7. SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Operating environment

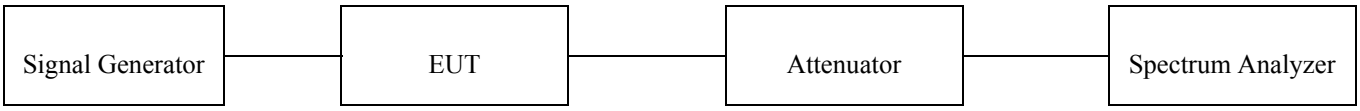
Temperature : 23 °C

Relative humidity : 50 % R.H.

7.2 Test set-up for conducted measurement

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 1 MHz and sufficient scans were taken to show any out of band emissions up to 25 GHz.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
☐ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
☐ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■	WRCT 1900/ 2200-5/40-10SSK	Wainwright Instruments GmbH	Tunable Band Reject Filter	33	Oct. 21, 2011(2Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

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EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

7.4 Test data

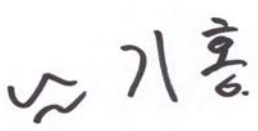
-. Test Date : February 27, 2012

-. Frequency range : 30 MHz ~ 25 GHz

-. Result : PASSED BY –24.66 dB at 1xEVDO Mode

Modulation	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
CDMA	Low	909.60	-61.14	0.85	-60.29	-13.00	-47.29
		7 825.00	-42.09	3.50	-38.59		-25.59
	Middle	865.90	-61.21	0.85	-60.36		-47.36
		7 825.00	-41.83	3.50	-38.33		-25.33
	High	673.60	-61.10	0.70	-60.40		-47.40
		7 825.00	-42.34	3.50	-38.84		-25.84
1xEVDO	Low	857.50	-60.93	0.85	-60.08	-13.00	-47.08
		7 825.00	-42.49	3.50	-38.99		-25.99
	Middle	756.40	-60.54	0.75	-59.79		-46.79
		7 825.00	-41.88	3.50	-38.38		-25.38
	High	861.70	-61.37	0.85	-60.52		-47.52
		7 825.00	-41.16	3.50	-37.66		-24.66
WCDMA	Low	976.80	-61.03	0.90	-60.13	-13.00	-47.13
		7 825.00	-42.06	3.50	-38.56		-25.56
	Middle	757.90	-60.11	0.75	-59.36		-46.36
		7 825.00	-41.83	3.50	-38.33		-25.33
	High	978.20	-61.26	0.90	-60.36		-47.36
		7 825.00	-42.26	3.50	-38.76		-25.76
LTE	Low	687.70	-60.75	0.70	-60.05	-13.00	-47.05
		7 825.00	-41.93	3.50	-38.43		-25.43
	Middle	920.70	-61.36	0.85	-60.51		-47.51
		7 825.00	-42.00	3.50	-38.50		-25.50
	High	853.30	-61.00	0.85	-60.15		-47.15
		7 825.00	-41.93	3.50	-38.43		-25.43

According to Part 27, out of band emission shall be attenuated by 43 + 10 log (P) dBc, equates to -13.0 dBm.



Tested by: Ki-Hong, Nam / Project Engineer

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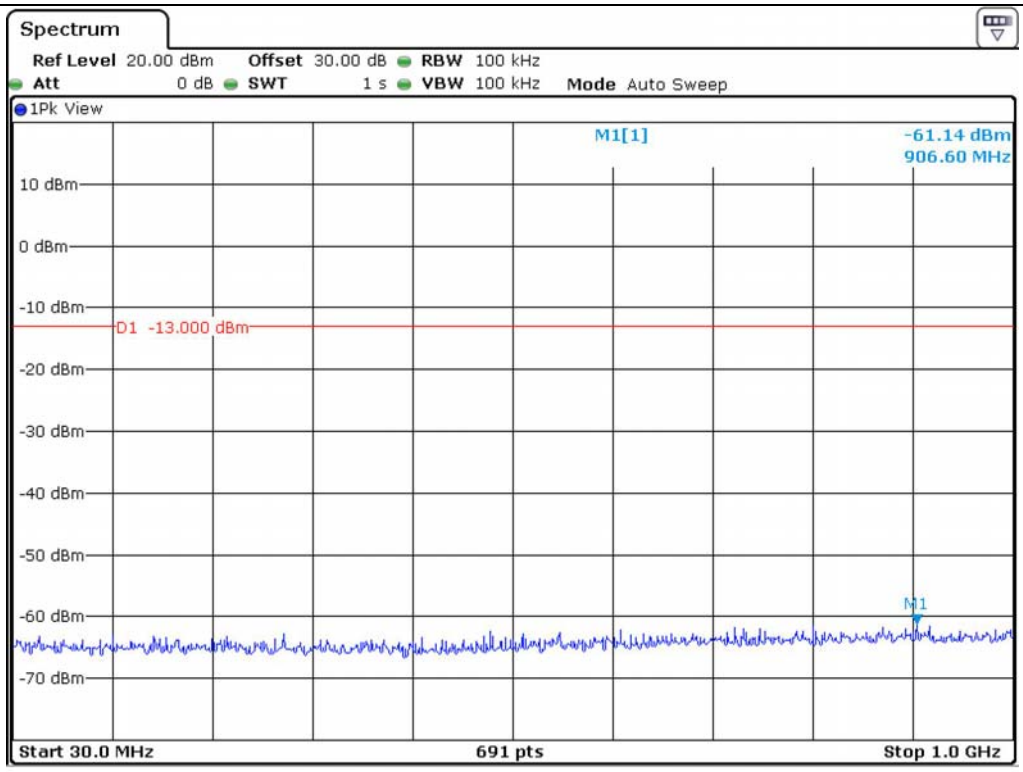
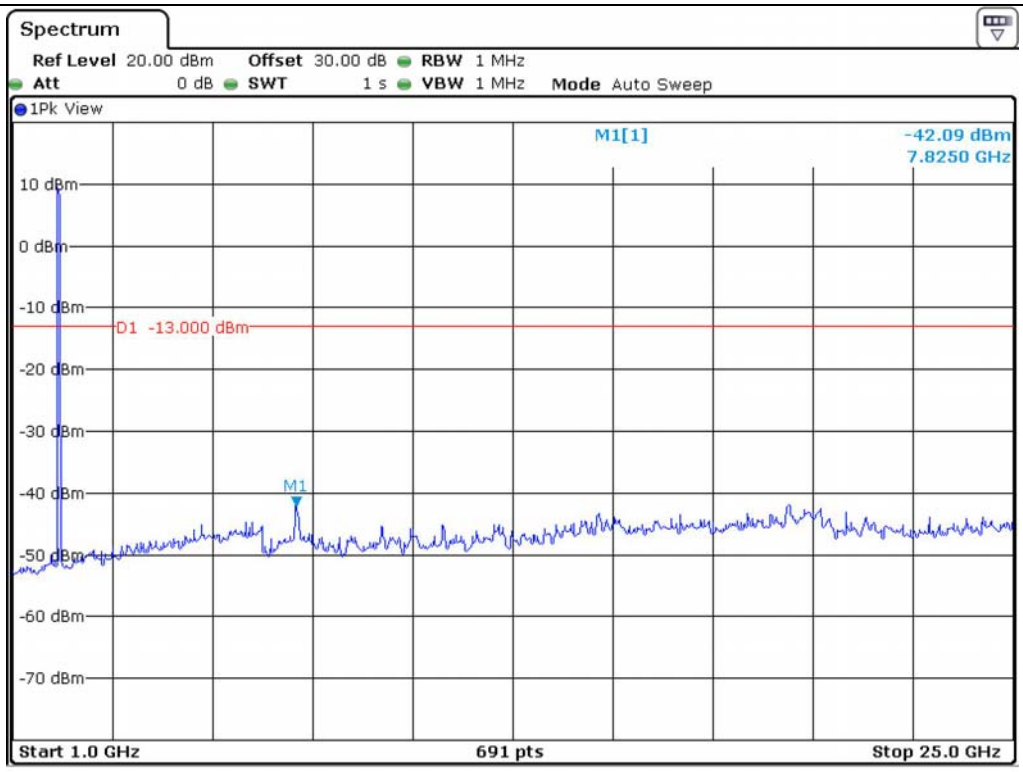


CDMA – Low Channel



CDMA – Low Channel

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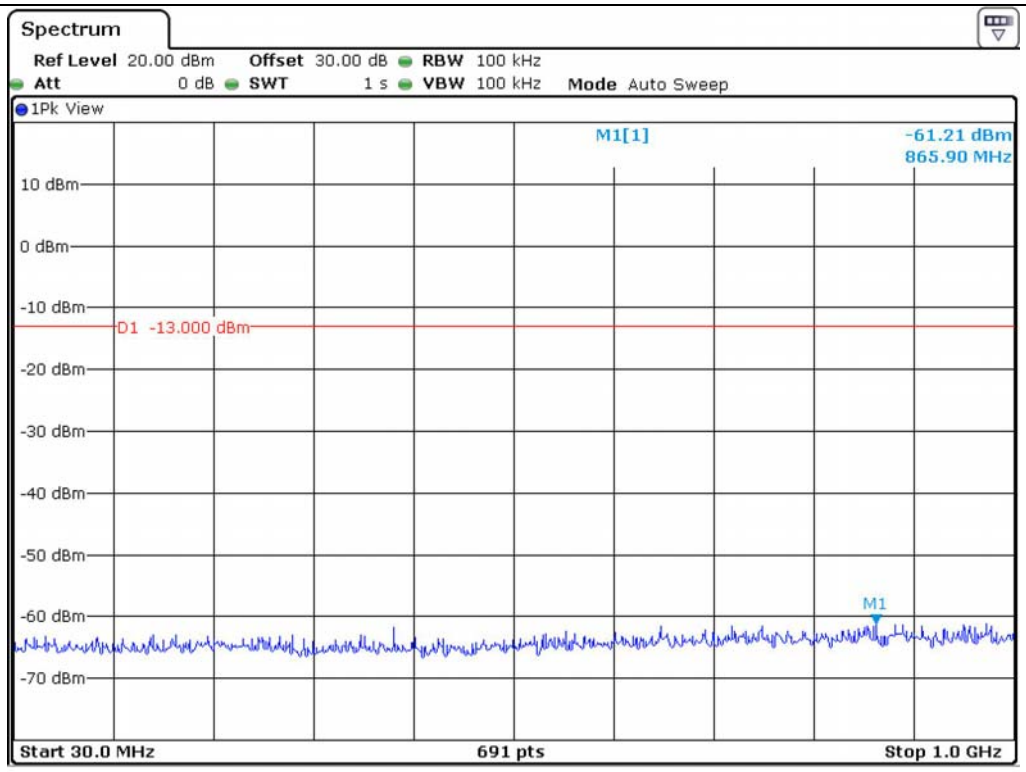
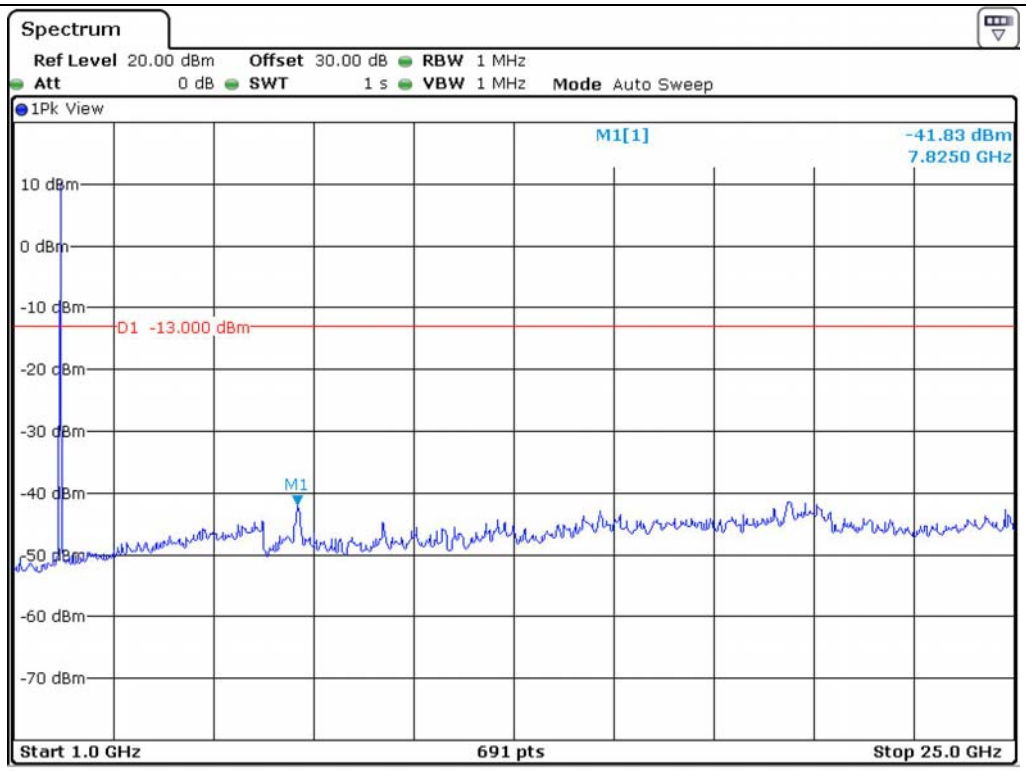


CDMA – Middle Channel



CDMA – Middle Channel

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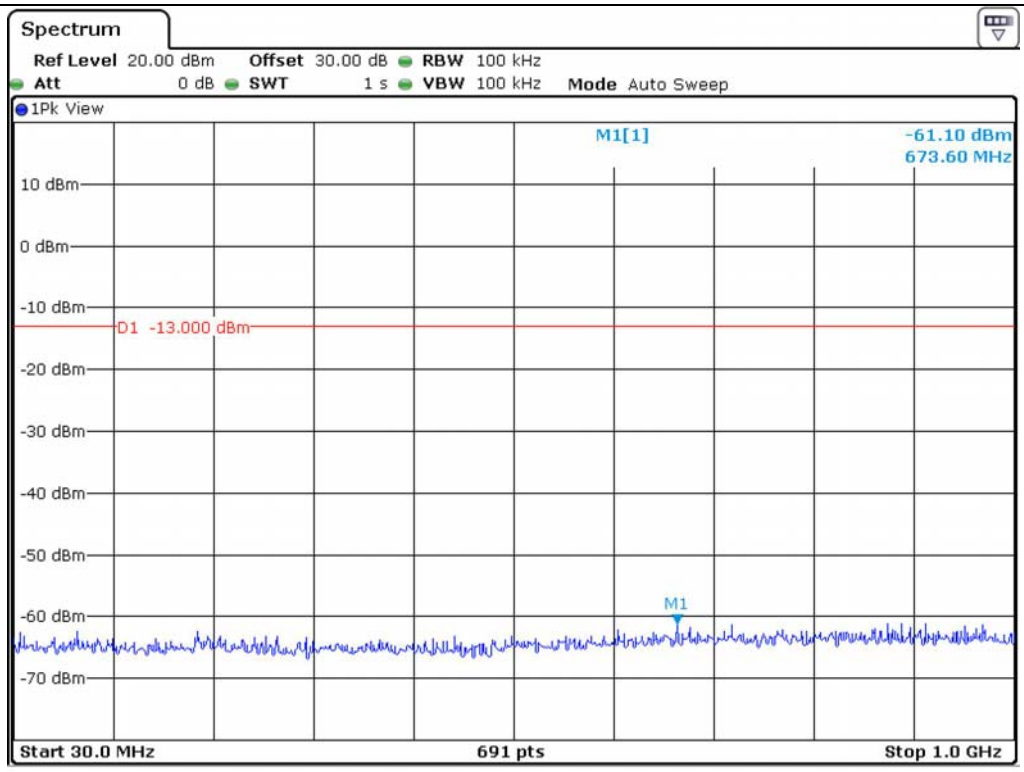
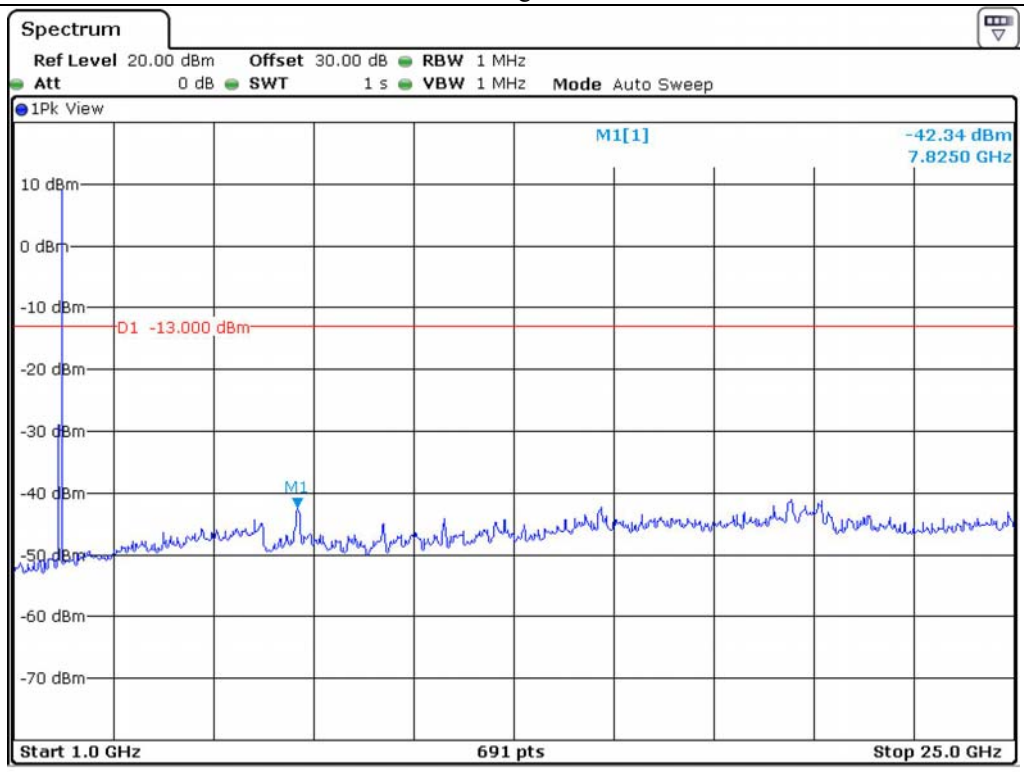


CDMA – High Channel



CDMA – High Channel

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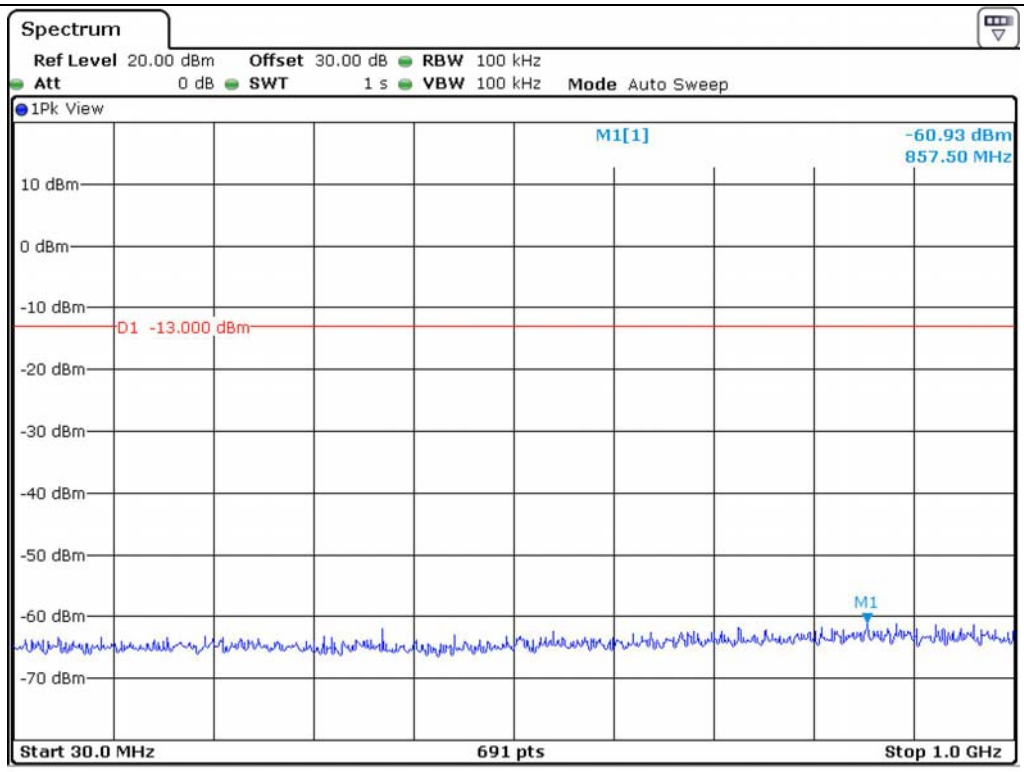
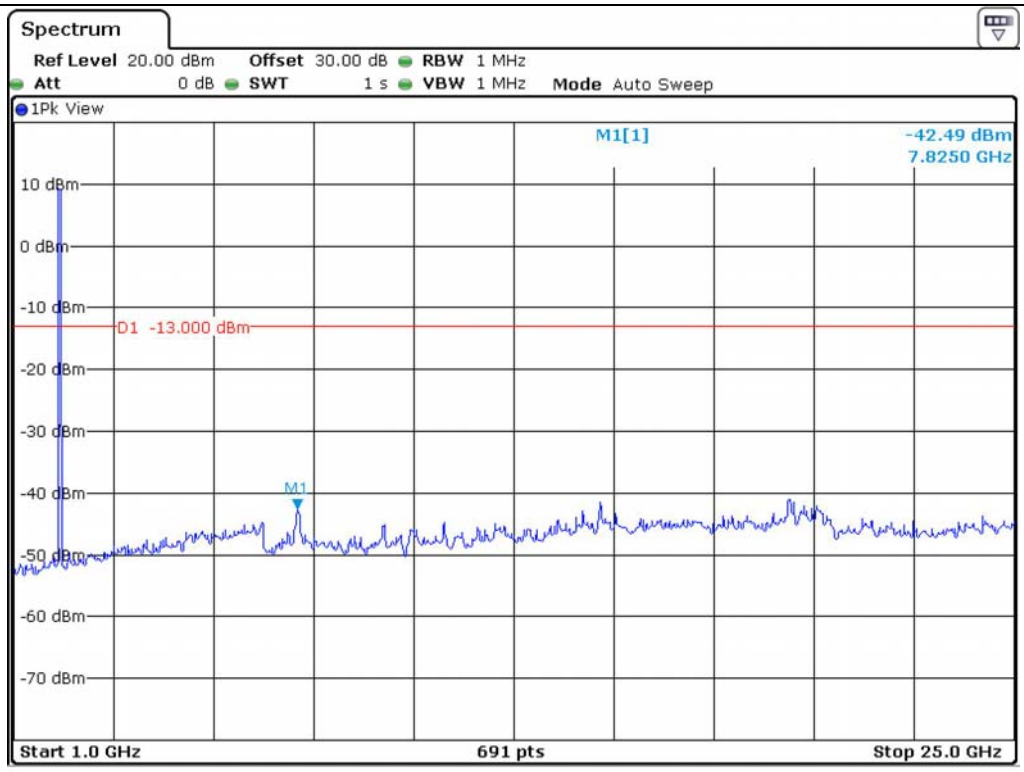


1xEVDO – Low Channel



1xEVDO – Low Channel

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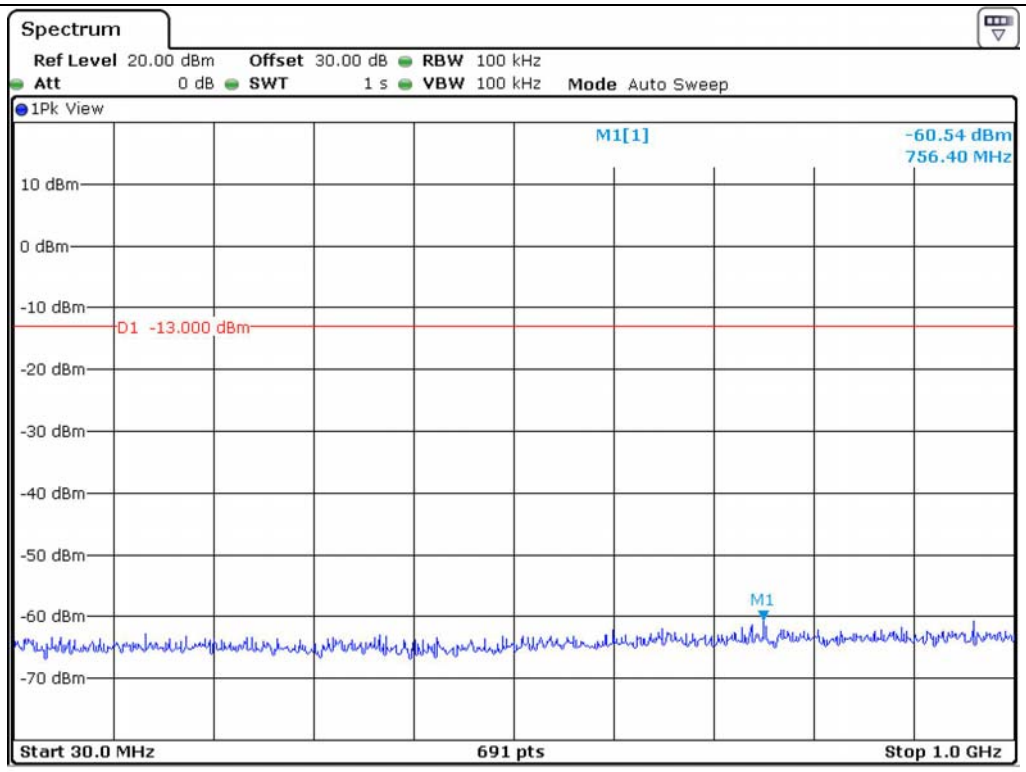
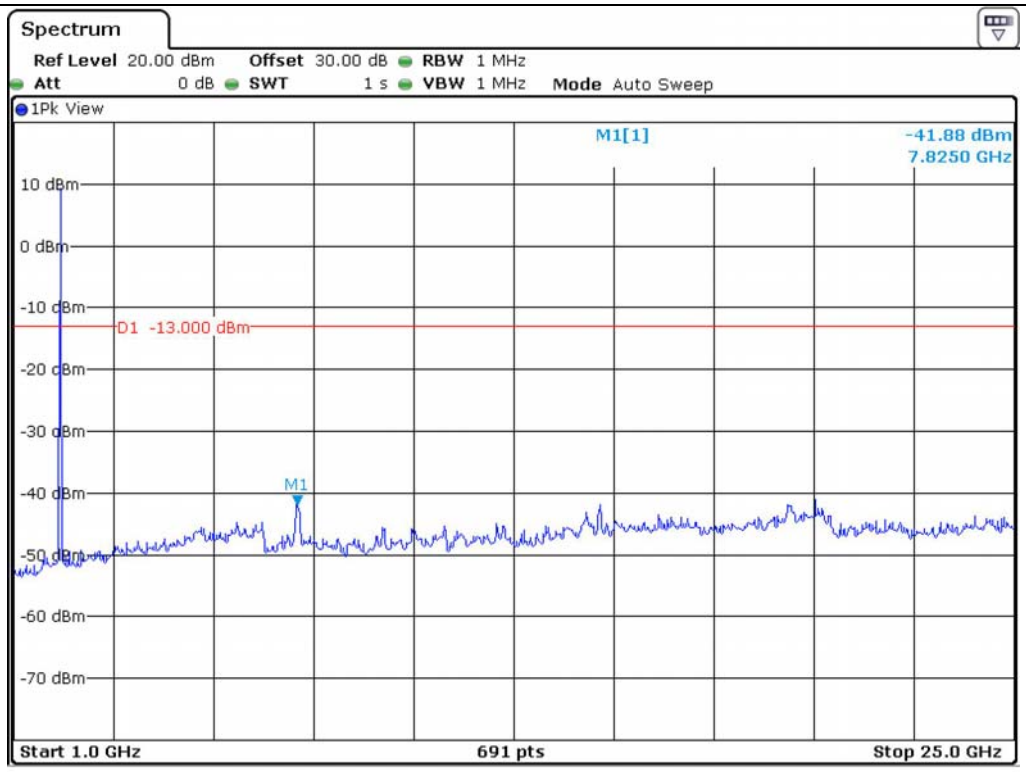


1xEVDO – Middle Channel



1xEVDO – Middle Channel

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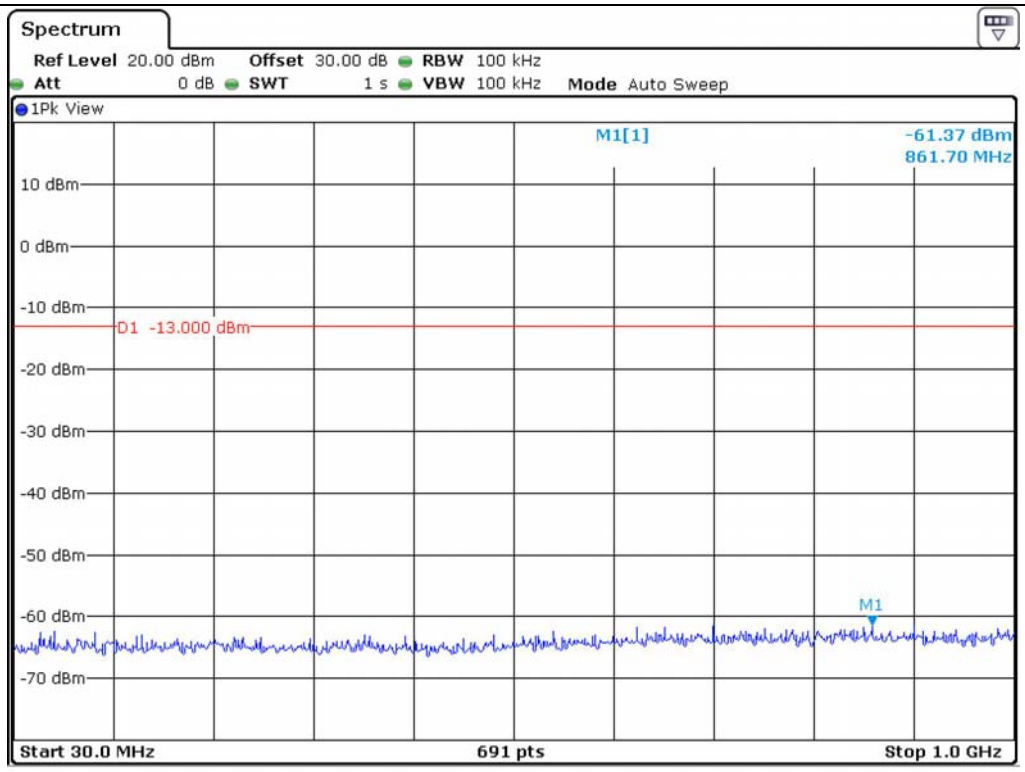
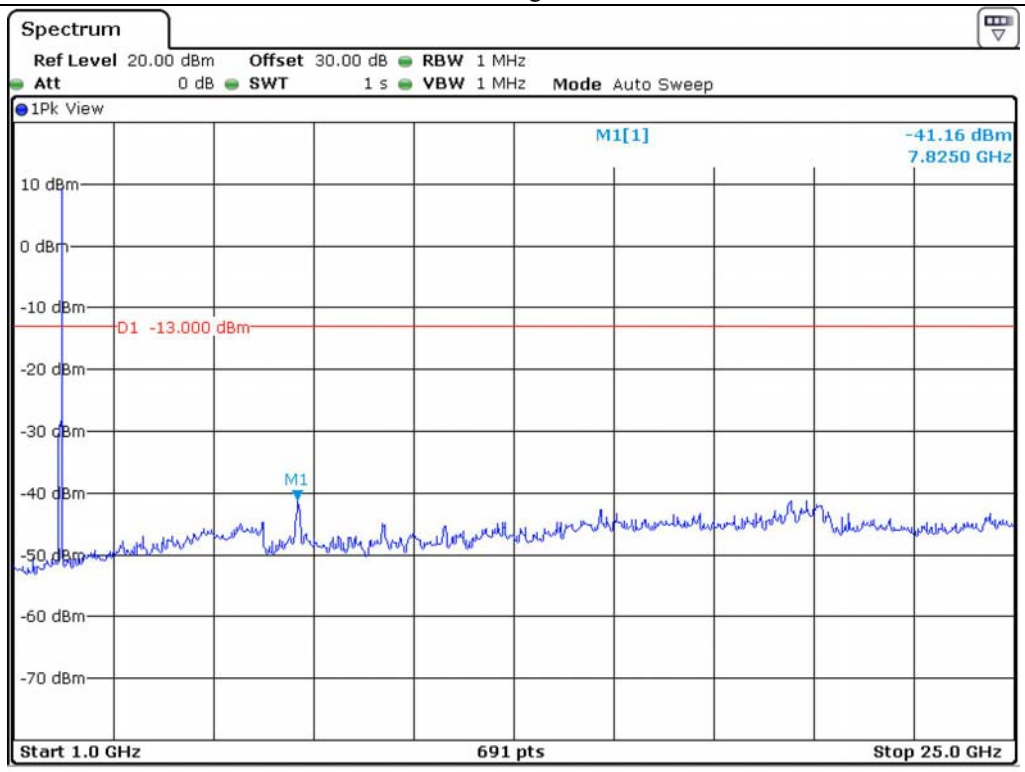


1xEVDO – High Channel



1xEVDO – High Channel

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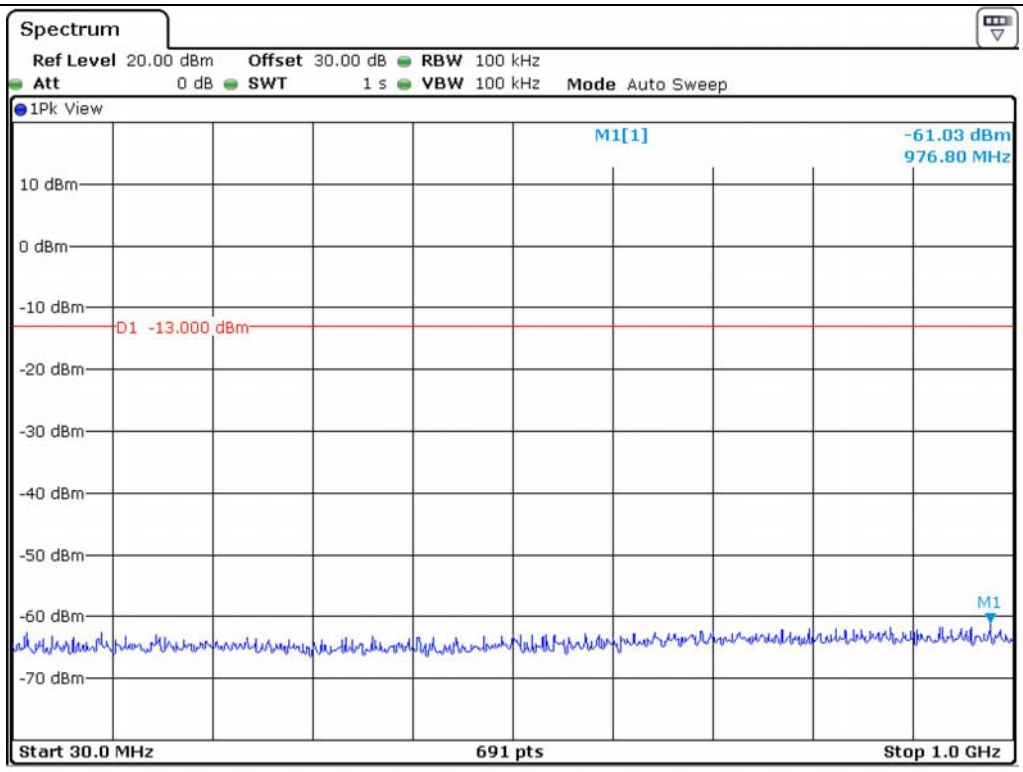
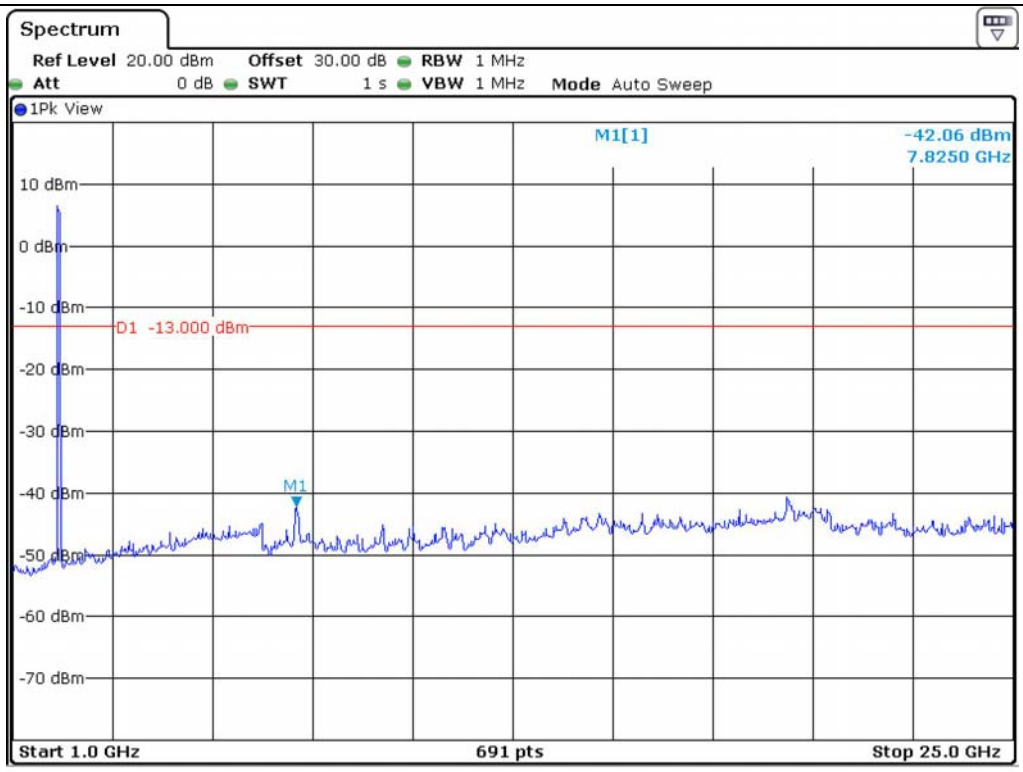


WCDMA – Low Channel



WCDMA – Low Channel

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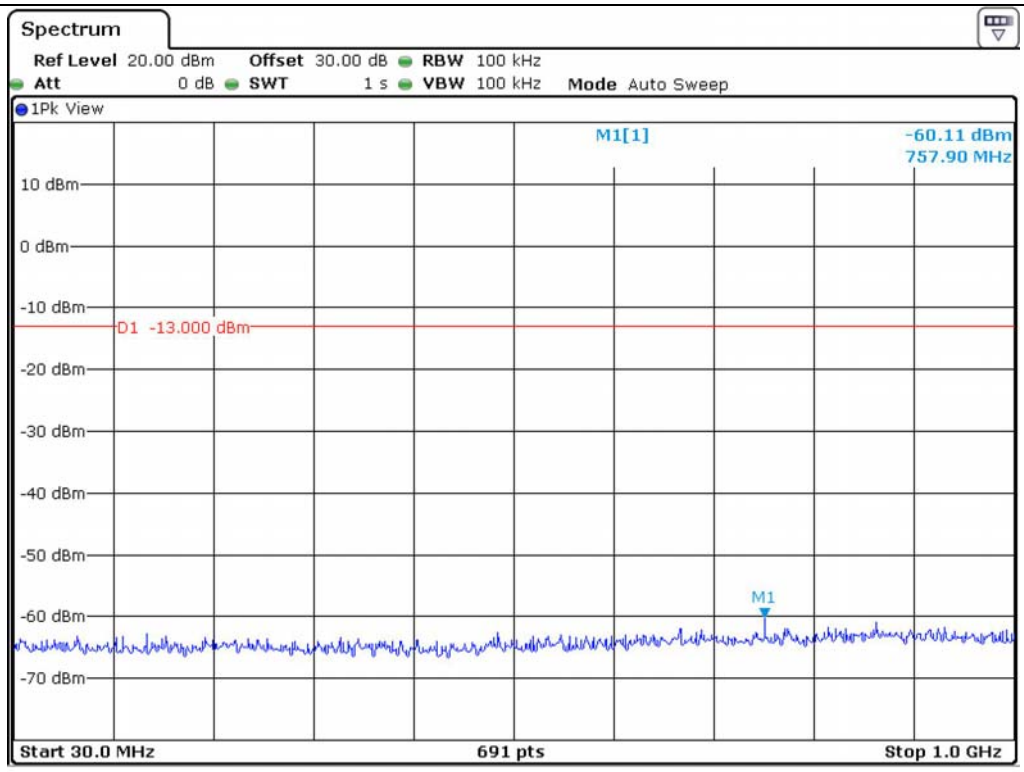
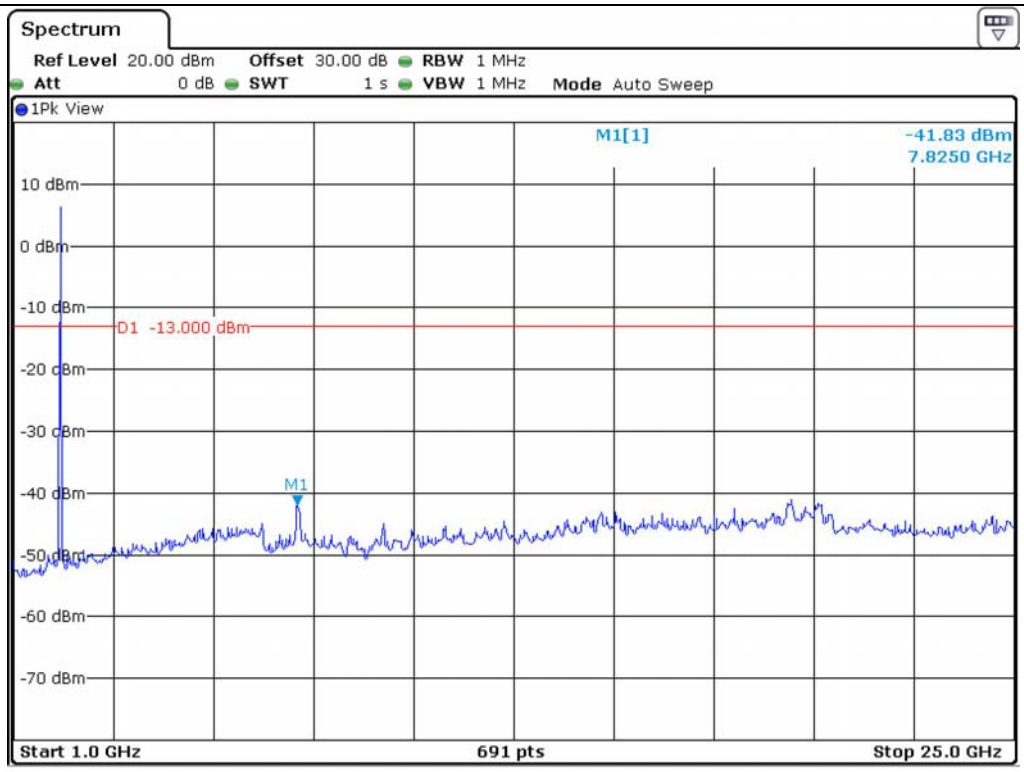


WCDMA – Middle Channel



WCDMA – Middle Channel

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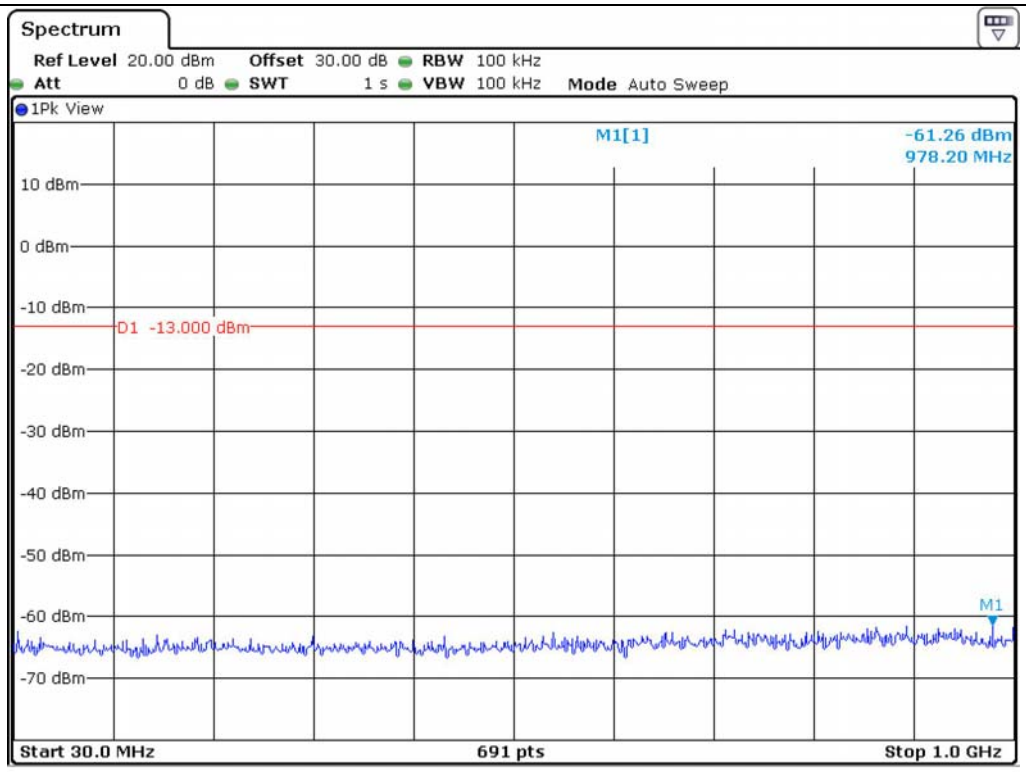
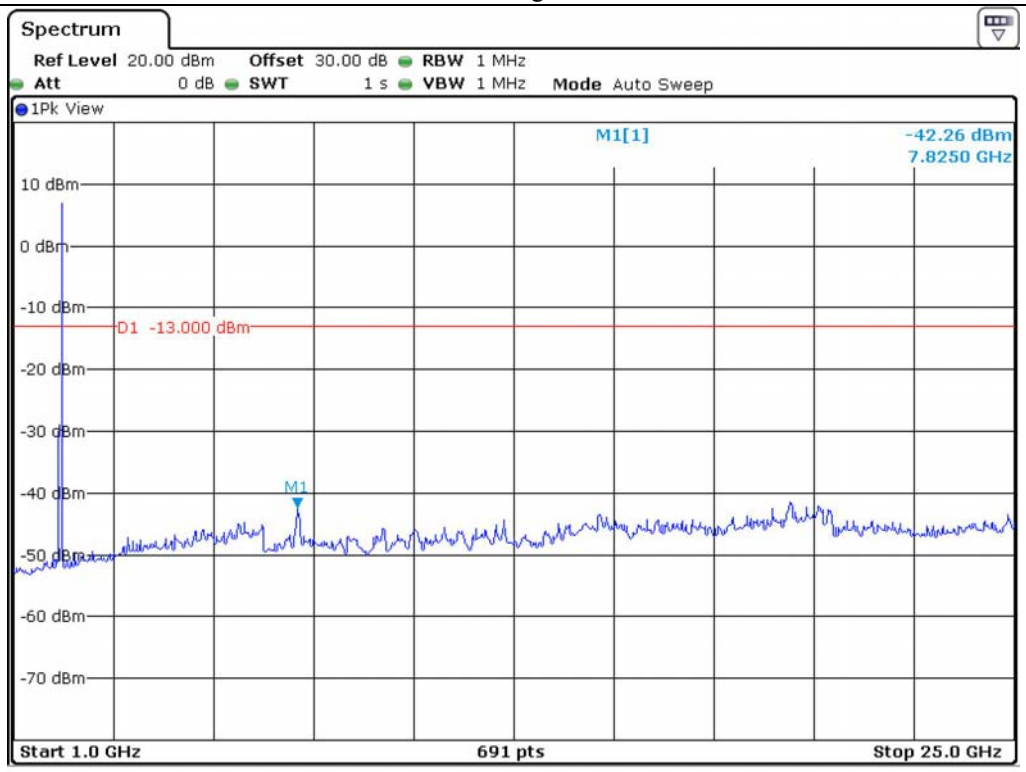


WCDMA – High Channel



WCDMA – High Channel

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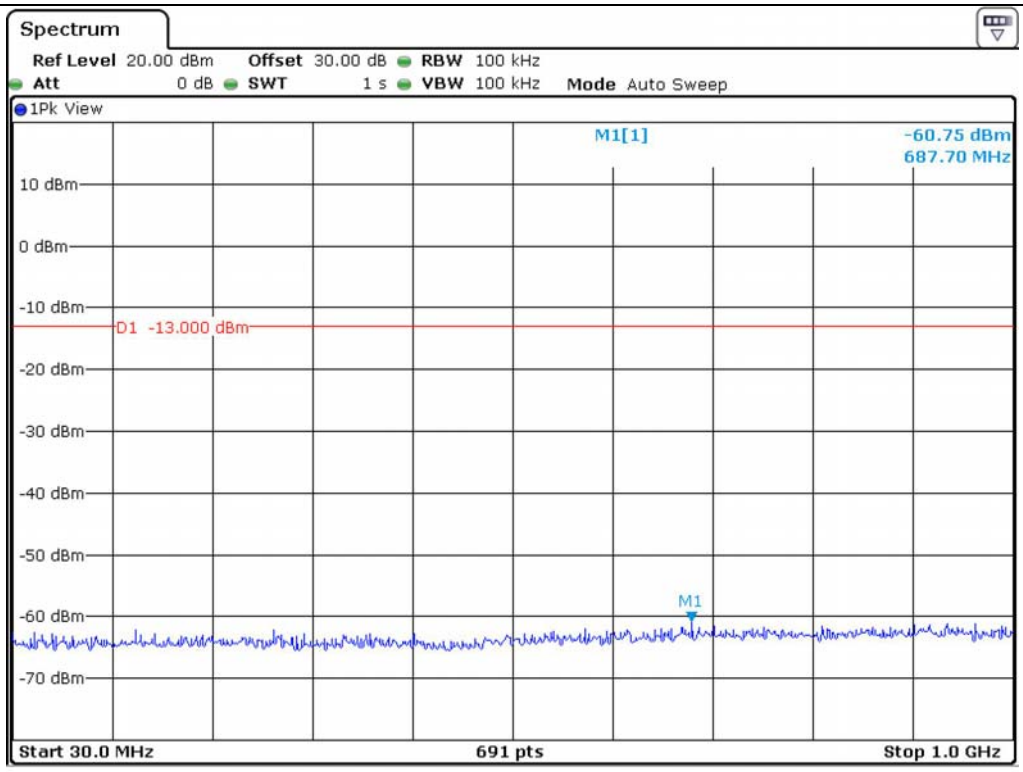
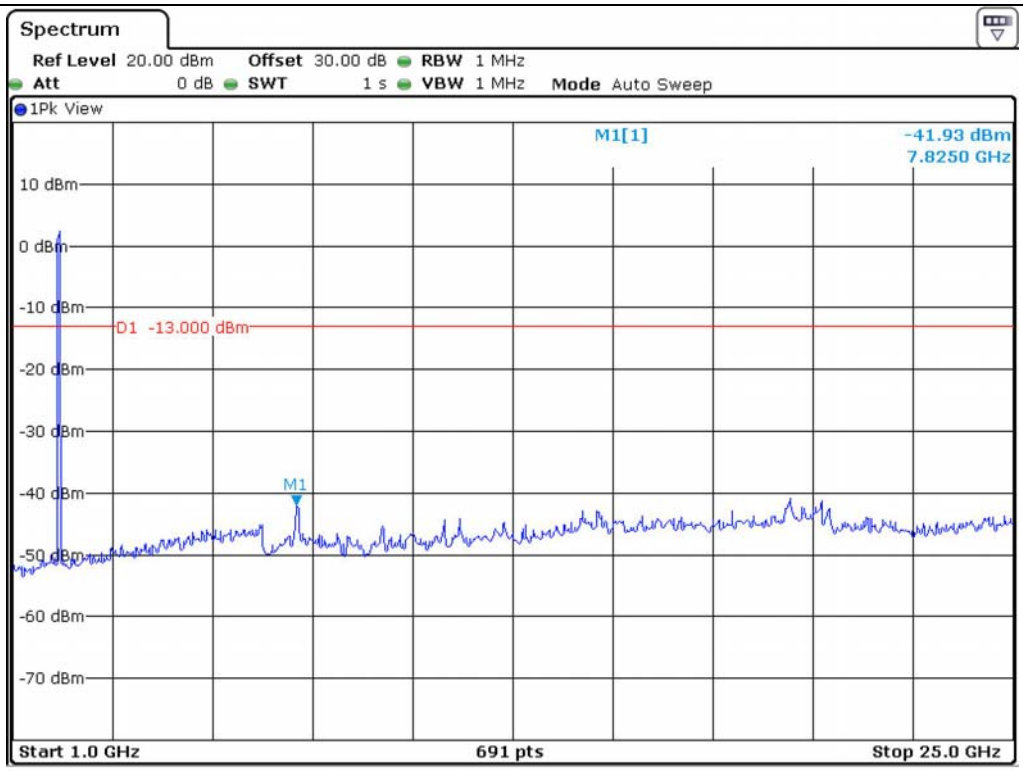


LTE – Low Channel



LTE – Low Channel

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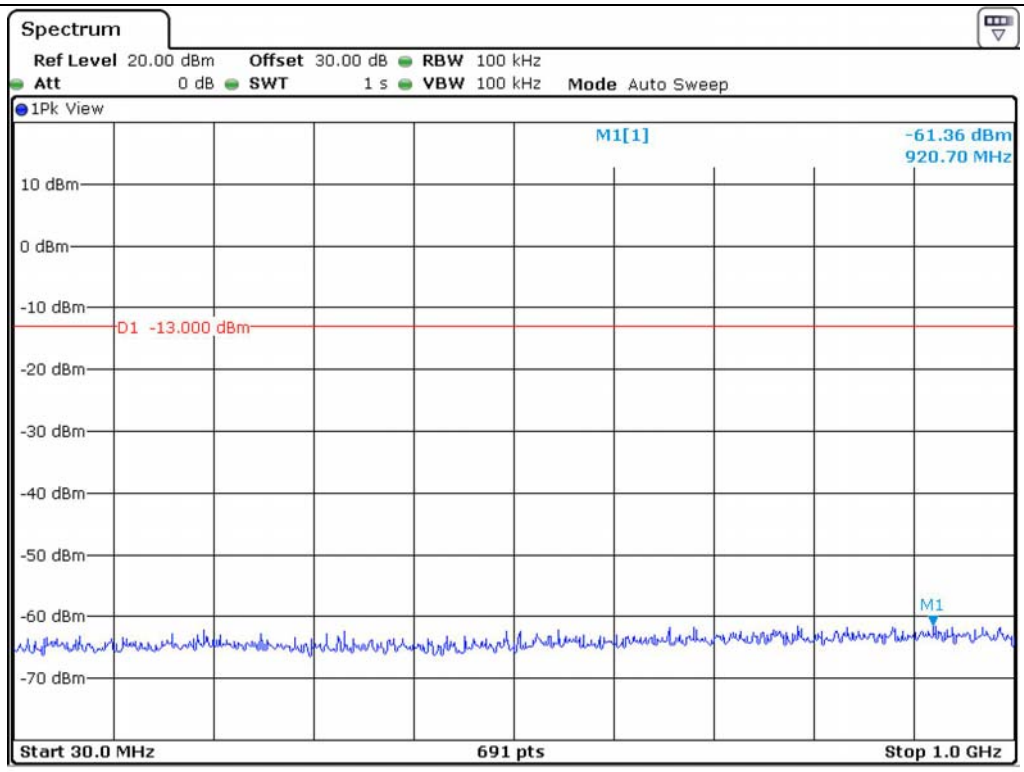
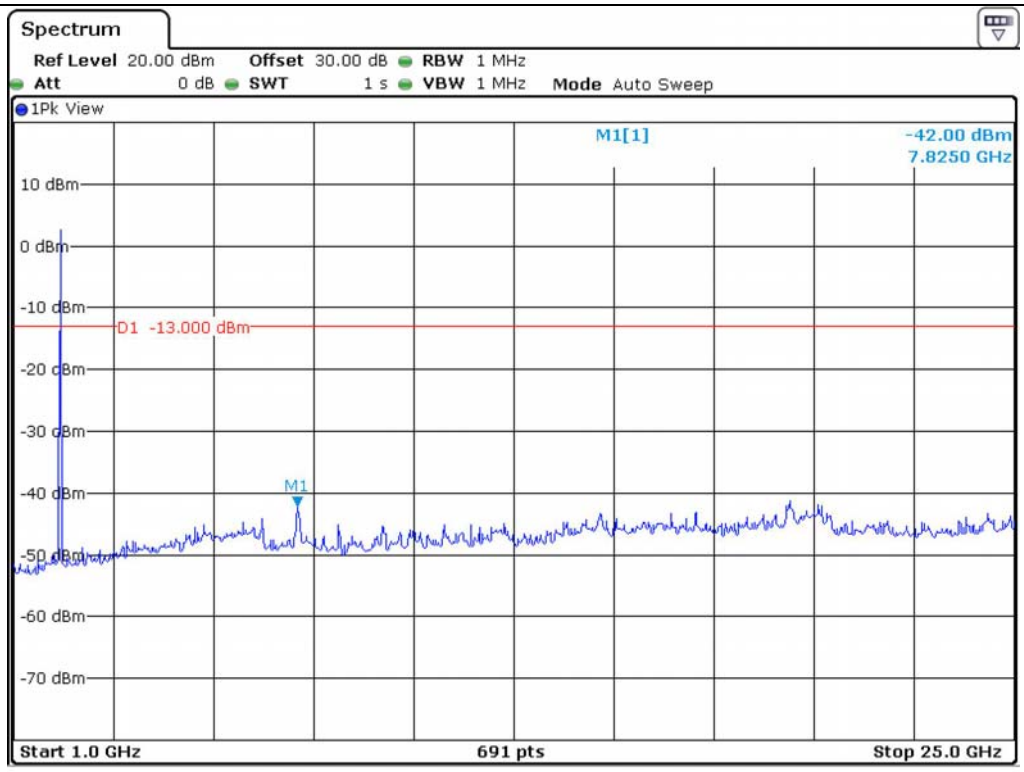


LTE – Middle Channel



LTE – Middle Channel

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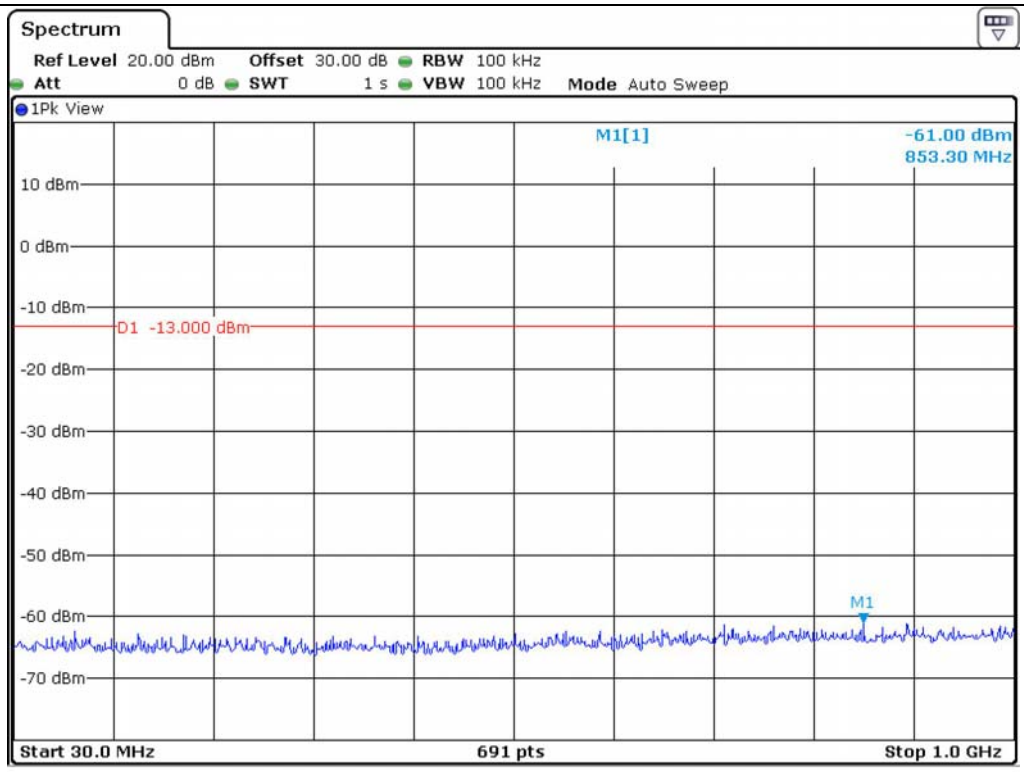
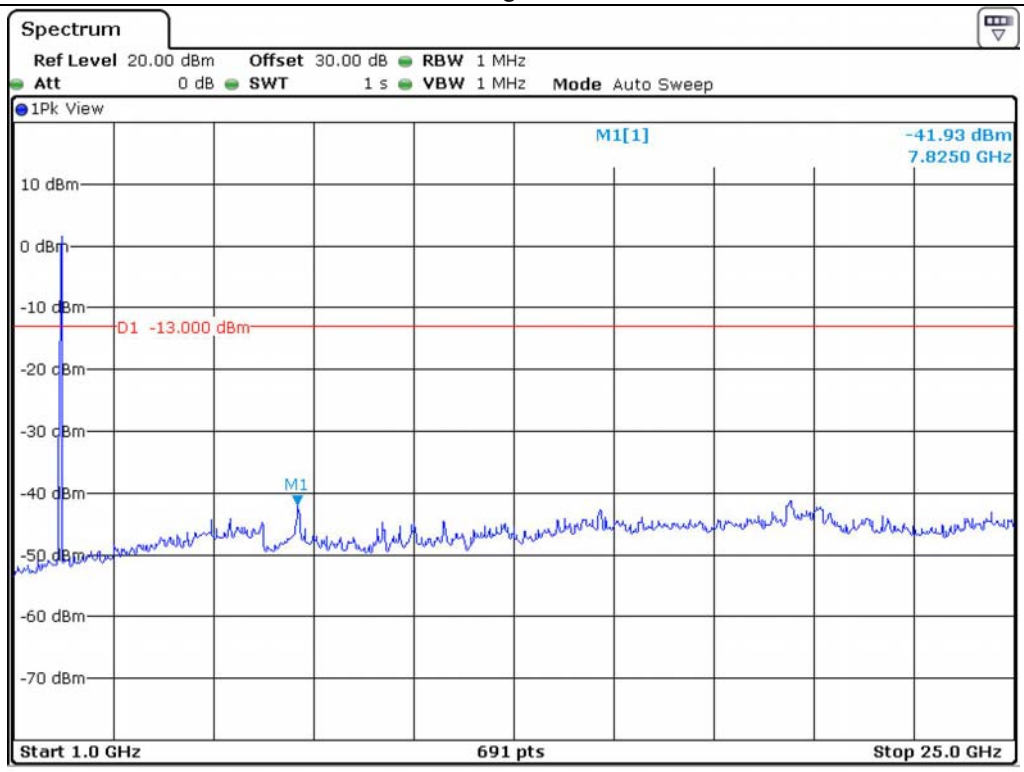


LTE – High Channel



LTE – High Channel

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8. BAND EDGE MEASUREMENT

8.1 Operating environment

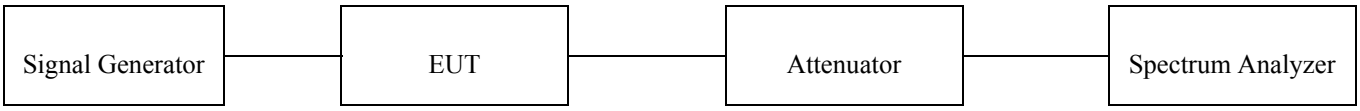
Temperature : 23 °C

Relative humidity : 50 % R.H.

8.2 Test set-up for conducted measurement

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

The resolution bandwidth and video bandwidth of the spectrum analyzer was set according to the regulation and sufficient scans were taken to show any out of band emissions.



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐-	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
☐ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
☐ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

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8.4 Test data

-. Test Date : February 27, 2012

-. Result : PASSED BY –9.30 dB at WCDMA Mode

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)	Margin (dB)
CDMA	Low	2 110.000	-32.30	-13.00	-19.30
	High	2 155.000	-30.62		-17.62
1xEVDO	Low	2 110.000	-31.87		-18.87
	High	2 155.000	-30.20		-17.20
WCDMA	Low	2 110.000	-22.30		-9.30
	High	2 155.000	-22.58		-9.58
WCDMA	Low	2 110.000	-27.40		-14.40
	High	2 155.000	-28.42		-15.42

According to Part 27, out of band emission shall be attenuated by 43 + 10 log (P) dBc, equates to -13.0dBm.

Tested by: Ki-Hong, Nam / Senior Engineer

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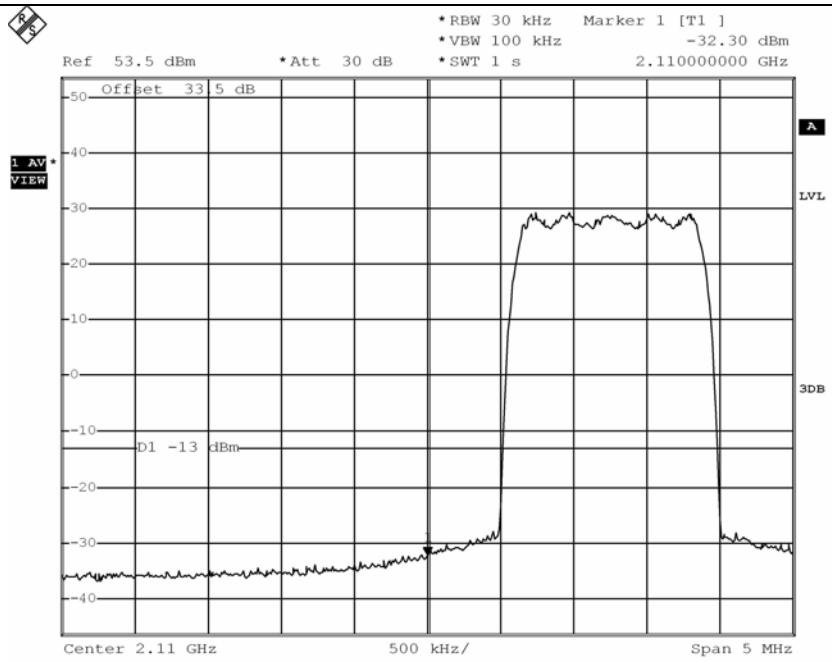
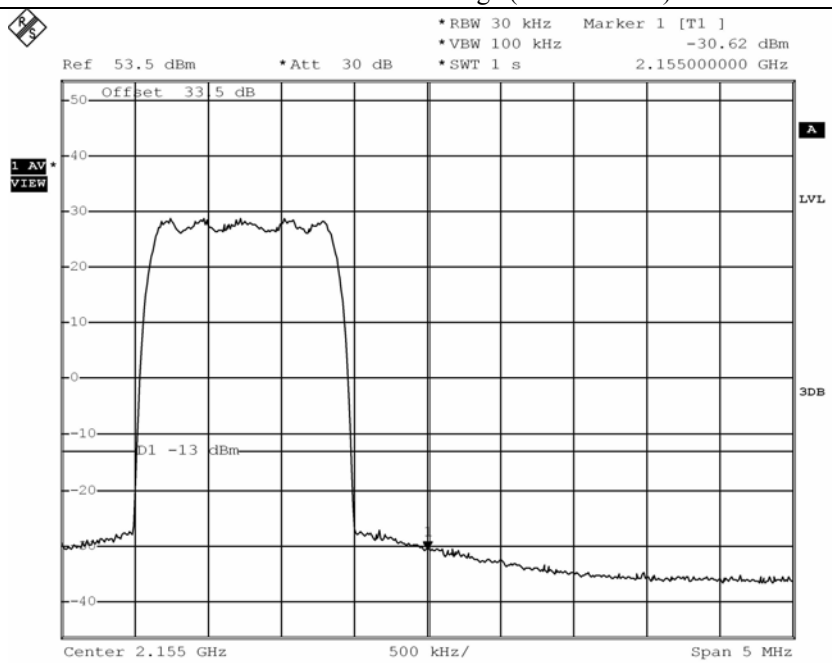


CDMA – Band Edge (Low Channel)



CDMA – Band Edge (High Channel)

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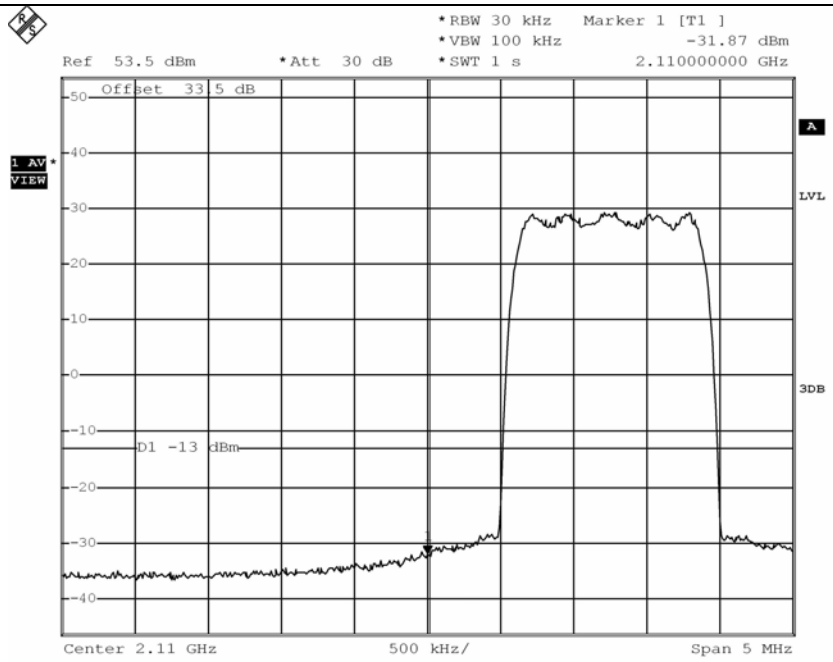
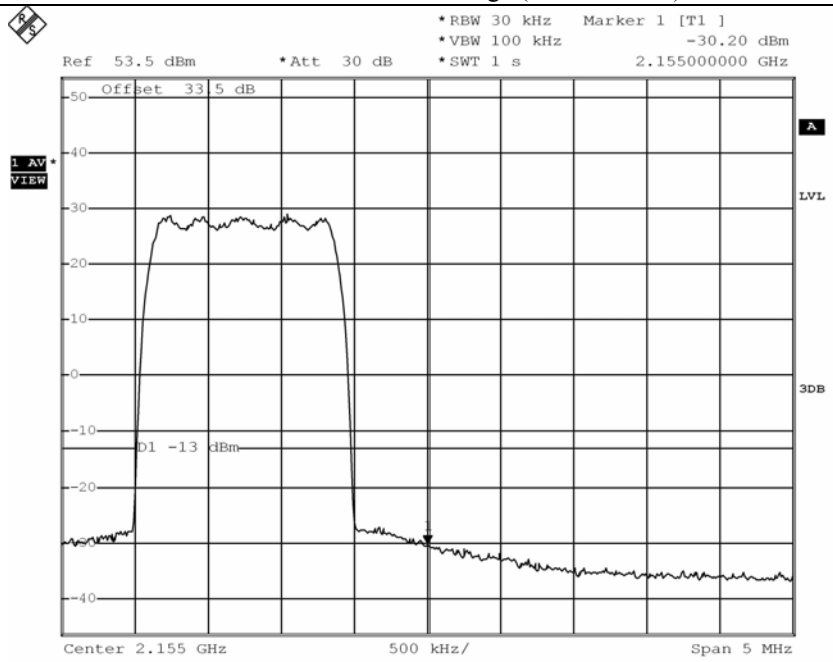
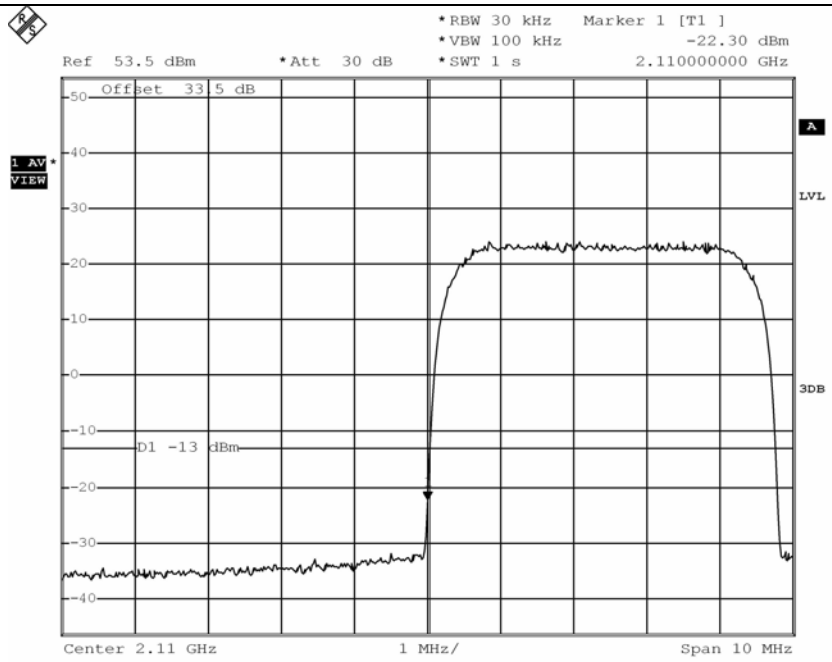


1xEVDO – Band Edge (Low Channel)

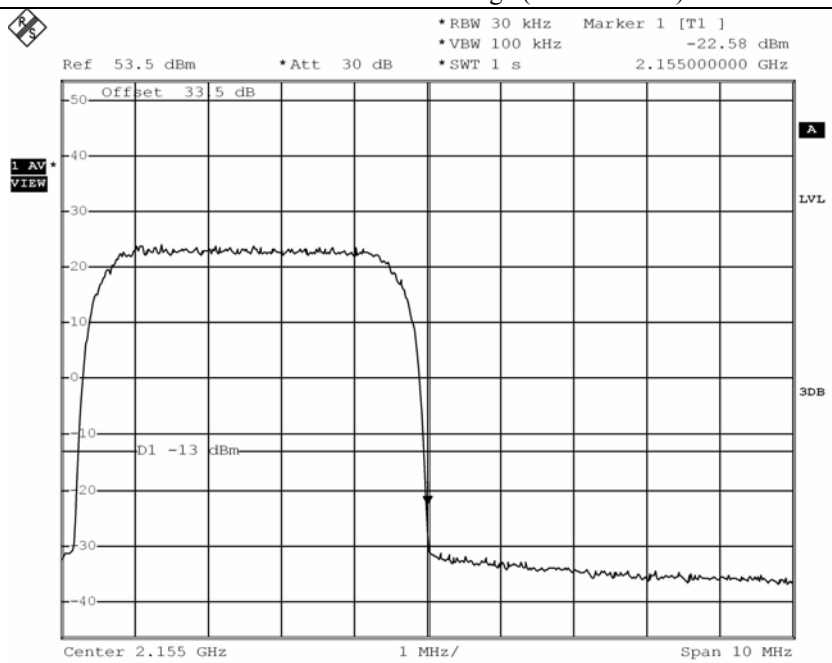


1xEVDO – Band Edge (High Channel)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)



WCDMA – Band Edge (Low Channel)



WCDMA – Band Edge (High Channel)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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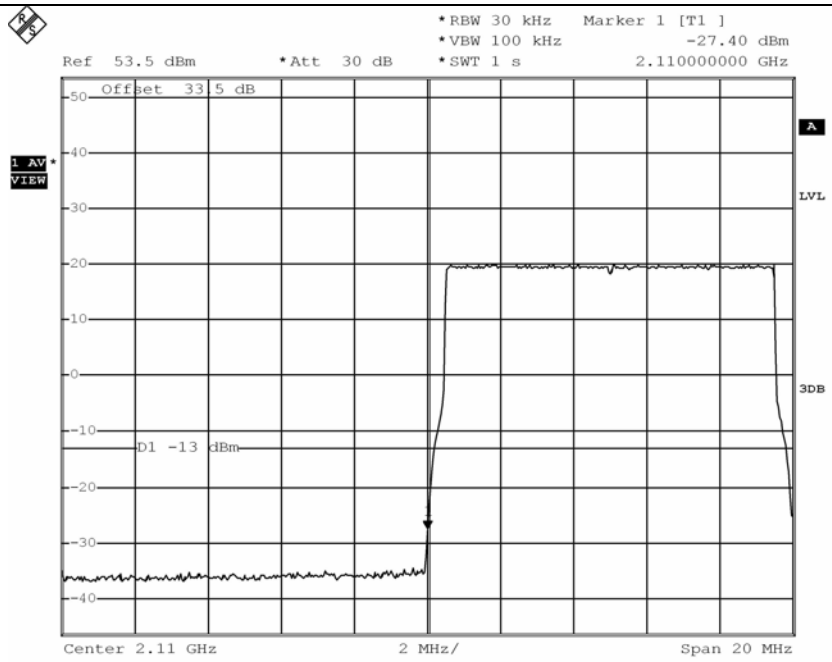
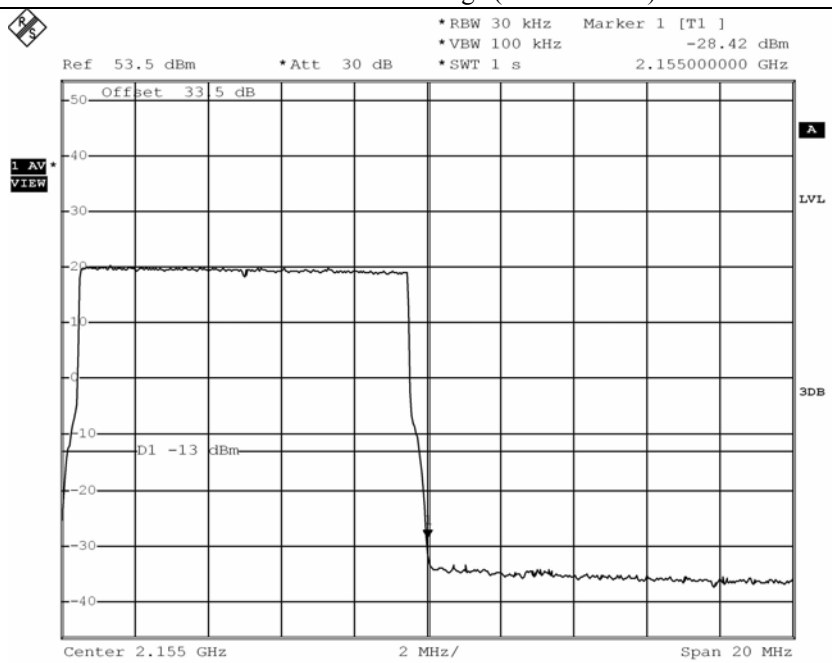


LTE – Band Edge (Low Channel)



LTE – Band Edge (High Channel)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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9. INTERMODULATION TEST

9.1 Operating environment

Temperature : 23 °C

Relative humidity : 50 %R.H.

9.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

Three input signals are equal in level and were sent to the input of the EUT.

9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
■ -	83650L	HP	Swept CW Generator	3844A00415	Jun. 10, 2012 (1Y)
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

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9.4 Test data

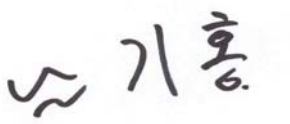
9.4.1 Test Result for peak power

-. Test Date : February 23, 2012

-. Test Result : Pass

-. Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
2 110.030	1	-9.90	44.49
2 110.030 & 2 110.06	2	-9.90	44.50
2 110.030 & 2 110.06 & 2 110.09	3	-9.80	44.49
2 154.970	1	-9.90	44.50
2 154.970 & 2 154.940	2	-9.80	44.48
2 154.970 & 2 154.940 & 2 154.910	3	-9.90	44.49



Tested by: Ki-Hong, Nam / Senior Engineer

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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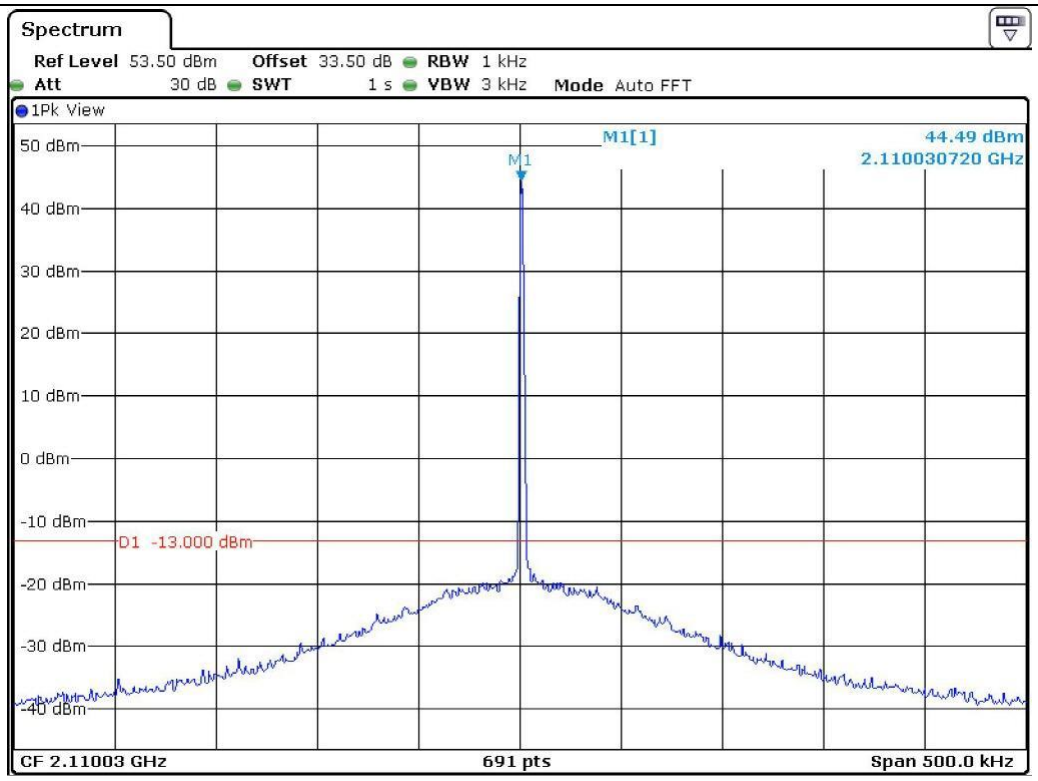
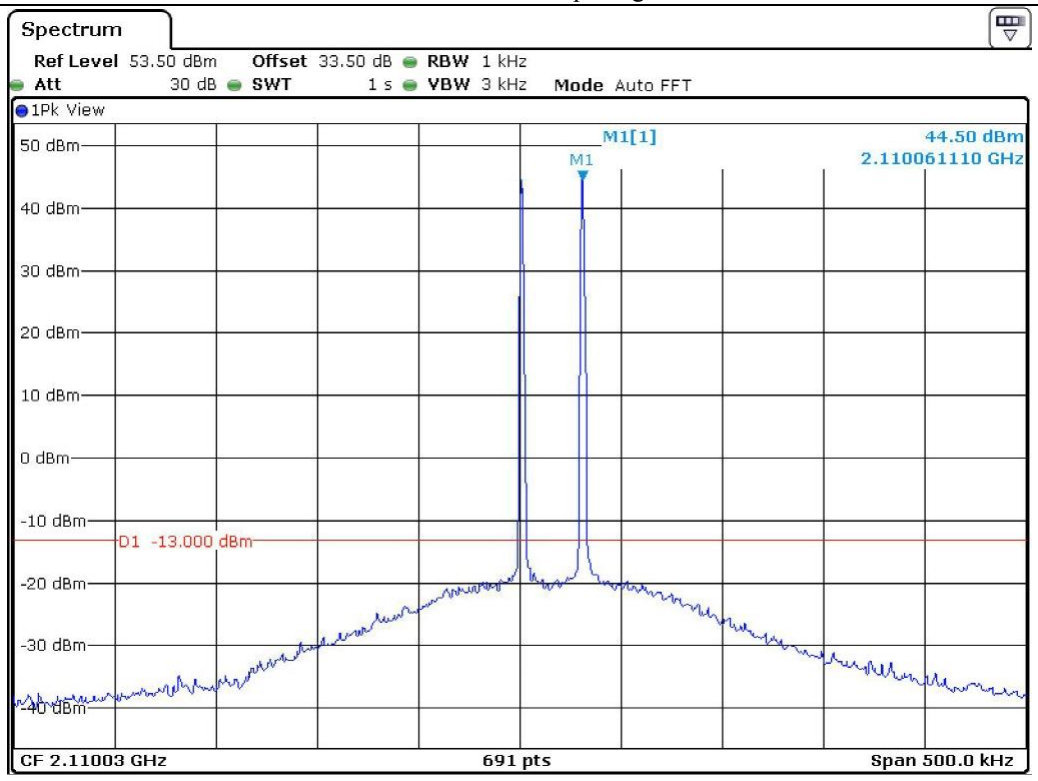
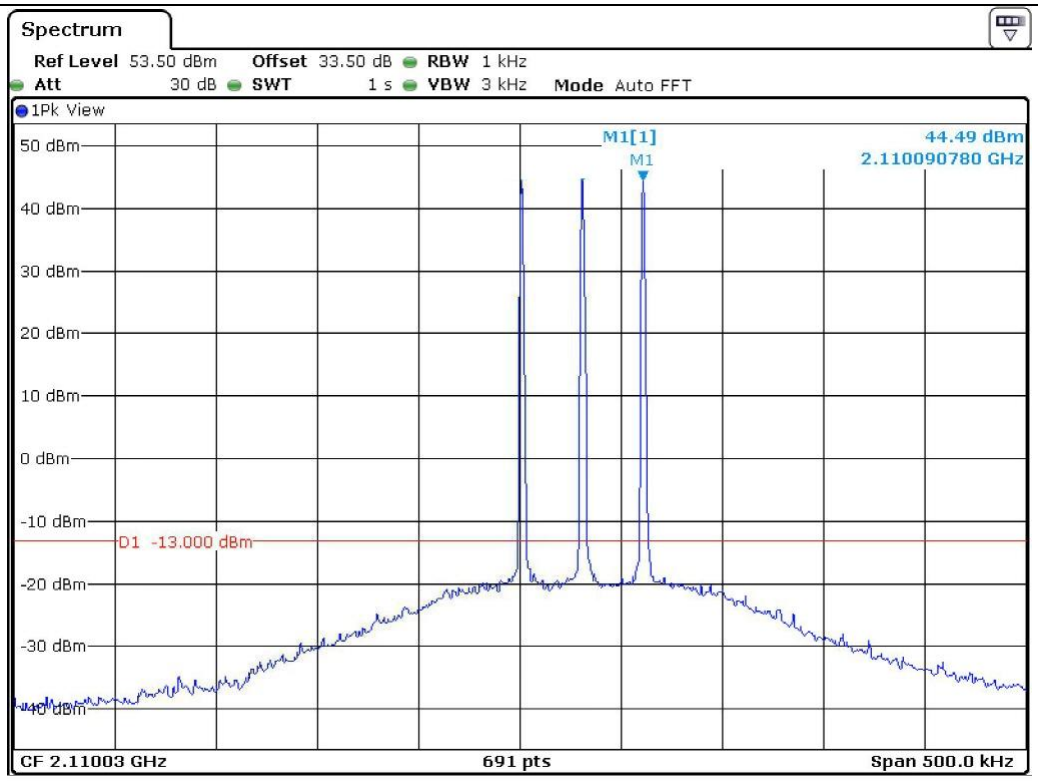


Low Channel – 1 input signal

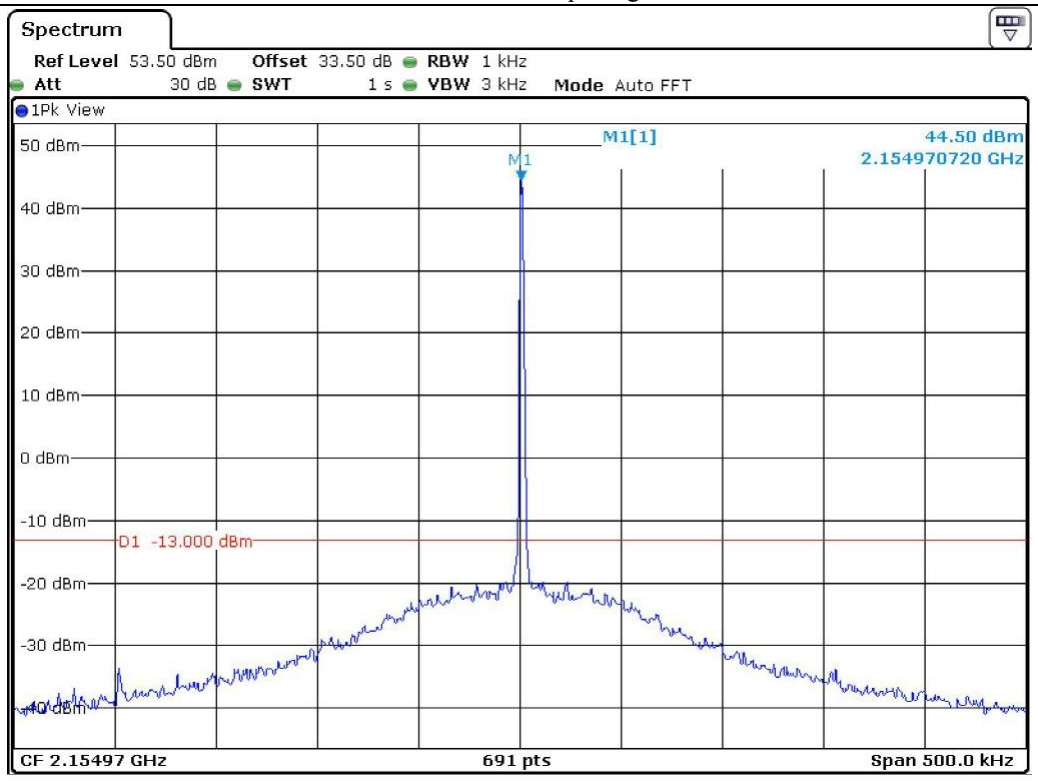


Low Channel – 2 input signals

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

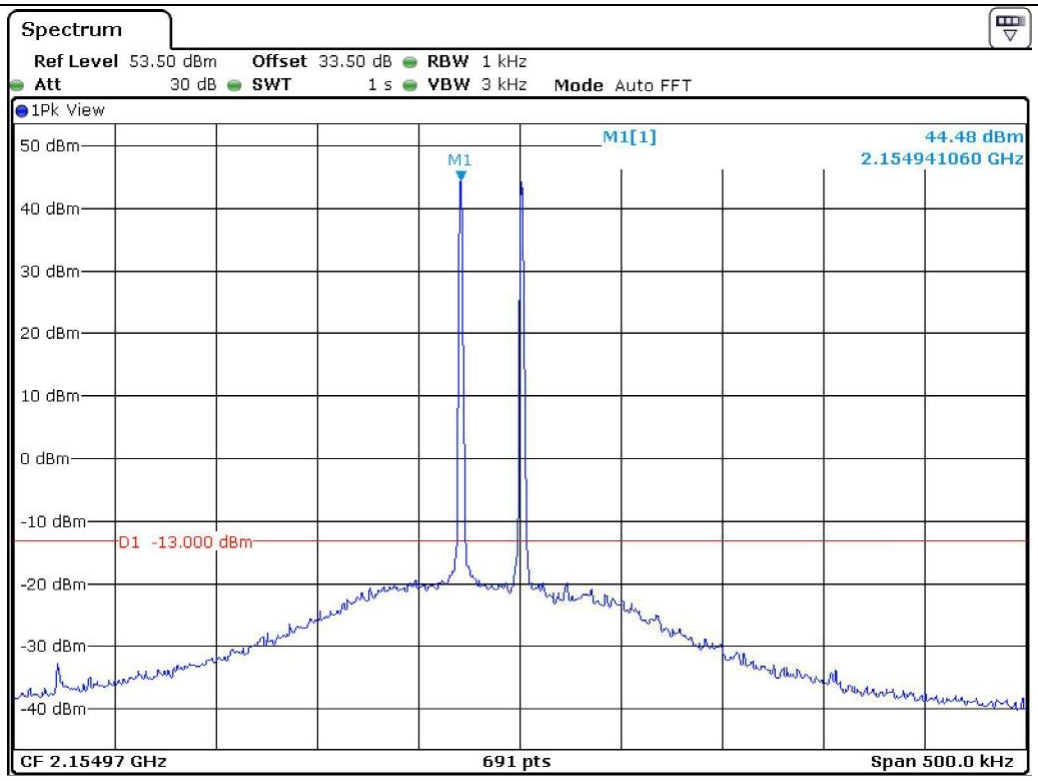


Low Channel – 3 input signals

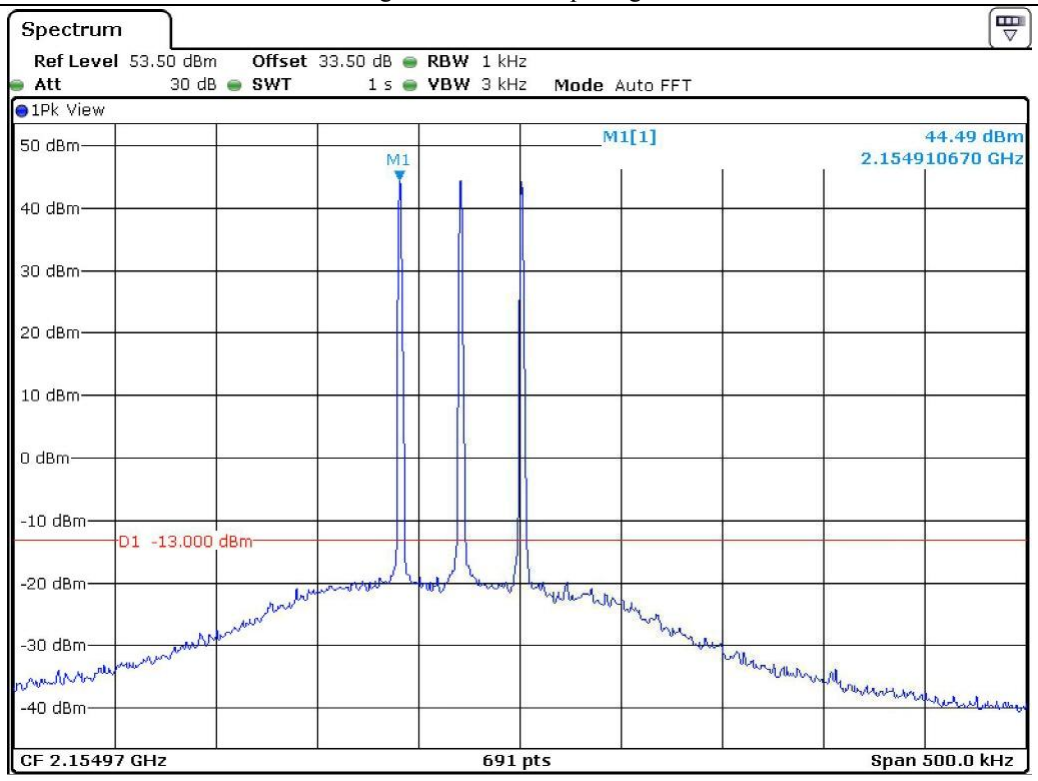


High Channel – 1 input signal

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)



High Channel – 2 input signals



High Channel – 3 input signals

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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9.4.2 Test Result for Spurious emission

-. Test Date : February 27, 2012

-. Test Result : Pass

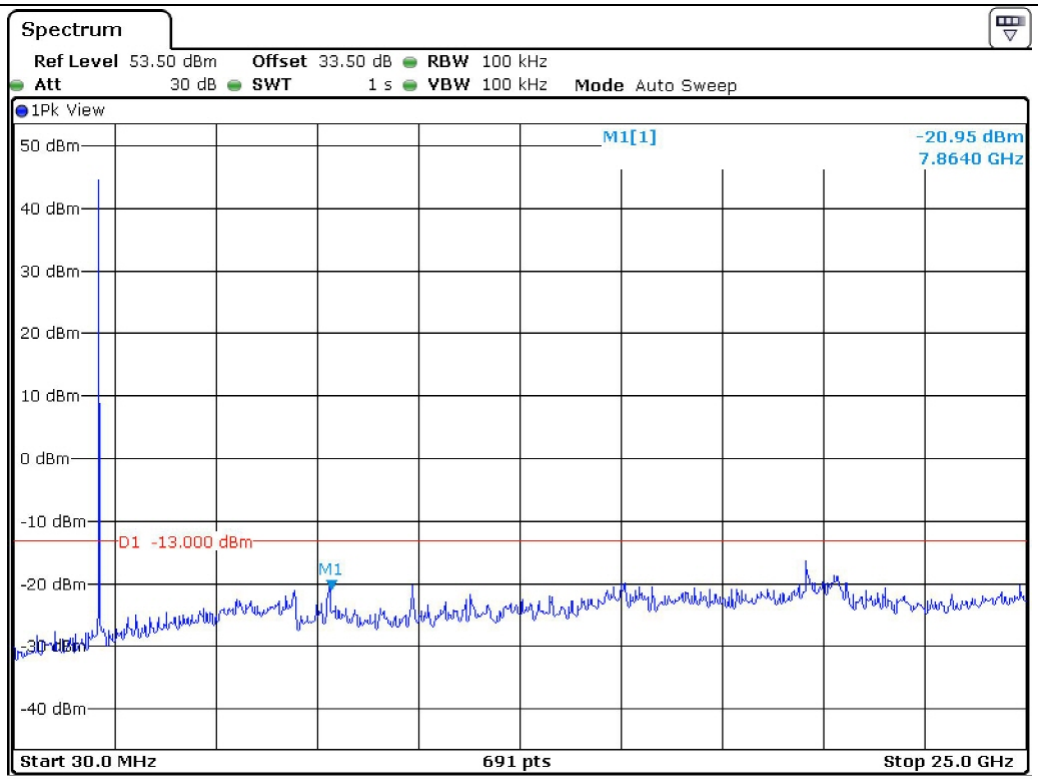
-. Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Measured Value	Result
2 110.030	1	< -13 dBm	Pass
2 110.030 & 2110.06	2		
2 110.030 & 2 110.06 & 2 110.09	3		
2 154.970	1	< -13 dBm	Pass
2 154.970 & 2 154.940	2		
2 154.970 & 2 154.940 & 2 154.910	3		

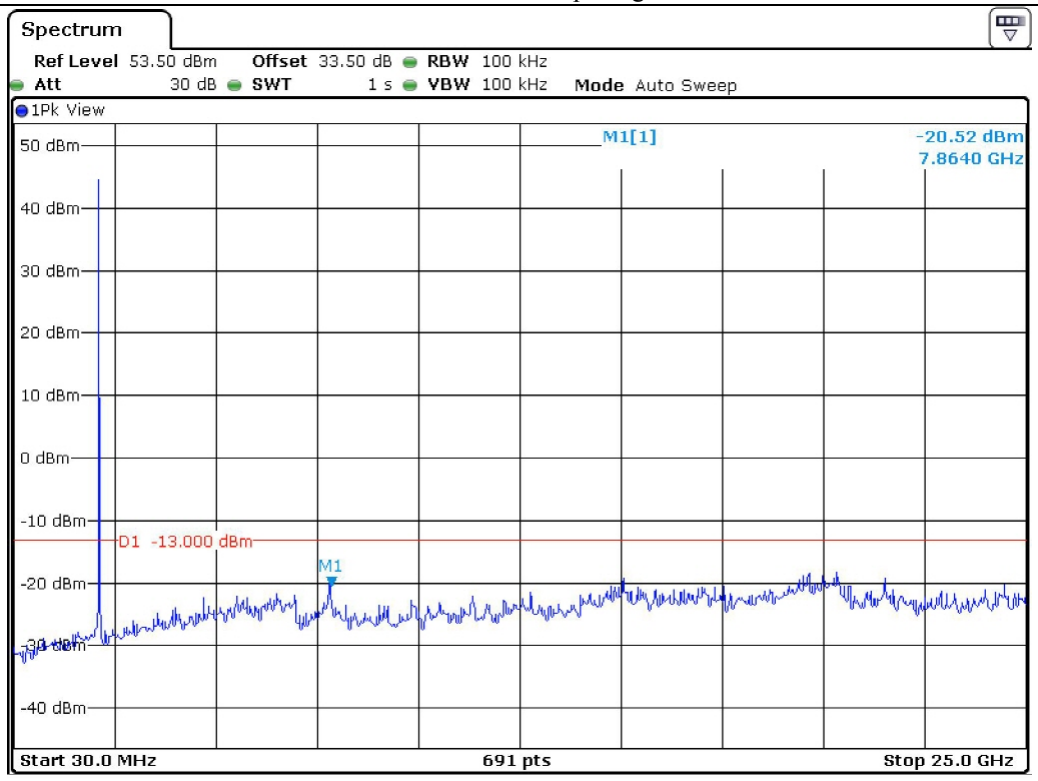
Remark: Intermodulation products must be attenuated below the rated power of the EUT at least 43 + 10log (Pw), equivalent to -13 dBm. Please refer to test data hereinafter.

Tested by: Ki-Hong, Nam / Senior Engineer

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

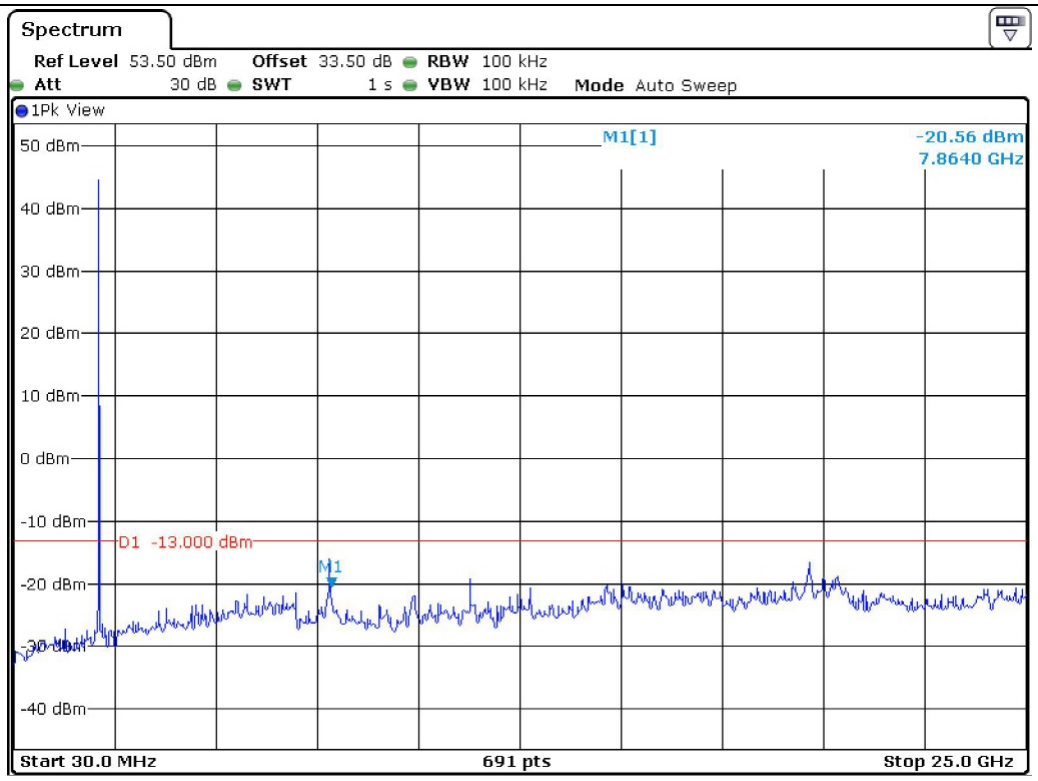


Low Channel – 1 input signal

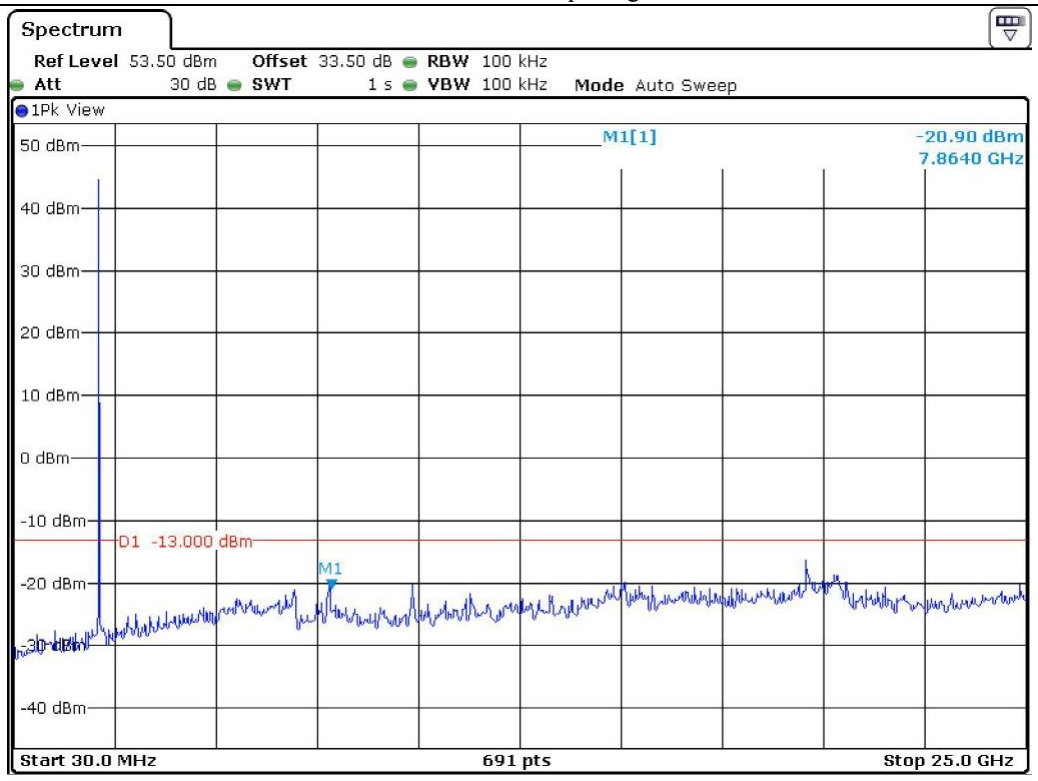


Low Channel – 2 input signals

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)



Low Channel – 3 input signals



High Channel – 1 input signal

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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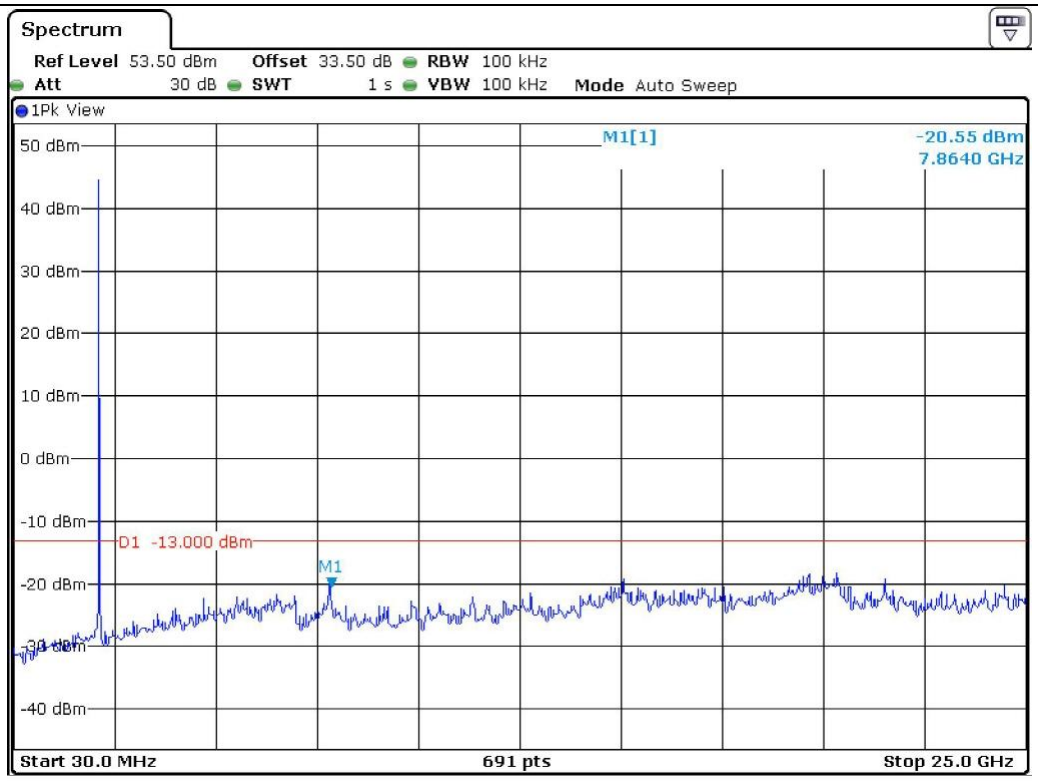
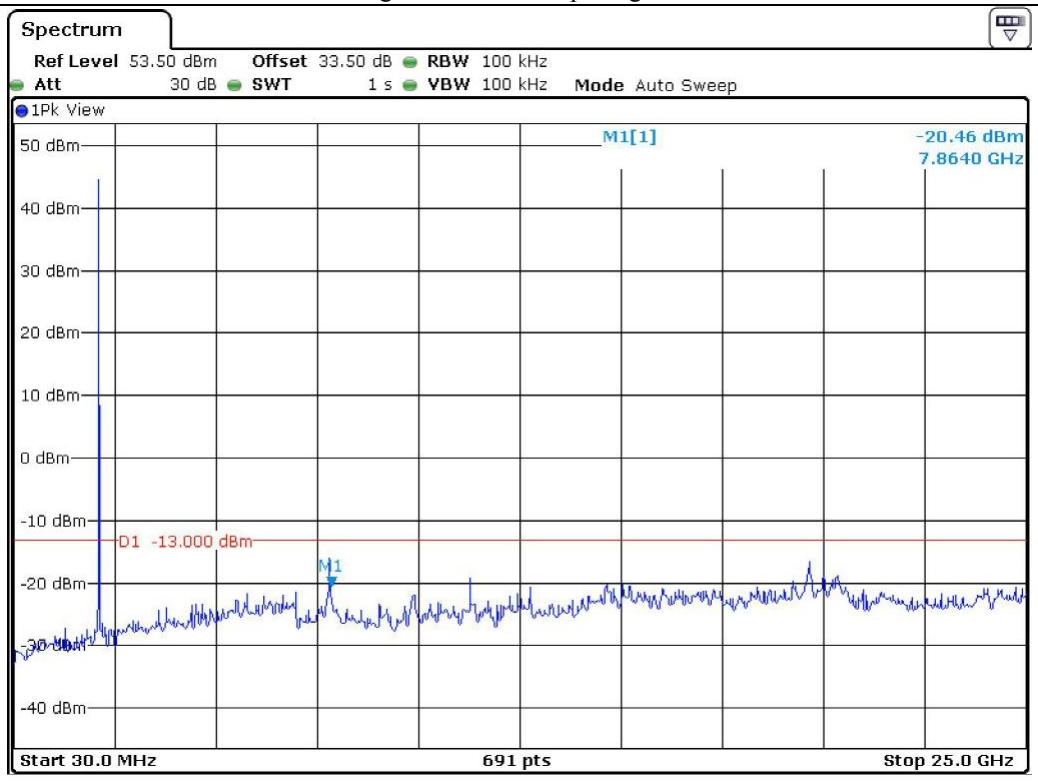


High Channel – 2 input signals



High Channel – 3 input signals

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10. FIELD STRENGTH OF SPURIOUS RADIATION

10.1 Operating environment

Temperature : 8 °C

Relative humidity : 42 % R.H.

10.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to up to 10th harmonic of the fundamental frequency was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. The test was performed by placing the EUT on 3-orthogonal axis. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The maximum radiated emission was recorded and used as reference for the effective radiated power measurement. The EUT was then replaced by a tuned dipole antenna or Horn antenna and was oriented for vertical polarization and then the length was adjusted to correspond to the frequency of the transmitter. The substitution antenna was connected to a signal generator with a coaxial cable. The receiving antenna height was raised and lowered again through the specified range of height until maximum signal level is detected by the measuring receiver. The signal to the substitution antenna was adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the EUT radiated power measured, corrected for the change of input attenuation setting of the measuring receiver. The signal generator level was recorded and corrected by the power loss in the cable between the signal generator and substitution antenna and further corrected for the gain of the dipole antenna or horn antenna used relative to an ideal tuned dipole antenna. The measurement was repeated with the test antenna and the substitution antenna oriented for horizontal polarization. The measure of the effective radiated power is the larger of the two levels recorded.

10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	ESVD	Rohde & Schwarz	EMI Test Receiver	838453/018	Oct. 20, 2011 (1Y)
☐ -	8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	83051A	Agilent	Preamplifier	3950M00201	Jun. 11, 2011 (1Y)
☐ -	E4432B	Hewlett-Packard	Signal Generator	US38440950	Jun. 10, 2011 (1Y)
☐ -	83650L	Hewlett-Packard	Signal Generator	3844A00415	Jun. 10, 2011 (1Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Aug. 23, 2011 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 23, 2011 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Aug. 23, 2011 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Aug. 23, 2011 (2Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
☐ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

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EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

10.4 Test data

-. Test Date : February 17, 2012

-. Resolution bandwidth : 120 kHz (below 1 GHz), 1 MHz (above 1 GHz)

-. Video bandwidth : 300 kHz (below 1 GHz), 3 MHz (above 1 GHz)

-. Frequency range : 1 GHz ~ 25 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY –47.44 dB at 136.80 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
2 110.03	66.80	-2.00	10.36	H	4.09	4.27	-	-
	69.50	0.50		V		6.77	-	-
Test Data for Middle Channel								
2 132.50	66.67	-2.17	10.37	H	4.11	4.09	-	-
	69.33	0.83		V		7.09	-	-
Test Data for High Channel								
2 154.97	67.00	-1.96	10.38	H	4.13	4.29	-	-
	69.83	0.67		V		6.92	-	-
38.00	29.00	-65.00	1.22	V	0.50	-64.28	-13.00	-51.28
42.83	28.33	-64.67	1.53	H	1.50	-61.64	-13.00	-48.64
136.80	35.50	-64.84	2.57	H	1.83	-60.44	-13.00	-47.44
163.86	32.00	-66.50	2.92	V	2.17	-61.41	-13.00	-48.41
Other frequencies have margin more than 20 dB.								

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Tested by: Ki-Hong, Nam / Senior Engineer

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EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

11.1 Operating environment

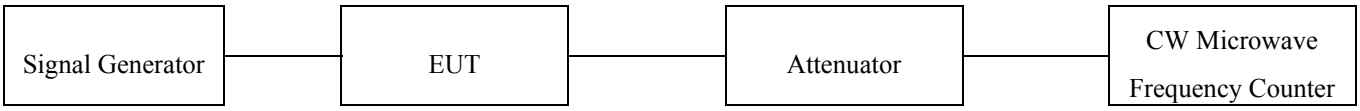
Temperature : 23 °C

Relative humidity : 50 % R.H.

11.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the CW Microwave Frequency Counter. The test was performed at Middle channel at each band using all applicable unmodulation.

Turn EUT off and set chamber temperature to -30 °C and then allow sufficient time (approximately 20 min to 30 min after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -30 °C to +50 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
☐ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
☐ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
☐ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	53152A	R/S	CW Microwave Frequency Counter	US39270295	Dec. 30, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)
■ -	SSE-43CI-A	Samkun Tech	Chamber	060712	Jun. 11, 2011(1Y)

All test equipment used is calibrated on a regular basis.

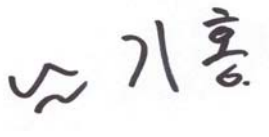
HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

11.4 Test data

-. Test Date : February 28 ~ 28, 2012

-. Result : PASSED

Temperature (˚C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-30	2 132 500 000	2 132 500 000	0.000 0	Within the Authorized Frequency block
-20		2 132 500 000	0.000 0	
-10		2 132 500 001	0.000 5	
0		2 132 500 001	0.000 5	
10		2 132 500 000	0.000 0	
20		2 132 500 001	0.000 5	
30		2 132 500 001	0.000 5	
40		2 132 500 000	0.000 0	
50		2 132 500 001	0.000 5	



Tested by: Ki-Hong, Nam / Senior Engineer

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12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

12.1 Operating environment

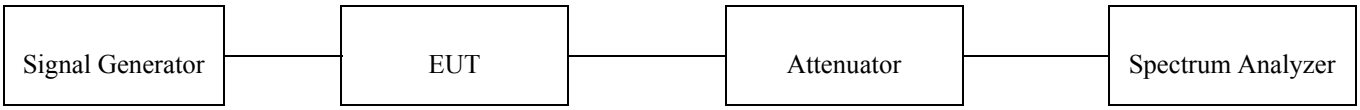
Temperature : 23 °C

Relative humidity : 50 % R.H.

12.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the CW Microwave Frequency Counter. The test was performed at Middle channel at each band using all applicable unmodulation.

The RF output port of the EUT was connected to the input of the spectrum analyzer. The signal generator was set to center frequency for each band with an un-modulated signal. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.



12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
☐ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
☐ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
☐ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
☐ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	53152A	R/S	CW Microwave Frequency Counter	US39270295	Dec. 30, 2011 (1Y)
■ -	DH-60	Dea Kwang Elec.	Slidacs	N/A	Sep 03, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

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12.4 Test data

-. Test Date : February 28 ~ 29, 2012

-. Result : PASSED

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
138 (115 %)	2 132 500 000	2 132 500 000	0.000 0	Within the Authorized Frequency block
120 (100 %)		2 132 500 001	0.000 5	
102 (85 %)		2 132 500 001	0.000 5	

Tested by: Ki-Hong, Nam / Senior Engineer

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13. MAXIMUM PERMISSIBLE EXPOSURE

13.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1.0 mW/cm² the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric filed strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$d = \sqrt{(30 * P * G) / (377 * S)}$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 100 * d (m)

$d = 0.282 * \sqrt{(P * G) / S}$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

13.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 60 cm Separation	(mW/cm²)
44.50	28 183.8	2.0	1.58	59.51	0.98	1.0

According to above table, safe safe distance, $D = 0.282 * \sqrt{28\,183.8 * 1.58} = 59.51$ cm.

For getting power density at 100 cm separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = 28\,183.8 * 1.58 / (4 * 3.14 * 60\text{^}2) = 0.98$

Where:

S = Power Density,
P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),
G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

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