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Report No.: GZEM170700411701
Page: 1 of 67
FCC ID: 2AJ3GRSH1104AI

TEST REPORT

Application No.: GZEM1707004117CR
Applicant: Zhuhai RaySharp Technology Co., Ltd.
Address of Applicant: NO.100 OF TECHNOLOGY ROAD 6, NATIONAL HI-TECH ZONE, ZHUHAI, GUANGDONG, P.R. CHINA
Manufacturer: The same of Applicant
Address of Manufacturer: The same of Applicant
Factory: The same of Applicant
Address of Factory: The same of Applicant
Equipment Under Test (EUT):
EUT Name: Wireless Network Video Recorder
FCC ID: 2AJ3GRSH1104AI
Model No.: RS-H1104AI-N-W-LR, RS-Hxxxxyy-zz-zz-zzz; (x= 0-9; y, z= A-Z or blank) □
 □ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Standards: 47 CFR Part 15, Subpart C:2016 section 15.247
Date of Receipt: 2017-07-08
Date of Test: 2017-07-26 to 2017-08-01
Date of Issue: 2017-08-09

Test Result :	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Ricky Liu
Manager

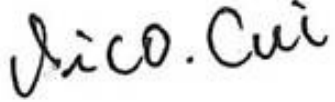

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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		2017-08-09		Original

Authorized for issue by:			
Tested By			2017-07-26 to 2017-08-01
	<u>Vico_Cui /Project Engineer</u>		<u>Date</u>
Checked By			2017-08-09
	<u>Ricky_Liu /Reviewer</u>		<u>Date</u>

3 Test Summary

Test	Test Requirement	Test method	Result
Antenna Requirement	FCC PART 15 C section 15.247 (c) and Section 15.203	FCC PART 15 C section 15.247 (c) and Section 15.203	PASS
6 dB Bandwidth	FCC PART 15 C section 15.247 (a)(2)	ANSI C63.10: Clause 11.8	PASS
Maximum Peak Output Power	FCC PART 15 C section 15.247(b)(3)	ANSI C63.10: Clause 11.9	PASS
Peak Power Spectral Density	FCC PART 15 C section 15.247(e)	ANSI C63.10: Clause 11.10	PASS①
Conducted Spurious Emission	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.11	PASS
Radiated Spurious Emission	FCC PART 15 C section 15.209	ANSI C63.10: Clause 11.12,6.3,6.5 and 6.6	PASS②
Radiated Emissions which fall in the restricted bands	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.12,6.3,6.5 and 6.6	PASS
Band Edges Measurement	FCC PART 15 C section 15.247 (d) &15.205	ANSI C63.10: Clause 11.13	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS
Remark1:			
<p>N/A: not applicable. Refer to the relative section for the details. EUT: In this whole report EUT means Equipment Under Test. Tx: In this whole report Tx (or tx) means Transmitter. Rx: In this whole report Rx (or rx) means Receiver. RF: In this whole report RF means Radio Frequency. ANSI C63.10: the detail version is ANSI C63.10:2013 in the whole report. Conducted testing use a direct connection between the antenna port of the device and the spectrum analyzer, may through suitable attenuator, all the attenuation in the conducted RF path, include cable loss or external attenuation will be offset to the spectrum analyzer during testing. Detailed offset value, please refer to the corresponding test plot.</p>			
<p>▣ Declaration of EUT Family Grouping: Model No.: RS-H1104AI-N-W-LR, RS-Hxxxxyy-zz-zz-zzz; (x= 0-9; y, z= A-Z or blank) Model No.: BES870, BES870 /A. According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, only with different Model No. Therefore only one model RS-H1104AI-N-W-LR was tested in this report.</p>			
<p>**: The EUT passed Peak Power Spectral Density and Radiated Emissions tests after modification.</p>			

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5 General Information

5.1 Details of E.U.T.

Operating Frequency	2406MHz to 2469MHz
Type of Modulation:	GFSK
Equipment types:	DSSS with Adaptive
Number of Channels	19Channels
Duty Cycle:	Continuous operation possible for testing purposes
Antenna Type	Integral
Antenna gain:	3 dBi
Function:	2.4G Wireless Network Video Recorder
Power Supply:	DC 12V (DC power Supplied by SGS for testing purpose)
Test Voltage:	DC 12V
Cable:	NA
EUT Function:	Video recorder with 2.4GHz wireless function for data transmission with The paired wireless function monitor.
EUT specialty:	The EUT contains two identical RF modules (RF1 & RF 2) and they are Working with paired monitors independently. And no possibility to occupy the same working frequency band at same time.

5.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
NoteBook	Lenovo	R400	L3-ABB9E
LCD-Displaying	DELL	SP2208WFPt	
Keyboard	DELL	SK-8115	
Mouse	Lenovo	MO28UOL	
DC Power supply(EMC 0008)	Instek	PS-6010	L9905E037.11
IR Controller	Raysharp	NA	NA

5.3 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

5.4 Abnormalities from Standard Conditions

The EUT passed Peak Power Spectral Density and Radiated Emissions which fall in the restricted bands tests after modification.



5.5 Other Information Requested by the Customer

None.

5.6 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

5.7 Measurement Uncertainty

No.	Item	Measurement uncertainty
1	Conducted emission	1.02dB(9kHz to 150kHz)
		1.05dB(150kHz to 30MHz)
2	Radiated emission	5.06dB(30MHz to 1GHz)
		5.06dB(1GHz to 26GHz)

5.8 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

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.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IEC 01 and Rules of procedure IEC 02, and the relevant IEC CB-Scheme Operational documents.

6 Equipment List

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2016-12-04	2019-12-03
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2017-01-20	2018-01-19
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2017-01-20	2018-01-19
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2016-04-19	2018-04-18
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2016-09-08	2019-09-07
SEM003-18	Trilog Broadband Antenna 25-2000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	665	2016-06-29	2019-06-28
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2016-09-08	2019-09-07
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2017-05-04	2020-05-03
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2016-09-09	2019-09-08
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2017-01-20	2018-01-19
EMC2065	Amplifier	HP	8447F	N/A	2017-06-19	2018-06-18
EMC2086	PRE AMPLIFIER MH648A	ANRITSU CORP	MH648A	N/A	2016-12-02	2017-12-01
EMC2063	Pre-amplifier 1GHz-26GHz	Compliance Direction Systems Lnc.	PAP-1G26-48	6279.628	2016-12-02	2017-12-01
EMC0523	Active Loop Antenna	EMCO	6502	42963	2016-02-27	2018-02-26
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9170	9170-375	2017-05-23	2020-05-22
EMC2079	High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	009	2017-01-20	2018-01-19
EMC2069	2.4GHz Filter	Micro-Tronics	BRM50702	149	2017-01-20	2018-01-19
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2016-04-30	2018-04-29



SGS-CSTC Standards Technical Services Co., Ltd.
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Conducted Emission						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m ³	N/A	N/A	N/A
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2017-01-20	2018-01-19
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2016-09-20	2017-09-19
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2016-12-02	2017-12-01
EMC0107	Coaxial Cable	SGS	2m	N/A	2016-07-24	2018-07-23
EMC0106	Voltage Probe	SGS	N/A	N/A	2016-04-05	2018-04-04
EMC0120	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	20550	2016-09-26	2017-09-25
EMC0121	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	20549	2016-09-28	2017-09-27
EMC0122	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	20548	2016-09-26	2017-09-25
EMC2047	CDN	Elektronik- Feinmechanik	L-801:AF2	2793	2015-09-19	2018-09-18
EMC2048	CDN	Elektronik- Feinmechanik	L-801:M2/M3	2738	2015-09-25	2018-09-24
EMC2062	6dB Attenuator	HP	8491A	24487	2016-04-05	2018-04-04
EMC0167	Conical metal housing	SGS-EMC	N/A	N/A	2016-04-19	2018-04-18

General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2016-09-01	2017-08-31
EMC0007	DMM	Fluke	73	70671122	2016-08-22	2017-08-21

7 Test Results

7.1 E.U.T. test conditions

Test Voltage:	DC 12V
Temperature:	20.0 -25.0 °C
Humidity:	38-50 % RH
Atmospheric Pressure:	1000 -1010 mbar

Requirements:

15.31(e): For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

15.32: Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

Test frequencies and frequency range: According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified



EUT channels and frequencies list:

No.	Channel
1	2406
2	2409.5
3	2413
4	2416.5
5	2420
6	2423.5
7	2427
8	2430.5
9	2434
10	2437.5
11	2441
12	2444.5
13	2448
14	2451.5
15	2455
16	2458.5
17	2462
18	2465.5
19	2469

Using the special software and development board we can enter the product for engineer mode then we can control the EUT to select the wanted channel for test as above list.

Test frequencies are the lowest channel: 1 channel (2406MHz), middle channel: 11 channel (2441 MHz) and highest channel: 19 channel (2469 MHz).

7.2 Antenna Requirement

Standard requirement

15.203 requirement:

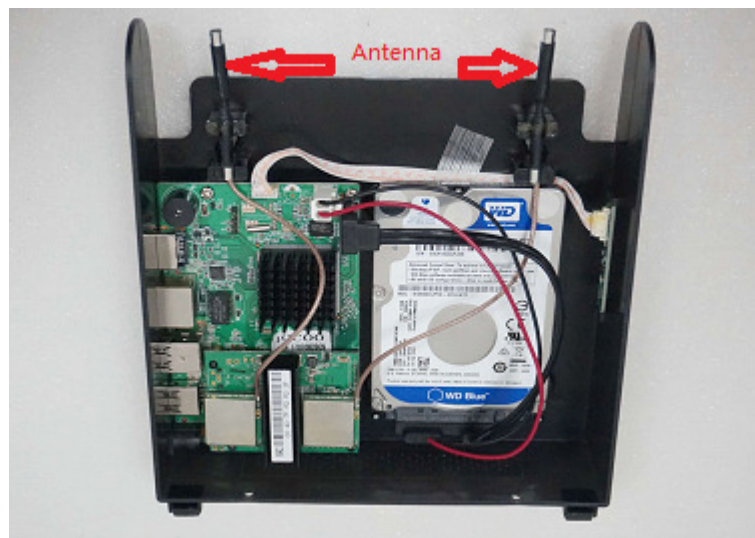
For intentional device. According to 15.203. an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna

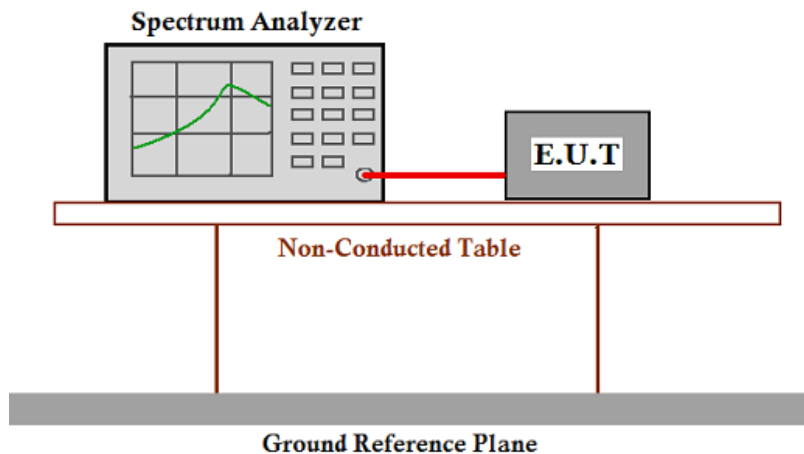
The antenna is integrated PCB antenna and no consideration of replacement. The two antennas and the two connected RF modules are totally identical. The maximum gain of the antenna is 3 dBi.



Test result: The unit does meet the FCC requirements.

7.3 6 dB Bandwidth

Test Requirement:	FCC Part 15 C section 15.247 (a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10: Clause 11.8
Test Status:	Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.
Test Configuration:	



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW=100 kHz. VBW = 300 kHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Set span to encompass the entire emission bandwidth of the signal.
3. Mark the peak power frequency and -6dB (upper and lower) power frequency.
4. Repeat until all the test status is investigated.
5. Report the worst case.

For RF1 Module:

Channel No.	Frequency (MHz)	Mode	Measured 6dB bandwidth (kHz)	Limit	Result
1	2406	GFSK	1442.8	≥500KHz	Pass
11	2441		1482.9		Pass
19	2469		1402.8		Pass

For RF2 Module:

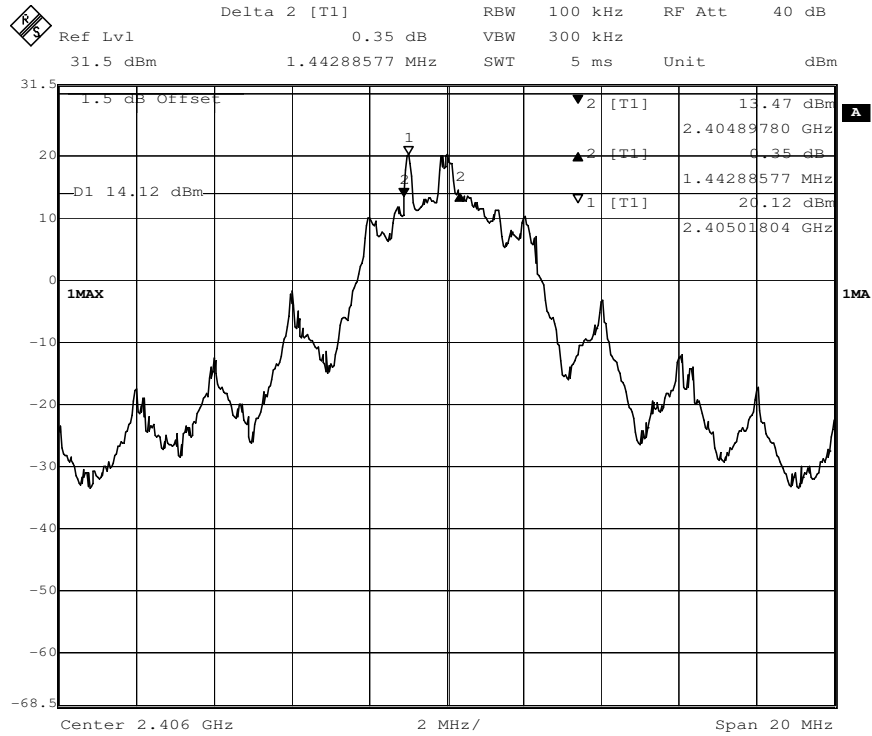
Channel No.	Frequency (MHz)	Mode	Measured 6dB bandwidth (kHz)	Limit	Result
1	2406	GFSK	1442.8	≥500KHz	Pass
11	2441		1402.8		Pass
19	2469		1482.9		Pass

Test result: The unit does meet the FCC requirements.

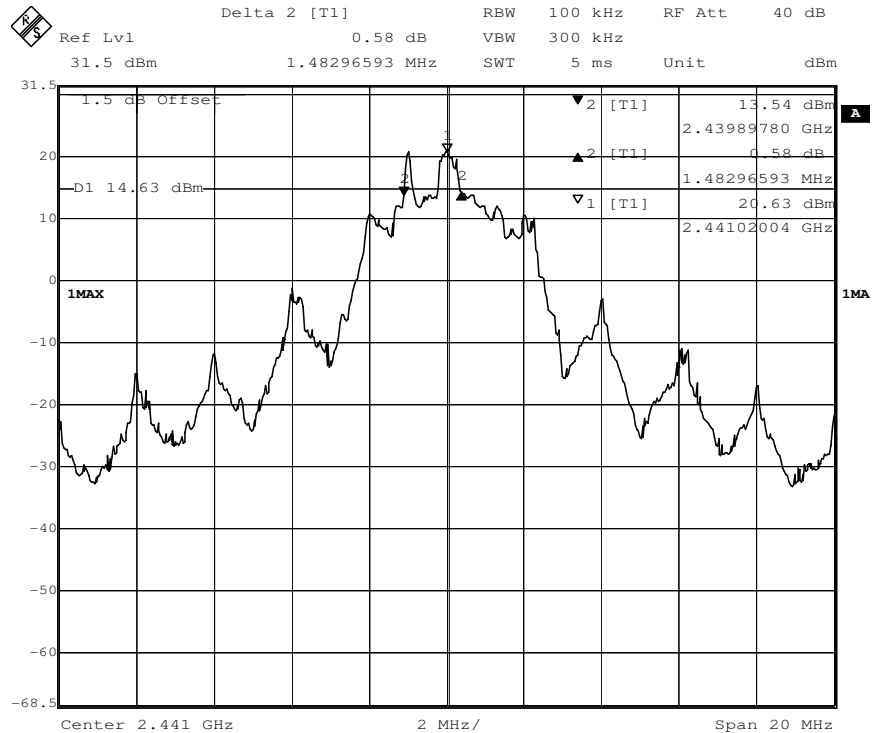
Result plot as follows:

For RF module1

Channel 1 (2406MHz):

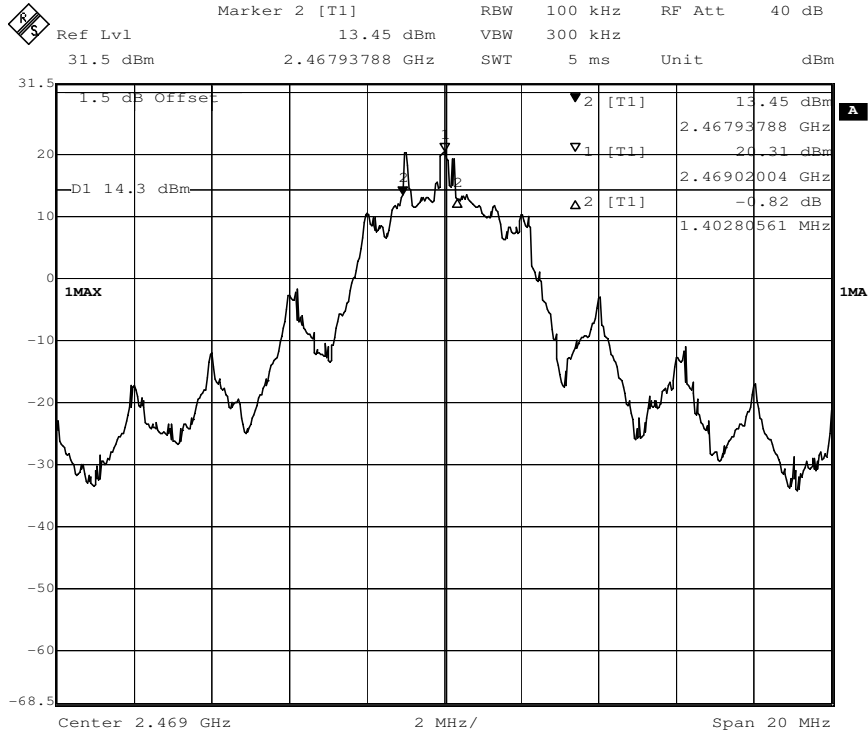


Channel 11 (2441 MHz):



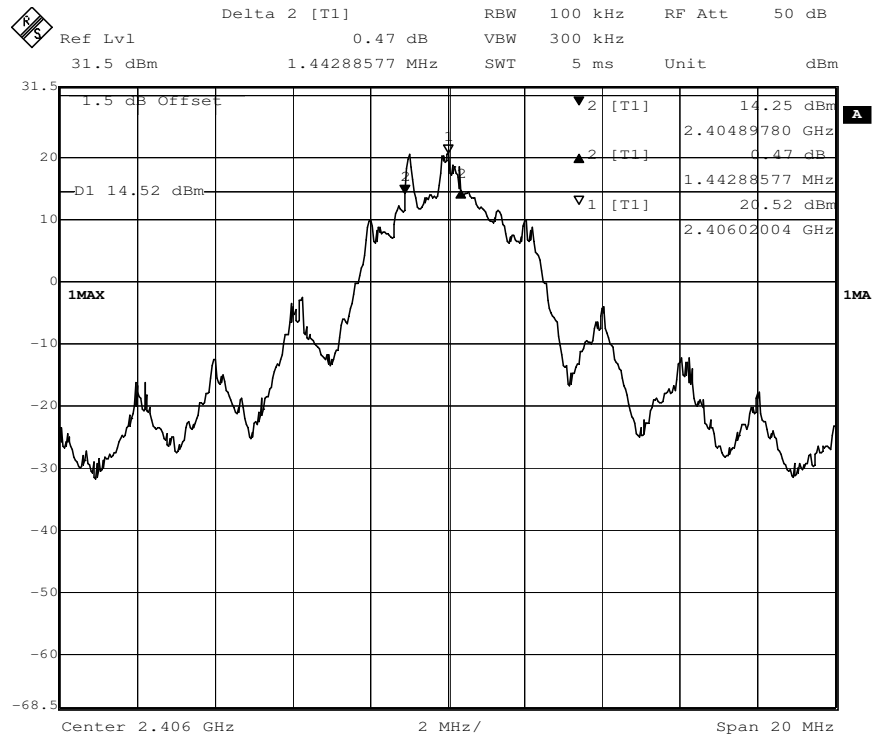


Channel 19 (2469 MHz):

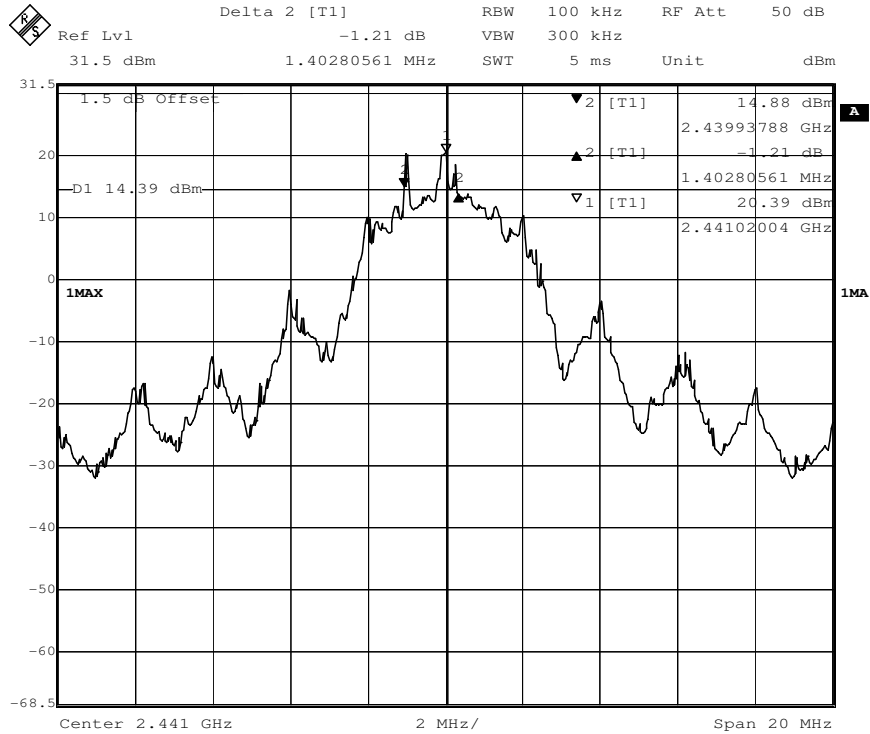


For RF module 2

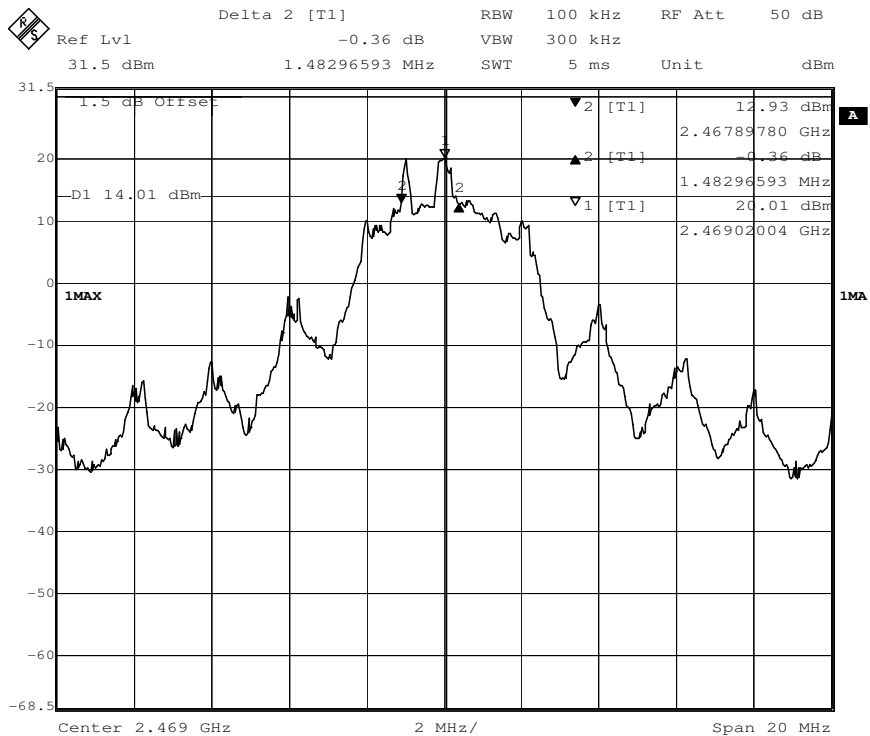
Channel 1 (2406MHz):



Channel 11 (2441 MHz):

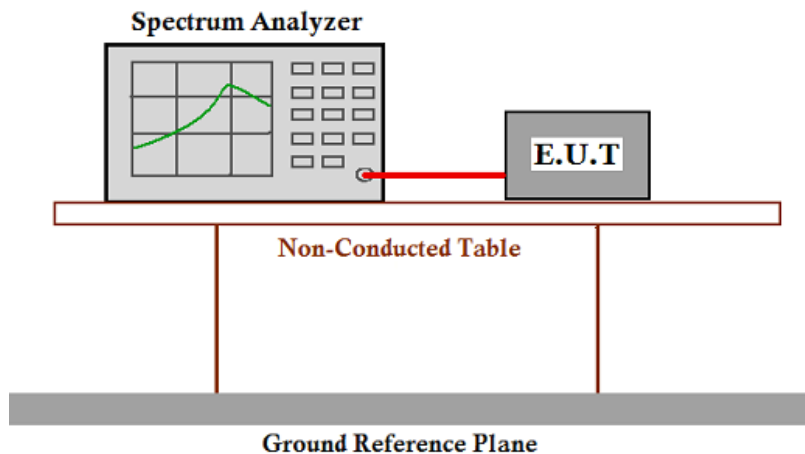


Channel 19 (2469 MHz):



7.4 Maximum Peak Output Power

- Test Requirement:** FCC Part 15 C section 15.247
 (b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.
 Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- Test Method:** ANSI C63.10: Clause 11.9
- Test Status:** Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.
- Test Configuration:**



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable from the antenna port to the spectrum.
2. Set the RBW≥ DTS. bandwidth.
3. Set the VBW ≥ 3 x RBW
4. Set the span ≥3 x RBW
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. . Use peak marker function to determine the peak amplitude level.
- 10.Report the worst case.

Test result:

For RF module1

Channel No.	Frequency (MHz)	Mode	Measured Channel Power (dBm)	Limit	Result
1	2406	GFSK	15.88	1W(30dBm)	Pass
11	2441		14.74		Pass
19	2469		13.41		Pass

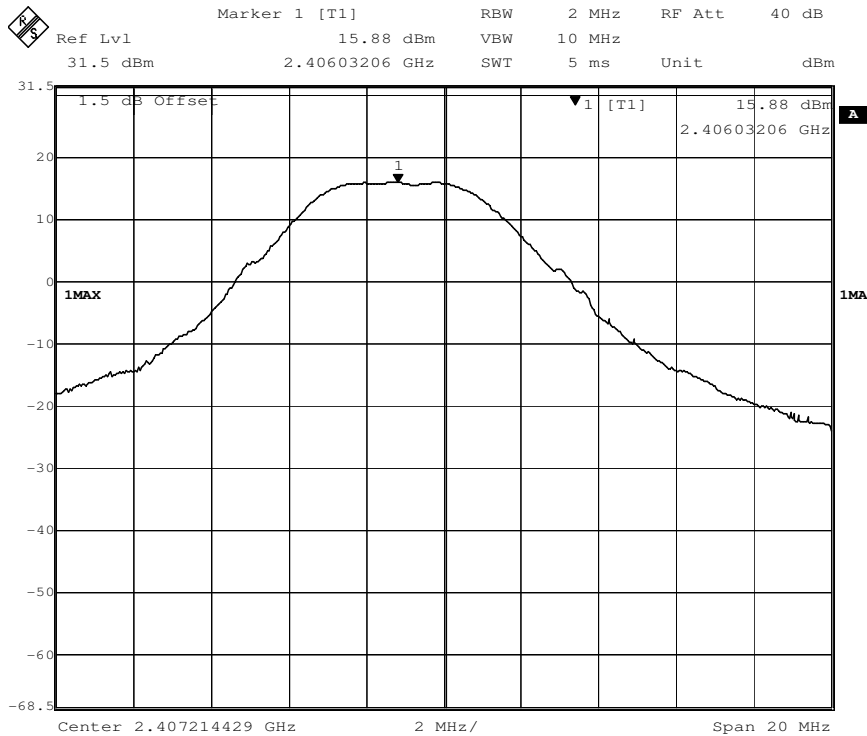
For RF module 2

Channel No.	Frequency (MHz)	Mode	Measured Channel Power (dBm)	Limit	Result
1	2406	GFSK	15.76	1W(30dBm)	Pass
11	2441		14.87		Pass
19	2469		13.28		Pass

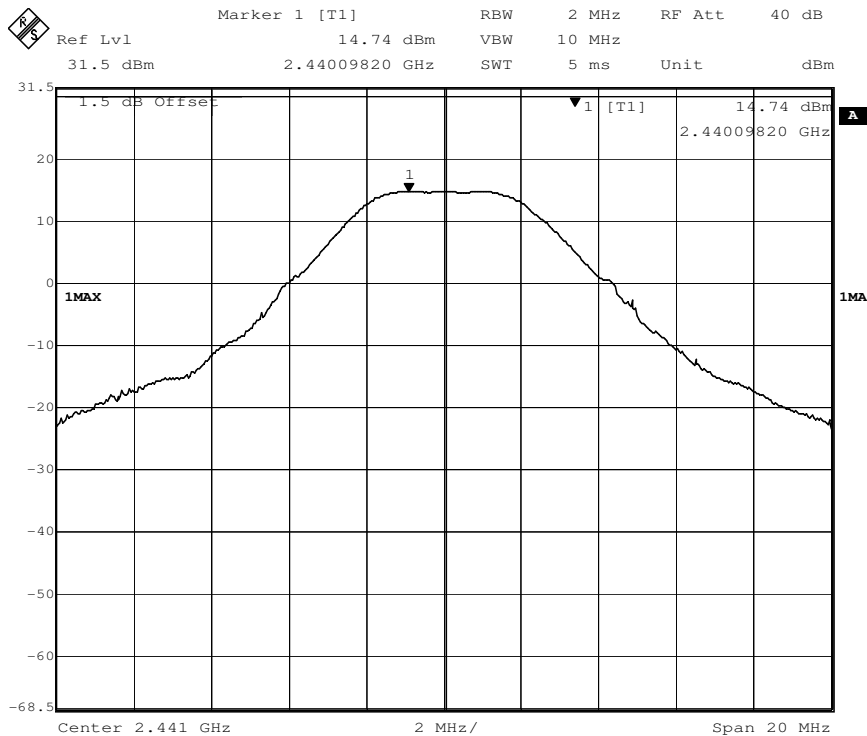
The unit does meet the FCC requirements.

**Result plot as follows:
 For RF module1**

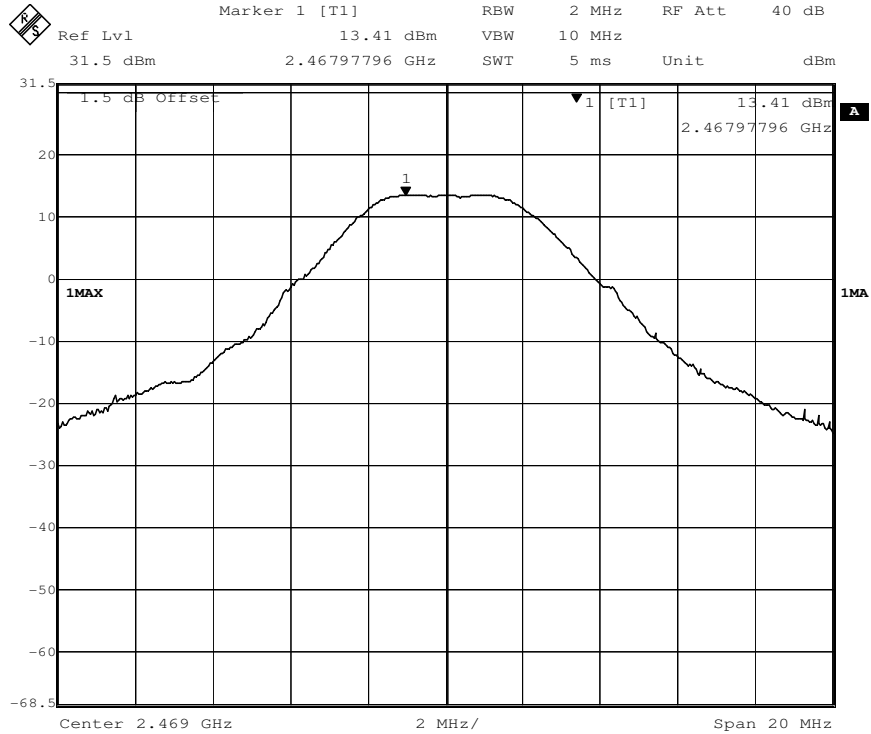
Channel 1 (2406MHz):



Channel 11 (2441 MHz):

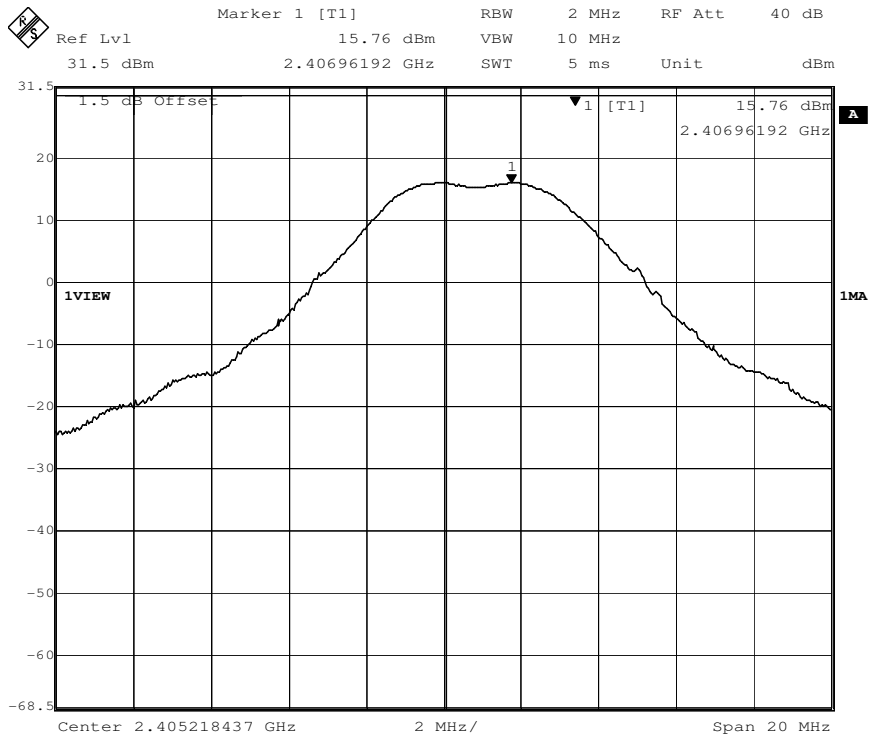


Channel 19 (2469 MHz):

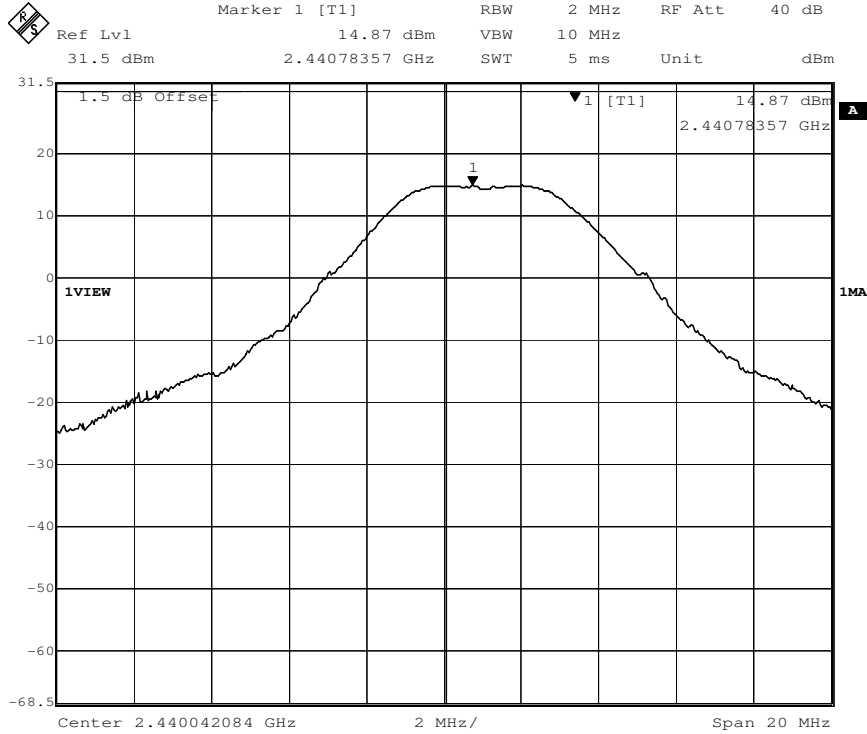


For RF module 2

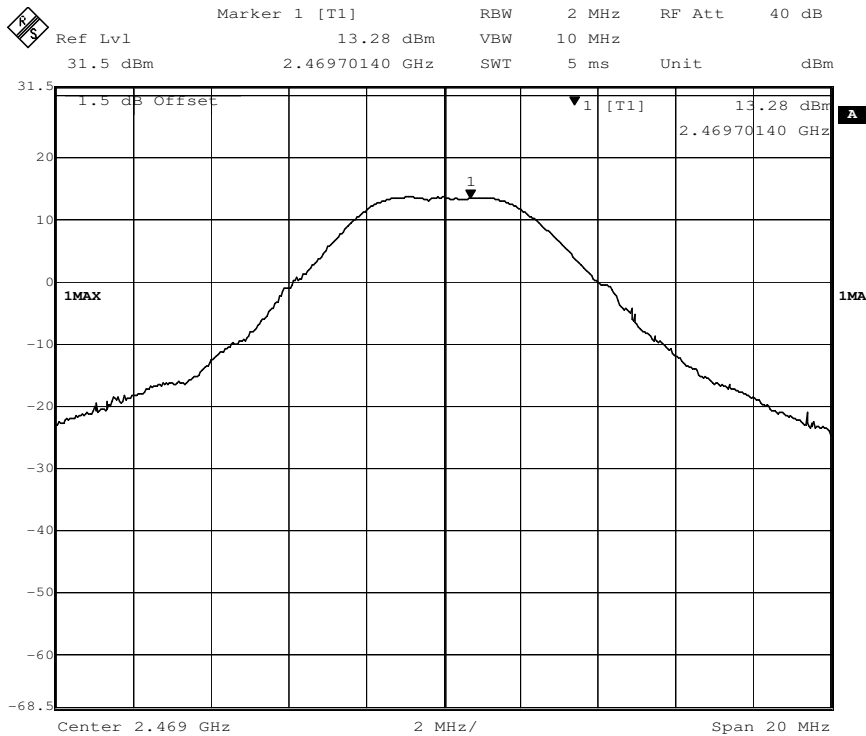
Channel 1 (2406MHz):



Channel 11 (2441 MHz):

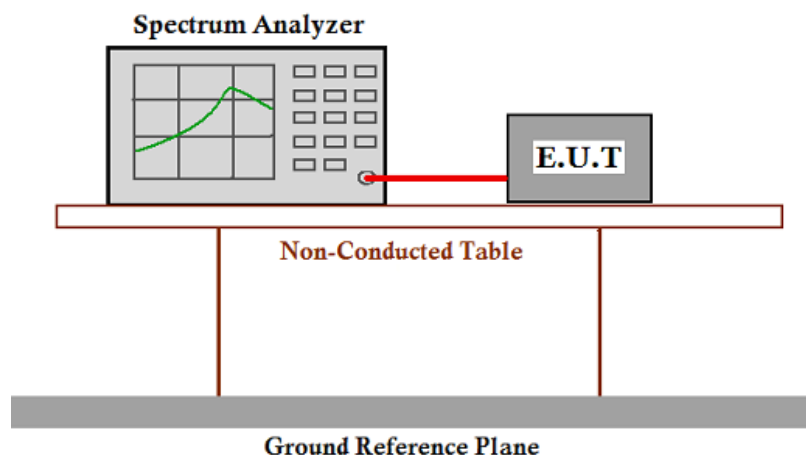


Channel 19 (2469 MHz):



7.5 Peak Power Spectral Density

Test Requirement:	FCC Part 15 C section 15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10: Clause 11.10
Test Status:	Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.
Test Configuration:	



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer: RBW=3 kHz.
3. VBW $\geq 3 \times$ RBW sweep= Auto couple; Set the span to 1.5 times the DTS bandwidth.
4. Detector Function = Peak. Trace = Max Hold, Centre = the Peak Power of the signal.
5. Measure the Power Spectral Density of the test frequency with special test status.
6. Repeat until all the test status is investigated.
7. Report the worst case.

Test result:

For RF module1

Channel No.	Frequency (MHz)	Mode	Measured Peak Power Spectral Density (dBm/3KHz)	Limit	Result
1	2406	GFSK	4.31	8dBm/3KHz	Pass
11	2441		3.33		Pass
19	2469		2.13		Pass

For RF module 2

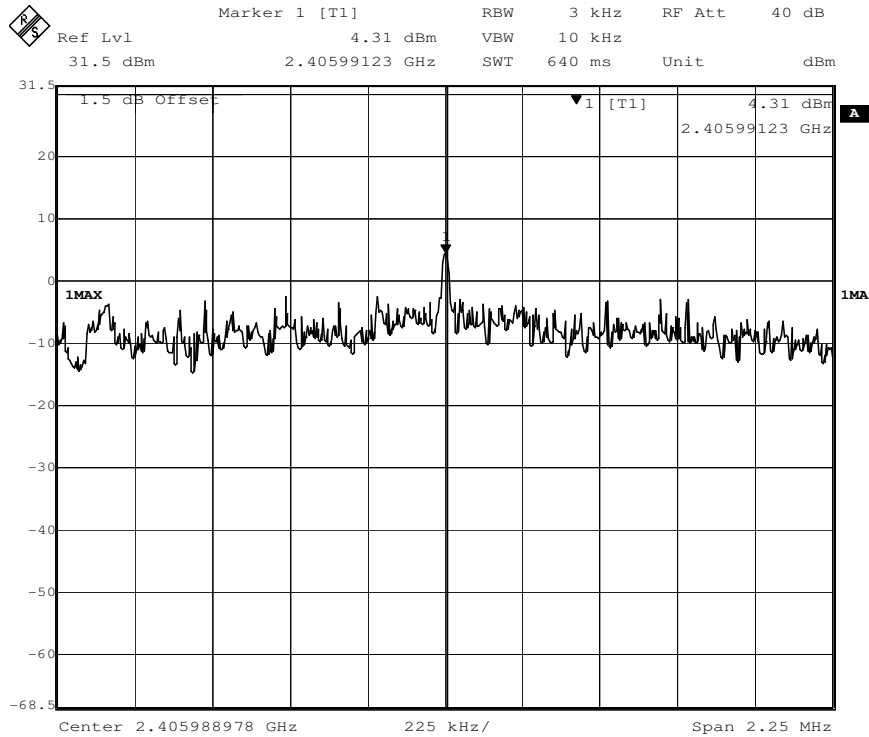
Channel No.	Frequency (MHz)	Mode	Measured Peak Power Spectral Density (dBm/3KHz)	Limit	Result
1	2406	GFSK	4.44	8dBm/3KHz	Pass
11	2441		3.39		Pass
19	2469		1.49		Pass

The unit does meet the FCC requirements.

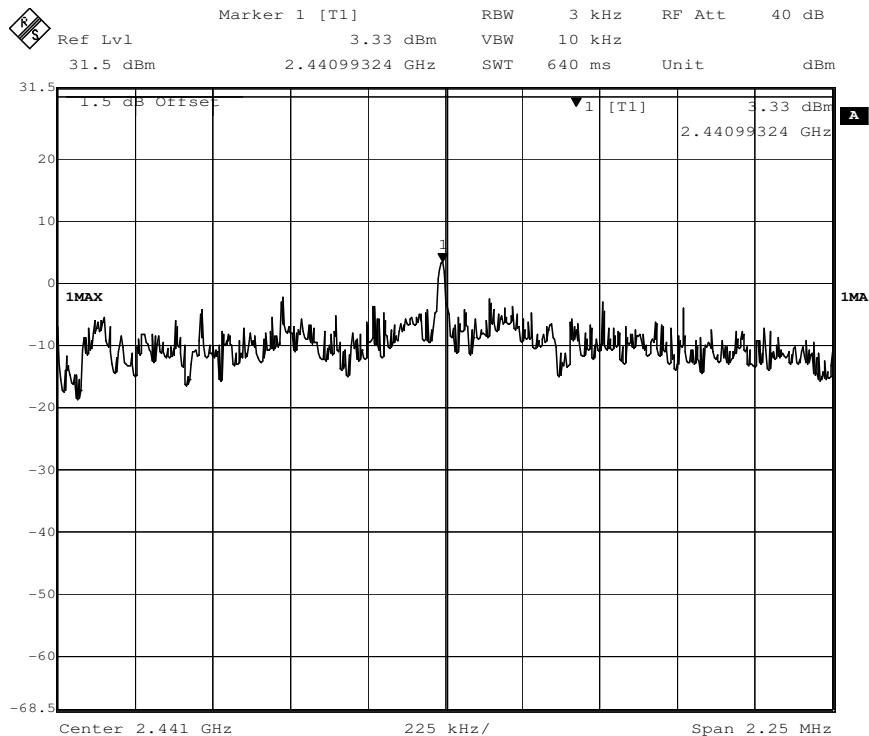
Result plot as follows:

For RF module1

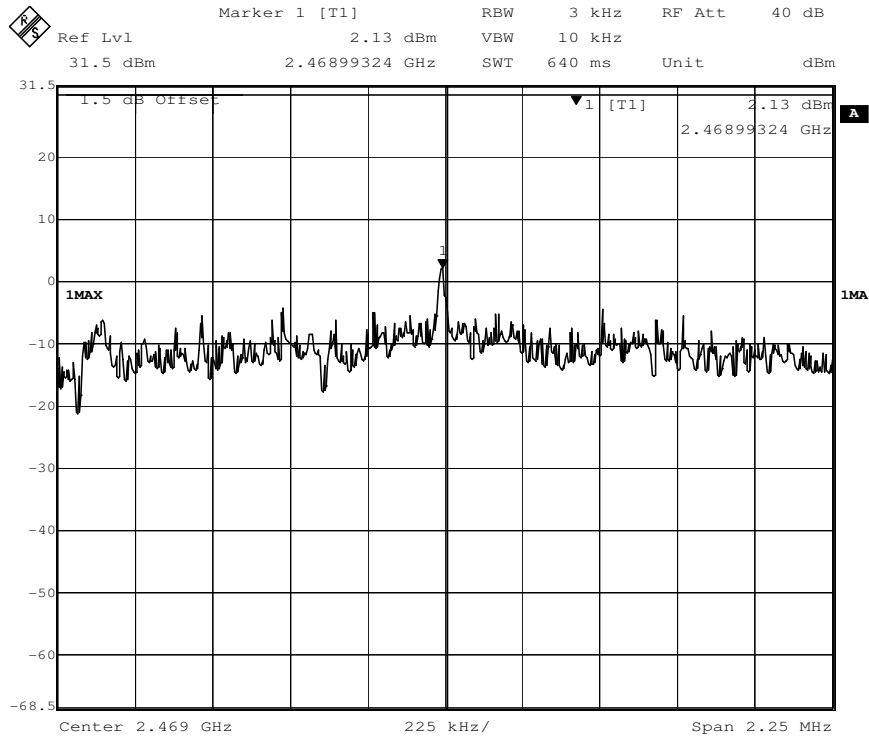
Channel 1 (2406MHz):



Channel 11 (2441 MHz):

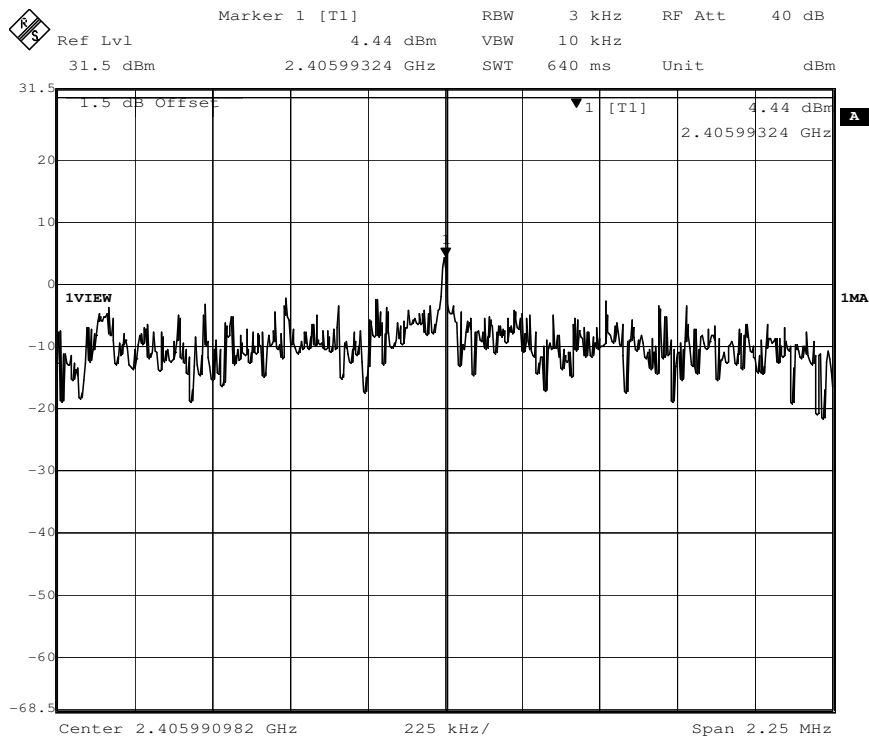


Channel 19 (2469 MHz):



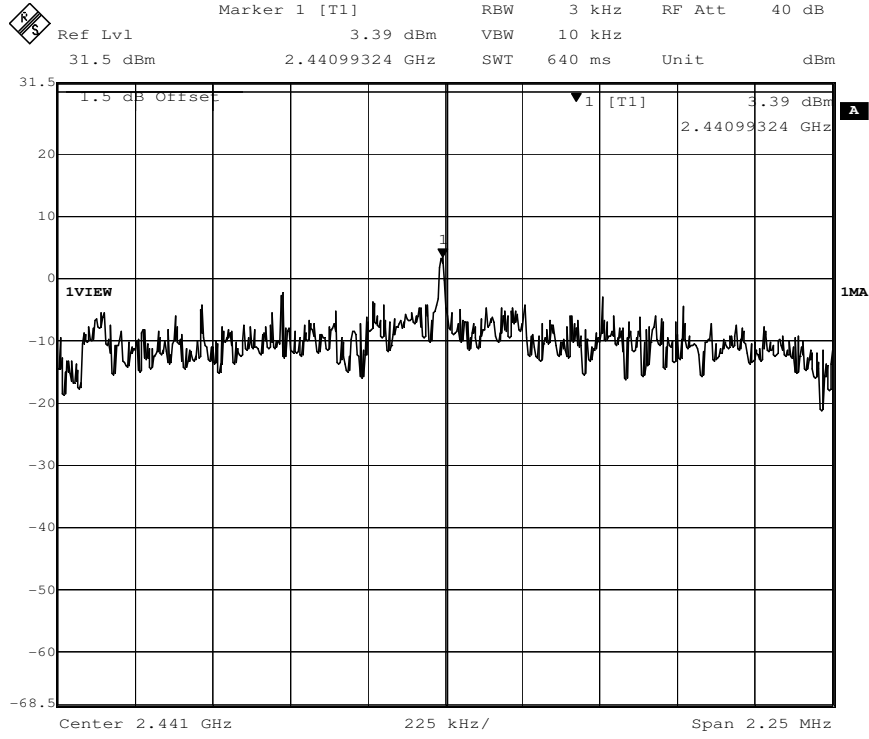
For RF module 2

Channel 1 (2406MHz):

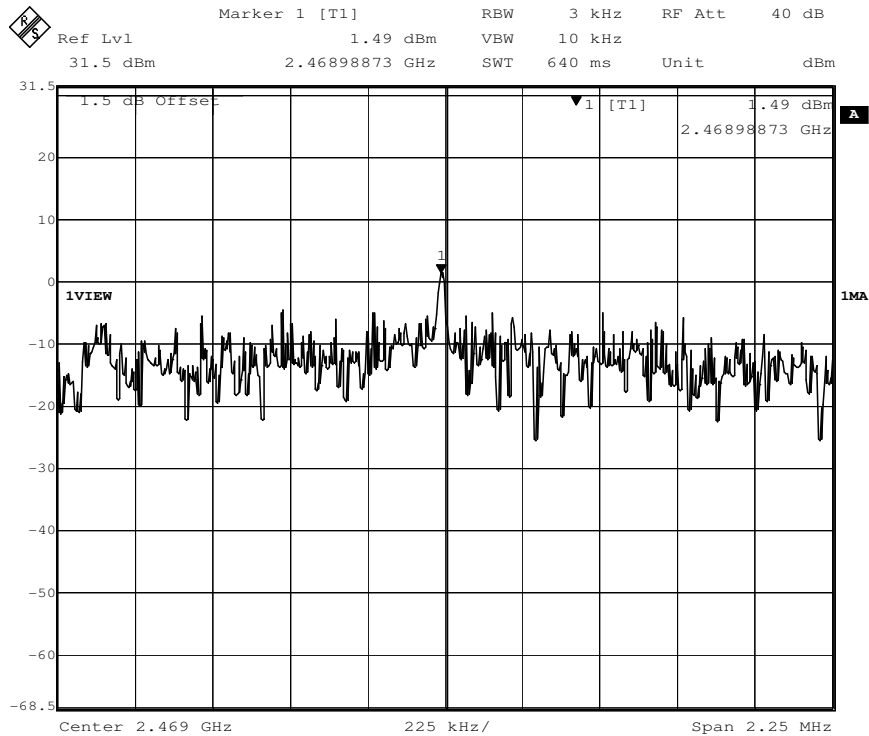




Channel 11 (2441 MHz):



Channel 19 (2469 MHz):



7.6 Conducted Spurious Emissions

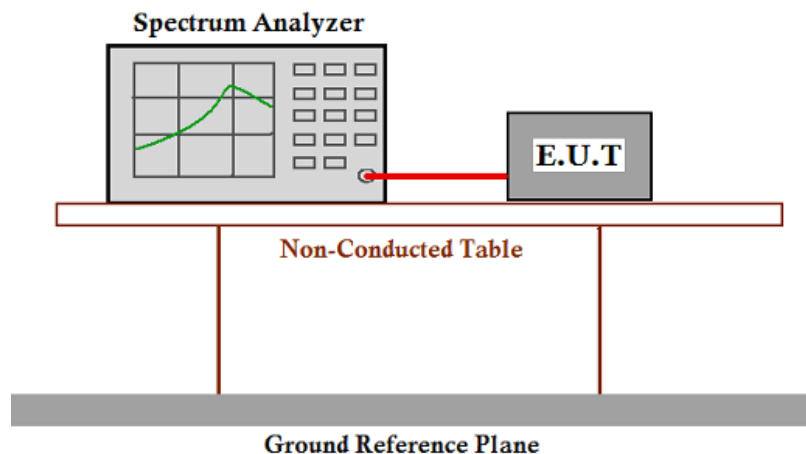
Test Requirement: FCC Part 15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 11.11

Test Status: Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.

Test Configuration:

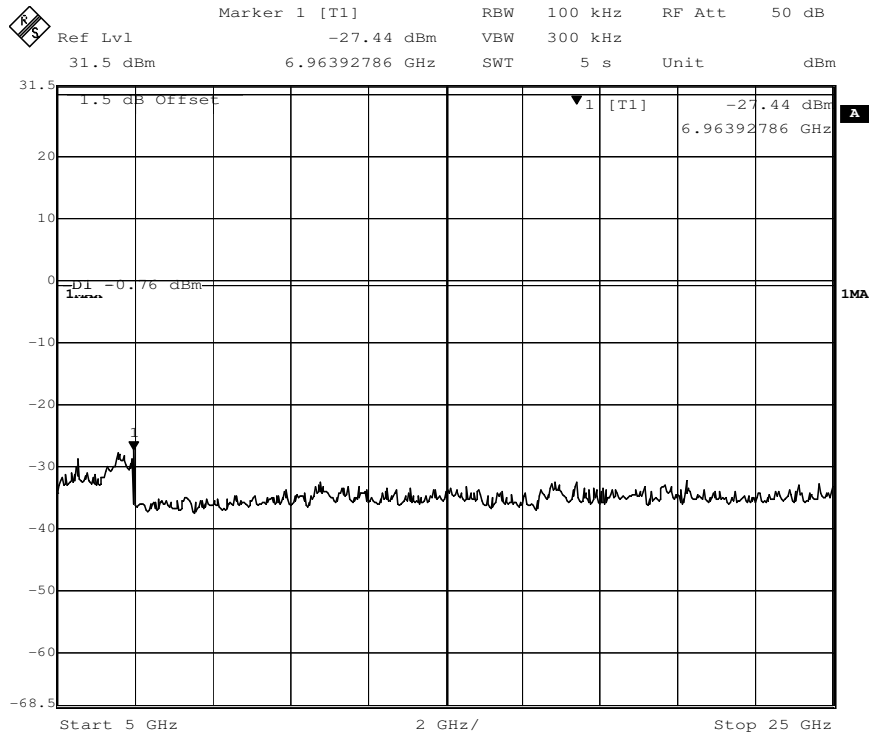


Test Procedure:

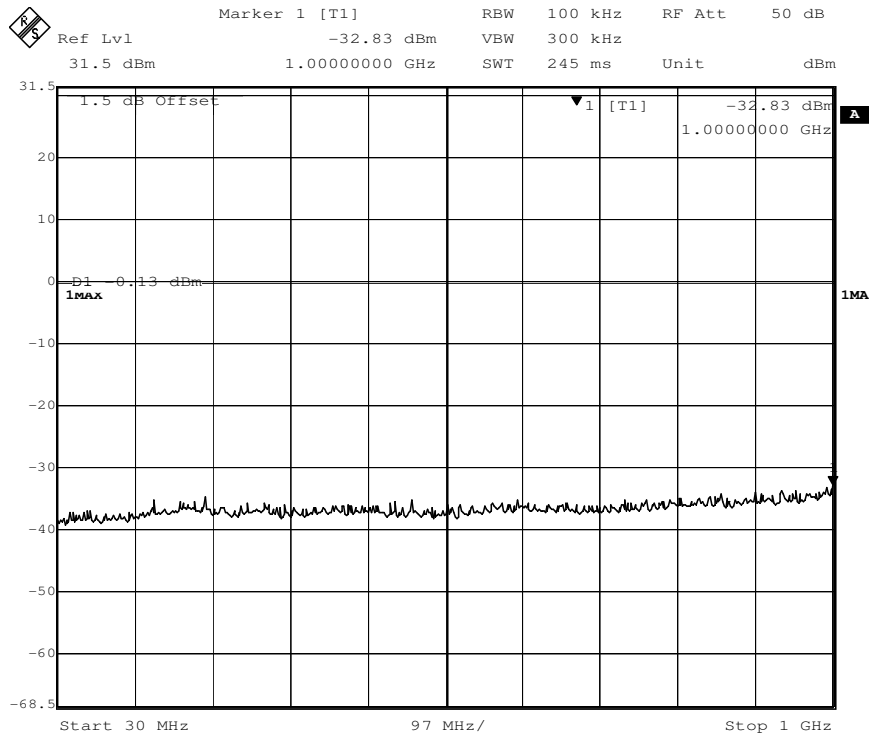
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer: RBW=100 KHz, VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Scan up through 10th harmonic.
3. Measure the Conducted Spurious Emissions of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worst case.



5GHz to 25GHz

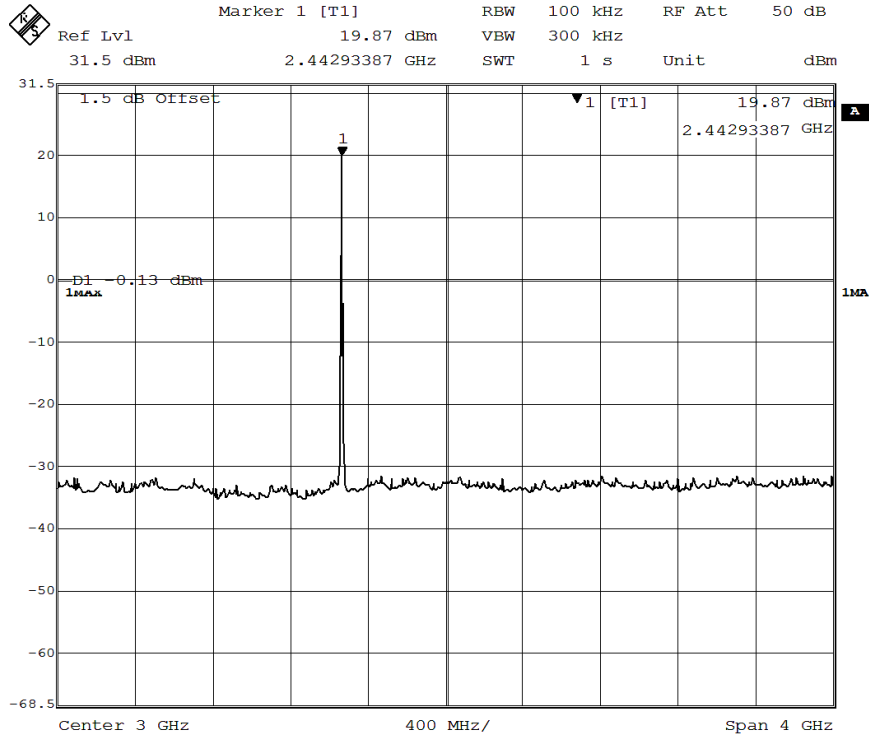


Channel 11 (2441 MHz):
30 MHz to 1GHz

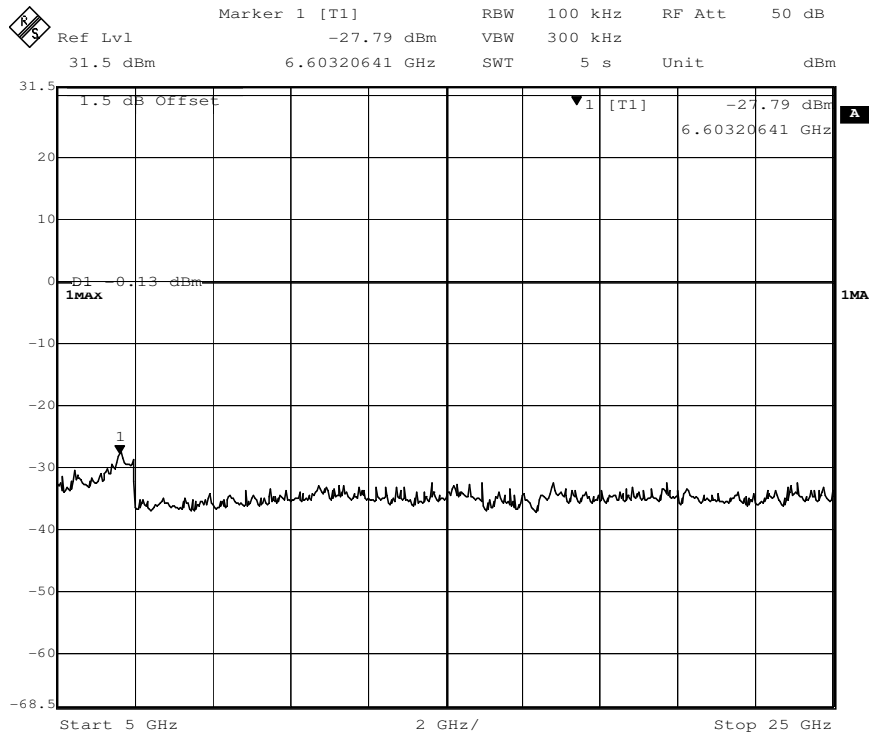




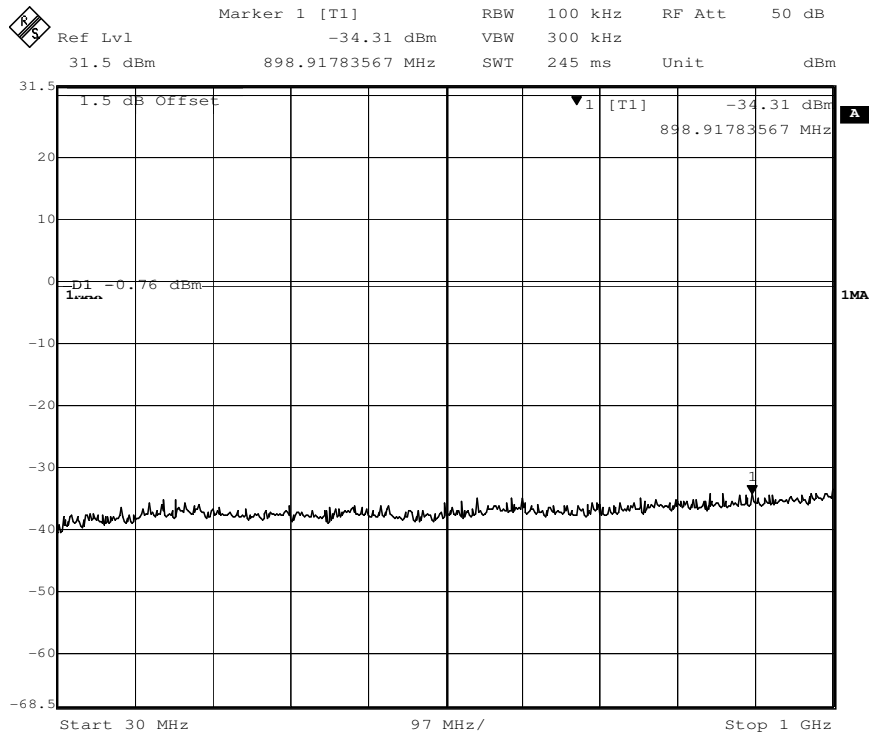
1GHz to 5GHz



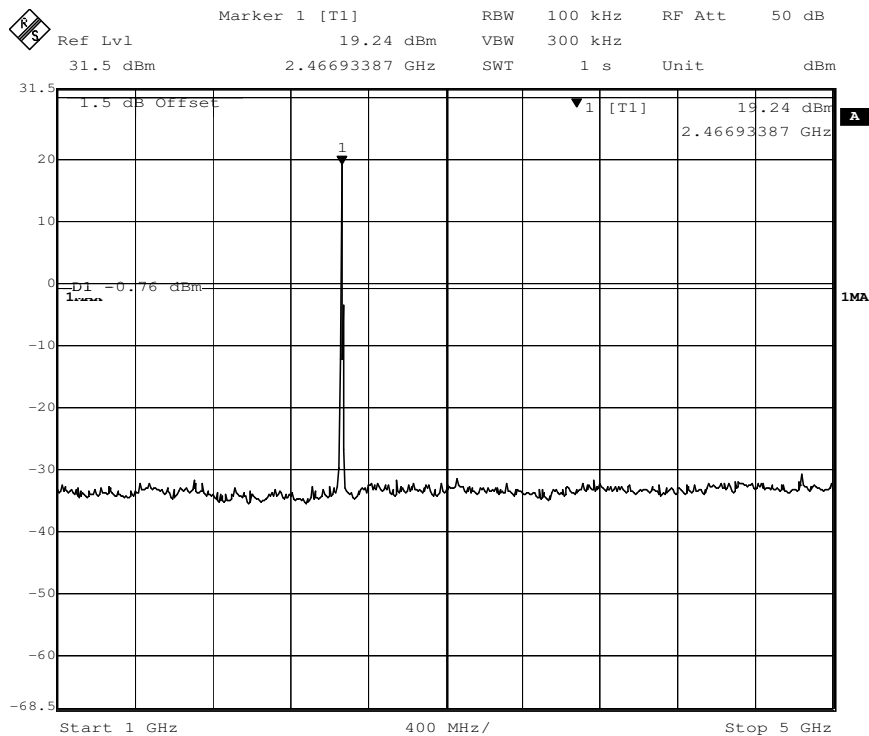
5GHz to 25GHz



Channel 19 (2469 MHz):
30 MHz to 1GHz

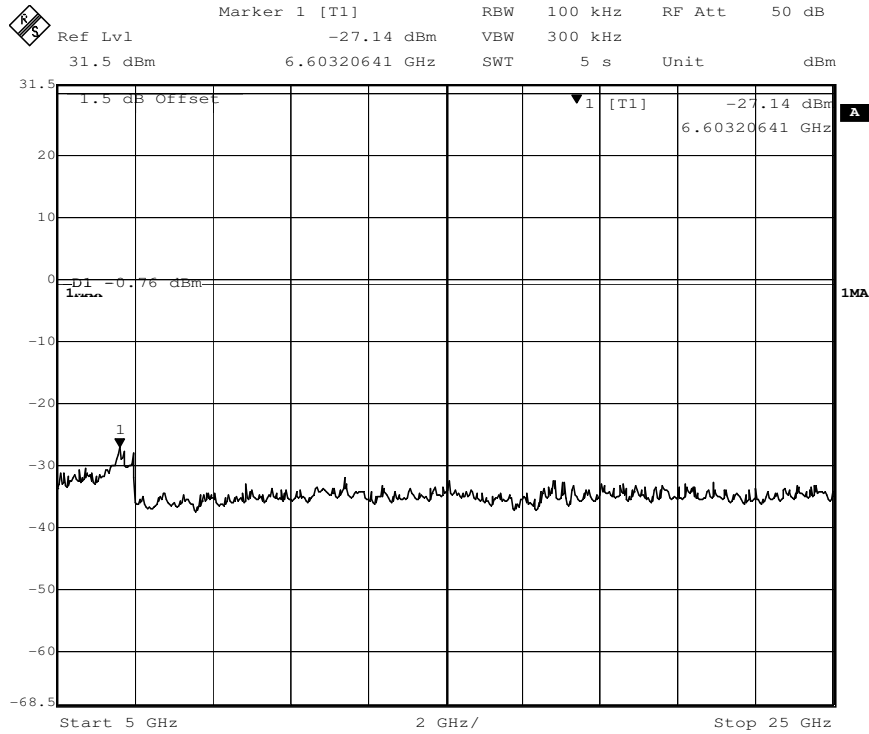


1GHz to 5GHz



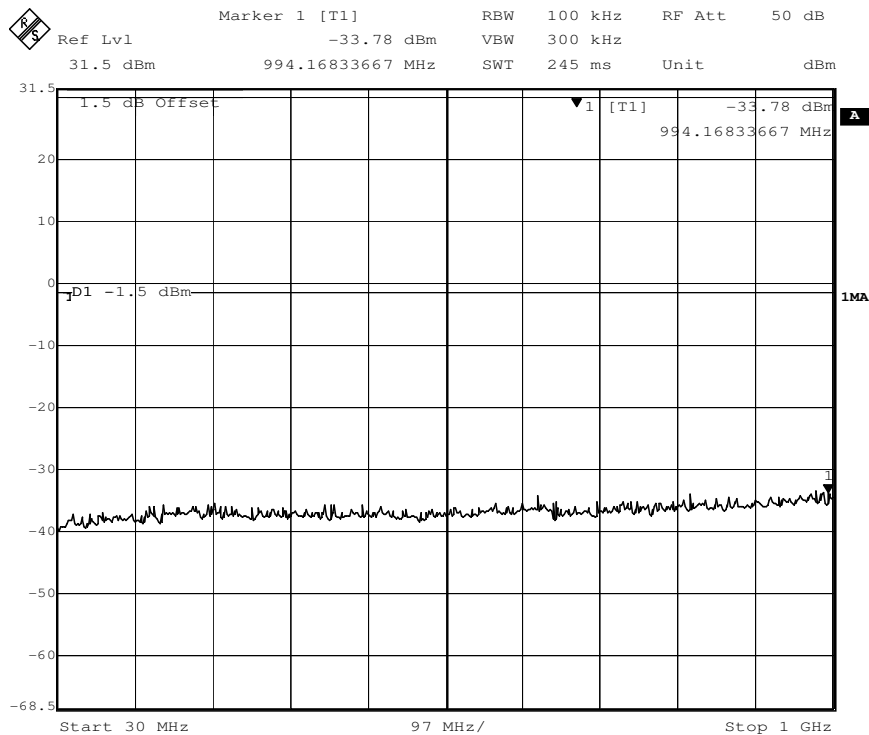


5GHz to 25GHz



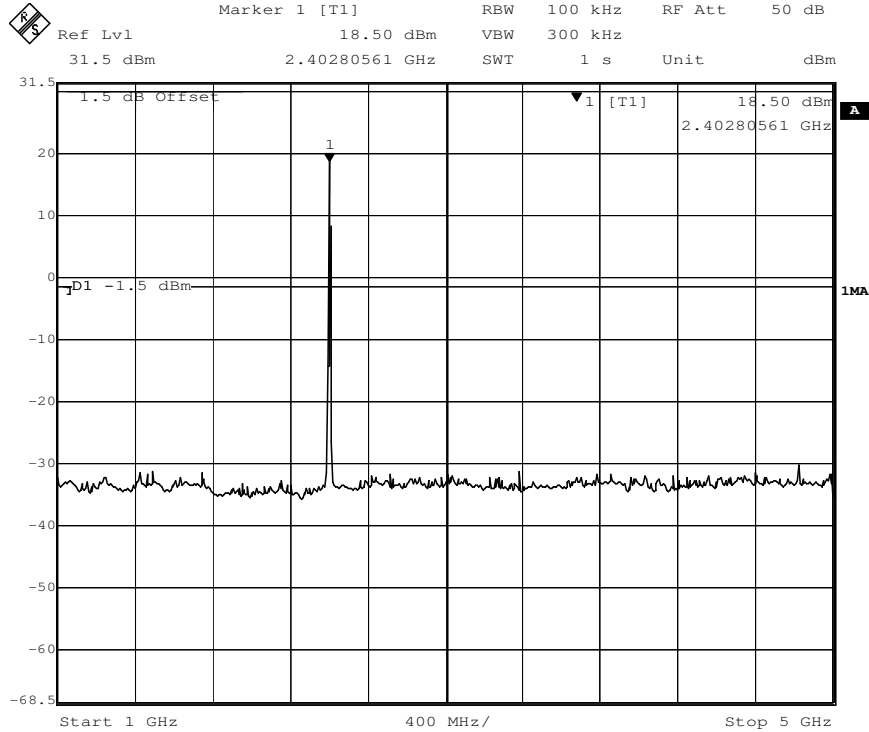
For RF module 2

Channel 1 (2406MHz):
30 MHz to 1GHz

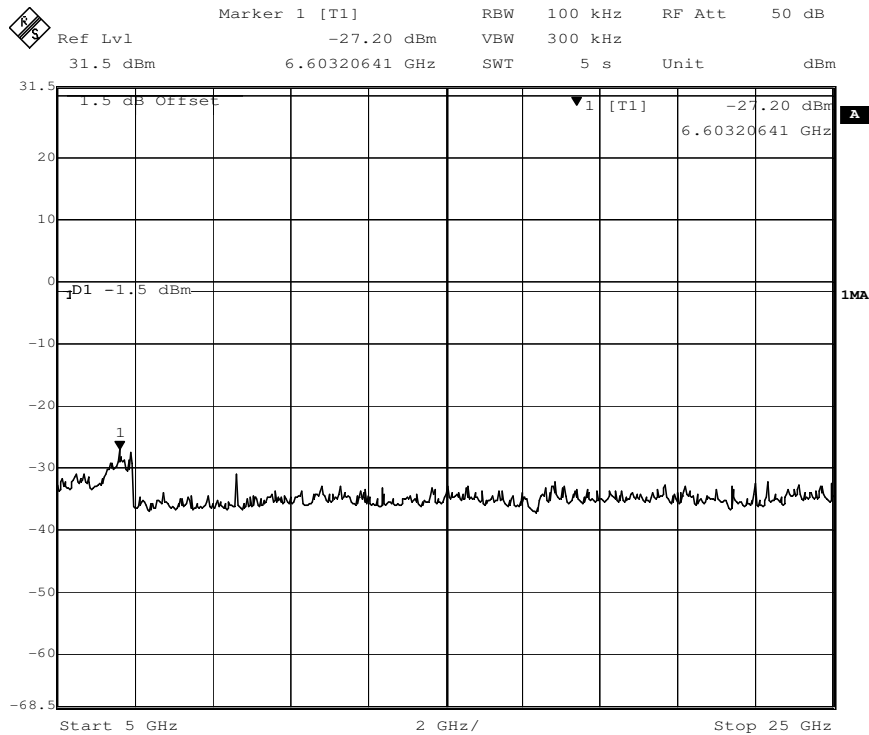




1GHz to 5GHz

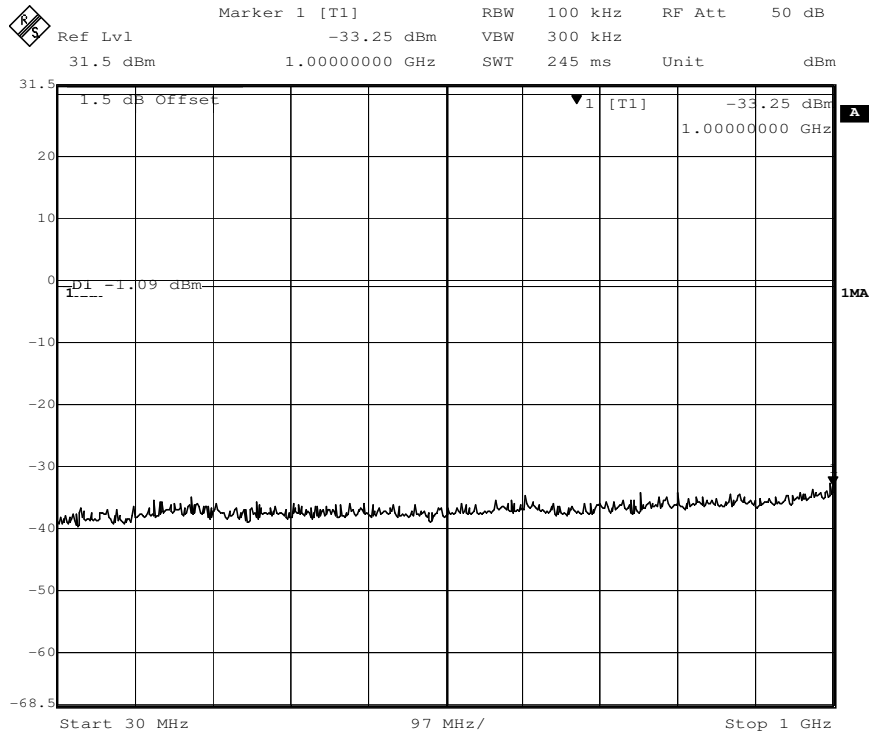


5GHz to 25GHz

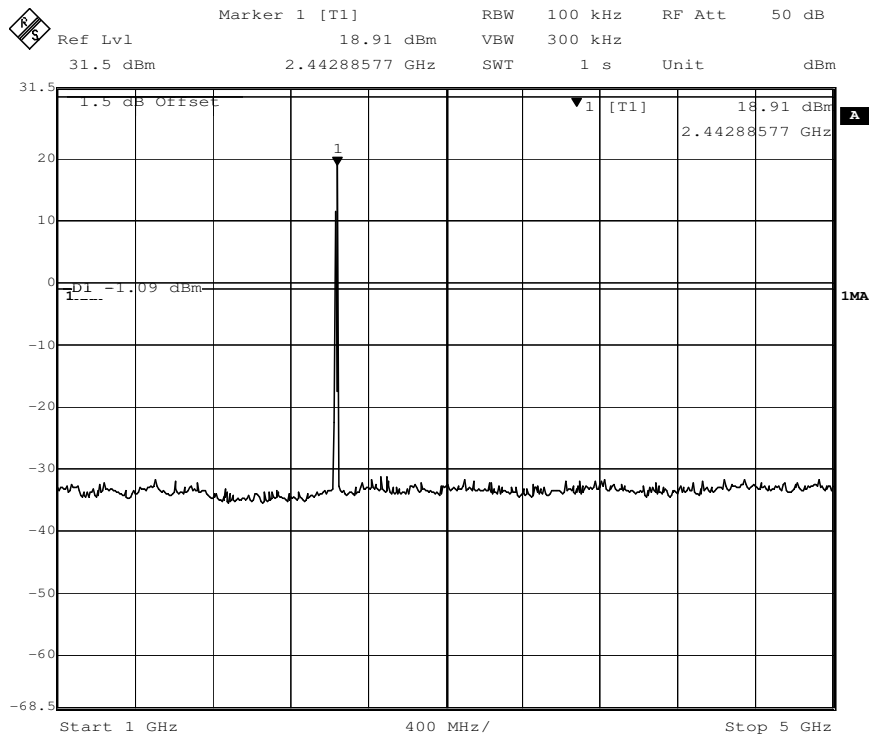




Channel 11 (2441 MHz):
30 MHz to 1GHz

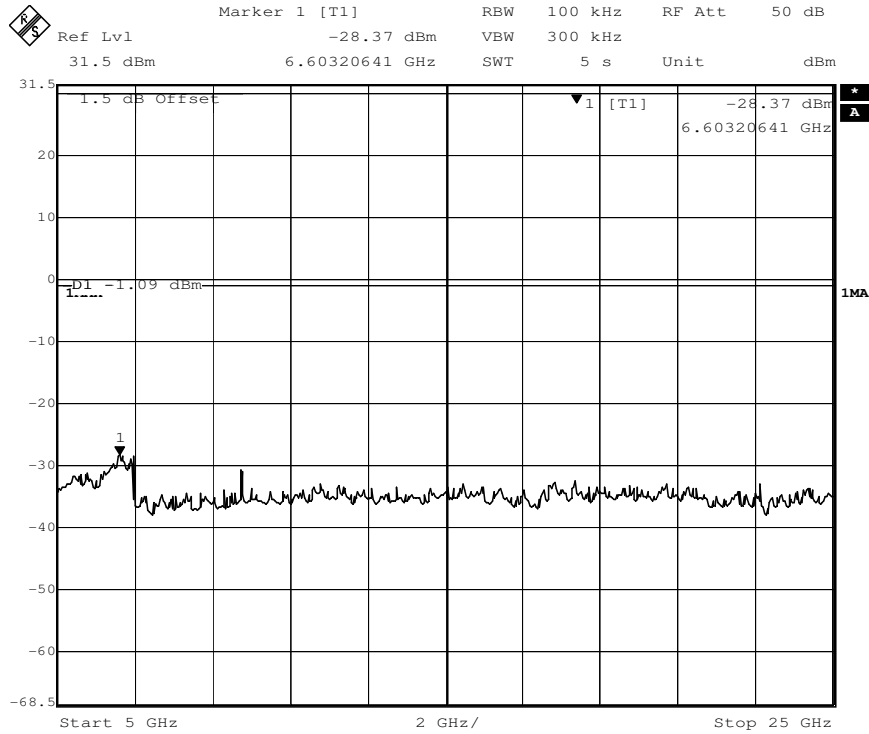


1GHz to 5GHz

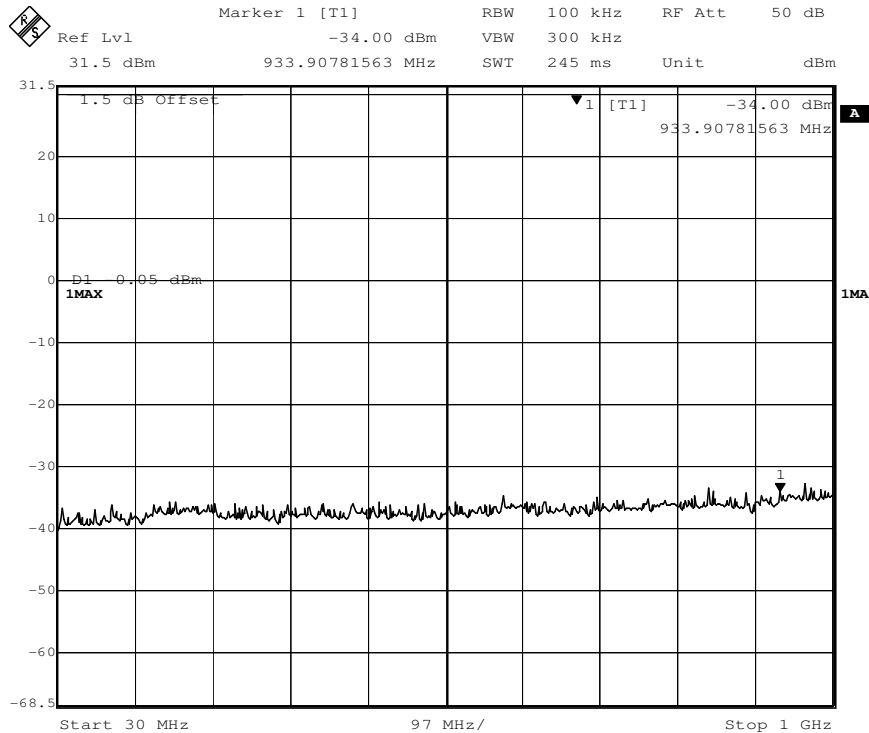




5GHz to 25GHz

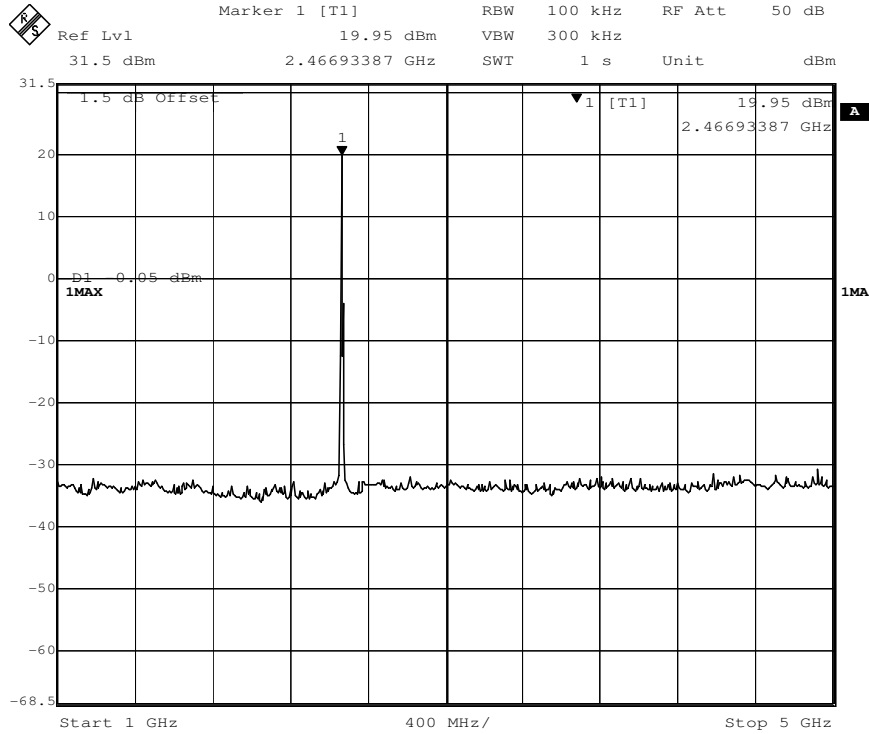


Channel 19 (2469 MHz):
30 MHz to 1GHz

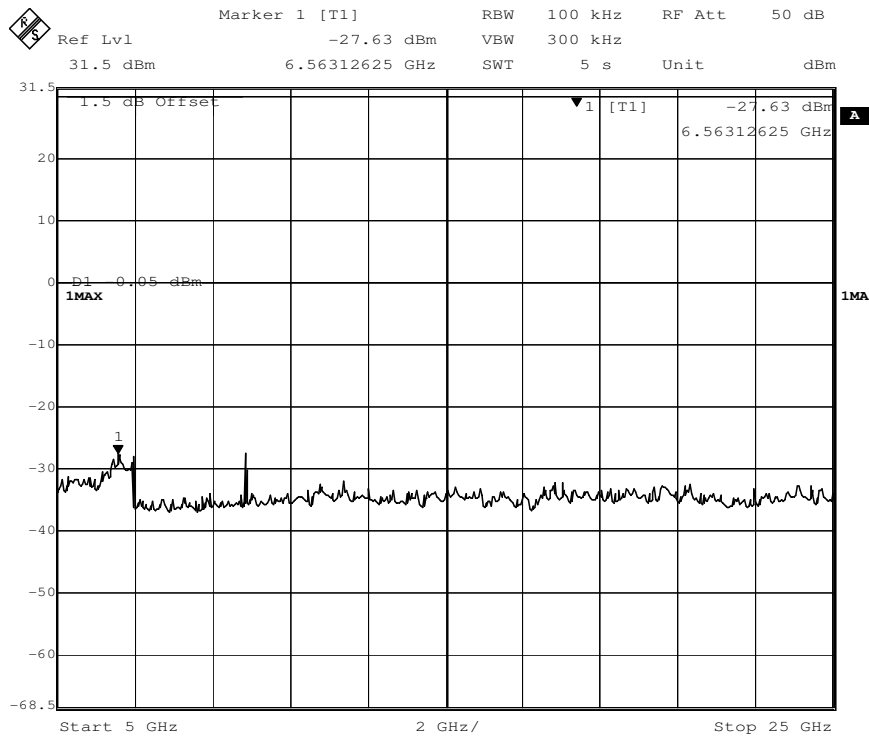




1GHz to 5GHz



5GHz to 25GHz



7.7 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15C Section 15.209 and 15.205

Test Method: ANSI C63.10: 2013

Test Site: Measurement Distance:3m

(Semi-Anechoic Chamber below 1GHz, Full Anechoic Chamber above 1GHz)

Receiver Setup:

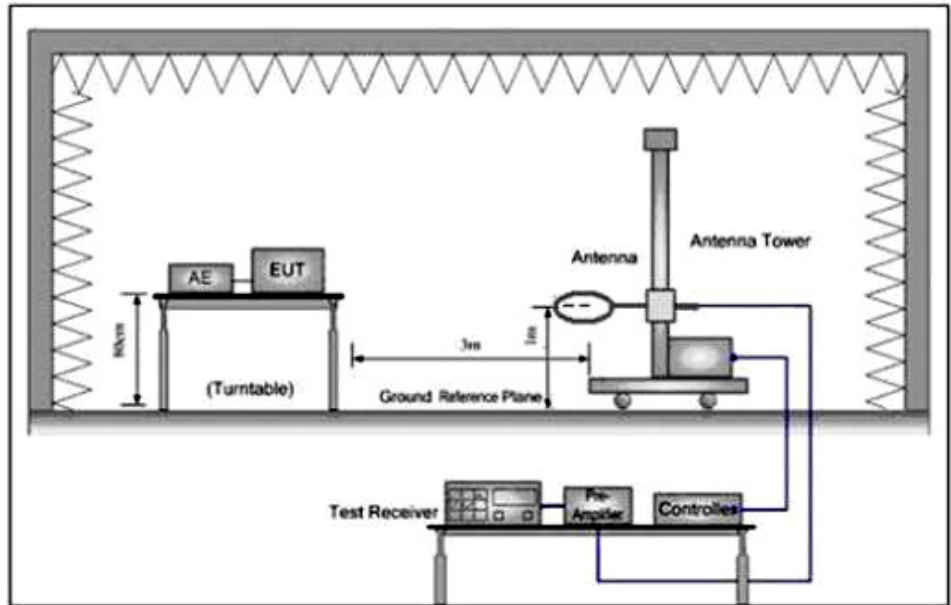
Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

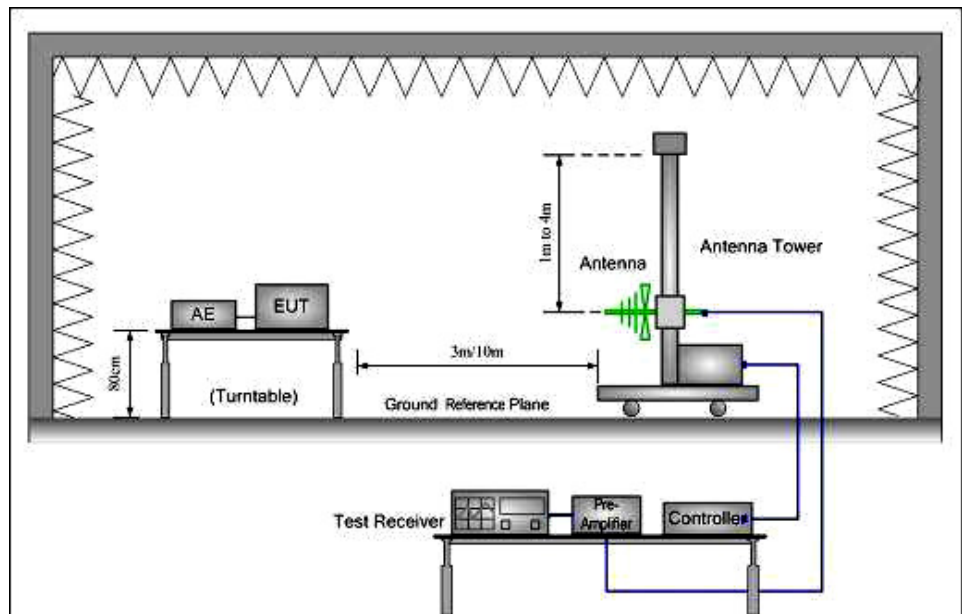
Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

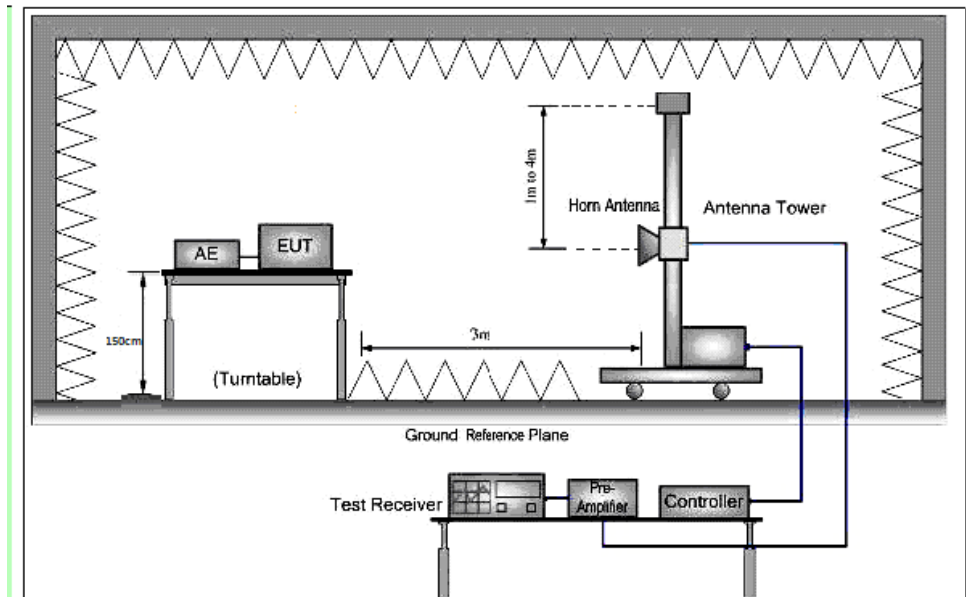
Test Setup:



Below 30MHz



30MHz to 1GHz



Above 1 GHz

Test Procedure:

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 and 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degree to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel (2406MHz), the middle channel (2441MHz), the Highest channel (2469MHz)
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Exploratory Test

Mode:

Transmitting with GFSK modulation.

For below 1GHz part, through pre-scan, the worst case is the lowest channel
 Only the worst case is recorded in the report.

Instruments Used: Refer to section 6 for details

Test Results: Pass

Test Result:

9KHz~30 MHz, Quasi-Peak Measurement

The measurements with Loop antenna and the amplitude of spurious emissions from the radiator are attenuated more than 20dB below the limit, so the test data were not recorded in the test report.

30MHz~1GHz, Quasi-Peak Measurement

The measurements with Log antenna.

For RF module1

Channel 1 (2406MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
36.509	48.15	13.79	1.05	27.00	35.99	40.00	-4.01	QP	Vertical
47.160	46.43	14.36	1.24	27.00	35.03	40.00	-4.97	QP	Vertical
133.151	47.14	12.51	2.17	26.86	34.96	43.50	-8.54	QP	Vertical
185.138	37.08	12.38	2.62	26.63	25.45	43.50	-18.05	QP	Vertical
313.276	43.36	14.10	3.45	26.49	34.42	46.00	-11.58	QP	Vertical
343.180	42.33	14.91	3.64	26.68	34.20	46.00	-11.80	QP	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
60.918	31.88	14.02	1.41	27.00	20.31	40.00	-19.69	QP	Horizontal
114.114	44.16	10.65	2.02	26.90	29.93	43.50	-13.57	QP	Horizontal
293.084	42.93	13.81	3.28	26.40	33.62	46.00	-12.38	QP	Horizontal
344.386	44.27	14.97	3.64	26.69	36.19	46.00	-9.81	QP	Horizontal
487.315	34.84	17.99	4.35	27.75	29.43	46.00	-16.57	QP	Horizontal
919.287	31.12	23.58	5.97	27.70	32.97	46.00	-13.03	QP	Horizontal



SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch

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For RF module 2

Channel 1 (2406MHz)

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
31.289	42.40	14.07	1.10	27.10	30.47	40.00	-9.53	QP	Vertical
36.381	47.59	13.79	1.05	27.00	35.43	40.00	-4.57	QP	Vertical
47.160	46.43	14.36	1.24	27.00	35.03	40.00	-4.97	QP	Vertical
135.506	45.57	12.72	2.20	26.84	33.65	43.50	-9.85	QP	Vertical
307.831	43.45	14.01	3.41	26.44	34.43	46.00	-11.57	QP	Vertical
341.979	43.13	14.85	3.64	26.67	34.95	46.00	-11.05	QP	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
48.672	29.79	14.44	1.28	27.00	18.51	40.00	-21.49	QP	Horizontal
113.714	43.65	10.62	2.02	26.90	29.39	43.50	-14.11	QP	Horizontal
131.758	36.52	12.35	2.17	26.86	24.18	43.50	-19.32	QP	Horizontal
181.920	38.08	12.6	2.59	26.65	26.62	43.50	-16.88	QP	Horizontal
359.186	44.27	15.61	3.72	26.86	36.74	46.00	-9.26	QP	Horizontal
480.528	40.50	17.91	4.33	27.71	35.03	46.00	-10.97	QP	Horizontal

Above 1GHz, Peak & Average Measurement

For RF module1

Channel 1 (2406MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4812.058	33.43	30.82	9.96	40.21	34.00	54.00	-20.00	Average	Vertical
4812.058	45.90	30.82	9.96	40.21	46.47	74.00	-27.53	Peak	Vertical
6358.789	27.63	33.84	11.56	39.63	33.4	54.00	-20.60	Average	Vertical
6358.789	40.12	33.84	11.56	39.63	45.89	74.00	-28.11	Peak	Vertical
7218.209	22.44	35.50	12.76	39.25	31.45	54.00	-22.55	Average	Vertical
7218.209	38.13	35.50	12.76	39.25	47.14	74.00	-26.86	Peak	Vertical
8343.918	22.13	36.20	13.72	38.92	33.13	54.00	-20.87	Average	Vertical
8343.918	34.45	36.20	13.72	38.92	45.45	74.00	-28.55	Peak	Vertical
9624.970	21.64	37.51	14.48	37.97	35.66	54.00	-18.34	Average	Vertical
9624.970	35.27	37.51	14.48	37.97	49.29	74.00	-24.71	Peak	Vertical
12030.13	17.68	39.46	15.83	38.08	34.89	54.00	-19.11	Average	Vertical
12030.13	31.77	39.46	15.83	38.08	48.98	74.00	-25.02	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4812.043	36.53	30.82	9.96	40.21	37.10	54.00	-16.90	Average	Horizontal
4812.043	50.85	30.82	9.96	40.21	51.42	74.00	-22.58	Peak	Horizontal
5615.62	28.04	31.97	10.61	40.05	30.57	54.00	-23.43	Average	Horizontal
5615.62	41.39	31.97	10.61	40.05	43.92	74.00	-30.08	Peak	Horizontal
7218.638	22.58	35.50	12.76	39.25	31.59	54.00	-22.41	Average	Horizontal
7218.638	35.60	35.50	12.76	39.25	44.61	74.00	-29.39	Peak	Horizontal
9624.461	17.50	37.51	14.48	37.97	31.52	54.00	-22.48	Average	Horizontal
9624.461	32.63	37.51	14.48	37.97	46.65	74.00	-27.35	Peak	Horizontal
11012.25	15.48	40.00	15.00	37.96	32.52	54.00	-21.48	Average	Horizontal
11012.25	32.80	40.00	15.00	37.96	49.84	74.00	-24.16	Peak	Horizontal
12030.46	16.43	39.46	15.83	38.08	33.64	54.00	-20.36	Average	Horizontal
12030.46	31.45	39.46	15.83	38.08	48.66	74.00	-25.34	Peak	Horizontal

Channel 11 (2441 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4062.629	29.61	29.55	9.05	40.09	28.12	54.00	-25.88	Average	Vertical
4062.629	40.94	29.55	9.05	40.09	39.45	74.00	-34.55	Peak	Vertical
4882.317	30.21	30.95	10.02	40.22	30.96	54.00	-23.04	Average	Vertical
4882.317	43.51	30.95	10.02	40.22	44.26	74.00	-29.74	Peak	Vertical
7323.542	24.30	35.74	12.93	39.22	33.75	54.00	-20.25	Average	Vertical
7323.542	39.23	35.74	12.93	39.22	48.68	74.00	-25.32	Peak	Vertical
8224.200	20.63	36.33	13.63	38.99	31.60	54.00	-22.40	Average	Vertical
8224.200	35.57	36.33	13.63	38.99	46.54	74.00	-27.46	Peak	Vertical
9764.795	18.30	37.70	14.45	37.90	32.55	54.00	-21.45	Average	Vertical
9764.795	32.76	37.70	14.45	37.90	47.01	74.00	-26.99	Peak	Vertical
12205.470	17.44	39.21	16.05	38.10	34.60	54.00	-19.40	Average	Vertical
12205.470	32.11	39.21	16.05	38.10	49.27	74.00	-24.73	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4882.833	35.40	30.95	10.02	40.22	36.15	54.00	-17.85	Average	Horizontal
4882.833	49.46	30.95	10.02	40.22	50.21	74.00	-23.79	Peak	Horizontal
6526.373	24.01	34.32	11.72	39.50	30.55	54.00	-23.45	Average	Horizontal
6526.373	39.87	34.32	11.72	39.50	46.41	74.00	-27.59	Peak	Horizontal
7323.729	21.42	35.74	12.93	39.22	30.87	54.00	-23.13	Average	Horizontal
7323.729	36.85	35.74	12.93	39.22	46.30	74.00	-27.70	Peak	Horizontal
9764.480	19.35	37.70	14.45	37.90	33.60	54.00	-20.40	Average	Horizontal
9764.480	34.00	37.70	14.45	37.90	48.25	74.00	-25.75	Peak	Horizontal
10698.510	16.64	39.34	14.87	37.90	32.95	54.00	-21.05	Average	Horizontal
10698.510	31.82	39.34	14.87	37.90	48.13	74.00	-25.87	Peak	Horizontal
12205.470	17.43	39.21	16.05	38.10	34.59	54.00	-19.41	Average	Horizontal
12205.470	31.92	39.21	16.05	38.10	49.08	74.00	-24.92	Peak	Horizontal

Channel 19 (2469 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4938.721	29.42	31.03	10.07	40.22	30.30	54.00	-23.70	Average	Vertical
4938.721	41.90	31.03	10.07	40.22	42.78	74.00	-31.22	Peak	Vertical
5615.620	25.41	31.97	10.61	40.05	27.94	54.00	-26.06	Average	Vertical
5615.620	40.38	31.97	10.61	40.05	42.91	74.00	-31.09	Peak	Vertical
7407.263	24.35	35.89	13.02	39.20	34.06	54.00	-19.94	Average	Vertical
7407.263	36.89	35.89	13.02	39.20	46.60	74.00	-27.40	Peak	Vertical
9876.710	17.11	37.86	14.42	37.86	31.53	54.00	-22.47	Average	Vertical
9876.710	32.62	37.86	14.42	37.86	47.04	74.00	-26.96	Peak	Vertical
11302.480	17.45	39.47	15.47	38.01	34.38	54.00	-19.62	Average	Vertical
11302.480	31.98	39.47	15.47	38.01	48.91	74.00	-25.09	Peak	Vertical
12345.270	18.17	38.98	16.25	38.11	35.29	54.00	-18.71	Average	Vertical
12345.270	32.22	38.98	16.25	38.11	49.34	74.00	-24.66	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
3233.260	29.14	27.90	8.00	39.70	25.34	54.00	-28.66	Average	Horizontal
3233.260	40.55	27.90	8.00	39.70	36.75	74.00	-37.25	Peak	Horizontal
4938.993	31.53	31.03	10.07	40.22	32.41	54.00	-21.59	Average	Horizontal
4938.993	45.82	31.03	10.07	40.22	46.70	74.00	-27.30	Peak	Horizontal
7407.172	19.29	35.89	13.02	39.20	29.00	54.00	-25.00	Average	Horizontal
7407.172	36.94	35.89	13.02	39.20	46.65	74.00	-27.35	Peak	Horizontal
9876.710	19.56	37.86	14.42	37.86	33.98	54.00	-20.02	Average	Horizontal
9876.710	33.61	37.86	14.42	37.86	48.03	74.00	-25.97	Peak	Horizontal
10760.540	16.49	39.50	14.90	37.91	32.98	54.00	-21.02	Average	Horizontal
10760.540	31.97	39.50	14.90	37.91	48.46	74.00	-25.54	Peak	Horizontal
12345.450	14.52	38.98	16.25	38.11	31.64	74.00	-42.36	Peak	Horizontal
12345.450	35.29	38.98	16.25	38.11	52.41	74.00	-21.59	Peak	Horizontal

For RF module 2

Channel 1 (2406MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
3823.371	25.96	29.08	8.75	40.02	23.77	54.00	-30.23	Average	Vertical
3823.371	41.56	29.08	8.75	40.02	39.37	74.00	-34.63	Peak	Vertical
4812.041	32.44	30.82	9.96	40.21	33.01	54.00	-20.99	Average	Vertical
4812.041	46.15	30.82	9.96	40.21	46.72	74.00	-27.28	Peak	Vertical
7218.420	22.49	35.50	12.76	39.25	31.50	54.00	-22.50	Average	Vertical
7218.420	37.58	35.50	12.76	39.25	46.59	74.00	-27.41	Peak	Vertical
8271.880	21.64	36.27	13.67	38.97	32.61	54.00	-21.39	Average	Vertical
8271.880	34.62	36.27	13.67	38.97	45.59	74.00	-28.41	Peak	Vertical
9624.430	22.4	37.51	14.48	37.97	36.42	54.00	-17.58	Average	Vertical
9624.430	35.54	37.51	14.48	37.97	49.56	74.00	-24.44	Peak	Vertical
12030.840	18.24	39.46	15.83	38.08	35.45	54.00	-18.55	Average	Vertical
12030.840	31.66	39.46	15.83	38.08	48.87	74.00	-25.13	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4812.928	37.54	30.82	9.96	40.21	38.11	54.00	-15.89	Average	Horizontal
4812.928	48.95	30.82	9.96	40.21	49.52	74.00	-24.48	Peak	Horizontal
7218.518	23.64	35.50	12.76	39.25	32.65	54.00	-21.35	Average	Horizontal
7218.518	36.78	35.50	12.76	39.25	45.79	74.00	-28.21	Peak	Horizontal
8176.795	34.66	36.37	13.60	39.02	45.61	74.00	-28.39	Peak	Horizontal
8176.795	19.31	36.37	13.60	39.02	30.26	74.00	-43.74	Peak	Horizontal
9624.910	20.47	37.51	14.48	37.97	34.49	54.00	-19.51	Average	Horizontal
9624.910	35.09	37.51	14.48	37.97	49.11	74.00	-24.89	Peak	Horizontal
10760.540	21.50	39.50	14.90	37.91	37.99	54.00	-16.01	Average	Horizontal
10760.540	31.49	39.50	14.90	37.91	47.98	74.00	-26.02	Peak	Horizontal
12030.970	17.43	39.46	15.83	38.08	34.64	54.00	-19.36	Average	Horizontal
12030.970	31.75	39.46	15.83	38.08	48.96	74.00	-25.04	Peak	Horizontal

Channel 11 (2441 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
3396.098	26.53	27.90	8.20	39.84	22.79	54.00	-31.21	Average	Vertical
3396.098	40.67	27.90	8.20	39.84	36.93	74.00	-37.07	Peak	Vertical
4882.062	30.64	30.95	10.02	40.22	31.39	54.00	-22.61	Average	Vertical
4882.062	43.60	30.95	10.02	40.22	44.35	74.00	-29.65	Peak	Vertical
5881.418	26.55	32.23	10.99	39.95	29.82	54.00	-24.18	Average	Vertical
5881.418	40.67	32.23	10.99	39.95	43.94	74.00	-30.06	Peak	Vertical
7323.207	20.55	35.74	12.93	39.22	30.00	54.00	-24.00	Average	Vertical
7323.207	37.80	35.74	12.93	39.22	47.25	74.00	-26.75	Peak	Vertical
9764.214	18.38	37.70	14.45	37.90	32.63	54.00	-21.37	Average	Vertical
9764.214	30.60	37.70	14.45	37.90	44.85	74.00	-29.15	Peak	Vertical
12205.900	17.44	39.21	16.05	38.10	34.60	54.00	-19.40	Average	Vertical
12205.900	31.76	39.21	16.05	38.10	48.92	74.00	-25.08	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4882.241	37.35	30.95	10.02	40.22	38.10	54.00	-15.90	Average	Horizontal
4882.241	50.11	30.95	10.02	40.22	50.86	74.00	-23.14	Peak	Horizontal
7323.536	24.19	35.74	12.93	39.22	33.64	54.00	-20.36	Average	Horizontal
7323.536	36.79	35.74	12.93	39.22	46.24	74.00	-27.76	Peak	Horizontal
8840.473	21.37	36.40	14.10	38.57	33.30	54.00	-20.70	Average	Horizontal
8840.473	32.55	36.40	14.10	38.57	44.48	74.00	-29.52	Peak	Horizontal
9764.789	21.31	37.70	14.45	37.90	35.56	54.00	-18.44	Average	Horizontal
9764.789	33.36	37.70	14.45	37.90	47.61	74.00	-26.39	Peak	Horizontal
12326.270	19.97	39.03	16.20	38.11	37.09	54.00	-16.91	Average	Horizontal
12326.270	32.48	39.03	16.2	38.11	49.60	74.00	-24.40	Peak	Horizontal
13599.130	17.08	40.42	17.55	38.31	36.74	54.00	-17.26	Average	Horizontal
13599.130	30.98	40.42	17.55	38.31	50.64	74.00	-23.36	Peak	Horizontal

Channel 19 (2469 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4938.102	27.48	31.03	10.07	40.22	28.36	54.00	-25.64	Average	Vertical
4938.102	41.05	31.03	10.07	40.22	41.93	74.00	-32.07	Peak	Vertical
5439.885	25.63	31.83	10.47	40.11	27.82	54.00	-26.18	Average	Vertical
5439.885	41.53	31.83	10.47	40.11	43.72	74.00	-30.28	Peak	Vertical
7407.942	25.22	35.89	13.02	39.20	34.93	54.00	-19.07	Average	Vertical
7407.942	37.16	35.89	13.02	39.20	46.87	74.00	-27.13	Peak	Vertical
9876.130	20.37	37.86	14.42	37.86	34.79	54.00	-19.21	Average	Vertical
9876.130	34.89	37.86	14.42	37.86	49.31	74.00	-24.69	Peak	Vertical
11172.560	16.60	39.75	15.22	37.99	33.58	54.00	-20.42	Average	Vertical
11172.560	32.22	39.75	15.22	37.99	49.20	74.00	-24.80	Peak	Vertical
12345.810	16.50	38.98	16.25	38.11	33.62	54.00	-20.38	Average	Vertical
12345.810	32.49	38.98	16.25	38.11	49.61	74.00	-24.39	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
4938.792	34.47	31.03	10.07	40.22	35.35	54.00	-18.65	Average	Horizontal
4938.792	46.78	31.03	10.07	40.22	47.66	74.00	-26.34	Peak	Horizontal
6322.136	26.41	33.68	11.52	39.67	31.94	54.00	-22.06	Average	Horizontal
6322.136	39.54	33.68	11.52	39.67	45.07	74.00	-28.93	Peak	Horizontal
7407.292	23.43	35.89	13.02	39.20	33.14	54.00	-20.86	Average	Horizontal
7407.292	36.44	35.89	13.02	39.20	46.15	74.00	-27.85	Peak	Horizontal
9876.880	18.93	37.86	14.42	37.86	33.35	54.00	-20.65	Average	Horizontal
9876.880	31.01	37.86	14.42	37.86	45.43	74.00	-28.57	Peak	Horizontal
11172.560	17.67	39.75	15.22	37.99	34.65	54.00	-19.35	Average	Horizontal
11172.560	31.73	39.75	15.22	37.99	48.71	74.00	-25.29	Peak	Horizontal
12345.610	17.03	38.98	16.25	38.11	34.15	54.00	-19.85	Average	Horizontal
12345.610	31.57	38.98	16.25	38.11	48.69	74.00	-25.31	Peak	Horizontal

7.8 Radiated Emissions which fall in the restricted bands

Test Requirement: FCC Part 15 C section 15.247

(d) 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)).

Test Method: ANSI C63.10.2013

Test Status: Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.

Test site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Detector:

For PK value:

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW = 10Hz

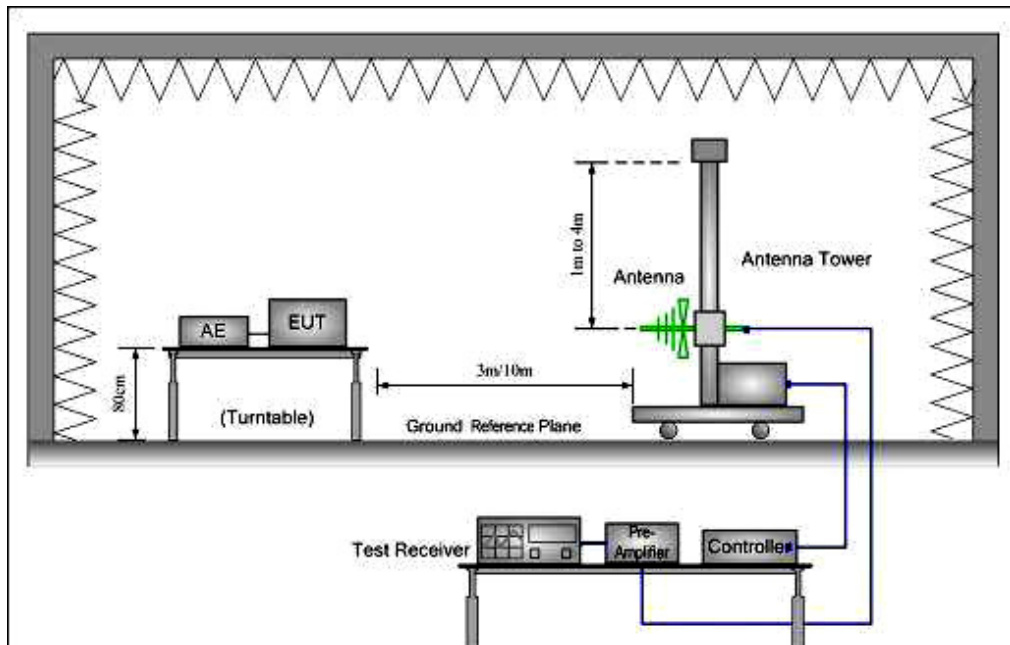
Sweep = auto

Detector function = peak

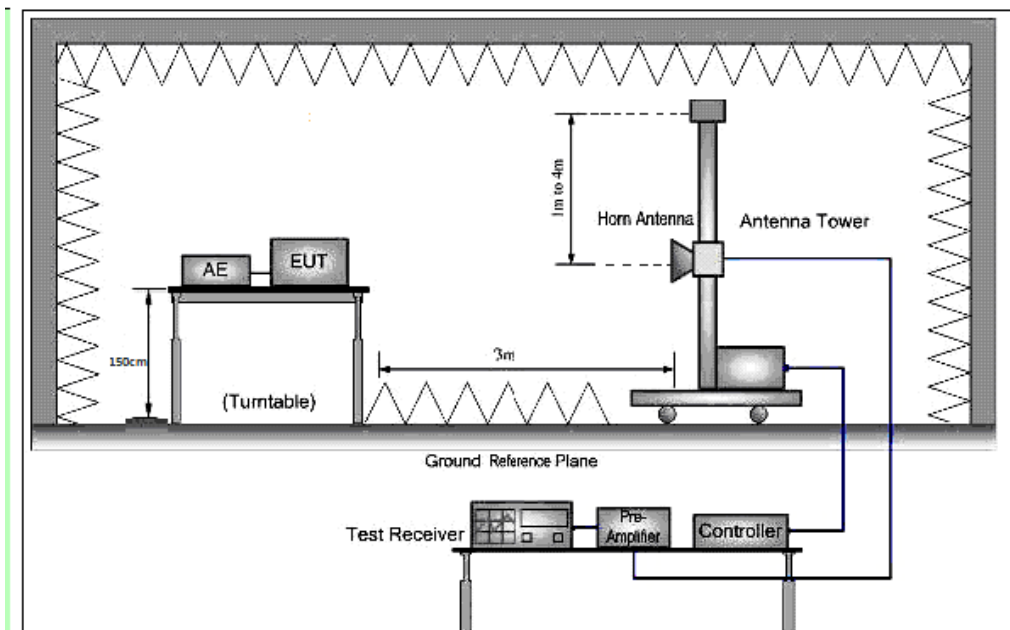
Trace = max hold

Test Configuration:

1). 30 MHz to 1 GHz emissions:



2). Above 1 GHz emissions:



Test Procedure:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2010 was used to perform radiated emission test above 1 GHz.

The receiver scanned from the lowest frequency generated within the EUT to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

From 30MHz to 1GHz, read the Quasi-Peak field strength of the emissions with receiver QP detector RBW=120KHz.

Above 1GHz, read the Peak field strength and Average field strength.

Read the Peak field strength through RBW=1MHz,VBW=3MHz in spectrum analyzer setting;

Read the Average field strength through RBW=1MHz,VBW=10Hz in spectrum analyzer setting;

While maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the average field strength reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

Test Result:

30 MHz to 1 GHz Measurement

The measurements with Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Above 1GHz, Peak & Average Measurement

For RF module1

Channel 1 (2406MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	26.42	26.25	6.80	39.07	20.40	54.00	-33.60	Average	Vertical
2310.000	41.38	26.25	6.80	39.07	35.36	74.00	-38.64	Peak	Vertical
2390.000	29.37	26.43	6.87	39.10	23.57	54.00	-30.43	Average	Vertical
2390.000	41.75	26.43	6.87	39.10	35.95	74.00	-38.05	Peak	Vertical
2483.500	28.81	26.58	7.07	39.14	23.32	54.00	-30.68	Average	Vertical
2483.500	41.43	26.58	7.07	39.14	35.94	74.00	-38.06	Peak	Vertical
2500.000	27.69	26.60	7.10	39.14	22.25	54.00	-31.75	Average	Vertical
2500.000	41.39	26.60	7.10	39.14	35.95	74.00	-38.05	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	29.08	26.25	6.80	39.07	23.06	54.00	-30.94	Average	Horizontal
2310.000	41.02	26.25	6.80	39.07	35.00	74.00	-39.00	Peak	Horizontal
2390.000	30.02	26.43	6.87	39.10	24.22	54.00	-29.78	Average	Horizontal
2390.000	42.16	26.43	6.87	39.10	36.36	74.00	-37.64	Peak	Horizontal
2483.500	27.11	26.58	7.07	39.14	21.62	54.00	-32.38	Average	Horizontal
2483.500	41.43	26.58	7.07	39.14	35.94	74.00	-38.06	Peak	Horizontal
2500.000	27.11	26.60	7.10	39.14	21.67	54.00	-32.33	Average	Horizontal
2500.000	41.52	26.60	7.10	39.14	36.08	74.00	-37.92	Peak	Horizontal

Channel 19 (2469 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	26.13	26.25	6.80	39.07	20.11	54.00	-33.89	Average	Vertical
2310.000	41.09	26.25	6.80	39.07	35.07	74.00	-38.93	Peak	Vertical
2390.000	27.51	26.43	6.87	39.10	21.71	54.00	-32.29	Average	Vertical
2390.000	40.95	26.43	6.87	39.10	35.15	74.00	-38.85	Peak	Vertical
2483.500	44.65	26.58	7.07	39.14	39.16	54.00	-14.84	Average	Vertical
2483.500	61.62	26.58	7.07	39.14	56.13	74.00	-17.87	Peak	Vertical
2500.000	27.84	26.60	7.10	39.14	22.40	54.00	-31.60	Average	Vertical
2500.000	41.83	26.60	7.10	39.14	36.39	74.00	-37.61	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	28.80	26.25	6.80	39.07	22.78	54.00	-31.22	Average	Horizontal
2310.000	41.02	26.25	6.80	39.07	35.00	74.00	-39.00	Peak	Horizontal
2390.000	29.64	26.43	6.87	39.10	23.84	54.00	-30.16	Average	Horizontal
2390.000	41.44	26.43	6.87	39.10	35.64	74.00	-38.36	Peak	Horizontal
2483.500	43.38	26.58	7.07	39.14	37.89	54.00	-16.11	Average	Horizontal
2483.500	64.67	26.58	7.07	39.14	59.18	74.00	-14.82	Peak	Horizontal
2500.000	30.16	26.60	7.10	39.14	24.72	54.00	-29.28	Average	Horizontal
2500.000	46.55	26.60	7.10	39.14	41.11	74.00	-32.89	Peak	Horizontal

For RF module 2

Channel 1 (2406MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	27.90	26.25	6.80	39.07	21.88	54.00	-32.12	Average	Vertical
2310.000	41.53	26.25	6.80	39.07	35.51	74.00	-38.49	Peak	Vertical
2390.000	26.70	26.43	6.87	39.10	20.90	54.00	-33.10	Average	Vertical
2390.000	41.66	26.43	6.87	39.10	35.86	74.00	-38.14	Peak	Vertical
2483.500	28.40	26.58	7.07	39.14	22.91	54.00	-31.09	Average	Vertical
2483.500	41.58	26.58	7.07	39.14	36.09	74.00	-37.91	Peak	Vertical
2500.000	29.53	26.60	7.10	39.14	24.09	54.00	-29.91	Average	Vertical
2500.000	41.45	26.60	7.10	39.14	36.01	74.00	-37.99	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	26.48	26.25	6.80	39.07	20.46	54.00	-33.54	Average	Horizontal
2310.000	41.42	26.25	6.80	39.07	35.40	74.00	-38.60	Peak	Horizontal
2390.000	29.44	26.43	6.87	39.10	23.64	54.00	-30.36	Average	Horizontal
2390.000	42.25	26.43	6.87	39.10	36.45	74.00	-37.55	Peak	Horizontal
2483.500	28.61	26.58	7.07	39.14	23.12	54.00	-30.88	Average	Horizontal
2483.500	41.25	26.58	7.07	39.14	35.76	74.00	-38.24	Peak	Horizontal
2500.000	30.22	26.60	7.10	39.14	24.78	54.00	-29.22	Average	Horizontal
2500.000	42.11	26.60	7.10	39.14	36.67	74.00	-37.33	Peak	Horizontal

Channel 19 (2469 MHz):

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	27.23	26.25	6.80	39.07	21.21	54.00	-32.79	Average	Vertical
2310.000	41.12	26.25	6.80	39.07	35.10	74.00	-38.90	Peak	Vertical
2390.000	27.46	26.43	6.87	39.10	21.66	54.00	-32.34	Average	Vertical
2390.000	41.46	26.43	6.87	39.10	35.66	74.00	-38.34	Peak	Vertical
2483.500	43.10	26.58	7.07	39.14	37.61	54.00	-16.39	Average	Vertical
2483.500	59.09	26.58	7.07	39.14	53.60	74.00	-20.40	Peak	Vertical
2500.000	27.89	26.60	7.10	39.14	22.45	54.00	-31.55	Average	Vertical
2500.000	41.82	26.60	7.10	39.14	36.38	74.00	-37.62	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark	Pol/Phase
2310.000	26.42	26.25	6.80	39.07	20.40	54.00	-33.60	Average	Horizontal
2310.000	40.49	26.25	6.80	39.07	34.47	74.00	-39.53	Peak	Horizontal
2390.000	26.93	26.43	6.87	39.10	21.13	54.00	-32.87	Average	Horizontal
2390.000	41.53	26.43	6.87	39.10	35.73	74.00	-38.27	Peak	Horizontal
2483.500	51.58	26.58	7.07	39.14	46.09	54.00	-7.91	Average	Horizontal
2483.500	65.56	26.58	7.07	39.14	60.07	74.00	-13.93	Peak	Horizontal
2500.000	33.41	26.60	7.10	39.14	27.97	54.00	-26.03	Average	Horizontal
2500.000	45.59	26.60	7.10	39.14	40.15	74.00	-33.85	Peak	Horizontal

Test result: The unit does meet the FCC requirements.

7.9 Band Edges Requirement

Test Requirement: FCC Part 15 C section 15.247

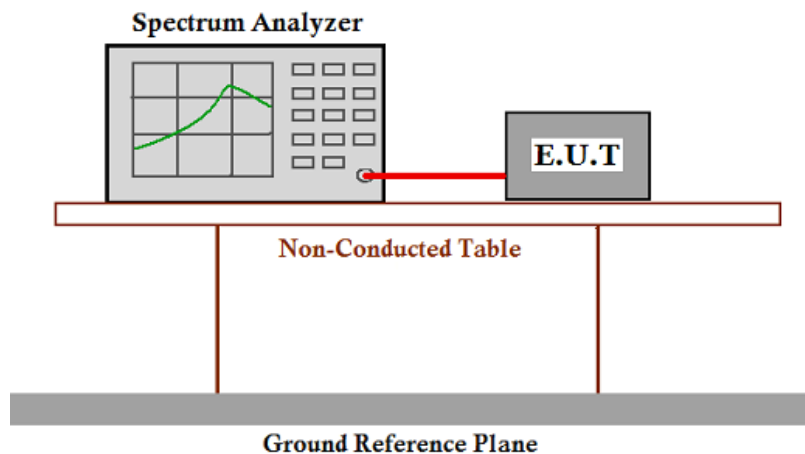
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Frequency Band: 2400 MHz to 2483.5 MHz

Test Method: ANSI C63.10: Clause 11.13

Test Status: Enter test mode for the product. Test in Channel lowest (2406MHz), middle (2441 MHz) and highest (2469 MHz), keep in continuously transmitting status.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set instrument center frequency to the frequency of the emission to be measured(must be within 2MHz of the authorized band edge).
3. Set span (wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.),
4. RBW=100kHz,
5. VBW \geq 3 \times RBW
6. Detector=peak
7. Sweep time =auto,
8. Trace mode=max hold.
9. Allow sweep to continue until the trace stabilizes(required measurement time may increase for low duty cycle applications)
10. Compute the power by integrating the spectrum over 1MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency($f_{\text{emission}}\pm 0.5\text{MHz}$).If the instrument does not have a band power function,the sum the amplitude levels(in power units) at 100kHz intervals extending across the 1MHz spectrum defined by $f_{\text{emission}}\pm 0.5\text{MHz}$.

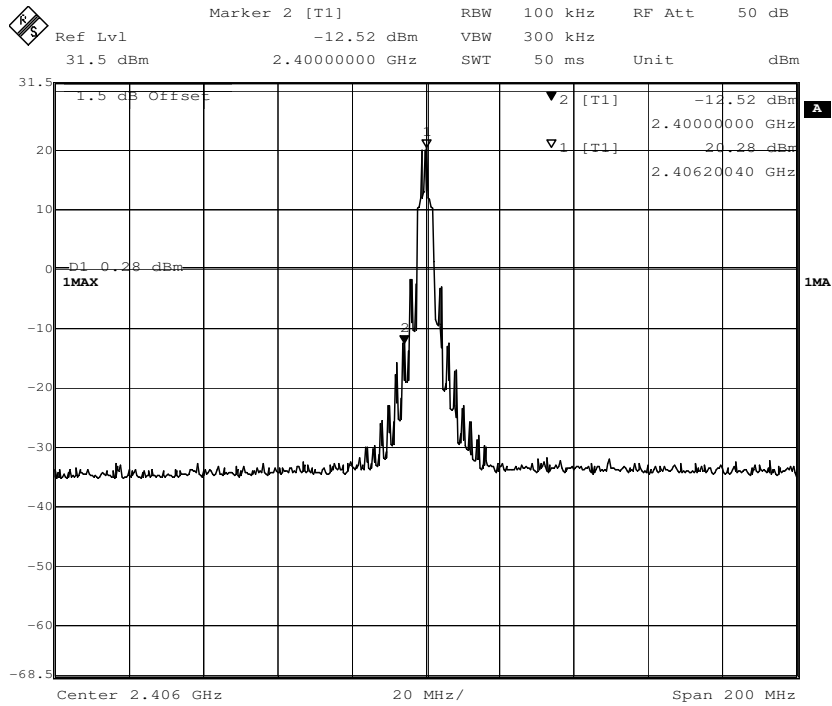
Test result with plots as follows:

Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB
 Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

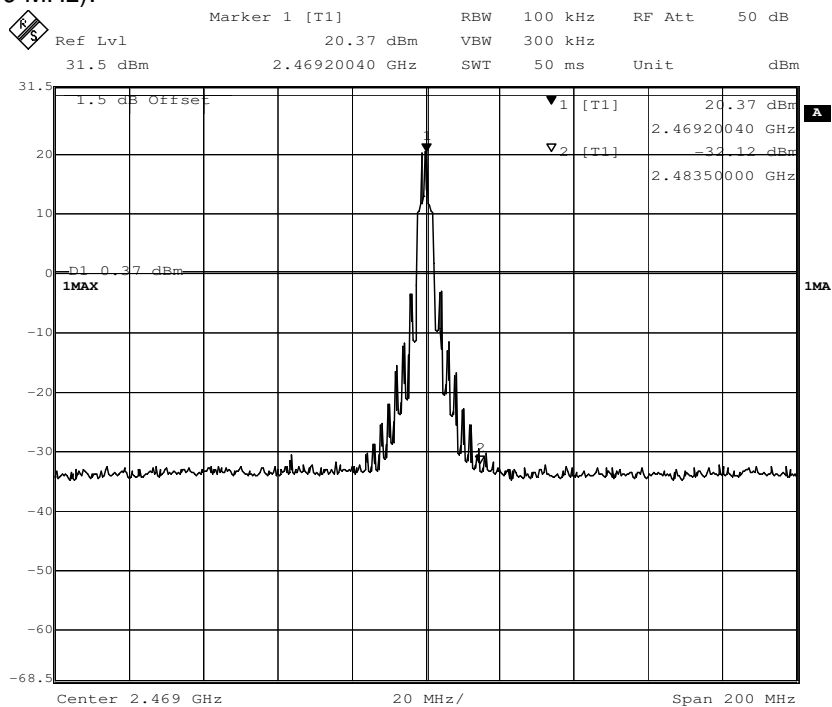
Result plot as follows:

For RF module1

Channel 1 (2406MHz):

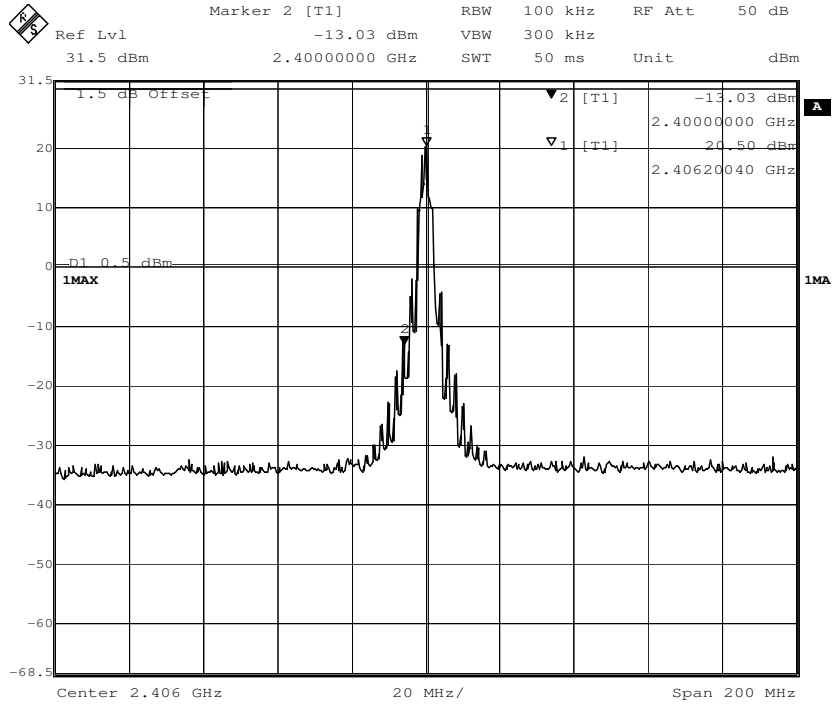


Channel 19 (2469 MHz):

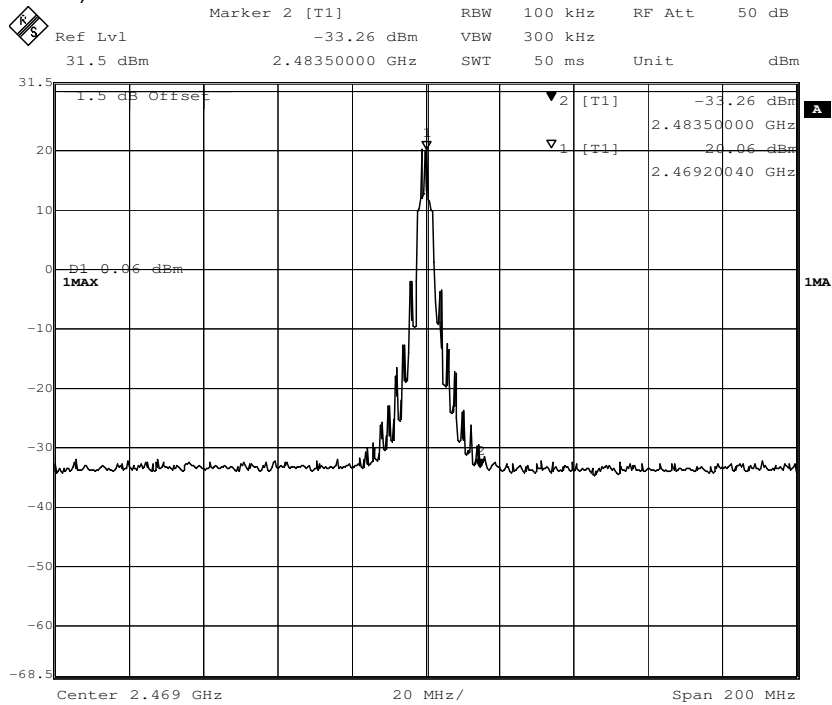


For RF module 2

Channel 1 (2406MHz):



Channel 19 (2469 MHz):



7.10 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

Test Requirement: FCC Part 15 C section 15.207
Test Method: ANSI C63.10: Clause 6.2
Frequency Range: 150 kHz to 30 MHz
Detector: Peak for pre-scan (9 kHz Resolution Bandwidth)
Test Limit

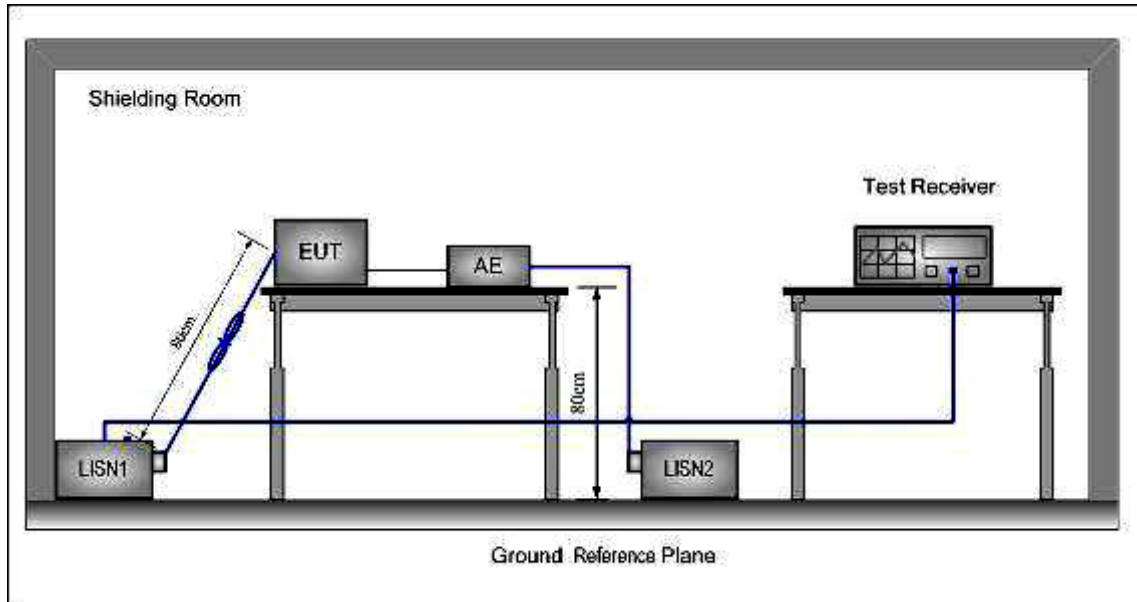
Limits for conducted disturbance at the mains ports of class B

Frequency Range (MHz)	Class B Limit 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

NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

EUT Operation: Keep the two RF module continuously emission at same time.

Test Configuration:



Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 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 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

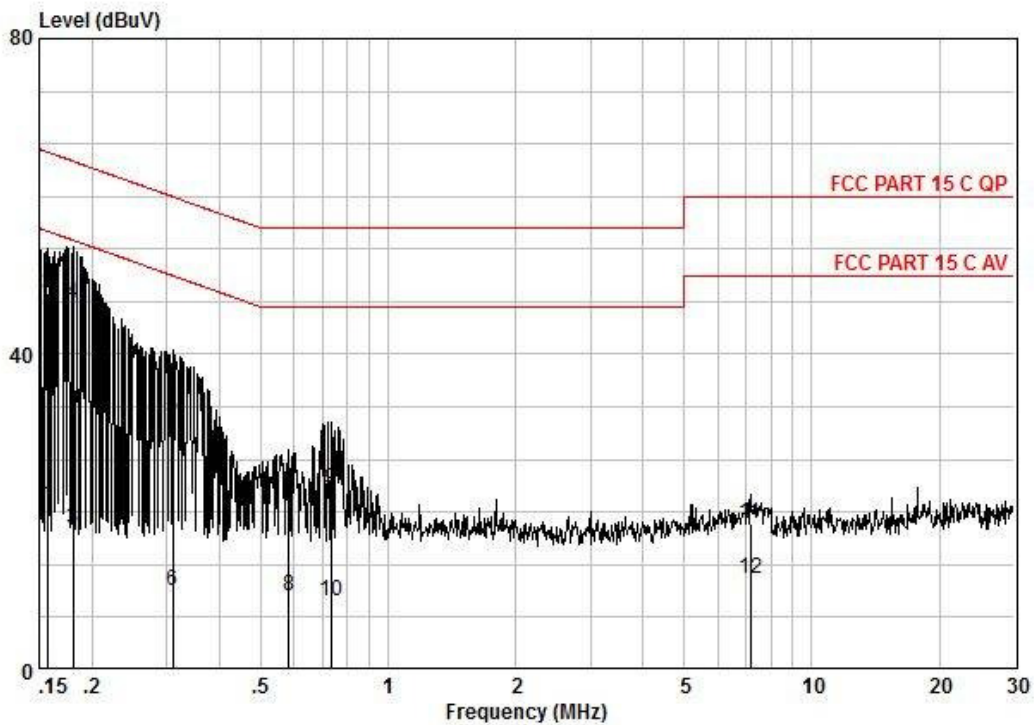
Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

The following Quasi-Peak and Average measurements were performed on the EUT:

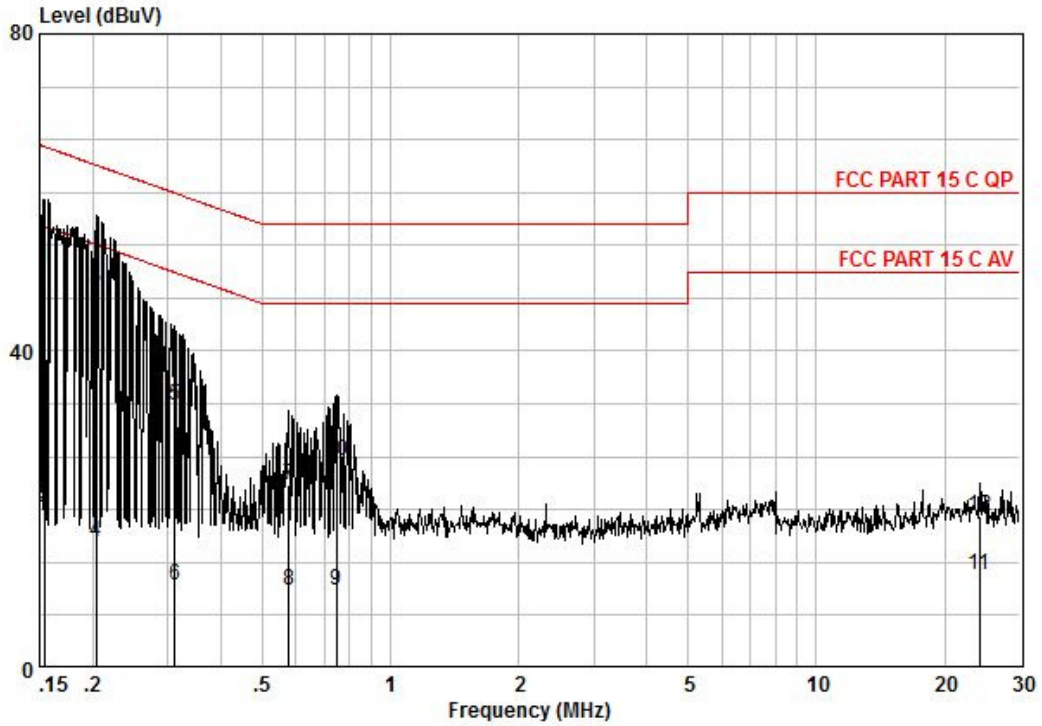
Test Result:

Neutral Line



Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0,16	11,11	0,10	9,67	20,88	55,60	-34,73	AVERAGE
0,16	38,01	0,10	9,67	47,78	65,60	-17,83	QP
0,18	8,07	0,10	9,67	17,84	54,46	-36,62	AVERAGE
0,18	36,62	0,10	9,67	46,39	64,46	-18,07	QP
0,31	22,24	0,15	9,66	32,05	59,97	-27,92	QP
0,31	0,29	0,15	9,66	10,10	49,97	-39,87	AVERAGE
0,58	10,83	0,22	9,67	20,73	56,00	-35,27	QP
0,58	-0,54	0,22	9,67	9,36	46,00	-36,64	AVERAGE
0,73	12,94	0,25	9,67	22,87	56,00	-33,13	QP
0,73	-1,13	0,25	9,67	8,80	46,00	-37,20	AVERAGE
7,18	8,13	0,65	9,77	18,56	50,00	-31,44	AVERAGE
7,18	1,06	0,65	9,77	11,49	50,00	-38,51	AVERAGE

Live Line



Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0,15	40,62	0,10	9,65	50,37	65,78	-15,41	QP
0,15	10,50	0,10	9,65	20,25	55,78	-35,53	AVERAGE
0,20	38,23	0,10	9,64	47,97	63,45	-15,47	QP
0,20	6,19	0,10	9,64	15,93	53,45	-37,51	AVERAGE
0,31	23,37	0,15	9,64	33,16	59,93	-26,77	QP
0,31	0,78	0,15	9,64	10,57	49,93	-39,36	AVERAGE
0,58	13,15	0,22	9,64	23,01	56,00	-32,99	QP
0,58	-0,08	0,22	9,64	9,78	46,00	-36,22	AVERAGE
0,75	0,01	0,26	9,65	9,92	46,00	-36,08	AVERAGE
0,75	16,16	0,26	9,65	26,07	56,00	-29,93	QP
24,14	0,89	0,69	10,22	11,80	50,00	-38,20	AVERAGE
24,14	8,32	0,69	10,22	19,23	60,00	-40,77	QP

--End of Report--