ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR PCS LICENSED TRANSMITTER

Test Report No.	**: E113R-020**
AGR No.	**: A112A-028**
Applicant	**: SOLiD Technologies, Inc.**
Address	**: 18Fl, KINS Tower, 25-1 Jeongja-Dong, Bundang-Gu, Seongnam-Si, Gyeonggi-Do 463-847, Korea**
Manufacturer	**: SOLiD Technologies, Inc.**
Address	**: 18Fl, KINS Tower, 25-1 Jeongja-Dong, Bundang-Gu, Seongnam-Si, Gyeonggi-Do 463-847, Korea**
Type of Equipment	**: REPEATER**
FCC ID.	**: W6U700LTEFSISO**
Model Name	**: RDU 700LTEF SISO**
Serial number	**: N/A**
Total page of Report	**: 88 pages (including this page)**
Date of Incoming	**: February 11, 2011**
Date of issue	**: March 07, 2011**

SUMMARY

The equipment complies with the regulation; **FCC Part 27 Subpart C.**

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.

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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
E113R-020	March 07, 2011	Initial Issue	All

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1. VERIFICATION OF COMPLIANCE

APPLICANT : SOLiD Technologies, Inc.
ADDRESS : 18Fl, KINS Tower, 25-1 Jeongja-Dong, Bundang-Gu, Seongnam-Si, Gyeonggi-Do 463-847, Korea
CONTACT PERSON : Mr. Kangyeob, Bae / Director
TELEPHONE NO : +82-31-784-8557
FCC ID : W6U700LTEFSISO
MODEL NAME : RDU 700LTEF SISO
SERIAL NUMBER : N/A
DATE : March 07, 2011

EQUIPMENT CLASS	PCB - PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	REPEATER
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)	PART 27 Subpart C
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), 27.50(c)	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1047	Modulation Characteristics	PASS (See Note 1)
2.1049	Occupied Bandwidth, Bandwidth Limitation	Met the Limit / PASS
2.1049	Band Edge	Met the Limit / PASS
2.1051, 27.53(c)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 27.53(c)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055, 27.54	Frequency Stability with Temperature variation	Met the requirement / PASS
2.1055, 27.54	Frequency stability with primary voltage variation	Met the requirement / PASS
2.1093	RF Exposure	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 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 307-51 Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Commission on August 21, 2008. (Registration Number: 340658)

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3. GENERAL INFORMATION

3.1 Product Description

The SOLiD Technologies, Inc., Model RDU 700LTEF SISO (referred to as the EUT in this report) is a REPEATER that shall be plugged in ROU (Remote Optic Unit). The ROU can be equipped with up to 3 RDUs (Remote Drive Unit), a RPSU (Remote Power Supply Unit), a RCPU (Remote Central Processor Unit), a R-Optic (Remote Optic), a SIU (System Interface Unit) and a Multiplexer. The System, SMDR-NH124 consists of ROU, BIU (BTS Interface Unit), ODU (Optic Distribution Unit), and OEU (Optic Expansion Unit). Except for ROU, the RF output ports of other units are connected to coaxial cable each other. ROU receives TX optical signals from ODU or OEU and converts them into RF signals. The converted RF signals are amplified through High Power Amp in a corresponding RDU, combined with multiplexer module and then radiated to the antenna port.

When receiving RX signals through the antenna port, this unit filters out-of-band signals in a corresponding RDU and sends the results to Remote Optic Module to make electronic-optical conversion of them. After converted, the signals are sent to an upper device of ODU or OEU. ROU can be equipped with up to three RDUs (Remote Drive Unit) and the module is composed of maximal Dual Band, but this report only covers RDU 700LTEF SISO, FCC ID: W6U700LTEFSISO and other modules shall be issued with other test report number. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	REPEATER
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	14.74 MHz
EMISSION DESIGNATOR	G7D (QPSK), D7W (16QAM, 64QAM)
OPERATING FREQUENCY	Tx: 728 MHz ~ 757 MHz Rx: 698 MHz ~ 716 MHz and 777 MHz ~ 787 MHz
RF OUTPUT POWER	30 dBm
DC VOLTAGE & CURRENT INTO FINAL AMPLIFIER	DC 27 V, 2 A, DC 9 V, 1 A, DC 6 V, 2.5 A
ELECTRICAL RATING	AC 120 V and DC -48 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
RDU 700LTEF SISO	SOLiD Technologies, Inc.	W6U700LTEFSISO	REPEATER (EUT)	-
SMJ100A	Rohde & Schwarz	N/A	Signal generator	EUT
AMU200A	Rohde & Schwarz	N/A	Baseband signal generator and fading simulator	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.

4. EUT MODIFICATIONS

-. None

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5. RF POWER OUTPUT at ANTENNA TERMINAL

5.1 Operating environment

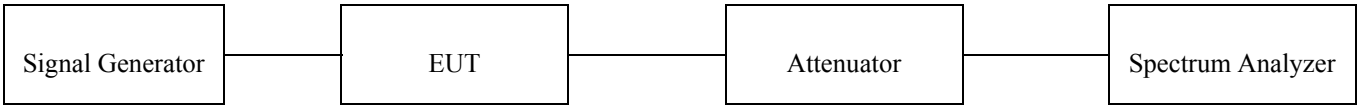
Temperature : 24 °C

Relative humidity : 48 % 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 power meter or 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, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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5.4 Test data

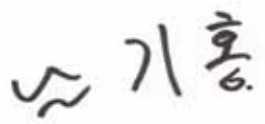
-. Test Date : February 14 ~ 15, 2011

-. Measurement Function : Channel Power

-. Detector Mode : RMS detector

-. Test Result : Pass

Channel	Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	QPSK	733.00	-9.80	30.00	1.000 000	1 000.00
	16QAM	733.00	-9.85	30.00		
	64QAM	733.00	-9.78	30.00		
Middle	QPSK	743.00	-9.83	30.00	1.000 000	
	16QAM	743.00	-9.90	30.00		
	64QAM	743.00	-9.85	30.00		
High	QPSK	752.00	-9.80	30.00	1.000 000	
	16QAM	752.00	-9.80	30.00		
	64QAM	752.00	-9.85	30.00		



Tested by: Ki-Hong, Nam / Senior Engineer

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6. OCCUPIED BANDWIDTH

6.1 Operating environment

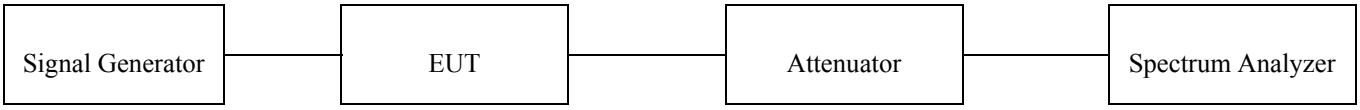
Temperature : 24 °C

Relative humidity : 48 % 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 power meter or 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

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

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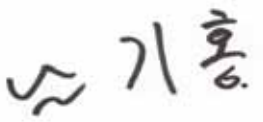
6.4 Test data

-. Test Date : February 14 ~ 15, 2011

-. Test Result : Pass

Channel	Modulation	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)
Low	QPSK	11.830	9.000
	16QAM	11.800	9.000
	64QAM	11.830	8.967
Middle	QPSK	11.830	9.033
	16QAM	11.830	9.000
	64QAM	11.830	9.000
High	QPSK	11.830	9.033
	16QAM	11.800	9.000
	64QAM	11.830	9.000

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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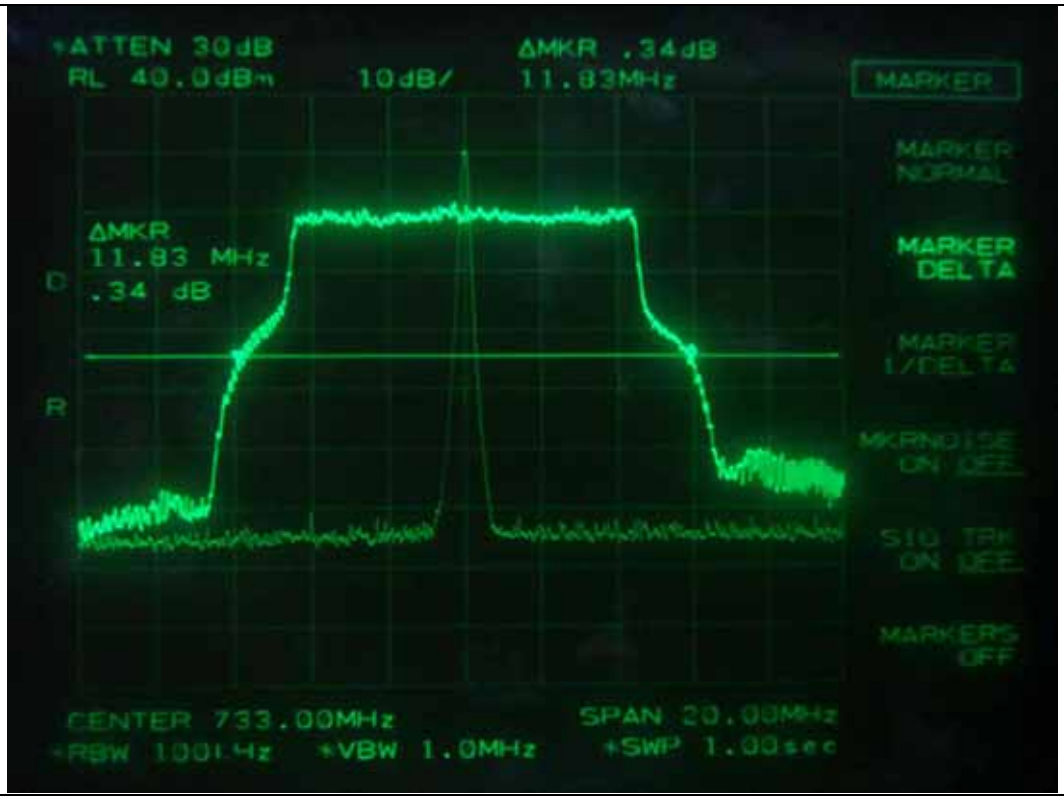
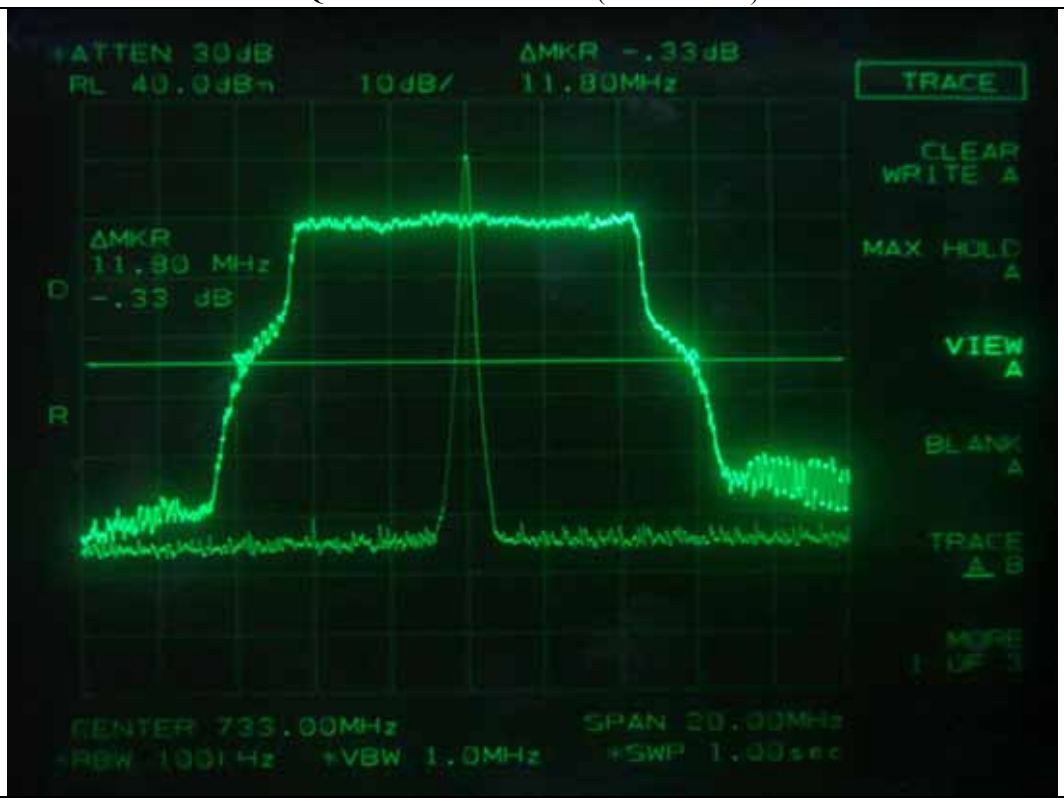


QPSK – 26 dB Bandwidth (Low Channel)



16QAM – 26 dB Bandwidth (Low Channel)

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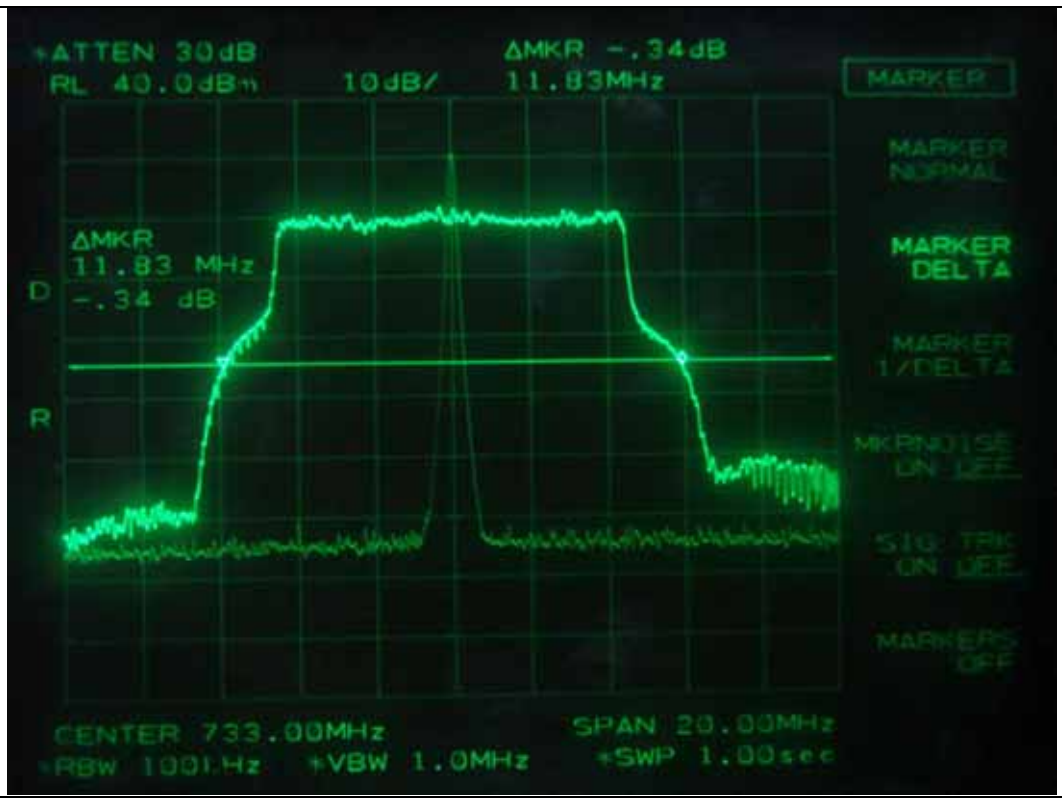
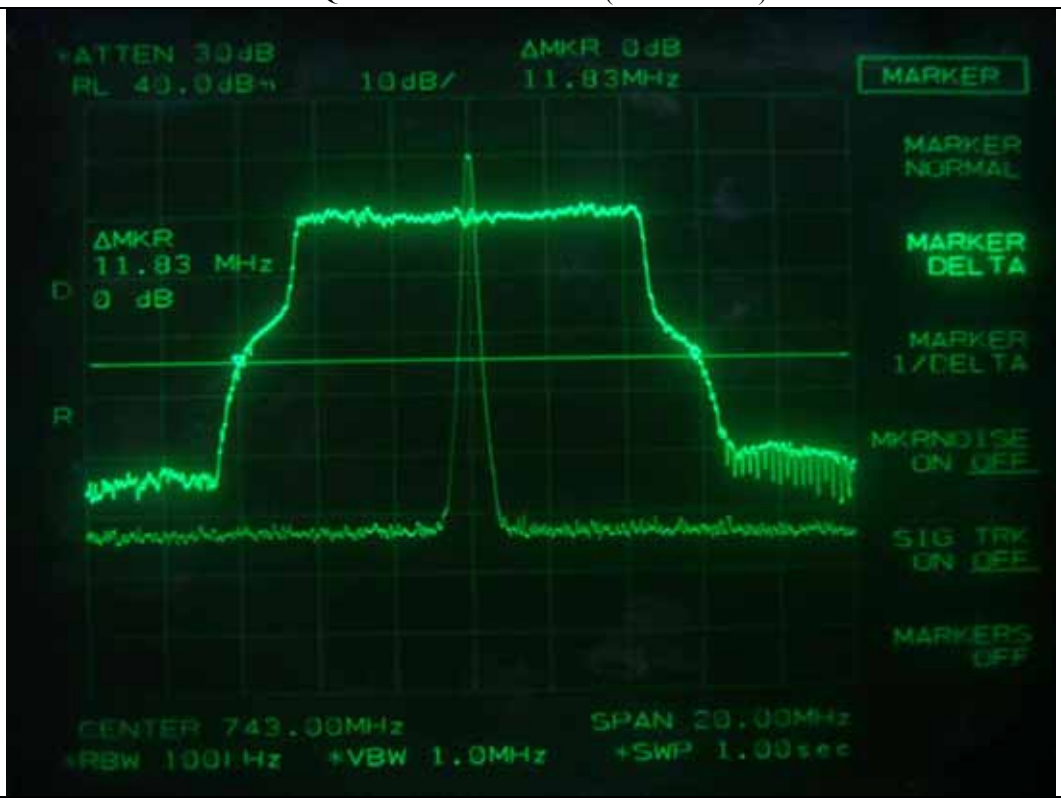


64QAM – 26 dB Bandwidth (Low Channel)



QPSK – 26 dB Bandwidth (Middle Channel)

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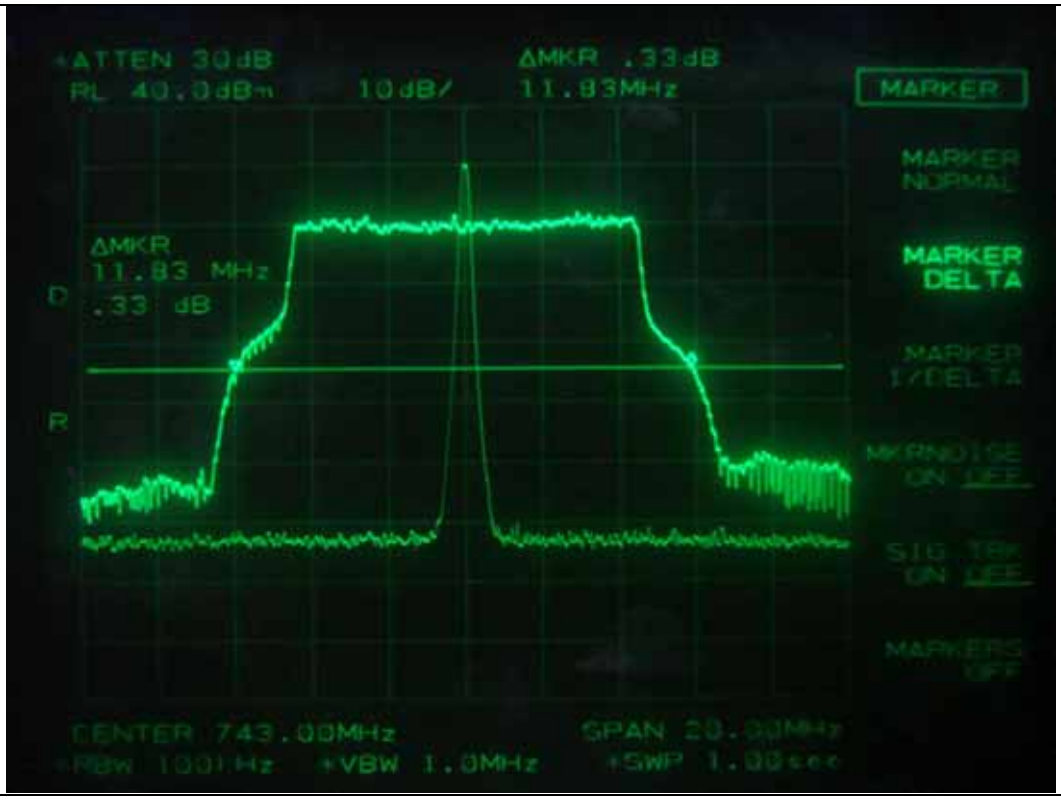
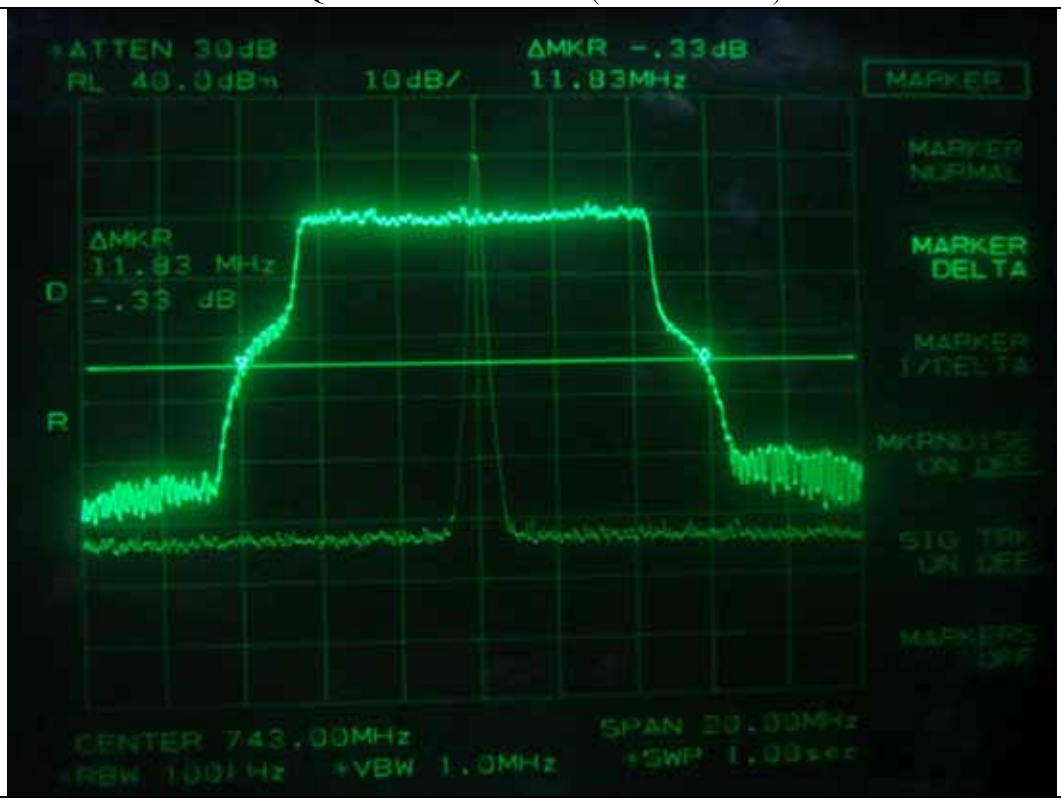


16QAM – 26 dB Bandwidth (Middle Channel)



64QAM – 26 dB Bandwidth (Middle Channel)

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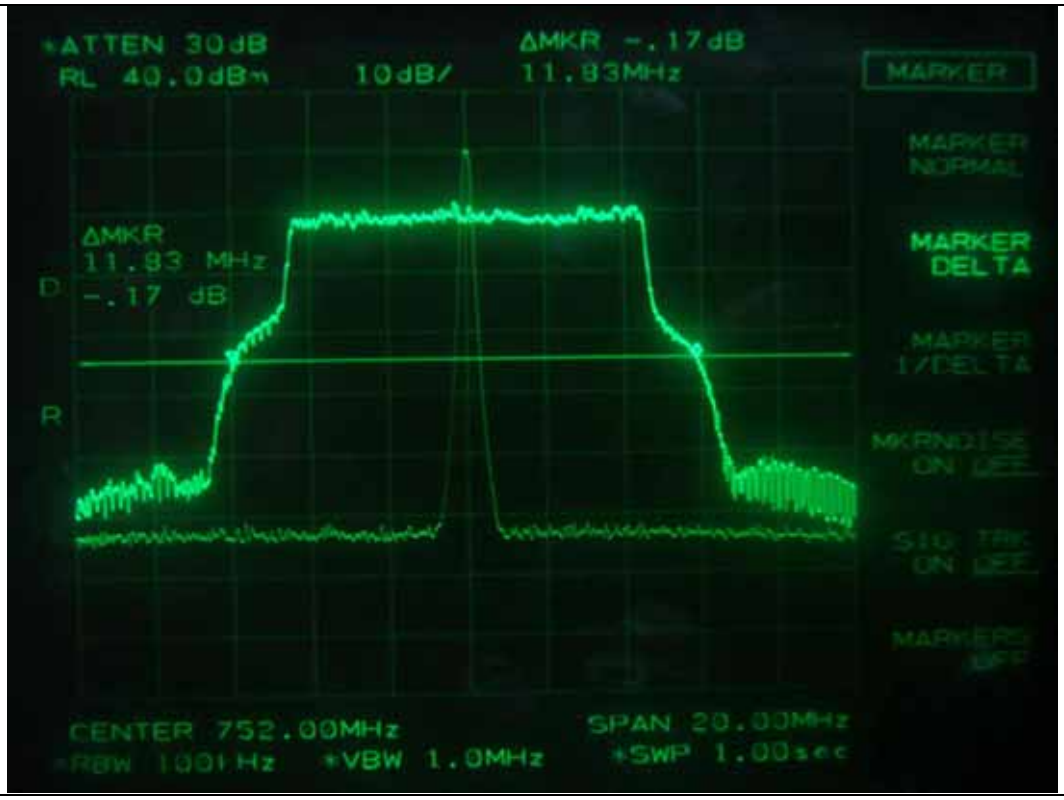
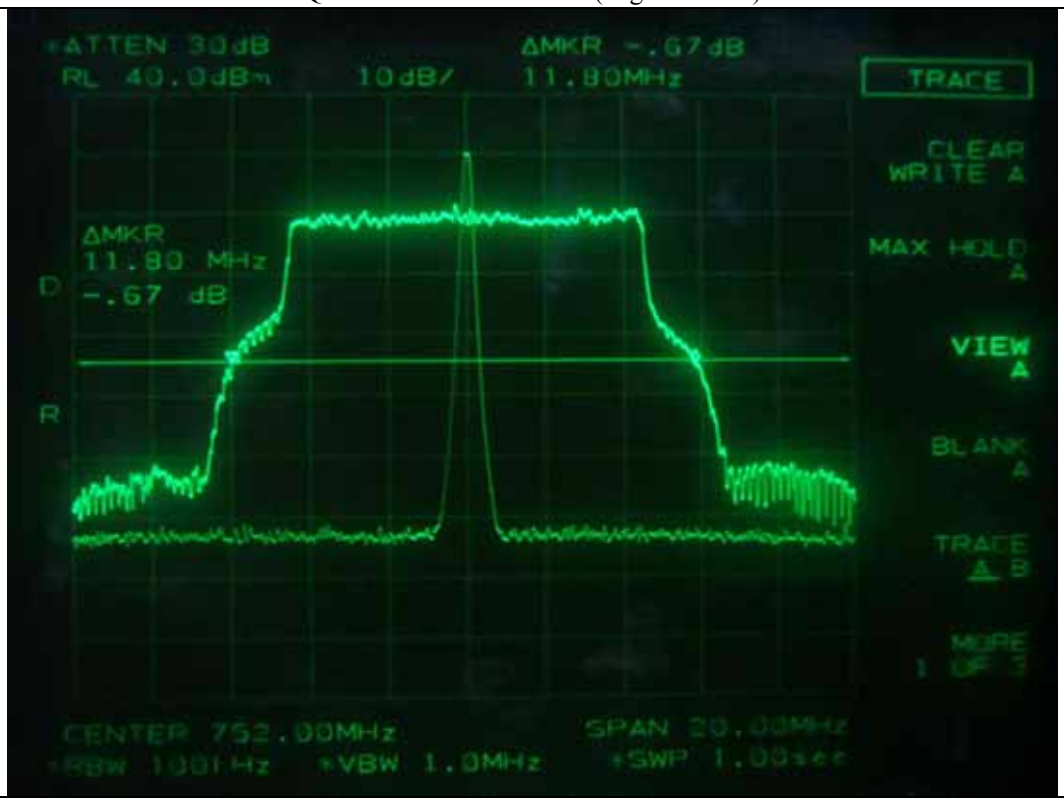
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)



QPSK – 26 dB Bandwidth (High Channel)



16QAM – 26 dB Bandwidth (High Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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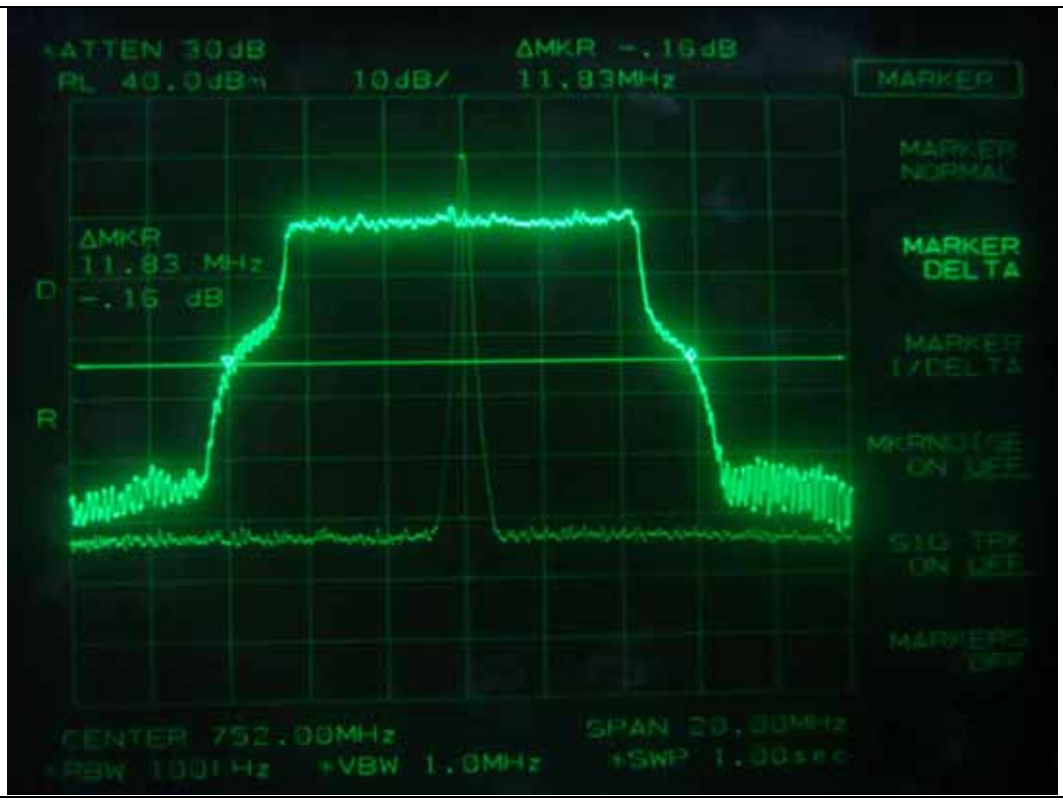

64QAM – 26 dB Bandwidth (High Channel)

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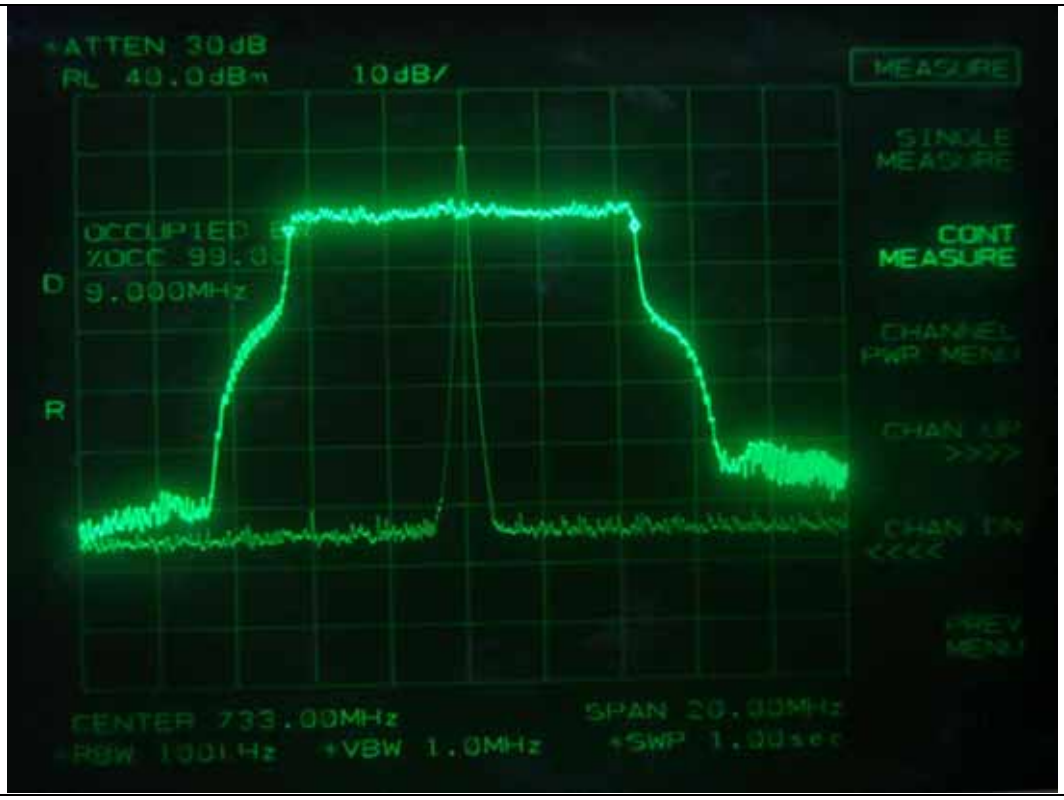
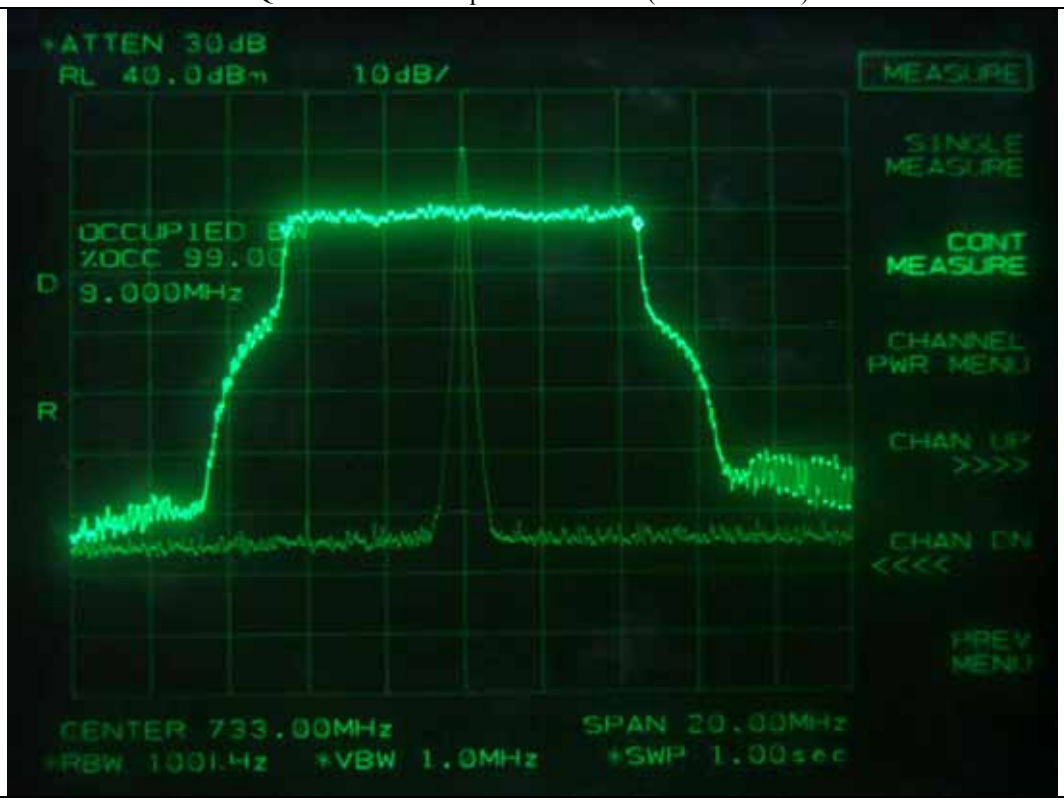


QPSK – 99 % Occupied Bandwidth (Low Channel)



16QAM – 99 % Occupied Bandwidth (Low Channel)

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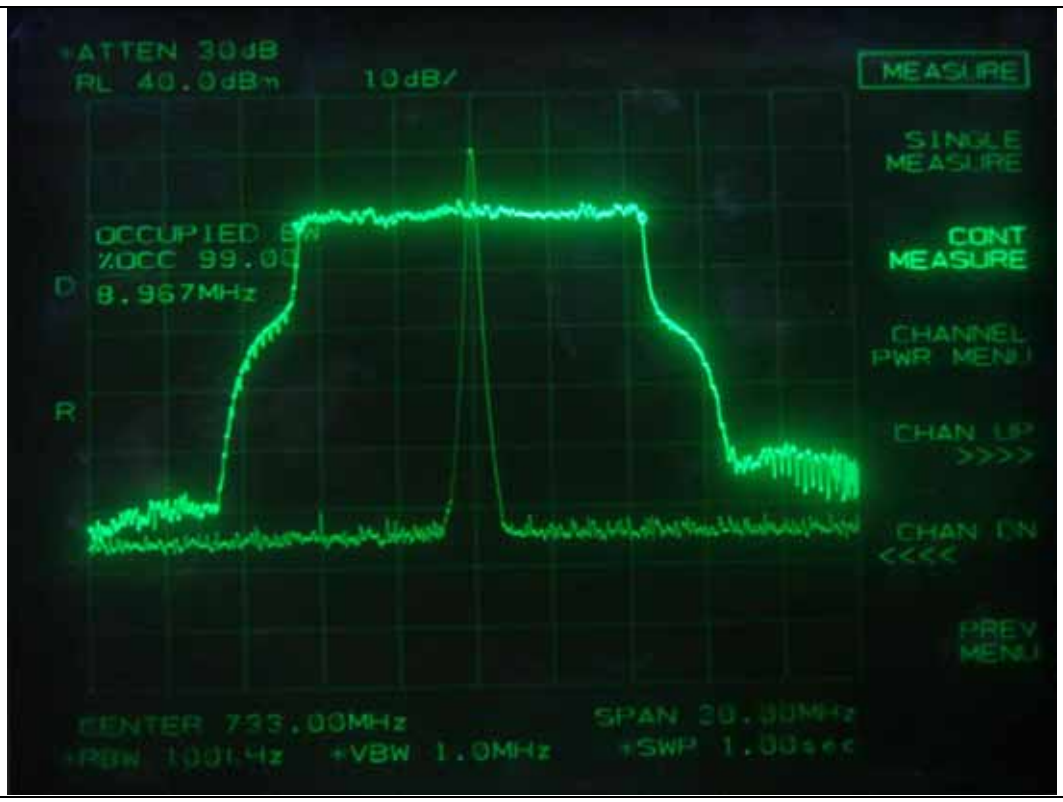
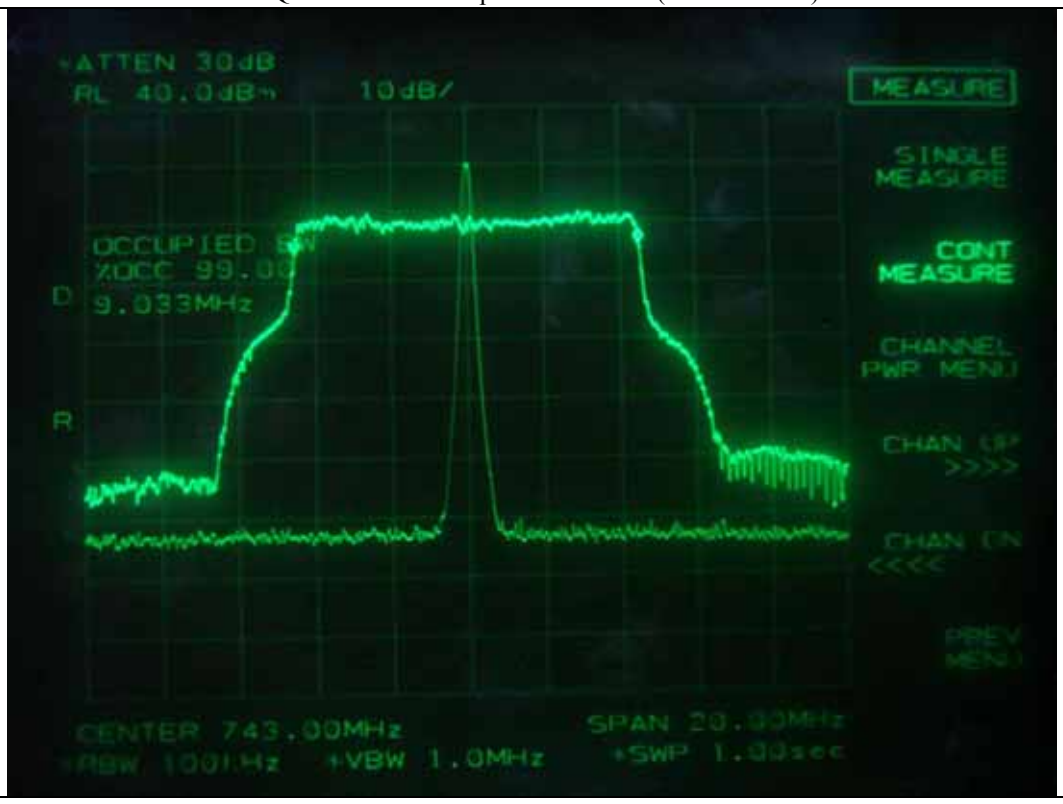


64QAM – 99 % Occupied Bandwidth (Low Channel)



QPSK – 99 % Occupied Bandwidth (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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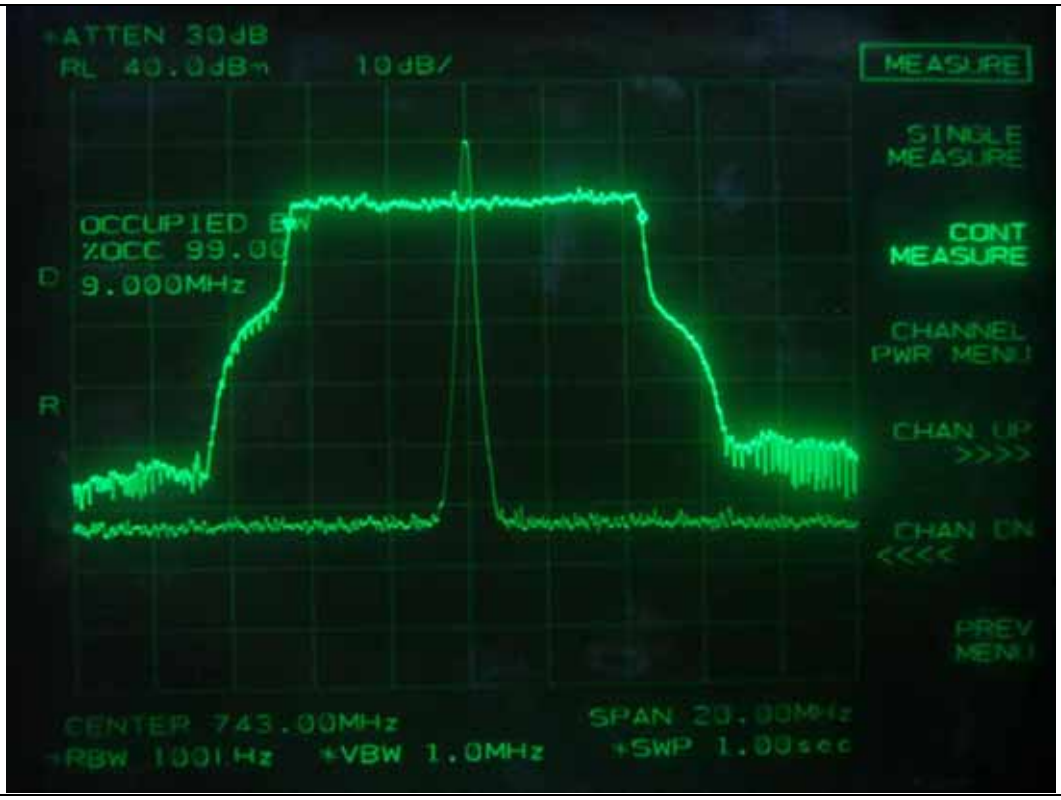
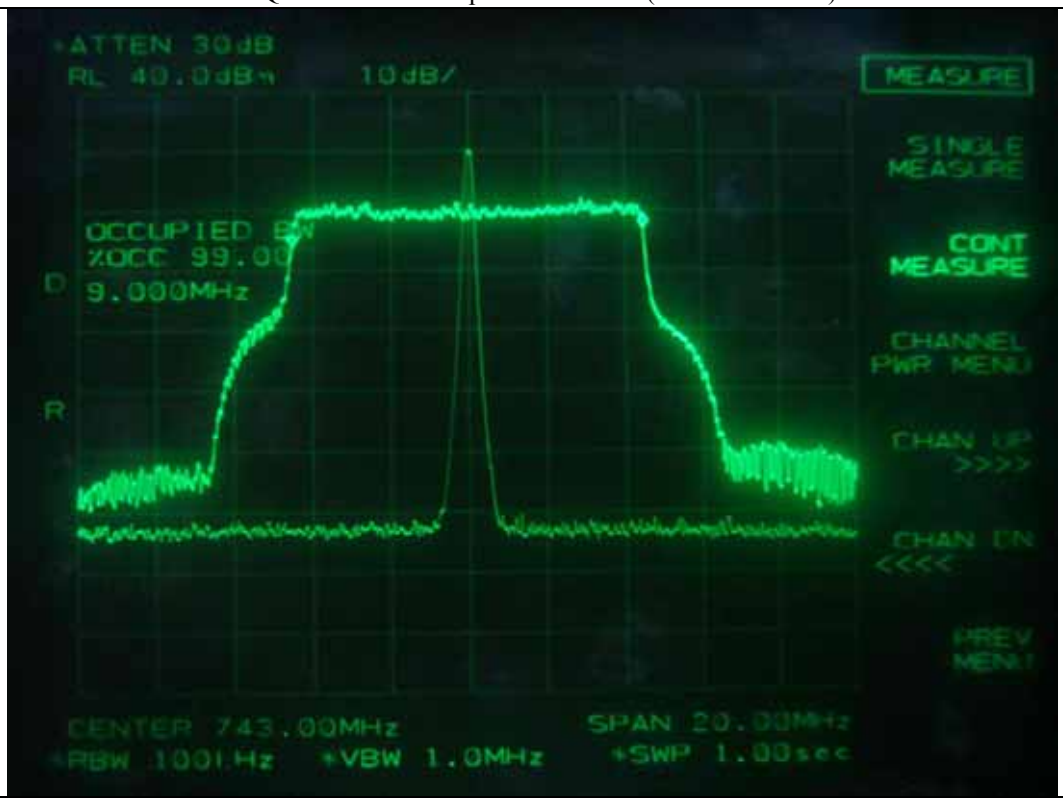


16QAM – 99 % Occupied Bandwidth (Middle Channel)



64QAM – 99 % Occupied Bandwidth (Middle Channel)

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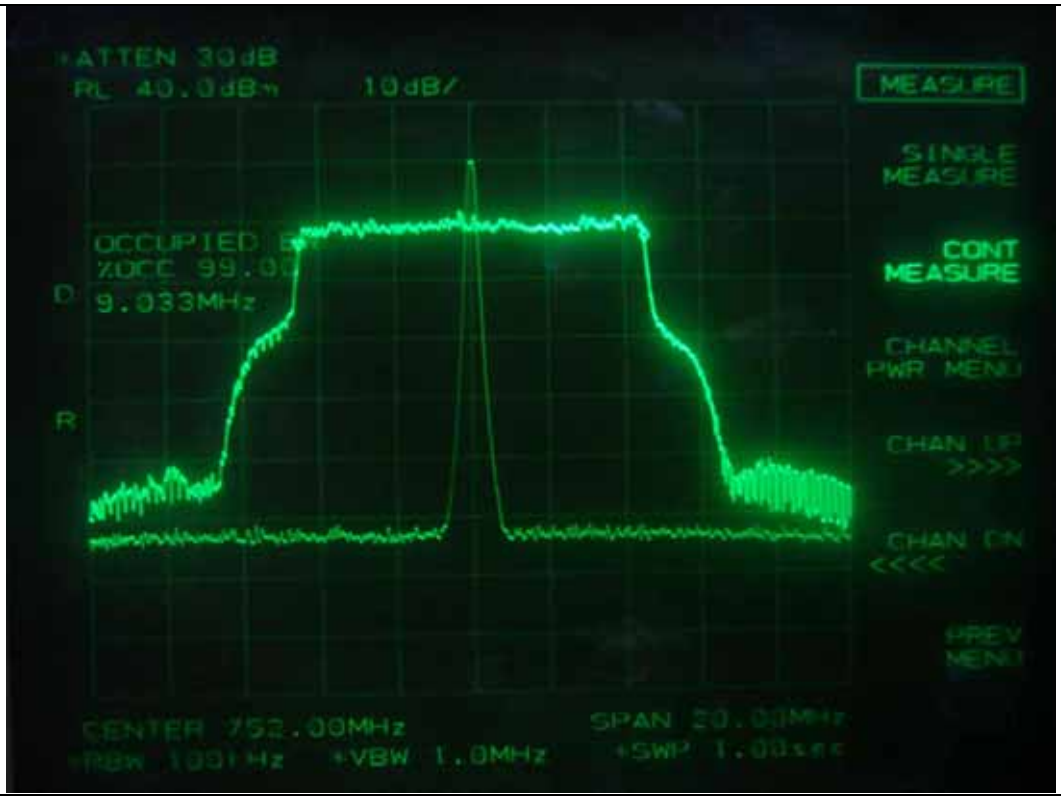

QPSK – 99 % Occupied Bandwidth (High Channel)

16QAM – 99 % Occupied Bandwidth (High Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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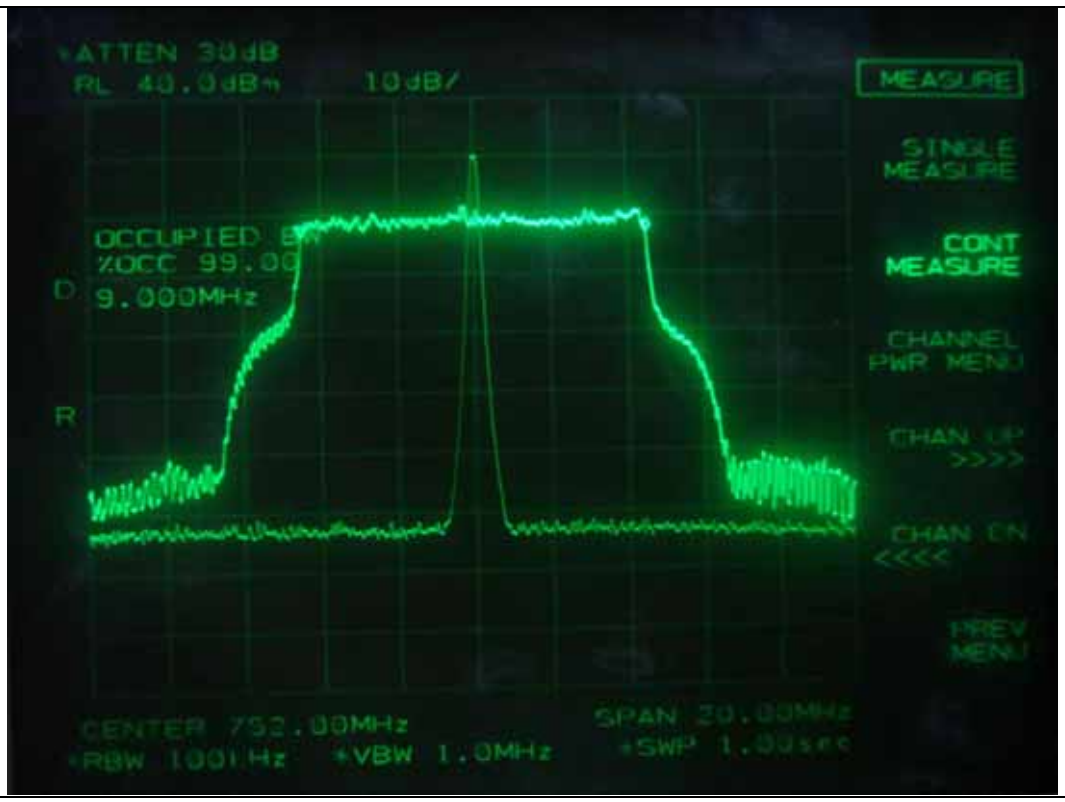

64QAM – 99 % Occupied Bandwidth (High Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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QPSK – Input (Low Channel)

16QAM – Input (Low Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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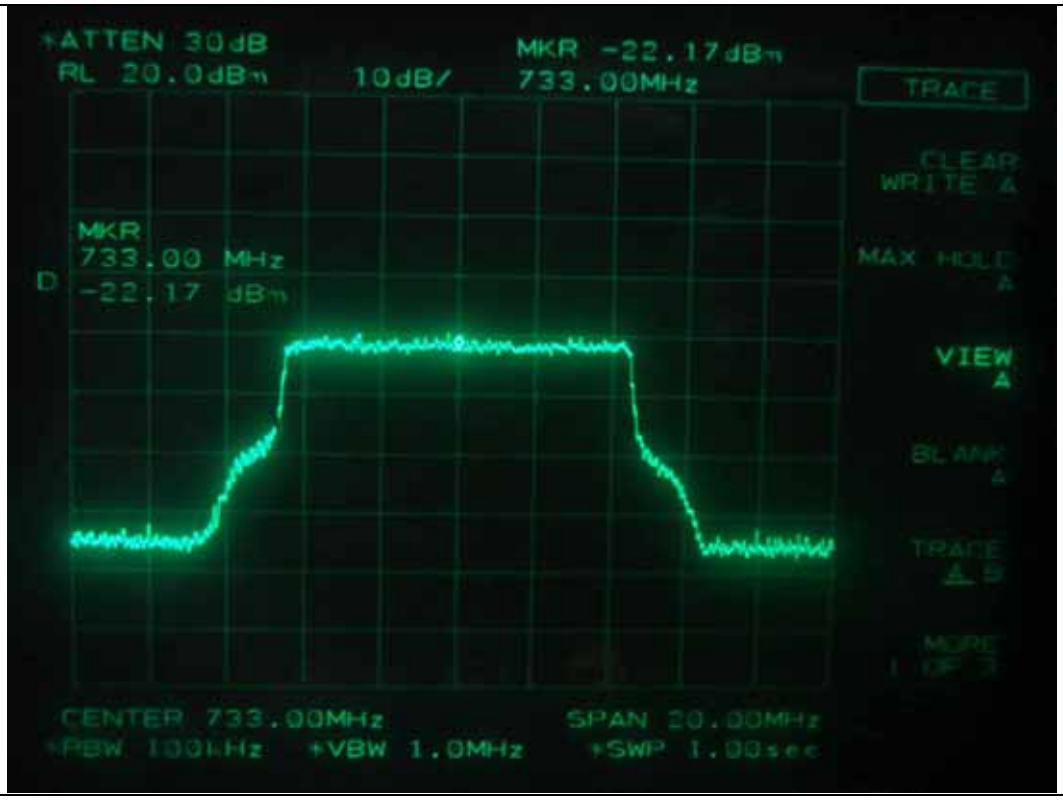

64QAM – Input (Low Channel)

QPSK – Input (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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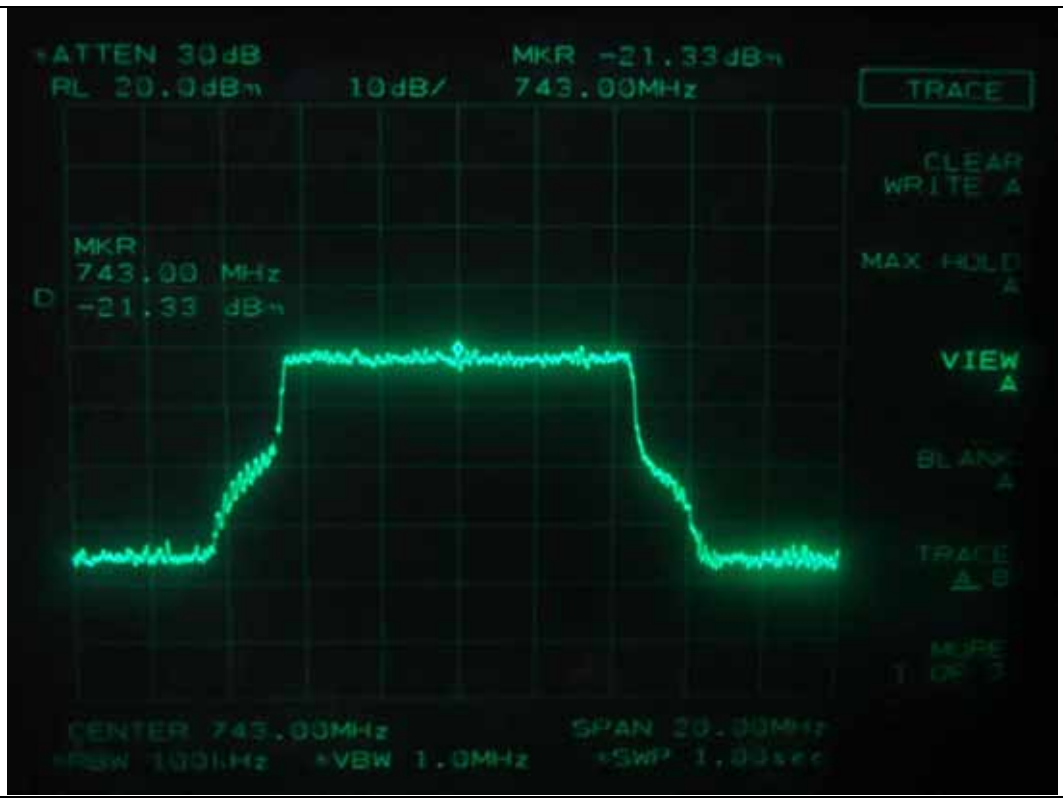
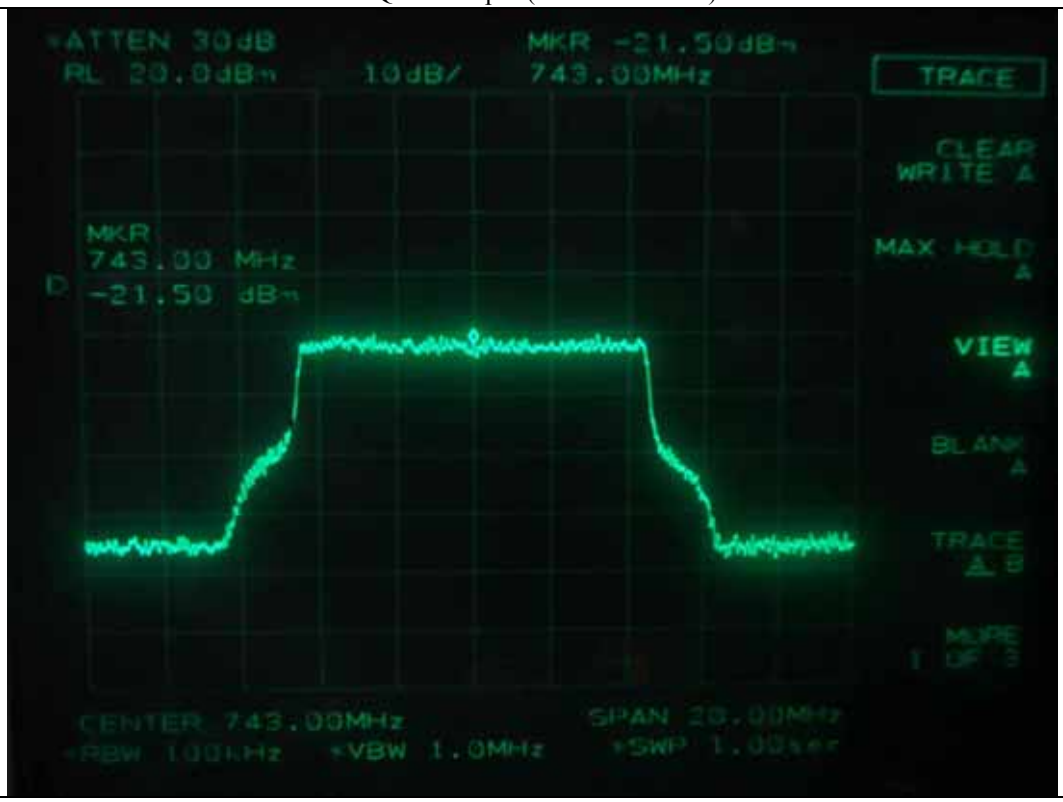


16QAM – Input (Middle Channel)



64QAM – Input (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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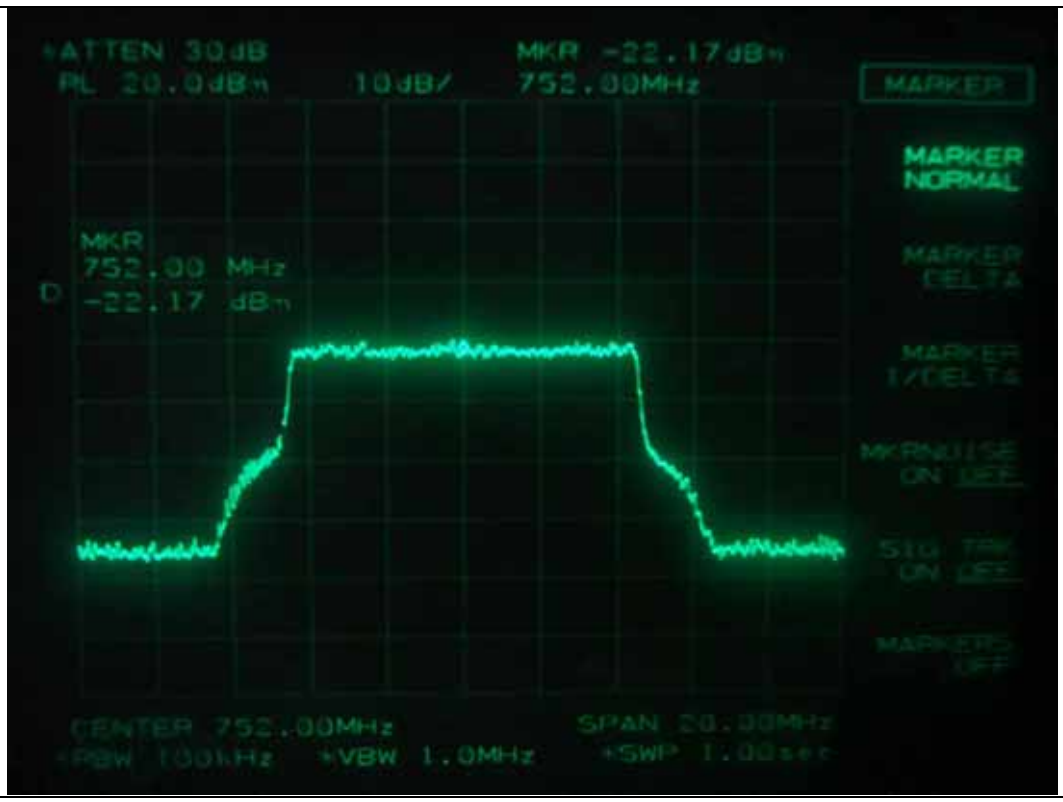
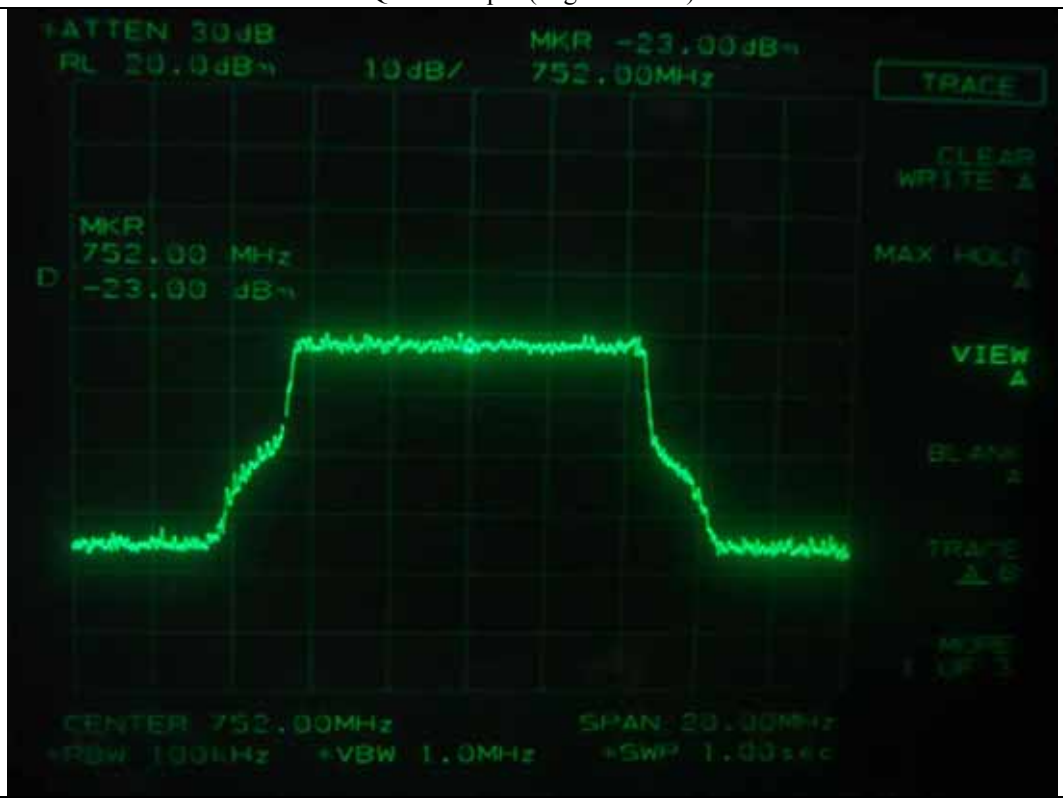


QPSK – Input (High Channel)



16QAM – Input (High Channel)

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64QAM – Input (High Channel)

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7. SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Operating environment

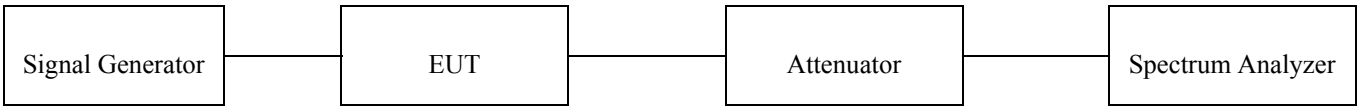
Temperature : 24 °C

Relative humidity : 48 % 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 power meter or 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 20 GHz.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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7.4 Test data

7.4.1 Test Result for Part 27 Subpart C §27.53 (c)(1)

-. Test Date : February 14 ~ 15, 2011

-. Frequency range : 30 MHz ~ 15 GHz

-. Result : PASSED BY –16.00 dB at QPSK, 16QAM and 64QAM Modes

Channel	Modulation	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	QPSK	511.800	-46.17	0.50	-45.67	-13.00	-32.67
		7 600.000	-32.67	3.33	-29.34		-16.34
	16QAM	557.000	-45.83	0.50	-45.33		-32.33
		7 580.000	-32.50	3.33	-29.17		-16.17
	64QAM	529.600	-46.50	0.50	-46.00		-33.00
		7 390.000	-32.33	3.33	-29.00		-16.00
Middle	QPSK	159.300	-45.33	0.33	-45.00	-13.00	-32.00
		7 490.000	-32.67	3.33	-29.34		-16.34
	16QAM	408.300	-45.50	0.33	-45.17		-32.17
		7 390.000	-32.33	3.33	-29.00		-16.00
	64QAM	440.600	-45.17	0.33	-44.84		-31.84
		7 440.000	-32.67	3.33	-29.34		-16.34
High	QPSK	413.200	-45.83	0.33	-45.50	-13.00	-32.50
		7 230.000	-32.33	3.33	-29.00		-16.00
	16QAM	531.200	-45.00	0.50	-44.50		-31.50
		7 460.000	-32.83	3.33	-29.50		-16.50
	64QAM	476.200	-45.83	0.50	-45.33		-32.33
		7 420.000	-32.50	3.33	-29.17		-16.17
Other frequencies up to 15 GHz have margin more than 20 dB.							

From CFR 27.53(c)(1): On any frequency outside the 746 MHz ~ 758 MHz band, the power of any emission shall be attenuated out side the band below the transmitter power (P) by at least 43 + 10log(P) dB, resulting in a limit of -13 dBm.

Tested by: Ki-Hong, Nam / Senior Engineer

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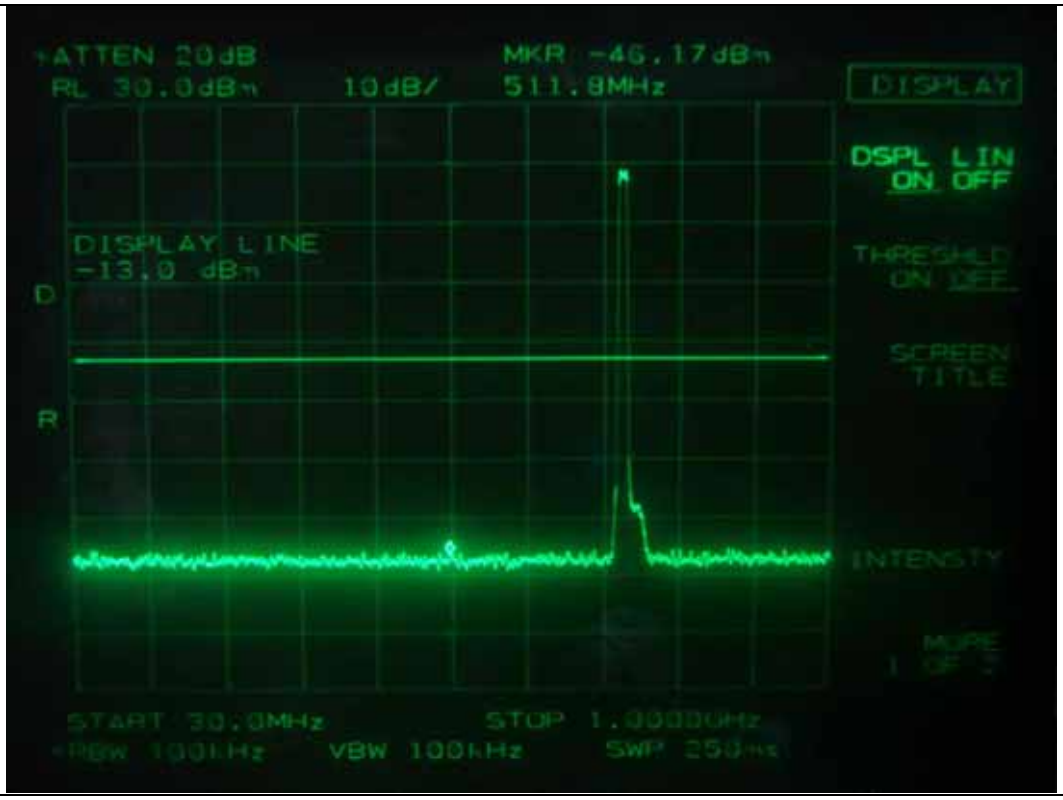
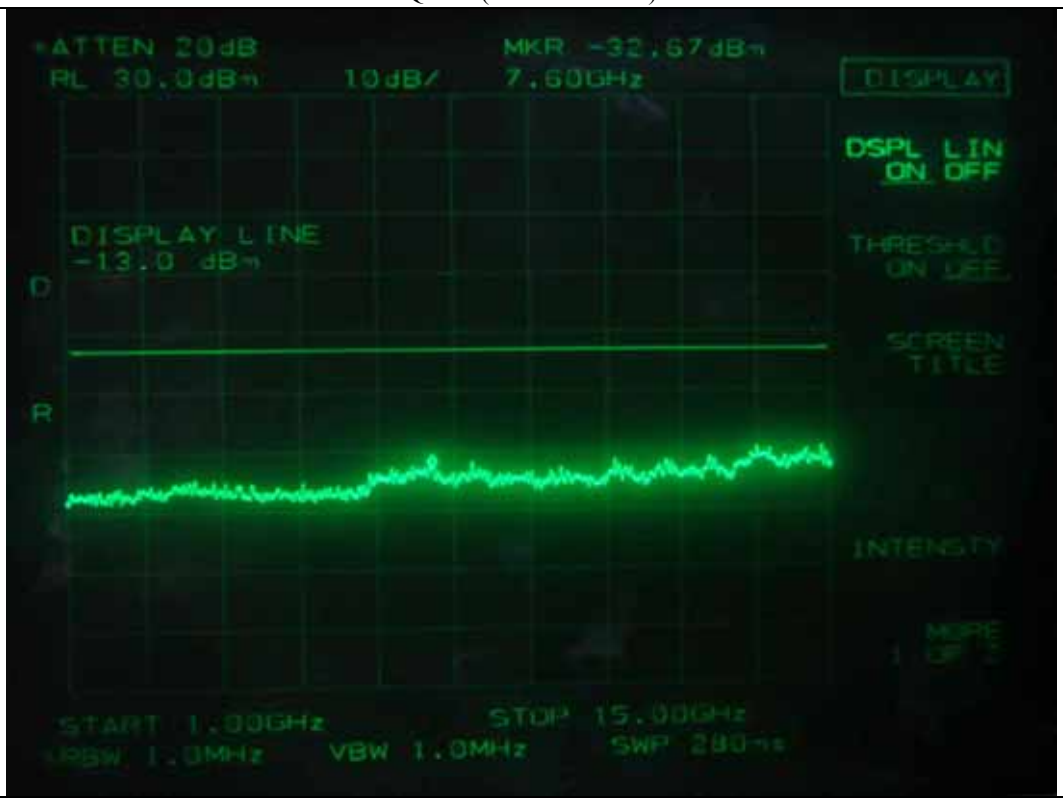


QPSK (Low channel 1)



QPSK (Low channel 2)

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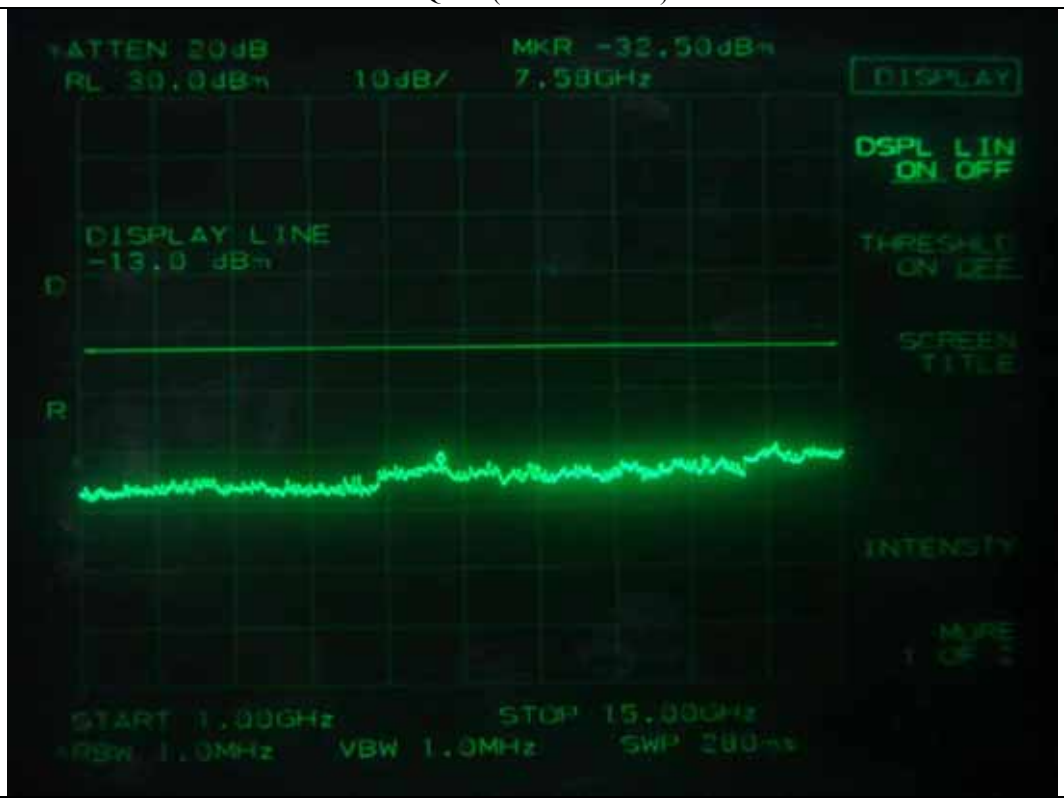
16QAM (Low channel 1)



16QAM (Low channel 2)

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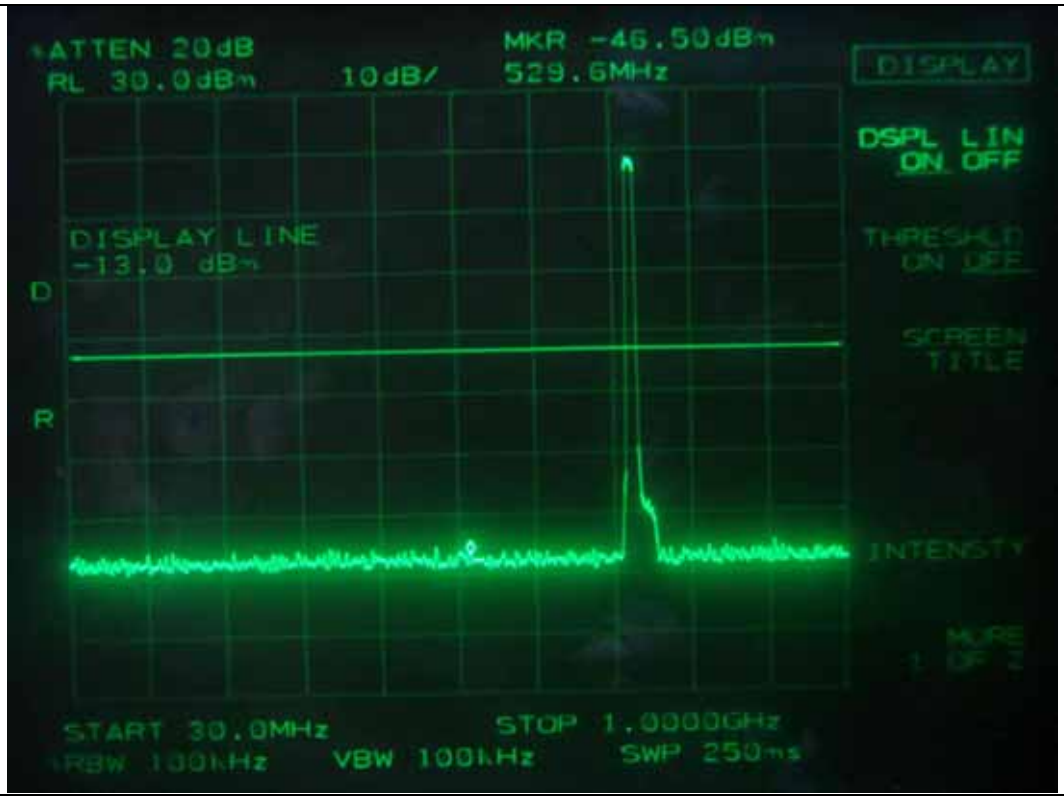
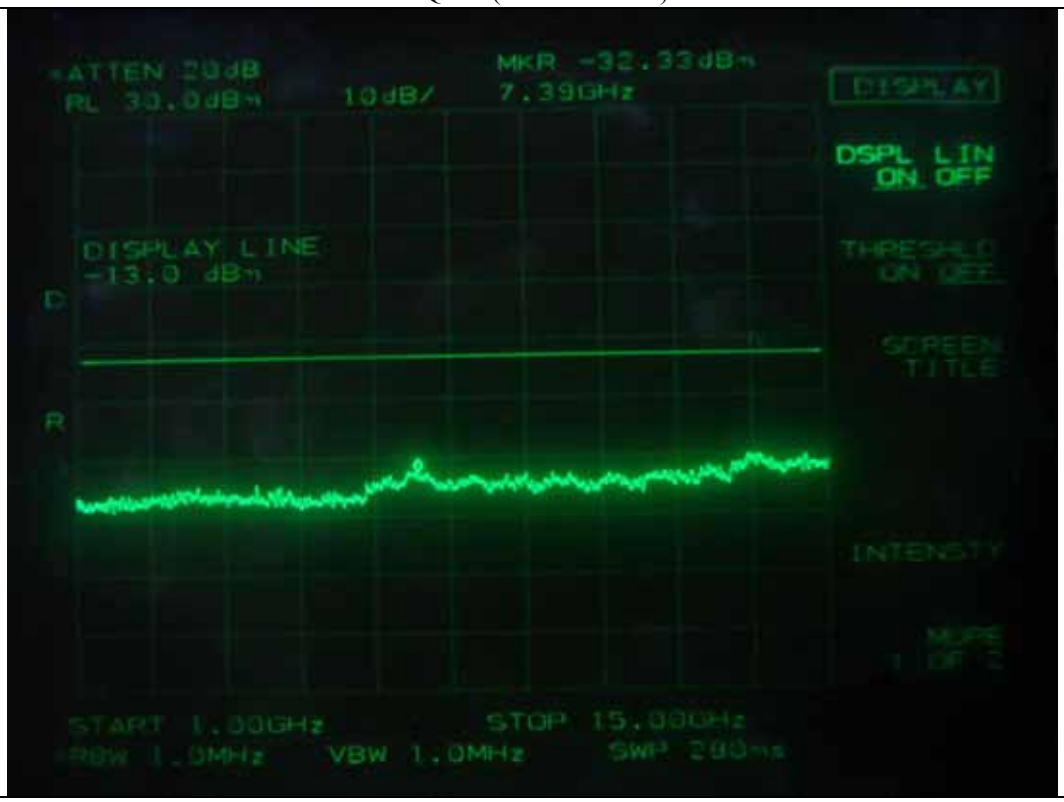


64QAM (Low channel 1)



64QAM (Low channel 2)

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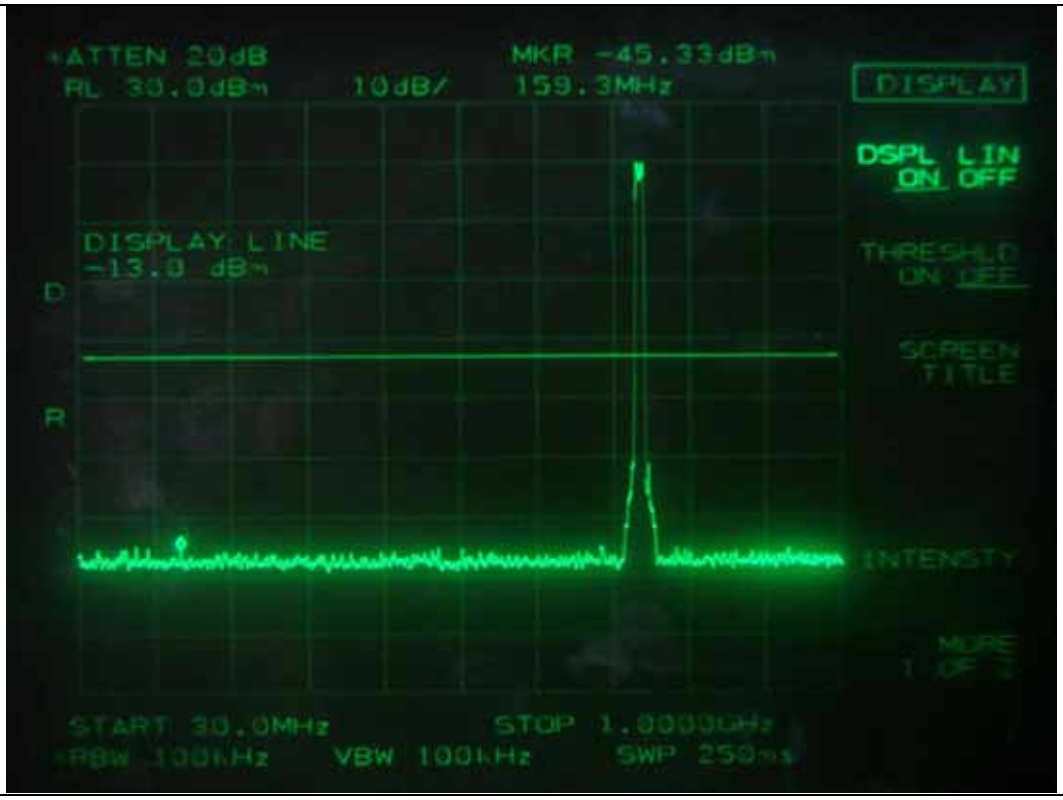

QPSK (Middle channel 1)

QPSK (Middle channel 2)

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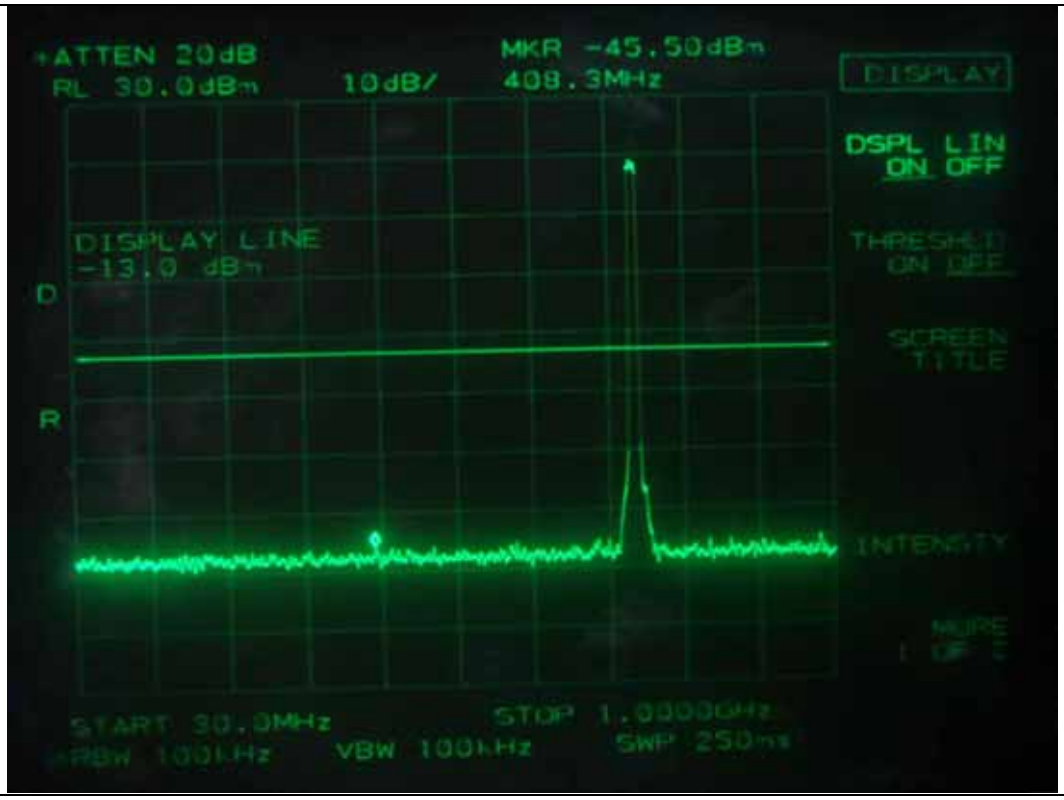
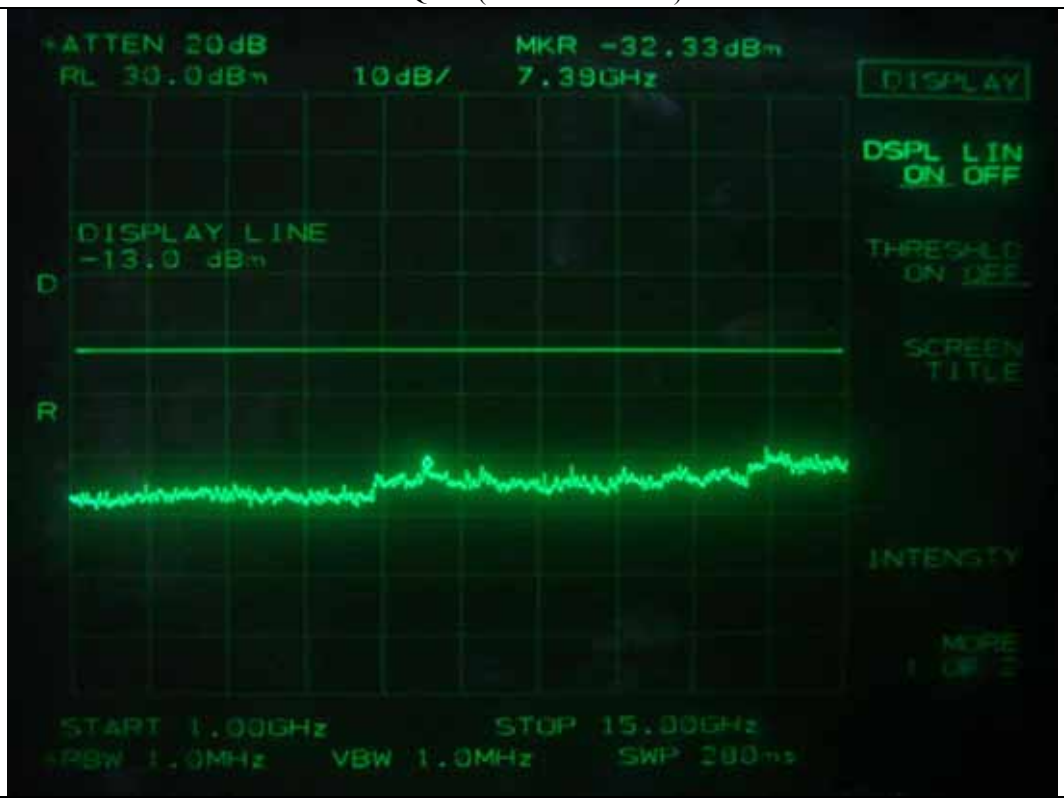


16QAM (Middle channel 1)



16QAM (Middle channel 2)

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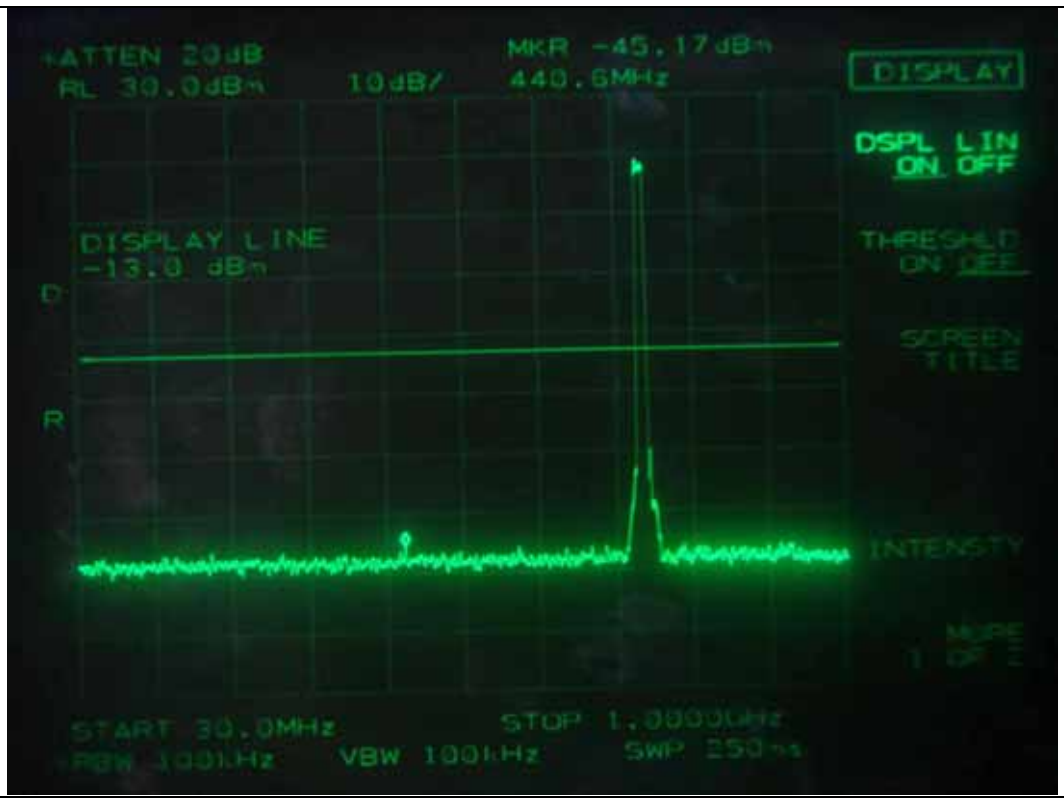
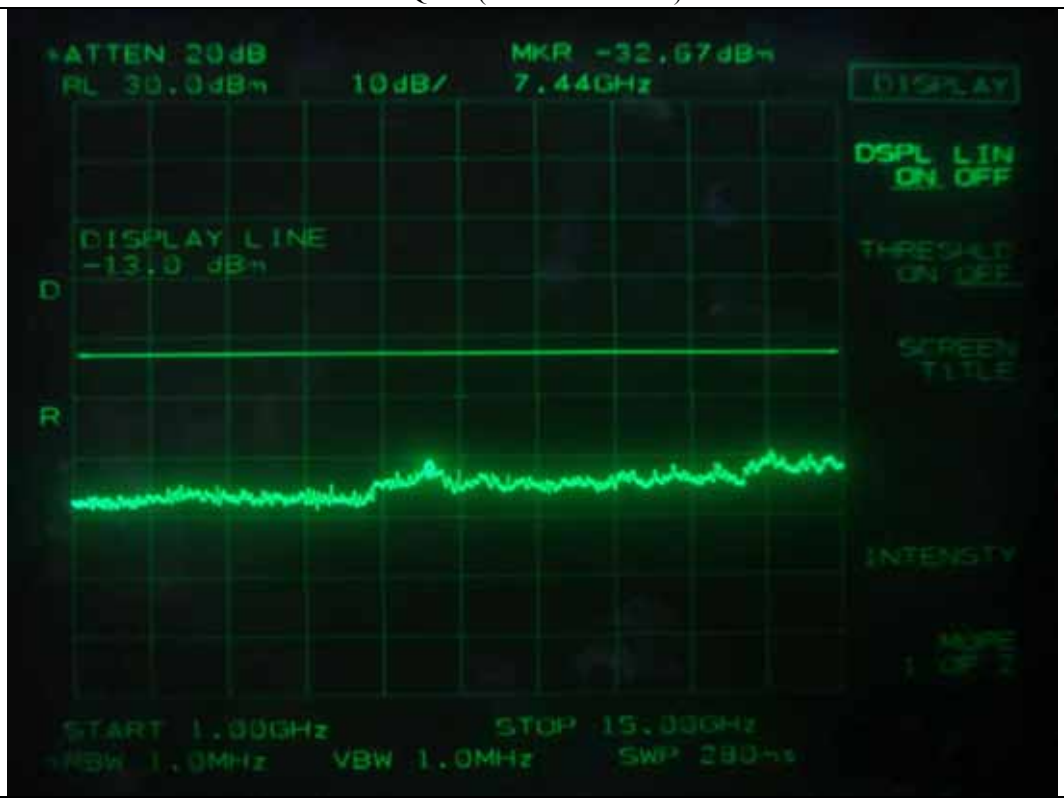


64QAM (Middle channel 1)



64QAM (Middle channel 2)

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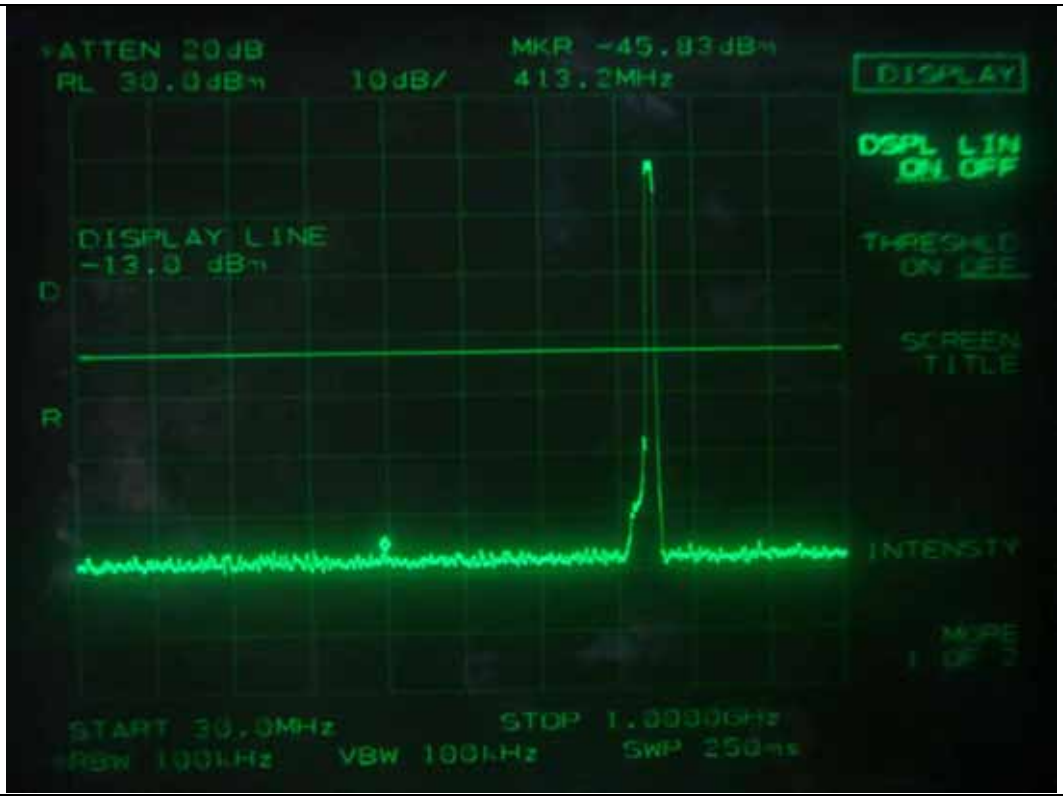
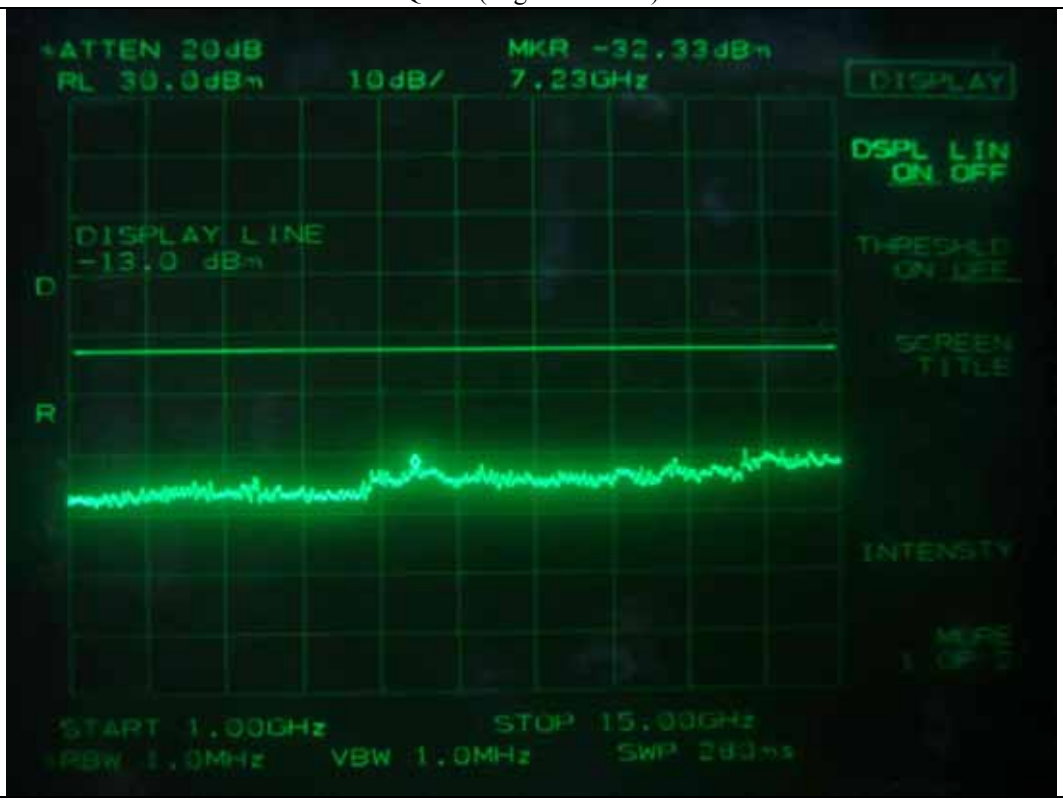


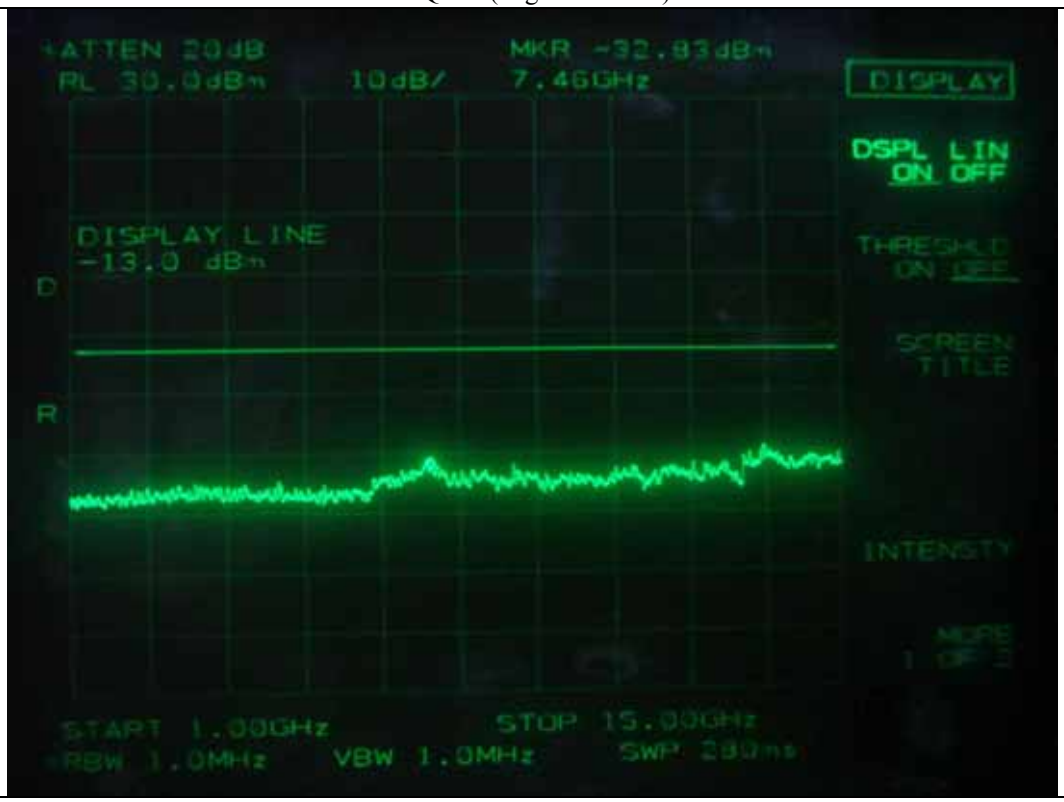
QPSK (High channel 1)



QPSK (High channel 2)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)

16QAM (High channel 1)



16QAM (High channel 2)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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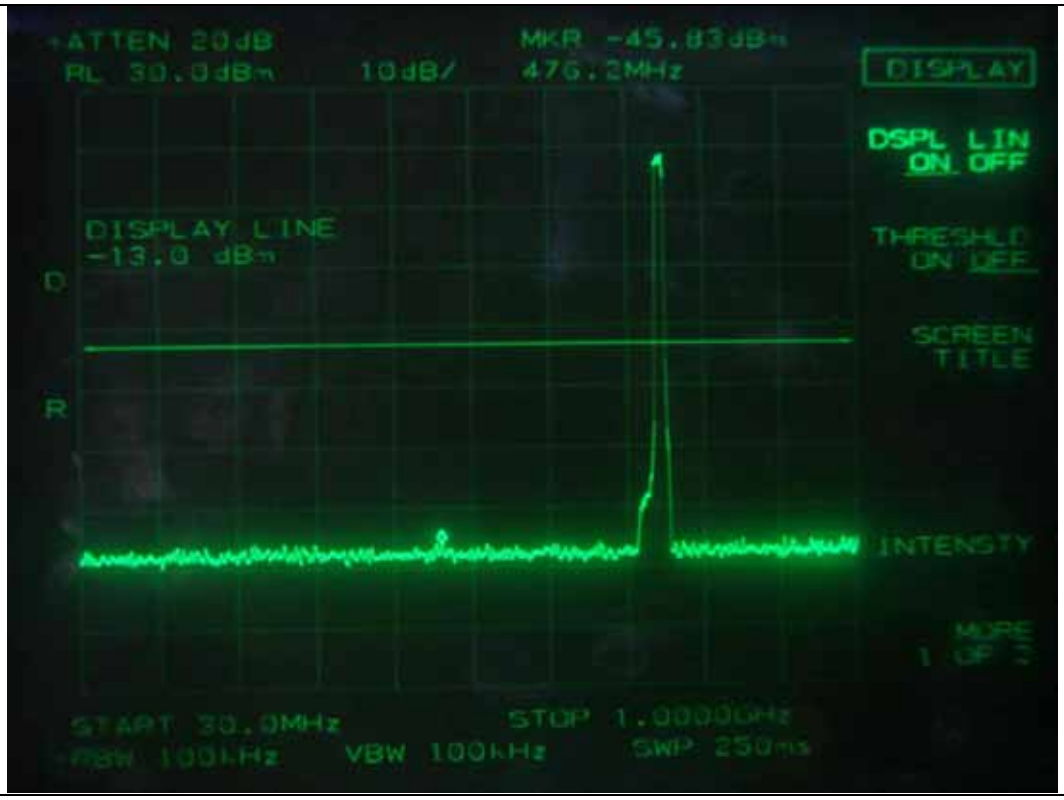
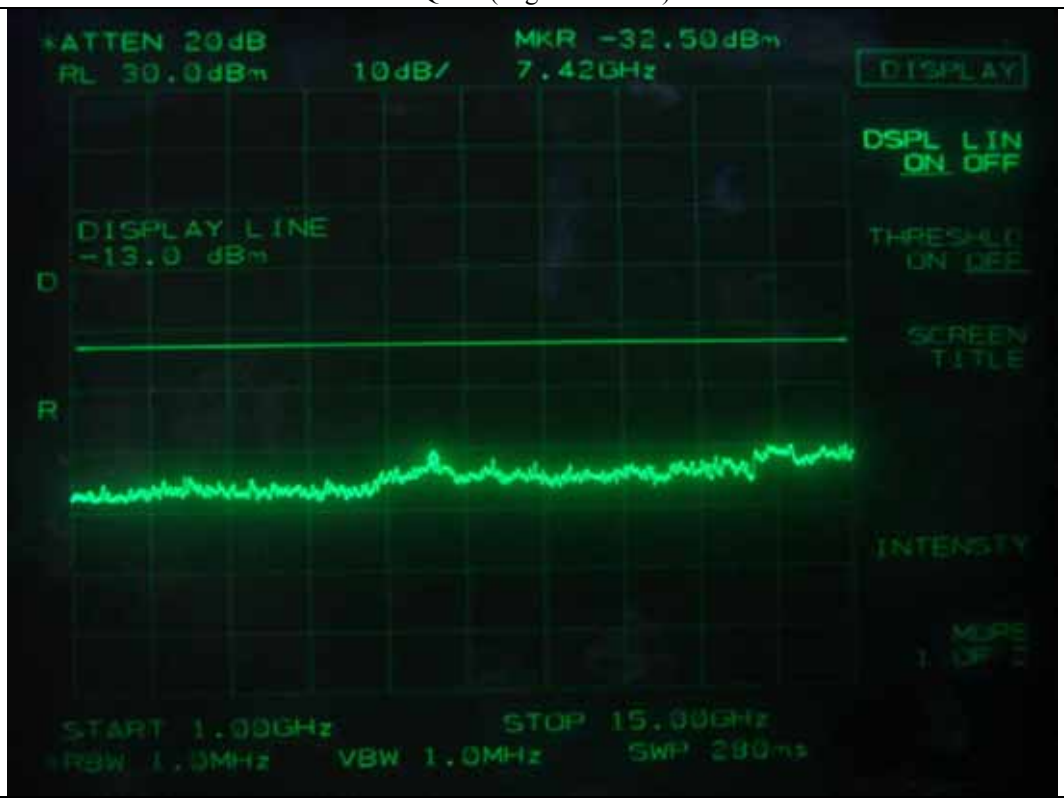


64QAM (High channel 1)



64QAM (High channel 2)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)

7.4.2 Test Result for Part 27 Subpart C §27.53 (c)(3)

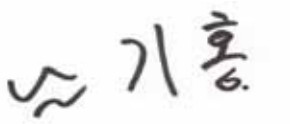
-. Test Date : February 14 ~ 15, 2011

-. Frequency range : 763 MHz ~ 775 MHz and 793 MHz ~ 805 MHz

-. Result : PASSED BY –14.56 dB at 64QAM Mode

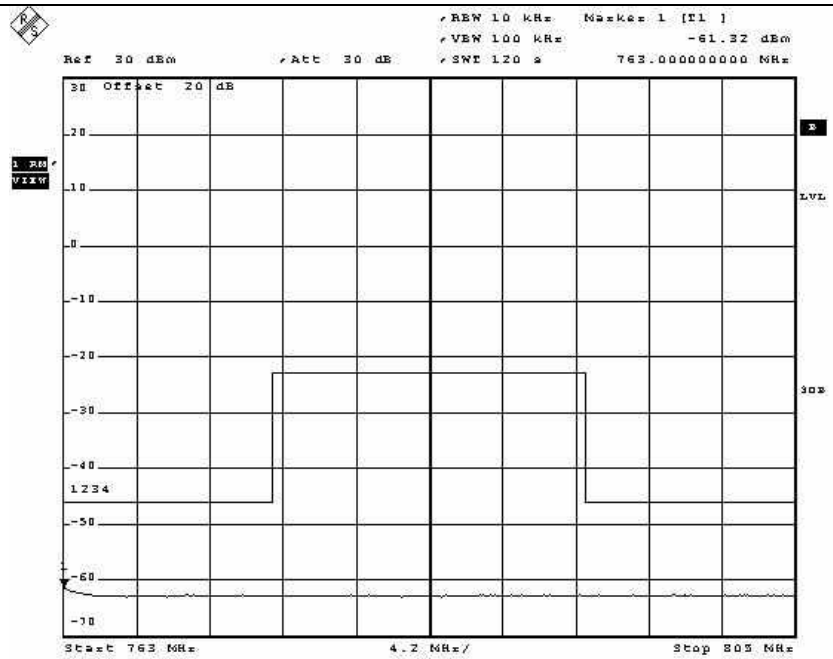
Channel	Modulation	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	QPSK	763.000	-61.32	0.67	-60.65	-46.00	-14.65
	16QAM	763.000	-61.33	0.67	-60.66		-14.66
	64QAM	763.000	-61.23	0.67	-60.56		-14.56
Middle	QPSK	763.000	-61.40	0.67	-60.73		-14.73
	16QAM	763.000	-61.46	0.67	-60.79		-14.79
	64QAM	763.000	-61.36	0.67	-60.69		-14.69
High	QPSK	763.000	-61.27	0.67	-60.60		-14.60
	16QAM	763.000	-61.41	0.67	-60.74		-14.74
	64QAM	763.000	-61.47	0.67	-60.80		-14.80

From CFR 27.53(c)(3)&(c)(6): On all frequency between the 763 MHz ~ 775 MHz and 793 MHz ~ 805 MHz, by a factor not less than 76 + 10log(P) dB in a 6.25 kHz band segment, for base and fixed stations, resulting in a limit of -46 dBm (per 6.25 kHz measurement bandwidth)

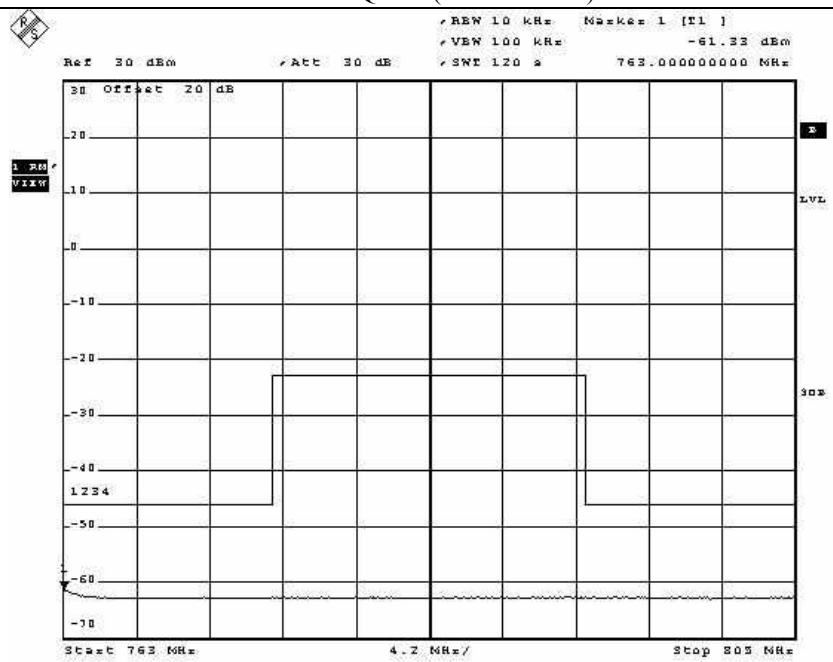


Tested by: Ki-Hong, Nam / Senior Engineer

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)



QPSK (Low Channel)



16QAM (Low Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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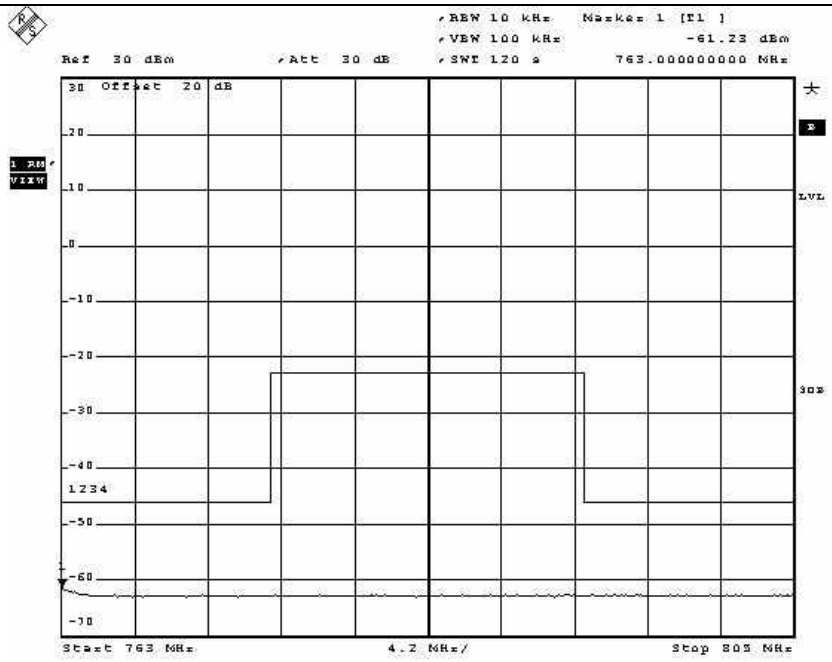
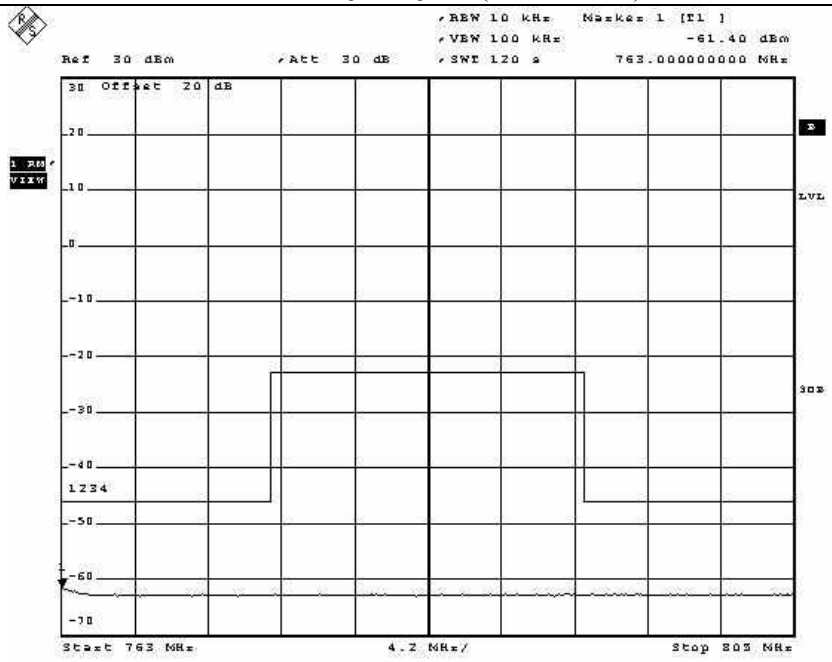
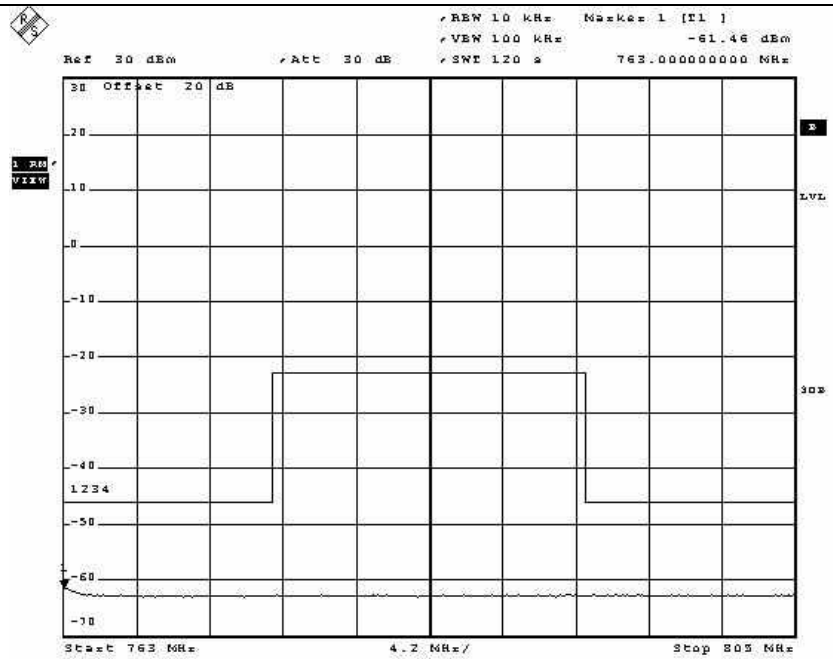


64QAM QPSK (Low Channel)

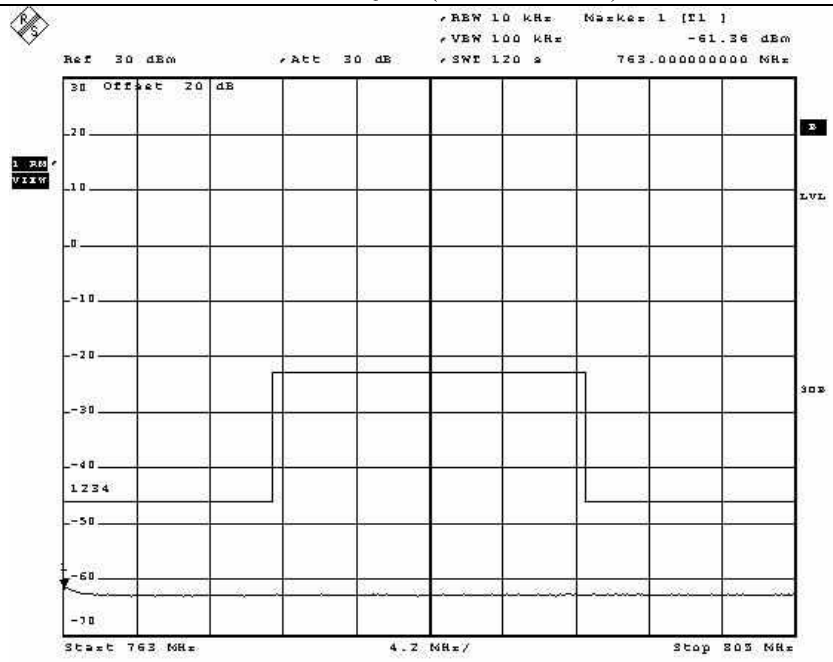


QPSK (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)



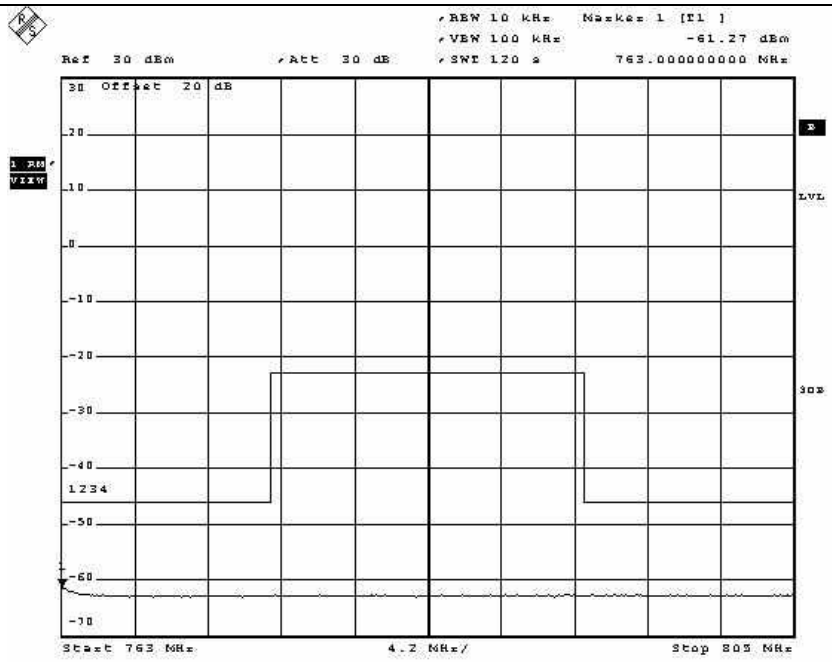
16QAM (Middle Channel)



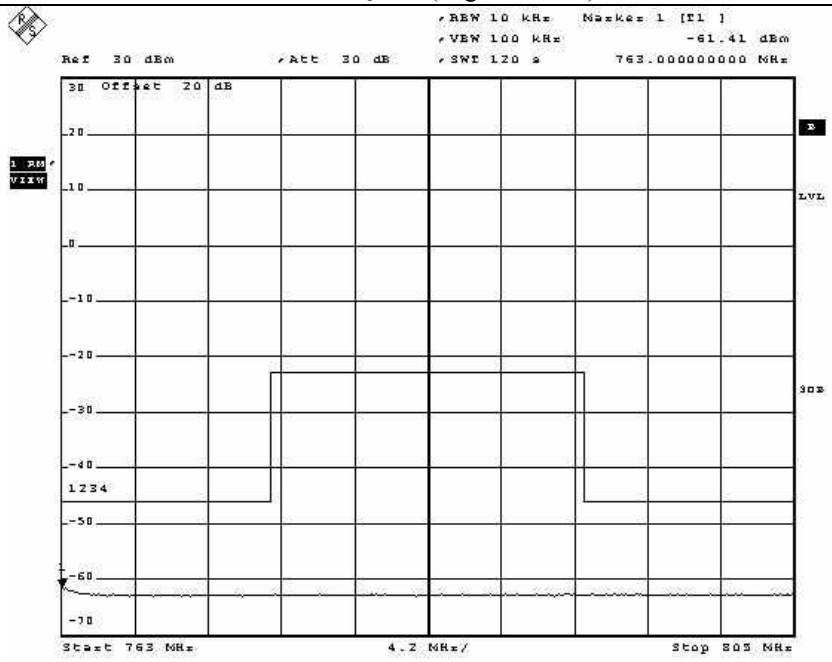
64QAM QPSK (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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)



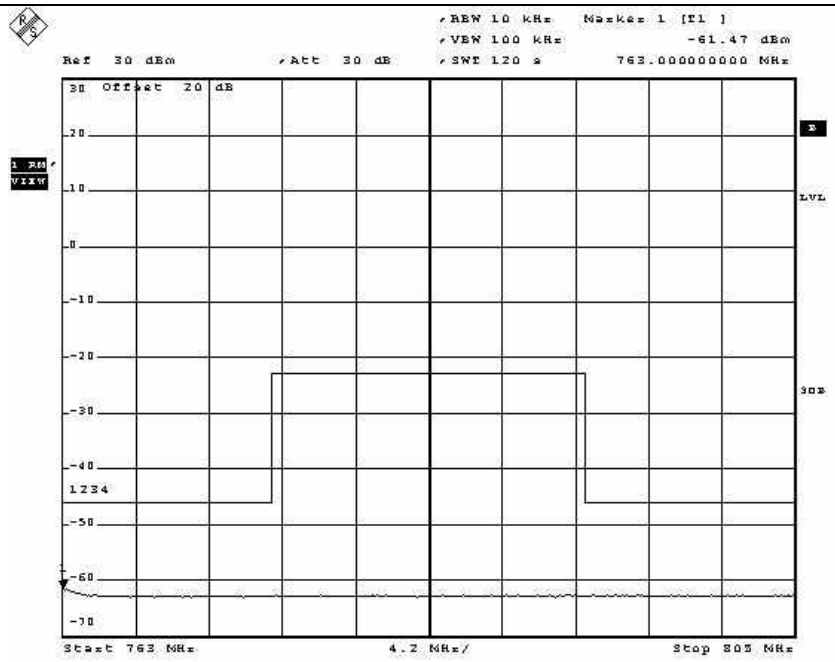
QPSK (High Channel)



16QAM (High Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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)



64QAM (High Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)

7.4.3 Test Result for Part 27 Subpart C §27.53 (f)

-. Test Date : February 14 ~ 15, 2011

-. Frequency range : 1 559 MHz ~ 1 610 MHz

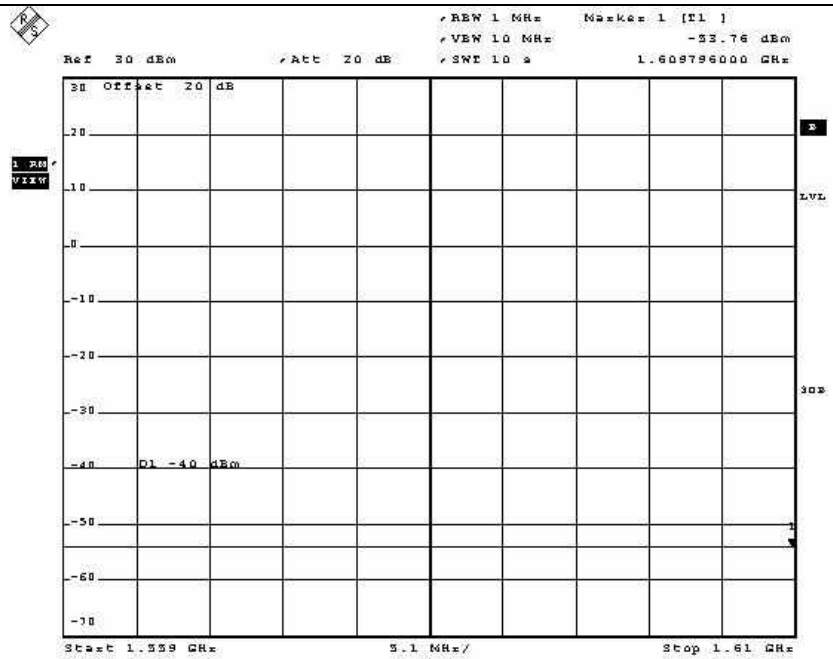
-. Result : PASSED BY –12.59 dB at QPSK and 64QAM Mode

Channel	Modulation	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	QPSK	1 609.796	-53.76	1.17	-52.59	-40.00	-12.59
	16QAM	1 608.776	-53.77	1.17	-52.60		-12.60
	64QAM	1 605.206	-53.78	1.17	-52.61		-12.61
Middle	QPSK	1 611.260	-53.78	1.17	-52.61		-12.61
	16QAM	1 605.512	-53.79	1.17	-52.62		-12.62
	64QAM	1 610.000	-53.76	1.17	-52.59		-12.59
High	QPSK	1 609.796	-53.78	1.17	-52.61		-12.61
	16QAM	1 609.796	-53.80	1.17	-52.63		-12.63
	64QAM	1 609.694	-53.77	1.17	-52.60		-12.60

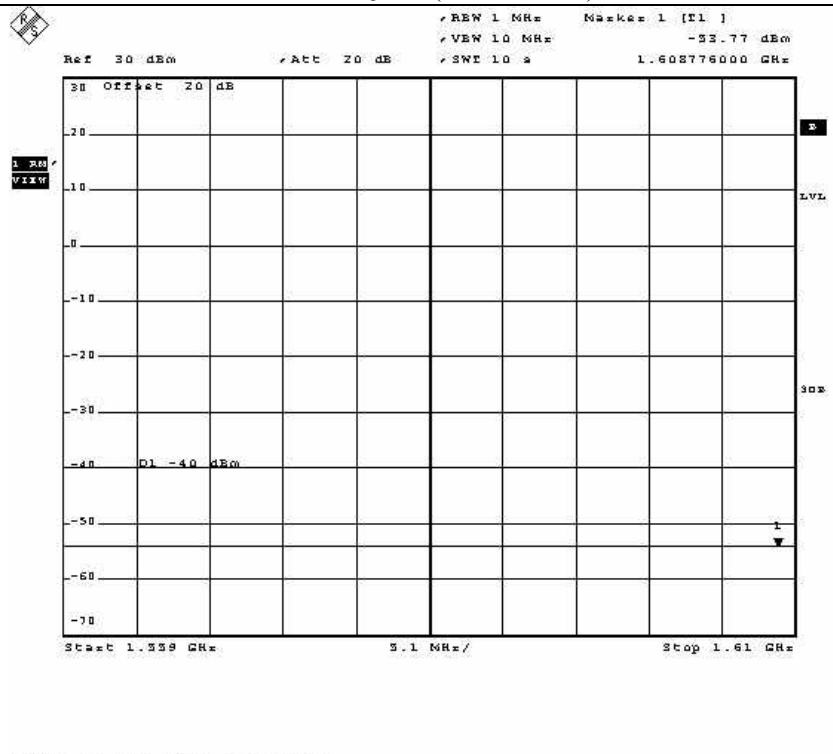
From CFR 27.53(f): For operations in the 746 MHz ~ 763 MHz, 775 MHz ~ 793 MHz, and 805 MHz ~ 806 MHz bands, emissions in the band 1 559 MHz ~ 1 610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less 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.

Tested by: Ki-Hong, Nam / Senior Engineer

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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)



QPSK (Low Channel)



16QAM (Low Channel)

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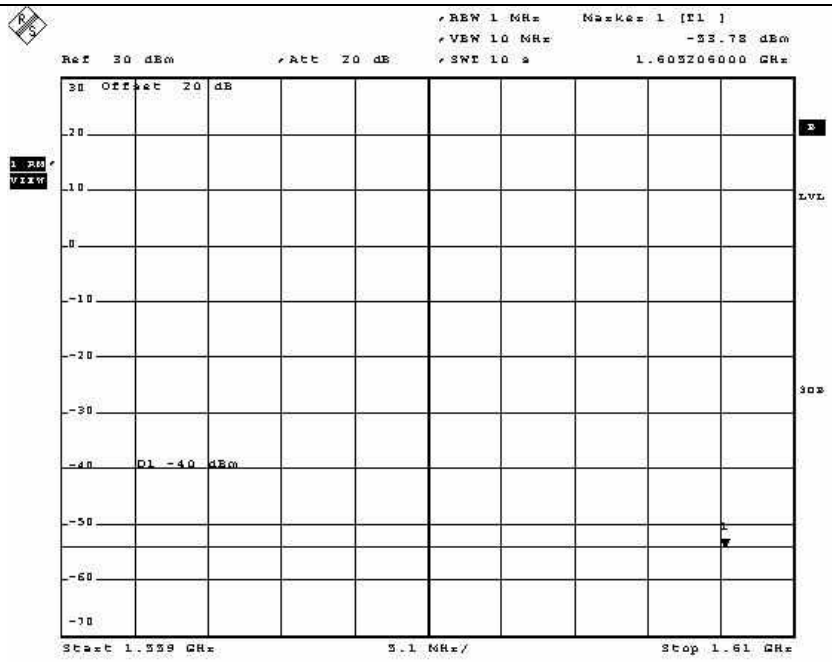
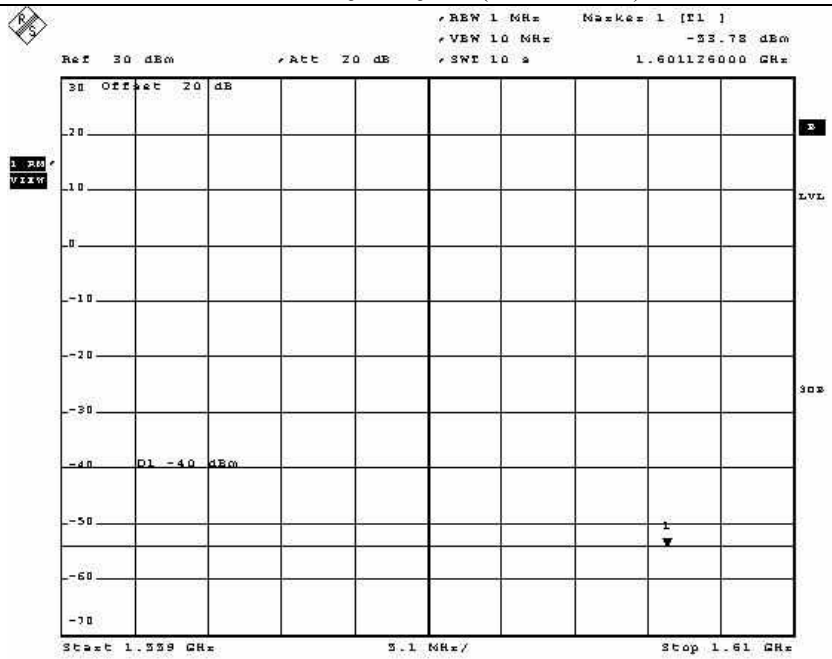


64QAM QPSK (Low Channel)



QPSK (Middle Channel)

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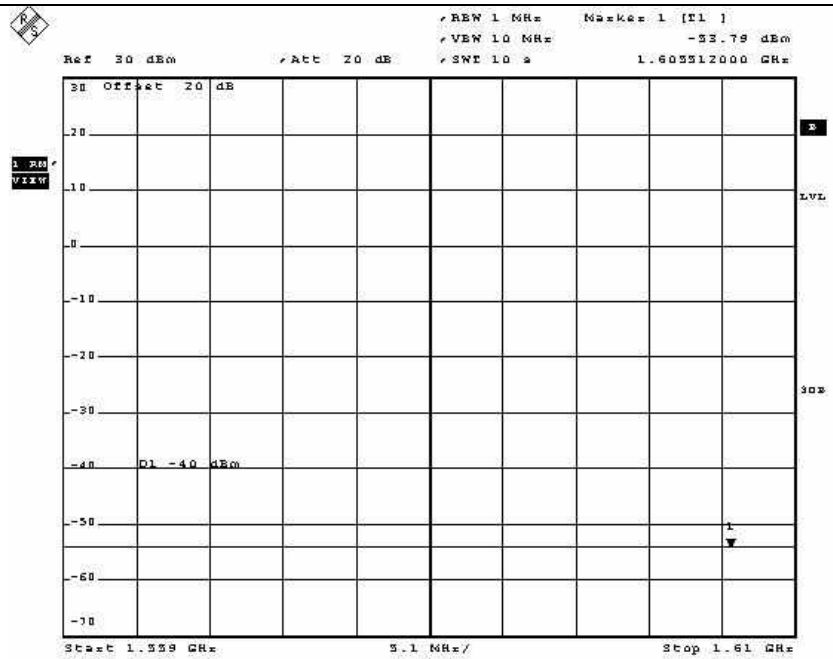
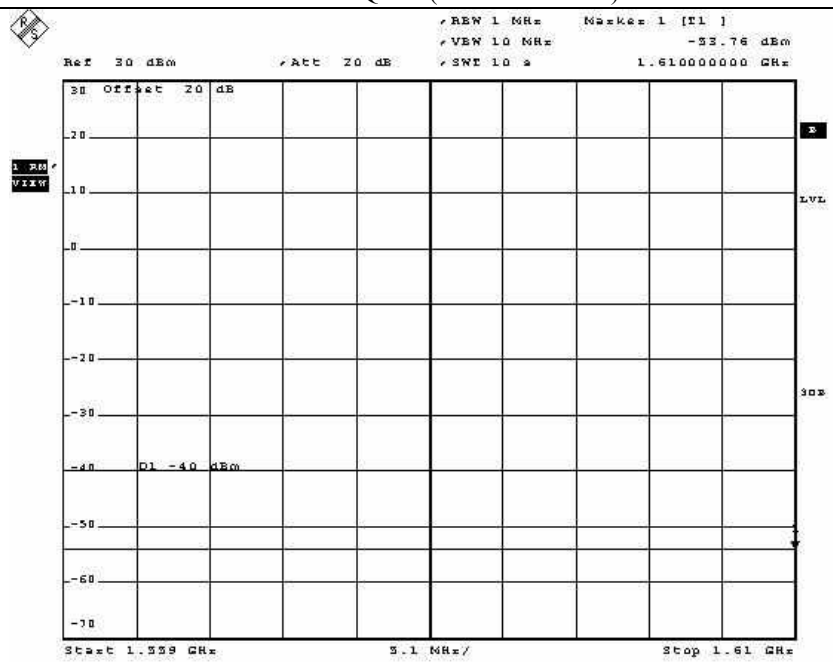


16QAM (Middle Channel)



64QAM QPSK (Middle Channel)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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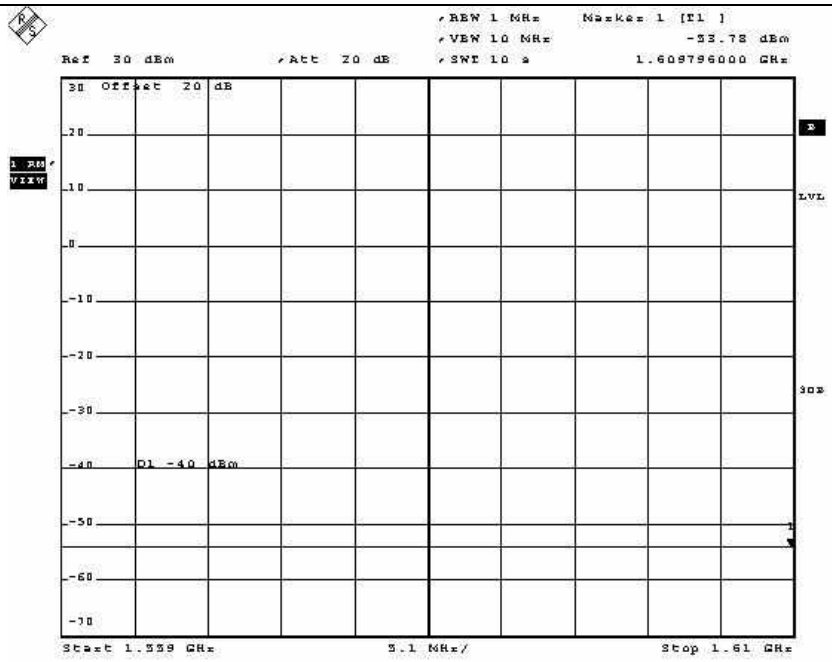
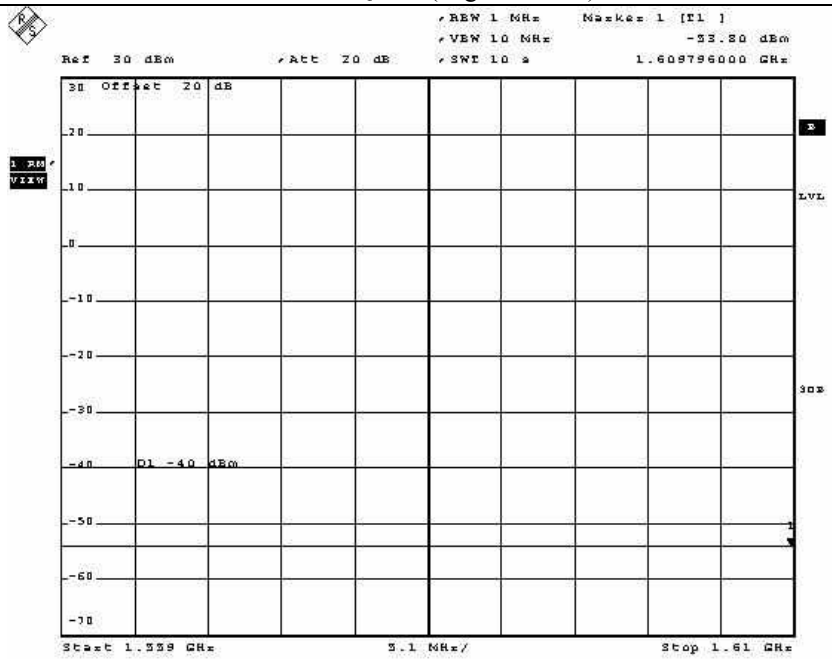


QPSK (High Channel)



16QAM (High Channel)

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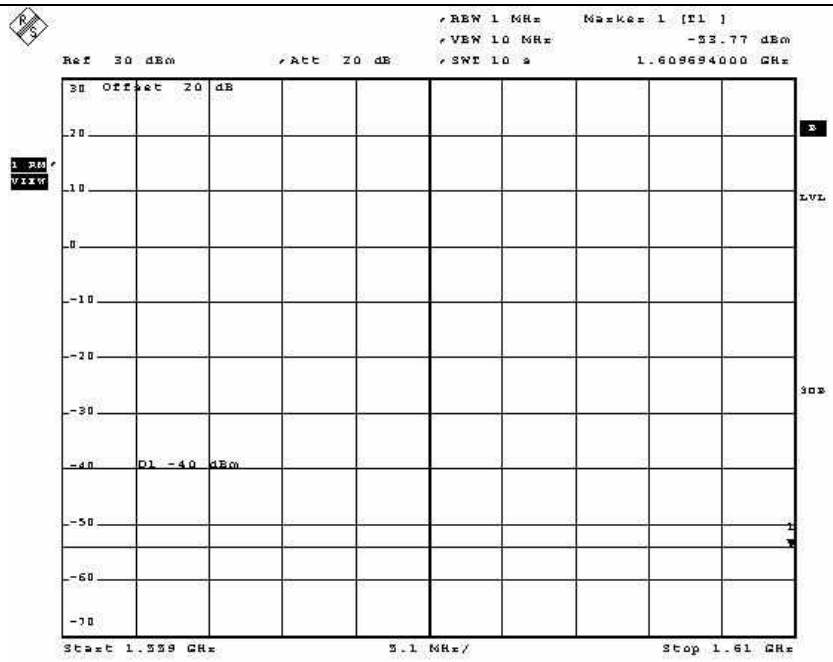


64QAM (High Channel)

8. BAND EDGE MEASUREMENT

8.1 Operating environment

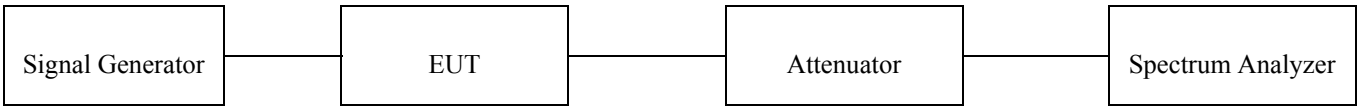
Temperature : 24 °C

Relative humidity : 48 % 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 power meter or 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)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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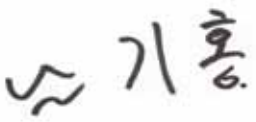
8.4 Test data

8.4.1 Test Result for Part 27 Subpart C §27.53 (c)(5)

-. Test Date : February 14 ~ 15, 2011

-. Result : PASSED

Channel	Modulation	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	QPSK	728.000	-24.33	0.67	-23.66	-13.00	-10.66
		727.900	-25.10	0.67	-24.43	-18.22	-6.21
		723.000	-46.38	0.67	-45.71	-13.00	-32.71
	16QAM	728.000	-24.27	0.67	-23.60	-13.00	-10.60
		727.900	-25.05	0.67	-24.38	-18.22	-6.16
		723.000	-46.34	0.67	-45.67	-13.00	-32.67
	64QAM	728.000	-24.24	0.67	-23.57	-13.00	-10.57
		727.900	-25.10	0.67	-24.43	-8.22	-16.21
		723.000	-46.31	0.67	-45.64	-13.00	-32.64
High	QPSK	757.000	-23.82	0.67	-23.15	-13.00	-10.15
		757.100	-24.61	0.67	-23.94	-18.22	-5.72
		762.000	-47.46	0.67	-46.79	-13.00	-33.79
	16QAM	757.000	-23.78	0.67	-23.11	-13.00	-10.11
		757.100	-24.50	0.67	-23.83	-18.22	-5.61
		762.000	-47.54	0.67	-46.87	-13.00	-33.87
	64QAM	757.000	-23.82	0.67	-23.15	-13.00	-10.15
		757.100	-24.56	0.67	-23.89	-18.22	-5.67
		762.000	-47.42	0.67	-46.75	-13.00	-33.75



Tested by: Ki-Hong, Nam / Senior Engineer

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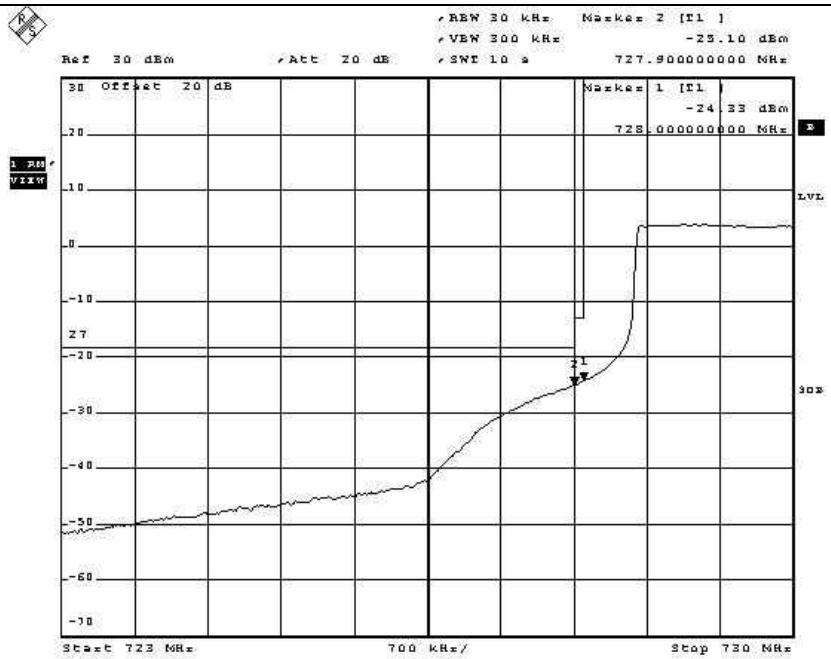
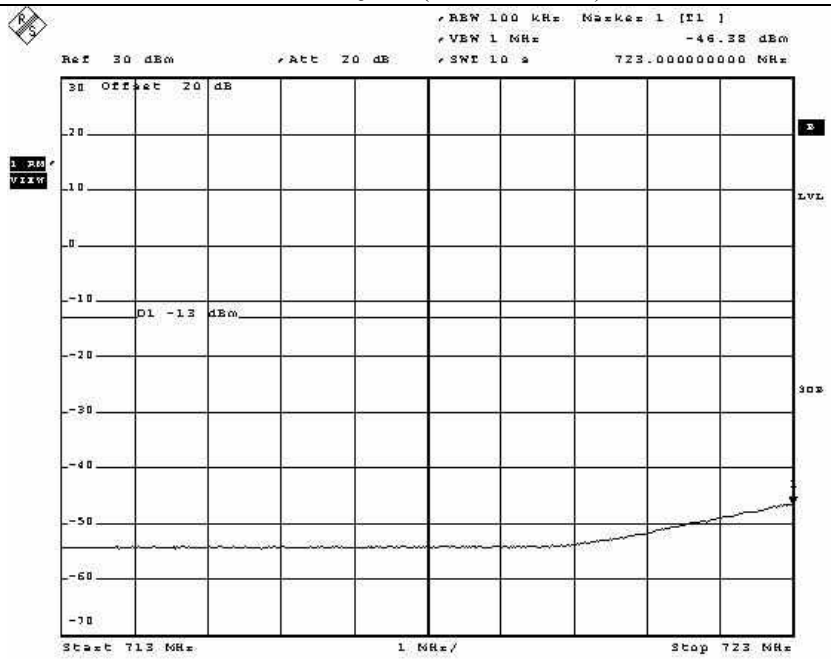


QPSK (Low Channel 1)



QPSK (Low Channel 2)

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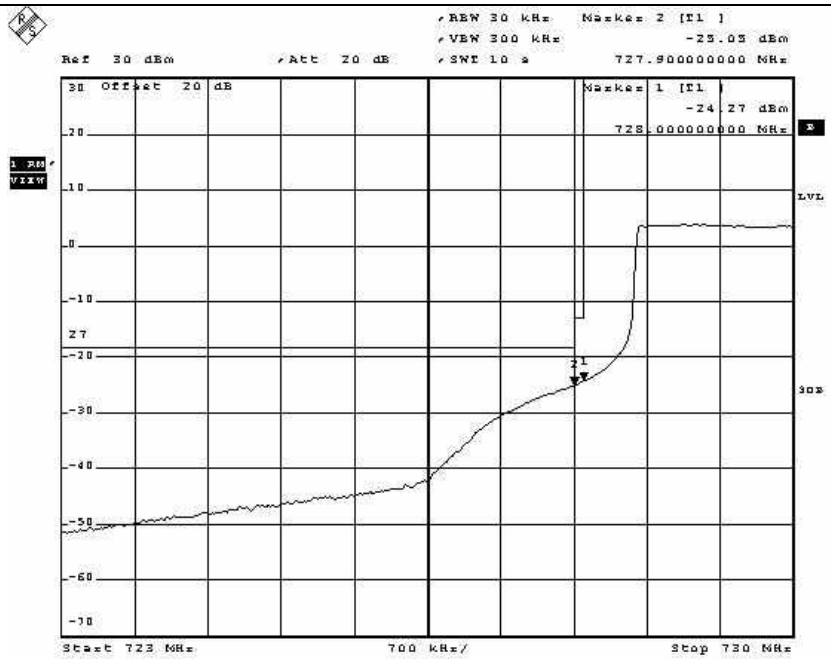
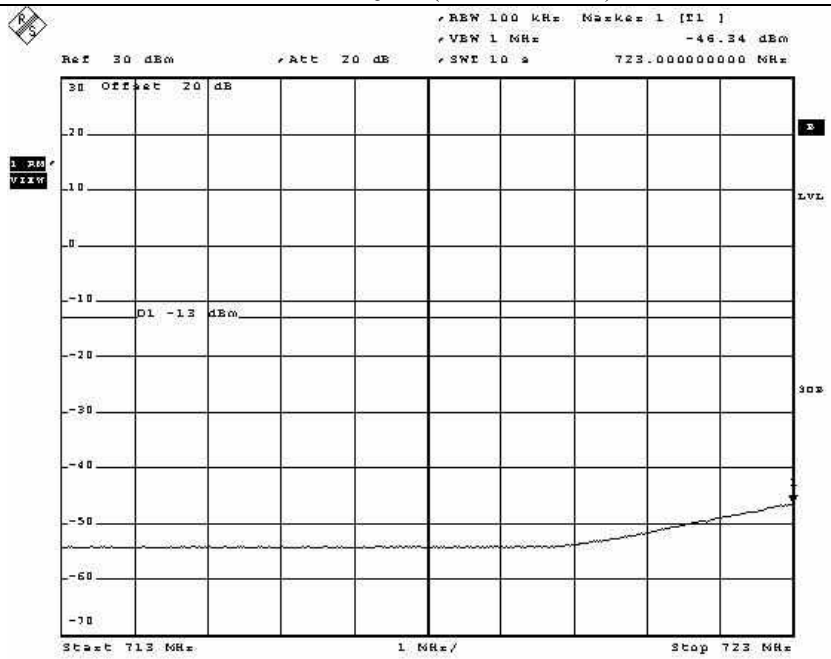


16QAM (Low Channel 1)



16QAM (Low Channel 2)

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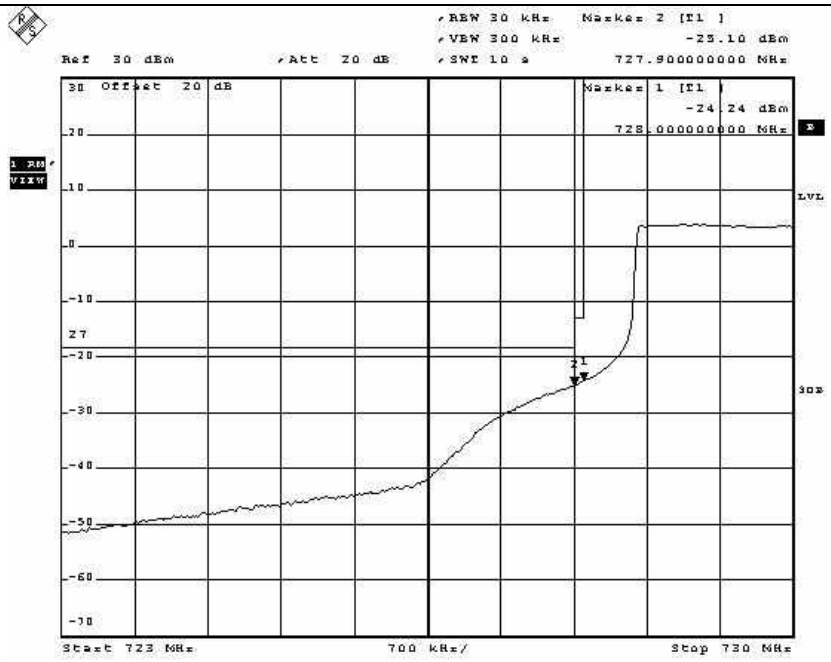
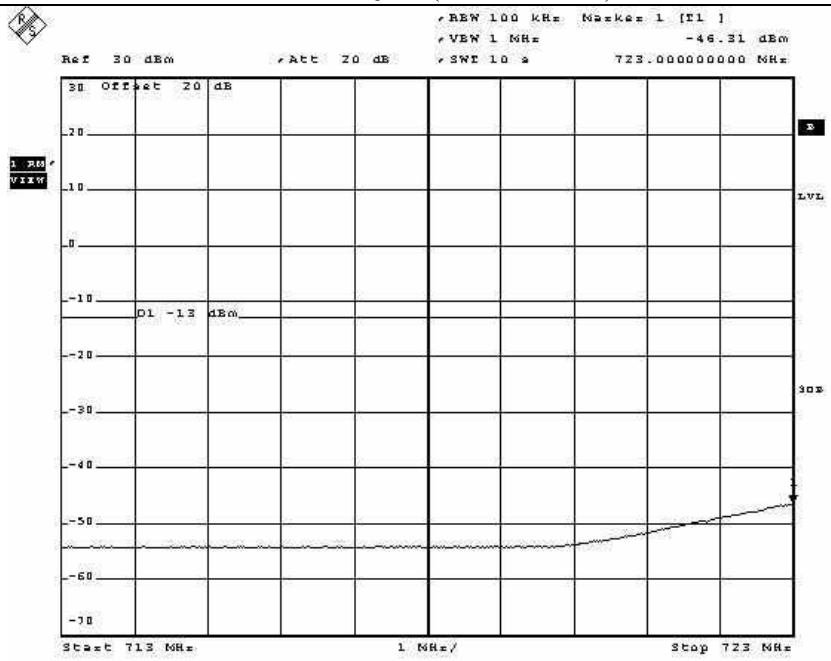


64QAM (Low Channel 1)



64QAM (Low Channel 2)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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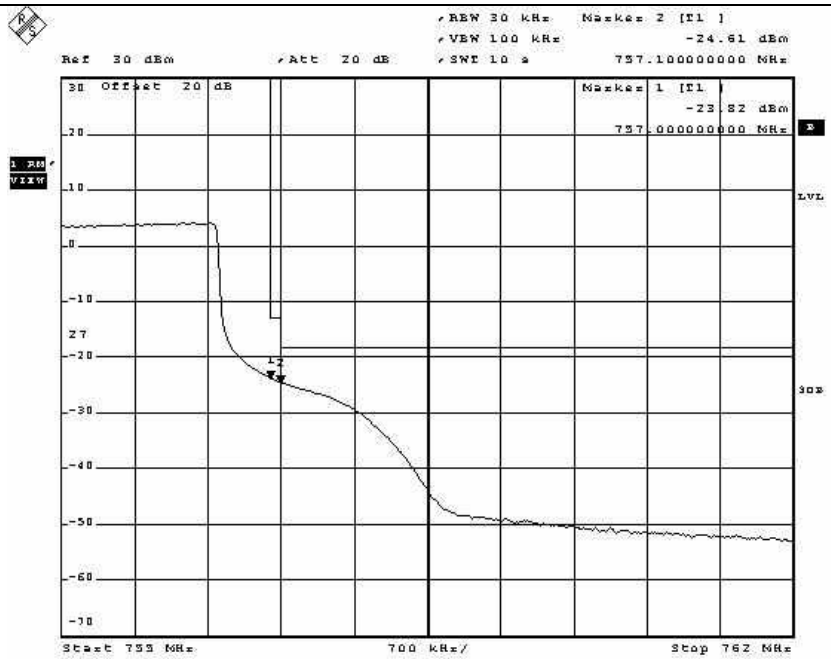
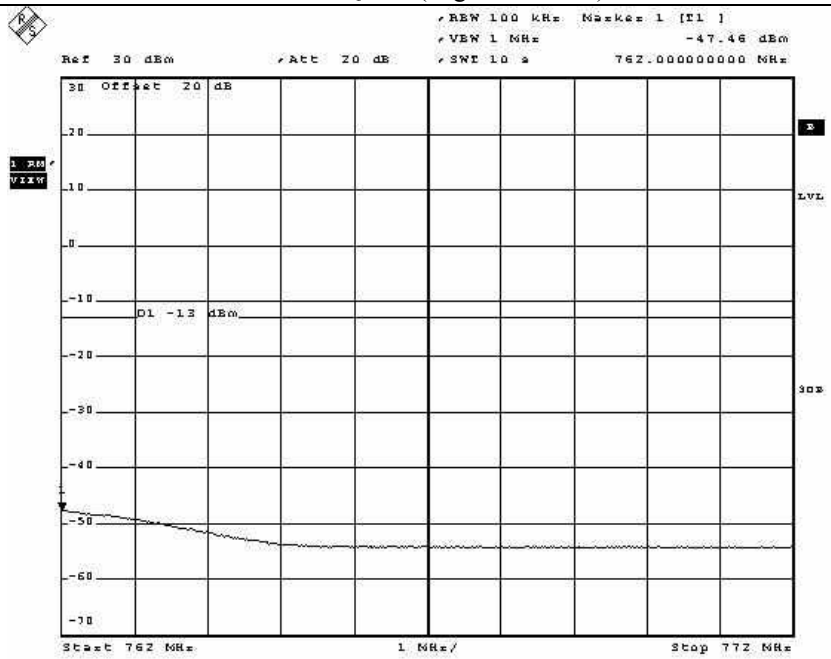


QPSK (High Channel 1)



QPSK (High Channel 2)

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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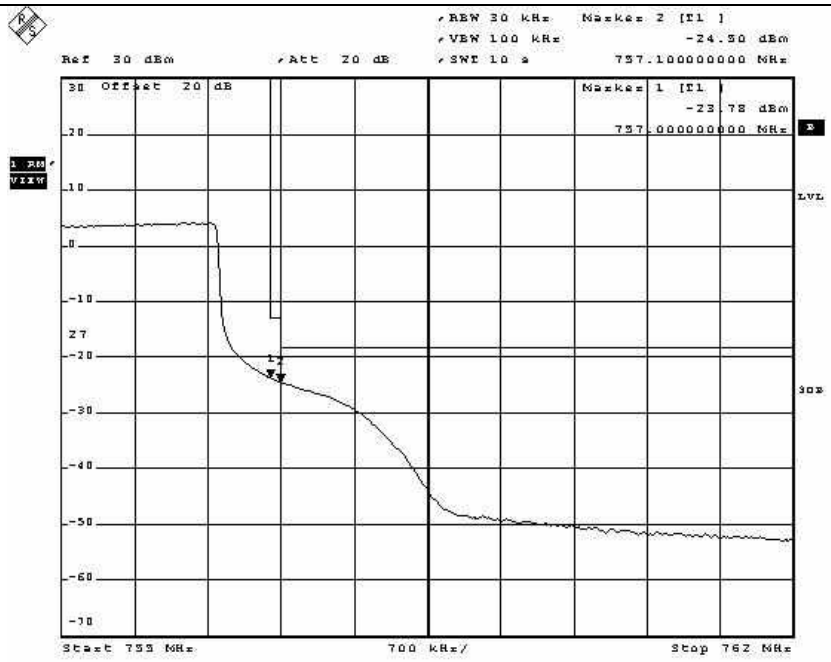
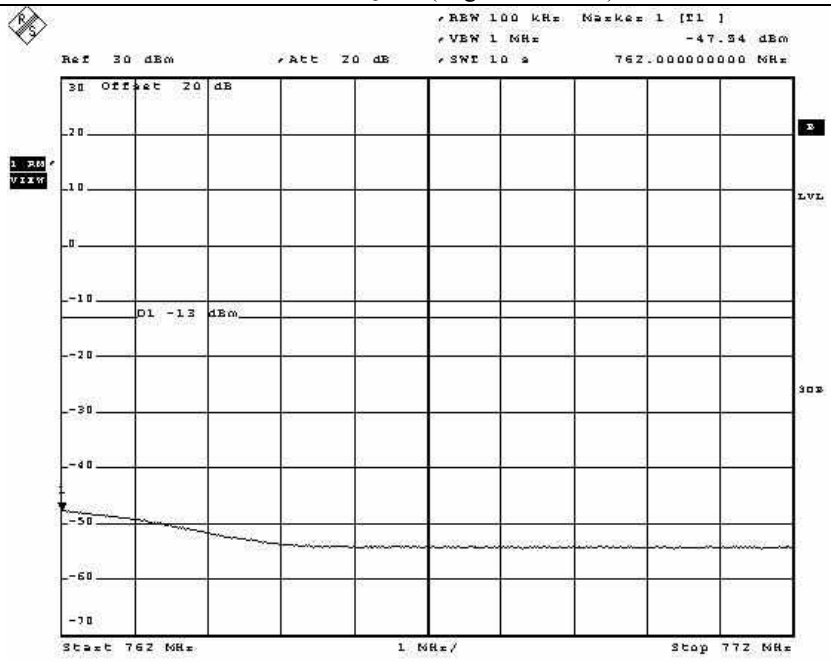


16QAM (High Channel 1)



16QAM (High Channel 2)

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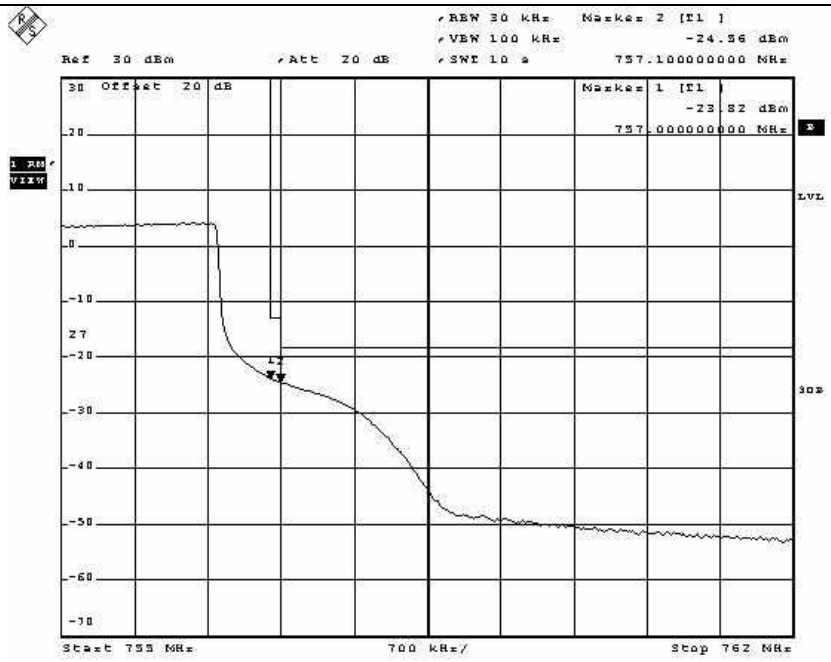
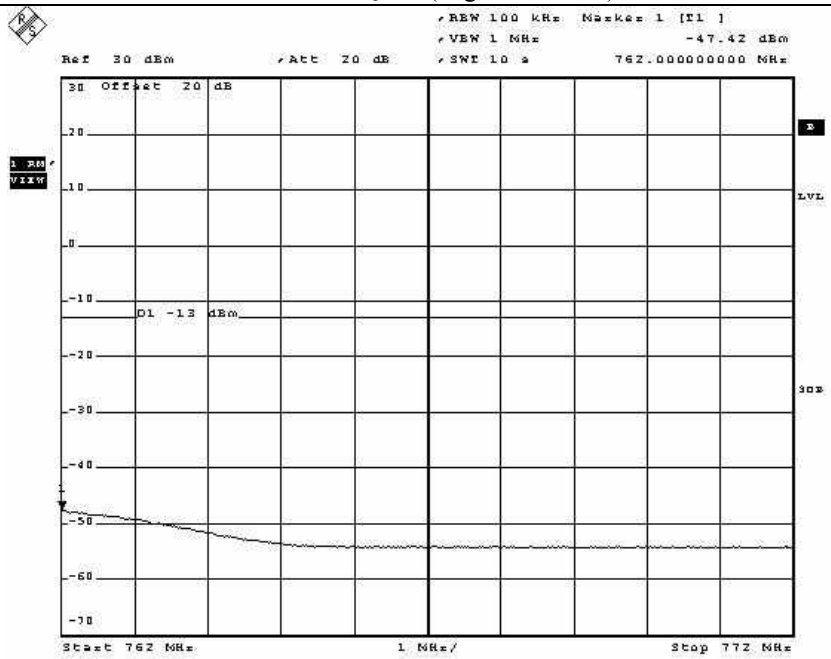


64QAM (High Channel 1)



64QAM (High Channel 2)

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9. INTERMODULATION TEST

9.1 Operating environment

Temperature : 24 °C

Relative humidity : 48 % 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, 2010 (1Y)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (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)

9.4 Test data

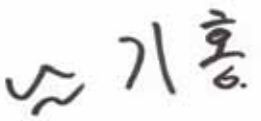
9.4.1 Test Result for peak power

-. Test Date : February 14 ~ 15, 2011

-. Test Result : Pass

-. Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
733.000	1	-9.83	30.00
733.000 & 733.025	2	-9.85	29.83
733.000 & 733.025 & 733.050	3	-9.90	29.83
752.000	1	-9.78	30.17
752.000 & 751.975	2	-9.85	30.17
752.000 & 751.975 & 751.950	3	-9.85	30.17



Tested by: Ki-Hong, Nam / Senior Engineer

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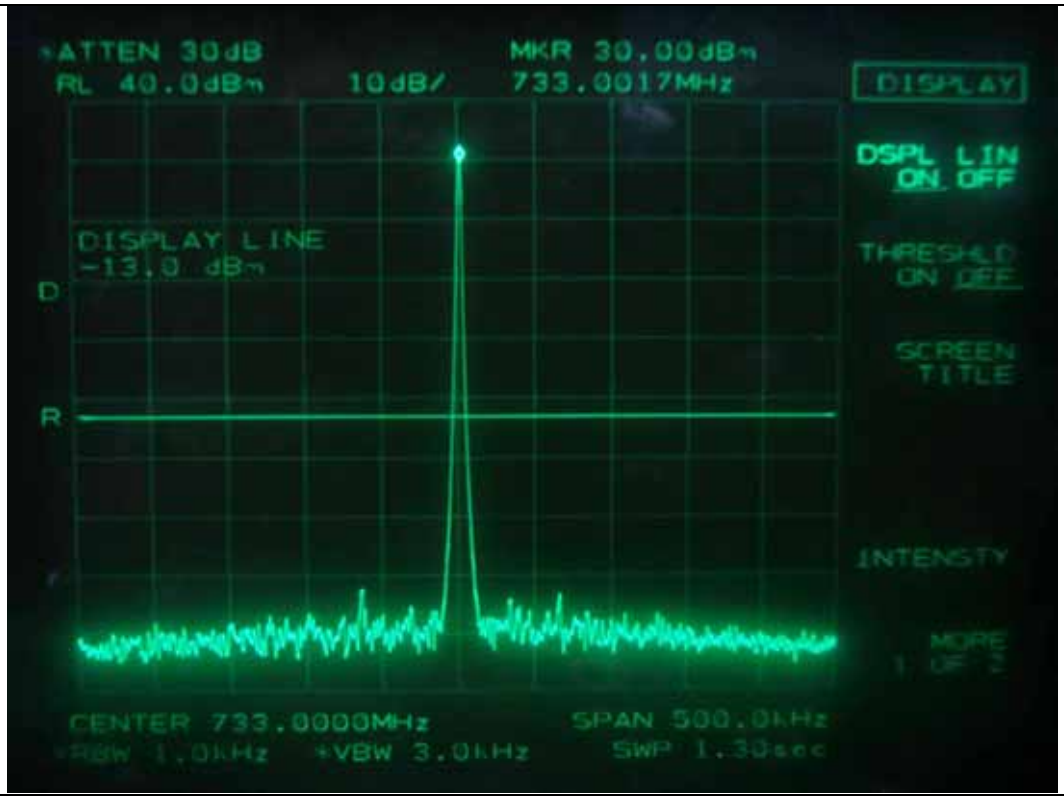
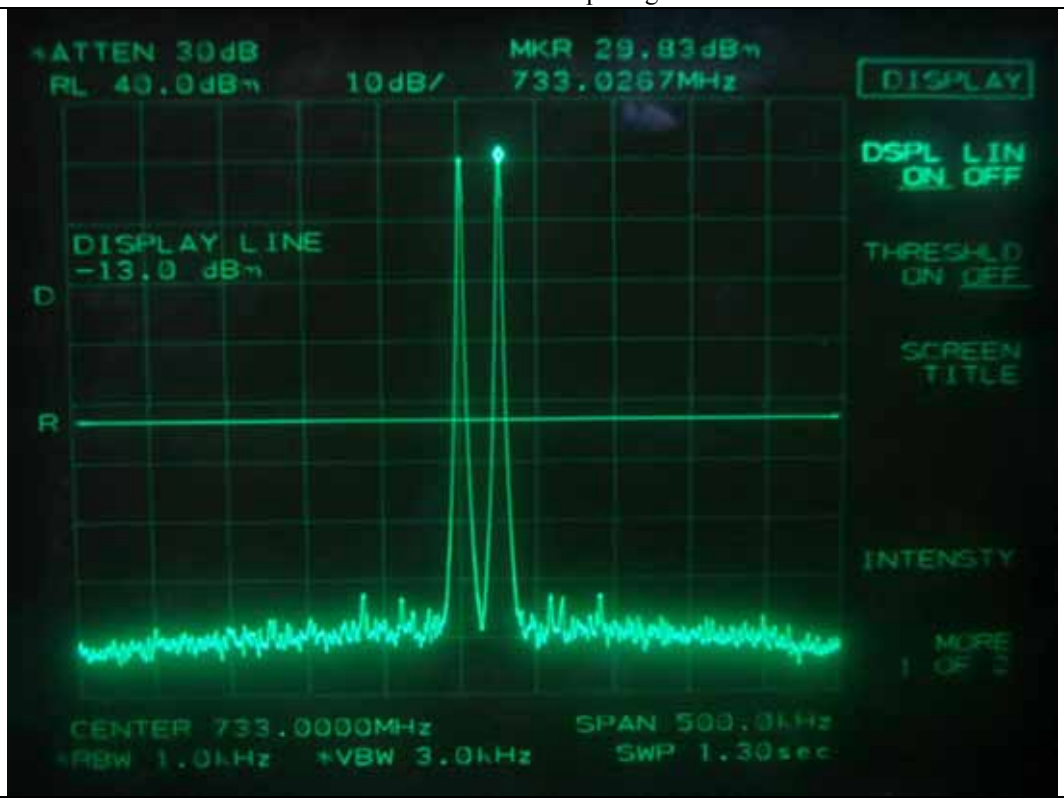
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)



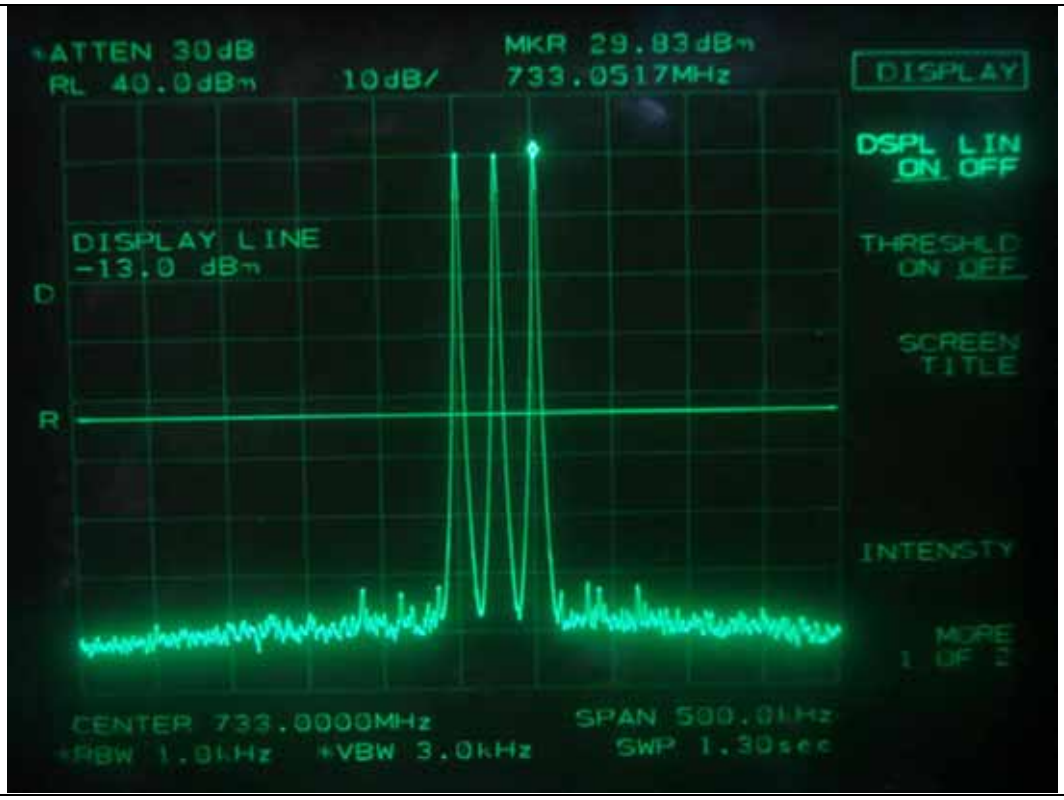
Low Channel – 1 input signal



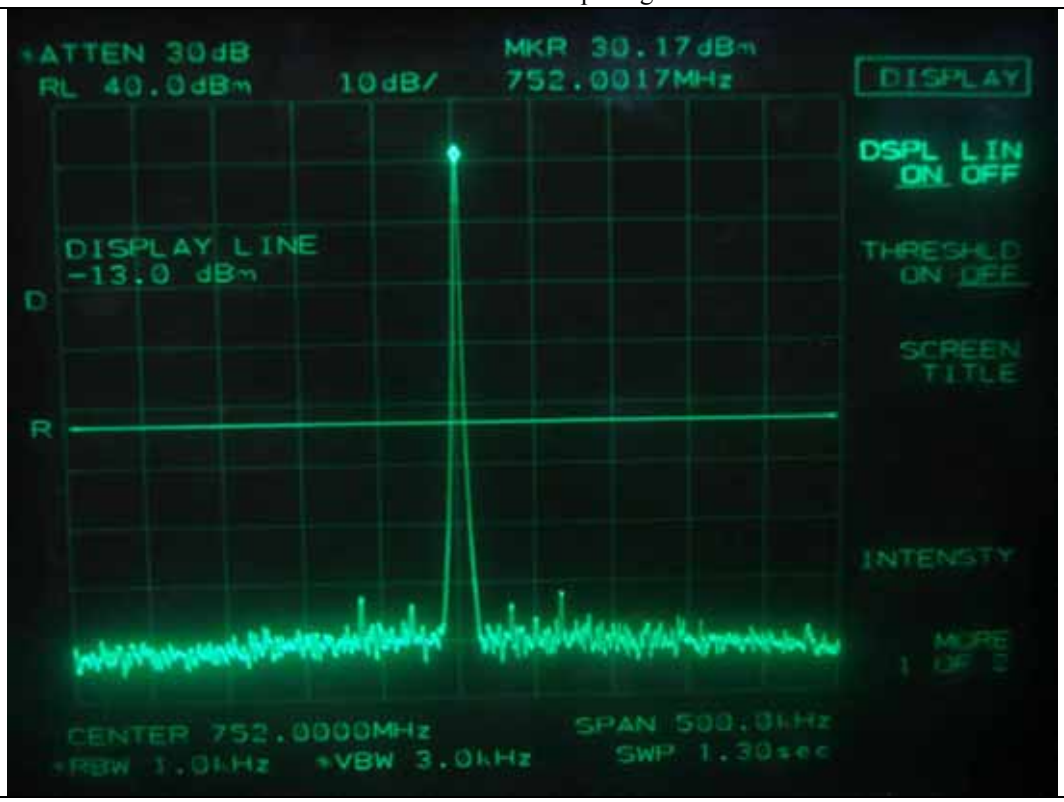
Low Channel – 2 input signals

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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)

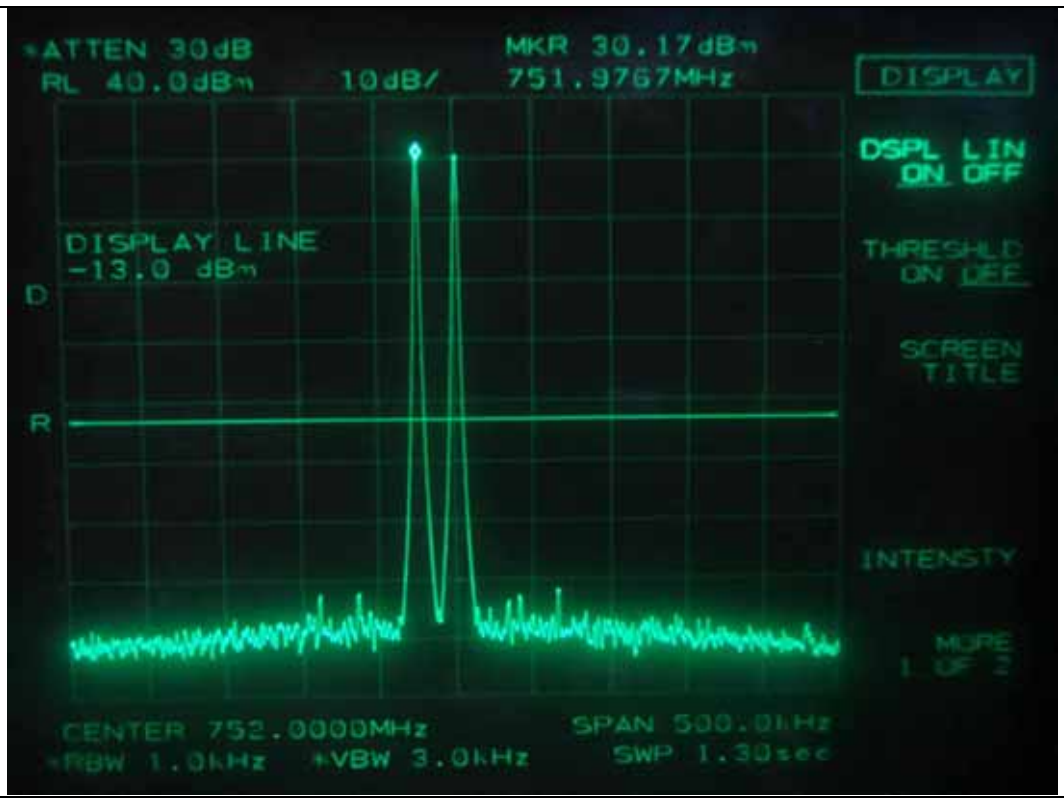


Low Channel – 3 input signals

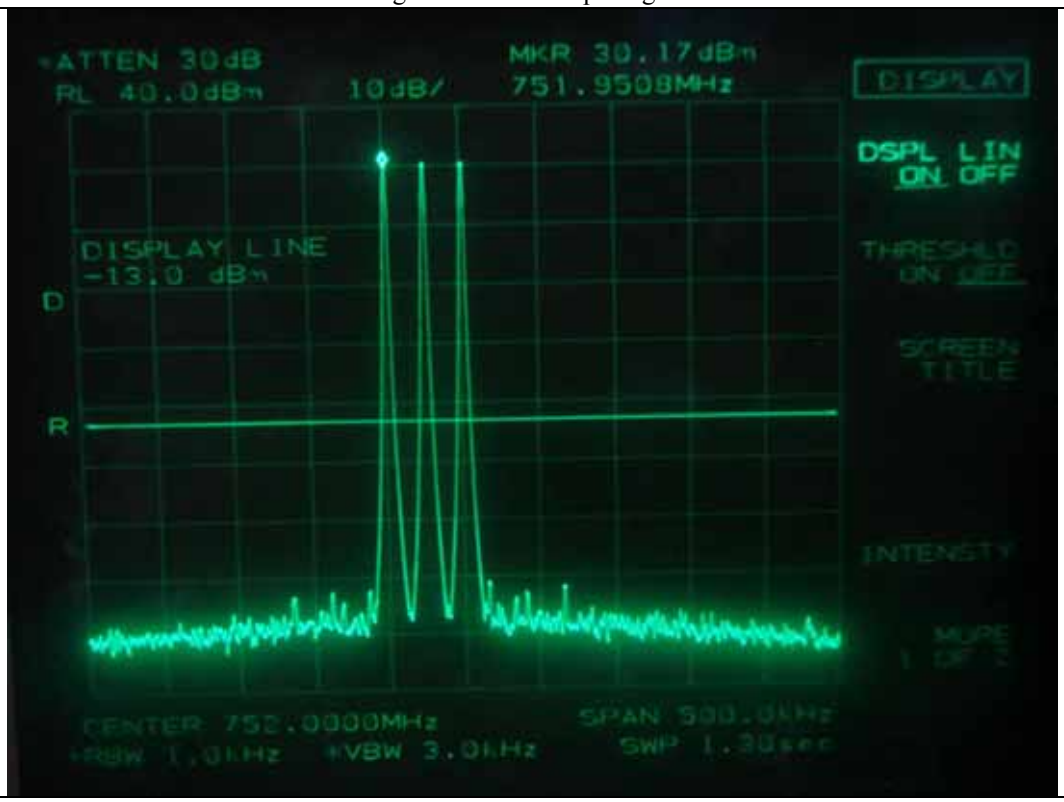


High Channel – 1 input signal

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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 : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)

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

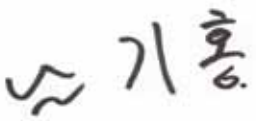
-. Test Date : February 14 ~ 15, 2011

-. Test Result : Pass

-. Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Measured Value	Result
733.000	1	< -13 dBm	Pass
733.000 & 733.025	2		
733.000 & 733.025 & 733.050	3		
752.000	1	< -13 dBm	Pass
752.000 & 751.975	2		
752.000 & 751.975 & 751.950	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

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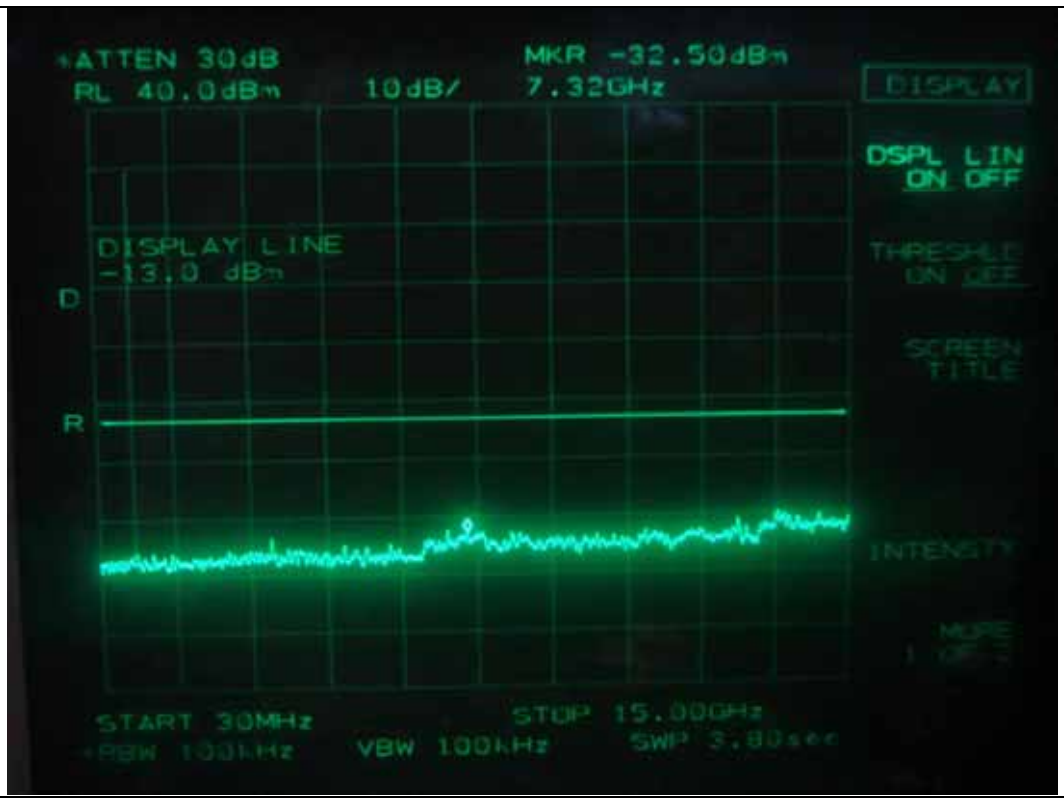
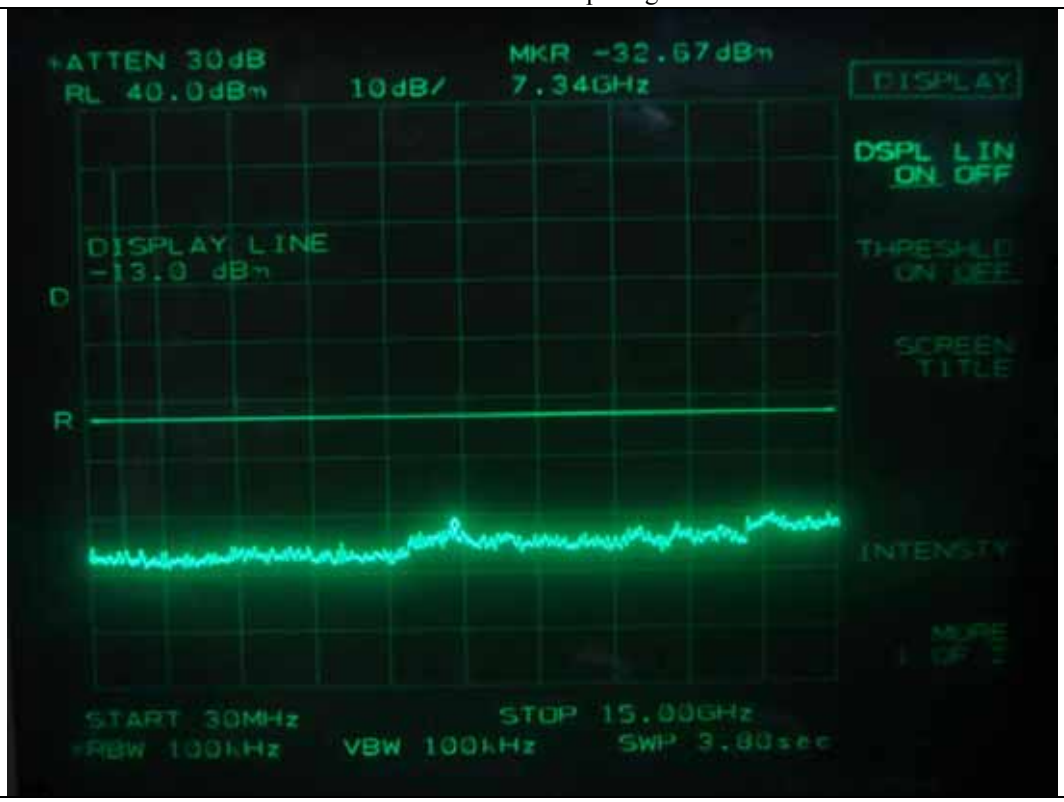


Low Channel – 1 input signal



Low Channel – 2 input signals

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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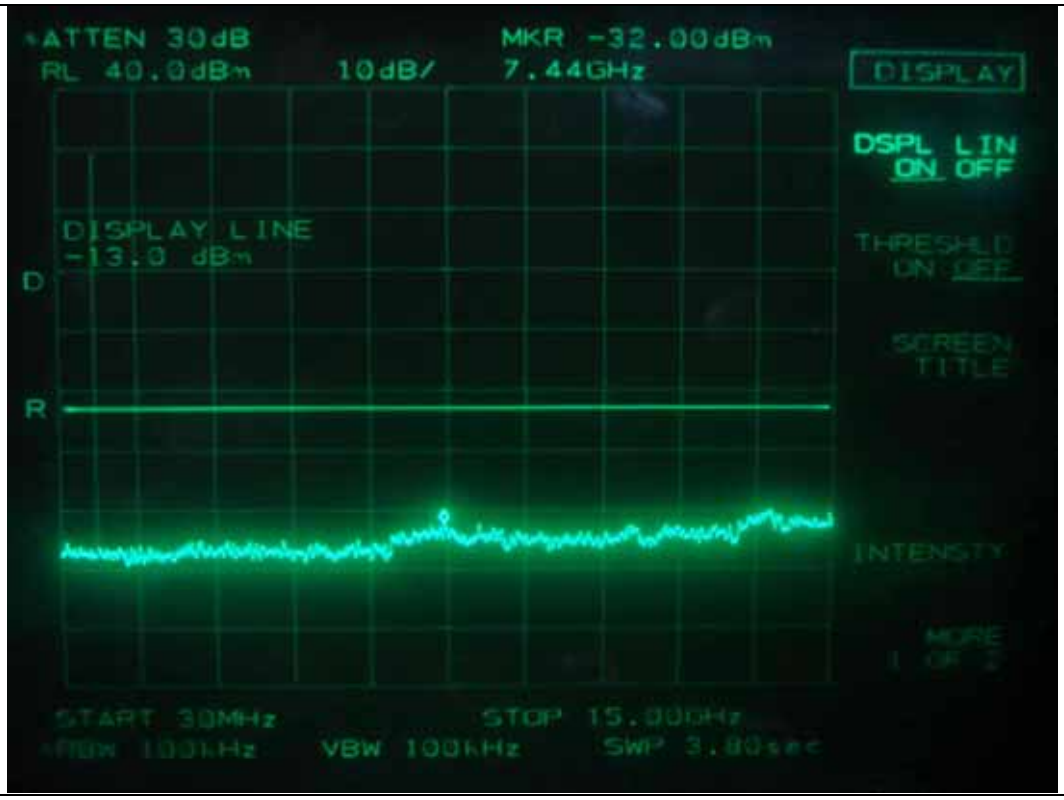
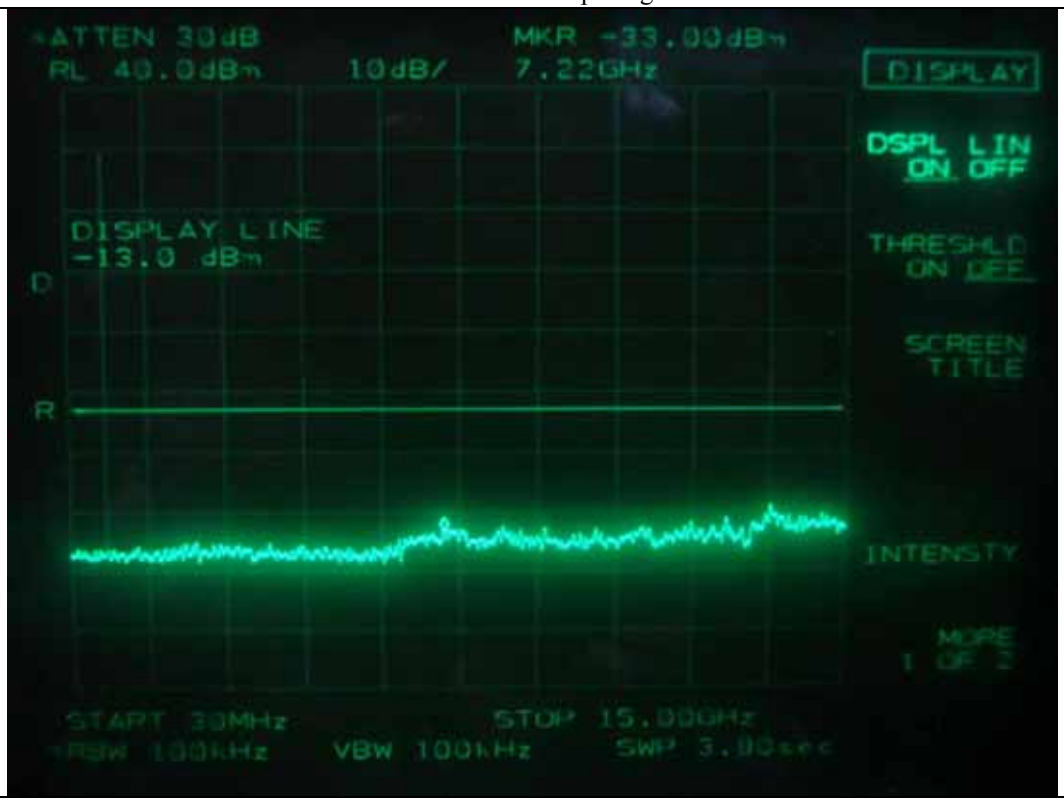


Low Channel – 3 input signals



High Channel – 1 input signal

HEAD OFFICE : #505 SK Apt. Factory, 223-28 Sangdaewon 1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
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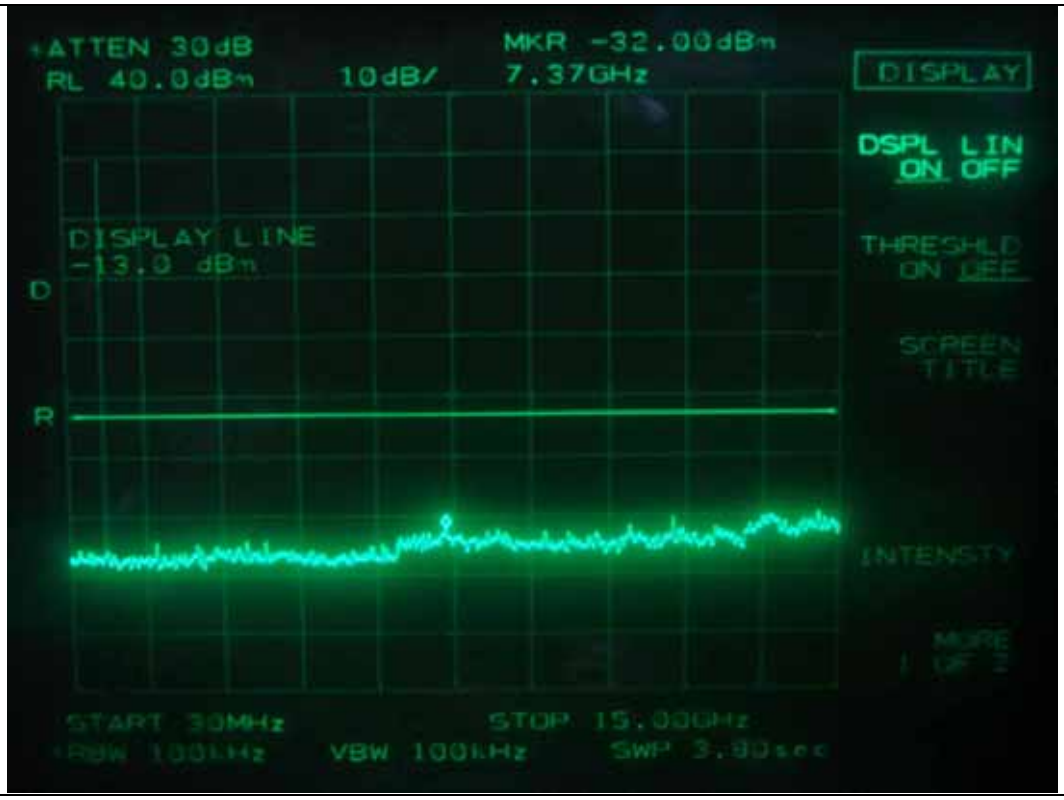
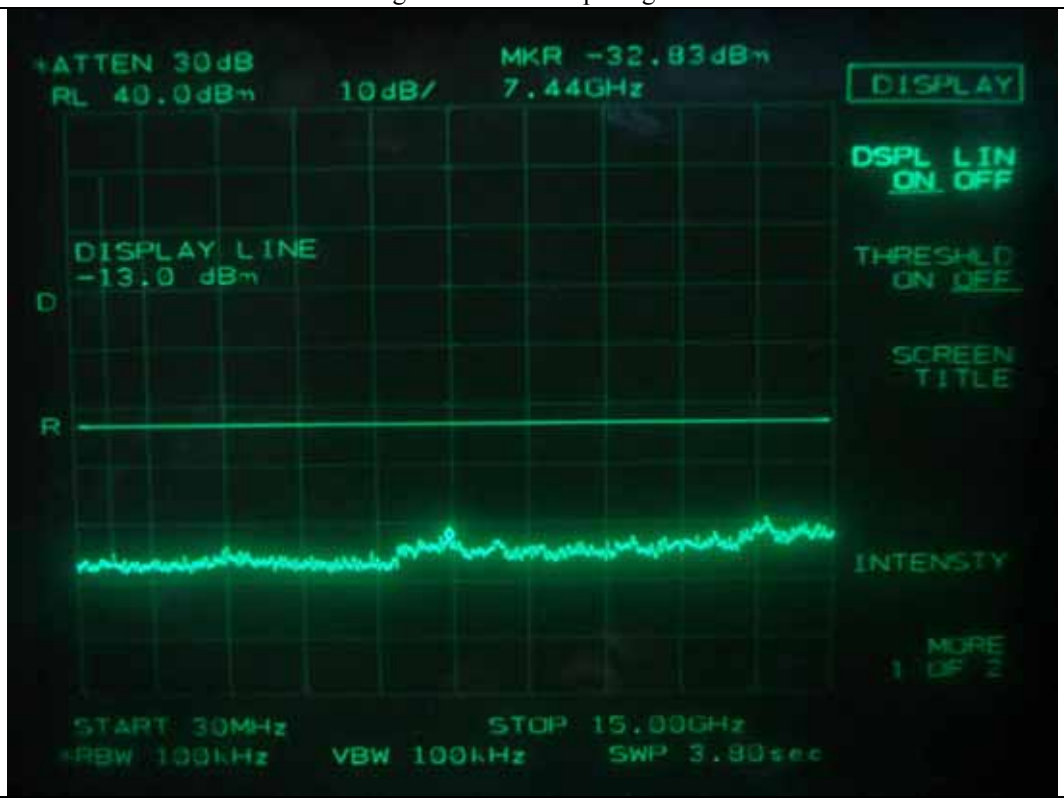


High Channel – 2 input signals



High Channel – 3 input signals

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10. FIELD STRENGTH OF SPURIOUS RADIATION

10.1 Operating environment

Temperature : 10 °C

Relative humidity : 48 % 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. 05, 2010 (1Y)
■ -	8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	83051A	Agilent	Preamplifier	3950M00201	Jun. 11, 2010 (1Y)
■ -	E4432B	Hewlett-Packard	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	83650L	Hewlett-Packard	Signal Generator	3844A00415	Jun. 10, 2010 (1Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Jun. 17, 2009 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Jun. 17, 2009 (2Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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10.4 Test data for radiated emission

10.4.1 Test Result with AC 120 V Power Supply

10.4.1.1 Operating Mode: QPSK

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY –54.45 dB at 36.80 MHz and 167.60 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.33	-3.08	1.07	H	3.33	-5.34	-	-
		64.67	-4.50		V		-6.76	-	-
Middle	743.00	66.45	-2.95	1.03	H	3.33	-5.25	-	-
		64.83	-4.30		V		-6.60	-	-
High	752.00	66.50	-2.90	0.98	H	3.33	-5.25	-	-
		65.00	-4.15		V		-6.50	-	-
36.80		20.50	-68.50	1.55	V	0.50	-67.45	-13.00	-54.45
67.50		15.80	-75.80	1.77	V	0.84	-73.19	-13.00	-60.19
167.60		18.00	-71.00	1.88	H	1.67	-67.45	-13.00	-54.45
200.00		15.17	-71.33	1.83	H	1.67	-67.83	-13.00	-54.83
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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10.4.1.2 Operating Mode: 16QAM

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

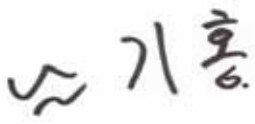
-. Measurement distance : 3 m

-. Result : PASSED BY –54.28 dB at 167.60 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.50	-2.91	1.07	H	3.33	-5.17	-	-
		64.83	-4.34		V		-6.60	-	-
Middle	743.00	66.67	-2.73	1.03	H	3.33	-5.03	-	-
		65.00	-4.13		V		-6.43	-	-
High	752.00	66.45	-2.95	0.98	H	3.33	-5.30	-	-
		64.73	-4.42		V		-6.77	-	-
36.80		20.33	-68.67	1.55	V	0.50	-67.62	-13.00	-54.62
67.50		16.00	-75.60	1.77	V	0.84	-72.99	-13.00	-59.99
167.60		18.17	-70.83	1.88	H	1.67	-67.28	-13.00	-54.28
200.00		15.00	-71.50	1.83	H	1.67	-68.00	-13.00	-55.00
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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10.4.1.3 Operating Mode: 64QAM

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY –54.45 dB at 36.80 MHz and 167.60 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.33	-3.08	1.07	H	3.33	-5.34	-	-
		64.50	-4.67		V		-6.93	-	-
Middle	743.00	66.50	-2.90	1.03	H	3.33	-5.20	-	-
		64.83	-4.30		V		-6.60	-	-
High	752.00	66.33	-3.07	0.98	H	3.33	-5.42	-	-
		64.73	-4.42		V		-6.77	-	-
36.80		20.50	-68.50	1.55	V	0.50	-67.45	-13.00	-54.45
67.50		16.17	-75.43	1.77	V	0.84	-72.82	-13.00	-59.82
167.60		18.00	-71.00	1.88	H	1.67	-67.45	-13.00	-54.45
200.00		15.33	-71.17	1.83	H	1.67	-67.67	-13.00	-54.67
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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10.4.2 Test Result with DC -48 V Power Supply

10.4.2.1 Operating Mode: QPSK

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

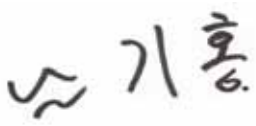
-. Measurement distance : 3 m

-. Result : PASSED BY –53.84 dB at 40.00 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.50	-2.91	1.07	H	3.33	-5.17	-	-
		64.45	-4.72		V		-6.98	-	-
Middle	743.00	66.67	-2.73	1.03	H	3.33	-5.03	-	-
		64.83	-4.30		V		-6.60	-	-
High	752.00	66.50	-2.90	0.98	H	3.33	-5.25	-	-
		64.83	-4.32		V		-6.67	-	-
40.00		21.00	-68.00	1.66	V	0.50	-66.84	-13.00	-53.84
75.00		17.50	-72.50	1.86	V	0.84	-69.80	-13.00	-56.80
172.00		18.50	-70.83	2.00	H	1.67	-67.16	-13.00	-54.16
200.00		15.33	-71.17	1.83	H	1.67	-67.67	-13.00	-54.67
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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10.4.2.2 Operating Mode: 16QAM

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY –53.51 dB at 40.00 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.33	-3.08	1.07	H	3.33	-5.34	-	-
		64.67	-4.50		V		-6.76	-	-
Middle	743.00	66.45	-2.95	1.03	H	3.33	-5.25	-	-
		64.50	-4.63		V		-6.93	-	-
High	752.00	66.50	-2.90	0.98	H	3.33	-5.25	-	-
		65.00	-4.15		V		-6.50	-	-
40.00		21.33	-67.67	1.66	V	0.50	-66.51	-13.00	-53.51
75.00		17.00	-73.00	1.86	V	0.84	-70.30	-13.00	-57.30
172.00		18.67	-70.66	2.00	H	1.67	-66.99	-13.00	-53.99
200.00		15.50	-71.00	1.83	H	1.67	-67.50	-13.00	-54.50
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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10.4.2.3 Operating Mode: 64QAM

-. Test Date : February 24, 2011

-. Resolution bandwidth : 1 MHz

-. Video bandwidth : 1 MHz

-. Frequency range : 1 GHz ~ 20 GHz

-. Measurement distance : 3 m

-. Result : PASSED BY –54.17 dB at 200.00 MHz

Channel	Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	733.00	66.33	-3.08	1.07	H	3.33	-5.34	-	-
		64.50	-4.67		V		-6.93	-	-
Middle	743.00	66.50	-2.90	1.03	H	3.33	-5.20	-	-
		64.83	-4.30		V		-6.60	-	-
High	752.00	66.67	-2.73	0.98	H	3.33	-5.08	-	-
		65.17	-3.98		V		-6.33	-	-
40.00		20.50	-68.50	1.66	V	0.50	-67.34	-13.00	-54.34
75.00		17.33	-72.67	1.86	V	0.84	-69.97	-13.00	-56.97
172.00		18.00	-71.33	2.00	H	1.67	-67.66	-13.00	-54.66
200.00		15.83	-70.67	1.83	H	1.67	-67.17	-13.00	-54.17
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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11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

11.1 Operating environment

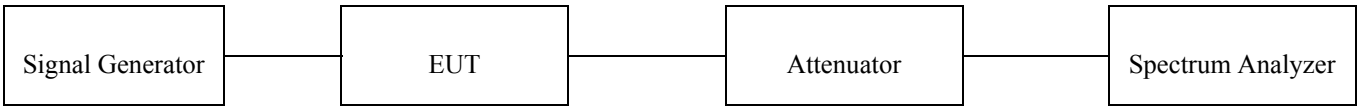
Temperature : 24 °C

Relative humidity : 48 % 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 three frequencies (low, middle, and high channels) at each band using all applicable modulation.

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)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	53152A	HP	Frequency Counter	US39270295	Dec. 01, 2010 (1Y)
■ -	SSE-43CI-A	Samkun	Chamber	060712	Jun. 11, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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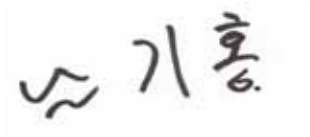
11.4 Test data

11.4.1 Test Result with AC 120 V Power Supply

-. Test Date : February 14 ~ 15, 2011

-. Result : PASSED

Temperature (˚C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-30	743 000 000	743 000 000	0.000 0	Within the Authorized Frequency block
-20		743 000 001	0.001 3	
-10		743 000 001	0.001 3	
0		743 000 000	0.000 0	
10		743 000 002	0.002 7	
20		743 000 001	0.001 3	
30		743 000 001	0.001 3	
40		743 000 002	0.002 7	
50		743 000 000	0.000 0	



Tested by: Ki-Hong, Nam / Senior Engineer

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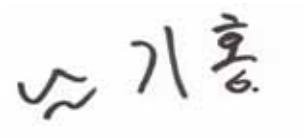
11.4.2 Test Result with DC -48 V Power Supply

-. Test Date : February 14 ~ 15, 2011

-. Result : PASSED

Temperature (˚C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-30	743 000 000	743 000 001	0.001 3	Within the Authorized Frequency block
-20		743 000 002	0.002 7	
-10		743 000 002	0.002 7	
0		743 000 001	0.001 3	
10		743 000 000	0.000 0	
20		743 000 001	0.001 3	
30		743 000 002	0.002 7	
40		743 000 002	0.002 7	
50		743 000 001	0.001 3	



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12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

12.1 Operating environment

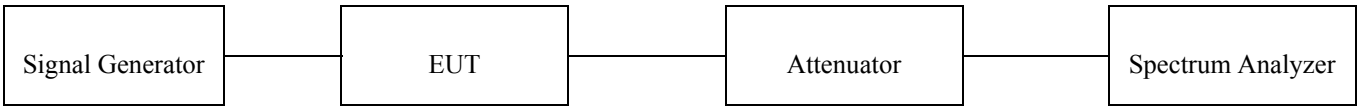
Temperature : 24 °C

Relative humidity : 48 % 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 power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

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)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	53152A	HP	Frequency Counter	US39270295	Dec. 01, 2010 (1Y)
■ -	2350A	HP	30 dB Attenuator Assembly	2350A03133	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2011 (1Y)
■ -	AMU200A	R/S	Baseband signal generator and fading simulator	100360	Aug. 28, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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12.4 Test data

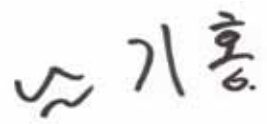
12.4.1 Test Result with AC 120 V Power Supply

-. Test Date : February 14 ~ 15, 2011

-. Rated Supply Voltage : 120 Vac

-. Result : PASSED

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
138 (115 %)	743 000 000	743 000 002	0.002 7	Within the Authorized Frequency block
120 (100 %)		743 000 001	0.001 3	
102 (85 %)		743 000 001	0.001 3	



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12.4.2 Test Result with DC -48 V Power Supply

-. Test Date : February 14 ~ 15, 2011

-. Rated Supply Voltage : -48 Vdc

-. Result : PASSED

Voltage (Vdc)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
- 55.2 (115 %)	743 000 000	743 000 002	0.002 7	Within the Authorized Frequency block
- 48 (100 %)		743 000 001	0.001 3	
- 40.8 (85 %)		743 000 002	0.002 7	

Tested by: Ki-Hong, Nam / Senior Engineer

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13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 10 °C

Relative humidity : 53 % R.H.

13.2 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 1 000 MHz 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. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESVD	Rohde & Schwarz	Test Receiver	838453/018	Oct. 05, 2010 (1Y)
■ -	8566B	HP	Spectrum Analyzer	3407A08547	Jun. 11, 2010 (1Y)
■ -	8447D	Hewlett Packard	Amplifier	2727A04987	Jun. 11, 2010 (1Y)
■ -	MA240	HD GmbH	Antenna Master	N/A	N/A
■ -	HD100	HD GmbH	Position Controller	N/A	N/A
■ -	DS420S	HD GmbH	Turn Table	N/A	N/A
■ -	VHA9104	Schwarzbeck	Biconical Antenna	148533554	Mar. 30, 2010 (2Y)
■ -	9108-A(495)	Schwarzbeck	Log Periodic Antenna	119782703	Mar. 30, 2010 (2Y)

All test equipment used is calibrated on a regular basis.

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13.4 Test data

13.4.1 Test Result with AC 120 V Power Supply

-. Test Date : February 24, 2011

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

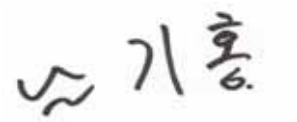
-. Measurement distance : 3 m

-. Result : Passed

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)
36.80	20.50	V	1.50	180.00	15.85	1.14	37.49	49.08	-11.59
67.50	15.80	V	1.00	180.00	7.26	2.00	25.06	49.08	-24.02
120.00	12.50	H	1.50	270.00	13.64	2.40	28.54	53.52	-24.98
144.50	16.33	H	1.80	270.00	14.79	2.55	33.67	53.52	-19.85
167.60	18.00	H	1.50	180.00	15.69	2.70	36.39	53.52	-17.13
200.00	15.17	H	1.00	0.00	17.06	3.10	35.33	53.52	-18.19

Tabulated test data for Radiated Electromagnetic Field

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



Tested by: Ki-Hong, Nam / Senior Engineer

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13.4.2 Test Result with DC -48 V Power Supply

-. Test Date : February 24, 2011

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

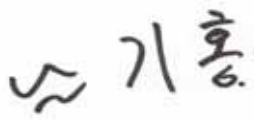
-. Measurement distance : 3 m

-. Result : Passed

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)
40.00	21.00	V	1.50	180.00	15.03	1.40	37.43	49.08	-11.65
75.00	17.50	V	1.00	180.00	6.45	2.10	26.05	49.08	-23.03
120.00	13.67	H	1.50	270.00	13.64	2.40	29.71	53.52	-23.81
150.50	17.00	H	1.80	270.00	15.00	2.61	34.61	53.52	-18.91
172.00	18.50	H	1.50	180.00	15.91	2.82	37.23	53.52	-16.29
200.00	15.33	H	1.00	0.00	17.06	3.10	35.49	53.52	-18.03

Tabulated test data for Radiated Electromagnetic Field

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



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14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 23 °C

Relative humidity : 35 % R.H.

14.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	May 27, 2010 (1Y)
■ -	NSLK 8128	Schwarzbeck	AMN	8128-216	Jun. 10, 2010 (1Y)
☐ -	3825/2	EMCO	AMN	9109-1867	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

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14.4 Test data

-. Test Date : February 21, 2011

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Test Result : Passed by -28.07 dB at 0.24 MHz

Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
0.24	N	50.93	79.00	-28.07
1.57	N	40.20	73.00	-32.80
1.86	H	42.08	73.00	-30.92
10.97	H	39.33	73.00	-33.67
10.99	N	39.78	73.00	-33.22
26.74	N	34.08	73.00	-38.92
Frequency (MHz)	**Line**	**Average (dBμV)**		**Margin (dB)**
		Emission level	**Limits**	
-				
-				

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

Average mode was not measured, because peak values were under the average limit.

See next page for an overview sweep performed with peak detector modes.

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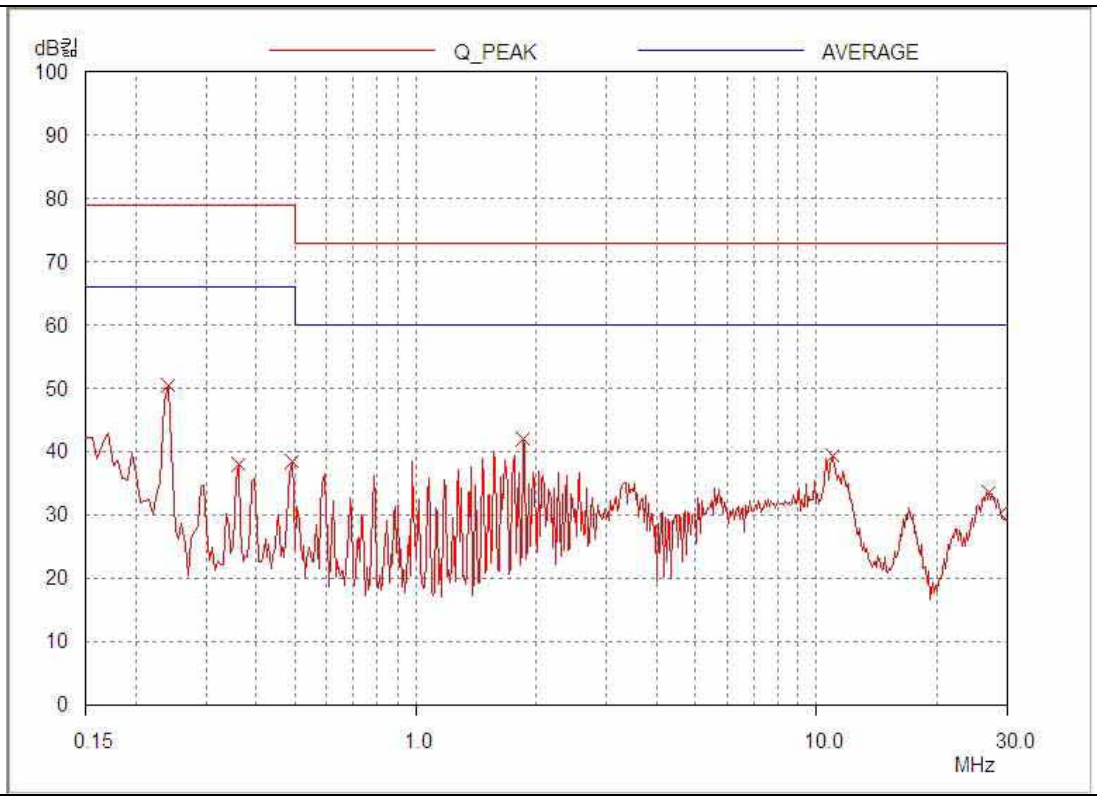
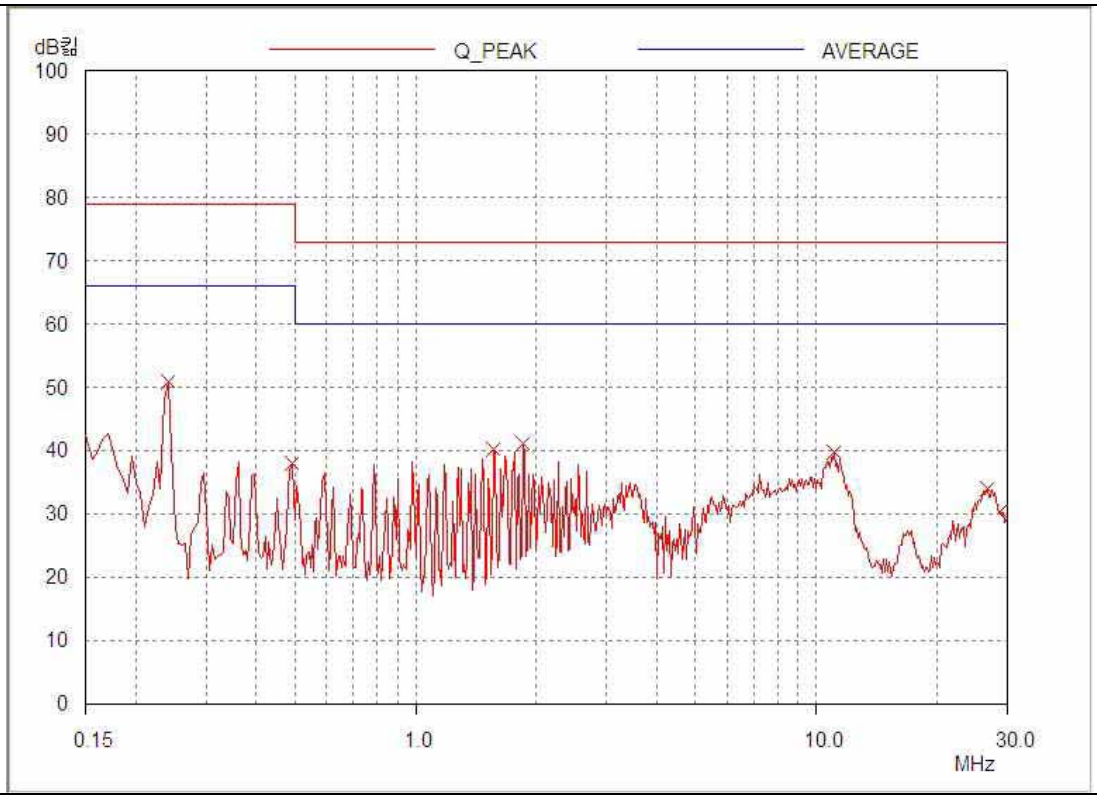


HOT LINE



NEUTRAL LINE

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15. MAXIMUM PERMISSIBLE EXPOSURE

15.1 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 (=0.485) 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 $S = E^2 / Z = E^2 / 754$, because 0.2 mW/cm² = 2 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

$d = \sqrt{(30 * P * G) / (754 * S)}$

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

$d = 0.199 * \sqrt{(P * G) / S}$

Where

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

15.2 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)	@ 20 cm Separation	(mW/cm²)
30.0	100.0	2.0	1.58	16.1	0.314	0.485

According to above table, safe safe distance, $D = 0.199 * \sqrt{(1000 * 1.58) / 0.49} = 16.14$ cm.

For getting power density at 20 cm separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = 1000.0 * 1.58 / (4 * 3.14 * 20\text{^}2) = 0.314$

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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