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

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FCC ID: 2ANIJ-TW-STARTER

TEST REPORT

Application No.:	GZEM1705002865LM
Applicant:	LEDWORKS s.r.l.
Address of Applicant:	Via Arcivescovo Calabiana 6, 20139, Milano, Italy
Manufacturer:	LEDWORKS s.r.l.
Address of Manufacturer:	Via Arcivescovo Calabiana 6, 20139, Milano, Italy
Factory:	Dongguan Bortex Industrial Co., Ltd
Address of Factory:	A5-A6 Building, Kaida Industrial Area, No.80 Qiaochang Road, Shishuikou Village, Qiaotou Town, Dongguan City, Guangdong Province, China
Equipment Under Test (EUT):	
EUT Name:	RGB leds string for entertainment
Model No.:	TW-224S-US, TW-56S-US, TW-105S-US, TW-175S-US. ¤
¤	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	Twinkly
Standards:	47 CFR Part 15, Subpart C:2016 section 15.247
Date of Receipt:	2017-06-01
Date of Test:	2017-07-12 to 2017-08-24
Date of Issue:	2017-10-27
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.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		2017-10-27		Original

Authorized for issue by:				
Tested By		Vico_Cui **Vico_Cui /Project Engineer**		2017-07-12 to 2017-08-24 **Date**
Checked By		Ricky_Liu **Ricky_Liu /Reviewer**		2017-09-14 **Date**

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 (30MHz to 25GHz)	FCC PART 15 C section 15.209 &15.247(d)	ANSI C63.10: Clause 11.11	PASS
Radiated Spurious Emissions	FCC PART 15 C section 15.247	ANSI C63.10 Section 11.11	PASS
Radiated Emissions which fall in the restricted bands	FCC PART 15 C section 15.247(d)	ANSI C63.10 Section 11.12	PASS
Band Edges Measurement	FCC PART 15 C section 15.247 (d) &15.205	ANSI C63.10: Clause11.13	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS

Remark:
EUT: In this whole report EUT means Equipment Under Test.
N/A: not applicable. Refer to the relative section for the details.
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.

¤ **Declaration of EUT Family Grouping:**

Model No.: TW-224S-US, TW-56S-US, TW-105S-US, TW-175S-US

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 **TW-224S-US** was tested in this report.

4 Contents

5 General Information

5.1 Details of E.U.T.

Operating Frequency:	2412 MHz to 2462 MHz
Type of Modulation:	IEEE for 802.11n (HT20): OFDM (64QAM, 16QAM, QPSK, BPSK)
Channel Number:	11 Channels
Channel Separation:	5 MHz
Channels Step:	Channels with 5MHz step
Sample Type:	Fixed production
Antenna Type:	Integrated PCB antenna
Antenna Gain:	0dBi
Function:	RGB LEDs String with Wifi function for remote control.
Power Supply:	Power supplied by Power Unit: Model No: XY-2401000-UO Input: AC 120V 0.5A MAX 50/60 Hz Output: DC 24.0V 1.0A
Test Voltage:	AC 120V 60Hz
Cable:	About 1m DC output cable with two magnetic beads to the control unit

5.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
iPhone 5	Apple	A1429	F18KC03FDTWD
Router	NETGEAR	DGN2200	REF. No.SEA2200

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.

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

6 Equipment List

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-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
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m^3	N/A	N/A	N/A
EMC1801	V-LISN	EM Test/AG	NNBM 8125	81251342	2016-12-02	2017-12-01
EMC1802	V-LISN	EM Test/AG	NNBM 8125	81251345	2016-12-02	2017-12-01
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
EMC0069	Signal Analyzer (20Hz ~ 26.5Ghz	R&S	FSIQ26	100312	2016/12/2	2017/12/1

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	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	FCC-TLISN-T8-02	20550	2016-09-26	2017-09-25
EMC0121	4 Line ISN	Fischer Custom Communications	FCC-TLISN-T4-02	20549	2016-09-28	2017-09-27
EMC0122	2 Line ISN	Fischer Custom Communications	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 (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

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:

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:

1. Test frequencies are lowest channel 1: 2412 MHz, middle channel 7: 2442 MHz and highest channel 11: 2462 MHz

Channel	Frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

7.2 Antenna Requirement

Standard requirement

15.203 requirement:

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

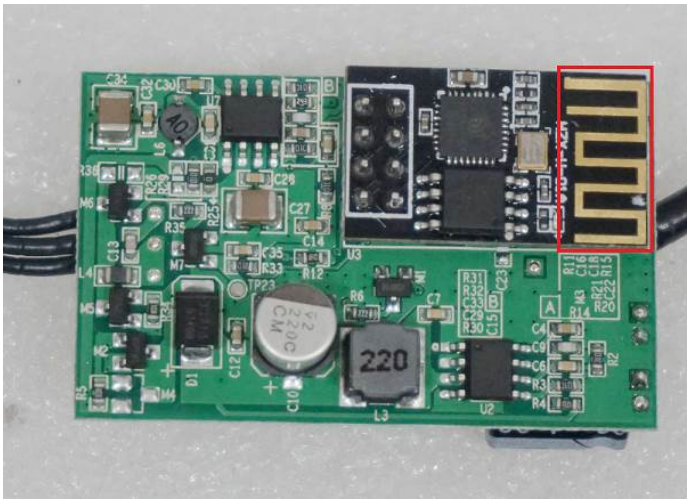
Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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 an integral PCB antenna and integrated on PCB no consideration of replacement. The best-case gain of the antenna is 0 dBi.



Test result: The unit does meet the FCC requirements.

7.3 6 dB Bandwidth

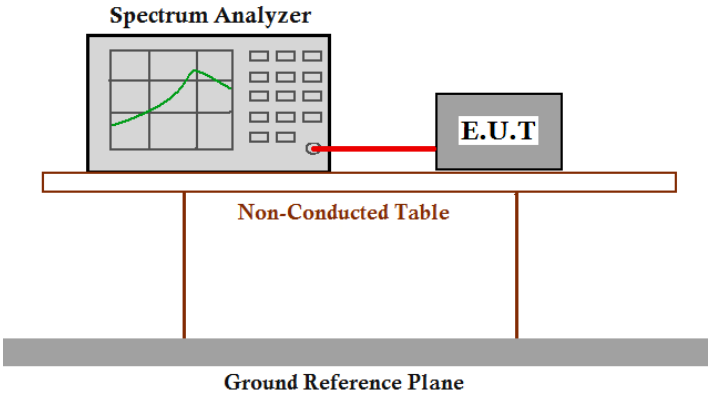
Test Requirement: FCC Part 15 C section 15.247

(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: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.0dB) 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 worse case.

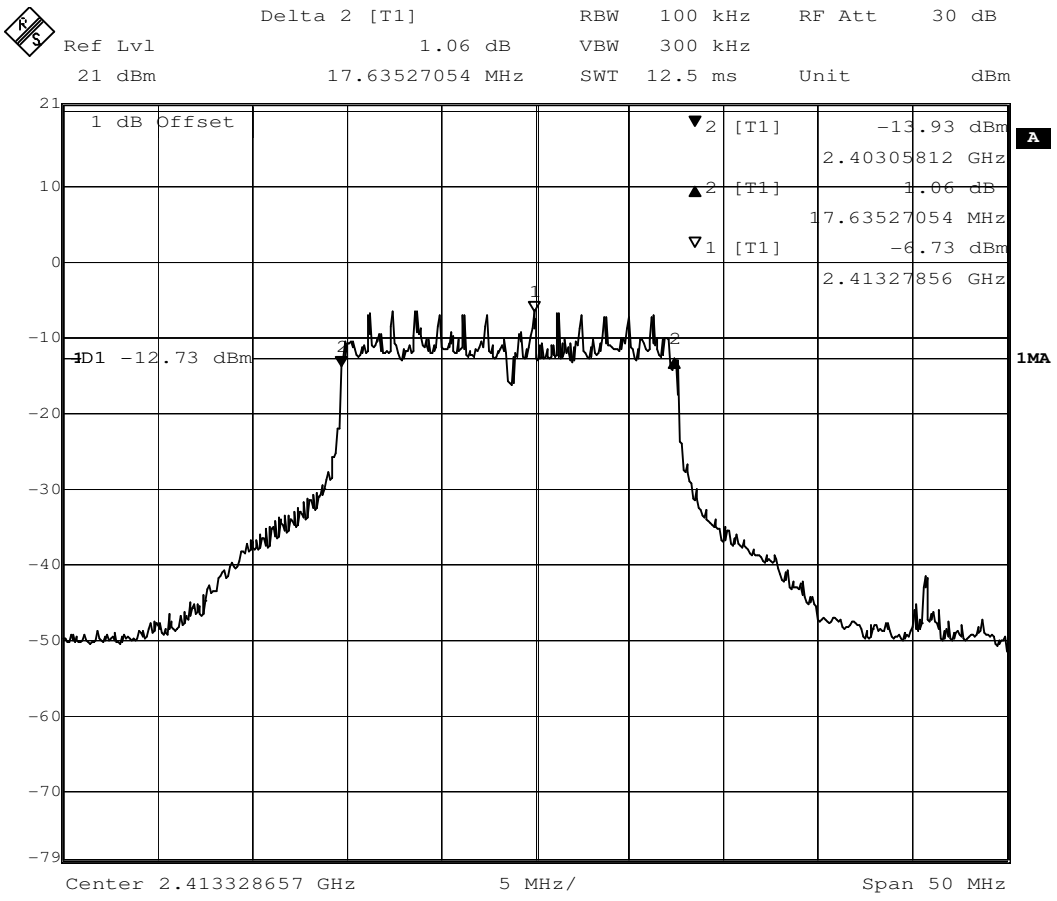
Test Result:

Channel No.	Frequency (MHz)	Mode	Measured 6dB bandwidth (MHz)	Limit	Result
1	2412	802.11n (HT20)	17.64	≥500KHz	Pass
7	2442		17.74		Pass
11	2462		17.64		Pass

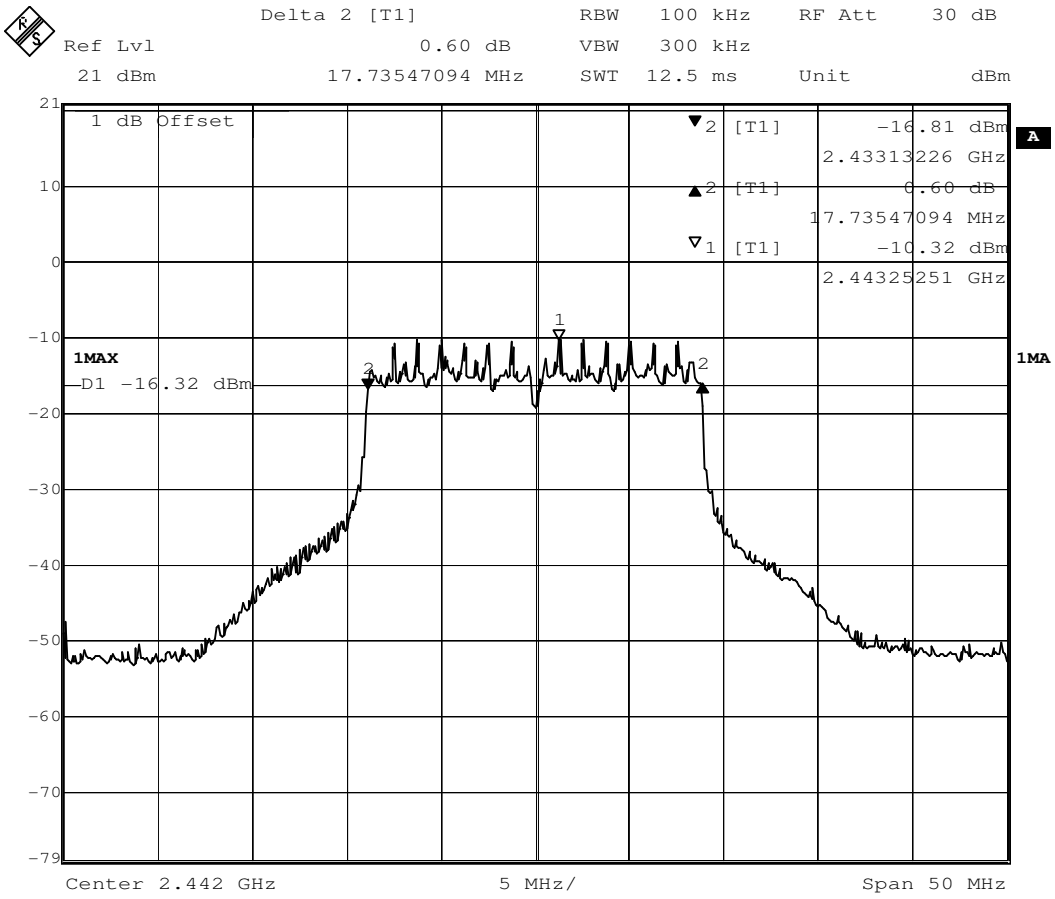
The unit does meet the FCC requirements.

Result plot as follows:

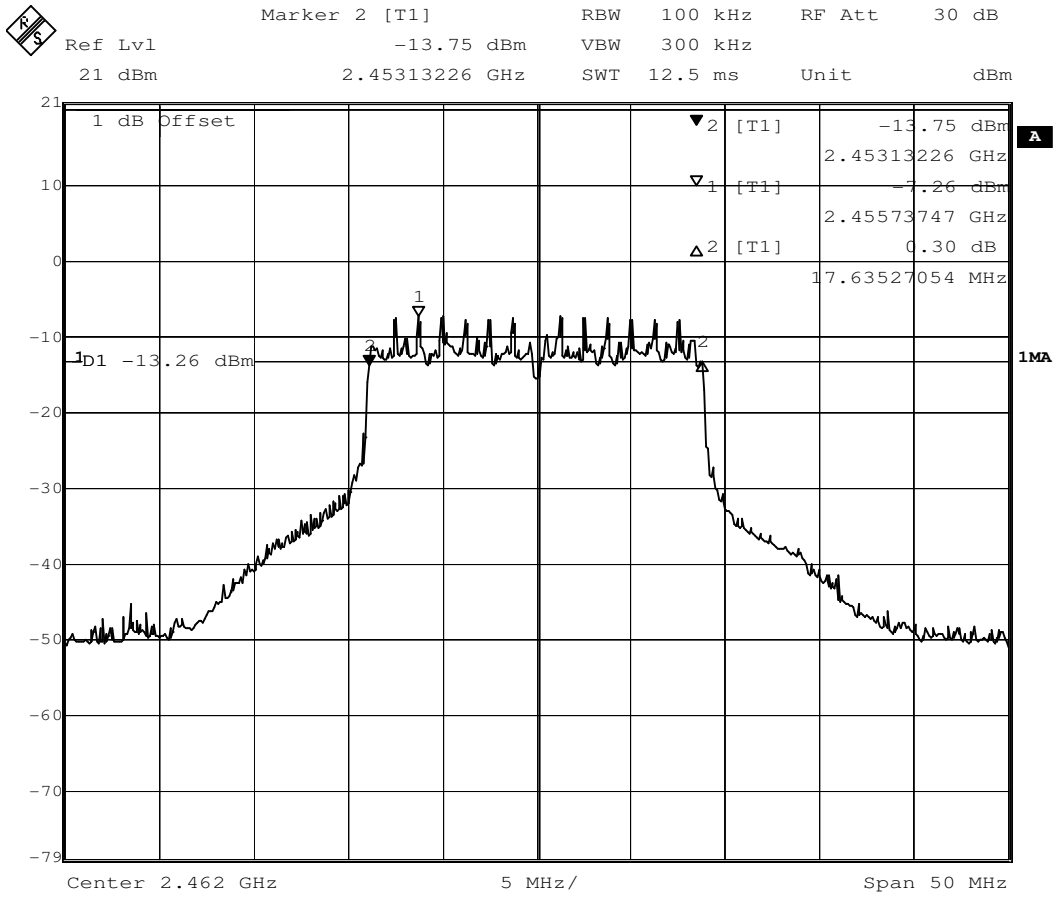
Channel 1: 2.412GHz:



Channel 7: 2.442GHz:



Channel 11: 2.462GHz:



7.4 Maximum Peak Output Power

Test Requirement: FCC Part 15 C section 15.247

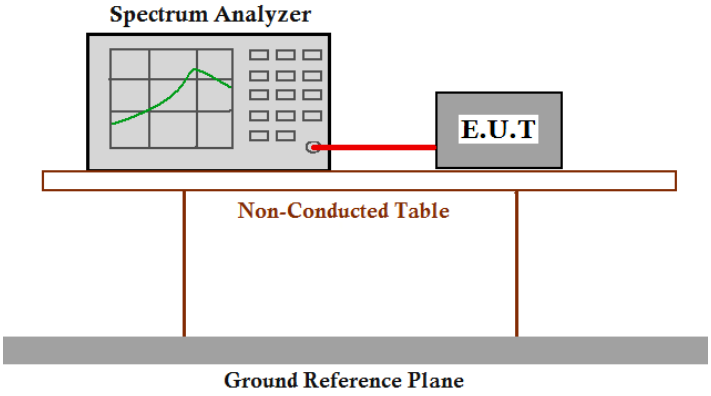
(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

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: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (Cable loss =1.0dB) from the antenna port to the spectrum.
2. Set the RBW=1MHz
3. Set the VBW ≥ 3 x RBW
4. Set the span ≥1.5 x DTS bandwidth
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.
10. Measure the channel power of the test frequency with special test status.
11. Repeat until all the test status is investigated and report the worse case.

Test result:

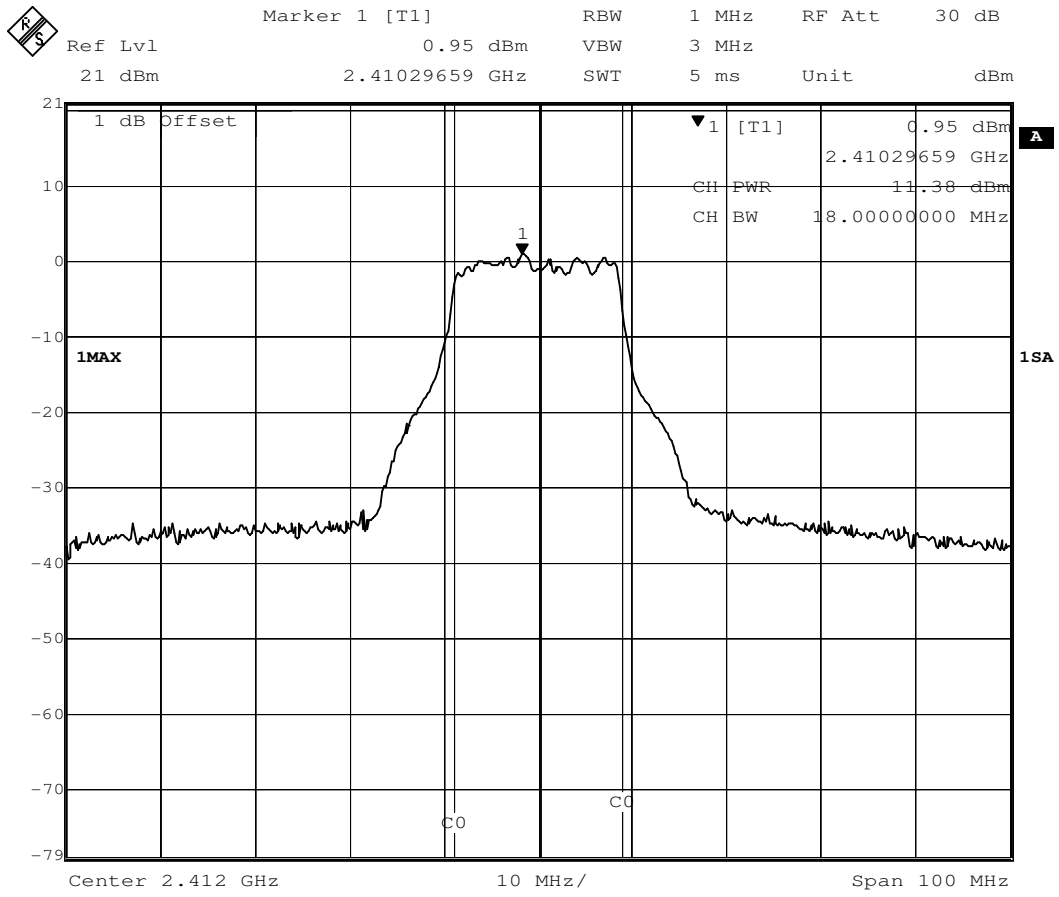
Channel No.	Frequency (MHz)	Mode	Measured Channel Power (dBm)	Limit	Result
1	2412	802.11n (HT20)	11.3	1W(30dBm)	Pass
7	2442		11.8		Pass
11	2462		11.4		Pass

Remark: Level = Read Level + Cable Loss + Antenna Gain

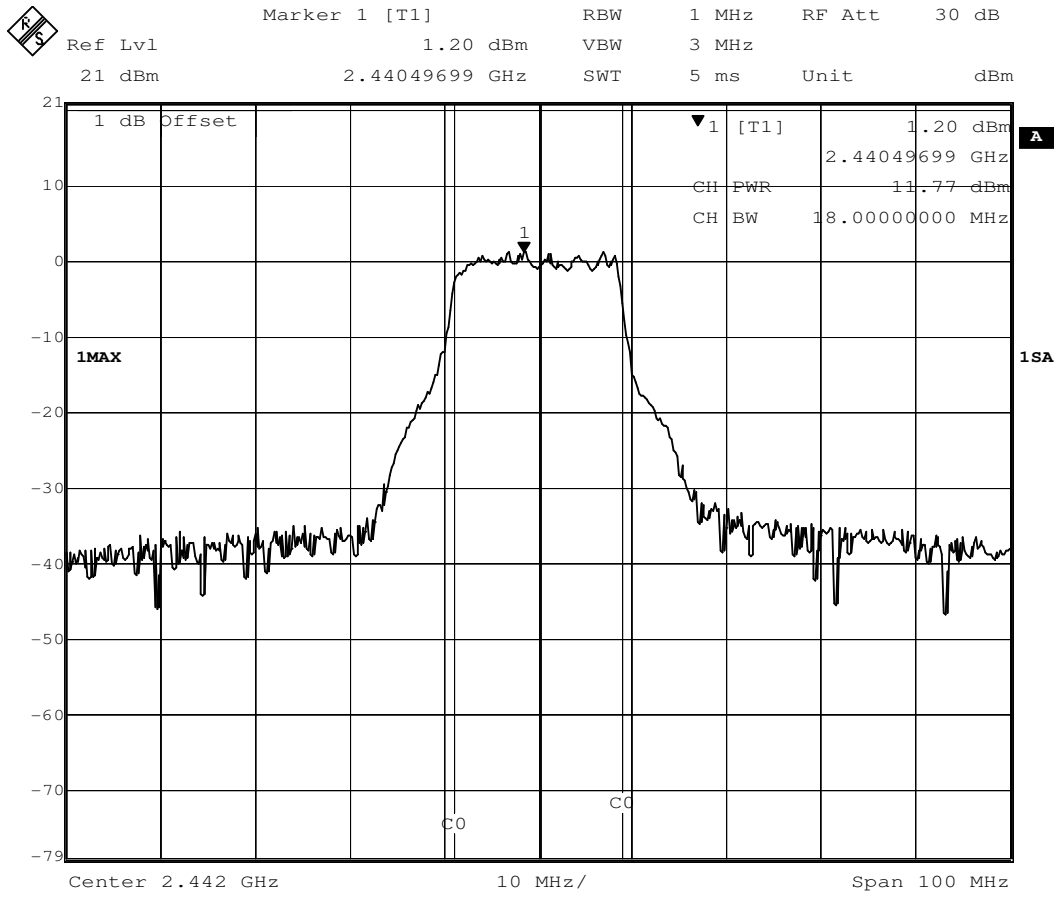
The unit does meet the FCC requirements.

Result plot as follows:

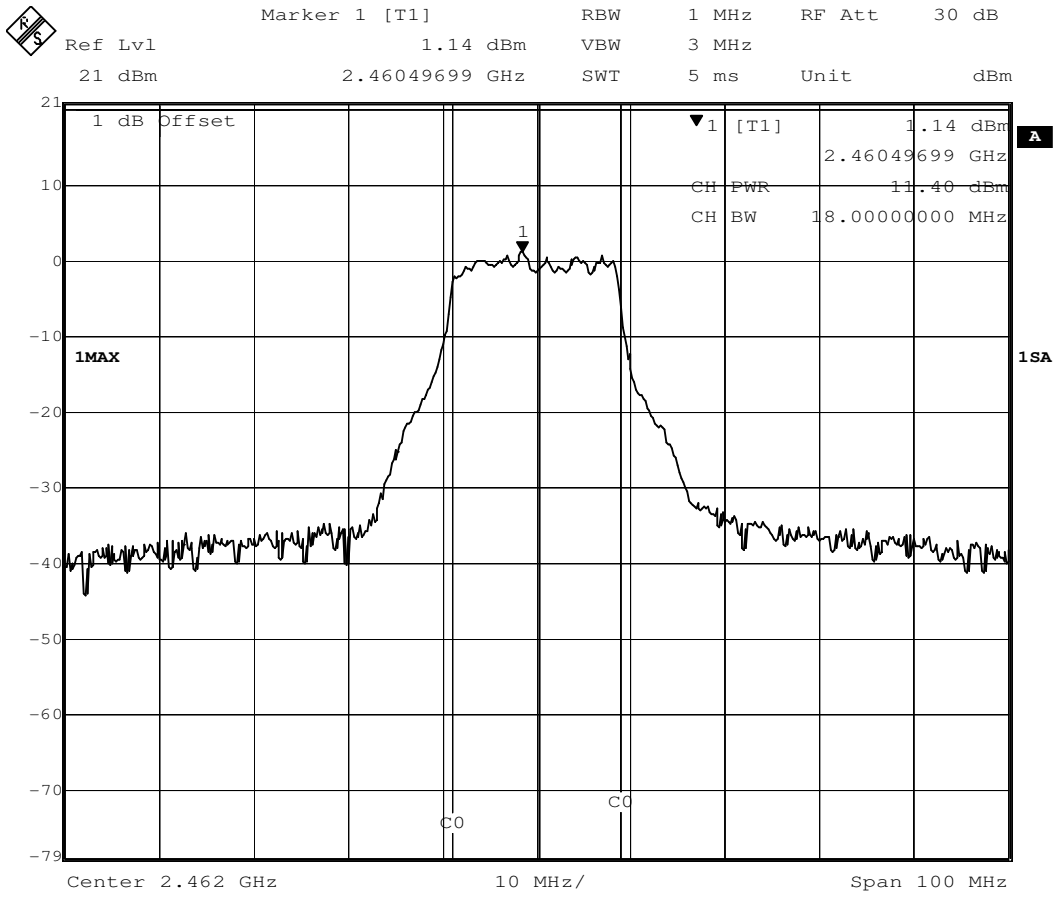
Channel 1: 2.412GHz:



Channel 7: 2.442GHz:



Channel 11: 2.462GHz:



7.5 Peak Power Spectral Density

Test Requirement: FCC Part 15 C section 15.247

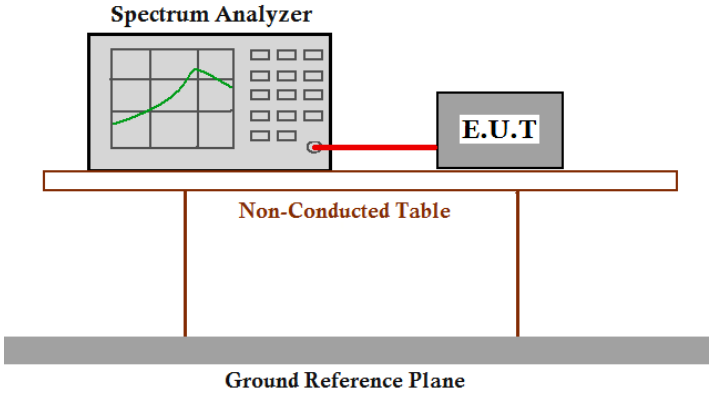
(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.0dB) from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer: RBW=3 kHz. VBW = 10 kHz. sweep= (SPAN/3 kHz); Detector Function = Peak. Trace = Max Hold, Centre = the Peak Power of the signal.
3. Measure the Power Spectral Density of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse case.

Test result:

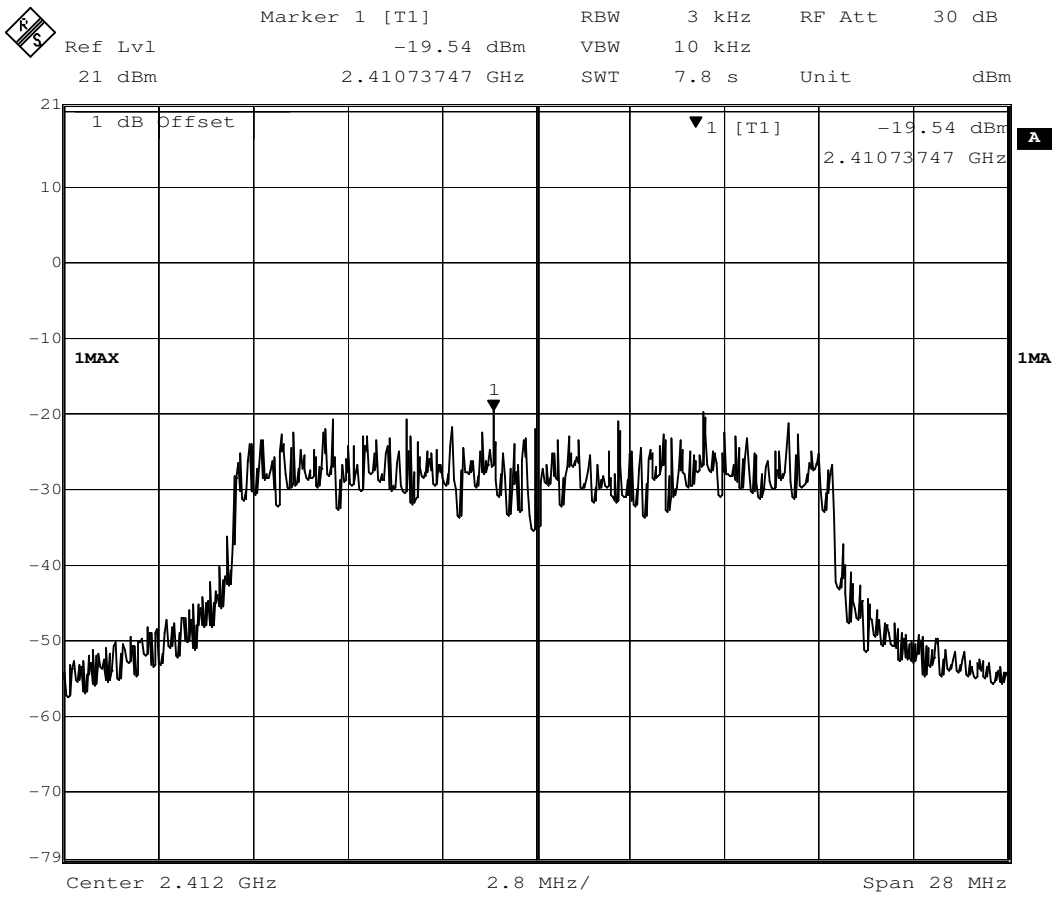
Channel No.	Frequency (MHz)	Mode	Measured Peak Power Spectral Density (dBm/3KHz)	Limit	Result
1	2412	802.11n (HT20)	-19.54	8dBm/3KHz	Pass
7	2442		-18.61		Pass
11	2462		-18.67		Pass

Remark: Level = Read Level + Cable Loss.

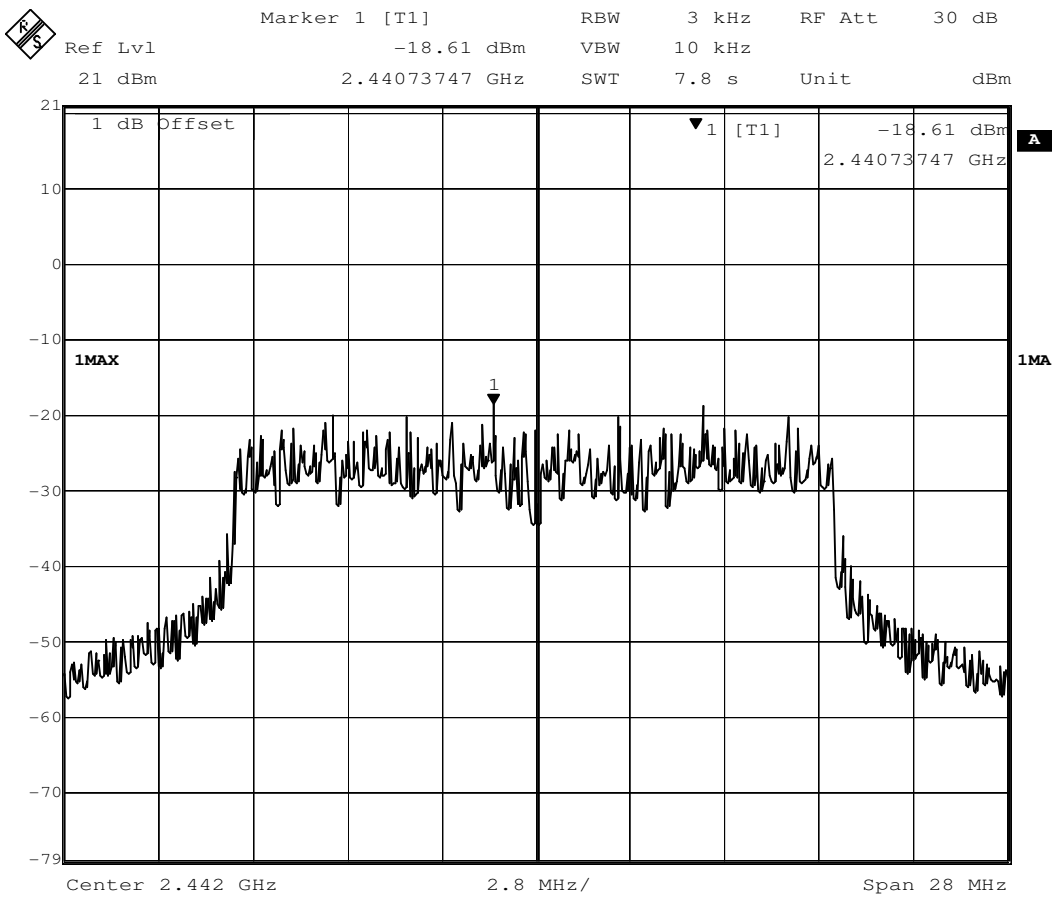
The unit does meet the FCC requirements.

Result plot as follows:

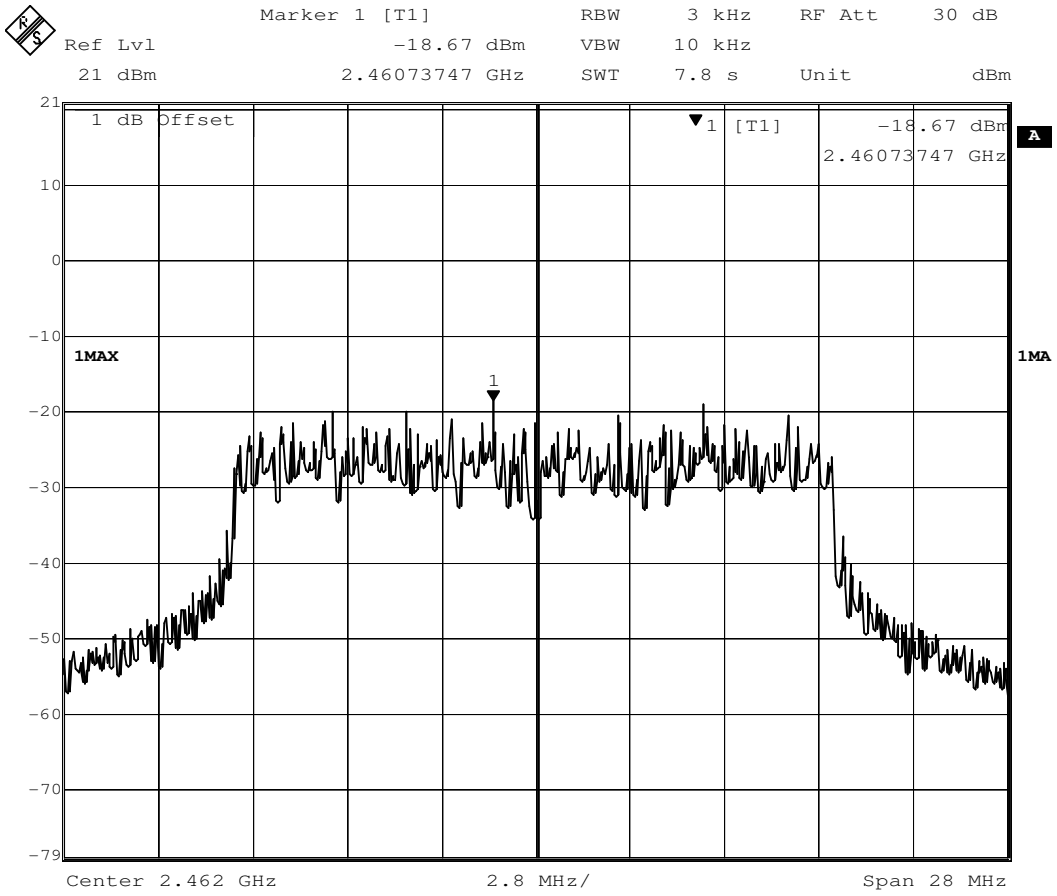
Channel 1: 2.412GHz:



Channel 7: 2.442GHz:



Channel 11: 2.462GHz:



7.6 Conducted Spurious Emissions

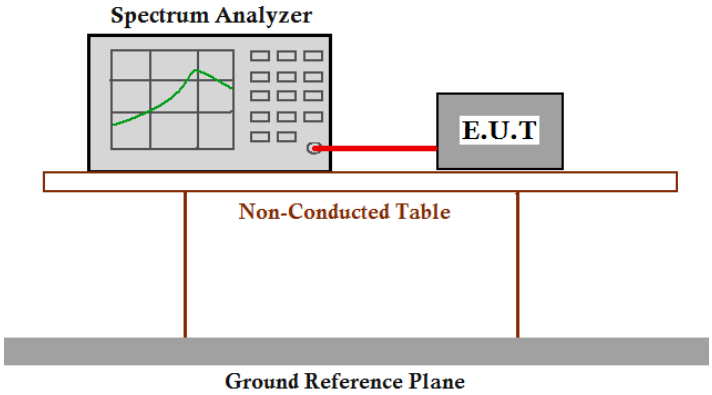
Test Requirement: FCC Part 15 C section 15.247

(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: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



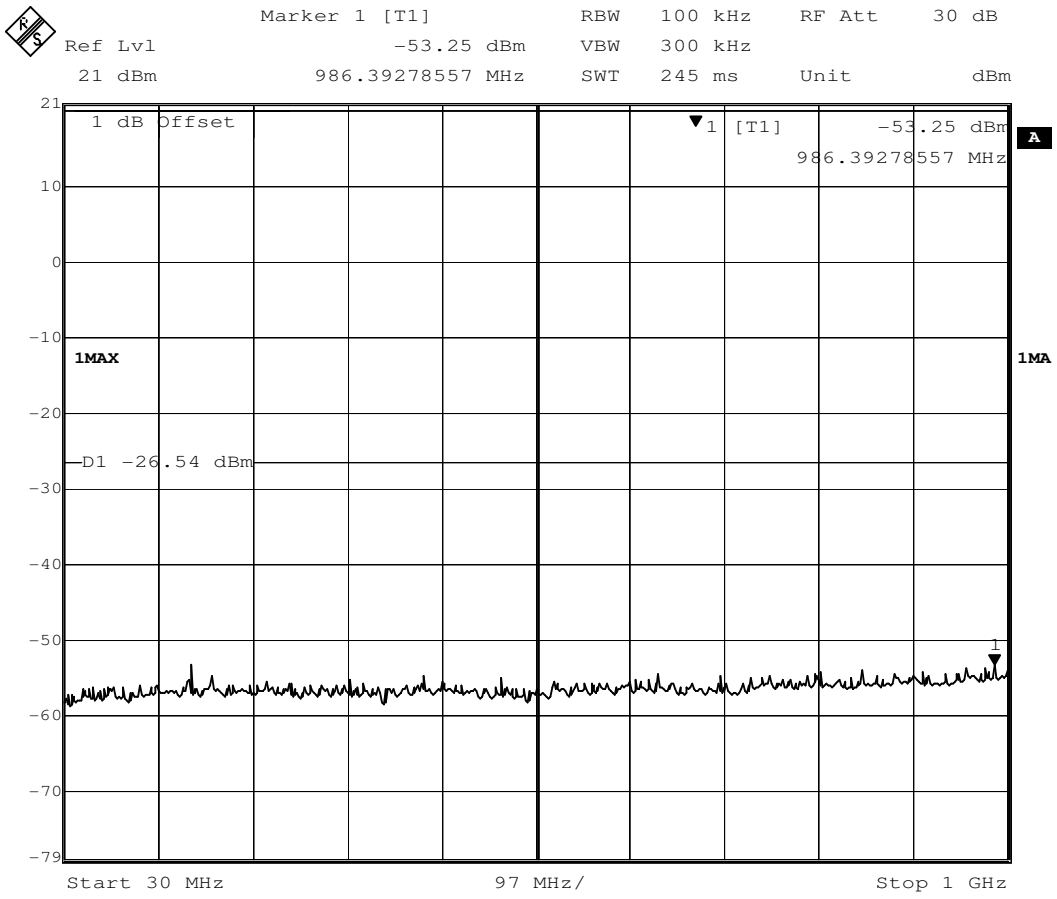
Test Procedure:

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 worse case.

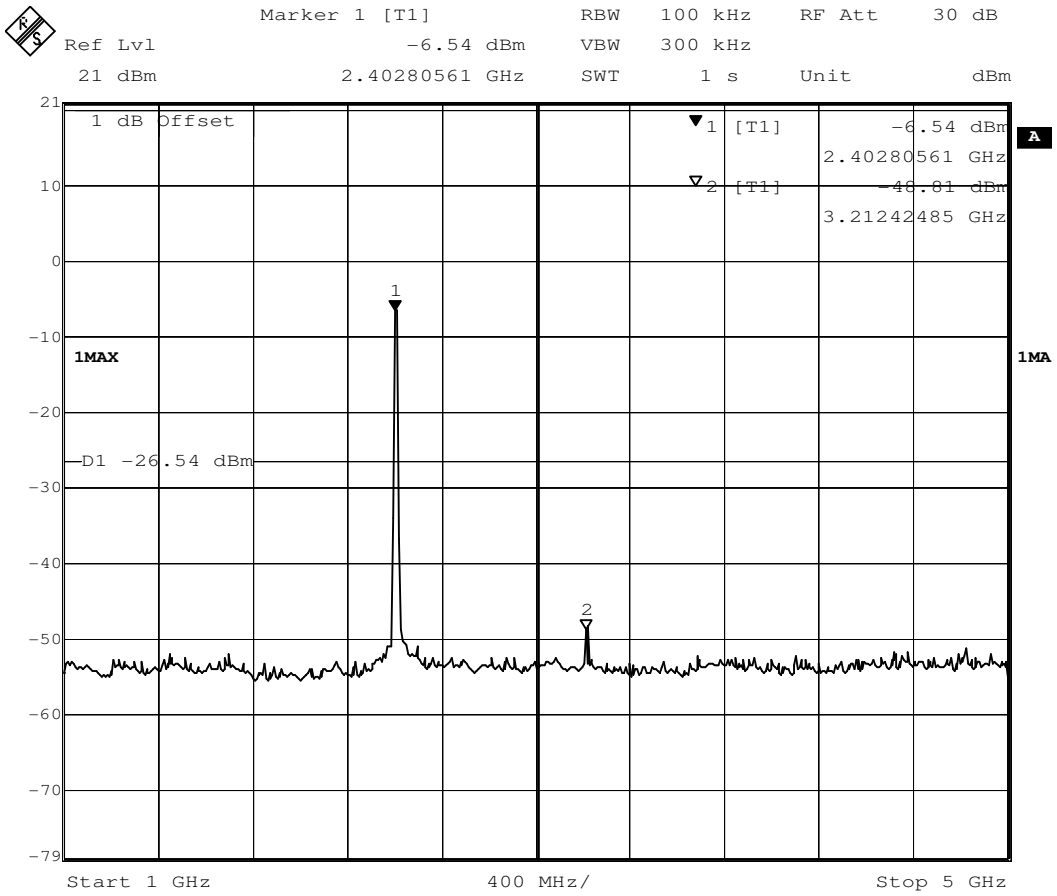
Result plot as follows:

Channel 1: 2.412GHz:

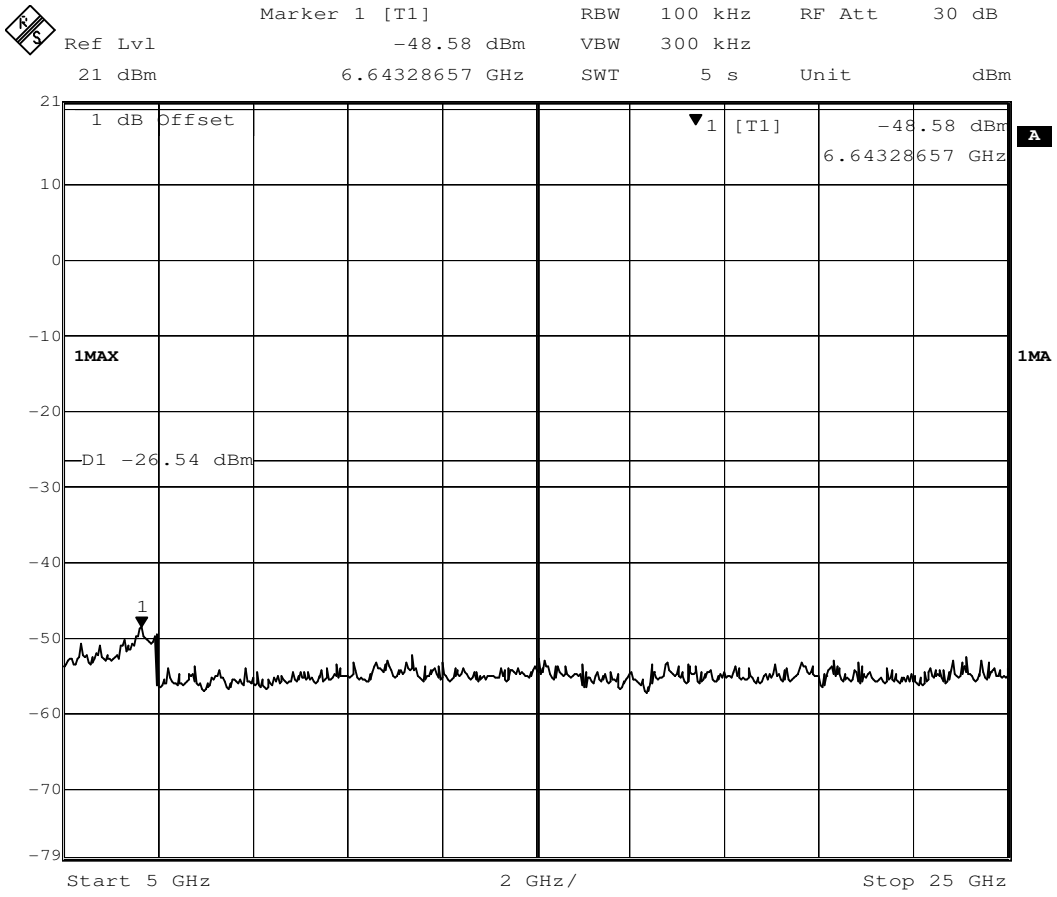
30 MHz to 1 GHz



1 G to 5 GHz

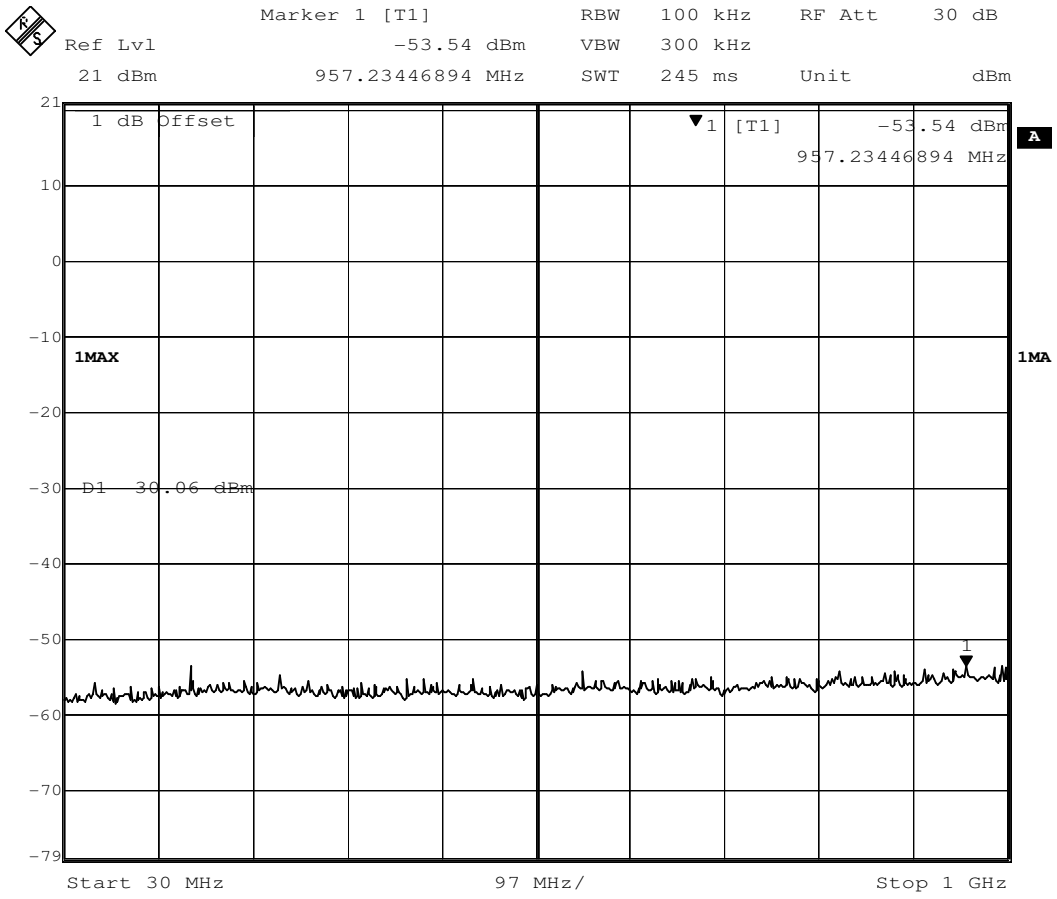


5 G to 25 GHz

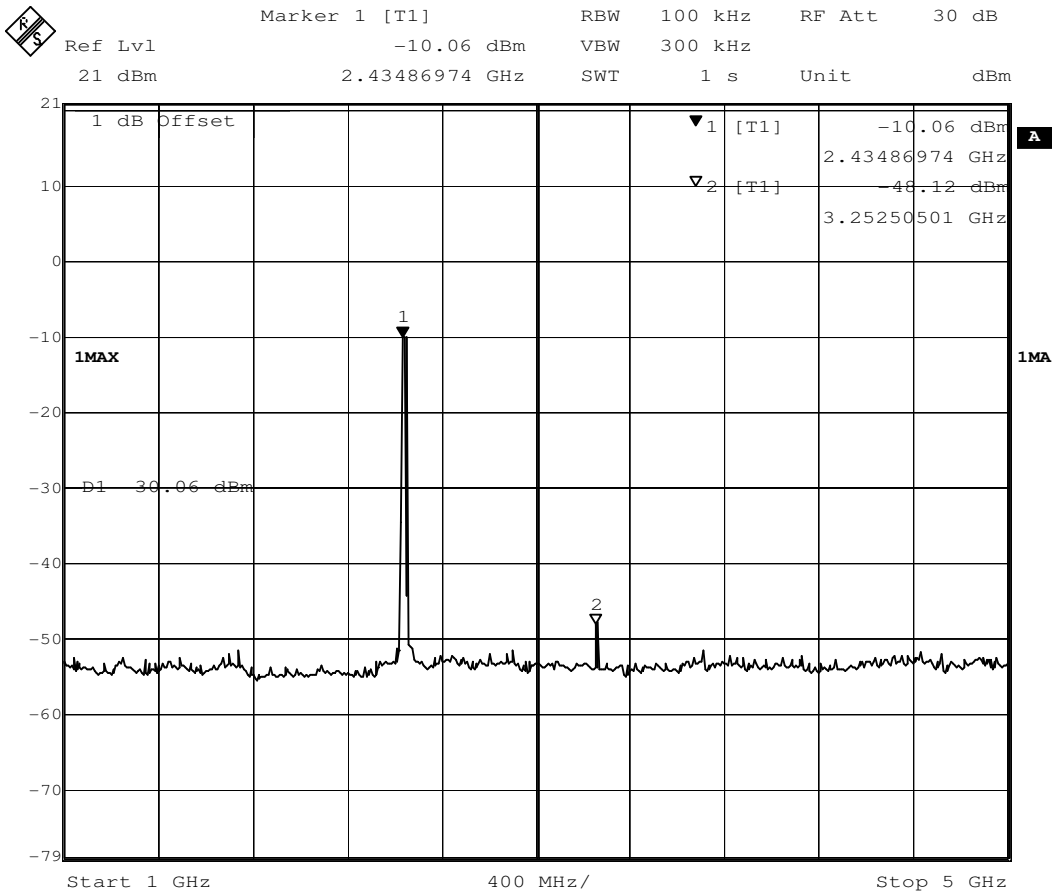


Channel 7: 2.442GHz:

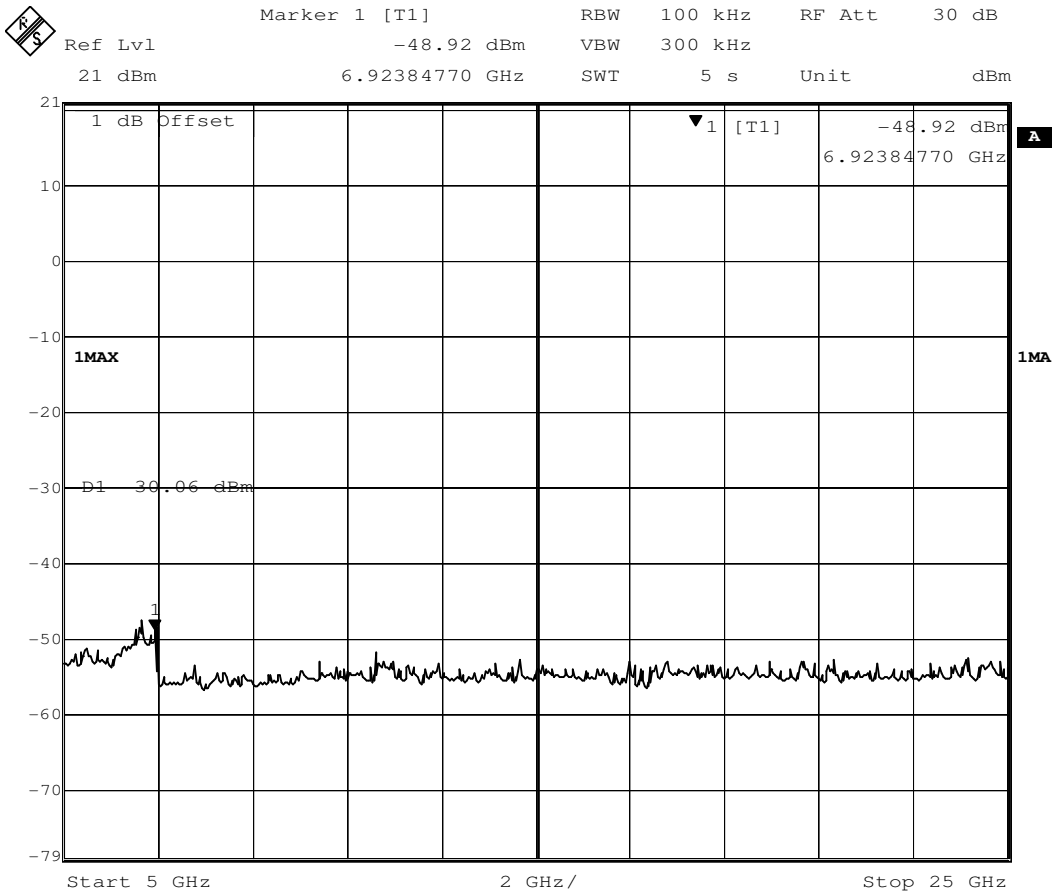
30 MHz to 1 GHz



1 G to 5 GHz

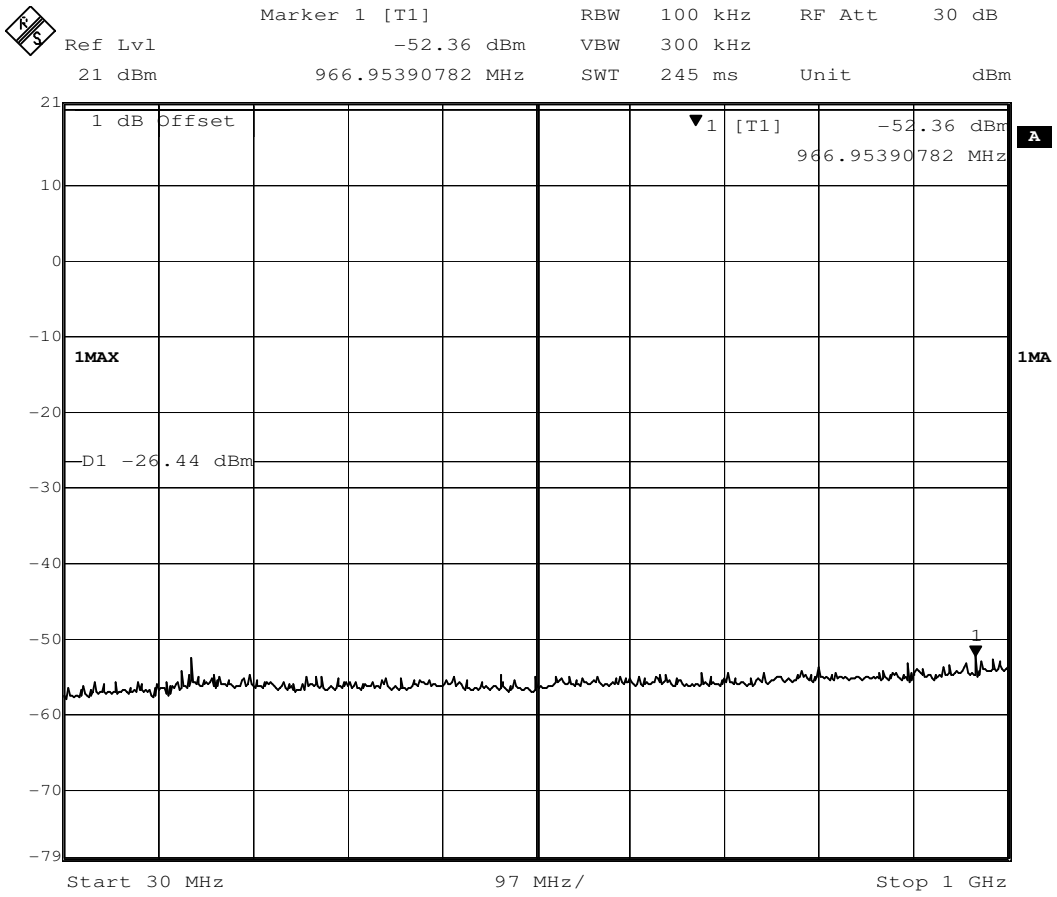


5 G to 25 GHz

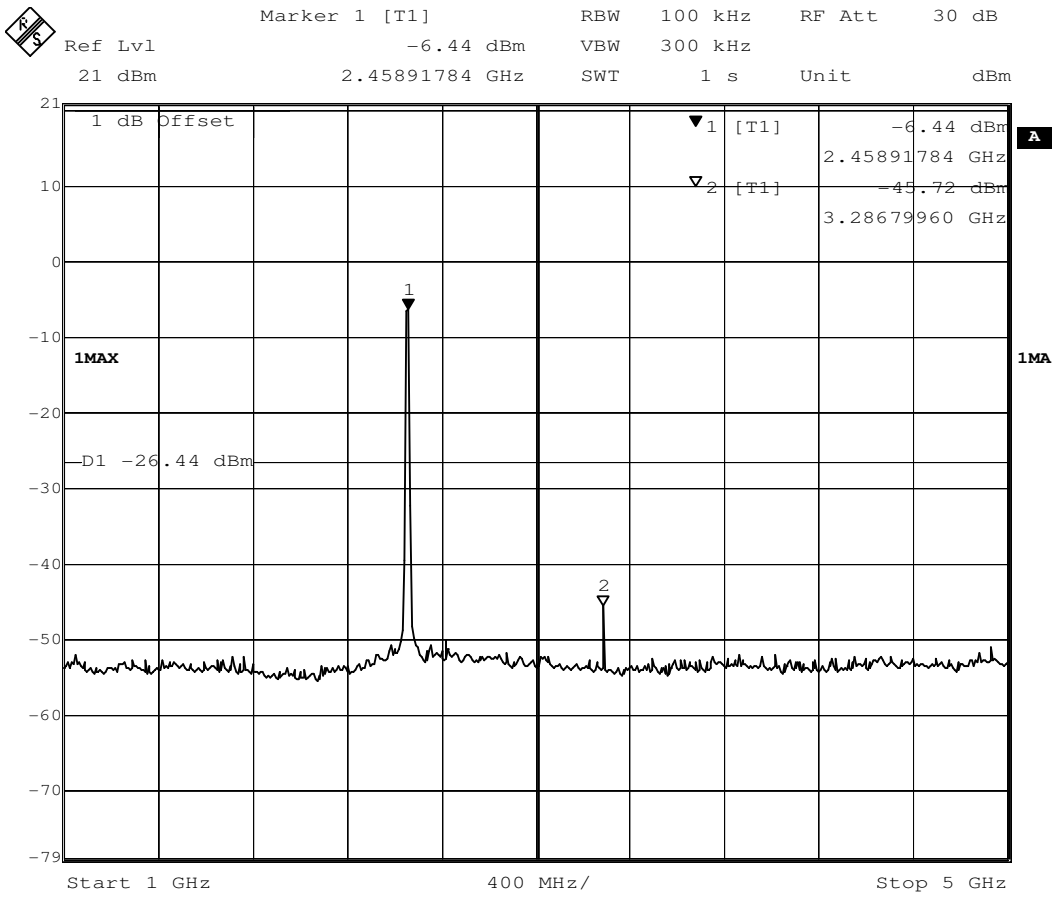


Channel 11:2.462 GHz

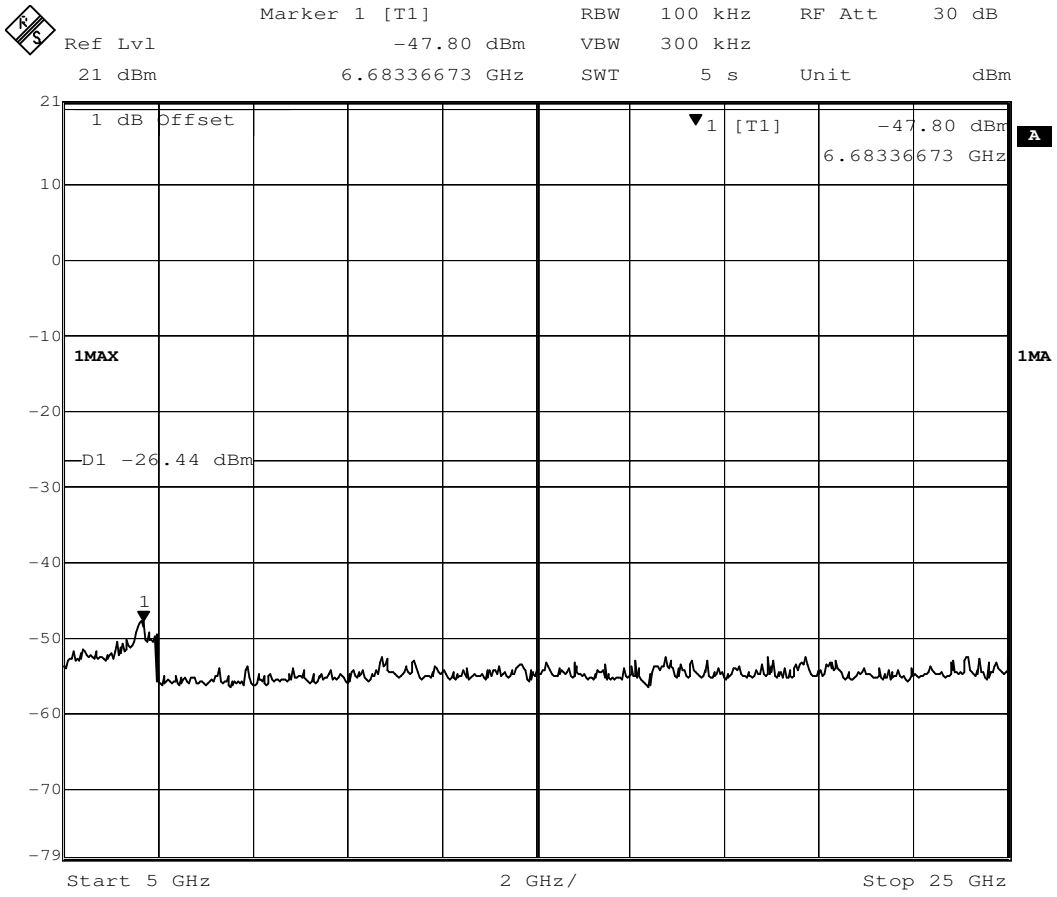
30 MHz to 1 GHz



1 G to 5 GHz



5 G to 25 GHz



7.7 Radiated Spurious Emissions

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

Test Method: ANSI C63.10: 2013

Test Status: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Site: Measurement Distance:3m (Semi-Anechoic Chamber below 1GHz, Full Anechoic Chamber above 1GHz)

Receiver Setup:

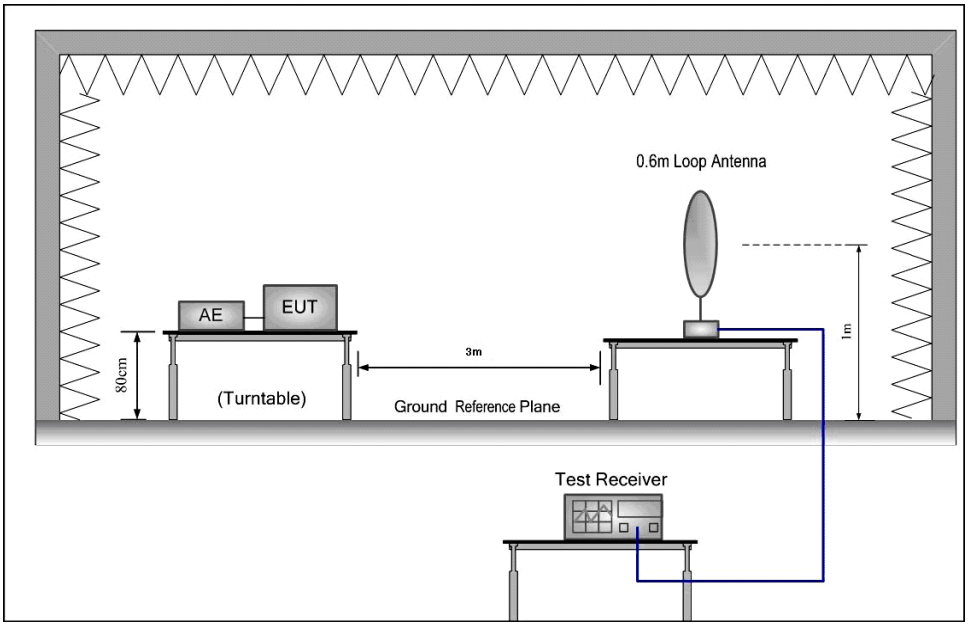
Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak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

Limit:

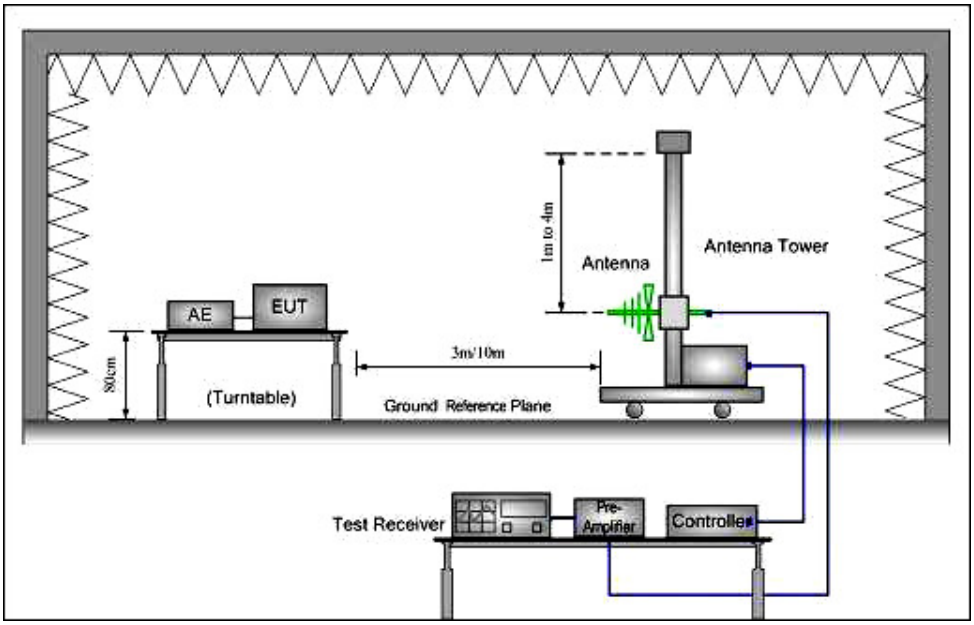
Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz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

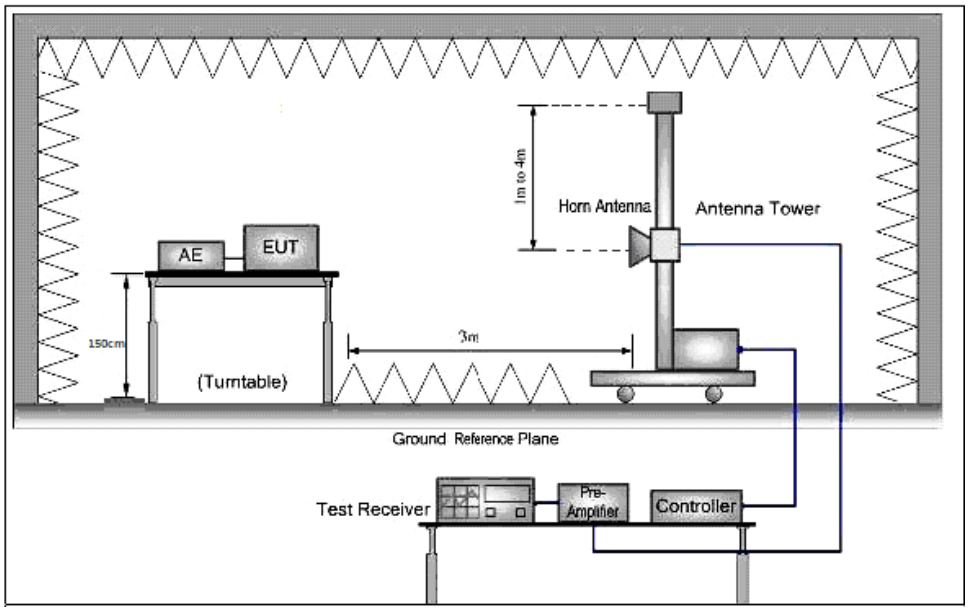
Test Setup:



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 (2412MHz),the middle channel (2442MHz),the Highest channel (2462MHz)

i.Repeat above procedures until all frequencies measured was complete.

Test Result:

9KHz~30 MHz Field Strength of Unwanted Emissions. 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~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Pre-test all modes with the according rate, the worst case is 802.11n (HT20) with 72.2Mbps lowest channel, so the final compliance test result is recorded in 802.11n (HT20) with 72.2Mbps mode with 2412MHz

	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	36.001	23.26	13.81	0.60	27.00	10.67	40.00	-29.33	HORIZONTAL	QP
2	51.121	24.74	14.47	0.72	27.00	12.93	40.00	-27.07	HORIZONTAL	QP
3	67.675	23.11	12.93	0.85	27.00	9.89	40.00	-30.11	HORIZONTAL	QP
4	146.888	23.84	13.22	1.29	26.80	11.55	43.50	-31.95	HORIZONTAL	QP
5	270.375	28.22	13.21	1.70	26.40	16.73	46.00	-29.27	HORIZONTAL	QP
6	724.261	27.91	21.52	2.90	27.99	24.34	46.00	-21.66	HORIZONTAL	QP

	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	32.179	43.94	14.04	0.60	27.00	31.58	40.00	-8.42	VERTICAL	QP
2	45.695	35.69	14.23	0.70	27.00	23.62	40.00	-16.38	VERTICAL	QP
3	159.784	28.28	13.70	1.33	26.74	16.57	43.50	-26.93	VERTICAL	QP
4	319.937	27.10	14.22	1.87	26.46	16.73	46.00	-29.27	VERTICAL	QP
5	562.662	27.72	19.70	2.53	27.98	21.97	46.00	-24.03	VERTICAL	QP
6	804.603	30.45	22.44	3.00	27.72	28.17	46.00	-17.83	VERTICAL	QP

Above 1GHz Field Strength of Unwanted Emissions. Peak and Average Measurement

802.11n(HT20) mode with 72.2Mbps data rate

Test at Channel 1 (2.412 GHz) in transmitting status

	Freq	ReadAntenna Level	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	3210.540	36.69	27.90	8.00	39.68	32.91	54.00	-21.09	HORIZONTAL	Average
2	3210.540	49.24	27.90	8.00	39.68	45.46	74.00	-28.54	HORIZONTAL	Peak
3	3969.767	29.66	29.44	8.96	40.06	28.00	54.00	-26.00	HORIZONTAL	Average
4	3969.767	42.06	29.44	8.96	40.06	40.40	74.00	-33.60	HORIZONTAL	Peak
5	4824.941	51.85	30.82	9.96	40.21	52.42	54.00	-1.58	HORIZONTAL	Average
6	4824.941	63.78	30.82	9.96	40.21	64.35	74.00	-9.65	HORIZONTAL	Peak
7	7236.309	25.44	35.55	12.80	39.25	34.54	54.00	-19.46	HORIZONTAL	Average
8	7236.309	40.70	35.55	12.80	39.25	49.80	74.00	-24.20	HORIZONTAL	Peak
9	9648.970	22.68	37.54	14.48	37.95	36.75	54.00	-17.25	HORIZONTAL	Average
10	9648.970	35.33	37.54	14.48	37.95	49.40	74.00	-24.60	HORIZONTAL	Peak
11	12060.810	19.33	39.46	15.83	38.09	36.53	54.00	-17.47	HORIZONTAL	Average
12	12060.810	32.18	39.46	15.83	38.09	49.38	74.00	-24.62	HORIZONTAL	Peak

	Freq	ReadAntenna Level	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	3210.804	38.03	27.90	8.00	39.68	34.25	54.00	-19.75	VERTICAL	Average
2	3210.804	52.93	27.90	8.00	39.68	49.15	74.00	-24.85	VERTICAL	Peak
3	3801.333	28.03	29.01	8.70	40.02	25.72	54.00	-28.28	VERTICAL	Average
4	3801.333	40.86	29.01	8.70	40.02	38.55	74.00	-35.45	VERTICAL	Peak
5	4827.693	52.38	30.85	9.97	40.21	52.99	54.00	-1.01	VERTICAL	Average
6	4827.693	66.15	30.85	9.97	40.21	66.76	74.00	-7.24	VERTICAL	Peak
7	7236.542	24.88	35.55	12.80	39.25	33.98	54.00	-20.02	VERTICAL	Average
8	7236.542	38.64	35.55	12.80	39.25	47.74	74.00	-26.26	VERTICAL	Peak
9	9648.684	19.39	37.54	14.48	37.95	33.46	54.00	-20.54	VERTICAL	Average
10	9648.684	33.71	37.54	14.48	37.95	47.78	74.00	-26.22	VERTICAL	Peak
11	12060.930	19.25	39.46	15.83	38.09	36.45	54.00	-17.55	VERTICAL	Average
12	12060.930	32.64	39.46	15.83	38.09	49.84	74.00	-24.16	VERTICAL	Peak

Test at Channel 7 (2.442 GHz) in transmitting status

	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	3250.251	35.94	27.90	8.00	39.72	32.12	54.00	-21.88	HORIZONTAL	Average
2	3250.251	49.27	27.90	8.00	39.72	45.45	74.00	-28.55	HORIZONTAL	Peak
3	3703.723	29.41	28.52	8.60	39.98	26.55	54.00	-27.45	HORIZONTAL	Average
4	3703.723	41.72	28.52	8.60	39.98	38.86	74.00	-35.14	HORIZONTAL	Peak
5	4887.498	48.66	30.95	10.02	40.22	49.41	54.00	-4.59	HORIZONTAL	Average
6	4887.498	61.99	30.95	10.02	40.22	62.74	74.00	-11.26	HORIZONTAL	Peak
7	7326.852	25.53	35.74	12.93	39.22	34.98	54.00	-19.02	HORIZONTAL	Average
8	7326.852	37.25	35.74	12.93	39.22	46.70	74.00	-27.30	HORIZONTAL	Peak
9	9768.432	20.32	37.74	14.44	37.90	34.60	54.00	-19.40	HORIZONTAL	Average
10	9768.432	33.75	37.74	14.44	37.90	48.03	74.00	-25.97	HORIZONTAL	Peak
11	12210.220	18.85	39.21	16.05	38.10	36.01	54.00	-17.99	HORIZONTAL	Average
12	12210.220	32.65	39.21	16.05	38.10	49.81	74.00	-24.19	HORIZONTAL	Peak

	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	3250.850	39.81	27.90	8.00	39.72	35.99	54.00	-18.01	VERTICAL	Average
2	3250.850	53.65	27.90	8.00	39.72	49.83	74.00	-24.17	VERTICAL	Peak
3	4887.699	49.26	30.95	10.02	40.22	50.01	54.00	-3.99	VERTICAL	Average
4	4887.699	65.47	30.95	10.02	40.22	66.22	74.00	-7.78	VERTICAL	Peak
5	7326.542	25.17	35.74	12.93	39.22	34.62	54.00	-19.38	VERTICAL	Average
6	7326.542	37.47	35.74	12.93	39.22	46.92	74.00	-27.08	VERTICAL	Peak
7	8319.836	21.25	36.22	13.71	38.95	32.23	54.00	-21.77	VERTICAL	Average
8	8319.836	35.41	36.22	13.71	38.95	46.39	74.00	-27.61	VERTICAL	Peak
9	9768.825	22.51	37.74	14.44	37.90	36.79	54.00	-17.21	VERTICAL	Average
10	9768.825	34.34	37.74	14.44	37.90	48.62	74.00	-25.38	VERTICAL	Peak
11	12210.720	19.77	39.21	16.05	38.10	36.93	54.00	-17.07	VERTICAL	Average
12	12210.720	34.44	39.21	16.05	38.10	51.60	74.00	-22.40	VERTICAL	Peak

Test at Channel 11 (2.462 GHz) in transmitting status

	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	3280.305	36.43	27.90	8.00	39.75	32.58	54.00	-21.42	HORIZONTAL	Average
2	3280.305	48.66	27.90	8.00	39.75	44.81	74.00	-29.19	HORIZONTAL	Peak
3	4944.100	47.56	31.03	10.07	40.22	48.44	54.00	-5.56	HORIZONTAL	Average
4	4944.100	58.80	31.03	10.07	40.22	59.68	74.00	-14.32	HORIZONTAL	Peak
5	7416.254	24.36	35.89	13.02	39.20	34.07	54.00	-19.93	HORIZONTAL	Average
6	7416.254	37.73	35.89	13.02	39.20	47.44	74.00	-26.56	HORIZONTAL	Peak
7	8129.664	23.41	36.41	13.57	39.04	34.35	54.00	-19.65	HORIZONTAL	Average
8	8129.664	35.18	36.41	13.57	39.04	46.12	74.00	-27.88	HORIZONTAL	Peak
9	9888.970	21.29	37.89	14.42	37.86	35.74	54.00	-18.26	HORIZONTAL	Average
10	9888.970	33.65	37.89	14.42	37.86	48.10	74.00	-25.90	HORIZONTAL	Peak
11	12360.880	21.41	38.98	16.25	38.11	38.53	54.00	-15.47	HORIZONTAL	Average
12	12360.880	34.74	38.98	16.25	38.11	51.86	74.00	-22.14	HORIZONTAL	Peak

	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	3280.326	35.32	27.90	8.00	39.75	31.47	54.00	-22.53	VERTICAL	Average
2	3280.326	47.14	27.90	8.00	39.75	43.29	74.00	-30.71	VERTICAL	Peak
3	4947.607	45.32	31.03	10.07	40.22	46.20	54.00	-7.80	VERTICAL	Average
4	4947.607	60.55	31.03	10.07	40.22	61.43	74.00	-12.57	VERTICAL	Peak
5	6195.508	28.30	33.00	11.31	39.75	32.86	54.00	-21.14	VERTICAL	Average
6	6195.508	40.63	33.00	11.31	39.75	45.19	74.00	-28.81	VERTICAL	Peak
7	7416.309	25.36	35.89	13.02	39.20	35.07	54.00	-18.93	VERTICAL	Average
8	7416.309	37.11	35.89	13.02	39.20	46.82	74.00	-27.18	VERTICAL	Peak
9	9888.991	21.54	37.89	14.42	37.86	35.99	54.00	-18.01	VERTICAL	Average
10	9888.991	33.92	37.89	14.42	37.86	48.37	74.00	-25.63	VERTICAL	Peak
11	12360.710	20.32	38.98	16.25	38.11	37.44	54.00	-16.56	VERTICAL	Average
12	12360.710	33.54	38.98	16.25	38.11	50.66	74.00	-23.34	VERTICAL	Peak

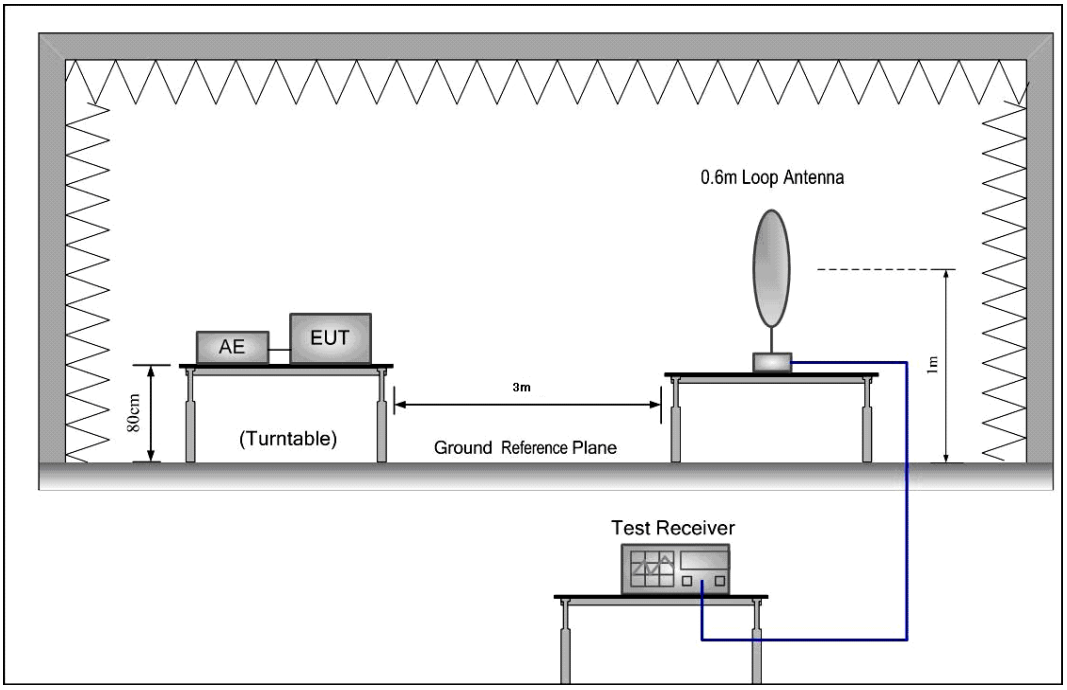
Test result: The unit does meet the FCC requirements.

7.8 Radiated Emissions which fall in the restricted bands

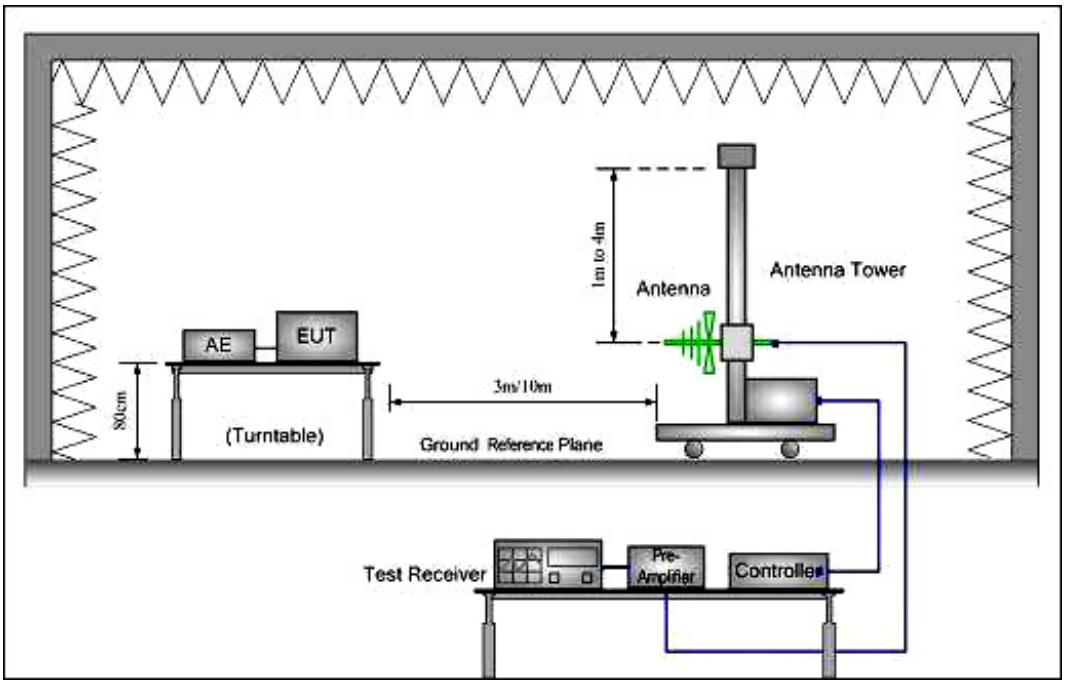
Test Requirement:	FCC Part 15 C section 15.247 (d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: Clause 11.12, 6.3, 6.5 and 6.6
Test Status:	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). Following channel(s) was (were) selected for the final test as listed below.
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	40.0 dBμV/m between 30MHz & 88MHz; 43.5 dBμV/m between 88MHz & 216MHz; 46.0 dBμV/m between 216MHz & 960MHz; 54.0 dBμV/m above 960MHz.
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
Test Frequency Range:	9kHz-26.5GHz

Test Configuration:

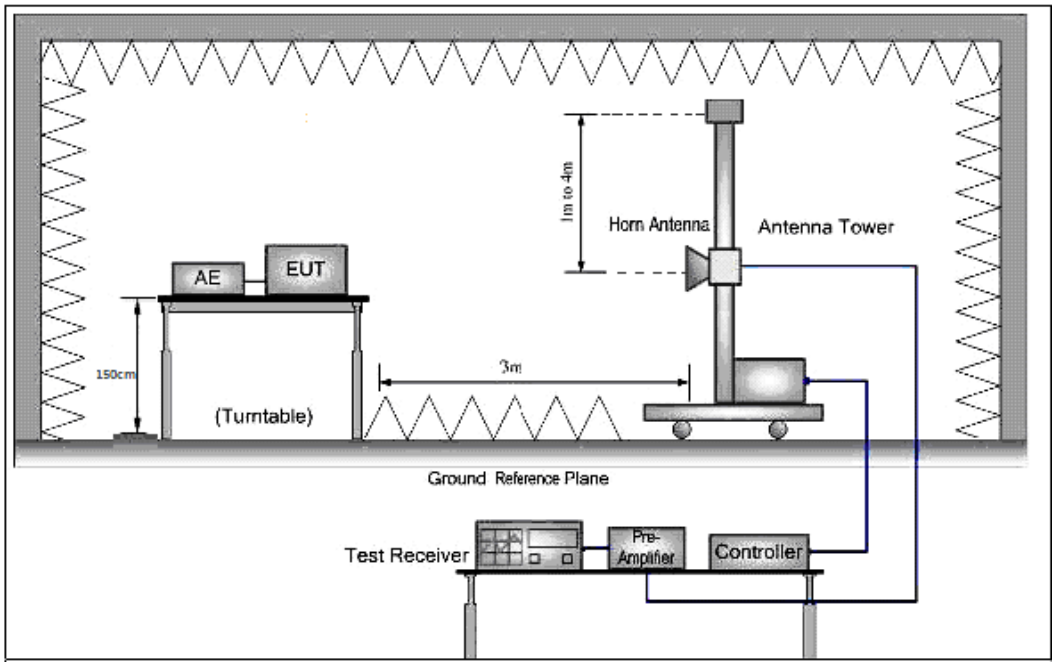
1) 9K to 30MHz emissions:



2) 2). 30 MHz to 1 GHz emissions:



3) GHz to 40 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 20log(dwell time/100 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:

30MHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak 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 Field Strength of Unwanted Emissions. Peak and Average Measurement

802.11n(HT20) mode with 72.2Mbps data rate

Test at Channel 1 (2.412 GHz) in transmitting status

	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	33.25	26.25	6.80	39.07	27.23	54.00	-26.77	HORIZONTAL	Average
2	2310.000	47.08	26.25	6.80	39.07	41.06	74.00	-32.94	HORIZONTAL	Peak
3	2390.000	50.21	26.43	6.87	39.10	44.41	54.00	-9.59	HORIZONTAL	Average
4	2390.000	65.45	26.43	6.87	39.10	59.65	74.00	-14.35	HORIZONTAL	Peak
5	2483.500	49.35	26.58	7.07	39.14	43.86	54.00	-10.14	HORIZONTAL	Average
6	2483.500	61.88	26.58	7.07	39.14	56.39	74.00	-17.61	HORIZONTAL	Peak
7	2500.000	48.44	26.60	7.10	39.14	43.00	54.00	-11.00	HORIZONTAL	Average
8	2500.000	61.14	26.60	7.10	39.14	55.70	74.00	-18.30	HORIZONTAL	Peak

	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	30.25	26.25	6.80	39.07	24.23	54.00	-29.77	VERTICAL	Average
2	2310.000	41.86	26.25	6.80	39.07	35.84	74.00	-38.16	VERTICAL	Peak
3	2390.000	43.83	26.43	6.87	39.10	38.03	54.00	-15.97	VERTICAL	Average
4	2390.000	54.55	26.43	6.87	39.10	48.75	74.00	-25.25	VERTICAL	Peak
5	2483.500	43.04	26.58	7.07	39.14	37.55	54.00	-16.45	VERTICAL	Average
6	2483.500	53.23	26.58	7.07	39.14	47.74	74.00	-26.26	VERTICAL	Peak
7	2500.000	38.70	26.60	7.10	39.14	33.26	54.00	-20.74	VERTICAL	Average
8	2500.000	52.94	26.60	7.10	39.14	47.50	74.00	-26.50	VERTICAL	Peak

Test at Channel 11 (2.462 GHz) in transmitting status

	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	29.48	26.25	6.80	39.07	23.46	54.00	-30.54	HORIZONTAL	Average
2	2310.000	41.16	26.25	6.80	39.07	35.14	74.00	-38.86	HORIZONTAL	Peak
3	2375.080	30.23	26.40	6.84	39.10	24.37	54.00	-29.63	HORIZONTAL	Average
4	2375.080	42.15	26.40	6.84	39.10	36.29	74.00	-37.71	HORIZONTAL	Peak
5	2483.500	56.27	26.58	7.07	39.14	50.78	54.00	-3.22	HORIZONTAL	Average
6	2483.500	70.86	26.58	7.07	39.14	65.37	74.00	-8.63	HORIZONTAL	Peak
7	2507.644	42.49	26.61	7.11	39.14	37.07	54.00	-16.93	HORIZONTAL	Average
8	2507.644	55.73	26.61	7.11	39.14	50.31	74.00	-23.69	HORIZONTAL	Peak

	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	29.46	26.25	6.80	39.07	23.44	54.00	-30.56	VERTICAL	Average
2	2310.000	41.81	26.25	6.80	39.07	35.79	74.00	-38.21	VERTICAL	Peak
3	2390.000	30.30	26.43	6.87	39.10	24.50	54.00	-29.50	VERTICAL	Average
4	2390.000	42.78	26.43	6.87	39.10	36.98	74.00	-37.02	VERTICAL	Peak
5	2483.500	50.02	26.58	7.07	39.14	44.53	54.00	-9.47	VERTICAL	Average
6	2483.500	68.68	26.58	7.07	39.14	63.19	74.00	-10.81	VERTICAL	Peak
7	2500.000	41.63	26.60	7.10	39.14	36.19	54.00	-17.81	VERTICAL	Average
8	2500.000	55.10	26.60	7.10	39.14	49.66	74.00	-24.34	VERTICAL	Peak

7.9 Band Edges Requirement

Test Requirement: FCC Part 15 C section 15.247

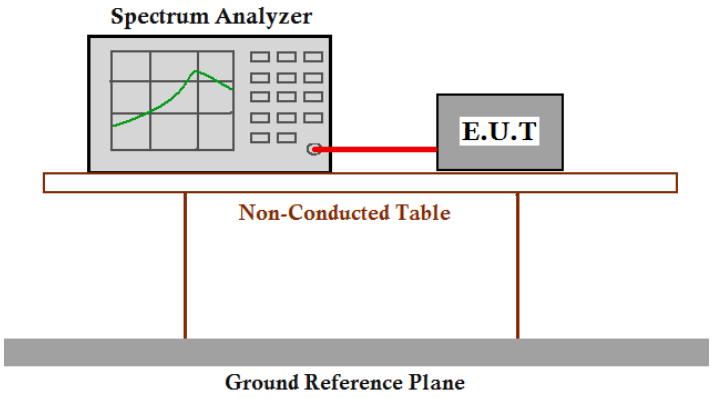
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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: 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). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

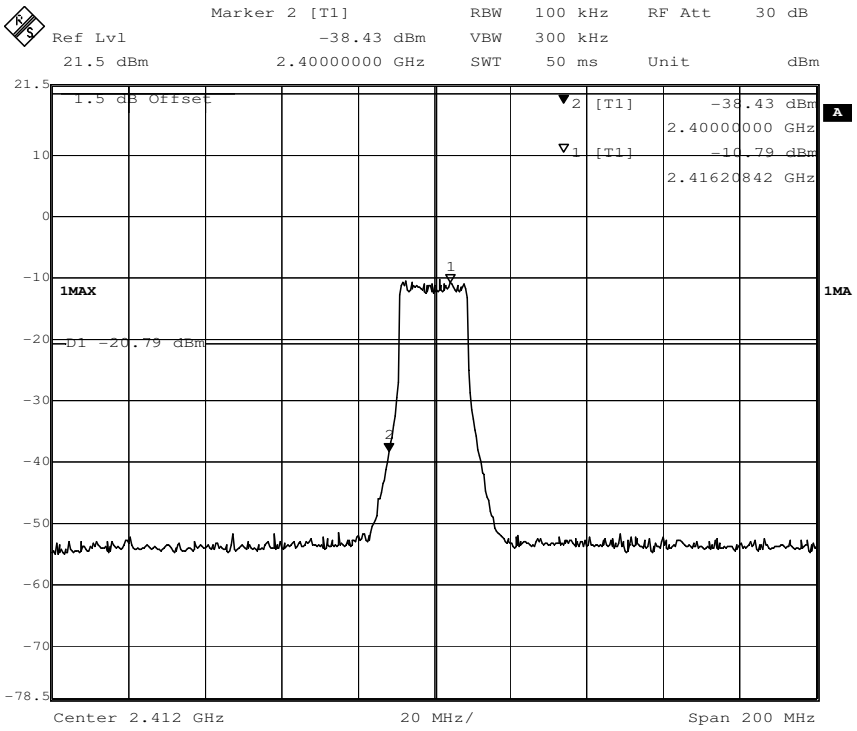
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set instrument center frequency to the frequency of the emission to be measured(must be within 2MHz of the authorized band edge).
3. Set span to 2MHz,
4. RBW=100kHz,
5. 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.

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.

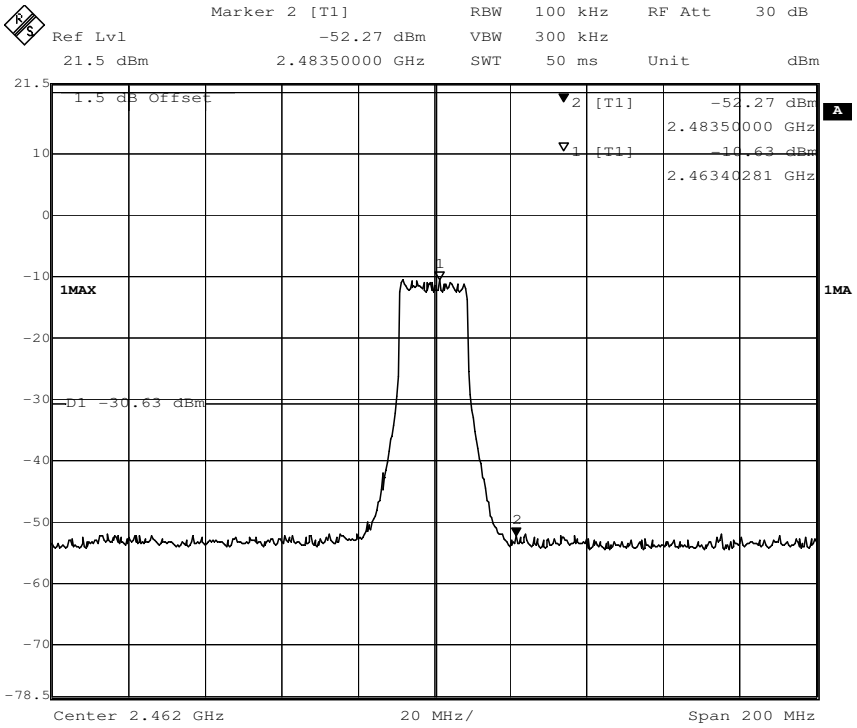
802.11n(HT20) mode with 72.2Mbps data rate

Channel1: 2.412 GHz



802.11n(HT20) mode with 72.2Mbps data rate

Channel11: 2.462 GHz



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

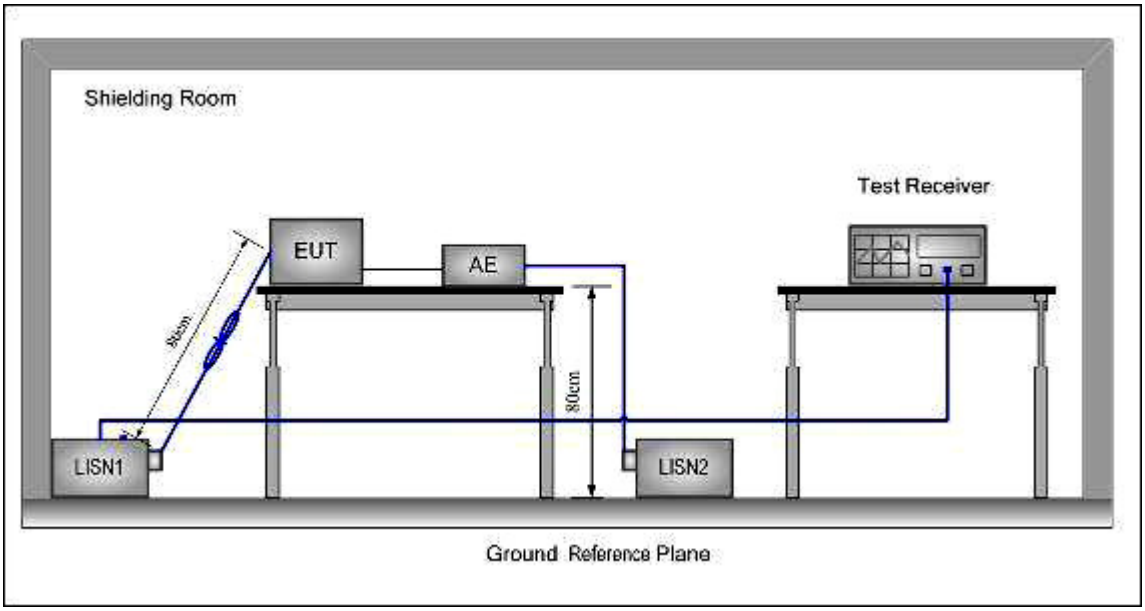
Limits for conducted disturbance at the mains ports of class B

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).

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.

Measurement Data

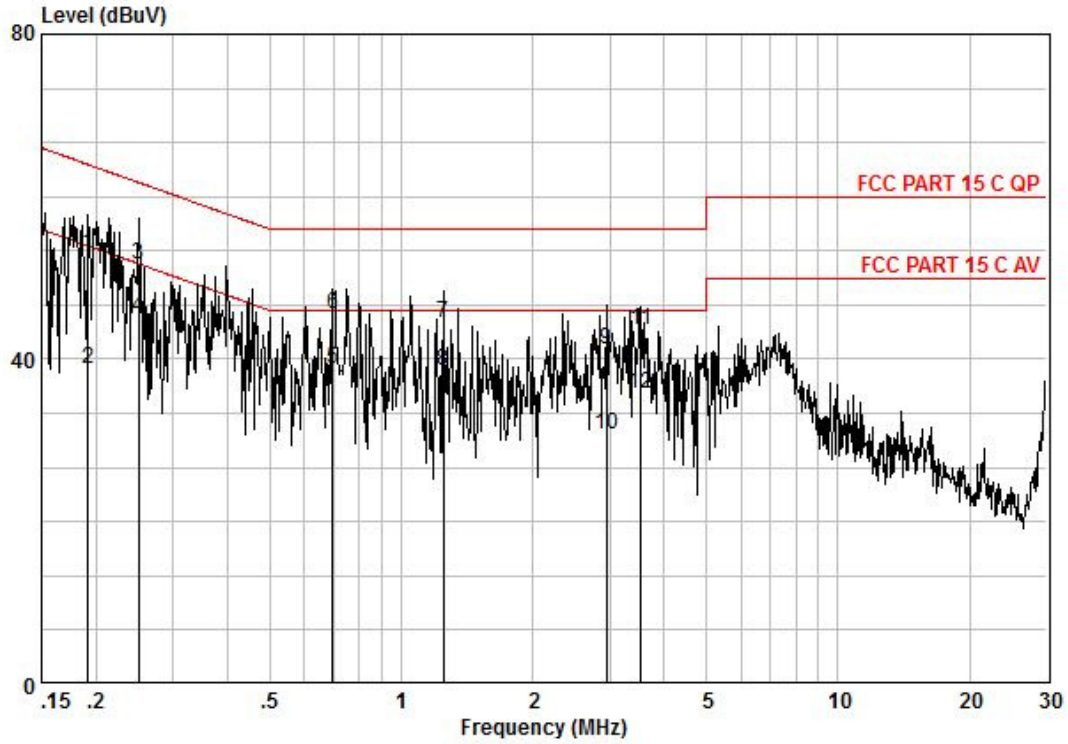
An initial pre-scan was performed on the live and neutral lines with peak detector.

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:

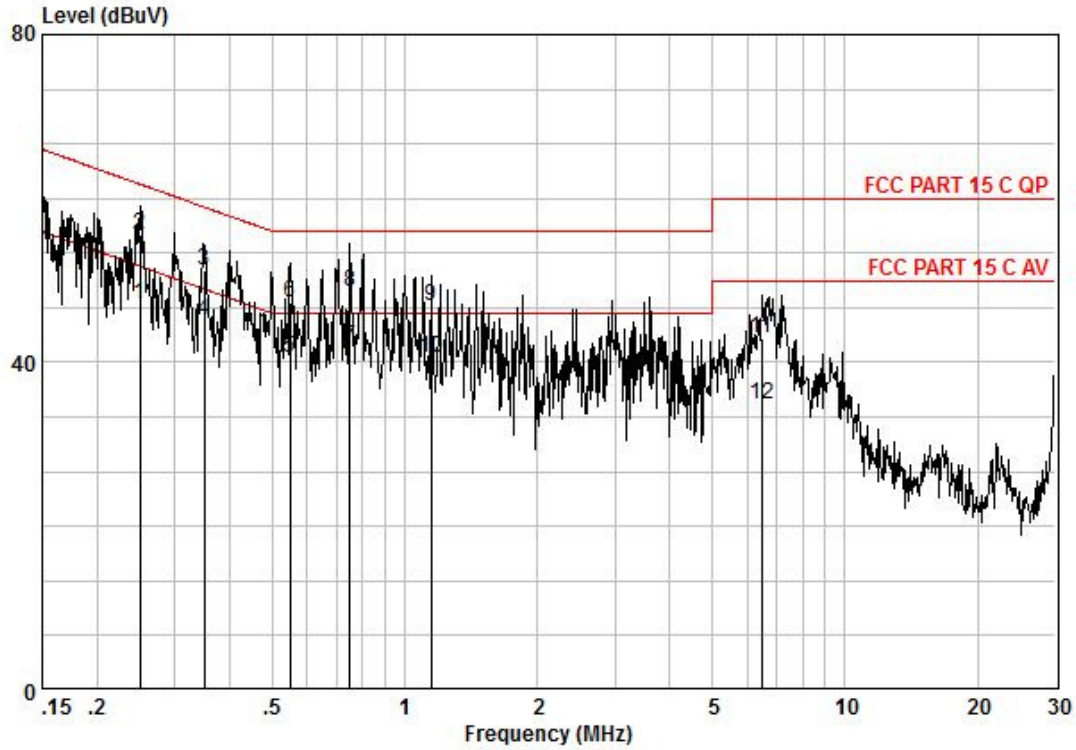
Neutral Line



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
0,19	43,22	0,10	9,67	52,99	63,98	-10,99	QP
0,19	29,01	0,10	9,67	38,78	53,98	-15,20	AVERAGE
0,25	41,96	0,12	9,66	51,74	61,73	-9,99	QP
0,25	35,25	0,12	9,66	45,03	51,73	-6,70	AVERAGE
0,70	28,83	0,25	9,67	38,75	46,00	-7,25	AVERAGE
0,70	35,66	0,25	9,67	45,58	56,00	-10,42	QP
1,25	34,52	0,30	9,68	44,50	56,00	-11,50	QP
1,25	28,69	0,30	9,68	38,67	46,00	-7,33	AVERAGE
2,95	30,88	0,53	9,70	41,11	56,00	-14,89	QP
2,95	20,60	0,53	9,70	30,83	46,00	-15,17	AVERAGE
3,55	33,36	0,59	9,71	43,65	56,00	-12,35	QP
3,55	25,55	0,59	9,71	35,84	46,00	-10,16	AVERAGE

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
0,25	37,25	0,12	9,64	47,01	51,73	-4,72	AVERAGE
0,25	45,72	0,12	9,64	55,48	61,73	-6,25	QP
0,35	41,40	0,16	9,64	51,20	58,96	-7,76	QP
0,35	35,37	0,16	9,64	45,17	48,96	-3,79	AVERAGE
0,55	30,69	0,21	9,64	40,54	46,00	-5,46	AVERAGE
0,55	37,46	0,21	9,64	47,31	56,00	-8,69	QP
0,75	31,96	0,26	9,65	41,87	46,00	-4,13	AVERAGE
0,75	38,76	0,26	9,65	48,67	56,00	-7,33	QP
1,15	36,80	0,30	9,66	46,76	56,00	-9,24	QP
1,15	30,54	0,30	9,66	40,50	46,00	-5,50	AVERAGE
6,45	32,44	0,66	9,74	42,84	60,00	-17,16	QP
6,45	24,55	0,66	9,74	34,95	50,00	-15,05	AVERAGE

--End of Report--