

How To Perform E-Field Strength Measurements Using WSA-308/408

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Introduction

Starting with software version 20260426, WSA's spectral display permits a convenient switch between power in dBm and E-field strength in "dBuV/m". Users just need to press two buttons and input an AF factor (Antenna Factor) in dB to initiate the switch.

Power in dBm vs Field Strength in dBuV/m

By default, WSA's various Spectrum Analyzer functions present a graph in terms of "*Power Spectral Density (PSD)*" (Y-axis) vs *Frequency* (in MHz, X-axis). With linear scale, the *PSD* is in unit of "*mW per RBW*", meaning power in milli-watts per RBW band. With dB log scale, the *PSD* is in unit of "*dBm*" (should be dBm/RBW, but the "/RBW" is dropped by convention).

In essence, the Spectrum Analyzer is a power sensor. The power is measured through a terminating impedance of 50 ohm. By its very nature, the power measured includes the antenna effect. That is, a high-gain antenna will cause higher power to be measured than a low-gain antenna.

A natural question is: how do I measure the actual electric field strength at the point where the EW wave impinges upon the antenna, and the E-field strength number should be independent of the antenna being used? That is, all antennas should give the same E-field strength providing the polarization and direction are the same. With linear scale, the E-field is in unit of V/m , or $\mu V/m$. With log scale, the unit is "*dBuV/m*".

The conversion between power and E-field strength requires inputting an Antenna Factor (AF). "AF" is in unit of " $1/m$ ", the reciprocal of the "effective length" of an antenna. The "larger" an antenna, the smaller its "AF". When entering "AF", one enters it in "dB" scale. 30 dB is a common number for most antennas.

How to switch

Figure 1 shows the steps required to do the switch. Press the left 2 button to initiate the switch between “Power” and “E-field” display.

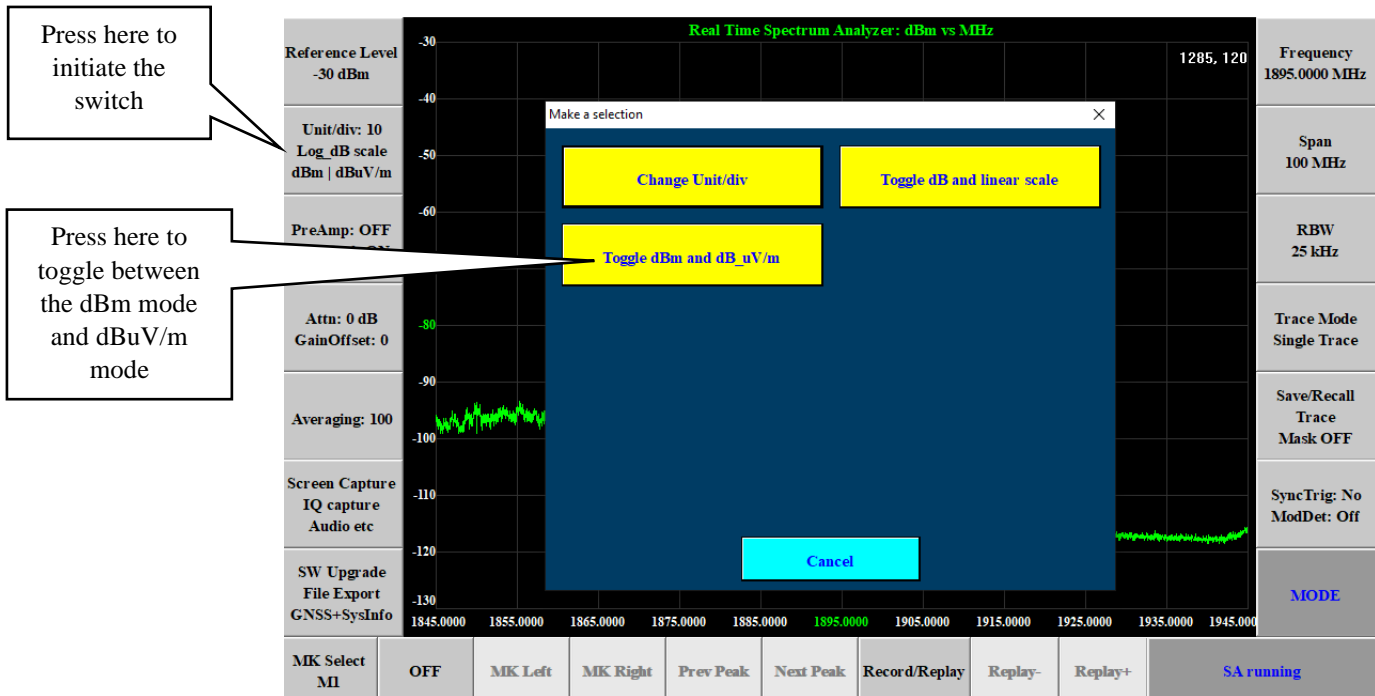


Figure 1 - Buttons to press to initiate the “Power and E-field strength” switch

After steps in Figure 1, you’ll be prompted to enter the “AF” (Antenna Factor) number in dB, as shown in Figure 2.

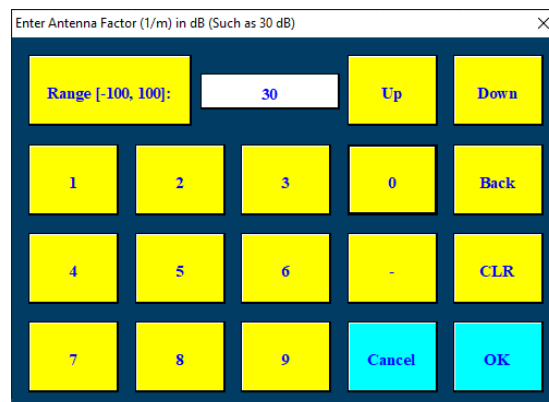


Figure 2 - Dialog for entering AF number in dB. “30” is a common number for most antennas

Figure 3 shows two spectral displays. The left one is the default “power” mode. The right one is in “E-field” mode.

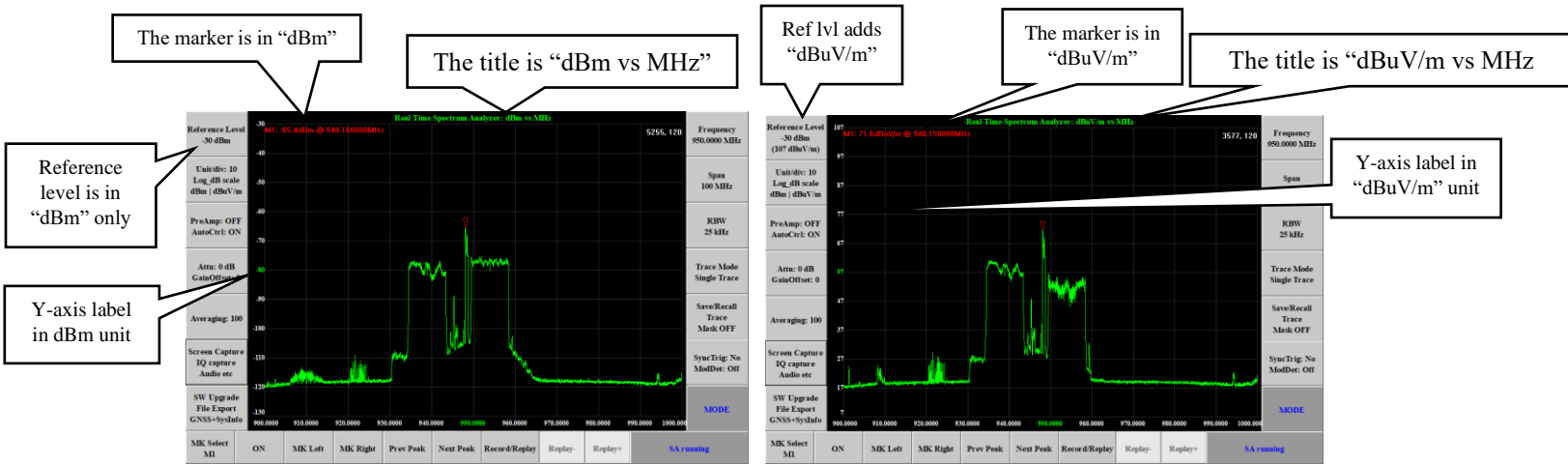


Figure 3 - Spectral display differences between “power mode” (left) and “E-field strength mode” (right)

Applicable test functions

The above switch is applicable to all Spectrum Analyzer derived test functions. On the test menu selection dialog in Figure 4, these tests are:

1. Top row: Real time SA, Wide-span SA, Continuous DPX, Block DPX;
2. First two tests on 2nd row: Spectrogram, TD-power+SA.



Figure 4 - Test selection menu dialog. The power and E-field switch is applicable to the 1st row and first two tests at 2nd row