

TEST REPORT

FCC Applicant: Legrand/Pass & Seymour
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IC Applicant: Pass & Seymour, Inc d/b/a Legrand
Address: 50 Boyd Ave Syracuse NY 13209 United States Of America
Manufacturer/Factory: Computime Electronics (Shenzhen) Company Limited
Address: Yuekenguangyu Industrial Park, Kangqiao Road 88#,
Danzhutou Community, Nanwan Street office, Longgang
District, Shenzhen, China.

Equipment Under Test (EUT)

Product Info: Thermostat
Model No.: WZ3TSTATH
Trade Mark: Legrand
FCC ID: 2AU5DWZ3TSTAT
IC: 25764-WZ3TSTAT
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
RSS-Gen Issue 5
RSS-247 Issue 2
Date of sample receipt: June 23, 2020
Date of Test: June 24, 2020-January 21, 2021
Date of report issued: January 21, 2021
Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:




Robinson Lo
Laboratory Manager

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2 Version

Version No.	Date	Description
00	January 21, 2021	Original

Prepared By:



Project Engineer

Date:

January 21, 2021

Check By:



Reviewer

Date:

January 21, 2021

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4 Test Summary

Test Item	Section	Result
Antenna requirement	FCC part 15.203/15.247 (c) RSS-Gen Section 6.8	Pass
AC Power Line Conducted Emission	FCC part 15.207 RSS-Gen Section 8.8	Pass
Conducted Peak Output Power	FCC part 15.247 (b)(3) RSS-247 Section 5.4(d)	Pass
Channel Bandwidth & 99% OCB	FCC part 15.247 (a)(2) RSS-247 Section 5.2(a) RSS-Gen Section 6.7	Pass
Power Spectral Density	FCC part 15.247 (e) RSS-247 Section 5.2(b)	Pass
Band Edge	FCC part 15.247(d) RSS-247 Section 5.5	Pass
Spurious Emission	FCC part 15.205/15.209 RSS-Gen Section 3.3 & 8.9 & 8.10	Pass
Frequency stability	RSS-Gen Section 6.11& Section 8.11	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark : Test according to ANSI C63.10:2013

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Info:	Thermostat
Model No.:	WZ3TSTATH
Serial No.:	N/A
Hardware version:	1.0
Software version:	1.0
Test sample(s) ID:	GTS202006000241-1
Sample(s) Status	Engineer sample
Operation Frequency:	2405MHz~2480MHz
Channel numbers:	16
Channel separation:	5MHz
Modulation type:	O-QPSK
Antenna Type:	Integral Antenna
Antenna gain:	1.0dBi (Declared by manufacturer)
Power supply:	AC 24V

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405MHz	15	2425MHz	19	2445MHz	23	2465MHz
12	2410MHz	16	2430MHz	20	2450MHz	24	2470MHz
13	2415MHz	17	2435MHz	21	2455MHz	25	2475MHz
14	2420MHz	18	2440MHz	22	2460MHz	26	2480MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2405MHz
The middle channel	2440MHz
The Highest channel	2480MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
Supplied by client	AC adaptor	PPI76-24V05AC	N/A

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none">● FCC —Registration No.: 381383 Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383.● IC —Registration No.: 9079A The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A● NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.7 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional instructions

Test Software	Test command provide by manufacturer.
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

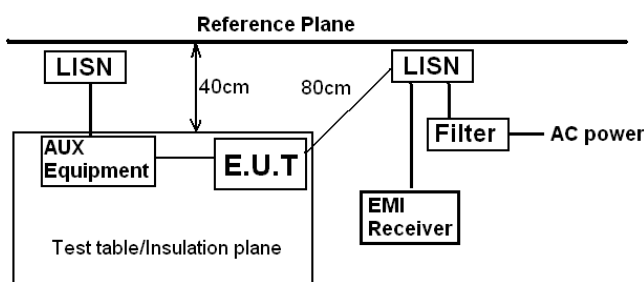
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
FCC Part 15.203 requirement: <p>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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p>	
15.247(c) (1)(i) requirement: <p>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi 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 6dBi.</p>	
RSS-Gen 6.8 <p>The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.</p> <p>For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).</p>	
EUT Antenna: <p><i>The antenna is Integral antenna, the best case gain of the antenna is 1.0dBi, Reference to the appendix II for details.</i></p>	

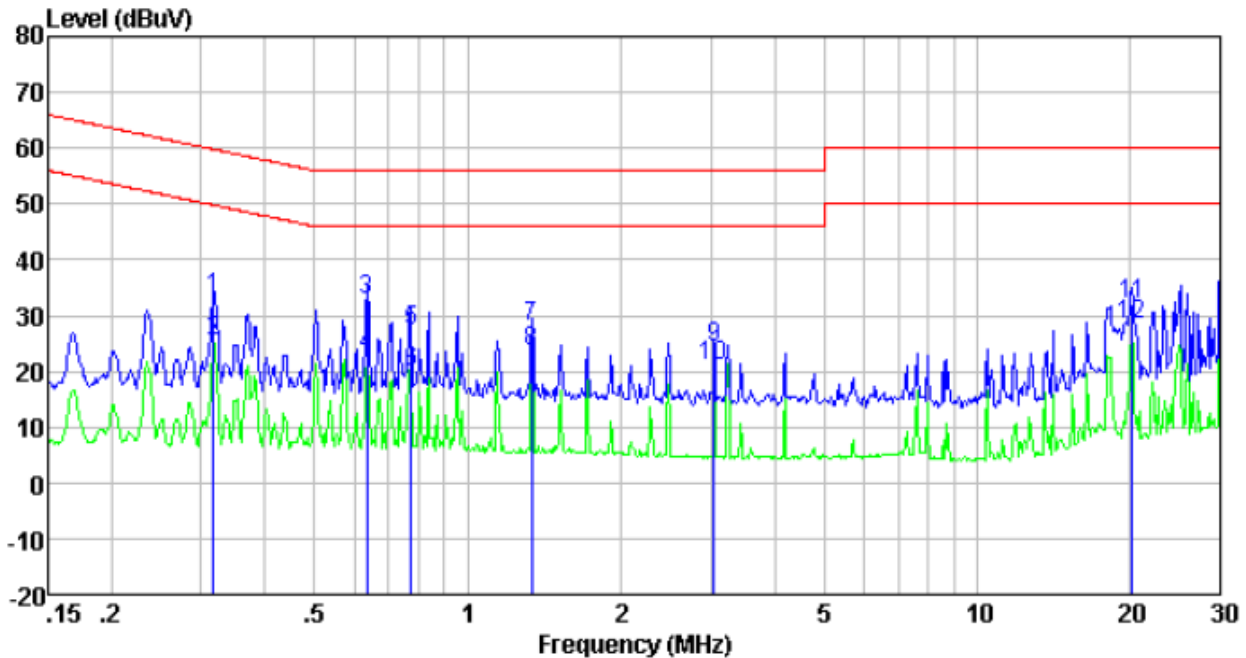
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207 RSS-Gen Section 8.8					
Test Method:	ANSI C63.10:2013 and RSS-Gen					
Test Frequency Range:	150KHz to 30MHz					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)		Limit (dBuV)			
			Quasi-peak		Average	
	0.15-0.5		66 to 56*		56 to 46*	
	0.5-5		56		46	
	5-30		60		50	
* Decreases with the logarithm of the frequency.						
Test setup:	<div><p style="text-align: center;">Reference Plane</p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>					
Test procedure:	<div><div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div><div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div><div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div></div>					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 24V					
Test results:	Pass					

Measurement data

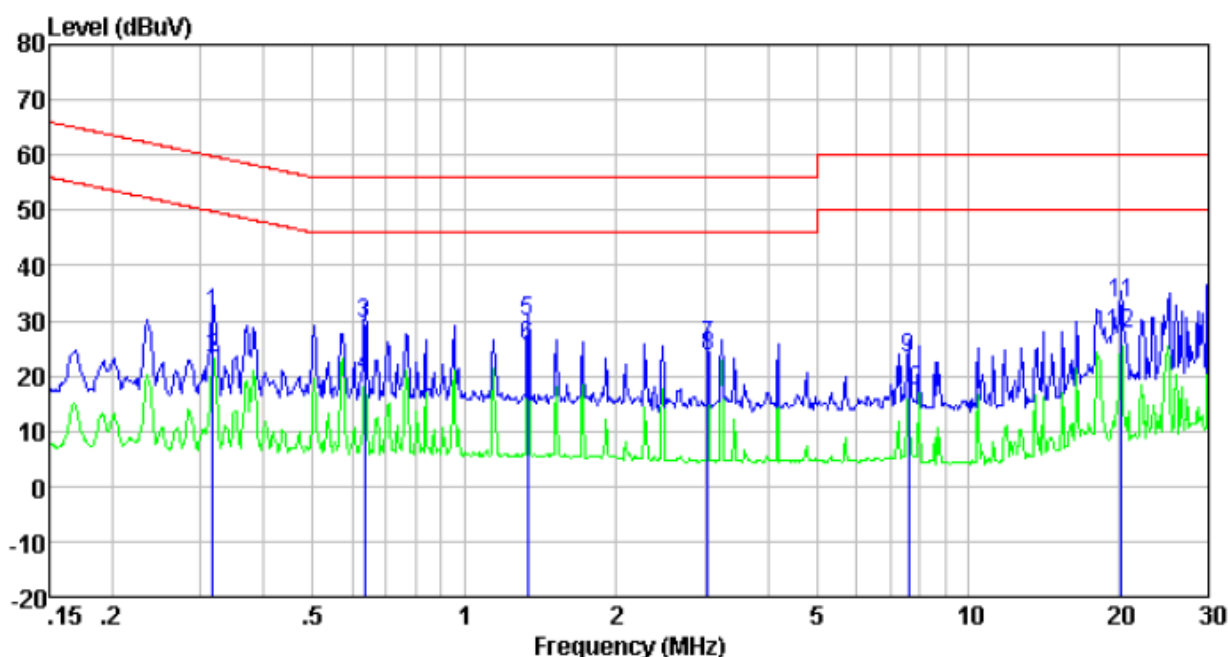
Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz

Line:



Freq. MHz	Read Level dBuV	Factor dB/m	Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.32	12.71	20.49	33.20	59.80	-26.60	QP
0.32	4.78	20.49	25.27	49.80	-24.53	Average
0.63	12.30	20.40	32.70	56.00	-23.30	QP
0.63	2.52	20.40	22.92	46.00	-23.08	Average
0.78	6.79	20.38	27.17	56.00	-28.83	QP
0.78	-0.61	20.38	19.77	46.00	-26.23	Average
1.34	7.58	20.36	27.94	56.00	-28.06	QP
1.34	3.16	20.36	23.52	46.00	-22.48	Average
3.04	3.94	20.39	24.33	56.00	-31.67	QP
3.04	0.40	20.39	20.79	46.00	-25.21	Average
20.16	11.64	20.53	32.17	60.00	-27.83	QP
20.16	7.92	20.53	28.45	50.00	-21.55	Average

Neutral:

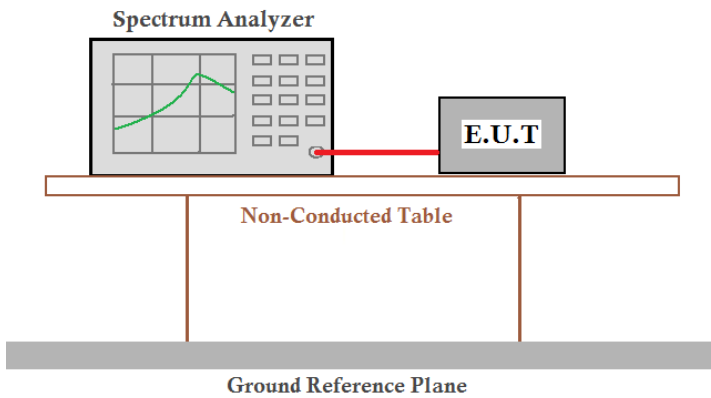


Freq. MHz	Read Level dBuV	Factor dB/m	Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.32	10.88	20.49	31.37	59.80	-28.43	QP
0.32	2.70	20.49	23.19	49.80	-26.61	Average
0.63	9.21	20.40	29.61	56.00	-26.39	QP
0.63	-0.57	20.40	19.83	46.00	-26.17	Average
1.34	9.32	20.36	29.68	56.00	-26.32	QP
1.34	4.91	20.36	25.27	46.00	-20.73	Average
3.04	4.89	20.39	25.28	56.00	-30.72	QP
3.04	3.33	20.39	23.72	46.00	-22.28	Average
7.61	2.79	20.39	23.18	60.00	-36.82	QP
7.61	-2.95	20.39	17.44	50.00	-32.56	Average
20.16	12.44	20.53	32.97	60.00	-27.03	QP
20.16	7.20	20.53	27.73	50.00	-22.27	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Conducted Peak Output Power

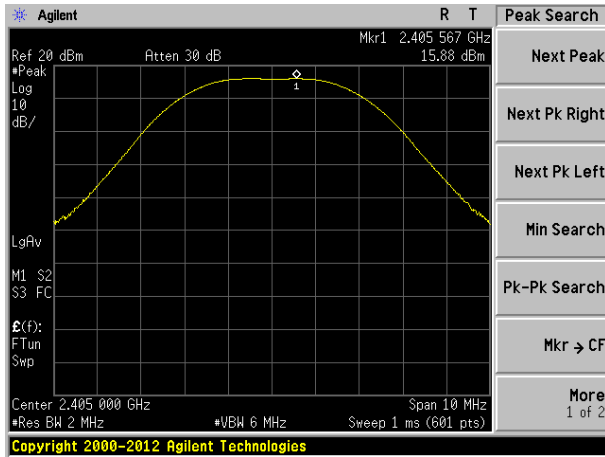
Test Requirement:	FCC Part15 C Section 15.247 (b)(3) RSS-247 Clause 5.4(d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm (36dBm e.i.r.p for IC requirement)
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

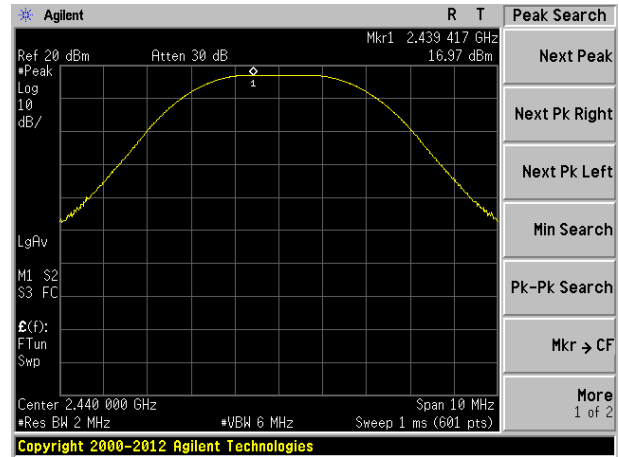
Frequency (MHz)	Peak Output Power (dBm)	Limit(dBm)	Result
2405	15.88	30	PASS
2440	16.97		
2480	17.08		

Frequency (MHz)	E.I.R.P(dBm)	Limit(dBm)	Result
2405	16.88	36	PASS
2440	17.97		
2480	18.08		

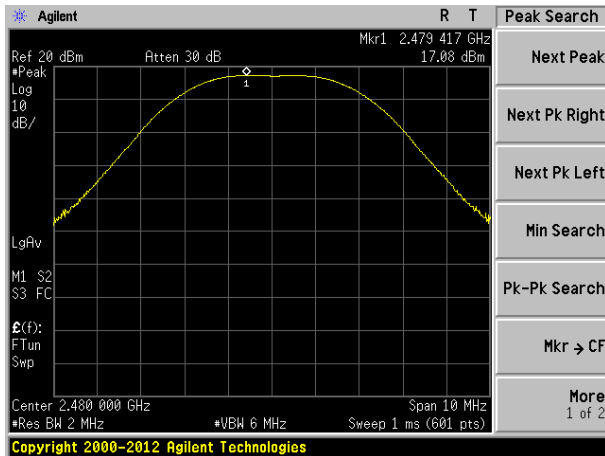
Test plot as follows:



2405MHz

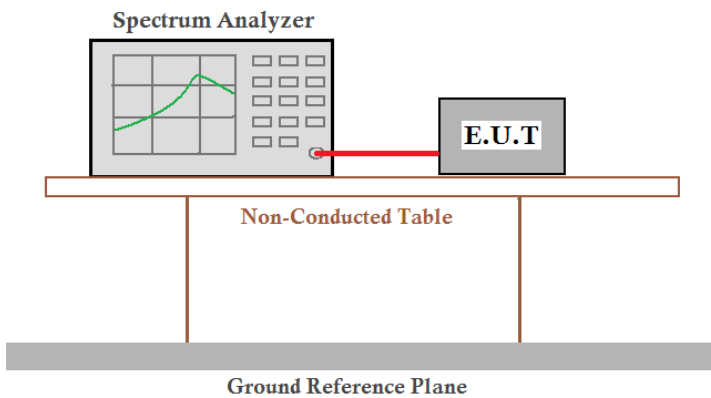


2440MHz



2480MHz

7.4 Channel Bandwidth & 99% Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2) RSS-247 Clause 5.2(a)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	>500KHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

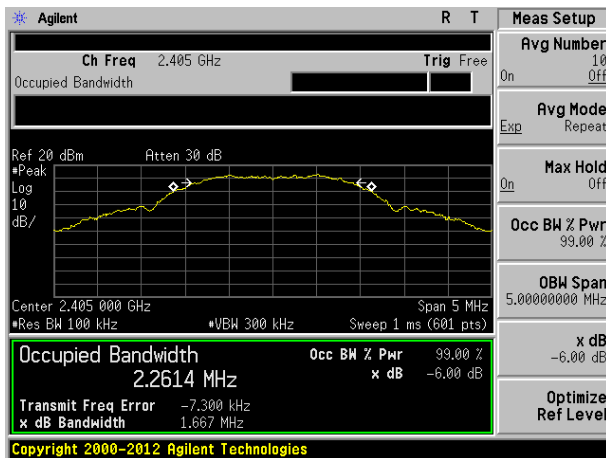
Measurement Data

Frequency (MHz)	Channel Bandwidth (MHz)	Limit(KHz)	Result
2405	1.667	>500	Pass
2440	1.694		
2480	1.661		

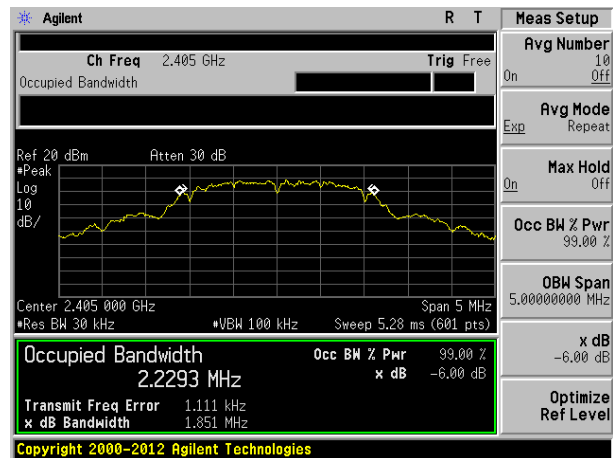
Frequency (MHz)	99% Occupy Bandwidth (MHz)	Result
2405	2.2293	Pass
2440	2.2311	
2480	2.2356	

Test plot as follows:

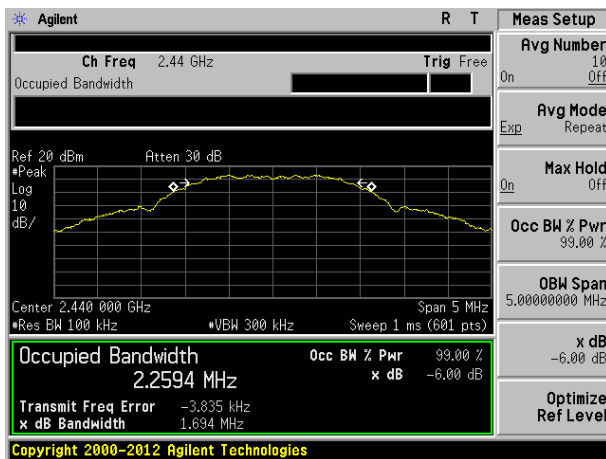
-6dB bandwidth



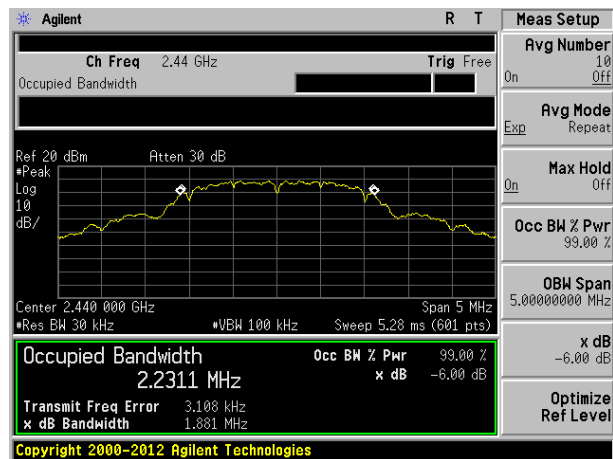
99% bandwidth



2405MHz



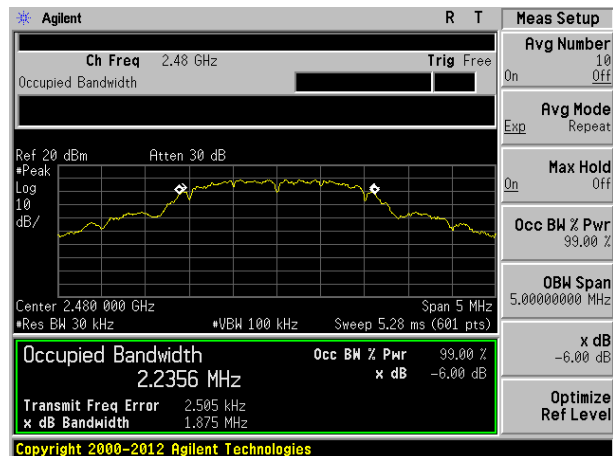
2405MHz



2440MHz



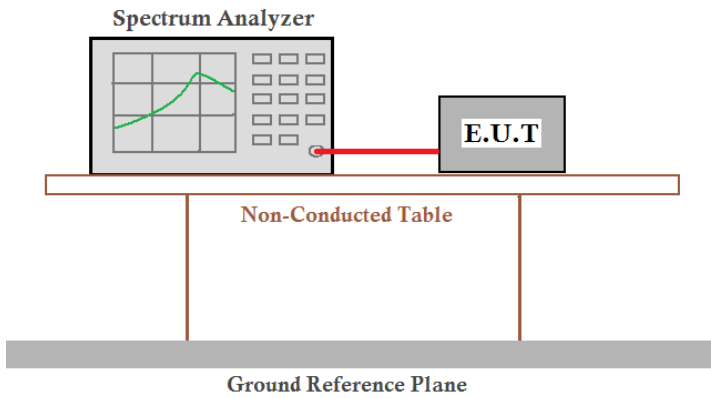
2440MHz



2480MHz

2480MHz

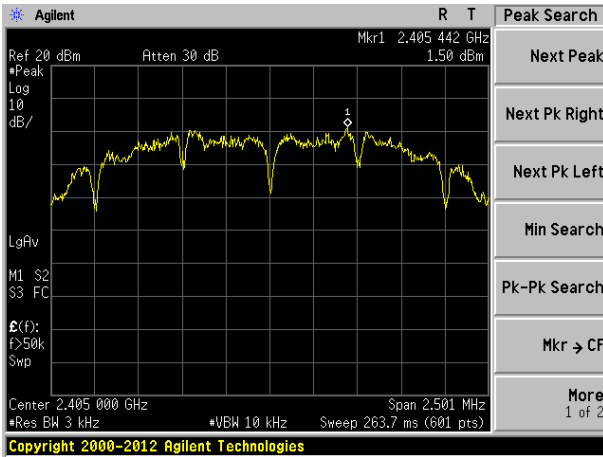
7.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e) RSS-247 Clause 5.2(b)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

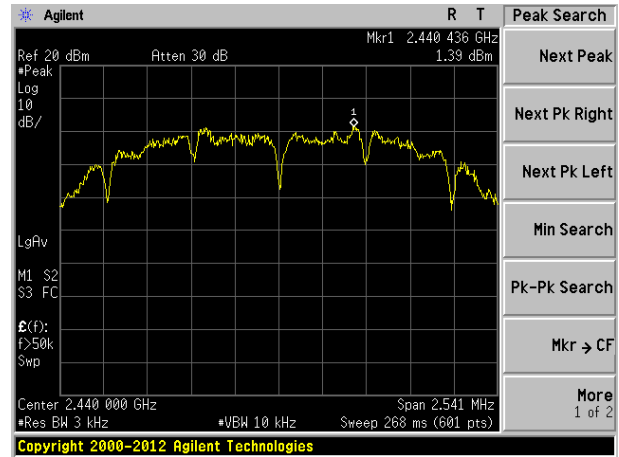
Measurement Data

Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Result
2405	1.50	8.00	Pass
2440	1.39		
2480	2.14		

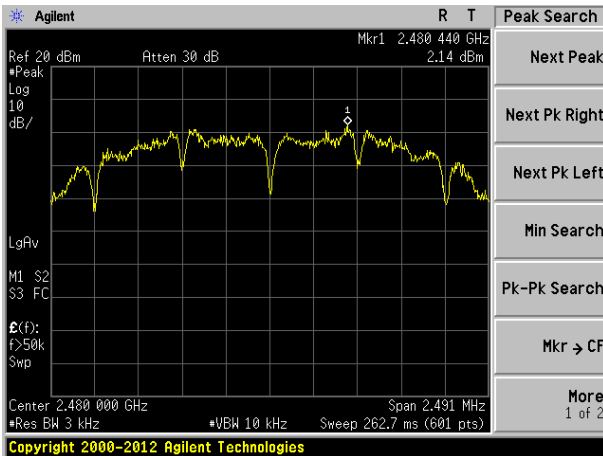
Test plot as follows:



2405MHz



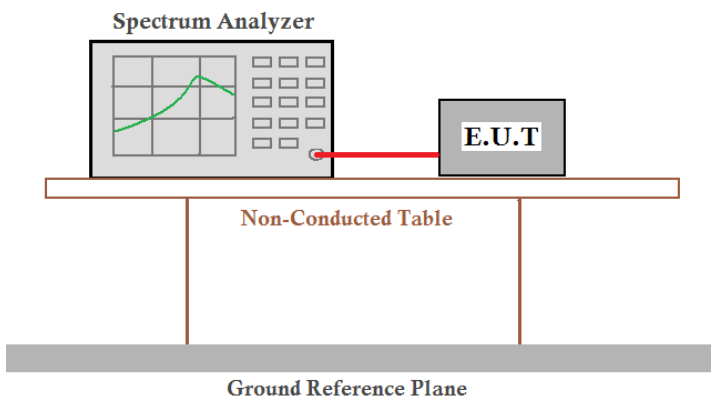
2440MHz



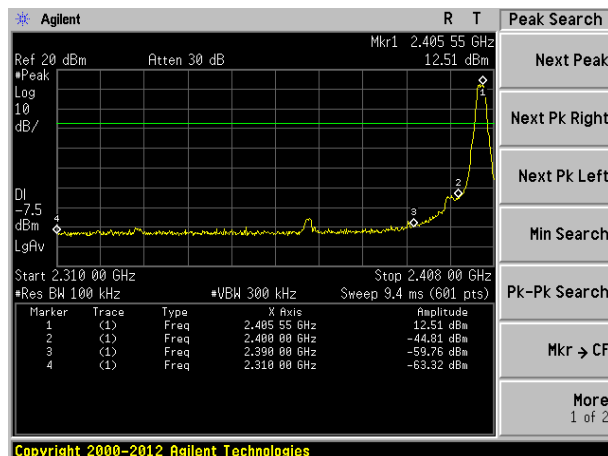
2480MHz

7.6 Band edges

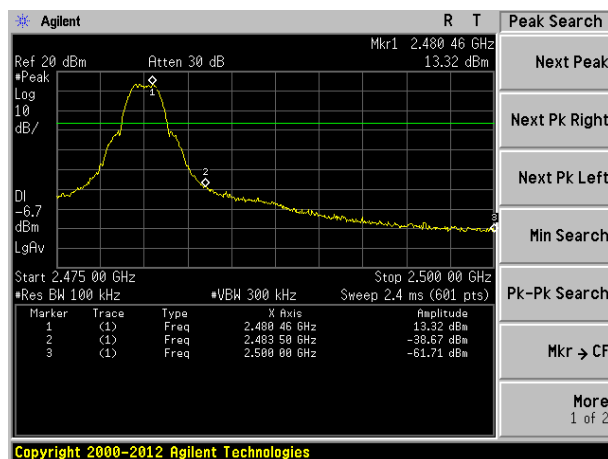
7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Clause 5.5 & RSS-Gen 8.9
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

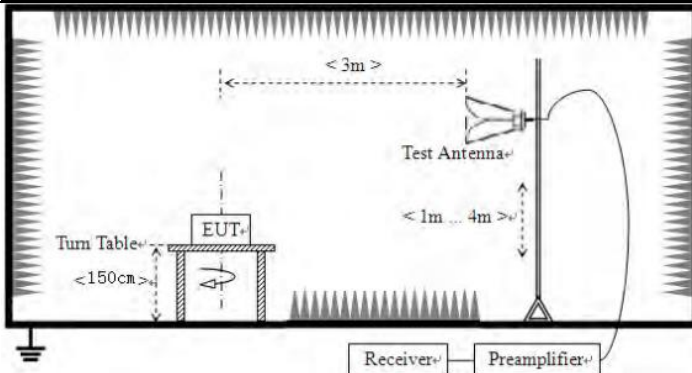


Lowest channel



Highest channel

7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205 RSS-Gen Clause 8.9&8.10				
Test Method:	ANSI C63.10:2013 and RSS-Gen				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
		RMS	1MHz	3MHz	Average
Limit:	Frequency		Limit (dBuV/m @3m)		Value
	Above 1GHz		54.00		Average
			74.00		Peak
Test setup:					
Test Procedure:	<ol style="list-style-type: none">1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.3. 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.4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.6. 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.7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.				
Test Instruments:	Refer to section 6.0 for details				

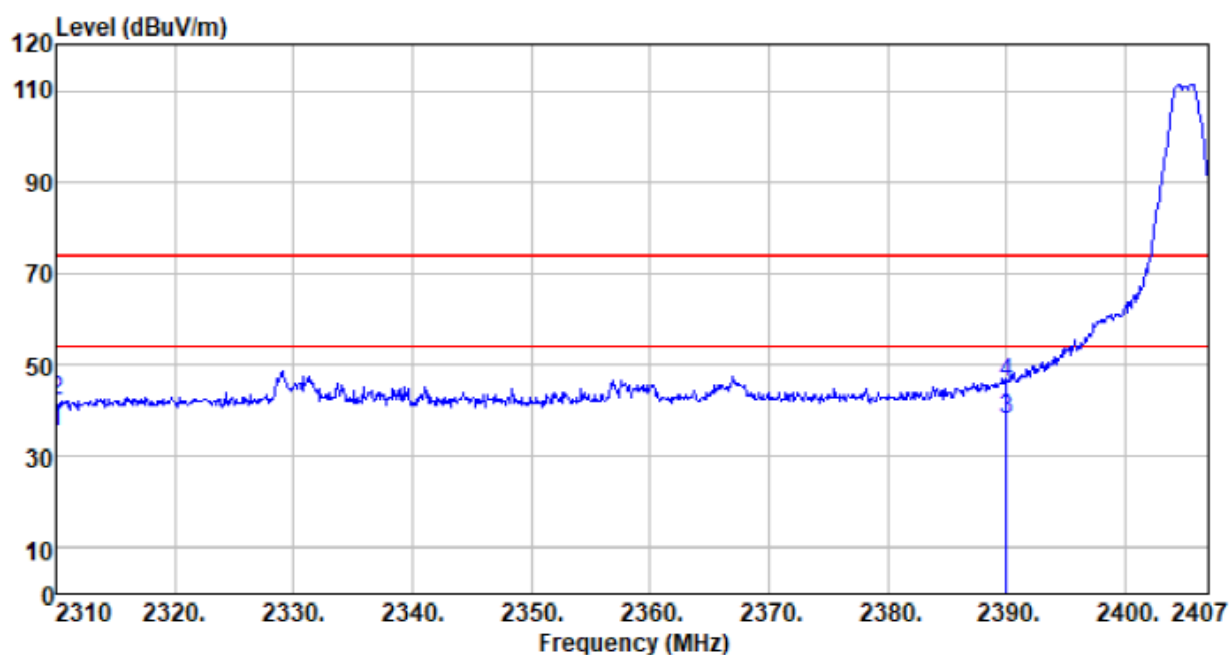
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Remark: The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.

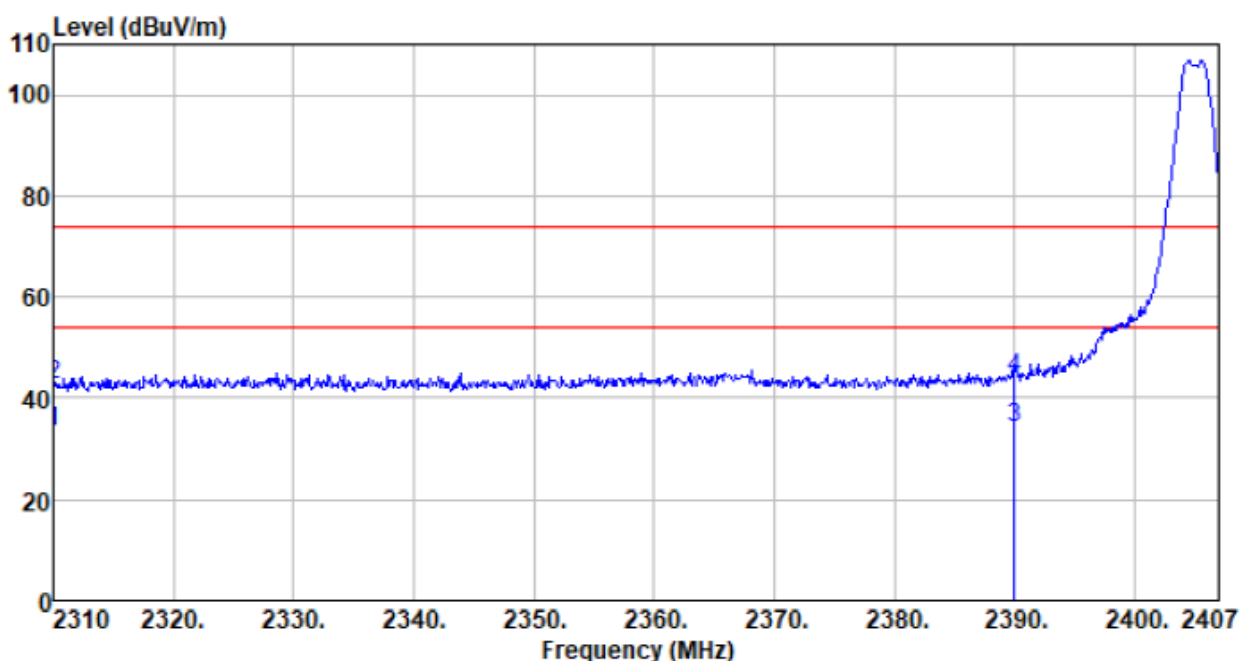
Test channel:	2405MHz
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Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	35.74	27.14	2.81	30.43	35.26	54.00	-18.74	Average
2310.000	42.44	27.14	2.81	30.43	41.96	74.00	-32.04	Peak
2390.000	38.21	27.37	2.91	30.24	38.25	54.00	-15.75	Average
2390.000	46.09	27.37	2.91	30.24	46.13	74.00	-27.87	Peak

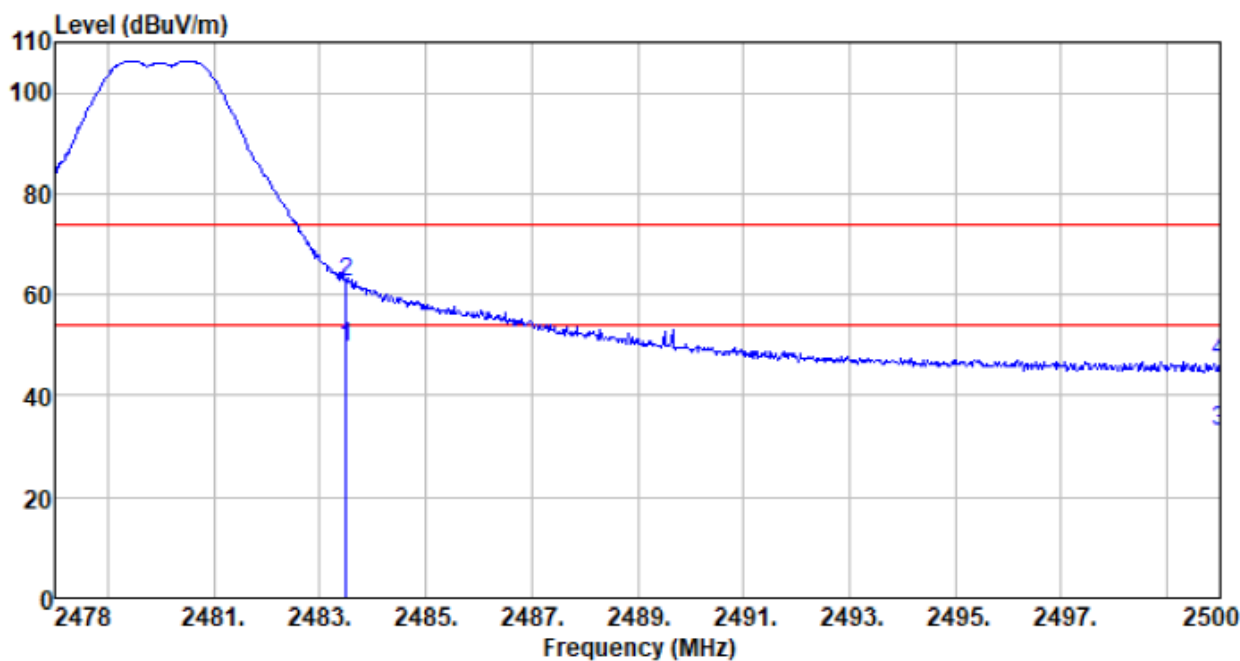
Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	33.90	27.14	2.81	30.43	33.42	54.00	-20.58	Average
2310.000	43.09	27.14	2.81	30.43	42.61	74.00	-31.39	Peak
2390.000	34.02	27.37	2.91	30.24	34.06	54.00	-19.94	Average
2390.000	43.87	27.37	2.91	30.24	43.91	74.00	-30.09	Peak

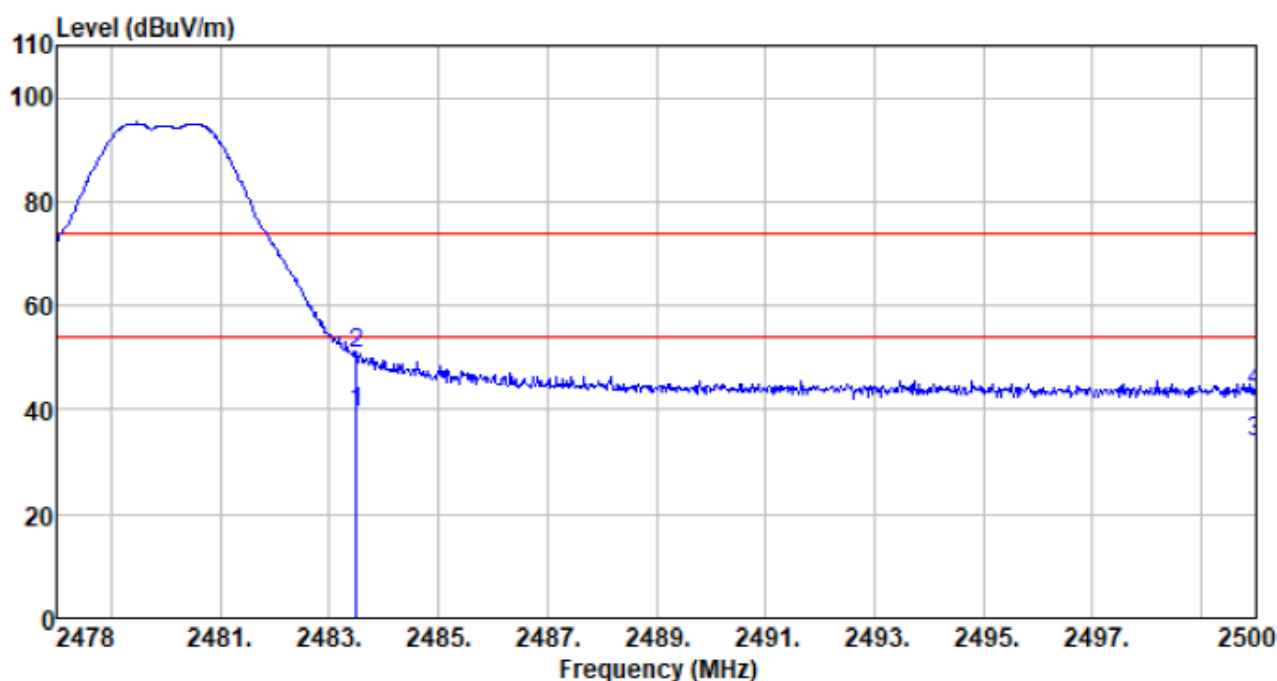
Test channel:	2480MHz
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Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	48.82	27.66	2.99	30.12	49.35	54.00	-4.65	Average
2483.500	61.91	27.66	2.99	30.12	62.44	74.00	-11.56	Peak
2500.000	32.24	27.70	3.01	30.13	32.82	54.00	-21.18	Average
2500.000	45.91	27.70	3.01	30.13	46.49	74.00	-27.51	Peak

Vertical:



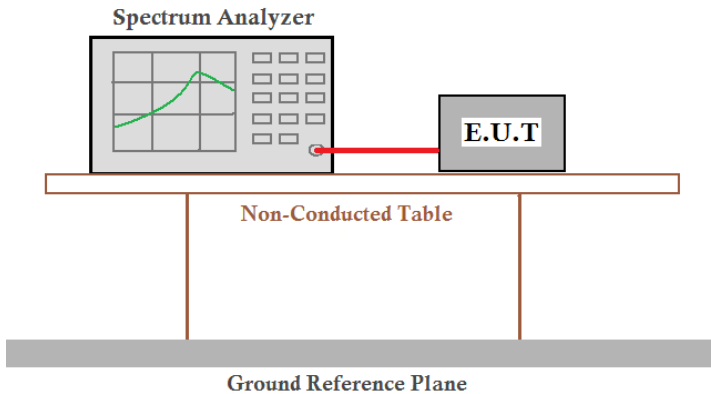
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	38.90	27.66	2.99	30.12	39.43	54.00	-14.57	Average
2483.500	50.35	27.66	2.99	30.12	50.88	74.00	-23.12	Peak
2500.000	32.93	27.70	3.01	30.13	33.51	54.00	-20.49	Average
2500.000	42.69	27.70	3.01	30.13	43.27	74.00	-30.73	Peak

Remark:

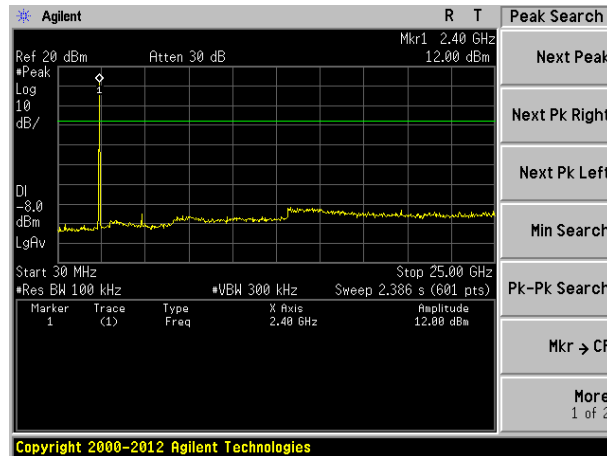
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

7.7 Spurious Emission

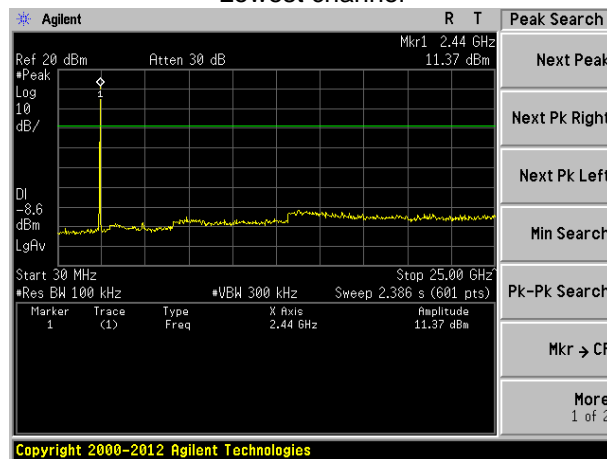
7.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Clause 5.5
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

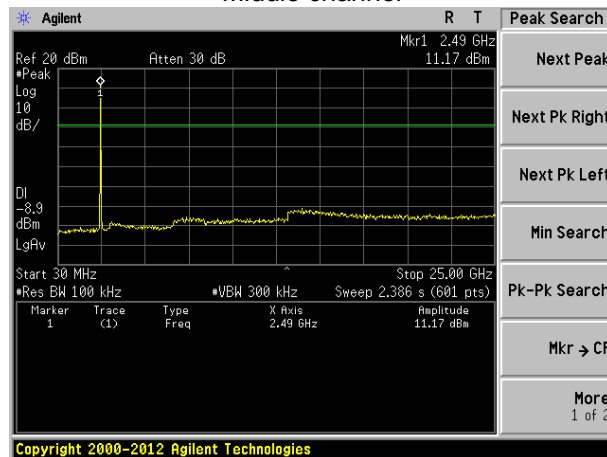
Test plot as follows:



Lowest channel



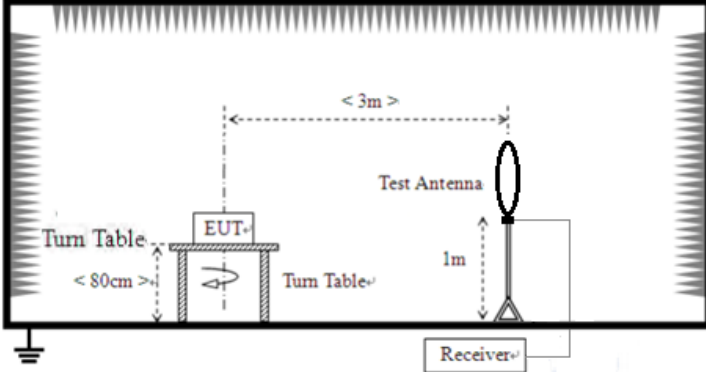
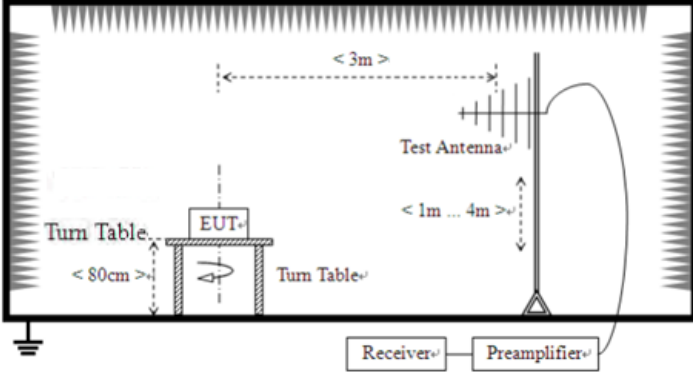
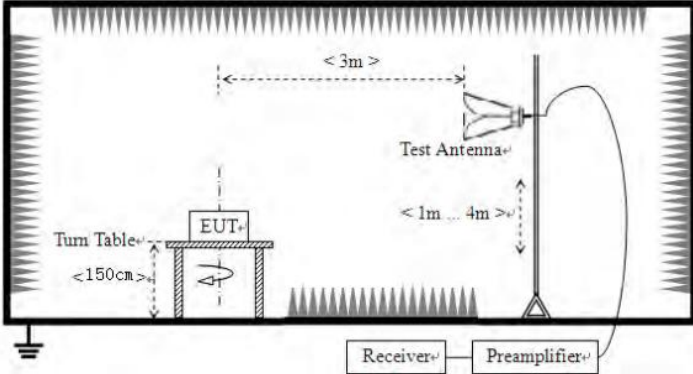
Middle channel



Highest channel

7.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 RSS-Gen Clause 8.9&8.10				
Test Method:	ANSI C63.10:2013 and RSS-Gen				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit: (Spurious Emissions)	Frequency		Limit (uV/m)	Value	Measurement Distance
	0.009MHz-0.490MHz		2400/F(KHz)	QP	300m
	0.490MHz-1.705MHz		24000/F(KHz)	QP	300m
	1.705MHz-30MHz		30	QP	30m
	30MHz-88MHz		100	QP	3m
	88MHz-216MHz		150	QP	
	216MHz-960MHz		200	QP	
	960MHz-1GHz		500	QP	
	Above 1GHz		500	Average	
			5000	Peak	
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.				

<p>Test setup:</p>	<p>Below 30MHz</p>  <p>Below 1GHz</p>  <p>Above 1GHz</p> 
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

	<p>3. 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.</p> <p>4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>6. 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.</p>					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement data:

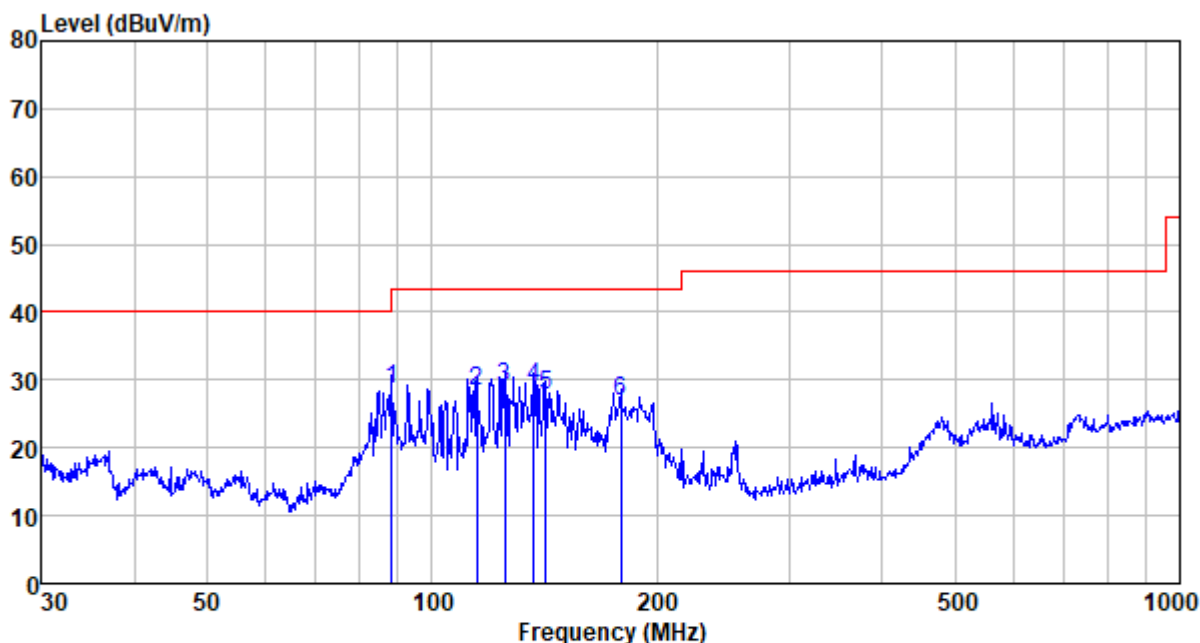
■ Below 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

■ Below 1GHz

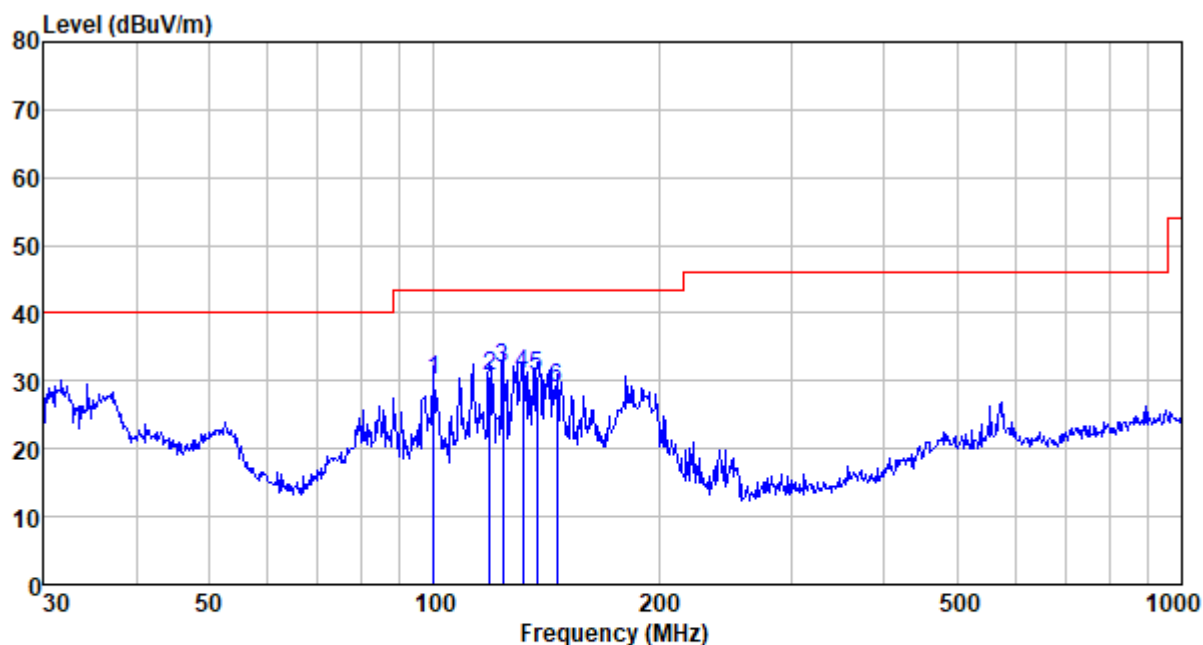
Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
88.342	53.97	10.19	1.10	36.62	28.64	43.50	-14.86	QP
114.917	53.55	10.26	1.32	36.84	28.29	43.50	-15.21	QP
125.007	55.68	8.81	1.40	36.92	28.97	43.50	-14.53	QP
136.939	56.76	7.64	1.48	37.00	28.88	43.50	-14.62	QP
141.826	55.87	7.43	1.52	37.03	27.79	43.50	-15.71	QP
178.758	53.40	8.87	1.73	37.23	26.77	43.50	-16.73	QP

Vertical:

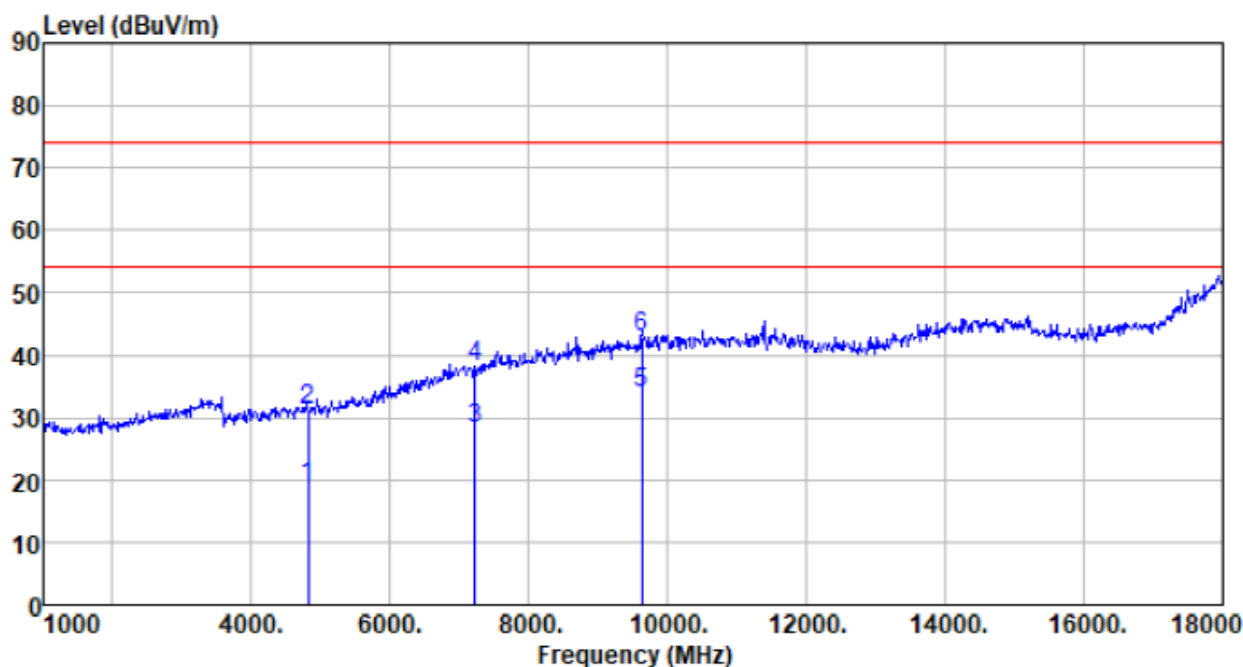


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
99.878	53.40	12.20	1.19	36.72	30.07	43.50	-13.43	QP
118.601	56.52	9.75	1.35	36.87	30.75	43.50	-12.75	QP
123.699	58.43	8.96	1.39	36.91	31.87	43.50	-11.63	QP
131.297	58.33	8.06	1.44	36.96	30.87	43.50	-12.63	QP
137.420	58.60	7.64	1.49	37.00	30.73	43.50	-12.77	QP
145.861	56.89	7.51	1.54	37.05	28.89	43.50	-14.61	QP

■ Above 1GHz

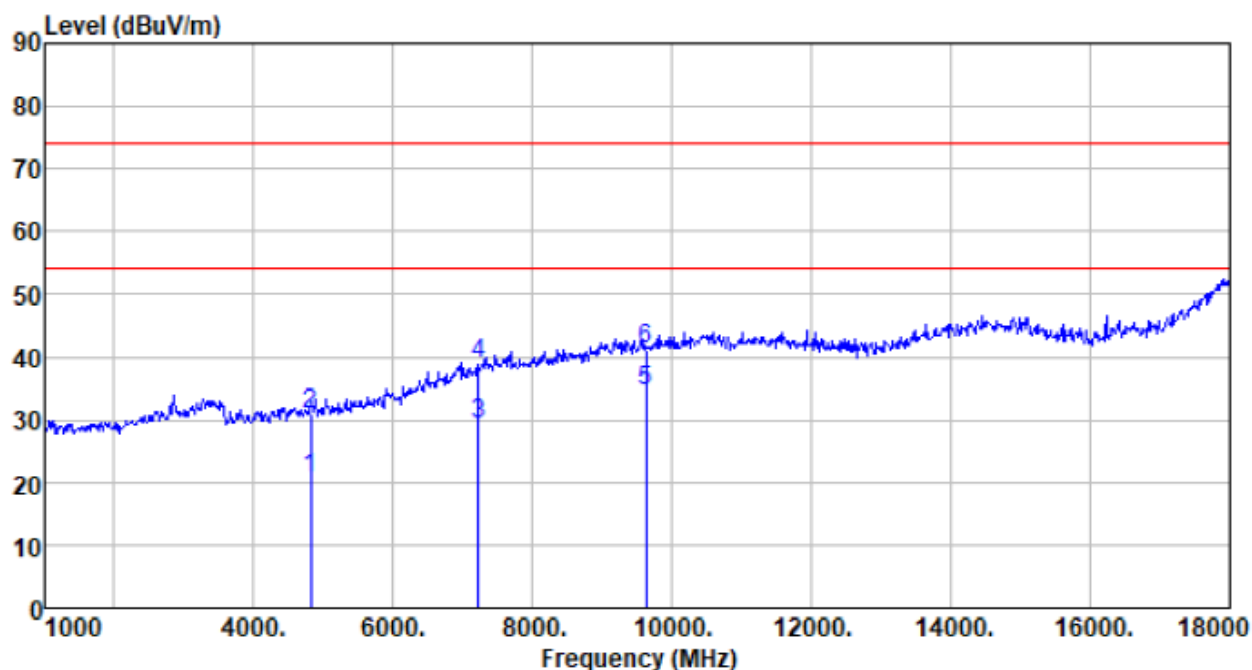
Test channel:	Lowest
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Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4810.000	20.87	31.20	4.61	37.73	18.95	54.00	-35.05	Average
4810.000	33.09	31.20	4.61	37.73	31.17	74.00	-42.83	Peak
7215.000	21.03	36.20	6.50	35.63	28.10	54.00	-25.90	Average
7215.000	31.11	36.20	6.50	35.63	38.18	74.00	-35.82	Peak
9620.000	23.02	37.93	7.98	34.94	33.99	54.00	-20.01	Average
9620.000	32.01	37.93	7.98	34.94	42.98	74.00	-31.02	Peak

Vertical:



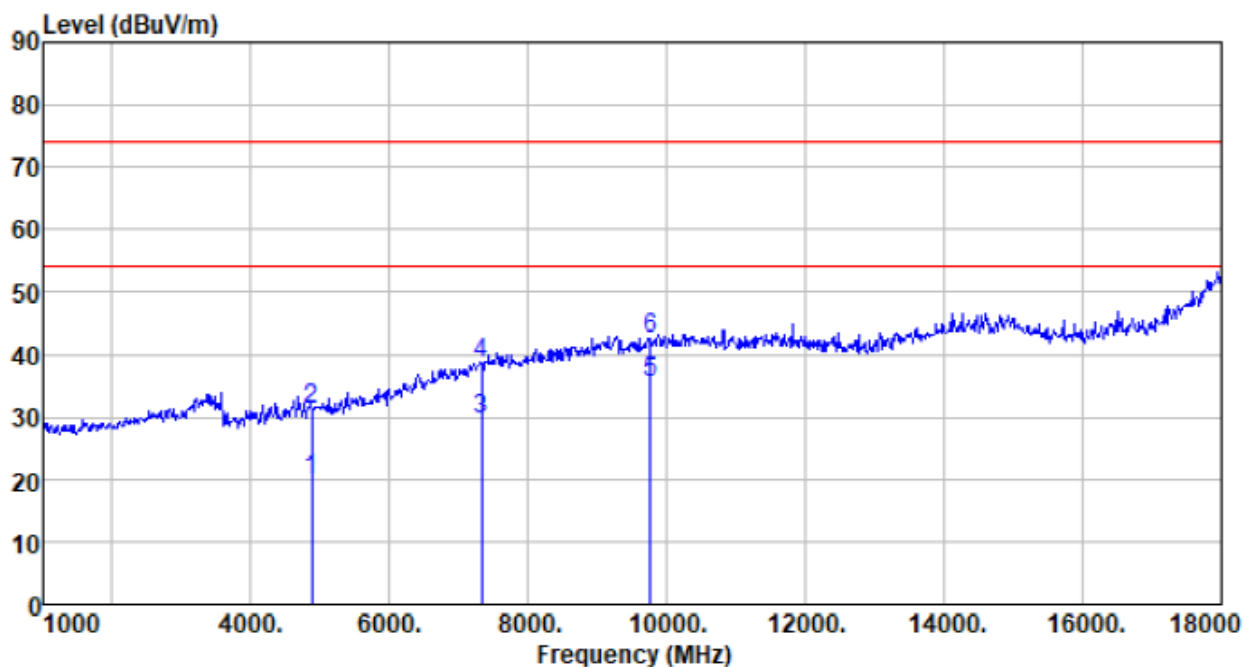
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4810.000	22.39	31.20	4.61	37.73	20.47	54.00	-33.53	Average
4810.000	32.88	31.20	4.61	37.73	30.96	74.00	-43.04	Peak
7215.000	22.08	36.20	6.50	35.63	29.15	54.00	-24.85	Average
7215.000	31.72	36.20	6.50	35.63	38.79	74.00	-35.21	Peak
9620.000	23.54	37.93	7.98	34.94	34.51	54.00	-19.49	Average
9620.000	30.36	37.93	7.98	34.94	41.33	74.00	-32.67	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamp factor
2. No emission found in frequency above 18GHz.

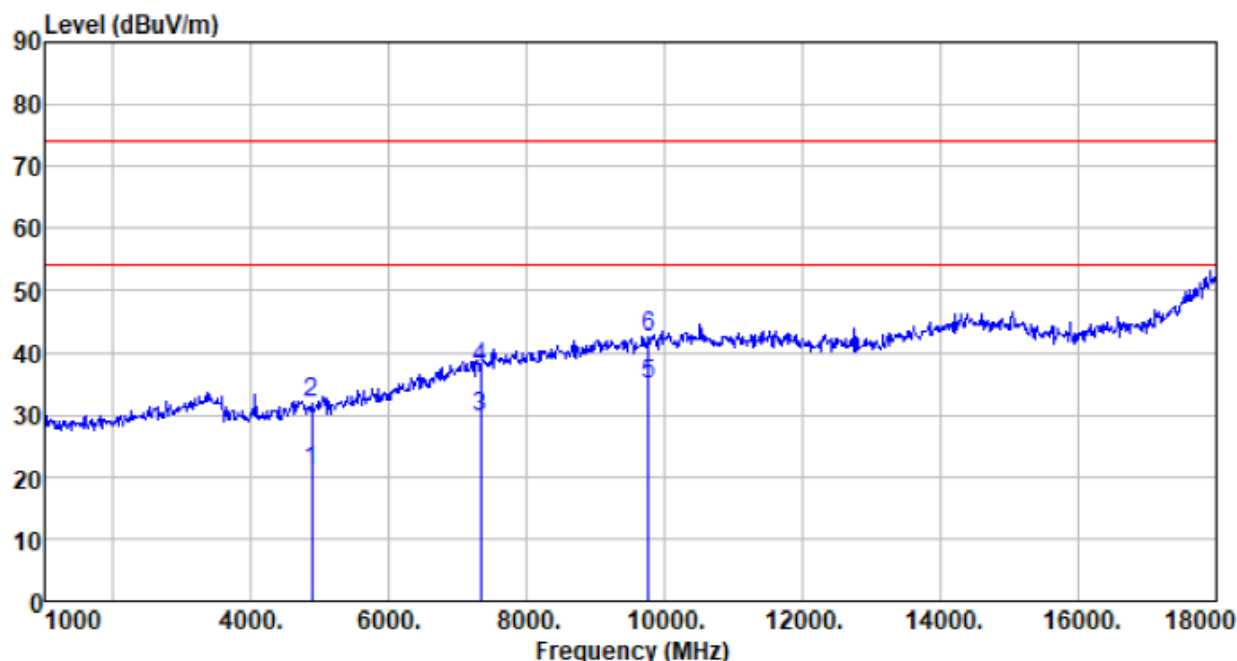
Test channel:	Middle
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Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	21.65	31.31	4.69	37.75	19.90	54.00	-34.10	Average
4880.000	33.06	31.31	4.69	37.75	31.31	74.00	-42.69	Peak
7320.000	22.05	36.43	6.63	35.60	29.51	54.00	-24.49	Average
7320.000	31.21	36.43	6.63	35.60	38.67	74.00	-35.33	Peak
9760.000	24.35	38.10	8.03	35.03	35.45	54.00	-18.55	Average
9760.000	31.33	38.10	8.03	35.03	42.43	74.00	-31.57	Peak

Vertical:



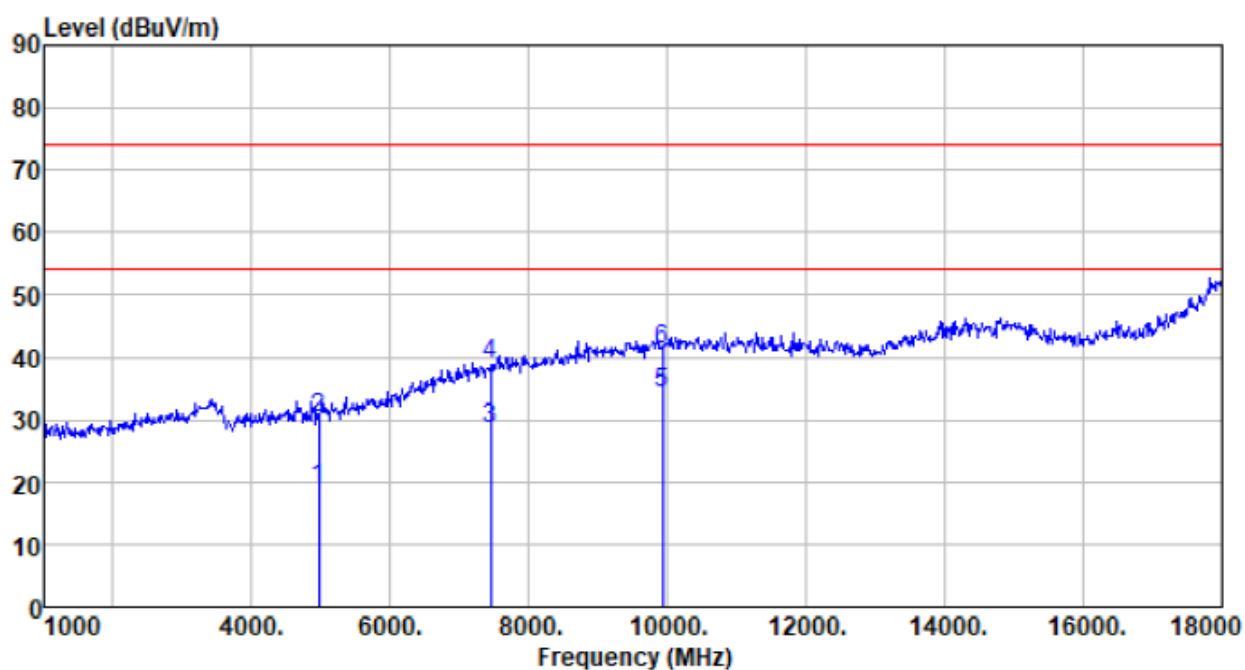
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	22.74	31.31	4.69	37.75	20.99	54.00	-33.01	Average
4880.000	33.67	31.31	4.69	37.75	31.92	74.00	-42.08	Peak
7320.000	21.96	36.43	6.63	35.60	29.42	54.00	-24.58	Average
7320.000	30.10	36.43	6.63	35.60	37.56	74.00	-36.44	Peak
9760.000	23.67	38.10	8.03	35.03	34.77	54.00	-19.23	Average
9760.000	31.57	38.10	8.03	35.03	42.67	74.00	-31.33	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamp factor
2. No emission found in frequency above 18GHz.

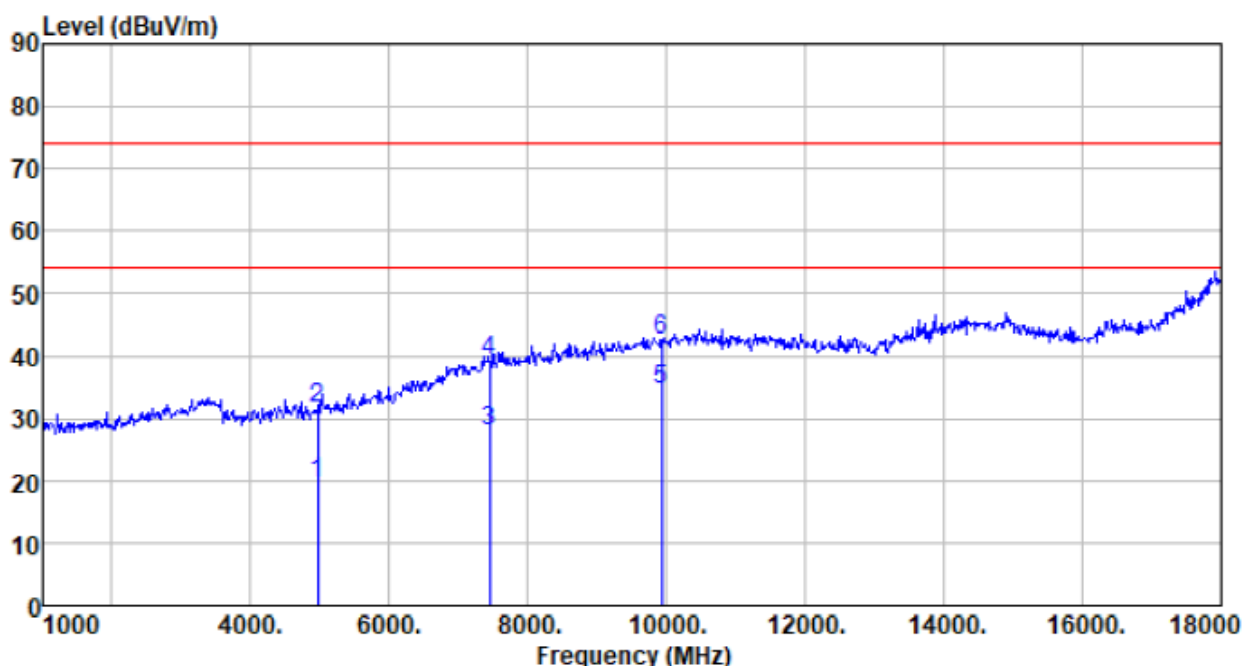
Test channel:	Highest
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Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	20.44	31.44	4.79	37.78	18.89	54.00	-35.11	Average
4960.000	31.84	31.44	4.79	37.78	30.29	74.00	-43.71	Peak
7440.000	20.62	36.66	6.77	35.56	28.49	54.00	-25.51	Average
7440.000	30.96	36.66	6.77	35.56	38.83	74.00	-35.17	Peak
9920.000	23.09	38.30	8.09	35.14	34.34	54.00	-19.66	Average
9920.000	30.01	38.30	8.09	35.14	41.26	74.00	-32.74	Peak

Vertical::

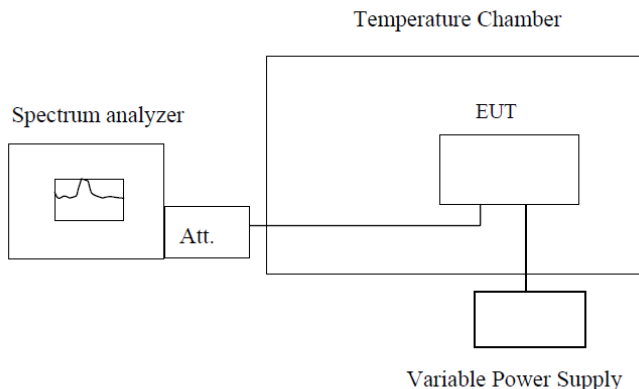


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	21.22	31.44	4.79	37.78	19.67	54.00	-34.33	Average
4960.000	33.24	31.44	4.79	37.78	31.69	74.00	-42.31	Peak
7440.000	20.15	36.66	6.77	35.56	28.02	54.00	-25.98	Average
7440.000	31.21	36.66	6.77	35.56	39.08	74.00	-34.92	Peak
9920.000	23.15	38.30	8.09	35.14	34.40	54.00	-19.60	Average
9920.000	31.22	38.30	8.09	35.14	42.47	74.00	-31.53	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. No emission found in frequency above 18GHz.

7.8 Frequency stability

Test Requirement:	RSS-Gen Section 6.11& Section 8.11
Test Method:	ANSI C63.10: 2013 & RSS-Gen
Limit:	Manufactures of devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified
Test Procedure:	The EUT was setup to ANSI C63.10, 2013; tested to 2.1055 for compliance to RSS-Gen requirements.
Test setup:	 <p>Note : Measurement setup for testing on Antenna connector</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark: Set the EUT transmits at un-modulation mode to test frequency stability.

Measurement data:

Frequency stability versus Temp.						
Power Supply: AC 24V						
Temp. (°C)	Operating Frequency (MHz)	0 minute Measured Frequency (MHz)	2 minute Measured Frequency (MHz)	5 minute Measured Frequency (MHz)	10 minute Measured Frequency (MHz)	Pass /Fail
-30	2405	2405.003	2405.806	2405.009	2405.986	Pass
	2440	2440.541	2440.885	2440.931	2440.318	Pass
	2480	2480.763	2480.639	2480.363	2480.315	Pass
-20	2405	2405.050	2405.885	2405.666	2405.790	Pass
	2440	2440.500	2440.598	2440.672	2440.724	Pass
	2480	2480.155	2480.049	2480.381	2480.316	Pass
-10	2405	2405.687	2405.197	2405.438	2405.719	Pass
	2440	2440.690	2440.518	2440.366	2440.265	Pass
	2480	2480.461	2480.885	2480.568	2480.177	Pass
0	2405	2405.944	2405.726	2405.870	2405.102	Pass
	2440	2440.470	2440.632	2440.784	2440.643	Pass
	2480	2480.812	2480.782	2480.203	2480.291	Pass
10	2405	2405.198	2405.510	2405.656	2405.978	Pass
	2440	2440.898	2440.549	2440.393	2440.830	Pass
	2480	2480.184	2480.990	2480.389	2480.995	Pass
20	2405	2405.988	2405.415	2405.116	2405.542	Pass
	2440	2440.839	2440.487	2440.145	2440.037	Pass
	2480	2480.009	2480.893	2480.562	2480.977	Pass
30	2405	2405.886	2405.309	2405.366	2405.360	Pass
	2440	2440.985	2440.150	2440.566	2440.770	Pass
	2480	2480.141	2480.646	2480.973	2480.050	Pass
40	2405	2405.690	2405.993	2405.990	2405.644	Pass
	2440	2440.135	2440.604	2440.698	2440.353	Pass
	2480	2480.798	2480.630	2480.347	2480.419	Pass
50	2405	2405.266	2405.136	2405.081	2405.201	Pass
	2440	2440.211	2440.540	2440.499	2440.969	Pass
	2480	2480.508	2480.134	2480.650	2480.307	Pass

Frequency stability versus Voltage						
Temperature: 25°C						
Power Supply (VAC)	Operating Frequency (MHz)	0 minute Measured Frequency (MHz)	2 minute Measured Frequency (MHz)	5 minute Measured Frequency (MHz)	10 minute Measured Frequency (MHz)	Pass /Fail
18	2405	2405.690	2405.741	2405.558	2405.319	Pass
	2440	2440.955	2440.150	2440.485	2440.649	Pass
	2480	2480.325	2480.390	2480.333	2480.943	Pass
30	2405	2405.320	2405.577	2405.488	2405.466	Pass
	2440	2440.186	2440.568	2440.762	2440.591	Pass
	2480	2480.924	2480.626	2480.771	2480.147	Pass

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

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