

PILOT CARRIER

The DTV pilot carrier provides a convenient way to measure the frequency of VSB signals. ATSC standard A/53e states the pilot may be generated by adding a small (digital 1.25) DC level to every symbol of the digital baseband data, including sync. As such, it is related to the symbol clock frequency. ATSC Recommended Practice A/54a explains that the nominal pilot carrier frequency can be determined “by fitting the DTV spectrum symmetrically into the RF carrier.” To do this, center the bandwidth of the DTV signal (one half the 10.7622378 MHz symbol clock or 5.3811189 MHz) in the 6 MHz DTV channel. Subtracting 5,381.1189 kHz from the 6,000 kHz channel bandwidth leaves 618.881119 kHz. Dividing that in half leaves 309.440559 kHz, giving the precise standard pilot offset above the lower channel edge.

Note that the FCC does not require DTV stations to broadcast with this precise pilot carrier offset from the lower channel edge. The only requirement is to meet the emission mask requirements. Indeed, in one situation where a DTV station is transmitting on an upper adjacent channel to an analog TV station located within 32 km, the FCC requires the pilot carrier be offset 5.082138 MHz above the visual carrier of the analog TV station. This offset is required to reduce the color beat and high frequency luminance beat created by the DTV pilot carrier in some DTV receivers. By using this precise offset, the beat will be visually canceled because it will be out of phase on successive video frames.