ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No.	**: E124R-043**
AGR No.	**: A122A-154**
Applicant	**: SOLiD, Inc.**
Address	**: 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, Korea**
Manufacturer	**: SOLiD, Inc.**
Address	**: 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, Korea**
Type of Equipment	**: RDU MODULE (700PS)**
FCC ID.	**: W6UH700PS**
Model Name	**: 700PS RDU44.5**
Serial number	**: N/A**
Total page of Report	**: 59 pages (including this page)**
Date of Incoming	**: February 06, 2012**
Date of issue	**: April 19, 2012**

SUMMARY

The equipment complies with the regulation; **FCC Part 90 Subpart I.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by: Ki-Hong, Nam / Senior Engineer, ONETECH Corp.

Approved by: Y. K. Kwon / Exe. Managing Director, ONETECH Corp.

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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)

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E124R-043	April 19, 2012	Initial Issue	All

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1. VERIFICATION OF COMPLIANCE

APPLICANT	: SOLiD, Inc.
ADDRESS	: 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, Korea
CONTACT PERSON	: Mr. Yong-Chul, Kim / Researcher
TELEPHONE NO	: +82-31-627-6292
FCC ID	: W6UH700PS
MODEL NAME	: 700PS RDU44.5
SERIAL NUMBER	: N/A
DATE	: April 19, 2012

EQUIPMENT CLASS	PCB - PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	RDU MODULE (700PS)
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.4: 2009, EIA/TIA-603-C
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC Part 90 Subpart I
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 m open area test site

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
2.1046(a), 90.205	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1047	Modulation Characteristics	PASS (See Note 1)
2.1049, 90.210	Occupied Bandwidth, Bandwidth Limitation	Met the Limit / PASS
2.1049	Band Edge	Met the Limit / PASS
2.1051, 90.210	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 90.210	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055, 90.213	Frequency Stability with Temperature variation	Met the requirement / PASS
2.1055, 90.213	Frequency stability with primary voltage variation	Met the requirement / PASS
1.1307(b), 90.205	RF Safety	PASS (See Note 2)

Note 1: The Equipment under Test (EUT) is a repeater which reproduces the modulated input signal, so the EUT meets the requirement

Note 2: End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original Grant

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2009 & EIA/TIA-603-C: 2004 and was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation number KR0013.

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3. GENERAL INFORMATION

3.1 Product Description

The SOLiD, Inc., Models 700PS RDU44.5 (referred to as the EUT in this report) is RDU MODULE (700PS) has function for transmitting of iDEN and SMR, LTE signal. And the device shall be plugged in HROU (High power Remote Optic Unit) or HMRU (High power Main Remote Unit).

ROU or HMRU devices are varied for each frequency band, including the following:

No	Unit naming	Description	Frequency	
			TX	RX
1	1900PCS RDU44.5	Single band	1 930-1995 MHz	1 850-1 915 MHz
2	850CEL RDU44.5	Single band	869-894 MHz	824-849 MHz
3	700LTE RDU44.5	Single band	728-756 MHz	698-716 MHz 777-787 MHz
4	AWS-1 RDU44.5	Single band	2 110-2155 MHz	1 710-1 755 MHz
5	700PS RDU44.5	Single band	758-775 MHz	788-805 MHz
6	800I/PS RDU44.5	Single band	851-869 MHz	806-824 MHz
7	900I RDU44.5	Single band	929-941 MHz	896-902 MHz

When receiving TX signals from each band through Remote Optic, RDU filters the signals and amplifies them with High Power Ampifier. The unit also filters RX signals given through cavity filter and amplifies them to send the signals to Remote Optic.In the unit, there is ATT to adjust gain. RDU consist of RFU, PAU and cavity duplexer and all modules are merged with one package. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	RDU MODULE (700PS)
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	14.745 6 MHz, 8 MHz
EMISSION DESIGNATOR	GXW(iDEN), D7W(LTE), F8W(SMR)
OPERATING FREQUENCY	758 MHz ~ 775 MHz
CHANNEL SEPARATION	25 kHz(iDEN), 12.5 kHz(SMR), 5 MHz(LTE)
RF OUTPUT POWER	44.5 dBm
DC VOLTAGE & CURRENT INTO FINAL AMPLIFIER	28 V, 11 A
ELECTRICAL RATING	AC 120 V
OPERATING TEMPERATURE	-10 °C ~ 50 °C

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

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3.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
700PS RDU44.5	SOLiD Technologies	W6UH700PS	RDU MODULE (700PS) (EUT)	Signal Generator
SMJ100A	Rohde & Schwarz	N/A	Vector Signal Generator	EUT

3.4 Mode of operation during the test

The EUT was received signal form signal generator and then each modulation was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission. The applicant does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports on the EUT for radiated spurious emission testing.

For the above testing, following frequencies and signal per channel were selected.

Modulation	Channel	Frequency (MHz)
iDEN	Low	758.025 0
	Middle	766.500 0
	High	774.975 0
SMR	Low	758.012 5
	Middle	766.500 0
	High	774.987 5
LTE	Low	760.500 0
	Middle	766.500 0
	High	772.500 0

4. EUT MODIFICATIONS

-. None

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5. RF POWER OUTPUT at ANTENNA TERMINAL

5.1 Operating environment

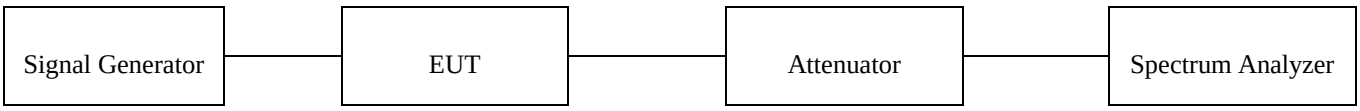
Temperature : 22 °C

Relative humidity : 49 % R.H.

5.2 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.

RF output power was measured by channel power measurement function of the spectrum analyzer with rms detector mode.



5.3 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. 02, 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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5.4 Test data

-. Test Date : March 05, 2012

-. Measurement Function : Channel Power

-. Detector Mode : RMS detector

-. Test Result : Pass

Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
iDEN	Low	758.025 0	-9.80	44.50	28.183 829	100.00
	Middle	766.500 0	-9.90	44.50	28.183 829	
	High	774.975 0	-9.80	44.50	28.183 829	
SMR	Low	758.012 5	-9.70	44.50	28.183 829	
	Middle	766.500 0	-9.80	44.50	28.183 829	
	High	774.987 5	-9.80	44.50	28.183 829	
LTE	Low	760.500 0	-9.90	44.50	28.183 829	
	Middle	766.500 0	-9.80	44.50	28.183 829	
	High	772.500 0	-9.80	44.50	28.183 829	

Tested by: Ki-Hong, Nam / Senior Engineer

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6. OCCUPIED BANDWIDTH

6.1 Operating environment

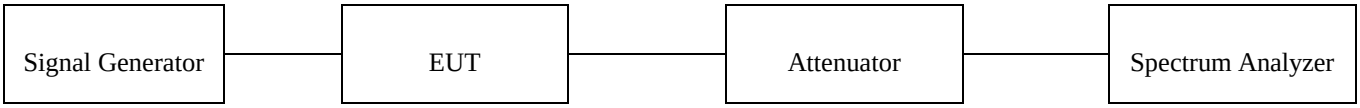
Temperature : 22 °C

Relative humidity : 49 % R.H.

6.2 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.

For the testing, the RBW was set to 1 % to 3 % of the - 26 dB bandwidth. The VBW is set to 3 times the RBW and sweep time is coupled.



6.3 Test equipment used

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■ -	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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6.4 Test data

-. Test Date : March 05, 2012

-. Test Result : Pass

Modulation	Channel	26 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)
iDEN	Low	20.3	18.10
	Middle	20.3	18.30
	High	20.3	18.20
SMR	Low	14.7	12.30
	Middle	14.7	12.30
	High	14.7	12.40
LTE	Low	5 000	4 520
	Middle	5 000	4 520
	High	5 000	4 520

Remark: According to above result, the carrier frequency shall be within the frequency block edges.

Tested by: Ki-Hong, Nam / Senior Engineer

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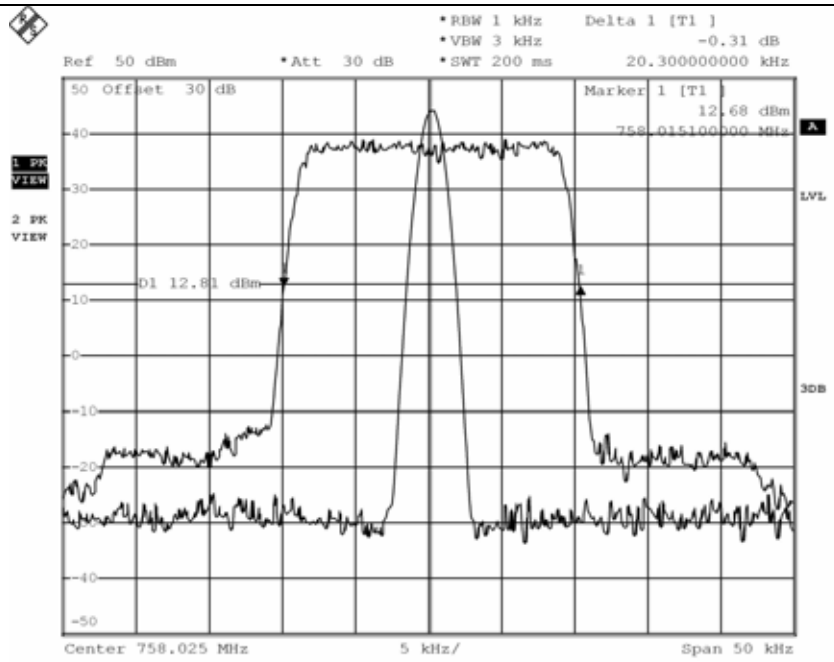
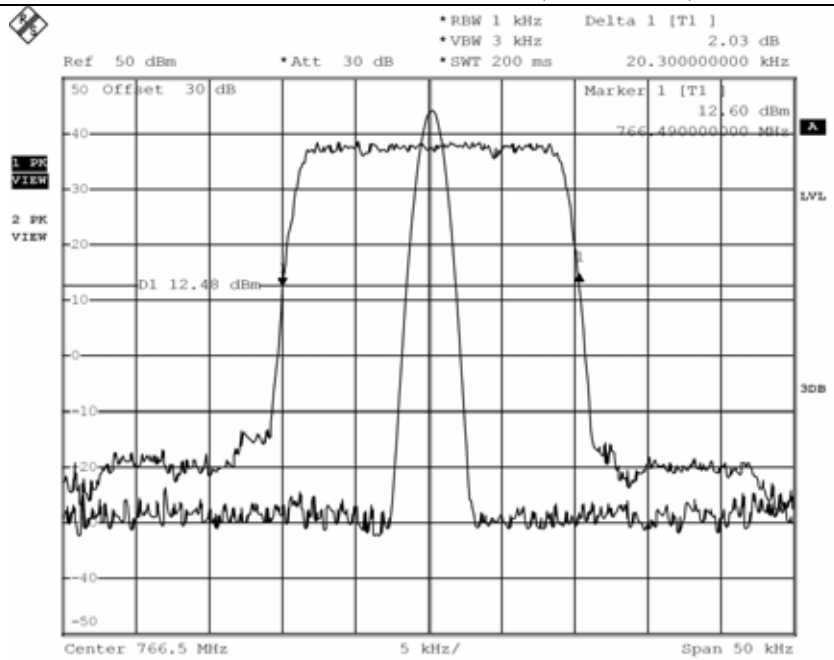


iDEN – 26 dB Bandwidth (Low Channel)



iDEN – 26 dB Bandwidth (Middle Channel)

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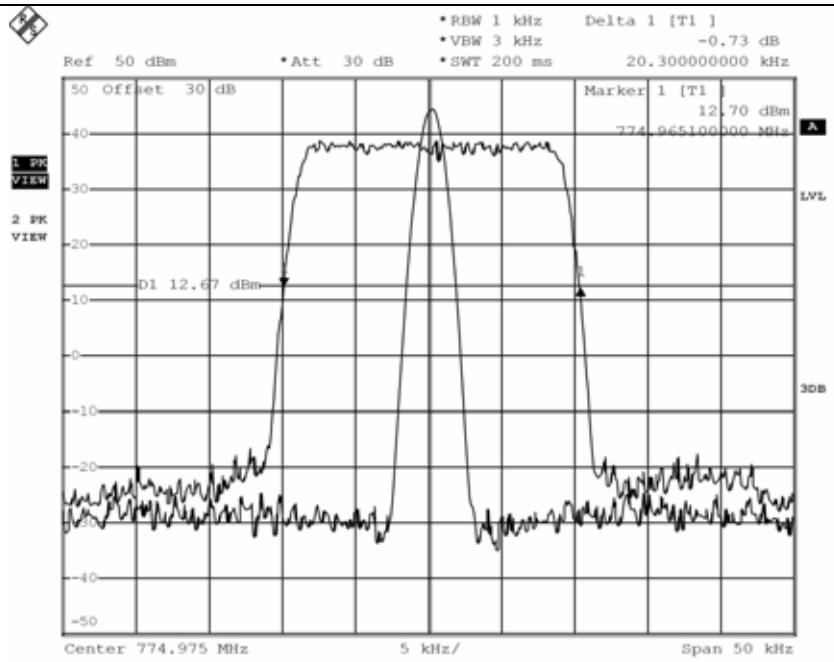
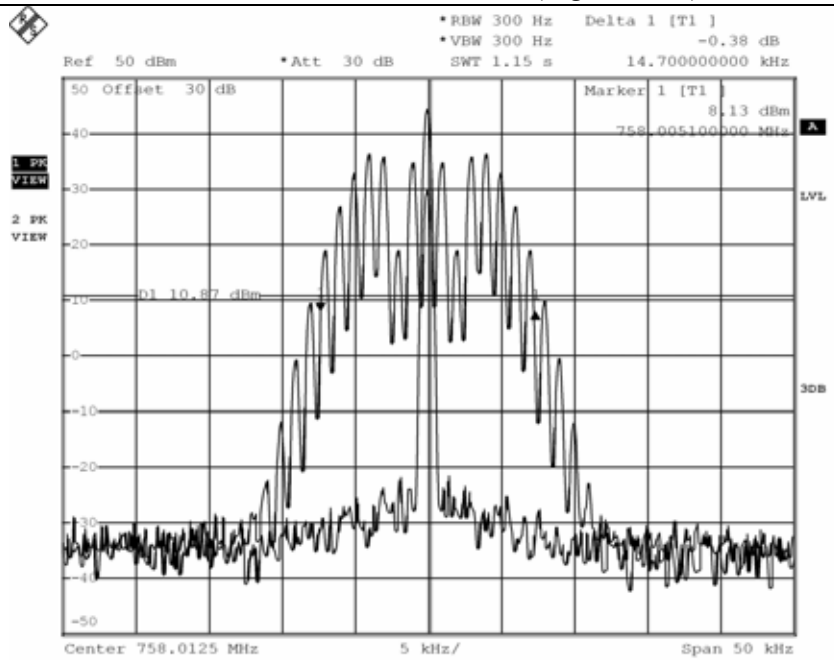


iDEN – 26 dB Bandwidth (High Channel)



SMR – 26 dB Bandwidth (Low Channel)

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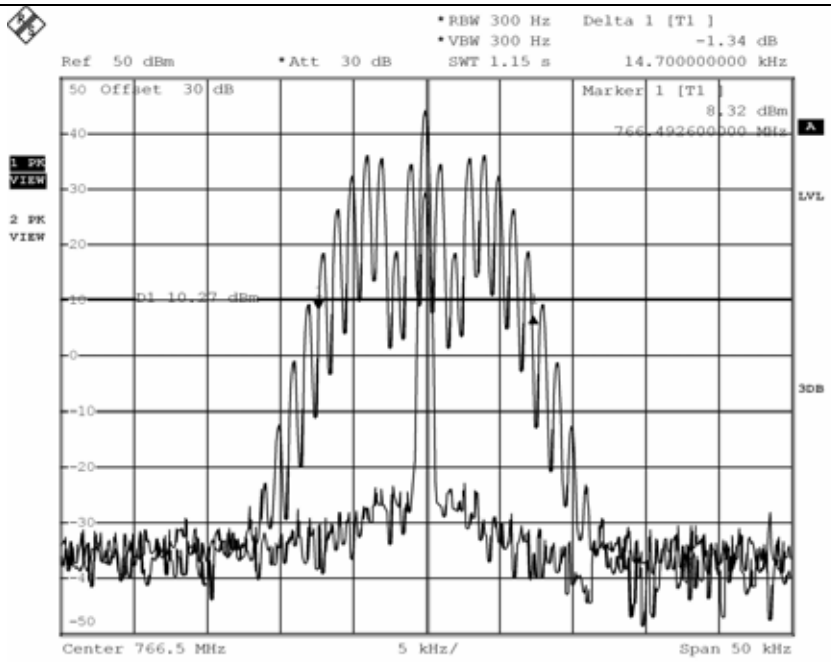
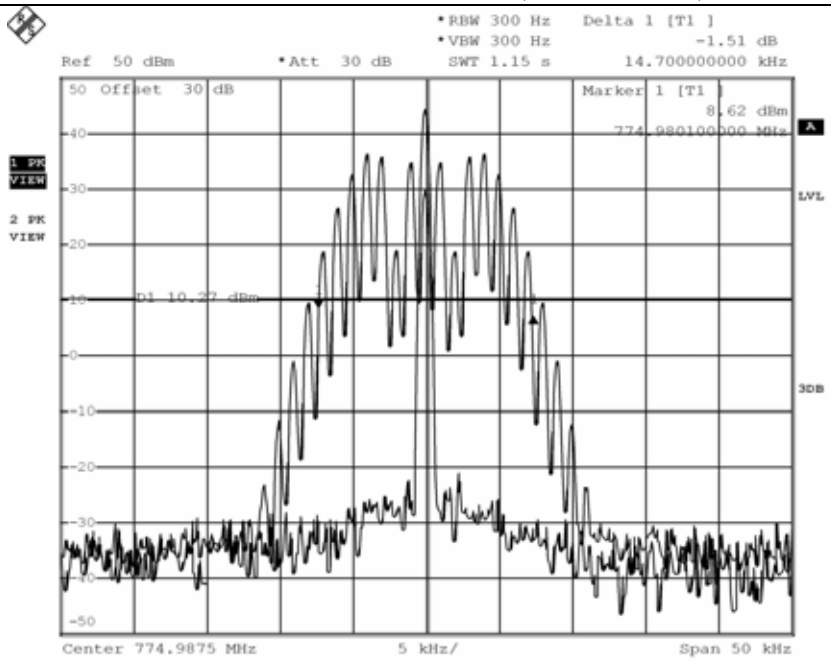


SMR – 26 dB Bandwidth (Middle Channel)



SMR – 26 dB Bandwidth (High Channel)

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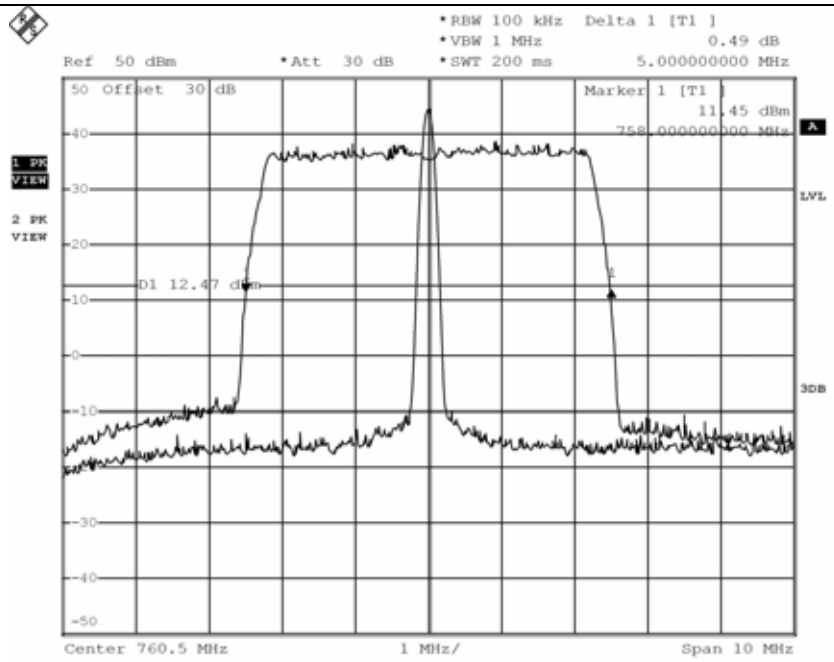
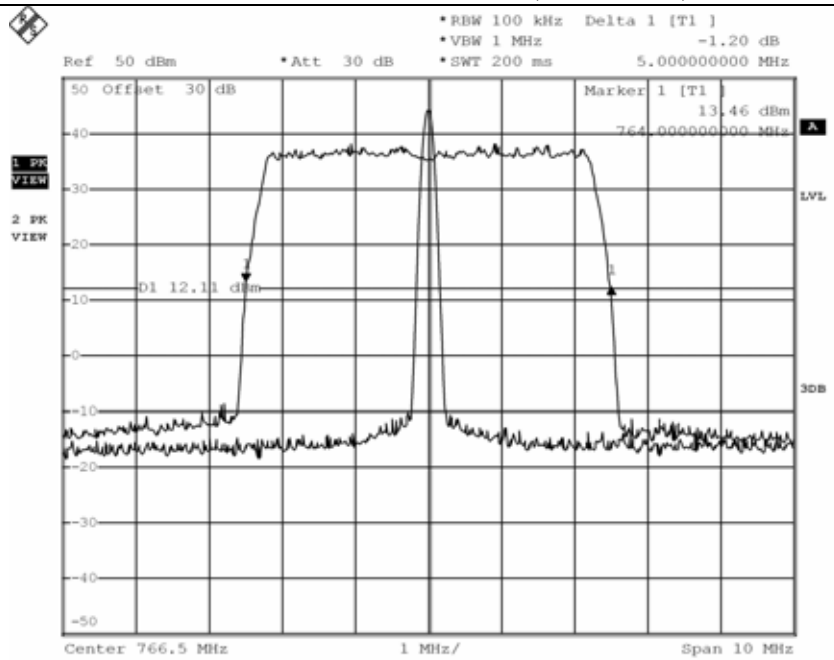


LTE – 26 dB Bandwidth (Low Channel)



LTE – 26 dB Bandwidth (Middle Channel)

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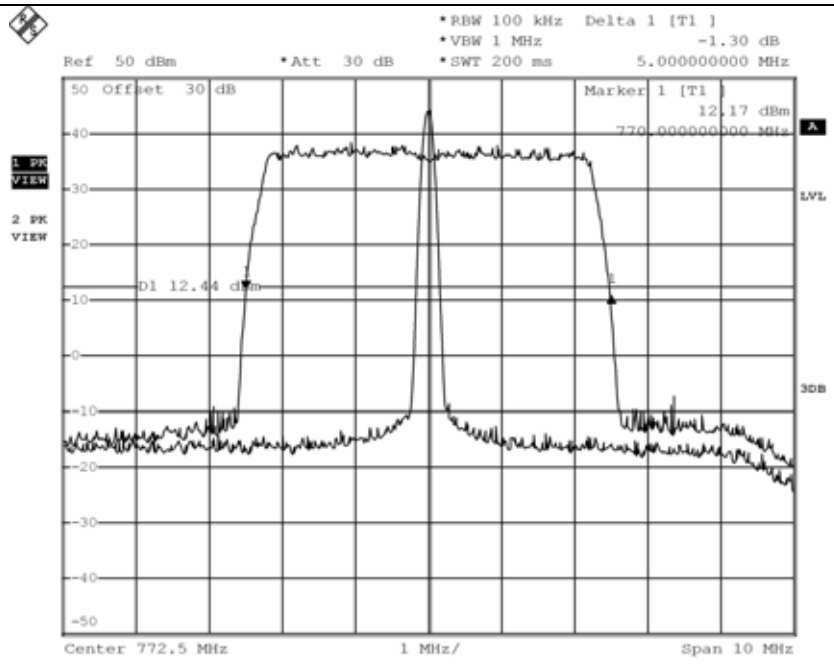

LTE – 26 dB Bandwidth (High Channel)

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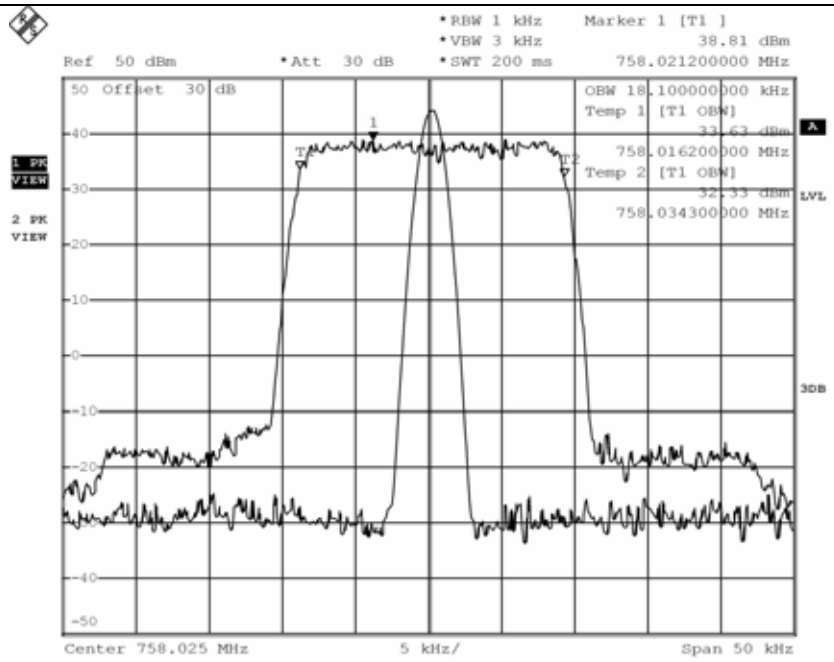
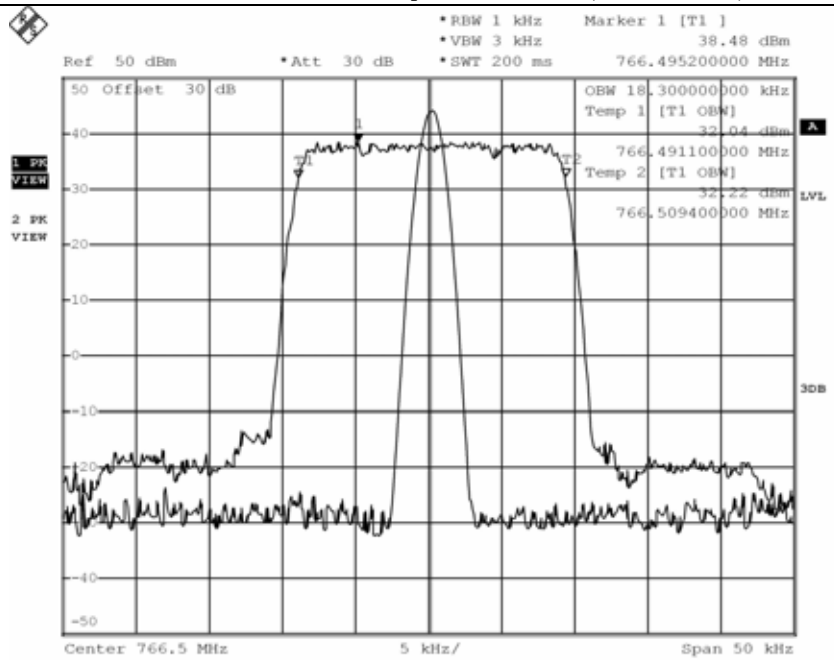


iDEN – 99 % Occupied Bandwidth (Low Channel)



iDEN – 99 % Occupied Bandwidth (Middle Channel)

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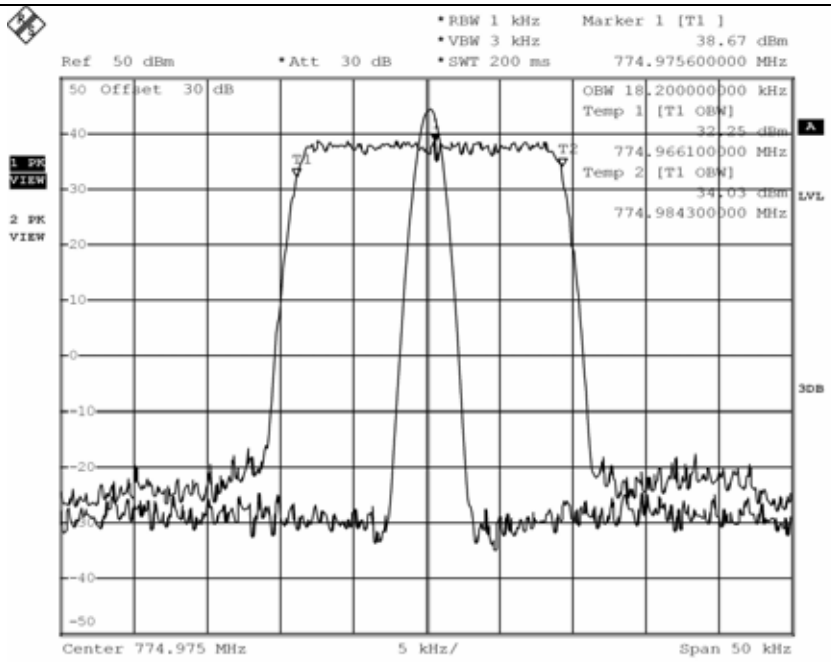
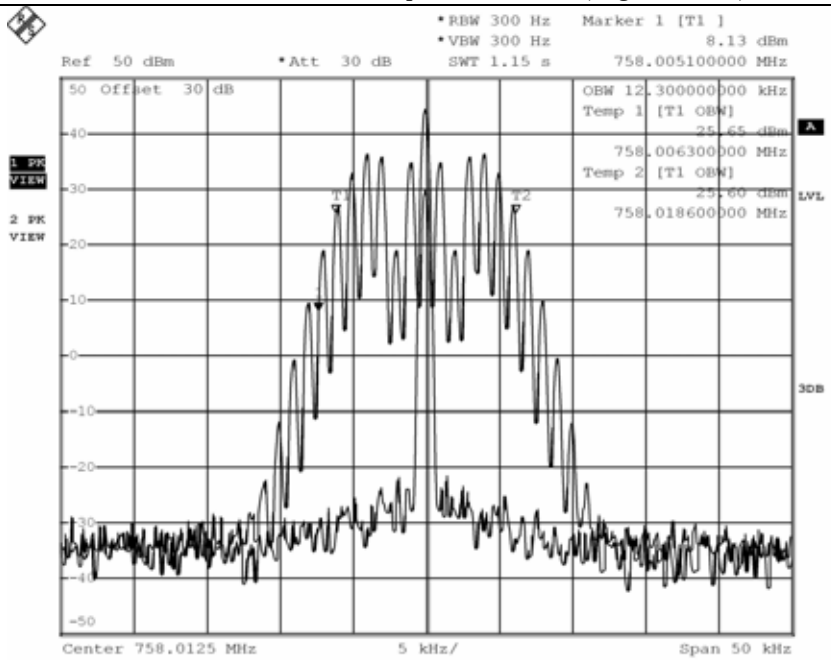


iDEN – 99 % Occupied Bandwidth (High Channel)



SMR – 99 % Occupied Bandwidth (Low Channel)

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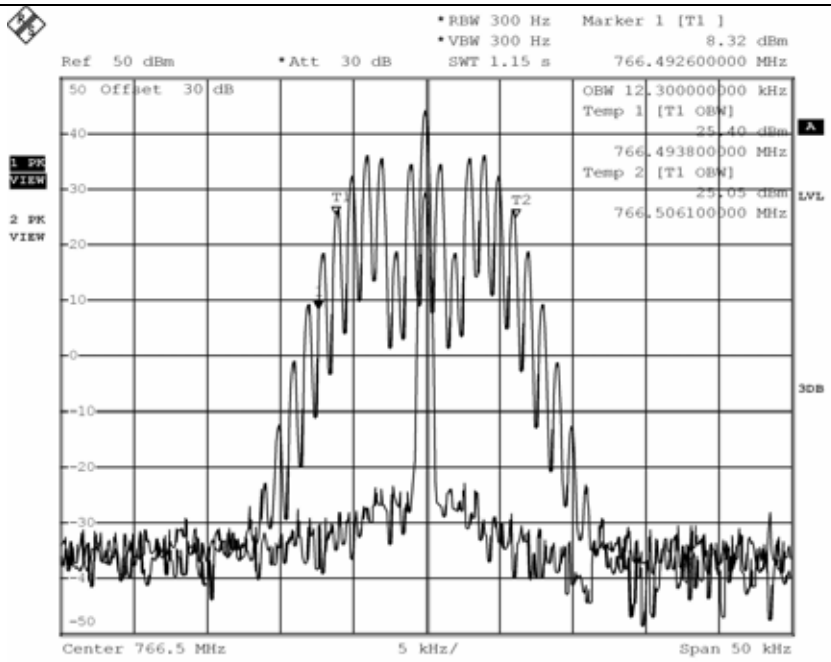
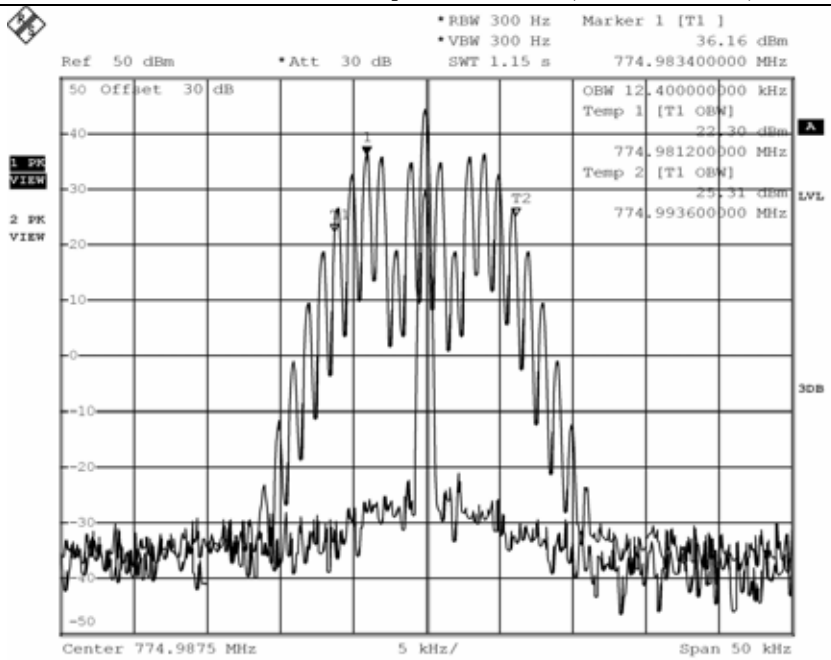


SMR – 99 % Occupied Bandwidth (Middle Channel)



SMR – 99 % Occupied Bandwidth (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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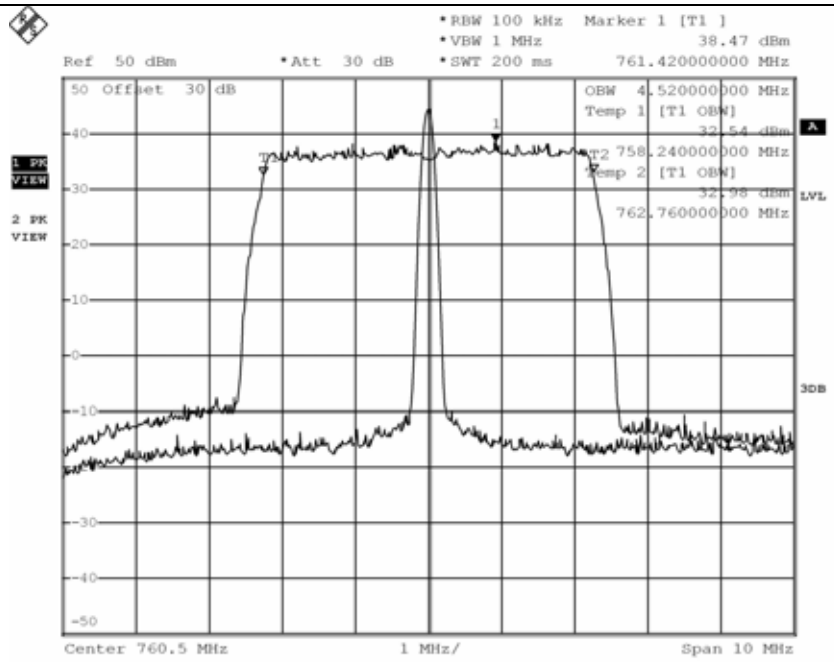
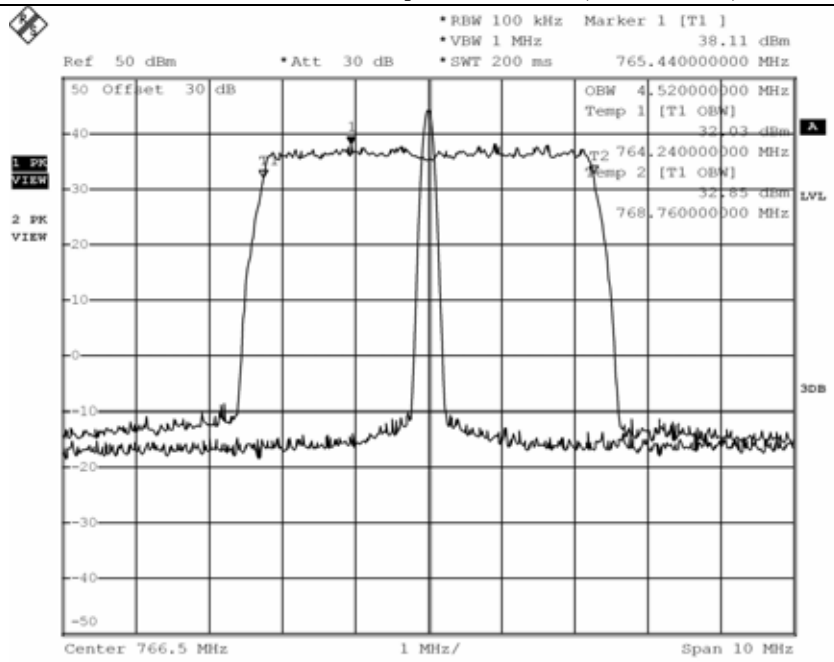


LTE – 99 % Occupied Bandwidth (Low Channel)



LTE – 99 % Occupied Bandwidth (Middle 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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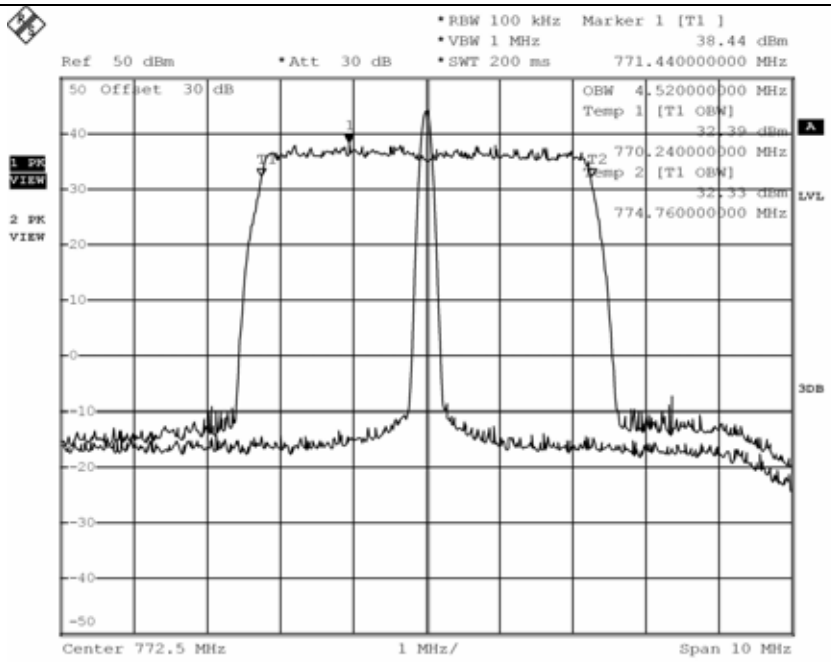

LTE – 99 % Occupied Bandwidth (High Channel)

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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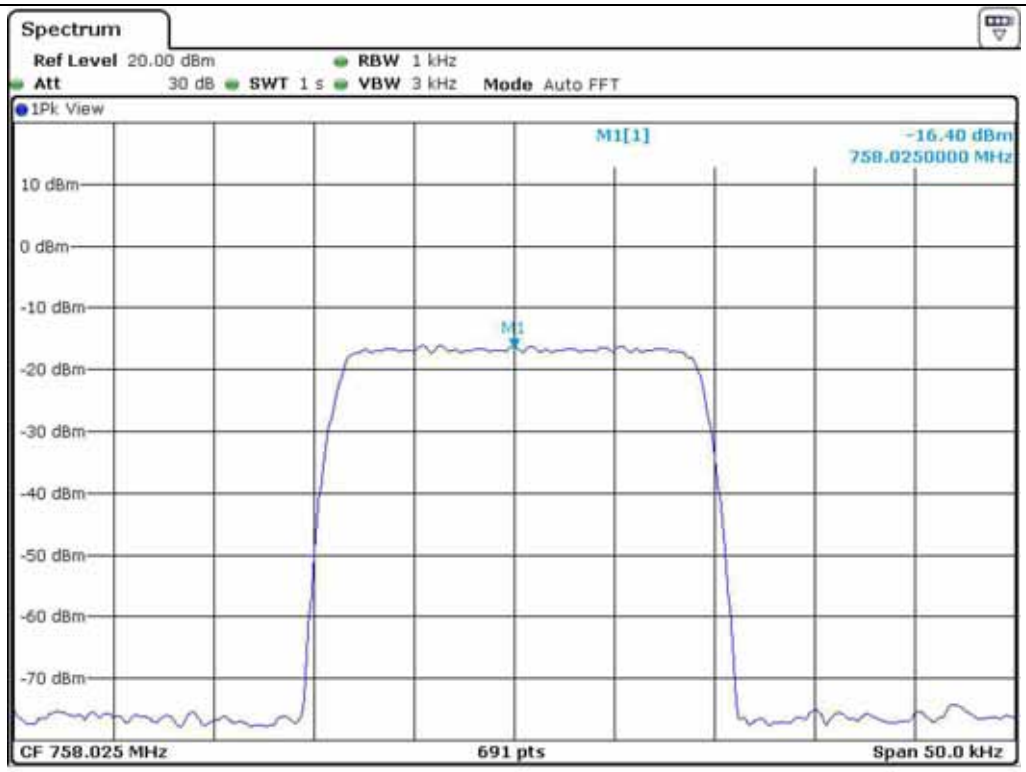
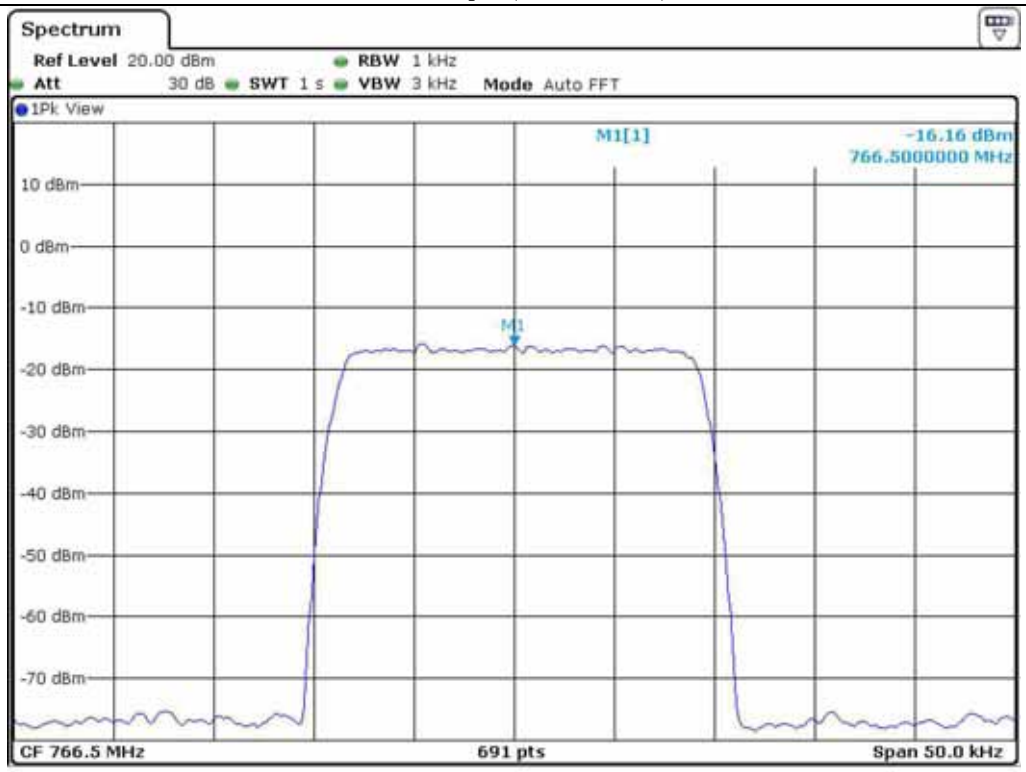


iDEN – Input (Low Channel)



iDEN – Input (Middle 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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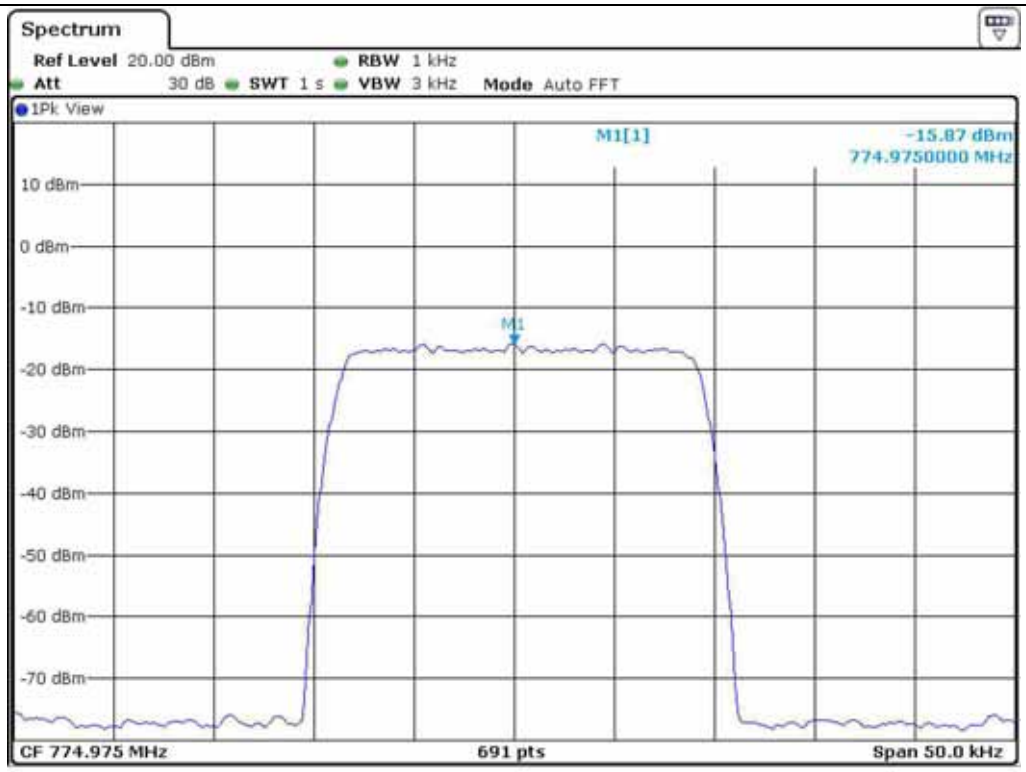
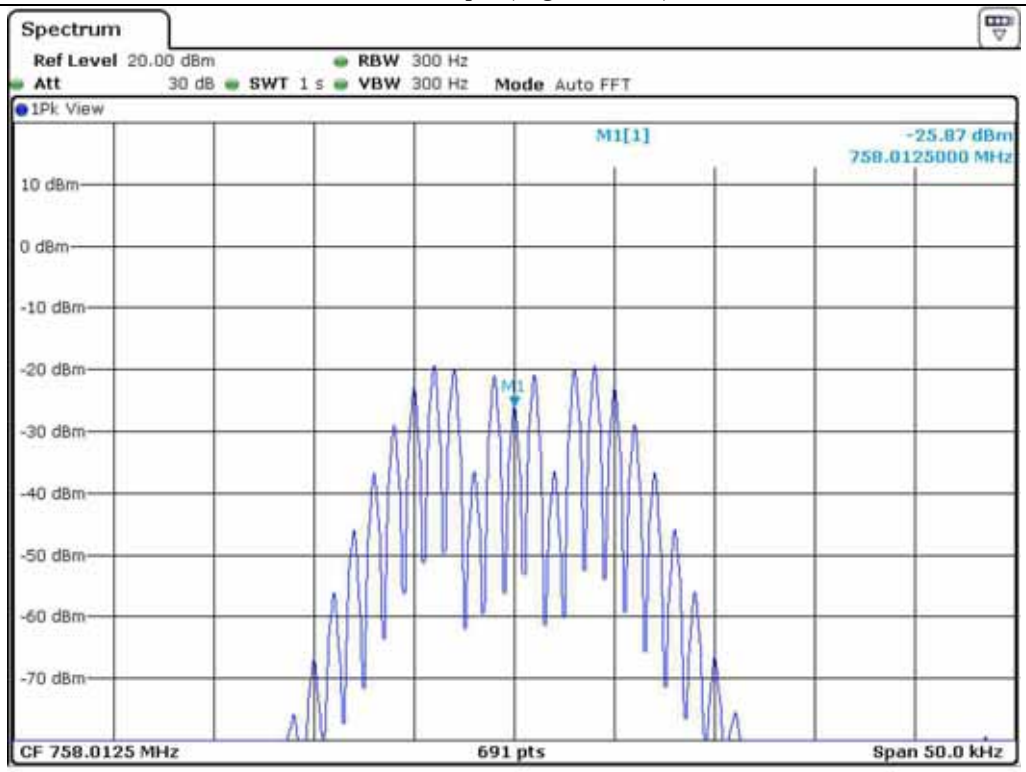


iDEN – Input (High Channel)



SMR – Input (Low 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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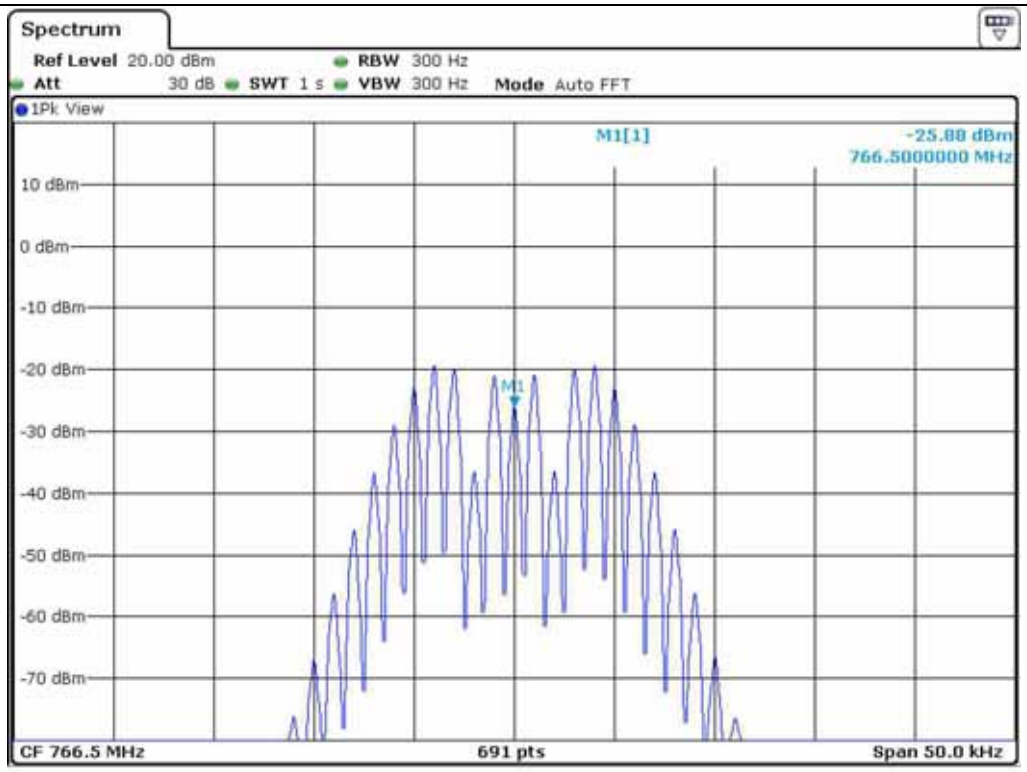
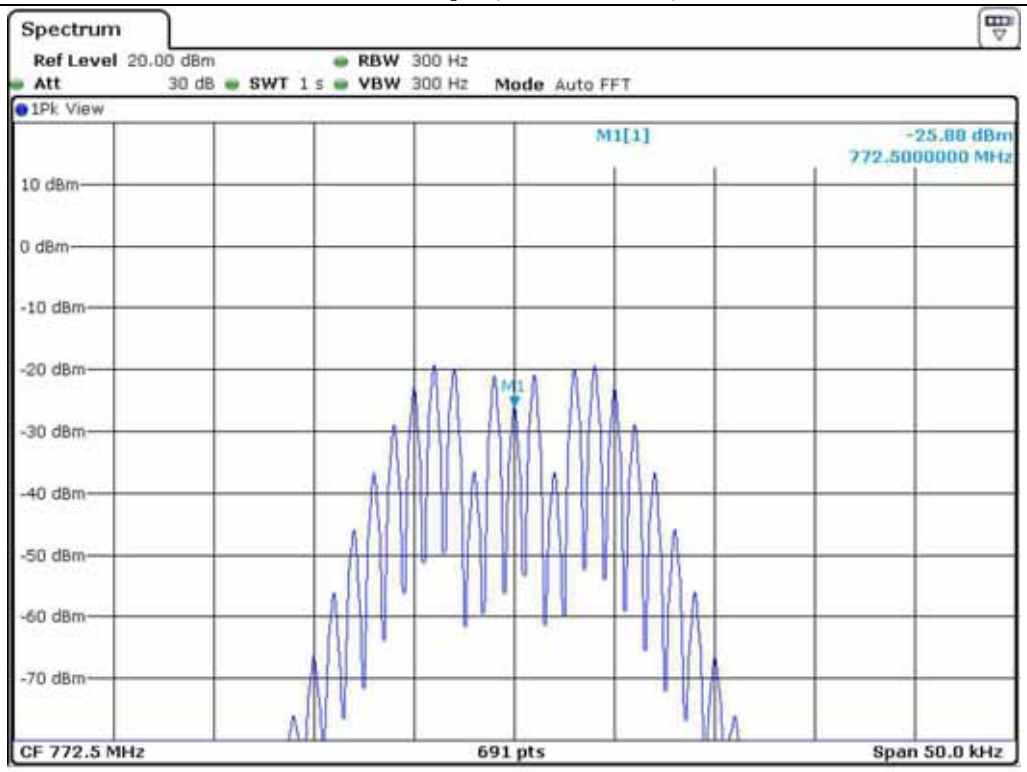


SMR – Input (Middle Channel)



SMR – Input (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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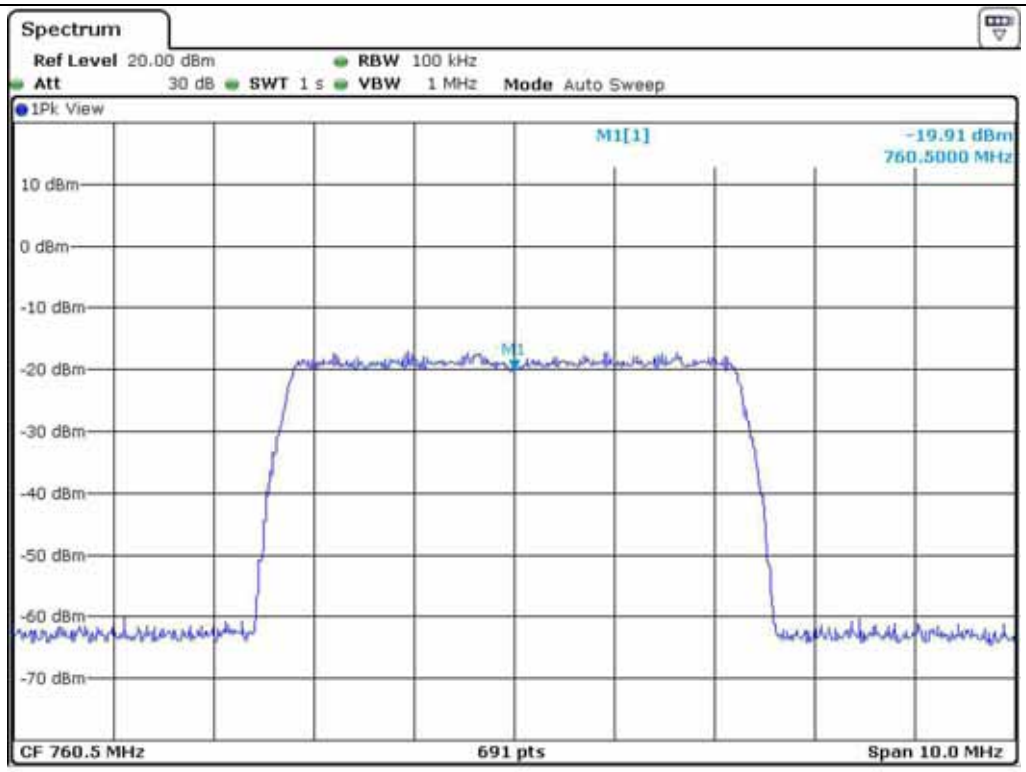
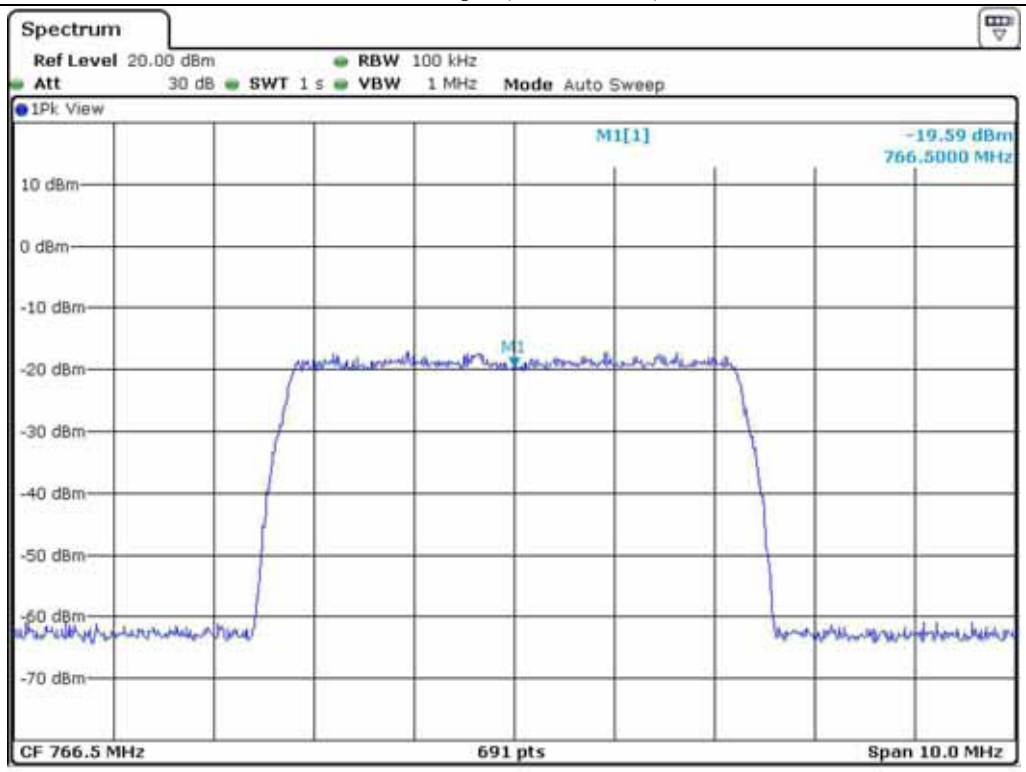


LTE – Input (Low Channel)



LTE – Input (Middle 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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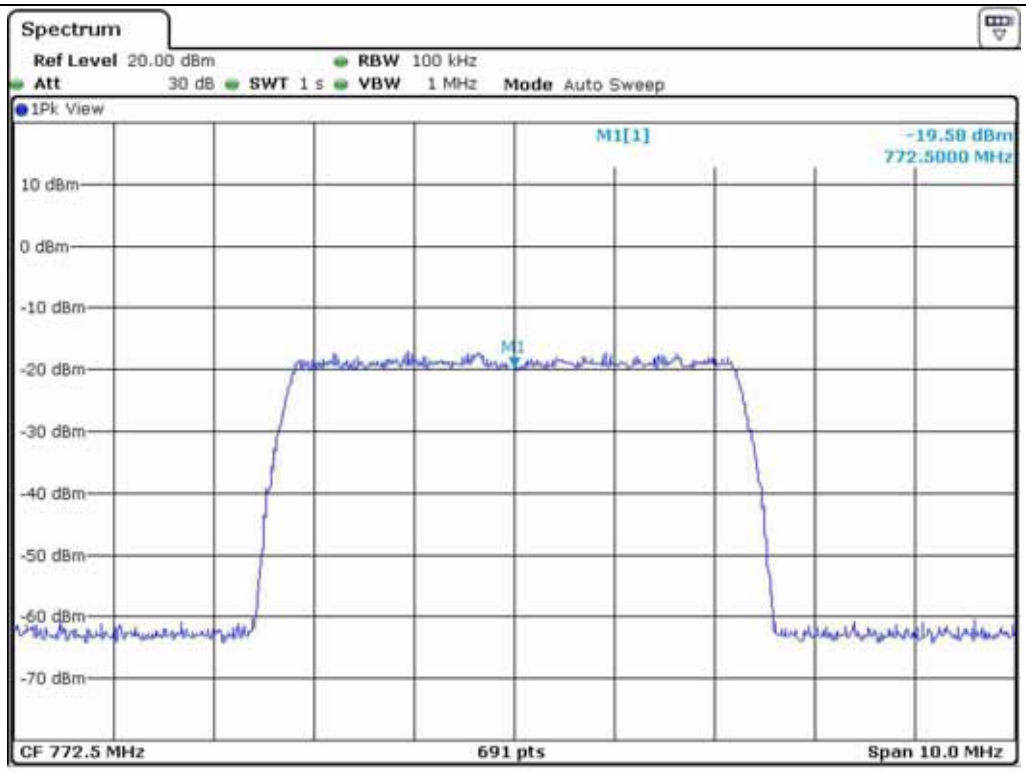

LTE – Input (High Channel)

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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7. SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Operating environment

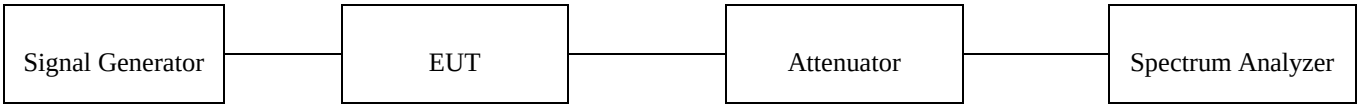
Temperature : 22 °C

Relative humidity : 49 % 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 10 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 700/1000 -0.2/40-5SSK	Wainwright Instruments GmbH	Tunable Band Reject Filter	19	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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7.4 Test data

-. Test Date : March 05, 2012

-. Frequency range : 30 MHz ~ 10 GHz

-. Result : PASSED BY -13.92 dB at LTE mode

Modulation	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
iDEN	Low	715.70	-51.88	0.70	-51.18	-13.00	-38.18
		7 831.00	-31.24	3.50	-27.74		-14.74
	Middle	656.80	-51.87	0.65	-51.22		-38.22
		7 844.00	-31.29	3.50	-27.79		-14.79
	High	732.60	-51.82	0.70	-51.12		-38.12
		7 805.00	-31.00	3.50	-27.50		-14.50
SMR	Low	683.50	-53.08	0.65	-52.43	-13.00	-39.43
		7 831.00	-31.11	3.50	-27.61		-14.61
	Middle	718.50	-51.04	0.70	-50.34		-37.34
		7 831.00	-31.67	3.50	-28.17		-15.17
	High	732.60	-51.79	0.70	-51.09		-38.09
		7 831.00	-31.54	3.50	-28.04		-15.04
LTE	Low	655.40	-52.15	0.65	-51.50	-13.00	-38.50
		7 831.00	-32.21	3.50	-28.71		-15.71
	Middle	677.80	-52.87	0.65	-52.22		-39.22
		7 805.00	-30.42	3.50	-26.92		-13.92
	High	687.70	-51.00	0.65	-50.35		-37.35
		7 805.00	-31.98	3.50	-28.48		-15.48

According to Part 90I, 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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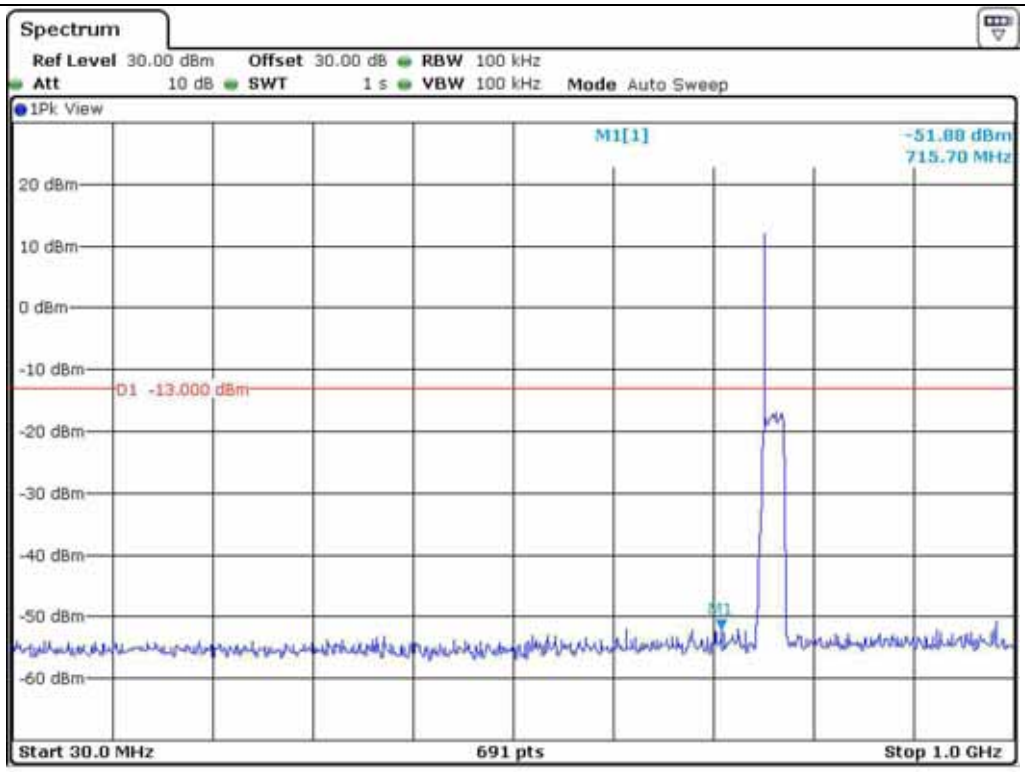
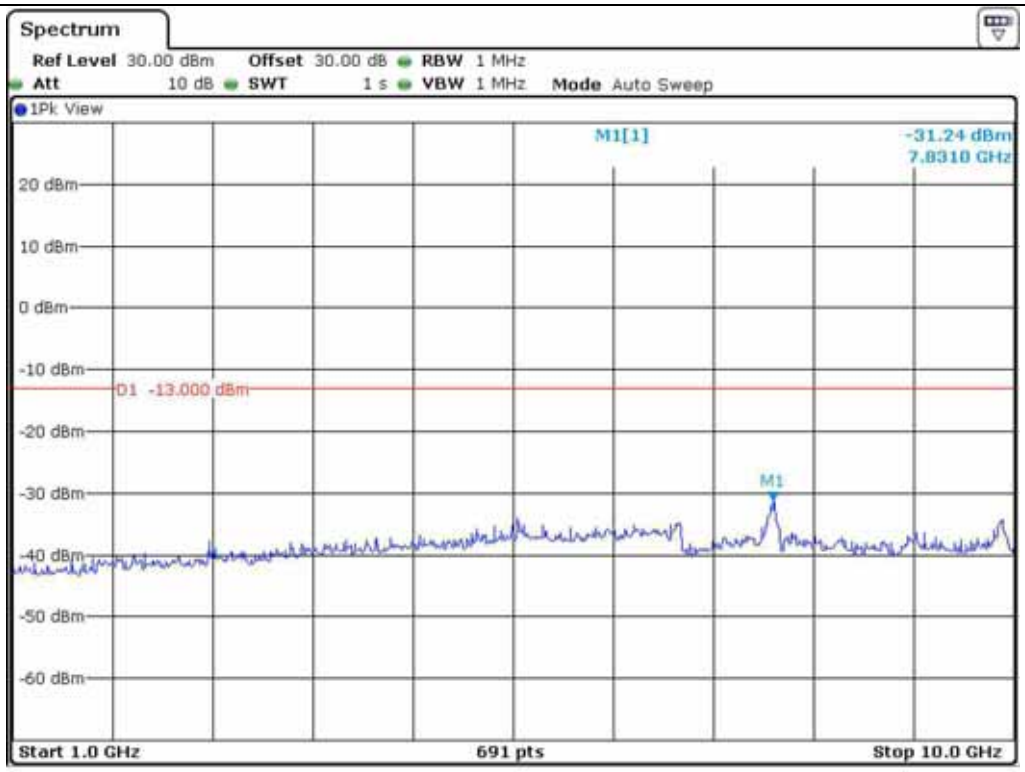


iDEN –Low Channel



iDEN –Low Channel

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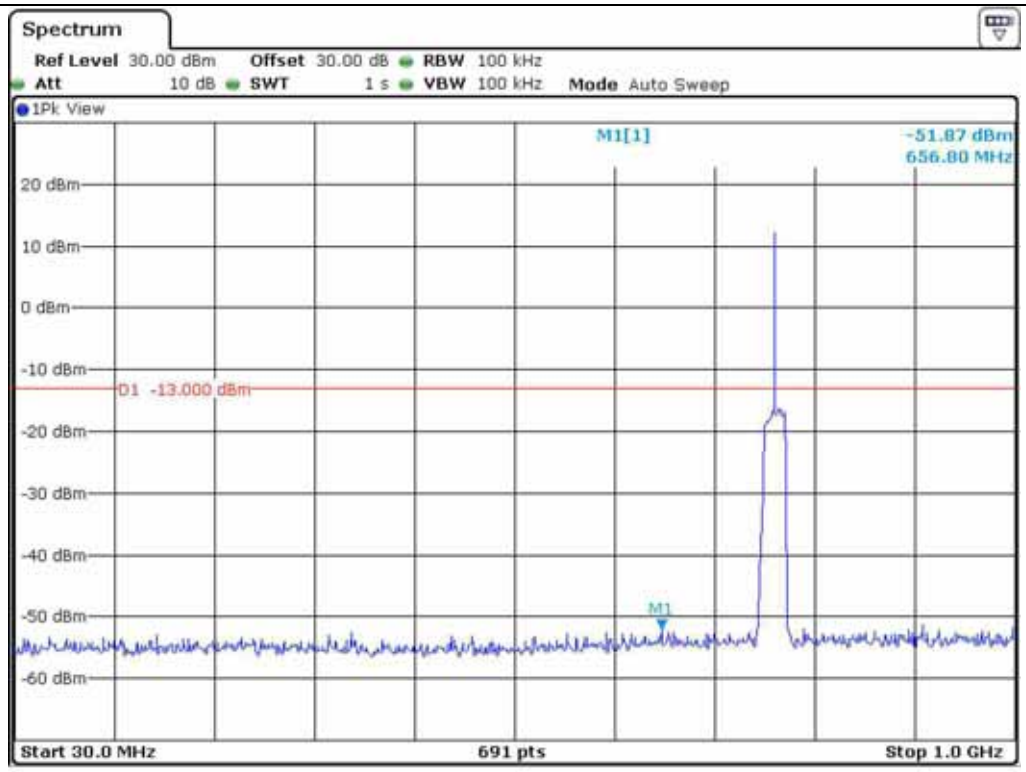
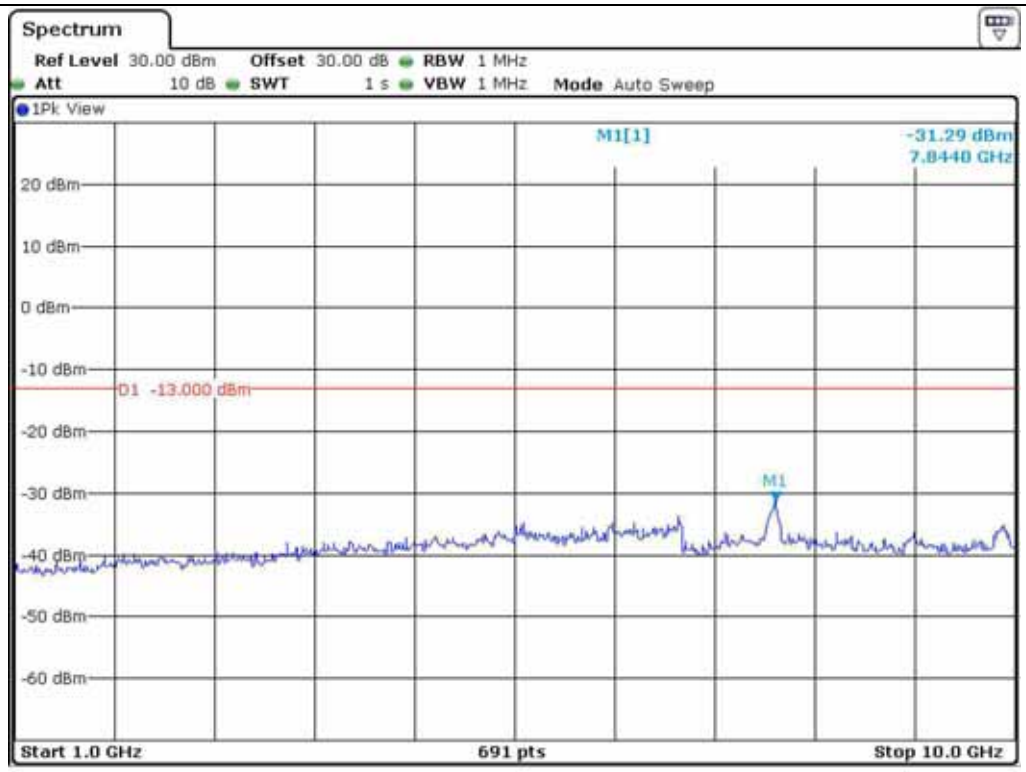


iDEN –Middle Channel



iDEN –Middle Channel

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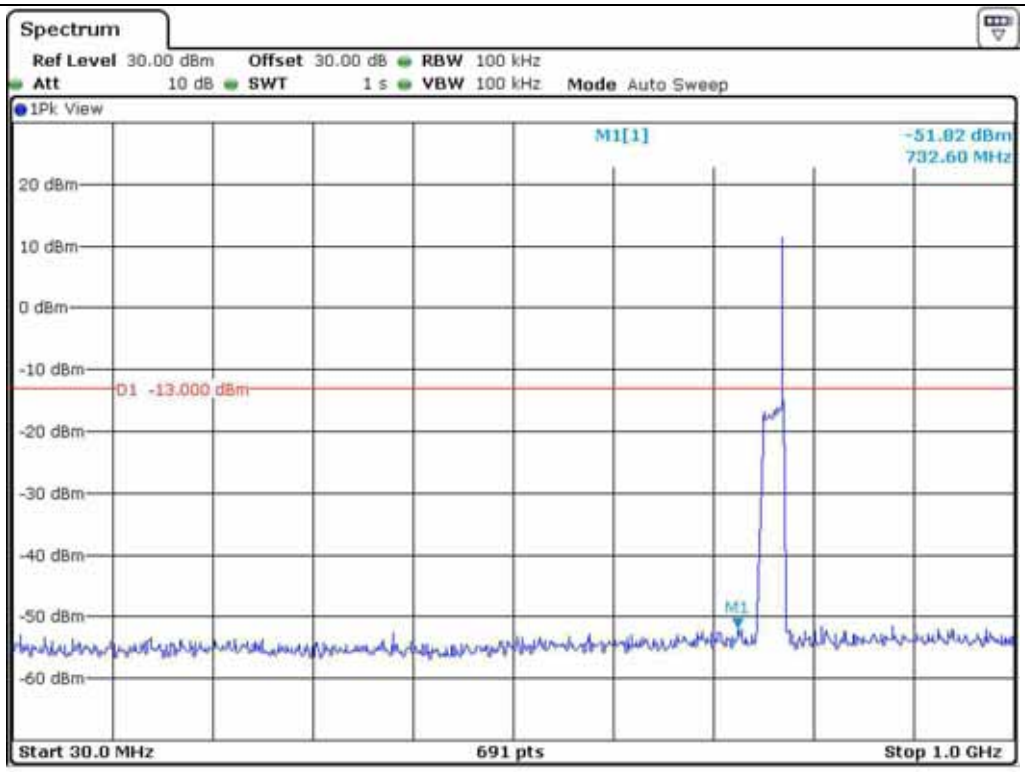
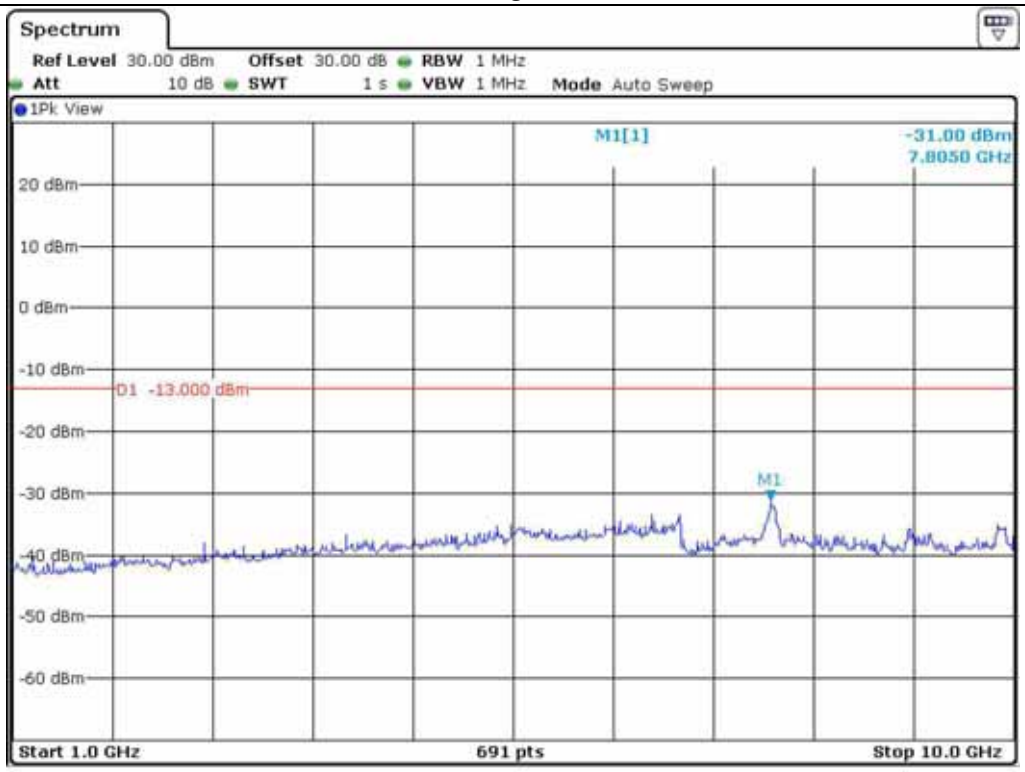


iDEN – High Channel



iDEN – High Channel

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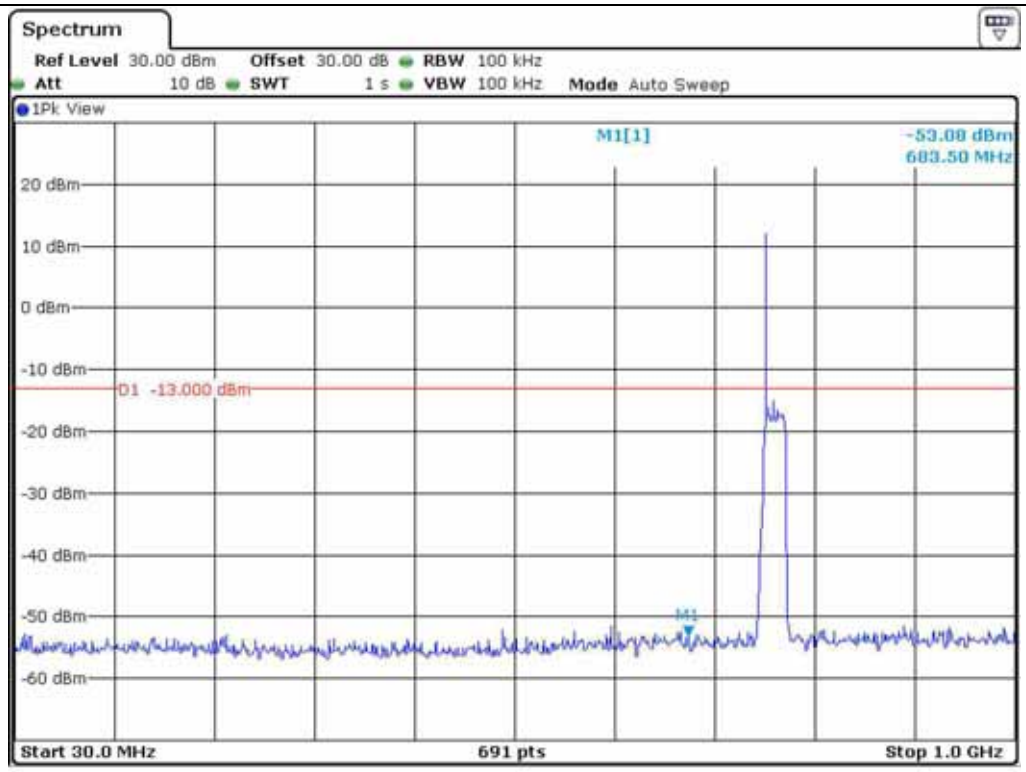
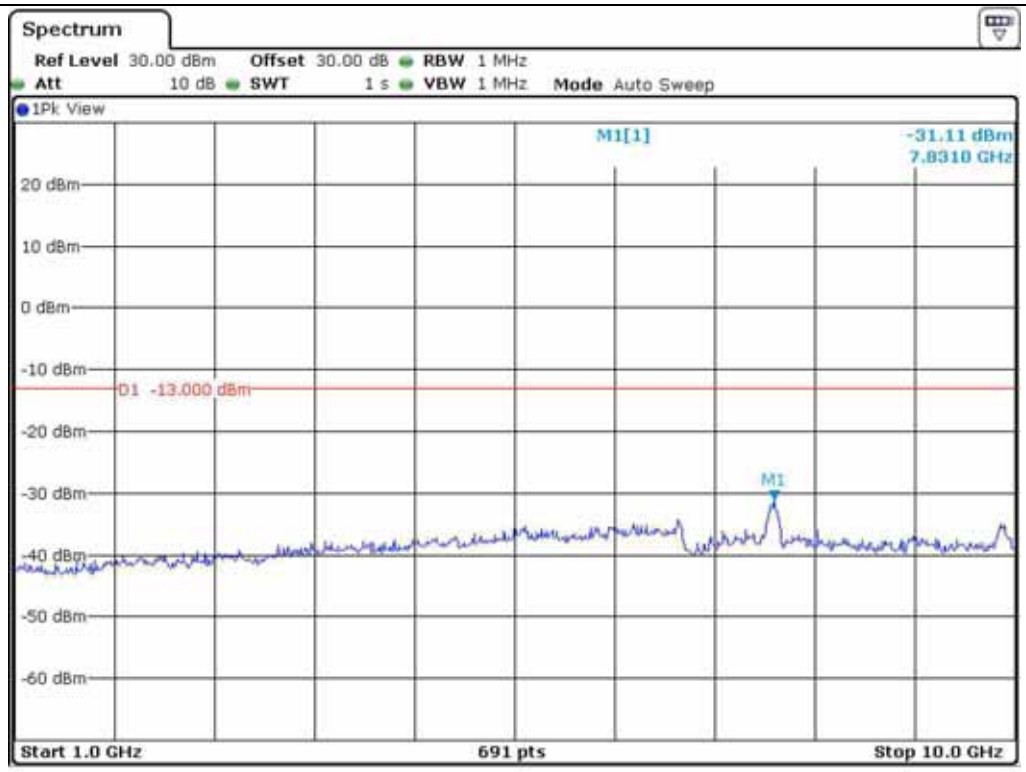


SMR – Low Channel



SMR – Low Channel

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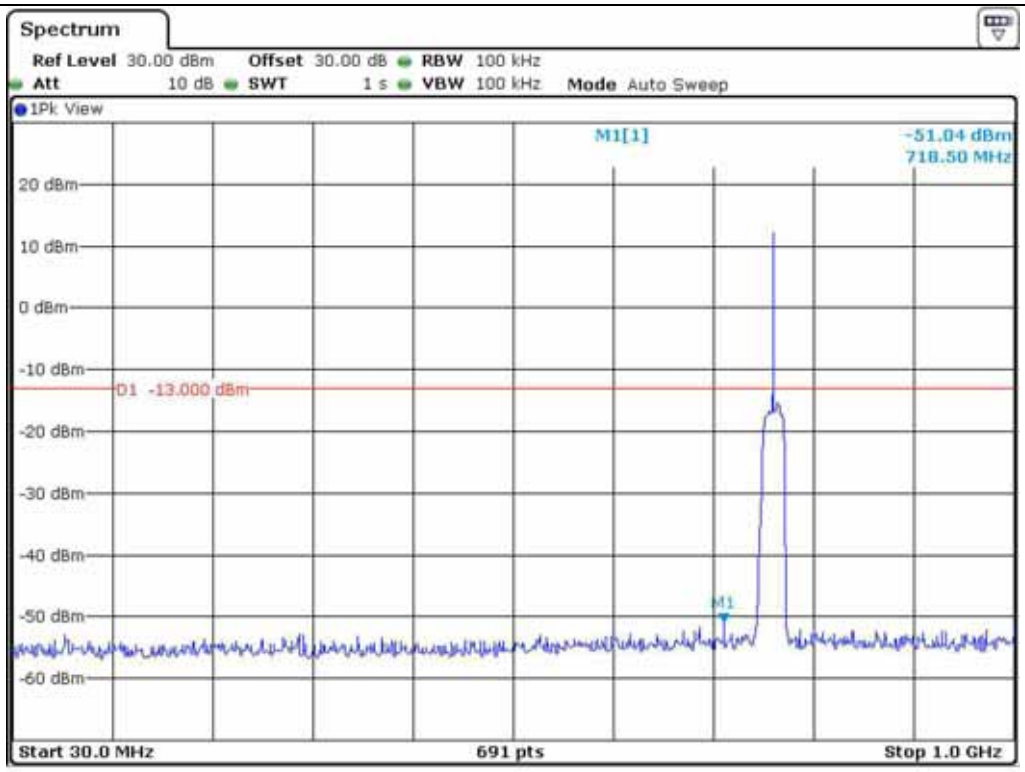
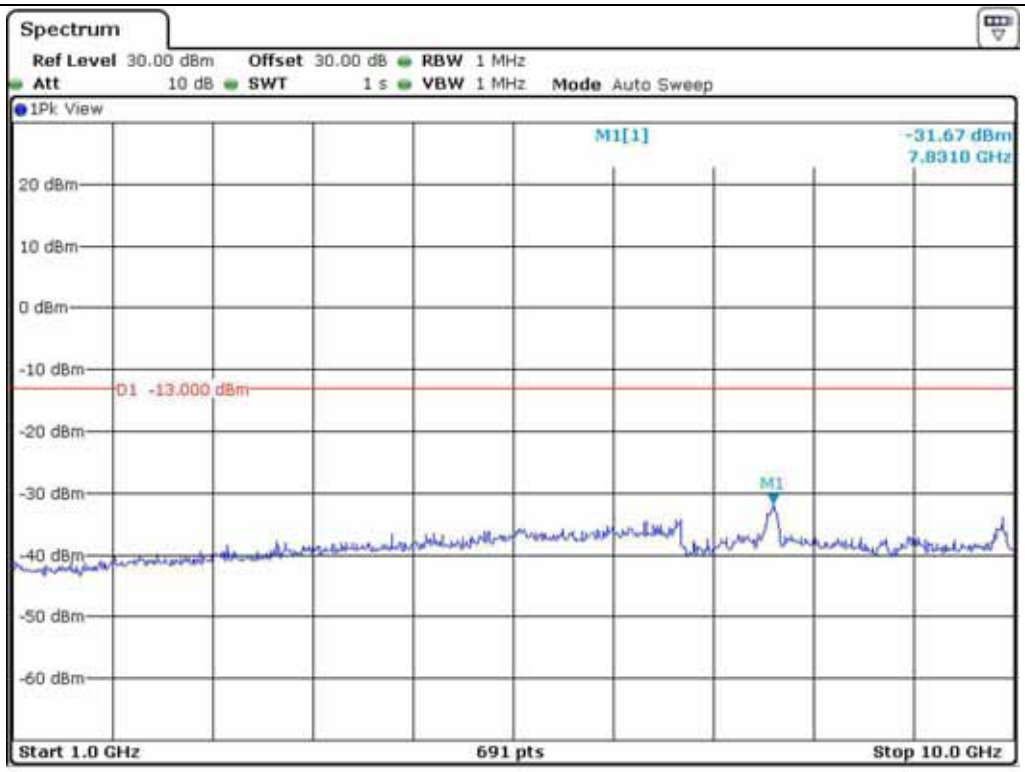


SMR – Middle Channel



SMR – Middle 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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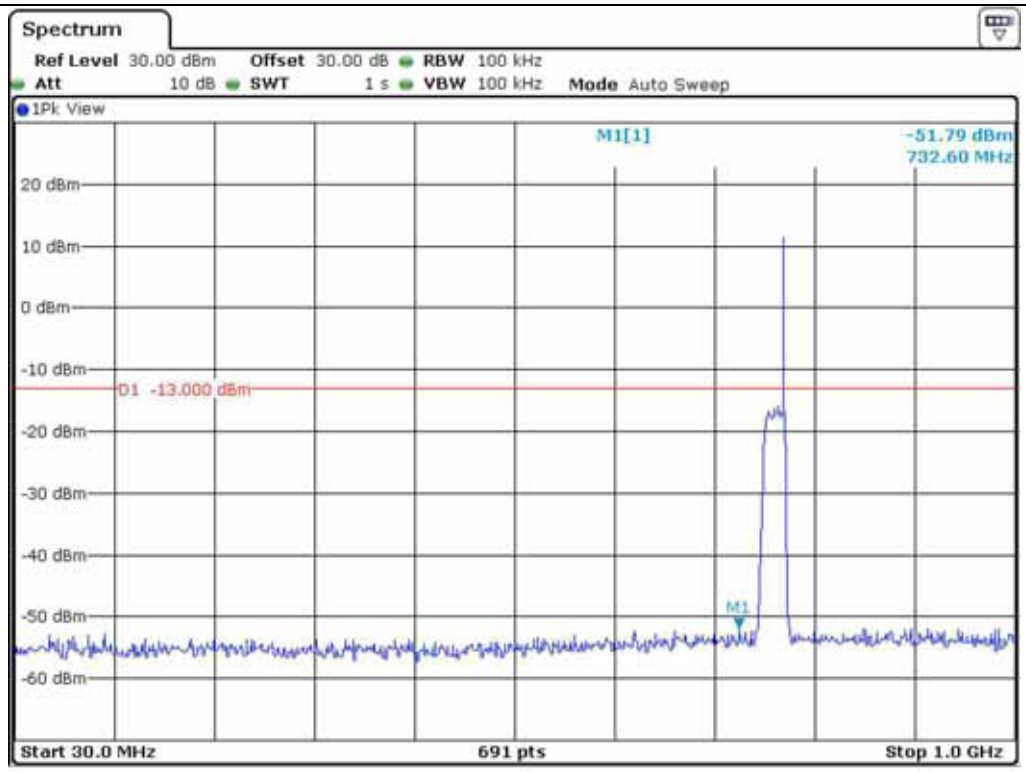
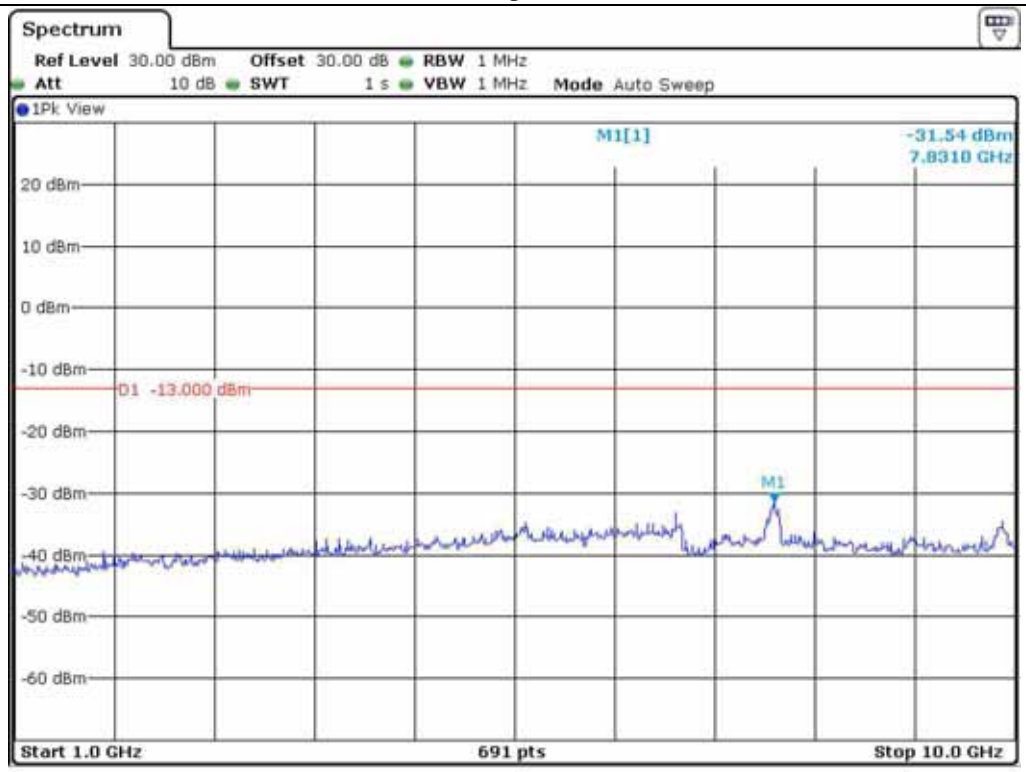


SMR – High Channel



SMR – 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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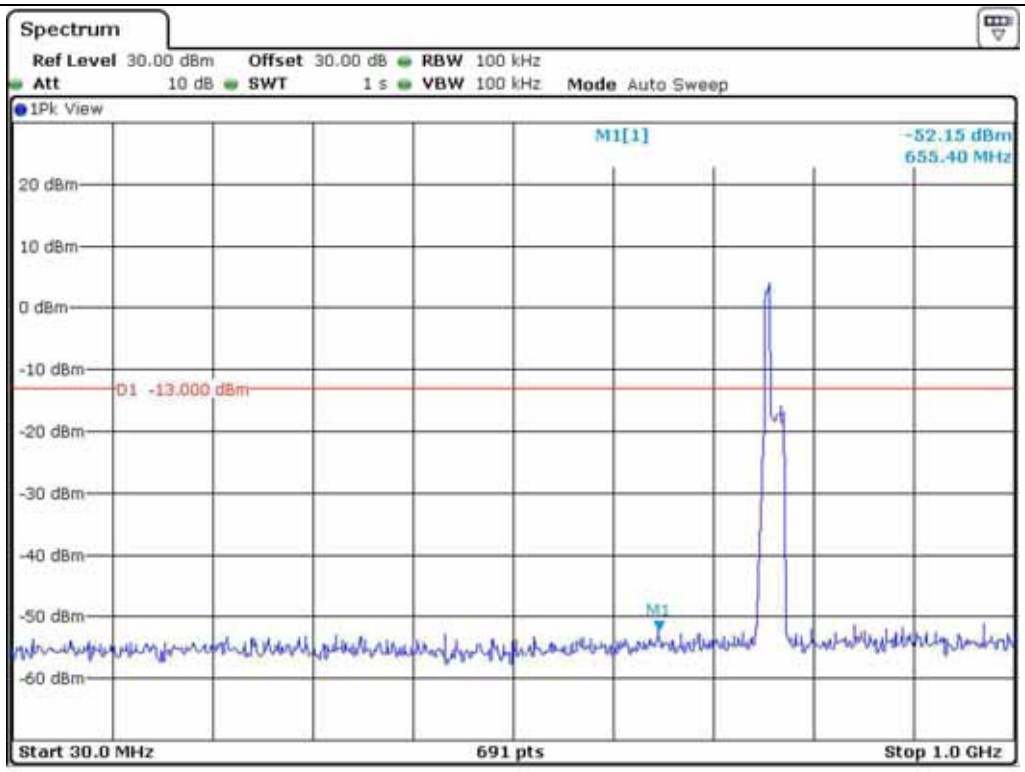
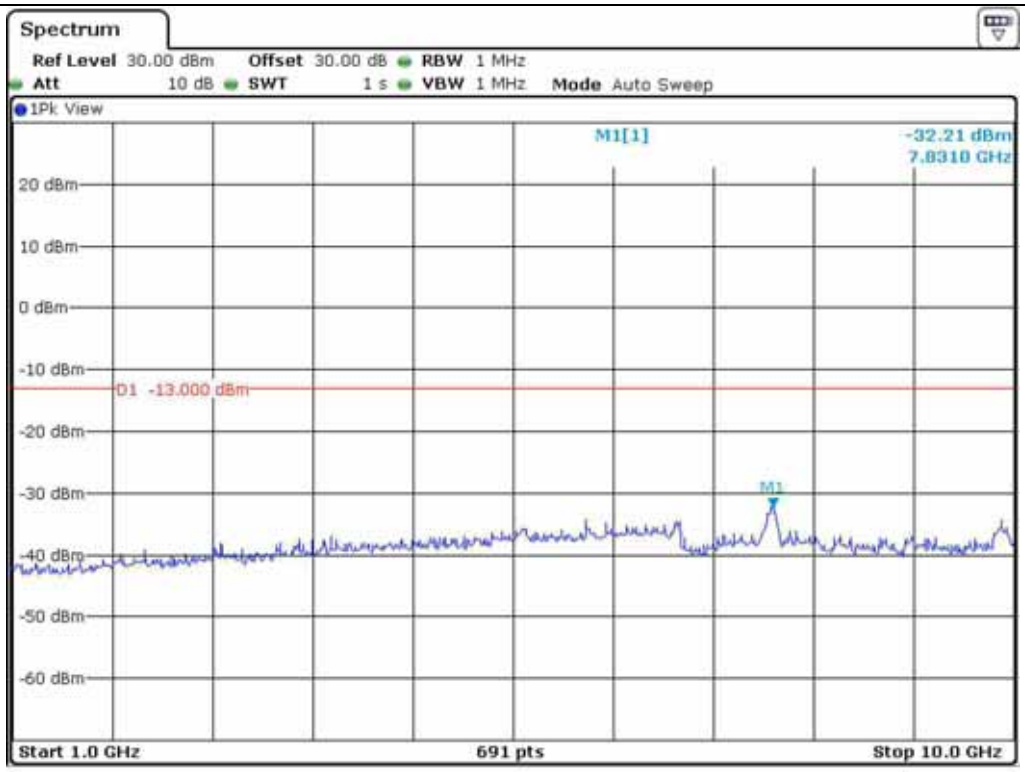


LTE –Low Channel



LTE –Low Channel

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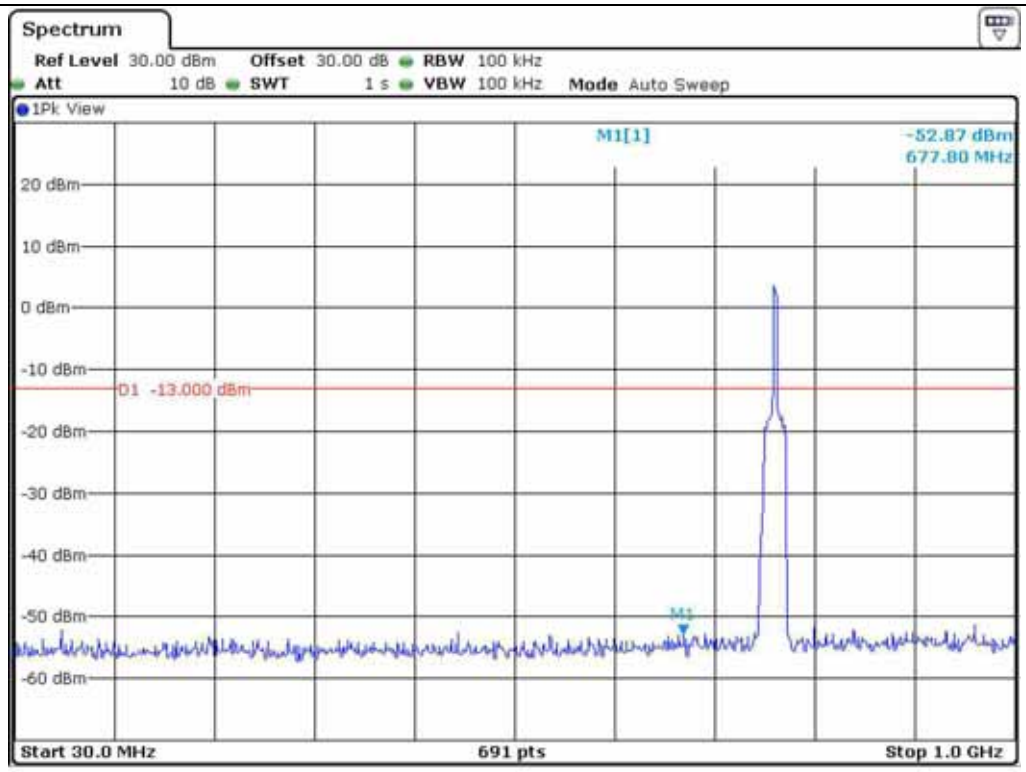
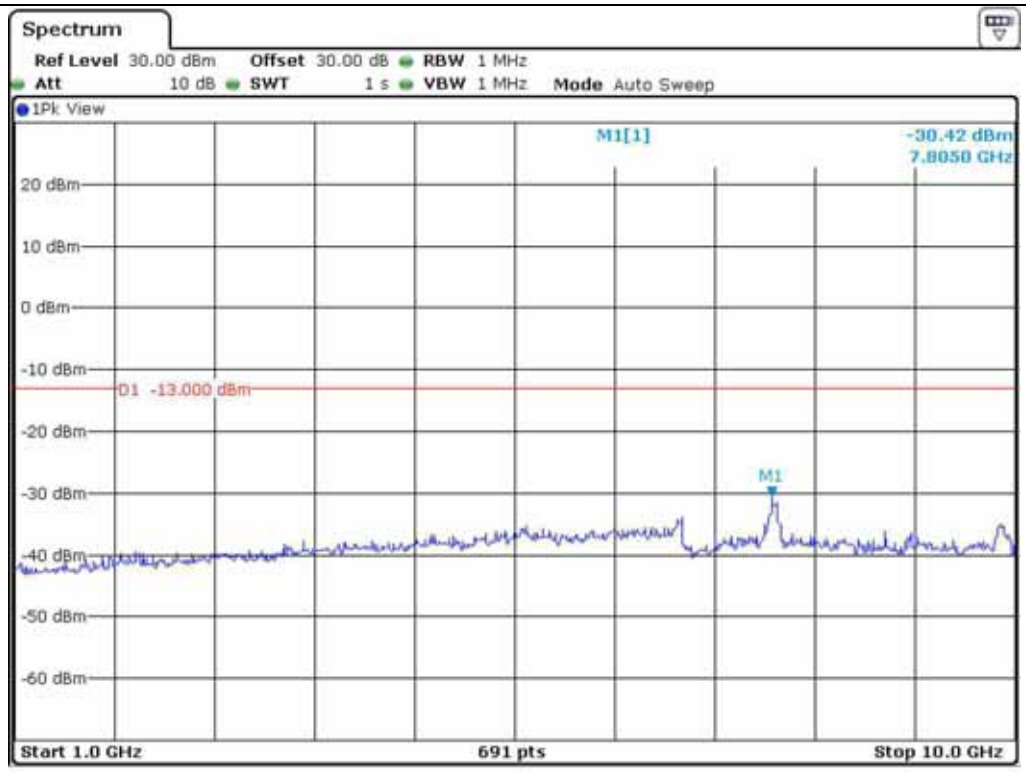


LTE – Middle Channel



LTE – Middle 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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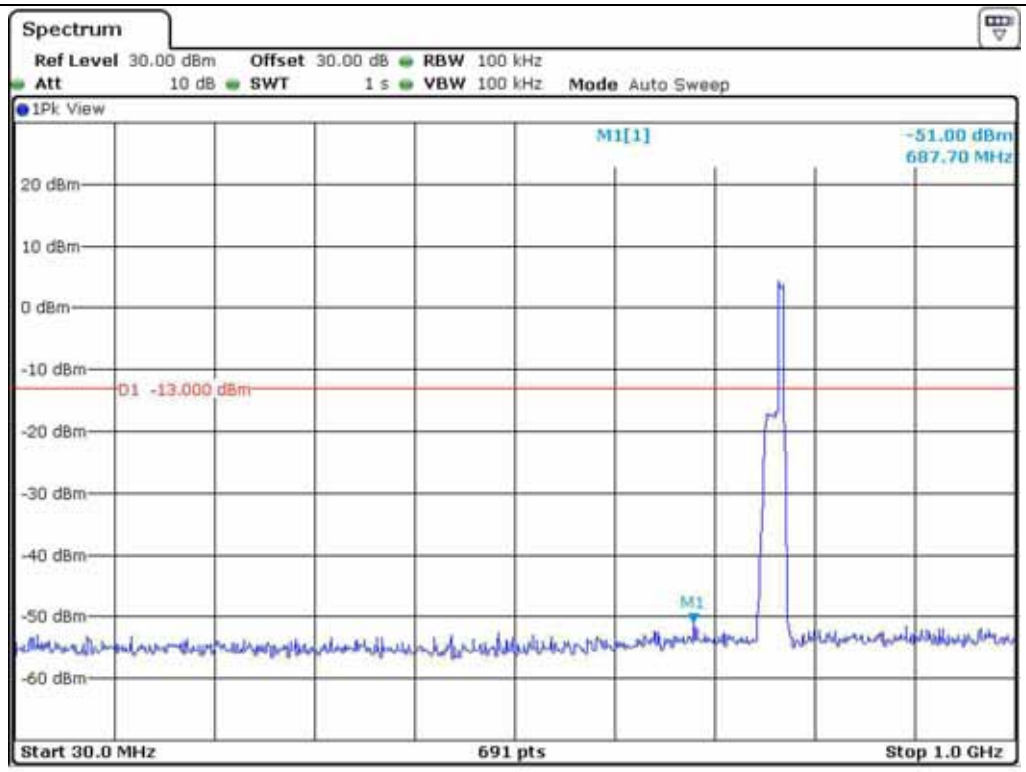
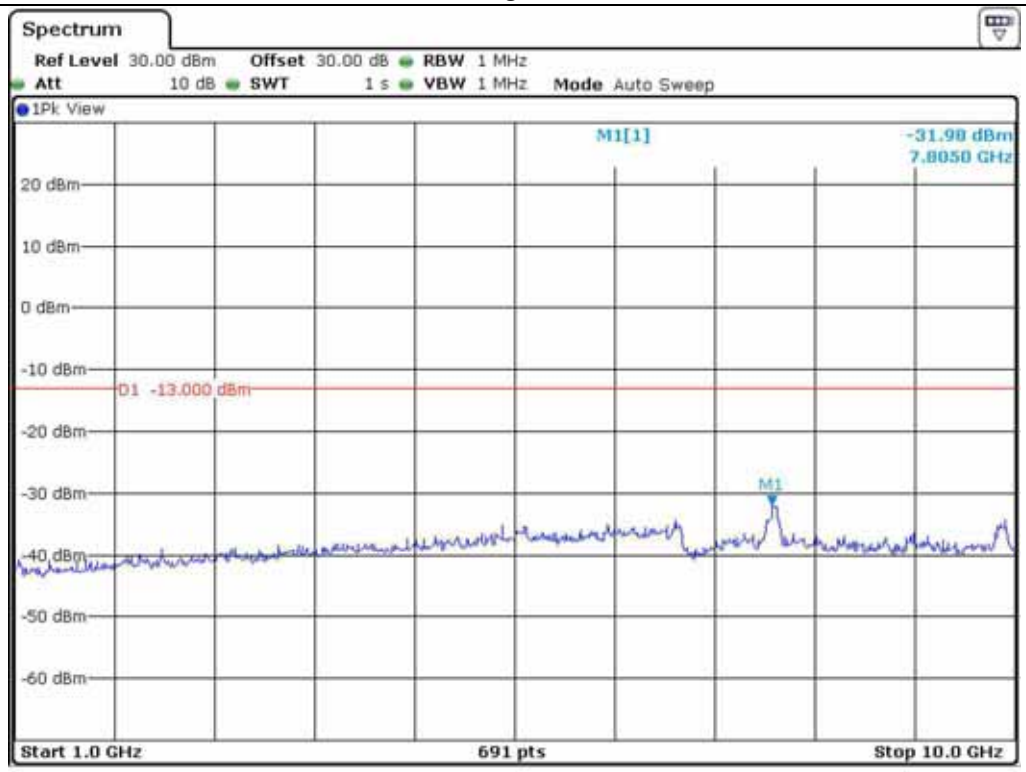


LTE – High Channel



LTE – High Channel

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8. BAND EDGE MEASUREMENT

8.1 Operating environment

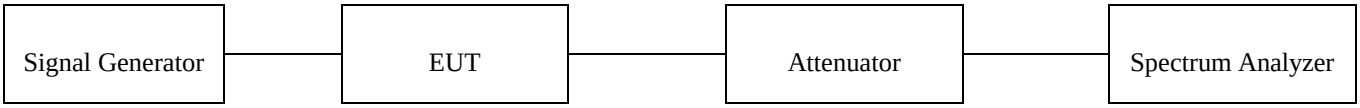
Temperature : 22 °C

Relative humidity : 49 % 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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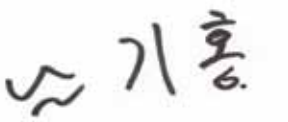
8.4 Test data

-. Test Date : March 05, 2012

-. Result : PASSED BY -5.27 dB at low channel of LTE mode

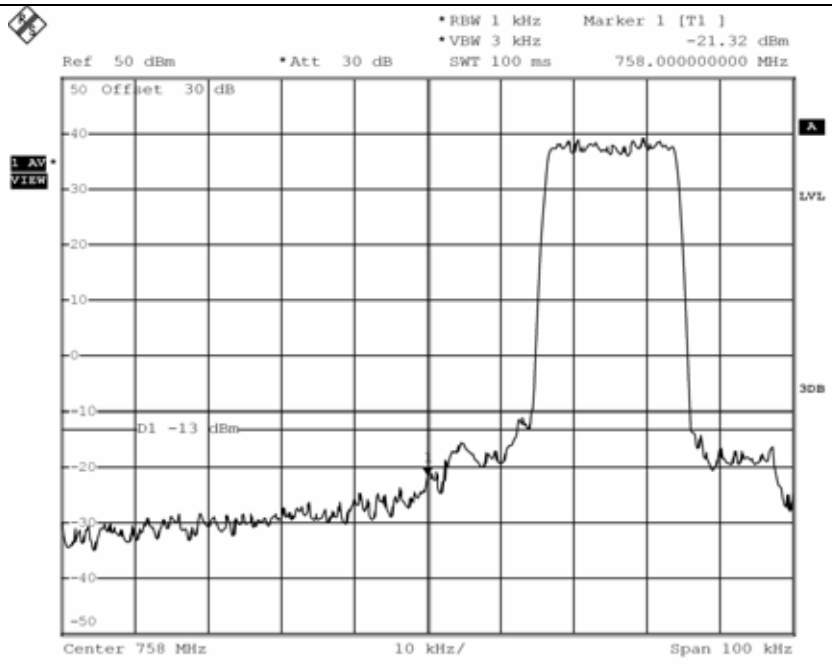
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)	Margin (dB)
iDEN	Low	758.000	-21.32	-13.00	-8.32
	High	775.000	-27.38		-14.38
SMR	Low	758.000	-32.39		-19.39
	High	775.000	-33.39		-20.39
LTE	Low	758.000	-18.27		-5.27
	High	775.000	-21.57		-8.57

According to Part 90I, out of band emission shall be attenuated by 43 + 10 log (P) dBc, equates to -13.0dBm.

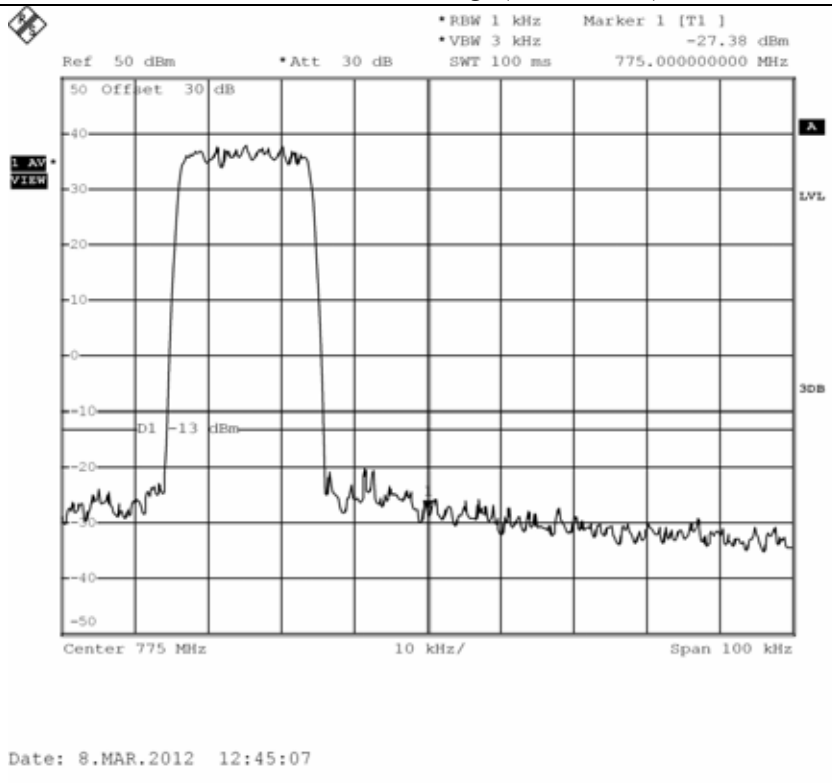


Tested by: Ki-Hong, Nam / Project Engineer

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)

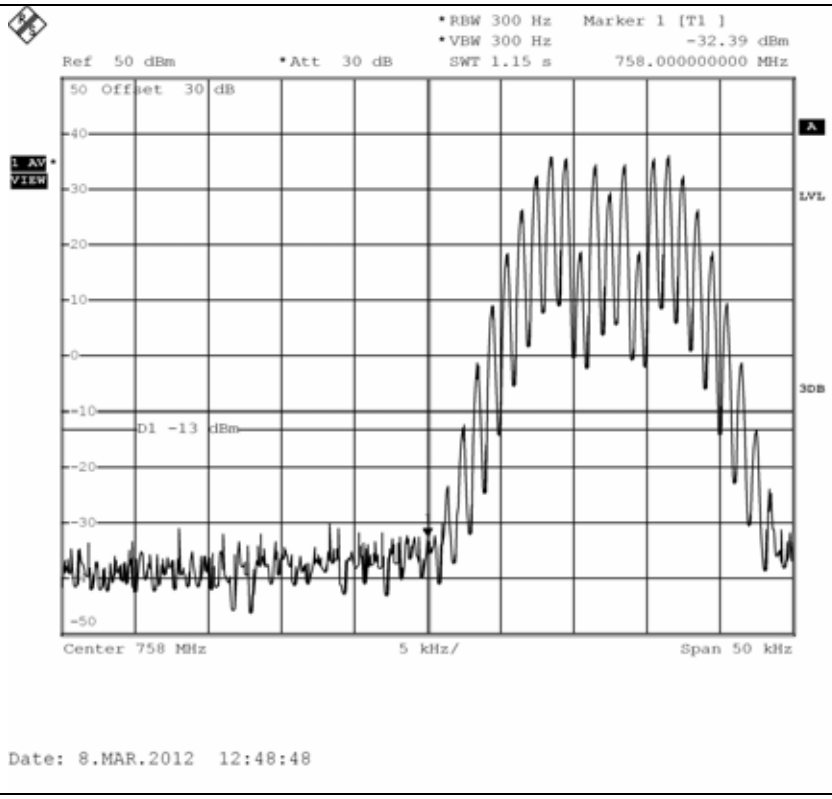


iDEN – Band Edge (Low Channel)

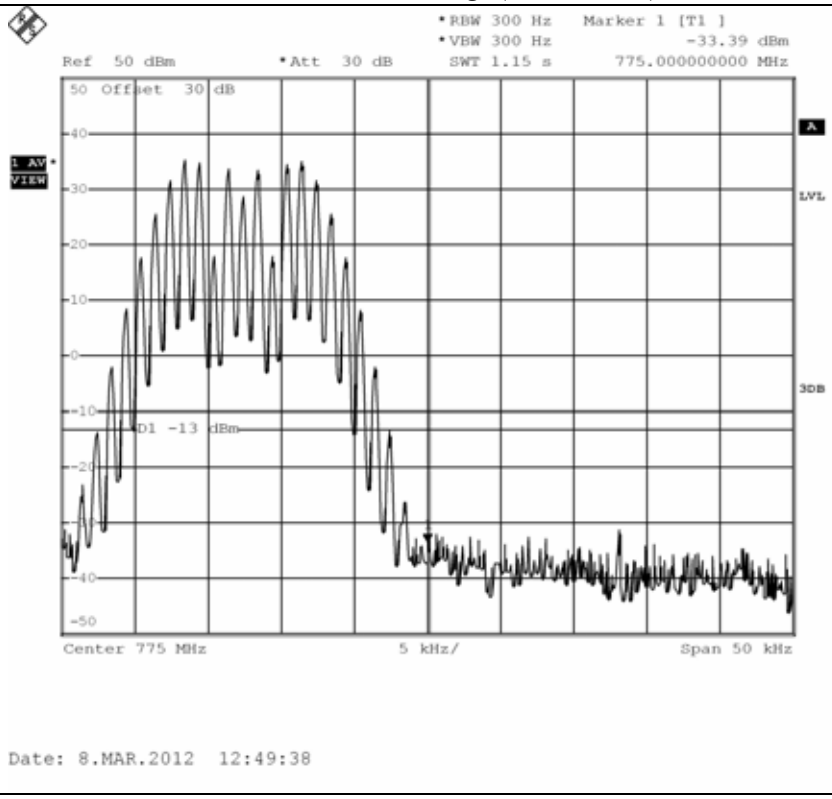


iDEN – Band Edge (High Channel)

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)

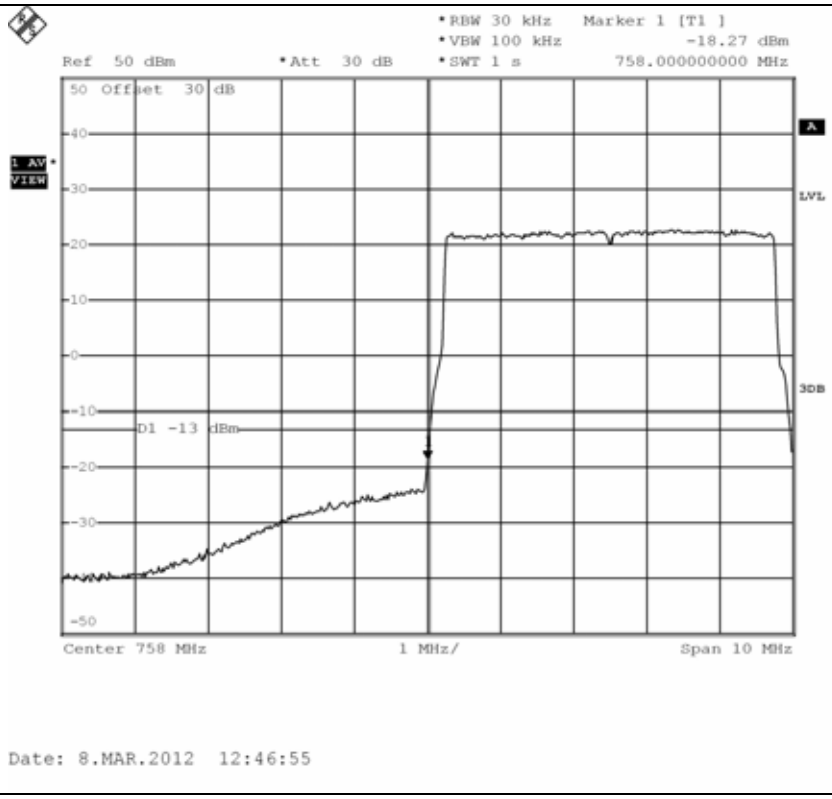


SMR – Band Edge (Low Channel)

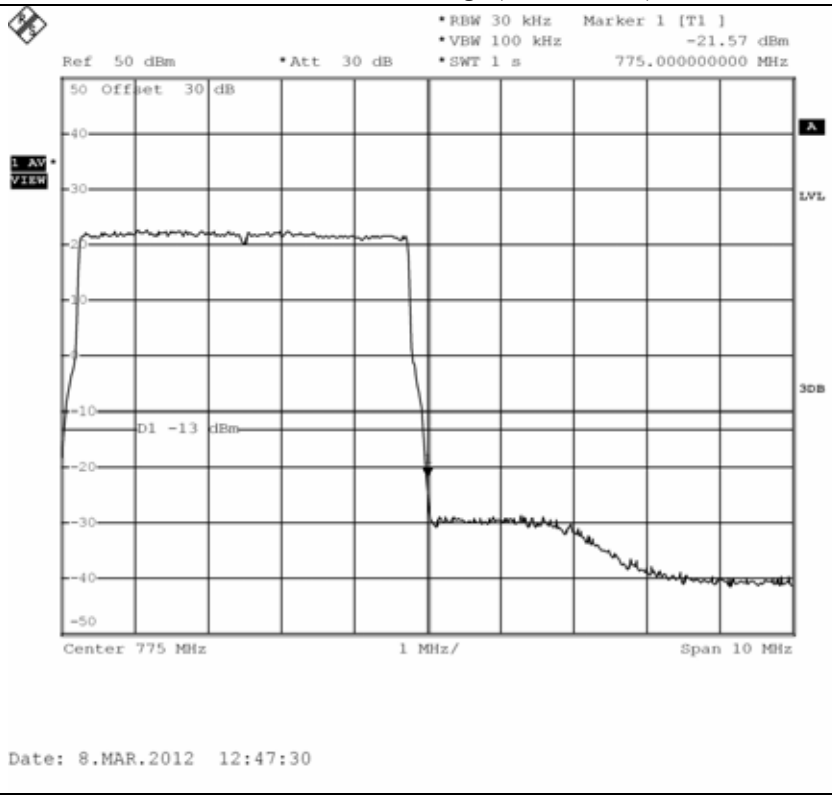


SMR – Band Edge (High Channel)

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)



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)
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)

9. INTERMODULATION TEST

9.1 Operating environment

Temperature : 22 °C

Relative humidity : 49 % 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 power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

Two 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)
☐ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	83650L	HP	Swept CW Generator	3844A00415	Jun. 10, 2011 (1Y)
☐ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 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.

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)

9.4 Test data

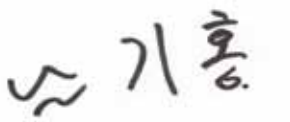
9.4.1 Test Result for peak power

-. Test Date : March 05, 2012

-. Test Result : Pass

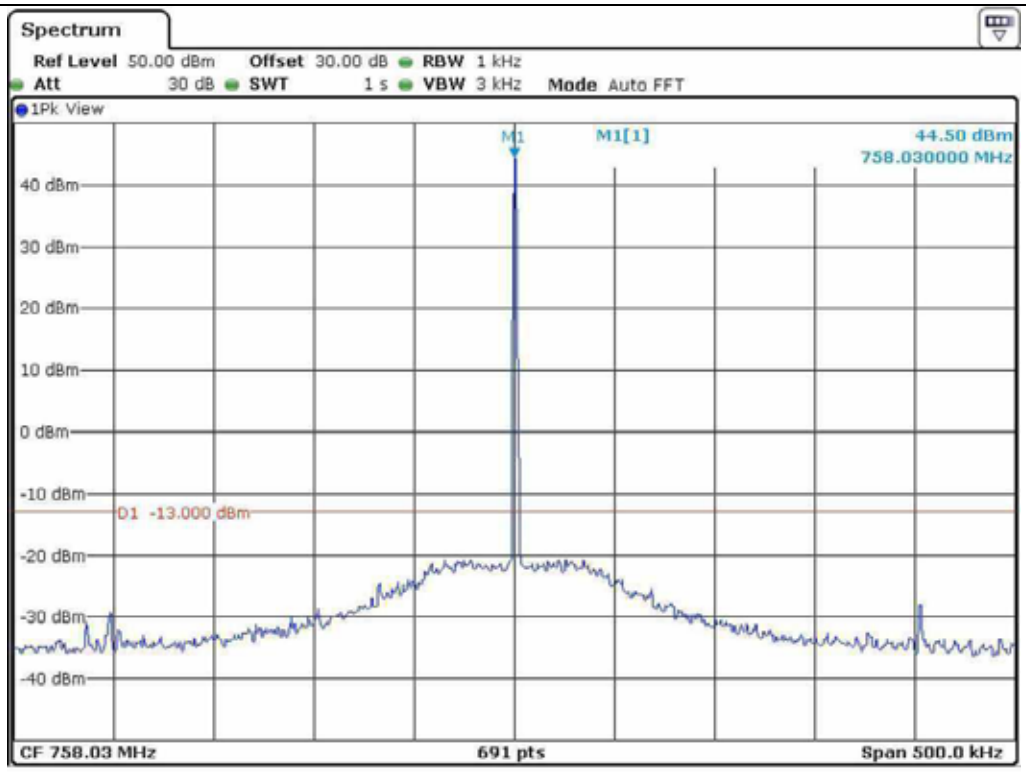
-. Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
758.030	1	-9.90	44.50
758.030 & 758.06	2	-9.90	44.49
758.030 & 758.06 & 758.09	3	-9.70	44.50
774.970	1	-9.70	44.50
774.970 & 774.940	2	-9.90	44.49
774.970 & 774.940 & 774.910	3	-9.90	44.50

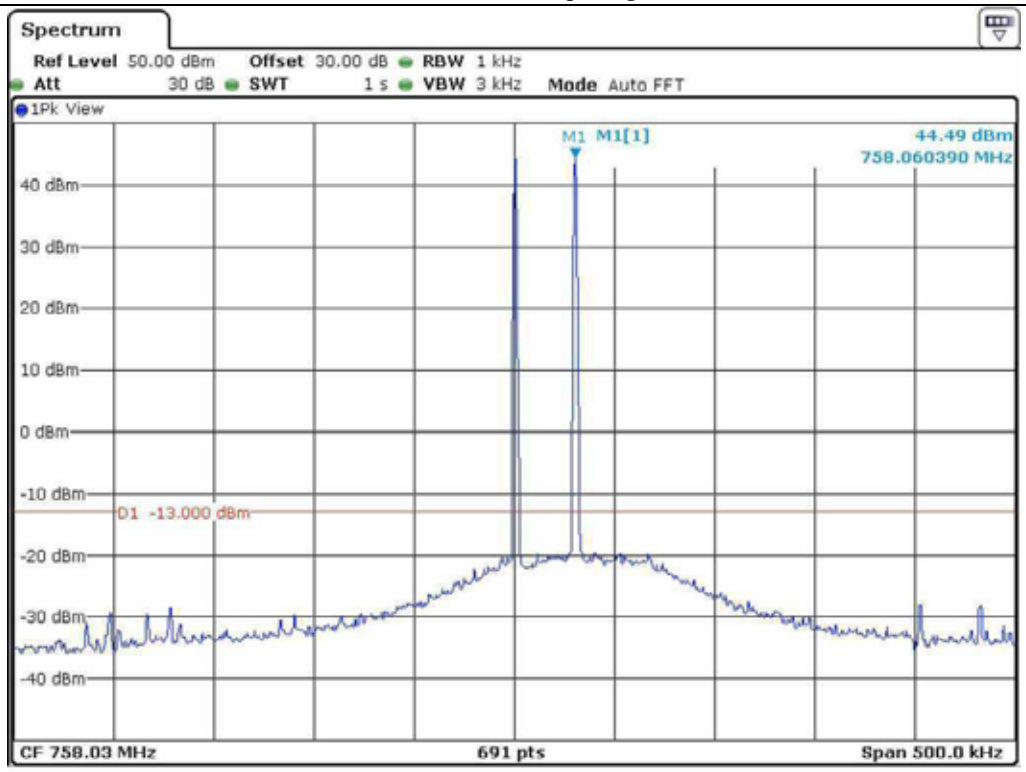


Tested by: Ki-Hong, Nam / Senior Engineer

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)

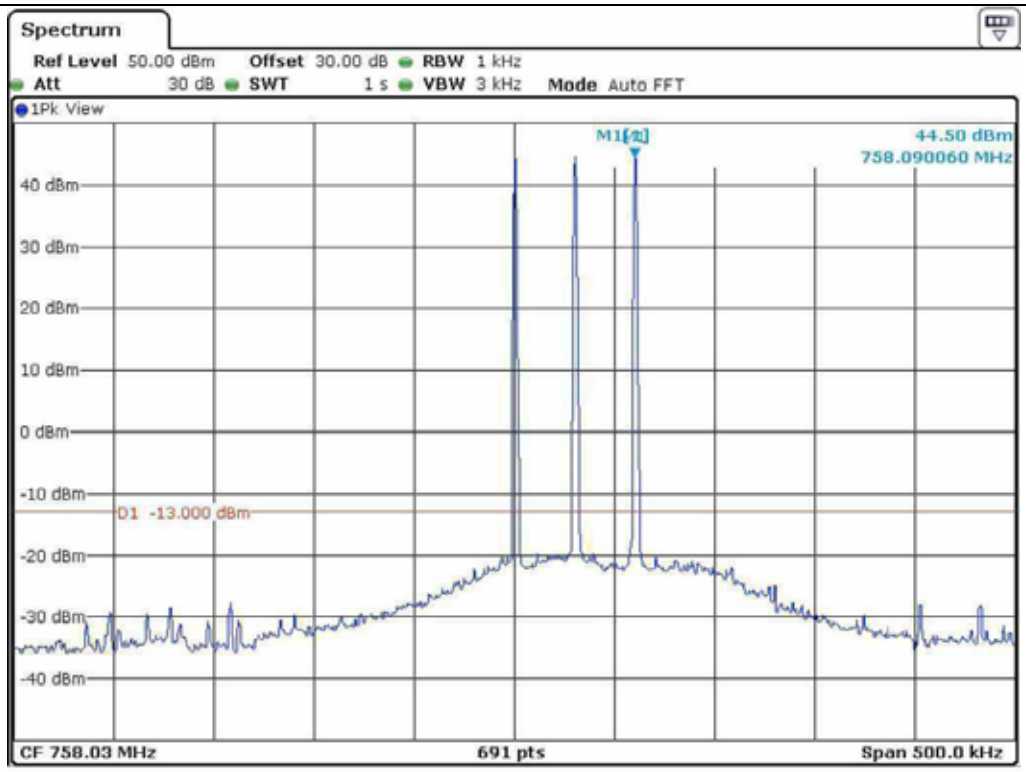


Low Channel – 1 input signal

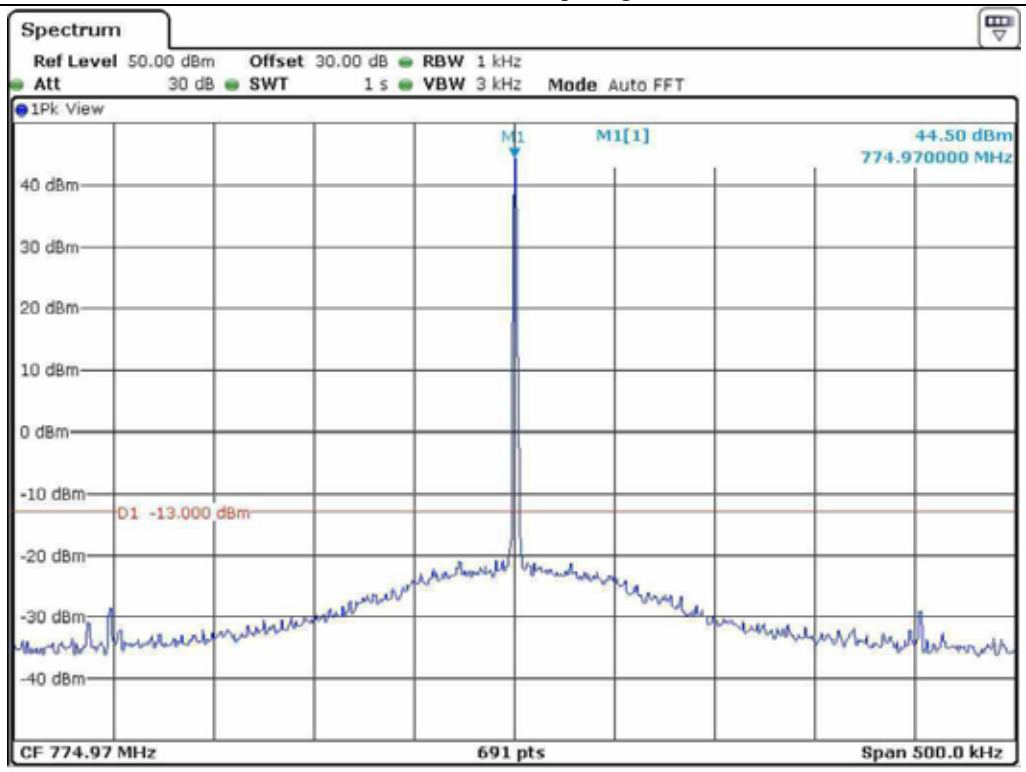


Low Channel – 2 input signals

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)

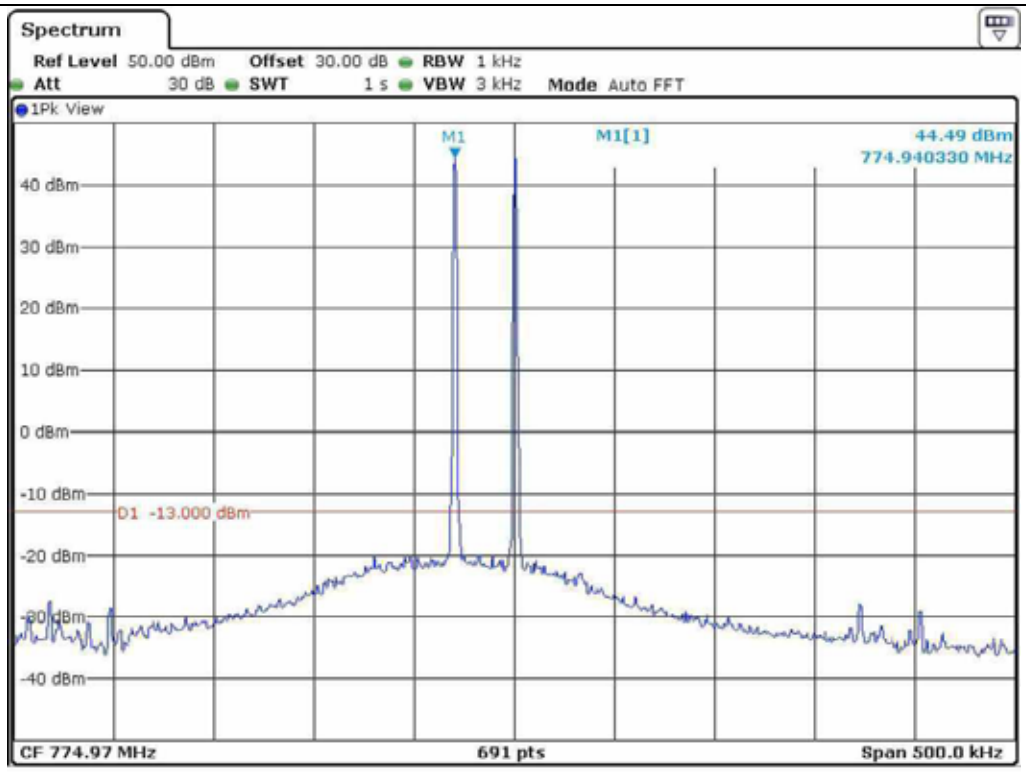


Low Channel – 3 input signals

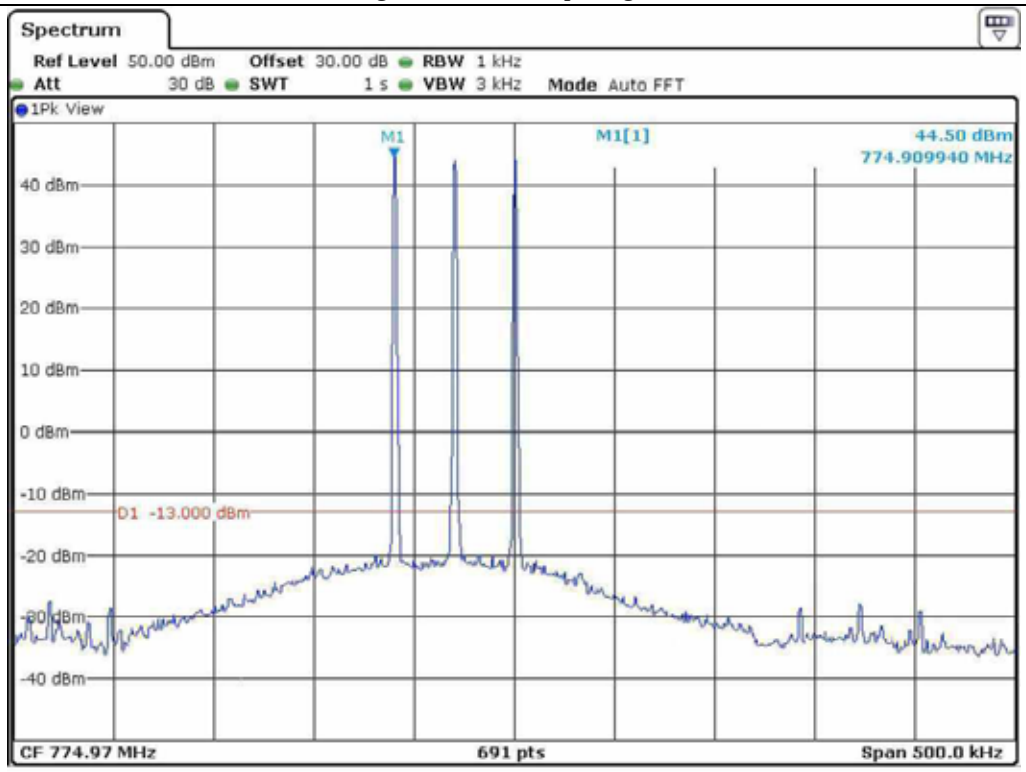


High Channel – 1 input signal

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)
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)
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)

9.4.2 Test Result for Spurious emission

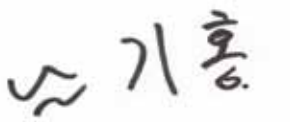
-. Test Date : March 05, 2012

-. Test Result : Pass

-. Modulation : No-Modulation

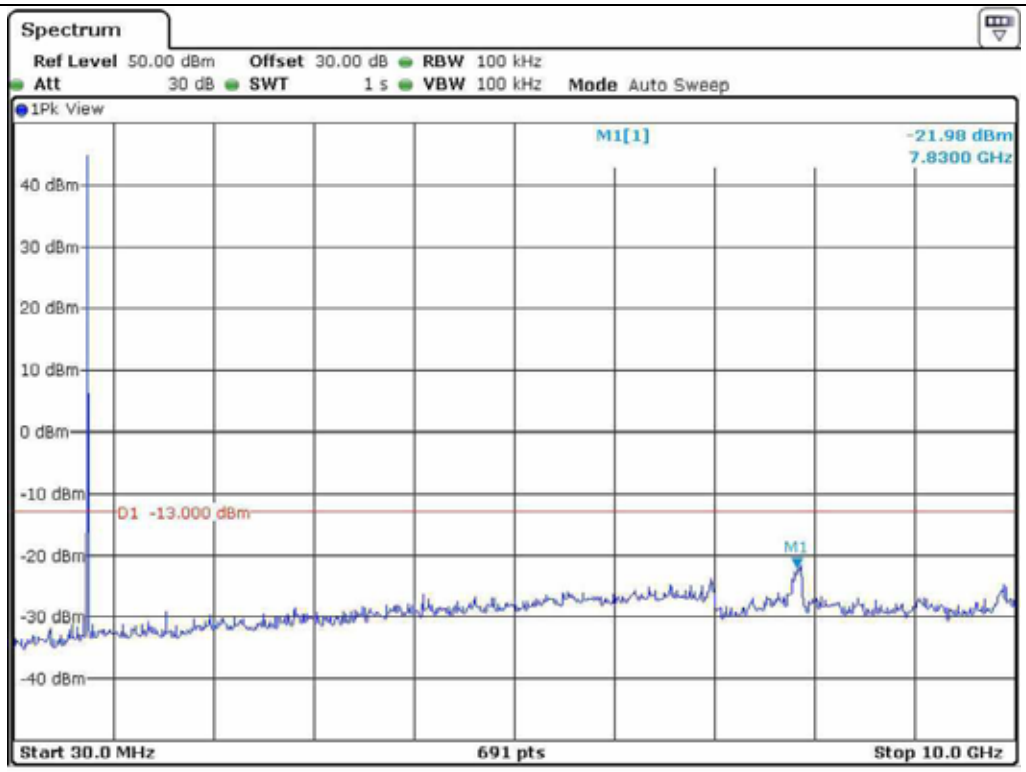
Frequency (MHz)	Number of Input Channel	Measured Value	Result
758.030	1	< -13 dBm	Pass
758.030 & 758.06	2		
758.030 & 758.06 & 758.09	3		
774.970	1	< -13 dBm	Pass
774.970 & 774.940	2		
774.970 & 774.940 & 774.910	3		

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.

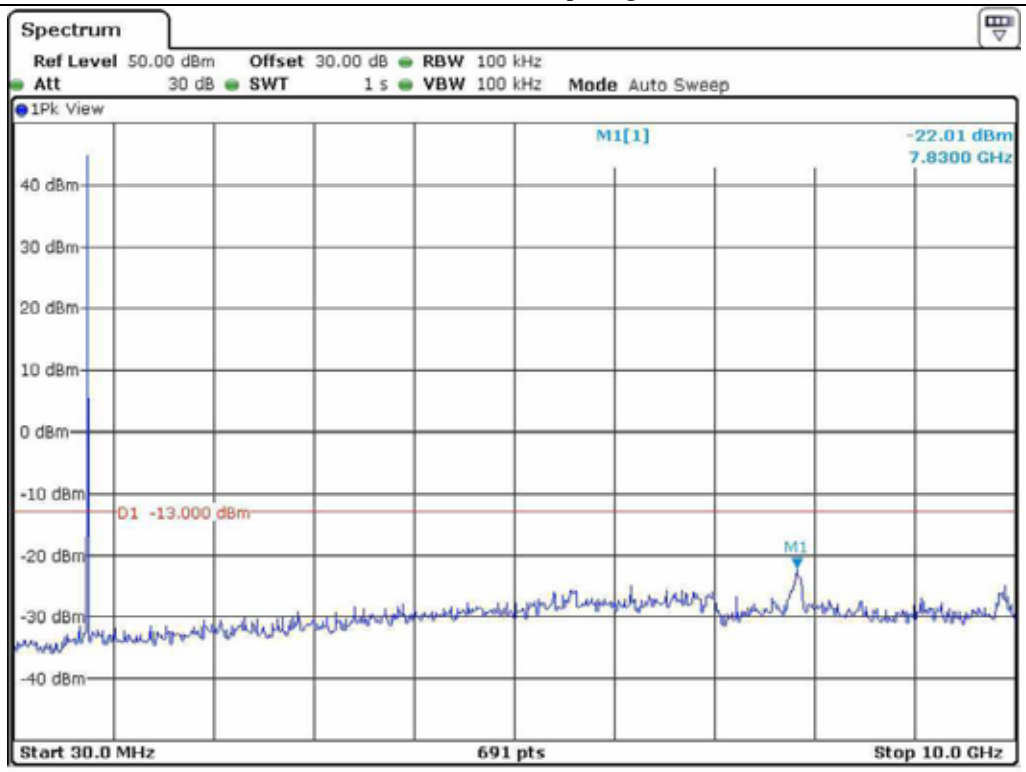


Tested by: Ki-Hong, Nam / Senior Engineer

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)

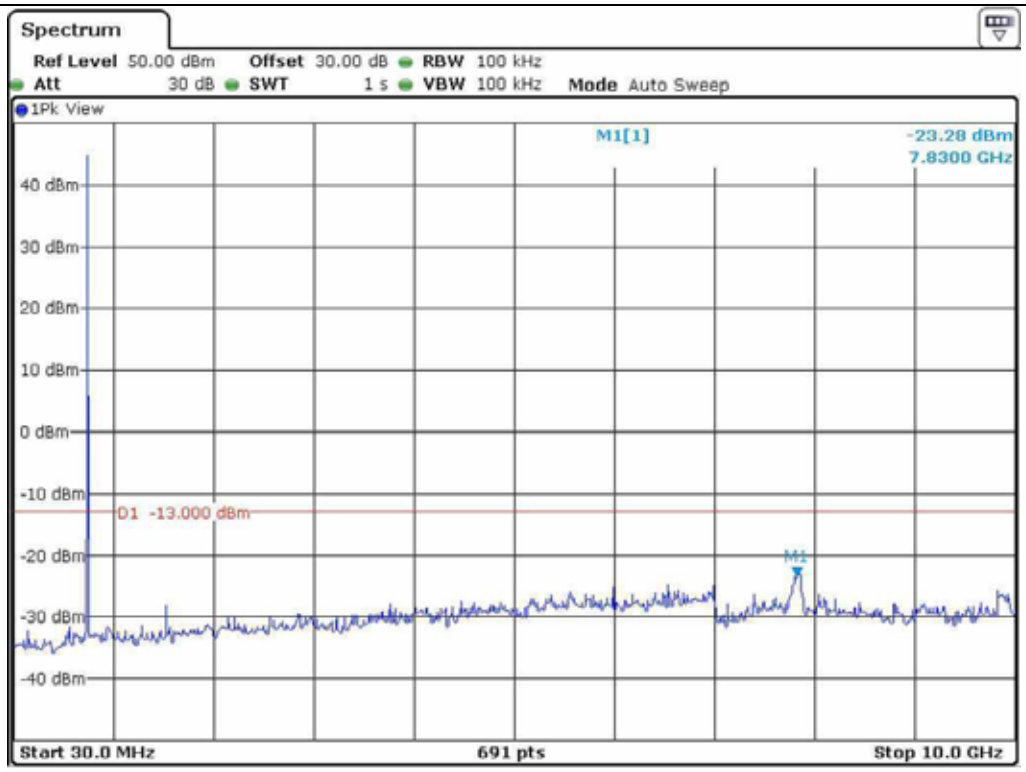


Low Channel – 1 input signal

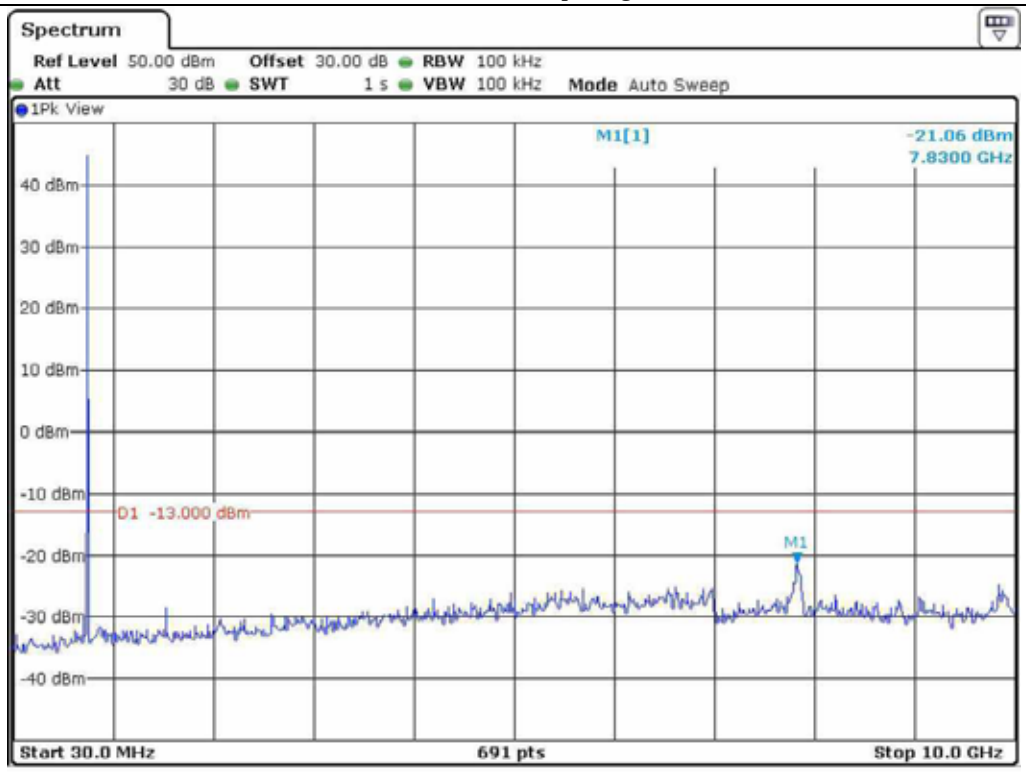


Low Channel – 2 input signals

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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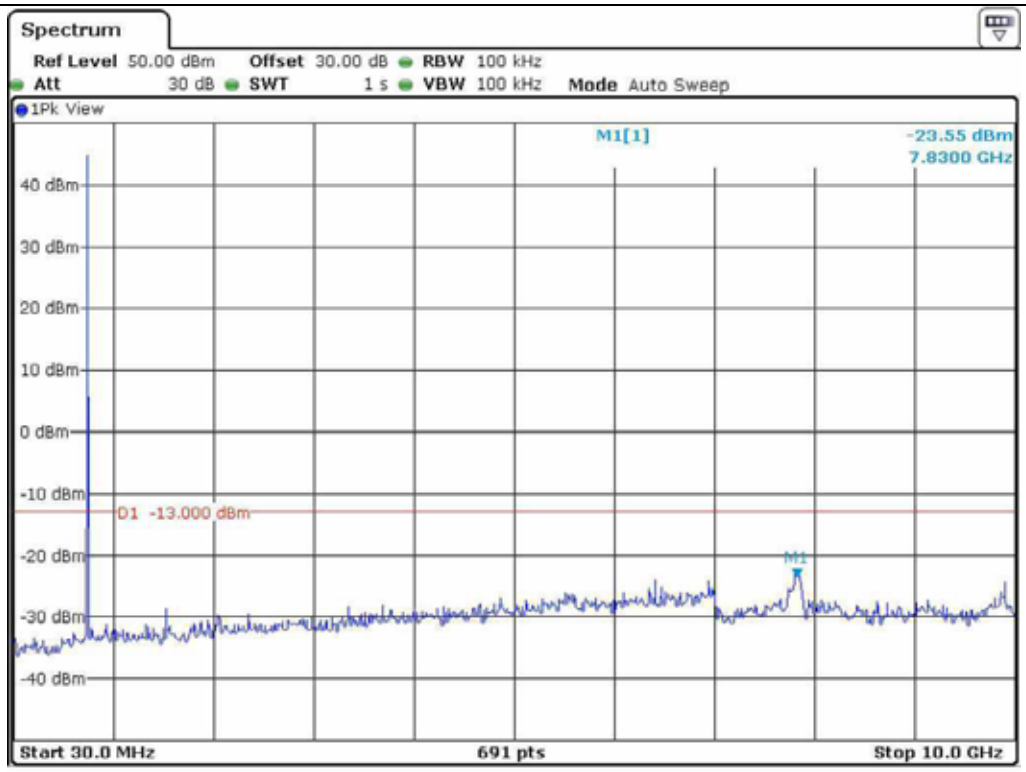
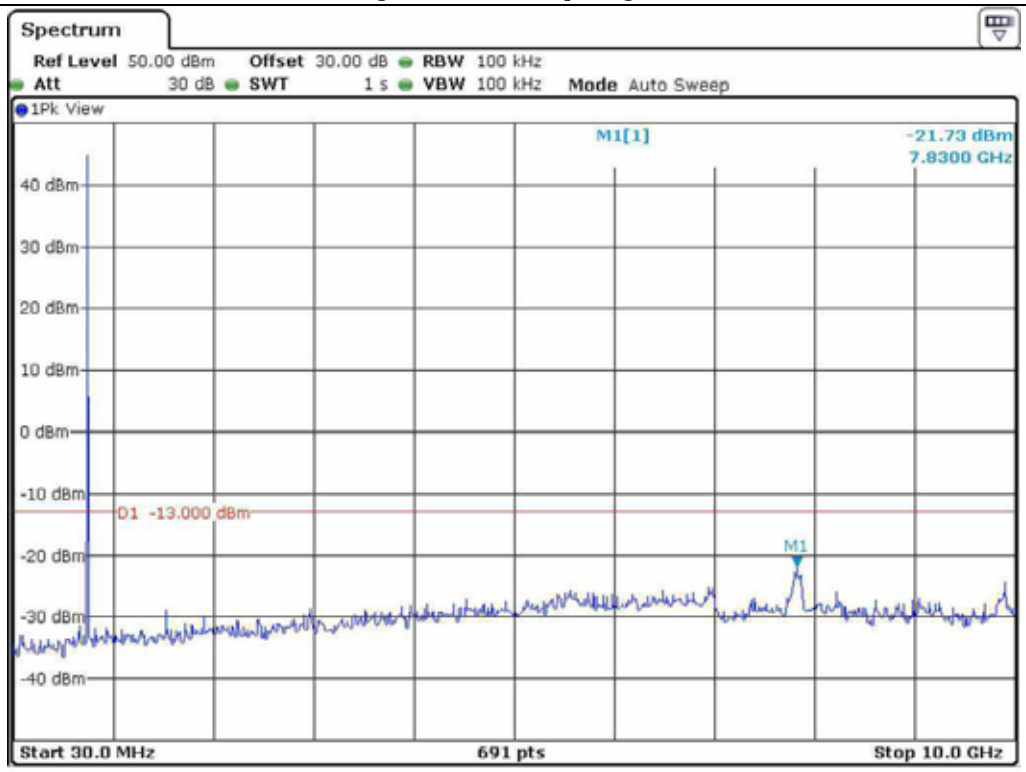


High Channel – 2 input signals



High Channel – 3 input signals

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)

10. FIELD STRENGTH OF SPURIOUS RADIATION

10.1 Operating environment

Temperature : 10 °C

Relative humidity : 45 % 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.

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)

10.4 Test data for radiated emission

-. Test Date : February 27, 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 : 30 MHz ~ 10 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY -47.61 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								
758.012 5	76.00	7.10	0.93	H	3.33	4.70	-	-
	77.90	8.95		V		6.55	-	-
Test Data for Middle Channel								
766.500 0	76.17	7.20	0.91	H	3.33	4.78	-	-
	78.00	9.00		V		6.58	-	-
Test Data for High Channel								
774.987 5	75.83	7.00	0.88	H	3.33	4.55	-	-
	77.67	8.83		V		6.38	-	-
38.00	29.83	-64.17	1.22	V	2.21	-65.16	-13.00	-52.16
42.83	28.50	-64.50	1.53	V	0.85	-62.12	-13.00	-49.12
136.80	35.33	-65.01	2.57	V	1.35	-61.09	-13.00	-48.09
163.86	32.33	-66.17	2.92	V	1.22	-62.03	-13.00	-49.03

Tabulated test data for Restricted Band

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

Tested by: Ki-Hong, Nam / Senior Engineer

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11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

11.1 Operating environment

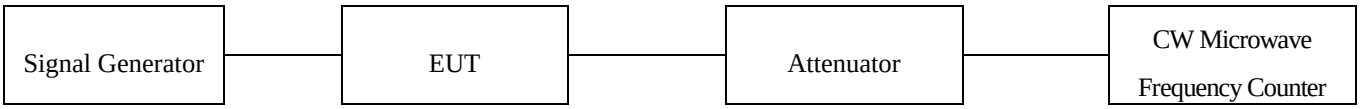
Temperature : 22 °C

Relative humidity : 49 % 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 power meter or spectrum analyzer. 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.

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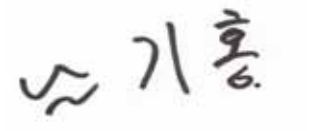
11.4 Test data

-. Test Date : March 05 ~ 06, 2012

-. Result : PASSED

Temperature (˚C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-30	766 500 000	766 500 001	0.001 3	Within the Authorized Frequency block
-20		766 500 002	0.002 6	
-10		766 500 000	0.000 0	
0		766 500 001	0.001 3	
10		766 500 001	0.001 3	
20		766 500 002	0.002 6	
30		766 500 000	0.000 0	
40		766 500 001	0.001 3	
50		766 500 002	0.002 6	



Tested by: Ki-Hong, Nam / Senior Engineer

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12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

12.1 Operating environment

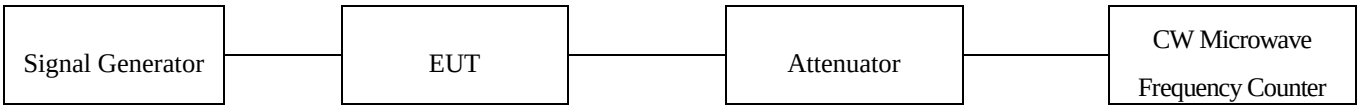
Temperature : 22 °C

Relative humidity : 49 % 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 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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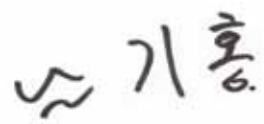
12.4 Test data

-. Test Date : March 05 ~ 06, 2012

-. Result : PASSED

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
138 (115 %)	766 500 000	766 500 001	0.001 3	Within the Authorized Frequency block
120 (100 %)		766 500 002	0.002 6	
102 (85 %)		766 500 001	0.001 3	



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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 f/1500 mW/cm² for the frequency range between 300 MHz and 1500 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)	@ 90 cm Separation	(mW/cm²)
44.50	28 183.8	2.0	1.58	83.33	0.44	0.51

According to above table, safe distance, $D = 0.282 * \sqrt{28\ 183.8 * 1.58/0.51}$ = 83.33 cm.

For getting power density at 80 cm separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = 28\ 183.8 * 1.58 / (4 * 3.14 * 90\text{^}2) = 0.44$

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

Note: End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT.

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