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8/16/2018

Subject: MSCL

The following formulas were used to calculate MSCL with minimum separation distances (D_{miles}) path loss and a 45 degree polarity mismatch between the inside antenna and the mobile device:

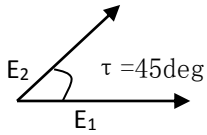
Path Loss =36.6+20Lg (F MHz) +20Lg (D_{miles}) dB

Polarity Loss=$10Lg(E_1/E_2)^2=10Lg((E_1/E_1\sin(45_{deg}))^2=20Lg((1/\sin(45_{deg}))=3.0$ dB

Where:

E_1=Maximum Possible Magnitude of the Electric Field form the Mobile Device

E_2=Magnitude of the electric field from the Mobil Device with a 45deg polarity mismatch=$E_1\sin(\tau)$



MSCL= Path Loss + Polarity Loss –Antenna Gain with Coax Loss dB

Due to close proximity of the cradle Integrated inside antenna to the mobile device's antenna, see the figure as below, the calculation for free space path loss cannot be used.

The minimum separation distances is 0.5 inch, the results of the path loss calculations are shown in the following table :

Uplink Frequency (MHz)	707	781.5	836.5	1732.5	1882.5
0.5'' Separation Distance Path Loss (dB)	-8.47	-7.60	-7.01	-0.68	0.038

For the above calculated number is not practical ie becomes negative number, so we perform the actual MSCL measurement instead of calculation.

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MSCL measurement test procedure:

The test is intended to confirm the signal booster minimum coupling loss (in dB) between the wireless device and the input (server) port of the Consumer Booster.

1. Connect the EUT to test equipment as shown in Figure 1. Begin with the uplink input (server) port connected to the spectrum analyzer and the wireless device's antenna port connected to the signal generator.

   Note-We use a small transmit antenna affixed into an enclosure as wireless device's antenna.

2. Set the center frequency of the spectrum analyzer and signal generator to the center of the operational band.

3. Set the signal generator power to 0dBm.

4. Make the wireless device's antenna close to the signal booster's integrated inside antenna. Move the wireless device's antenna to different position on the signal booster as shown in Figure 2.

5. Record the smallest MSCL that is observed.

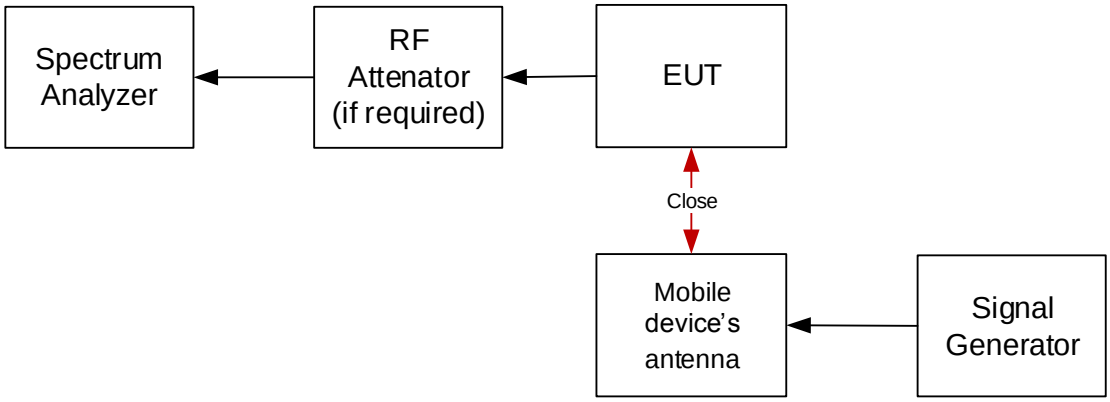

Figure 1

Figure 2

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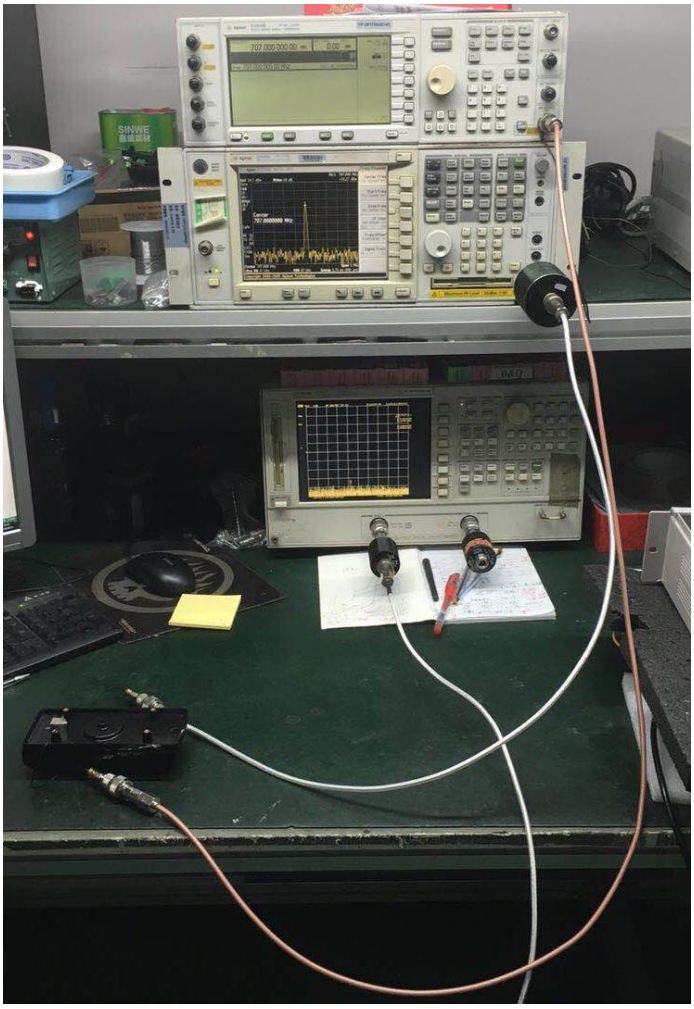
Uplink Frequency (MHz)	707	781.5	836.5	1732.5	1882.5
Measured MSCL of position 1 (dB)	15.14	18.93	16.80	11.42	11.31
Measured MSCL of position 2 (dB)	22.48	26.63	29.18	21.14	18.91
Measured MSCL of position 3 (dB)	17.71	20.03	22.66	16.78	12.64
Measured MSCL of position 4 (dB)	22.04	22.31	33.23	18.28	13.68
Measured MSCL of position 5 (dB)	32.18	27.54	36.47	25.93	33.07
Measured MSCL of position 6 (dB)	33.10	31.63	43.12	36.29	33.22

The minimum MSCL are shown in the following table

Uplink Frequency (MHz)	707	781.5	836.5	1732.5	1882.5
Minimum MSCL (dB)	15.14	18.93	16.80	11.42	11.31

Test Setup Photos



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