APPLICATION NOTE

Cell Master Average Cable Loss Measurement

CELL MASTER™

Introduction

Traditionally, measuring the insertion loss of an installed coaxial cable is a one-port reflection measurement since it is virtually impossible to connect both ends of the cable to test equipment. The measurement is made by placing a short on one end of the cable and measuring the return loss at the other end. The desired value, cable loss, is return loss divided by two, since the signal travels through the cable in both directions before it is measured.

Most installers need to know the average insertion loss of cables during the commissioning and maintenance of antenna sites. The traditional way to do this calculation is to find the minimum return loss and the maximum return loss in the frequency range of interest by using marker to peak and marker to valley, then solve this simple equation while you're hanging from a tower 100 feet in the air.

$$CL_{average} = \frac{\left(\frac{RL_{max} + RL_{min}}{2}\right)}{2} = \frac{RL_{max} + RL_{min}}{4}$$

Cable Loss Measurement with Cell Master

With a Cell Master, by selecting "Cable Loss – One-Port," cable loss is displayed directly. Also, the calculated value of average cable loss is shown directly on screen, see figure 1. The calculation is done exactly as you would do it manually – average the peak and valley values.

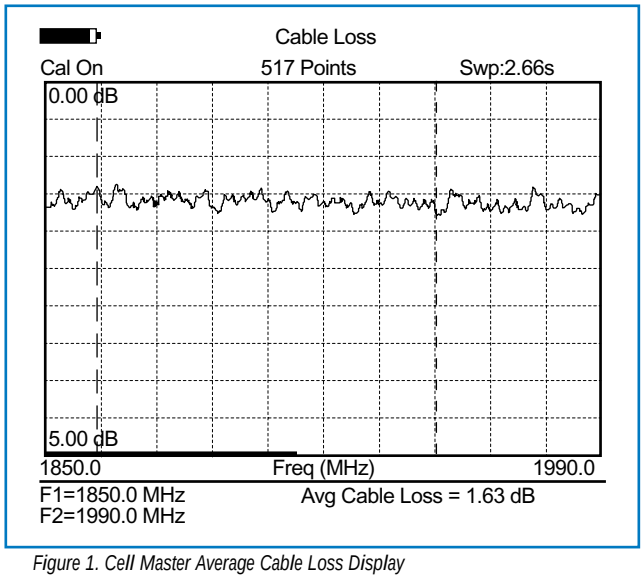

Figure 1. Cell Master Average Cable Loss Display

CellMaster

To make an average cable loss measurement on a Cell Master

- Press the **MODE** key
- Use the up and down arrows to scroll to “Cable Loss – One Port,”
- Press **ENTER**.
- Set the desired frequency range
- Perform a calibration

There is no need to set the markers, thereby saving valuable time. This is especially valuable if you are measuring a cable that has an intermittent problem. For each sweep the peak and valley values are automatically extracted for the average loss calculation.

Here is a comparison of measured data taken on a 30 meter cable using three different methods: Cell Master, an Anritsu Scorpion Vector Network Analyzer, and a signal generator with a power meter in 10 MHz steps. To assure good source match, a 10 dB attenuator was attached to the signal generator output.

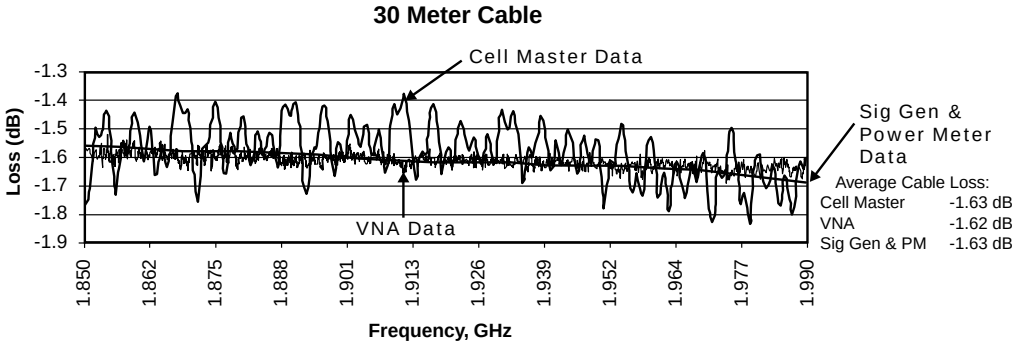

Figure 2: Measurement Comparison

The Cell Master calculates average cable loss on every sweep using this equation.

$$CL_{average} = \frac{CL_{max} + CL_{min}}{2}$$

This table shows the results when measurements on several different cables were done over the frequency range of 1850 to 1990 MHz, which covers the PCS band in the United States.

Cable	Manufacturer’s Specified Loss at 2 GHz for this cable length	Cell Master automatic measurement	Signal Generator & Power Meter (15 points)	Scorpion VNA (1601 points)
2.4 m of Cablewave Systems FLC12-50J	0.27 dB plus connectors	0.36 dB	0.40	0.41
9.1 m of Andrew LDF4-50A Heliax cable	0.97 dB plus connectors	1.05 dB	1.04	1.07
30 m of Cablewave Systems FLC78-50J	1.83 dB plus connectors	1.63 dB	1.63	1.62
21.3 m of Andrew LDF4-50A Heliax with loose connectors (defective cable)	2.28 dB plus connectors	8.21 dB	8.43	8.43

As you can see, there is very close agreement between all three methods. Which would you rather carry up a tower?

Summary

The Cell Master’s average cable loss measurement provides an effective way to measure an installed cable without the need to do manual calculations or the need to drag heavy equipment to a cell site, with accuracy rivaling the other techniques.

SALES CENTERS:
United States (800) ANRITSU
Canada (800) ANRITSU
South America 55 (21) 286-9141
Europe 44 (0) 1582-433433
Japan 81 (46) 223-1111
Asia-Pacific (65) 6282-2400
Microwave Measurements Division
490 Jarvis Drive, Morgan Hill, CA 95037-2809
http://www.us.anritsu.com

Discover What’s Possible®