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TEST REPORT

Application No.:	GZEM1711006414CR
Applicant:	Dubs Concepts, LLC
Address of Applicant:	1001 SW Emkay Dr. Bend, OR 97702 U.S.A.
Manufacturer:	Dubs Concepts, LLC
Address of Manufacturer:	1001 SW Emkay Dr. Suite 100, Bend, OR 97702 U.S.A.
Factory:	Zhongshan Hungsing Electronics CO.,Ltd
Address of Factory:	No.152, Tanshen South Road, Tanzhou Town, Zhongshan, Guangdong, China (528400)
Equipment Under Test (EUT):	
EUT Name:	Wireless headphones
FCC ID:	2AODCDUBSLABS
Model No.:	Bedphones Wireless, Versafit. ¤
¤	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	DubsLabs
Standards:	47 CFR Part 15, Subpart C:2016 section 15.247
Date of Receipt:	2017-11-01
Date of Test:	2017-11-22 to 2017-11-24
Date of Issue:	2017-12-05
Test Result :	**Pass***

* 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		2017-12-05		Original

Authorized for issue by:				
Tested By		Vico.Cui **Vico Cui /Project Engineer**		2017-11-22 to 2017-11-24 **Date**
Checked By		Ricky Liu **Ricky_Liu /Reviewer**		2017-12-05 **Date**

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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	PASS
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	PASS **
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:

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.

¤ **Declaration of EUT Family Grouping:**

Model No.: Bedphones Wireless, Versafit

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 on color and branding.

Therefore only one model **Versafit** was tested in this report.

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4 Contents

1 Cover Page **1**

2 Version **2**

3 Test Summary **3**

4 Contents **4**

5 General Information **5**

5.1 Details of E.U.T. 5
5.2 Description of Support Units 5
5.3 Deviation from Standards 5
5.4 Abnormalities from Standard Conditions 5
5.5 Other Information Requested by the Customer 5
5.6 Test Location 6
5.7 Measurement Uncertainty 6
5.8 Test Facility 7

6 Equipment List **8**

7 Test Results **10**

7.1 E.U.T. test conditions 10
7.2 Antenna Requirement 13
7.3 6 dB Bandwidth 14
7.4 Maximum Peak Output Power 17
7.5 Peak Power Spectral Density 21
7.6 Conducted Spurious Emissions 25
7.7 Radiated Spurious Emissions 31
7.8 Radiated Emissions which fall in the restricted bands 39
7.9 Band Edges Requirement 45
7.10 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz 48

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5 General Information

5.1 Details of E.U.T.

Operating Frequency	2402 MHz to 2480 MHz
Type of Modulation:	GFSK
Number of Channels	40 Channels
Channel Separation:	2 MHz
Duty Cycle:	Continuous operation possible for testing purposes
Antenna Type	Integrated chip antenna
Antenna gain:	2 dBi
Specialty:	Bluetooth 4.0 Dual mode
Function:	Headphone with BT function to transmit and receive audio signal.
Power Supply:	Working voltage: DC 3.7V for internal rechargeable battery normal working. Charging voltage: DC 5V from USB port battery charging.
Power Cord:	About 0.2m USB cable (supply unit)

5.2 Description of Support Units

The EUT has been tested with corresponding accessories as below supplied by SGS:

Description	Manufacturer	Model No.	Serial No.
iPhone 5	Apple	A1429	F18KC03FDTWD
Adapter	Apple	A1357 W010A051	REF. No.SEA0500

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. The test board and PC are only to configure the engineer mode and not used to final test.

5.3 Deviation from Standards

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

5.4 Abnormalities from Standard Conditions

None.

5.5 Other Information Requested by the Customer

None.

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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)

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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, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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6 Equipment List

FCC & IC equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YYYY-MM-DD)	Cal.Due date (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
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-ELEKTRONI	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	BRM 50702	149	2017-01-20	2018-01-19
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2016-04-30	2018-04-29
EMC2136	MI Cable	SGS	0.8m	N/A	2017-11-02	2018-11-01
EMC2137	MI Cable	SGS	0.8m	N/A	2017-11-02	2018-11-01
EMC2138	EXA Signal Analyzer	KEYSIGHT	N9010A	MY57120105	2017-11-15	2018-11-14
EMC0069	Signal Analyzer(20Hz ~ 26.5Ghz	R&S	FSIQ26	100312	2017-11-20	2018-11-19

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Conducted Emission						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YYYY-MM-DD)	Cal.Due date (YYYY-MM-DD)
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m^3	N/A	2016-12-27	2019-12-26
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2017-01-20	2018-01-19
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2017-09-20	2018-09-19
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2017-11-27	2018-11-26
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
EMC2123	8 Line ISN Cat 6	SCHWARZBECK MESS-ELEKTRONIK	NTFM 8158	NTFM 8158 0151	2017-06-23	2018-06-22
EMC2124	8 Line ISN Cat 5	SCHWARZBECK MESS-ELEKTRONIK	CAT5 8158	CAT5 8158-188	2017-06-23	2018-06-22
EMC2126	8 Line ISN Cat 3	SCHWARZBECK MESS-ELEKTRONIK	CAT3 8158	CAT38158-0081	2017-06-23	2018-06-22
EMC2122	ISN S8	SCHWARZBECK MESS-ELEKTRONIK	ISN S8	57	2017-06-23	2018-06-22
EMC2121	ISN S1	SCHWARZBECK MESS-ELEKTRONIK	ISN S1	10	2017-06-23	2018-06-22
EMC2125	2 wires ISN	SCHWARZBECK MESS-ELEKTRONIK	NTFM 8131	8131-198	2017-06-23	2018-06-22
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 (YYYY-MM-DD)	Cal.Due date (YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2017-07-26	2018-07-25
EMC0007	DMM	Fluke	73	70671122	2017-07-26	2018-07-25

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7 Test Results

7.1 E.U.T. test conditions

Test Voltage:	AC 120V
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:

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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

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EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2456
1	2404	28	2458
2	2406	29	2460
3	2408	30	2462
4	2410	31	2464
5	2412	32	2466
6	2414	33	2468
7	2416	34	2470
8	2418	35	2472
9	2420	36	2474
10	2422	37	2476
11	2424	38	2478
12	2426	39	2480
13	2428	40	/
14	2430	41	/
15	2432	42	/
16	2434	43	/
17	2436	44	/
18	2438	45	/
19	2440	46	/
20	2442	47	/
21	2444	48	/
22	2446	49	/
23	2448	50	/
24	2450	51	/
25	2452	52	/
26	2454	53	/

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: 0 channel(2402MHz), middle channel: 20 channel(2442 MHz) and highest channel: 39 channel(2480 MHz)

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7.2 Antenna Requirement

Standard requirement

15.203 requirement:

For intentional device. According to 15.203. an intentional radiator shall be designed to

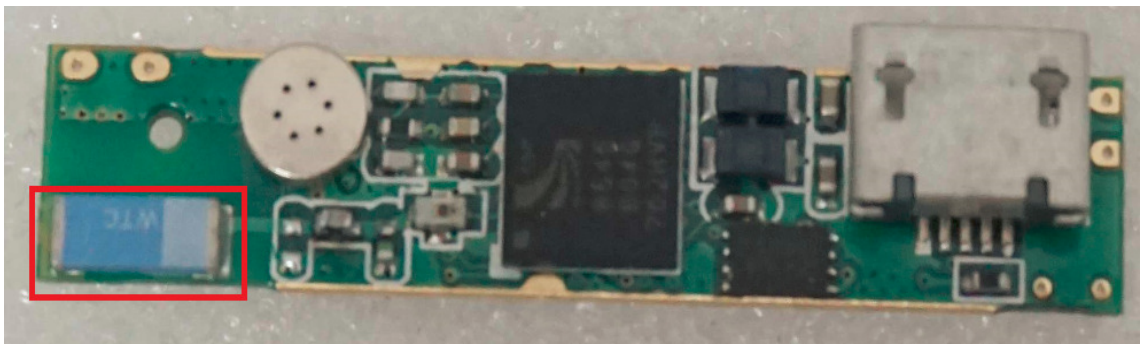
Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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 Chip antenna and no consideration of replacement. The maximum gain of the antenna is 2 dBi.



Test result: The unit does meet the FCC requirements.

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7.3 6 dB Bandwidth

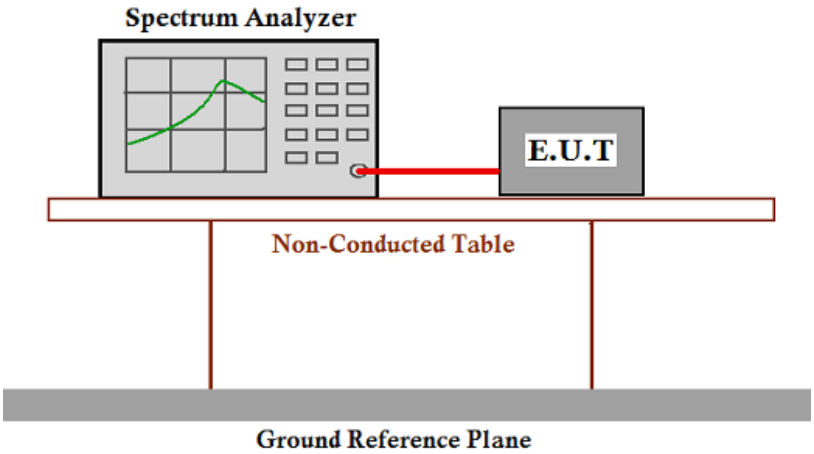
Test Requirement: FCC Part 15 C section 15.247

(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 (2402MHz), middle (2442MHz) and highest (2480MHz), 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.

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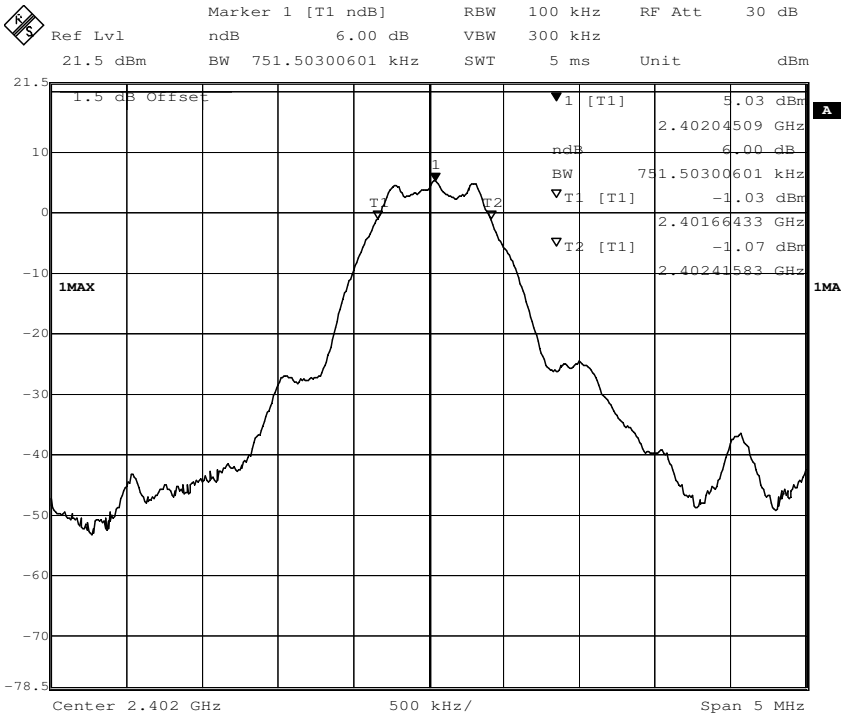
Channel No.	Frequency (MHz)	Mode	Measured 6dB bandwidth (kHz)	Limit	Result
0	2402	GFSK	751.50	≥500KHz	Pass
20	2442		741.48		Pass
39	2480		741.48		Pass

Test result: The unit does meet the FCC requirements.

Result plot as follows:

Channel 0:2.402GHz:



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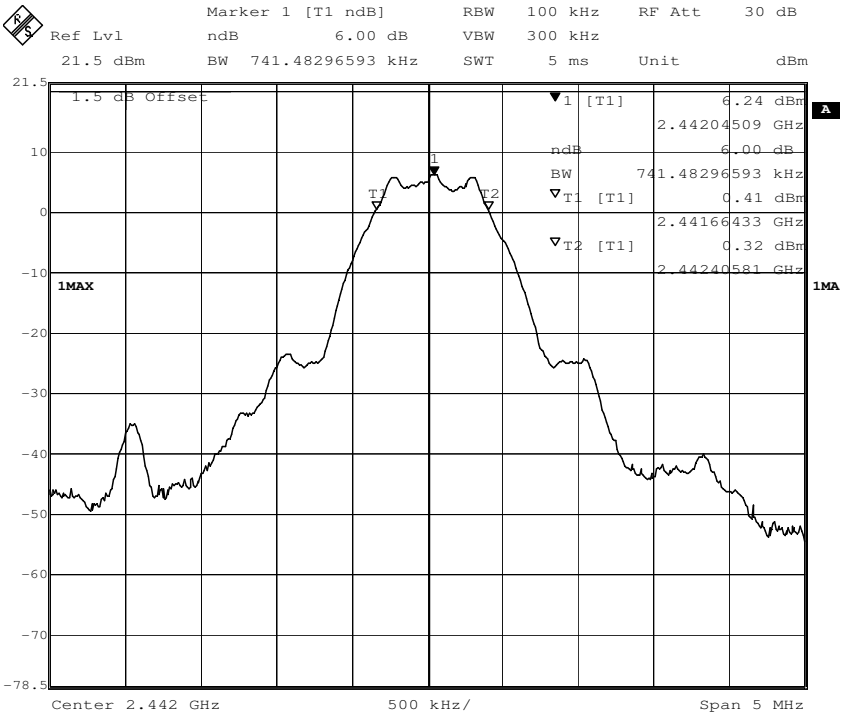
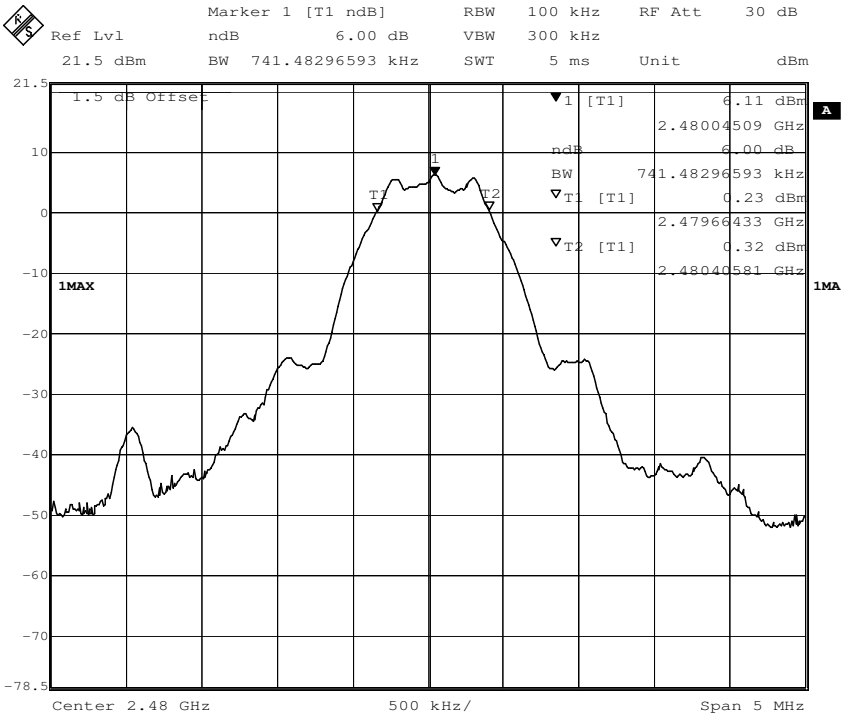
Channel 20:2.442GHz:



Channel 39:2.480GHz:



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7.4 Maximum Peak Output Power

Test Requirement: FCC Part 15 C section 15.247

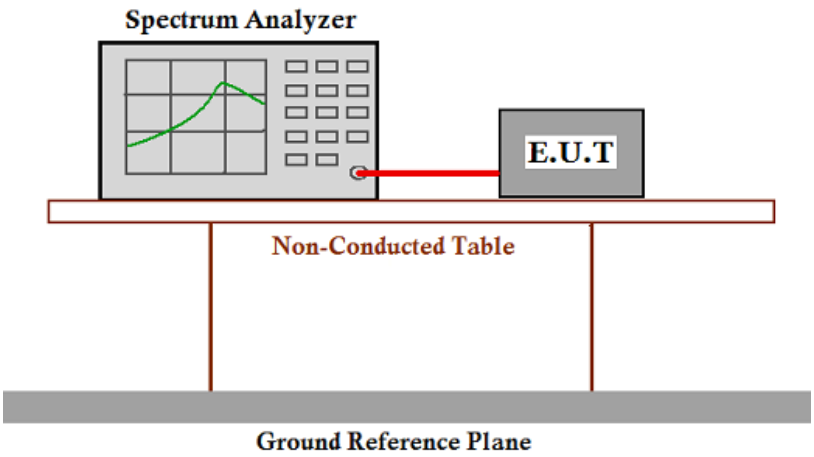
(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

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 (2402MHz), middle (2442MHz) and highest (2480MHz), keep in continuously transmitting status.

Test Configuration:



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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:

Channel No.	Frequency (MHz)	Mode	Data Rate	Measured Conducted Power (dBm)	Limit(dBm)	Result
0	2402	GFSK	1 Mbps	5.25	30	Pass
20	2442		1 Mbps	6.44	30	Pass
39	2480		1 Mbps	6.37	30	Pass
Test result: The unit does meet the FCC requirements.						

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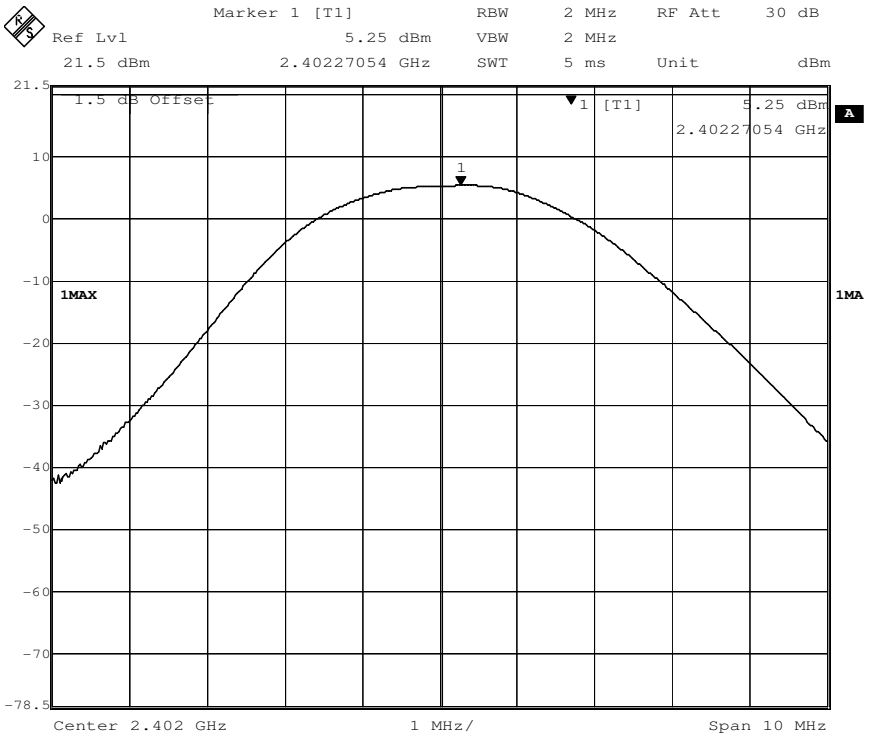
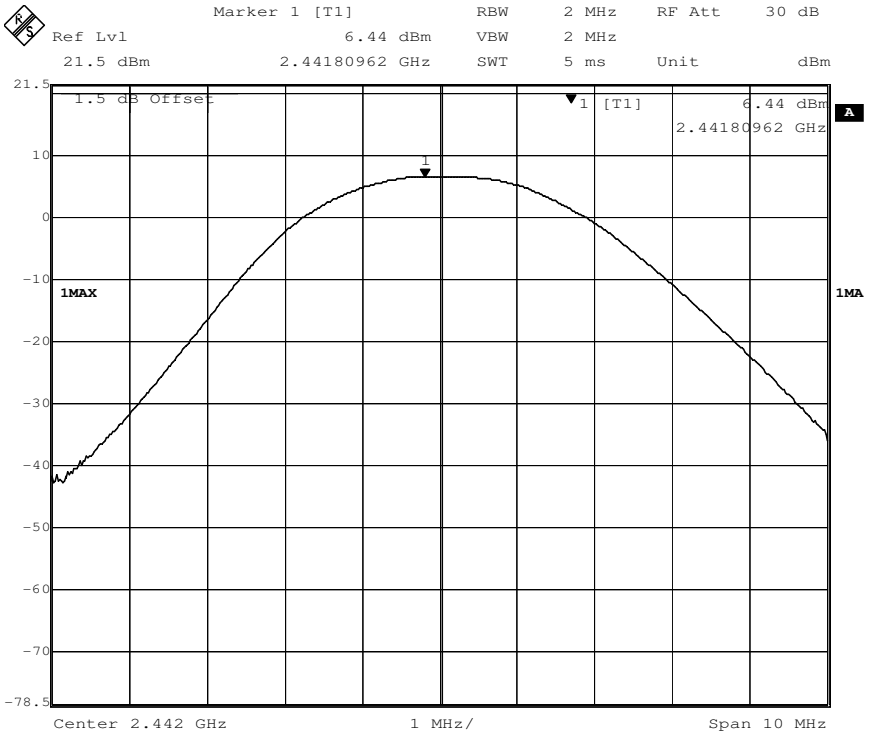
Result plot as follows:
Channel 0:2.402GHz:



Channel 20:2.442GHz:



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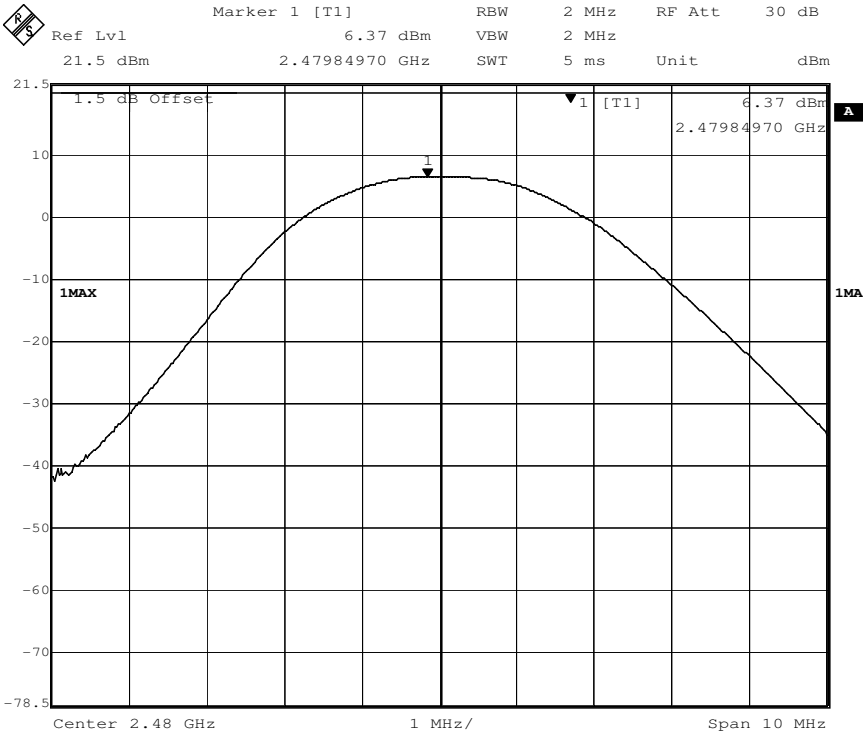
Channel 39:2.480GHz:



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7.5 Peak Power Spectral Density

Test Requirement: FCC Part 15 C section 15.247

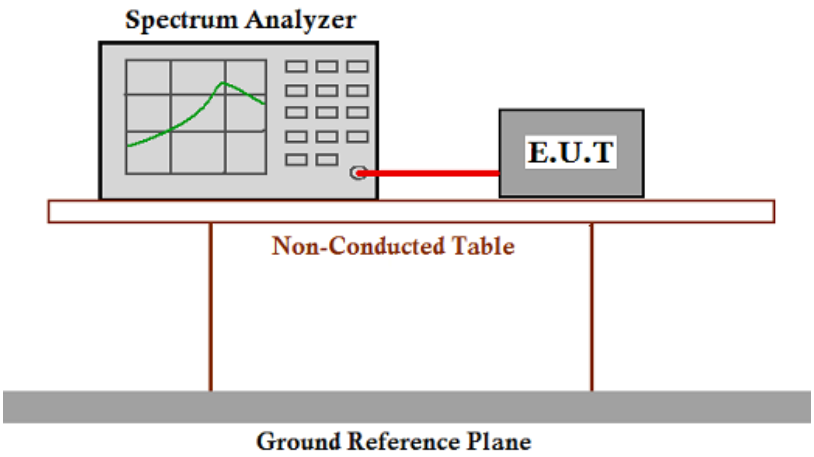
(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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 lowest Channel 2402MHz, middle Channel 2442MHz and highest Channel 2480MHz, 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 ≥ 3 x 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.

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Channel No.	Frequency (MHz)	Mode	Measured Peak Power Spectral Density (dBm/3KHz)	Limit	Result
0	2402	GFSK	-10.12	8dBm/3KHz	Pass
20	2442		-8.61		Pass
39	2480		-8.77		Pass

Test result: Level = Read Level + Cable Loss.

The unit does meet the FCC requirements.

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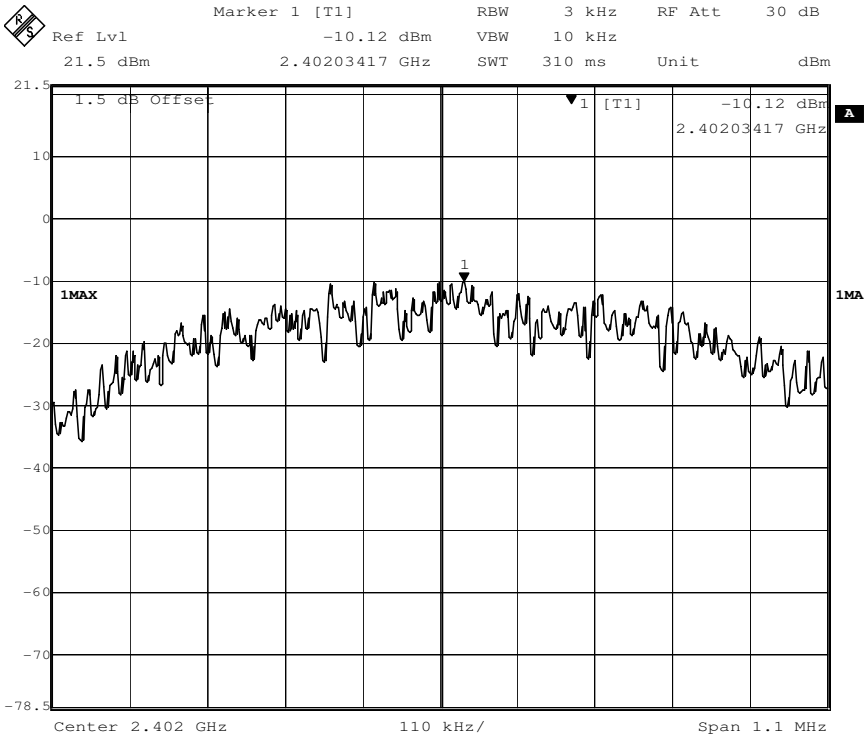
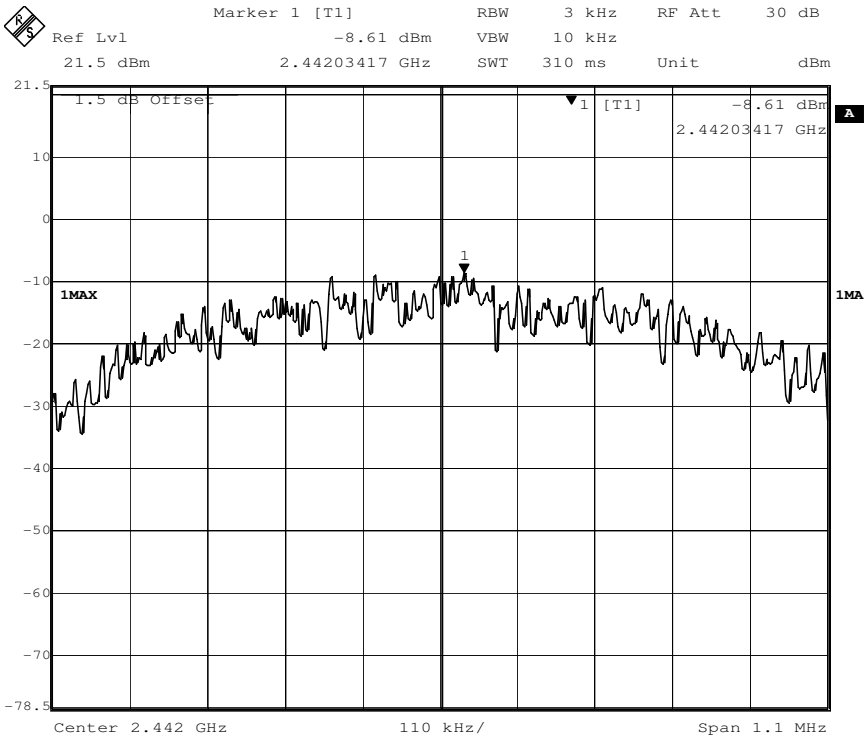
Result plot as follows:

Channel 0:2.402 GHz:



Channel 20:2.442 GHz:



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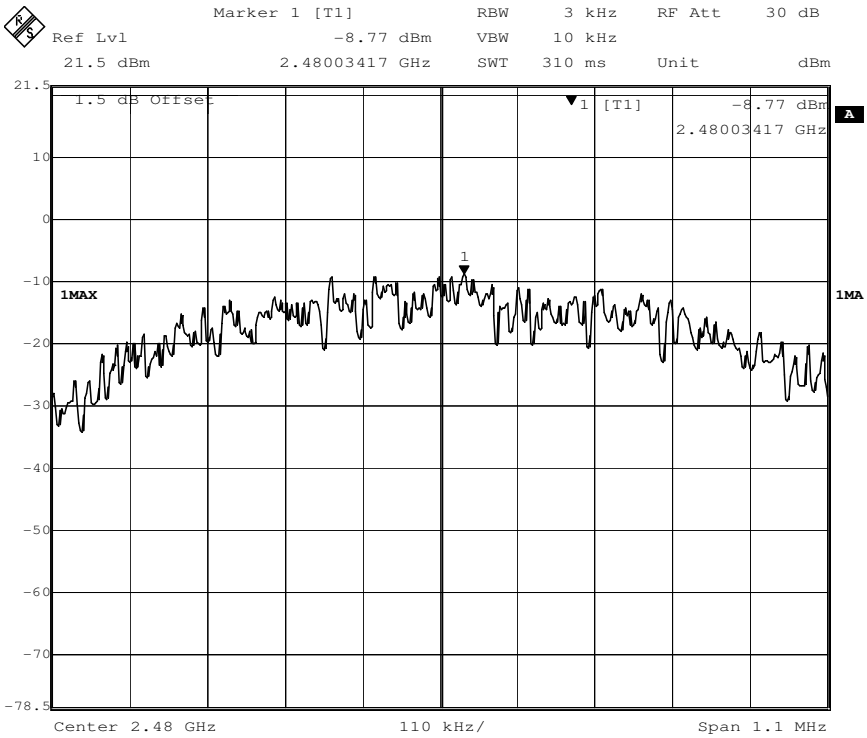
Channel 39:2.480 GHz:



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7.6 Conducted Spurious Emissions

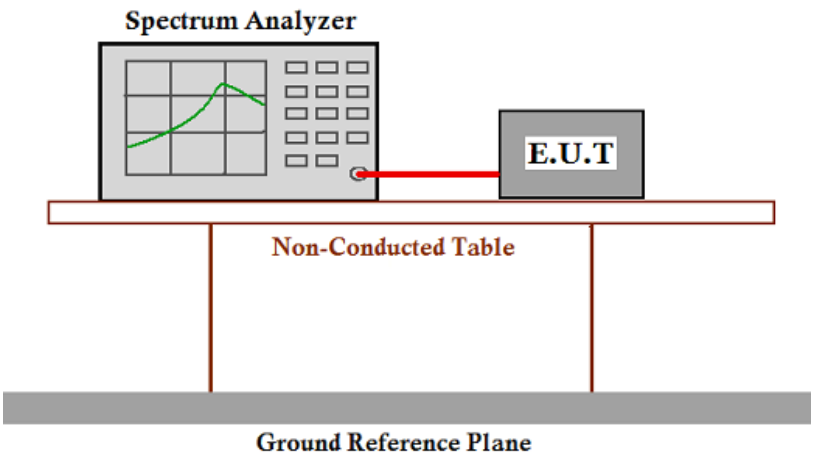
Test Requirement: FCC Part 15 C section 15.247

(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 lowest Channel 2402MHz, middle Channel 2442MHz and highest Channel 2480MHz, 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.

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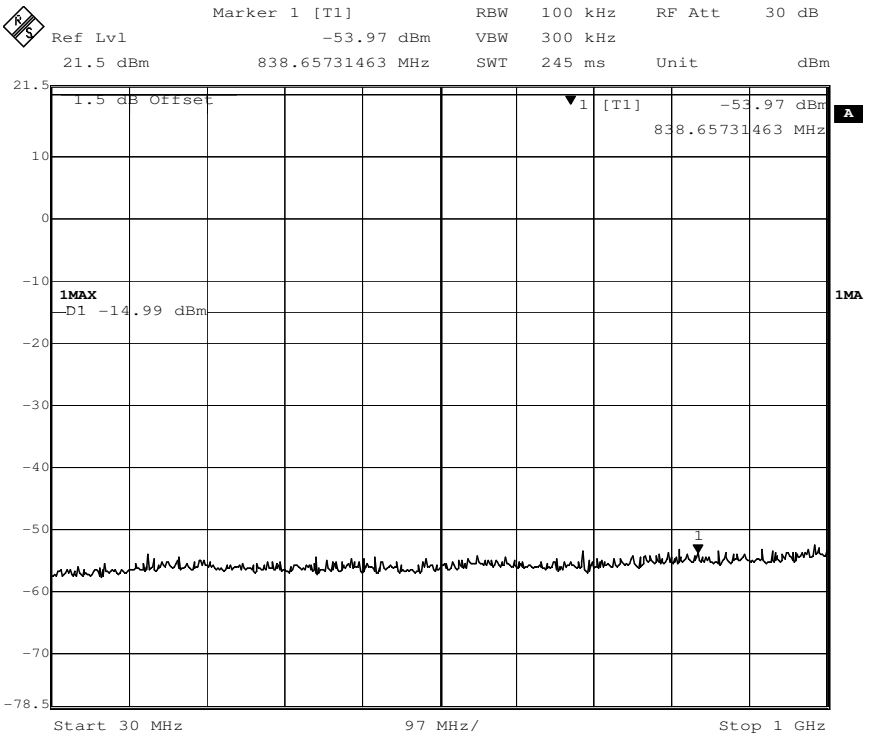
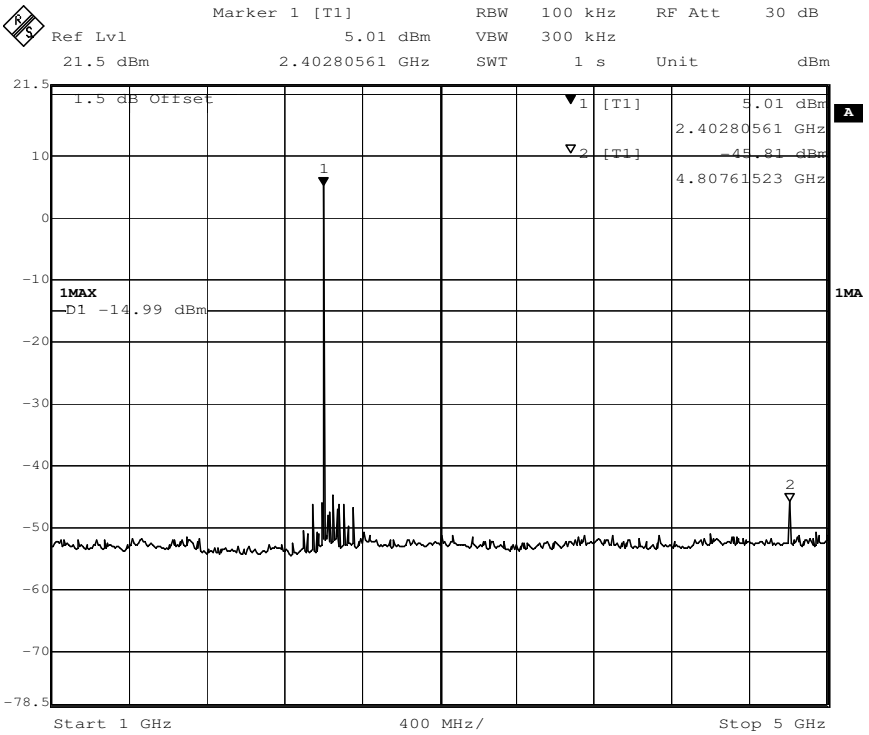
Result plot as follows:

Channel 0: 2.402 GHz

30 MHz to 1GHz



1GHz to 5GHz



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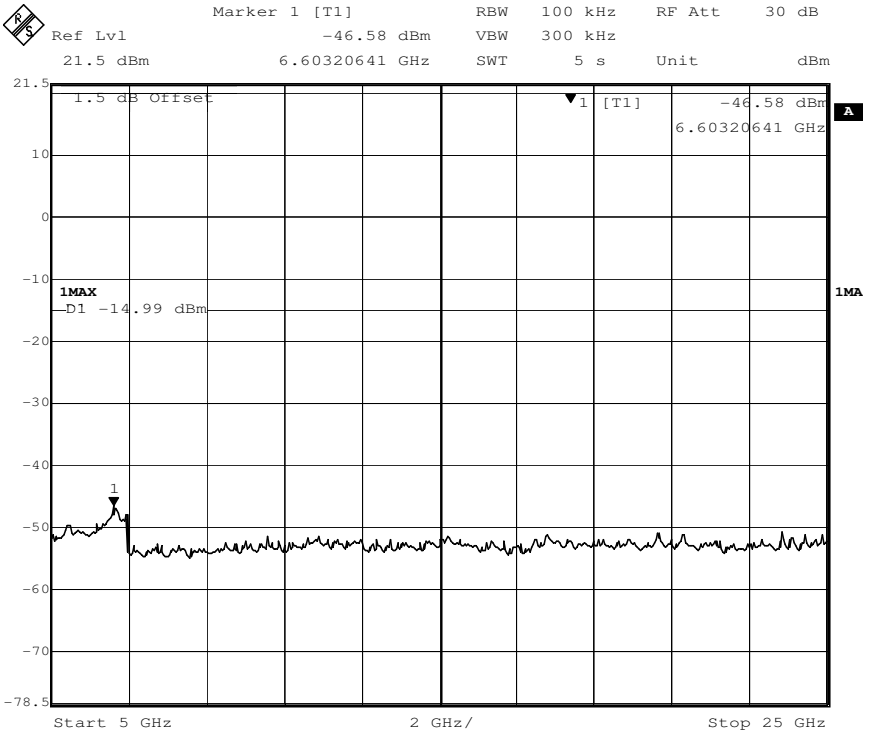
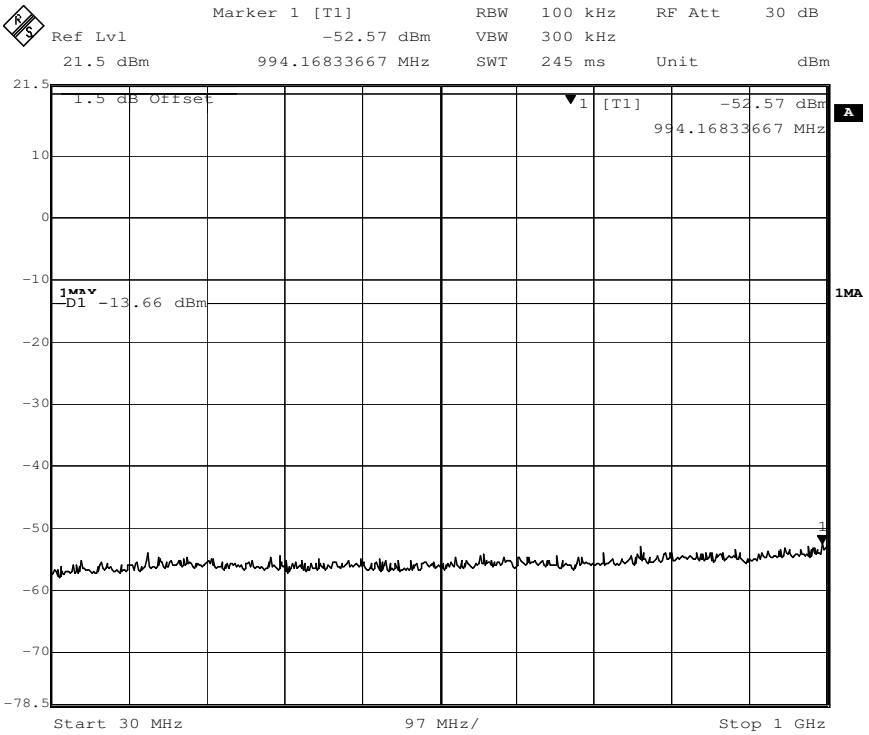
5GHz to 25GHz



Channel 20:2.442GHz

30 MHz to 1GHz



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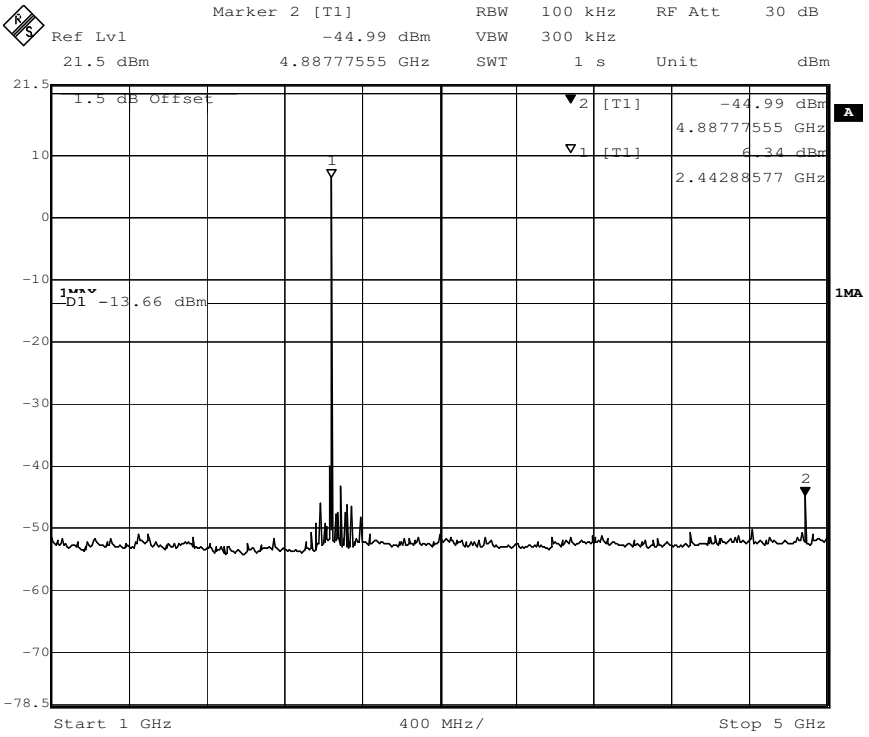
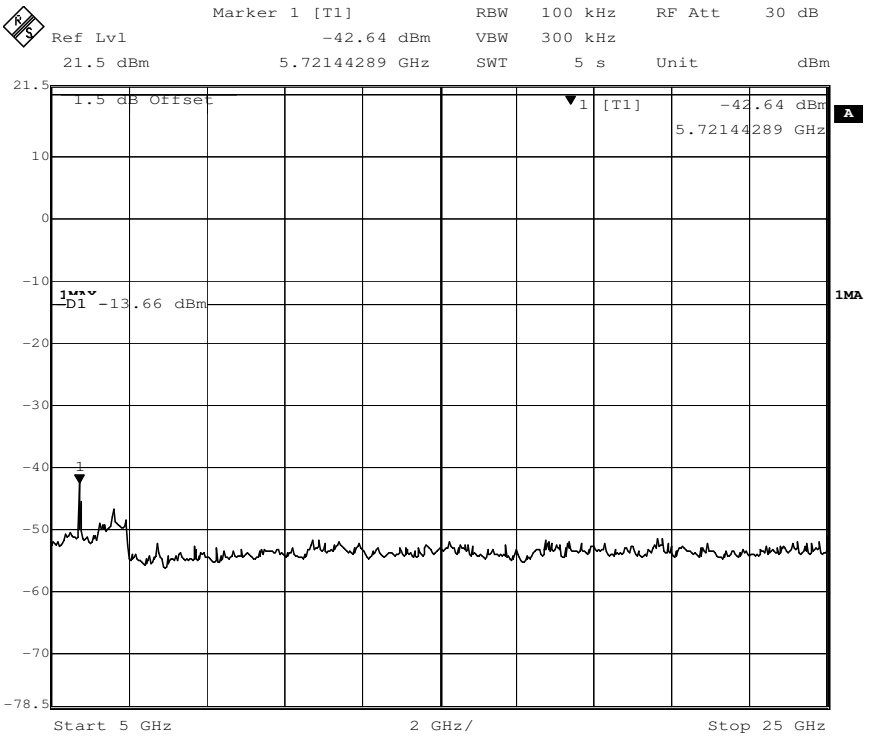
1GHz to 5GHz



5GHz to 25GHz



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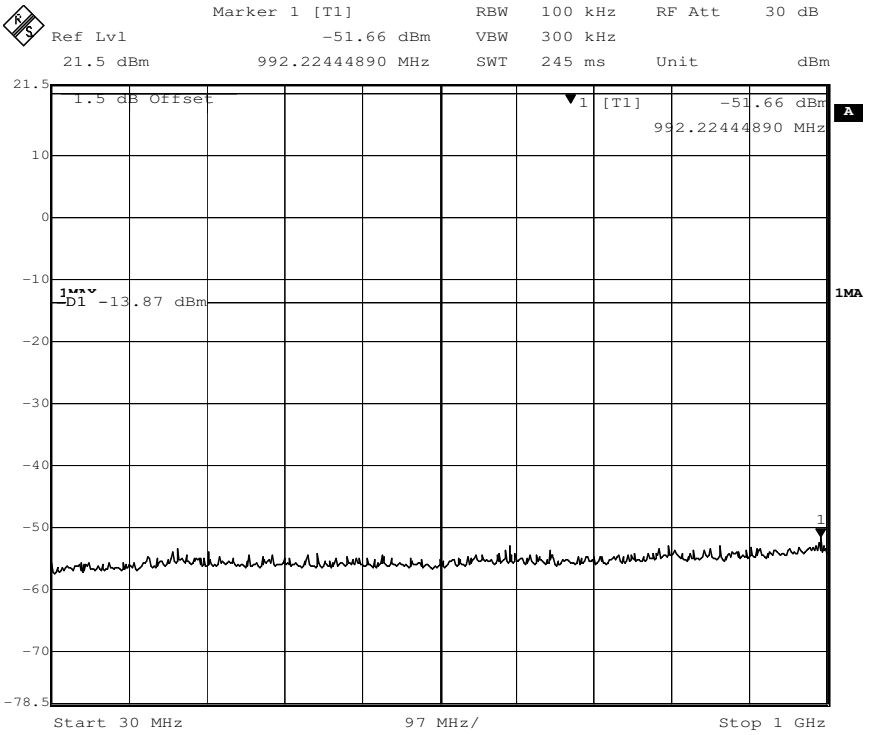
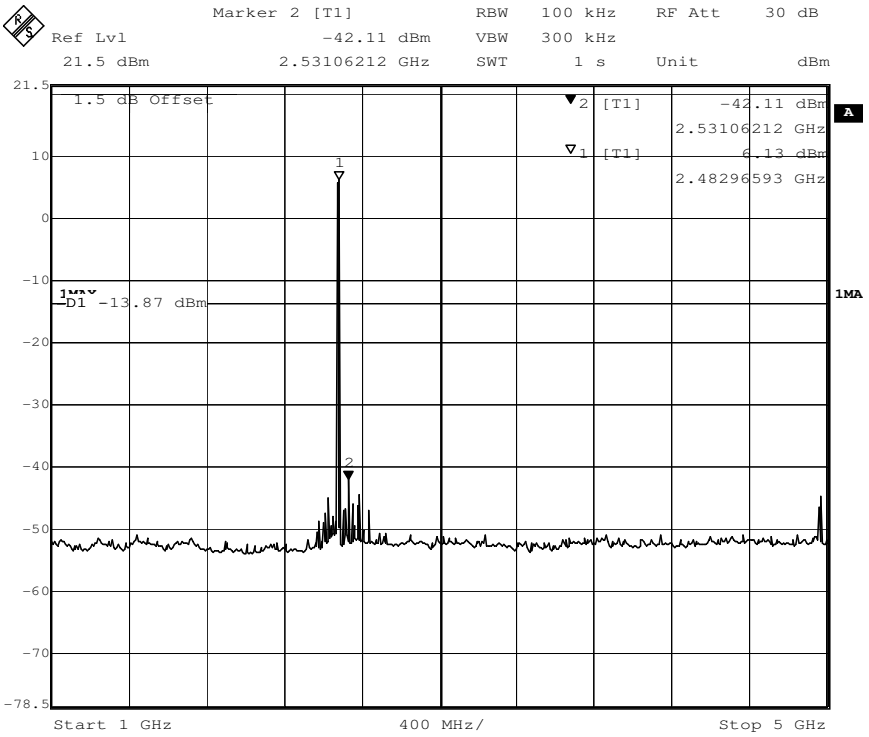
Channel 39:2.480GHz

30 MHz to 1GHz



1GHz to 5GHz



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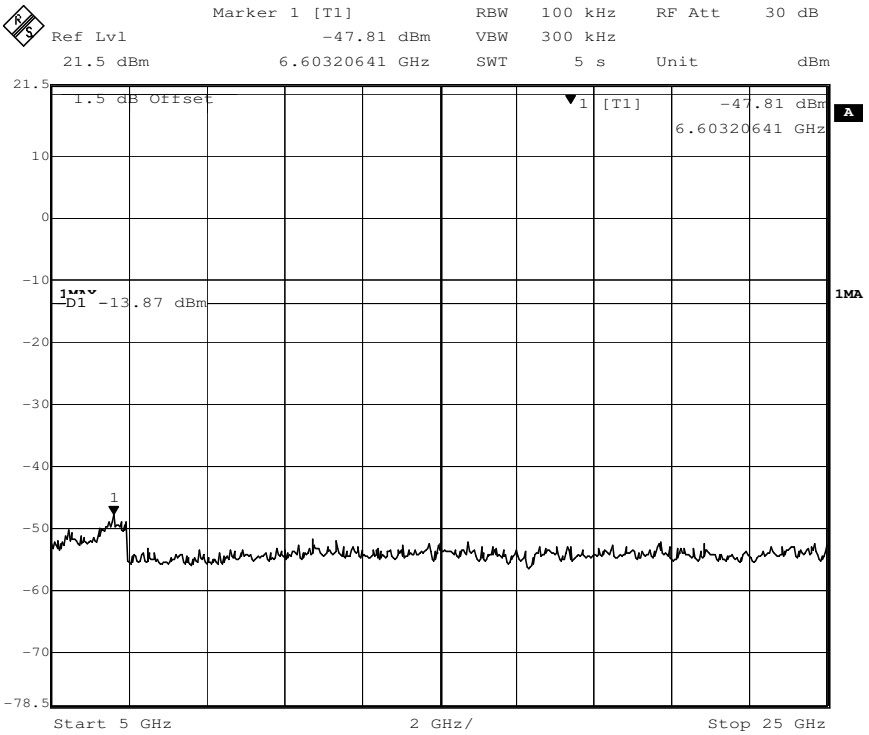
5GHz to 25GHz



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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.

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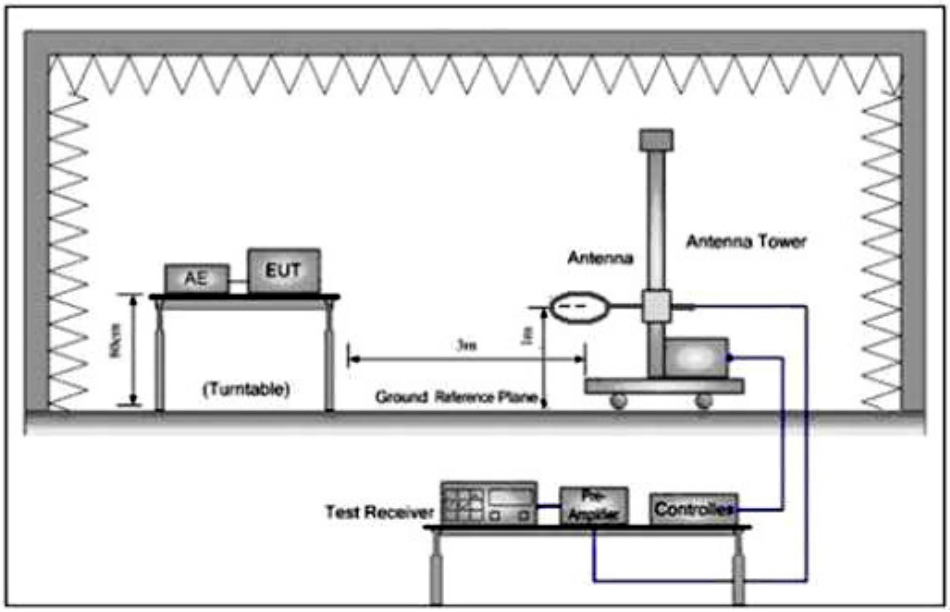
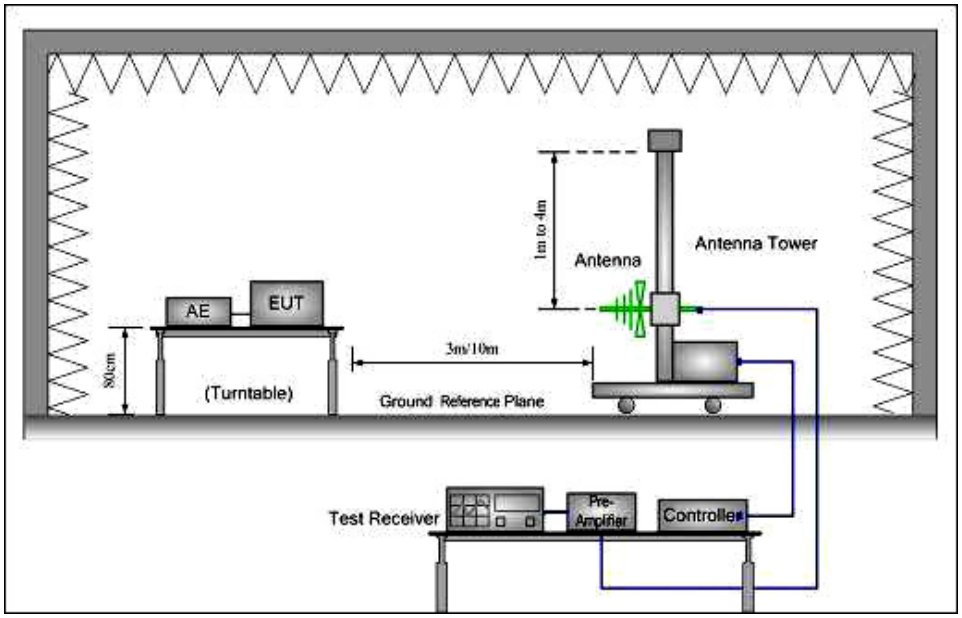
Test Setup:



Below 30MHz



30MHz to 1GHz

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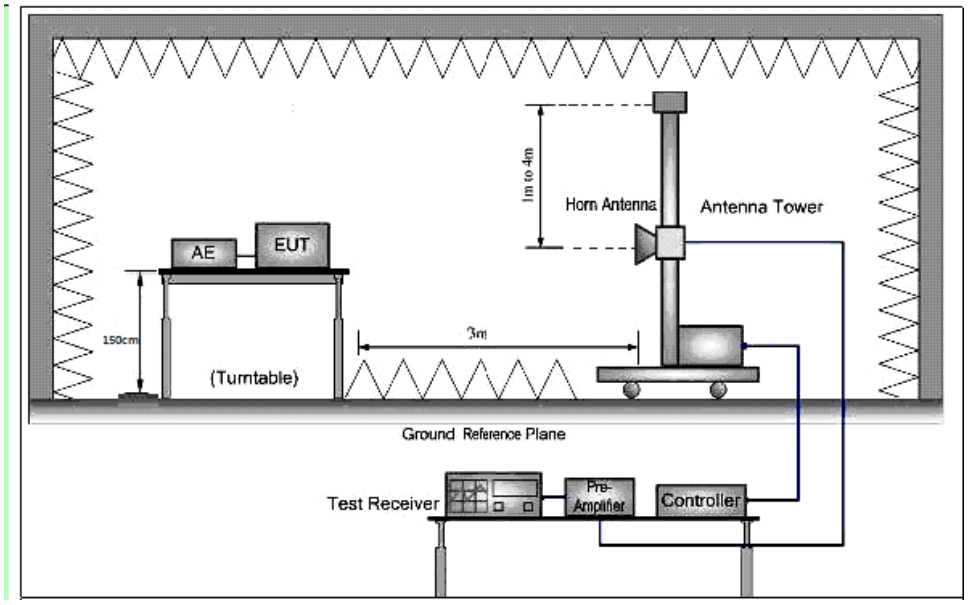

Above 1 GHz

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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 (2402MHz), the middle channel (2442MHz), the Highest channel (2480MHz)
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.

a. Charge + Transmitting mode.

b. Transmitting mode.

Final Test Mode:

Transmitting with GFSK modulation.

Pretest the EUT at Charge + Transmitting mode and Transmitting mode

For below 1GHz part, through pre-scan, the worst case is the lowest channel Transmitting mode

Only the worst case is recorded in the report.

Instruments Used: Refer to section 6 for details

Test Results: Pass

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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.

Lowest channel/ Vertical:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	36.895	23.03	13.77	0.70	27.00	10.50	40.00	-29.50	VERTICAL	QP
2	51.121	22.09	14.47	0.72	27.00	10.28	40.00	-29.72	VERTICAL	QP
3	63.983	22.66	13.60	0.80	27.00	10.06	40.00	-29.94	VERTICAL	QP
4	146.374	22.92	13.20	1.29	26.81	10.60	43.50	-32.90	VERTICAL	QP
5	452.720	30.37	17.41	2.30	27.53	22.55	46.00	-23.45	VERTICAL	QP
6	755.387	27.14	21.99	2.90	27.91	24.12	46.00	-21.88	VERTICAL	QP

Lowest channel /Horizontal:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	34.760	23.38	13.89	0.60	27.00	10.87	40.00	-29.13	HORIZONTAL	QP
2	46.666	23.25	14.32	0.70	27.00	11.27	40.00	-28.73	HORIZONTAL	QP
3	63.092	21.96	13.75	0.80	27.00	9.51	40.00	-30.49	HORIZONTAL	QP
4	272.278	31.53	13.31	1.71	26.40	20.15	46.00	-25.85	HORIZONTAL	QP
5	362.985	36.86	15.71	1.97	26.80	27.74	46.00	-18.26	HORIZONTAL	QP
6	815.968	30.23	22.53	3.03	27.70	28.09	46.00	-17.91	HORIZONTAL	QP

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Above 1GHz, Peak & Average Measurement

Lowest channel/ Vertical:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3318.471	43.45	27.90	8.04	39.79	39.60	54.00	-14.40	VERTICAL	Average
2	3318.471	54.78	27.90	8.04	39.79	50.93	74.00	-23.07	VERTICAL	Peak
3	4804.419	37.35	30.79	9.95	40.21	37.88	54.00	-16.12	VERTICAL	Average
4	4804.419	49.05	30.79	9.95	40.21	49.58	74.00	-24.42	VERTICAL	Peak
5	6195.508	28.27	33.00	11.31	39.75	32.83	54.00	-21.17	VERTICAL	Average
6	6195.508	41.52	33.00	11.31	39.75	46.08	74.00	-27.92	VERTICAL	Peak
7	7206.527	32.29	35.45	12.73	39.25	41.22	54.00	-12.78	VERTICAL	Average
8	7206.527	43.57	35.45	12.73	39.25	52.50	74.00	-21.50	VERTICAL	Peak
9	9608.123	22.73	37.51	14.48	37.97	36.75	54.00	-17.25	VERTICAL	Average
10	9608.123	32.58	37.51	14.48	37.97	46.60	74.00	-27.40	VERTICAL	Peak
11	12010.310	20.05	39.50	15.80	38.08	37.27	54.00	-16.73	VERTICAL	Average
12	12010.310	32.58	39.50	15.80	38.08	49.80	74.00	-24.20	VERTICAL	Peak

Lowest channel /Horizontal:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3318.471	43.24	27.90	8.04	39.79	39.39	54.00	-14.61	HORIZONTAL	Average
2	3318.471	54.49	27.90	8.04	39.79	50.64	74.00	-23.36	HORIZONTAL	Peak
3	4804.245	42.01	30.79	9.95	40.21	42.54	54.00	-11.46	HORIZONTAL	Average
4	4804.245	52.77	30.79	9.95	40.21	53.30	74.00	-20.70	HORIZONTAL	Peak
5	6018.999	28.01	32.35	11.11	39.88	31.59	54.00	-22.41	HORIZONTAL	Average
6	6018.999	41.17	32.35	11.11	39.88	44.75	74.00	-29.25	HORIZONTAL	Peak
7	7206.309	32.35	35.45	12.73	39.25	41.28	54.00	-12.72	HORIZONTAL	Average
8	7206.309	44.60	35.45	12.73	39.25	53.53	74.00	-20.47	HORIZONTAL	Peak
9	9608.123	23.40	37.51	14.48	37.97	37.42	54.00	-16.58	HORIZONTAL	Average
10	9608.123	35.07	37.51	14.48	37.97	49.09	74.00	-24.91	HORIZONTAL	Peak
11	12010.540	20.12	39.50	15.80	38.08	37.34	54.00	-16.66	HORIZONTAL	Average
12	12010.540	33.35	39.50	15.80	38.08	50.57	74.00	-23.43	HORIZONTAL	Peak

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Middle channel /Horizontal:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3242.619	56.64	27.90	8.00	39.72	52.82	54.00	-1.18	HORIZONTAL	Average
2	3242.619	64.12	27.90	8.00	39.72	60.30	74.00	-13.70	HORIZONTAL	Peak
3	4062.629	45.07	29.55	9.05	40.09	43.58	54.00	-10.42	HORIZONTAL	Average
4	4062.629	49.09	29.55	9.05	40.09	47.60	74.00	-26.40	HORIZONTAL	Peak
5	4859.975	46.36	30.90	10.00	40.21	47.05	54.00	-6.95	HORIZONTAL	Average
6	4859.975	51.41	30.90	10.00	40.21	52.10	74.00	-21.90	HORIZONTAL	Peak
7	5680.921	44.36	32.03	10.69	40.03	47.05	54.00	-6.95	HORIZONTAL	Average
8	5680.921	47.02	32.03	10.69	40.03	49.71	74.00	-24.29	HORIZONTAL	Peak
9	7322.493	42.73	35.74	12.93	39.23	52.17	54.00	-1.83	HORIZONTAL	Average
10	7322.493	51.96	35.74	12.93	39.23	61.40	74.00	-12.60	HORIZONTAL	Peak
11	9764.371	27.35	37.70	14.45	37.90	41.60	54.00	-12.40	HORIZONTAL	Average
12	9764.371	36.28	37.70	14.45	37.90	50.53	74.00	-23.47	HORIZONTAL	Peak

Middle channel / Vertical:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3242.619	53.53	27.90	8.00	39.72	49.71	54.00	-4.29	VERTICAL	Average
2	3242.619	57.92	27.90	8.00	39.72	54.10	74.00	-19.90	VERTICAL	Peak
3	4882.975	42.58	30.95	10.02	40.22	43.33	54.00	-10.67	VERTICAL	Average
4	4882.975	46.85	30.95	10.02	40.22	47.60	74.00	-26.40	VERTICAL	Peak
5	5680.921	37.54	32.03	10.69	40.03	40.23	54.00	-13.77	VERTICAL	Average
6	5680.921	43.47	32.03	10.69	40.03	46.16	74.00	-27.84	VERTICAL	Peak
7	7322.545	41.47	35.74	12.93	39.23	50.91	54.00	-3.09	VERTICAL	Average
8	7322.545	50.28	35.74	12.93	39.23	59.72	74.00	-14.28	VERTICAL	Peak
9	9764.991	25.63	37.70	14.45	37.90	39.88	54.00	-14.12	VERTICAL	Average
10	9764.991	34.30	37.70	14.45	37.90	48.55	74.00	-25.45	VERTICAL	Peak
11	12205.910	24.04	39.21	16.05	38.10	41.20	54.00	-12.80	VERTICAL	Average
12	12205.910	32.39	39.21	16.05	38.10	49.55	74.00	-24.45	VERTICAL	Peak

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Highest channel / Vertical:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3318.471	41.03	27.90	8.04	39.79	37.18	54.00	-16.82	VERTICAL	Average
2	3318.471	52.36	27.90	8.04	39.79	48.51	74.00	-25.49	VERTICAL	Peak
3	4960.975	33.11	31.05	10.07	40.23	34.00	54.00	-20.00	VERTICAL	Average
4	4960.975	46.29	31.05	10.07	40.23	47.18	74.00	-26.82	VERTICAL	Peak
5	6018.999	30.48	32.35	11.11	39.88	34.06	54.00	-19.94	VERTICAL	Average
6	6018.999	41.01	32.35	11.11	39.88	44.59	74.00	-29.41	VERTICAL	Peak
7	7440.267	31.33	35.92	13.04	39.20	41.09	54.00	-12.91	VERTICAL	Average
8	7440.267	40.76	35.92	13.04	39.20	50.52	74.00	-23.48	VERTICAL	Peak
9	9920.525	23.38	37.92	14.41	37.84	37.87	54.00	-16.13	VERTICAL	Average
10	9920.525	34.18	37.92	14.41	37.84	48.67	74.00	-25.33	VERTICAL	Peak
11	12400.700	21.60	38.93	16.29	38.12	38.70	54.00	-15.30	VERTICAL	Average
12	12400.700	32.97	38.93	16.29	38.12	50.07	74.00	-23.93	VERTICAL	Peak

Highest channel /Horizontal:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	3318.471	43.02	27.90	8.04	39.79	39.17	54.00	-14.83	HORIZONTAL	Average
2	3318.471	55.71	27.90	8.04	39.79	51.86	74.00	-22.14	HORIZONTAL	Peak
3	4960.975	37.53	31.05	10.07	40.23	38.42	54.00	-15.58	HORIZONTAL	Average
4	4960.975	44.71	31.05	10.07	40.23	45.60	74.00	-28.40	HORIZONTAL	Peak
5	7440.267	28.88	35.92	13.04	39.20	38.64	54.00	-15.36	HORIZONTAL	Average
6	7440.267	41.40	35.92	13.04	39.20	51.16	74.00	-22.84	HORIZONTAL	Peak
7	8176.795	21.70	36.37	13.60	39.02	32.65	54.00	-21.35	HORIZONTAL	Average
8	8176.795	35.43	36.37	13.60	39.02	46.38	74.00	-27.62	HORIZONTAL	Peak
9	9920.789	23.70	37.92	14.41	37.84	38.19	54.00	-15.81	HORIZONTAL	Average
10	9920.789	34.21	37.92	14.41	37.84	48.70	74.00	-25.30	HORIZONTAL	Peak
11	12400.070	20.47	38.93	16.29	38.12	37.57	54.00	-16.43	HORIZONTAL	Average
12	12400.070	32.82	38.93	16.29	38.12	49.92	74.00	-24.08	HORIZONTAL	Peak

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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 lowest channel 2402 MHz and highest channel 2480 MHz, keep in continuously transmitting status with GFSK modulation.

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 ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
For AV value:
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW =10Hz
Sweep = auto
Detector function = peak
Trace = max hold

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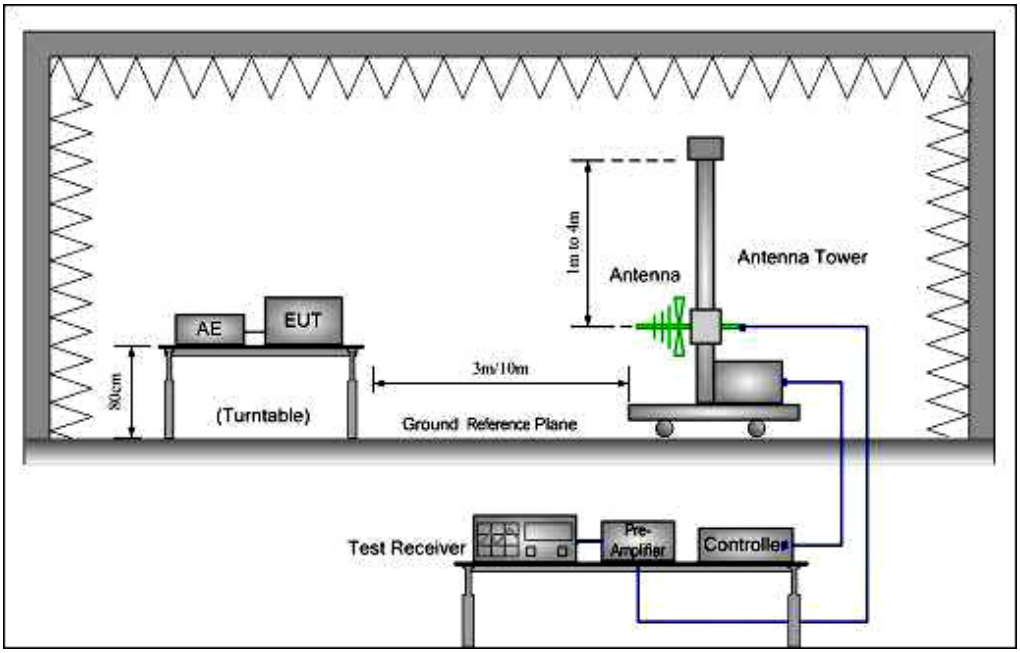
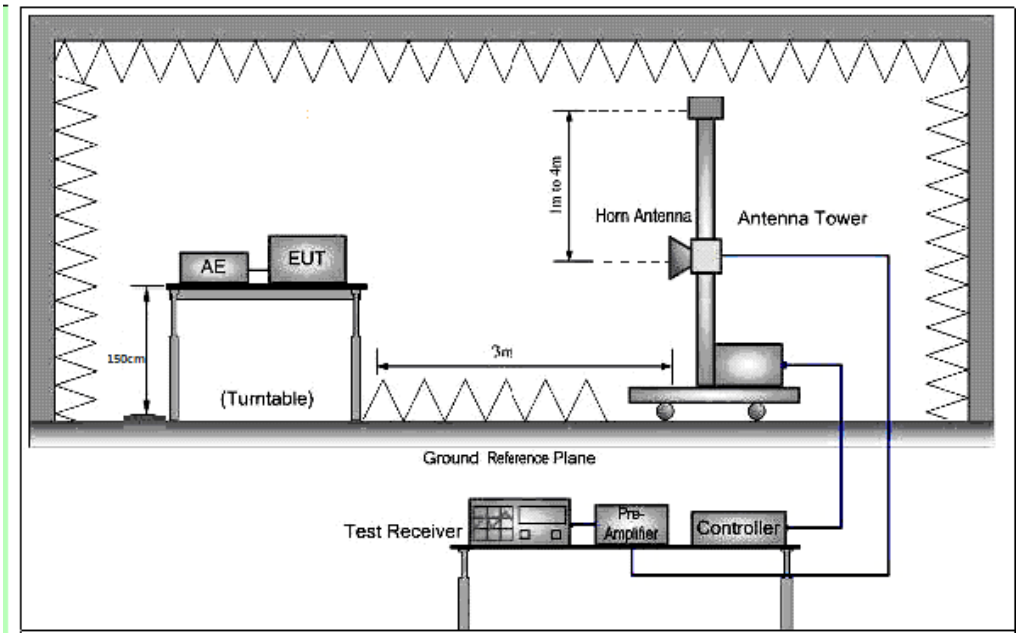
Test Configuration:

1). 30 MHz to 1 GHz emissions:



2). Above 1 GHz emissions:



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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 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

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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		

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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

Lowest channel / Vertical:

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	32.25	26.25	6.80	39.07	26.23	54.00	-27.77	VERTICAL	Average
2	2310.000	42.37	26.25	6.80	39.07	36.35	74.00	-37.65	VERTICAL	Peak
3	2390.000	37.00	26.43	6.87	39.10	31.20	54.00	-22.80	VERTICAL	Average
4	2390.000	50.43	26.43	6.87	39.10	44.63	74.00	-29.37	VERTICAL	Peak
5	2483.500	32.28	26.58	7.07	39.14	26.79	54.00	-27.21	VERTICAL	Average
6	2483.500	41.48	26.58	7.07	39.14	35.99	74.00	-38.01	VERTICAL	Peak
7	2500.000	31.92	26.60	7.10	39.14	26.48	54.00	-27.52	VERTICAL	Average
8	2500.000	42.80	26.60	7.10	39.14	37.36	74.00	-36.64	VERTICAL	Peak

Lowest channel /Horizontal:

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	32.70	26.25	6.80	39.07	26.68	54.00	-27.32	HORIZONTAL	Average
2	2310.000	42.48	26.25	6.80	39.07	36.46	74.00	-37.54	HORIZONTAL	Peak
3	2390.000	46.61	26.43	6.87	39.10	40.81	54.00	-13.19	HORIZONTAL	Average
4	2390.000	60.02	26.43	6.87	39.10	54.22	74.00	-19.78	HORIZONTAL	Peak
5	2483.500	33.39	26.58	7.07	39.14	27.90	54.00	-26.10	HORIZONTAL	Average
6	2483.500	41.69	26.58	7.07	39.14	36.20	74.00	-37.80	HORIZONTAL	Peak
7	2500.000	30.23	26.60	7.10	39.14	24.79	54.00	-29.21	HORIZONTAL	Average
8	2500.000	42.86	26.60	7.10	39.14	37.42	74.00	-36.58	HORIZONTAL	Peak

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Highest channel / Vertical:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	32.07	26.25	6.80	39.07	26.05	54.00	-27.95	VERTICAL	Average
2	2310.000	42.21	26.25	6.80	39.07	36.19	74.00	-37.81	VERTICAL	Peak
3	2390.000	33.45	26.43	6.87	39.10	27.65	54.00	-26.35	VERTICAL	Average
4	2390.000	43.12	26.43	6.87	39.10	37.32	74.00	-36.68	VERTICAL	Peak
5	2483.500	48.25	26.58	7.07	39.14	42.76	54.00	-11.24	VERTICAL	Average
6	2483.500	60.99	26.58	7.07	39.14	55.50	74.00	-18.50	VERTICAL	Peak
7	2500.000	40.35	26.60	7.10	39.14	34.91	54.00	-19.09	VERTICAL	Average
8	2500.000	51.50	26.60	7.10	39.14	46.06	74.00	-27.94	VERTICAL	Peak

Highest channel /Horizontal:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	32.86	26.25	6.80	39.07	26.84	54.00	-27.16	HORIZONTAL	Average
2	2310.000	42.18	26.25	6.80	39.07	36.16	74.00	-37.84	HORIZONTAL	Peak
3	2390.000	31.52	26.43	6.87	39.10	25.72	54.00	-28.28	HORIZONTAL	Average
4	2390.000	42.99	26.43	6.87	39.10	37.19	74.00	-36.81	HORIZONTAL	Peak
5	2483.500	48.24	26.58	7.07	39.14	42.75	54.00	-11.25	HORIZONTAL	Average
6	2483.500	61.85	26.58	7.07	39.14	56.36	74.00	-17.64	HORIZONTAL	Peak
7	2500.000	45.13	26.60	7.10	39.14	39.69	54.00	-14.31	HORIZONTAL	Average
8	2500.000	55.52	26.60	7.10	39.14	50.08	74.00	-23.92	HORIZONTAL	Peak

Test result: The unit does meet the FCC requirements.

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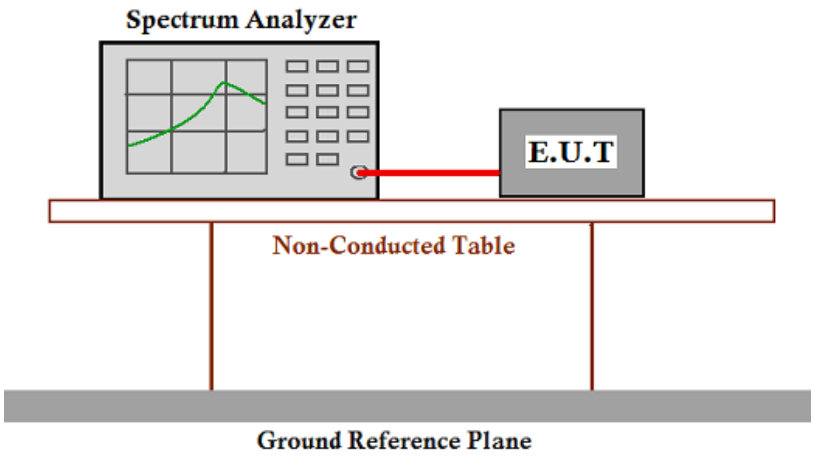
7.9 Band Edges Requirement

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 lowest channel 2402 MHz and highest channel 2480 MHz, keep in continuously transmitting status with GFSK modulation.

Test Configuration:



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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≥3×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($f_{emission}$)±0.5MHz.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 femission±0.5MHz.

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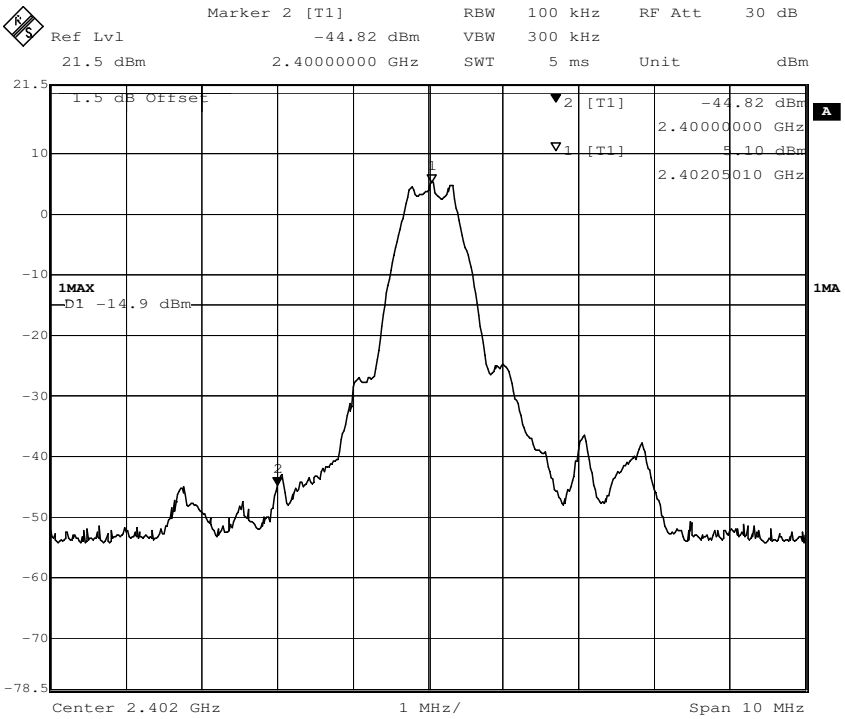
Test result with plots as follows:

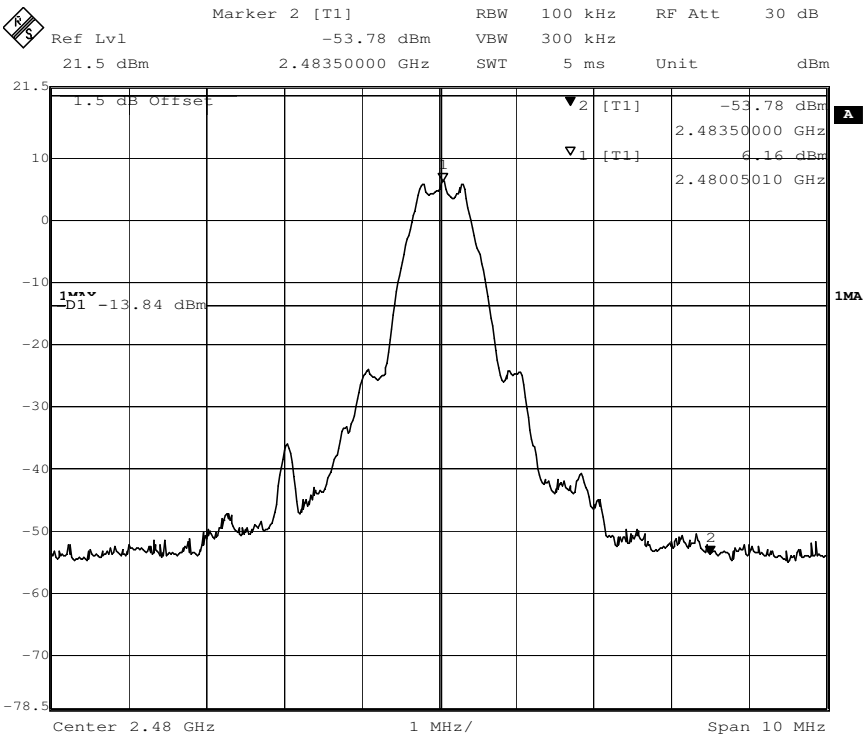
Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB
Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

Result plot as follows:

Channel 0: 2.402 GHz



Channel 39: 2.480GHz



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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: Test in normal operating mode. 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.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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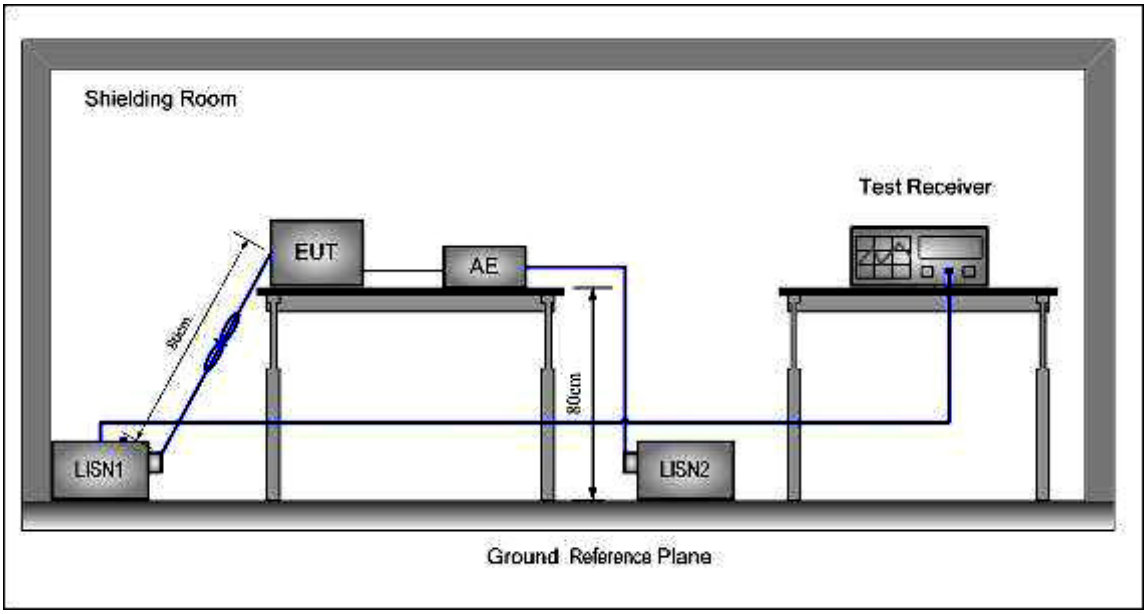
Test Configuration:



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 50Ω/50μH + 5Ω 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.

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Measurement Data

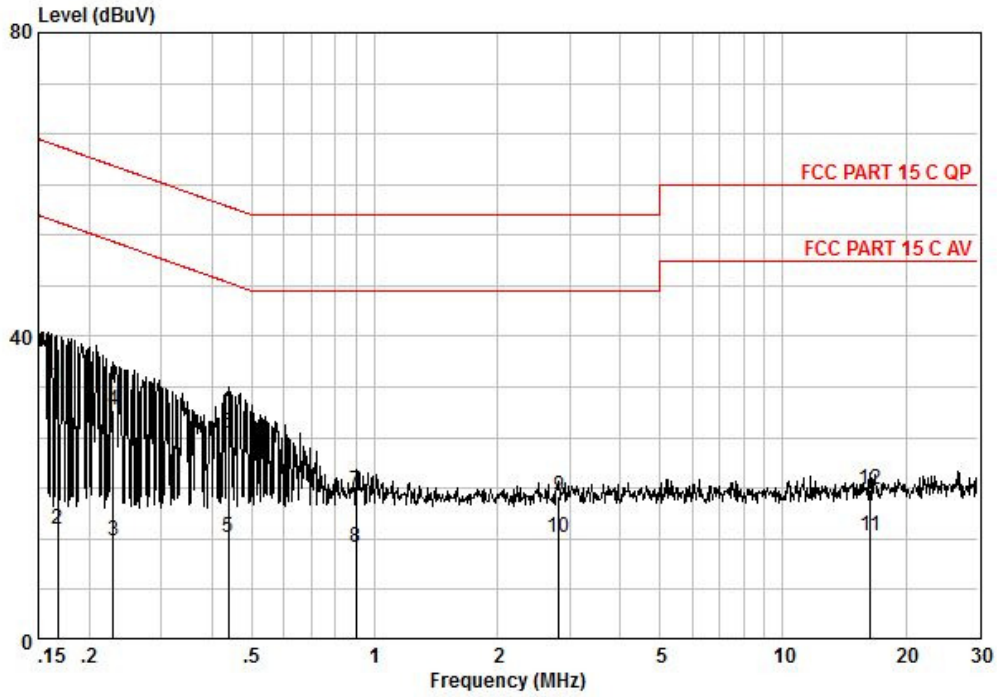
An initial pre-scan was performed on the live and neutral lines with peak detector.

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



Pol :NEUTRAL
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0,17	24,03	0,10	9,46	33,59	65,08	-31,49	QP
0,17	5,12	0,10	9,46	14,68	55,08	-40,40	AVERAGE
0,23	3,32	0,12	9,58	13,02	52,48	-39,46	AVERAGE
0,23	20,52	0,12	9,58	30,22	62,48	-32,26	QP
0,44	3,78	0,19	9,56	13,53	47,11	-33,58	AVERAGE
0,44	17,51	0,19	9,56	27,26	57,11	-29,85	QP
0,90	9,64	0,28	9,59	19,51	56,00	-36,49	QP
0,90	2,30	0,28	9,59	12,17	46,00	-33,83	AVERAGE
2,82	8,84	0,51	9,55	18,91	56,00	-37,09	QP
2,82	3,36	0,51	9,55	13,43	46,00	-32,57	AVERAGE
16,40	3,31	0,70	9,72	13,73	50,00	-36,27	AVERAGE
16,40	9,44	0,70	9,72	19,86	60,00	-40,14	QP

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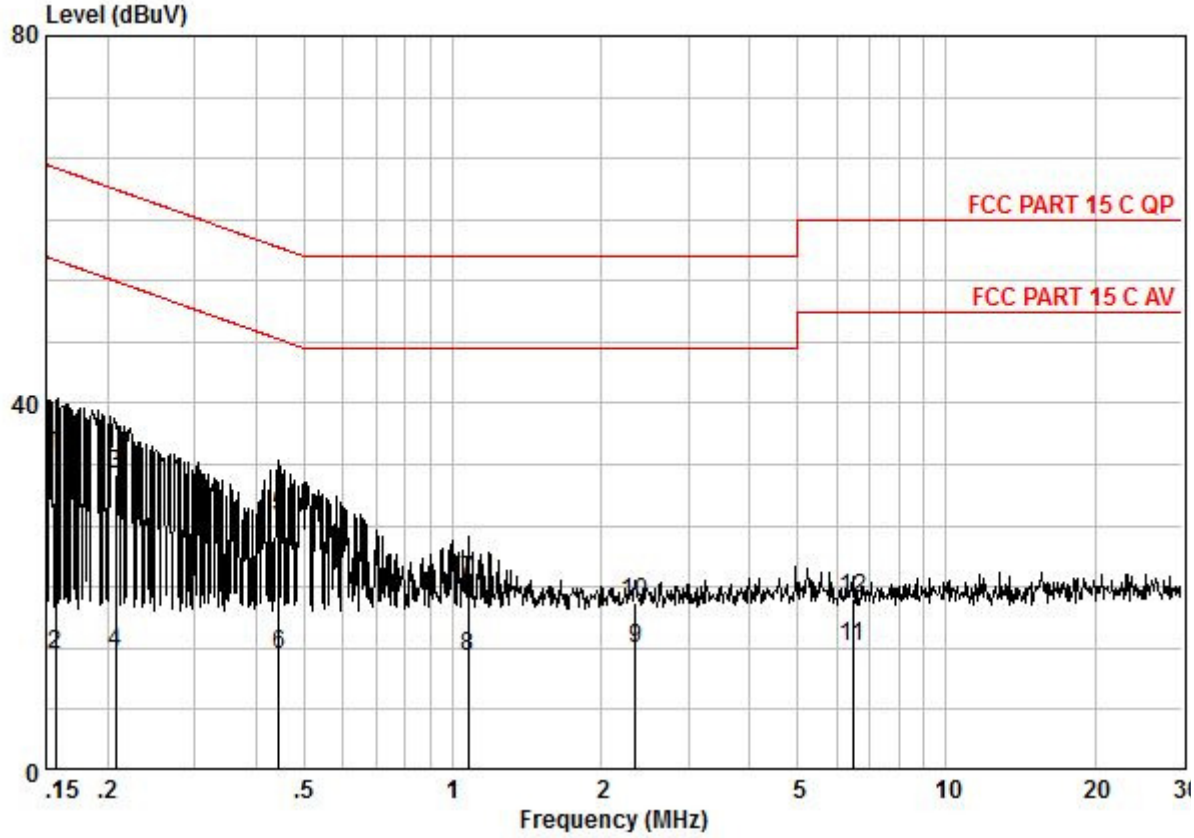
Live Line



Pol :LIVE
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.16	24.87	0.10	9.48	34.45	65.65	-31.20	QP
0.16	3.14	0.10	9.48	12.72	55.65	-42.93	AVERAGE
0.21	22.52	0.10	9.62	32.24	63.32	-31.07	QP
0.21	3.23	0.10	9.62	12.95	53.32	-40.36	AVERAGE
0.44	17.93	0.19	9.65	27.77	56.98	-29.21	QP
0.44	2.73	0.19	9.65	12.57	46.98	-34.41	AVERAGE
1.08	10.81	0.30	9.63	20.74	56.00	-35.26	QP
1.08	2.40	0.30	9.63	12.33	46.00	-33.67	AVERAGE
2.35	3.27	0.45	9.61	13.34	46.00	-32.66	AVERAGE
2.35	8.33	0.45	9.61	18.40	56.00	-37.60	QP
6.45	3.18	0.66	9.63	13.47	50.00	-36.53	AVERAGE
6.45	8.53	0.66	9.63	18.82	60.00	-41.18	QP

--End of Report--

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