Why Don't Output Equation Units Match Corresponding Measurements

Problem

When I add measurements to a graph, they follow the global units; e.g. mA, mW, dBm, etc. When I use Output Equations, however, the measurements come out in base units; e.g. Amps, Watts, dBW, etc., regardless of the global units. Why is this?

Solution

Measurements in the Output Equations window are always evaluated in base units. This is done in order to make the rest of the equations in the window independent of the global or LPF units.

As an example, consider using the Output Equations window to calculate power by multiplying Voltage and Current. Let's assume the voltage of interest is 1 Volt and the current of interest is 1 Ampere for a total of 1 Watt. In the Output Equations, the equation for voltage will always return 1 V and the equation for current will always return 1 Ampere. So regardless of what the project units are for Voltage and Current, this equation for power will always return the same number. Consider what would happen if the Output Equations did scale these numbers by the project units. Starting with base units so that no modifier is used for V and A, this would give us the same answer as above, 1 Watt.

Now, if the voltage modifier is changed to `mV`, the voltage variable would return 1000 mV and the power calculation value would be 1000. This number has changed by a factor of 1000 simply by changing the setting for project units. Now, the units for this new power number is mW. The Output Equations do not know what the unit type is for the result of the equation. The potential issue is that the equation would not be able to scale itself back to Watts.

Note: If using Output Equations, which return values in base units, and comparing the values to graphical data, which use global or LPF units, you may need to apply a conversion factor. For instance, you will need to add 30 to your values in Output Equations in dBw in order to match your graphical values measured in dBm.