APPLICATION NOTE

In-Channel Frequency Response Measurements with the AT2000 Spectrum Analyzer

SUNRISE TELECOM BROADBAND

AP-AT10-001-A

In order to better understand the In-Channel Frequency Response measurement, first let's look at how it is defined by the FCC. It is a ±2 dB peak to valley maximum from .75 MHz above the lower channel boundary to 5 MHz above the lower channel boundary. Figure 1 illustrates this.

One way we can accomplish this measurement is to use a Vertical Interval Test Signal called an FCC Multiburst. As the name implies, it contains several bursts at different frequencies within the measurement bandwidth described above. Usually these bursts are at .5, 1.25, 2, 3, 3.6 and 4.2 MHz above the video carrier as shown in Figure 2, but can vary depending on the VITS inserter used. The amplitude of these bursts is measured and the difference in dB between the highest and the lowest burst in amplitude is the Peak to Valley.

Figure 2 is an illustration of an FCC Multiburst signal, as it would be inserted into a modulator. Notice that the amplitude of the individual bursts is equal.

Figure 3 is an example of the same signal after it passes through a modulator with a frequency response problem. Notice that the amplitude of the .5 MHz burst is compared to the amplitude of the 3.6 MHz burst. The 4.2 MHz burst is not measured because it falls outside the FCC parameters (1.25 MHz video carrier + 4.2 MHz = 5.45 MHz above the lower channel boundary).

In order to make this measurement, the first step is to find an FCC Multiburst VITS signal on the channel to be measured. A word of caution: not all broadcasters carry VITS signals and there is no standard for which VITS signals are to be carried. Nor is there a standard for what signals are carried on what line of video. That means the user must be able to recognize different VITS signals in order to make valid measurements.

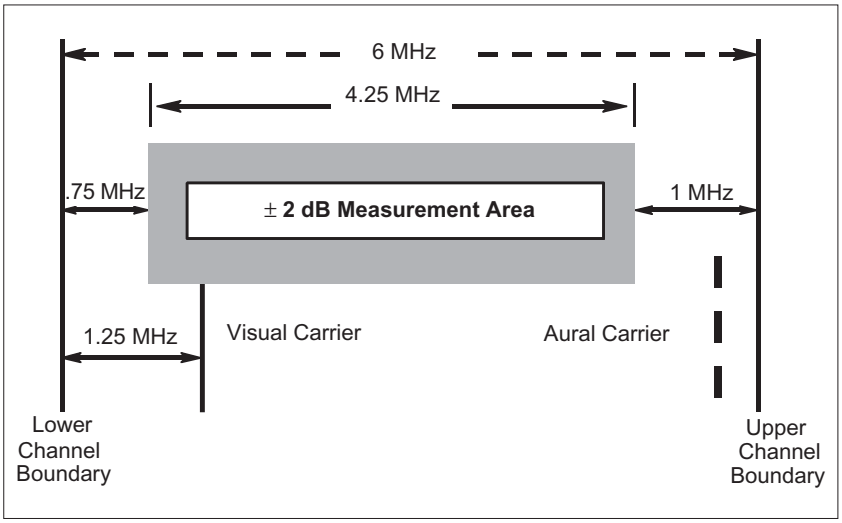

Figure 1

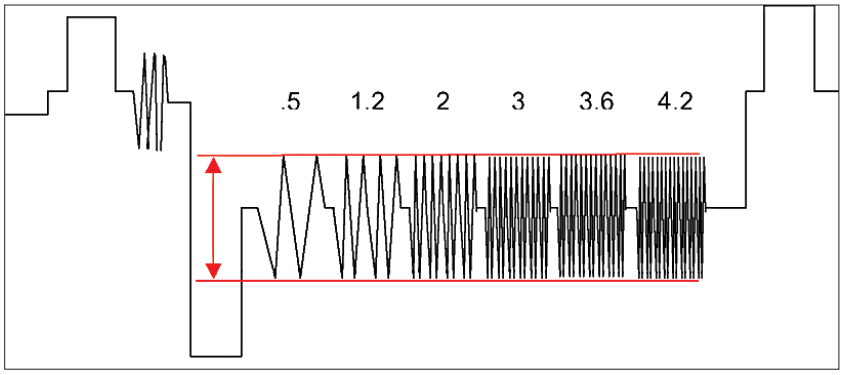

Figure 2

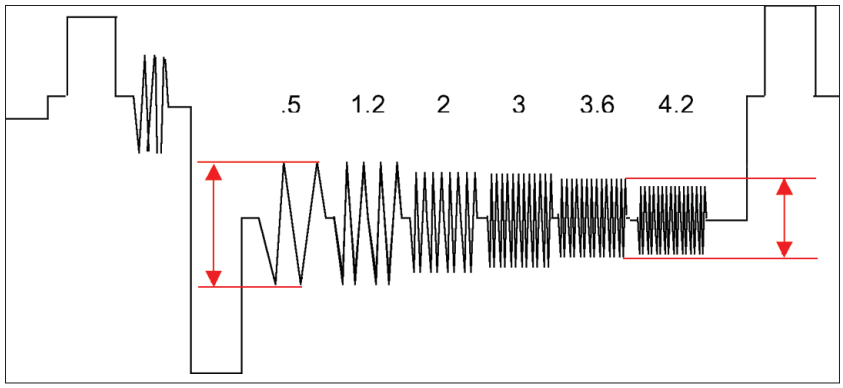

Figure 3

Figure 4 shows the FCC Multiburst VITS signal as it appears in the depth of modulation measurement on the AT2000. Using the depth of modulation measurement first allows the user to easily find and recognize different VITS signals and then to find which line of video they are on. The attenuation should also be set so that the horizontal sync pulses are near the top of the screen without being clipped off. Notice that the FCC Multiburst signal was found on line 16 in field 2.

Now the In-channel Response menu can be entered. The analyzer will begin to make the measurement on whatever line and field is currently selected. The measurement can be interrupted and the correct line and field from the depth of modulation screen can be selected with the soft keys on the right side of the display. In Figure 5, the same line and field are selected.

The correct measurement points of the burst frequencies must also be selected in the multiburst setup menu. These aforementioned frequencies are shown on the bottom of the display in Figure 5. After the test is complete, simply press the min/max soft key to place the markers and read the results.

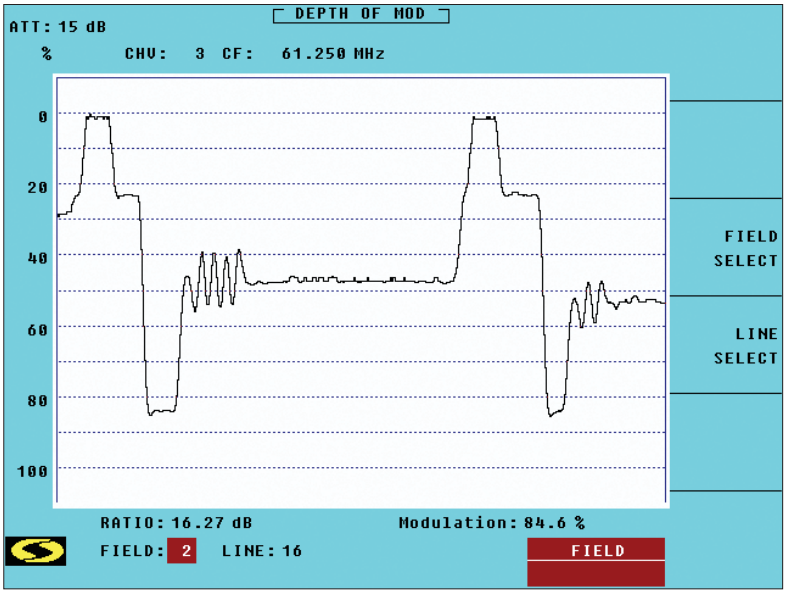

Figure 4

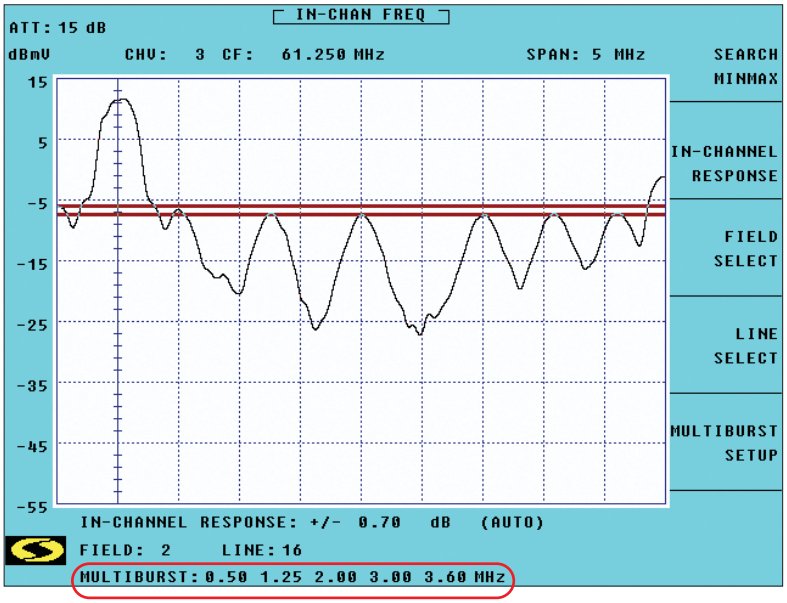

Figure 5

Multiburst Frequencies

Another VITS signal that can be used to make the same In-channel Response measurement is the Ghost Cancellation Reference signal, (GCR.) A screen shot of the GCR in the depth of modulation mode is displayed in Figure 6.

By going back to the In-channel Response measurement in the main menu, selecting the correct line, and pressing the Search min/max key, the results should look like Figure 7.

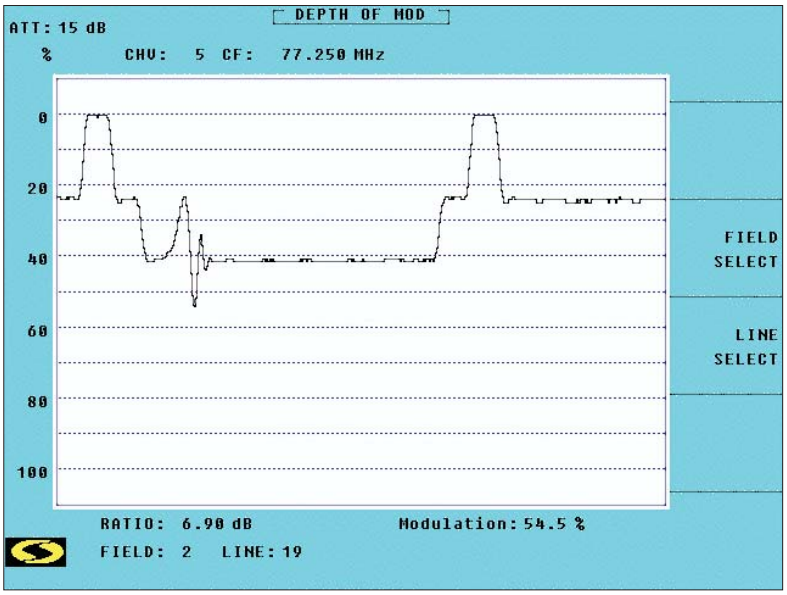

Figure 6

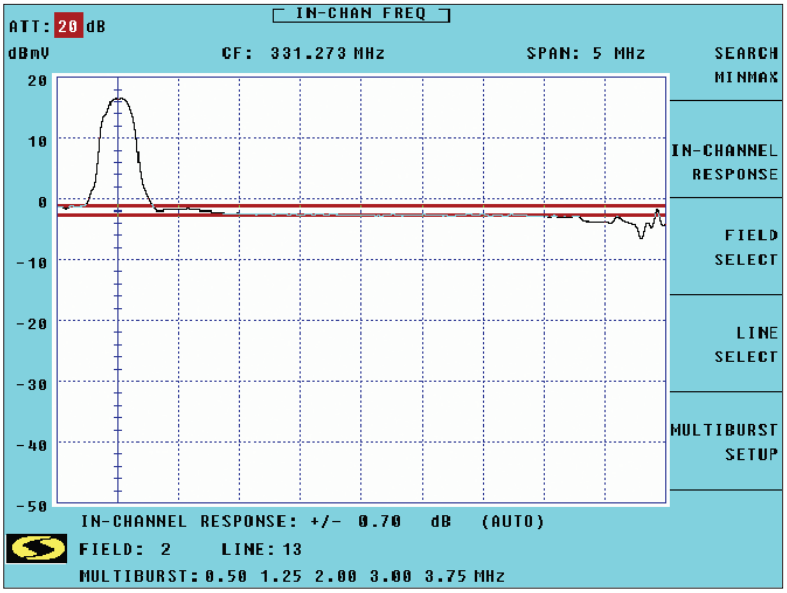

Figure 7