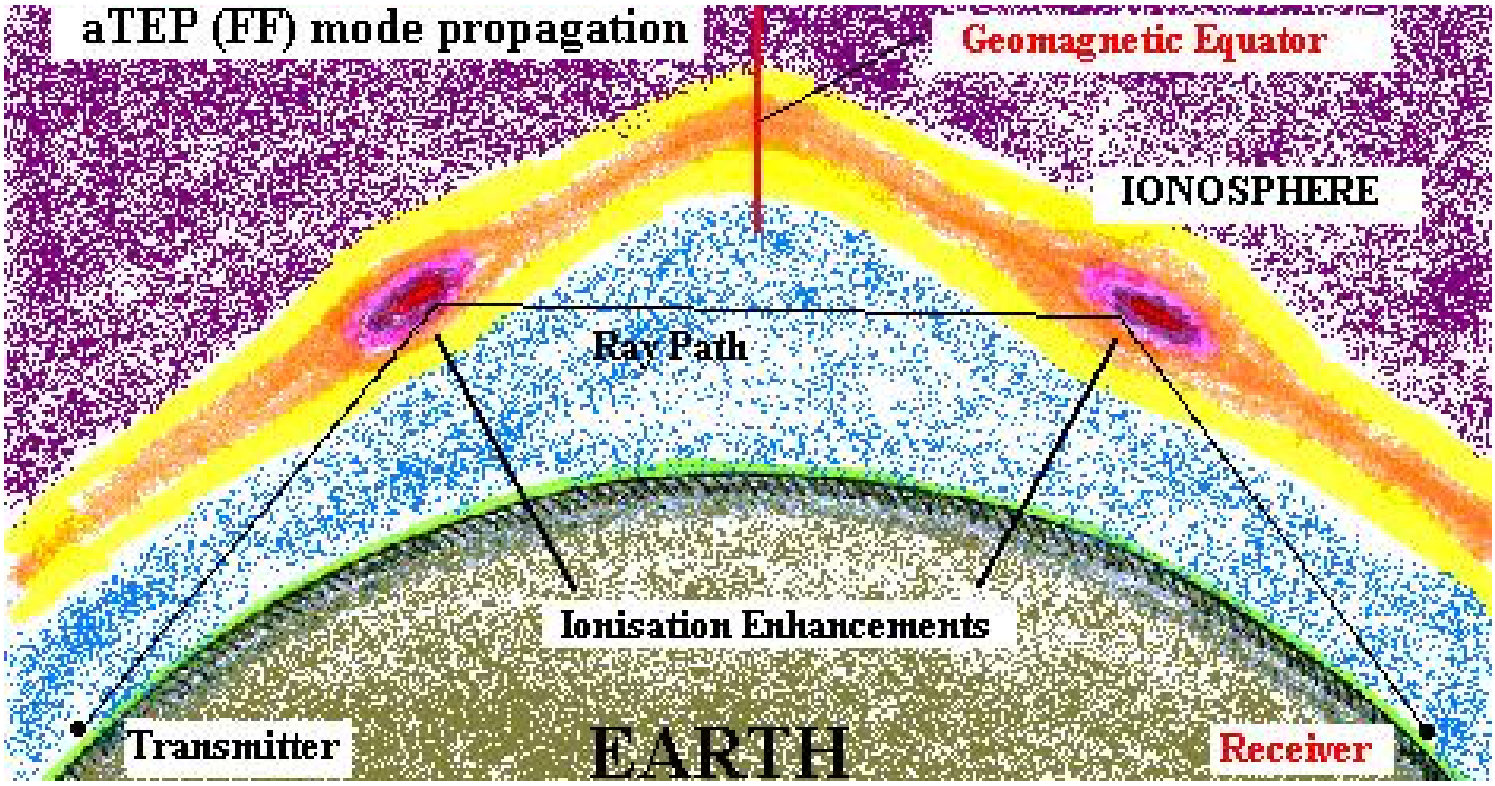
With grateful thanks to those pioneers who set up the EDXC and especially to: EDXC founding member, Anker Petersen, who was also a key member of the DSWCI (Danish Short Wave Club International), which was founded in 1956 and folded in 2016. Since 1973, Anker has published the annual Tropical Bands Survey and Domestic Broadcasting Survey.

EDXC website and blog: **https://edxcnews.wordpress.com**

About the author:

Chrissy Brand has been a DXer since the 1970s. Her career has included posts at the BBC World Service in London and the Royal Northern College of Music in Manchester. Chrissy is a freelance writer and researcher. She edits the monthly journal of the British DX Club, ***Communication****, and is a columnist for UK monthly radio communications magazine,* ***RadioUser****.*

TSM



(Graphic copyright Space Weather Services, Commonwealth of Australia 2017, Bureau of Meteorology, used with permission)

Trans-Equatorial Propagation: Pillows in the Sky

By John Piliounis SV1OCS

Growing up in Greece means that you are continuously exposed to a cultural canvas of untold length and a beginning lost in the millennia. At the late 20th century, as a part of this canvas, there was identified a very prominent poet, unrecognized by the cultural elite of his time, named Nikos Kavadias. He was a navy-trained radio operator who spent most of his life on huge commercial ships mostly sailing on routes to the southern seas.

During that time he managed to compile three poem collections of exceptional quality[1]. One of his best-known poems is, "The Southern Cross." When you read it you feel a lightning wave enveloping all of your existence. From the first time that I read his poems, it became an obsession of mine to see that Southern Cross some day in real life.

My professional life in electronics, informatics and radio communications one day led me to read a PhD thesis of a very productive and noble professor on communications at the University of Athens, Dr. George Stefanou, who is now retired.

His thesis of 1981 [2] was focused on the study of a special kind of radio propagation between Earth's northern and southern hemispheres, called Trans-Equatorial Propagation, or TEP. A couple of years ago, due to business traveling to South Africa, for the first time in my life I had at last the opportunity to enjoy the spectacle of the Southern Cross continuously for many nights. I also had the opportunity to again study that PhD thesis while enjoying the "Southern Cross" and other poems of Kavadias and some exceptional red wine of the Zevenwacht winery.

Magic Channel

It is known that most of RF communications at VHF happens between different locations in line-of-sight propagation, or more rarely, either through the E or F2 layers' ionospheric refraction during periods of intense sunspots, or through tropospheric ducting. But Mother Nature has it that VHF communication links also happen between symmetrical locations to the geomagnetic equator. Propagation of this type has been named Trans-Equatorial Propagation (TEP).

TEP ionospheric-assisted RF propagation was first observed in the late 1940s and through the 50s due to experimental activities by radio amateurs.

During 1957 and 1958 hams had communicated via the TEP link from Limassol, Cyprus, to Pretoria. South Africa. Ground stations at a distance of more than 4000 km, up to 7000 Km, at quasi-symmetrical locations (found on both sides of the geomagnetic equator), can communicate via TEP due to ionospheric-assisted reflections of a special type, without any ground reflection happening in the middle.

The time patterns of those communication windows are heavily dependent on the time of the day and on the seasonal window. Geomagnetic Equator is a zone around earth, with seasonal dependence regarding its zonal shape and its posi-

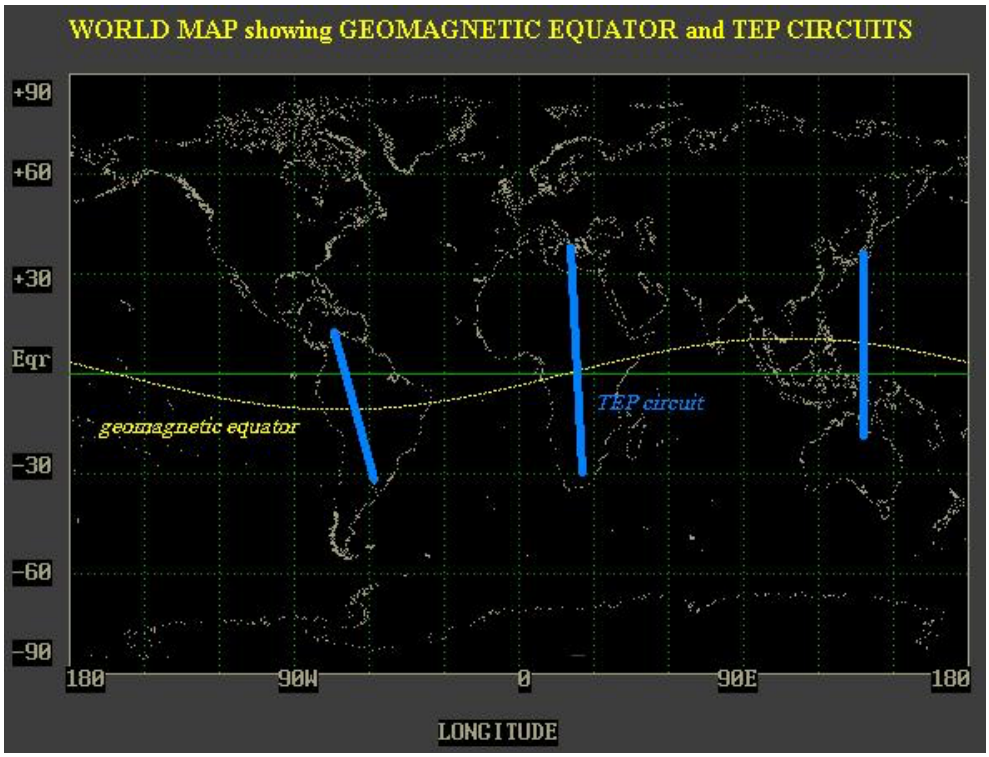
tion regarding the geographic equator. Exactly on the geomagnetic equator, the magnetic inclination of a compass's needle is zero.

TEP communication announcements were initially confronted with skepticism due to the fact that VHF frequencies were beyond the MUFs in the one-hop ionospheric propagation method. In a few years, TEP propagation had already caught the attention of many research centers and eventually became a well studied and recognized ionospheric method of linking stations between northern and southern locations on the Earth's hemispheres, symmetrical to the geomagnetic equator.

How it Happens

TEP links happen due to ionospheric plasma concentrations that are pillow-shaped, at a height of about 400 km above earth's surface, that reflect/refract the RF waves from north to south and vice versa. These "pillows," according to the local shape of the magnetic equator, can be located below and above the geomagnetic equator (see graphic on previous page). So, one station's broadcast reflects on the first pillow towards the second pillow and from there to the other station.

Studies of this phenomenon have shown that, during periods of intense solar activity, the TEP channels are more readily available. The channel of the TEP link is heavily dependent on the shape of the magnetic equatorial distribution in a zone of plus or minus 15 degrees latitude. During daytime, the most intense ionospheric propagation happens between 12:00 and 18:00 local time, at high-HF and low-VHF (30 MHz to 80 MHz). This is known as "afternoon TEP." During evening ("evening-TEP") channel links move to higher frequencies, up to low UHF, but with distortion and signal fading. For the American continental region, the geomagnetic equator is found at the south of the geographic equator, while for Africa and Asian continental regions above, at the north of the geographic equator. The annual pattern of TEP is more intense from September to April,



(Graphic copyright Space Weather Services, Commonwealth of Australia 2017, Bureau of Meteorology, used with permission)

while during the summer period the intensity of the phenomenon is, in general, weakened, becoming more intense at about 15:00. Times are always considered to be local times.

The TEP phenomenon, or anomaly as it is frequently called, is not linear in nature. Although we already have a lot of experimental data from over six decades of studying it, there are no certain patterns of its behavior for either predicting its presence or its strength accurately. The Sun's activity at large, and geomagnetic zone's seasonal and diurnal alterations strongly affect TEP's link channels. With some experimentation between radio amateurs or radio professionals, the specific period's TEP profile can be revealed and one can take full advantage of its presence as a communication channel.

Questions about the nature of TEP have lead many research teams and universities around the globe in detailed study of it via design, construction and the use of very clever scientific instruments and methods. One such research effort was very successfully carried out for many years from a research team of professors and PhD students of the Physics Department at the University of Athens (UoA) during the late 1970s and early 80s.

TEP Study's Equipment

The PhD thesis of professor Stefanou, mentioned at the beginning of this article, is a very detailed and thorough study of TEP. It is of great scientific and technological value due to the innovative design approaches employed. That study on TEP was carried out based on the analysis of the data collected from TEP links between Athens –UoA and Penteli mountain observatory locations, and Salisbury, today known as Harare, the capital of Zimbabwe, then known as Rhodesia. Equipment that was operating as both transmitters and receivers, installed at both places, and the experimental procedure was a combination of the backscatter and the forward-propagation methods. The study took place during equinoxes and a period of low Sun activity.

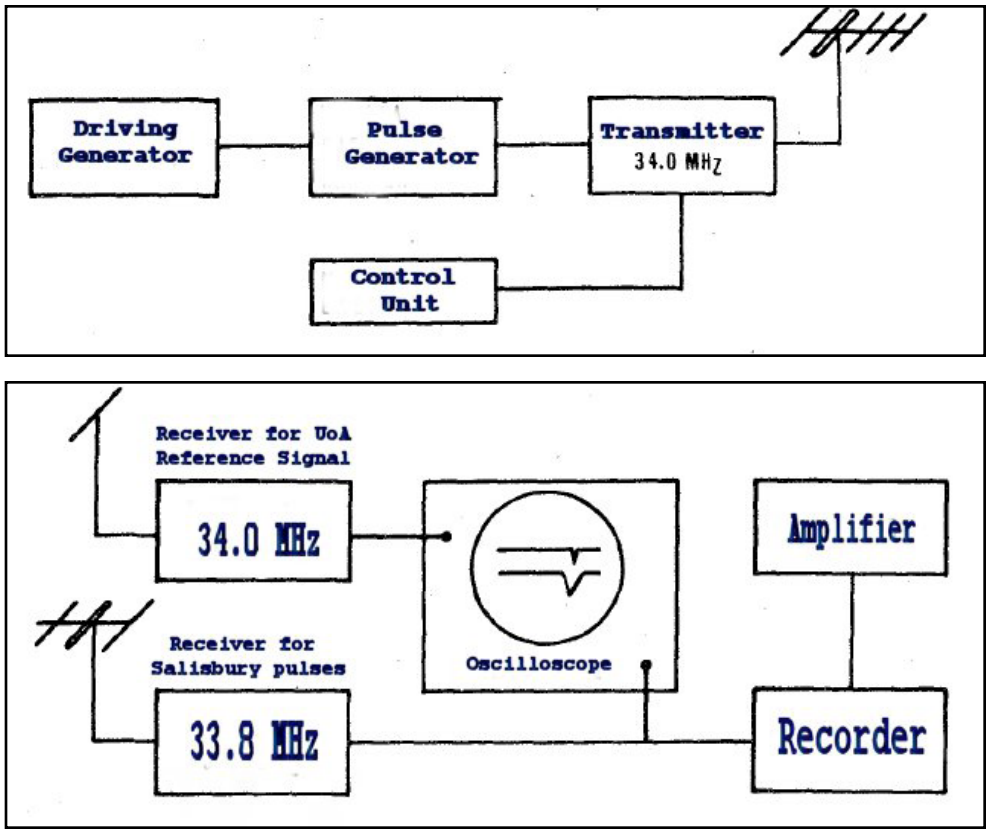
The main transmitter center was installed at the physics building of UoA and

the receiving center's equipment was installed at the Penteli observatory. The main transmitter unit was a 500-Watt Motorola box with a carrier at 34 MHz that was driven by a pulse generator of exceptional accuracy. The duration of each pulse was 200 microseconds and was repeated every 40 mS. The transmitting antenna was a 5-element Yagi with folded dipole and a gain of 7 dB positioned on a 15-meter high metal tower directed to the south, toward Salisbury.

The transmitter was periodically driven into a 5-minute transmission of a pulse-modulated signal and a 5-minute transmission of a CW signal. The receive center was installed at Penteli's mountain observatory, far enough from the transmitter so that crosstalk or interference could be avoided as well as city industrial noise. The receive center hosted two receiver units of high sensitivity for the reception of two distinct signals that were driven to a dual-beam, quad-input oscilloscope operating with two distinct time references for accurately measuring the propagation time.

The one receiver unit at the receiving center at Penteli was receiving the 34 MHz pulses of the transmitting unit at UoA as a time reference via an λ/2 dipole antenna. The second receiving unit was receiving the pulses sent back from Salisbury's station at 33.8 MHz. This receiver's antenna was also a 3-element Yagi with a gain of 5 dB placed on the top of a 10-meter metal tower.

Salisbury's Rx/Tx station (block diagram next page) was installed in the University of Salisbury and was re-transmitting back to Athens pulses upon reception of the pulses coming from Athens' transmission center at UoA. The receiving unit was receiving at 34 MHz and was retransmitting at 33.8 MHz so that crosstalk and interference was avoided. The main component of the transmitter unit was the pulse regeneration gauge, designed and built in the UoA physics department, that upon reception of each pulse from Athens, and avoiding false or multiple triggering, was immediately sending back to Athens–Penteli's receiver, a new pulse of 200 microseconds in duration



Block diagrams for transmitting and receiving pulses for Transequatorial Propagation experiments between University of Athens at Pentali and Salisbury (now Harare) in Rhodesia (now Zimbabwe) in the 1970s and early 1980s. (Diagram courtesy of the author)

at 100 watt peak level. The time delay inside the unit between the received and transmitted pulses was about 280 +/-20 microseconds. Both systems, Athens—Pentali and Salisbury, were equipped with local pulse recorders for keeping track of any inconsistency.

Methodology of Operation

Both Athens and Salisbury stations, communicating over the TEP link, were absolutely synchronized with the aid of the transmitted signals of the well known radio "lighthouse" WWVH at 5, 10 and 15 MHz. Tuned that way, the two stations could operate continuously on a 24-hour basis.

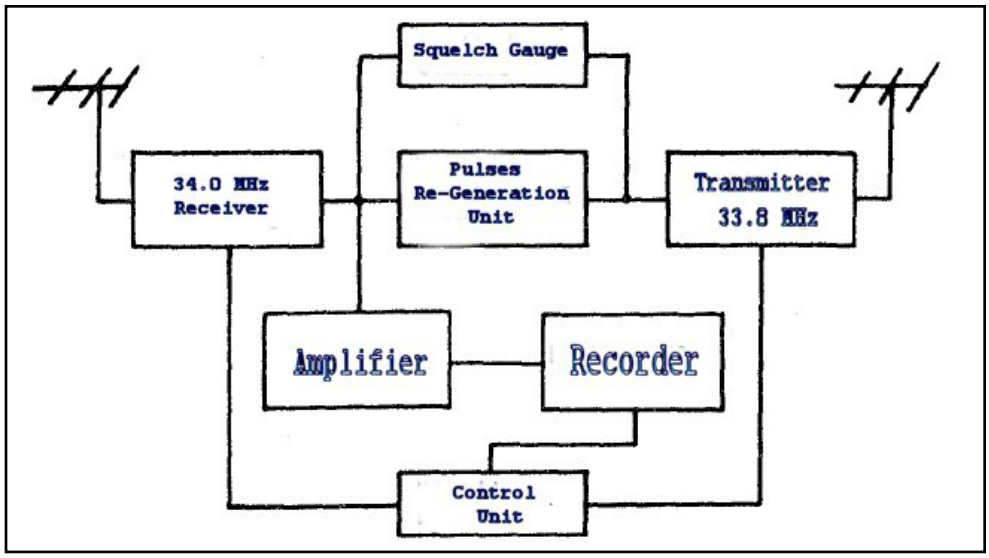
Each hour was split in 6 periods of 10 minutes. In the first five minutes of each ten-minute period, both transmitters were broadcasting a carrier CW signal, which was muted during the last 2 seconds of each minute. Upon the beginning of each 5-minute period, Salisbury's transmitter output was isolated from the gauge of the pulse generator and was automatically connected to the local pulse recorder. During that period, if a TEP link was open between the two stations, verification of the accuracy of the tuning of the two stations would take place. The next five minutes, the Athens station was automatically switching to PW signal transmission, while Salisbury's station was automatically re-connected to the pulse generation gauge and stopped from sending the CW signal. Should the case be that now Salisbury's station received a "loud and clear" pulse from Athens's transmitting station, it would immediately re-generate and transmit this pulse back to Athens at 33.8 MHz. During that five-minute period, Athens was measuring and registering the time spans and the dB levels between transmission and reception of each pulse pair, the first part of which was the pulse sent from Athens to Salisbury and the second part the responded pulse sent from Salisbury back to Athens. The measurement of the signals' "flight time" and power levels was happening at Penteli's receiver installation with the aid of a TEKTRONIX 556 oscilloscope having two

distinct beams: A and B, each hosting its own time reference. What a luxury at the time!

The horizontal deflection generator of beam-A starts its horizontal motion upon triggering the received signal from the 34 MHz receiver as soon as the pulse to Salisbury is transmitted. Time is then considered to be 0 msec. at the horizontal scale of the oscilloscope. Auto-triggering of this beam-A was taking place every 80 msec thus ensuring its stability. The horizontal deflection generator was "dived" as 5 msec/cm and performed a full screen scan every 50 msec.

The 33.8 MHz receiver at Penteli of the Salisbury's responded pulses was tied to the vertical deflection of the oscilloscope. This input was common to both A and B beams. By configuring the B beam's horizontal time scale triggering at 0.5 msec/cm and delaying it by 39.5 msec, they managed to enlarge the observation length of the responded pulse on B by 10 times. That way the 40-msec repetition rate of the pulses at Salisbury's pulse re-generation unit could be seen on the oscilloscope's screen at Athens as the transmission delay difference of the two beam's pulse signatures. This difference, divided by 2, reflected the time needed for a pulse to travel from Athens to Salisbury over the already open TEP communication link under study, assuming that the ionospheric plasma distribution that had generated the communication channel, have not been disturbed or changed during the back and forth traveling of each pulse. This assumption was holding and still holds true today after many years of experiments. Also, the dB level differences between transmitted and received pulse, observed as time was passing, was revealing the gradual modification of the shapes of the plasma pillows and the state of the TEP link as well.

Processing all of the collected data was done on punch cards and was taking place on FORTRAN programmed computers of that time at UoA. Rigorous analysis and post processing of the data and of all of the experiment's factors became gradually consolidated into a clear picture of the nature of the TEP channel and of the function of the geomagnetic equator.



Block diagram for Salisbury's Rx/Tx station (above) was installed in the University of Salisbury and was re-transmitting back to Athens pulses upon reception of the pulses coming from Athens' transmission center at UoA. (Diagram courtesy of the author)

This experiment, and subsequent studies, added more solid knowledge on the inner workings of the ionospheric plasma physics. Along with similar TEP studies in the U.S., as well as gradual consolidation of satellite data regarding ionospheric behavior, we are in a better position to understand this magnificent phenomenon. Radio amateurs use TEP channel links frequently for a variety of experimental purposes such as testing their antennas and of the transmitted/received dBs, as well as for their own enjoyment. Civil authorities between countries and military agencies around the globe also make frequent use of TEP communication channels.

Ionospheric engineering by man-made technology allows the scientific research of today (let's hope it is only scientific research), to study and handle many aspects of the ionospheric plasma physics. It might be the case that, for communication purposes, man-made pillows in the sky can be created at will and allow TEP communications from any point in the northern hemisphere to any point at the Southern Cross's territory and beyond.

References:

[1] **https://en.wikipedia.org/wiki/Nikos_Kavvadias**

[2] "A Contribution on the Study of TEP between Athens and Salisbury," PhD Thesis, George Stephanou, UoA, Physics Dept., 1981 [In Hellenic Language]

Trans-Equatorial Propagation in South Africa
http://www.qsl.net/zs6bte/Trans%20Equatorial%20Propagation%20in%20South%20Africa%20v2.htm

"Trans-Equatorial VHF propagation through Equatorial Plasma Bubbles," Heron, McNamara, *Radio Science*, Volume 14, Number 5, pages 897-910, September-October 1979.

Transequatorial Radio Propagation from Australia

The two graphics depicting TEP used in this article are from Space Weather Services at the Australian Bureau of Meteorology. There are also two Australian amateur radio beacons listed on this website to look for from VK8VF on 10-meters at 28.268 and 6-meters at 50.310 MHz **http://www.sws.bom.gov.au/Educational/5/2/3**

TSM

Scanning America

By Dan Veeneman **dan@signalharbor.com**

Post Falls and Kootenai County, Idaho

When we envision public safety radio systems, we typically think of voice traffic – first responders and other agency personnel talking with dispatchers. However, mobile data has also been a significant component of many public safety agencies.

Early mobile data terminals (MDTs) were dedicated hardware devices, usually with a CRT (cathode ray tube) and keyboard, designed for use in vehicles. Police officers were typical users, performing routine motor vehicle license plate checks and NCIC (National Crime Information Center) database queries.

More modern MDTs are now ruggedized laptop computers connected to a separate modem that transmits and receives digital information over a radio channel. That channel can either be dedicated to MDTs or be allocated as needed from an existing trunked radio system. In addition to text record lookups, new mobile data systems can send fingerprints, photographs, and even live video from a vehicle back to a dispatch center.

Post Falls, Idaho

In August, the Federal Communications Commission (FCC) granted a waiver to the city of Post Falls, Idaho, allowing the continued operation of their wideband mobile data system on frequencies that are normally reserved for narrowband public safety operations.

Post Falls is a city of about 30,000 residents located in the western part of Kootenai County, between Coeur d'Alene and Spokane, Washington.

Post Falls operates an 11-year-old mobile data system that is installed in every city police patrol vehicle and apparently provides coverage throughout the county. The city has stated that the system provides a valuable service to the community and enhances the safety of its officers.

The mobile data system was originally licensed under call sign WQIR243 to operate on the frequency pair of 768.525 MHz (base transmit) and 798.525 MHz (mobile transmit). This frequency pair lies within the guard band of 768-769/798-799 MHz that separates the broadband spectrum block (758-768/788-798 MHz) from the public safety narrowband block (769-775/799-805). The guard band, along with the broadband spectrum block, are now licensed to the First Responder Network Authority (FirstNet), which is the government authority tasked to develop and operate a public safety broadband network, established by Congress as part of the Middle Class Tax Relief and Job Creation Act of 2012.

Kootenai County, Idaho (Courtesy of the author)

Because Post Falls was operating their mobile data system on frequencies now licensed to FirstNet, they were required to relocate it to a new frequency pair. FCC regulations established in 2016 require that all license holders operating in FirstNet's spectrum, including Post Falls, must vacate that spectrum by August 31, 2017, unless FirstNet expressly consents for the holder to remain longer.

So, in May, Post Falls filed an application with the FCC to relocate the mobile data system from the guard band to a frequency pair in the narrowband public safety spectrum.

The Post Falls mobile data system requires radio bandwidth of 50 kilohertz (kHz) in order to support current data

(Courtesy: Post Falls, Idaho)

rates to patrol cars. This classifies the system as "wideband" because it uses more than 25 kHz of bandwidth. However, FCC rules require that systems operating in the public safety narrowband spectrum cannot use more than 25 kHz of bandwidth. This would put Post Falls at odds with FCC rules. This is where the waiver comes in.

The Association of Public Safety Communications Officials (APCO) International, which acts as frequency coordinator for Post Falls, indicated that not only are there are no existing license holders on the proposed frequency pair, there are no license holders on the co-channel and adjacent frequency pairs. This means that moving Post Falls to the frequency pair would not adversely impact other potential narrowband public safety operators.

The FCC agreed to the proposal, indicating that the relocation would serve the public interest because it would move Post Fall out of FirstNet's licensed spectrum, helping to clear the way for a nationwide broadband public safety network.

The FCC also said that it would be "unduly costly and burdensome" to require Post Falls to reduce the mobile data system bandwidth to 25 kHz, which would dramatically reduce the supported data rate to police officers.

The FCC granted the waiver and the Post Falls mobile data system is now licensed for operation on 771.9250 (base transmit) and 801.9250 (mobile transmit).

Call sign WQIR243 shows the new base transmit frequency of 771.9250 MHz based at Blossom Mountain. The frequency is licensed for an emissions designator of 28K0F1D.

An emissions designator is a shorthand code that describes the basic properties and content of a transmitted signal. Each part of the designator has a specific meaning related to the signal. For instance, the emissions designator 28K0F1D breaks down as:
Bandwidth: 28.0 kHz (the "28K0" part)

(Courtesy: FirstNet)

Modulation Type: Angle-modulated, straight FM ("F")
Modulation Nature: Digital, on-off or quantized, no modulation ("1")
Information Type: Data, telemetry, telecommand ("D")

CalAmp Dataradio

CalAmp Wireless Networks, Inc. manufactures the former Dataradio line of products that provide mobile data services for public safety agencies. The primary products are the GeminiG3 and Gemini PD+ mobile data radios along with the Paragon3 and Paragon PD+ digital base stations. Each of these products is intended for use in a dedicated public safety mobile data radio system.

Marketing material indicates that mobile units communicate with base stations using a proprietary protocol called Enhanced Dynamic Bandwidth Allocation (E-DBA). The radios also support Automatic Vehicle Location (AVL) using a built-in Global Positioning System (GPS) receiver.

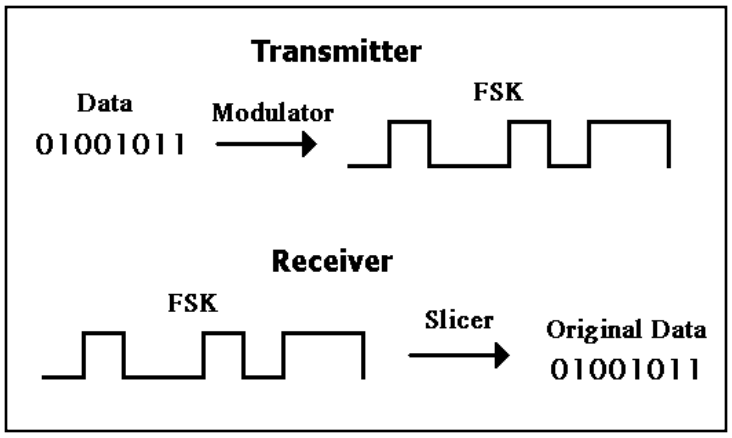
The GeminiG3 mobile units paired with the Paragon3 base stations support a data rate of 128 kilobits per second (kbps) when operating in the 700 MHz band. This requires a channel bandwidth of 50 kHz.

The FCC license database lists the CalAmp equipment as using an emissions designator of 28K0F1D and state-level documentation shows these products are in use with the Post Falls Police Department.

An examination of the CalAmp technical documentation shows the mobile data radio signal itself uses 16 levels of frequency shift keying (FSK) to deliver digital data.

Frequency Shift Keying

There are a number of ways to transfer digital information across a radio channel. These methods typically vary one of the primary characteristics of a basic radio carrier wave. The wave can be modified ("modulated") in terms of amplitude, frequency or phase. In any particular method, each possible modification is assigned to a specific digital value. When a sequence of digital values is to be sent, the transmitter modifies the carrier wave according to the assignment for each digital value as it is sent. This process is known as modulation. The receiver follows these modifications and recreates the original sequence of values in a process called demodulation.



Data slicing. (Courtesy of the author)

The simplest method of modulating the frequency of a carrier is called two-level (or binary) frequency shift keying (FSK). It uses two closely spaced carrier frequencies to represent binary digit ("bit") values of '0' and '1'. The amplitude and phase of the carrier wave remains the same; the only thing that changes is the frequency. This type of scheme produces a "constant envelope" signal that allows the use of smaller, cheaper and more efficient non-linear amplifiers. Non-constant envelope signals typically require more expensive amplifiers to correctly transmit the signal.

Older Motorola trunked radio systems with analog voice channels have a dedicated control channel that uses two-level FSK to transmit data at the rate of 3,600 bits per second (bps). Bits with a value of '0' are transmitted at one frequency and bits with a value of '1' are transmitted at a different frequency. The receiver follows these frequency changes to recover the original sequence of zeroes and ones.

The simplicity of this method means that the discriminator output of a scanner can be fed into a simple op-amp level comparator (the circuit is commonly called a "data slicer") and the resulting output will be the transmitted stream of bits. The popular "hamcomm" interfaces make use of this principle, and the same idea is used in most trunk-tracking scanners.

It is possible to use more than two levels of modulation. Multilevel modulation methods are popular because they enable higher data rates in a relatively narrow radio channel.

Four-level FSK uses four frequencies to represent four different bit sequences: 00, 01, 10 and 11. In this way a single frequency change can deliver two bits worth of information.

APCO Project 25 Phase I systems use a type of four-level FSK called Continuous 4 Level FM (C4FM) to transmit information at 4,800 frequency changes per second. Each of these changes represents two bits of information, so the actual data rate for C4FM is 9,600 bits per second.

Eight-level FSK, as you might expect, uses eight frequencies to represent eight different bit sequences: 000, 001, 010, 011, 100, 101, 110 and 111. Each change in frequency delivers three bits of information.

Sixteen-level FSK, as used in the Dataradio products, uses sixteen frequencies to represent sixteen bit sequences, from 0000 up to 1111.

(Courtesy: Kootenai County, Idaho)

Although adding additional levels to an FSK scheme increases the number of information bits that can be sent during a single change, those additional frequencies require increasing amounts of bandwidth and quickly outgrow the relatively narrow channels used in public safety radio systems.

Kootenai County, Idaho

Kootenai County is located in northern Idaho, on the eastern border of Washington. The county has a population of just over 138,000, nearly a third of whom live in the county seat of Coeur d'Alene. Geographically, the county covers about 1,300 square miles and is a mixture of urban and rural areas, with mostly mountains in the east and prairies in the west. Interstate 90 runs through the county.

The county is part of Idaho's statewide public safety trunked radio system called the Idaho Cooperative Agencies Wireless Interoperable Network (ICAWIN), which is an APCO Project 25 Phase I system.

There are several ICAWIN repeater sites within Kootenai County:

Location	**Frequencies**
Mica Peak (Post Falls)	769.11875, 770.20625, 771.00625, 771.66875, 772.53125, 773.13125, 773.58125 and 774.16875 MHz
Canfield Mountain (Coeur d'Alene)	770.05625, 770.56875, 771.40625, 771.83125, 772.33125, 772.88125, 773.91875 774.38125 MHz
Mason Butte (Worley)	769.51875, 770.80625, 771.21875,

	771.98125, 773.66875 and 774.65625 MHz
Killarney Mountain (Harrison)	769.28125, 769.80625, 770.30625, 772.15625, 772.70625 and 773.38125 MHz
Mount Spokane	769.61875, 770.76875, 771.76875, 772.74375, 773.89375 and 774.91875 MHz

Talkgroups directly related to Kootenai County include:

Decimal	Hex	Description
28000	6D60	County Sheriff (Dispatch)
28001	6D61	County Sheriff (Records)
28002	6D62	County Sheriff (Tactical)
28003	6D63	County Jail
28005	6D65	County Juvenile Hall
28008	6D68	County Court Security
28011	6D6B	County Law Enforcement Emergency
28013	6D6D	Coeur dAlene Police (Dispatch)
28014	6D6E	Coeur dAlene Police (Records)
28015	6D6F	Coeur dAlene Police (Tactical)
28017	6D71	Post Falls Police (Dispatch)
28018	6D72	Post Falls Police (Channel 2)
28019	6D73	Post Falls Police (Channel 3)
28021	6D75	Rathdrum Police
28024	6D78	Hayden Police
28027	6D7B	Spirit Lake Police
28030	6D7E	Coeur dAlene Tribal Police
28100	6DC4	County Fire (Dispatch)
28101	6DC5	County Fire Operations 1
28102	6DC6	County Fire Operations 2
28103	6DC7	County Fire Operations 3
28104	6DC8	County Fire Operations 4
28105	6DC9	County Fire Operations 5
28106	6DCA	County Fire Operations 6
28200	6E28	Kootenai Electric Cooperative
28202	6E2A	Lakes Highway District
28800	7080	Kootenai Special Events (Channel 1)
28801	7081	Kootenai Special Events (Channel 2)
28802	7082	Kootenai Special Events (Channel 3)
28803	7083	Kootenai Special Events (Channel 4)
28804	7084	Kootenai Special Events (Channel 5)
28813	708D	County Special Weapons and Tactics (SWAT)
28814	708E	County interoperability with Federal agencies
28820	7094	County Sheriff (Detectives)
28900	70E4	County Search and Rescue
28921	70F9	Kootenai Medical Center
28926	70FE	Department Of Lands (Mica Dispatch)
45127	B047	Kootenai County Regional
48100	BBE4	Kootenai County Hospital

A number of agencies, including Kootenai County law enforcement, Kootenai County fire, Coeur D'Alene police, and Post Falls police, have moved to the ICAWIN trunked radio system but continue to transmit on their old VHF (Very High Frequency) and UHF (Ultra High Frequency) channels. Other agencies and organizations continue to operate on conventional (non-trunked) analog frequencies.

Frequency	**Description**
150.9950	Post Falls Streets / Snow Plows / Public Works
154.1150	County Fire ("Alpha")
154.1300	Worley Fireground
154.1600	Timberlake Fire Protection District (Athol Operations)
154.2800	Timberlake Fire Protection District (Bayview Operations)
154.3550	Worley Fire (Dispatch)
154.3700	Timberlake Fire Protection District (Dispatch)
155.0850	Coeur d'Alene Water Department
155.1450	Coeur d'Alene Street Department
156.0900	Hauser Fire (Dispatch) / Road Department
173.3125	Post Falls Water Department (Telemetry Data)
453.2500	Worley Highway District
453.3000	Post Falls Highway District (Operations)
453.3250	Kootenai Office of Emergency Management
453.4000	East Side Highway District (Operations)
453.4250	Hayden Department of Public Works
453.5000	Kootenai Airport Authority
453.8500	Coeur d'Alene Police (Dispatch) [P25]
453.9250	Post Falls Police (Tactical)
460.2250	Kootenai Sheriff (Green Dispatch Central) [P25]
460.3250	Kootenai Sheriff (Yellow Dispatch South)
460.4000	Post Falls Police (Records)
460.4125	Post Falls Police (Car-to-Car)
460.4500	Coeur d'Alene Police (Records and Special Events)
460.4750	Post Falls Police (Dispatch)
465.1750	Post Falls Police (Car-to-Car)
771.9250	Post Falls Police (Mobile Data Terminals)

TSM

Federal Wavelengths

By Chris Parris **cparris@thefedfiles.com**

Eclipse, Weather Provide Scanner Action

In the month of August of 2017, two major events involving the forces of nature were the focus of national attention. One was the total solar eclipse that crossed the United States. The second was the arrival and consequential rains from Hurricane Harvey. Both events involved large scale responses by federal agencies. Let's take a closer look at what these events were about and the federal agencies that were involved.

2017 Solar Eclipse

A rare natural phenomenon that occurred on August 21, 2017, brought a lot of attention. A total solar eclipse, where the moon blocks the Sun's light for a short time, was visible across the United States. This was the first total solar eclipse that had been visible in the continental United States since 1979. I was fortunate enough to be very near the "path of totality," that is the line along which the eclipse crossed the United States, plunging a narrow strip the earth in near total darkness for a few minutes in the middle of the day.

There was tremendous media buildup prior to the eclipse, and there was concern by public safety agencies in the areas where the eclipse was going to pass, that the large crowds would be an issue. Many cities and states affected by the expected large crowds were preparing for emergencies, including massive traffic jams and potential failures in infrastructure, such as power grids and cellular networks. A lot of emergency preparations looked similar to plans that were activated for the Y2K scare. Some public safety agencies upgraded communications, brought in extra personnel and the Federal Aviation Administration (FAA) even set up some temporary air traffic control towers at smaller airports to help with coordination of more than normal expected air traffic.

In addition to the huge crowds, there was a large response of scientific researchers on hand to observe and record the eclipse. The National Aeronautics and Space Administration (NASA) had multiple aircraft flying, including their WB-57 high-altitude research planes, up "chasing" parts of the eclipse as it crossed over the country. NASA provided continuous media coverage of the eclipse as it moved from the Pacific Ocean on to the Oregon coast. NASA has an excellent web site set up with all things about the eclipse and what they were doing with it: https://eclipse2017.nasa.gov

Here is a list of likely VHF and UHF aircraft frequencies that would be used by NASA aircraft. Listeners in other regions of the country have confirmed some of these as in use by NASA aircraft, particularly by the NASA fleet aircraft that fly between NASA facilities in Houston, Florida and California. Keep these in your scanner and see what you hear:

NASA aircraft N808NA flew over the Pacific Coast of Oregon to bring live pictures of the eclipse. (Courtesy of NASA)

123.1250		
123.4500		
135.8250		
230.5000	AM	NASA WB-57
235.4000		
259.6500		
259.6750		
259.7000	AM	NASA Gulfstream III doing live TV reports
259.7250		
260.7500		
260.7750		
261.6250		
264.0500		
278.9500		
278.9750		
279.0000		
279.0250		
296.7000		
296.7750		
296.8000		
296.8250		
314.6000		
320.7000		
382.6000		

Besides NASA, the National Oceanic and Atmospheric Administration (NOAA) flew some aircraft to observe and record the eclipse. I did not have any luck catching the NOAA air traffic on any agency specific air-to-ground frequencies, at least in the Portland, Oregon, area. I heard some traffic from the Bureau of Land Management (BLM) and the U.S. Forest Service giving status reports on traffic and crowds at some of the eclipse viewing areas.

All in all, the fears over major problems with the eclipse crowds did not come to pass, but traffic was an issue in a lot of the areas where the eclipse viewers were gathered. In some areas, departing cars took hours to go just a few miles, but by the end of the day, most traffic was back to normal.

Hurricane Harvey

On August 25, 2017, Hurricane Harvey made landfall just north of Corpus Christi, Texas. The storm did tremendous damage to the towns of Port Aransas and Rockport, just north of the Corpus Christi metro area. After moving on land, Harvey began dumping unprecedented levels of rain, (some sources estimate 20 trillion gallons) on the southeast Texas region, ending up stalling for a short time and causing massive flooding in the Houston, Texas area. Houston is now the fourth most populous city in the United States, and the massive floods caused major problems for not only the 2.5 million residents in Houston and Harris County, but in the surrounding counties as well.

Even before the hurricane had reached land, various state and federal emergency management agencies were in the process of moving resources near the southeast Texas region to respond. The response by federal agencies in past large-scale disasters had generated criticism of being too little, too late. But in this case, everyone was getting prepped and in position well before Harvey made landfall. Nearly every federal agency that had aircraft, boats or personnel that could stage near the southeastern Texas area were heard moving equipment and people into safe staging areas. San Antonio, Texas, was one of those areas, and much was heard on federal and military channels prior to and after the flooding began.

In addition to the federal agency communications, the Harris County and City of Houston area communications were very busy. Amazingly, the wide-area APCO P-25 digital trunked radio system that serves much of southeast Texas (known as TXWARN), survived relatively unscathed. According to news reports in communications industry publications, the system only lost one trunked repeater site due to the site flooding, and had some generator issues at others, but those sites were never off line. Listener reports indicate the system performed as required during the initial storms and flooding.

It's also interesting to note how much military support communications were heard as well. It appears that the military quickly moved into the role of air traffic control for

The Civil Air Patrol prepares for another Hurricane Harvey mission. (Courtesy of FEMA)

all the state, local, military and federal air assets that were moved into the Houston area. The flooded region quickly became a restricted flight zone, and Air Force AWACS aircraft as well as CBP aircraft were on scene providing coordination for all the emergency air assets. The call sign of WIZARD ALPHA was heard referenced on many aircraft frequencies around the Houston area during the emergency response, most likely an airborne controller in an AWACS aircraft. Both of the main Houston airports (Houston Hobby HOU and Bush Intercontinental IAH) were closed to commercial traffic during the height of the flooding, but many flights of support aircraft worked out of nearby smaller airfields, such as Ellington Field (EFD), Mabry Army Guard Base (TX26), and Martindale Army Heliport (MDA).

In light of the discussions in the June 2107 edition of this column, about the FBI and other federal agencies using the Zello push-to-talk application for mobile phones, I should point out that Zello use during the flooding in Houston made national news. Reports were that several hurricane-specific, public Zello channels were available for rescue calls. Stories were that the Coast Guard was accepting calls on Zello for rescue from people stranded by high water, but who still had cell phone service. Here is a BBC story on the use of Zello during Harvey: **http://www.bbc.com/news/technology-41224942**

I would like to thank all the amateur radio operators and scanner listeners who listened and logged these frequencies over the days and weeks of Hurricane Harvey for sharing with all of us in the scanner monitoring hobby. These came from multiple sources, including Radio Reference, the Houston Scan Yahoo list and some reports sent to me directly. Some of these were heard in the San Antonio area, as local, state and federal agencies prepped for the post-storm response. And I included mostly federal and military operations as well as some nationwide interoperability frequencies:

36.8000150.0 PL Texas Army Guard helicopters
36.9000150.0 PL Texas Army Guard helicopters, ALAMO

call sign
41.0000150.0 PL Texas Army Guard helicopters, Ellington Field (EFD)
42.5000150.0 PL
47.4200146.2 PL Red Cross
47.5000146.2 PL Red Cross
51.9000150.0 PL USAF Rescue helicopters DUSTY
55.0000150.0 PL COMMO ONE

118.0000 AM EFD tower alternate
118.0500 AM
118.7000 AM Houston Hobby (HOU) tower, helicopters
121.5000 AM VHF Guard, air traffic coordination
123.0250 AM Houston helicopters air-to-air
1213.100 AM Search & Rescue aircraft common
123.4500 AM Rescue aircraft common
126.0500 AM EFD Tower, helicopters
127.3000 AM IAH Tower, helicopters
128.8500 AM Hermann Hospital with Coast Guard helicopters
130.3000 AM Common air traffic frequency called "Thirty-Thirty"
136.3750 AM Customs and Border Protection (CBP) "Company"
139.8750 173.8 PL Civil Air Patrol (CAP) TAC 1
139.9500 AM SWITCHBLADE heard in the Beaumont, TX area
141.0000 131.8 PL CAP Command 2
141.5750 127.3 PL CAP Command 1
143.6250 203.5 PL CAP portable/airborne repeater
148.1375 203.5 PL CAP portable/airborne repeater
148.1375 N7F3 CAP P25 portable/airborne repeater
150.2250 162.2 PL CAP Guard 1

151.1375 156.7 PL VTAC 11
154.9500 156.7 PL Texas TXCALL 1D
155.3400 156.7 PL VMED 28
155.7525 156.7 PL VCALL 10 - landing zone ops, downtown Houston
156.8000 FM Marine 16 - Harris County EOC talking with USCG
157.0500 FM Marine channel 21A
157.1000 FM Marine channel 22A
157.1250 FM Marine channel 82A
157.1500 FM Marine channel 23A
157.1750 FM Marine channel 83A
158.4075 151.4 PL DMAT Command Post at NRG Stadium
158.7375 156.7 PL VTAC 13

162.7125 N764 Unknown
163.1000 N167 FBI federal common
163.1125 N021 ICE Nationwide NAT TAC 3
163.1125 N169 ICE
163.2000 N156 DEA - possible Dallas units
163.4375 N100 US Army Corps of Engineers
163.7000 N021 ICE
163.7000 N169 ICE Nationwide NAT TAC 1
163.7250 N169 ICE Nationwide NAT DIR
164.5500 N001 Organized Crime Drug Enforcement Task Force
164.7875 N169 ICE Nationwide NAT TAC 4
165.0875
165.2125 N001 US Secret Service MIKE
165.2375 N301 CBP DTAC 1
165.2875 N657 BATFE NET 7 (input to repeater)
165.3125 N293 US Coast Guard NET 121
165.3750 N001 US Secret Service CHARLIE
165.4875 N301 CBP DTAC 6
165.8250 N293
165.8500 N293
165.8875 N156 DEA - possible Dallas units
165.9250 N293
166.2750 103.5 PL
166.4625 N7FE Federal Agency Common
166.5125 N001 White House Communications Agency
166.7375 N314 CBP
166.7875 N293 CBP AIR 8 Air Marine Operations with HAMMER
166.9875 N167 FBI
167.0875 167.9 PL LE-1
167.1625 N650 BATFE TAC 1
167.2500 N156 DEA - possible Dallas units
167.5375 N167 FBI D6 - "Tennessee Task Force 1"
167.6125 N167 FBI Houston A1
167.7875 N167 FBI Houston A7
168.3500 N650 BATFE TAC 4
168.8250 N052 ICE HOU 2
168.8375 N293 CBP AIR 1 - CBP Airborne Command Post
168.8875 N167 FBI A6 - "Tennessee Task Force 1"
169.5125 127.3 PL
170.6250 N167 FBI Houston A5
170.6500 N653
170.6750 N051 ICE HOU 1
170.6875 167.9 PL NTIA Incident Response 8 (direct for IR 3)
170.7250 N653 FBI L1 Federal Interoperability Command
170.8500 N864 US Marshals
170.88125 N167 FBI Radio techs San Antonio (not a typo on the frequency)
170.9625 N653 BATFE
171.4375 N653 FBI L2 Federal Interoperability Patch
172.5000 N293 Unidentified agency
173.0125 N650 BATFE TAC 3
173.0375 NTIA IR-9
173.0875 67.0 PL Unidentified agency
173.1000 N167 FBI Houston H4
173.4750 NA34 Unidentified agency

173.8875	N650	BATFE TAC 6
225.0500	AM	NORAD - STREAK, VOODOO, BEAR, ANVIL call signs
225.2750	AM	ROPER 61
228.2250	AM	
231.8250	AM	WIZARD ALPHA - military air traffic control
234.6000	AM	NORAD - BLUE 10, BIGFOOT, WIZARD
241.8000	AM	Texas Army Guard - SHINER UH-60 helicopters
242.4000	AM	Texas Air National Guard TAC 3
243.6000	AM	
246.9000	AM	
247.0500	AM	Aerial refueling
251.9000	AM	KING aircraft air-to-air
252.8000	AM	USAF Airborne Command Post - KING, ROPER
263.9250	FM	UHF SATCOM (downlink)
269.0750	AM	SENTRY 25 AWACS coordinating with ATC
271.0000	AM	NORAD - SENTRY 50
275.4250	AM	Texas Air National Guard
282.6000	AM	NORAD
288.5000	AM	Texas ANG CP at Ellington Field (EFD)
297.5250	FM	UHF SATCOM (uplink)
303.1000	AM	AWACS Air Traffic Controller
321.0000	AM	
335.9500	AM	AWACS
345.0000	AM	USCG Air operations
350.0250	AM	CBP Air Marine Operations Center, March AFB
364.2000	AM	NORAD AICC - BLACK GATOR call sign heard
397.4250	156.7 PL	ISR-5, possibly Civil Air Patrol at EFD
406.2000	131.8 PL	Unidentified agency
406.8625	N421	FEMA NDMS 1/2
407.6625	N421	FEMA 5/6
408.8625	N421	FEMA USAR 1/2
409.0000	N447	FEMA DMAT
409.0625	N421	FEMA 7/8
409.5250	N156	DEA – Houston Field Office
409.8625	N421	FEMA USAR 7/8
409.9000	N156	DEA - Houston 9
410.4625	N421	FEMA 9/10
410.8000	N798	Federal Protective Service - TEAM 1, TEAM 3
410.8375	167.9 PL	IR12/IR18 - “Texas Task Force” SAR Incident Command
410.8625		FEMA MERS 9/10
411.1000	N293	Unidentified agency
413.0250	N293	Coast Guard NET 411

A CBP UH-60 helicopter picks up some Hurricane Harvey survivors in Houston. (Courtesy of CBP)

413.2125	167.9 PL	NTIA Interagency Response 14
413.4750	N201	Federal Protective Service
413.9500	N201	Federal Protective Service
413.9500	N293	Federal Protective Service (simplex)
413.9825	N201	Federal Protective Service TAC 5
851.5125	156.7 PL	8TAC91
852.5125	156.7 PL	8TAC93

I am fairly certain that there may have been some frequencies that were used that may not have been heard by the small group of listeners in the Houston and San Antonio areas. And many scanner listeners were busy keeping their homes safe. But thanks again to those who monitor!

Know Your NIFOG!

As is now very evident, many of the nationwide interoperability frequencies are very likely to become active in a large emergency, such as severe weather or natural disasters. It’s always a good idea to know ahead of time where to listen to these operations and have them in a bank of your scanner. You never know when these channels might get used.

One of the first places to start is the National Interoperability Field Operations Guide, or NIFOG. This document was put together by a group under the Department of Homeland Security (DHS), and features all of the standard, nationwide interoperability frequencies that can be used by any local, state or federal agency. These have been standardized in order to make sure that all agencies can switch to a common channel and be able to communicate. Once communications have been established, users can switch off of

the common channels to work on tactical or agency-specific frequencies as well.

Not only have the frequencies and usage been standardized, but the channel names as well. There have been many instances, particularly with federal interoperability, where common radio frequencies will have different names in different agency radio templates. This can often lead to massive confusion when two separate agencies need to work together on a particular operation.

Getting your own copy of the NIFOG is easy. The information is not classified and should be in the hands of any first responder agencies or radio techs and scanner listeners as well. Start by going to this web site: **https://www.dhs.gov/publication/fog-documents**.

Here you will find links to various forms and related documents available for download as PDF files. The latest version of the NIFOG is version 1.6.1, July 2016, **https://www.dhs.gov/sites/default/files/publications/National%20Interoperability%20Field%20Operations%20Guide%20v1%206%201.pdf**

If you have a scanner that can download and install frequencies from an Internet database, you can find all the NIFOG frequencies under the Nationwide Frequencies, National Interop. You can have a look at those frequencies here: **http://www.radioreference.com/apps/db/?aid=7742**.

In addition to the DHS NIFOG frequency guide, many states have developed and deployed their own regional versions. My home state of Oregon has what they are calling the Oregon Regional Tactical Interoperability Communications Field Operations Guide or TICFOG. You have a look at the TICFOG here: **http://www.oregon.gov/siec/Documents/TICFOG/FINAL_OREGON%20REGIONAL%20TICFOG%20_April%2007%202017_%20Version%202.1.pdf**

Texas also has an interoperability communications plan available, called the Statewide Interoperability Channel Plan, or TSICP. You can have a look here:**https://www.dps.texas.gov/LawEnforcementSupport/communications/interop/documents/tsicpMOU.pdf**

If you are interested, search for your state and "interoperability communications" on the Internet search engine of your choice and you are likely to come up with a copy of the plan for your area.

Federal Wavelengths Frequency List Legend

Unless otherwise noted, frequencies listed are FM and frequencies are shown in Megahertz (MHz). Frequencies listed will show additional information as follows:

PL CTCSS Tone Squelch

D DCS Digital Coded Squelch

RID APCO P25 Radio Identification Number

CSQ Carrier Squelch, no squelch tone

N APCO P25 digital Network Access Code (NAC)

DMR Digital Mobile Radio, marketed by Motorola as TRBO

NXDN Nexedge Digital, marketed by Kenwood

WACN Wide Area Communications Network, an APCO P25 trunked network Identifier

TSM

MilCom

By Larry Van Horn N5FPW MilcomMP@gmail.com

Introduction to Military Monitoring:
What Equipment do you need to monitor HF MilComms?

As always seems to be the case, recent world events have drawn many radio listeners back into their radio shacks turning the action bands located in the shortwave radio spectrum. Shortwave radio offers the radio hobbyist an opportunity to hear what is really happening behind the scenes without the filters imposed by any of the news media outlets.

If you want to tune into the latest natural disaster, crisis or world hotspot, one area of HF listening will usually be more productive than many of the others in the shortwave radio spectrum – military communications. When the world has a crisis, disaster or tension rise between countries, the military will usually be called upon first to intervene so it pays to monitor them when the heat gets turned up.

The good news is you do not have to live close to a military installation to hear these communications. That is part of the magic of military monitoring in the shortwave radio spectrum. Anyone that has the capability to monitor the radio spectrum from 0 to 30 MHz is in range of a wide variety of communications from military organizations around the world.

To monitor HF military communications, you will need to use certain pieces of hardware and depending on what you want to monitor, a computer and some software to hear certain radio transmissions. In this edition of Milcom I will dive into selecting an antenna and receiver with some general thoughts to help the newcomer and veteran radio monitor alike.

Receiving Hardware

The first rule of thumb, if you want to equip your radio shack for HF military monitoring: money equals performance. It doesn't require much in the way of an antenna or a lot of receiver performance to hear a 500,000-watt international shortwave broadcaster. But if you are trying to hear a 100-watt aircraft radio or a 10,000-watt ground/shore radio station, you aren't going to have a lot of success with an under $50 Chinese import. So, when shopping for a receiver for military monitoring, any shortcuts you take will result in less than satisfying performance.

Second, if you are going to monitor HF military communications, the radio you use must be capable of single sideband (SSB) mode reception. AM/FM radios won't work for this type of radio listening. A digital tuning frequency readout is also a highly desirable feature for monitoring military bands.

U.S. Navy Information Systems Technician 1st Class Aaron Goshay, left, assigned to Joint Mobile Ashore Support Terminal Pacific, and Mongolian Army Lt. Ochirbat Gunaajav test a high frequency radio. (Photo by U.S. Navy)

You will also have to decide if you are going to purchase a portable versus tabletop, a traditional hardware based radios versus software defined radios (SDR), new versus used, and shortwave only versus the more expensive wideband coverage radios.

Third, the reality of today's marketplace is that there aren't as many manufacturers of dedicated shortwave radios as there was in years past. If you are a true knob twirler you may be a bit disappointed in what is really left of the HF radio selves at the local ham radio store.

Finally, get the best antenna in the air that you can afford. If the antenna doesn't see that signal, the receiver has nothing to receive. While directional antennas such as the Yagi or Quad are great performers, the frequency ranges usually aren't optimized for monitoring military HF frequency ranges and they are highly directional. This is where one or more simple longwire antenna can fill that important need of a good overall antenna.

Other wire antenna designs to consider include the offset-L dipole, multi-band longwires, and the center fed wire dipole. You can find some good information on longwire style antennas on the Hamuniverse.com website at **http://**

Codan Patrol 2110M HF Military Man-pack portable. (Image courtesy of Codan Radio)

Sangean ATS-909X.jpg: Sangean ATS-909X portable shortwave radio. (Photo courtesy of Sangean)

www.hamuniverse.com/shortwaveantenna.html and the DXZone website at **http://www.dxzone.com/catalog/Antennas/Shortwave**.

There is no way I can completely cover all the various types of HF antennas that can be used to monitor military comms. But to simplify for this column, the equation is simple, more metal (aka more wire), more signal to the receiver, thus more stations to hear.

So, this month I will concentrate primarily on radio receivers. In our sneak peek at the radios mentioned in this column, I have judged all of them on the three main areas of performance that matter when receiving HF radio signals—sensitivity, selectivity and receiver dynamic range. These are the first and most important criteria you should use when judging any radio you plan to purchase for your radio shack.

Receiver sensitivity is the lowest power level at which the receiver can detect a radio frequency (RF) signal and demodulate data. Sensitivity is purely a receiver specification and is independent of the transmitter and transmit power.

Selectivity is a measure of the performance of a radio receiver to respond only to the radio signal it is tuned to (such as a radio station) and reject other signals nearby in frequency, such as another broadcast on an adjacent channel.

The overall dynamic range of the receiver is as important as sensitivity because it is just as important for a set to be able to handle strong signals well as it is to be able to pick up weak ones. This comes into play when you trying to pick up weak signals in the presence of nearby strong ones. Under these circumstances a set with a poor dynamic range may not be able to hear the weak stations picked up by a less sensitive set with a better dynamic range.

What's for Sale in the Marketplace?

In general, shortwave radios can be classified into price groupings: under $100, $100-$199, $200-$499, $500 and up. The prices that I will be quoting below are the listed U.S. retail prices for each unit. Actual street sale prices are usually lower depending on the dealer you purchase from.

The under $100 group represents the bulk of shortwave radio sales. They are turned out by Chinese manufacturers and sold worldwide by the millions each year. Unfortunately, most of these radios are AM/FM modes only so are useless for HF military monitoring. I did find two hardware radios that seem to be readily available – the CountryComm GP-5/SSB Gen 3 and Kaito 1103, both portables. But I must warn you that for a variety of reasons (including the performance factors mentioned above) monitoring military communications using these two radios will be marginal at best.

Stepping up in to the $100-$199 price range adds three more choices to consider, all from Tecsun. These include the PL-600, PL-660 and PL-880 portables. Tecsun is a Chinese company that designs and manufactures AM, FM, and shortwave radios. Some of their products have been rebranded and sold by Eton Corporation, who also holds the Grundig radio label.

This brings us to the $200-$499 range. The most obvious difference in this price range is the abundance of units with digital display tuning which is a must.

The models in the lower end of this price range carry the Grundig label and are sold by Eton. They are the Grundig Executive Satellit portable and the Satellit 750 portatop. Of these two receivers, I would give the 750 the nod and as a bonus it also includes the 117-137 MHz civilian aircraft band.

But the undisputed leader of the "portable" hardware radios in today's marketplace is the Sangean ATS-909X. It packs a lot of features and performance in a compact package. With a street price averaging around $250, it is a great HF military radio if you want to buy a true portable HF receiver.

After Drake closed its doors several years ago and now that Icom has also left the shortwave only tabletop marketplace, you still have one choice left in this price range of you

Sony ICF-2010.jpg: A longtime favorite portable radio of many military HF listeners the Sony ICF-2010. (Photo courtesy of Universal Radio)

The Alinco DX-R8T receiver covers 150 kHz to 30 MHz in SSB, CW, AM and FM. (Courtesy: Universal Radio)

are looking at a tabletop – the Alinco DX-R8T.

The DX-R8T receiver covers 150 kHz to 30 MHz in SSB, CW, AM and FM. Other features include an IF shift, band and memory scanning, attenuator, preamp, receiver incremental tuning (RIT), noise blanker, and 600 alphanumeric memories (3 banks of 200 channels). There are also rear panel connectors for connecting external devices including an IQ output for possible use in SDR applications, DRM (Digital Radio Mondiale), external decoding, etc. None of the previously mentioned portables gets even close in performance to this fine tabletop radio.

Finally, when you venture above that $500 mark, not only has the cost increased, but so does receiver performance, feature sets and the ability to hear more military HF communications. This part of the marketplace is clearly the domain of the wideband and software defined radios.

Here clearly the undisputed leader of the pack, with a hefty price tag is the Icom IC-R8600 all band, all mode software defined radio (See *TSM* review Sep 2017 page 10). This one isn't going to fit in your suitcase, but it is a star performer in its price range.

Another major player in the wideband radio field is AOR and their flagship receiver is the DV-1B (See *TSM* review Jan 2016 page 14). Like the Icom R8600, if you want to listen to HF military in style, these two radios will get the job done, but at a steep price, of course. I should add that are more choices in this price range to investigate, but they are too numerous to mention in this column.

The Used Receiver Market

If your "Google is strong," and you are willing to invest some time prowling the Internet and/or Hamfest, there are a lot of great used radios you will find for military HF monitoring.

Here are just some of the radios that I have used for military monitoring in the past to keep a sharp eye out for in the used marketplace: Any of the older Grundig portables, Sangean ATS-505/818/909, many of the Sony portables (ICF-2010, SW-07/77/100/7600), Icom IC-R72/75/8500 tabletops, any of the old Drake R-8 series, Kenwood R-2000/5000 tabletops, and many more too numerous to mention.

Most licensed ham radio operators own a transceiver and if that is you then slap an antenna on it and you have all the makings of a great milcom receiver. Modern transceivers sold today include HF general coverage receive capability, and if it can dig out ham radio signals, it certainly will do the same for military comms.

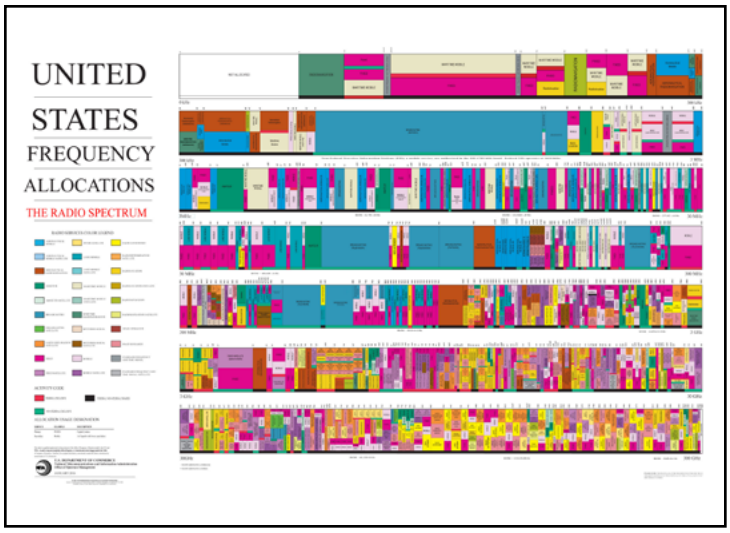
The Digital Revolution

The move to more modern digital communications, the advent of the PC sound card digital mode decoders, and more powerful PC computers have changed the receiver marketplace dramatically.

I truly believe that the days of hardware based analog HF receivers are numbered. That old tuning knob will evidently go the way of the dodo bird. Software defined radios now have a huge presence in the HF/VHF/UHF spectrum for good reason. A much more capable radio can be built into a much smaller package at a cheaper price than anything you will find in the analog only market.

Not only can these radios be updated to provide new listening capability using software instead of a complete hardware replacement, but a wide variety of non-encrypted digital modes used by military forces worldwide are easily incorporated into the SDR receivers.

So, what should you be on the lookout for? Remember what I said at the beginning of this article, "money equals performance." Same applies to SDRs. While these cheap RTL-SDR dongles work well for VHF/UHF, even with most



United States Frequency Allocations https://www.ntia.doc.gov/files/ntia/publications/january_2016_spectrum_wall_chart.pdf (Chart courtesy of US Department of Commerce NTIA)

SDRplay (Photo courtesy of SDRplay)

AirspyR2/SpyverterR2. (Courtesy: Airspy)

Icom IC-R8600 all-mode, all-band SDR. (Courtesy: Universal Radio)

add-ons, HF performance in the mil bands won't be that great.

Probably the "best bang for the buck" SDR should go to SDRPlay (See *TSM* review Jun 2015 page 31) at $149. With very wide coverage from 100-kHz to 2-GHz you can listen to just about anything. The very wide bandwidth up to 8-MHz will you to view large swaths of frequencies at once in the SDR software client or even set up multiple VFO's to monitor several frequencies at once. It is easy to set up with free SDR software such as HDSDR, SDR-Console, and CubicSDR. Learn more on the SDRPlay website at **http://www.sdrplay.com**.

The AirspyR2/SpyverterR2 (See *TSM* review Nov 2015 page 21) combination is a nice SDR package at around $218. Using their free SDR# (pronounced SDR Sharp) control software, add in free virtual audio cable software to get the audio over to your sound card decoding package, download some free frequency management add-ons, and you can have a lot of fun in the HF/VHF/UHF military bands with this SDR.

RFSPACE, Inc., offers three different SDR packages with the CloudIQ at the low end starting at $620. Their complete line of SDRs are available from our friends at Universal Radio (**https://www.universal-radio.com**).

There are also other players in the SDR marketplace including the Elad, Enablia, Microtelecom (Perseus), FlexRadio Systems, and Ten-Tec. A quick Google search on those manufacturers will take you to their SDR offerings.

That does it for our brief introduction to Milcom monitoring equipment. Next month, it is time to start digging into the actual radio spectrum itself to uncover some frequencies where you can hear military comms.

Go back and review last month's *TSM* Milcom column on VHF/UHF equipment, and re-read this one on HF equipment so that when the next natural disaster or hotspot flares up, you will be ready to monitor comms in the military action bands.

Milcom Tip of the Month: Many years ago, a very wise military monitor passed along to me this sage piece of advice, "Don't be afraid to throw away old military frequencies. Frequencies do change because military band plans can and have changed." The take away here is to beware of old frequency lists posted on even some respected and reliable Internet radio related websites.

TSM

Utility Planet

By Hugh Stegman **mtutilityworld@gmail.com**

Summer 2017: Nature Gets the Last Word

Every so often, Mother Nature tells someone to hold her beer while she reminds us who is really in charge. The past month was one of these times, on and off the radio. The period opened with a historic solar eclipse. Little did we know at the time that it was only the curtain raiser. And we don't even have room for the Mexican earthquake that took place at the same time as everything else. Let's get going with all this.

Eclipse

Preliminary data support the idea that the August 21 transcontinental solar eclipse did have a measurable effect on HF propagation. Research at MIT indicated that the electron density of the ionosphere declined by half in the areas with totality, then it recovered afterwards. One amateur heard 160 meters open up in mid-day, as the D region became thinner. After the eclipse, it closed down again. Another one heard 20 meters drop out as if it were night, then come back.

Here in Los Angeles, the land that totality forgot, not much happened. I had WSPR going on 20 meters, among other things. The only noteworthy effect was when a few European stations briefly popped in and out at a time when the eclipse was total farther east. That simply never happens here at that time of day in the summer. It's the only time it happened in several days of observing. Of course, there are other variables here, so I'm not ready to say the eclipse did it. It's an interesting result, however.

Hurricanes

Four days later, on August 25, the Hurricane Watch Net activated on 14325 and 7268 kHz as hurricane Harvey approached the Texas coast. This began a historic flood that brought back memories of Katrina 12 years before. A week after that, massive hurricane Irma did catastrophic damage to Caribbean islands on its way to a trip right up the Florida coast. Havana was also badly hit, and HM01 was missing its schedules on the one day I had time to check. WRMI, in Okeechobee, FL took damage, and Shortwave Radiogram missed its 7730 kHz schedule. Others aired as usual. As this is written, the aftermath of both hurricanes is still being actively worked by disaster agencies. Worse, more storms seem to be on the way.

All this gave an opportunity to hear how all our fancy

U.S. Coast Guard HC-130H and HC-130J in formation. (Courtesy USCG)

new communications systems would hold up. In Katrina, pretty much everything failed except a couple of HF nets. The real workhorse beyond line-of-sight was Rockwell Collins' COTHEN (Cellular Over-The-Horizon Enforcement Network). COTHEN uses ALE on at least 5732, 5909.5, 7527, 8912, 10242, 11494, 12222, 13312, 13907, 14582, 15867, 18594, 20890, 23214, and 24838.5 kHz USB.

Since the Katrina experience, various U.S. agencies and business ventures have spent a huge amount of time and money on additional HF disaster capability. It's essentially a backup to a backup. The scenario assumes a dire emergency where absolutely everything else that can communicate beyond line of sight is gone. Absent landlines, there are cell phones and mobile Internet. Absent those too, there is satellite comm, if anybody can get access to it. When that goes, there is the good old ionosphere, most of the time anyway. We have more about that later.

There were short periods during Harvey, and longer ones in Irma, when things actually got up to the worst case. A lot of people listened to hear whether these new HF capabilities would be put to a real world test. The result was, well, interesting.

Sure enough, everything activated. We heard MARS, SHARES, amateurs, NGOs, and more. Unfortunately, there wasn't much for them to do. Information can't move until someone originates it, and often that simply wasn't happen-

ing. It remains to be seen whether this was due to the magnitude of the disaster, or to planners putting too much faith in newer and sexier comm systems.

Once again, COTHEN was the exception. FEMA, the National Guard, and the U.S. Army Corps of Engineers had some sporadic activity. The U.S. Coast Guard made heavy use of it in both hurricanes. Fixed-wing aircraft, usually HC-130s and HC-144As, flew over the regions, providing command control communication. At press time, they are still doing extensive HF flight following with COMMCOM, the Communications Command in Virginia.

USCG ALE stations often link with other ones, and they usually do a 2-way link check called a LQA (Link Quality Analysis). After this, there is a very good chance of voice communication similar to what used to be common on the old frequencies such as 5696 and 8983 kHz. These frequencies are still used, but they are nowhere near as active as before. COTHEN is a very resilient, extremely well thought out system, and it does the job.

Oddly, USCG was also making limited use of 8000 kHz USB. It's one of their tactical frequencies, but it's usually allocated to the Pacific. Lately, it's been used mostly for the DRM "Journaline" broadcast in Alaska. However, people near the action have heard some interesting voice comms here.

People often ask whether it's possible to hear the U.S. Air Force Reserve "Hurricane Hunters." The short answer is no. At one time, they had an extensive HF network with "Miami Monitor" at the National Hurricane Center. That is long gone. Weather reports go by satellite. What we do hear, on occasion, is the hurricane aircraft working oceanic air traffic control on the same Major World Air Route Area (MWARA) nets used by airliners. The call sign is TEAL plus two figures, and the procedures used are the same as for civil aircraft. New York on 8918 kHz USB has had some of this. 2017 is shaping up as one of the bad hurricane seasons, and I'm sure there'll be more to write about. But, in general, disaster communication has changed. The whole concept of a "hurricane frequency" may be obsolete. At least for me, though, there's still a buzz in hearing routine ALE soundings and voice check-ins from mobiles that we know are actively saving lives in these monster storms.

Solar Flares

The last thing anybody needs as a major hurricane moves through Florida is for a solar flare to cause a major ionospheric disturbance. That's just what happened, though, and the effect was sudden and dramatic. It was the climax of an incredibly active solar phenomenon that once again demonstrates how the low parts of cycles can still have fireworks.

But let's start at the beginning. Those watching the eclipse might have noticed that the sun was a bit spotty.

Sunspots have been rare in the past year or so, as the already anemic Cycle 24 moved toward its bottom. For whatever reason, this changed in August. The ultimate result was a high-energy sunspot group with the low-energy name of Active Region 2673. At first, this ran the solar flux up to 140, doing wonders for HF propagation above 20 MHz. Then, ominously, it started putting out noteworthy solar flares.

U.S. Coast Guard HC-144A at Corpus Christi, TX (Courtesy USCG)

At 1200 UTC on September 6, the region blew, big time.

The result was a huge X9.3 flare with coronal mass ejection (CME). This was the biggest flare in over a decade, and way the biggest of Cycle 24. These flares can zap the Earth with awesome electromagnetic energy, not to mention fast "relativistic" protons. The ionosphere helps protect us from all this, but at a price. HF propagation on the daylight side stops, quite suddenly, as if a switch had been pulled. Europe was on the sunny side for this one, and that's exactly what happened.

This effect can get pretty creepy. A lot of the static on HF is propagated from distant lightning discharges, and this goes away too. It can get really quiet. One's first reaction is to check their equipment. Surely the antenna feeder is broken or something's not right in the front end. But these are fine, of course. It's the ionosphere that's broken. It comes back in 45 minutes to an hour, except in extreme cases like this one. Then it can be several hours.

Observations showed that the CME was headed directly towards Earth. This ionized solar material usually gets here a couple of days later, but this one had more energy than most. On September 7, it hit Earth's magnetic field, causing lines on charts to go crazy. The official name for all this is severe (G4) storming. It brought aurora to locations as far south as Arkansas. Traffic stopped in Scandinavia as drivers paused to watch it all.

Then came Irma. On September 10, as it neared Florida, everyone had their HF on. Suddenly, there was no HF. Yes, we had gotten another flare, this one a respectable X8.2 at 1606 UTC. It's the second largest one of this cycle, by a mile. The unfortunate timing put the U.S. on the sunny

U.S. Army Corps of Engineers mobile units at a 2004 hurricane (Courtesy USACE)

side, and it was our turn for propagation to go away. Here, it was most of the day coming back. It's by far the longest ionospheric blackout I've ever heard, and I've heard a lot of them.

For reasons best understood by geophysicists, this flare was extra heavy on protons. These precipitated a rare ground level event (GLE). That means, basically, that the particles have sufficient energy to make it through the atmosphere and magnetic field, thus reaching the ground. It sounds scarier than it is, but it indicates that the gods were angry indeed.

I'm sure the unfortunate Irma outage will be used as yet another argument for the uselessness of HF in disaster situations. This might be true, had anything else been working in the hardest-hit areas. It wasn't. Cell phones were mostly out, satellite dishes had become flying saucers, hardly anyone had access to an Iridium phone, and forget about Twitter. Barring carrier pigeons, that's just the way things go sometimes. One tries to minimize these cases when you just can't get there from here, but sometimes nature gets the last word.

More UVB-76

As expected, last month's column got quite a bit of attention. We start, however, with a correction. The proper Google Earth coordinates for the Russian 69th Communication site are 60.231100° north, and 30.273928° east. The erroneous position that I gave in the column is still in Russia, but way out in the Ural Mountains, far from much of anything. The 69th Comm is near St. Petersburg.

Ary Boender, of Numbers and Oddities, gave some more information. He writes, "The station is and always was a comms hub used to communicate with other stations in its net, and it is/was used to alert stations in its region. It became more active after the reorganization of the Russian Forces in 2010. Several regions merged in that period."

The reorganization that Ary mentions is the one that put the military districts and naval fleets under four commands. The Moscow district became part of the Western Military District under the West Strategic Command in St. Petersburg. Boender continues:

"Note that the 4625 kHz transmitter already was part of radio network Nr. 43 in the Soviet days, and it is still known as comms hub #60 for the Western Military District. It has always served as a comms hub. Nice to know: People who visited Bunker 42 in Moscow before it opened to the public as a museum, say that several radios in the bunker were tuned to 4625 kHz, which is logical looking at its role as comms hub for the region."

More Russian Military

This column is being written in the middle of Russia's massive Zapad 2017 exercise. It's a recurring joint activity that happens every few years. It has been in the news quite a bit due to its proximity to Russia's western border. This caused the usual people to speculate about the usual scary things. Back in the real world, the exercise has lit up the usual frequencies, though nothing is all that spectacular. Air transport still uses 6685, 8847, and 11360 kHz, all USB.

Naval air transport is on 11354 kHz USB. A ground/air net for bombers is on 8033 kHz USB. This is the expected "Bear Net" frequency for the period of September 1 through October 31.

IDs heard on 11360 include the usual Davlenie (Taganrog), Korsar (Pskov), and Klarnetist (Migalovo/Tver). There are also some unfamiliar ones which await a more definitive identification.

That's it for this month. Check the logs for more on these "interesting times."

Resources:

Eclipse radio propagation effects:
http://www.arrl.org/news/more-professional-and-citizen-research-suggests-eclipse-briefly-affected-hf-propagation

Recordings of UVB-76 through the years:
http://www.numbersoddities.nl/rusmilvoice.html

Wiki article on Zapad 2017:
https://en.wikipedia.org/wiki/Zapad_2017_exercise

TSM

Shortwave Utility Logs

Recent Shortwave Utility Logs Compiled by Hugh Stegman

Frequency	Callsign	User, Location	Time	System Details
2187.50	002750100	Riga Rescue Radio, Latvia	2304	DSC test with unknown vessel
3881.00	Unid	French Military (M51)	2145	CW, hours of 5-character groups, simulkeyed on 6825
4372.00	Hard Charge	Unknown U.S. Navy vessel	0229	USB, radio check with Proud Warrior
4458.00	KNY74	U.S. SHARES net control	0001	USB, voice and MT63-1KL with WQRA205, others
4618.00	BPLEZS	German Federal Police, Cuxhaven	2151	ALE and secure voice with BP21, Police Boat *Bredstedt*
4900.00	Unid	S. Korean Intelligence (V24)	1530	AM, folk music intro and numbers in Korean
5253.50	NF82RR	USCG Auxiliary net control	1600	USB, USCG Auxiliary District 7 Irma Net, voice & MT63-1KL
5401.00	KRAKOW	Polish MSWiA, Krakow	1758	ALE, calling WARSZAWA1 (MSWiA, Warsaw)
6312.00	219465000	Vessel *Esvagt Celina* (OWKX2)	0030	DSC, test from Danish flag search and rescue vessel
6501.00	NMN	USCG, VA	2232	USB, Iron Mike voice with Irma and Jose advisories
6865.00	XS61	Possible UK DHFCS	2213	ALE, calling NX40
7268.00	N8BHL	Hurricane Watch Net, OH	2330	LSB, repeating report of heavy damage in Barbuda
7290.00	KF5IOU	Dallas ARES, TX	2036	LSB, working N5WAJ at Houston Red Cross HQ
7348.00	WGY 912	FEMA, Mt. Weather, VA	1355	USB, ALE and voice with unknown station
7527.00	LNT	USCG COMMCOM, VA	2314	ALE and voice with 718, USCG HC-130H #1718, Clearwater, FL
7697.10	CONTROL22	U.S. telco NS/EP Net	1429	ALE, National Security/Emergency Preparedness with MIAMFL182
7965.00	Aircraft 350	Unknown U.S. Military	1427	USB, came from 9005.4 for Shade Tree and Mad Dog
8000.00	Tiburon 910	USCG Cutter *Thetis*	1447	USB, working Shark 25, possibly USCG Cutter *Venturous*
8033.00	Unid	Russian Military	1119	USB, coded message in Russian on Bear Net for aircraft "03116"
8088.00	415	Polish Intelligence (E11)	1730	USB, callup "415/36" and 5-figure-group message
8191.00	Unid	Togolese Navy	2058	USB, oil tanker piracy protection escort, passing Pactor-III mail
8425.50	XSG	Shanghai Radio, China	1718	Sitor-A, "QUICK BROWN FOX…" test slip
8426.00	Unid	Russian Military	1140	USB, voice in Russian, then digital with 035 and 037
8439.00	Greyder	Russian Navy, Vladivostok	0019	USB, Pacific Fleet HQ working Bagranets, in Russian
8473.00	WLO	ShipCom, Mobile, AL	2252	RTTY (45/170), running endless idler after Irma
8580.00	Unid	Probably South African Navy	2300	FSK/MFSK, idling with SAAB Grintek MHF-50 modem
8682.00	NMC	USCG, Pt. Reyes, CA	2150	FAX, clear tropical surface chart showing Harvey
9106.00	KGE22A	U.S. FBI, Quantico, VA	2045	ALE, calling NCS004DAT, unknown SHARES control station
9963.00	633	Polish Intelligence (E11a)	0710	USB, callup "633/32" and 5-figure-group message
10194.00	WGY 912	FEMA, Mt. Weather, VA	1400	USB, ALE and voice with WGY924, TN state EOC, Nashville
10242.00	LNT	USCG COMMCOM, VA	0010	ALE, 2-way LQA with 003, USCG HC-130J #2003, Elizabeth City
10588.00	WGY 912	FEMA, Mt. Weather, VA	1406	USB, ALE and voice calling WGY 904, FEMA Region 4, GA
10715.00	Unid	Cuban Intelligence (HM01)	2240	AM, loud machine voice callup and RDFT bursts
11228.00	DH-66	Likely NATO aircraft	1220	USB, crypto setup with JP-66, then secure voice
11330.00	Reach 850	USAF C-5M #87-0034	0644	USB, position for Tokyo (CWP1/2 air route control)
11350.00	GANOB10	Likely Egyptian Net	1313	USB, ALE and voice with HQ4
12140.00	516	Russian Intelligence (S06s)	0930	AM, callup "516 824 7" and 5-figure-group message in Russian
12222.00	TGT	USCG Cutter *Sturgeon* (WPB 87336)	2320	ALE sounding, likely Harvey op
12270.00	Lost Shoe	U.S. Military airborne CP	1252	USB, came from 11175 for patch via Mail Bag to Strategy
12579.00	NMO	USCG, Hawaii	2100	Sitor-B, Pacific wather and Navarea XII warnings
12585.50	KPH	MRHS, Pt. Reyes, CA	2052	RTTY (45/170) and Sitor-B, with hurricane advisory for Lee
13312.00	J36	USCG MH-60T #6036	0029	ALE, likely Harvey op, working LNT, USCG COMMCOM, VA
13379.00	A98	Chinese Military	1315	ALE, working D78
13881.00	818	Russian Intelligence (E07)	1700	AM, callup "818 2 498 64" and 5-figure-group message
13907.00	N05	USCG HC-144A #2305, Miami	1923	ALE, calling LNT, USCG COMMCOM, VA
14325.00	KC0YHM	Hurricane Watch Net, MN	2055	USB, Harvey advisory, then taking weather report from field
14396.50	NCS312	SHARES Control Station	1545	USB, weekly net check-ins for NC044, FL, and many others
14455.00	"AB"	North Korean Diplomatic	0749	DPRK-ARQ (600/600), also 15856 (unid), 16020 (CE), and 16318 (D3
15867.00	N05	USCG HC-144A #2305, Miami	2132	ALE and voice with LNT, on Harvey op near Houston
15988.00	DDK7	German Weather Ofc., Pinneberg	2044	FAX (120/576), grungy Mediterranean wind chart
16167.00	Unid	Russian Polytone (XPA2)	1900	MFSK-16/20, message in 128 groups, repeated on 14663 and 13923
16180.00	Unid	Cuban Intelligence (HM01)	2100	AM, callup "51575 32259 01665 55784 03201 77223" and RDFT bur
16804.50	432934000	Panama bulker *Sage Sagitterius*	2339	DSC Safety test with 004122100, Shanghai Radio, China
17416.60	Unid	Egyptian Diplomatic	0658	Sitor-A, Arabic opchat in ATU-80
17430.00	9VF/252	Kyodo News, Singapore	1208	FAX (60/576), with Japanese newspaper
17480.00	Unid	Cuban Intelligence (HM01)	2158	AM, callup "51575 32259 01665 55784 03201 77223," and RDFT bu
18594.00	503	USCG HC-130H #1503	2159	ALE and voice with LNT/ COMMCOM, landing in Houston
18650.00	CVZ	Algerian Air Force	0722	ALE, calling HA6
20890.00	ICB	USCG Cutter *Forward* (WMEC 911)	2030	ALE, on Irma op, sounding, also 18594 and 24838.5
24838.50	TGT	USCG Cutter *Sturgeon* (WPB 87336)	0035	ALE, likely Harvey traffic

Shortwave Utility Logs

Recent Shortwave Utility Logs Compiled byMike Chace-Ortiz

Freq (kHz)	Callsign	UTC	User, Location	System Details
7880.00	DDK3	2207	Hamburg Meteo, Germany	120lpm/900/288 FAX, wx chart
7981.40	KZN508	2200	SailMail Association, Rockhill, SC	PacTOR-III HF modem, tfc "Welcome to SailMail R3 Rock Hill #1"
8136.20	???	2200	NATO MIL, ???	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10312.60	NAU	2220	US Navy, Isabela PR	75bd/850 STANAG4481FSK, crypto tfc
10331.00	KZN508	1938	SailMail Association, Rockhill, SC	PacTOR-III HF modem, tfc “Welcome to Sailmail R3 Rock Hill SC #2”
10360.00	???	1930	UK MIL DHFCS, ???	1200bps/L STANAG4285 HF Modem, crypto tfc (on USB)
10371.20	???	1930	???, ???	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10559.20	DHJ59	0023	German Navy, Neuharlingersiel	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10568.20	IBA	2310	NATO MIL, Naples	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10733.25	DHJ59	2152	German Navy, Neuharlingersiel	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10733.30	DHJ59	2332	German Navy, Neuharlingersiel	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
10984.00	???	2350	Russian MIL, ???	AT3004D 12 tone HF modem, tfc (on USB)
11088.00	RCV	1940	Russian Navy, Sevastopol	50bd/200 BEE, tfc
11337.00	4XZ	1944	Israeli Navy, Haifa	Hybrid FSK/2400bd PSK HF modem, tfc (on USB)
11470.00	???	1131	Russian MIL, Chita	50bd/500 BEE, idle
11638.00	DDK8	2004	Hamburg Met, Germany	120lpm/576/800 Fax, chart
11668.00	RDL	2219	Russian Navy, Moscow	50bd/200 BEE, tfc and CW F1B "rdl rdl rdl" and 5FGs
11980.00	???	2115	NATO MIL, ???	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
12370.00	???	1917	Russian MIL, ???	AT3004D 12 tone modem, idle with full carrier (on USB)
13042.50	FUV	2356	French Navy, Djibouti	600bps/L STANAG4285 HF modem, “voyez le brick” marker in ITA2
13057.60	EBA	2040	Spanish Navy, Madrid	600bps/L STANAG4285 HF modem, crypto (on USB)
13411.60	FUE	2010	French Navy, Brest	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
13447.00	???	1915	NATO MIL, ???	Link-11 CLEW, 2 channels tfc (on DSB)
13917.20	DHM85	1730	German Navy, Marlow	600bps/L STANAG4285 HF modem, crypto (on USB)
13921.70	OVK	1450	Danish Navy, Aarhus	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
13964.00	???	1810	???, ???	MIL-188-110C HF modem, tfc (on USB)
13964.00	???	2315	???, ???	MIL-188-110C Wideband HF modem, 48kHz waveform (on USB)
13975.00	RAL2	0400	Russian Navy, ???	CW, wkg RFH71
14444.00	???	1310	North Korean Embassy, Europe	600bd/600 FSK UNID ARQ System, tfc (+1500Hz on LSB)
14478.50	???	2000	???, ???	100bd/200 PacTOR, robust connect mode selcalls
14532.00	???	2005	Russian Intelligence, Cuba	50bd/500 FSK UNID System, ACF=128 tfc
14548.20	???	1110	UK MIL DHFCS, Akrotiri	600bps/L STANAG4285 HF Modem, crypto tfc (on USB)
14681.50	RTI***	1414	US National Guard, Utah	125bd/1750 MIL-188-141A, ALE sounding (on USB)
14681.50	TOO***	1414	US National Guard, Utah	125bd/1750 MIL-188-141A, ALE sounding (on USB)
14692.00	03011***	1759	Congolese Police, ???	125bd/1750 MIL-188-141A, ALE sounding (on USB)
15091.00	JNRSPR***	1230	US Air Force SIPRNet, Roosevelt Roads PR	125bd/1750 MIL-188-141A, ALE sounding (on USB)
15812.10	MKD	1130	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF Modem, crypto tfc (on USB)
15950.00	???	1230	???, ???	USB, OMs in Arabic
16011.70	SSE	2045	Egyptian MFA, Cairo	100bd/170/E SITOR-A, Calling selcal "TVXS" (Embassy Manama)
16106.20	???	1208	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
16112.00	RDL	2040	Russian Navy, Moscow	50bd/250 BEE, tfc sync on [0x1414bebe952] & [0x1414bebe64c]
16123.00	NAU	1135	US Navy, Isabela PR	50bd/850 FSK UNID System, sync, cont, ACF=0
16132.00	XSS***	1937	UK MIL TASCOM, Forest Moor	125bd/1750 MIL-188-141A, ALE sounding (on USB)
16176.70	???	1200	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF Modem, crypto tfc (on USB)
16200.00	RDL	1335	Russian Navy, Moscow	50bd/200 BEE, tfc on sync=[0x1eb41eb2952] (idles on 50bd reversals)
16218.00	???	2000	Russian Intel, Cuba	50bd/500 FSK UNID System, sync, cont, ACF=16 idle, ACF=128 tfc
16240.00	2415***	1309	Moroccan DGSN, Morocco	125bd/1750 MIL-188-141A, ALE sounding (on USB)
16250.00	NEWT***	1147	Ghanaian Navy, ???	125bd/1750 MIL-188-141A, ALE sounding (on USB)
16250.00	MOCSEK**[illegible]	1147	Ghanaian Navy, HQ Sekondi	125bd/1750 MIL-188-141A, ALE sounding (on USB)
16250.00	MOCTEMA[illegible]	1147	Ghanaian Navy, HQ Sekondi	125bd/1750 MIL-188-141A, ALE sounding (on USB)
16368.20	???	1426	Italian Navy, ???	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
16559.00	???	1400	Shanghai Radio, Shanghai	120lpm/576/800 Fax, SE Asia chart
16603.50	???	1647	???, ???	MIL-188-110C HF modem, tfc (on USB)
16605.50	???	1647	???, ???	MIL-188-110C HF modem, tfc (on USB)
16606.00	???	1144	UK MIL DHFCS, Akrotiri	2400bps/L STANAG4285 HF modem, crypto tfc (on USB)
16680.00	RLA88	1206	Russian Navy, Ship	CW, calling RCV
16808.00	RDL	1540	Russian Navy, Moscow	50bd/200 BEE, idle on 50bd reversals and tfc on sync=[0x1eb41eb2952]
17237.60	EBA	1800	Spanish Navy, Madrid	600bps/L STANAG4285 HF modem, crypto tfc (on USB)
17398.20	???	1125	NATO MIL, ???	1200bps/L STANAG4285 HF modem, crypto tfc (on USB)
18750.00	???	1400	???, Bucharest	6 tone UNID selcall, 400Hz shift, 3 of 6 tones active per burst (on USB)
20723.20	???	1335	UK MIL DHFCS, Akrotiri	1200bps/L STANAG4285 HF Modem, crypto tfc (on USB)

VHF and Above

By Joe Lynch N6CL **VHFandabove@gmail.com**

A DIY Hardware Store 2-Meter GOTA/EMCOMM Antenna

Many of us amateur radio operators have been shocked by the news stories about Hurricanes Harvey, Irma, and Maria, to name a few. We have grimaced at the scenes of destruction and even wondered about volunteering to be of assistance in one of the disaster zones.

Also, we may have wondered about what would it be like to be in the middle of the disaster area with our antennas down and the electrical power is out throughout the area, thereby making it very difficult to communicate, except by way of a handheld radio. The enormity of this type of situation is being played out in Puerto Rico, as this is written, where 95 percent of the island's electrical power was destroyed when Hurricane Maria crossed over it. No power and no antennas were the results.

With disaster and emergency communications in mind, I approached this month's column with the premise that you as the amateur radio operator are either planning on going into the disaster zone or are already in it as a survivor. By way of either scenario, you may find yourself without an outside antenna and without the means to acquire one.

In consideration of these two restrictions on my scenario for you, I decided to design a 2-meter vertical antenna made entirely from parts purchased from a do-it-yourself (DIY) big box hardware store. By doing so, I make a few assumptions: First, there is such a store reasonably close to the disaster area and it is reasonably stocked. Second, there is an urgency to get on the air quickly. Third, temporarily, there is no mail or FedEx or UPS delivery to your QTH. Fourth, you have certain connectors in your junk or toolbox. Specifically, at minimum, you have a female BNC to PL-259 adapter connector. Also, you should have an SMA to female BNC adapter for your handheld. These connectors are easily obtainable from Amazon so there is no excuse for you not to have them. Be sure the SMA part of the adapter is correct for your handheld. Most of the popular Japanese models require a male SMA adapter. While most of the Chinese models require a female SMA adapter.

It might be a good idea to have both in your toolbox, just in case your ham radio buddy at the disaster site has none. In fact, it might be a good idea to have a kit box full of diverse adapters. NooElec.com sells a box with eight adapters and room for more through Amazon.

Finally, it is also a good idea to have a couple of female Type-F to SO-239 and/or a Type-F to female BNC adapter connectors on hand, just in case you might need them. You never know, as you will see below.

NooElec's collection of useful adaptors sells for $20. (Courtesy: NooElec.com)

Regarding the DIY store, it is highly likely that its stock of highly needed supplies has been sold out. However, it is likely that the coaxial cable, CPVC stock, and hookup wire are still on the shelves in the aftermath of the disaster, because of the low demand for these items. See photo above for some idea of the various types of adapters you may need in your toolbox.

When you go to the coaxial cable section, you should find plenty of RG-6 coax. It is the cable of choice for CATV. It is also used for video installations. Video also uses connectors that are very familiar to us hams: BNC. Yes, RG-6 coax is 75 ohms and we hams use 50-ohm coax. Therefore, there is a mismatch. For temporary installations, as described here, the mismatch should not be considered that significant.

One peculiarity of the compression connector stock is the lack of female BNC connectors. The CATV and video industry's solution is to use female-to-female in-line connectors. However, don't worry about the lack of compression female BNC connectors. Sticking one of those female-to-female connectors into a male BNC connector suddenly makes it a female connector that works for your BNC equipped coax cable.

Concerning connector-equipped coaxial cable, while you will find plenty of already made up lengths of coax with F-connectors, you will find practically no coaxial cables equipped with BNC connectors. Even so, as you will read further into this column, it is not that hard to make up your own BNC-equipped coaxial cables, just a little expensive.

If you acquired those female F to SO-239 or female F to female BNC connectors, then your coaxial cable situation

A view of the various tools you may need, all of which are available at the DIY hardware store.(N6CL photo)

How to insert the coaxial cable into the trigger strip tool. (N6CL photo)

is solved. Simply attach the appropriate adapter for your radio to the male F-connector on the cable. You now have a slightly mismatched feedline for your radio to your antenna you are about to build using CPVC pipe and some hookup wire. I will discuss the mismatch below when I discuss the antenna I constructed from CPVC pipe and fittings.

Installing the BNC Connector onto the Coax

Back to those BNC connectors: If you do not have F to PL-259 adapters, you are not out of luck. Simply acquire a length of RG-6 coaxial cable appropriate for your installation and install the off-the-shelf BNC connectors onto the cable. There is a caveat, however: The crimper installation tool that the store stocks costs nearly $60. Admittedly, this alternative plan is expensive. Even so, the third alternative, no coaxial cable to connect your radio to your antenna, is unacceptable.

If you must create your own BNC-equipped coaxial cable, here is how you do it: You should find a 4-pack of male compression BNC connectors. Be sure they are for RG-6 coaxial cable. If RG-59 coaxial cable is all that is on the shelf, then use the appropriate size male compression BNC connector.

Also, you will need another tool: a coax cutter/stripper. For stripping the coax, you can use a straight cutter/stripper or you can use a trigger strip tool. Both tools, along with the crimper should be on the rack in the coax cable and fittings. See photo above left for a view of the various tools you may need, all of which are available at the DIY hardware store.

The trigger strip tool is very handy because it makes two measured cuts simultaneously: It cuts lightly into the outside insulation and deeply into the inner insulation. The cuts are measured to be about 1/4-inch. When making the strip for the center conductor, be sure that the center conductor is no more than 3/8-inch long, because it fits into a tiny hole on the backside of the BNC's center conductor. See photo 3 above right for how to insert the coaxial cable into the trigger strip tool.

Installing the BNC connector onto the coax is straightforward: After stripping the coax and making sure the center conductor is no more than 1/4-inch long, then gently push the connector onto the end of the newly stripped coax. After the connector is on the coax, continue to gently push the coax into the connector until it seems it will go no further into the connector. Then, push it onto the coax a bit more.

At this point, it is a good idea to make a continuity check. Use your multimeter to be sure the center pin of the BNC connector is connected to the center conductor of the coax by touching the center pin with one probe and the other end of the coax cable with the other probe. If you see continuity, you are ready to finish installing the connector onto the coax using that expensive crimping tool.

Be sure the crimping tool is set for the proper coax and connector, as it is designed to accommodate BNC and F-connectors, as well as various sizes of coax. When the crimper is set, place the coax and connector into the resting area on the tool. When the coax and connector are in place, squeeze the handles of the crimping tool together until they seem to not come any closer. Then, give them another good squeeze. Your BNC connector is now both physically and electrically installed. See photo top left on the next page for the proper way of inserting the compression BNC connector into the crimper. See photo top center on the next page for how the compression male BNC connector is connected to the female BNC to male SMA adapter that is installed onto the handheld radio.

The Vertical Antenna

Based on my design of a 6-meter CPVC vertical antenna (please see my June 2017 column), I decided to build something similar—and simpler—for 2 meters. As I did with the 6-meter antenna, I chose CPVC pipe and fittings. For the 2-meter version, however, I used half-inch pipe and fittings

The proper way of inserting the compression BNC connector into the crimper. (N6CL photo)

The type of crimping tool I used for the terminal wire connectors. (N6CL photo)

throughout.

As with the 6-meter antenna, I used stranded 14-gage THHN wire, just because I like working with it—and I had plenty of scrap pieces from other projects. The major difference in the center feed point for the two antennas was that I did not use a SO-239 connector. Rather, I used a compression BNC connector and a BNC female-to-female connector to create the female connecting point for my BNC connector equipped RG-6 coaxial cable.

For the center connections, I used a short piece of RG-6, about four inches long. I crimped a compression BNC connector on one end and inserted a female-to-female connector into the compression BNC connector.

Next, I stripped the insulation off the open end of the short piece of coax, exposing the braided and foil-wrapped shield. I pulled back the braided shield and peeled off the foil-wrapped shield, thereby exposing the insulation surrounding the center conductor. I stripped about three-quarters of an inch of the insulation off the center conductor.

For the dipole, I used terminal wire connectors (blue for 16-14 gage wire) to connect the 14-gauge wire to the stripped ends of the coax cable. I inserted the wires and stripped ends into the terminal wire connectors and crimped the connectors, making sure the physical connections were solid. It is important to mention that the crimping tool you use make good crimps. I used a spring-loaded tool that crushed the terminal wire connector around the wires. To be sure that the wires were secured inside the terminal wire connector, I used the red (smallest) size of the crimper. See photo above right for the type of crimping tool I used for the terminal wire connectors. See photo next page left for the attachment of the wires to the male compression BNC coax connector.

Next, I fed the wires through a short piece of CPVC that acts as a sleeve to stabilize the compression BNC connector. Then I fed the wires through the center hole of the CPVC Tee fitting. Finally, I fed each wire out each of the cross holes of the fitting.

Next, I cut two 20-inch pieces of 1/2-inch CPVC pipe. I inserted the wire into each pipe and inserted the pipe into each cross-hole on the tee fitting. Finally, I placed a CPVC cap fitting on one of the 20-inch pipes and a 1/2-inch female pipe threaded fitting. I chose that fitting because I use it for almost all my antennas as the means of mounting them on the PVC pipe I use for a mast. The 1/2-inch female pipe threaded fitting also works on the Buddipole mast because it is equipped with a 1/2-inch female pipe threaded fitting.

Using an-F-Connector

I went through almost the same procedure constructing another antenna using an F-connector as I did with the above compression BNC connector, except for the following:

Using an existing piece of cable TV coaxial cable with the F-connector, I cut off one end of the cable about four inches from the end. Next, I stripped the insulation off the open end of the cable, as I described above for the compression BNC connector. Finally, I assembled the antenna in the same way that I did as I described above. See photo next page right for a view of the parts I used to assemble the F-connector antenna. See photo at left on page after next, which shows both completed antennas.

The Mismatch and the On-the-Air Test

Ideally, you want to use 50-ohm coaxial cable (Type 8X is recommended because of its size and flexibility). However, as I pointed out above, your DIY hardware store carries only 75-ohm coaxial cables (RG-59 and RG-6). This problem means that you will have to deal with a bit of a mismatch.

Here is what I observed: I designed the antenna to be resonant at 146 MHz, using 50-ohm coaxial cable. At that frequency, the SWR was nearly 1:1.

How the compression male BNC connector is connected to the female BNC to male SMA adapter that is installed onto the handheld radio. (N6CL photo)

Next, I switched to the 25-foot length of compression BNC-equipped RG-6 cable. I connected the cable to the antenna and the antenna analyzer. The analyzer indicated that the antenna now had a dip at about 147.30 MHz. The SWR was a little over 1:1.2.

Finally, I connected the BNC connector to a female BNC to PL-259 connector that I previously connected to the ICOM IC-7100 VHF/UHF antenna port. Testing the antenna with the 7100, I could easily key up the on-post W2KGY USMA Amateur Radio Club repeater. Its return signal measured S9+40 dB, which is not significant, considering that it is about three miles from my QTH on the other side of the post. Even so, it demonstrated that my creation was working. For the F-connector antenna operation, I added a female F to SO-239 adapter. Then, I connected the PL-259-equipped coaxial cable to both the antenna and radio, with identical test results as I described above for the compression BNC connector antenna.

Mounting and Supporting the Antenna

As I mentioned above, I installed a 1/2-inch female pipe-threaded fitting on one end of the antenna to easily mount it on a Buddipole mast or atop a 1/2-inch female pipe-threaded equipped PVC pipe. See photo next page right, which shows how I used the step ladder and paint bucket to vertically support the PVC pipe mast by inserting the PVC pipe through a hole in the top of the step-ladder and down into a paint bucket. You can use a paint bucket full of sand surrounding the PVC pipe for stability.

To Summarize

I have produced two easily assembled 2-meter dipole

A view of the parts I used to assemble the Type-F connector antenna.

antennas almost exclusively from parts obtained at a DIY hardware store. These antennas can be mounted on PVC pipe or anything that has a 1/2-inch female pipe thread fitting on its end. I have described how to create a feedline for the antenna to your radio, assuming you have previously acquired the proper adapter fittings. Thus, you can get on the air with your handheld radio and an outside portable antenna.

These antennas can be used for EMCOMM and for SOTA communications. In the worst-case situation, with ingenuity, you can construct the antenna and get on the air with it. In the best-case situation, you can construct the antenna before you deploy and have it available—just in case you need it. I did not glue any of the fittings. Therefore, it is easily disassembled and stored in a bag for quick assembly and deployment.

I hope I have given you ideas on how you can create your easily deployable and effective 2-meter antenna for your portable/SOTA/GOTA/EMCOMM requirements.

Current Contests

The 432 MHz Fall Sprint is October 4. The 902+ MHz Fall Sprint is October 7.

The ARRL International EME Contest (50-1296 MHz Round 1) is October 7-8.

For ARRL contest rules, see their URL: **http://www.arrl.org**. For Fall Sprint contest rules, see the Southeast VHF Society URL: **http://www.svhfs.org**.

Current Conferences and Conventions

The Microwave Update conference is to be held October 26-29, in Santa Clara, California at the Biltmore Hotel. Please see the Microwave Update website for registration and hotel reservations information: **http://www.microwaveupdate.org**.

The AMSAT-NA Space Symposium and Annual Meet-

The author demonstrates the practicality of the DIY antenna to the volunteer examiners for the USMA Amateur Radio club just before the testing began. Looking on are Mark Halabuda W2VIS and Carol Lynch W6CL. Photo courtesy Stephen Hamilton KJ5HY

ing is to be held October 27-29, in Reno, Nevada, at the Silver Legacy Hotel. For more information, please see the AMSAT URL pertaining to the symposium at: **https://www.amsat.org/amsat-symposium**.

Meteor Showers

The Draconids is predicted to peak on October 8 around 1800 UTC. The Southern Taurids is predicted to peak on October 10 around 0200 UTC. The epsilon Geminids is predicted to peak on October 18 around 0500 UTC. The Leonis Minorids is predicted to peak on October 22 around 0500 UTC. The Orionids is also predicted to peak on October 22 around 0500 UTC.

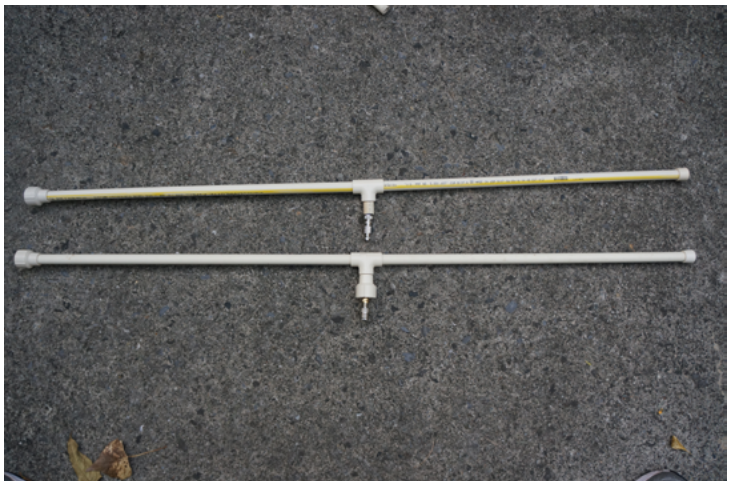
For more information on the above meteor shower predictions please see the American Meteor Society website: **http://www.amsmeteors.org/meteor-showers/2017-meteor-shower-list**.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' Proceedings, or both. For more information, questions about format, media, hardcopy, email, etc., please contact the person listed with the announcement. The following organization or conference organizer has announced a call for papers for its forthcoming conference:

AMSAT-NA 2017 Space Symposium

Technical papers are solicited for the 2017 AMSAT Annual Meeting and Space Symposium to be held on the weekend of October 27, 28, 29, 2017 at the Silver Legacy



Both completed antennas. (N6CL photo)

Shows how I used the step ladder and paint bucket to vertically support the PVC pipe mast. (N6CL photo)

Resort, Reno, Nevada. Proposals for papers, symposium presentations and poster presentations are invited on any topic of interest to the amateur satellite community. They request a tentative title of your presentation as soon as possible, with final copy to be submitted by October 6 for inclusion in the printed proceedings. Abstracts and papers should be sent to Dan Schultz N8FGV at n8fgv@amsat.org.

Amateur Radio Insights

By Kirk Kleinschmidt NT0Z **nt0z@stealthamateur.com**

The Twists and Turns of Amateur Radio Rotators

Even with a bit more than 40 years of hamming under my belt, it still never ceases to amaze me that certain tidbits of wisdom and common sense can still surprise me, even in areas in which I have plenty of experience. This year (in addition to sump pumps, gutters, and well heads—all non-ham "educational" topics with which I had little experience) it was rotators.

I haven't actually used too many rotators over the years. Despite the fact that I have been largely successful with DXing, contesting, and wallpaper chasing over the decades, mostly as a QRPer, I never felt a consistent need to put up a directional antenna on HF, as my (then) big horizontal loop already worked as well as, or even better than, a typical tri-band beam.

In light of the dreadful antenna restrictions many of us face, however, and the fact that none of us are getting any younger, I recently moved from a townhouse (horizontal loop in third-floor attic) to a rambler with a 1-acre yard specifically earmarked for antenna farming.

My "honey-do" homeowner's list became much larger than expected, however, so the several modest towers that I had acquired over the years haven't yet been installed. Yes, it's been a full year since the move and I still have the same two "Hail Mary" antennas: a 102-foot doublet at 35 feet fed with ladder line and an autocoupler, and a multi-band/multi-wire vertical mounted over a decent radial field (soon to be fed via an additional autocoupler). I recently added small beams for 6 and 2 meters to a chimney mount, but because the chimney is attached to a rambler, those antennas don't even reach 25 feet in elevation.

The real travesty? The attic-mounted horizontal loop easily outperformed, on average, both of my present outdoor antennas. Dang! (My local noise level is quite improved, however...)

Worked (from) All Zones?

Traditionally, there have been several "zones" that characterized our stations. The first zone, in which most hams lived, includes a 100-W transceiver and wire dipoles strung between backyard trees. Upscale variants included taller trees (Pacific Northwest pines often eclipse 100 feet, while upper-Midwest pines are lucky to reach 50 feet), a telephone pole or TV tower from which to hang the dipole, or perhaps a medium-power linear amplifier.

The rotator stuff on hand at NT0Z. Not shown: The rotators I want at NT0Z! In the center red box is a "new" AR-303 TV rotator from the '90s (never deployed). At the left are two CDE control boxes. The top one even has a matching rotator! At the right (super-ancient-looking controller on top of the red box) is a vintage Cornell-Dubilier TR-2, from the 1950s. Burly housing aside, the TR-2 is, unfortunately, pretty wimpy, as it was designed to handle TV antennas. To the left of the old Bakelite control box is an unused lower mast mount, probably for AR- or TR-series "bell shaped" rotators. (NT0Z photo)

Zone 2—where most of us wanted to live but didn't—sported a 50-foot tower from which to hang the dipole and mount a tri-band Yagi or a 2-element quad. Upscale variants included more powerful linear amplifiers, a tower that might reach 70 or 80 feet, perhaps a crank-up/tilt-over variety, more expensive radios, etc. This was ham radio's upper middle class, and during the '50s through the '80s, we all expected to get there, right?

Zone 3—was Mercedes Benz country. Sure, we wanted to be there, but while most of us could see making it into Zone 2, especially during the aforementioned period when it was appropriate to expect such things, Zone 3 required serious cash. Multiple towers topping 100 feet with stacks of monoband beams didn't come cheap, nor did the real estate on which to base such beautiful dreams! And let's not forget the best radios, amplifiers and all of the associated goodies.

Sporting a near-infinite number of brand names, this AR-303 light-duty TV rotator can be used to steer small VHF/UHF antennas in non-critical applications. It's easy to install and requires only a three-wire control cable. Don't overload it and don't expect years or trouble-free service. This one, Gemini-branded from the mid-'90s, still steers my small VHF Yagis. No longer bargain-priced, the least-expensive version seems to be the Channel Master CM-9521A, which costs $103 at www.newegg.com. Yikes! (NT0Z photo)

Is there a Zone 4? For sure. Zone 4 stations are over the top, even when compared to Zone 3 stations. The station of the late Don Wallace W6AM, comes to mind. Back in the day, Don's station, built on a 120-acre site high atop cliffs overlooking the Pacific Ocean, sported 14 massive rhombic directional arrays. Think Voice of America-style arrays. It seems anemic to call them antennas, so let's stick with arrays! If another op tried to beat Don in a pileup...well...that pretty much never happened. Sitting atop the DXCC Honor Roll, W6AM crushed all comers in his gentlemanly way.

There are ops who presently have Zone 4 stations, and many of them are the cooperative efforts of wealthy ham industrialists. I'm thinking of collectives such as Radio Arcala, in Finland. Until an ice storm tore it down, OH8X had the world's most awesome 160-meter antenna: a 3-element full-size Yagi on a 350-foot tower. It weighed 40 tons and it took an 11-kW motor to power the rotator! I've never seen a cost estimate for this antenna (site), but it has to be at least $5,000,000. You don't build a Zone 4 station because it's inexpensive, you build it because you can!

In terms of performance, I have to wonder if a giant Yagi was the best choice. I would think that an array of eight four-square or eight-square vertical arrays, electrically phaseable/steerable, would equal or even exceed it. And even if they were full size, 32 or even 64 130-foot verticals would be a lot less expensive than the monster Yagi. And the resulting station would still be firmly entrenched in Zone 4.

Zone 0—is the newest zone. It's inhabited by stealth ops who live in apartments, condos or other deed-restricted environments. Many Zone 0 inhabitants have tiny, often invisible antennas, and some don't even have radios, operating exclusively from club stations, remote stations, or other people's stations (contesting, Field Day, etc). Speaking from experience, Zone 0 is not desirable!

Changing Zones

W6AM's rhombic arrays aside, one common element of almost every station in Zones 2-4 is the use of antenna rotators. Once your station supports directional antennas, some means of aiming or steering them is necessary.

I usually prefer antennas that are electrically steerable (instant direction switching) or that provide omni-directional gain (difficult at HF and not always desirable). But for most of us, and anyone who has moved into Zone 2 or higher, our dream antennas almost always require some kind of antenna rotator!

Unfortunately, many Zone 1 hams have never owned a "real" rotator. TV rotators, especially modern models, are suitable only for the smallest ham radio antennas and often fail early, even if they're treated well. There are a lot of junky rotators out there—in all price ranges, but especially among low-priced models—so you really need to do your homework before spending your money.

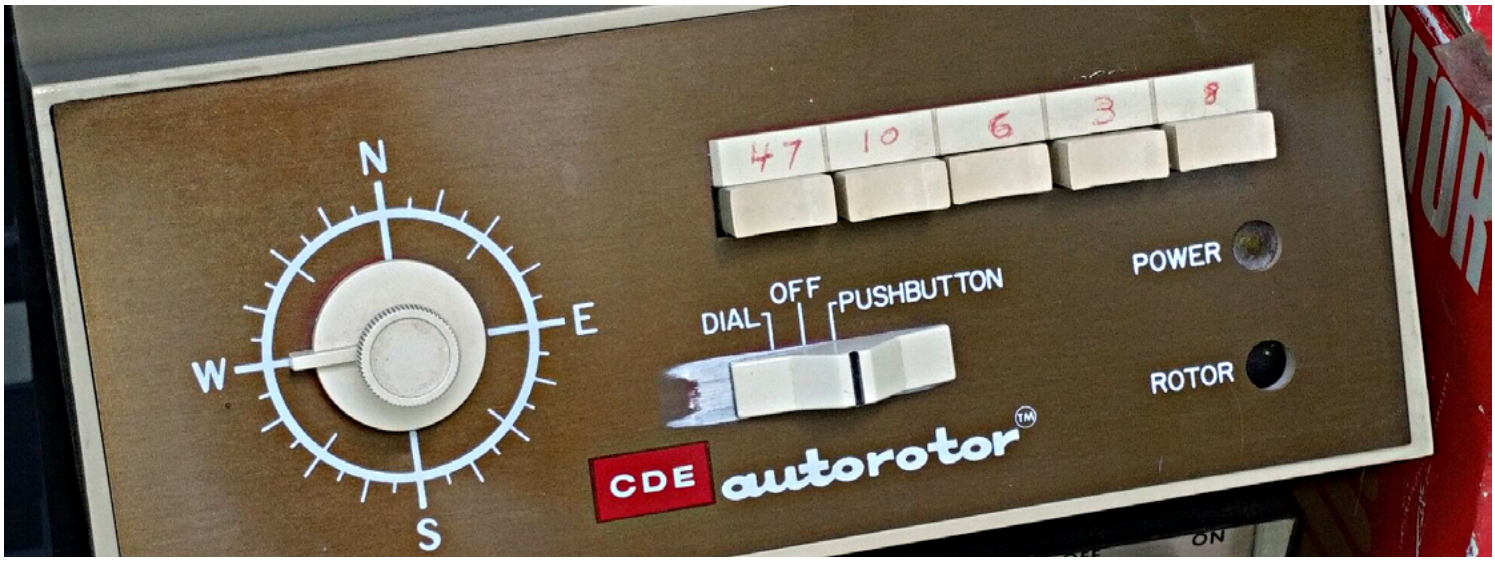
Changing rotators is a lot more difficult than changing radios or accessories in your shack. Switching radios is easy, but removing the rotator from the top of your tower or antenna mast, rigging the new rotator and reinstalling it is more difficult and more dangerous. If you live in snow country, working atop towers is difficult or impossible for at least several months each year.

Many hams, especially Old-Timers, think that modern rotators aren't built as beefy as their antique counterparts. Certain makes and models aside, they're probably right. But even if most modern rotators aren't massive and overbuilt as they once may have been, learning about how they work, how they're rated and how to correctly and safely install them will still help you choose the best rotator for your needs and your budget.

Speaking of budget, know that regardless of capacity, there aren't any inexpensive, decent-quality antenna rotators at retail. They all cost more than we'd like them to, and they all probably cost more than they need to, but because of the small market size, prices remain needlessly high.

You can find deals on used (and abused) rotators if you're handy enough to rebuild them. Getting exact parts for long-obsolete models can be challenging, so consider limiting your efforts to units that need to be disassembled, cleaned, adjusted, and properly lubricated. There are plenty of these available if you can dig them up.

There's also a growing secondary market for refurbished rotators and, as with anything that's refurbished, the value of such devices often hinges on who refurbished them, their skills, and their attention to detail. The classified ads at www.eham.net and elsewhere have regular listings for rebuilt



A CDE AR-33 rotator (control box only shown here) came with the house atop a short tower. Instead of Rochester TV channels, I plan to mark my pushbuttons with CQ Zones 22, 23, 24, and 26, plus LOCAL RPTR! It pays to think big! (NT0Z photo)

rotators that cost about 30% to 50% of the cost of similar (overpriced) modern units.

Many local clubs have a de facto "rotator guy" who knows a lot about rotator innards and probably fixes and rebuilds them on the side. Finding a good rotator guy is an excellent idea, so be sure to ask around.

If you want to buy a refurbished rotator from a long-established company with a consistent history of quality (but an unfortunate name), look no further than Norm's Rotor Service (**www.rotorservice.com**). Prices are closer to retail, however, so choose your level of comfort.

As long as we're talking about Norm's Rotor Service, let me add my "pet peeve" spiel, if only to get it out of the way: Helicopters have rotors, as do automobile brakes. Antennas have rotators—no exceptions! There, I have done my part...

When it comes to amateur radio rotators, myths, legends, folklore and misinformation abound. All factors considered, the best up-front advice concerning these necessary beasts is to simply buy more rotator than you need, and don't try to twirl a big stack of ham antennas with a $49 TV rotator!

Rotators 101

Simply, antenna rotators are motorized, weather-resistant gearboxes that mount atop your tower or support mast to aim your antenna in the desired direction. Most ham radio rotators have distinctive bell-shaped housings, but some are box-shaped. An internally mounted AC or DC motor turns a gearbox or gear mechanism (planetary or worm) to slowly steer your antenna back and forth. Also inside is a position sensor that lets a shack-mounted control box accurately display the direction the antenna is pointed, and a braking mechanism to prevent your antenna from moving once it's aimed.

A multi-strand control cable usually runs between the shack-mounted control box and the tower-mounted rotator. Some rotators require only a few wires, while some require a whole bunch. Generally speaking, the wires related to position sensing can be smaller than those carrying power to the drive motor. Although somewhat similar, there are enough variations in drive motors, gear mechanisms and position sensors to make things potentially confusing. Many specific parts depend on the rotator's capacity. Although surprisingly similar from a functional perspective, the gearbox and braking mechanisms required to rotate an 80-meter Yagi and hold it in place in during gale-force winds are much beefier than those required to handle a small 2-meter beam on a calm afternoon (and a lot more expensive).

Exactly how you mount your rotator to the top of your tower or antenna support mast makes a huge difference in its capacity and expected longevity. Most antenna towers have a "rotator shelf" in the top section to support the rotator and transfer all rotational forces to the tower, which is much sturdier than the rotator or a mast. Make sure the bolt patterns of the rotator and the mounting shelf line up correctly prior to installation. If they don't you'll have to drill more holes or fabricate an adapter plate.

It's important to note that shelf-mounted rotators have at least twice the capacity of mast-mounted units and are much more likely to remain functional and trouble-free.

For tower-mounted rotators, the use of a thrust bearing at the very top of the tower is an ideal way to extend the service life of your rotator and keep it from self-destructing. The idea is to mount the rotator in the center of the tower while extending the rotating mast vertically through the thrust bearing. The thrust bearing isolates the rotator from "side to side" and "up and down" forces. Remember, the rotator's main job is to steer the antenna left and right and absorb any rotational forces (torque) that are present. If the rotator isn't subjected to other forces it will function at its rated capacity, work better and last longer.

Not every installation is tower-based, however, so most

Rohn 25G rotator and thrust bearing shelf fits atop a Rohn 25G tower section. The rotator is bolted to the bottom shelf with the 2 or 3-inch mast going through the thrust bearing on the top shelf. (Courtesy: Amazon)

The rotator cable above is 8-conductor stranded wire with a UV resistant PVC outer jacket. At 60 cents to $1 per foot, expect to pay $60-100 for a 100-foot run for the antenna rotator cable alone. (Courtesy: Universal Radio)

rotators can be mast mounted, which sometimes requires model-specific (and needlessly expensive) adapters. The bottom of the rotator is mounted to a fixed support mast, while a rotating mast (with attached antennas) is mounted to the top part of the rotator. With no thrust bearing and no rotator shelf to safely transmit mechanical forces to the tower, all of those forces must be handled by the rotator itself, and the effective capacity of the rotator is typically cut in half! If your antenna rotator is rated for 10 square feet of antenna load while tower mounted, it can safely handle only five square feet when mast mounted. This is critically important!

Capacity

The most common performance specification for amateur radio antenna rotators is wind load, typically measured in square feet (in the US). Simply, if a rotator is designed to handle a maximum wind load of 20 square feet, that means it can handle an antenna (or antennas) with the total (or combined) wind load of 20 square feet while properly tower mounted with a mast of a reasonable length in reasonable weather conditions. A rotator's wind load rating isn't absolute, and it doesn't allow you to violate any and all physical laws as long as you keep the wind-load totals under the rotator's design limit. Most rotators with capacities beyond a few square feet, for example, will also list their braking or torque specifications, which indicate the point at which the rotator can no longer hold an antenna in a fixed position.

If your antenna's wind load specs are within your rotator's rating, but your antenna has an extra-long boom, for example, the extra torque transmitted to the rotator may cause it to fail prematurely (or spectacularly). The same goes for the antenna mast, especially if there's no thrust bearing in the system. If you install a 15-foot mast into a rotator designed to handle a 6-foot mast, the additional leverage will probably cause it to fail prematurely. The extra long mast may also cause your tower to fail as well, so don't think you'll just be sacrificing your rotator!

Long-boom antennas and excessively long masts are premier rotator and tower killers. Keep that in mind!

Rotators come in a variety of capacities, from wind loads of about 3 square feet for models designed to aim small TV antennas, to monster-size units that might as well be built from dump truck parts. Mid-sized units are rated for wind loads of 5 to 15 square feet, and the mega models handle larger arrays from 20 to 50 square feet. Prices start high and go higher, so be sure to do your homework before buying.

Control Boxes and Accessories

Basically, a rotator's control box sits in your shack and displays the direction in which the antenna is pointed. Knobs or buttons allow you to point the antenna in the desired direction and engage or disengage the rotator's brake. Most rotators ship with functional—but often visually unappealing—control boxes. Some manufacturers offer deluxe control boxes, as do some third parties (not inexpensive).

Basic control boxes typically don't incorporate digital interfaces, so if you want your logging or rig-control software to steer your antenna you'll have to upgrade the control box or purchase a third-party digital interface. Some companies also offer kits or upgrade boards that add delayed braking capabilities or swap LEDs for less-reliable incandescent bulbs.

Digital interfaces and digitally controlled third-party rotator controllers cost several hundred to several thousand dollars, but thanks to the explosion of open-source DIY mi-

Yaesu G800DXA ($500) is considered a medium-duty rotator with a wind load of 16 square feet. It requires 6-conductor cable. (Courtesy: Universal Radio)

crocontroller development systems (Arduino, Raspberry Pi, etc), home-brew kits and equivalents are becoming available.

The Lowdown

If you need to aim a three-element, 6-meter Yagi or a short-boom 2-meter beam, you'll probably do fine with a farm store TV rotator. Modern models are all made offshore and have plastic, junky parts. They typically fail early and fail often, however, so if your antenna is difficult to reach, expect replacement hassles if the thing dies in the middle of winter. These critters can't be tower mounted, but they're not beefy enough to handle tower mounting anyway!

TV rotators have synchronous motor controllers that require frequent recalibration (easy, but annoying), but you can find them on sale for $50-$80. Don't overload them. Old-school units in good condition may be better built than their modern counterparts.

When it comes to solid Zone 2 rotators—medium-duty units deigned to handle wind loads of about 10 square feet—consider the old-school Alliance HD-73 (still available from Norms Rotor Service, www.rotorservice.com) and the Yaesu G-450A. And if you're going to spend more than $400 on any rotator, Yaesu's G-800 series, rated for wind loads of at least 16 square feet, is well-received and costs about half of what competing units cost at retail.

Moving into Zone 3 and need something larger? You're on your own! (Thankfully, you can afford expensive hardware and even a few expensive mistakes!)

Experts recommend loading your rotator to 80% of its maximum capacity (max) to build in a reasonable safety margin. So, if you're rotator's rated for 10 square feet, limit your antennas to 8 square feet to ensure a long and healthy service life.

If, after a nasty winter storm, you find your antenna covered by a thick coating of ice (Radio Arcala?), don't touch the rotator control box until the ice has completely

l call this dark and gloomy still life, "Death of a Channel Master." Captured at an unknown aperture setting in overcast, north light, I spotted this valiant soldier on the edge of a mass rotator grave site, where unloved and unworthy rotators go to die—a slab behind my garage! I was offered the thick-wall, galvanized tower mast for free, but to get it I had to also take the dead rotator! (NT0Z photo)

melted or you may destroy your rotator, antenna, and even your tower! The extra weight of the ice may far exceed specs, and if you don't try to move the antenna until all of the excess weight has melted away, you just might get lucky!

When installing your rotator, be sure to use control wires of the specified size (or larger) or your rotator's motor may not work, may work slowly, or may fail prematurely. You may be able to get away with just about any size of wire for the signal and position indicator wires, but the drive motor wires must be sufficiently beefy.

Before climbing to the top of your tower, connect your rotator and control box and test them. If possible, purchase your rotator from a vendor that will test it prior to shipping.

Buying the right antenna rotator is rarely an easy process. In general, they all cost too much, aren't as rugged as they could/should be, and don't take advantage of superior mechanical and electronic design elements, many of which have been perfected for decades (worm gears instead of planetary gears, and Hall-effect, solid-state positioning sensors instead of potentiometers, among the many).

As mentioned, perhaps the best way to ensure long-term success and happiness is to buy more rotator than you need. Go big or go home!

TSM

Radio 101

By Ken Reitz KS4ZR **ks4zr1@gmail.com**

Monitoring Emergencies Via FTA Satellite

When a news event breaks, those with Free-to-Air (FTA) satellite-TV systems find it is possible to follow events as they happen, direct from the scene, but you have to know where to look.

The domestic commercial satellite belt for the western hemisphere, including the continental US (CONUS), is considered to stretch from 61 degrees to 139 degrees West longitude and is comprised of some 51 satellites using C-band (the 3-4 GHz frequency range), Ku-band (the 11-12 GHz frequency range) or a C/Ku-band combination.

While that seems like a lot, many of those satellites are used exclusively for Direct-to-Home satellite TV programming such as Dish Network and DirecTV in the US; Bell and Shaw Direct satellite services in Canada and Sky Mexico. Virtually all of the channels on these satellites are encrypted and cannot be seen with an FTA satellite-TV system.

Some satellites in the arc are beamed to South America, Central America or Alaska, making them nearly impossible to be received from other parts of the North American continent. Others have very little traffic on their transponders.

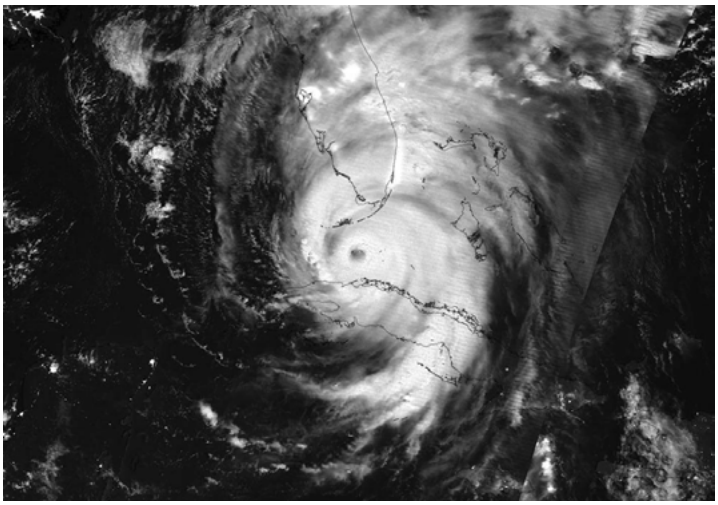
The nine satellites from 121 degrees to 135 degrees west carry mostly cable-TV programming on C-band satellites in what is called the "cable neighborhood." If you are on the East Coast and happen to pass by your local cable-TV headend offices you may see a dish farm with most of the large C-band dishes pointed to the western horizon. Those dishes will be more elevated as you move west. That's where your cable-TV programming comes from.

While there are some FTA channels on a few of the cable satellites (PBS channels on AMC-21, the Ku-band side of 125 degrees; religious broadcasters on the C-band side Galaxy 14 of 125 degrees and NASA-TV on the C-band side of 127 degrees via Galaxy 13, for example), the rest are encrypted cable-TV channels.

SNGs and Ku-band

For monitoring emergencies, such as the two powerful hurricanes that swept through the southern US in late August and early September, I will focus on those Ku-band FTA channels used by satellite news gathering (SNG) crews.

If you've ever been near a large gathering in a town of almost any size, you will have noticed one or more vans with a heavy-duty satellite dish perched on top. Typically, these vehicles are painted up with the letters and logos of their respective organizations: NBC News; Fox News; ESPN Sports, the Weather Channel, even CSPAN. The crews running the trucks go from place to place, event to event as needed, beaming back live video, taped on-the-scene interviews and "stand-ups," live, somewhat rehearsed reports, and somewhat rehearsed questions from the studio anchor. These broadcasts are often known as "backhauls."



On Sept. 10, at 3:38 a.m. EDT (0738 UTC) NASA-NOAA's Suomi NPP satellite captured this infrared nighttime image of Hurricane Irma between Cuba and the Florida Keys. (Credits: NOAA/NASA Goddard Rapid Response Team)

In many cases, the local affiliate stations of traditional TV networks (ABC, CBS, NBC and Fox Network), can provide a quickly deployed crew and reporter to an event for their network, especially if it's a late breaking news story. There are also companies that lease complete backhaul trucks and crews. All a network has to do is fly their reporter, producer and others to the location—the for-hire company handles the technical side.

Big networks lease satellite capacity for years at a time. For example, NBC has maintained a number of transponders for program distribution to network affiliates as well as backhauls and SNG work to network headquarters on the Ku-band side of SES-3 at 103 degrees west.

High-definition FTA NBC network feeds for all four time zones are found here and easily accessible on nearly any FTA Ku-band satellite-TV system. The network also leases additional transponders that are used for SNG purposes. I found the most active ABC network feeds on the Ku-band side of Galaxy 17 at 91 degrees west.

90-cm (about 36-inches) Ku-band dish in foreground with 10-foot C/Ku-band dish in background. The small dish is fixed on Hispasat at 30 degrees west. Positioned over the Atlantic Ocean, it serves both eastern and western hemispheres. This was the satellite to go to for Cuban hurricane coverage. (KS4ZR photo)

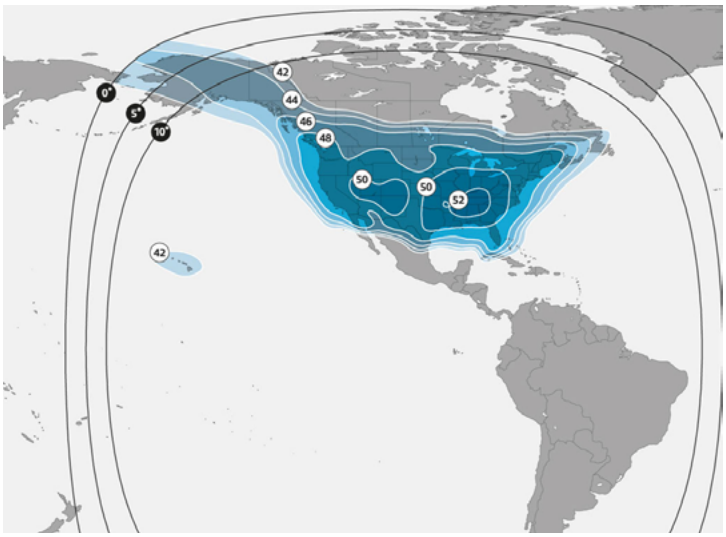
What You Need for Reception

In the 1980s such news and sports backhauls were all done on C-band—there were virtually no Ku-band satellites in orbit at that time. Everything was done in analog NTSC video format (5:4 aspect ratio on 36-MHz wide video channels) and there was no encryption. The big problem was the size of the dish needed to send and receive the backhaul at C-band frequencies. Satellites in those days were very low powered and 10-foot backyard dishes with 120-degree noise-figure LNAs struggled to deliver noise-free signals.

The advent of Ku-band satellites, which allow much smaller dishes, and higher-powered satellites, makes it possible to use dishes with less gain and changed the whole scene for news and sports backhauls. Today, there are not many C-band backhauls found on the satellites—though it sometimes does happen.

The switch from C-band to Ku-band was made-to-order for the satellite-TV hobbyist. Much smaller, far less complicated and less expensive systems with very low temperature LNBFs, made viewing under even the most restrictive conditions possible. It's ironic that, while there are more FTA channels available for viewing today, there are far fewer FTA satellite TV hobbyists taking advantage of the change.

The typical FTA satellite-TV system is set up for one satellite but if motorized, it can allow you to explore all the FTA action from horizon-to-horizon (or at least as much of the horizon as is available at your location). A complete FTA



SES-3 footprint (Courtesy: SES)

system, including a 90-cm (36-ich) dish, receiver, LNBF, 75-feet of coax, wall-mount and other hardware items is available for $239, shipping included, from **http://hypermegasat.com/Package%20Deals.html**. A dish motor, that will let you cruise the satellite arc looking for news feeds, will add another $90 to that cost, but you can set up a dish for one news backhaul satellite and later add the motor.

As mentioned before in previous columns on this subject, you can operate several stationary dishes from a single receiver without the need of a motorized dish but a dish motor has far more flexibility and is cheaper in the long run. I have two stationary Ku-band dishes and a motorized one all connected to one receiver, which allows maximum flexibility.

If you are restricted to being able to view just one satellite for news backhauls, I would recommend setting it up for SES-3 at 103 degrees. Not only will you have access to the NBC news backhauls and network programming, but you'll also have NHK World TV (Japan), RT (Russia), Cozi-TV (vintage TV shows) and, on the radio side, WCPE-FM, a 24/7 noncommercial classical music station from Wake Forest, North Carolina, as well as the North Carolina Radio Reading Service.

The satellite downlink contour map of SES-3 (above), shows the relative signal stength across the US. The typical FTA dish offered is 90 cm (36.5 inches), which should give good performance throughout. My experience is that, when offered a choice between two dish sizes, always opt for the bigger dish—a bigger antenna equals more gain and more gain equals more robust reception. This is particularly important in rainy weather as Ku-band frequencies suffer from "rain fade," in which raindrops block Ku-band frequencies causing signal dropouts. A larger Ku-band dish can overcome all but the heaviest rainfall.

Placement of your Ku-band dish at your location is critical. First, you'll have to assess if you even have a view to the satellite belt. You'll need a fairly unobstructed view to the south-southwest in the eastern US; due south in the midwestern US, and south-southeast in the western US, i.e.

Special Cuban coverage was constant on several of Cuba's TV channels on Hispasat as Irma ripped into much of that country. At the storm's peak in Cuba, on Saturday, September 9, the TV and radio signals disappeared from the satellite, including the Radio Havana feed. They were back the next morning. (KS4ZR photo)

Telesur, the main South American news channel, on Hispasat, had constant updates on Irma's progress through the Caribbean, which was happening at the same time as Pope Francis was touring South America. The channel split live coverage of both events, alternately relegating one or the other to a smaller portion of the screen. (KS4ZR photo)

no buildings or trees blocking your view above about 45 degrees over the southern horizon. Most Ku-band SNG-related satellites are located pretty much in these directions so, for example, if you live on the north side of a condo or apartment building, you will be unlikely to have such a view, unless you have access to the roof or a gable end or a patio that would allow a dish to look south. That could be tricky.

One question that often comes up is, "Can I repurpose my no longer used Dish Network or DirecTV dish for FTA reception?" The general answer is no. The main issue is dish size—FTA reception requires a bigger dish than either pay satellite-TV services offer. Original DirecTV dishes were only 18 inches, about half the size that will work comfortably for FTA work. While newer, multiple LNBF pay satellite dishes are bigger, even at 30 inches they're still too small. This is mostly due to FTA satellites having lower power than the pay satellites. You will also have to replace the LNBF on the pay satellite dish because the pay satellite LNBFs are circularly polarized and the local oscillators aren't configured for FTA satellite frequencies. However, all is not lost. You can still use the dish mount and coax run from the pay satellite location to your TV set. This will also save a lot of time in setting up your FTA system.

One of the important things to know is that under FCC Over-the-Air-Reception-Devices (OTARD) rules, in effect since October 1996, you cannot be prevented from setting up an FTA satellite dish regardless of whether you rent or lease or own a home in an area governed by Homeowner's Association (HOA) rules. Here's an excerpt from the FCC's OTARD rules:

"These rules prohibit restrictions that impair the installation, maintenance or use of antennas used to receive video programming. The rule applies to video antennas including direct-to-home satellite dishes that are less than one meter (39.37 inches) in diameter (or of any size in Alaska), TV antennas, and wireless cable antennas. The rule prohibits most restrictions that: (1) unreasonably delay or prevent installation, maintenance or use; (2) unreasonably increase the cost of installation, maintenance or use; or (3) preclude reception of an acceptable quality signal.

"Effective January 22, 1999, the Commission amended the rule so that it also applies to rental property where the renter has an exclusive use area, such as a balcony or patio.

"On October 25, 2000, the Commission further amended the rule so that it applies to customer-end antennas that receive and transmit fixed wireless signals. This amendment became effective on May 25, 2001.

"The rule applies to individuals who place antennas that meet size limitations on property that they own or rent and that is within their exclusive use or control, including condominium owners and cooperative owners, and tenants who have an area where they have exclusive use, such as a balcony or patio, in which to install the antenna. The rule applies to townhomes and manufactured homes, as well as to single family homes."

The complete OTARD text may be found here: **https://www.fcc.gov/media/over-air-reception-devices-rule**.

Following Disasters via FTA Satellite

It was unusual to have back-to-back weeks of natural disasters for news crews to report when Harvey and Irma struck, but the networks were up to the task. Both storms were very different in nature. In the case of Harvey, the impact of flooding in the Houston area made dramatic video as reporters climbed into boats to follow citizen-rescuers from an impromptu "Cajun Navy." The portability of these crews was impressive. The fact that electricity and cell service remained useful throughout the storm was also unusual.

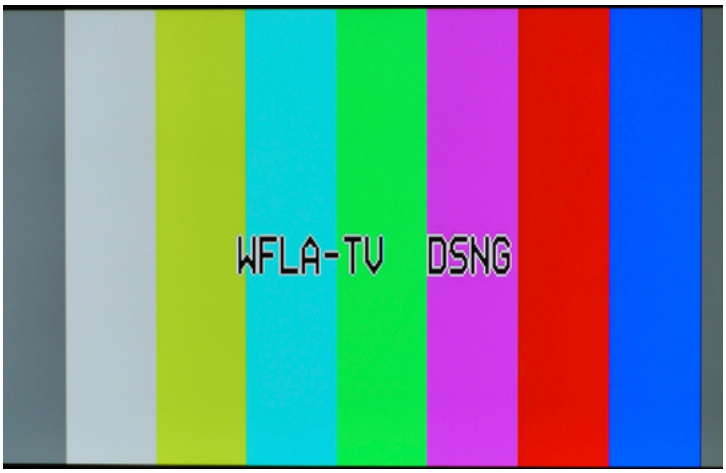
Having just sprung up in the Gulf of Mexico before intensifying and making landfall, it did not have the terrible legacy that Irma carried with her to Florida.

In the case of Irma, its destruction in the Caribbean is-

An eerie scene from what is normally one of Florida's busiest Interstate interchanges (I-95, the number 1 highway on the US East Coast, and I-10, the number 1 highway along the southern tier of the US) as the storm looms in the background. This channel was one of several online feeds from the state's 511 highway camera system, uplinked to Ku-band on SES-3. (KS4ZR photo)

Florida Governor Rick Scott was everywhere on satellite during the storm. Here he's on Florida's own Ku-band channel, on SES-2 at 87 degrees west. The Florida Channel is a full-time service of that state's executive branch. (KS4ZR photo)

State and county officials held news conferences nearly around the clock as they grappled with the logistics of alerting, evacuating and housing hundreds of thousands fleeing the path of Irma. Feeds direct from those news conferences included Miami-Dade County and many more throughout the emergency as news crews awaited spokespersons. (KS4ZR photo)



Tampa TV station WFLA put up color bars/ID prior to a storm related feed. (KS4ZR photo)

lands and Cuba had everyone in Florida bracing for the worst and the preparations made for dramatic viewing as well—all covered on FTA satellite.

I used two fixed Ku-band dishes, one on Hispasat, one on SES-3 and the steerable dish to find various other satellites before settling it on Galaxy 17. The trick to chasing down SNG feeds is to do a "blind scan" of each satellite regularly. This is a normal function in the setup of an FTA receiver that automatically finds which transponders are in use for such feeds and those can change from day to day—so scan each satellite at least once each day during the emergency.

During Irma, a number of transponders not usually used were pressed into service for various feeds. For example, heavily populated counties had their own feeds for press conferences by county officials; the state of Florida had its own official state channel in use; video from TV crews assigned to beaches, hotels, Emergency Operations Centers, evacuation centers and other emergency headquarters could be found on many channels on both SES-3 and G17. Video from Hispasat was particularly useful for reports from Cuba, which was little covered on US TV, though one Miami TV station, whose signal was uplinked for quite some time on Ku-band FTA, actually had one of their reporters giving live video updates, in English, from Cuba as the storm raged there.

Late Saturday, September 9 and early Sunday, September 10, the night the storm straddled the Straits of Florida, grinding away simultaneously on both the northern edge of Cuba and the Florida Keys, I turned my terrestrial TV antenna to Washington DC, and found that band conditions allowed me two see nearly all DC TV stations. I was astonished to see normal network programming, including all-important season-opening football games and one professional soccer match. But, for FTA satellite-TV viewers the drama was well reported.

SNG backhauls aren't just for impending weather disasters. Seasoned FTA Ku-band viewers know, as soon as any breaking news story is announced, where to go for live feeds and updates.

TSM

Radio Propagation

By Tomas Hood NW7US **nw7us@nw7us.us**

A Last Hoorah?

No one argues that this sunspot cycle, Cycle 24, is much weaker than Cycle 23. There have been a few very powerful flares, measuring at least X1.0 on the NOAA scale where an X-class is the strongest category. The number of X-class flares in Cycle 24, so far, are significantly fewer than what occurred in Cycle 23.

Early in September 2017 we witnessed a large active sunspot region grow into one of the biggest regions of Cycle 24. This sunspot group spawned a series of M- and X-class flares. Active region 2673 (AR 2673) emitted a series of flares including: an M5.5 on 4 September, an X2.2 and an X9.3 on 6 September, an M7.3 and an X1.3 on 7 September, an M8.1 on 8 September and an X8.2 on 10 September 2017. Many of these included a coronal mass ejection, some of which were Earth-directed.

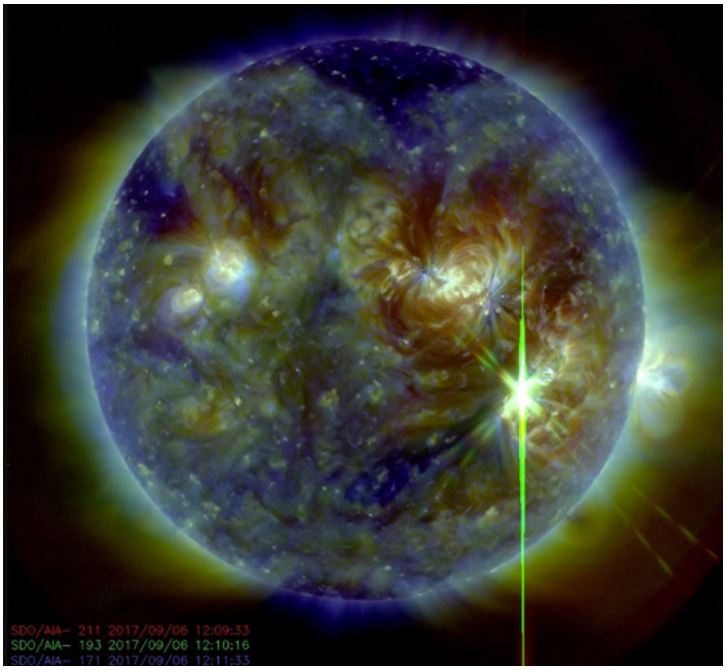
Radio blackouts occurred with each of these flares. The X-class flares caused the most immediate and severe radio blackouts (remember: a flare's impact reaches Earth when the energy of the flare makes the eight-minute trip at the speed of light), but these Sudden Ionospheric Disturbances (or, SID) only last as long as the flare continues producing that energy. Once the flare is over, the ionosphere returns to normal.

On the other hand, coronal mass ejections (CMEs), which take anywhere from one to three days to reach Earth, impacted shortwave communications by causing geomagnetic disturbances that in turn caused a degradation of propagation via the ionosphere.

The first couple of weeks in September were plagued with a number of geomagnetic storms and disturbances. While the active regions raised the sunspot count and increased the ionospheric Maximum Usable Frequency (MUF) over most propagation paths, the geomagnetic storms degraded ionospheric propagation, countering the benefits of having the sunspot activity. What's worse is the presence of recurring coronal holes during September.

Speaking of Coronal Holes…

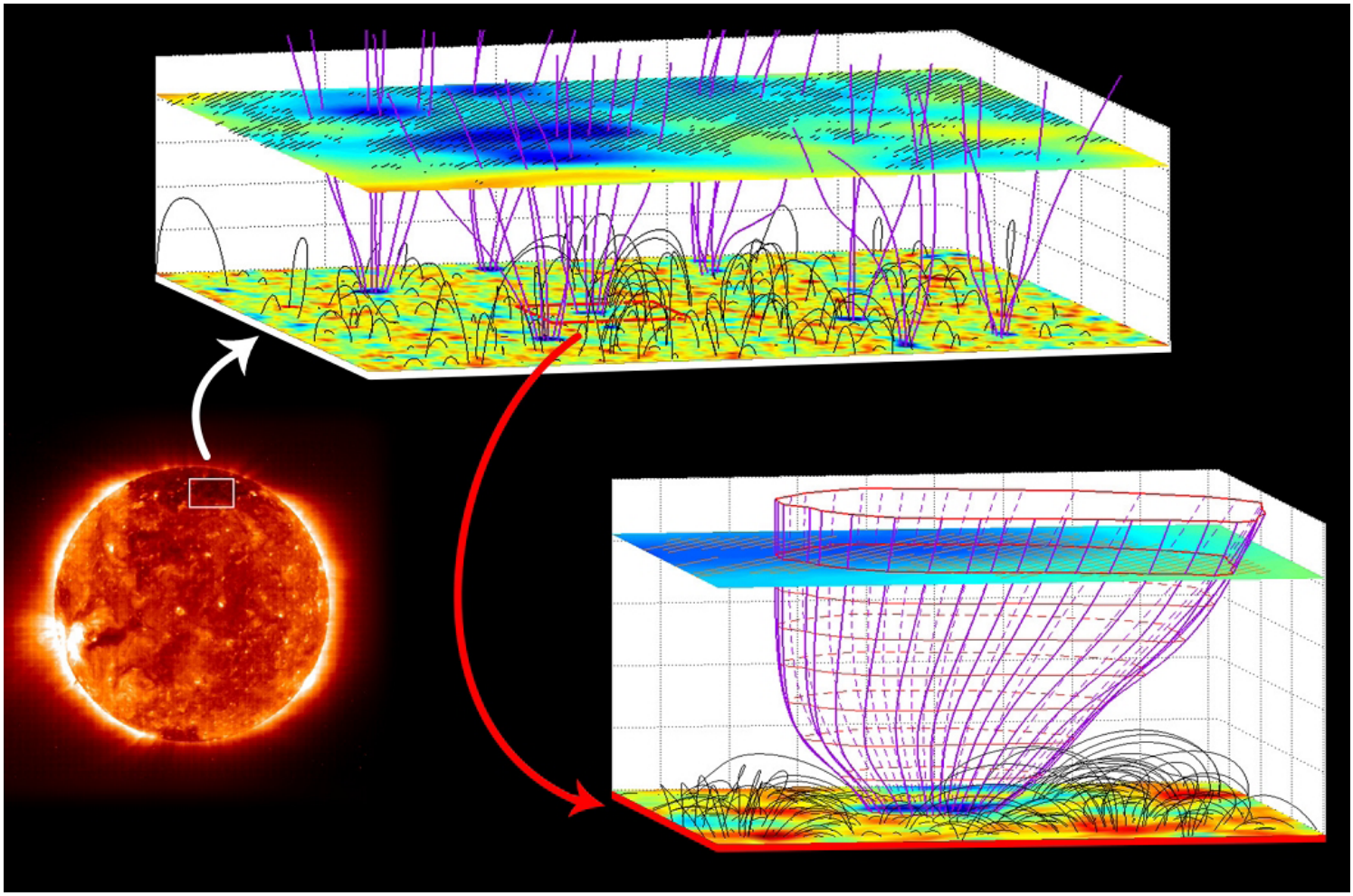
A major source of solar disturbance during solar cycle minimums is the occurrence of coronal holes and the resulting solar wind storms (yes, we are approaching solar cycle minimum, the end of Sunspot Cycle 24). When the Earth is under the influence of high-speed solar winds, we often



A massive, X9.3-class X-ray solar flare blasted from active sunspot region 2673 at 12:02 UTC. This is the strongest flare since the X9.0-class flare on December 5, 2006. The strongest solar flare measured since the start of our space age happened in 2003. Scientists recorded a blast so powerful that it was off the charts at X28. (Credit: SDO/AIA)

experience periods of geomagnetic disturbances that can develop into significant storms. That in turn triggers the aurora VHFers look forward to.

A Chinese-German team of scientists identified the magnetic structures in the solar corona where these fast solar winds originate. They analyzed images and Doppler maps from the Solar Ultraviolet Measurements of Emitted Radiation (SUMER) spectrometer and magnetograms delivered by the Michelson Doppler Imager (MDI) on the space-based Solar and Heliospheric Observatory (SOHO) of ESA and NASA, and found that solar winds were flowing from funnel-shaped magnetic fields that are anchored in the lanes of the magnetic network near the surface of the Sun. The fast solar wind seems to originate in coronal funnels with a speed of about 10 km/s at a height of 20,000 kilometers above the photosphere. According to Professor Chuanyi Tu from the Department of Geophysics of the Peking University in Beijing, China, "The fast solar wind starts to flow out from the top of funnels in coronal holes with a flow speed of



Origin region of solar wind. This picture was constructed from measurements that were made on 21 September 1996 on SOHO with the Solar Ultraviolet Measurements of Emitted Radiation spectrometer (SUMER) providing Doppler spectroscopy of the coronal plasma, with the Michelson Doppler Imager (MDI) delivering magnetograms of the solar photosphere, and the Extreme ultraviolet Imaging Telescope (EIT) giving the context image of the Sun in the left corner.

The SUMER spectrometer analyses ultraviolet light which is emitted by the hot gas in the Sun's atmosphere, and is ideally suited for studying atmospheric motions. However, a careful data analysis, involving subtle wavelength calibration and coronal magnetic-field extrapolation, was required before the slow outward motions could be identified at various heights above the solar surface, and their links with the magnetic field guiding the flow be established.

The figure illustrates the location and geometry of three-dimensional magnetic field structures in the solar atmosphere. The magenta coloured curves illustrate open field lines, and the dark grey solid arches show closed ones. In the lower plane the magnetic field vertical component obtained at the photosphere by MDI is shown. In the upper plane inserted at 20,600 km we compare the Ne VIII Doppler shift with the model field. The hatched area indicates where the outflow speed of highly charged neon ions is larger than 7 kms(superscript: -1). Note the funnel constriction by pushing and crowding of neighbouring loops.

The scale of the upper figure is stretched quite a lot in the vertical direction. The smaller figure in the lower right corner shows a single magnetic funnel, with the same scale in both vertical and horizontal directions. (Credit: SOHO / NASA)

about 10 kilometers per second. This outflow is seen as large patches in Doppler blue shift [hatched areas in the figure 2] … at a temperature of 600,000 Kelvin." Together with fellow team-member Professor Marsch, they were able determine that the blue-shift pattern of this line correlates best with the open field structures at 20,000 kilometers.

Solving the nature and origin of the solar wind is one of the main goals for which SOHO was designed. It has long been known to the astronomical community that the fast solar wind comes from coronal holes. What is new here is the discovery that these flows start in coronal funnels, which have their source located at the edges of the magnetic network. Just below the surface of the Sun there are large convection cells. Each cell has magnetic fields associated with it, which are concentrated in the network lanes by magneto-convection, where the funnel necks are anchored. The plasma, while still being confined in small loops, is brought by convection to the funnels and then released there, like a bucket of water is emptied into an open water channel.

Because of this discovery, the solar wind plasma is now considered to be supplied by plasma stemming from the many small magnetic loops, with only a few thousand kilometers in height, crowding the funnel. Through magnetic reconnection plasma is fed from all sides to the funnel, where it may be accelerated and finally form the solar wind.

Another group of scientists were surprised to discover

that the structure of the Sun's cooler, dense lower atmosphere, the chromosphere, could be used to estimate the speed of the solar wind. This was unexpected because the solar wind originates in the corona, and the chromosphere is much deeper: it lies just above the Sun's visible surface. "It's like discovering that the source of the river Nile is another 500 miles inland," said Dr. Scott McIntosh of the Southwest Research Institute, Boulder, Colorado, lead author of a paper on this research published May 10 2005 in the Astrophysical Journal.

The new work promises to increase the accuracy of space radiation forecasts. When the Sun unleashes a coronal mass ejection (a billion-ton blast of plasma) into space at millions of miles per hour, it is likely to trigger geomagnetic storms. The VHF enthusiast benefits from a forecast that accurately identifies a pending storm, because that would signal the possible auroral propagation soon to commence.

The solar wind is gusty, much like winds on Earth, and range in speed from about 750,000 miles per hour (approximately 350 kilometers per second, to 1.5 million miles per hour (700 kilometers per second). You can view the current solar wind speed as measured by sending your Internet web browser to http://SunSpotWatch.com.

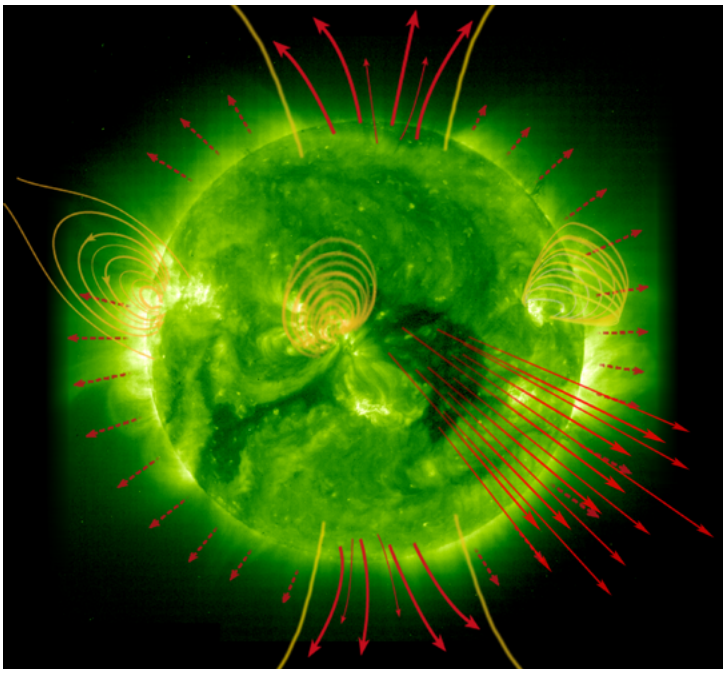
Since the solar wind is made up of electrically charged particles, it responds to magnetic fields that permeate the solar atmosphere. Solar wind particles flow along the invisible lines of magnetic force. When the magnetic field lines stretch straight out into space, as they do in coronal hole regions, the solar wind will move along these magnetic lines at a very high rate of speed. But, when the magnetic field lines bend sharply back to the solar surface, like the pattern you see with iron filings around a bar magnet, the solar wind emerges relatively slowly. For over thirty years this model has allowed Space Weather Scientists to create a crude estimate for the speed of the solar wind.

In the new work, the team has tied the speed of the solar wind as it blows past Earth to variations deeper in the solar atmosphere than had previously been detected, or even expected. By measuring the time taken for a sound wave to travel between two heights in the chromosphere, they were able to determine that the chromosphere is effectively "stretched thin" below coronal holes with their open magnetic fields, but compressed below magnetically closed regions.

The team used the observation to derive a continuous range of solar wind speeds from the structure of the chromosphere.

The wider the chromospheric layer is, the more it is being allowed to expand by open magnetic fields and the faster the solar wind will blow. This new method is more precise than the old "fast or slow" estimate.

This is a welcomed development, since the radio hobbyist can now better assess the probability of geomagnetic activity that would trigger conditions useful for VHF propagation. By knowing more accurately when a solar wind shock wave will arrive, and how intense the plasma cloud will be, combined with the orientation of the magnetic



The Sun's atmosphere is threaded with magnetic fields (yellow lines). Areas with closed magnetic fields give rise to slow, dense solar wind (short, dashed, red arrows), while areas with open magnetic fields -- so-called "coronal holes" -- yield fast, less dense solar wind streams (longer, solid, red arrows). In addition to the permanent coronal holes at the Sun's poles, coronal holes can sometimes occur closer to the Sun's equator, as shown here just right of center. (Credit: September 18, 2003 image from the SOHO Extreme ultraviolet Imaging Telescope. ESA/NASA)

components, the VHF radio amateur scientist can be ready for action. With the VHF radio community ready for these opportunities, more participants will be on-scene to make these openings memorable.

When the interplanetary magnetic field lines are oriented opposite to the magnetosphere's orientation, the two fields connect and allow solar wind particles to collide with oxygen and nitrogen molecules in the upper atmosphere of these ovals. This causes light photons to be emitted. When the molecules and atoms are struck by these solar wind particles the stripping of one or more of their electrons ionizes them to such an extent that the ionized area is capable of reflecting radio signals at very high frequencies. This ionization occurs at an altitude of about 70 miles, very near the E layer of the ionosphere. The level of ionization depends on the energy and amount of solar wind particles able to enter the atmosphere.

HF Propagation for October

The following is a band-by-band summary of DX propagation conditions expected during October for amateur radio operations (shortwave radio listeners can extrapolate expected conditions on bands near each of the following):

160 Meters

As usual, this slice of radio spectrum begins to turn

attractive for DXing, as well as everyday use, now with the considerably decreased static levels. The recent rise in coronal hole activity will make the "top band" somewhat more variable than a year ago during this season. The longer hours of darkness in the Northern Latitudes should provide many DX openings on this band. These openings will often be weak due to the relatively high signal absorption, since we are not yet to the longest periods of daily darkness. But give this band a try, as some good openings should be possible toward Europe and the south from the eastern half of the United States, and toward the south, the Far East, Australasia, and the South Pacific from the western half of the country.

Other DX openings might also be possible. The best propagation aid for this band (and for 80 and 40 meters as well) is a set of sunrise and sunset curves, since DX signals tend to peak when it is local sunrise at the easterly end of the path. A good Internet web site featuring a gray-line map display is found at http://www.fourmilab.ch/earthview. Follow the link, "map of the Earth" showing the day and night regions.

80 Meters

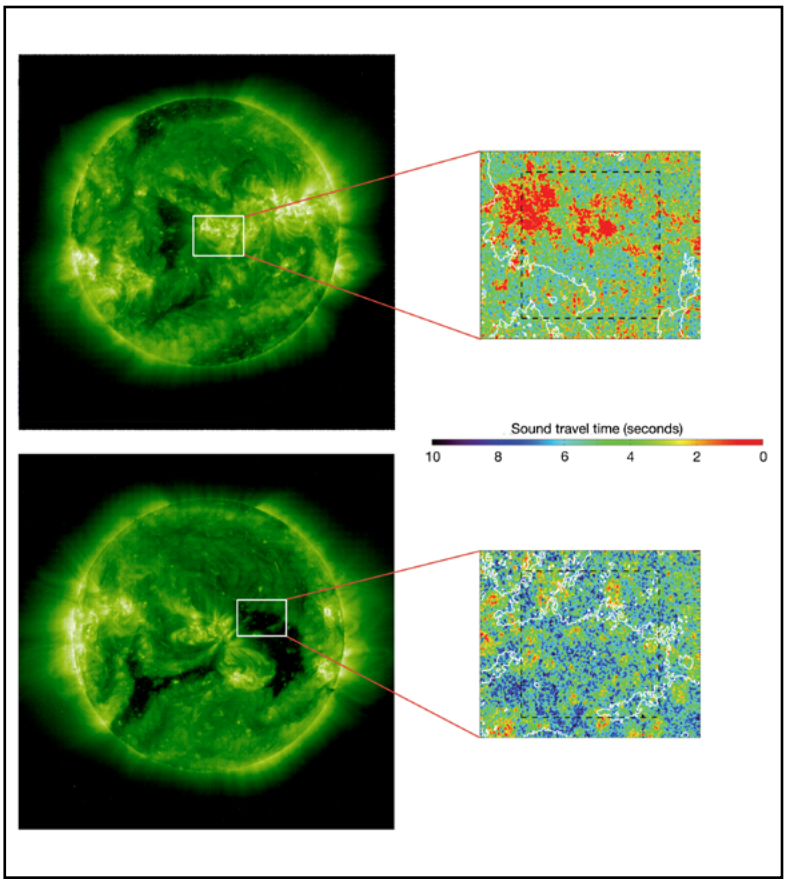
Here is the workhorse nighttime band for those with a well designed antenna system. This band provides great DX openings to many areas of the world during the hours of darkness and into the sunrise period. The band should peak towards Europe and in a generally easterly direction around midnight. For openings in a generally western direction, expect a peak just after sunrise. The band should remain open towards the south throughout most of the night. Propagation in this band is quite similar to that expected on 40 meters, except that signals will be somewhat weaker on the average, noise levels will be a bit higher, and the period for band openings in a particular direction will be a bit shorter.

40 Meters

This should be the hottest DX band during hours of darkness as the seasonal static levels are lower than they were during the summer. The band should be open first for DX toward Europe and the east during the late afternoon. Signals should increase in intensity as darkness approaches. During the hours of darkness expect good DX openings to most areas of the world. Signals should peak from an easterly direction about midnight, and from a westerly direction just after sunrise. Excellent openings toward the south should be possible throughout most of the nighttime period.

20 Meters

DX openings should be possible on this band both day and night. Conditions should peak from about an hour or two after sunrise and again during the late afternoon and early evening hours.



Sampling an area of the Sun's upper atmosphere (shown approximately by the white outlines on the full Sun images at left), McIntosh and Leamon used measurements made by NASA's TRACE spacecraft of a region with strong, closed magnetic fields on July 7, 2003 (top) and another region with weaker, open magnetic field on September 18, 2003 (bottom). The areas in red in the top "time difference" image show a shallow, dense chromosphere beneath an area with slow, dense solar wind outflow; the areas in blue in the bottom image show a deep, less dense chromosphere below a "coronal hole" with fast, tenuous solar wind outflow. (Credit: Images on left from the SOHO Extreme ultraviolet Imaging Telescope - ESA/NASA; images on the right from The Astrophysical Journal - University of Chicago Press)

Expect to work into some areas of the world between sunrise and sunset, when conditions are a mix of low geomagnetic activity and an increase in solar activity. Good openings should be possible to many areas of the world during the dusk and dawn periods, following the grey-line. When conditions are good, expect 20 meters to offer a few surprise worldwide-DX openings during the night. Look for long-path openings for about an hour or so after sunrise and again for an hour or so before local sunset. Signal levels are expected to be exceptionally strong during the October contest period.

15 Meters

This year, 15 meters won't play too often as a DX band. During the daylight hours, this band could offer some significant action, but not very often if at all, due to the declining sunspot

cycle activity. Poor to fair conditions are expected from shortly after sunrise through the early evening hours. The band could remain open into the evening toward southern and tropical areas.

10 Meters

For those in lower to middle latitudes, this band could yield a number of daytime contacts, typically between the points in the Southern Hemisphere and along paths crossing the equator. Those in the Caribbean and other tropical regions will find 10 meters usable at times.

VHF Conditions

Watch for possible tropospheric ducting conditions during October because of the changing weather patterns. Two meters is the best band to watch for this.

There is a moderate to strong chance to work meteor scatter VHF propagation off this year's Draconids, active during early October. The shower is expected to be moderate. The best time to check for radio propagation would be from about midnight onward until dawn, locally.

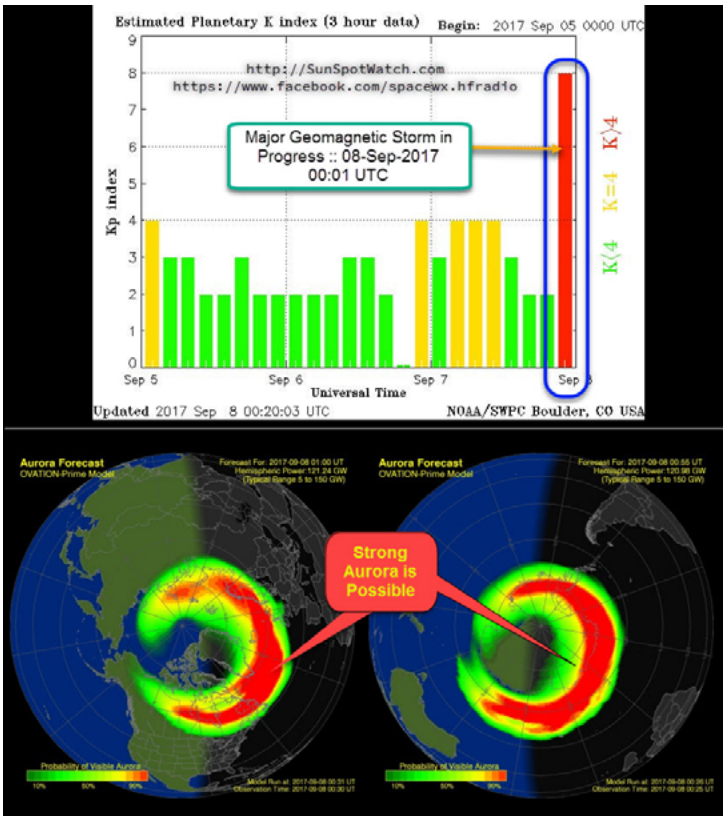
Draconid meteors are exceptionally slow moving, a characteristic which helps separate genuine shower meteors. This shower could produce meteor scatter mode (Ms) propagation openings on VHF and UHF. Predictions are indicating that the only interaction with these meteors will be from a thin wispy trail of debris that will intersect Earth's orbit, this time around.

Solar Cycle 24 Today

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 19.9 for August 2017. The mean value for August results in a 12-month running smoothed sunspot number of 16.0 centered on February 2017. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 18 is expected for October 2017, plus or minus 14 points.

Canada's Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports a 10.7-cm observed monthly mean solar flux of 77.9 for August 2017. The twelve-month smoothed 10.7-cm flux centered on February 2017 is 78.7. A smoothed 10.7-cm solar flux of about 75 is predicted for October 2017.

The geomagnetic activity as measured by the Planetary-A index (Ap) for August 2017 is 12. The twelve-month smoothed Ap index centered on February 2017 is 11.3. Geomagnetic activity this month should stay level at about the same activity as seen in September 2017, perhaps with slight improvement. Refer to the Last-Minute Forecast for the outlook on what days we might witness degraded propagation (remember that you can get an up-to-the-day Last-Minute Forecast at **http://SunSpotWatch.com** on the main page).



A major geomagnetic Storm commenced on September 7, 2017. Aurora was observed, both visually, and on HF and VHF. The Auroral Oval extended at times into mid-latitudes. In this composite image, the polar plots are forecast intensity and spread of the auroral ovals, with the North Pole on the left, and the South Pole on the right. (Credit: NASA/SDO)

Feedback Requested

Do you have propagation-related questions, or a topic related to the Sun, the Ionosphere, or the Sun-Earth connection, that you'd like answered? Please send in your questions and comments, for possible inclusion in this column. If you are interested in a space weather and radio propagation forecast self-study course, visit **http://SunSpotWatch.com/swc** for details.

Your columnist has a website dedicated to space weather, at **http://SunSpotWatch.com** and also provides a Facebook page at https://www.facebook.com/spacewx.hfradio which features daily updates with solar images, space weather graphs, data, and educational tidbits, all day long, so please take a look. There are quite a few space weather and radio videos on this columnist's YouTube channel at **https://YouTube.com/NW7US**. Be sure to check out the Tumblr blog, **http://blog.nw7us.us**, in which daily space weather posts are available.

On Twitter, radio propagation and space weather Tweets are provided in regular updates by @hfradiospacewx (**https://Twitter.com/hfradiospacewx**). Your columnist is on Twitter, as @NW7US (https://Twitter.com/NW7US).

TSM

The World of Shortwave Listening

By Andrew Yoder **info@hobbybroadcasting.com**

AM and Shortwave Pirates: Then and Now Plus: Global HF Pirate Weekend

At the dawn of the modern era of North American pirate radio, a spin through the dial of your Yaesu FRG-7 or Realistic DX-160 would be less likely to yield an unlicensed signal on the shortwave bands than at the top end of the medium-wave band. Back in the 70s and 80s, before the AM band was expanded, pirates were regularly active from 1615 to about 1632 kHz and sometimes as high as 1650 kHz.

Two factors have nearly killed AM broadcast band piracy in North America. First, the expanded band might have benefited a few radio station owners, but filled the radio frequencies up through 1710 kHz. More importantly, receiver manufacturers stopped making analog radios in general and instead made equipment that receives only in 10-kHz steps, with nearly all ending at 1710 kHz.

At that time, when AM piracy was at its height, the average non-DXer would tune through the band, looking for something to listen to, whether a clear station or maybe a song he or she liked—and most radios covered an extra 20 or 30 kHz above the broadcast band. Not only was there a lot of space for other stations, but also those broadcasters could operate on off channels. When KPRC operated on 1616 kHz in the early 80s and WKND on 1621.3 kHz later in the decade, no one batted an eye. Today, the only people who could hear a station on 1616 kHz would either be those with classic analog radios or communications receivers.

It's not 1982 anymore, but AM pirate radio isn't entirely dead. Of course, there are still daytime operations anywhere through the dial, but those are confined by propagation. Otherwise, the only option is 1710 kHz, but this frequency has some drawbacks. I've heard Radio Moshiach and Redemption, Radio Celestial, and Undercover Radio on 1710 kHz over the past few years, so long-distance coverage is possible. And listeners in the northern Midwest have heard W807 and The Big Q.

The frequency is limited in the Northeast by a few Travelers' Information Stations (TIS). Output for standard TIS operations with antenna systems (as opposed to those that use "leaky" transmission lines to emit a low power) can be as much as 10 watts. Because TIS transmitters can vary

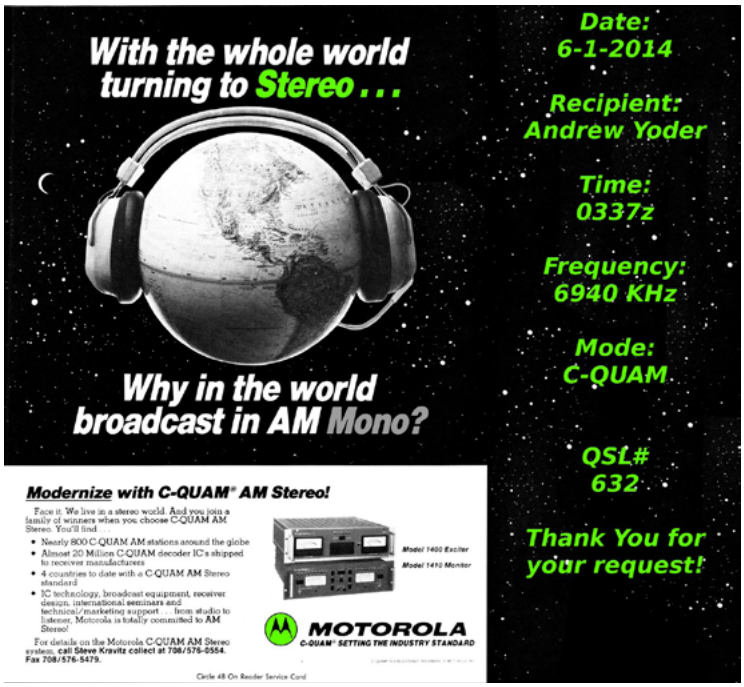
W807 on 1710 kHz has been reported for the past few years in the northern Midwest. (Courtesy of the author)

in output power and their antenna systems vary in efficiency, their coverage ranges are also significantly different.

My home location receives a significant amount of electronic noise on the AM band, so I spend more time listening to 1710 kHz in the car than in my own radio room. In my general location, what I most often hear on 1710 kHz is WQFG689, a 10-watt TIS from Hudson County, New Jersey.

According to the FCC database, this station is located at the intersection of Summit and Laidlaw Streets in Jersey City, New Jersey. Despite only using 10 watts and being 230 miles from my location, it seems that most nights, if I listen for 15 to 30 minutes, I'll hear some clear audio at some point. Programming is what you'd expect from a TIS: NOAA weather, public service announcements, and identifications running in a loop.

I've been reading reports that another TIS has joined the Hudson County station. Information from these reports states that the station is KID761, which transmits information about the Flight 93 Memorial in Shanksville, Pennsylvania. I've read that the station has one transmitter at Bedford and another near Somerset, Pennsylvania. I don't know any particulars of this station because I have never heard a trace



X-FM, one of the few shortwave stations to operate in true stereo (C-QUAM), is taking a sabbatical. (Courtesy of the author)

of it at my location—even though both Bedford and Somerset are much closer to my location than Hudson County, New Jersey.

The Hudson County TIS is audible in many parts of the East, so anyone in this area will have to contend with the station when trying to log pirates on 1710 kHz. A few years ago around Halloween during particularly good propagation conditions on the band, I was able to hear the New York City area pirate Radio Celestial mixing with WQFG689, and both stations often had solid signals that night.

Since that night, I haven't had much luck hearing pirates on 1710. Undercover Radio has tested on the frequency with fantastic results, but WQFG689 caused enough interference in the mid-Atlantic that the station jumped to 1720 kHz. On the latter frequency, reception was much better at my location, but jumping out of band prevents the general public from being able to tune in, so the advantages of the clear frequency are more than balanced out by the potential loss of audience.

Over the past year or two, very little pirate activity has been reported on the AM broadcast band. One of the last pirates that I heard there was a local in-band station that seasonally broadcast Christmas music. For a few years of its activity, it had a range of maybe a 20-mile radius that was restricted by propagation and licensed stations. The last time I heard the station was in 2013, when it appeared that the operator had dropped the power to maybe Part 15 levels. While driving and listening for the station then, I found that its signal range was down to about a mile

Because the culture and personalities of AM broadcast-band pirates have traditionally differed from those on shortwave, with some of the shortwave guys occasionally experimenting on AM, I love to check out the range. But until this season, there hasn't been much to write about. Fortunately for fans of odd radio, more has been reported on 1710 kHz in August. To this point, most of the stations have been reported in the Midwest and northern Midwest by HF Underground members Kilokat7, BDM, and Skeezix. One station has not been heard with an identification playing pop oldies, such as Tommy James and the Shondells, Smokey Robinson and the Miracles, Patsy Cline, and the Dave Clark Five. It was heard several times in late August and will hopefully continue to be heard into the autumn.

Another station that continues to be heard, but with a much smaller range, is W807 from northern Illinois. This station claims to be Part 15, and could well be, but it has been heard as far away as Michigan. W807 is on the air regularly but because of the low power, it isn't often reported. And that's too bad because it has

Moonlight Radio offered this generic eQSL for broadcasts during the last Global HF Pirate weekend. (Courtesy of the author)

a lot of personality. Gava and DJ Storm present programming on current events and various controversial subjects. Big on audience participation, Gava has announced on its Facebook page, "People are listening to W807 1710 a.m. and me and DJ storm wish to thank you personally! You got an opinion? Or maybe there's something that you heard on 1710 that you don't agree with? Go ahead and leave a comment, the only thing we ask is please keep it clean. Chances are we're going to read it on the airwaves."

In late July, Chris Smolinski in Maryland took screenshots of the range on his SDR from 1709.920 to 1710.08 kHz and they showed about a dozen separate stations and carriers on approximately 1710 kHz. Some of these are TIS stations, maybe some of these are noise sources, but surely at least a few are either pirates or Part 15 (unlicensed) stations.

Between the recent loggings and the number of signals around 1710 kHz, I'm encouraged that we'll have some activity on the frequency in the coming months.

Hurricane Radio

I've been writing this column with CNN and Weather Channel on in the background so that I could follow the progress of Hurricane Irma. First of all, best wishes to all of my radio friends in Texas and Florida who have just experienced Hurricanes Harvey and Irma. If you sustained property damage or upheaval in your life from either, I sincerely hope that your recovery goes as smoothly and quickly as possible.

As I've been writing, I've thought a lot about both hurricanes and pirate radio. Florida, the Miami area in particular, has long been a hotbed of FM pirate activity. The FCC has been unable to control unlicensed broadcasting to the point that the action has been made a felony in Florida.

Connecting the dots between a statewide hurricane that's so widespread and powerful that emergency personnel announced when they would no longer answer 911 calls, a vast number of unlicensed radio operators, and a felony punishment for pirate broadcasting, well, Hurricane Irma seems like it would be a perfect storm of events for those who want to transmit. Of course, there are plenty of safety issues that would prevent a pirate from broadcasting in the midst of a hurricane evacuation zone. But, just for the sake of argument, a number of people did not evacuate—even in Key West, where the islands took a direct hit from the largest

hurricane on record.

If any of these people who chose to stay behind would choose to broadcast, what would be the dangers, aside from personal safety? Unless the FCC would do some post-broadcasting research, which seems unlikely, an enforcement action seems out of the question because if emergency personnel aren't going out, you can be sure that FCC agents won't be traveling into a hurricane. Probably the biggest issue would be the antenna. It would be difficult to build and install a hurricane-proof antenna—especially at the shortwave and AM broadcast band frequencies. On the latter, there probably wouldn't be much hope—the pirate would probably just broadcast into a long wire antenna (whether a dipole, L, random wire, etc.) until it snapped in the wind. Shortwave would have the best possibilities because a whip antenna could be used indoors or in a low profile outside area, such as strapped to a chimney. FM requires height, so attaching to a chimney, apartment balcony, etc. seems like the route a station would take.

The next big issue would be power. Electricity was the first thing to go and it's still the last to return. Anyone who would want to broadcast through a storm like this would need to have a lot of charged high-capacity batteries and/or a generator (but the noise of the generator during the pre- and post-storm calm and the carbon monoxide emissions would probably keep the op from choosing that route).

I could imagine that a station broadcasting phone calls from other people staying behind through the storm would be fascinating for anyone, but particularly informative for local authorities who could find out what roads are flooding, where power lines are down, etc.

I've been running some searches to see if any pirates were broadcasting from Florida during Irma, but I've been having a tough time finding anything. The biggest problem is fake pirates—online and licensed stations that call themselves "pirate radio." Pirate Radio Miami is actually just an online station and Pirate Radio Key West is actually WKYZ, a 100-kW licensed station running an Adult Album Alternative format on 101.7. I could go on complaining about this, but that's another topic for another day. If you know of any pirate that broadcast from Florida through Irma, please let me know.

X-FM Dry Docked

If you occasionally listen to shortwave pirate radio from North America, then chances are good that you've heard X-FM, which along with Wolverine Radio and Undercover Radio, probably have the best signals across the continent. Just today, station operator, known only as Redhat, said that the project is being shelved for the foreseeable future. Here's the message in part:

"I've been spending a lot of time lately trying to get transmission gear to behave and at the same time trying to pay the bills. As of late, things have been piling up faster around here than I care to admit, and progress on the transmitters and associated gear has been going far slower than I anticipated. The looming date of Halloween, this list of things that must be finished beforehand brought me to a conclusion late last night that I didn't really want to admit, but now have to. For the last six years or so, this has been my hobby, and one of my few remaining ways to blow off steam and have a good time. Lately it's become too much of a burden on my time and finances. I'll never say I'm not coming back, but without a functioning transmitter and the spare funds to go out and play, it looks like it's going to be a while. I thank you all for your support over the years, your reports, and sticking through the rough conditions. Needless to say unless something happens over the next month or so, Halloween is probably off the table, as are any show for the following year. I'll still be hanging around the boards and helping folks where I can."

Next Global HF Weekend: November 3-5, 2017

It's still about two months away, so be sure to mark the next Global HF Pirate Weekend on your calendar. The last one, which occurred during the first weekend of April, resulted in some success with intercontinental broadcasting. North American pirates WHYP, XEROX, Radio Free Whatever, and Captain Morgan all operated around 0600 UTC between 6920 and 6950 kHz and were heard in New Zealand. Radio Pirana International from South America ran 24/7 tests on 6930 kHz across Global HF Weekend and was reported in Germany, Maryland, Pennsylvania, and South America with only 10 watts. Cupid Radio from Netherlands was logged in Pennsylvania, Rhode Island, New Jersey, Massachusetts, Michigan, Kentucky, New York, Maryland, and Virginia. Other stations were active specifically for the weekend, but just for a local or regional audience, such as Moonlight Radio and Radio Batavia.

We'll see how many stations show up during the next weekend, but here are the original specs from years past. It seems unlikely that stations will be using 13 meters this time and much more likely that stations will be trying the 6900-kHz range and possibly 31 and 25 meters.

November 3-5, 2017

General frequency ranges: 15010-15100 kHz and 21455-21550 kHz

Basic schedule:

European morning, 0800-1200 UTC from Europe to Asia/Japan/Oceania.

European afternoon, 1200-1600 UTC from Europe to North America and vice versa.

European night, 2200-2400 UTC from North America to Asia/Oceania.

Of course, these are general frequency ranges where pirates have broadcast during prior Global HF Pirate weekends. Some stations will surely operate on frequencies and times outside of these ranges. These will be updated on the Hobby Broadcasting blog as it happens at **http://hobby-broadcasting.blogspot.com**. TSM

The Shortwave Listener

By Fred Waterer **programming_matters@yahoo.ca**

BBC Program Notes for October and More

Welcome to the October edition of the shortwave listener. This month we look at he aftermath of Hurricane Irma, lots of programming info from the BBC, Uncle Bill is moving and we present several "blasts from the past."

During Hurricane Irma, I kept my ears open for news about how the storm was affecting places like Cuba, Anguilla and Florida. Many shortwave stations such as Radio Habana Cuba, the late Gene Scott's operation on Anguilla and WRMI were in the path of this massive storm.

Many of these stations survived relatively well. Signals from Havana suggest that the transmitter site survived.

WRMI was initially knocked off the air. In a Facebook post at 1430 UTC on September 11, Jeff White noted, "Hurricane Irma has done extensive damage at WRMI in Okeechobee, Florida. Two antenna towers are down and many poles holding transmission lines are also down. Power went out at around 2030 UTC Sunday, and it may not be restored for days. Meanwhile, all transmitters are off the air. Our Internet service is also down, which means that our live stream is down as well. All of our staff are OK. Thanks for all of your messages of support." However it has since been noted back on the air at 9395 kHz with lower but listenable power. We wish WRMI all the best as they try to get back up to speed. Check them out when you get a chance. WRMI has been a wonderful source of international relays from such stations as RAE Argentina, Radio Ukraine International, Prague, Slovakia and many others. No doubt Gene Scott will still be exhorting his flock to "get on the telephone!" by the time you read this.

Not shortwave (yet) but the BBC World Service has begun an extensive language expansion. In September, the BBC World Service launched the first new language service in its biggest expansion since the 1940s. A digital Pidgin service for West Africa was launched, to be followed shortly by new online services in Amharic, Afaan Oromo and Tigrinya, aimed at Ethiopia, Eritrea and diaspora audiences around the world. Further services, including Korean (reportedly on shortwave), are set to launch from this autumn. This expansion means BBC News will operate in more than 40 languages.

The BBC World Service expansion comes thanks to a funding boost of £289 million from the UK Government.

At the launch, Director-General of the BBC, Tony Hall, sad, "Today marks the start of a new chapter for the BBC.

Uncle Bill's Melting pot moves to a new day. (Courtesy: William Tillford)

The BBC World Service is one of the UK's most important cultural exports. In a world of anxieties about 'fake news,' where media freedom is being curtailed rather than expanded, the role of an independent, impartial news provider is more important than ever. The new services we're launching will reach some of the most under-served audiences in the world."

World Service Director Francesca Unsworth says, "For more than 80 years the BBC World Service has brought trusted news to people across the globe. I'm delighted that millions in West and then East Africa will be able to access the BBC in the languages they speak.

"The BBC World Service expansion will also bring benefits to audiences in the UK. Having more journalists on the ground will enrich our international reporting, bringing news from areas which are often under-reported."

Pidgin is spoken by an estimated 75 million people in Nigeria alone, with additional speakers in Cameroon, Ghana, and Equatorial Guinea.

The Pidgin service is fully digital featuring six daily editions of BBC Minute - a 60-second audio news update - followed by two daily news video bulletins in November. Two further services for West Africa—Yoruba and Igbo—will launch at the beginning of next year.

The Amharic, Afaan Oromo and Tigrinya services will launch online and on dedicated Facebook pages next month. This will be followed later in the year with shortwave radio services in each language, consisting of a 15-minute news

Big Daddy Russ Horton hosts mornings at fm108.ca (Photo courtesy of the author's collection)

Dale Patterson heard on weekends at fm108.ca (Photo courtesy of the author's collection)

and current affairs program, followed by a 5-minute Learning English program, from Monday-Friday. Programs can be heard at https://www.bbc.com/pidgin

This is a great development for listeners worldwide, even if most of the programming is online. I know our focus is on shortwave listening but access to programming like this should be cherished regardless of how we hear it. Stay tuned for the new service for North Korea as well, which should be imminent.

September 7, was the last Thursday broadcast of Uncle Bill's Melting Pot on WBCQ 7490 kHz, according to a program announcement. "We then moved to Sundays, 2200-2330 UTC (6:00-6:30pm Eastern Time US) on 7490 kHz, right after Marion's Attic, another wonderful show that plays recordings from the 1890s to the 1950s. We think our listeners are mutually compatible and look forward to the change.

"WBCQ's schedule stays keyed to US time, so when the time changes, UTC will change to 2300-2330 Mondays but stay at 6:00-6:30pm Eastern). Our first Sunday broadcast was Sunday, September 17."

The BBC has launched its 100 Women season for 2017, with a unique celebration of female talent. Now in its fifth year, the season is again leading the charge by challenging women across the world to solve four global problems.

Starting in October, 100 Women Challenge, according to a BBC announcement: "Change Is Coming will be drawing on the world's wealth of female talent across all spheres of modern life—from engineering to the creative industries, from sport to business—as four teams tackle everyday problems currently blighting women's lives across the globe. With help and inspiration from women who face these challenges daily, as well as star ambassadors and the BBC's global audience, they will have a week to invent, develop and deliver a prototype. This could be a tech solution, product or campaign that tackles the issue.

"The teams' progress will be followed throughout each week on the BBC's digital platforms. There will also be live shows marking the beginning and end of each project and content across all the BBC's language services and its international TV news channel BBC World News.

"Audience participation will be a cornerstone of the challenge. The teams will want to hear directly from women affected by the issues they are tackling and find out what solutions may have already been tried. Viewers and listeners will be able to get involved in the challenge via social media with @BBC100Women and #100Women, and through the live shows.

"The 100 Women Challenge will begin in San Francisco on Monday October 2 with the first team looking at breaking through the glass ceiling. The next team will be based in Delhi, tackling female illiteracy (October 9-13), before the focus moves to Kenya, where a team in Nairobi will try to improve safety for women on public transport (October 16-21). And finally for the fourth week a team in Rio de Janeiro will take on sexism in sport (October 23-28).

"But the 100 Women season would not be complete without the now famous 100 Women List. In 2016 it included singer-songwriter Alicia Keys; US gold medal winning gymnast, Simone Biles; French politician Rachida Dati and Chairman of Santander UK, Baroness Shriti Vadera, among others. This year the list will celebrate the women around the world trying to tackle the problems highlighted in the season. And, in a new twist, while 60 women have already have been identified, the remaining 40 places will be filled by those who have supported, inspired and helped the teams on the ground over the course of the weeks. They might be someone working on a solution on the other side of the world; the woman who suggested the piece of code; the woman who named the campaign; or the woman who, by courageously sharing her story, inspired the solution.

"Alongside the 100 Women Challenge, additional content will be broadcast throughout October and into the autumn across all the BBC's language services and BBC World News, ranging from short form news reports to documentaries. There will also be a wealth of digital content on **www.bbc.com/100women** such as opinion pieces by leading

experts, personal stories, infographics and films."

Fiona Crack, Editor of 100 Women says: "The message we've heard loud and clear from women across our audiences is that they want action, that it's not just talking about issues anymore, it's doing something about them. In 2015 women hosted 150 debates in 10 languages and 30 countries, in 2016 people added 450 deserving but over-looked women to Wikipedia, and now in 2017 we're taking it to a whole new level of participation. It's going to be exciting but nerve-racking to see what these talented 100 will come up with and if they can pull it off in a month. 100 Women was established in 2013 as an annual series focused on a list of 100 inspirational women.

"The list was supported by news, features, investigations and interviews highlighting the work of these women, targeting female audiences. In 2016 100 Women site generated 30 million hits over three weeks and was awarded an Alliance for Women in Media Gracie award. The project was also a finalist for the US Peabody Awards 2017 and scooped many other accolades." Programming is available throughout October.

The Compass: Making It Work

"Making It Work explores the messy, roller coaster reality of being an entrepreneur serving one of the most challenging markets in the world—the bottom billion.

"Science journalist Angela Saini is fascinated by geeky thinkers who are trying to change people's lives. In this series we travel with her on a journey to meet those who are bringing innovative new products to the world's poorest, while showing that they can also, hopefully, turn a profit.

"We'll be hearing about great innovations, the customers who use them and the problems that arise along the way, as we follow some of the world's most forward thinking business start-ups, who are Making It Work." Listen on UTC Wednesdays at 1330 UTC

I am a big fan of the BBC's Radio Four Extra, an online archive station playing great programming from the past. In late September, they will be airing this three-hour special called The Golden Age Of American Radio:

"The decades between the end of the silent film era and the rise of TV were golden years for the medium of radio in America.

"In this three-hour special program, Toby Hadoke will introduce some classic radio shows from the 1930s, 40s & 50s to the 4 Extra audience for their very first broadcasts on British radio.

The radio work of established stars such as Joan Crawford, Jack Benny and Vincent Price will feature, as well as some lesser known shows from that era. The Golden Age of American Radio features:

- Vincent Price in an episode of The Saint called The Horrible Hamburger from 1950
- The Columbia Workshop presents Meridian 7-1212 by Irving Reis from 1939
- An episode of The Jack Benny Program from 1950 in which Jack Give 50 cents to a Bum
- Zero Hour by Ray Bradbury, dramatized for X Minus One in 1956
- A 1946 polemic from Jack Webb for One Out of Seven - Senator Theodore Bilbo
- Joan Crawford stars in The Ten Years on Suspense in 1949"

The program airs at 9 am London time on September 23 but should still be available via the program archive. Simply go to bbc.co.uk/4extra and click on September 23.

fm108.ca

Back in the Stone Age when I was a teenager, a radio station came on the air that changed my life. I'm sure we all have a story like this with (insert name of radio station) depending on where we grew up. In my case it was FM 108 (CING 107.9) in Burlington, Ontario. It became my go to station playing the best music of the fifties and sixties. I loved that station. And the driving force at the station back then was the late Norman B. Anyone who heard his broadcasts will never forget them. (Norman B. Was a member of the Ontario DX Association. One of my fondest memories was chatting with him about radio, scanners and DXing, very shortly before he died. One rarely gets to talk to one's heroes, I am glad I had that one chance).

Many of the jocks who made that station what it was have reunited, online. You can hear some of the great guys who brought you the music all those years ago. Big Daddy Russ Horton, Glen Darling, Dale Patterson, Mark Panopoulos and many others. If you love the music of the fifties and sixties check this station out.

saint.fm

Back in the day, how many of us tried for the annual shortwave broadcast from the tiny island of St. Helena in the middle of the South Atlantic. I heard it a couple of times in the 1990s. It was a rare opportunity to hear radio from this exotic place. Fast-forward to 2017 and you can hear St. Helena radio 24/7. Saint FM is a pretty cool station playing a really nice mix of music. I like to listen to it while I am working on other things. Thanks to Andy Sennitt for the heads up on this station via the PCJ Facebook page.

TSM

Maritime Monitoring

By Ron Walsh VE3GO **marinecolumn@gmail.com**

Nothing Remains the Same Except Change!

This month my research has uncovered the proposed changes to the marine VHF radio frequencies worldwide in regions 1 and 3. The Americas have yet to announce changes but the new marine radios will have to accommodate these changes. Digital modes and narrower bandwidths will cause changes in the marine VHF spectrum. The Canadian frequency chart reflects these changes. The summary of the changes is listed below:

Marine Radio Frequencies will change Jan 2017. The recent ITU World Radio Conference has developed a new channel plan for the VHF marine radio band. The changes are summarized below.

1. From January 1 2017 in Regions 1 and 3 (basically, everywhere apart from the Americas), channels 78, 19, 79 and 20 will be split into single frequency channels, as follows: Using 78 as an example - it has 2 frequencies: 156.925 MHz (ship transmit) and 161.525 MHz (Coast Station transmit). The ship transmit frequency becomes new channel 1078 (156.925 MHz), and the Coast transmit frequency (161.525 MHz) becomes new channel 2078.

So, the new channels will be numbered: 1078 2078 1019 2019 1079 2079 1020 2020

In Region 2 (The Americas), channels 78, 19, 79 and 20 are simplex channels now, using the ship transmit frequencies.

2. From January 1, 2017, channels 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26 and 86 will be available for digital modes.

3. Channels 27, 87, 28 and 88 may be used for testing of new AIS applications.

4. The frequency 160.9 MHz (a spare Coast Station transmit frequency between channels 65 and 66) may be used for testing of new applications. This will be known as channel as channel 2006.

The full list of frequencies is listed in a document from US Homeland Security which I have attached to this column I would also like to add the lists of eastern Canadian HF frequencies used by the Canadian Coast Guard Radio Stations. They should provide you with some great listening. The complete Canadian Marine Radio information is contained in Radio Aids To Marine Navigation (RAMN) 2017 issue. There is an eastern and western issue of this publication. (You can find them at **www.ccg-gcc.gc.ca/folios/01195/docs/**

New Group Ocean tug Ocean Simard, which had to stop in Kingston for engine repairs. My radio monitoring let me get this shot of her. (Courtesy of the author)

RAMN-2017-eng.pdf Pages 16-20.

We have had only a few minor incidents on the Seaway this year and no real interesting radio traffic. The big problem was record high water levels, restrictions as to speed as well as meeting in narrow areas and heavy water flows causing big current changes. The HF propagation has been poor here this summer and there has been a lot of noise on the bands. Digital transmissions thus can be more useful in this situation. I hope for better winter conditions, a better horizontal antenna and less local noise. Hopefully this will be my change for the year.

I have added two tables and hope there is enough room to print them. If not, I will do the Canadian hf table in the January column.

The following table is adapted from the International Telecommunications Union Radio Regulations Appendix 18, including changes adopted by the 2015 World Radio Conference. Transmission on frequencies or channels shown in blue are not allowed within U.S. territorial waters, but are allowed on the high seas and in most other countries. Note that a marine radio operating in the international mode on a channel in which the ship station frequency is shown in black and the shore station frequency shown in blue would not be able to communicate with a U.S. shore station. Frequencies and channels shown in green were auctioned in the U.S. and are only available from the auction winner. The large number of blue channels and frequencies indicates the shortage of VHF maritime spectrum in the U.S. compared to most other maritime countries.

General Notes on The Table Below:

The Table below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several duplex channels. The channel numbering and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-5 Annex 4, Tables 1 and 3. The Table below also describes the harmonized channels where the digital technologies defined in the most recent version of Recommendation ITU-R M.1842 could be deployed.

a. Administrations may designate frequencies in the intership, port operations and ship movement services for use by light aircraft and helicopters to communicate with ships or participating coast station in predominantly maritime support operations under the conditions specified in Nos. 51.69, 51.73, 51.74, 51.75, 51.76, 51.77 and 51.78. However, the use of the

Table of Transmitting Frequencies in the VHF Maritime Mobile

Channel Designator	Notes	Transmitting Frequencies (MHz)		Intership	Port Operations and Ship Movement		Public correspondence
		Ship Stations	Coast Stations		Single frequency	Two frequency	
60	*m*	156.025	160.625		x	x	x
01	*m*	156.050	160.650		x	x	x
1001		156.050	156.050		x		
61	*m*	156.075	160.675		x	x	x
02	*m*	156.100	160.700		x	x	x
62	*m*	156.125	160.725		x	x	x
03	*m*	156.150	160.750		x	x	x
63	*m*	156.175	160.775		x	x	x
1063		156.175	156.175		x		
04	*m*	156.200	160.800		x	x	x
64	*m*	156.225	160.825		x	x	x
05	*m*	156.250	160.850		x	x	x
1005		156.250	156.25		x		
65	*m*	156.275	160.875		x	x	x
1065		156.275	156.275		x		
06	*f*	156.300		x			
2006	r	160.900	160.900				
66	*m*	156.325	160.925		x	x	x
1066		156.325	156.325		x		
07	*m*	156.350	160.950		x	x	x
1007		156.350	156.350		x		
67	*h*	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	*i*	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	*h,q*	156.500	156.500	x	x		
70	*f,j*	156.525	156.525	Digital selective calling for distress, safety and calling			
11	*q*	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	*i*	156.625		x			
13	*k*	156.650	156.650	x	x		
73	*h,i*	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	*g*	156.750	156.750	x	x		
75	*n,s*	156.775	156.775		x		
16	f	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n,s*	156.825	156.825		x		
17	*g*	156.850	156.850	x	x		
77		156.875		x			
18	*m*	156.900	161.500		x	x	x
1018		156.900	156.900		x		
78	*m*	156.925	161.525		x	x	x
1078		156.925	156.925		x		
2078	*mm*	161.525	161.525		x		
19	*m*	156.950	161.550		x	x	x
1019		156.950	156.950		x		
2019	*mm*	161.550	161.550		x		
79	*m*	156.975	161.575		x	x	x
1079		156.975	156.975		x		
2079	*mm*	161.575	161.575		x		
20	*m*	157.000	161.600		x	x	x
1020		157.000	157.000		x		
2020	*mm*	161.600	161.600		x		
80		157.025	161.625		x	x	x
1080		157.025	157.025		x		
21	*y,wa*	157.050	161.650		x	x	x
1021		157.050	157.050			x	
81	*y,wa*	157.075	161.675		x	x	x
1081		157.075	157.075		x		
22	*y,wa*	157.100	161.700		x	x	x
1022		157.100	157.100		x		
82	*x,y,wa*	157.125	161.725		x	x	x
1082		157.125	157.125		x		
23	*x,y,wa*	157.150	161.750		x	x	x
1023		157.150	157.150		x		
83	*x,y,wa*	157.175	161.775		x	x	x
1083		157.175	157.175		x		
24	*w,wx,x,xx*	157.200	161.800		x	x	x
1024	*w,wx,x,xx*	157.200					
2024	*w,wx,x,xx*	161.800	161.800	x (digital only)			
84	*w,wx,x,xx*	157.225	161.825		x	x	x
1084	*w,wx,x,xx*	157.225		x (digital only)			
2084	*w,wx,x,xx*	161.825	161.825				
25	*w,wx,x,xx*	157.250	161.850		x	x	x
1025	*w,wx,x,xx*	157.250		x (digital only)			
2025	*w,wx,x,xx*	161.850	161.850				
85	*w,wx,x,xx*	157.275	161.875		x	x	x
1085	*w,wx,x,xx*	157.275					
2085	*w,wx,x,xx*	161.875	161.875				
26	*w,ww,x*	157.300	161.900		x	x	x
1026	*w,ww,x*	157.300					
2026	*w,ww,x*		161.900				
86	*w,ww,x*	157.325	161.925		x	x	x
1086	*w,ww,x*	157.325					
2086	*w,ww,x*		161.925				
27	z,zx	157.350	161.950			x	x
1027	z,zz	157.350	157.350				
ASM 2 (2027)	z	161.950	161.950				
87	z,zz	157.375	157.375		x		
28	z,zx	157.400	162.000			x	x
1028	z,zz	157.350	157.350		x		
ASM 2 (2028)	z	162.000	162.000				
88	z,zz	157.425	157.425		x		
AIS 1	*f, l, p*	161.975	161.975				

channels which are shared with public correspondence shall be subject to prior agreement between interested and affected administrations.

b. The channels of the present Appendix, with the exception of channels 06, 13, 15, 16, 17, 70, 75 and 76, may also be used for highspeed data and facsimile transmissions, subject to special arrangement between interested and affected administrations.

c. The channels of the present Appendix, with exception of channels 06, 13, 15, 16, 17, 70, 75 and 76, may be used for direct-printing telegraphy and data transmission, subject to special arrangement between interested and affected administrations

d. The frequencies in this table may also be used for radiocommunications on inland waterways in accordance with the conditions specified in No. 5.226.

e. Administrations may apply 12.5 kHz channel interleaving on a non-interference basis to 25 kHz channels, in accordance with the most recent version of Recommendation ITU-R M.1084, provided:

- It shall not affect the 25 kHz channels of the present Appendix maritime mobile distress and safety frequencies, especially the channels 06, 13, 15, 16, 17, 70, AIS 1 and AIS 2, nor the technical characteristics mentioned in Recommendation ITU-R M.489-2 for these channels;
- Implementation of 12.5 kHz channel interleaving and consequential national requirements shall be subject to coordination with affected administrations.

Specific notes

f. The frequencies 156.300 MHz (channel 06), 156.525 MHz (channel 70), 156.800 MHz (channel 16), 161.975 MHz (AIS 1) and 162.025 MHz (AIS 2) may also be used by aircraft stations for the purpose of search and rescue operations and other safety-related operations.

g. Channels 15 and 17 may also be used for on-board communications provided the effective radiated power does not exceed 1 W, and subject to the national regulations of the administration concerned when these channels are used in its territorial waters.

h. Within the European Maritime Area and in Canada these frequencies (channels 10, 67, 73) may also be used, if so required, by the individual administrations concerned, for communication between ship stations, aircraft stations and participating land stations engaged in coordinated search and rescue and anti-pollution operations in local areas, under the conditions specified in Nos. 51.69, 51.73, 51.74, 51.75, 51.76, 51.77 and 51.78.

i. The preferred first three frequencies for the purpose indicated in note a) are 156.450 MHz (channel 09), 156.625 MHz (channel 72) and 156.675 MHz (channel 73).

j. Channel (70) is to be used exclusively for digital selective calling for distress, safety and calling.

k. Channel 13 is designated for use on a worldwide basis as a navigation safety communication channel, primarily for intership navigation safety communications. It may also be used for the ship movement and port operations service subject to the national regulations of the administrations concerned.

l. The channels (AIS 1 and AIS 2) are used for an automatic identification system (AIS) capable of providing worldwide operation, unless other frequencies are designated on a regional basis for this purpose. Such use should be in accordance with the most recent version of Recommendation ITU-R M.1371.

m. These channels may be operated as a single frequency channels, subject to coordination with affected administrations. The following conditions apply for single frequency usage:

- The lower frequency portion of these channels may be operated as single frequency channels by ship and coast stations.
- Transmission using the upper frequency portion of these channels is limited to coast stations.
- If permitted by administrations and specified by national regulations, the upper frequency portion of these channels may be used by ship stations for transmission. All precautions should be taken to avoid harmful interference to channels AIS 1, AIS 2, 2027 and 2028. From 1 January 2019, channel 2027 will be designated ASM 1 and channel 2028 will be designated ASM 2.

mm. Transmission on these channels is limited to coast stations. If permitted by administrations and specified by national regulations, these channels may be used by ship stations for transmission. All precautions should be taken to avoid harmful interference to channels AIS 1, AIS 2, 2027 and 2028. From 1 January 2019, channel 2027 will be designated ASM 1 and channel 2028 will be designated ASM 2.

n. With the exception of AIS, the use of these channels (75 and 76) should be restricted to navigation-related communications only and all precautions should be taken to avoid harmful interference to channel 16 by limiting the output power to 1 W.

o. (n/a)

p. Additionally, AIS 1 and AIS 2 may be used by the mobile-satellite service (Earth-to-space) for the reception of AIS transmissions from ships.

q. When using these channels (10 and 11), all precautions should be taken to avoid harmful interference to channel 70.

r. In the maritime mobile service, this frequency is reserved for experimental use for future applications or systems (e.g. new AIS applications, man over board systems, etc.). If authorized by administrations for experimental use, the operation shall not cause harmful interference to, or claim protection from, stations operating in the fixed and mobile services.

s. Channels 75 and 76 are also allocated to the mobile-satellite service (Earth-to-space) for the reception of long-range AIS broadcast messages from ships (Message 27; see the most recent version of Recommendation ITU-R M.1371).

t. (n/a)

u. (n/a)

v. (n/a)

w. In Regions 1 and 3:

Until 1 January 2017, the frequency bands 157.025-157.325 MHz and 161.625-161.925 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26, 86) may be used for new technologies, subject to coordination with affected administrations. Stations using these channels or frequency bands for new technologies shall not cause harmful interference to, or claim protection from, other stations operating in accordance with Article 5.

From 1 January 2017, the frequency bands 157.025-157.325 MHz and 161.625-161.925 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23, 83, 24, 84, 25, 85, 26, 86) are identified for the utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842. These frequency bands could also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 by an administration that wishes to do so, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions and subject to coordination with affected administrations.

ww. In Region 2 (i.e. N. and S. America), the frequency bands 157.200-157.325 and 161.800-161.925 MHz (corresponding to channels: 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions in accordance with the most recent version of Recommendation ITU-R M.1842.

wa. In Regions 1 and 3:

Until 1 January 2017, the frequency bands 157.025-157.175 MHz and 161.625-161.775 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23 and 83) may be used for digitally modulated emissions, subject to coordination with affected administrations. Stations using these channels or frequency bands for digitally modulated emissions shall not cause harmful interference to, or claim protection from, other stations operating in accordance with Article 5.

From 1 January 2017, the frequency bands 157.025-157.100 MHz and 161.625-161.700 MHz (corresponding to channels: 80, 21, 81 and 22) are identified for utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842 using multiple 25 kHz contiguous channels.

From 1 January 2017, the frequency bands 157.150-157.175 MHz and 161.750-161.775 MHz (corresponding to channels: 23 and 83) are identified for utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842 using two 25 kHz contiguous channels. From 1 January 2017, the frequencies 157.125 MHz and 161.725 MHz (corresponding to channel: 82) are identified for the utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842.

The frequency bands 157.025-157.175 MHz and 161.625-161.775 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23 and 83) can also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 by an administration that wishes to do so, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions and subject to coordination with affected administrations.

w. In Region 2, the frequency bands 157.200-157.325 and 161.800-161.925 MHz (corresponding to channels: 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions in accordance with the most recent version of Recommendation ITU-R M.1842.

In Canada and Barbados, from 1 January 2019 the frequency bands 157.200-157.275 and 161.800-161.875 MHz (corresponding to channels: 24, 84, 25 and 85) may be used for digitally modulated emissions, such as those described in the most recent version of Recommendation ITU-R M.2092, subject to coordination with affected administrations.

x. From 1 January 2017, in Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Democratic Republic of the Congo, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, the frequency bands 157.125-157.325 and 161.725-161.925 MHz (corresponding to channels: 82, 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions.

From 1 January 2017, in China, the frequency bands 157.150-157.325 and 161.750-161.925 MHz (corresponding to channels: 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions.

xx. From 1 January 2019, the channels 24, 84, 25 and 85 may be merged in order to form a unique duplex channel with a bandwidth of 100 kHz in order to operate the VDES terrestrial component described in the most recent version of Recommendation ITU-R M.2092.

y. These channels may be operated as single or duplex frequency channels, subject to coordination with affected administrations.

z. Until 1 January 2019, these channels may be used for possible testing of future AIS applications without causing harmful interference to, or claiming protection from, existing applications and stations operating in the fixed and mobile services.

From 1 January 2019, these channels are each split into two simplex channels. The channels 2027 and 2028 designated as ASM 1 and ASM 2 are used for application specific messages (ASM) as described in the most recent version of Recommendation ITU-R M.2092.

zx. In the United States, these channels are used for communication between ship stations and coast stations for the purpose of public correspondence.

zz. From 1 January 2019, channels 1027, 1028, 87 and 88 are used as single-frequency analogue channels for port operation and ship movement.

The Longwave Zone

By Kevin O'Hern Carey WB2QMY **wb2qmy@arrl.net**

Get it in the Log!

Historically in North America, October brings out some of the best longwave conditions seen since the end of the previous winter. Lately, we've been talking about readiness for the new season, which is now upon us. One of the things you'll want to do is compare last season's log with what you're hearing today. It's an easy way to spot changes in the band, and over time, you'll develop a feel for the quality of conditions and the performance of your equipment in the new season. Don't have a log started? Well, as is often said about trees, the best time to plant one was 20 years ago. The second best time is now!

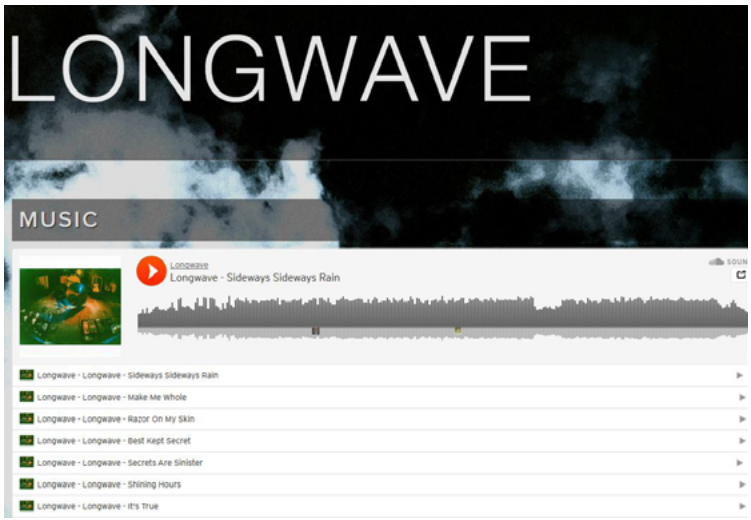
What should be in a log? Well, that's largely up to you. The essentials are as follows: Frequency, ID, Location, and the Date/Time of reception. These can be placed in computerized format, using the Table function in your favorite word processor or a spreadsheet program. It can also be as simple as a handwritten log in a loose-leaf notebook or tablet of paper. Some DXers even like to make sound recordings of notable catches, and key them to the logging entries they have made. Each entry would have an audio reference number, and with that data you can then locate the recording to have a complete picture of the intercept. Recordings are especially useful for rare or unusual catches, or for when there may have been a keying error in effect at the time of reception.

The layout and design of a log is completely up to you. If you're looking for some additional categories of information to include, consider adding columns for the following:

ID Pitch: U.S. Beacons typically use a nominal 1020 Hz pitch, while Canadian stations typically use a nominal 400 Hz. There are readily available software packages you can use to measure the exact tone in Hz. Spectran software is one of these. You may be satisfied with just stating "400" or "1020" Hz from ear.

Signal Report: Whether you use the tried and true "RST" system, the SINPO/SINFO code, or some other means, charting the signal quality you hear can provide valuable data when comparing to past conditions.

QSL?: You may wish to indicate if you sent a QSL card confirming reception, and whether you received an acknowledgment/confirmation from the Engineer-in-Charge of the station. Sending a brief, polite letter and SASE to the "NAVAIDS" section of the nearest air facility to a beacon may yield productive results. Some listeners make a sub-hobby out of this activity and collect the cards they receive. A useful site showcasing the art of QSLing and resources for beacon DXing can be seen at: **http://www.jazzkeyboard.com/jilly/jillys-radio-pages/jillys-longwave-radio-dxing-page**. A connected page listing the mailing addresses used for many popular beacons can be found at: **http://www.jazzkeyboard.com/jilly/jillys-radio-pages/directory-of-longwave-beacon-navaid-qsl-addresses**. These pages may show some beacons that are no longer active, but the core information is spot-on. You could spend quite a bit of time here.

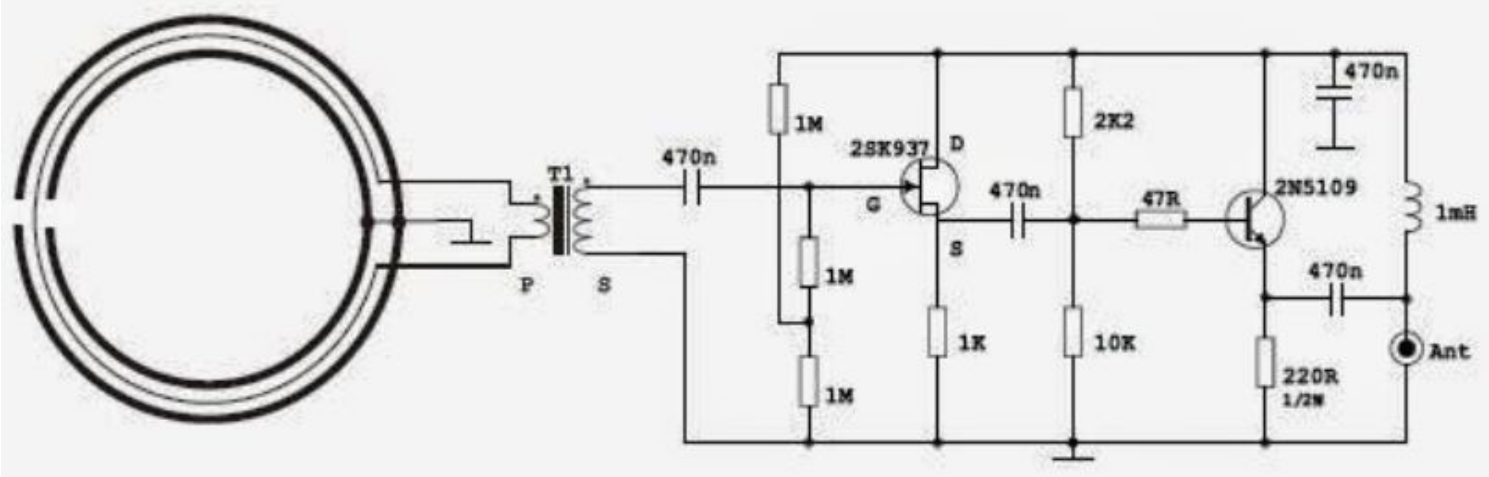


Although currently in a "resting" mode, the group Longwave has released many songs in the past. You can hear some of them right on the group's webpage at http://www.longwavetheband.com. (Courtesy: Longwave)

Distance: Charting the distance (miles or km) to each catch adds another dimension to your listening, and you could even run a little contest with yourself to see the greatest distances (both night and day) you can achieve on longwave. Need a challenge right out of the gate? How many beacons can you hear during the daytime at a distance of 300 miles or more? There are websites that will give you the exact airline distance between any two cities. One I found that works well is located at: **http://www.distancefromto.net**.

No. of IDs per Minute: This parameter acts as the "fingerprint" of a station you hear. You simply record the number of complete IDs sent in a 60-second period, and write this number down.

There might be other information you wish to add, and I'd like to hear from listeners who make up their own logs



This alternative preamp was suggested to me by Steve McDonald VE7SL for use with my broadband shielded loop on 160 meters. You can read more about it at http://ve7sl.blogspot.ca/2014/07/wellbrook-loop-plans.html.

and the categories they choose to include. Best DXing success in the 2017-2018 season!

Latest Project: Loop Antenna Mods

Another topic we addressed recently was antennas. We talked about the basic traits of random wire, active whip, and loop antennas. While all of these have their place in the listening lineup, loops have always held special interest for me. Their small size can help limit noise pickup as compared to a random length wire antenna, but more importantly, you can turn a "deaf ear" to interference and focus squarely on a signal of interest. There is one type of loop, the broadband shielded type with preamp, which combines the best of both active whips and traditional directional loop antennas.

I built one of these toward the end of my run with Monitoring Times magazine, and described it there. It turned out to be a big success. You can see the overall design at Steve McDonald's (VE7SL) excellent webpage at http://www.qsl.net/ve7sl/burhans.html. The one I built has a round loop of about a 1-meter in diameter. I learned later that a larger loop can increase signal strengths considerably, but mine works very well, and it offers a compact arrangement that can be transported, if necessary, for field trips. I may try a larger loop later on.

Another change I'm considering is a modification to the preamplifier to allow for operation on the 160-meter (1800-2000 kHz) amateur band as a receive-only antenna. I am active on 160 meters, especially in the cooler months of the year when natural static is reduced. 160 meters can be a fascinating band, and it attracts the type of operator who doesn't mind experimenting with antennas and other equipment to get a signal on the band. In chatting with Steve (VE7SL), he suggested I try bypassing the Low Pass Filter (LPF) in the loop's preamp as a first step at 160-meter operation.

The filter serves an important role in longwave work by sharply cutting off signals above 550 kHz or so, limiting Broadcast Band interference. However, in my case, I am not extremely close to any high-powered AM broadcasters, and by opening up the input response, it may give the performance I need on 160m. I will report on my progress here. Ideally, I would create some sort of switching arrangement where I could use the antenna on LW or 160 meters with the throw of a switch.

Steve also steered me toward another preamp design that may be better suited for 160-meter use, as it is intended for the nearby AM Broadcast band. I may also give this a try as well. You can see this preamp design described at Steve's blog site at: **http://ve7sl.blogspot.ca/2014/07/wellbrook-loop-plans.html**

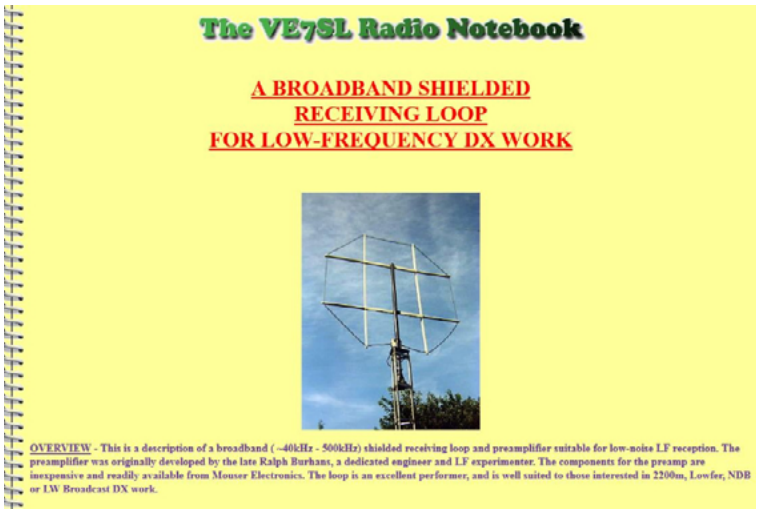
Videio Channel?

I am considering starting a YouTube or Vimeo channel focused on my radio and longwave activities. This would play well with my career work creating video-based training modules, and perhaps allow me to fine-tune my skills while providing useful content for radio fans. What do you think? Would you like to see such a channel offered? What type of content would you like to see on it? Please drop me an e-mail with your thoughts and ideas for such a channel. Ideas from anyone who has created YouTube (or similar site) content would also be appreciated. I would likely begin serious development of this channel in 2018, if I decide to pursue the project.

Mailbag

Last month we ran a letter from self-described "Beacon Tourist" Kriss Larson KR6SS (CA) who travels the World and always tries to include some radio sites and on-air listening in his journeys. Last month he reported on his recent trip to Europe, and gave some observations of the LF scene there. This time, we have a reply from noted LW listener Alan Gale of the UK. Alan writes:

"Hi Kriss, Nice trip, and good to see what Mainflingen



The basis for my shielded loop antenna is described at VE7SL's Radio Notebook website (http://qsl.net/ve7sl/burhans.html). This site has loads of information for anyone exploring the LF through MF regions of the spectrum, and well beyond! (Courtesy: VE7SL)

looks like. The NDB at Laupheim is typical of many German military bases, they use Mode A2A, and the long dashes are for DF purposes. Most NDBs in Europe are Non A2A types, so just have the call sign and a gap in between of anything from one to 8 seconds usually.

"I think the UK and Ireland are the main countries running LORAN now, though there may still be a few others, a lot of them closed down a couple of years back.

"The Germans have butchered their LW and MW services, mainly to force listeners onto DAB and save money, but the UK still keeps adding new MW stations, though mostly low power. Same in the Netherlands, a lot of the high power transmitters go, but low power ones spring up all over the place. There are said to be many reasons for this, one is the high price of electricity in parts of Europe, the other is (ridiculously) high land prices, which earns the owners more money from selling it for housing than for hosting radio aerials. DAB is bloody awful, I just wish they'd hurry up and get some reasonably priced DRM receivers on the market, then we might well see a few more new stations come on, and the bands gain a bit of life again.

"Very few religious and talk stations over here, it's mostly just music and news, and is very bland to say the least. The Long Wave broadcasters are often the more interesting ones, but they are getting axed due to the high power and maintenance costs sadly. The immigrant language stations are mostly to be found on FM covering the small areas where they tend to congregate, Algeria is the exception, with the massive Longwave signal from their new Ampegon transmitter and antenna giving coverage all over France (and beyond) for all the Algerian workers there."

Later in the month, Alan Gale sent the following update to me at the TLZ column:

"Kevin, I also heard recently that Morocco broadcasters have also added a new DRM-capable Longwave transmitter, so it doesn't look like they have any plans to depart from the band anytime soon. This was the press release about the project: **http://www.thomson-broadcast.com/thomson-broadcast-moroccan-radio-transmitter-contract-win-new-s7hp-neo-transmitter-range**. I wish some of the European countries would give LW DRM a go, with more space on the band now they could easily find room for a few 12-15 kHz bandwidth stations. We can but hope!"

Selected LW Loggings

All contributors for this month are identified below the loggings table. Remember, loggings are always welcome from TSM readers, and this column is not restricted to just aviation beacons. Any longwave signals below 535 kHz are welcome!

kHz	ID	Location	By
200	UAB	Anahim Lake, BC	T.F. (WY)
200	UAB	Anahim Lake, BC	A.P. (CA)
206	QI	Yarmouth, NS	T.R. (MI)
216	CLB	Wilmington, NC	T.R. (MI)
218	PR	Prince Rupert, BC	A.P. (CA)
218	RL	Red Lake, ON	T.R. (MI)
219	YMG	Manitouwadge, ON	T.R. (MI)
223	YYW	Armstrong, ON	T.R. (MI)
224	MO	Moosonee, ON	T.R. (MI)
233	QN	Nakina, ON	T.R. (MI)
242	XC	Cranbrook, BC	T.F. (WY)
248	WG	Winnipeg, MB	T.R. (MI)
275	SF	Williston, ND	R.P. (MO)
278	NM	Matagami, QC	T.R. (MI)
284	QD	The pas, MB	T.F. (WY)
290	YYF	Penticton, BC	T.F. (WY)
305	ONO	Ontario, OR	A.P. (CA)
317	VC	La Ronge, SK	T.F. (WY)
326	DC	Princeton, BC	T.F. (WY)
329	YHN	Hornepayne, ON	T.R. (MI)
332	QT	Thunder Bay, ON	T.R. (MI)
335	YLD	Chapleau, ON	T.R. (MI)
340	YY	Mont-Joli, QC	T.R. (MI)
341	YYU	Kapuskasing, ON	R.H. (MI)
341	YYU	Kapuskasing,ON	T.R. (MI)
344	JA	Jacksonville, FL	R.H. (MI)
346	YXL	Sioux Lookout, ON	T.R. (MI)
348	MNC	Shelton, WA	A.P. (CA)
350	DF	Deer Lake, NL	R.H. (MI)
350	RG	Oklahoma City, OK	T.F. (WY)
351	LI	Little Rock, AR	R.H. (MI)
351	YKQ	Waskaganish, QC	R.H. (MI)
351	YKQ	Waskaganish, QC	T.R. (MI)
353	IN	Int'l Falls, MN	T.R. (MI)
353	LLD	Lanai, HI	A.P. (CA)
366	YMW	Maniwaki, QC	T.R. (MI)
367	FVX	Farmville, VA	R.P. (MO)
368	SX	Cranbrook, BC	T.F. (WY)

368	VIQ	Neillsville, WI	R.P. (MO)
370	VOF	Covington, GA	R.P. (MO)
371	ITU	Great Falls, MT	T.F. (WY)
371	MD	Bemidji, MN	R.P. (MO)
382	YPL	Pickle Lake, ON	R.H. (MI)
382	YPL	Pickle Lake, ON	T.R. (MI)
383	CNP	Chappel, NE	T.F. (WY)
383	PI	Pocatello, ID	A.P. (CA)
385	TKL	Tikal/Flores, GTM	R.P. (MO)
385	WL	Williams Lake, BC	T.F. (WY)
390	JT	Stephenville, NL	R.P. (MO)
391	DDP	San Juan, PR	T.R. (MI)
392	ML	Charlevoix, QC	T.R. (MI)
392	PNA	Pinedale, WY	A.P. (CA)
393	FGP	Ft. Bragg, NC	R.P. (MO)
395	L7	Estevan, SK	R.P. (MO)
395	ULS	Ulysses, KS	A.P. (CA)
397	ZSS	Saskatoon, SK	R.P. (MO)
400	ENS	Ensenada, MEX	A.P. (CA)
400	XW	Flemingsburg, KY	T.R. (MI)
402	CV	Carlsbad, NM	R.P. (MO)
404	MOG	Montague, CA	T.F. (WY)
404	MOG	Montague, CA	R.P. (MO)
404	YSL	St. Leonard, NB	R.P. (MO)
406	YLJ	Meadow Lake, SK	T.F. (WY)
406	YLJ	Meadow Lake, SK	R.P. (MO)
407	CO	Colorado Springs, CO	R.P. (MO)
407	ZHU	Montreal, QC	T.R. (MI)
409	YTA	Pembroke, ON	T.R. (MI)
410	DAO	Fort Huachuca, AZ	R.P. (MO)
410	V7YE8	Rowan Resolute, Gulf	R.P. (MO)
413	YHD	Dryden, ON	T.R. (MI)
417	IY	Charles City, IA	T.R. (MI)
420	V7BE3	Deepwater Platform	R.P. (MO)
434	SLB	Storm Lake, IA	T.R. (MI)

Notes:
- All loggings received at 300 miles/483 km or greater distance are welcome.
- For ITU codes, refer to: https://en.wikipedia.org/wiki/List_of_ITU_letter_codes.
- All logging times are in UTC format, as broadcast by WWV or CHU Canada.
- Please double-check the spellings in your location data.

A.P. (CA) Arthur W. Peterson, Richmond, CA.
Receiver: Sony ICF-2002, Antennas: Radio Plus+ Quantum loop and Burhans active whip in a portable case.

R.H. (MI): Russ Hill, Oak Park, MI.
Receiver: Kenwood R5000, Antenna: Palomar Loop.

R.P. (MO): Richard D. Palmer W7KAM, Foristell, MO.
Receiver: Icom R-75, Antenna(s): Clifton Z1501 active, base up 25 foot, 10 foot whip. Audio Processors: Timewave DSP-599zx and a Ratzlaff 9Hz in series.

Longwave Link of the month:
http://www.longwavetheband.com
This is the website for the musical group Longwave. Why include it here? Well, it is technically not about radio, but this band is aware of our activities and the LWCA has reached out to them in the past. You might find their music interesting, and there are some samples right on the site.

T.F. (WY): Tom Filecco W1WSO/7, Pavillion, WY.
Receiver: Icom R-75, Antenna: 250-foot longwire.

T.R. (MI): Tom Root WB8UUJ, Flushing, MI.
Receiver: Icom IC-R75, Antenna: Clifton Z1501F active antenna with a 10' whip, sitting on my 2nd floor wood balcony; the antenna base is ~12'7" above earth ground.

Adventures in Radio Restoration

By Rich Post KB8TAD kb8tad@gmail.com

Re-converting a Radio for the Summer of '42 (Motorola 50P for Pontiac)

Left: Ad for 1942 Pontiac (From the author's collection) Right: Motorola 50P Chairside back in service. (Courtesy of Paula H.)

After I saw the rust, I almost quit. The back metal cover of this 1942 model car radio made by Motorola for the '42 Pontiac had been hacked open and a large power transformer had been crudely mounted with relatively short wire leads going into the rest of the radio allowing little clearance to work on the radio itself. One of the back cover mounting screws had been rust-welded so tight that my nut driver could not move it. A larger tool finally freed that screw. Using a hammer and large screwdriver, I had managed to remove the back cover only to find more rust inside. It was only because of the rarity of this radio that I continued.

In February 1942, all automobile manufacturing and in April all home radio production were halted by order of the War Production Board.(1) No cars or radios were to be manufactured in the USA for the duration of World War II. Thousands of radios had already been manufactured for installation in the 1942 model cars as after-market items from Motorola and Philco. With no new cars and no new radios, those car radios could be converted for home use and 115 volts AC. Philco received permission to re-manufacture some of their car radios using wood cabinets since wood was not on the restricted list. Motorola also produced some factory-made wood cabinets, typically for chair-side use, but the actual radio conversions were completed by the individual Motorola dealers using whatever power transformers they had on hand or could still obtain from distributors.

An Unusual Motorola

I was familiar with Motorola chairside sets, which used the elongated automobile chassis intended for Chrysler Corporation cars, but this radio was the first one I had ever seen of a radio intended for a General Motors car in a chair-side cabinet. I first found out about the existence of this chairside conversion when contacted by Paula H in an e-mail in February 2016 who had found my webpage detailing my Motorola-for-Chrysler chairside conversion. She was inquiring to identify the car for which her radio had originally been intended. The conversation went as follows:

"We have a Motorola chairside console radio much like the 47D1 pictured on your website. It was purchased about 9 months ago in Asheville, North Carolina. So far we haven't attempted to plug it in to see if it still works, but it does have all the original parts. There is one radio knob missing and two of the pushbuttons need replacing. Ours differs from the pictured one in one respect - the radio is oriented across the speaker end rather than lengthwise in the cabinet. Thanks for

Rusty cover with hole cut for power transformer. (KB8TAD photo)

Do you suppose a good cleaning might be needed? (KB8TAD)

the information in the article. It's interesting to learn more about it. We're still hoping to get it to working condition. The cabinet was in great shape, albeit very dirty."

I Responded With:

"Yours is a variation I have not seen before. The radio is definitely not intended for Chrysler like the Motorola 47D1 which had a vertical face in the cars with two knob controls on the bottom to match Chrysler products. It is also not for a '42 Ford. I rebuilt a Zenith built for Ford in a table model cabinet as detailed in my article in *The Spectrum Monitor*, titled "Radios for the Summer of '42." I'll look to see if I can find a match, perhaps for General Motors as the intended car or some brand other than the big three. Cool find!"

After some inquiries, it was determined that the Motorola radio was intended for the 1942 Pontiac. It was my first indication that Motorola radios intended for General Motors cars had ever been installed in chairside cabinets, thus making this example unusual and likely a rare version. Paula contacted me again a year after the initial inquiry looking for someone to evaluate the possibility of restoring function to the set after understandably not having success with local repair shops. I normally only work on my personal radios but given her enthusiasm for the set and its historical context, agreed to take a look.

Philco vs. Motorola

The Motorola chairside cabinets are all designed so that the car radio could be recessed, allowing a book or magazine to lie flat on the cabinet top. The controls of the Philco chairside sets protrude above the top surface. Philco, in its factory conversions, had installed a power transformer on a board inside its chairside cabinets, thus not needing to cut into the metal of the car radios, a simpler and more elegant approach to conversion. Also, Philco used a standard power transformer probably intended for a radio they were ready to manufacture. Thus the transformers were already in the pipeline or warehouse prior to the radio manufacturing cutoff.

Motorola conversions by individual dealers sometimes left a lot to be desired. The power transformers were variously mounted sometimes in a rather crude manner inside the case, on the back of the case or in this instance, in a square hole crudely cut intro the back cover. The Motorola transformers, being whatever the dealer could get his hands on, did not necessarily match the B+ requirements of the car radios. I had already encountered large dropping resistors in one conversion. The resistors and the initial high voltage turn-on surges took their toll on filter capacitors and audio transformers as well as added to the heat in the radios.

A Rather Crude Conversion

The power transformer in this conversion was large. The conversion had removed the vibrator, its transformer, and all the input filter circuits. A small choke had been mounted across the hole left after removal of the vibrator socket. The rectifier had been replaced with a 5Y3, which takes 10 watts just for its own filament power. Two large power resistors and an electrolytic capacitor were crudely mounted with in-the-air splices but no terminal strip or insulation and with exposed high voltage points on the flexible wires rather close to the metal of the cabinet cover. The conversion was obviously not intended to last for any length of time! Here it was 75 years later. What to do? Because of the relatively short wires, I had to undo the conversion not only to allow access to the chassis and the tubes, but also to test the transformer itself.

I began with an initial cleaning of the very dirty chassis and its parts so I could at least identify the components and any color-coding on the wires. I also needed to extend all the transformer wires to allow better access to the chassis in the future, assuming I could simply re-use the conversion. With

The 'in-the-air' resistors and capacitor. (KB8TAD photo)

Chassis bottom of converted car radio as found. (KB8TAD photo)

the existing conversion, there was barely enough clearance to pull or replace the tubes. And it had the usual, "Who needs fuses?" attitude of radios for the home in the early 1940s. A proper and up-dated conversion would require both a 3-wire grounded power cord and a fuse to be installed assuming the radio could be made to function.

Testing the Transformer

I began by identifying all nine of the transformer leads and marking each with tape. I found some leakage of the primary leads to chassis,which I traced to a couple of leaky bypass capacitors—no surprise there. I disconnected the plate leads to what was now the 5Y3 socket (pins 4 and 6). After this I powered the set to test voltage on those now disconnected leads. With the filament load still connected including that of the 5Y3, the high voltage measured at just under 800 volts center tapped. That was too high in 1942 and part of the reason why those extra resistors with their in-the-air splices were installed. Today's line voltage is even higher than experienced in 1942.

Determining the Design High Voltage

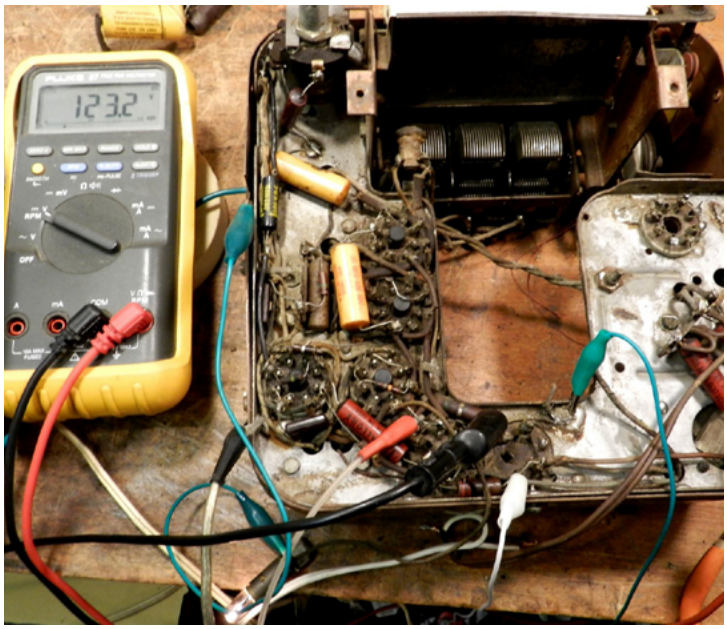
The Motorola 50P1 chassis used a 6U6GT audio output tube, which was designed for a maximum of 200 volts of B+. That tube is not found in my RCA tube manuals, probably because RCA did not manufacture it. However, a quick view in Frank's wonderful compilation of manufacturer's tube data[2] showed the data sheets from Tung-Sol with the note, "The Tung-Sol 6U6GT is a beam-power amplifier designed for service in the output stage of storage-battery-operated receivers. It has high power sensitivity and high power output at comparatively low supply voltages." The maximum plate voltage is shown at 200 and screen grid maximum is 135. The original electrolytic filter capacitor, still on the chassis, was also rated at only 200 volts as also indicated on the schematic. The schematic[3], while somewhat difficult to read, showed the B+ voltage at the plate of the 6U6GT to be 140. The 6SK7 tubes had a plate voltage of 120. Assuming the 6U6 had survived the journey thus far, I was going to have to find a way to reduce the B+ to that for which the radio was designed.

With the transformer and the back cover now fully removed, I finally had access to the tubes and the rest of the innards. The output transformer primary showed continuity, a relief. The 6U6 socket had a 6V6 in its place, a substitute tube designed for higher voltages. It was likely that the technician who did the conversion did the swap knowing that the 6U6 would fail quickly when subjected to the high B+ voltage of the conversion. But what about the rest of the set which was designed for a maximum of 140 volts instead of almost 400?

Re-Thinking the Conversion

The power supply had to be either seriously modified or replaced. With 75-year-old insulation inside a rusty transformer with much too high a voltage, a change had to be made. The obvious answer was to replace that transformer. I would need to plan for about 140 volts of B+ and a couple of amps at 6 volts for the filaments. Since the 5Y3 rectifier was itself a substitute, I could simply use a 6X5 as originally designed according to the schematic or perhaps even one or two silicon rectifiers as a simple but modern substitute. I ordered a Hammond 166N6 which would supply 6 volts at 4 amps for the filaments and a Triad N68-X isolation transformer to supply the AC volts for the rectifier. I estimated that the rectified and filtered B+ with that transformer would be about 140 or 190 volts depending upon how it was installed. Both were ordered from Mouser Electronics. The advantage for new transformers would be a measure of reliability and safety as well as operating the radio at the voltages for which it was designed instead of more than twice that voltage, a no-brainer decision.

I replaced the tubular capacitors in the set, finding all



Initial testing with external power supply. (KB8TAD photo)

Bottom of intermittent 6SA7. Can you spot the problem? (KB-8TAD)

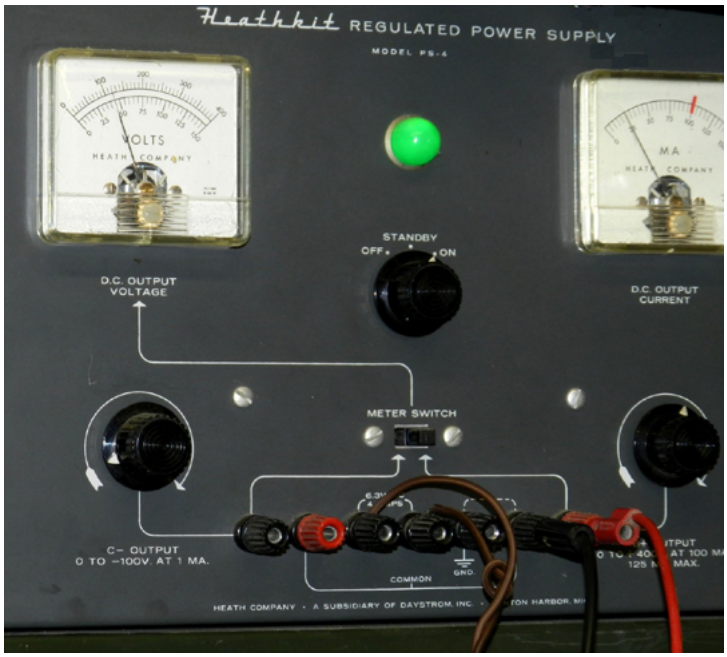
of them leaky to some extent. While waiting for the new transformers to be delivered, I proceeded with testing using my Heathkit PS-4 variable regulated power supply for the filaments and B+. I also attacked the rust inside the rear cover with a steel brush and further cleaning and then applied a coating of primer paint. I also checked all the tubes with my Heathkit tube tester, cleaning the tube pins and sockets in turn. All the tubes tested at good emission.

After connecting my shop speaker to the radio and a wire with a banana plug into the jack for an antenna connection, the radio was powered by the PS-4 substitute power supply, first for just the 6 volts of filament and then for B+, initially using just clip leads. I managed to get a buzz from the speaker and some squeal when the signal injector was connected to the audio line from the volume control but nothing further. Since the power resistor from the B+ input to the 6V6 screen and all the other circuitry had been changed from 1000 ohms to 2200 ohms, a resistor which had then increased itself in value to over 6000 ohms due to excessive heating from the high voltage and current of the modification, I started troubleshooting at that point. With the now proper voltage for B+, the screen grids of the 6SK7 pair read only 38 volts instead of 74 as shown on the schematic. The other resistors in that line were in the ballpark so the first act was changing that power resistor back to the 1000 ohms to conform to the schematic. I mounted a new terminal strip near the existing electrolytic for that resistor and the output transformer and choke B+ leads. Eventually I would also need to connect new individual electrolytics to that strip. I temporarily soldered long color-coded wires to the B+, B-, filament feed and chassis ground. I could shorten those wires later for connecting to a rebuilt power supply. I did not want to simply rely on temporary clip leads because of possible short circuits since I had to move the chassis from side to side to access test points.

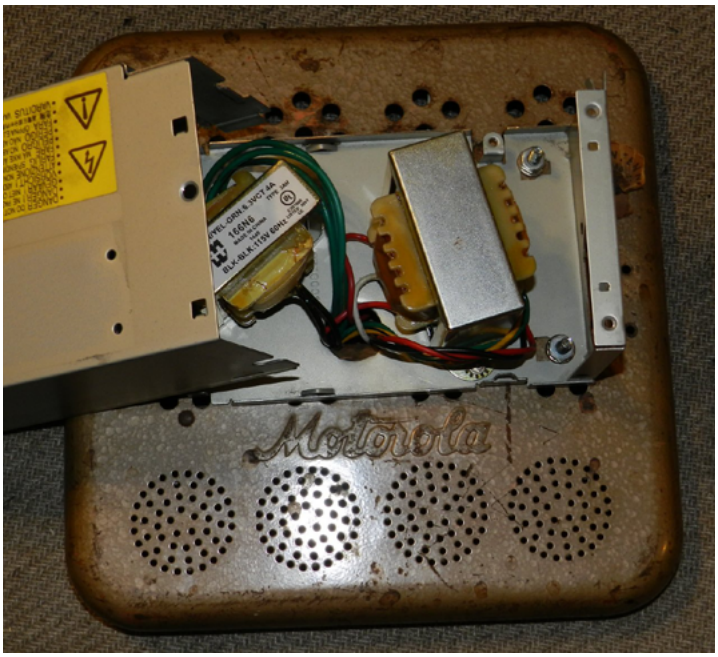
Audio Problem

I connected my signal tracer to the input side of the volume control but found no signal at that point. The squeal of my signal injector at that same point was getting through but was very weak despite the volume control being turned all the way up. I began to check resistances and found the volume control measured only about 500 ohms end-to-end. Something was shorting out. I checked the schematic for components connected to the volume control. Was it the 500-pF cap across the volume control input connected from the detector diode to ground? I cut one end of the cap lead—no change. Was it that small cap internal to the second IF transformer? I cut its ground lead—no change. About the only thing left in the circuit was the volume control itself. I cut the volume control feed from the diode and still measured only the low ohms. It was indeed the volume control itself! Powering the set and feeding the input audio lead that had been cut loose from the control yielded a much louder squeal when the signal injector touched it.

I temporarily clipped in a capacitor as a total bypass of the volume control but still had no radio signal although injecting a signal at the plate pin of the 6SA7 converter produced a healthy squeal that could still be heard even with the injector just held near that plate pin but not touching. OK, that meant the IF stage was working. I had already checked the 6SA7 tube itself but now suspected that the oscillator might not be functioning. That was confirmed by holding my portable frequency counter near the oscillator section of the variable tuning cap. I checked for continuity from both sides of the oscillator coil to the tube pins. That was fine. What else? The compression trimmer caps for the oscillator and RF section are mounted in the air, essentially bolted and soldered onto the main tuning cap. I noticed some rust particles on the trimmer cap leaves. Could that possibly be shorting



Heathkit PS-4 variable regulated power supply temporarily powering the chassis. (KB8TAD photo)



Bottom cover with new transformers bolted inside case from a defunct computer power supply. (KB8TAD photo)

out the oscillator? Cleaning the trimmers did not help and a continuity check confirmed that they were not shorted. While checking the trimmers, I bumped the 6SA7 and the radio started making noise! Was there a bad connection on the 6SA7 socket? No, it turns out that the pins of the 6SA7 tube itself were poorly soldered (see figure). Apparently when testing that tube on the tube tester, the connections were temporarily OK. Re-soldering the tube pins solved the dead oscillator problem.

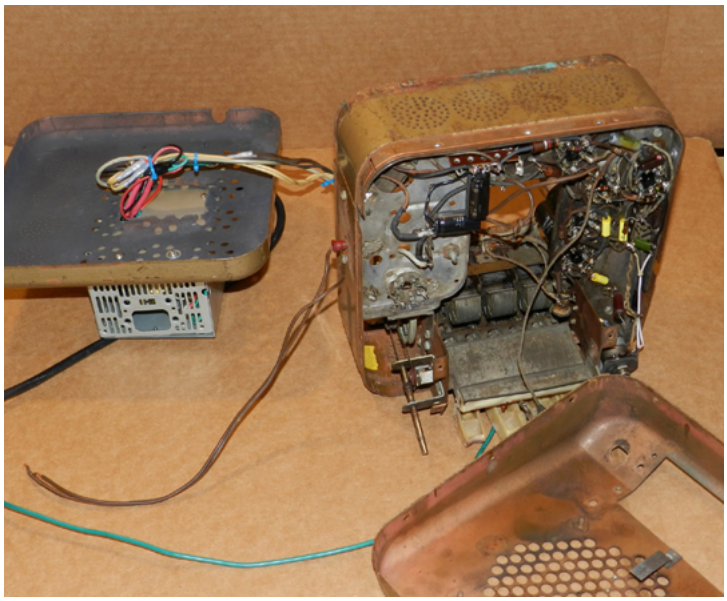
That Volume Control

I next removed the volume control from the chassis for a closer look. The ohms reading from one side to the other was as it should be, about 500,000 ohms. However, the control itself was nearly shorted to the case, the first time I had ever run into that. Cleaning and DeoxIT did not help. I thought that perhaps there might be an internal connection to the tone section but removing the resistor on the tone switch with its three fixed positions showed no continuity. To further test the volume control, I connected it with clip leads to its terminals but kept the control body clear of the chassis. In that hook-up, the control worked as expected. Connecting another clip lead from the control body to chassis cut out the sound. I expected as much due to the injected hum when I simply touched the control to adjust the volume. The control was sealed. Opening it would likely destroy it. Although there was no evidence of it, I was also concerned that the power switch, which was originally purposed for 6 volts, might also develop leakage over time. The set obviously needed a replacement volume control with a power switch designed for full line voltage.

I assumed I could find an electrical match in the "boxe de junque" but not a physical match because of the large diameter threads used for mounting the radio to an automobile dashboard. But since this was an automobile radio adapted to a wooden cabinet, just about any volume control of the right shaft length might work. I had a couple of controls to choose from in the boxe de junque, selecting one with a split serrated knob shaft because I also found a knob that required that type of shaft. The knob was similar in color and design to an original that was missing. I mounted and wired the replacement volume control onto the chassis. It worked well as expected. I had soldered a length of zip cord onto the volume control's power switch, carefully covering the solder joints with heat shrink as well as at the chassis opening through which the wiring was routed for eventual connection to the new power transformers.

Testing the New Transformers

A few days after submitting the order, a package arrived from Mouser. In testing, the AC voltages of the Triad N68-X isolation transformer produced 138 volts at no load with 120 volts input. Reversing the transformer produced 105 volts AC. The forward voltage of 138 is designed to match the input voltage when operated at its full rated load of 50 volt-amperes. However, the B+ requirements of the radio would load it only to about 10 volt-amperes. With capacitor input filtering, the B+ voltage would climb to near peak voltage of 1.414 times its input, about 195 volts in the forward direction. I decided to try the reverse connection since 1.414 times 105 would yield a peak of 148 volts. As described in the February 2017 restoration column, I had used that same reverse connection scheme with another N68-X isolation transformer to avoid over-voltage when powering the Hallicrafters SR-75. In this case, it was a choice since with a light load, either connection would work but a larger



Power transformers on rear cover and a longer umbilical to chassis to allow easier future access (KB8TAD photo)

Ready for some more cosmetics and return to its chairside cabinet. (KB8TAD photo)

resistor would be needed for the forward connection. The reverse connection would allow for a much cooler running transformer in the event of higher line voltages. I had already tested the radio on the variable power supply. It had worked quite well even with B+ as low as 70 volts so the reverse connection option should work out.

Confident that the power supply I planned to install would work fine, I mounted both of the new transformers in a handy metal box liberated from a defunct computer power supply, bolting the assembly onto the back cover of the radio in place of the previous transformer. A three-wire cord was installed along with a one-amp fuse assembly. The white neutral wire was directly connected to the primary of the two transformers. The green safety ground and the electrostatic shield wire from the isolation transformer were bolted to the case. The wire from the new one-amp fuse was routed to the power switch on the replaced volume control. The other wire from the power switch was routed back to the transformer primaries. I installed a new power diode and two 33-uF electrolytics onto new terminal strips on the chassis itself.

The Motorola choke installed for the original conversion was re-used between those new electrolytics for a Pi filter.

I tested for adequacy of filtering by listening for any residual hum with the antenna connection shorted and the volume control at maximum. There was no hum and the circuit worked as expected. The B+ voltage was 135 volts under load, more than adequate for the radio with enough margin for those times when line voltage might climb higher than 120. However, I noticed what is called "tunable hum" on stronger stations. I had thought that the shield between the windings of the isolation transformer might prevent that, but it was also possible that the safe three-wire power cord might be contributing to the problem. I added a 0.047 uF capacitor between the transformer connection to the rectifier and chassis ground as an RF bypass, which, as expected, cleared up the problem.

I tweaked the IF alignment and the RF for greatest overall sensitivity, patched the small tears in the cone of the permanent magnet speaker that had been installed in 1942 as a replacement for the electro-dynamic speaker that required a 6-volt battery for its field coil. I had given thought to simply replacing that speaker since it was also based on whatever the Motorola technician had on hand but the cone moved freely, the patching was not in the outer flexible area, and the sound was fine.

After some more cleaning of the set and the chrome bezel, it was time to button up the Motorola and get it ready for its return trip to Paula H to rejoin its cabinet and perhaps spend some time in a museum for its unique place in the history of the "Summer of '42."

Notes:

(1) See "Radios for the Summer of '42", October 2014 issue of *The Spectrum Monitor*

(2) Frank Philipse's compilation of manufacturer's tube data **https://frank.pocnet.net/sheets66.html**

(3) Motorola 50P schematic from Rider Volume 15 courtesy of Nostalgiaair **http://www.nostalgiaair.org/Resources/618/M0006618.htm**

TSM

Antenna Connections

By Dan Farber AC0LW **ac0lw@att.net**

Getting High: Antenna Effects and Oddities at UHF and Up

Welcome back, my friends. A summer and early fall of odd and spotty propagation continues. I made my very first QSO with Iran, on CW, just the other day. Woo-hoo! It goes to show that if you are vigilant, or desperate, or just plain lucky, you can still make the QSOs you want to, lack of sunspots or no…

This month, let's examine an area that we haven't explored much in this column—what antennas are like at UHF and above, or if you prefer, 300 MHz and above. The laws of physics, and the modes of propagation available, make this "closer to daylight" region a very different place from the usual world I present here, namely antennas for the ham and SW bands between 1.8 and 29.7 MHz. Ah, my long-standing HF CW prejudice is showing…but it's my mission, as your antenna columnist, to present as broad, complete, and, er, unbiased overview of antenna principles as I can. With that in mind, let's take a look at the world of antennas at these extra-high frequencies.

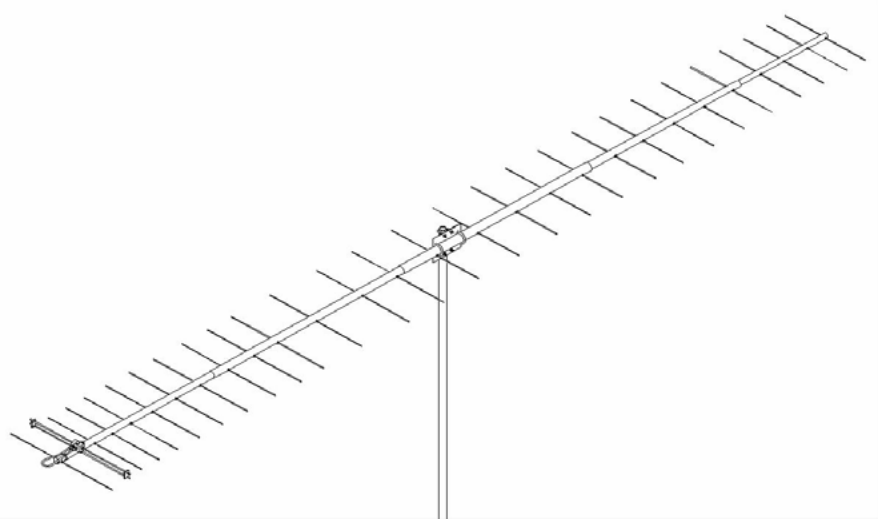
Humble dish antenna in my front yard brings me hundreds of TV channels via satellite. (Author's photo)

Losses and Gains

The first thing to wrap your head around, when it comes to the vast region above 300 MHz, is the realization that the ionosphere is no longer your friend! The "skip" propagation, signals reflected from the ionosphere to places as far as halfway around the globe, that we are so accustomed to at HF and low VHF, is almost totally absent here. Instead, a bizarre group of effects, atmospheric and otherwise, give us forms of propagation unknown to HF operators; microwave operators revel in something called "rain scatter" propagation, which works because your average raindrop is large in terms of microwave wavelength, and thus readily bounces microwaves from here to there; lower down, in UHF and even VHF, temperature inversions in the lower atmosphere create "ducts" by way of which signals can travel comparatively great distances, which is a process we call tropospheric ducting; and sometimes, the phenomenon called "sporadic-E" propagation will occur even this high in frequency, giving VHF and UHF operators some nice DX.

The second great point to grasp about antennas for this frequency range is that, at least in terms of size, weight, ease of working with, and so forth, the math really comes to your rescue. At 80 meters, a half-wave is 135 feet long; at 432 MHz it's a hair over a foot long. This means that even a many-element Yagi for 432 MHz has elements that are all less than sixteen inches long! The small size and weight of such short element means we can build, and erect, and rotate, a Yagi of 20 or more elements quite easily, enjoying the massive gain and directivity gained thereby, even at the highest HF frequency range (10 meters), the elements, and their spacing, and the necessary boom length, would be sixteen times as large.

This brings up a crucial point about wavelengths at this frequency range. Let us recall that Feet=468/MHz is our default formula for determining a half-wavelength. This works well, up to about 30 MHz or so. Above this frequency, the diameter of the conductors used to build an antenna begins to be significant in terms of wavelength, and a "k" factor is added to the formula. By the time we reach UHF, conductor size has become significant in terms of wavelength. Con-



DX Engineering's 28 element Yagi for 432 MHz, weighing 8 lbs. and sporting 19 db gain. A comparable Yagi for HF would be physically enormous and unsupportable. (Image courtesy DX Engineering)

sider two vertical antennas, one a full-sized quarter-wave vertical for 20 meters, the other a full-sized 432 MHz vertical; both are made from 1-inch metal tubing. The 20-meter vertical is roughly 16 feet long, so the ratio between length and diameter is about 16 x 12, or 192:1; this is a vanishingly small ratio (the antenna diameter is insignificant compared to its length). On the other hand, the full-sized quarter wave vertical at 432 MHz is about six inches long, a ratio of only 6:1. In other words—the vertical's diameter is significant in terms of wavelength.

By the time we reach, say, 4680 MHz, a half-wave is about 1.2 inches, about the diameter of the 1-inch conductor. The element has become very large in diameter, in terms of wavelength. This has most definitely become a significant factor! It takes a certain finite amount of time for the signal to actually cross the conductor, of course. In this extreme example, the transit time to cross the half-wave conductor will introduce all sorts of phasing issues—one reason why antenna designs begin to change radically at these super high frequencies.

Another crucial concept to grasp about antennas, and radio emissions, at these very high frequencies, is that the super-short wavelength is potentially quite injurious or even lethal to living tissue—such as the station operator, for example. Yes, that shiny small appliance in your kitchen is called a "microwave." Radio waves at extremely high frequency cause the water molecules in food to vibrate rapidly, producing a rapid heating effect. It doesn't take a lot of imagination to see a scenario where, during testing, you somehow get in front of a high-gain antenna while transmitting at these super-high frequencies—and manage to cook your insides! Here is another huge difference from our experience at lower frequencies; we may get RF burns by TOUCHING a conductor that is radiating RF energy at, say, 40 meters; but we will NOT get cooked from the inside out by getting in front of a 40 meter antenna. The wavelength is simply way too long to produce such an effect. (If humans were 65 feet tall, it might be a different story, ha ha.) Interestingly, the first huge peak in the danger of "irradiation" occurs around 50 MHz, so be aware of these concepts when working with six meter antennas.

One issue that is difficult to overcome or work around is that, at these very high frequencies, any kind of coaxial cable, no matter how fancy or expensive, becomes very lossy. You can't outrun the laws of physics! Open-wire feed, or as-short-as-possible runs of very high quality coaxial cable, are your main weapons here. This is another factor that makes high antenna gain crucial, for we must not only overcome path losses, but also the losses incurred by the feedline we use.

The final main concept to understand is that, at these very high frequencies, something called "path losses" begins to be a crucial factor. Since the wavelength becomes shorter as we go higher in frequency, it becomes ever easier for ordinary objects to block, deflect, or absorb radio waves. Here's an easy way to demonstrate the difference. With a pocket radio tuned to a local AM station in one hand and your cell phone in the other, walk around inside the place where you work and notice the difference. The long wavelength AM signal, at high power, effortlessly reaches your portable radio almost regardless; meanwhile, numerous spots can be found indoors where the cell phone "isn't getting s signal," because the much shorter wavelength, at less power, is easily blocked, absorbed, or deflected by any number of aspects of building construction. All of this makes high gain a crucial aspect for ham antennas at these extra high frequencies, to overcome path losses while transmitting, and to pull weak struggling signals in while receiving.

If I've made this "path loss" issue seem overwhelming, keep in mind that hams routinely make QSOs by bouncing signals off the Moon, which reflects them back to another ham's receive antenna—a trip of over half a million miles. To equal this a signal at HF would have to bounce around the Earth about 200 times—an unlikely scenario, with lots of

An example of a bicone antenna. (Image courtesy free-illustration.com)

time lag and, ahem, path losses.

Shapes of Things

What all of this means in a practical sense is that the antenna designs we are accustomed to using below 30 MHz are not suited to this "near daylight" region of super-high frequencies. But the very short wavelength does allow for some nifty possibilities that we can't use at lower frequencies.

ne of the most familiar, and effective, is what is commonly called a dish antenna. This is a nifty adaptation of a concept from optics for astronomy; it was figured out some centuries past that, if a perfectly parabolic mirror is placed the correct distance from an eyepiece, that the mirror itself greatly magnifies the image size, and without the chromatic aberration and other oddities produced by ordinary lenses. Since light is just another form of electromagnetic radiation, the same principle works quite well at radio frequencies, except that "visible" is no longer part of the equation. A parabolic dish antenna, with a "horn antenna" replacing the eyepiece of the telescope, is capable of immense gain and directivity, and with benefits; for example, if we have a dish designed for 432 MHz, we can also operate it at, say, 1296 MHz, and pick up an additional 6 dB of gain! Here again, the tradeoff in size versus frequency is immense; a parabolic dish antenna for HF frequencies would be the size of a football field and weigh more than New Hampshire.

Other designs include things like the slot antenna, which is a dipole-sized aperture cut into the skin of an aircraft, with RF power fed to the middle of the "hole." This seems counterintuitive, but it actually works quite well! This discovery was a godsend for aircraft design, since conventional antennas, sticking out into the slipstream of air rushing over and around the aircraft, are subject to high mechanical stresses and so forth. Slot antennas have also been used on spacecraft such as Earth orbit satellites; in fact the very first American satellite in orbit, Explorer 1, featured slot antennas.

Another nifty idea that works well at these ultra high frequencies, since the wavelength is so short, is something called a bicone antenna. This is a modified dipole that, instead of linear conductors, uses cones of metal as the dipole elements. The points of the cones face each other at the dipole's center feed point. This was famously used in the nose of the one-man Mercury spacecraft in the early 1960s, for UHF communication with the ground. When the flight was ending and the front of the nose popped off to release the parachutes, it took the bicone with it! To replace it for voice communication purposes, an ordinary length of wire spooled out along with the parachutes, to serve as an end-fed antenna for communication with the ground at around 15 MHz during the few minutes of parachute-slowed descent. Here again, the math makes a bicone at super high frequencies a manageable size, while a bicone at any HF frequency would be impossibly enormous. Interestingly, the concept of making the elements conical instead of linear hearkens back to the very early days of radio, when "cage" and "cone" designs for dipoles, instead of single wires, was viewed as an orthodox way of broad-banding the antenna.

There You Have It

The world of much-shorter wavelengths is a fascinating place, where the math makes small antennas possible, where the physics makes path losses a major issue to overcome, where one can get nuked by one's own antennas if not careful, where DX is much easier to attain in outer space than on the Earth's surface, where sunspots have very little to do with what's going on. The major issues to understand, and conquer, are those of path losses. Antennas mounted up high, with lots of gain and directivity, are the key solution here. I hope I've given you some things to chew over and ponder. Antennas and feedlines at these frequencies MUST be as loss-free, and as gain-capable, as possible, to overcome path losses and the near-complete absence of any kind of "propagation." One liability we have down at HF is a tendency to be a bit more lax about these issues since they are so much more minor, or even nonexistent. We can't afford this complacency above 300 MHz. Everything MUST be tightened up and shipshape, with losses minimized and gain maximized. That's all for this month. Join me here in November for further exploration of the Big Antenna Jungle. Be careful out there, and happy operating! TSM

Radio Horizons

Product Announcements of Interest to *TSM* Readers

Two New Products Promote DRM Reception: Titus SDR and Gospell GR-227

Titus SDR, PantronX, Jasmin-Infotech, TWR, and the Fraunhofer Institute for Integrated Circuits IIS have teamed up to make Titus II, a complete media solution utilizing worldwide engineering in the USA, Germany, India, and Asia.

Titus II, the world's first consumer Software Defined Radio (SDR) digital receiver, is a highly innovative breakthrough platform supporting for the first time true multi-standard radio reception with DRM (AM & VHF bands), DAB(+) and core data applications.

These features are based on a custom Android tablet platform, which features multi-point touch, Wi-Fi/Bluetooth and stereo sound.

Titus II units will be soon available as a stand-alone product from Titus SDR, Inc., and from selected OEMs. As a module, it serves as the full-featured basis for third-party product development.

Titus II unit is the team product of Titus SDR addressing the global market, of PantronX providing the platform and RF expertise, and of Fraunhofer IIS enabling the digital and analog radio features.

Titus II receiver features include:

- DRM in the AM bands (MW, SW, LW) and VHF bands (FM-band, VHF band-I, VHF band-III) with latest xHE-AAC audio codec.

- DAB Classic/DAB+ (VHF band-III).

- FM stereo with RDS (Service Signaling).

- AM with AMSS (AM Signaling Service).

- Integrated service list management and service selection.

- DRM/DAB Data Apps: Text Messages, Dynamic Label/DL+, Journaline, (Categorized) Slideshow, EPG, Transparent File Transmission (e.g., for educational services), etc.
- Remote Radio Hotspot: Built-in Wi-Fi hotspot feature, which allows any mobile device with an HTML5 web browser to connect to the Titus II via Wi-Fi, select radio services, listening to HTML5 audio streaming and accessing all the DRM/DAB data apps.

Titus SDR receiver is based on an Android tablet platform featuring multi-point touch, Wi-Fi/Bluetooth and stereo sound. (Courtesy: Titus SDR, Inc.)

- Recording feature and Archiving interface to select existing recordings for playback.

About Titus SDR, Inc:

Titus SDR, Inc., a division of PantronX, Inc., markets globally digital media platforms which maximizes synergy of core engineering performed in the USA with worldwide partners and manufacturing in Asia. For more information visit the Titus SDR website at www.titusradio.com About Fraunhofer Institute for Integrated Circuits IIS:

To learn more about Titus SDR go here: ***https://titusradio.com***

[Text and graphic courtesy: Titus SDR, Inc.]

Gospell GR-227 DAB/DRM/AM/FM USB Car Adaptor

Chengdu, China, September 04, 2017 -A new adaptor specifically designed for in-car use that simplifies digital radio on the road will be introduced at IBC by Gospell.

GR-227 is a small, low-cost adaptor that acts as an after-market add-on to car stereos receiving high-quality digital broadcast programs and data application, and serving it to the car audio system over a USB cable. Based on software defined radio technology, GR-227 is compatible with both modes of the DRM standard, with its latest extended audio codec xHE-AAC. It also supports DAB and DAB+.

GR-227 literally works with any kind of car stereos with a USB port. Our patent pending technology allows the adaptor to behave like a thumb drive when plug into a USB port and makes it compatible with most of the music players not only in-car but also for home use.

To make the most of GR-227, the Gospell Smart Tune App for Android has been included to add more features. When partnered with an Android powered car stereo, the app not only allows for playback of the broadcast audio program but data application which brings much fun to car entertainment.

By connecting the supplied triple band active antenna, which can be attached to the windscreen through the SMA antenna connector, the reception in DRM, FM and DAB bands can be significantly improved, offering maximum flexibility between different broadcasting standards.

Installing the plug-and-play GR-227 adaptor to your car is easy and doesn't require changing your car stereo. It is one of the easiest ways to upgrade your car radio to digital without replacing anything.

The Gospell's after-market car adaptor range starts with USB model but more will follow to support more types of car stereos.

Haochun Liu, DRM director, Gospell, said: "By leveraging SDR, we can now combine multiple broadcasting standards together to offer flexibility and cost advantages, coupled with easy installation without the necessity of buying a new car stereo as in traditional solutions."

For additional information, please visit **www.goscas.com** or contact Gospell sales at linx@gospell.com.

About Gospell

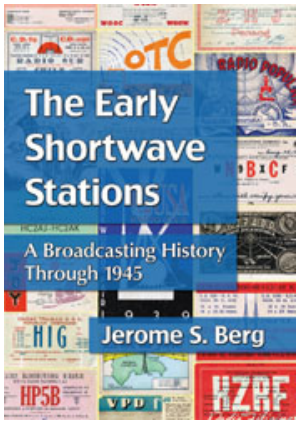
Founded in 1993, Gospell Digital Technology Co Ltd (GOSPELL) is a private hi-tech enterprise with R&D, manufacturing, business consultancy and planning, trade, delivery, project implementation and after sales service, acting as a complete DTV and triple-play solution provider for Digital TV/OTT related projects. Headquartered in GOSPELL

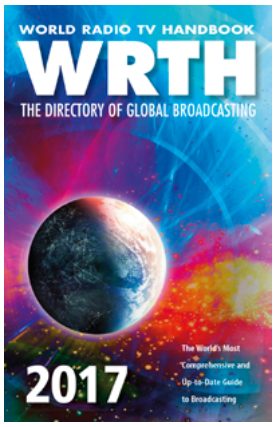
Gospell GR-227 DAB/DAB+/DRM/AM/FM USB car adaptor. (Courtesy: Gospell Digital Technology Co., LTD)

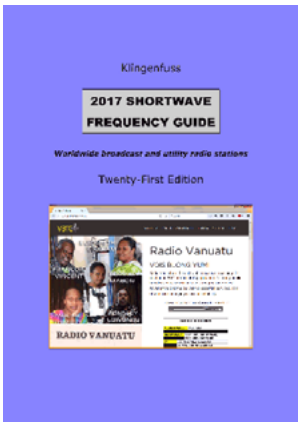
INDUSTRIAL PARK at Chenzhou, Hunan Province for CPE related production manufacturing, GOSPELL also has its office in Shenzhen for business/marketing management and administration, in Chengdu for R&D and headend/transmitter system production/debugging and Customer Service Center, and in 12 cities in China as well as international offices in India, Africa and Mexico. [Text and graphic courtesy of Gospell]

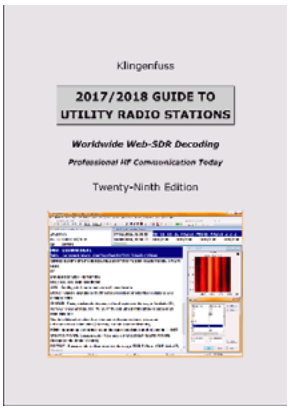
T S M Bookshelf

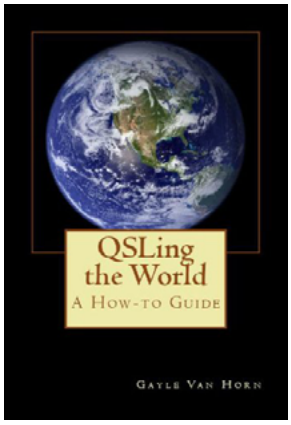
Books of Interest to *TSM* Readers to Enhance your Radio Listening

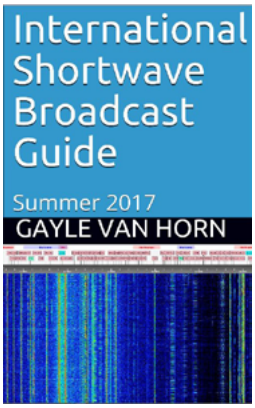


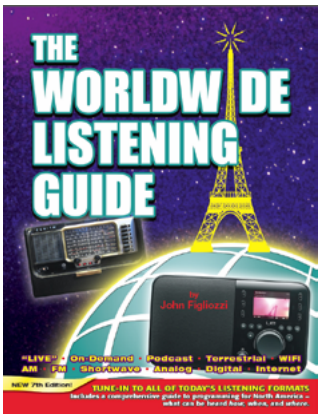


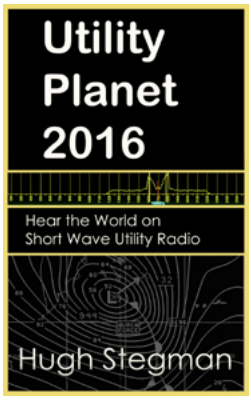


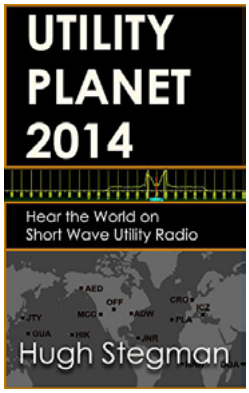


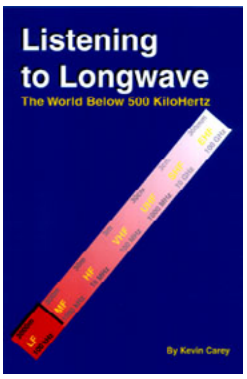


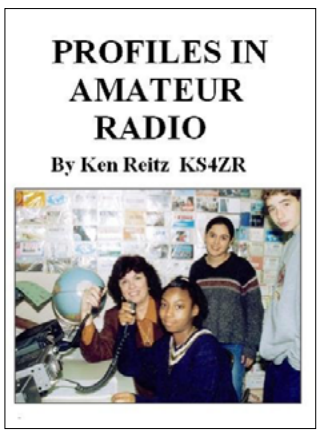


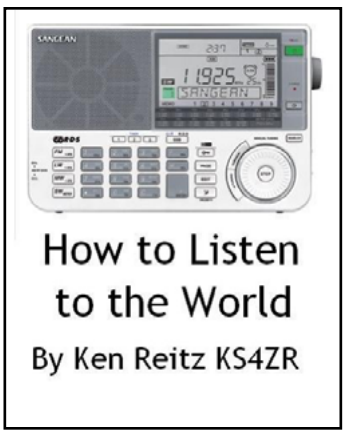


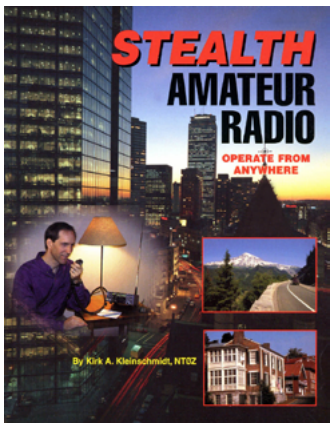












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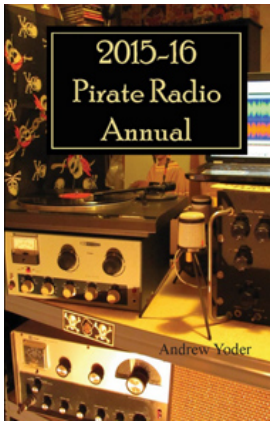

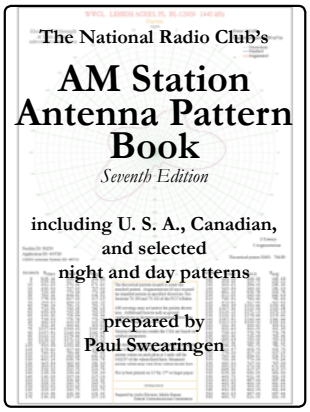

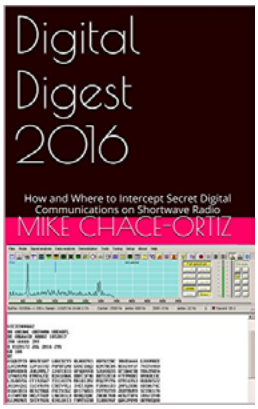

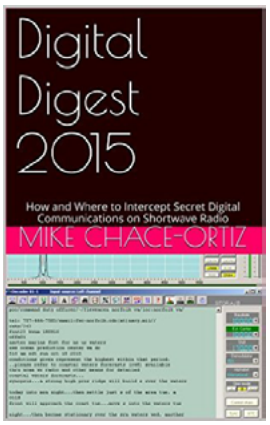

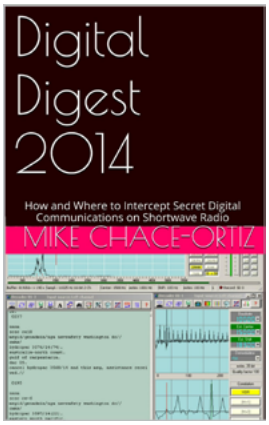

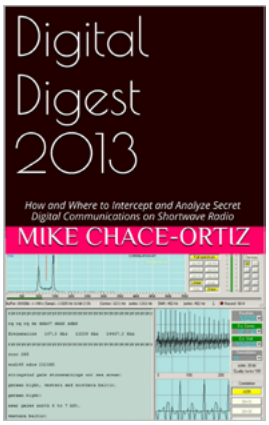

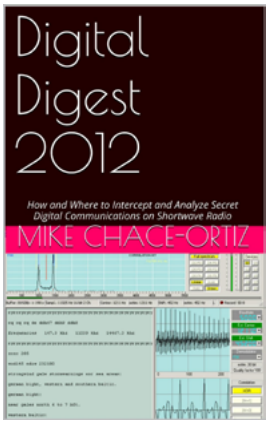

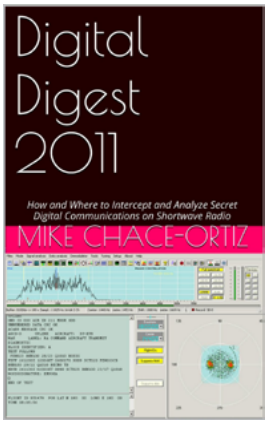

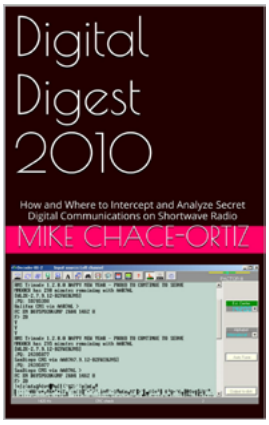

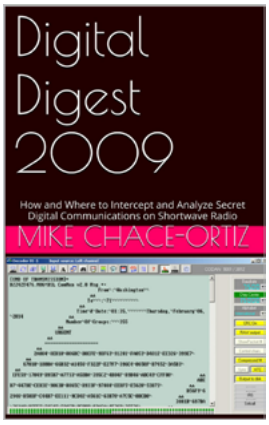

About Us

The Spectrum Monitor Writers' Group

The Spectrum Monitor is edited and published by Ken Reitz KS4ZR, former managing editor, features editor, columnist and feature writer for *Monitoring Times*. Former feature writer and columnist for *Satellite Times*, *Satellite Entertainment Guide*, *Satellite Orbit*, *Dish Entertainment Guide, Direct Guide;* contributing editor on personal electronics for *Consumers Digest*. Author of the Kindle e-books "How to Listen to the World" and "Profiles in Amateur Radio." E-mail: editor@thespectrummonitor.com

The Spectrum Monitor Writers' Group consists of former columnists, editors and writers for *Monitoring Times* and *Popular Communications* magazines. Below, in alphabetical order, are the columnists, their amateur radio call signs, the name of their column in *The Spectrum Monitor,* a brief bio and their websites and contact information.

Keith Baker KB1SF/VA3KSF, "Amateur Radio Satellites"

Past president and currently treasurer of the Radio Amateur Satellite Corporation (AMSAT). Freelance writer and photographer on amateur space telecommunications since 1993. Columnist and feature writer for *Monitoring Times*, *The Canadian Amateur* and the *AMSAT Journal*. kb1sf@hotmail.com **www.kb1sf.com**

Kevin O'Hern Carey WB2QMY, "The Longwave Zone"

Reporting on radio's lower extremes, where wavelengths can be measured in miles, and extending to the start of the AM broadcast band. Since 1991, editor of "Below 500 kHz" column for *Monitoring Times*. Author of "Listening to Longwave" (http://www.universal-radio.com/catalog/books/0024u.html). This link also includes information for ordering his CD, "VLF RADIO!," a narrated tour of the longwave band from 0 to 530 kHz, with actual recordings of longwave stations. E-mail: wb2qmy@arrl.net

Mike Chace-Ortiz AB1TZ/G6DHU "Digital HF: Intercept and Analyze"

Author of the *Monitoring Times* "Digital Digest" column since 1997, which follows the habits o f embassies, aid organizations, intelligence and military HF users, the digital data systems they use, and how to decode, breakdown and identify their traffic. **www.chace-ortiz.org/umc**

Dan Farber AC0LW, "Antenna Connections"

Monitoring Times antenna columnist 2009-2013. Building ham and SWL antennas for over 40 years. E-mail: ac0lw@att.net.

Richard Fisher KI6SN

A veteran journalist with a 35-year career in daily newspapers, and an amateur radio operator living in Riverside, California, Richard has been an editor and writer for *Popular Communications, WorldRadio Online*, and *CQ Amateur Radio* magazines. Among his previous responsibilities have been the monthly "Emergency Communications," "Trail-Friendly Radio" and "Easy Does It" columns for *CQ*, and has written for several QRP publications, including *QRP Quarterly* and *QRPp* magazine. An avid homebrewer, he is a co-founder of The Adventure Radio Society. Write to him at ki6sn@aol.com.

Tomas Hood NW7US, "Radio Propagation"

An Extra Class operator since 1990, Tomas enjoys CW and digital modes on all HF bands. He is a contributing editor to *CQ Amateur Radio*, the former *Popular Communications* and *CQ VHF* magazines, an ARRL publication on QRP communications, and *Monitoring Times*. He runs the Space Weather and RadioPropagation Center at **http://SunSpotWatch.com**. Web site: **http://nw7us.us** Twitter: **https://twitter.com/NW7US**.

Kirk Kleinschmidt NT0Z, "Amateur Radio Insight"

Amateur radio operator since 1977 at age 15. Author of "Stealth Amateur Radio." Former editor, "ARRL Handbook," former *QST* magazine assistant managing editor, columnist and feature writer for several radio-related magazines, technical editor for "Ham Radio for Dummies," wrote "On the Ham Bands" column and numerous feature articles for *Monitoring Times* since 2009. Web site: **www.stealthamateur.com**. E-mail: nt0z@stealthamateur.com

Joe Lynch N6CL, "VHF and Above"

Currently Director of Religious Education for the Army at West Point, New York. He holds a Doctor of Ministry, Master of Divinity, an MBA and is an adjunct instructor for four colleges and universities and a retired United Methodist minister. He served as the editor of *CQ VHF* magazine for 12 years and the VHF editor for *CQ* magazine for 22 years.

Stan Nelson KB5VL, "Amateur Radio Astronomy"

Amateur radio operator since 1960. Retired after 40-plus years involved in mobile communications/electronics/computers/automation. Active in radio astronomy for over twenty years, specializing in meteor monitoring. He wrote the "Amateur Radio Astronomy" column for *Monitoring Times* since 2010. A member of the Society of Amateur Radio Astronomers (SARA). **www.RoswellMeteor.com**. E-mail: Stan.Nelson@RoswellMeteor.com

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Rich Post KB8TAD, "Adventures in Radio Restoration"

As a teenager Rich Post repaired radios and TV sets. He passed the exam for a First Class FCC license when he was told he needed one to repair his CB. He later received his amateur radio license as KB8TAD. Rich now holds a University Emeritus title having retired from Ohio University as Assistant Dean and Director of the Instructional Media and Technology Services. One of his hobbies is collecting and restoring "boat anchors." He maintains the web site Boat Anchor Pix at **https://people.ohio.edu/postr/bapix**

Tony Roper, "Military Air and Naval Reception"

A Civil Air Traffic Controller in the UK as well as previously being in ATC in the Royal Air Force, totaling 25 years experience. He has worked as a part-time aviation photographer/writer and has been published worldwide. He also provides photos and research for IHS Jane's, principally Jane's Fighting Ships. His photography website is **www.rogdabbit.co.u**k and his blog is **http://planesandstuff.wordpress.com**

Cory GB Sickles WA3UVV, "Digitally Speaking"

First licensed as a Novice over 40 years ago, he enjoys exploring various facets of amateur radio, from the latest state of the art technologies, to the elegant simplicity found with a one-tube transmitter and straight key. He has an extensive background with computers and likes to restore 8, 12 and 16-bit classics from the 1970s. He owns a television production company and creates series programming, as well as marketing and training videos. wa3uvv@gmail.com.

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