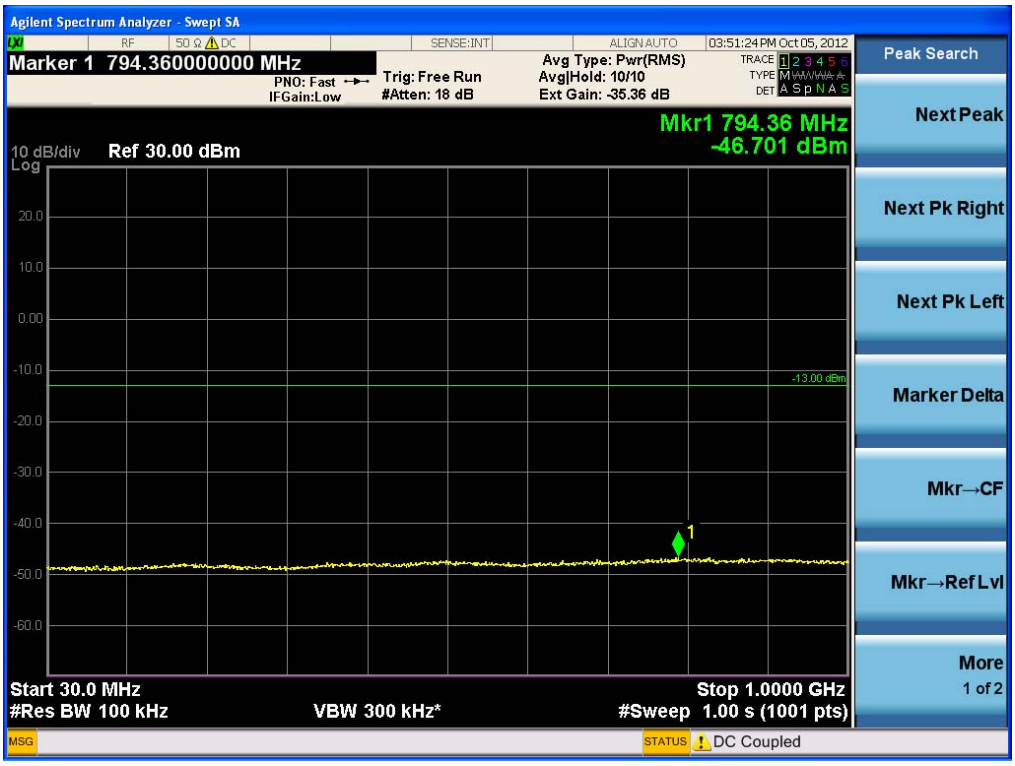
Plots of Spurious Emission

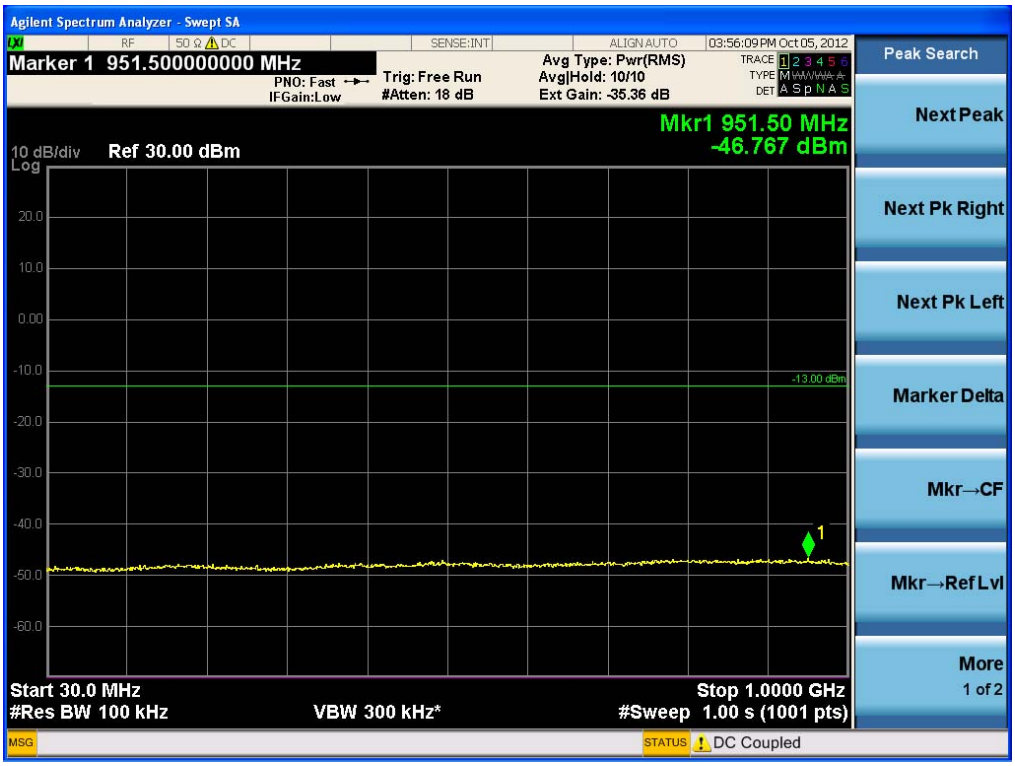
Conducted Spurious Emissions (30 MHz – 1 GHz)

[CDMA Downlink Low]

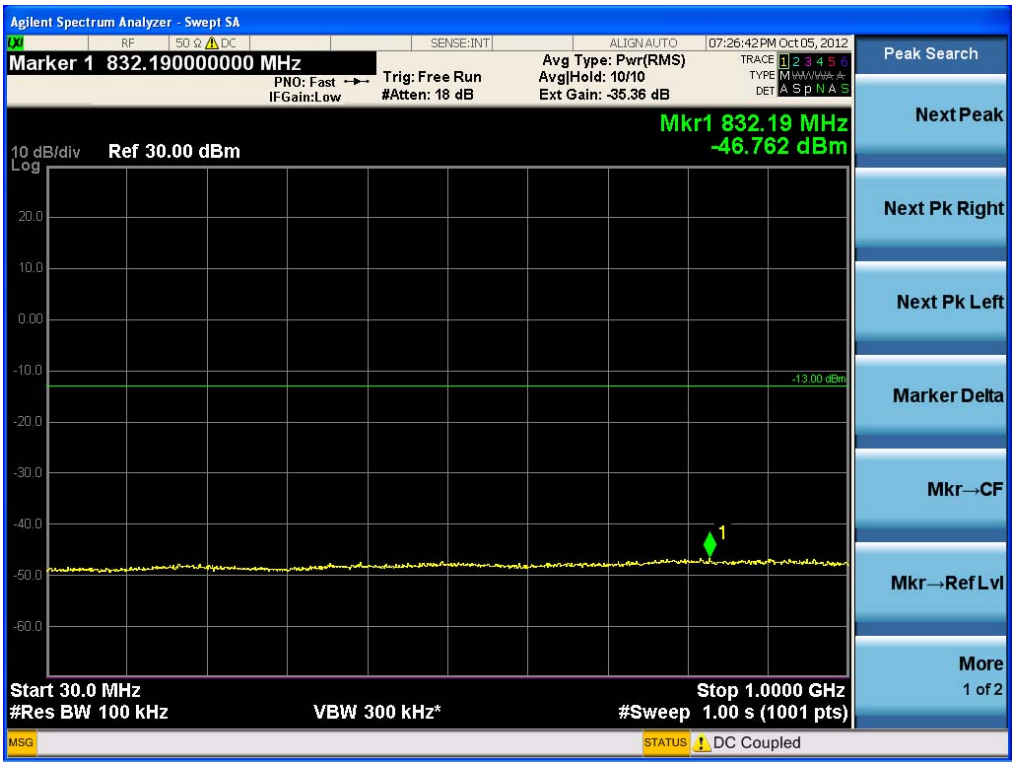
[CDMA Downlink Middle]



[CDMA Downlink High]

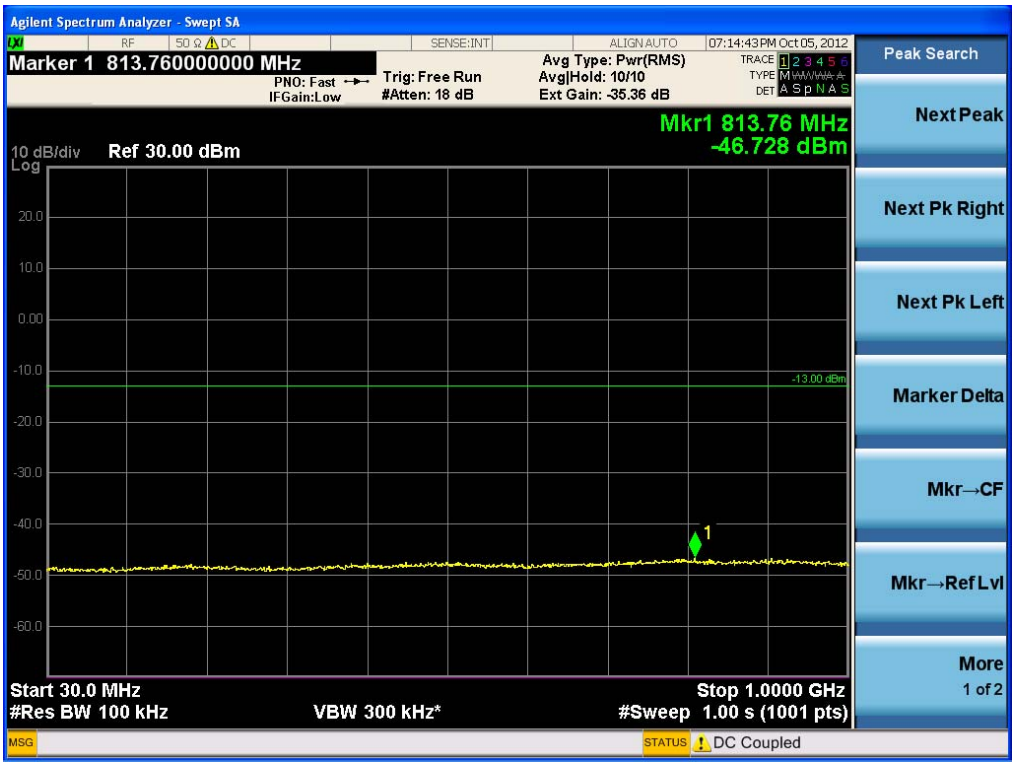


[LTE Downlink Low_5MHz]

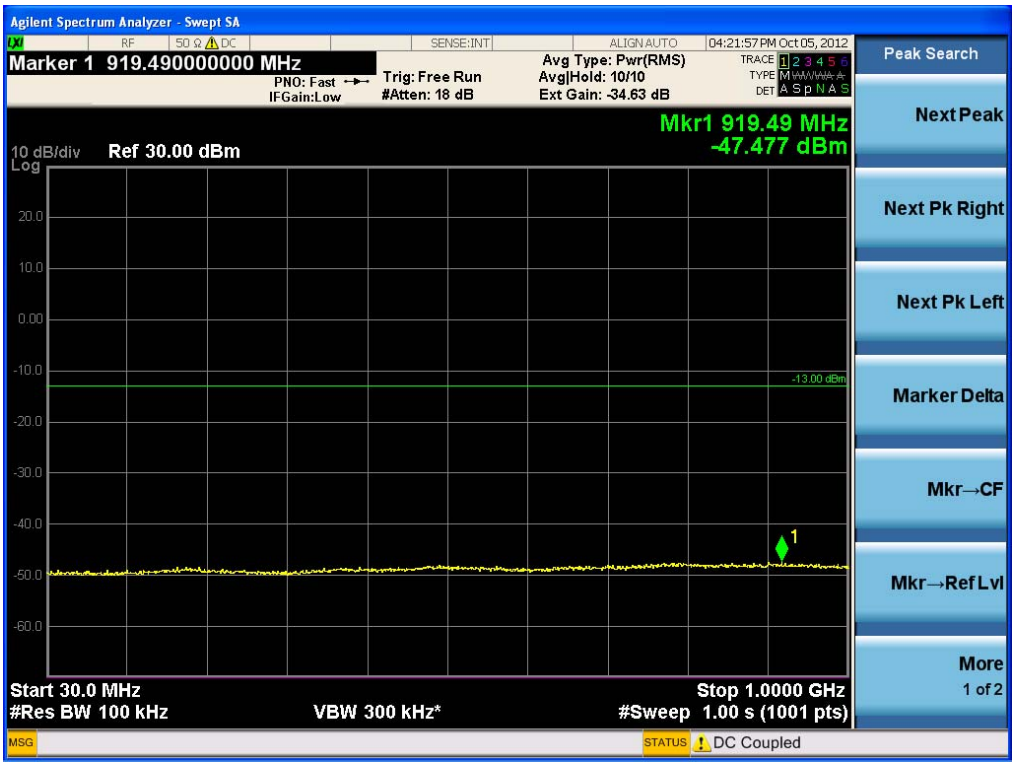


[LTE Downlink High_5MHz]

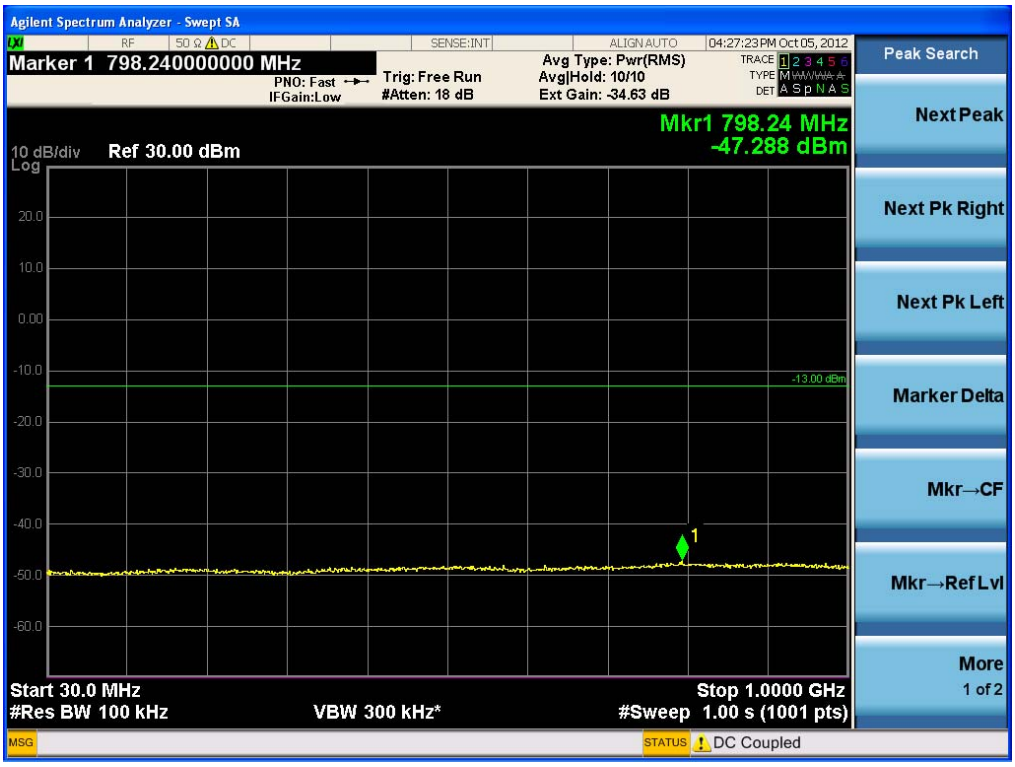
[LTE Downlink 10MHz]



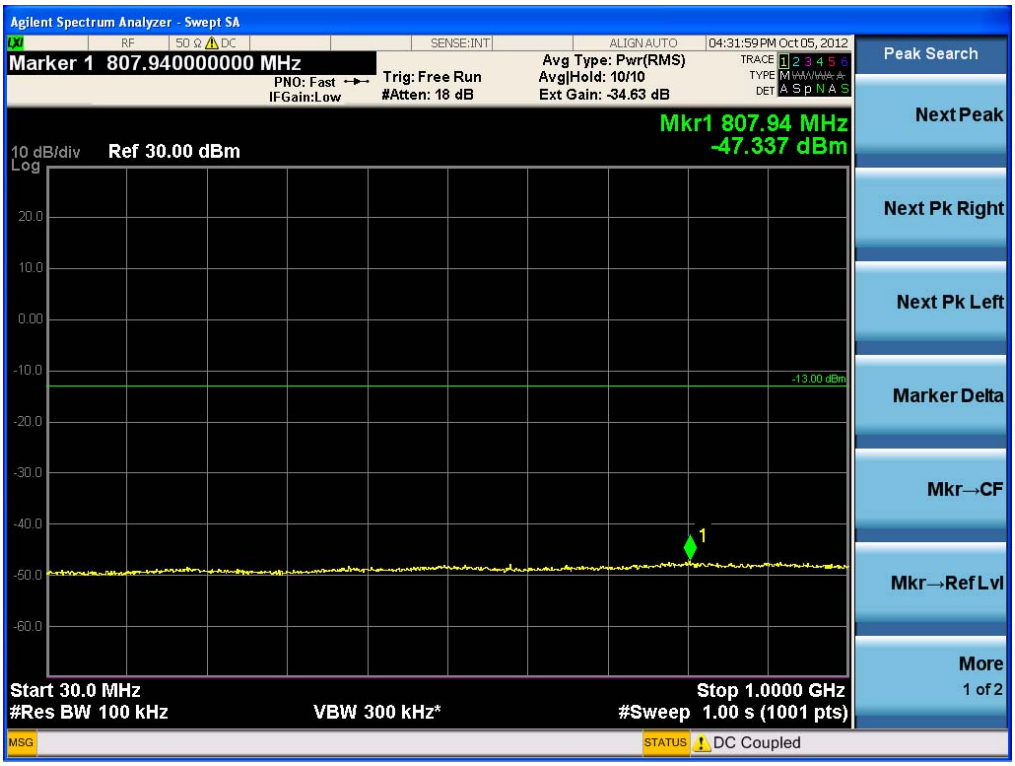
[CDMA Uplink Low]



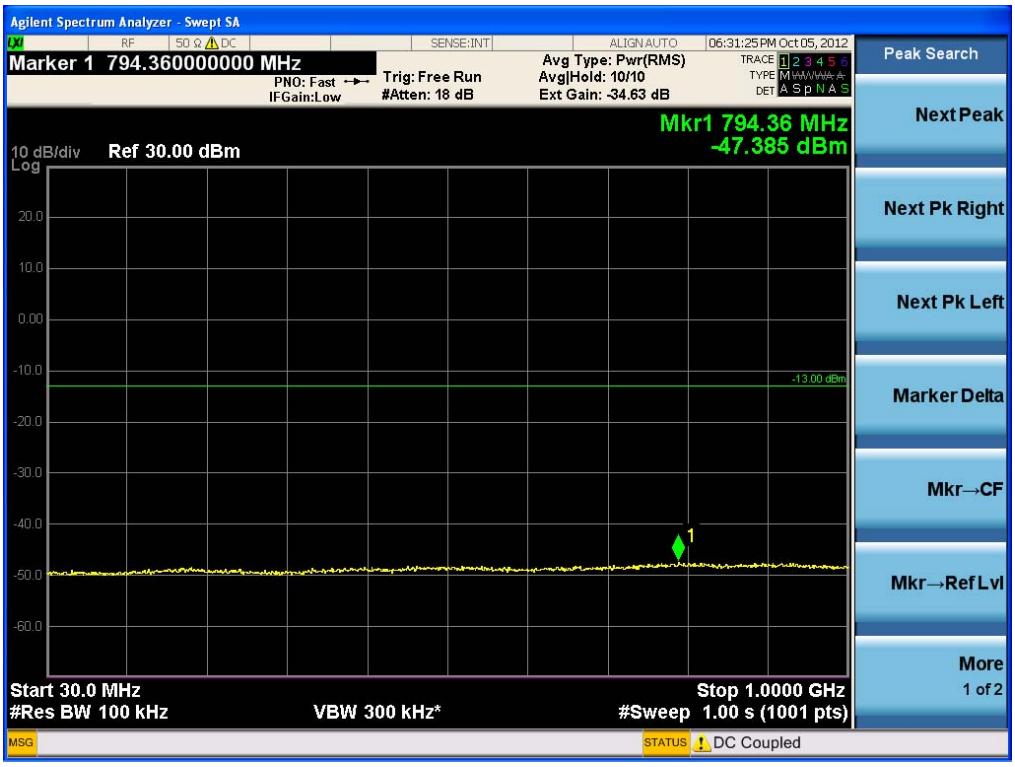
[CDMA Uplink Middle]



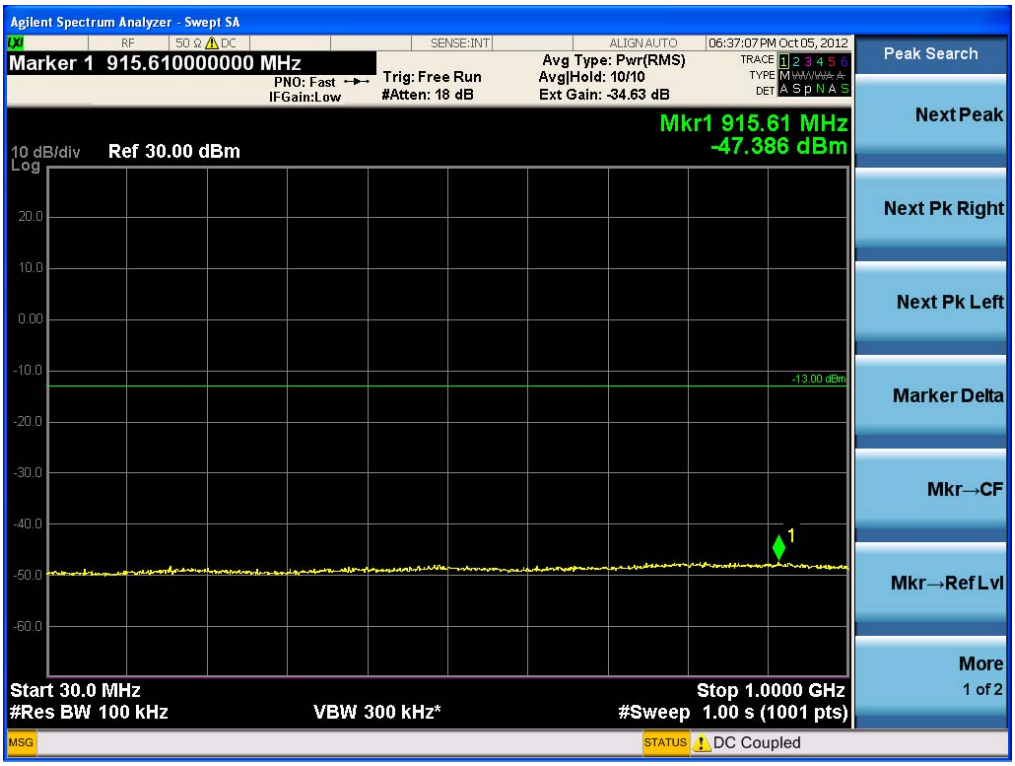
[CDMA Uplink High]



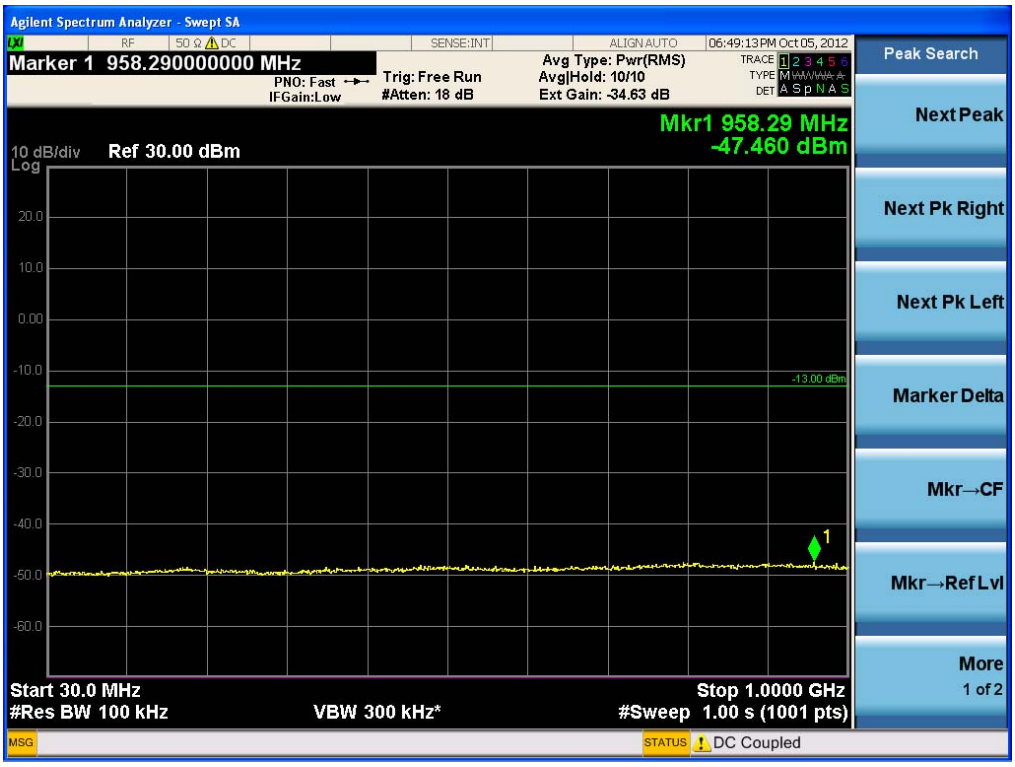
[LTE Uplink Low_5MHz]



[LTE Uplink High_5MHz]



[LTE Uplink 10MHz]



Conducted Spurious Emissions (1 GHz –26.5 GHz)

[CDMA Downlink Low]

[CDMA Downlink Middle]

[CDMA Downlink High]

[LTE Downlink Low_5MHz]

[LTE Downlink High_5MHz]

[LTE Downlink 10MHz]

[CDMA Uplink Low]

[CDMA Uplink Middle]

[CDMA Uplink High]

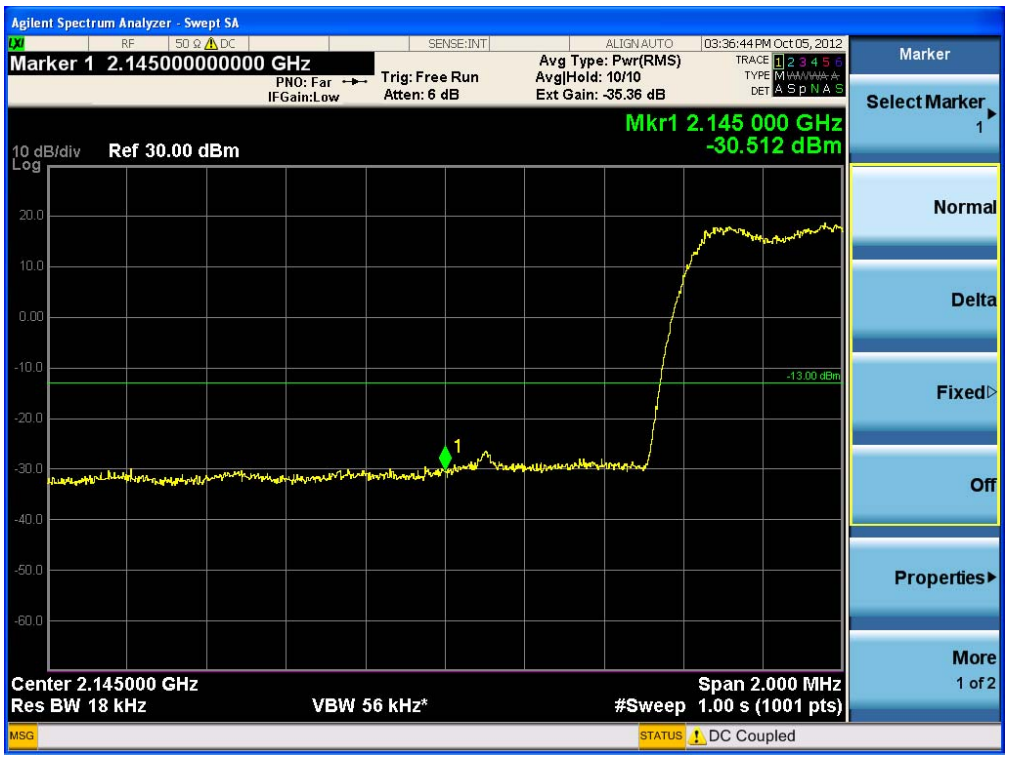
[LTE Uplink Low_5MHz]

[LTE Uplink High_5MHz]

[LTE Uplink 10MHz]

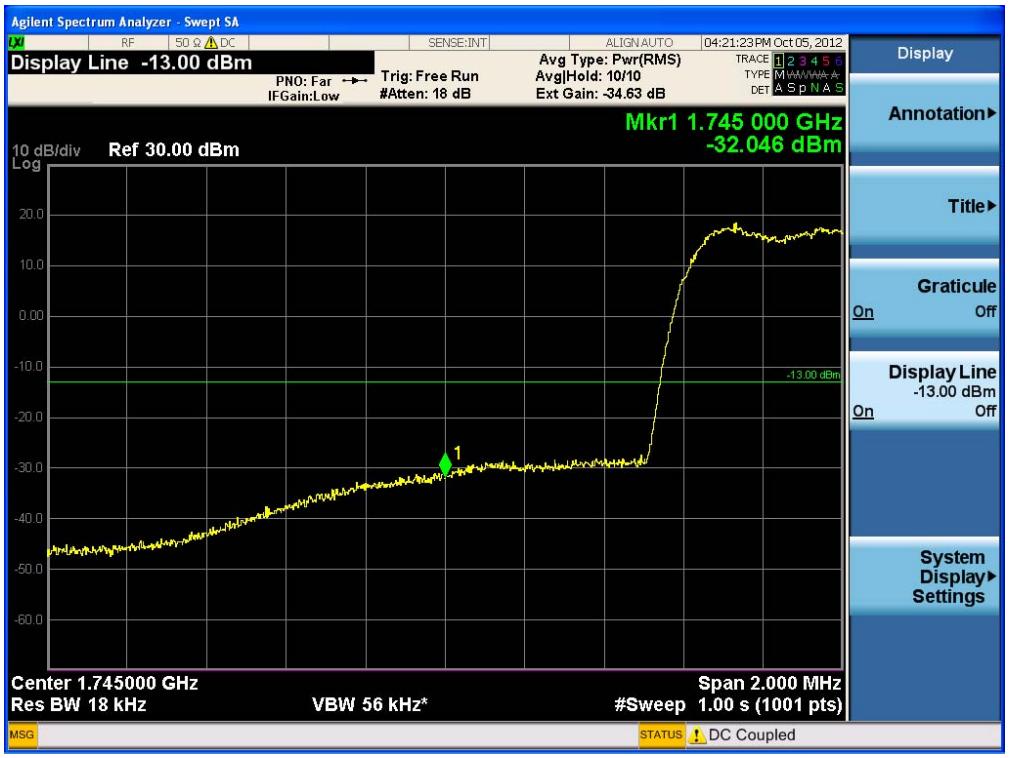
Band Edge

[CDMA Downlink Low]



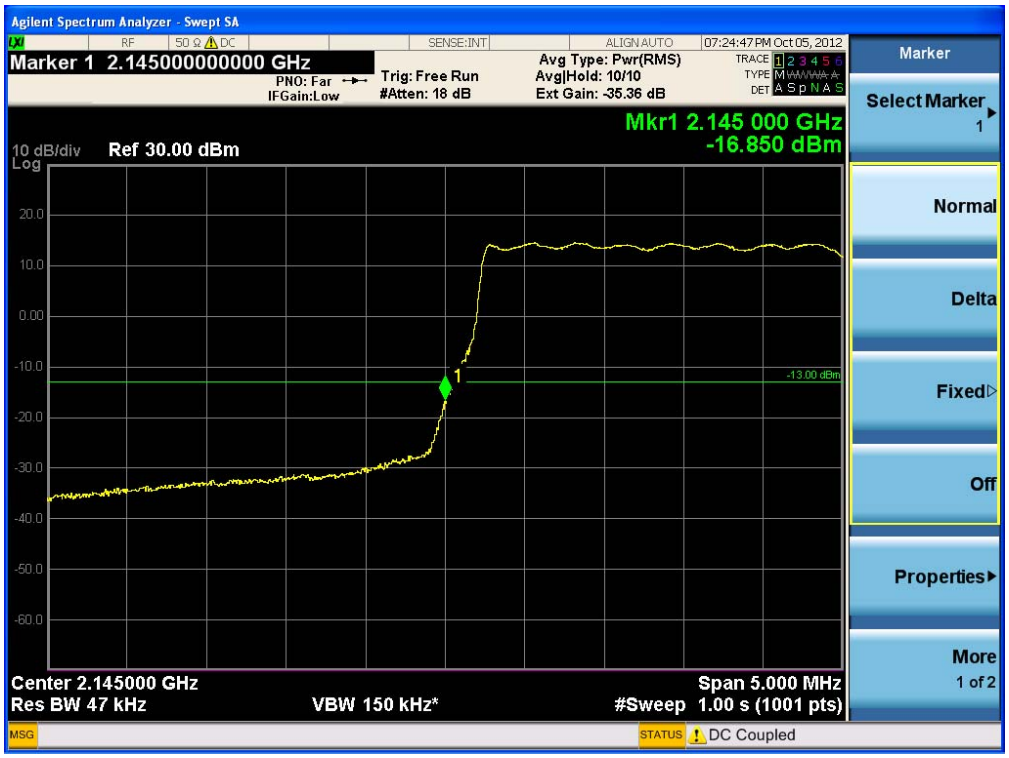
[CDMA Downlink High]

[CDMA Uplink Low]



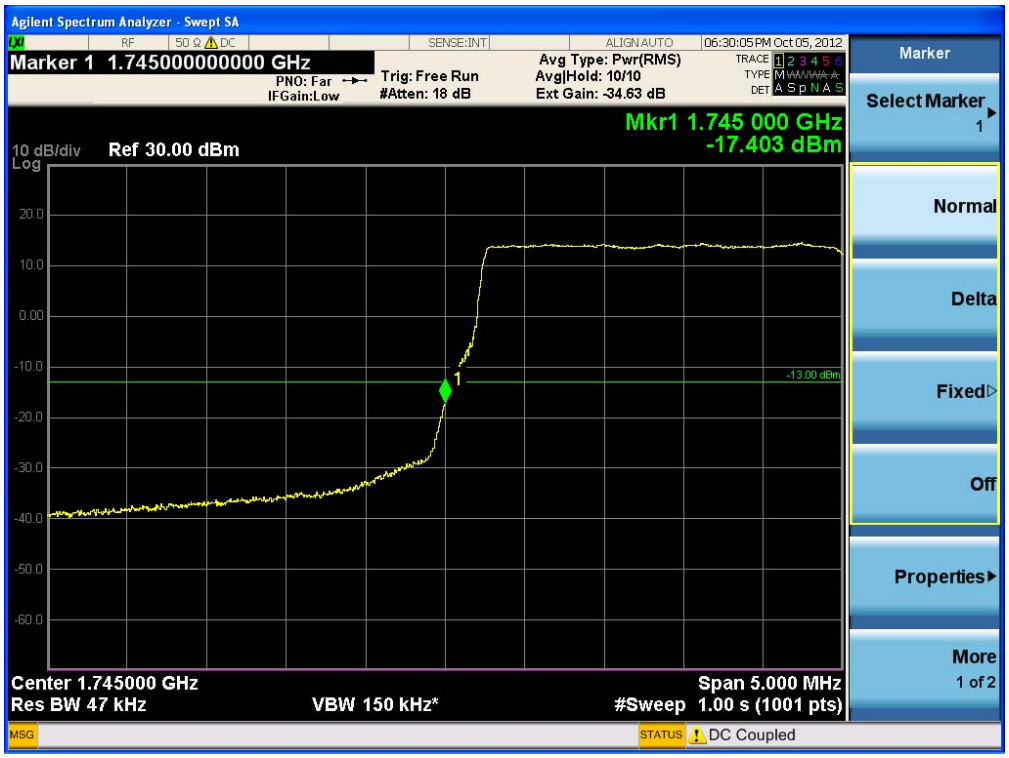
[CDMA Uplink High]

[LTE Downlink Low]



[LTE Downlink High]

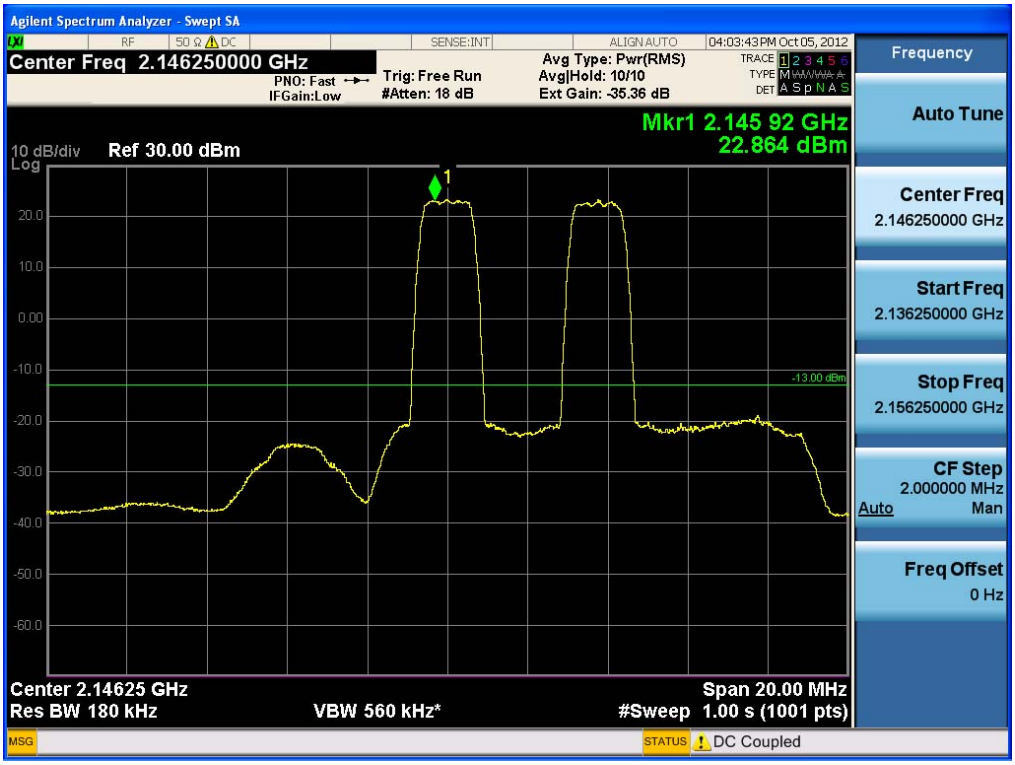
[LTE Uplink Low]



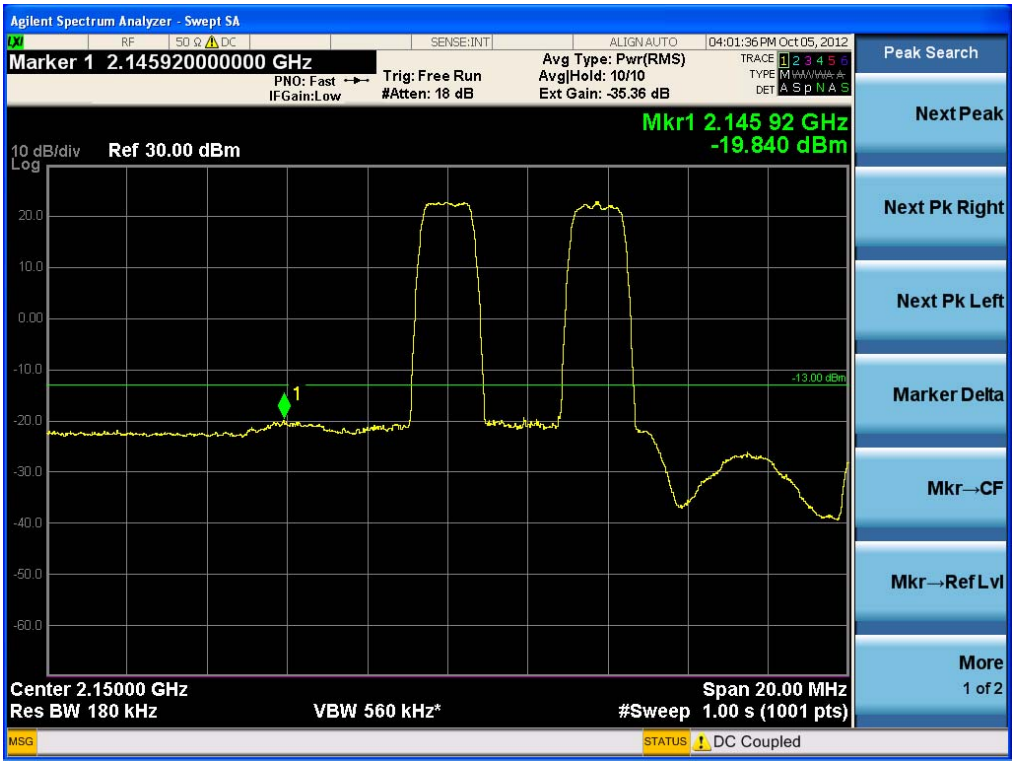
[LTE Uplink High]

Intermodulation Spurious Emissions

[CDMA Downlink Low]

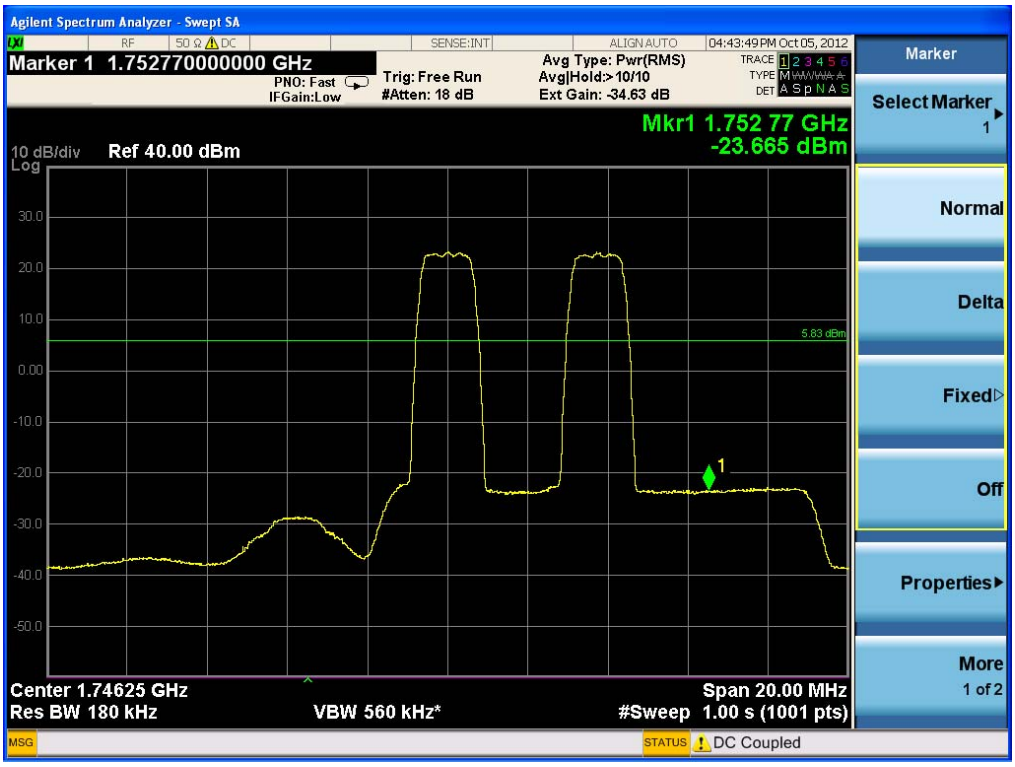


[CDMA Downlink High]

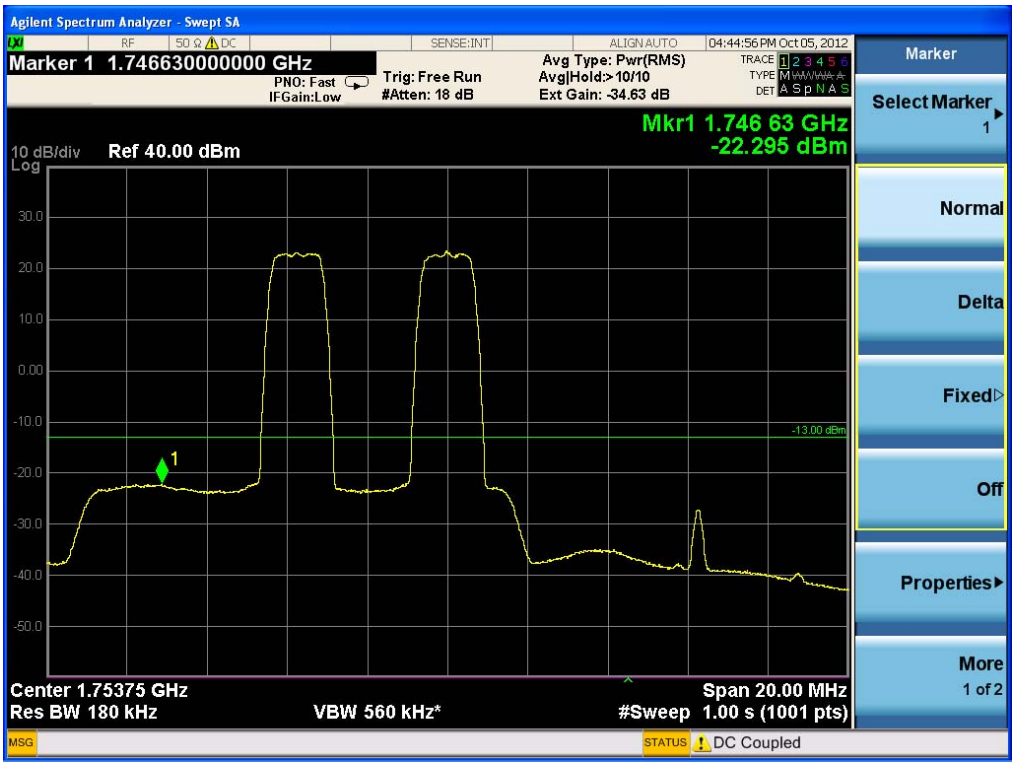


[LTE Downlink Middle]

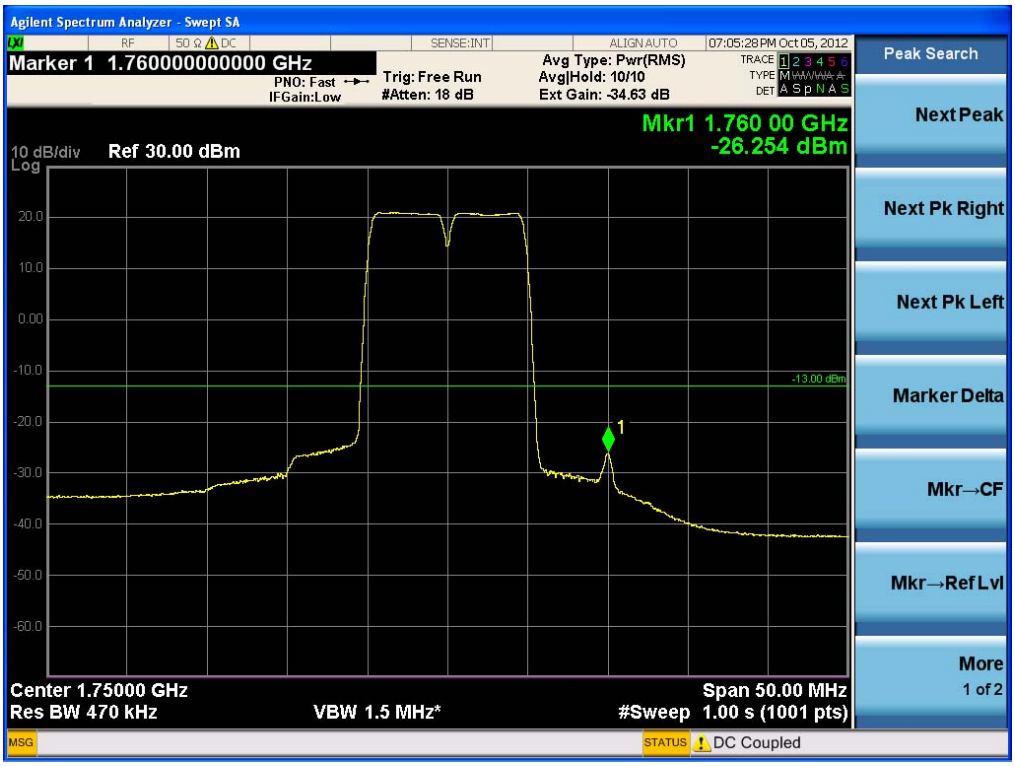
[CDMA Uplink Low]



[CDMA Uplink High]



[LTE Uplink Middle]



8. FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be Radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to The transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

§ 27.53 Emission limit (c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

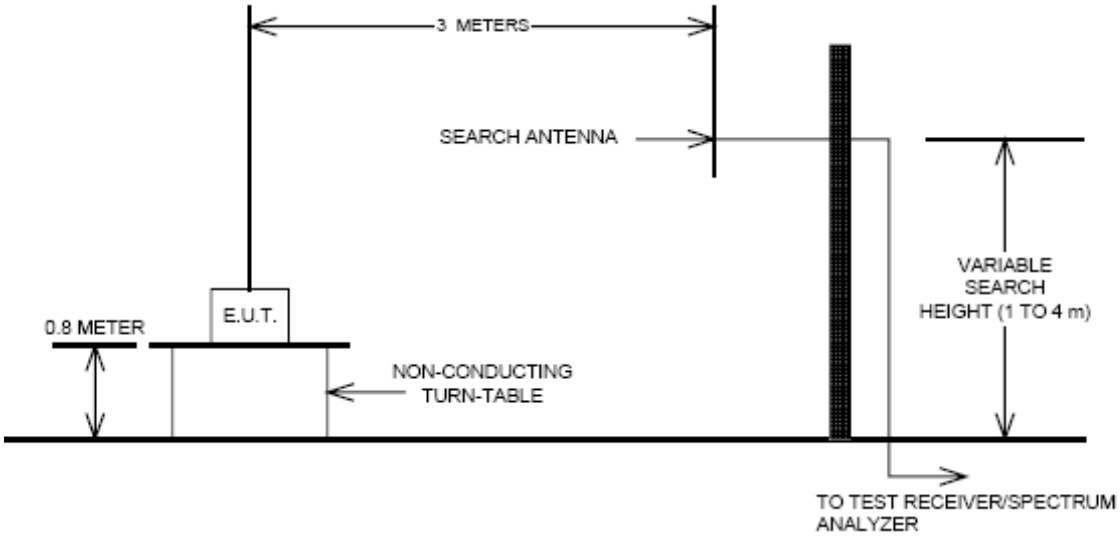
(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber.
The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360 and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried. out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.

Test Results:

.

Radiated Spurious Emissions Test Setup



Sample Calculation

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
1982.5	-83.12	10.56	5.6	-51.92	V	-46.96	33.96

EIRP = Substitude LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

-46.96 = -51.92 + 10.56 - 5.60

1) The EUT mounted on a table on 0.8 meter above test site ground level.

2) During the test, the turn table is rotated and the antenna height is also varied from 1 to 4 meters until the maximum signal is found.

3) Record the field strength meter's level.

4) Replace the EUT with antenna that is connected to a calibrated signal generator.

5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power (**EIRP**).

[Downlink]

Test Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
2146.25	1982.5	-83.12	10.56	5.6	-51.92	V	-46.96	33.96
	4133.5	-76.65	12.73	8.69	-38.12	V	-34.08	21.08
2150	2040	-82.94	10.56	5.7	-51.4	V	-46.54	33.54
	3070	-75.97	11.25	7.21	-40.1	H	-36.06	23.06
2153.75	3865	-75.6	12.62	8.42	-38.1	H	-33.90	20.90
	4307.5	-74.32	12.73	8.72	-34.3	H	-30.29	17.29

[Uplink]

Test Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	C.L	SigGen Level [dBm]	Pol.	EIRP (dBm)	Margin (dB)
1746.25	2152.5	-82.95	10.57	5.89	-50.82	H	-46.14	33.14
	3385	-77.54	12.05	7.46	-41.82	H	-37.23	24.23
1750	1660	-81.25	9.6	4.99	-51.3	H	-46.65	33.65
	3500	-76.35	12.34	7.56	-41.03	H	-35.73	22.73
1753.75	2223	-80.64	10.57	6.01	-48.1	H	-43.55	30.55
	3507.5	-74.85	12.34	7.57	-39.5	H	-34.72	23.72

9. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s): RSS-131 6.5

A band translator is essentially a repeater station and should introduce as little frequency error as possible. The frequency stability should therefore meet the objectives of the overall land mobile or cellular service for which it serves. Better frequency stability than the minimum standard cited below will therefore be required in some cases.

The frequency stability shall be within ± 1.5 parts per million (0.00015%).

Test Procedures: RSS-131 4.5

In addition, the local oscillator frequency stability of the band translator shall be reported.

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20oC and rated supply voltage.

The following temperature and supply voltage ranges apply:

(a) at 10 degree intervals of temperatures between -30oC and +50oC, and at the manufacturer's rated-supply voltage; and

(b) at +20oC temperature and ± 15% supply voltage variations.

Test Results:

Reference: 110 Vac at 20°C **Freq.** = 2150.0 MHz [Downlink]

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2149 999 990	-10.3	0.0	0.0000
	-30	2149 999 990	-10.2	0.1	0.0000
	-20	2149 999 990	-9.8	0.5	0.0002
	-10	2149 999 990	-9.7	0.6	0.0003
	0	2149 999 990	-10.2	0.1	0.0000
	+10	2149 999 990	-10.1	0.2	0.0001
	+30	2149 999 990	-9.8	0.5	0.0002
	+40	2149 999 990	-9.9	0.4	0.0002
	+50	2149 999 990	-10.0	0.3	0.0001
115%	+20	2149 999 990	-10.2	0.1	0.0000
85%	+20	2149 999 990	-10.1	0.2	0.0001

Reference: 110 Vac at 20°C **Freq.** = 1750.0 MHz [Uplink]

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1749 999 991	-8.9	0.0	0.0000
	-30	1749 999 991	-8.7	0.2	0.0001
	-20	1749 999 992	-8.5	0.4	0.0002
	-10	1749 999 991	-8.8	0.1	0.0001
	0	1749 999 991	-8.6	0.3	0.0002
	+10	1749 999 992	-8.4	0.5	0.0003
	+30	1749 999 992	-8.5	0.4	0.0002
	+40	1749 999 991	-8.6	0.3	0.0002
	+50	1749 999 991	-8.7	0.2	0.0001
115%	+20	1749 999 992	-8.5	0.4	0.0002
85%	+20	1749 999 991	-8.6	0.3	0.0002

10. RF EXPOSURE STATEMENT

1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/ f^2)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	.....	.....	f/1500	30
1500 - 100.000	.....	.....	1.0	30

F = frequency in MHz

* = Plane-wave equivalent power density

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

2-1 Limit (Down Link)

Max Peak output Power at antenna input terminal	33.11000	dBm
Max Peak output Power at antenna input terminal	2.04644	W
Prediction distance	20.00000	cm
Prediction frequency	2152.50000	MHz
Antenna Gain(typical)	3.00000	dBi
Antenna Gain(numeric)	1.99526	-
Power density at prediction frequency (S)	0.81233	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm^2

2-2 Limit (Up Link)

Max Peak output Power at antenna input terminal	33.09000	dBm
Max Peak output Power at antenna input terminal	2.03704	W
Prediction distance	50.00000	cm
Prediction frequency	1750.00000	MHz
Antenna Gain(typical)	9.00000	dBi
Antenna Gain(numeric)	7.94328	-
Power density at prediction frequency (S)	0.51505	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm^2

3. RESULTS

The power density level at 20 cm is 0.81233 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² at DownLink.

The power density level at 50 cm is 0.51505 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² at Up Link

Warning: In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, it must also have a minimum distance of 50 cm from the body during normal operation.