SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

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FCC Part 15E TEST REPORT

Application No. :	SHEM1303000453RF
Applicant:	Lenbrook Industries Limited
FCC ID:	SVC-USBDAC2RX
IC:	152A-USBDAC2RX
Equipment Under Test (EUT): **NOTE:** The following sample(s) submitted was/were identified on behalf of the client as	
Product Name:	Wireless USB DAC2
Brand Name:	NAD
Model:	DAC 2 USB Wireless DAC Receiver
Fundamental Frequency :	2.4GHz Band: 2412MHz to 2464MHz 5.2GHz Band: 5180MHz to 5240MHz 5.8GHz Band: 5736MHz to 5814MHz
Test Frequency:	5.2GHz Band: 5180MHz to 5240MHz
Standards:	FCC PART 15 SUBPART E, Section 15.407:2012 RSS-210 Issue 8 (December 2010) RSS-Gen Issue 3 (December 2010)
Date of Receipt:	March 26, 2013
Date of Test:	April 07, 2013 to April 10, 2013
Date of Issue:	May 21, 2013
Test Result :	**PASS ***

* In the configuration tested, the EUT (Equipment under test) complied with the standards specified above.

Tony Wu
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00	/	May 21, 2013	/	Original

Authorized for issue by:				
Engineer		Zenger Zhang **Print Name**		Zenger Zhang
Clerk		Susie Liu **Print Name**		Susie Liu
Reviewer		Keny Xu **Print Name**		Keny.xu

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3 Test Summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	Test Procedure	RESULT
Power line conducted emission	15.407(b)(6) 15.207	RSS-Gen Issue 8 Clause 7.2.4	ANSI C63.4,2009 Clause 7.3	Pass
Peak Transmit Power	15.407(a)(1)	RSS-210 Issue 8 Annex 9	ANSI C63.4,2009 Clause 8.3	Pass
Peak Power Spectral Density	15.407(a)(1)	RSS-210 Issue 8 Annex 9	KDB 789033 D01	Pass
Peak Power Excursion	15.407(a)(6)	RSS-210 Issue 8 Annex 9	KDB 789033 D01	Pass
Electric Field Strength Spurious Emissions	15.407(b)(1)(6)(7) 15.205 15.209	RSS-210 Issue 8 Annex 9	KDB 789033 D01	Pass
Radiated Emission BandEdge	15.407(b)(5)(7) 15.205	---	KDB 789033 D01	Pass
Frequency stability	FCC Part15 407 (g)	---	KDB 789033 D01	Pass
Occupied bandwidth	---	RSS-Gen Issue 3 Clause 4.6.1	RSS-Gen Issue 3 Clause 4.6.1	Tested

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4 Contents

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5 General Information

5.1 Client Information

Applicant :	Lenbrook Industries Limited
Applicant Address:	633 Granite Court, Pickering Ontario, Toronto L1W 3K1, Canada
Manufacturer:	Lenbrook Industries Limited
Manufacturer Address:	633 Granite Court, Pickering Ontario, Toronto L1W 3K1, Canada
Factory:	Hansong (Nanjing) Technology Ltd.

5.2 Details of E.U.T.

EUT Name:	Wireless USB DAC2		
Brand Name:	NAD		
Model No:	DAC 2 USB Wireless DAC Receiver		
Power Supply:	DC 5V		
Test Band and Channels :	5.2GHz Band Channel Description:		
	Channel of Tranmitter	Frequency(MHz)	
	Low	5180	
	Mid	5210	
	High	5240	
Modulation Type:	QPSK		
Antenna Type:	Integral antenna(Antenna Gain 2.0dBi)		
Adapter:	Rated Input:	AC 100V-240V 50-60Hz 0.5A	
	Rated Output:	DC 5.0V 2.0A	

5.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.	Supplied By
Voice box	Guangdong Shantou Zhongwang Electronics Co., Ltd.	CT-338	**N/A**	**SGS**

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5.4 Details of Test Mode

Test Mode	Description of Test Mode
Transmitting mode	Keep the EUT on continue transmitting mode.
Remark:N/A	

5.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
No.588 West Jindu Road, Songjiang District, Shanghai, China.201612.

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

  CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2014-07-26.

- **FCC – Registration No.: 402683**

  SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2015-02-22.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

  The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A. Expiry Date: 2014-09-20.

- **VCCI (Member No.: 3061)**

  The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868 and C-4336 respectively. Date of Registration: 2012-05-29. Date of Expiry: 2015-05-28.

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6 Equipments Used during Test

Conducted Emission

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Due date
1	EMI test receiver	Rohde & Schwarz	ESCS30	100086	2014-02-22
2	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2014-02-22
3	Line impedance stabilization network	ETS	3816/2	00034161	2014-02-22

☒ **RF Test**

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESU40	100109	2014-02-22
2	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-679	2014-03-06
3	Horn Antenna	Rohde & Schwarz	HF906	100284	2014-06-01
4	ANTENNA	SCHWARZBECK	VULB9168	9168-313	2014-03-06
5	Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 373	2014-03-06
6	Ultra broadband antenna	Rohde & Schwarz	HL562	100227	2013-10-08
7	Atmosphere pressure meter	Shanghai ZhongXuan Electronic Co;Ltd	BY — 2009P	--	2013-10-08
8	CLAMP METER	FLUKE	316	86080010	2014-06-01
9	Thermo-Hygrometer	ZHICHEN	ZC1-2	01050033	2013-10-08

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11	High-low temperature cabinet	Shanghai YuanZhen	GW2050	--	2014-06-01
12	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT1800.0/ 2000.0-0.2/40-5SSK	11	2014-06-01
13	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT800.0/880.0-0.2/40-5SSK	9	2014-06-01
14	High pass Filter	FSCW	HP 12/2800-5AA2	19A45-02	2014-06-01
15	Low nosie amplifier	TESEQ	LNA6900	70133	2014-02-22
16	EMI test receiver	Rohde & Schwarz	ESCS30	100086	2014-02-22
17	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2014-02-22

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7 Test Results

7.1 E.U.T. Operation

Input voltage:	AC 120V
Operating Environment:	
Temperature:	25.0 °C
Humidity:	45 % RH
Atmospheric Pressure:	1013 mbar
EUT Operation:	The EUT has been tested under operating condition. Test program was used to control the EUT for staying in continuous transmitting mode is programmed.

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7.2 Conducted Emissions on Mains Terminals

Test Requirement: FCC Part 15E.407(b)(6) and 15.207

RSS-Gen Issue 8 Clause 7.2.4

Test Method: ANSI C63.4:2009 Section 6.2

Test Result: Pass

Test Voltage: AC 120V 60Hz

Frequency Range: 150 KHz to 30 MHz

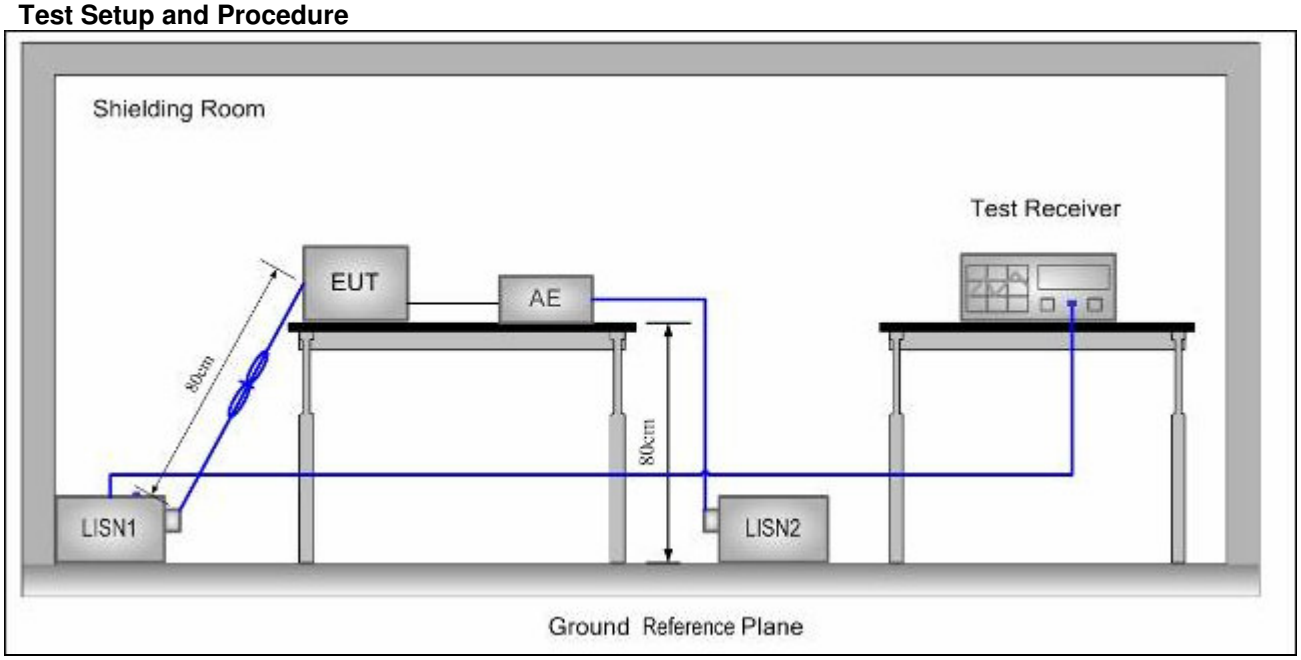
Class/Severity: Class B

Test mode: Transmitting mode

Limit:

Frequency range MHz	Class B Limits dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50MHz. Note2: The lower limit is applicable at the transition frequency.		

Test Setup and Procedure



1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT was connected to a second LISN, which was bonded to the ground reference plane in the same way as the

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LISN for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded

3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance was between the closest points of the LISN and the EUT. The mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m. All other units of the EUT and associated equipment was at least 0,8 m from the LISN.

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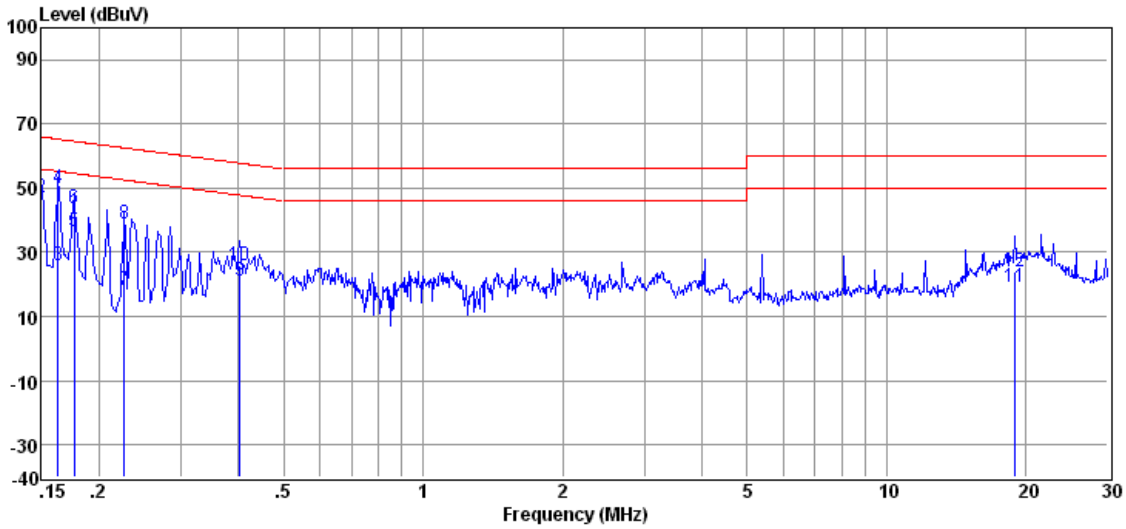
Measurement Data

Pre-scan was performed with peak detected on all ports, Quasi-peak & average measurements were performed at the frequencies at which maximum peak emission level were detected.
Please see the attached Quasi-peak and Average test results.

Level = Read Level + LISN/ISN Factor + Cable Loss.

Test Mode: Transmitting mode **Test Port:** AC Live Line



Freq (MHz)	Read Level (dBµV)	LISN Factor (dB)	Cable Loss (dB)	Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Detector	Phase
0.150	26.91	0.20	0.10	27.21	56.00	-28.79	Average	Live
0.150	46.76	0.20	0.10	47.06	66.00	-18.94	QP	Live
0.163	25.47	0.17	0.10	25.74	55.30	-29.56	Average	Live
0.163	49.75	0.17	0.10	50.02	65.30	-15.28	QP	Live
0.177	36.46	0.15	0.10	36.71	54.64	-17.93	Average	Live
0.177	43.51	0.15	0.10	43.76	64.64	-20.88	QP	Live
0.227	18.20	0.11	0.10	18.41	52.57	-34.16	Average	Live
0.227	38.83	0.11	0.10	39.04	62.57	-23.53	QP	Live
0.402	20.82	0.17	0.10	21.09	47.81	-26.72	Average	Live
0.402	25.76	0.17	0.10	26.03	57.81	-31.78	QP	Live
18.920	18.62	0.60	0.18	19.40	50.00	-30.60	Average	Live
18.920	23.24	0.60	0.18	24.02	60.00	-35.98	QP	Live

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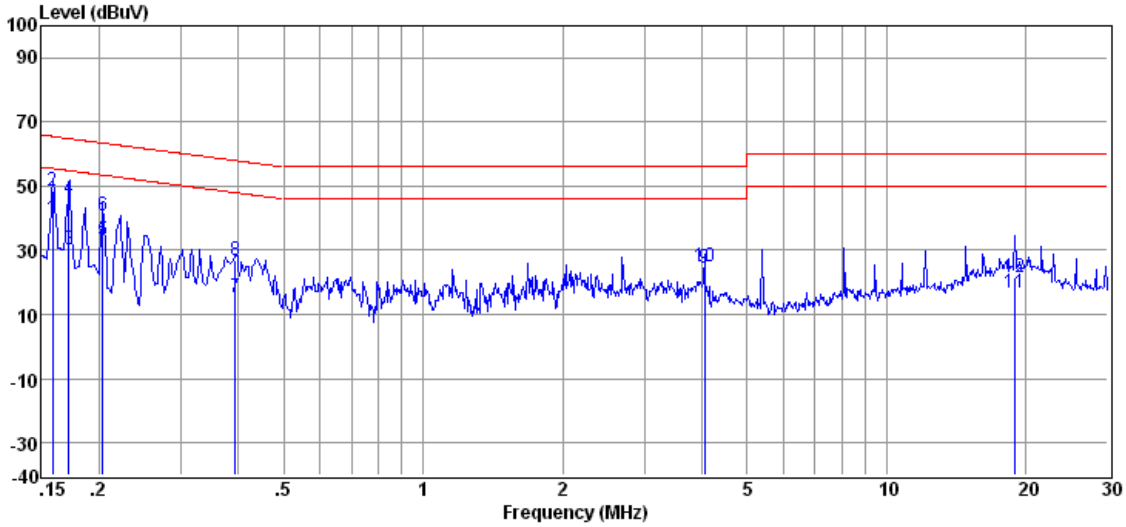
Test Mode: Transmitting mode **Test Port:** AC Neutral Line



Freq (MHz)	Read Level (dBµV)	LISN Factor (dB)	Cable Loss (dB)	Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Detector	Phase
0.159	39.82	0.18	0.10	40.10	55.52	-15.42	Average	Neutral
0.159	48.31	0.18	0.10	48.59	65.52	-16.93	QP	Neutral
0.172	29.99	0.15	0.10	30.24	54.86	-24.62	Average	Neutral
0.172	46.06	0.15	0.10	46.31	64.86	-18.55	QP	Neutral
0.204	33.01	0.10	0.10	33.21	53.45	-20.24	Average	Neutral
0.204	40.84	0.10	0.10	41.04	63.45	-22.41	QP	Neutral
0.393	15.01	0.10	0.10	15.21	47.99	-32.78	Average	Neutral
0.393	26.50	0.10	0.10	26.70	57.99	-31.29	QP	Neutral
4.049	23.84	0.22	0.17	24.23	46.00	-21.77	Average	Neutral
4.049	24.60	0.22	0.17	24.99	56.00	-31.01	QP	Neutral
18.920	15.92	0.58	0.18	16.68	50.00	-33.32	Average	Neutral
18.920	20.95	0.58	0.18	21.71	60.00	-38.29	QP	Neutral

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7.3 Peak Transmit Power

Test Requirement: FCC Part 15 407 (a) (1)
RSS-210 Issue 8 Annex 9

Standard Applicable: According to section 15.407(a)
(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26- dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Produre:
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF calbe from the antenna port to the spectrum.
3. Set the occur band to the entire emission bandwitdth of the signal.
4. Record the max. channel power reading
   Repeat above procedures until all the frequency measured were complete.

Limit: ≦16dBm
Note: For 5.15-5.25GHz band the Minimum 26BW is 16.70MHz. So the minimum limit is 4dBm + 10logB=16dBm<17dBm.

Measurement Result:

For Antenna A 5180-5240MHz Band:

CH	Frequency (MHz)	Reading RMS Power (dBm)	Cable Loss (dB)	Output RMS Power (dBm)	PEAK POWER LIMIT (dBm)	Result
LOW	5180	6.61	1.9	8.51	16	PASS
MID	5210	6.05	1.9	7.95	16	PASS
HIGH	5240	4.60	1.9	6.50	16	PASS

For Antenna B 5180-5240MHz Band:

CH	Frequency (MHz)	Reading RMS Power (dBm)	Cable Loss (dB)	Output RMS Power (dBm)	PEAK POWER LIMIT (dBm)	Result
LOW	5180	5.13	1.9	7.03	16	PASS
MID	5210	6.03	1.9	7.93	16	PASS
HIGH	5240	4.09	1.9	5.99	16	PASS

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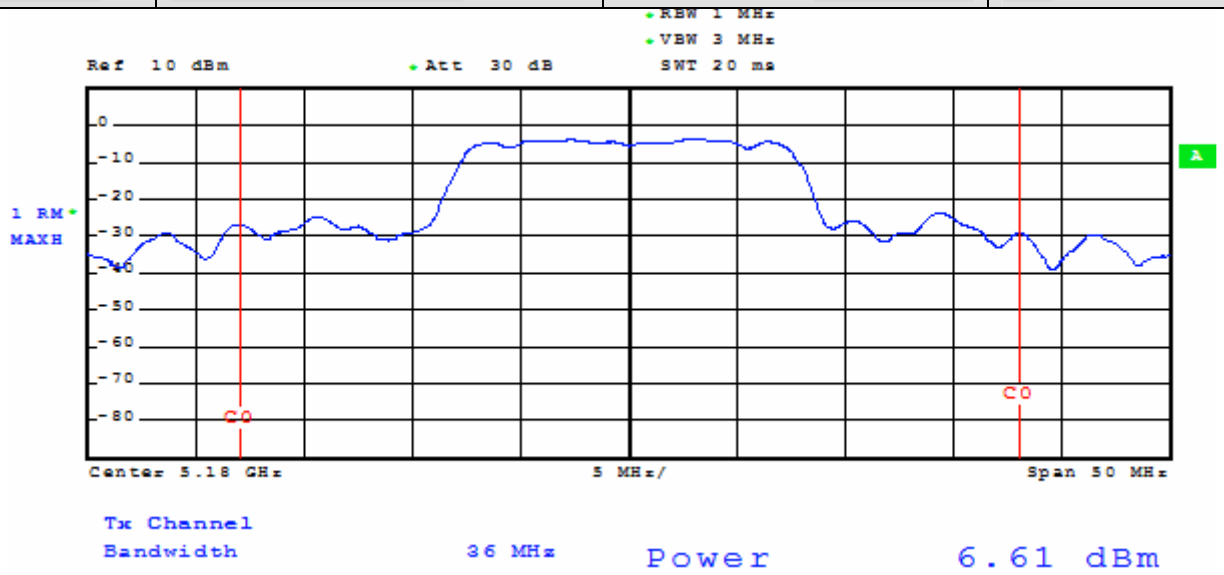
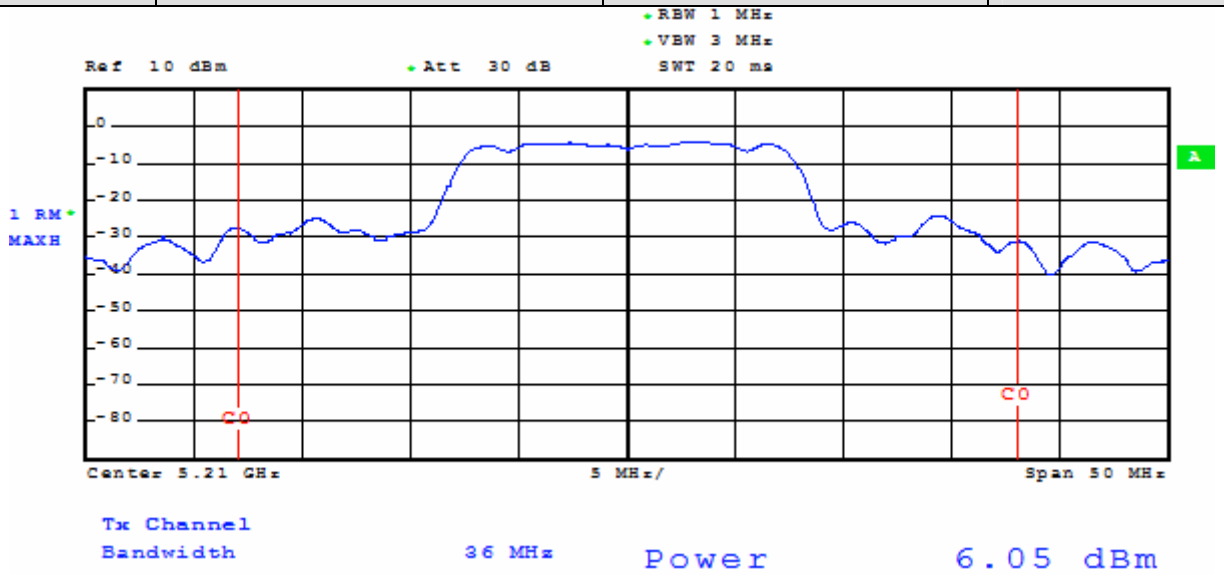
Test plot as follows:

Test mode:	5.2GHz Band Antenna A	Test channel:	Low



Test mode:	5.2GHz Band Antenna A	Test channel:	Middle



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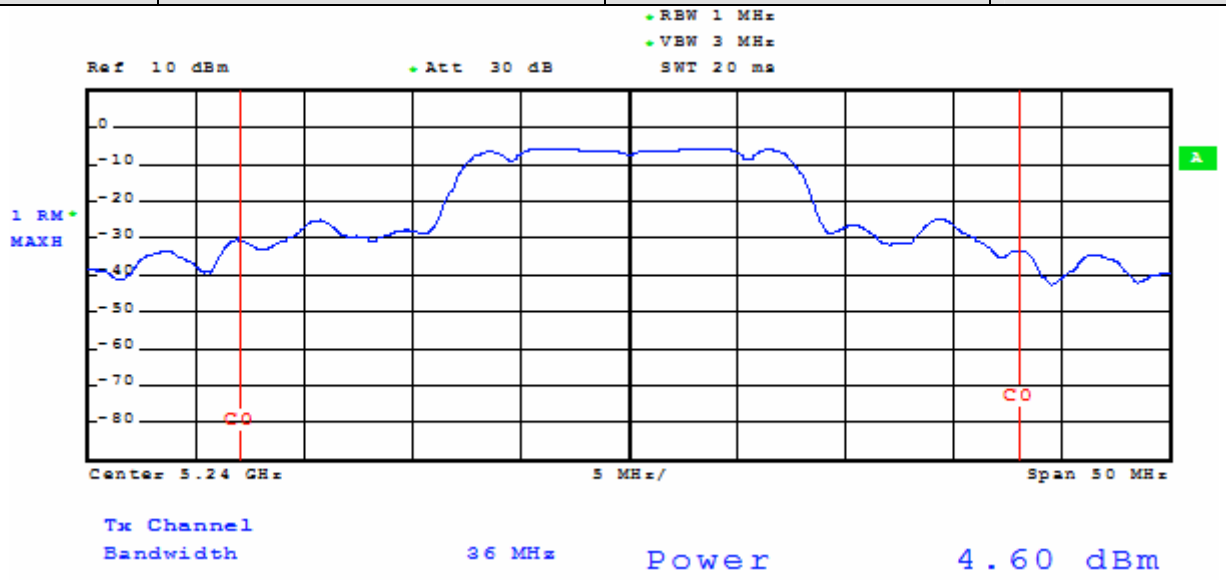
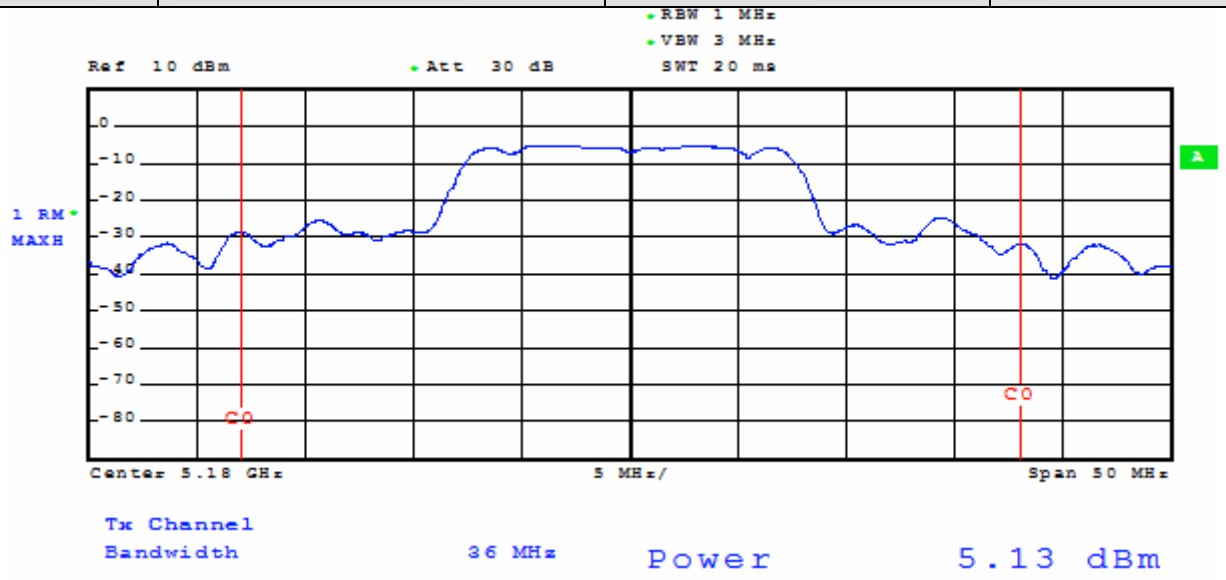
Test mode:	5.2GHz Band Antenna A	Test channel:	High



Test mode:	5.2GHz Band Antenna B	Test channel:	Low



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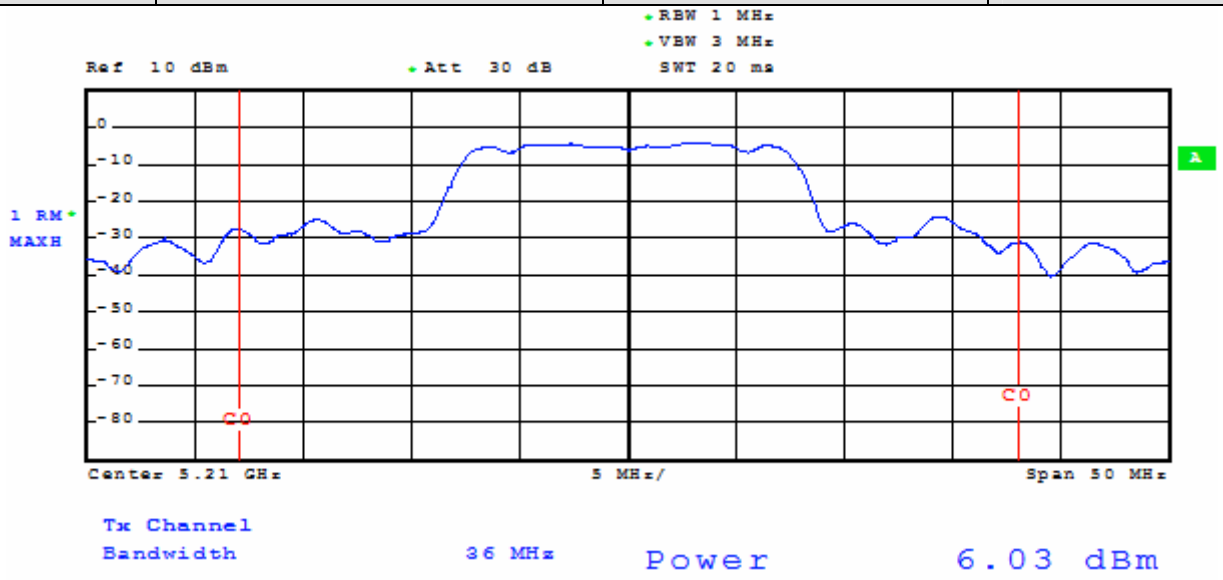
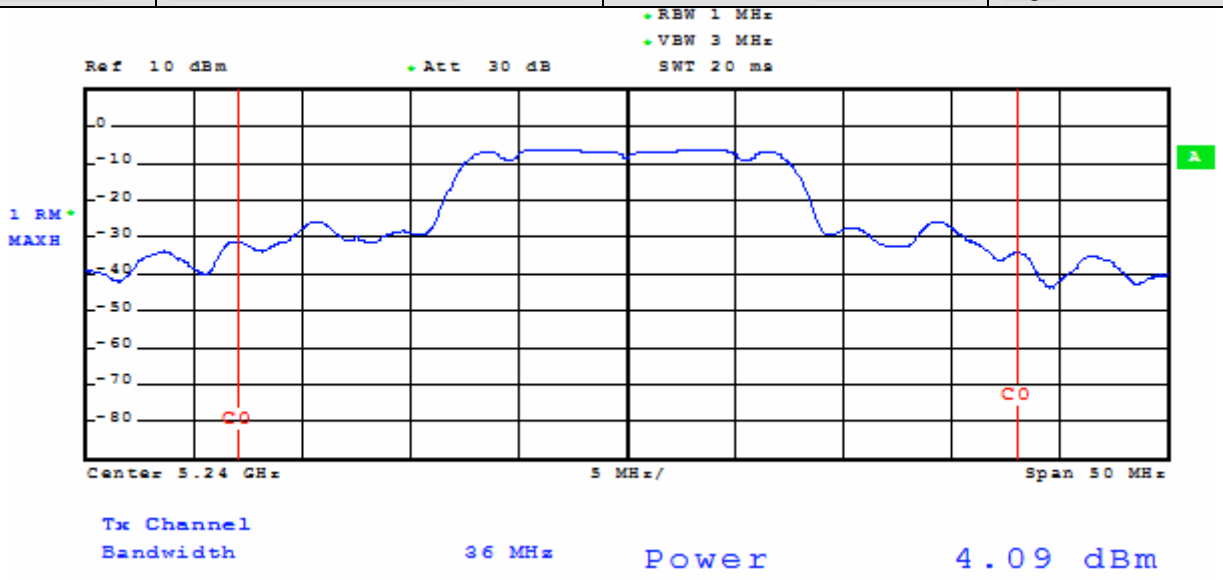
Test mode:	5.2GHz Band Antenna B	Test channel:	Middle



Test mode:	5.2GHz Band Antenna B	Test channel:	High



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7.4 Peak Power Spectral Density

Test Requirement: FCC Part15 407(a)(1)
RSS-210 Issue 8 Annex 9

Standard Applicable: According to section 15.407(a),
(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26- dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Procedure: The EUT was tested according to UNII test procedure of KDB 789033 for compliance to FCC 47CFR 15.407 requiremnts.
Set RBW=1MHz,Set VBW=3MHz,Span=50MHz,Sweep time=Auto,Set detector=Peak detector.

Measurement Result:

For Antenna A 5180-5240MHz Band:

CH	Frequency (MHz)	Reading (dBm)	Cable Loss (dB)	RF Power Density (dBm)	Limit (dBm)	Result
LOW	5180	-3.90	1.9	-2.00	4	PASS
MID	5210	-4.41	1.9	-2.51	4	PASS
HIGH	5240	-5.80	1.9	-3.90	4	PASS

For Antenna B 5180-5240MHz Band:

CH	Frequency (MHz)	Reading (dBm)	Cable Loss (dB)	RF Power Density (dBm)	Limit (dBm)	Result
LOW	5180	-5.58	1.9	-3.68	4	PASS
MID	5210	-6.46	1.9	-4.56	4	PASS
HIGH	5240	-6.82	1.9	-4.92	4	PASS

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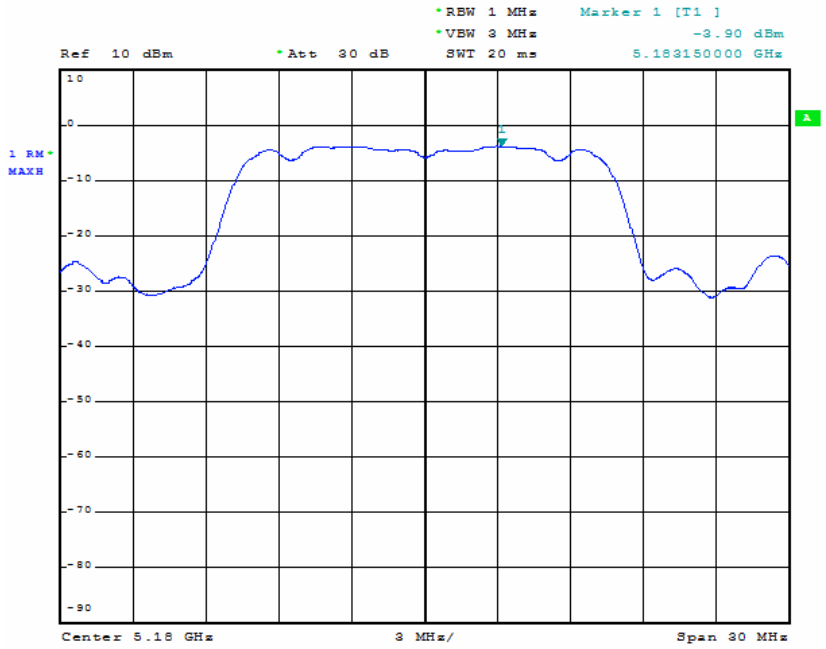
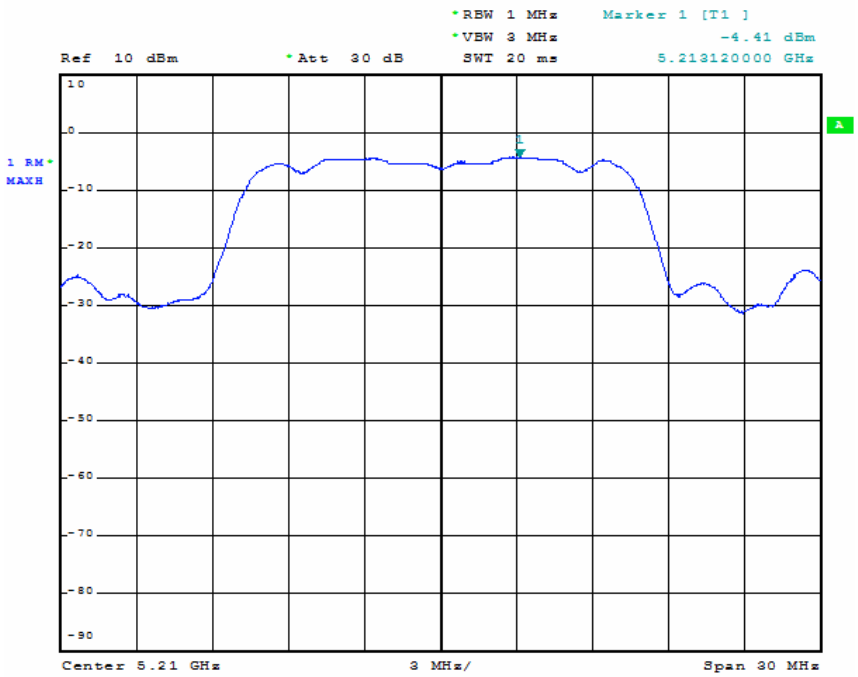
Test mode:	5.2GHz Band Antenna A	Test channel:	Low



Test mode:	5.2GHz Band Antenna A	Test channel:	Middle



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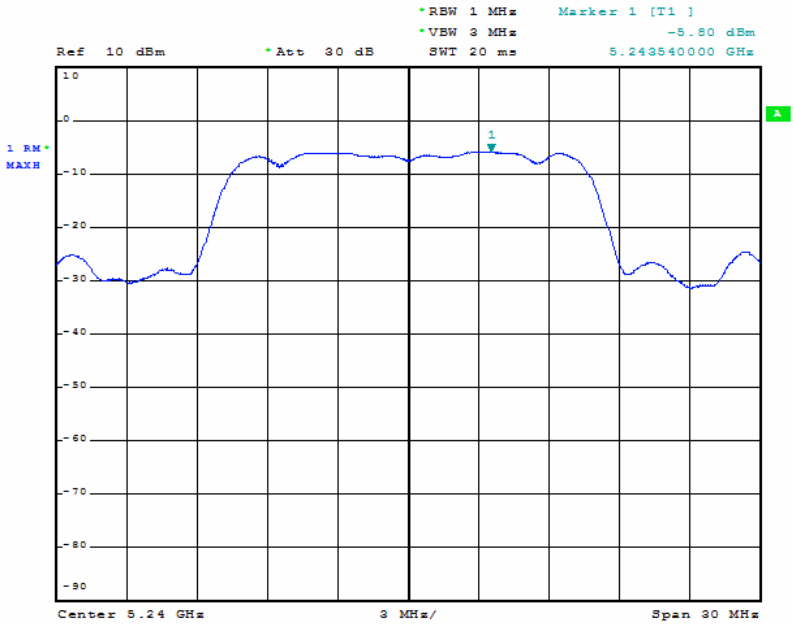
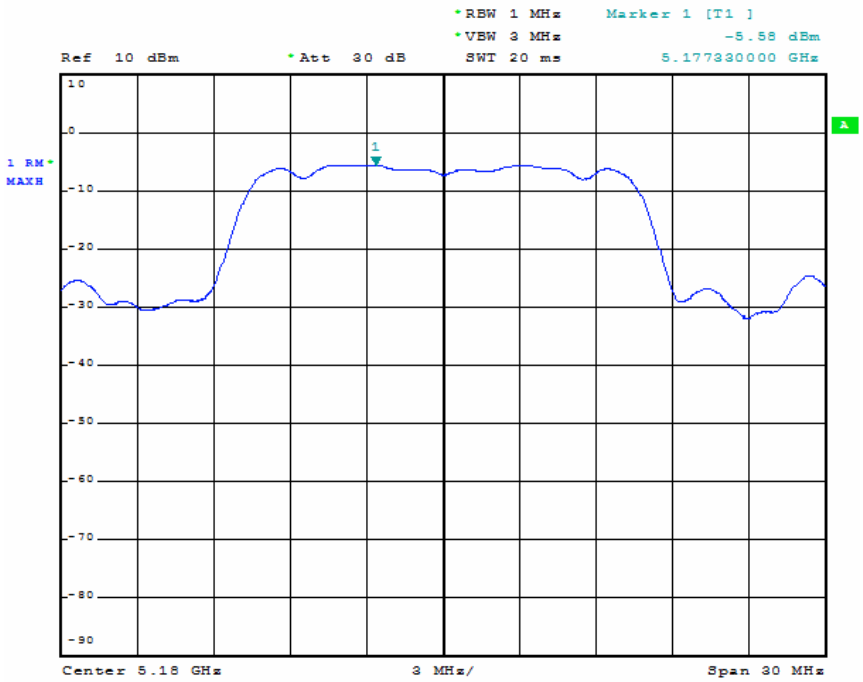
Test mode:	5.2GHz Band Antenna A	Test channel:	High



Test mode:	5.2GHz Band Antenna B	Test channel:	Low



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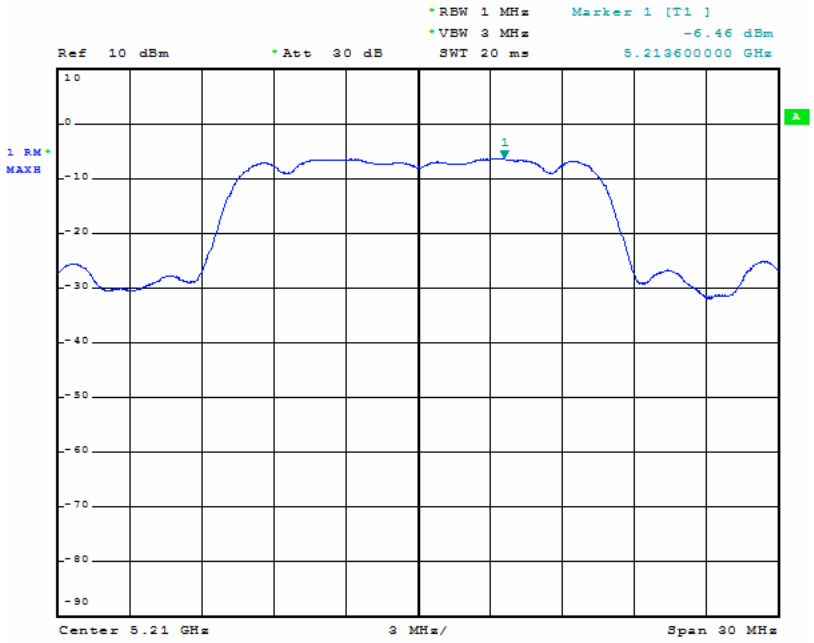
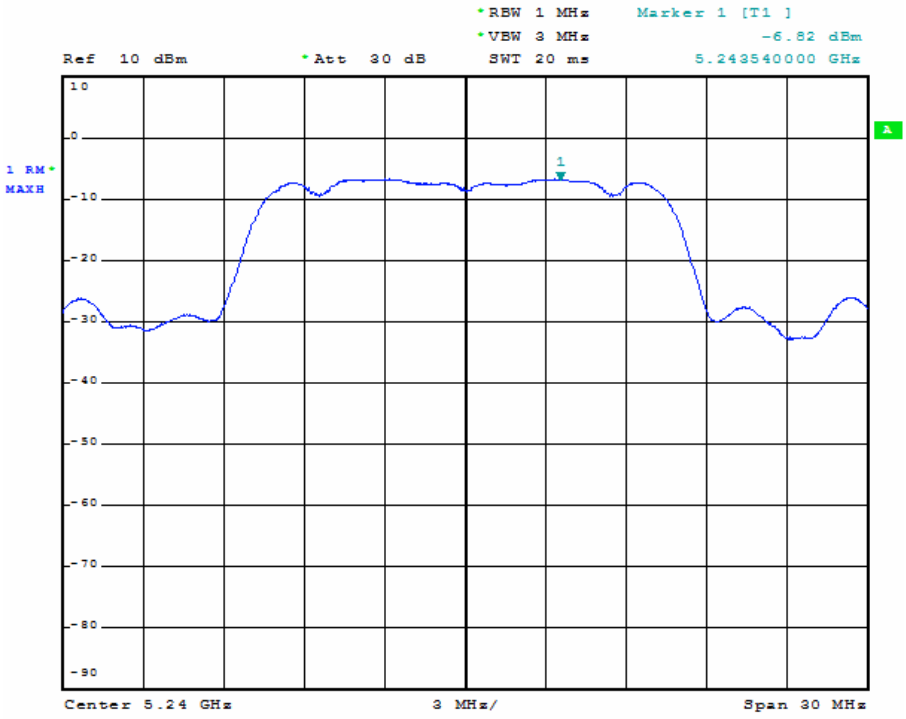
Test mode:	5.2GHz Band Antenna B	Test channel:	Middle



Test mode:	5.2GHz Band Antenna B	Test channel:	High



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7.5 Peak Power Excursion

Test Requirement: FCC Part15 407(a)(6)
RSS-210 Issue 8 Annex 9

Standard Applicable: According to section 15.407(a) and KDB 789033

(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Measurement Procedure:

1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum analyzer span to view the entire emission bandwidth.
3. Find the maximum of the peak-max-hold spectrum.

set RBW=1MHz,VBW ⩾ 3MHz, Detector=peak, Trace mode=max-hold

4. allowt the sweeps to continue until the trace stabilizes.
5. Use the peak search function to find the peak of the spectrum.
6. Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD

Note: PPSD reference section 6.3

Limit:

Frequency Band	Limit
5.15 – 5.25 GHz	13dB

Measurement Result:

For Antenna A 5180-5240MHz Band:

CH	Frequency (MHz)	Measure Value (dBm)	PPSD (dBm)	Peak power excursion (dB)	Limit (dBm)	Result
LOW	5180	-0.09	-3.90	3.81	13	PASS
MID	5210	-0.84	-4.41	3.57	13	PASS
HIGH	5240	-2.14	-5.80	3.66	13	PASS

For Antenna B 5180-5240MHz Band:

CH	Frequency (MHz)	Measure Value (dBm)	PPSD (dBm)	Peak power excursion (dB)	Limit (dBm)	Result
LOW	5180	-1.72	-5.58	3.86	13	PASS
MID	5210	-2.87	-6.46	3.59	13	PASS
HIGH	5240	-4.13	-6.82	2.69	13	PASS

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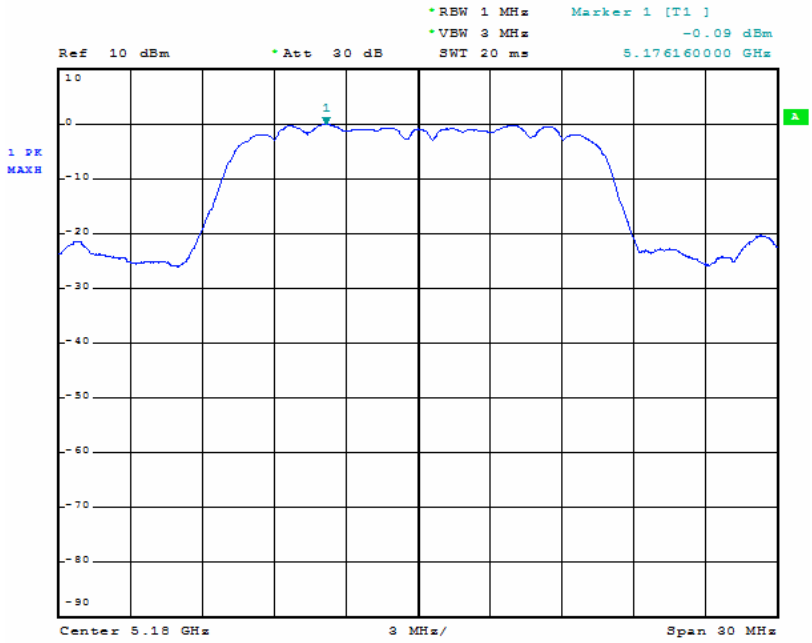
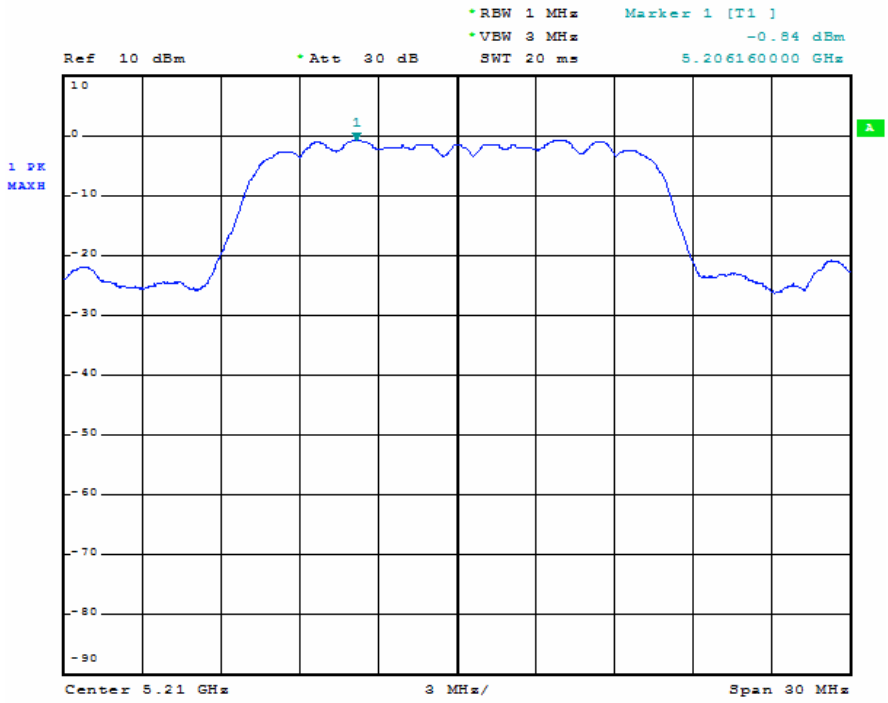
Test mode:	5.2GHz Band Antenna A	Test channel:	Low



Test mode:	5.2GHz Band Antenna A	Test channel:	Middle



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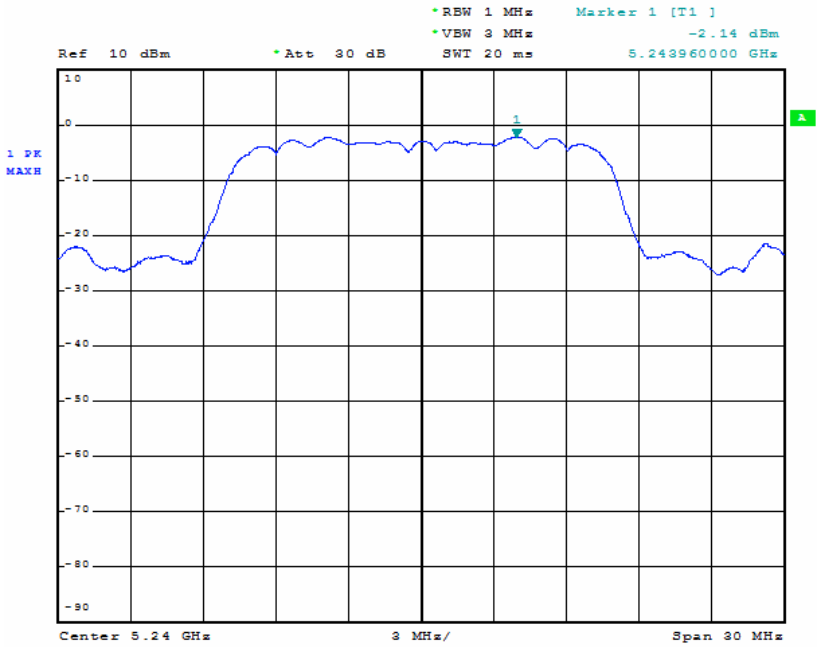
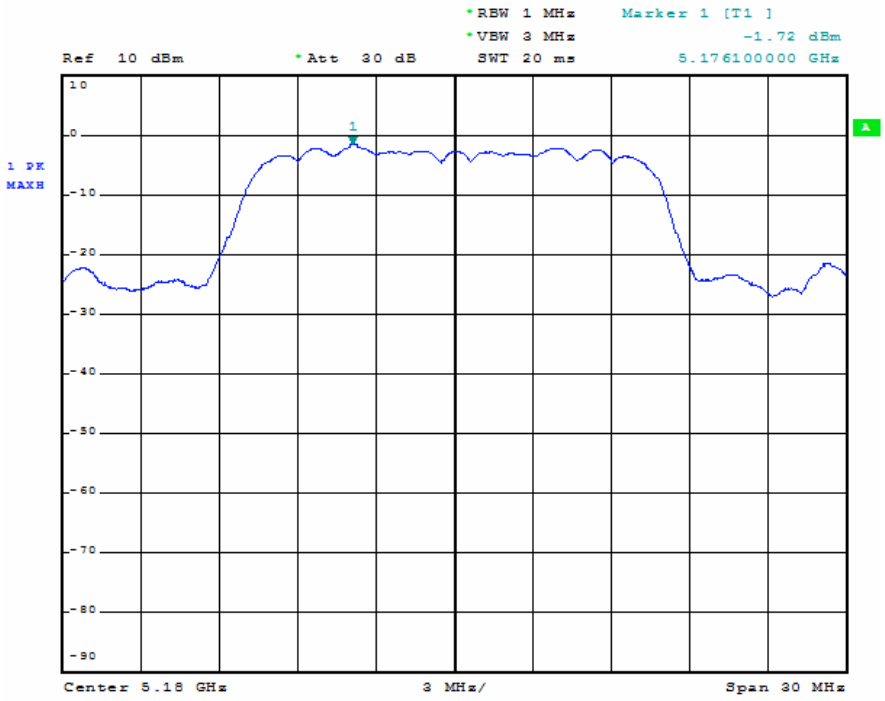
Test mode:	5.2GHz Band Antenna A	Test channel:	High



Test mode:	5.2GHz Band Antenna B	Test channel:	Low



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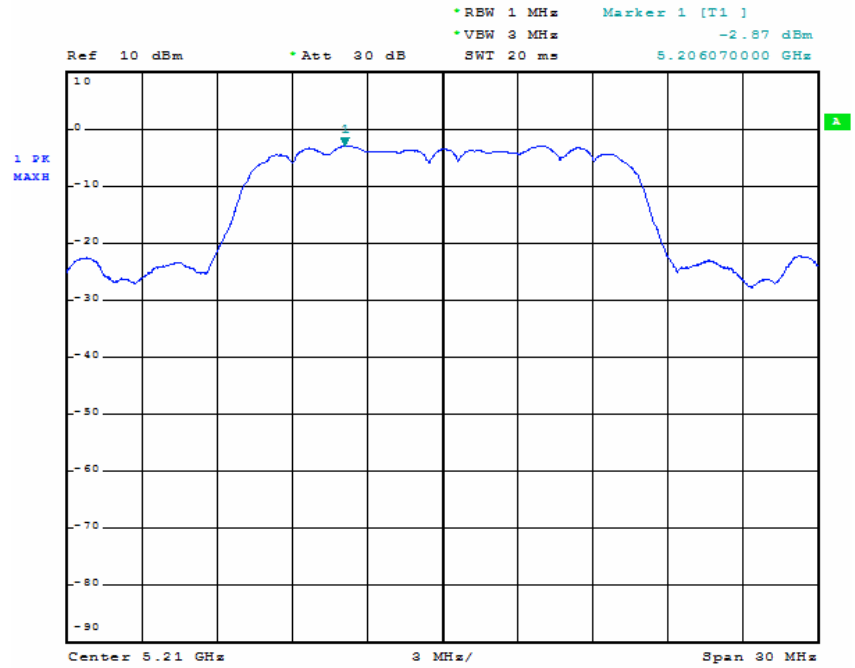
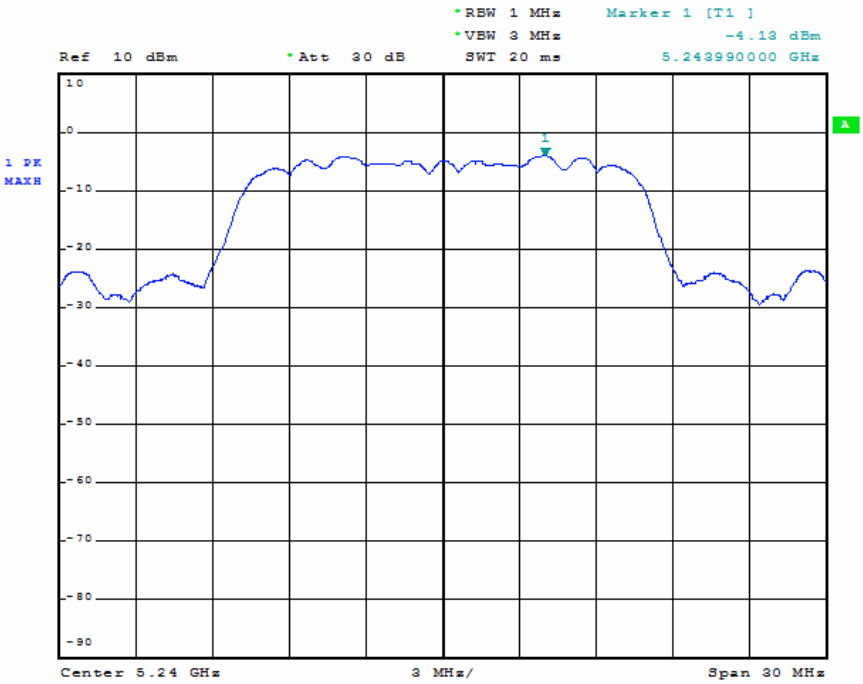
Test mode:	5.2GHz Band Antenna B	Test channel:	Middle



Test mode:	5.2GHz Band Antenna B	Test channel:	High



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7.6 Electric Field Strength Spurious Emissions

Test Requirement: FCC Part15 407(b)(1)(6)(7) and FCC Part 15.209
RSS-210 Issue 8 Annex 9

Standard Applicable: According to section 15.407(b)

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Pre-test with the Horizontal, Vertical and other status towards to the test antenna. To find the worst status.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
Test instrumentation resolution bandwidth 120 kHz and Quasi-Peak detector applies (30 MHz - 1000 MHz). 1MHz resolution bandwidth and Peak detector apply (1000 MHz – 25GHz)
Above 1GHz
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

Limit:

According to the general radiated limits in 15.209 as following

Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Limits of unwanted emission out of the restricted bands in 15.407

Operation Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength at 3m (dBμV/m) *
5150-5250	-27	68.3

Note: 1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

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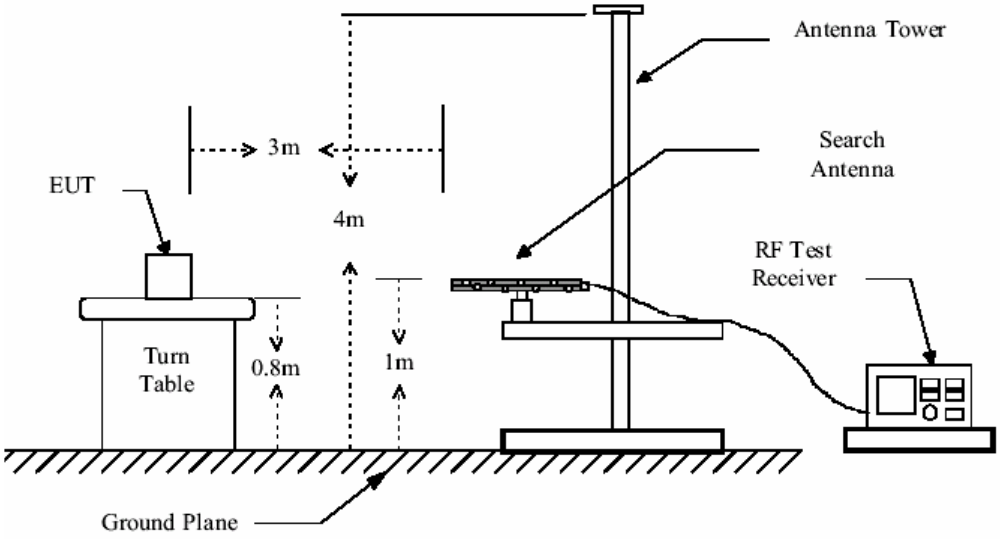
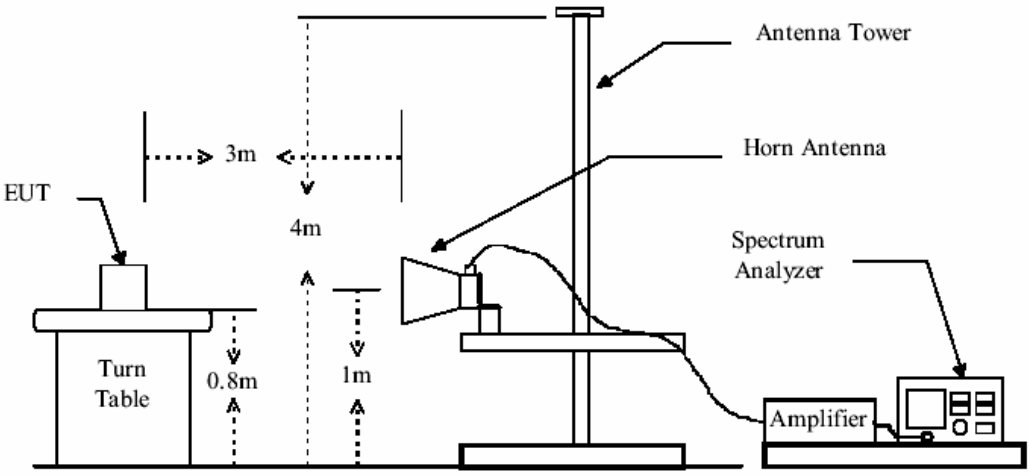
Radiated Test Set-up:

Radiated Emission Test Set-up,Frequency Below 1000MHz



Radiated Emission Test Set-up Frequency Over 1GHz



Low nosie amplifier was used below 1GHz,High pass Filter was used above 1GHz.

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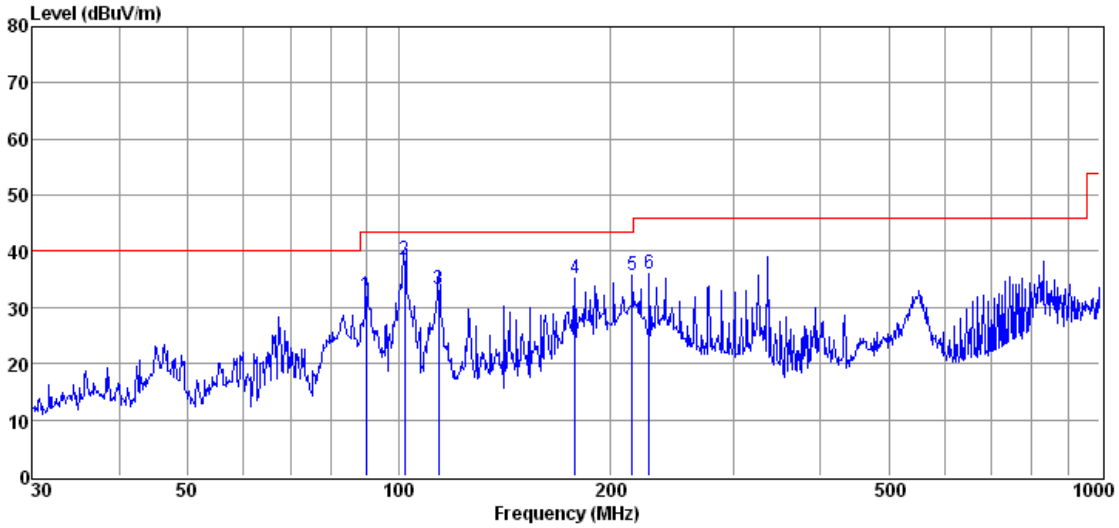
Tests results:

From the pre-test the worst status is the EUT Horizontal towards to the antenna. Below is the worst test results.

Operation Mode: 5.2GHz Band

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement Antenna: Horizontal



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit
(Mark)	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBuV/m)	(dB)
1	89.92	47.49	8.50	24.70	0.95	32.24	43.50	-11.26
2	101.99	52.81	9.38	24.70	1.05	38.54	43.50	-4.96
3	114.06	46.42	10.55	24.70	1.11	33.38	43.50	-10.12
4	178.43	47.13	11.29	24.60	1.40	35.22	43.50	-8.28
5	215.50	49.65	9.14	24.60	1.58	35.77	43.50	-7.73
6	227.90	49.72	9.26	24.60	1.63	36.01	46.00	-9.99

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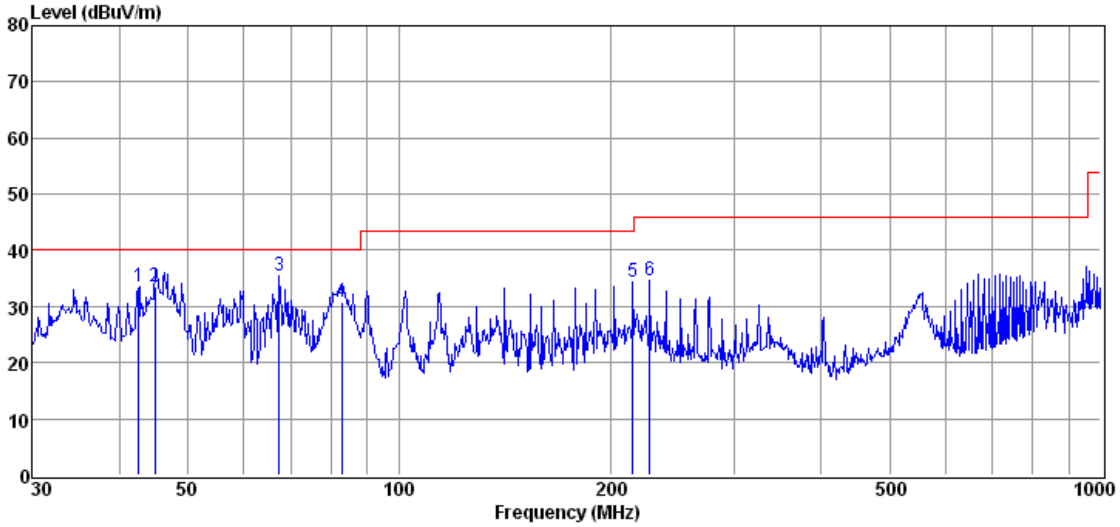
30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement Antenna: Vertical



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit
(Mark)	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dBµV/m)	(dBuV/m)	(dB)
1	42.58	44.38	13.20	24.70	0.58	33.46	40.00	-6.54
2	44.85	44.66	13.11	24.70	0.60	33.67	40.00	-6.33
3	67.50	48.32	11.15	24.70	0.78	35.55	40.00	-4.45
4	82.81	45.91	8.72	24.70	0.89	30.82	40.00	-9.18
5	215.45	48.36	9.15	24.60	1.58	34.49	43.50	-9.01
6	227.73	48.45	9.25	24.60	1.63	34.73	46.00	-11.27

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Above 1GHz Peak and Average Spurious Emissions Measurement

EUT mode: Antenna A

Test Antenna: Horizontal **Test Channel: Low**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10360	39.05	11.39	50.44	74	-23.56	peak
2	15540	46.60	9.66	56.26	74	-17.74	peak
3	20720	46.72	10.37	57.09	74	-16.91	peak
4	25900	45.47	14.61	60.08	74	-13.92	peak
5	10360	36.98	11.39	48.37	54	-5.63	AVG
6	15540	40.66	9.66	50.32	54	-3.68	AVG
7	20720	40.69	10.37	51.06	54	-2.94	AVG
8	25900	36.10	14.61	50.71	54	-3.29	AVG

Test Antenna: Vertical **Test Channel: Low**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10360	40.30	11.39	51.69	74	-22.31	peak
2	15540	46.60	9.66	56.26	74	-17.74	peak
3	20720	46.40	10.37	56.77	74	-17.23	peak
4	25900	46.18	14.61	60.79	74	-13.21	peak
5	10360	37.96	11.39	49.35	54	-4.65	AVG
6	15540	41.26	9.66	50.92	54	-3.08	AVG
7	20720	41.00	10.37	51.37	54	-2.63	AVG
8	25900	36.18	14.61	50.79	54	-3.21	AVG

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Test Antenna: Horizontal **Test Channel: Middle**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10420	45.37	11.52	56.89	74	-17.11	peak
2	15630	40.76	9.56	50.32	74	-23.68	peak
3	20840	45.91	10.24	56.15	74	-17.85	peak
4	26050	44.84	14.56	59.40	74	-14.6	peak
5	10420	38.3	11.52	49.82	54	-4.18	AVG
6	15630	36.97	9.56	46.53	54	-7.47	AVG
7	20840	39.17	10.24	49.41	54	-4.59	AVG
8	26050	37.39	14.56	51.95	54	-2.05	AVG

Test Antenna: Vertical **Test Channel: Middle**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10420	38.26	11.52	49.78	74	-24.22	peak
2	15630	46.32	9.56	55.88	74	-18.12	peak
3	20840	46.67	10.24	56.91	74	-17.09	peak
4	26050	45.95	14.56	60.51	74	-13.49	peak
5	10420	35.19	11.52	46.71	54	-7.29	AVG
6	15630	40.33	9.56	49.89	54	-4.11	AVG
7	20840	40.40	10.24	50.64	54	-3.36	AVG
8	26050	36.81	14.56	51.37	54	-2.63	AVG

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Test Antenna: Horizontal **Test Channel: High**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3428	47.11	-6.49	40.62	54	13.38	peak
2	9551	38.40	11.84	50.24	54	3.76	peak
3	13894	34.55	9.87	44.42	54	9.58	AVG
4	13903	44.97	9.89	54.86	74	19.14	peak
5	15410	34.53	10.44	44.97	54	9.03	AVG

Test Antenna: Vertical **Test Channel: High**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3428	45.98	-6.49	39.49	54	14.51	peak
2	7868	40.22	7.74	47.96	54	6.04	peak
3	10214	39.02	10.92	49.94	54	4.06	peak
4	15530	34.44	10.67	45.11	54	8.89	AVG
5	15535	45.28	10.67	55.95	74	18.05	peak

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EUT mode: Antenna B

Test Antenna: Horizontal **Test Channel: Low**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10360	38.74	11.39	50.13	74	-23.87	peak
2	15540	45.88	9.66	55.54	74	-18.46	peak
3	20720	45.94	10.37	56.31	74	-17.69	peak
4	25900	44.66	14.61	59.27	74	-14.73	peak
5	10360	37.32	11.39	48.71	54	-5.29	AVG
6	15540	41.05	9.66	50.71	54	-3.29	AVG
7	20720	40.42	10.37	50.79	54	-3.21	AVG
8	25900	35.88	14.61	50.49	54	-3.51	AVG

Test Antenna: Vertical **Test Channel: Low**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10360	39.93	11.39	51.32	74	-22.68	peak
2	15540	45.83	9.66	55.49	74	-18.51	peak
3	20720	45.88	10.37	56.25	74	-17.75	peak
4	25900	45.07	14.61	59.68	74	-14.32	peak
5	10360	36.46	11.39	47.85	54	-6.15	AVG
6	15540	40	9.66	49.66	54	-4.34	AVG
7	20720	40.35	10.37	50.72	54	-3.28	AVG
8	25900	35.9	14.61	50.51	54	-3.49	AVG

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Test Antenna: Horizontal **Test Channel: Middle**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10420	38.28	11.52	49.80	74	-24.20	peak
2	15630	45.78	9.56	55.34	74	-18.66	peak
3	20840	46.33	10.24	56.57	74	-17.43	peak
4	26050	45.42	14.56	59.98	74	-14.02	peak
5	10420	34.71	11.52	46.23	54	-7.77	AVG
6	15630	39.80	9.56	49.36	54	-4.64	AVG
7	20840	40.18	10.24	50.42	54	-3.58	AVG
8	26050	36.22	14.56	50.78	54	-3.22	AVG

Test Antenna: Vertical **Test Channel: Middle**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	10420	38.65	11.52	50.17	74	-23.83	peak
2	15630	40.25	9.56	49.81	74	-24.19	peak
3	20840	45.34	10.24	55.58	74	-18.42	peak
4	26050	45.1	14.56	59.66	74	-14.34	peak
5	10420	34.59	11.52	46.11	54	-7.89	AVG
6	15630	36.46	9.56	46.02	54	-7.98	AVG
7	20840	40.32	10.24	50.56	54	-3.44	AVG
8	26050	37.20	14.56	51.76	54	-2.24	AVG

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Test Antenna: Horizontal **Test Channel: High**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3771	41.06	-2.95	38.11	74	-35.89	peak
2	7766	39.84	7.74	47.58	74	-26.42	peak
3	9568	37.91	11.81	49.72	74	-24.28	peak
4	13764	34.89	9.51	44.40	54	-9.6	AVG
5	13767	46.3	9.51	55.81	74	-18.19	peak

Test Antenna: Vertical **Test Channel: High**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2411	48.92	-6.51	42.41	74	-31.59	peak
2	7817	40.25	7.74	47.99	74	-26.01	peak
3	9517	38.11	11.89	50.00	74	-24	peak
4	13760	34.76	9.5	44.26	54	-9.74	AVG
5	13767	45.52	9.51	55.03	74	-18.97	peak

Remark: No other radiation has been found

Test Level =Receiver Reading + Antenna Factor + Cable Loss –Preamplifier Factor.

Remark: No any other emissions level which are attenuated less than 20dB below the limit.

According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part. Hence there no other emissions have been reported.

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7.7 Radiated Emission Band Edge

Test Requirement: FCC Part15 407(b)(5)(7) and FCC Part 15.205

Standard Applicable: According to section 15.407(b)

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Measurement Distance: 3m (Semi-Anechoic Chamber)

Limit: 40.0 dBμV/m between 30MHz & 88MHz;

43.5 dBμV/m between 88MHz & 216MHz;

46.0 dBμV/m between 216MHz & 960MHz;

AV 54.0 dBμV/m PK 74.0dBμV/m above 960MHz.

Measurement Procedure: The EUT was setup according to ANSI 63.10,2009 and tested according to DTS test procedure of KDB789033 D01 for compliance to FCC 47 CFR 15.407 requirements.The EUT is placed on a turn table which is 0.8 m above ground.The turn table is rotated 360 degrees to determine to the position of the maximum emission level.The EUT was positioned such that the distance from antenna to the EUT was 3 menters.The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level

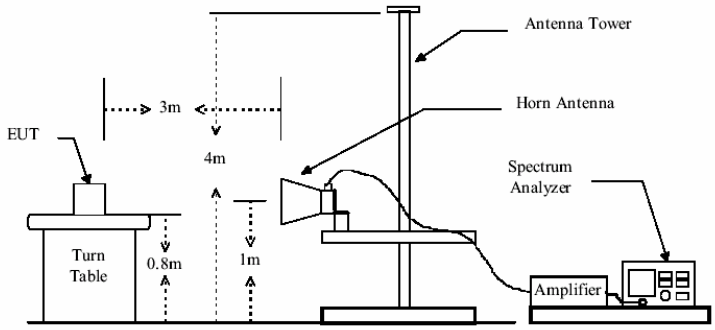
This is repeated for both horizontal and vertical polarization of the antenna.In order to find the maximum emission,all of the interface cables were manipulated according to ANSIC 63.10:2009 on radiated measurement.

Spectrum analyzer parameters setting as shown below:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

Radiated Emission Test Set-up Frequency Over 1GHz



The field strength is calculated by adding the Antenna Factor,Preamplifier Factor&Cable Factor. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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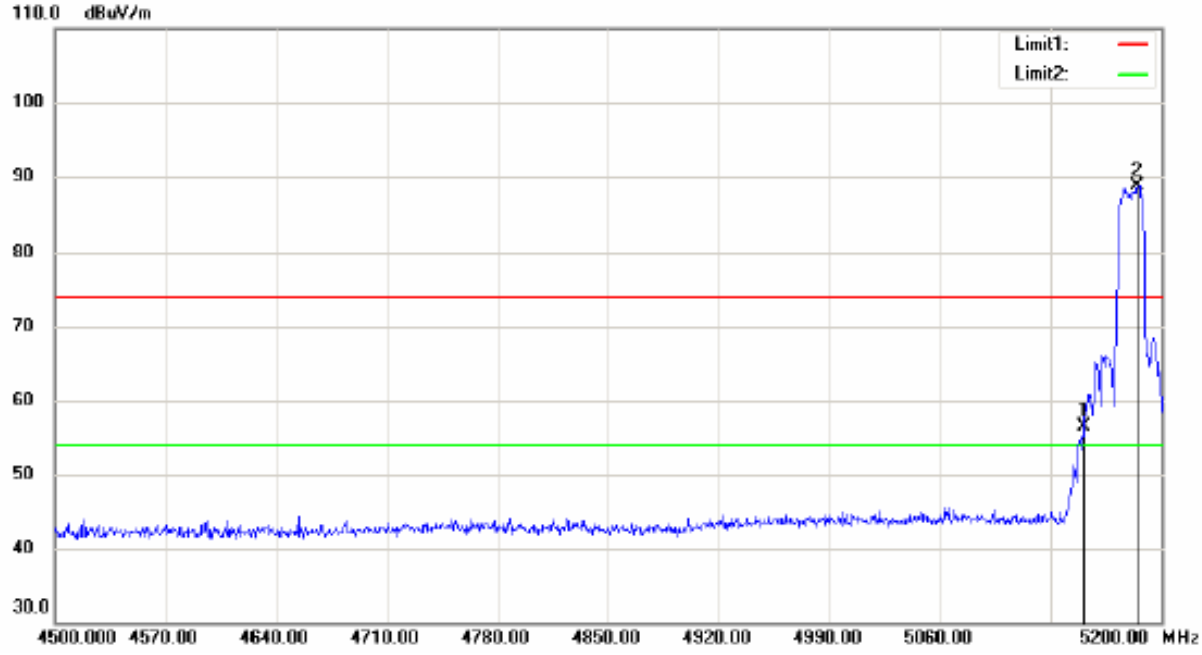
Radiated Bandedge Measurement Result:

Test mode:	5.2GHz Band Antenna A	Test channel:	Low

Horizontal, Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5151.000	55.71	peak	0.74	56.45	74.00	-17.55
2	5184.600	87.89	peak	0.78	88.67	74.00	14.67

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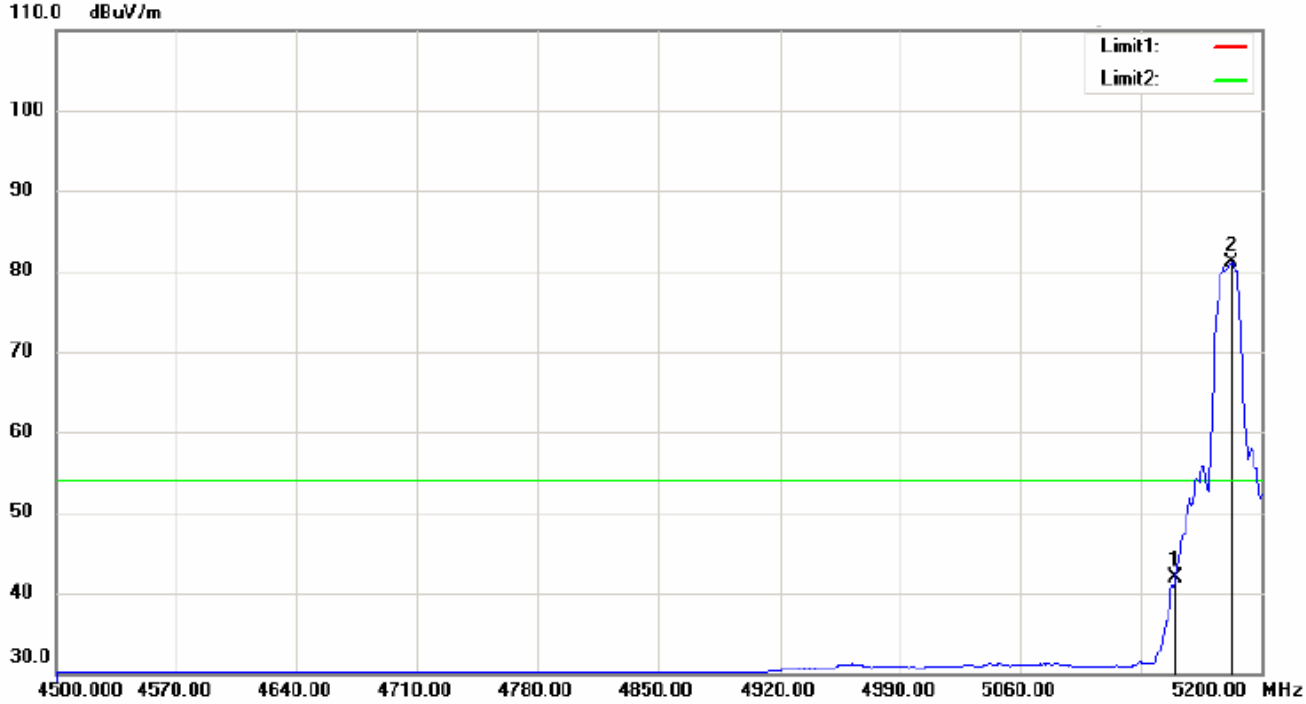
Horizontal, Average Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5150.300	41.11	peak	0.74	41.85	54.00	-12.15
2	5182.500	80.28	peak	0.77	81.05	54.00	27.05

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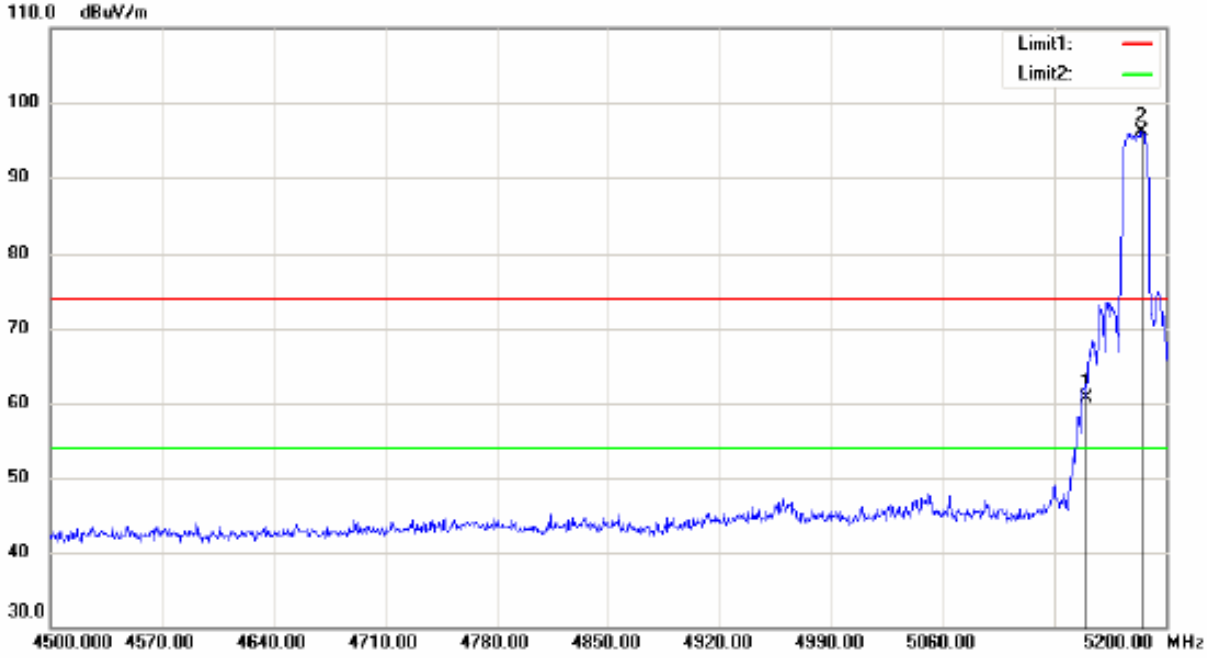
Vertical , Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5150.300	59.98	peak	0.74	60.72	74.00	-13.28
2	5184.600	95.33	peak	0.78	96.11	74.00	22.11

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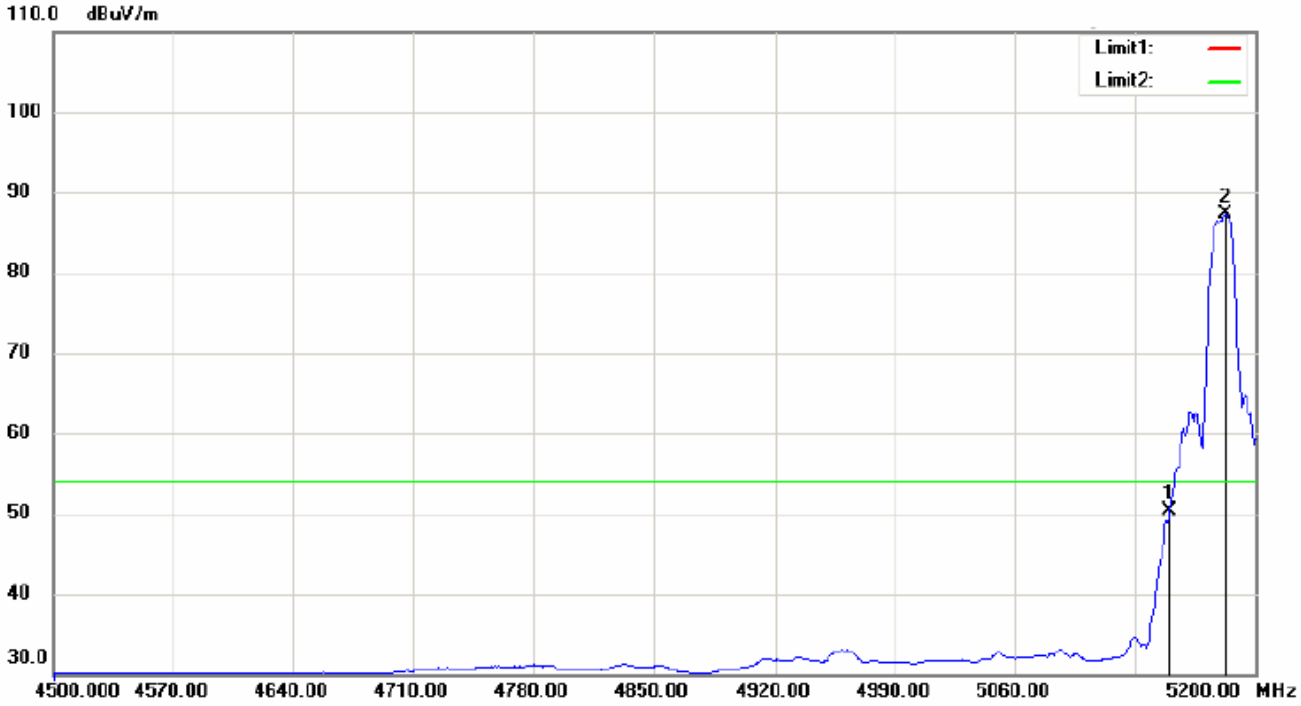
Vertical, Average Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5150.300	49.66	peak	0.74	50.40	54.00	-3.60
2	5182.500	86.44	peak	0.77	87.21	54.00	33.21

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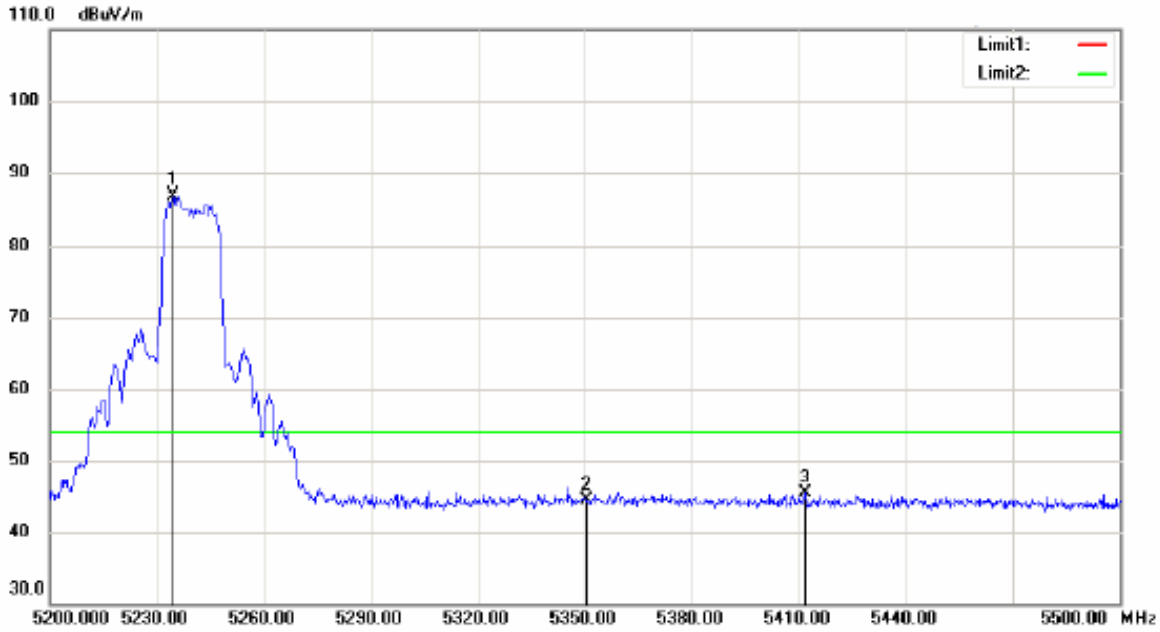
Test mode:	5.2GHz Band Antenna A	Test channel:	High

Horizontal, Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5234.500	86.17	peak	0.82	86.99	54.00	32.99
2	5350.600	43.55	peak	0.92	44.47	54.00	-9.53
3	5411.800	44.56	peak	0.97	45.53	54.00	-8.47

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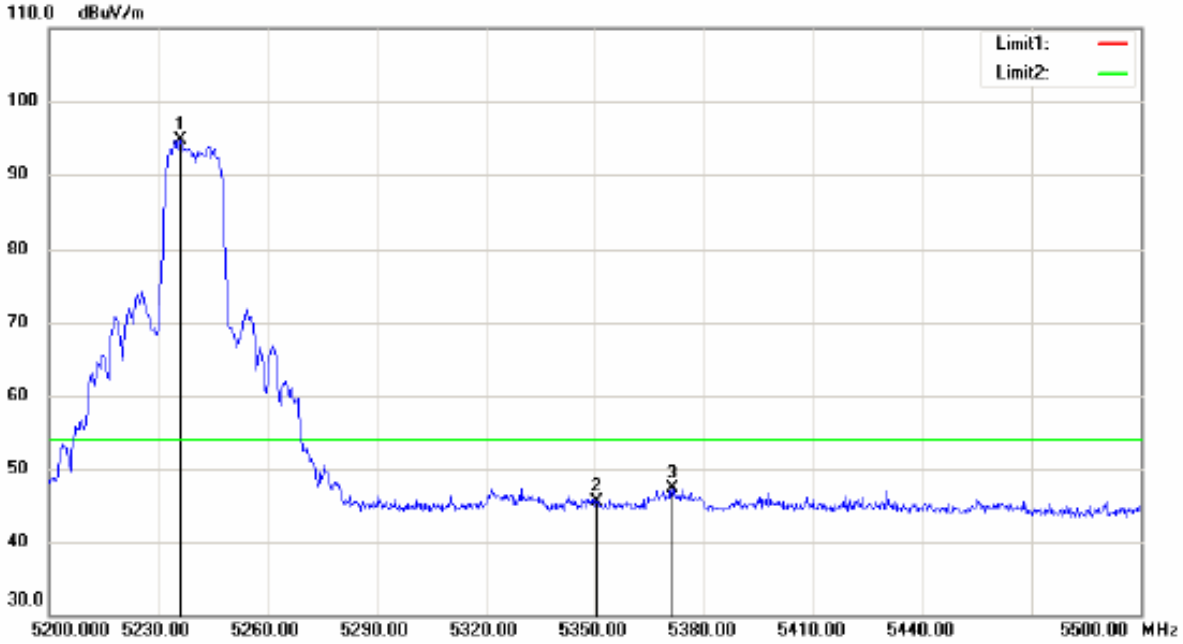
Vertical , Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5236.000	93.83	peak	0.82	94.65	54.00	40.65
2	5350.600	44.60	peak	0.92	45.52	54.00	-8.48
3	5371.300	46.37	peak	0.94	47.31	54.00	-6.69

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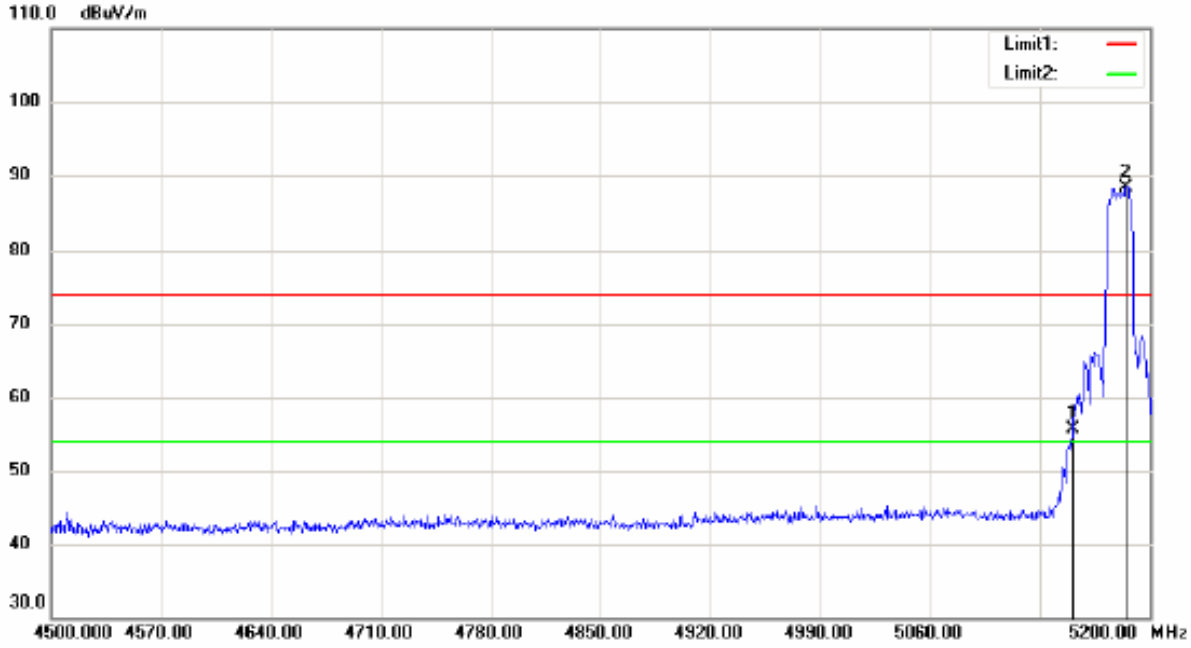
Test mode:	5.2GHz Band Antenna B	Test channel:	Low

Horizontal, Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5151.000	54.91	peak	0.74	55.65	74.00	-18.35
2	5184.600	87.62	peak	0.78	88.40	74.00	14.40

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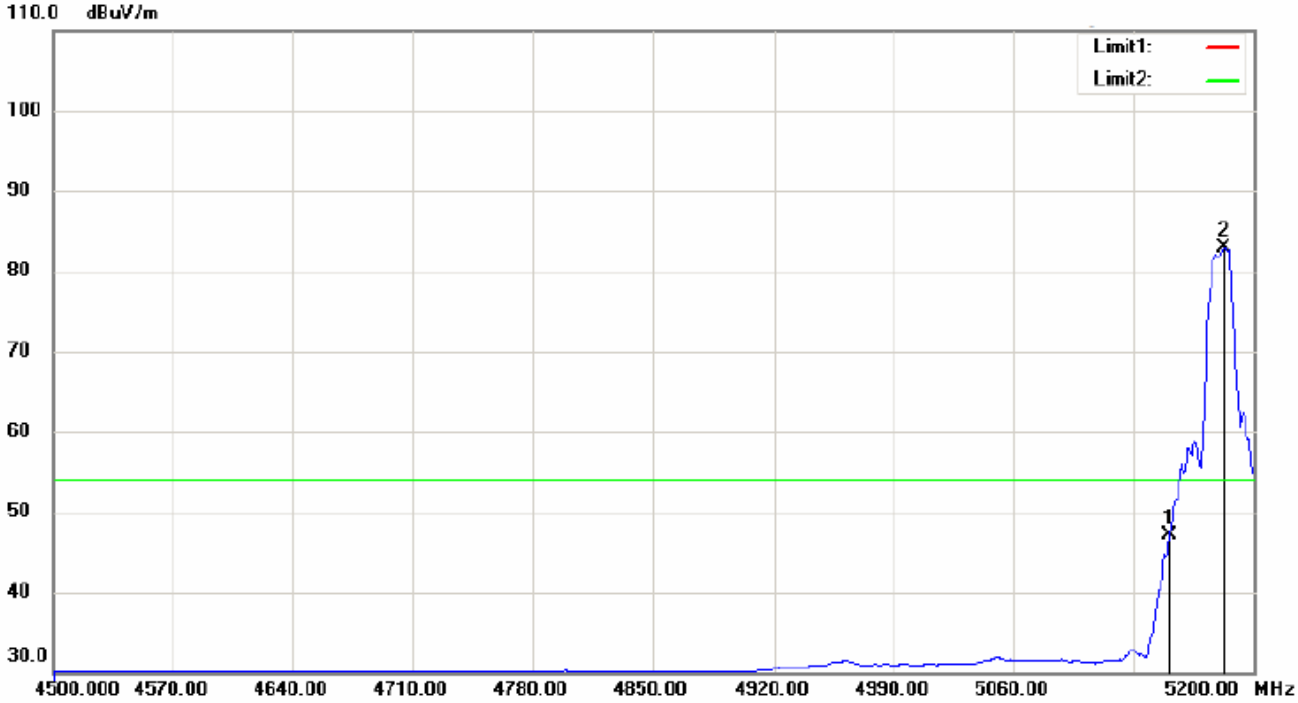
Horizontal, Average Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5151.000	46.31	peak	0.74	47.05	54.00	-6.95
2	5182.500	82.15	peak	0.77	82.92	54.00	28.92

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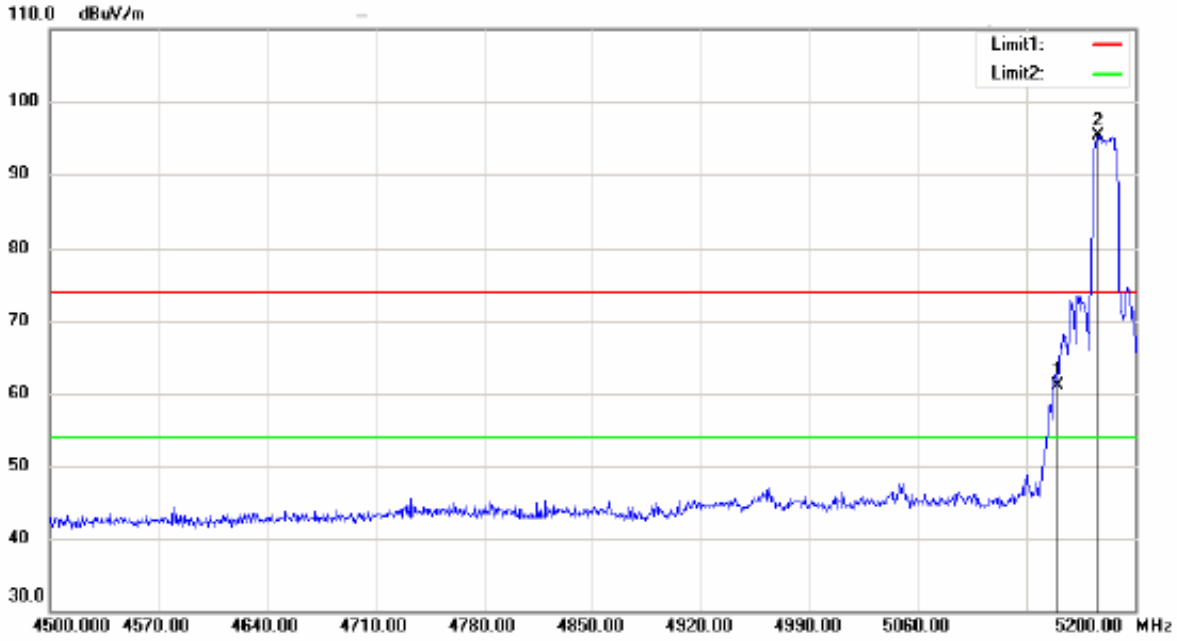
Vertical , Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5150.300	60.30	peak	0.74	61.04	74.00	-12.96
2	5176.200	94.53	peak	0.76	95.29	74.00	21.29

Horizontal, Average Detector:

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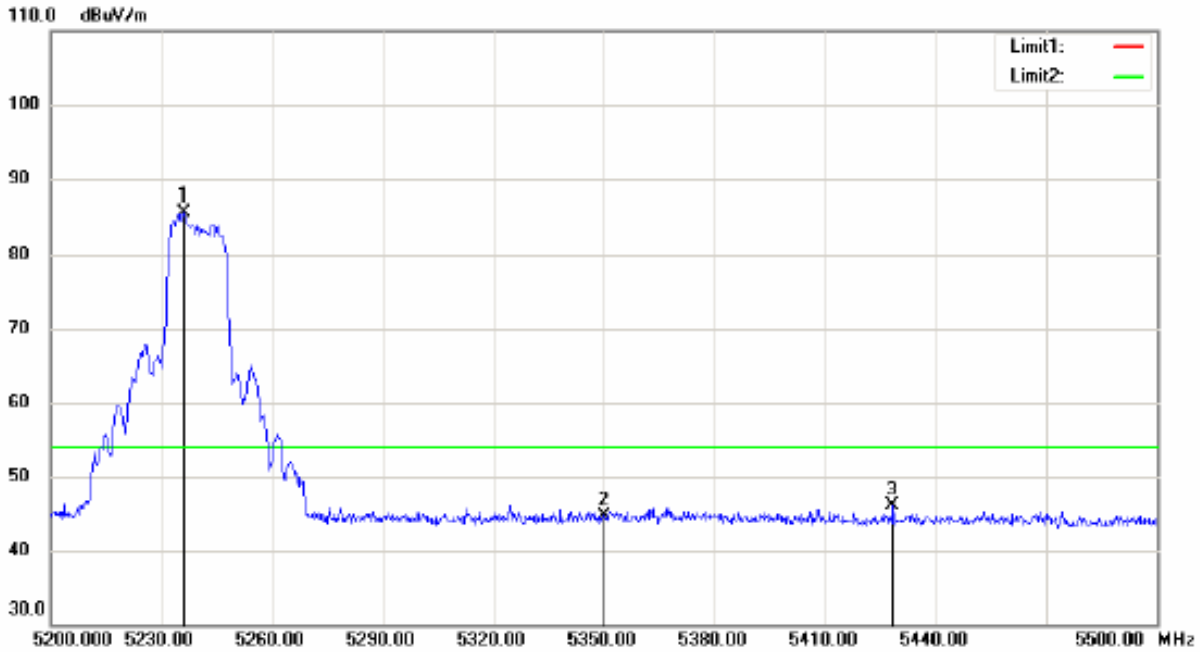
Test mode:	5.2GHz Band Antenna B	Test channel:	High

Horizontal, Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5236.000	84.81	peak	0.82	85.63	54.00	31.63
2	5350.300	43.79	peak	0.92	44.71	54.00	-9.29
3	5428.300	45.20	peak	0.98	46.18	54.00	-7.82

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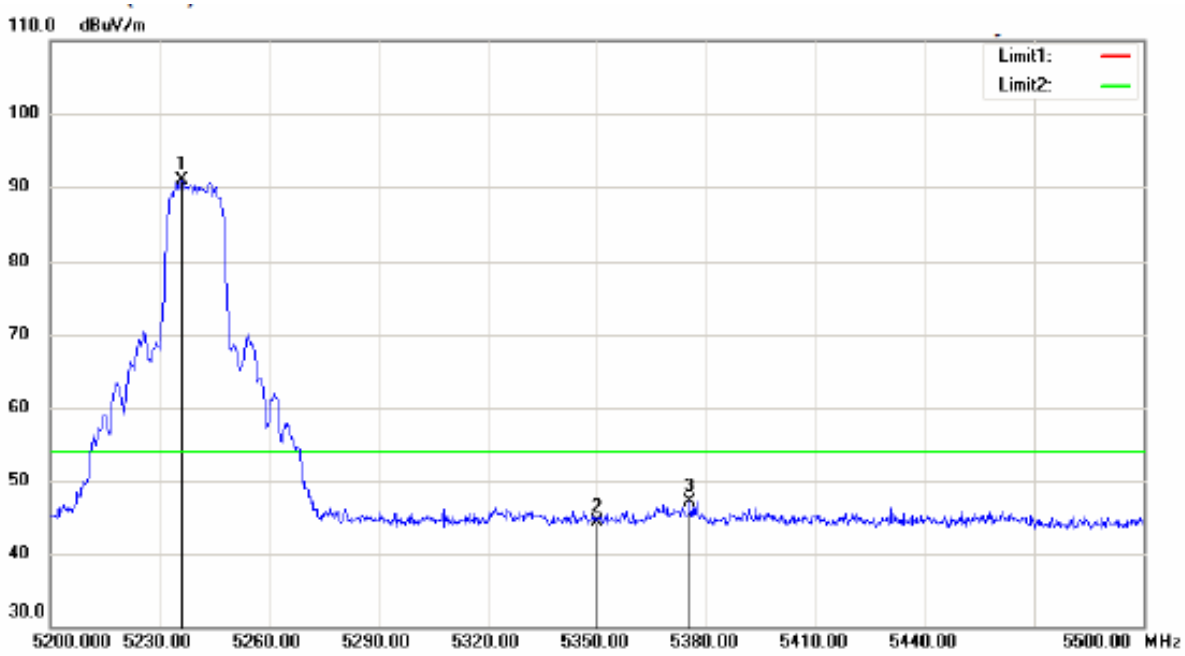
Vertical , Peak Detector:



Mk.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	5236.000	90.09	peak	0.82	90.91	54.00	36.91
2	5350.300	43.48	peak	0.92	44.40	54.00	-9.60
3	5375.500	46.22	peak	0.94	47.16	54.00	-6.84

Remark: No any other emission which fall in restricted bands can be detected and be reported.

Test Level = Receiver Reading + Antenna Factor + Cable Loss- Preamplifier Factor

All frequencies within the “Restricted bands” have been evaluated to compliance. Section 15.205 Restricted bands of operation.

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7.8 Frequency stability

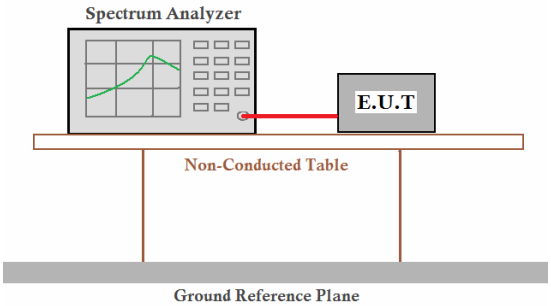
Test requirement: FCC Part15 407 (g)

Standard Applicable: According to section 15.407(g), the manufacturers of UNII devices are responsible for ensuing frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

Test Procedure:

1) Set up the EUT on lowest channel and the highest channel
2) Test the EUT in the lowest channel and the Highest channel ,
3) Select the lowest operating frequency of the equipment under test.
4) Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.
5) Adjust the centre frequency of spectrum analyzer on any frequency be measured.
6) Measure the frequency range by spectrum analyzer Marker function. set the Spectrum Analyzer as below:
   Span: Wide enough to capture the complete power envelope, including all side bands
   RBW: 100KHz
   VBW: 100KHz
   Detector function: RMS average
   Trace mode: Max Hold
   Sweep time: 1minute
7) Using the marker of the spectrum analyzer, find the the lowest frequency of the spectrum envelope This frequency shall be recorded as FL.
8) Select the highest operating frequency of the equipment under test.
9) Using the same set as step 6), find the highest frequency of the spectrum envelope. This frequency shall be recorded as FH.
10) Pretest the EUT at different transmission rate and worst case data in the report.

Test setup:



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Test Data:

Antenna A

Test Conditions		Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)	Result
Temp (℃)	Volt (V AC)				
T_{nom} (25)	V_{nom} (120)	5180	5169.35	F_L>5150	Pass
		5240	5248.65	F_H <5250	Pass
T_{min} (-20)	V_{min} (138)	5180	5171.53	F_L>5150	Pass
		5240	5248.56	F_H <5250	Pass
	V_{max} (102)	5180	5172.37	F_L>5150	Pass
		5240	5248.44	F_H <5250	Pass
T_{max} (55)	V_{min} (138)	5180	5175.49	F_L>5150	Pass
		5240	5248.72	F_H <5250	Pass
	V_{max} (102)	5180	5174.68	F_L>5150	Pass
		5240	5248.51	F_H <5250	Pass

Antenna B

Test Conditions		Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)	Result
Temp (℃)	Volt (V AC)				
T_{nom} (25)	V_{nom} (120)	5180	5174.06	F_L>5150	Pass
		5240	5248.95	F_H <5250	Pass
T_{min} (-20)	V_{min} (138)	5180	5175.03	F_L>5150	Pass
		5240	5249.02	F_H <5250	Pass
	V_{max} (102)	5180	5174.83	F_L>5150	Pass
		5240	5248.74	F_H <5250	Pass
T_{max} (55)	V_{min} (138)	5180	5174.94	F_L>5150	Pass
		5240	5248.67	F_H <5250	Pass
	V_{max} (102)	5180	5174.88	F_L>5150	Pass
		5240	5248.77	F_H <5250	Pass

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7.9 Occupied Bandwidth Test

Test Requirement: RSS-Gen Issue 3 Clause 4.6.1

Standard Applicable According to the section RSS-Gen Issue 3 Clause 4.6.1

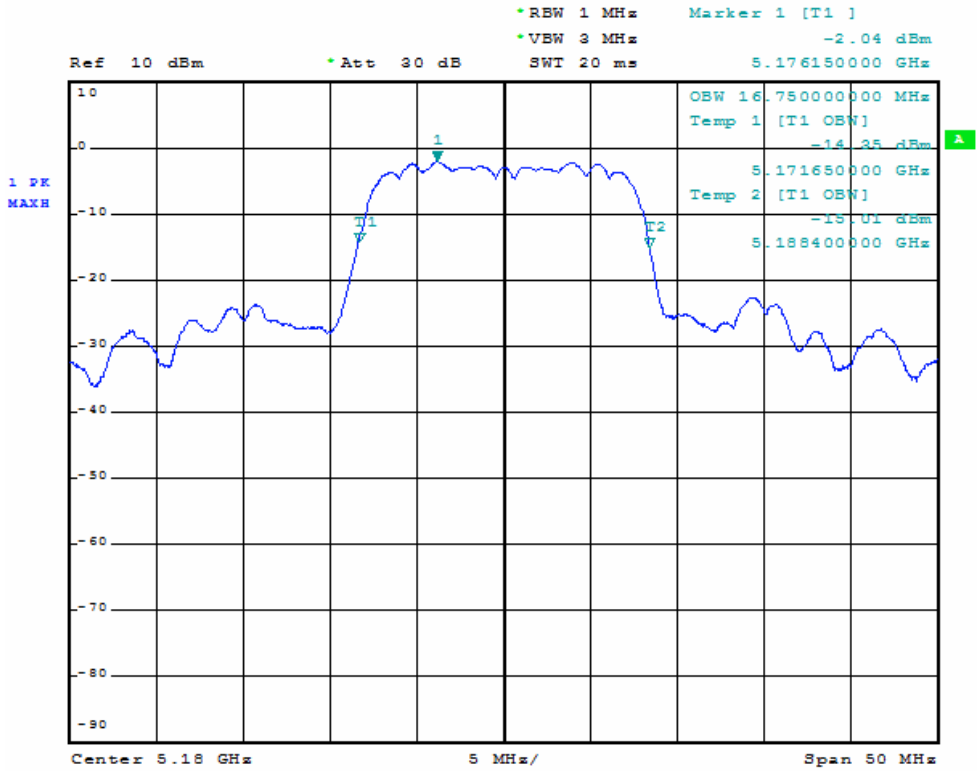
EUT Setup The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions set at 100kHz,the video bandwidth set at 300kHz.

Measurement Result:

For 5180-5240MHz Band

Test Mode	Channel	Frequency (MHz)	Bandwidth (MHz)
Antenna A	Low	5180	16.75
	Middle	5210	16.95
	High	5240	17.45
Antenna B	Low	5180	16.70
	Middle	5210	17.65
	High	5240	17.55

Test mode:	5.2GHz Band Antenna A	Test channel:	Low



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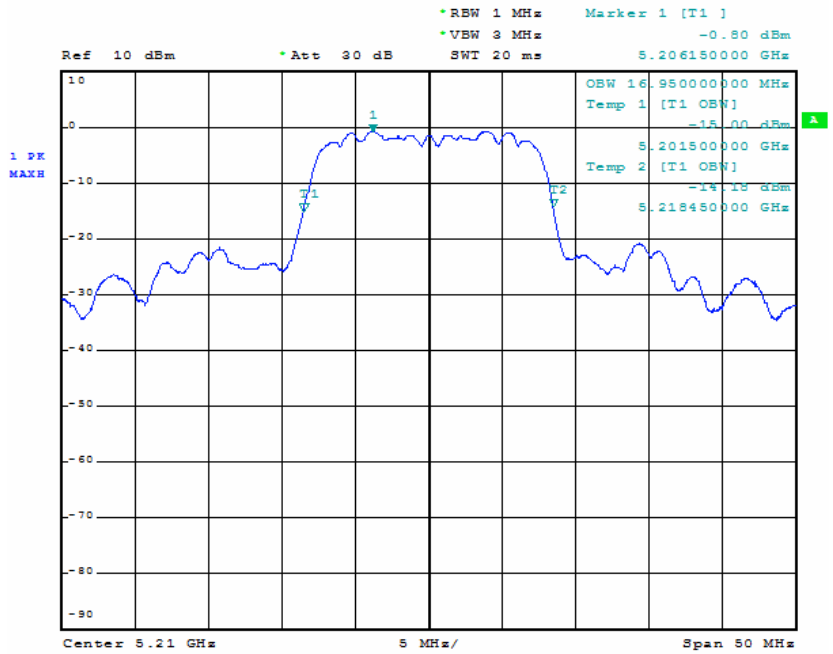
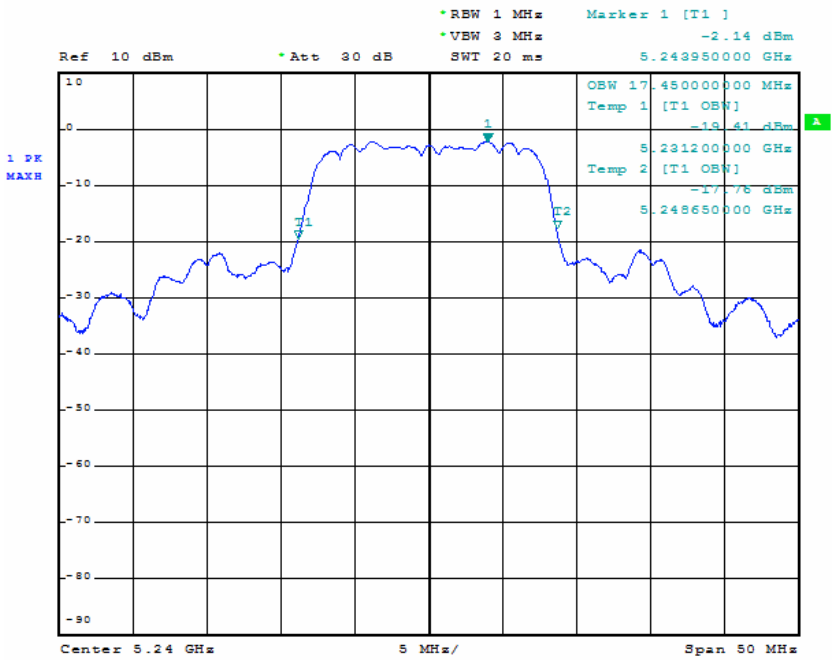
Test mode:	5.2GHz Band Antenna A	Test channel:	Middle



Test mode:	5.2GHz Band Antenna A	Test channel:	High



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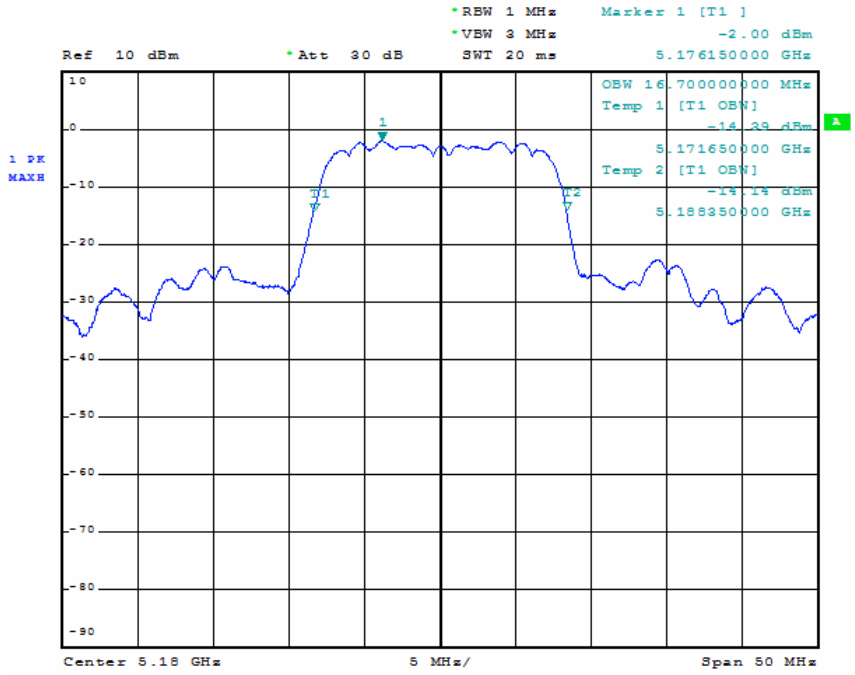
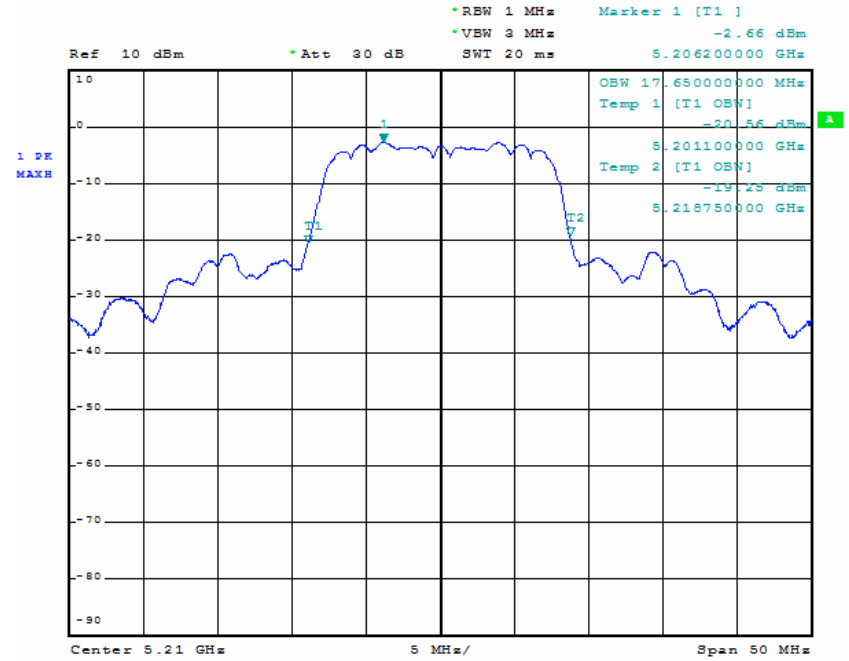
Test mode:	5.2GHz Band Antenna B	Test channel:	Low



Test mode:	5.2GHz Band Antenna B	Test channel:	Middle



Date: 9.APR.2013 13:40:06

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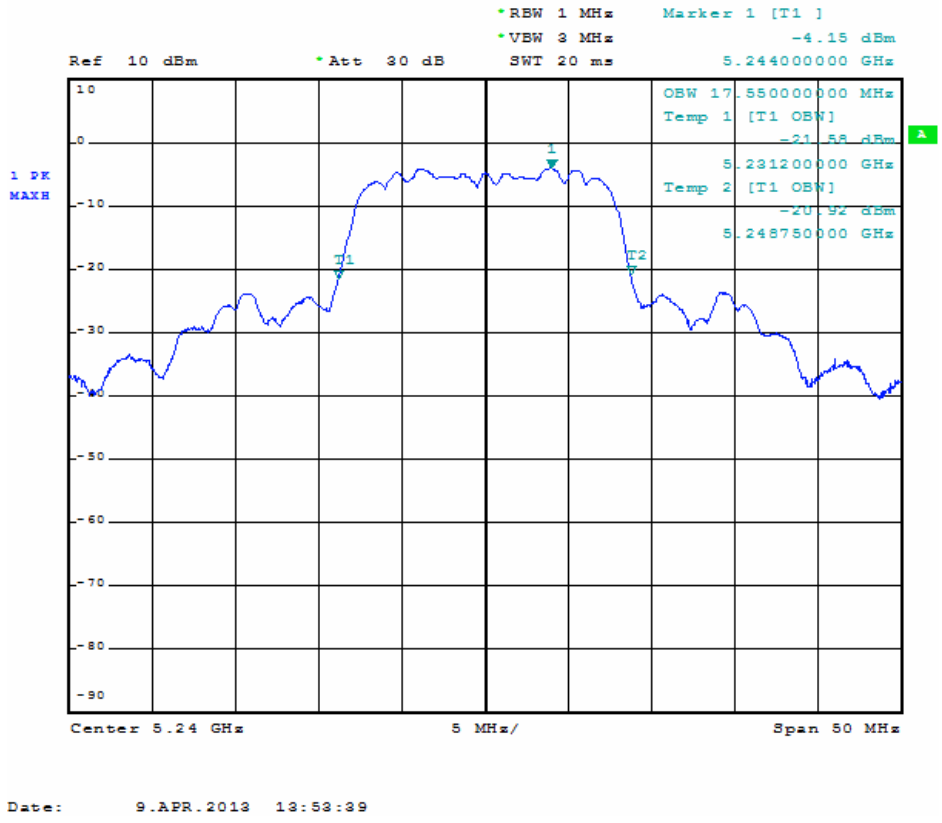
Test mode:	5.2GHz Band Antenna B	Test channel:	High



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8 Test Setup Photographs

Refer to the < DAC2-RX_Test Setup photos>.

9 EUT Constructional Details

Refer to the < DAC2-RX _External Photos > & < DAC2-RX _Internal Photos >.

End of Report

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