



Test Report

Product Name	Interactive Pen
Model No	RBP-001
FCC ID.	H79RBP001

Applicant	DELTA ELECTRONICS, INC.
Address	3 Tungyuan Road Chungli Industrial Zone Taoyuan County 32063, Taiwan.

Date of Receipt	Oct. 19, 2012
Issue Date	Nov. 15, 2012
Report No.	12A336R-RFUSP42V01
Report Version	V1.0



Testing Laboratory

0914

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Issue Date: Nov. 15, 2012

Report No.: 12A336R-RFUSP42V01


Accredited by NIST (NVLAP)

NVLAP Lab Code: 200533-0

Product Name	Interactive Pen
Applicant	DELTA ELECTRONICS, INC.
Address	3 Tungyuan Road Chungli Industrial Zone Taoyuan County 32063, Taiwan.
Manufacturer	DELTA ELECTRONICS, INC.
Model No.	RBP-001
EUT Rated Voltage	DC 1.5V (Power by Battery)
EUT Test Voltage	AC 120V/ 60Hz
Trade Name	RICOH
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2010 ANSI C63.4: 2003
Test Result	Complied

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Interactive Pen
Trade Name	RICOH
Model No.	RBP-001
FCC ID.	H79RBP001
Frequency Range	2401~2481MHz
Number of Channels	29CH
Channel Separation	1MHz
Type of Modulation	MSK
Antenna Type	Chip Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	YAGEO	CAN4311 895 05 245 2K	2.85dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2401 MHz	Channel 02:	2402 MHz	Channel 03:	2403 MHz	Channel 04:	2407 MHz
Channel 05:	2408 MHz	Channel 06:	2417 MHz	Channel 07:	2422 MHz	Channel 08:	2423 MHz
Channel 09:	2427 MHz	Channel 10:	2428 MHz	Channel 11:	2432 MHz	Channel 12:	2433 MHz
Channel 13:	2442 MHz	Channel 14:	2443 MHz	Channel 15:	2447 MHz	Channel 16:	2448 MHz
Channel 17:	2458 MHz	Channel 18:	2462 MHz	Channel 19:	2463 MHz	Channel 20:	2467 MHz
Channel 21:	2468 MHz	Channel 22:	2472 MHz	Channel 23:	2473 MHz	Channel 24:	2476 MHz
Channel 25:	2477 MHz	Channel 26:	2478 MHz	Channel 27:	2479 MHz	Channel 28:	2480 MHz
Channel 29:	2481 MHz						

Note:

1. The EUT is a Interactive Pen.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample for the purpose of demonstrating compliance of 2.4GHz transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode:	Mode 1: Transmit
------------	------------------

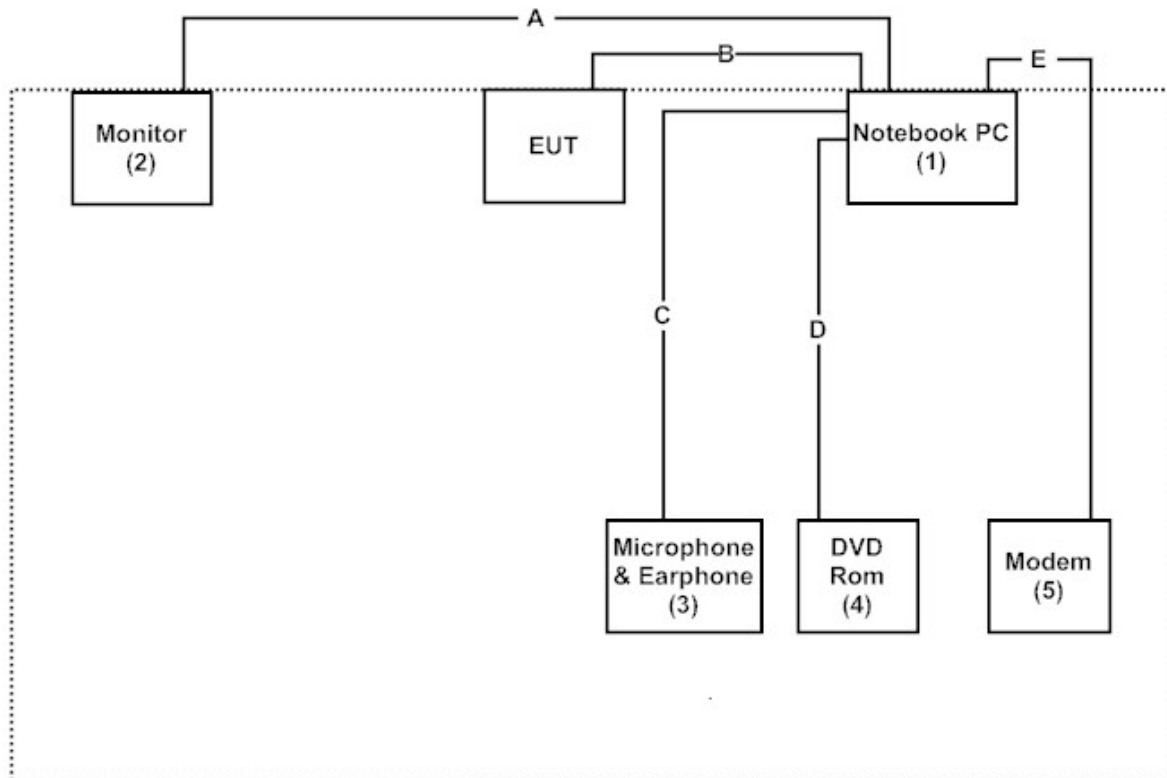
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	PPT	N/A	Non-Shielded, 0.8m
2	Monitor	LG	W2261VT	907YHZK07373	Non-Shielded, 1.8m
3	Microphone & Earphone	PCHOME	N/A	N/A	N/A
4	DVD Rom	DELL	PDO1S	N/A	N/A
5	Modem	ACEEX	DM-1414	0102027533	Non-Shielded, 1.8m

Signal Cable Type	Signal cable Description
A	VGA Cable Shielded, 1.8m, with two ferrite cores bonded
B	Mini USB to USB Cable Non-Shielded, 1.1m, with one ferrite core bonded
C	Microphone & Earphone Cable Non-Shielded, 1.2m
D	DVD Rom Cable Non-Shielded, 0.8m
E	Modem Cable Non-Shielded, 1.5m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4.
- (2) Provide the DC Power Source.
- (3) Start transmits continually.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from

Quietek Corporation's Web Site : <http://tw.quietek.com/tw/emc/accreditations/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :

<http://www.quietek.com/>

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

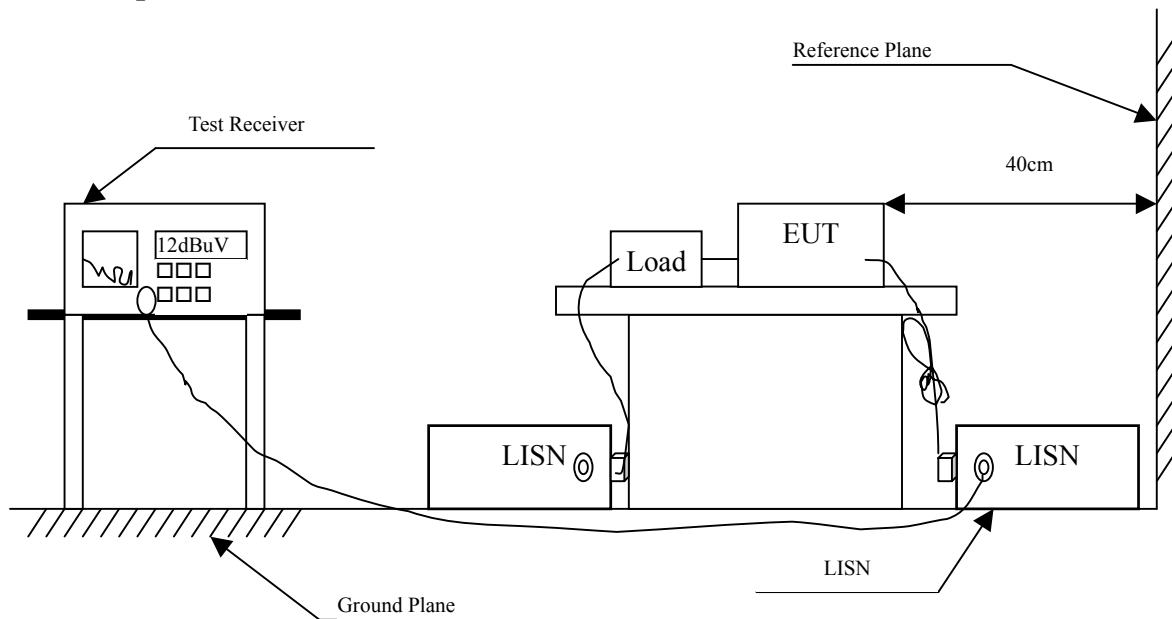
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2012	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2012	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2012	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2012	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : Interactive Pen
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.170	9.830	25.030	34.860	-30.569	65.429
0.502	9.830	19.880	29.710	-26.290	56.000
0.588	9.830	17.870	27.700	-28.300	56.000
2.087	9.840	18.470	28.310	-27.690	56.000
4.763	9.865	16.630	26.495	-29.505	56.000
15.908	10.110	23.180	33.290	-26.710	60.000
Average					
0.170	9.830	24.040	33.870	-21.559	55.429
0.502	9.830	19.170	29.000	-17.000	46.000
0.588	9.830	14.520	24.350	-21.650	46.000
2.087	9.840	17.300	27.140	-18.860	46.000
4.763	9.865	11.570	21.435	-24.565	46.000
15.908	10.110	11.650	21.760	-28.240	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Interactive Pen
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
0.166	9.838	27.970	37.808	-27.735	65.543
0.252	9.830	23.010	32.840	-30.246	63.086
0.502	9.840	26.460	36.300	-19.700	56.000
2.091	9.860	21.810	31.670	-24.330	56.000
6.959	9.948	14.710	24.658	-35.342	60.000
20.716	10.300	19.610	29.910	-30.090	60.000
Average					
0.166	9.838	25.900	35.738	-19.805	55.543
0.252	9.830	22.740	32.570	-20.516	53.086
0.502	9.840	26.110	35.950	-10.050	46.000
2.091	9.860	21.670	31.530	-14.470	46.000
6.959	9.948	5.890	15.838	-34.162	50.000
20.716	10.300	12.120	22.420	-27.580	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

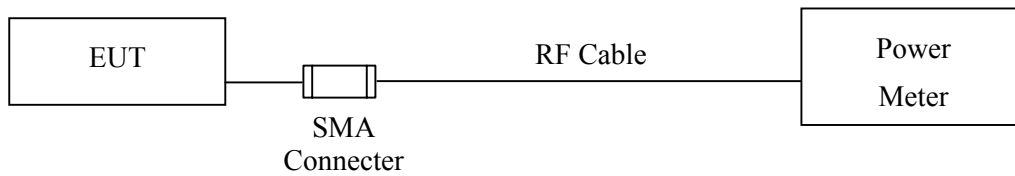
3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2012
X	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2012

Note: 1. All equipments are calibrated every one year.
 2. The test instruments marked by “X” are used to measure the final test results.

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1Watt.

3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product : Interactive Pen
Test Item : Peak Power Output
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 01	2401	-4.52	1 Watt= 30 dBm	Pass
Channel 16	2448	-4.71	1 Watt= 30 dBm	Pass
Channel 29	2481	-4.57	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Equipment

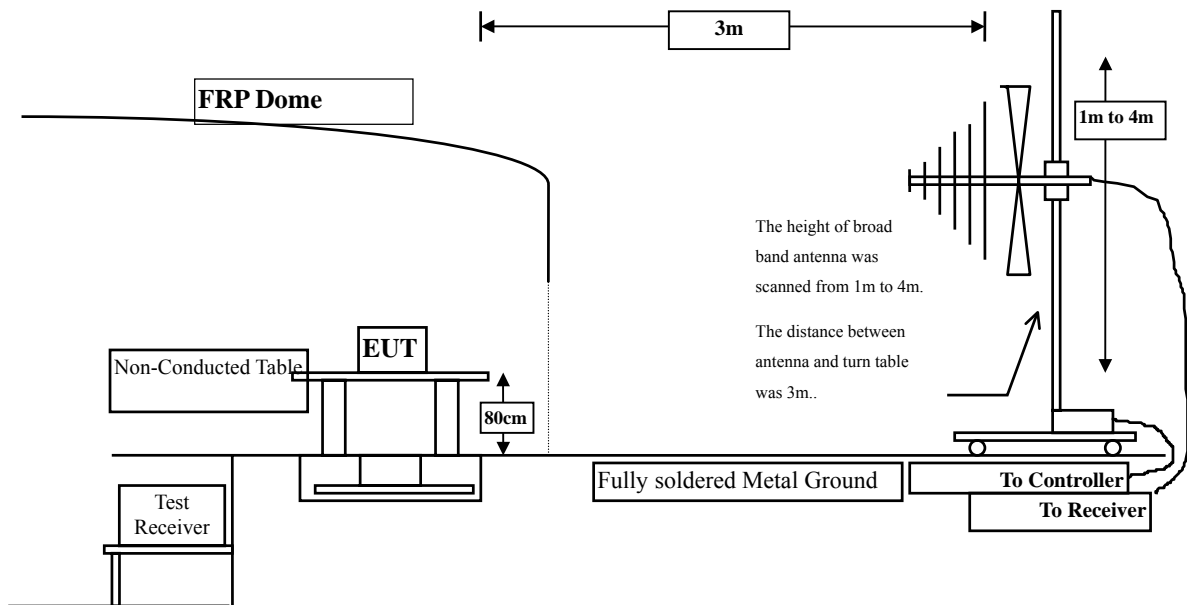
The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2012
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2012
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012
	X	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2012
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2012
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2012
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2012
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

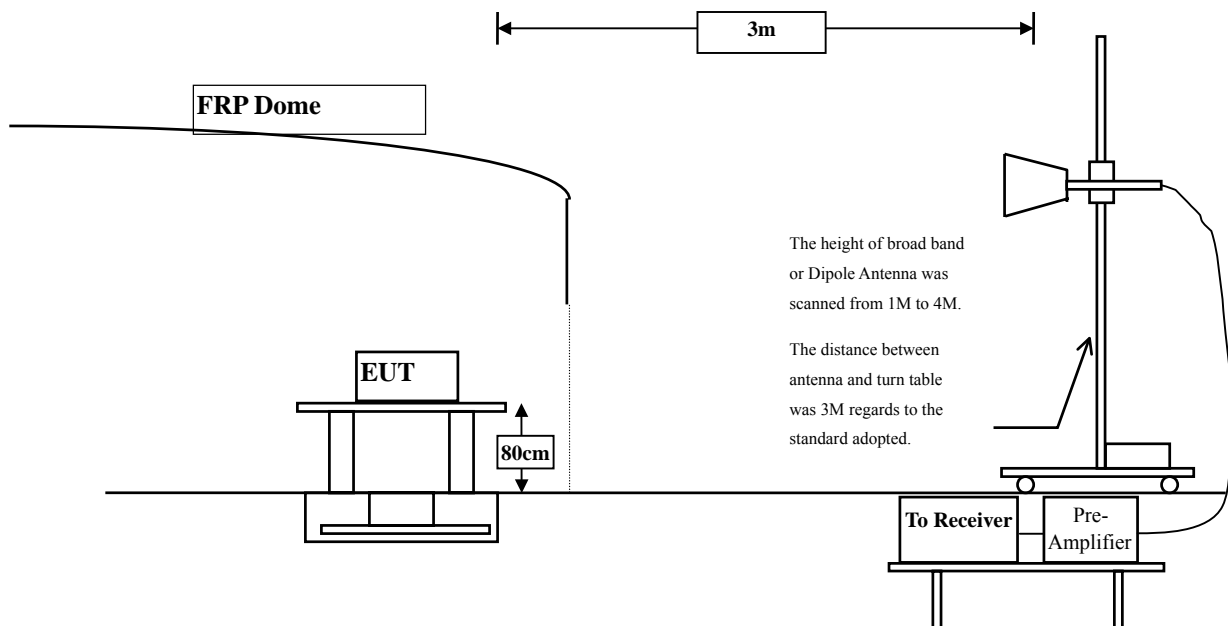
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

4.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement. The measurement frequency range from 30MHz - 10th Harmonic of fundamental was investigated.

4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

4.6. Test Result of Radiated Emission

Product : Interactive Pen
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2401MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4802.000	3.324	42.160	45.485	-28.515	74.000
7203.000	10.114	38.520	48.634	-25.366	74.000
9604.000	13.743	35.890	49.634	-24.366	74.000
Vertical					
Peak Detector:					
4802.000	6.648	42.890	49.539	-24.461	74.000
7203.000	10.983	37.770	48.753	-25.247	74.000
9604.000	14.133	35.990	50.123	-23.877	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Interactive Pen
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2448MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4896.000	2.942	41.630	44.573	-29.427	74.000
7344.000	11.940	37.570	49.510	-24.490	74.000
9792.000	12.451	36.960	49.411	-24.589	74.000
Vertical					
Peak Detector:					
4896.000	5.566	42.940	48.507	-25.493	74.000
7344.000	12.903	37.600	50.503	-23.497	74.000
9792.000	12.877	37.490	50.366	-23.634	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Interactive Pen
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2481MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4962.000	2.755	41.060	43.815	-30.185	74.000
7443.000	12.595	36.650	49.245	-24.755	74.000
9924.000	13.479	36.550	50.028	-23.972	74.000
Vertical					
Peak Detector:					
4962.000	5.560	42.950	48.509	-25.491	74.000
7443.000	13.430	36.770	50.200	-23.800	74.000
9924.000	13.955	35.600	49.555	-24.445	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Interactive Pen
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2448MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
111.480	-7.914	24.851	16.937	-26.563	43.500
371.440	-1.097	24.955	23.858	-22.142	46.000
544.100	3.512	25.032	28.544	-17.456	46.000
644.980	1.552	25.932	27.484	-18.516	46.000
745.860	3.308	26.199	29.507	-16.493	46.000
932.100	6.922	23.036	29.958	-16.042	46.000
Vertical					
103.720	-0.151	23.280	23.128	-20.372	43.500
371.440	-2.737	26.232	23.495	-22.505	46.000
516.940	-0.876	24.084	23.208	-22.792	46.000
685.720	2.319	23.331	25.649	-20.351	46.000
837.040	2.223	26.508	28.730	-17.270	46.000
968.960	8.191	22.731	30.922	-23.078	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

5. RF antenna conducted test

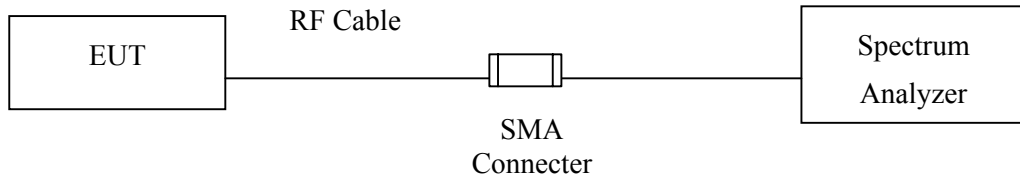
5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2012
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

5.2. Test Setup

RF antenna Conducted Measurement:



5.3. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.4. Test Procedure

The EUT was tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.5. Uncertainty

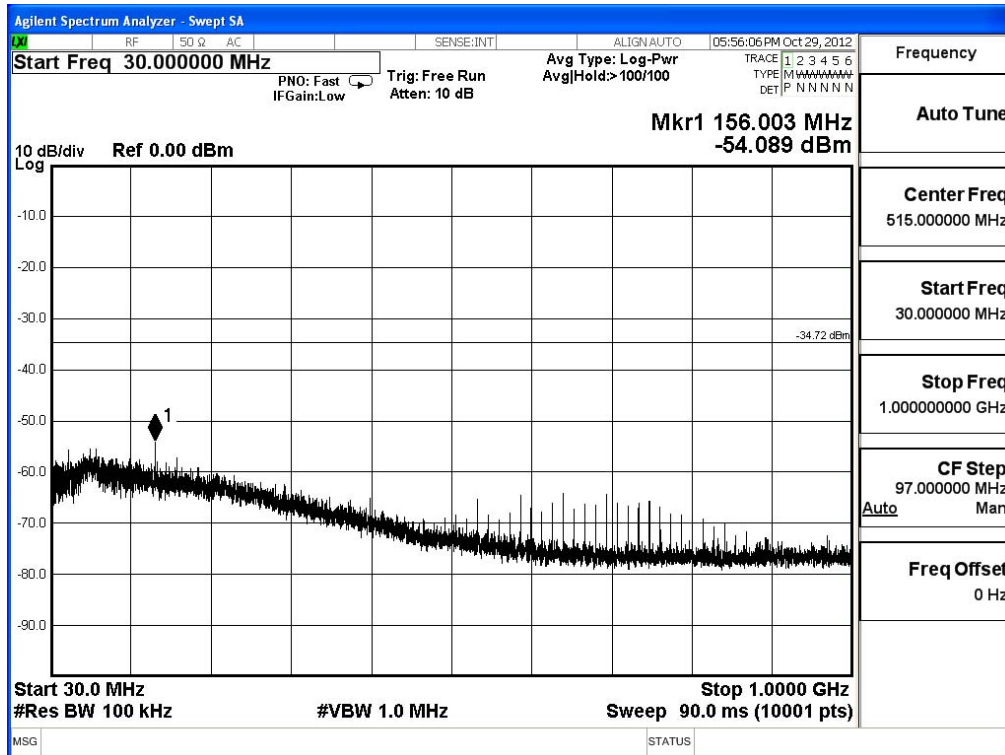
The measurement uncertainty

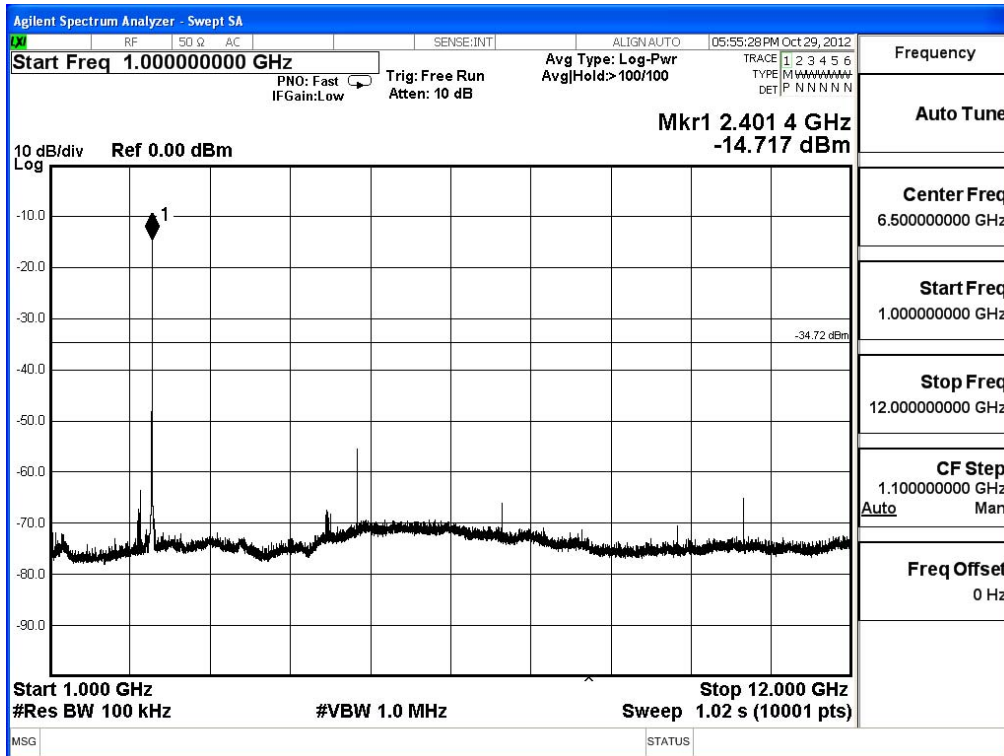
Conducted is defined as $\pm 1.27\text{dB}$

5.6. Test Result of RF antenna conducted test

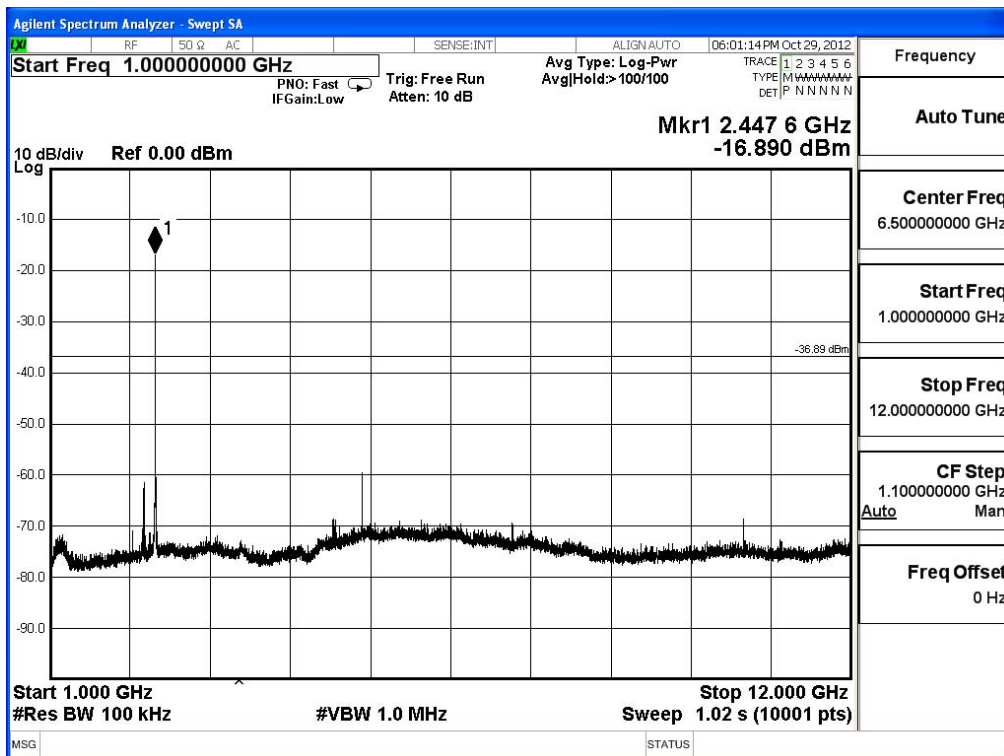
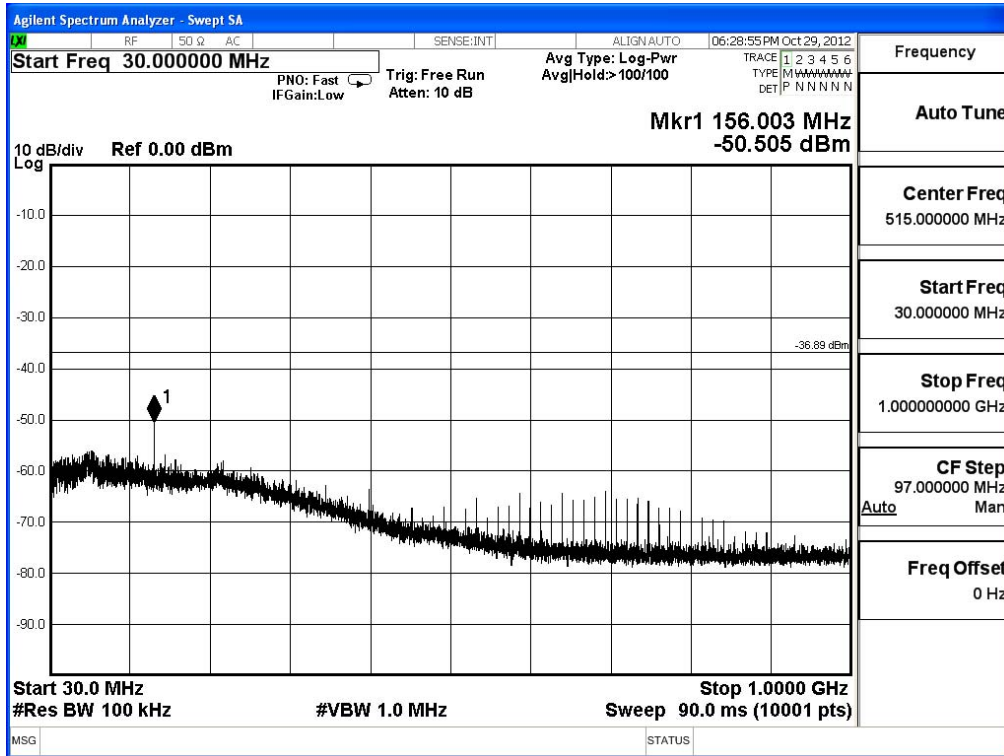
Product : Interactive Pen
 Test Item : RF antenna conducted test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

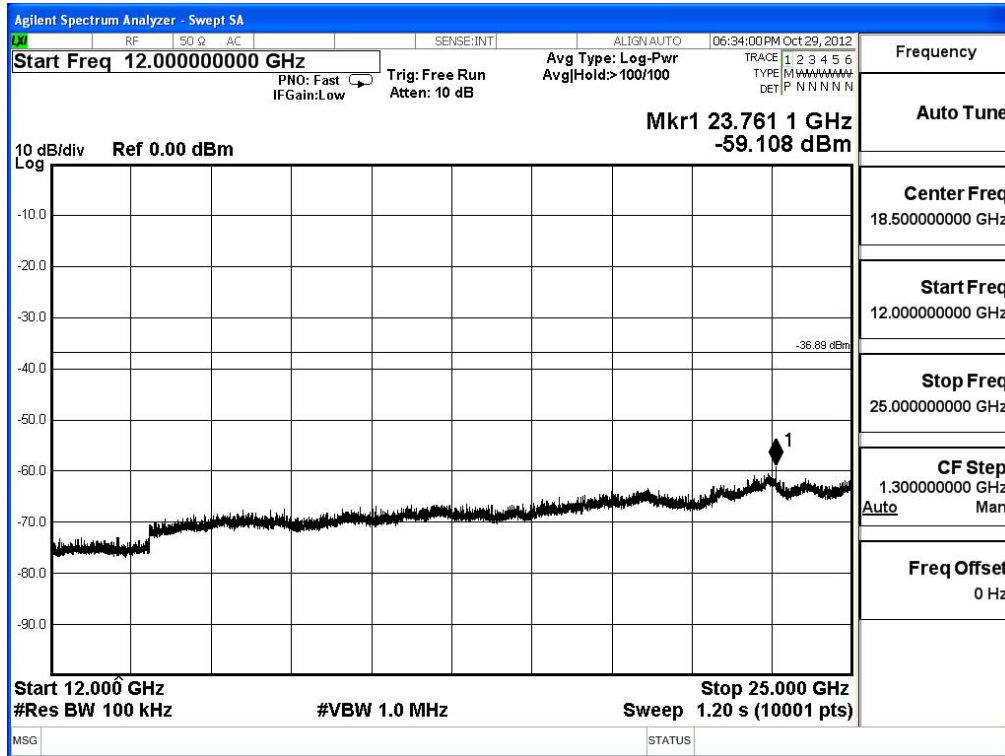
Channel 01 (2401MHz) 30M-25GHz



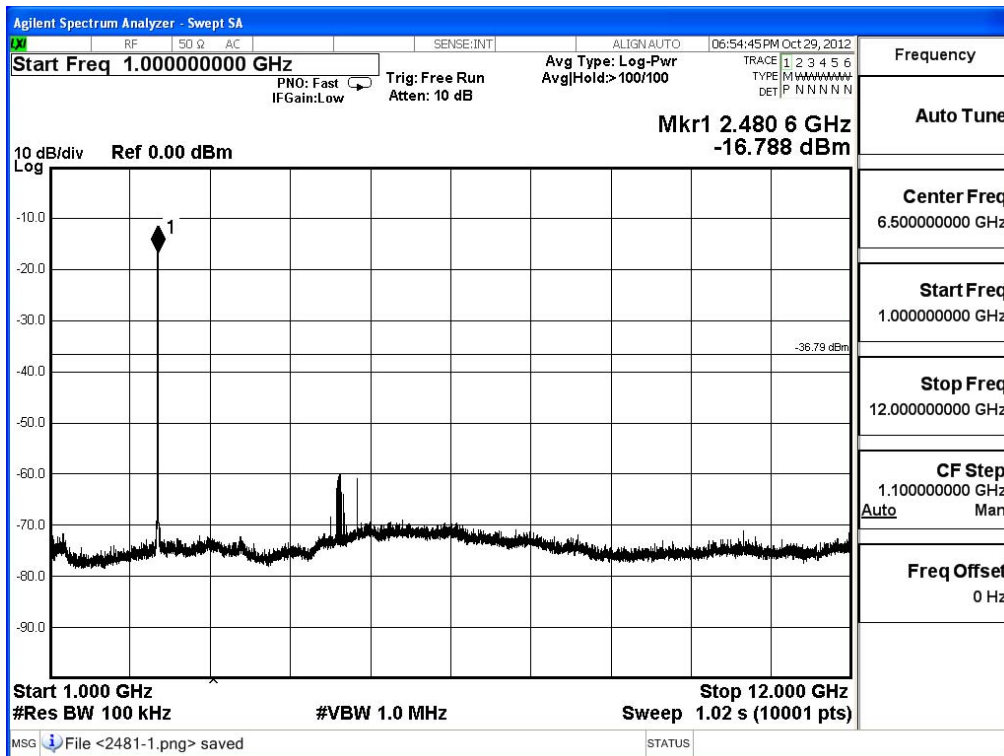
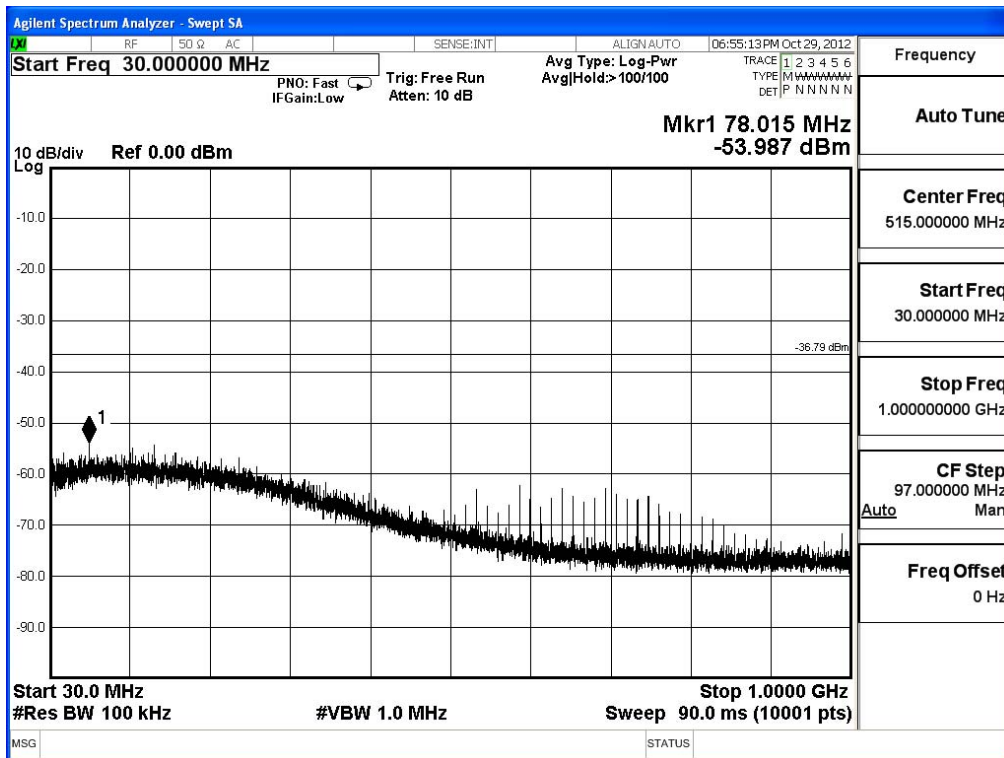


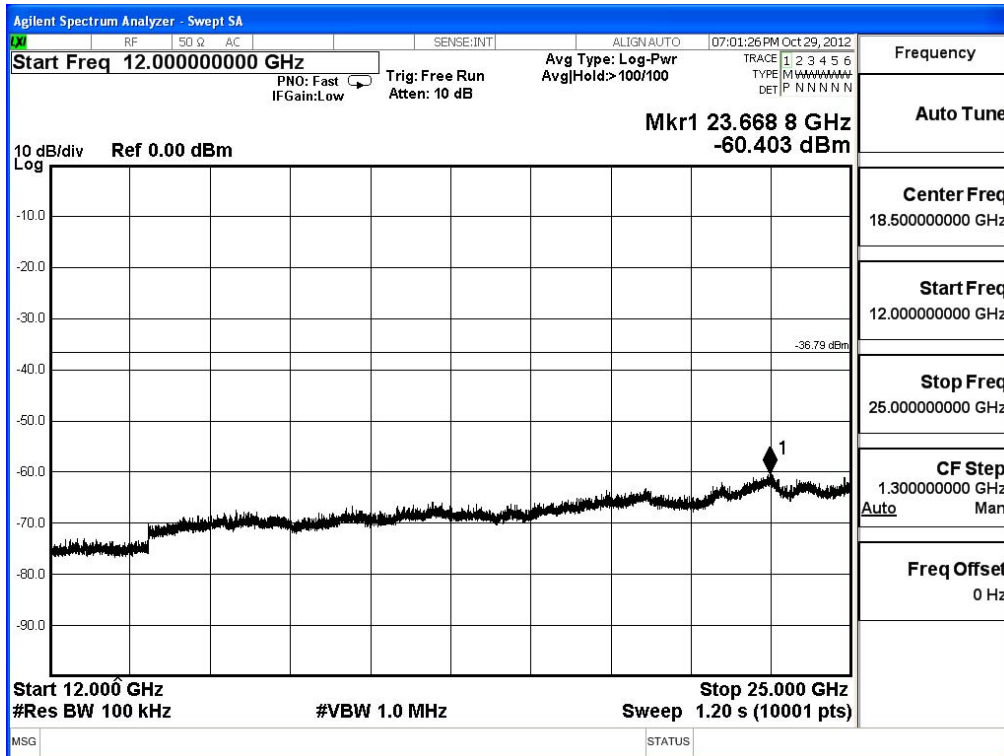
Channel 16 (2448MHz) 30M-25GHz





Channel 29 (2481MHz) 30M-25GHz





6. Band Edge

6.1. Test Equipment

RF Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2012
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with “X” are used to measure the final test results.

RF Radiated Measurement:

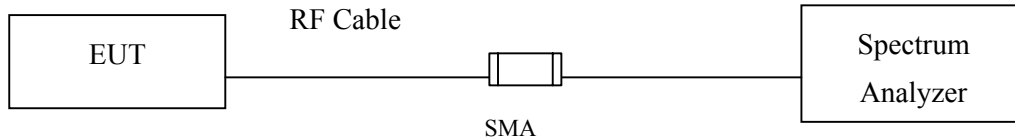
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	
☒ Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2012
		Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2012
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2012
		Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2012
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2012
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2012
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2012
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

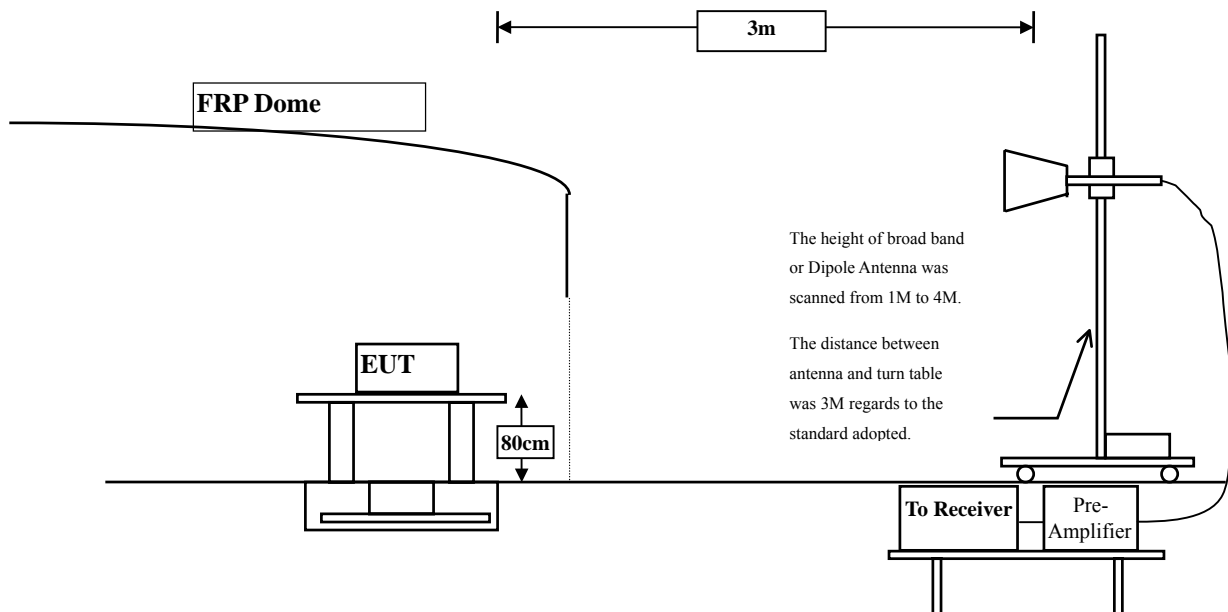
- Note:
1. All instruments are calibrated every one year.
 2. The test instruments marked by “X” are used to measure the final test results.

6.2. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

6.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

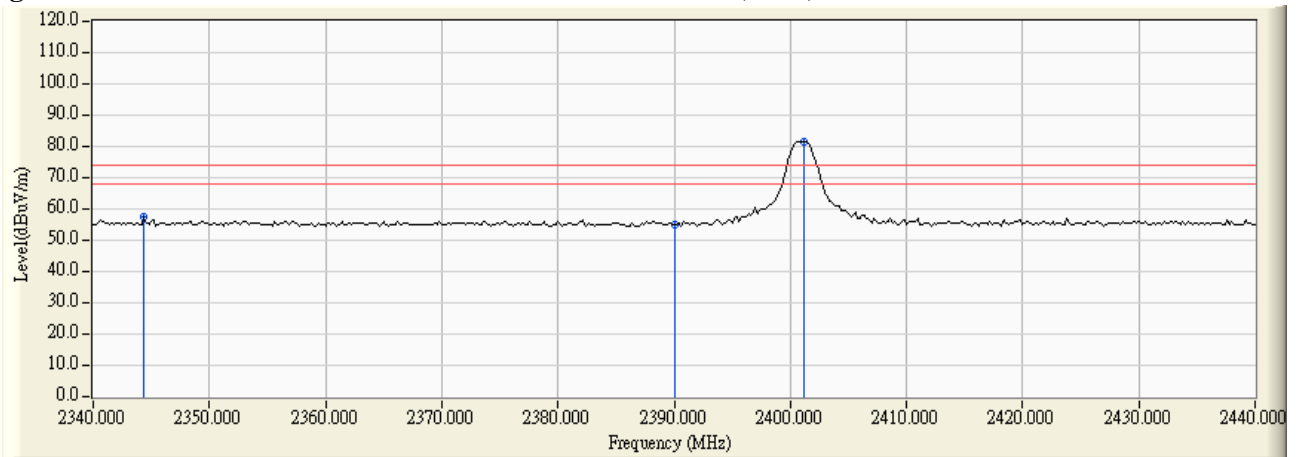
6.6. Test Result of Band Edge

Product : Interactive Pen
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2344.400	31.331	26.019	57.350	74.00	54.00	Pass
01 (Peak)	2390.000	31.509	23.452	54.961	74.00	54.00	Pass
01 (Peak)	2401.200	31.569	49.957	81.526	--	--	Pass

Figure Channel 01: Horizontal (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:					
Frequency	Peak Measurement	Duty Cycle Correct Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Horizontal					
2344.400	57.350	-13.398	43.952	-10.048	54.000
2390.000	54.961	-13.398	41.563	-12.437	54.000

Note:

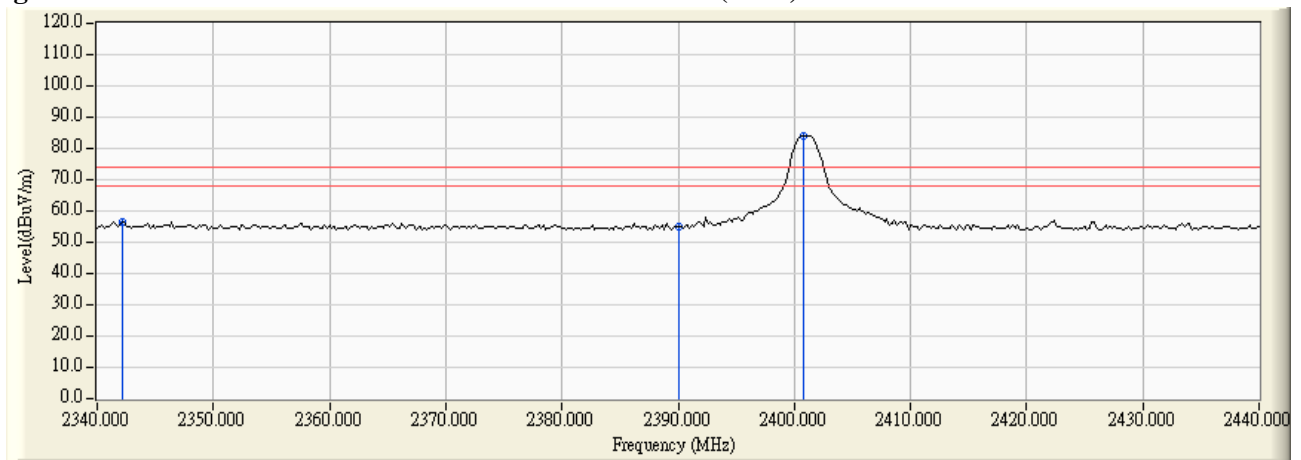
1. $AVG \text{ Measurement} = \text{Peak Measurement} - \text{Duty Cycle Correct Factor}$
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Interactive Pen
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
01 (Peak)	2342.200	31.137	25.523	56.660	74.00	54.00	Pass
01 (Peak)	2390.000	30.915	24.251	55.166	74.00	54.00	Pass
01 (Peak)	2400.800	30.915	53.175	84.089	--	--	Pass

Figure Channel 01: Vertical (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:					
Frequency	Peak Measurement	Duty Cycle Correct Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Vertical					
2342.200	56.660	-13.398	43.262	-10.738	54.000
2390.000	55.166	-13.398	41.768	-12.232	54.000

Note:

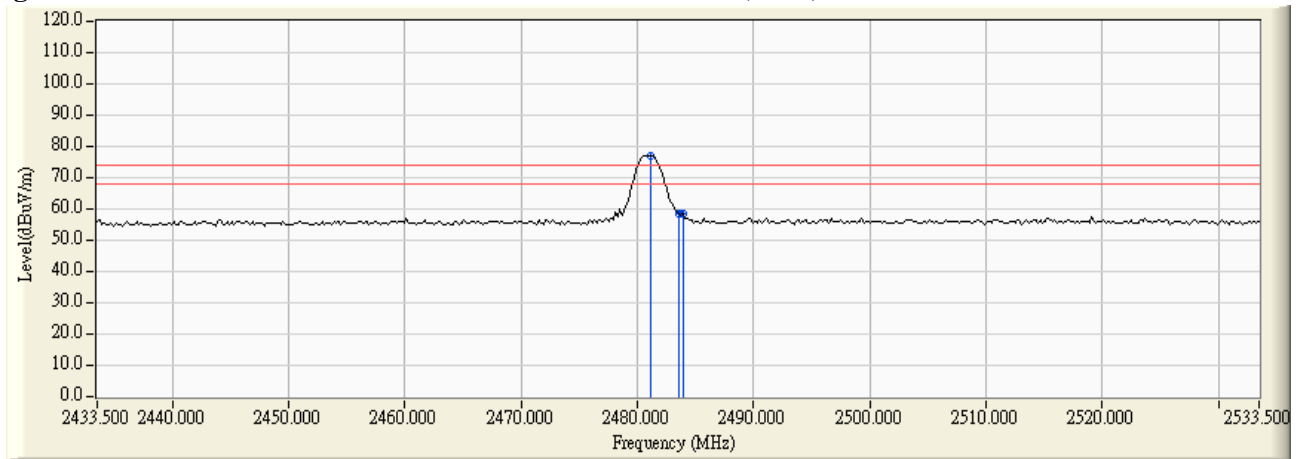
1. $AVG \text{ Measurement} = \text{Peak Measurement} - \text{Duty Cycle Correct Factor}$
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Interactive Pen
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
29 (Peak)	2481.100	32.164	44.863	77.027	--	--	Pass
29 (Peak)	2483.500	32.182	26.129	58.311	74.00	54.00	Pass
29 (Peak)	2483.900	32.185	26.460	58.645	74.00	54.00	Pass

Figure Channel 29: Horizontal (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:					
Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Correct Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m
Horizontal					
2483.5	58.311	-13.398	44.913	-9.087	54.000
2483.900	58.645	-13.398	45.247	-8.753	54.000

Note:

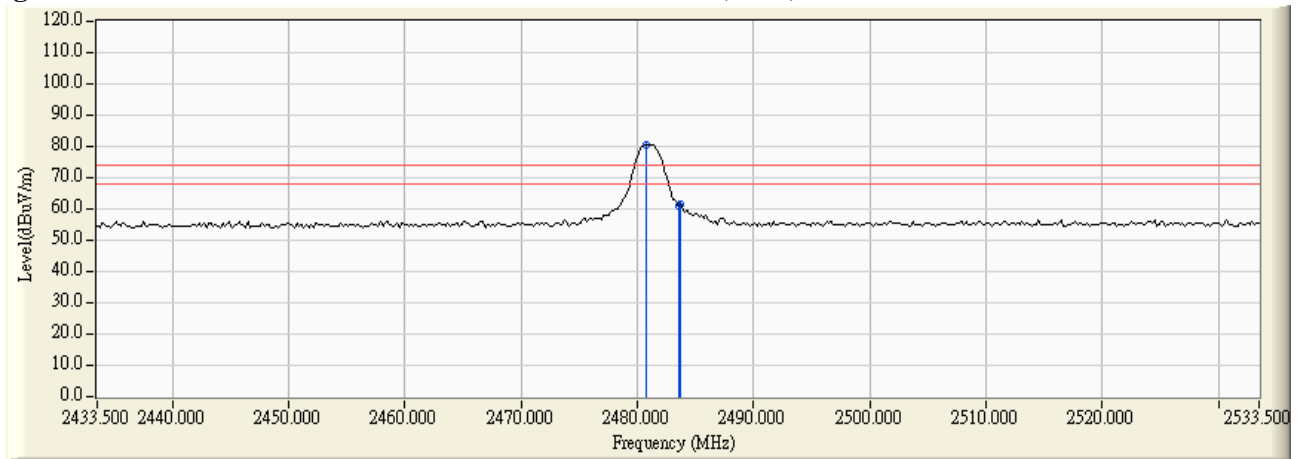
1. $AVG \text{ Measurement} = \text{Peak Measurement} - \text{Duty Cycle Correct Factor}$
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Interactive Pen
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
29 (Peak)	2480.700	31.417	49.154	80.571	--	--	Pass
29 (Peak)	2483.500	31.435	29.503	60.938	74.00	54.00	Pass
29 (Peak)	2483.700	31.437	29.988	61.425	74.00	54.00	Pass

Figure Channel 29: Vertical (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:					
Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Correct Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m
Vertical					
2483.5	60.938	-13.398	47.540	-6.460	54.000
2483.700	61.425	-13.398	48.027	-5.973	54.000

Note:

1. $AVG \text{ Measurement} = \text{Peak Measurement} - \text{Duty Cycle Correct Factor}$
2. The Duty Cycle is refer to section 9.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

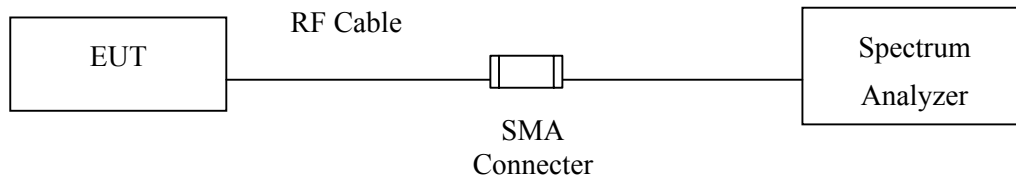
7. Occupied Bandwidth

7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2012
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note: 1. All instruments are calibrated every one year.
 2. The test instruments marked by "X" are used to measure the final test results.

7.2. Test Setup



7.3. Limits

The minimum bandwidth shall be at least 500 kHz.

7.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 * RBW$

7.5. Uncertainty

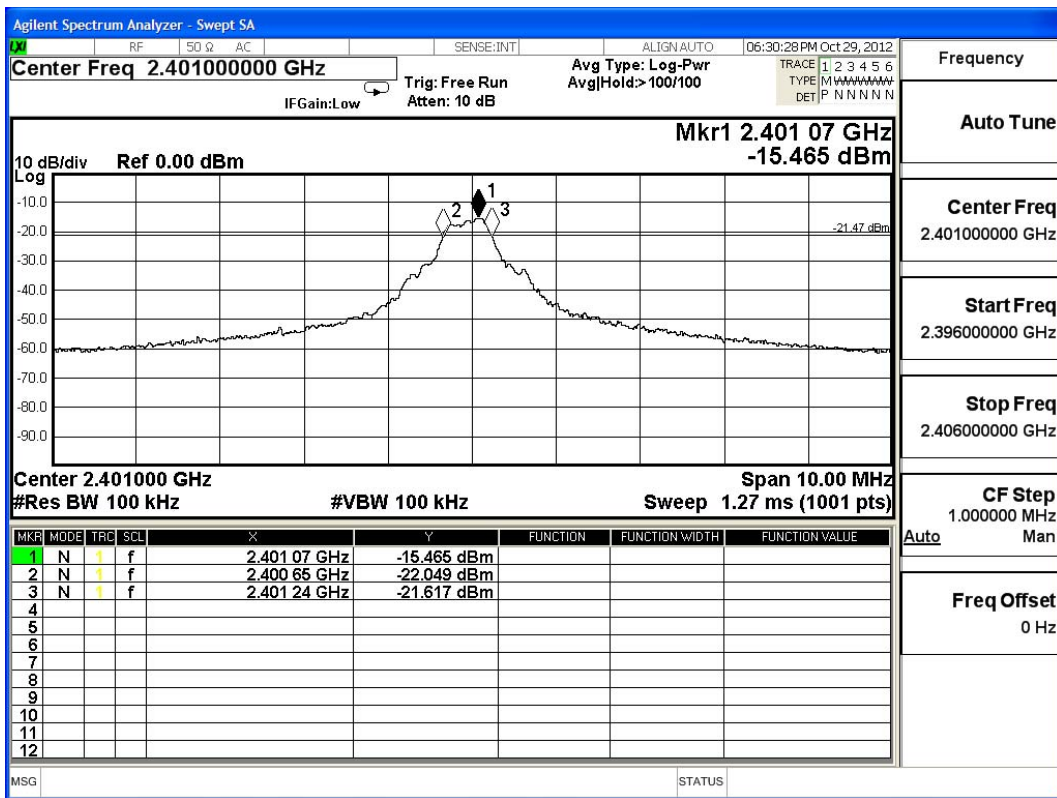
$\pm 150\text{Hz}$

7.6. Test Result of Occupied Bandwidth

Product : Interactive Pen
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2401MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2401.00	590	>500	Pass

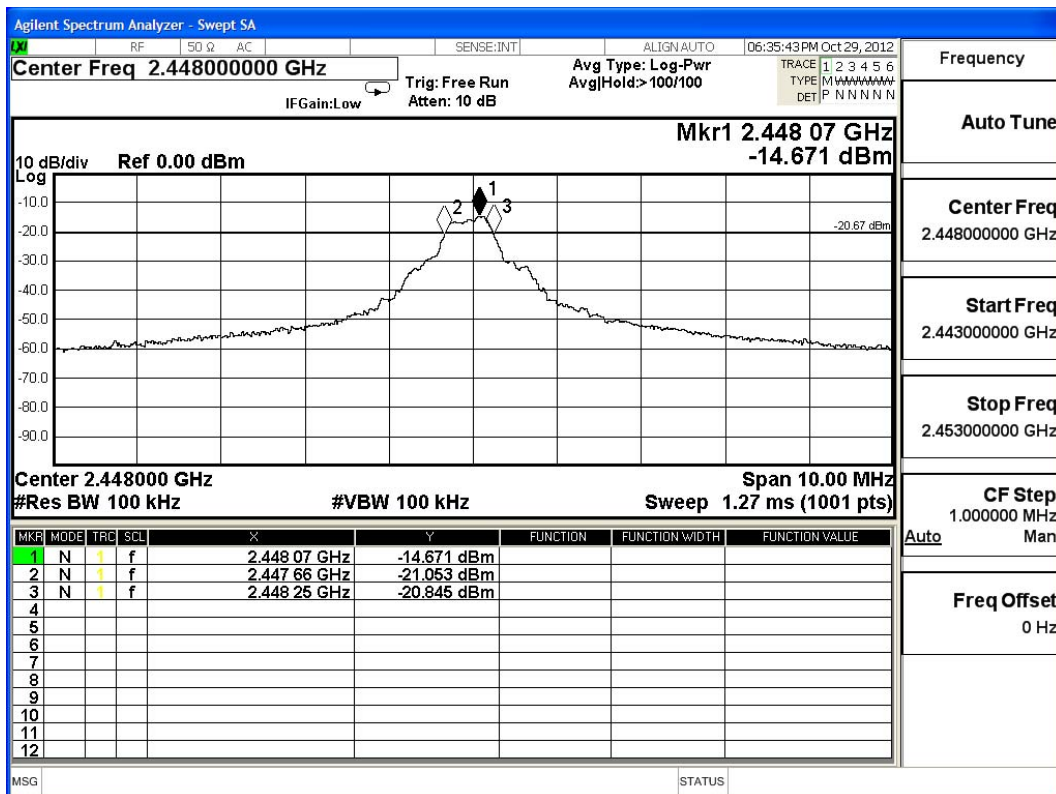
Figure Channel 01:



Product : Interactive Pen
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2448MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
16	2448.00	590	>500	Pass

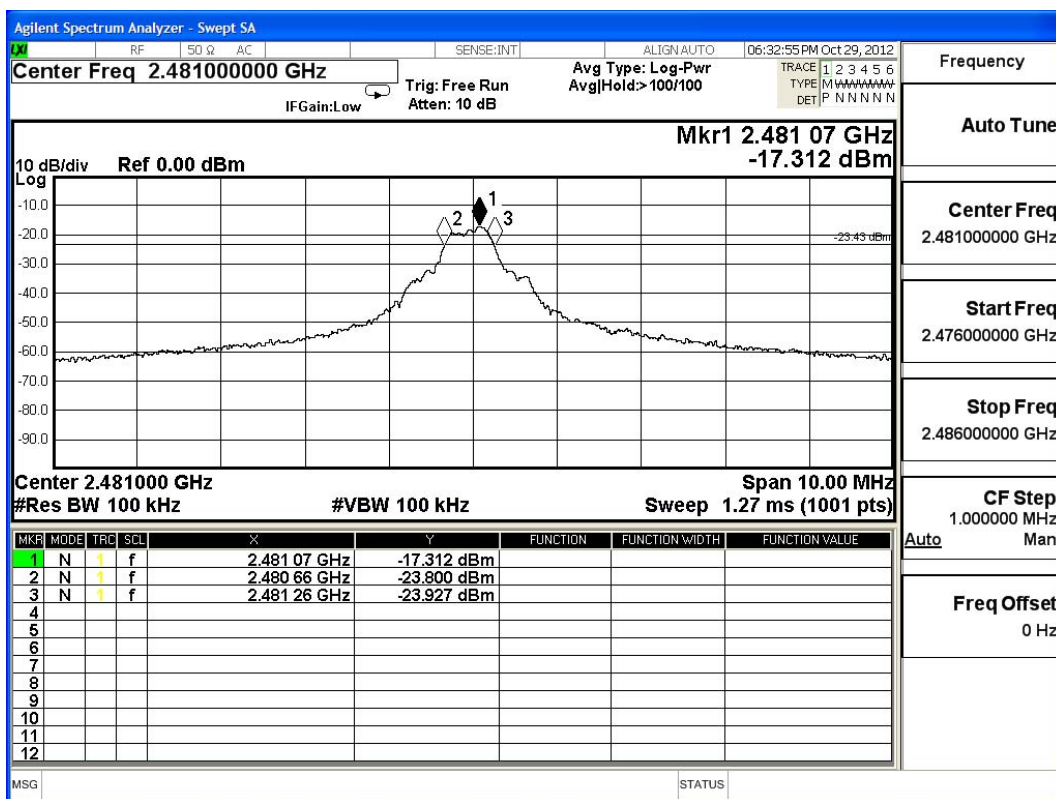
Figure Channel 16:



Product : Interactive Pen
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2481MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
29	2481.00	600	>500	Pass

Figure Channel 29:



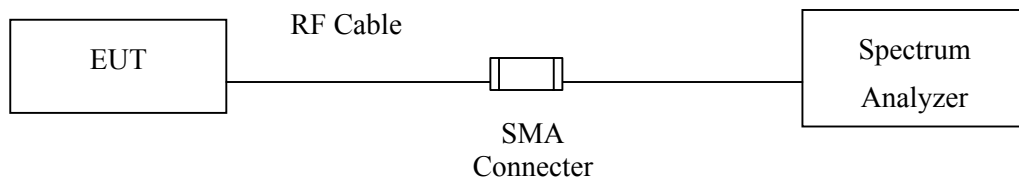
8. Power Density

8.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 202
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

Note: 1. All equipments are calibrated every one year.
 2. The test instruments marked by “X” are used to measure the final test results.

8.2. Test Setup



8.3. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW= 100 kHz, VBW \geq 300KHz, SPAN to 5-30 % greater than the EBW,

Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3\text{ kHz}/100\text{ kHz}) = -15.2\text{ dB}$.

8.5. Uncertainty

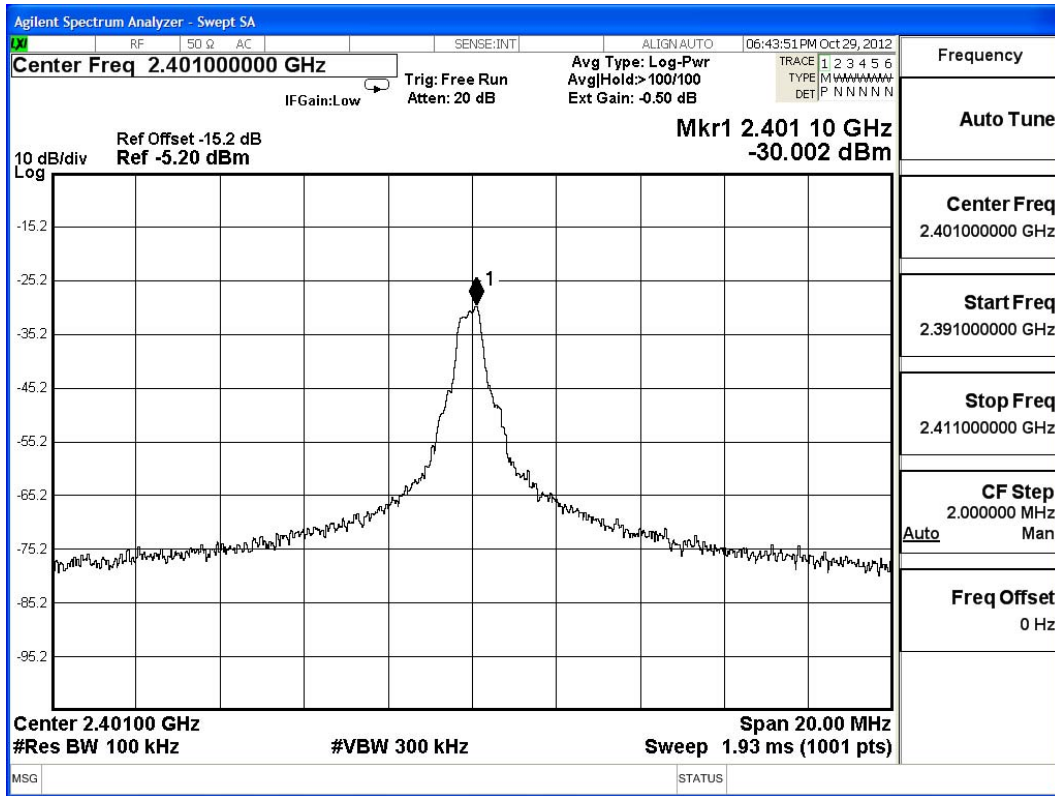
$\pm 1.27\text{ dB}$

8.6. Test Result of Power Density

Product : Interactive Pen
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit(2401MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2401.00	-30.002	< 8dBm	Pass

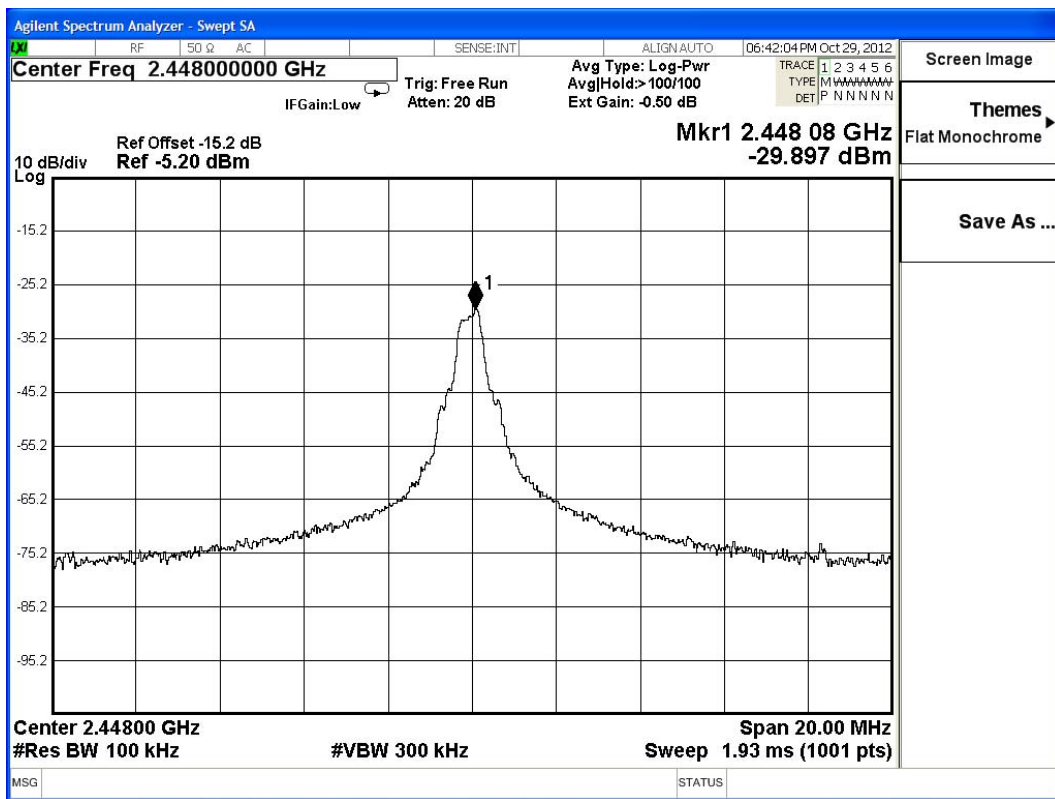
Figure Channel 01:



Product : Interactive Pen
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit (2448MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
16	2448	-29.897	< 8dBm	Pass

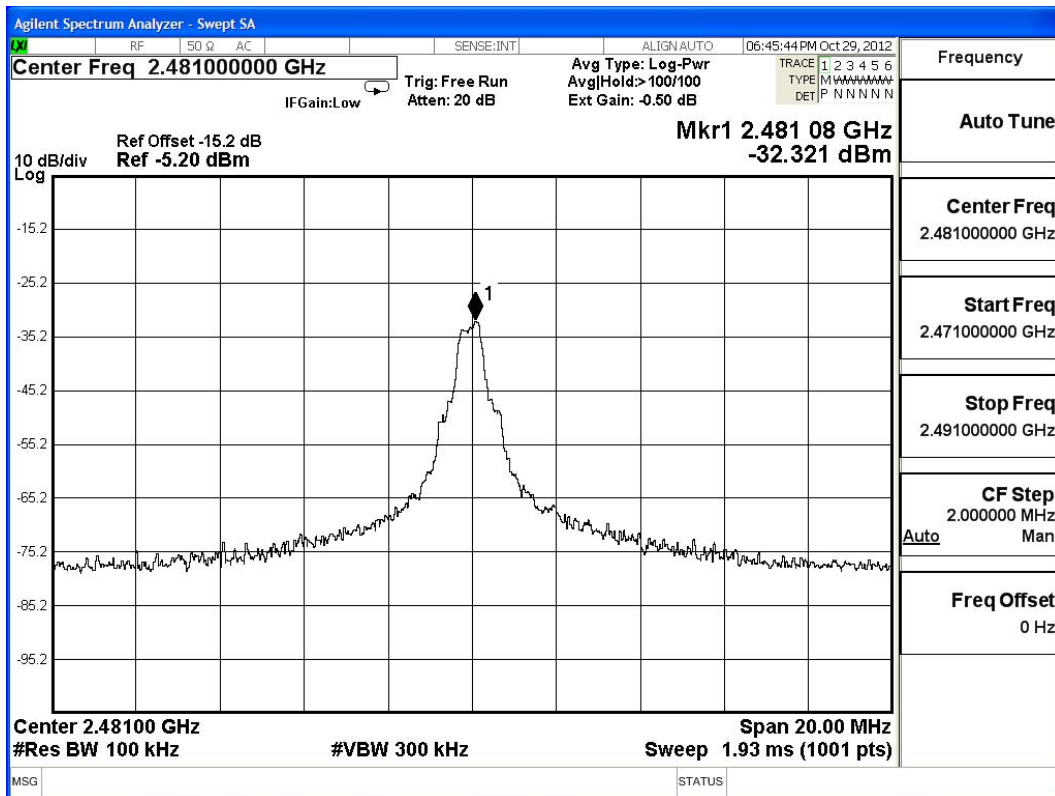
Figure Channel 16:



Product : Interactive Pen
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit (2481MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
29	2481.00	-32.321	< 8dBm	Pass

Figure Channel 29:



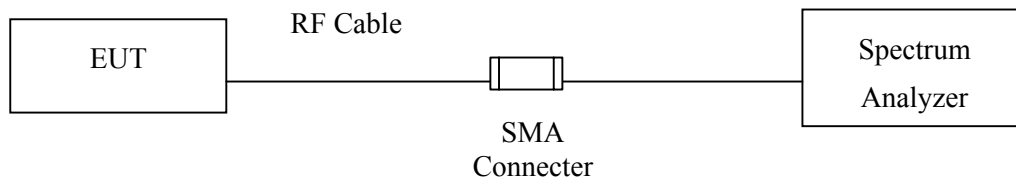
9. Duty Cycle

9.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2012
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2012
	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2012

- Note:
1. All equipments are calibrated every one year.
 2. The test equipments marked by "X" are used to measure the final test results.

9.2. Test Setup

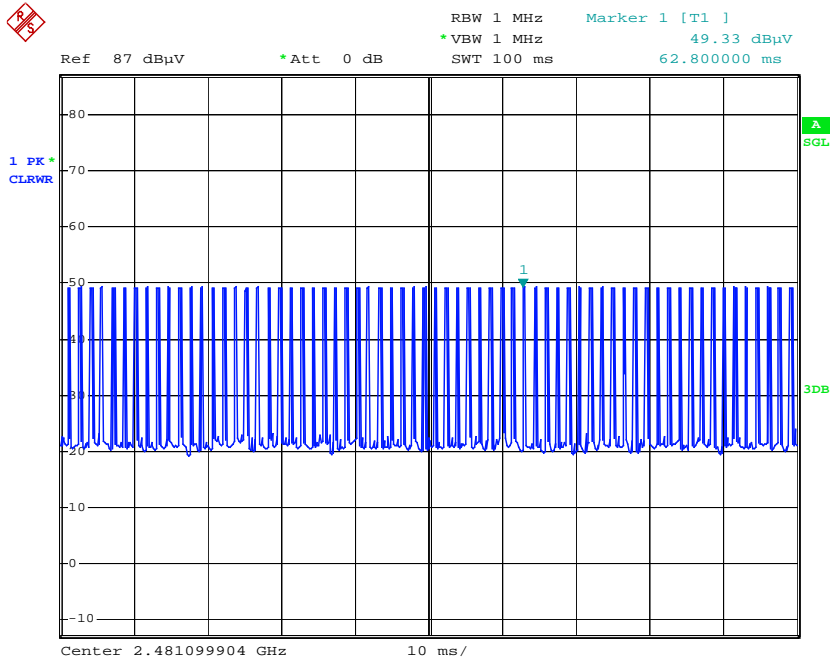


9.3. Uncertainty

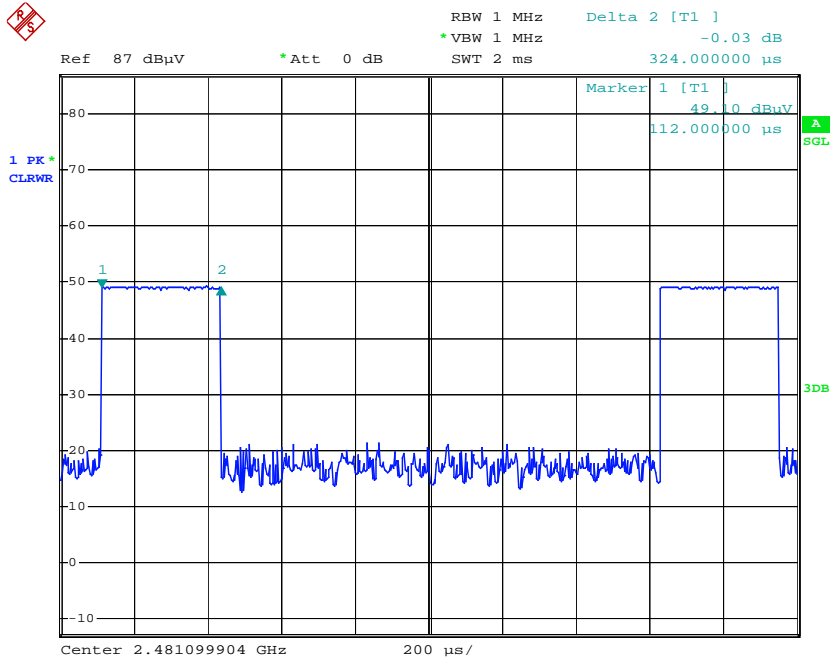
± 150Hz

9.4. Test Result of Duty Cycle

Product : Interactive Pen
Test Item : Duty Cycle Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit



Date: 24.OCT.2012 15:23:00



Date: 24.OCT.2012 15:24:01

Time on of 100ms= (0.324ms*66) = 21.384 ms

Duty Cycle= 21.384ms / 100ms= 0.21384

Duty Cycle correction factor= 20 LOG 0.21384= -13.398 dB

Duty Cycle correction factor	-13.398	dB
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10. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs