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Monitoring Ships on Canada's Welland Canal

Plus:

The Challenge of OTA TV DX

An Outboard BFO for SW Radios

TSM Reviews: SDRplay SW Radio



From Mexico to Canada, North American Over-the-Air TV has been the passion of TV DXers since the medium began. (Left) DXers often see "Info 7" news from Monterrey via E-skip during the morning and early afternoon on analog XHTAU-TV, channel 2 in Tampico, Tamaulipas, Mexico. Fairly short E-skip for me at 745 miles. (Right) CIII-TV, channel 2, Bancroft, Ontario via E-skip. (Courtesy of the author)

The Challenge of Over-the-Air TV DX

In a digital age, with the FCC's spectrum auction and TV band re-packing looming, is OTA-TV DX still possible?

By Danny Oglethorpe

Much of my spare time during the spring and summer is spent watching for over-the-air (OTA) television stations from faraway places. My TV set is not connected to cable TV, satellite TV or the Internet. Instead, my TV is connected to an outdoor antenna, and I have seen TV stations from Ontario, New Jersey, South Dakota, Nevada, Mexico, Honduras and other distant locations this past year at my home in northern Louisiana. My hobby is TV DXing, and my goals are to identify, record, photograph and keep a log of DX (distant) analog and digital TV stations received at my QTH.

Receiving video from distant locations has fascinated me since my childhood in the 1960s. As much as I enjoy AM, FM and shortwave radio DXing, receiving video at a very long distance is a truly unique experience. And, today, you can even share your screen shots on Facebook and upload your video to YouTube.

If you think the TV DXing hobby passed away after the 2009 digital TV transition, you might be surprised at the interesting DX possibilities in the digital era. TV DXing remains an exciting hobby for DXers who live in regions of the United States and Canada where a number of TV channels remain unused by local TV stations and TV signals are frequently enhanced during the spring-summer TV DX season. On the other hand, TV DXing is difficult in the largest TV markets since there are few open channels where OTA DX can be received. This is an introduction to the fundamen-

tal of TV DXing and an overview of the hobby as it stands in 2015.

Spectrum Auctions and Channel Repacking

DXers are concerned about the impact channel repacking will have on TV DXing, so let us examine repacking at this point. The U.S. federal government plans to auction off another piece of TV spectrum, which will result in repacking TV stations onto fewer channels. While definite plans and a timeline are not yet certain, it appears that the repacking auction will take place in the first quarter of 2016.

Here's what's transpired so far. Channels 52-69 were removed from TV spectrum during the DTV conversion of 2009, yet TV DXers in many regions between the Atlantic coast and the Rocky Mountains continue to receive digital and analog TV stations at very long distances.

The Federal Communications Commission (FCC) has several proposed options from which to choose before the next auction, after which, there will be major changes in TV broadcasting. First, some stations will no longer have their own transmitter and radio frequency channel. Henceforth, those stations will become sub-channels on a transmitter shared by multiple stations. Los Angeles TV stations KCET and KLCS, for example, have already reached an agreement to share a transmitter. In addition, it is possible that the U.S. could switch to a new digital TV system which would not be



(Left) This is the manual tuning screen of a Zenith DTT-901. The “19” in the yellow box is the RF channel, while the “DTV 20-1” is the virtual channel. “KTXHDT” is the station ID. Note the signal strength bar across the bottom. (Center) This channel list is from a Zenith DTT-901. Those numbers are virtual channels. For example, XHMTA’s RF channel is actually 12. (Right) At a distance of 1,157 miles, digital WPVI-DT, channel 6 (virtual channel 6) in Philadelphia is a regular summertime catch for me. (Courtesy of the author)

compatible with current DTV tuners and converters.

Of course, nobody can predict the final outcome. The future of TV DXing will hinge on the number of channels the FCC retains for TV use. Since TV DXing is already difficult in the largest TV markets, DXers in densely populated locations will probably have a difficult time receiving DX or not be able to receive DX at all.

It is also possible that DXers in rural areas, smaller TV markets and sparsely populated regions will have open channels for DX reception. Another possibility is that the new digital system will be more efficient than the current one, which might actually make DTV DXing easier. This remains to be seen. More about the auction and repacking can be found in TV industry trade journals, including “**TV Technology,**” February 20, 2015.

The Digital TV Era

As part of the 2009 analog-to-digital TV conversion, every OTA, full power, analog TV station in the United States was replaced by a digital TV (DTV) station. Furthermore, most Canadian stations transitioned to DTV in 2011. Thus, the majority of current TV DX targets in the U.S. and Canada are DTV stations.

One major difference between DTV and analog TV DX is that digital signals must reach a certain quality threshold in order to produce video and audio. As a result, DTV will never display the weak, snowy, interference-ridden pictures that DXers often receive with analog DX. The production of video, audio and station data on a DTV tuner is known as “decoding.”

Opportunities for TV DXers

In spite of the differences between digital and analog TV technology, DTV signals can travel hundreds of miles via the same propagation modes that affect analog TV. In addition, antennas and amplifiers that pull in analog TV signals

also work well for DTV.

The most-impressive aspect of DTV, however, is the mind-boggling quick-identification feature of digital stations. The same Program and System Information Protocol (PSIP) that displays the identification and program data of your local stations on the screen will do the same for distant signals. In fact, it is often possible for PSIP identification (ID) data to be obtained with very brief video or no video decode at all.

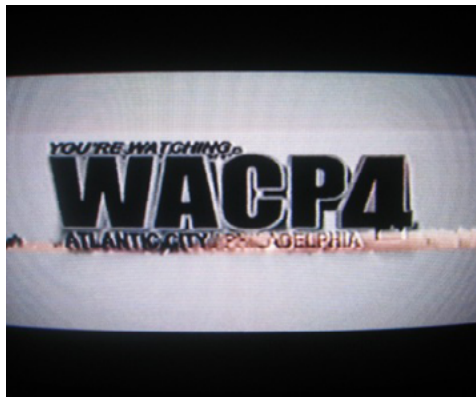
Because the analog and digital TV formats are vastly different TV transmission technologies, they are considered different types of TV by DXers. Therefore, the old, defunct analog WPVI-TV, channel 6, is counted as one station in my log, while the modern digital WPVI-DT, channel 6, is counted as a separate station.

Consequently, DTV gives long-time TV DXers the opportunity to log new stations. A veteran TV DXer in Kentucky, who has logged over 1,100 analog TV stations, began DTV DXing in 2008. Using a digital converter connected to an analog TV, he logged more than 700 digital TV stations in five years! Although that is an extraordinary achievement, it is evidence that DXers can be successful with DTV DXing. Furthermore, a number of high-powered analog TV DX targets remain on the air in North America. An updated list of the remaining DX-possible Canadian analog stations, along with network information, is on the Worldwide TV-FM DX Association (WTFDA) site (<http://www.wtfda.org/canlbtv.html>). In addition, logos and ID tips for analog TV stations in Mexico, Central America, and the Caribbean are on my tips site (www.tvdxtips.com).

Basics of the TV DX Hobby

As FM radio is spaced between TV channels 6 and 7, on 88-108MHz, FM and TV share many of the same characteristics and as a natural result; many TV DXers are also FM DXers.

Although TV DX can appear any time of the day and any day of the year, spring through mid-summer is the best



Left: A common log for me, KSNV-DT, channel 2 (virtual channel 3) in Las Vegas is 1,238 miles from my QTH. Center: Digital WACP-DT, channel 4 (virtual channel 4), Atlantic City, transmits from New Jersey. The bar through the picture is digital pixelation, probably caused by the unstable E-skip signal. Right: This is the morning program logo of analog HRTG-TV, channel 5, in Honduras. Distance is 1,330 miles via E-skip. (Courtesy of the author)

time of year for TV DX and autumn to January is the second best. While AM radio DX is available every night after dark and shortwave DX is nearly always available, TV and FM DX cannot be received at a regular time on any given day. Certain atmospheric or ionospheric activity must take place first.

Generally, a station that is not receivable on a full-time basis is considered DX. Even so, most TV DXers count their local stations as logged stations. Most of all, DXers should be confident that their logs have been positively identified.

Propagation

Propagation causes a TV signal to travel long distances from the station's local market. TV DX travels by several distinct modes of propagation, and the most-common modes are discussed here.

Regardless of mode, TV DX generally comes from one direction (sporadic E-skip and tropospheric bending) or two opposing directions (tropospheric bending), instead of all directions. It is possible, however, for signals to slowly migrate from one direction to another. In fact, it is normal for sporadic E-skip to move from one region to another.

Tropospheric Ducting and Sporadic E-skip

Sporadic E-skip begins on channel 2 and rarely rises above channel 6 and FM, whereas Tropospheric Bending affects all channels. The differences between these two modes of propagation are substantial. Therefore, a chart, found at the end of this article, contrasts the two most-common modes, Tropospheric Bending (known as "Tropo") and Sporadic E-skip (known as Es).

A longtime DXer in south Florida has logged DTV stations at exceptionally long distances via tropo. Among his outstanding logs is KENS-DT, channel 39, San Antonio at a distance of 1,100 miles. The path from his QTH to Texas is mostly over the Gulf of Mexico, which is an excellent path for long distances via tropo. Such long distances by tropo are

not as common over all-land paths.

Meteorologist William Hepburn operates this useful tropo forecast map page (<http://dxinfocentre.com/tropo.html>). A real-time Es DX map is here (<http://www.dxmaps.com>).

Here is an example of how tropo and Es differ, and what it means to TV DXers. Prior to 2012, New Jersey did not have a full-power low-band (channels 2-6) analog or digital TV station with a transmitter located within the state. Since tropo was the only way to log New Jersey, few DXers outside of the Northeastern U.S. ever logged the Garden State. Then, three years after the New York City analogs vacated the low-band as part of the DTV conversion, digital WACP-DT put a transmitter on channel 4 in the Atlantic City area. Many DXers in the eastern half of the U.S. and Canada now have a New Jersey TV station in the log, thanks to WACP and the magic of E-skip. New Jersey is my forty-second state via TV.

Meteor Scatter

Although DTV decodes by meteor scatter are more difficult than the reception of analog signals, a few DXers have logged DTV signals by meteor scatter. In this mode, TV signals reflect off the ionized trail of meteors entering the earth's atmosphere. Reception usually lasts from a fraction of a second to a few seconds and is best found on channels 2 to 6, with the best time from late night until early morning. Major meteor showers during the second half of 2015 will peak on the evenings of August 12 (Perseid), October 21 (Orionid), November 17 (Leonid) and December 13 (Geminid). For more information about less-common modes, you can read this thorough propagation article written by Glenn Hauser (www.anarc.org/wtfda/propagation.htm).

Is Your Location Favorable for TV DX?

When asked about the key to success, many TV DXers answer "location." According to Pat Dyer (WA5IYX) in San



(Left) Low-power digital K04QP-LD, channel 4 (virtual channel 4), Casa Adobes, Arizona, relays KVOA-DT in Tucson, so the ID data displays those calls instead of the proper call sign. Distance via E-skip is 1,003 miles. (Right) My TV antennas include a Winegard CA-5254 for VHF and a Channel Master old-style 4228 eight-bay connected to a Winegard AP-4700 preamp for UHF, both on Antennacraft TDP-2 rotators. (Photos courtesy of the author)

Antonio, who has been observing and keeping records on propagation for many years, the worst area in the U.S. for TV and FM DX is the west coast.

The best locations for tropo are the southern states, especially those near the Gulf of Mexico, and areas in the Great Lakes region. Other good regions are the Midwest and Great Plains states.

E-skip, on the other hand, is a little more plentiful in the southern U.S. States, but it can be received throughout North America during the spring and summer.

Digital TV Basics

Although decoded DTV video is snow-free, a DTV signal looks like bright, long-grained snow on some analog TV sets, especially when the snow is mixed with an analog TV video.

Decoded DTV video itself is snow-free, but it is not always perfect. Due to unstable signals and/or interference, digital video is sometimes pixilated, with missing and/or mixed-up parts. In fact, strong electrical interference, co-channel interference (stations mixing with each other on the same channel), LTE (Long Term Evolution) telephone service and other kinds of interference can totally prevent DTV decoding. An informative thread on LTE interference is on WTFDA Forums (<http://forums.wtfda.org/showthread.php?8240-Houston-we-have-a-problem>).

The Manual Tuning Mode

The most efficient way to DX is in a “manual” tuning mode (especially during Es reception), moving from RF channel to RF channel by pressing channel-up and channel-down buttons on a remote control. The presence of a weak, yet-to-be-decoded DTV signal will be indicated by the signal strength bar, often long before it decodes. Therefore, keep an eye on the signal strength bar while tuning manually (see photo of a Zenith DTT-901 DTV converter’s manual tuning screen)

During an Es event on a hot July day in 2011, the DTV

converter was sitting on channel 4 as I watched the signal bar making erratic movements while it slowly nudged closer to the “good” signal section of the bar. At the same time, my analog TV told the story: The long-grained, bright snow of the DTV station on channel 4 was mixed with an analog channel 4 in Sonora, Mexico. In the end, the DTV prevailed. That was my first log of a low-power DTV (LDTV) via Es. It was 250-watt digital K04QP-LD, channel 4 in Casa Adobes, Arizona, a relay of Tucson’s KVOA-DT.

RF Channels and Virtual Channels

DXers count Radio Frequency (RF) channels because that is where digital transmitters are located. Unfortunately, the virtual channel number displayed on the air by a TV station and placed on the screen by TV sets and converters is often not the channel where the digital transmitter is located.

The virtual channel is where the station’s old analog transmitter was located. For example, KSNV-DT uses virtual channel 3, while the current digital transmitter is on RF channel 2.

Many DTV stations divide their bandwidth into sub-channels. All of a station’s sub-channels are broadcast over the same transmitter, so DXers count a station as only one log.

Best DTV Tuners

According to a poll on the Worldwide TV-FM DX Association’s TV & FM DXing Facebook page in 2015, most TV DXers use DTV converters that can be tuned manually. Very few use DTV sets for DXing. The most popular converters are the Zenith DTT-901, Zenith DTT-900 and Insignia NS-DXA1 models, all of which feature a manual-tuning mode. Unfortunately, those models are no longer manufactured, but used ones are available sometimes on E-bay and other Internet sources.



Channel Master CM-7777 Titan 2 TV antenna pre-amplifier (\$68) comes with mast-mount pre-amp and power supply and offers up to 30 dB gain from 54 - 1002 MHz. You'll still need a run of RG-6 coax from the pre-amp to the antenna. (Courtesy: Solid Signal.com)

Status of the Analog-to-Digital TV Conversion in Latin America

Mexico TV blogger and researcher, Raymie Humbert, provided this list of analog TV shutdown dates for countries, which are received by DXers in North America:

- Colombia: December 31, 2019
- Costa Rica: 2017(could be delayed)
- Cuba: 2021
- Dominican Republic: September 2015
- El Salvador: 2018 (could be delayed)
- Guatemala: 2018; Haiti: June 15, 2015
- Honduras: 2018
- Mexico: end of 2015
- Nicaragua: date unsure
- Panama: 2020
- Venezuela: 2020

Recording and Photographing TV DX

It is no longer common for DXers to seek written verification for DX reception of TV stations. Instead, DXers generally record their TV DX and photograph the ID material as it appears on the screen. Another reason for recording analog DX is that it gives a DXer the opportunity to review questionable ID material. DX can be recorded on video cassette recorders, digital video recorders and video cameras. Some DXers photograph DX using a digital camera. While the camera's shutter speed does not matter with DTV screens, shutter speed should be set at 1/15th to 1/30th of a second when photographing an analog TV screen. Others make video captures with their computer, using such products as the Diamond VC500 (\$40 plus \$6 shipping, Solid Signal.com).

South Louisiana TV DXer Mike Perron uses thoroughly modern technology to record and photograph his TV DX. He



Channel Master CM9521A rotator (\$120) has infrared remote control and can store 69 station positions. You'll need a run of 3-conductor control wire to complete installation. (Courtesy: SolidState.com)

uses an iPhone 6, and the results are excellent. Some of his highly impressive DX videos are on YouTube (www.youtube.com/user/chalemi).

Equipment for TV DXing

In the digital TV era, it is common for TV DXers to have simple setups, consisting of an analog TV, DTV tuner, TV antenna, preamplifier, antenna rotator, and a mast made of steel tubes with guy wires and/or a tripod.

Old analog TV sets can sometimes be found at yard sales and thrift shops. If you are interested in analog DX, make sure the TV does not have a weak-signal mute that shows only a blue or black screen when a less-than-local-quality analog signal is received.

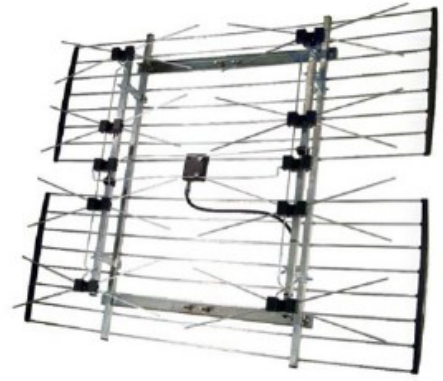
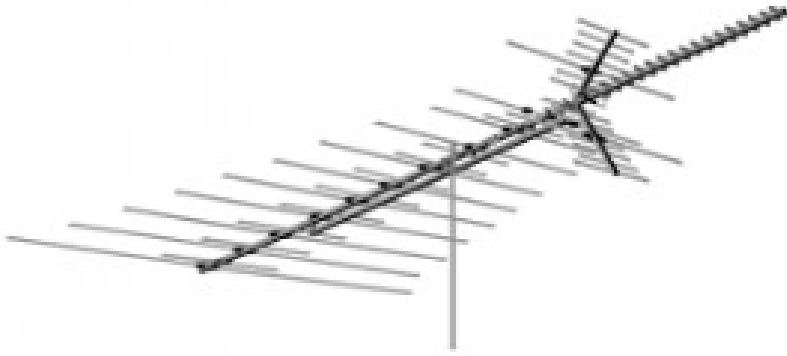
Antenna System Basics

Although TV DXing can be relatively inexpensive compared to some hobbies, an adequate antenna (preferably outside, in the attic or on the second floor) is necessary for satisfactory results. The laws of physics are stacked against small antennas. Remember, the lower the frequency, the longer the wavelength. Thus, VHF antennas need long elements, especially for reception on channels 2-6 (55-88MHz).

Here are some other antenna facts:

- (1) Large antennas are more directional than smaller ones. Antenna directivity is more important than ever due to DTV's difficulty in decoding when co-channel interference or other interference is present.
- (2) Antennas at higher elevations receive better signals via tropo than lower ones, yet height makes little difference with Es.
- (3) Using RG-6 or RG-11 coaxial cable for antenna lead-in will help keep signal loss at a minimum.

Due to the proliferation of cable and satellite TV during the last twenty-five years, antenna manufacturers currently



Left: At 180 inches long (15 feet) this Antenna Craft VHF/UHF/FM antenna (\$150) is one of the largest “deep fringe” TV antennas available. It claims features 69 elements and has a 300 ohm impedance. You’ll need a balun to attach to RG-6 coax. The longest element is 112 inches. This antenna claims 6.2 dB gain on Low VHF; 9.4 dB gain on high VHF and 10.0 dB at UHF. Right: Channel Master CM-4228 8-bay bow-tie VHF/UHF antenna (\$110) that claims 12 dB gain (UHF) and a small turning radius. Don’t expect too much in the way of VHF signals from this antenna. (Photos courtesy: SolidSignals.com)

make few deep-fringe TV antennas. Fortunately, some adequate, yet economical, antennas are still available. All of the antenna system products below are available from Solid Signal (www.solidsignal.com or 1.877.312.4547), other online retailers and some local hardware/building material stores.

A good all-channel VHF-UHF antenna for both tropo and Es is the Channel Master CM3020 /Advantage 100 (\$120 plus \$9 shipping). A popular UHF-only antenna is the Antennas Direct 91XG (\$100 and free ground shipping).

A preamp (outside amplifier) mounted near the antenna will improve weak signals, especially on UHF. However, preamp overloading (from strong locals, including FM stations) can prevent DTV signals from decoding. Therefore, high-gain pre-amps are best in areas away from strong local signals, whereas lower-gain pre-amps are best in areas near high-powered locals. Many DXers use the Channel Master Titan-2 preamp CM7777 (\$68 plus \$6 shipping).

Directional antennas work best when aimed toward the DX. Some successful TV DXers use what is referred to as “Armstrong rotors;” an outdoor antenna mast that is turned literally by the DXer’s hands. The Antennacraft TDP-2 is an inexpensive, light-duty rotor that is capable of turning the CM3020 (\$73 plus \$9 shipping).

Final Thoughts

The 2015 TV DX season is currently underway. On March 25, I received my first new log of the year: XHMTA-DT, RF channel 12, Matamoros, at a distance of 505 miles.

Mexican analogs are scheduled to leave the air at the end of this year, so I hope DXers within TV DX range of Mexico will take advantage of the interesting analog DX opportunities from south of the border before it is too late .

About the Author

The author has been a DXer since the 1960s. In addition to TV DX, he is interested in MW, SW and FM. His log

contains more than 1,100 TV stations. He has been a member of the Worldwide TV-FM DX Association for 21 years. He has previously written about TV DX for Monitoring Times.

Dedication:

This article is dedicated to the memory of Jeff Kadet (K1MOD), North America’s most-successful and best-known TV DXer. Jeff passed on November 22, 2014 at the age of 67. It is difficult for me to think about TV DXing without thinking of Jeff. He is the leader in most TV DX categories, and he is very close to the top in the few categories of which he is not number one.

Although I never met Jeff, we corresponded by e-mail many times. Much of my success with TV DX can be attributed to Jeff’s advice about using a TV and videocassette recorder for each low-band TV channel (2-6) during Sporadic E-skip reception. That setup brought me many logs, especially of difficult-to-identify Mexican TV stations. I still remember Jeff telling me to use two Channel Master four-output distribution amplifiers rather than one of the eight-output models. The setup always worked perfectly.

We in the DX community deeply miss Jeff, and we appreciate his many great contributions to the TV DX hobby.
– Danny Oglethorpe