

White Paper

Branch Insertion Loss
Measurements with the iVA

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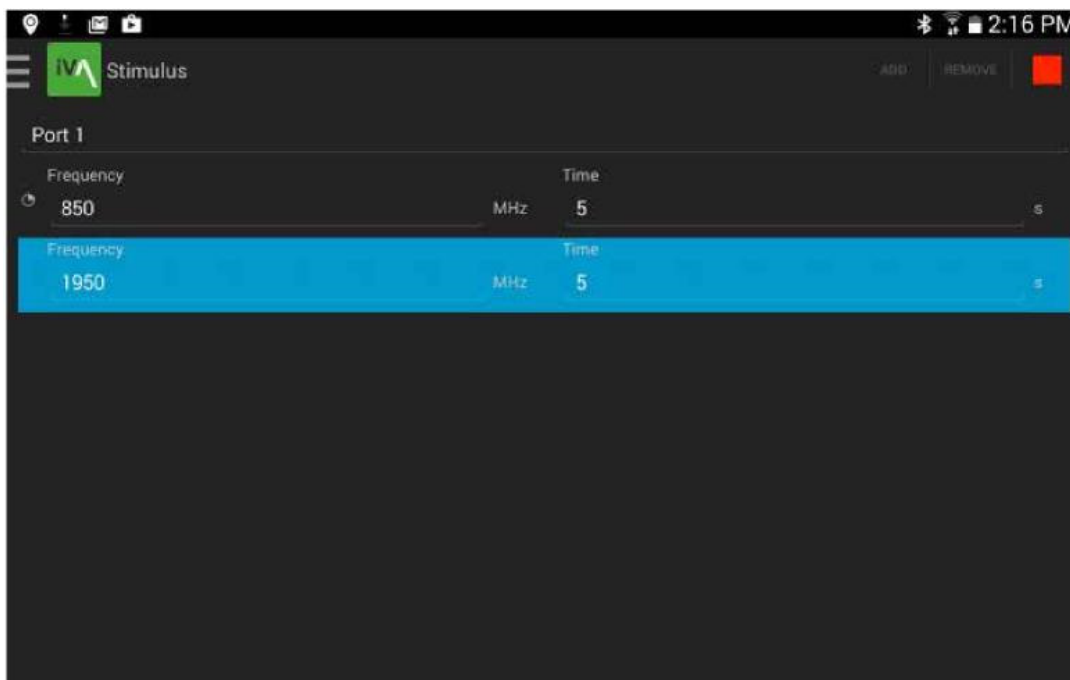
Introduction

Branch insertion loss in a DAS system (indoor or outdoor) measures the insertion loss from the equipment room out to the antenna ports that provide coverage within the venue. Performing this measurement requires two iVA units: one to provide the transmit signal(s) and one to receive and measure the signal. Because continuous Bluetooth link cannot be assumed in this environment, the iVA transmission mode cannot be used. Rather, the two iVA units operate independently, and therefore a separate user device (tablet and/or laptop) is required for each iVA.

Transmit iVA

The first step in the process is to specify the frequencies for the test using the Stimulus Mode.

After pairing to iVA 1, which we will use as the Transmitter, go to Stimulus mode and specify the test frequency or frequencies. In this example, the test will be performed at 850 MHz and 1950 MHz. “Add” these two frequencies to the list and set the Transmit Time for each. The 5 second default is acceptable for this example (See figure 1).



The output power at these frequencies will be measured using the second iVA.

Figure 1

Receiving iVA

The second iVA serves as the receiver and the power measurement device.

After pairing with iVA 2, Receiver, go to the Spectrum Monitor mode. The receiver in the iVA is very sensitive and can measure signals with good accuracy down to -80 dBm. This is achieved by having a narrow band IF filter in the receiver. As a consequence, when you use the iVA as a receiver, it is a requirement that the measurement frequencies in the Spectrum Monitor mode must land precisely on the transmit signal frequency. Otherwise, the signal received will be measured incorrectly or not at all, if it lands outside the cut-off of the IF filter.

In Spectrum Monitor mode, you have the choice to select the power range to be measured. To do this, go into the Trace menu by touching the “Trace” icon¹. The choices are -50 to +20 dBm and -115 to -35 dBm. Select -50 to +20 dBm.

¹ To view icon labels, press the ? icon in the lower left corner of the user interface.

Next, specify the measurement frequencies. For this example, define the Start frequency as 850 MHz and the Stop frequency as 1950 MHz and the number of points equal to 2.

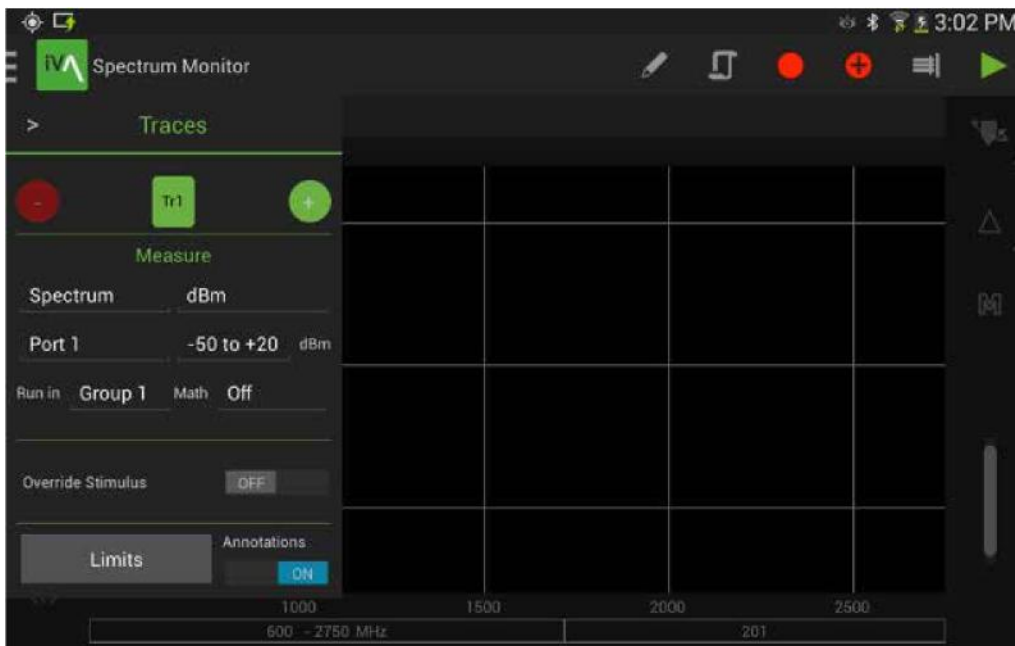


Figure 2

Now, turn on Markers and set them to the two test frequencies. The markers are now displaying the measured power at the two test frequencies

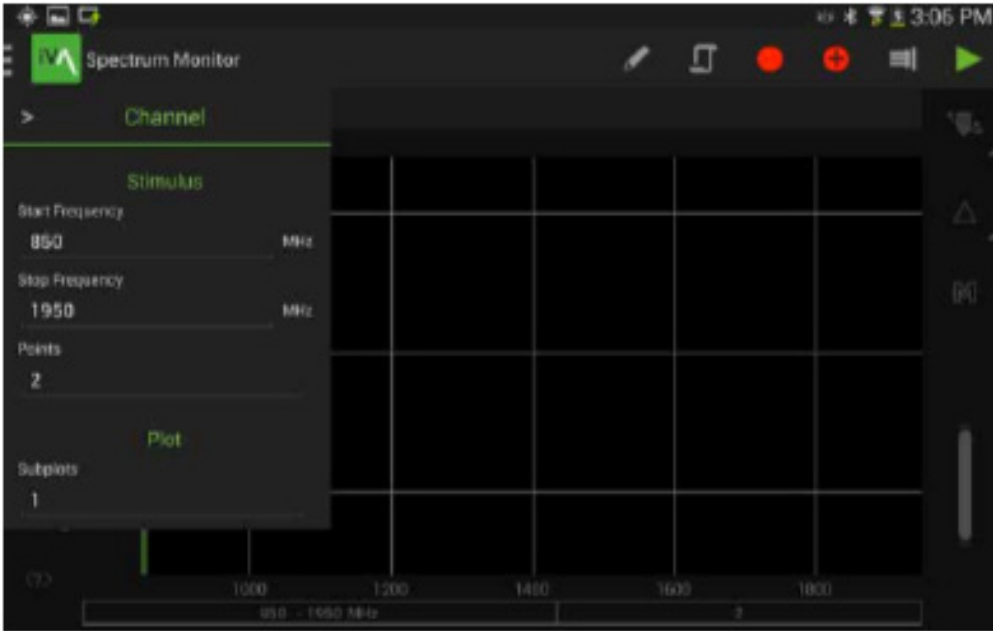


Figure 3



Figure 4

Measure the Transmit Power

Connect iVA 1 to iVA 2 using a Type N Female-to-Female adapter.

Start the Stimulus Mode transmission on iVA 1. Stimulus Mode continuously transmits at each specified frequency and dwells at each frequency for the specified number of seconds, which in this case is 5 seconds.

Put iVA 2 in continuous sweep and turn on Peak Hold to capture the output power at the two test frequencies, note the values.



Figure 5

For the current example:

850 MHz: 0.86 dBm

1900 MHz: -2.73 dBm

At this point, you are ready to measure the Branch Insertion loss.

Measure Branch Insertion Loss

Connect iVA 1 (transmit) to the input to the DAS and iVA 2 (receive) in place of the DAS antenna. Repeat the procedure used to measure the Transmit Power and note the received signal level.

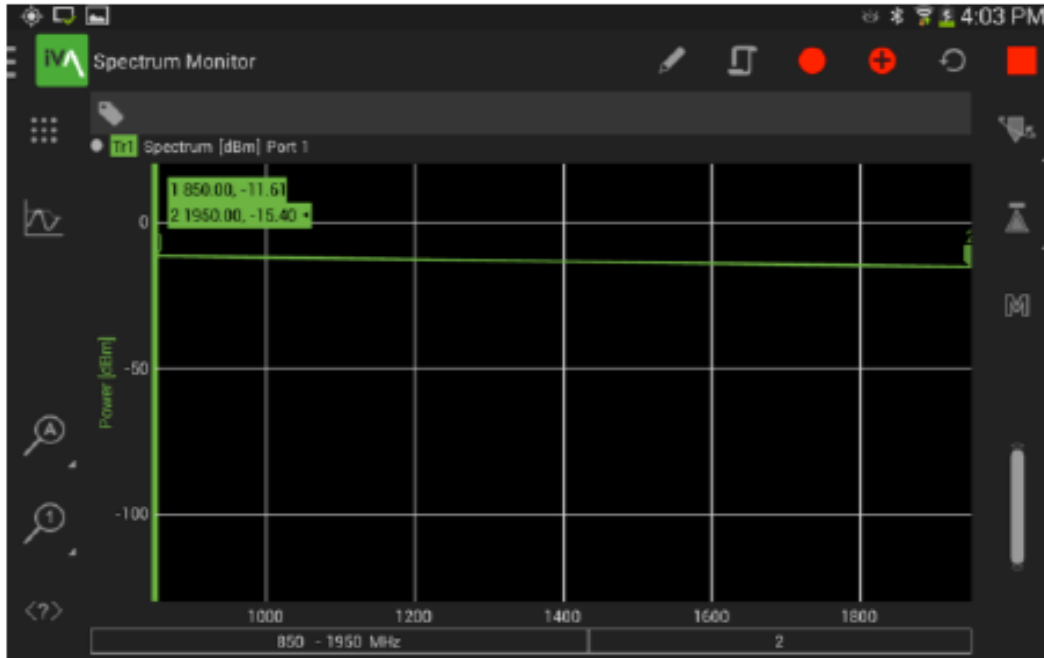


Figure 6

Calculate the Branch Insertion Loss

The Branch Insertion Loss is the difference in power level measured in the two steps above.

$$\begin{aligned}
 &850 \text{ MHz: } 0.86 - (- \\
 &11.6) = 12.46 \text{ dB } 1900 \\
 &\text{MHz: } -2.73 - (-15.40) \\
 &= 12.67 \text{ Db}
 \end{aligned}$$

Future Capability Makes It Simpler

The next release of the iVA software supports trace math. This will allow you to store the first measurement, and then when measuring the received power through the DAS, this second measurement can be subtracted from the first measurement to directly yield the insertion loss.



Figure 7