Application Note
AN-76

May, 2026

web = www.kh6htv.com email = kh6htv@arrl.net

RFI Potential of Digital TV

Jim Andrews, KH6HTV

For frequency coordination of amateur band repeaters, frequency coordinators ask the question
"What is the possibility of RFI from Digital TV signals to FM users ?"

I claim that due to the wide band-widths and noise like characteristics of DTV, the RFI potential is quite low.

So, let's compare what the rf spectrums look like for typical FM voice and DTV transmissions. Fig. 1 shows a typical 5 kHz deviation FM signal. When fully deviated, it occupies about 15 kHz of band-width. Fig. 2 shows a typical DVB-T TV transmitter's signal. It occupies a 6 MHz wide TV channel with a uniform, flat noise-like spectrum. If a DTV signal is listened to on a conventional SSB receiver, it sounds simply like white noise. It has no distinguishing features.

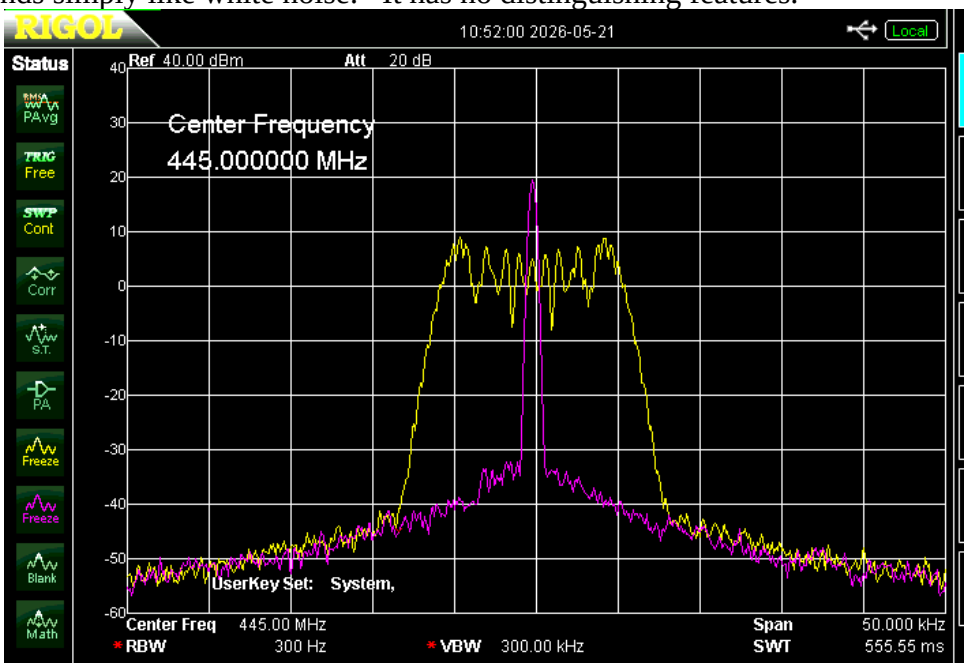

Fig. 1 Typical FM voice transmitter spectrum. Signal from HP-8640B Signal Generator. Set to 445 MHz, -10dBm. Display is 445 MHz center frequency, span of 50 kHz, 10dB/div & 5kHz/div. Resolution band-width was set to 300 Hz. Magenta trace is generator in CW mode. Yellow trace is generator set for FM modulation. 400 Hz tone at 5 kHz deviation.

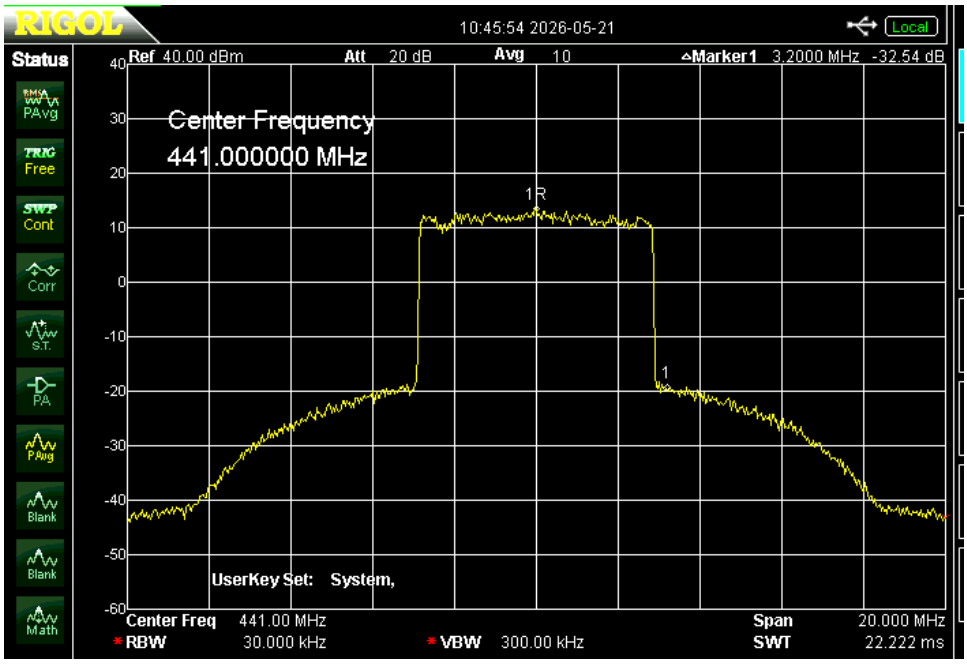

Fig. 2 Typical amateur band, digital Television transmitter's spectrum. The transmitter's average power output was 3 Watts (+35 dBm). Center frequency is 441 MHz, span of 20 MHz, 10dB/div & 2 MHz/div. 30kHz resolution band-width.

A pure DTV signal (such as from a DTV modulator), only occupies the center 6 MHz TV channel. The extra skirts seen on either side in adjacent TV channels are due to inherent non-linearities in the final RF power amplifier of the transmitter. They are internally generated inter-mod products. A properly driven final amplifier has the shoulder break-point set no higher than -30 dB below the in channel power level. For DTV repeaters, we then also add additional 6 MHz wide TV channel band-pass filters to remove these shoulders. See Fig. 3 for an example.

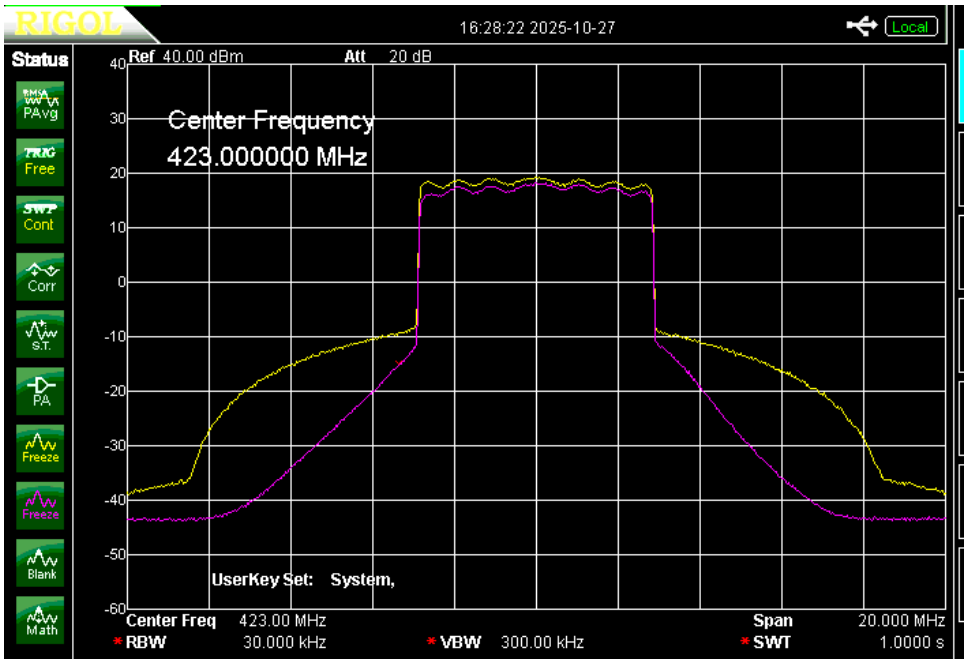

Fig. 3 RF spectrum from a typical DVB-T TV repeater with a 10 Watt transmitter. Yellow trace is the rf output from the final amplifier at 10 Watts. Magenta trace is after passing this through an inter-digital TV channel band-pass filter. 8 Watts output. center frequency is 423 MHz, span of 20 MHz, 10dB/div & 2 MHz/div. 30kHz resolution band-width.

For DTV, the max. average power of the transmitters in use today by Colorado ATV hams is 10 Watts. It should be noted that for DTV transmitters, for linearity and bit-error-rate considerations, the amplifiers can NOT be driven to max. saturation. The average rf power output must be kept at least -8 dB or more below the max. saturated power output. Thus, most Colorado DTV hams and repeaters are using rf power amplifiers capable of at most 70 Watts max. saturated power. The max. average powers from these amplifiers are about 10 Watts (+40 dBm). When conditions permit, many DTV hams even throttle back the power. Many times, we get perfect digital pictures with much lower power levels of even 300 mW.

Now let's put a little math to compare RFI potentials.

What is the RF power density therefore of a DTV signal ? Assume a 10 Watt transmitter.

Pd(DTV) = Avg. Power / Channel BW = 10 W / 6 MHz = 1.67×10^{-6} Watts / Hz

What is the RF power density of a typical FM voice signal ? Also assume a 10 Watt transmitter.

Pd(FM) = Avg. Power / BW = 10 W / 15 kHz = 6.67×10^{-4} Watts / Hz

Now what would be the equivalent rf power in a 15 kHz FM channel from a 10 W DTV transmitter ?

P(15kHz) = Pd(DTV) x BW (FM) = 1.67×10^{-6} W/Hz x 15 kHz = 25 milli-Watts

Thus, we see that due to the extremely low rf power density of a DTV signal, even our most powerful 10 Watt transmitters create the equivalent RFI of a very low power, 25 mW, hand-held HT FM radio !

Due to the complex design of a DVB-T signal, it was originally designed to be very tolerant and resist in-band interference from narrow-band, CW/FM signals. The DVB-T signal uses about 8,000 sub-carriers with COFDM. If an RFI CW signal knocks out a few of these sub-carriers, the digital TV receiver is still able to decode the DTV signal. We have conducted RFI tests on a lab bench. We found that an interfering CW/FM signal in the TV channel pass-band had to be at least > 20 dB stronger than the desired DTV signal to cause the DTV receiver to stop decoding the picture.

Conclusion: As a result, both wide-band DTV and narrow-band FM voice signals should be able to normally co-exist in the 70 cm amateur band.