

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Report No. : E079R-010

AGR No. : A075A-103R1

Applicant : Samsung Electronics Co., Ltd.

Address : 416, Maetan 3-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea

Manufacturer : Samsung Electronics Co., Ltd.

Address : 416, Maetan 3-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea

Type of Equipment : Mobile WiMAX Indoor RAS

FCC ID. : A3LSPI-2210012500

Model Name : SPI-2210

Serial number : None

Total page of Report : 56 pages (including this page)

Date of Incoming : August 3, 2007

Date of issuing : September 5, 2007

SUMMARY

The equipment complies with the regulation; **FCC Part 27**

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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1. VERIFICATION OF COMPLIANCE

APPLICANT : Samsung Electronics Co., Ltd.
 ADDRESS : 416, Maetan 3-dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea
 CONTACT PERSON : Josep Kang / Principal Engineer
 TELEPHONE NO : +82-31279-3140
 FCC ID : A3LSPI-2210012500
 MODEL NO/NAME : SPI-2210
 SERIAL NUMBER : N/A
 DATE : September 5, 2007

EQUIPMENT CLASS	TNB-Licensed Non-Broadcast Station Transmitter
EQUIPMENT DESCRIPTION	Mobile WiMAX Indoor RAS
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4: 2003, EIA/TAI 603B
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	PART 27
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER(S) 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.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
2.1046, 27.50(h)	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1049, 27.53(l)	Occupied Bandwidth	Met the Limit / PASS
2.1051, 27.53(l)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1051, 27.53(l)	Spurious Emissions at Antenna Terminals at Block Edges	Met the Limit / PASS
2.1053, 27.53(l)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055(a)(1), 27.54	Frequency Stability over Temperature variation	Met the requirement / PASS
2.1055(d), 27.54	Frequency stability over Primary voltage variation	Not Applicable / See Note1

Note 1) The power of the device shall be supplied by a rectifier, so the voltage variation shall not be occurred.

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 submittal only

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: 2003. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at 307-51 Daessangryung-Ri, Chowol-Eup, Kwangju-City, Kyeonggi-Do, 464-080, Korea. Description details of test facilities were submitted to the Federal Communications Commission on August 31, 2005 (Registration Number: 92819 and 340658), accredited by KOLAS (Korea Laboratory Accreditation Scheme, No: 85) and approved by TUV, DNV and MIC (Ministry of Information and Communications in Korea) according to the requirement of ISO17025.

3. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co., Ltd., Model SPI-2210 (referred to as the EUT in this report) is a Mobile WiMAX Indoor RAS. The EUT consists of Radio Access Station (RAS), Access Control Router (ACR) and Mobile WiMAX System Manager (WSM). RAS manages 802.16 Medium Access Control (MAC)/Physical Layer (PHY) function for Mobile Station (MS), ACR manages various control functions and inter-working function between Mobile WiMAX system and CSN system. The EUT provides up to 3Carriers/3Sectors capacities and basically supports MIMO. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE		Mobile WiMAX Indoor RAS
EMISSION DESIGNATOR		9M24G7W
USED STANDARD		IEEE 802.16e, MIMO Technology
OPERATING FREQUENCY		2647 ~ 2667 MHz
OUTPUT POWER	Rated Power	10.0W (40.0dBm)
	Measured Power	9.23W (39.65dBm)
CHANNEL BANDWIDTH	Rated Bandwidth	10MHz
	Measured Bandwidth	9.24 MHz
MODULATION		OFDMA(QPSK, 16QAM, 64QAM)
MAXIMUM NUMBER OF CARRIERS/SECTORS		3 Carriers/3 Sectors
CHANNEL CARD CAPACITY		1 Carrier/1 Sector
LIST OF EACH OSC. ORCRY. FREQ.(FREQ.>=1MHz)		25, 33.33, 40, 50, 56, 61.44,,66, 100, 125 MHz
NUMBER OF LAYER		MEI: 10 Layers, MMA: 12 Layers, MRA: 12 Layers
POWER REQUIREMENT		DC -48V,
EXTERNAL CONNECTOR		GPS Antenna, LAN Port, and Adapter Input Port

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

No other model differences have been mentioned.

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MMA	Samsung Electronics Co., Ltd.	N/A	N/A
MRA	Samsung Electronics Co., Ltd.	N/A	N/A
MEI	Samsung Electronics Co., Ltd.	N/A	N/A
MRU	Samsung Electronics Co., Ltd.	N/A	N/A
External GPS Antenna	N/A	N/A	N/A

5.3 Peripheral equipment

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

Model	Manufacturer	FCC ID	Description	Connected to
SPI-2210	Samsung Electronics Co., Ltd.	A3LSPI-2210012500	Mobile WiMAX Indoor RAS (EUT)	-
DP-REC150S	Daeggi Power Supply.	N/A	Regulator	EUT
SP20	Samsung Electronics	DoC	Notebook Computer	EUT
N/A	N/A	N/A	External GPS Antenna	EUT

5.4 Mode of operation during the test

The Indoor Base Station Transceiver System (BTS) was configured with Regulator, External GPS antenna, and external PC to control the EUT to transmit maximum FF signal. The EUT with host external computer 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. All Modulation, QPSK, 16QAM, and 64QAM modes and different data rates were tested, but the worst data was recorded in this test report.

The device 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.

6. RF POWER OUTPUT at ANTENNA TERMINAL

6.1 Operating environment

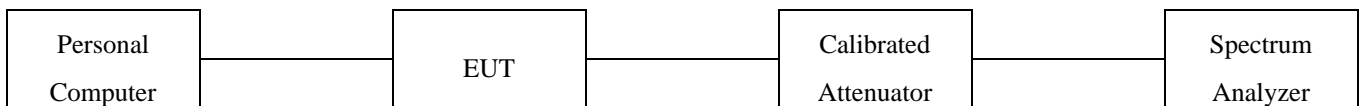
Temperature : 20°C

Relative humidity : 50 %

6.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels) using all modulation.

RF output power was measured by channel power measurement function of the spectrum analyzer.



6.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSP13	Rohde&Schwarz	Spectrum Analyzer	100637	April 17, 2007
■ -	SJ-30dB	N/A	Attenuator	N/A	July 20, 2007

All test equipment used is calibrated on a regular basis.

6.4 Test data

- . Test Date : August 7, 2007
- . Test Result : Pass
- . Resolution Bandwidth : 1 MHz
- . Video Bandwidth : 3 MHz
- . Detector : Average

6.4.1 Test Data at Output Port 0

Modulation	Channel	Frequency	Measured Output Power		Limit (dBW)
			dBm	W	
QPSK	Low	2647.00	39.31	8.5310	35.51
	Middle	2657.00	39.34	8.5901	35.11
	High	2667.00	39.34	8.5901	35.49
16QAM	Low	2647.00	39.43	8.7700	35.53
	Middle	2657.00	39.37	8.6497	35.11
	High	2667.00	39.38	8.6696	35.49
64QAM	Low	2647.00	39.41	8.7297	35.51
	Middle	2657.00	39.34	8.5901	35.11
	High	2667.00	39.35	8.6099	35.49

6.4.2 Test Data at Output Port 1

Modulation	Channel	Frequency	Measured Output Power		Limit (dBW)
			dBm	W	
QPSK	Low	2647.00	39.26	8.4333	35.51
	Middle	2657.00	39.63	9.1833	35.13
	High	2667.00	39.35	8.6099	35.49
16QAM	Low	2647.00	39.21	8.3368	35.51
	Middle	2657.00	39.64	9.2045	35.11
	High	2667.00	39.37	8.6497	35.51
64QAM	Low	2647.00	39.25	8.4140	35.51
	Middle	2657.00	39.65	9.2257	35.13
	High	2667.00	39.34	8.5901	35.49

기홍

Tested by: Ki-Hong, Nam / Test Engineer

Photo Data for Output 0



Low Channel



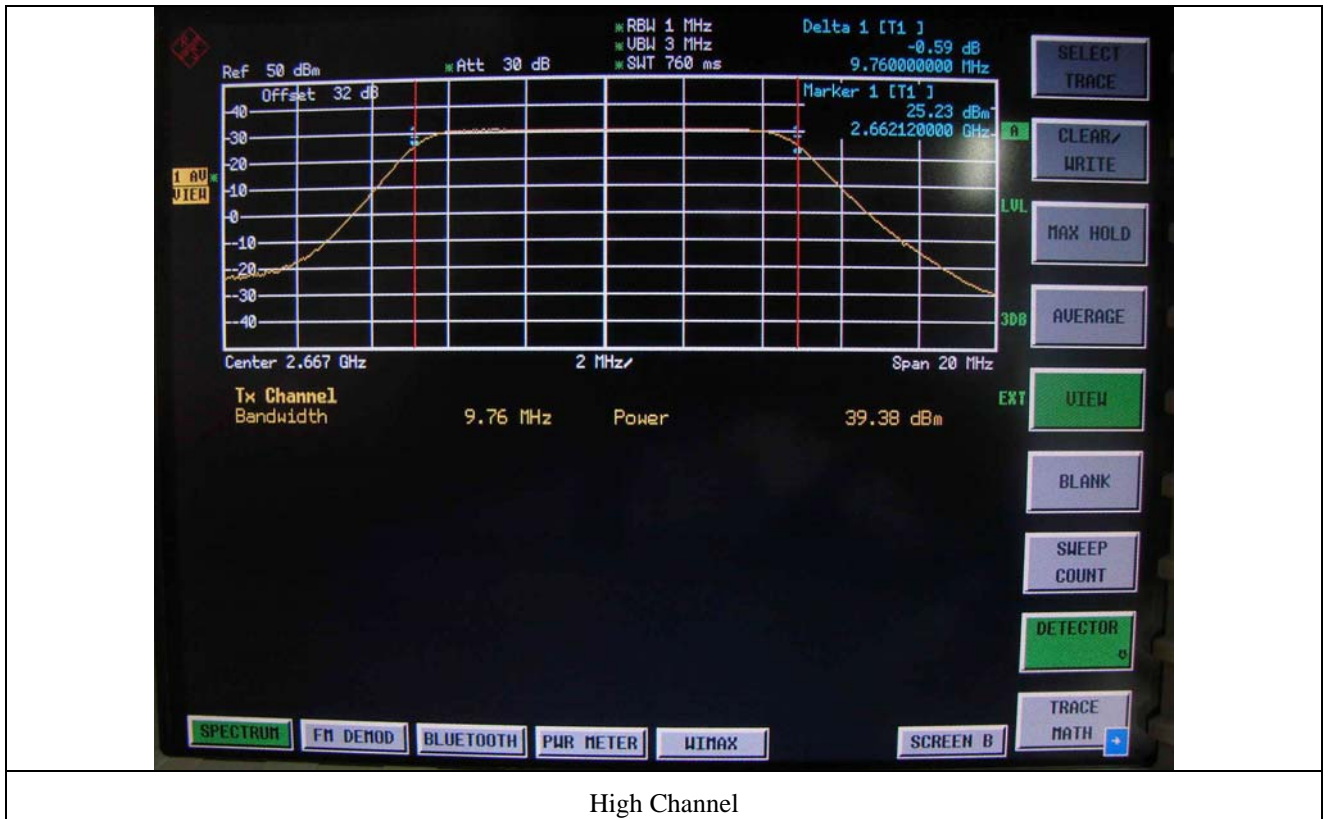
Middle Channel

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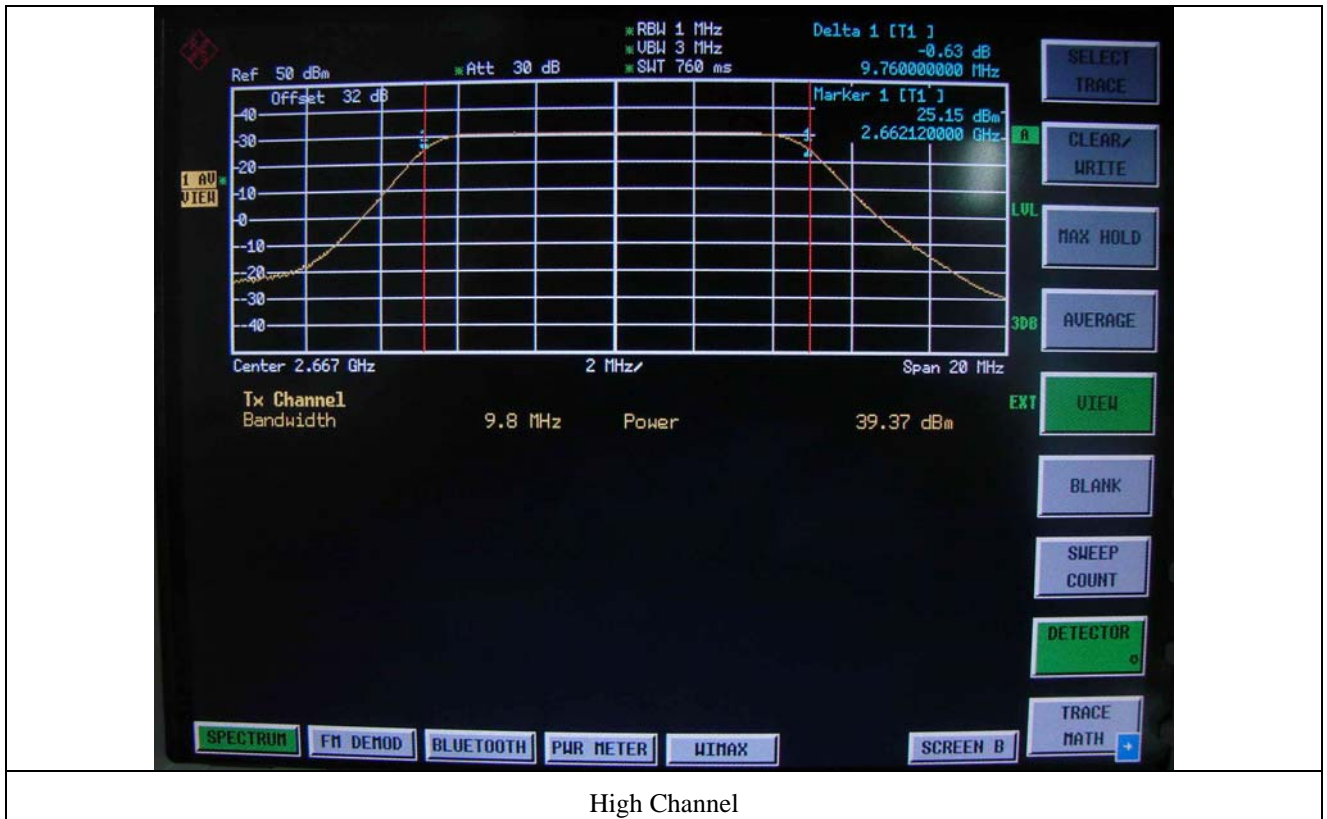
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EMC Testing Dept : 307-51 Daessangryung-Ri, Chowol-Eup, Kwangju-City, Kyunggi-Do 464-860 Korea. (TEL: 82-31-765-8289 FAX: 82-31-766-2904)



High Channel



7. OCCUPIED BANDWIDTH TEST

7.1 Operating environment

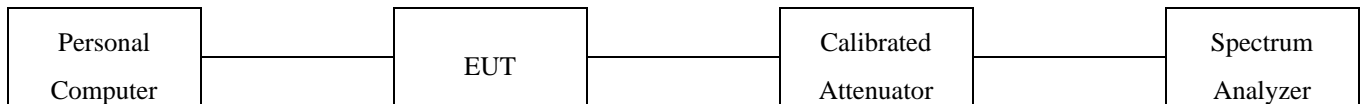
Temperature : 20°C

Relative humidity : 50 %

7.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels).

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.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSP13	Rohde&Schwarz	Spectrum Analyzer	100637	April 17, 2007
■ -	SJ-30dB	N/A	Attenuator	N/A	July 20, 2007

All test equipment used is calibrated on a regular basis.

7.4 Test data

- Test Date : August 7, 2007
- Resolution/Video Bandwidth : 100 kHz
- Detector : Peak
- Test Result : Pass

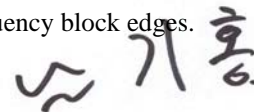
6.4.1 Test Data at Output Port 0

Modulation	Channel	Frequency	Measured Bandwidth	
			99 %	26dB
QPSK	Low	2647.00	9.240	9.800
	Middle	2657.00	9.240	9.760
	High	2667.00	9.240	9.760
16QAM	Low	2647.00	9.280	9.840
	Middle	2657.00	9.240	9.760
	High	2667.00	9.240	9.760
64QAM	Low	2647.00	9.240	9.800
	Middle	2657.00	9.240	9.760
	High	2667.00	9.240	9.760

6.4.2 Test Data at Output Port 1

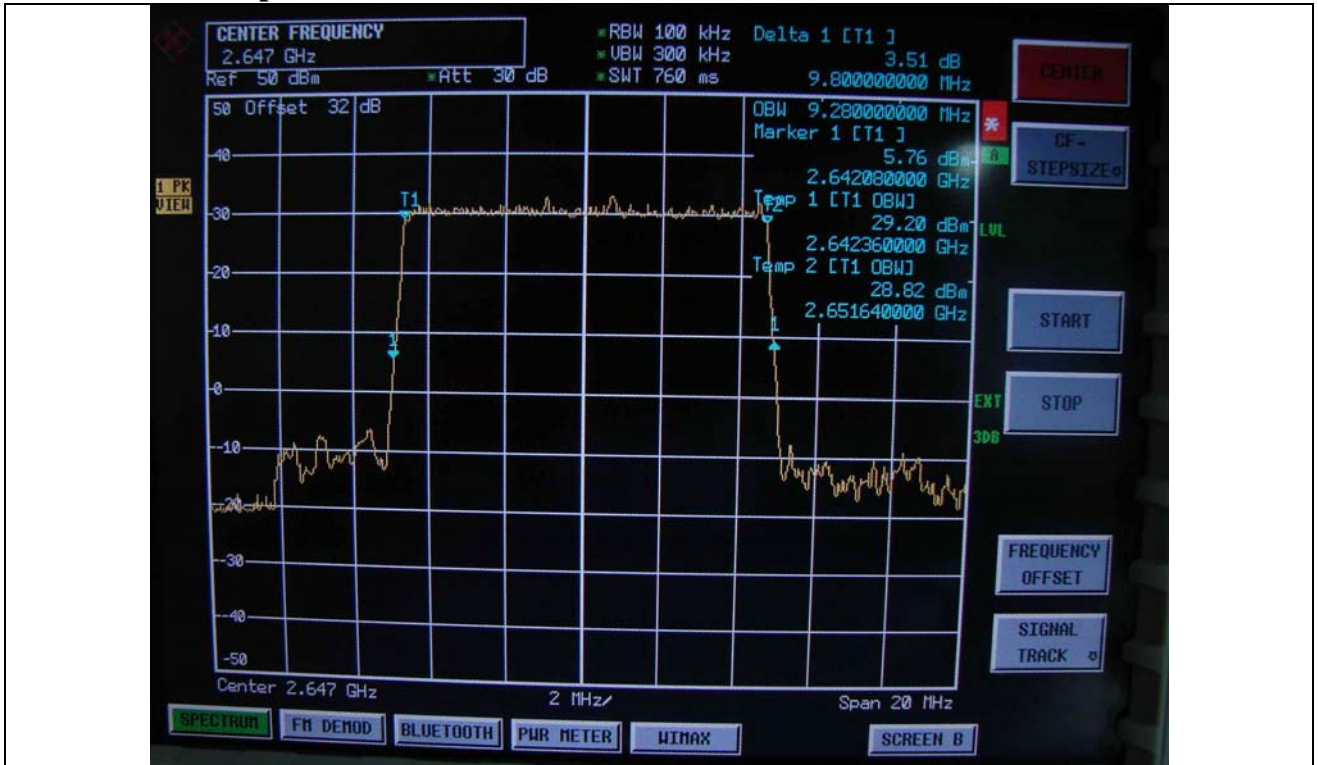
Modulation	Channel	Frequency	Measured Bandwidth	
			99 %	26dB
QPSK	Low	2647.00	9.280	9.800
	Middle	2657.00	9.240	9.800
	High	2667.00	9.240	9.760
16QAM	Low	2647.00	9.280	9.800
	Middle	2657.00	9.240	9.760
	High	2667.00	9.240	9.800
64QAM	Low	2647.00	9.240	9.800
	Middle	2657.00	9.240	9.800
	High	2667.00	9.240	9.760

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

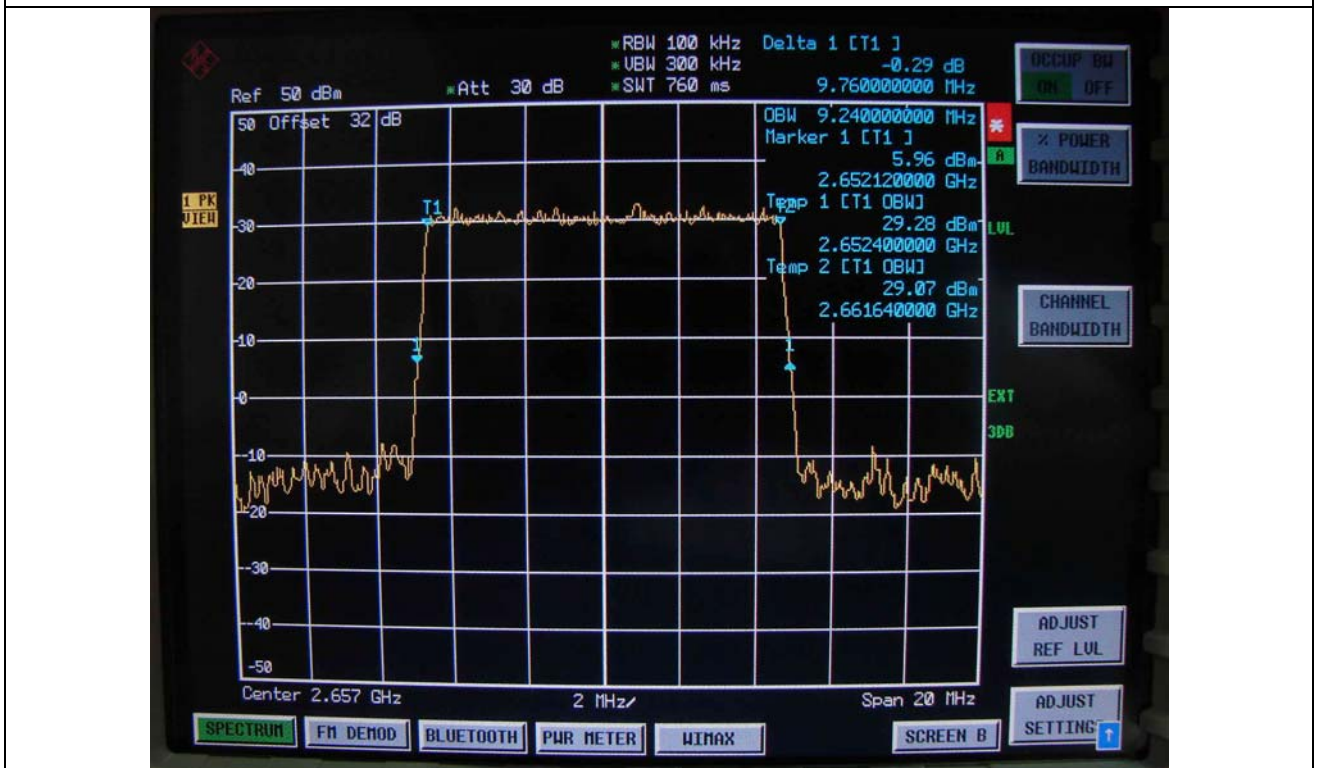


Tested by: Ki-Hong, Nam / Test Engineer

Photo Data for Output 0_99% Bandwidth



Low Channel



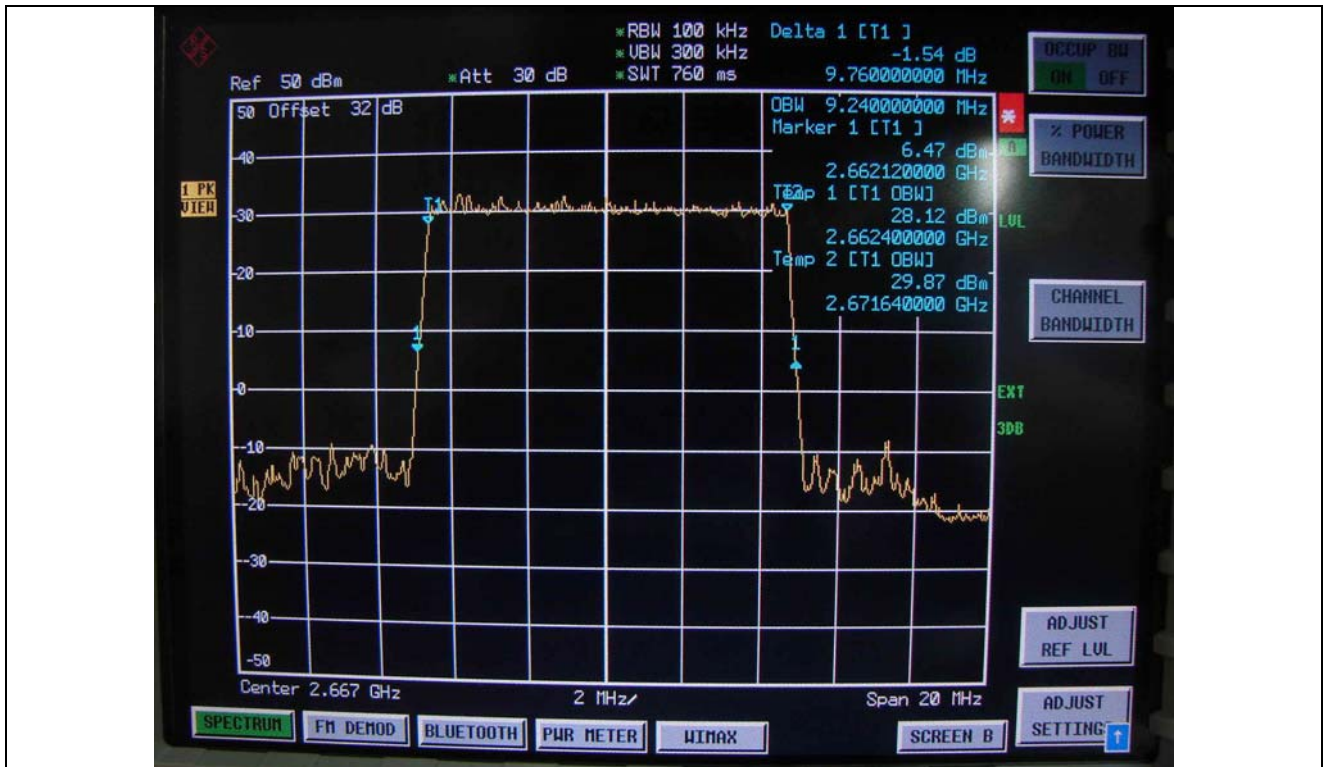
Middle Channel

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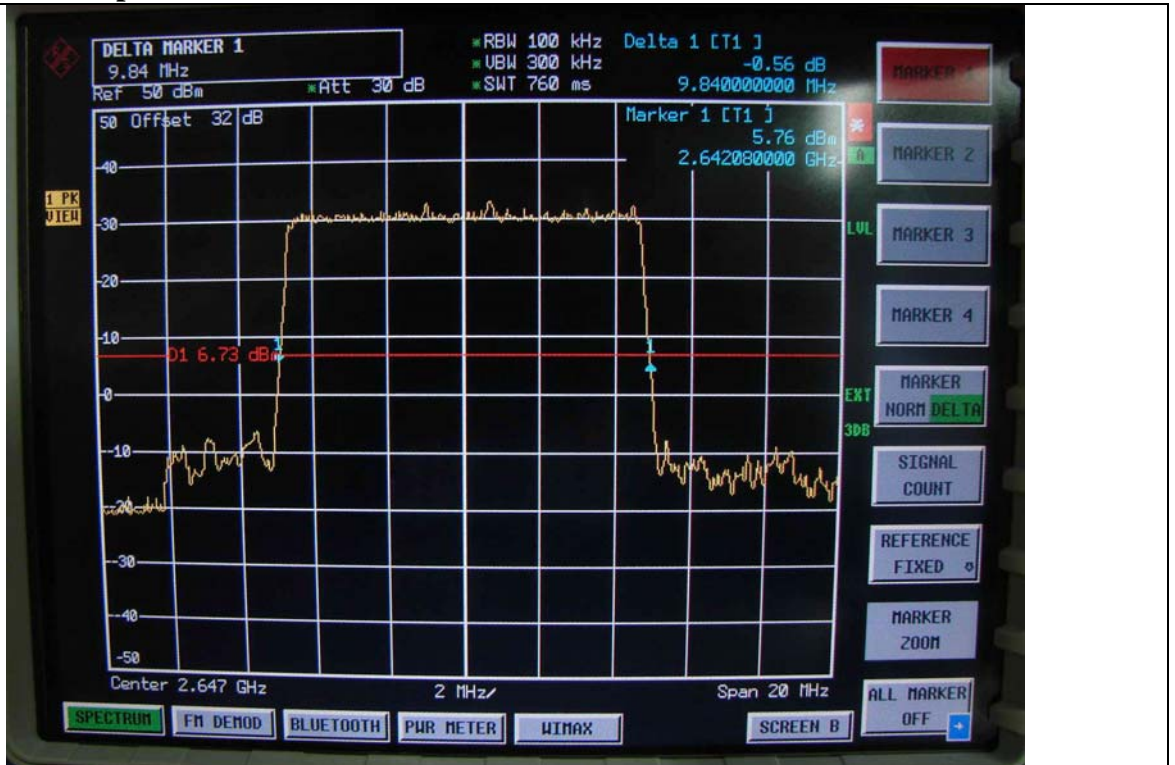
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(TEL: 82-31-746-8500 FAX: 82-31-746-8700)

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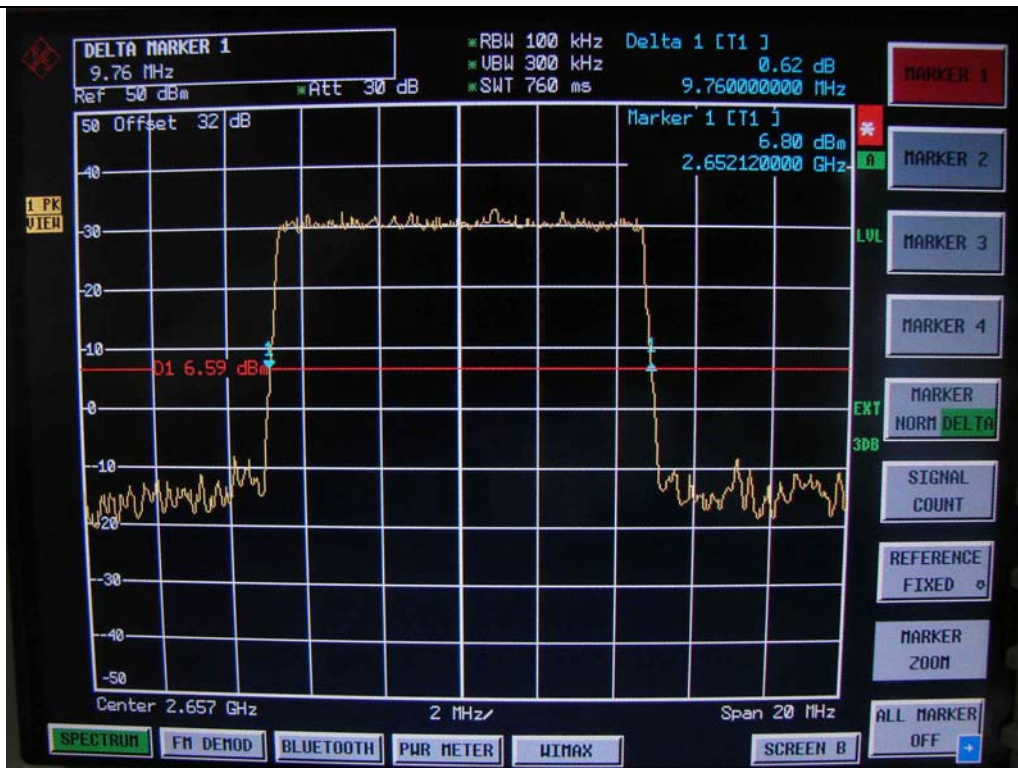


High Channel

Photo Data for Output 0_26dB Bandwidth



Low Channel



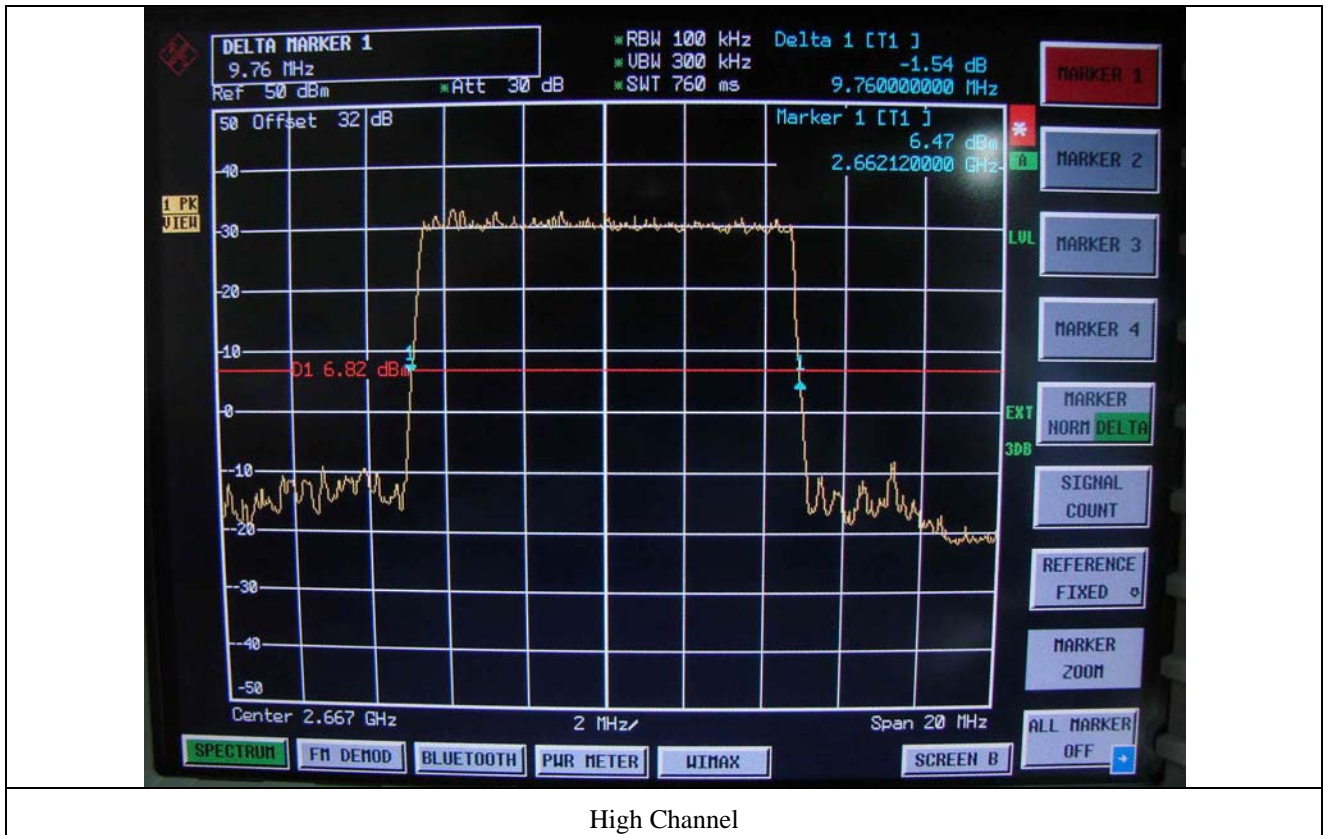
Middle Channel

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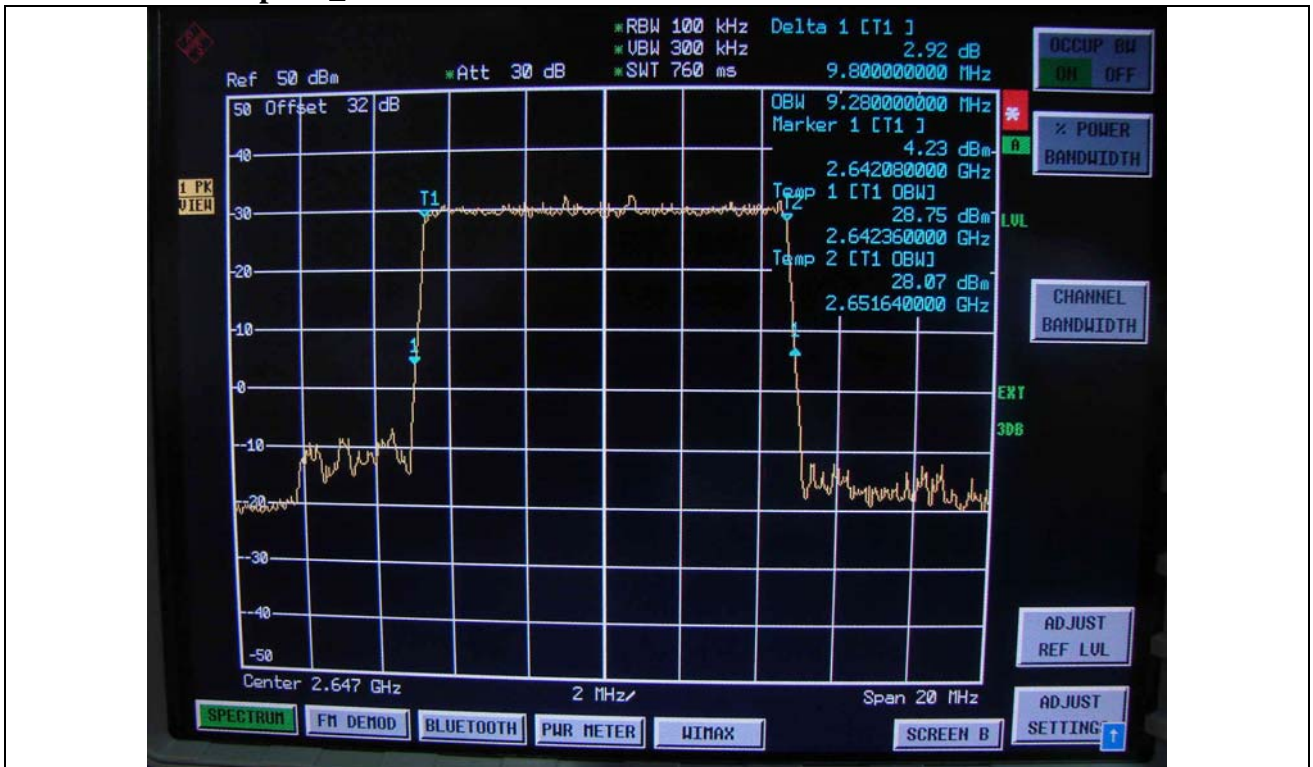
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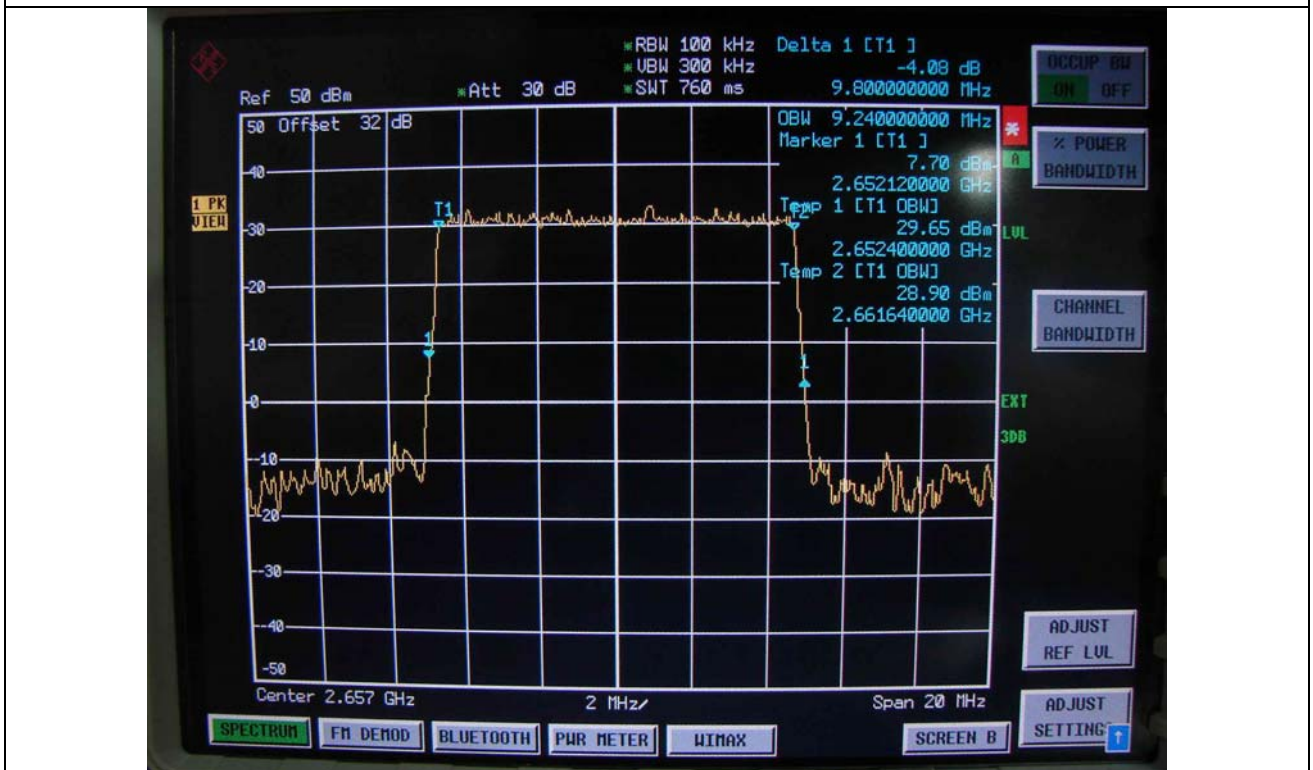


High Channel

Photo Data for Output 1_99% Bandwidth



Low Channel



Middle Channel

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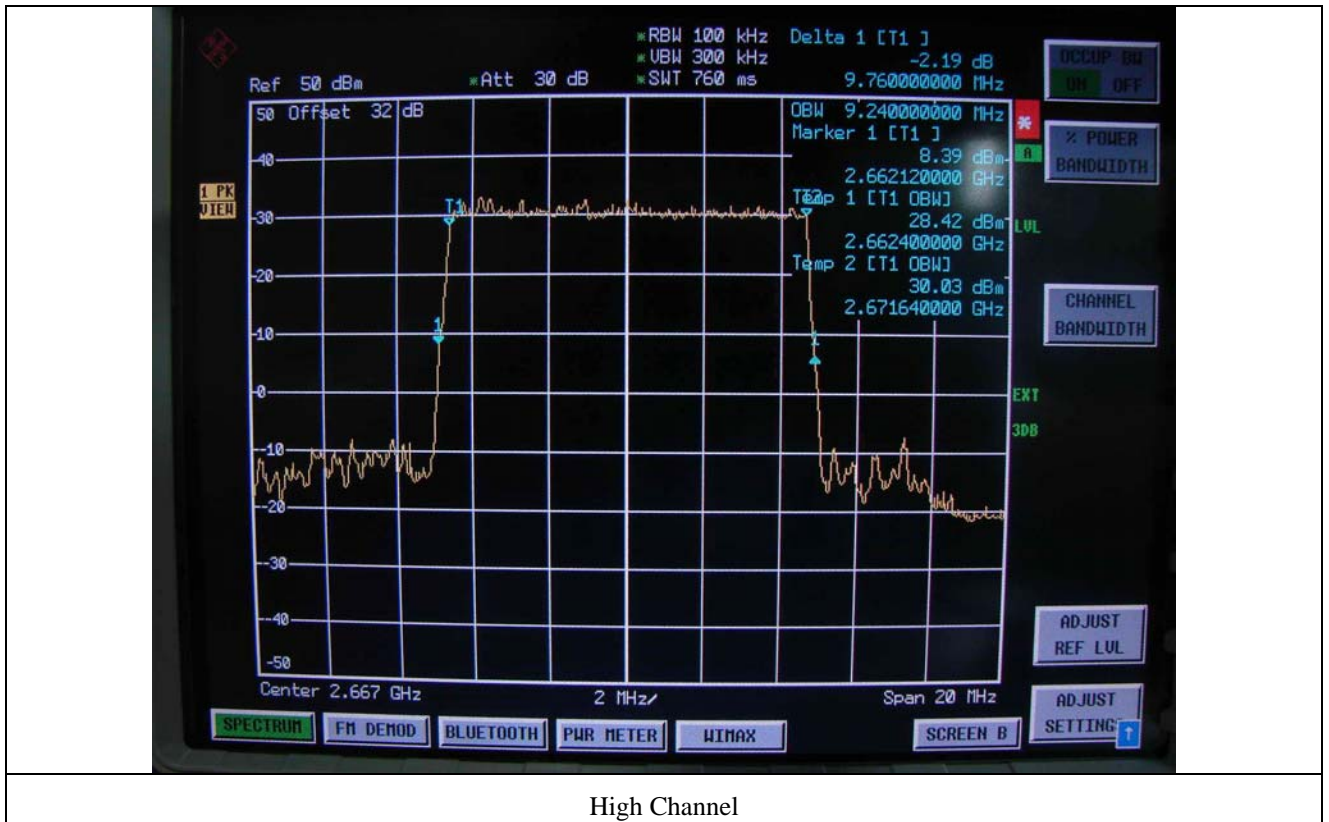
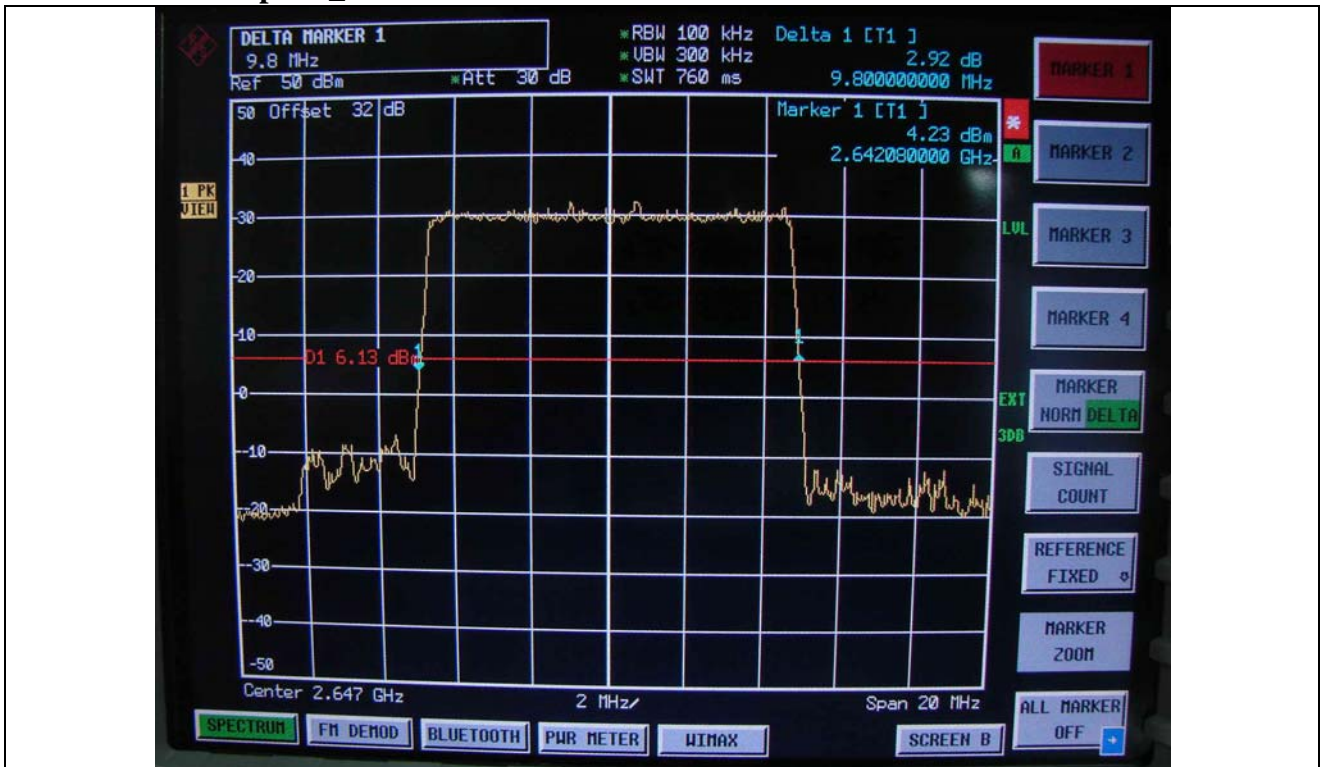
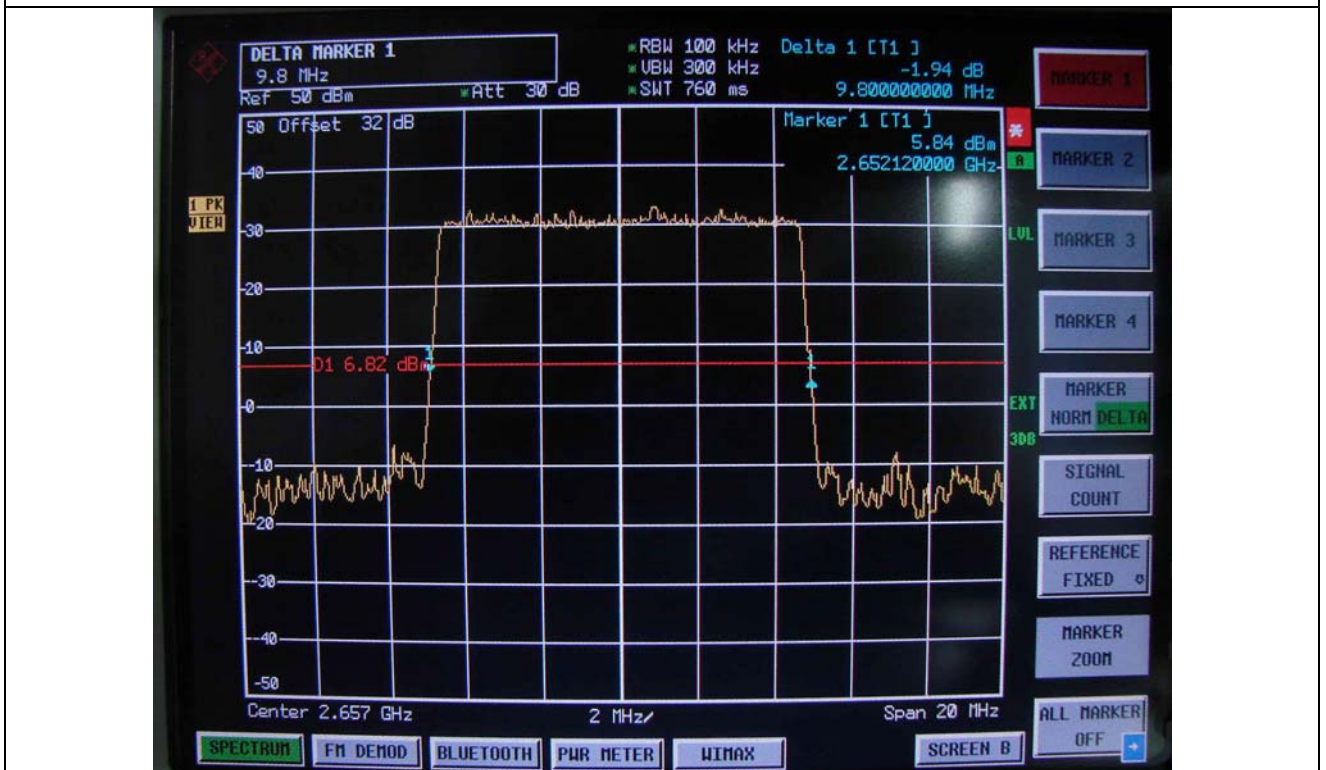


Photo Data for Output 1_26dB Bandwidth



Low Channel



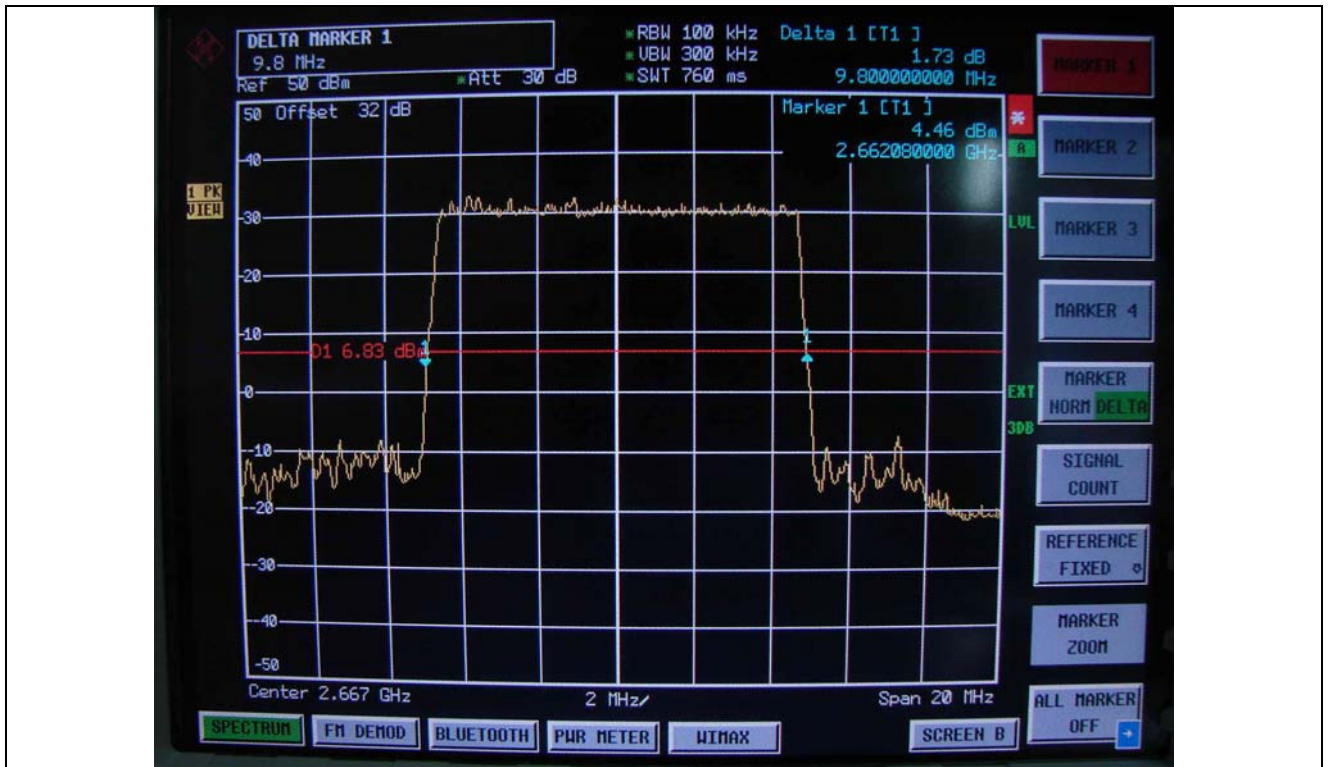
Middle Channel

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High Channel

8. SPURIOUS EMISSION AT ANTENNA TERMINAL

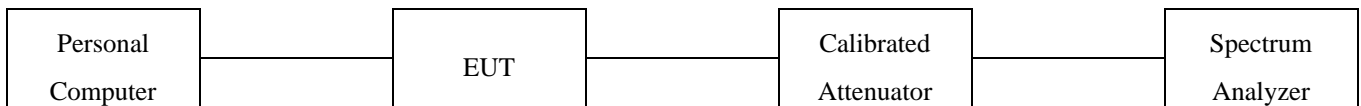
8.1 Operating environment

Temperature : 20°C

Relative humidity : 50 %

8.2 Test set-up for conducted measurement

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels).



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	8564E	HP	Spectrum Analyzer	3650A00756	June 22, 2007
■ -	FSP13	Rohde&Schwarz	Spectrum Analyzer	100637	April 17, 2007
■ -	SJ-30dB	N/A	Attenuator	N/A	July 20, 2007

All test equipment used is calibrated on a regular basis.

8.4 Test data

- . Test Date : August 9, 2007
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
- . Frequency range : 30 MHz ~ 27GHz
- . Result : PASSED

8.4.1 Test Data at Output Port 0

8.4.1.1 Modulation: QPSK

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2816.00	-35.33	0.68	-34.65	-13.00	-21.65
	4760.00	-34.17	1.08	-33.09		-20.09
	7350.00	-30.67	1.50	-29.17		-16.17
Middle	2766.00	-33.67	0.64	-33.03	-13.00	-20.03
	4450.00	-35.00	1.00	-34.00		-21.00
	7150.00	-31.33	1.50	-29.83		-16.83
High	2811.00	-35.00	0.68	-34.32	-13.00	-21.32
	4720.00	-34.50	1.10	-33.40		-20.40
	7310.00	-31.50	1.50	-30.00		-17.00

8.4.1.2 Modulation: 16QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2811.00	-34.33	0.68	-33.65	-13.00	-20.65
	4020.00	-34.50	0.86	-33.64		-20.64
	8480.00	-31.67	1.83	-29.84		-16.84
Middle	2865.00	-35.00	0.72	-34.28	-13.00	-21.28
	3710.00	-33.83	0.84	-32.99		-19.99
	6800.00	-31.33	1.42	-29.91		-16.91
High	2846.00	-34.33	0.71	-33.62	-13.00	-20.62
	5150.00	-34.83	1.17	-33.66		-20.66
	7430.00	-31.00	1.50	-29.50		-16.50

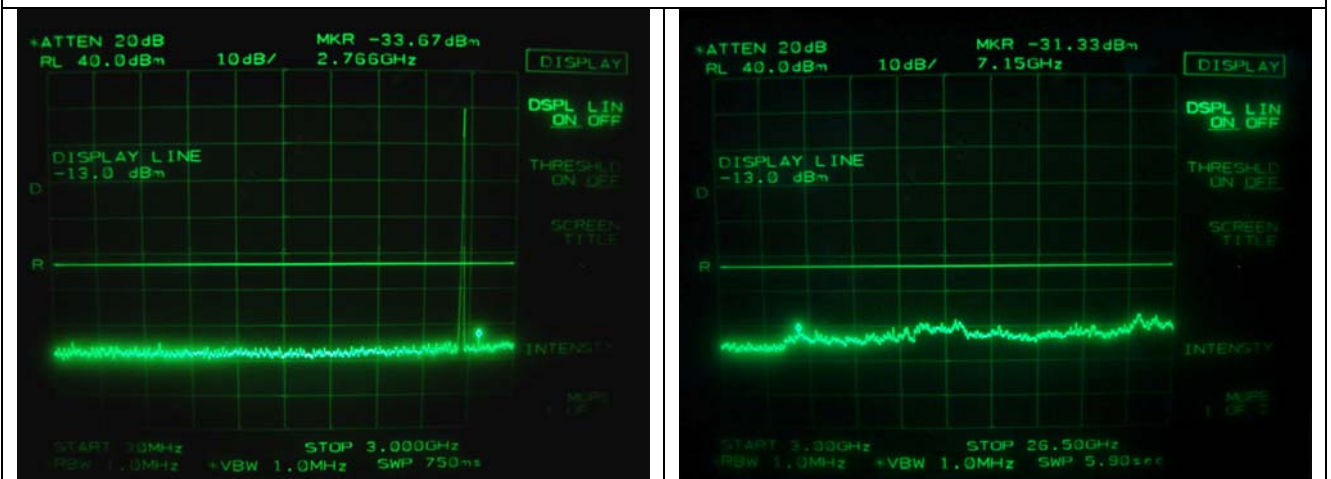
8.4.1.3 Modulation: 64QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2766.00	-34.67	0.64	-34.03	-13.00	-21.03
	6020.00	-33.83	1.17	-32.66		-19.66
	9850.00	-31.33	2.50	-28.83		-15.83
Middle	2900.00	-35.50	0.75	-34.75	-13.00	-21.75
	4680.00	-35.00	1.02	-33.98		-20.98
	7390.00	-31.50	1.50	-30.00		-17.00
High	2935.00	-34.83	0.78	-34.05	-13.00	-21.05
	4250.00	-35.17	0.92	-34.25		-21.25
	7500.00	-31.33	1.50	-29.83		-16.83

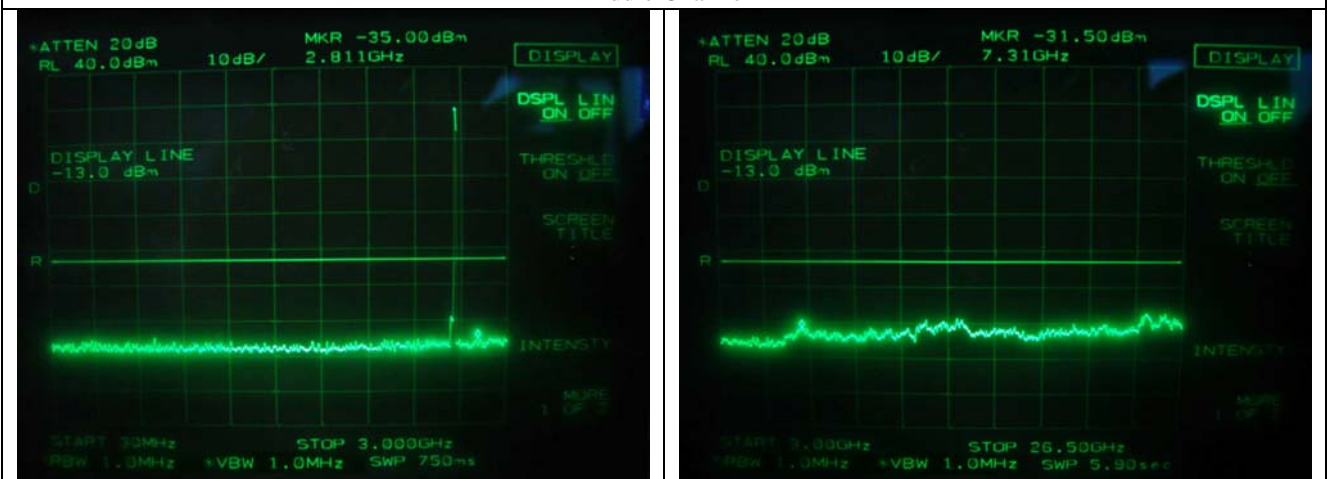
Photo Data for QPSK Modulation



Low Channel



Middle Channel



High Channel

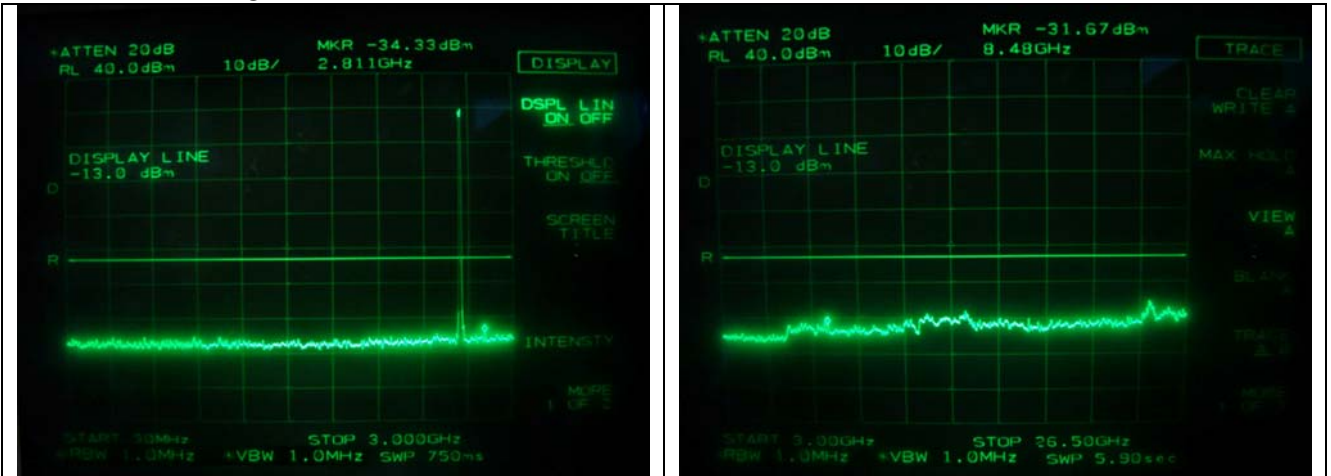
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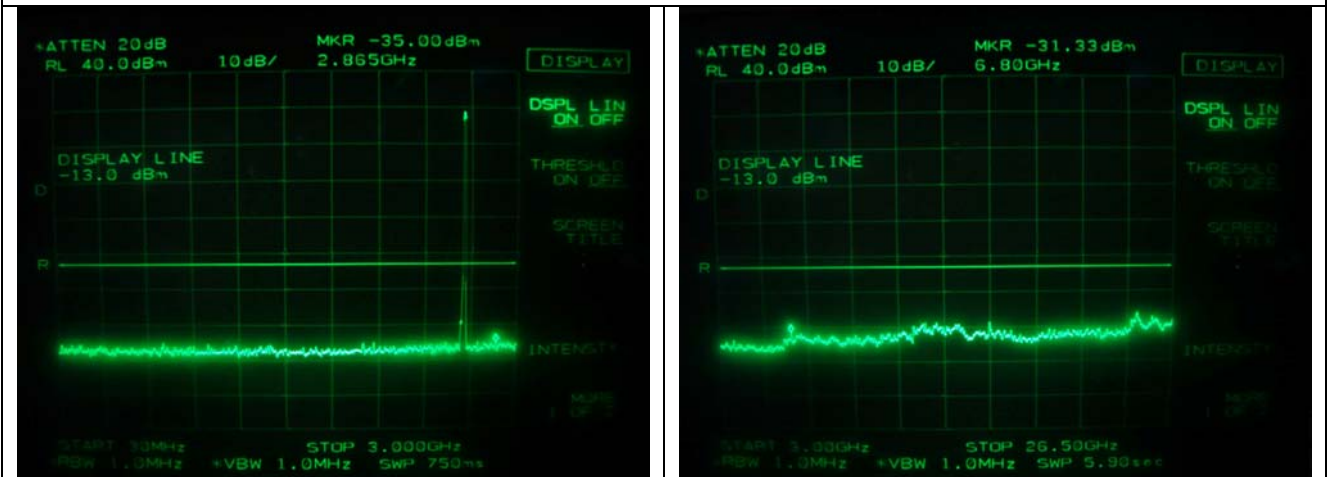
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Photo Data for 16QAM Modulation



Low Channel



Middle Channel



High Channel

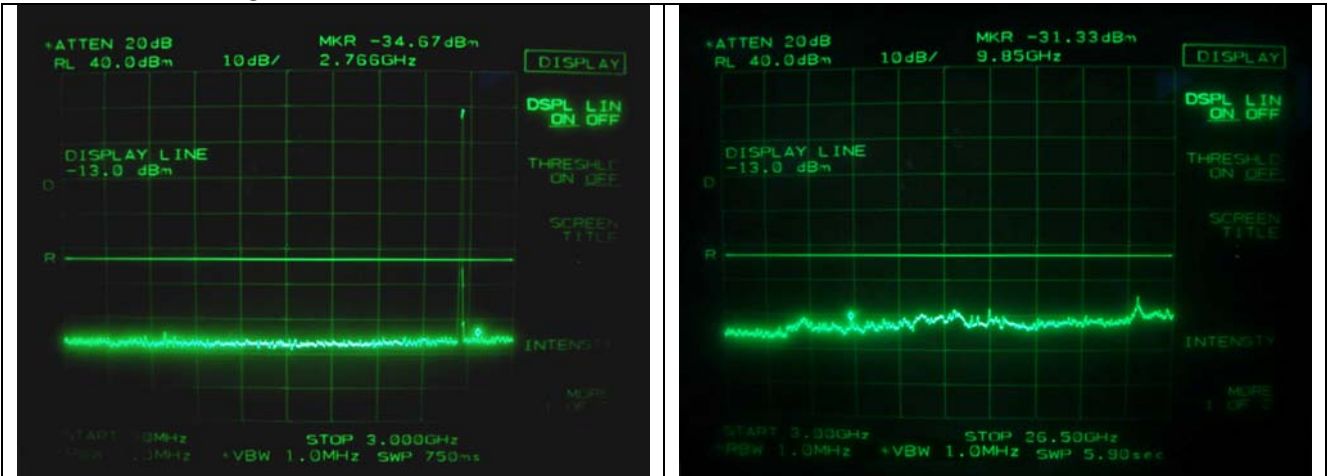
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Photo Data for 64QAM Modulation



Low Channel



Middle Channel



High Channel

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8.4.2 Test Data at Output Port 1

8.4.2.1 Modulation: QPSK

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2881.00	-34.00	0.74	-33.27	-13.00	-20.27
	3670.00	-34.17	0.84	-33.33		-20.33
	7310.00	-31.33	1.50	-29.83		-16.83
Middle	2901.00	-35.17	0.75	-34.42	-13.00	-21.42
	5270.00	-34.50	1.17	-33.33		-20.33
	7150.00	-30.50	1.50	-29.00		-16.00
High	2881.00	-34.67	0.74	-33.94	-13.00	-20.94
	4610.00	-34.83	1.02	-33.81		-20.81
	7310.00	-32.17	1.50	-30.67		-17.67

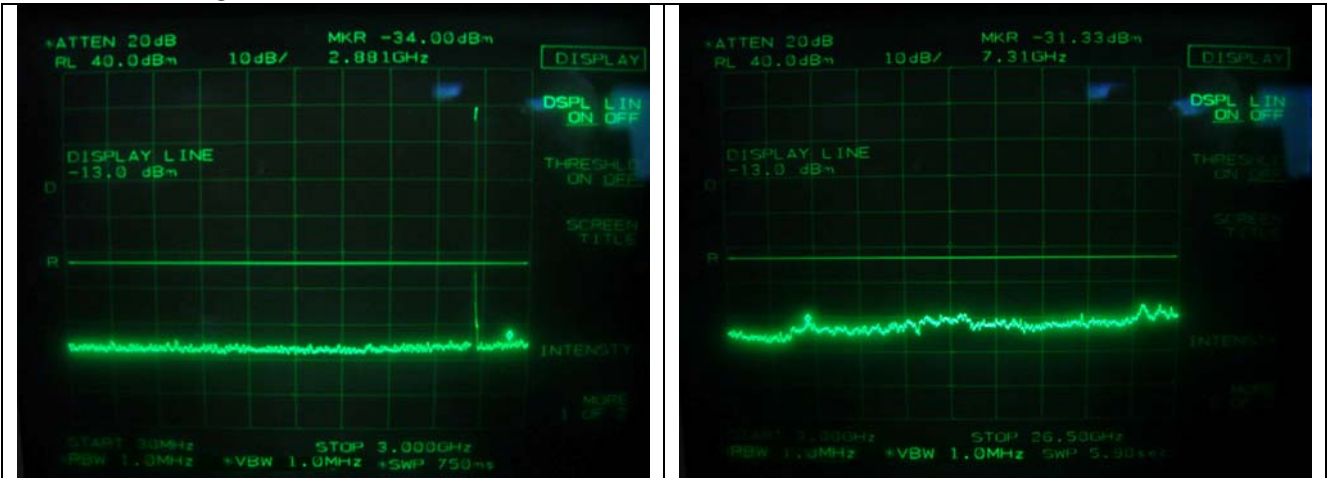
8.4.2.2 Modulation: 16QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2906.00	-34.83	0.76	-34.08	-13.00	-21.08
	4370.00	-34.67	0.92	-33.75		-20.75
	7390.00	-31.67	1.50	-30.17		-17.17
Middle	2916.00	-34.83	0.76	-34.07	-13.00	-21.07
	5040.00	-34.33	1.18	-33.15		-20.15
	7230.00	-32.50	1.50	-31.00		-18.00
High	2797.00	-34.00	0.67	-33.33	-13.00	-20.33
	4920.00	-34.83	1.15	-33.68		-20.68
	7150.00	-31.17	1.50	-29.67		-16.67

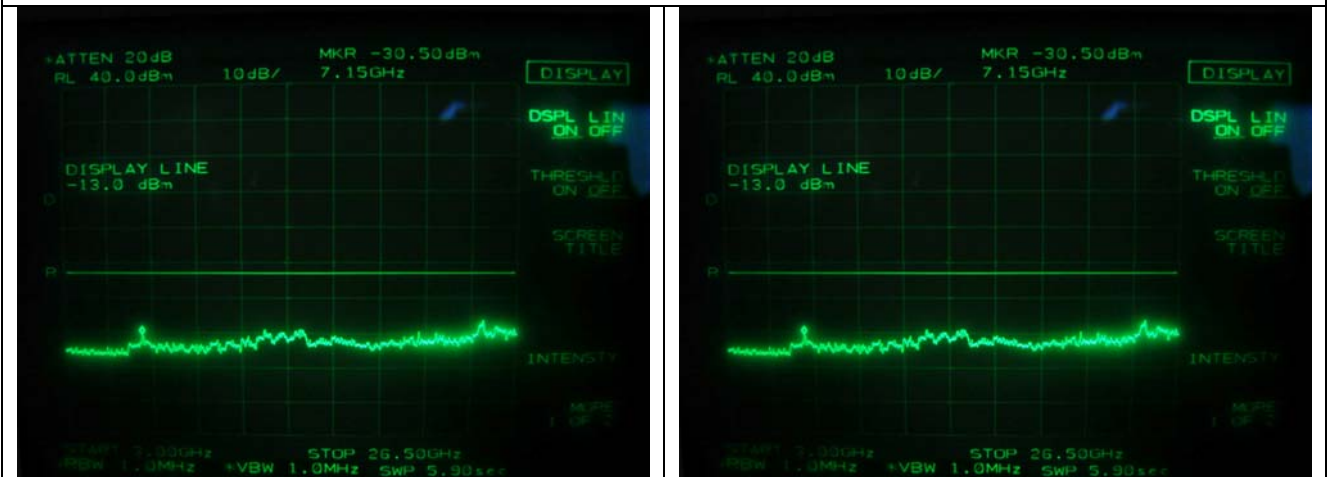
8.4.2.3 Modulation: 64QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2817.00	-33.83	0.68	-33.15	-13.00	-20.15
	4370.00	-35.50	0.95	-34.55		-21.55
	7230.00	-32.17	1.50	-30.67		-17.67
Middle	2906.00	-34.33	0.76	-33.58	-13.00	-20.58
	4450.00	-35.33	0.98	-34.35		-21.35
	7310.00	-31.17	1.50	-29.67		-16.67
High	2941.00	-34.00	0.78	-33.22	-13.00	-20.22
	4370.00	-35.17	0.92	-34.25		-21.25
	7540.00	-32.00	1.50	-30.50		-17.50

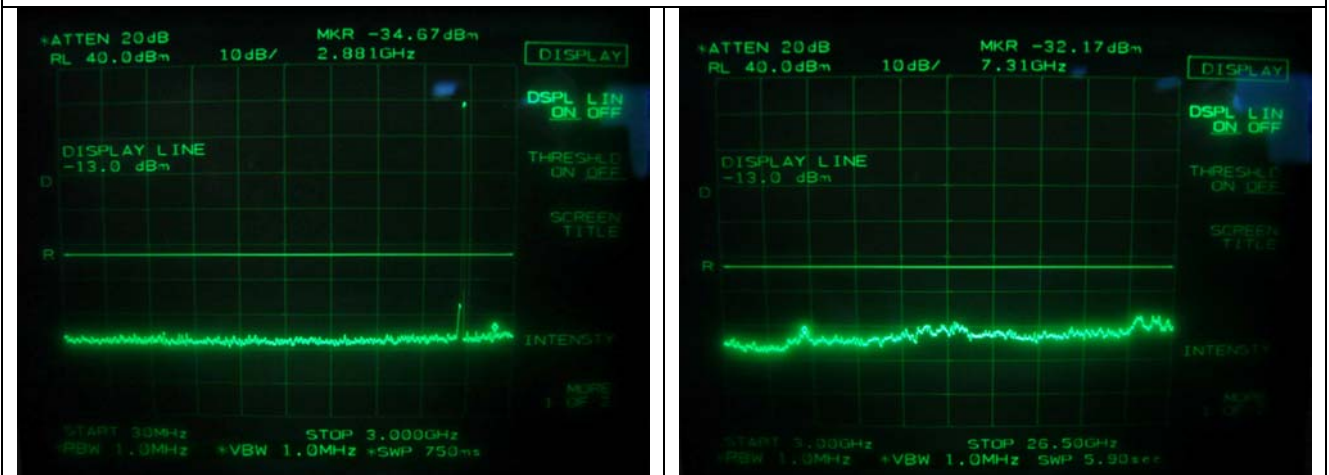
Photo Data for QPSK Modulation



Low Channel



Middle Channel



High Channel

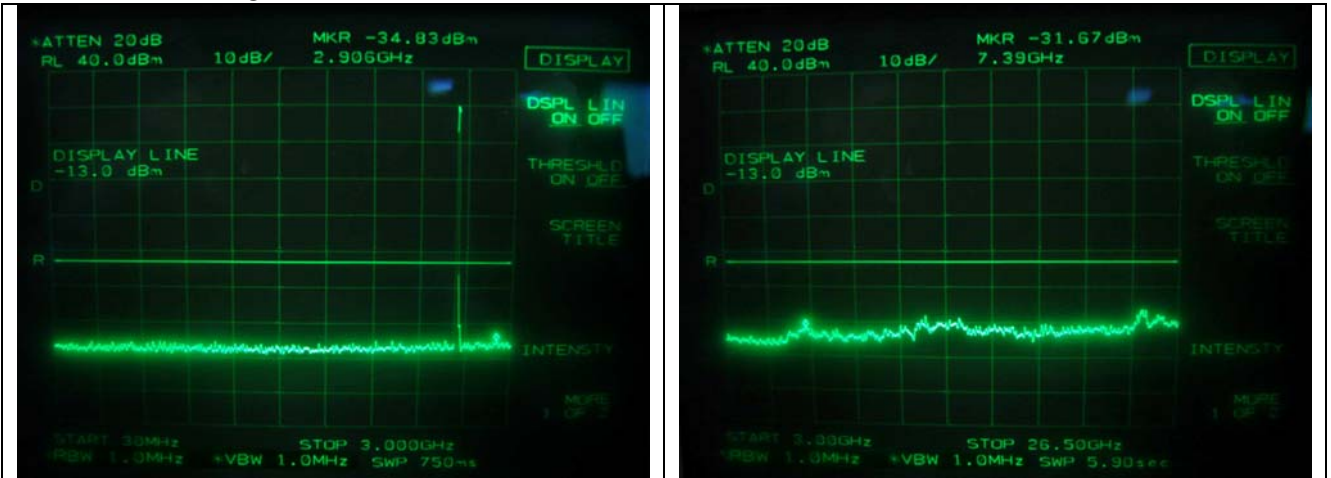
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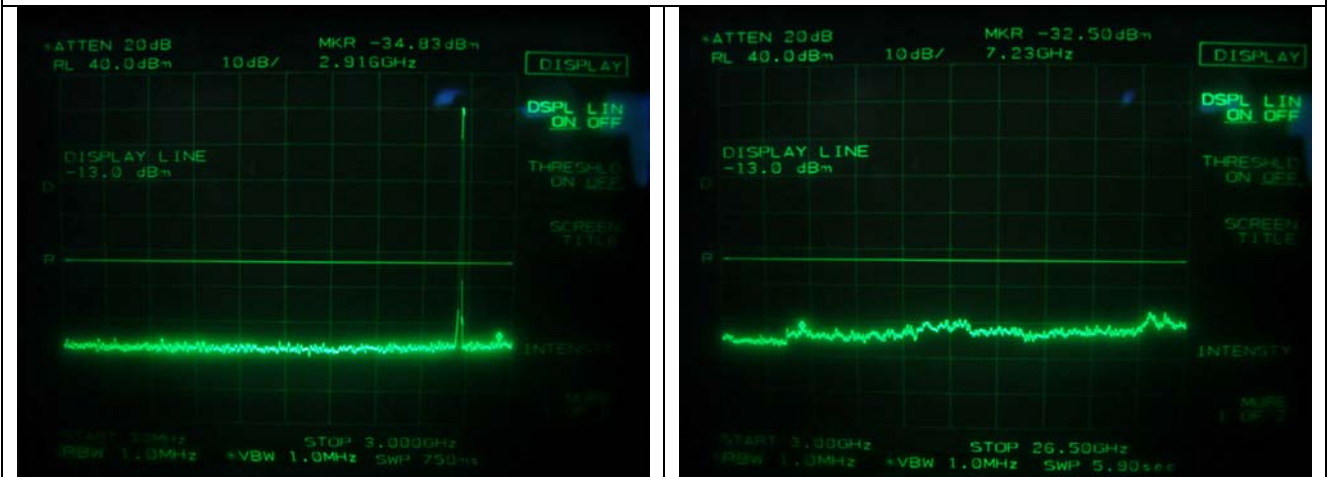
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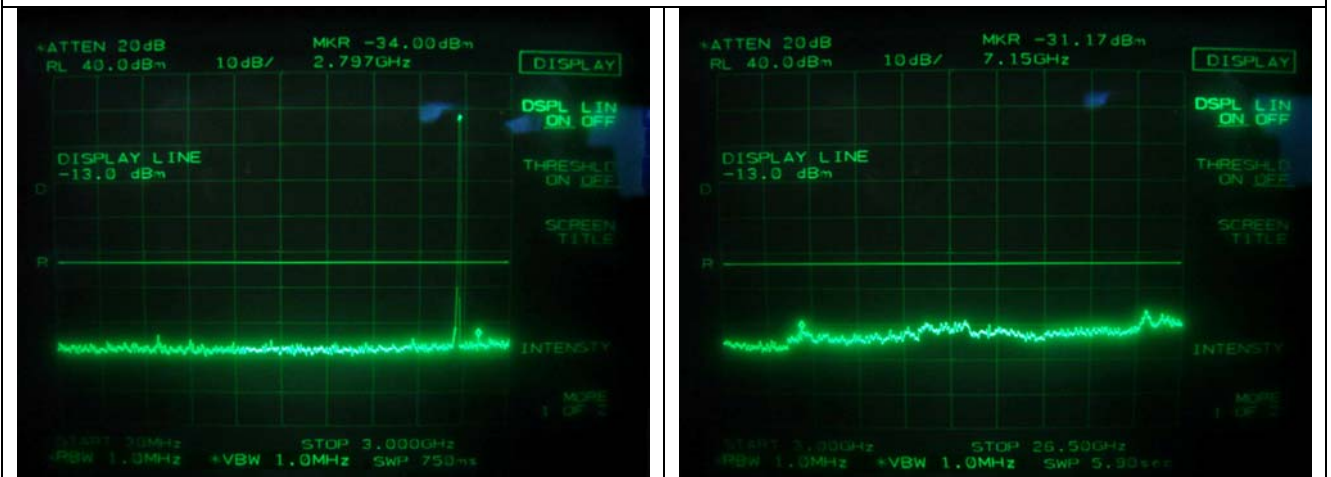
Photo Data for 16QAM Modulation



Low Channel



Middle Channel



High Channel

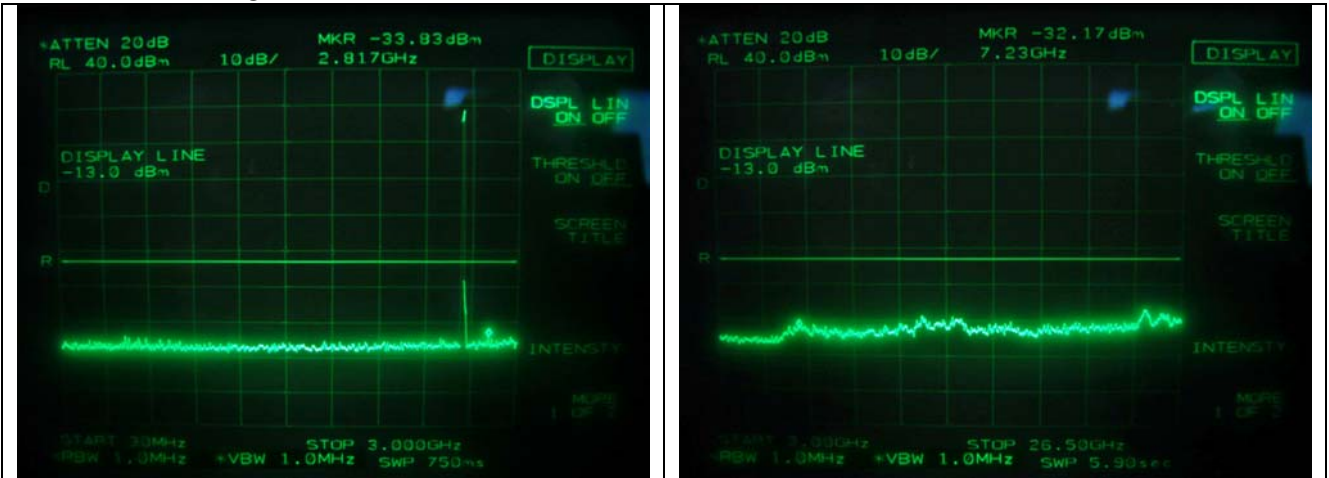
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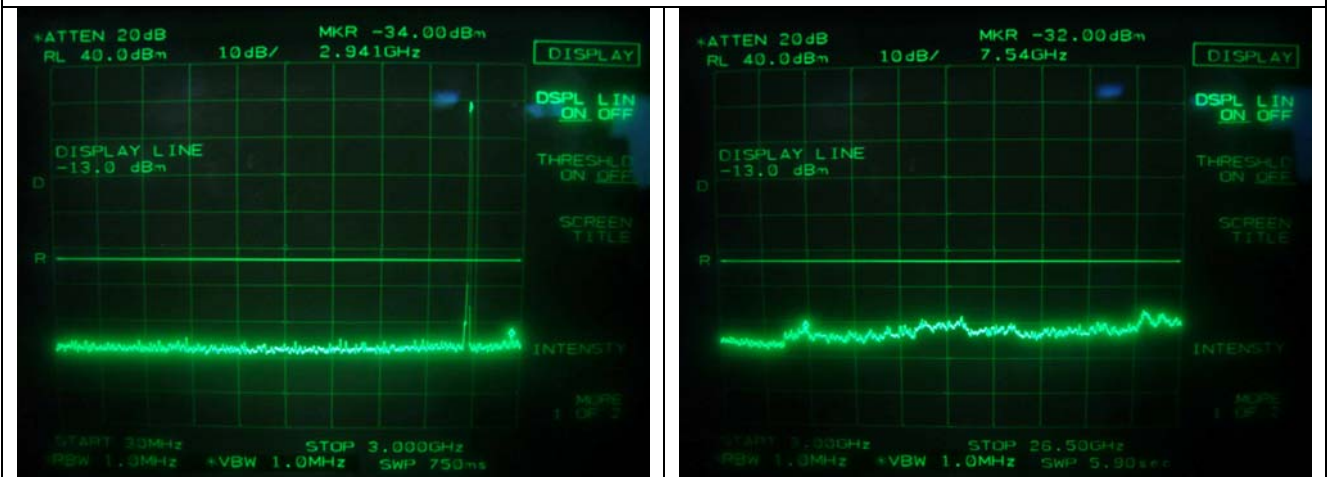
Photo Data for 64QAM Modulation



Low Channel



Middle Channel



High Channel

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8.4.3 Test Data for Aggregate Signal

8.4.3.1 Modulation: QPSK

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2792.00	-25.83	0.66	-25.17	-13.00	-12.17
	3900.00	-26.00	0.84	-25.16		-12.16
	4840.00	-26.83	1.10	-25.73		-12.73
Middle	2916.00	-27.00	0.76	-26.24	-13.00	-13.24
	4370.00	-26.67	0.92	-25.75		-12.75
	5390.00	-27.67	1.17	-26.50		-13.50
High	2891.00	-26.67	0.69	-25.98	-13.00	-12.98
	3590.00	-26.50	0.84	-25.66		-12.66
	4610.00	-26.83	1.02	-25.81		-12.81

8.4.3.2 Modulation: 16QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2822.00	-26.50	0.69	-25.81	-13.00	-12.81
	3740.00	-26.83	0.84	-25.99		-12.99
	4880.00	-27.00	1.10	-25.90		-12.90
Middle	2728.00	-26.17	0.61	-25.56	-13.00	-12.56
	4290.00	-26.67	0.93	-25.74		-12.74
	5620.00	-27.50	1.17	-26.33		-13.33
High	2866.00	-26.00	0.72	-25.28	-13.00	-12.28
	4290.00	-27.33	0.93	-26.40		-13.40
	4760.00	-27.00	1.03	-25.97		-12.97

8.4.3.3 Modulation: 64QAM

Channel	Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total W	Limit (dBm)	Margin (dB)
Low	2822.00	-25.83	0.69	-25.14	-13.00	-12.14
	3710.00	-26.83	0.84	-25.99		-12.99
	4210.00	-26.00	0.90	-25.10		-12.10
Middle	2807.00	-26.50	0.68	-25.82	-13.00	-12.82
	3740.00	-26.83	0.84	-25.99		-12.99
	5230.00	-26.50	1.17	-25.33		-12.33
High	2822.00	-26.00	0.69	-25.31	-13.00	-12.31
	4330.00	-27.33	0.94	-26.39		-13.39
	5390.00	-27.33	1.17	-26.16		-13.16

Photo Data for QPSK Modulation



Low Channel



Middle Channel



High Channel

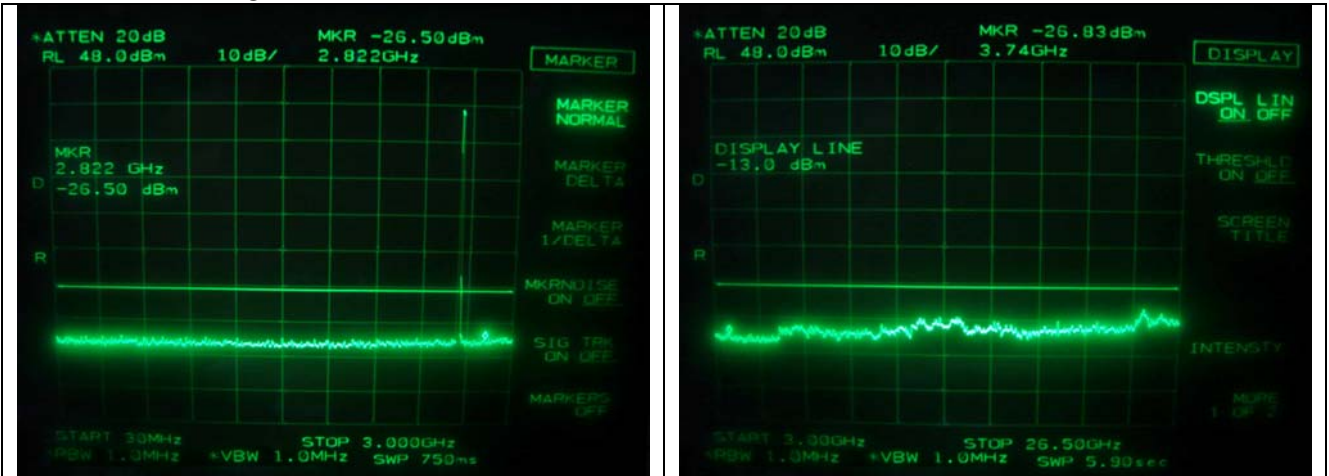
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Photo Data for 16QAM Modulation



Low Channel



Middle Channel



High Channel

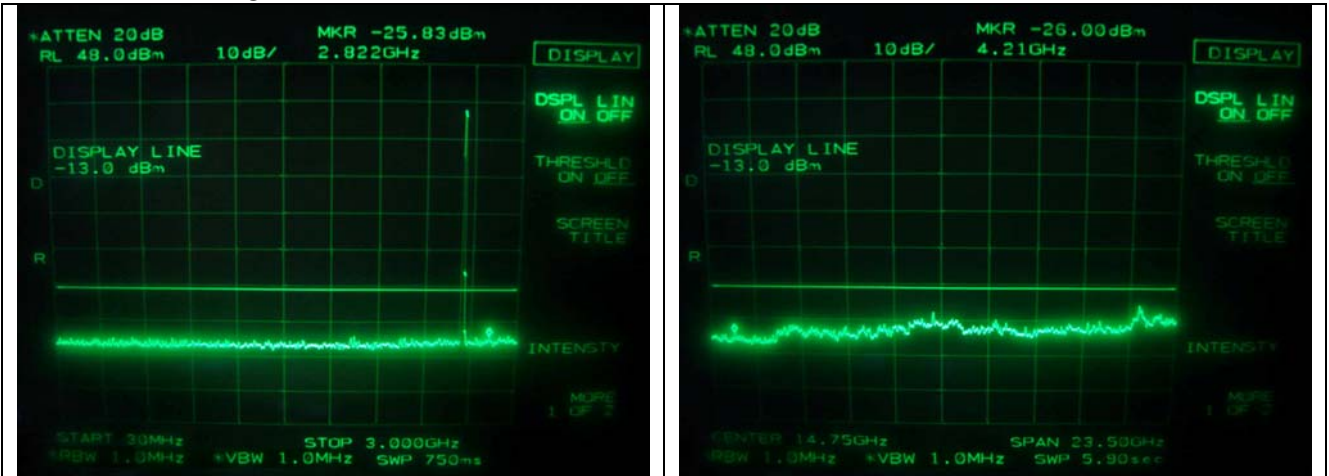
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Photo Data for 64QAM Modulation



Low Channel



Middle Channel



High Channel

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9. SPURIOUS EMISSION AT ANTENNA TERMINAL AT BLOCK EDGES

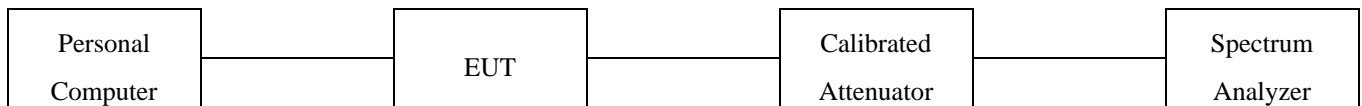
9.1 Operating environment

Temperature : 20 °C

Relative humidity : 50 %

9.2 Test set-up for conducted measurement

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels).



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	8564E	HP	Spectrum Analyzer	3650A00756	June 22, 2007
■ -	FSP13	Rohde&Schwarz	Spectrum Analyzer	100637	April 17, 2007
■ -	SJ-30dB	N/A	Attenuator	N/A	July 20, 2007

All test equipment used is calibrated on a regular basis.


9.4 Test data

-. Test Date : August 9, 2007
 -. Result : PASSED

9.4.1 Test data at Output 0

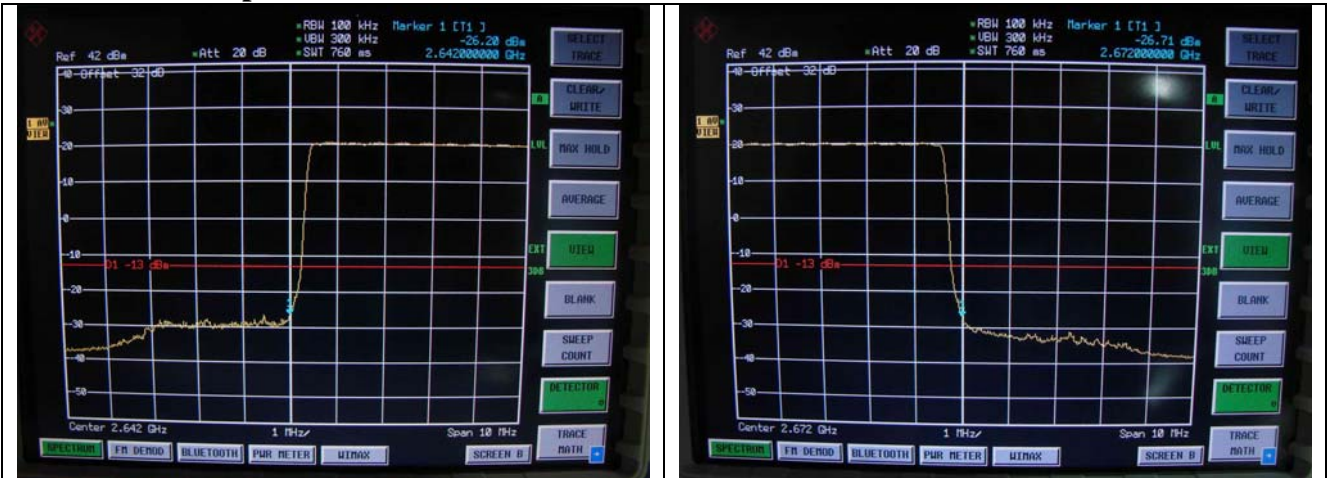
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2642.00	-26.20	-13.0
	High	2672.00	-26.71	
16QAM	Low	2642.00	-26.35	
	High	2672.00	-26.87	
64QAM	Low	2642.00	-26.85	
	High	2672.00	-27.00	

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

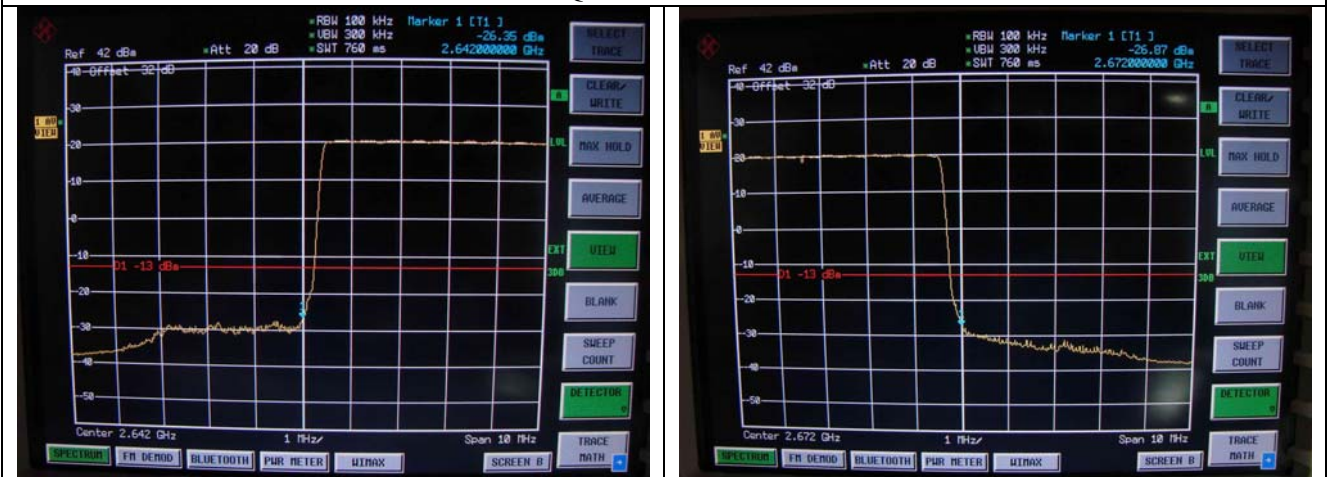


Tested by: Ki-Hong, Nam / Test Engineer

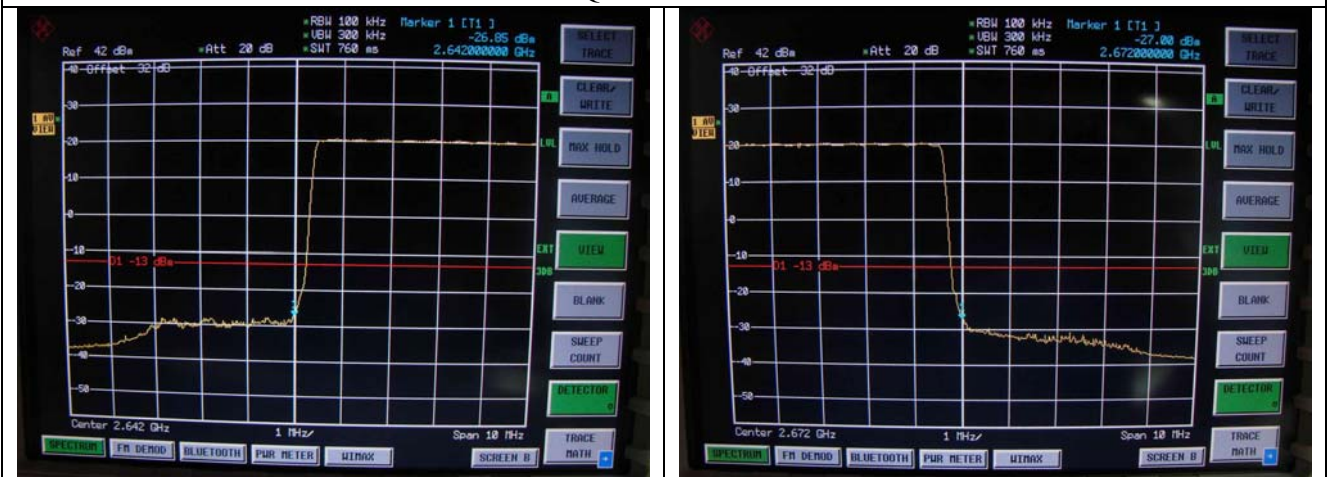
Photo Data at Output 0



QPSK Modulation



16QAM Modulation



64QAM Modulation

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9.4.2 Test data at Output 1

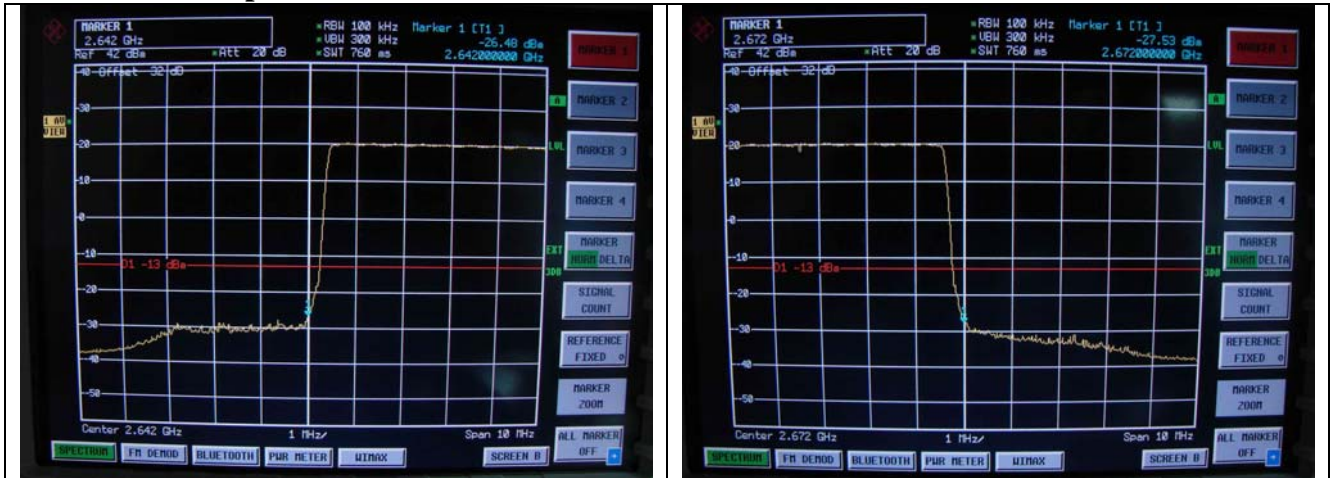
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2642.00	-26.48	-13.0
	High	2672.00	-27.53	
16QAM	Low	2642.00	-26.58	
	High	2672.00	-27.17	
64QAM	Low	2642.00	-26.55	
	High	2672.00	-27.12	

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

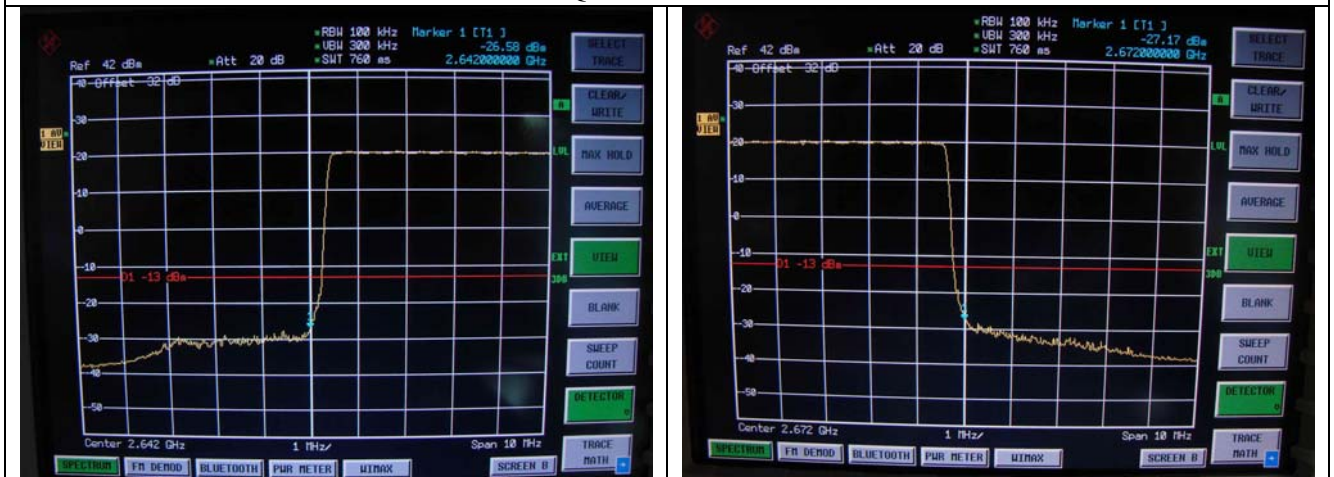


Tested by: Ki-Hong, Nam / Test Engineer

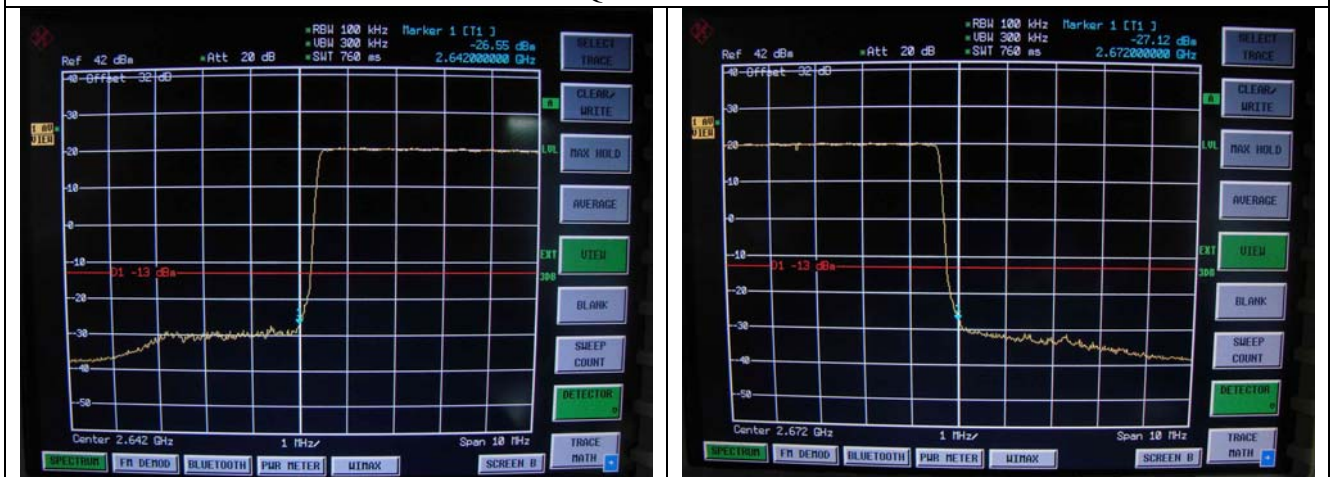
Photo Data at Output 1



QPSK Modulation



16QAM Modulation



64QAM Modulation

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9.4.3 Test data for Aggregate Signal

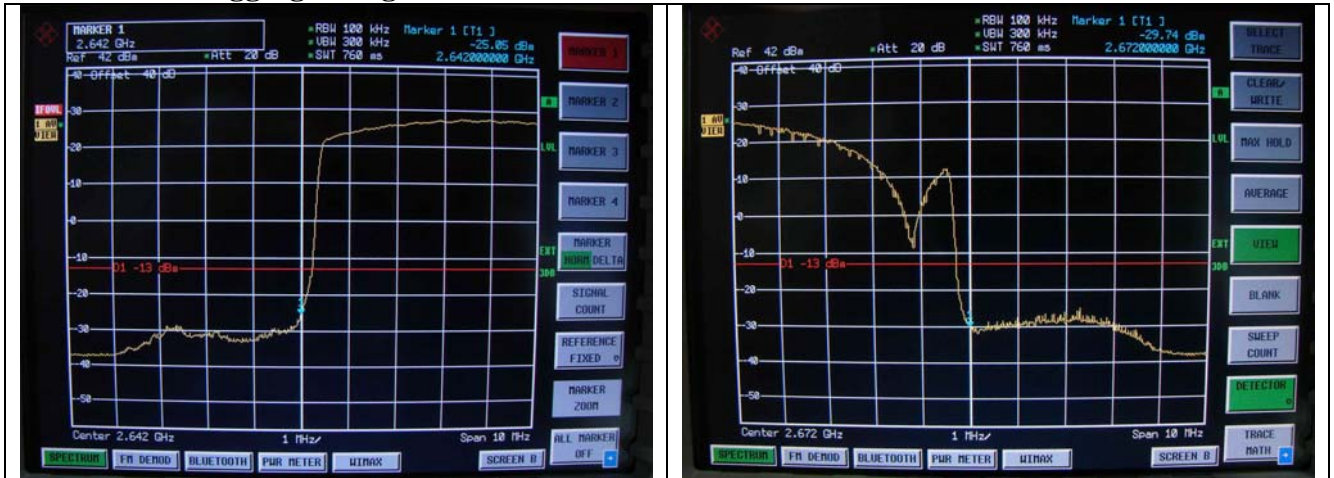
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2642.00	-25.05	-13.0
	High	2672.00	-29.74	
16QAM	Low	2642.00	-25.04	
	High	2672.00	-29.49	
64QAM	Low	2642.00	-25.01	
	High	2672.00	-30.14	

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

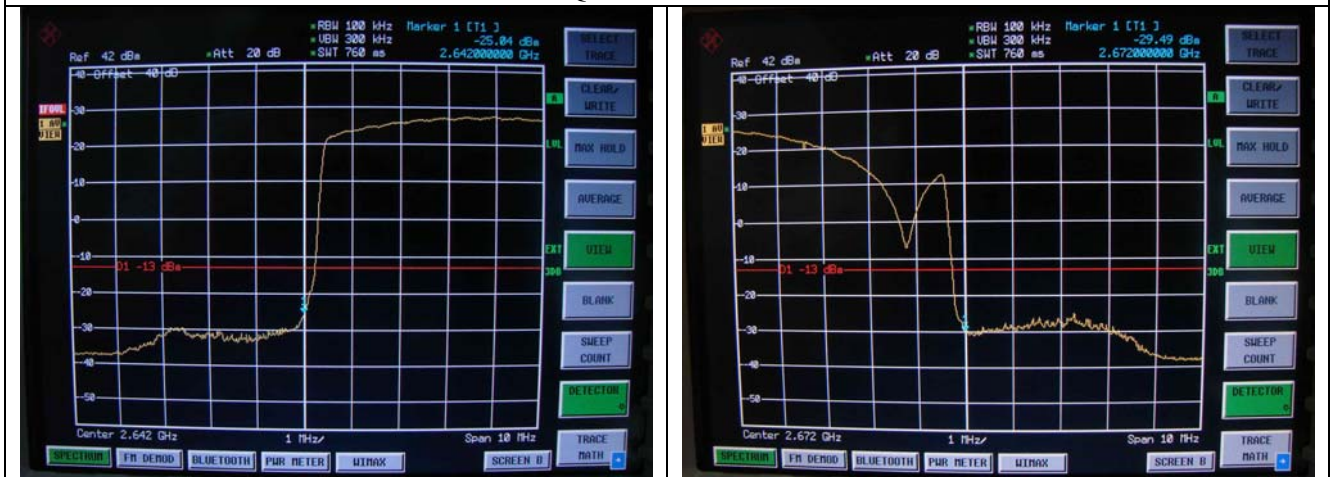


Tested by: Ki-Hong, Nam / Test Engineer

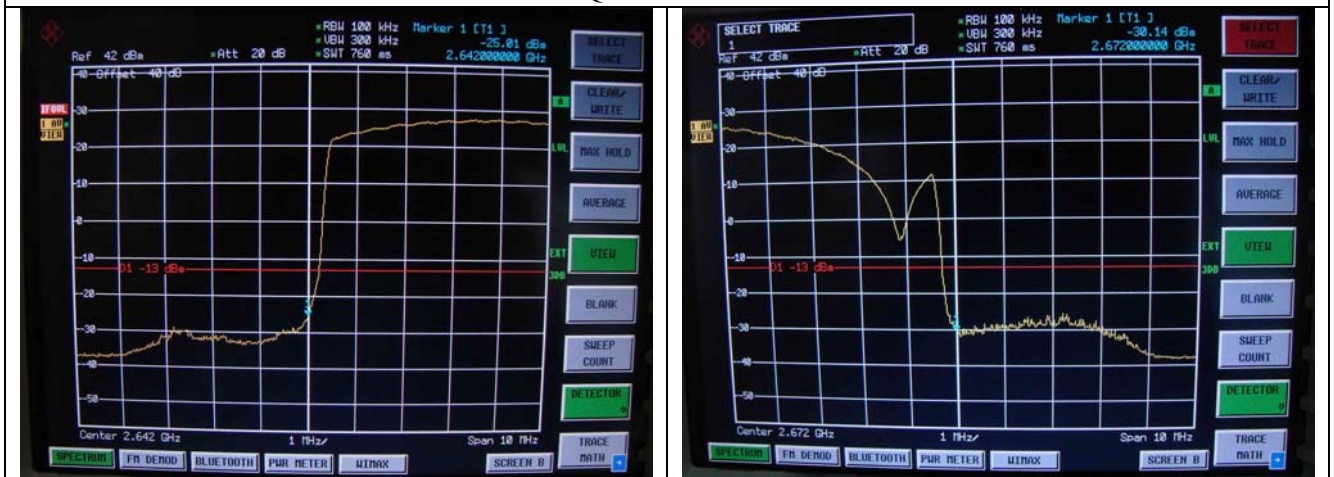
Photo Data for Aggregate Signal



QPSK Modulation



16QAM Modulation



64QAM Modulation

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10. FIELD STRENGTH OF SPURIOUS RADIATION

10.1 Operating environment

Temperature : 26 °C
Relative humidity : 47 %

10.2 Test set-up

The radiated emissions measurements were on the 3 meters, 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 30MHz 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 and 4.0 meters 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.
■ - ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005	Dec. 20, 2005
■ - 85650A	Hewlett Packard	Quasi-Peak Adapter	3107A01542	June 20, 2006
■ - 8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456	June 20, 2006
■ - 85685A	Hewlett-Packard	RF Preselector	3107A01264	June 20, 2006
■ - 8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	June 22, 2006
■ - E4432B	Hewlett-Packard	Signal Generator	US38440950	June 22, 2006
■ - 83650L	Hewlett-Packard	Signal Generator	3844A00415	June 22, 2006
□ - 8447F	Hewlett-Packard	RF Amplifier	2944A12573	June 09, 2006
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	July 03, 2006
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	July 04, 2006
□ - 8447F	HP	RF Amplifier	2944A12573	June 09, 2006
■ - DS420S	HD GmbH	Turn Table	N/A	N/A
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - VHA9103	Schwarzbeck	Biconical Antenna	91031852	Feb 13, 2006
■ - 9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Feb 13, 2006

All test equipment used is calibrated on a regular basis.

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EMC-003(Rev.0)

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10.4. Test data for radiated emission

10.4.1. Test data for QPSK Mode

- . Test Date : August 23 ~24, 2007
- . Resolution bandwidth : 1 MHz
- . Frequency range : 1 GHz ~ 27 GHz
- . Result : PASSED
- . Remark : RF Output ports were terminated with dummy load, but max. RF output was transmitted.
- . Video bandwidth: 1 MHz
- . Measurement distance: 3m

Frequency (MHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	Antenna Gain (dBi)	Antenna Gain (dBd)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel									
2647.00	53.90	-21.10	H	10.57	8.43	1.21	-17.75		
	58.40	-16.27	V				-12.92		
5294.00	16.90	-53.77	H	12.3	10.22	1.93	-49.70	-13.0	-36.70
	16.40	-52.77	V				-48.70		-35.70
Middle Channel									
2657.00	56.50	-18.83	H	10.57	8.43	1.22	-15.47		
	60.10	-14.40	V				-11.04		
5314.00	16.70	-49.80	H	12.36	10.22	1.94	-45.72	-13.00	-32.72
	16.40	-51.10	V				-47.02		-13.00
High Channel									
2667.00	56.00	-19.50	H	10.57	8.43	1.22	-16.14		
	62.50	-12.00	V				-8.64		
5334.00	17.10	-51.07	H	12.37	10.23	1.94	-46.99	-13.00	-33.99
	16.80	-53.37	V				-49.29		-13.00

Tabulated test data for Restricted Band

10.4.2. Test data for 16QAM Mode

Frequency (MHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	Antenna Gain (dBi)	Antenna Gain (dBd)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel									
2647.00	54.50	-20.50	H	10.57	8.43	1.21	-17.15		
	59.00	-15.67	V				-12.32		
5294.00	17.00	-53.67	H	12.3	10.22	1.93	-49.60	-13.0	-36.60
	16.80	-52.37	V				-48.30		-35.30
Middle Channel									
2657.00	55.20	-20.13	H	10.57	8.43	1.22	-16.77		
	60.30	-14.20	V				-10.84		
5314.00	17.10	-49.40	H	12.36	10.22	1.94	-45.32	-13.00	-32.32
	16.50	-51.00	V				-46.92		-33.92
High Channel									
2667.00	56.00	-19.50	H	10.57	8.43	1.22	-16.14		
	62.70	-11.80	V				-8.44		
5334.00	16.90	-51.27	H	12.37	10.23	1.94	-47.19	-13.00	-34.19
	16.70	-53.47	V				-49.39		-36.39

Tabulated test data for Restricted Band

10.4.3. Test data for 64QAM Mode

Frequency (MHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	Antenna Gain (dBi)	Antenna Gain (dBd)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel									
2647.00	54.00	-21.00	H	10.57	8.43	1.21	-17.65		
	58.33	-16.34	V				-12.99		
5294.00	16.80	-53.87	H	12.3	10.22	1.93	-49.80	-13.0	-36.80
	16.30	-52.87	V				-48.80		-35.80
Middle Channel									
2657.00	55.00	-20.33	H	10.57	8.43	1.22	-16.97		
	60.00	-14.50	V				-11.14		
5314.00	16.80	-49.70	H	12.36	10.22	1.94	-45.62	-13.00	-32.62
	16.60	-50.90	V				-46.82		-33.82
High Channel									
2667.00	56.10	-19.40	H	10.57	8.43	1.22	-16.04		
	62.60	-11.90	V				-8.54		
5334.00	17.00	-51.17	H	12.37	10.23	1.94	-47.09	-13.00	-34.09
	16.50	-53.67	V				-49.59		-36.59

Tabulated test data for Restricted Band

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Tested by: Ki-Hong, Nam / Test Engineer

11. FREQUENCY STABILITY OVER TEMPERATURE VARIATION

11.1 Operating environment

Temperature : 20 °C

Relative humidity : 40 %

11.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at center frequency.

Turn EUT off and set chamber temperature to -30°C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON 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.
■ - 8564E	HP	Spectrum Analyzer	3650A00756	June 22, 2007
■ - 53152A	HP	Frequency Counter	US39270295	Dec. 13, 2006
■ - N/A	Tabai ESPEC Corp.	Chamber	5104390	N/A

All test equipment used is calibrated on a regular basis.

11.4 Test data

-. Test Date : August 21, 2007
-. Result : PASSED

11.4.1 Test data at Output 0

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-5	2647000000	2646999998	0.00	Within the Authorized Frequency block
0		2646999995	0.00	
10		2647000005	0.00	
20		2646999989	0.00	
30		2646999994	0.00	
40		2647000013	0.00	
50		2647000001	0.00	
-5		2657000000	2656999999	
0	2656999995		0.00	
10	2657000003		0.00	
20	2657000002		0.00	
30	2657000005		0.00	
40	2657000008		0.00	
50	2657000007		0.00	
-5	2667000000		2667000002	
0		2667000005	0.00	
10		2667000008	0.00	
20		2667000003	0.00	
30		2667000005	0.00	
40		2667000008	0.00	
50		2666999993	0.00	

11.4.2 Test data at Output 1

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
-5	2647000000	2647000003	0.00	Within the Authorized Frequency block
0		2647000007	0.00	
10		2647000003	0.00	
20		2647000006	0.00	
30		2646999993	0.00	
40		2646999997	0.00	
50		2647000000	0.00	
-5		2657000000	2657000005	
0	2657000009		0.00	
10	2656999998		0.00	
20	2656999991		0.00	
30	2656999996		0.00	
40	2656999992		0.00	
50	2656999995		0.00	
-5	2667000000		2667000004	
0		2667000007	0.00	
10		2667000002	0.00	
20		2667000003	0.00	
30		2666999995	0.00	
40		2666999991	0.00	
50		2666999995	0.00	

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Tested by: Ki-Hong, Nam / Test Engineer

12. RADIATED EMISSION TEST FOR DIGITAL DEVICE PART

12.1 Operating environment

Temperature : 25 °C

Relative humidity : 48 %

12.2 Test set-up

The radiated emissions measurements were on the 3 meters, 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 30MHz to 1000MHz 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 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The test set-up photos are included in appendix VI.

12.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005	Dec 20, 2005
■ - 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
■ - VHA9103	Schwarzbeck	Biconical Antenna	91031852	Feb 13, 2006
■ - 9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Feb 13, 2006

All test equipment used is calibrated on a regular basis.

12.4 Test data


- . Test Date : August 23, 2007
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30MHz ~ 1000MHz
- . Measurement distance : 3m
- . Test result : Passed by -4.38 dB at 250.00 MHz

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
79.975	25.60	V	6.66	1.10	33.36	49.08	-15.72
144.025	18.60	H	14.61	2.84	36.05	53.52	-17.47
250.00	30.70	H	17.56	3.30	51.56	56.44	-4.88
299.97	11.70	V	19.11	3.60	34.41	56.44	-22.03
368.63	19.10	H	16.61	4.51	40.22	56.44	-16.22
437.47	18.70	V	18.60	4.85	42.15	56.44	-14.29
687.50	16.20	H	22.00	6.33	44.53	56.44	-11.91

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

Low, Middle and High channels were tested, but the worst emissions levels were recorded in this test report.



Tested by: Ki-Hong, Nam / Test Engineer