

FM ATV TRANSMITTER ALIGNMENT PROCEDURES

By Mike Collis, WA6SVT Email: WA6SVT@aol.com
POB 1594
Crestline, CA 92325

I am writing this article to clear up how to properly set up modulation on your FM ATV transmitter. This information is out there, some good and some not. So with my many years experience with broadcast television as a microwave and transmitter engineer, I wanted to share the basic procedures involved.

Flat, pre-emphasis what is this about? The easiest way to run FM is flat response from vertical sync through the highest audio subcarrier frequency but much better signal to noise ratios with weaker signals can be had by pre-emphasizing the transmitter and de-emphasis in the receiver. Is all emphasis the same? No it is not. Most FM TV systems use CCIR 405-1 that elevates the video signal slowly above a few hundred KHz then much faster near 1 MHz then slowly again near the top of the video or base-band pass band in the transmitter (pre-emphasis) and just the opposite in the receiver (de-emphasis).

Due to the nature of cheap consumer electronics (video senders etc) not all manufactures follow CCIR 405-1 as close as they should, some are also set for 525 line NTSC and others for 625 line PAL. How do you know if your emphasis is correct? If you have a video test generator, run the "window" pattern through your transmitter and look at the video from the receiver with a scope or waveform monitor and if it is correct, the wave form should be square. This is a good way to test transmitters like the Comtech after adding the pre-emphasis circuit (last issue of ATVQ) to see if you got it right.

Oh yeah, this article is about transmitter deviation adjustment so hear you go. In broadcast microwave as well as FM-ATV we should be using 4 MHz deviation and about 12 to 14 MHz bandwidth channel depending on the subcarrier frequency used. In a crowded band with only a 10 MHz allocation we drop to 3 MHz deviation and only one subcarrier of 4.5 or 4.83 MHz.

Now how to do it! You have 2 choices, 1: Bessell (1st center carrier) null, 2: Calibrated receiver. The test equipment for method one is a spectrum analyzer, function generator and scope or waveform monitor. Equipment for method two is a calibrated receiver, function generator and a scope or waveform monitor.

Method one: Connect the transmitter through enough inline attenuation to not overload the analyzer. Connect the function generator to the transmitter via a tee connector to allow a scope or waveform monitor high impedance bridge the video line and the transmitter needs to be terminated (usually internally) at 75 ohms. Now set the generator for 2.33 MHz sine wave (no triangle or square wave) at 1 volt p-p as measured on the scope.

If adjustment is needed, start by turning down to minimum deviation then bring up the deviation and you should see many carriers

at 2.33 MHz spacing above and below the video (center) carrier. As you increase the deviation the video carrier will reduce way down to a null with all the other carriers still present. Stop at this point, you are now at 4 MHz deviation for CCIR-405-1.

Usually the subcarrier (s) are turned off but this is not easy to do with the consumer video so do not worry just leave it on as the error in transmitter deviation is very small for one or two subcarriers. While we are talking about subcarriers, the level should be -20 to -22 dB below the video carrier with no video (or function generator) signal present. Setting stronger than -20 dB and even more so with multiple subcarriers will cause inter-modulation distortion to the video. Weaker subcarrier levels will reduce audio detection in weak signals and noisy or hissy audio on moderate signals.

3 MHz deviation the procedure is the same but the function generator is set for 1.61 MHz. Subcarrier level is usually set for -25 dB below video carrier to help reduce channel bandwidth.

Method two: Set up the function generator the same as method one, then in the case of a dual input scope connect the calibrated receiver the second input terminated in 75 ohms usually via another tee/75 ohm termination. And adjust the deviation control for 1 volt p-p. If you have a known calibrated receiver and no function generator, use a color bar or video test generator and adjust for 1 volt p-p. To calibrate a receiver for use as test equipment, you need to use method one setup.

If someone in your club or group has the equipment above, it is handy to bring over a receiver and calibrate it and now you can set your deviation at home with just a scope and known 1 volt p-p video source. Many ATV'ers use satellite receivers without the LNB for 900 and 1.2 GHz ATV adding a preamp and filter. Satellite receivers are not 4 MHz deviation standard! They are 11 MHz and will produce about 0.35 volts p-p with 4 MHz deviation transmitters. Running 11 MHz deviation on 900 and 1.2 GHz is not good amateur practice, leave room for others to use the band too. Many of the consumer modules like the Comtech boards use satellite tuner/demodulator modules in them (see last issue of ATVQ for the narrow IF filters modification).

Enjoy FM ATV

73,
Mike WA6SVT