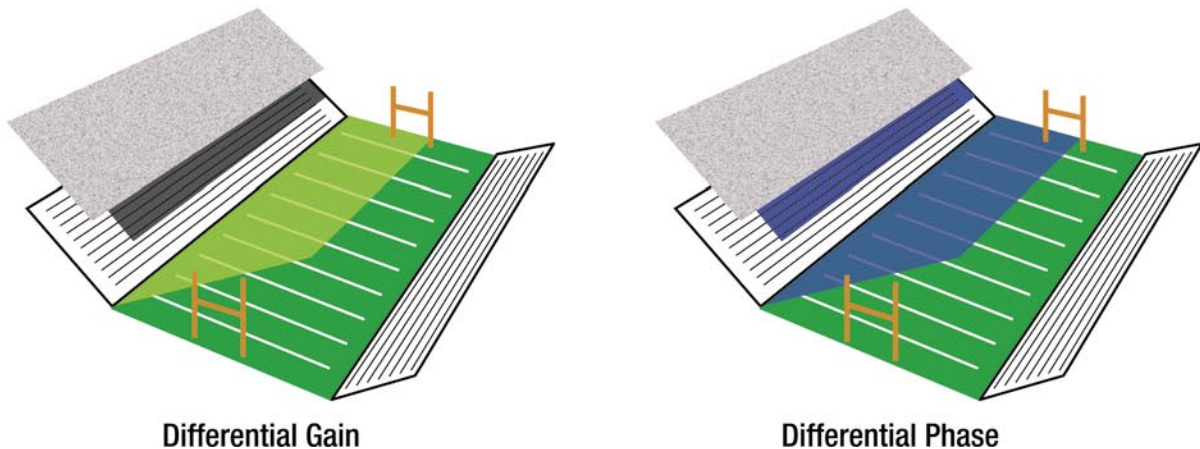


By Larry Jump  
*Regional Sales Support Engineer*

The AT2500RQV Spectrum Analyzer now has a built in video demodulator that makes color and video measurements possible. Part 76.605 of the FCC Rules and Regulations require that Differential Gain and Differential Phase be measured on 4 channels plus one for every 100 MHz or fraction thereof, in the headend, once every 3 years. This means that a 750 MHz system is required to test at least 12 channels. With the right test equipment, it is easy to ensure that all channels be measured. The FCC requires that Differential Gain be no more than 20% and that Differential Phase be no more than 10°. This paper will address what these measurements are, what they mean, and how to make them correctly using the AT2500RQV.

Differential Gain means that color saturation or depth of color varies over different luminance or light levels. Differential Phase means that the color hue changes over different luminance levels. Figure 1 illustrates this. If for example a football game is being shown and part of the field is in the shadows and part of the field is in the sunlight. For differential gain, the color saturation would show up as a washed out, faded green in the shade, while the sunlit portion of the field would show up as a deep intense green. In other words the intensity of the color varies with the light levels. Differential Phase might show up as blue in the shade and green in the sunlight. This time there is a difference in the color hue over different light levels. Rarely is one present without the other.



*Figure 1*

To make these measurements a Vertical Interval Test Signal (VITS,) is used. These lines can be inserted by the broadcaster or by using a VITS inserter in the headend. There is no standard for a broadcaster on what VITS signals to carry, when to carry them, or what lines to place them on. Therefore Sunrise Telecom BroadBand recommends the use of a VITS inserter.

There are many different types of VITS, but two of the VITS signals that can be used are the NTC-7 Composite test signal and the FCC Composite test signal. Both contain what is known as a riser stair step and each step is a burst of the color reference over various luminance levels. The two signals as seen on an AT2500RQV are shown and labeled in Figure 2; they are basically mirror images of each other.

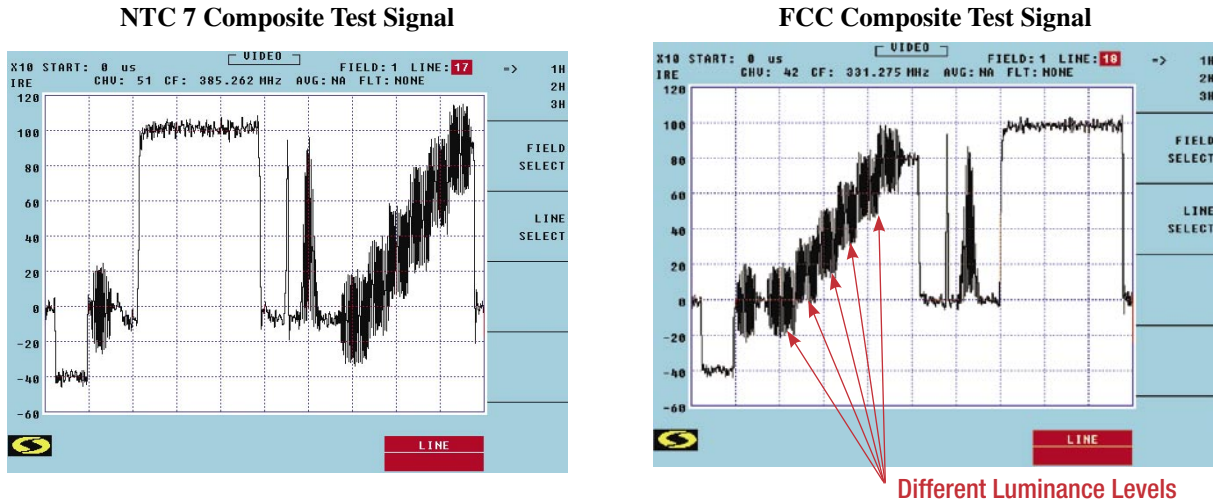


Figure 2

To measure differential gain, the analyzer measures the amplitudes of these color burst signals over the differing luminance levels. To measure differential phase, the analyzer compares the phase relationship of the reference burst to the other color burst signals over differing luminance levels. This is illustrated in figure 3.

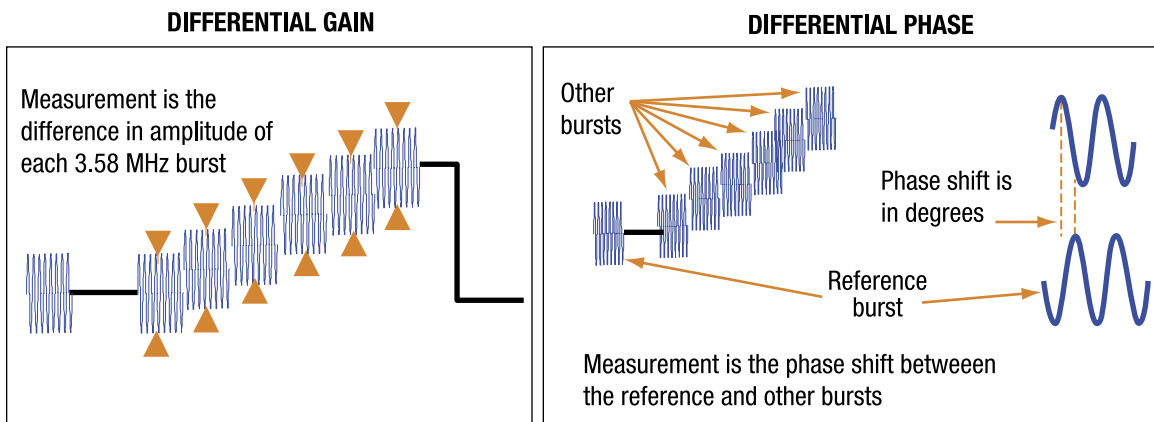


Figure 3

To make these measurements using the AT2500RQV, the following procedure should be followed step by step. It is highly recommended that a channel plan is built, properly edited and loaded into the analyzer before making these measurements because the analyzer will automatically go to the correct VITS, line and field.

1. From the menu, choose the video icon by either the knob or the arrow keys and press enter.
2. Choose the channel to make the measurement on by pressing the FREQ hard key, pressing the video carrier soft key, then entering the channel to be measured.
3. The analyzer will default to field 1, line 12 if no channel plan has been loaded into the instrument. If the plan has been correctly loaded and edited, the analyzer will automatically go to the correct field and line to make the measurement.
4. To select the correct field and line, press the SPAN key, then the line select soft key. Using the up and down arrow keys, search for either the NTC 7 signal or the FCC as shown in Figure 2 above, then press the escape key.
5. The measurement parameters must now be set up. Press the soft key and screen like Figure 4 will appear. Press the enter key until the appropriate test signal is displayed. In the example in Figure 4, the NTC 7 signal is used. The FCC signal is called the Composite TX in the analyzer.

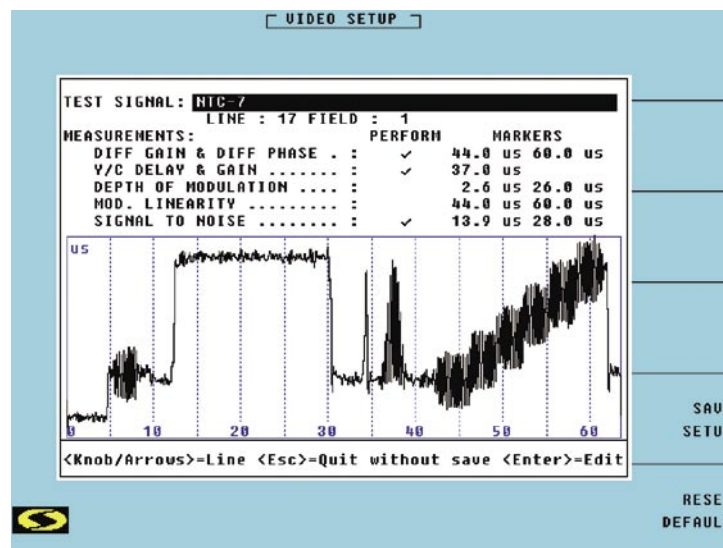


Figure 4

6. Next the correct line and field must be chosen. To do this, turn the knob to the right until the line selection field is highlighted, then press enter. To choose a different line, use the knob or the up / arrow keys to select the correct line. Press enter. Use the knob to select the correct field. Press enter, choose field 1 or field 2, and then press enter again.
7. Use the knob to enter get to the perform field on the Diff Gain & Diff Phase measurement. Make sure that entry is checked as in Figure 4.
8. Use the knob to toggle through the remainder of the parameters screen and choose what measurements are to be performed. In example of Figure 4, Diff Gain, Diff Phase, Y/C Delay and Gain and Signal to Noise will all be performed.
9. Press the Save Set up soft key and the analyzer will return to the original screen as in Figure 2.
10. Press the measure soft key and the results will be displayed as in Figure 5.
11. To save the measurement press the STORE key and then the STORE RECORD softkey. Enter a file name, ID Code (optional) and comments (optional).

**Note:** If these measurements are to be used to create an FCC proof of performance report using WinCom II, you must enter the correct ID Code (HEAD for headend or TP01, TP02...for field test points) to identify the location of the measurement.

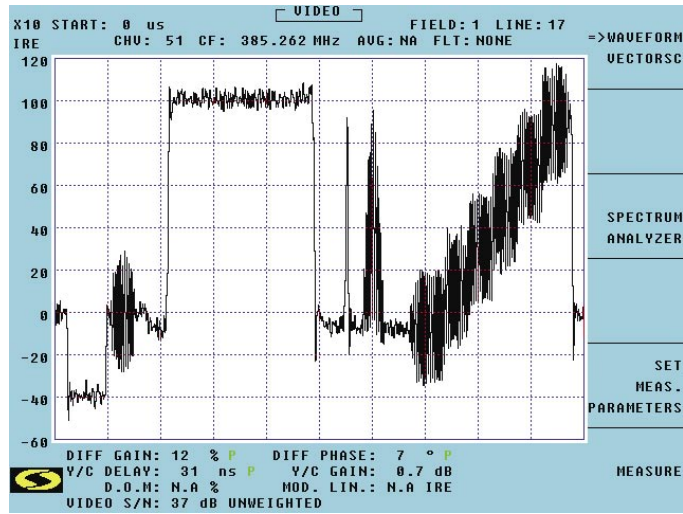


Figure 5

Specifications are less than 20% for Differential Gain and less than 10° for Differential Phase. The analyzer gives a pass-fail indication measured against these specifications. Also if the channel plan is programmed properly, steps 5 to 9 above can be eliminated.

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