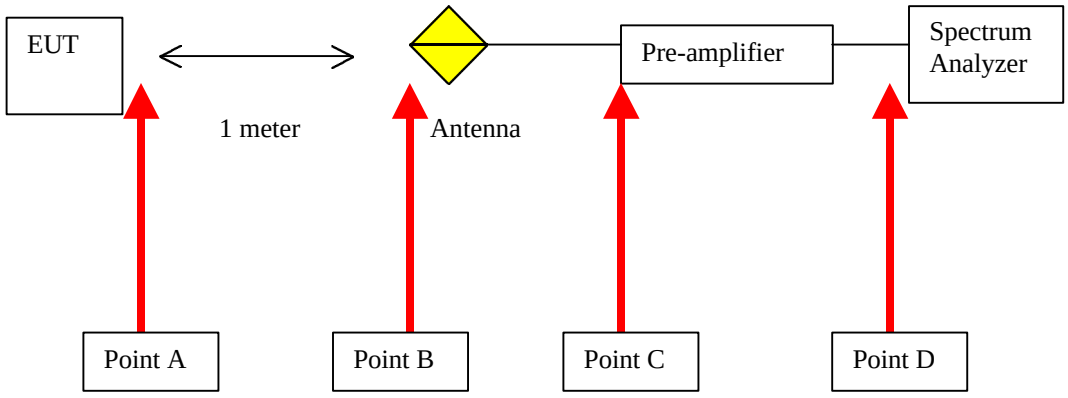
Was Spectrum Analyzer OVERLOAED???

The concern of overloading spectrum analyzer was raised by TCB. This calculation is to clarify such concern.

Calculation is based on the following facts:

1. Frequency 2.4GHz (the operating frequency of the device under test, and believe this is the frequency concerned by TCB to overload spectrum analyzer, otherwise, please specify).
2. Antenna Gain of the EUT is declared 1.6dBi
3. Output power is declared 3.75dBm
4. Pre-amp gain factor at 2.4GHz is 32.8dB
5. The max power at Spectrum Analyzer input should not exceed +30dBm
6. The max power at pre-amp input should not exceed +20dBm
7. The test distance is 1 meter
8. The gain of test antenna at 2.4GHz is 7.4dBi
9. The Antenna factor at 2.4GHz is 30.7dB

Calculation is based on the following setup (for illustration purpose only):



Our calculation shows the following result which was not possibly overloading the spectrum analyzer:

1. Power at Point A as declared: 5.35dBm
2. Space loss from Point A to Point B at 2.4 GHz: 48.2dB
3. Power at Point B = - 42.85dBm
4. Power at Point C = -68.15dBm
5. Power at Point D = - 35.85dBm

Calculation:

1. Point A = Output power (3.75dBm) + Gain (1.6dBi) = 5.35dBm
2. Space Loss = a + 20Logd + 20Log F
   Where, a = 40.6 (constant for air), d = distance in km, F = frequency in MHz.
   Thus, Space Loss = 40.6 + 20Log0.001 + 20Log2400 = 40.6 - 60 + 67.6 = 48.2dB
3. Point B = Point A – Space Loss = 5.35 – 48.2 = -42.85dBm
4. Point C = Point B – Antenna Factor + Antenna Gain – Cable Loss = -42.85 – 30.7 + 7.4 – 2.0 = -68.15 dBm
5. Point D = Point C + Pre-amp Gain – Cable Loss = -68.15 + 32.8 – 0.5dB = -35.85dBm

Conclusion:

The spectrum analyzer front end maximum input power is specified +30dBm. The derived result shows that the power at this point should be around –35.85dBm. Based on above calculation, the overload of spectrum analyzer during this testing should not happen.

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