

## TEST REPORT

**Applicant:** TrickleStar Limited

**Address of Applicant:** Room 901, Centre Point, 181-185 Gloucester Road, Wan Chai, Hong Kong, China

**Manufacturer:** Computime Ltd.

**Address of Manufacturer:** 6/F, Building 20E, Phase 3, Hong Kong Science Park, 20 Science Park East Avenue Shatin, New Territories, Hongkong, China

**Factory:** Computime Electronics (Shenzhen) Company Limited

**Address of Factory:** Yuekenguangyu Industrial Park, Kangqiao Road 88#, Danzhotou Community, Nanwan Street office, Longgang District, Shenzhen, China.

**Equipment Under Test (EUT)**

Product Name: Sensor

Model No.: TS1921

FCC ID: 2AG8Q-TS1921

IC: 7723A-TS1921

**Applicable standards:** RSS-247 Issue 2  
RSS-Gen Issue 5  
FCC CFR Title 47 Part 15 Subpart C Section 15.247

**Date of sample receipt:** August 14, 2020

**Date of Test:** August 14-24, 2020

**Date of report issued:** August 24, 2020

**Test Result :** PASS \*

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

Authorized Signature:



**Robinson Luo**

**Laboratory Manager**

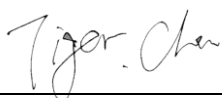
This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.



## 2 Version

Version No.	Date	Description
00	August 24, 2020	Original

Prepared By:



Project Engineer

Date:

August 24, 2020

Check By:



Reviewer

Date:

August 24, 2020



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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c) RSS-Gen Section 6.8	Pass
AC Power Line Conducted Emission	15.207 RSS-Gen Section 8.8	N/A
Conducted Output Power	15.247 (b)(3) RSS-247 Section 5.4(d)	Pass
Channel Bandwidth	15.247 (a)(2) RSS-247 Section 5.2(a)	Pass
99% Occupy Bandwidth	RSS-Gen Section 6.7	Pass
Power Spectral Density	15.247 (e) RSS-247 Section 5.2(b)	Pass
Band Edge	15.247(d) RSS-247 Section 5.5	Pass
Spurious Emission	15.205/15.209 RSS-247 Section 5.5 RSS-Gen Section 8.9 8.10	Pass
Frequency stability	RSS-Gen Section 6.11& Section 8.11	Pass

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013 and RSS-Gen.

### 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 Name:	Sensor
Model No.:	TS1921
Test sample(s) ID:	GTS202008000117-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Hardware Version:	3.0
Software Version:	V2.09
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi(declare by applicant)
Power Supply:	DC 3V(1*3V, SIZE"CR2477X")

A new battery was used during test



Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

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	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz



## 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark:	

## 5.3 Description of Support Units

None
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## 5.4 Deviation from Standards

None.
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## 5.5 Abnormalities from Standard Conditions

None.
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## 5.6 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>• <b>FCC —Registration No.: 381383</b> 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.</li> <li>• <b>IC —Registration No.: 9079A</b> 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</li> <li>• <b>NVLAP (LAB CODE:600179-0)</b> Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0</li> </ul>
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## 5.7 Test Location

All tests were performed at:
<p>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</p>

## 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. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	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



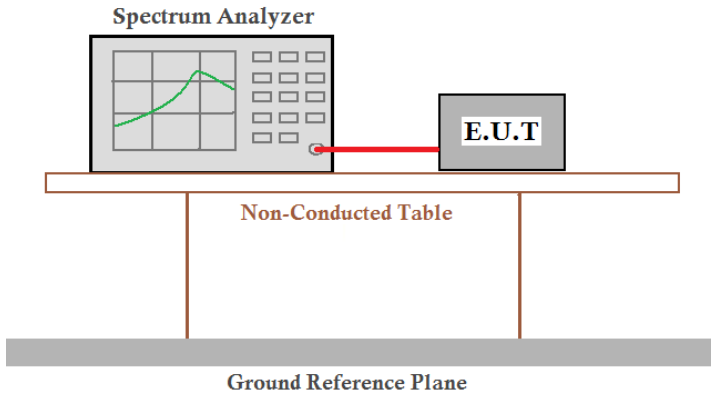
## 7 Test results and Measurement Data

### 7.1 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
<b>15.203 requirement:</b> 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.	
<b>15.247(c) (1)(i) requirement:</b> (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.	
<b>Standard requirement:</b>	RSS-Gen Section 6.8
A transmitter can only be sold or operated with antennas with which it was approved. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power	
<b>E.U.T Antenna:</b>	
<i>The antenna is PCB antenna, the best case gain of the is 0dBi, reference to the appendix II for details</i>	



## 7.2 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3) RSS-247 Section 5.4(d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02 and RSS-Gen
Limit:	30dBm 36dBm(4W for e.i.r.p)
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

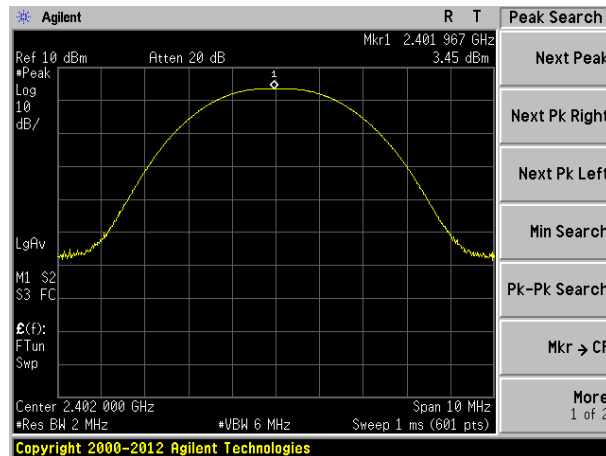
### Measurement Data

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	3.45	30.00	Pass
Middle	3.21		
Highest	3.27		

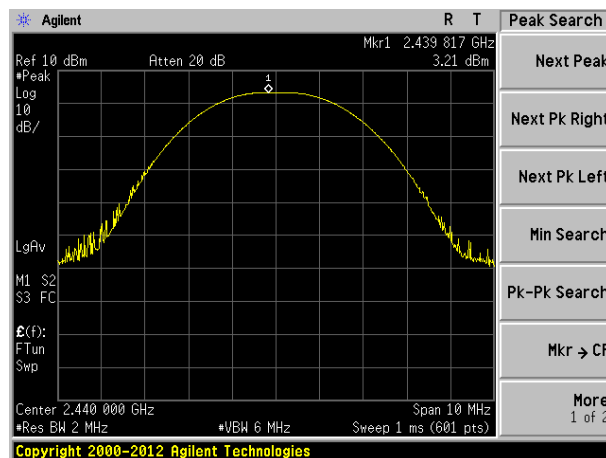
Test channel	e.i.r.p. (dBm)	Limit(dBm)	Result
Lowest	3.45	36.00	Pass
Middle	3.21		
Highest	3.27		



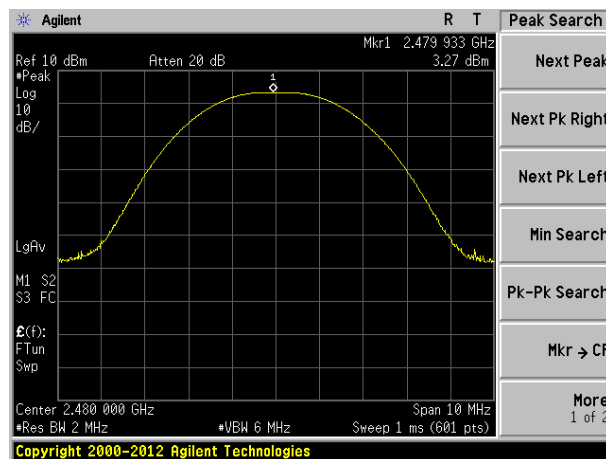
Test plot as follows:



Lowest channel



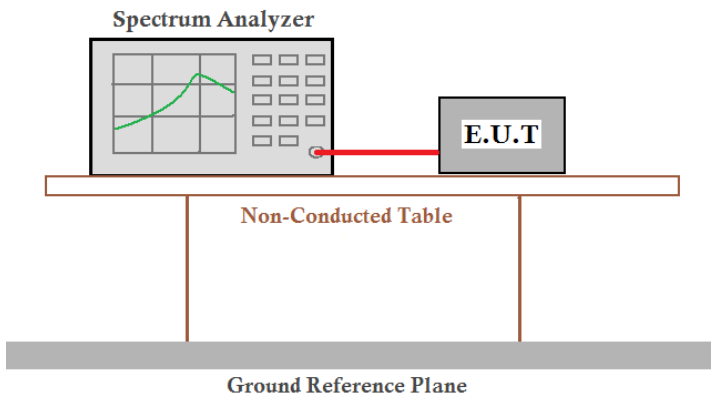
Middle channel



Highest channel



## 7.3 Channel Bandwidth & 99% Occupancy Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2) & RSS-247 Section 5.2(a)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02 and RSS-Gen
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 are placed on a Non-Conducted Table, which 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

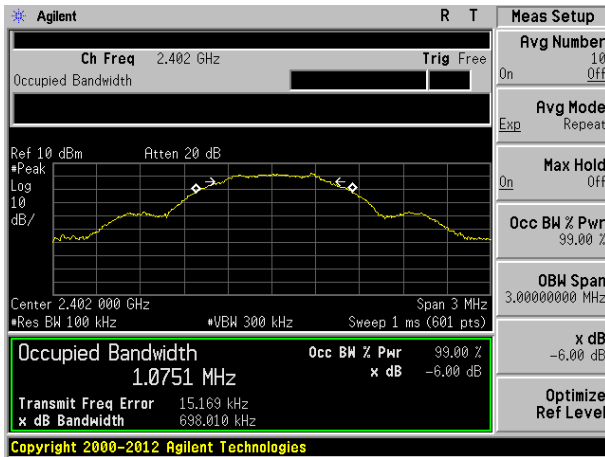
Test channel	Channel Bandwidth (MHz)	Limit(KHz)	Result
Lowest	0.698	>500	Pass
Middle	0.714		
Highest	0.742		

Test channel	99% Bandwidth (MHz)	Result
Lowest	1.0665	Pass
Middle	1.0625	
Highest	1.0520	

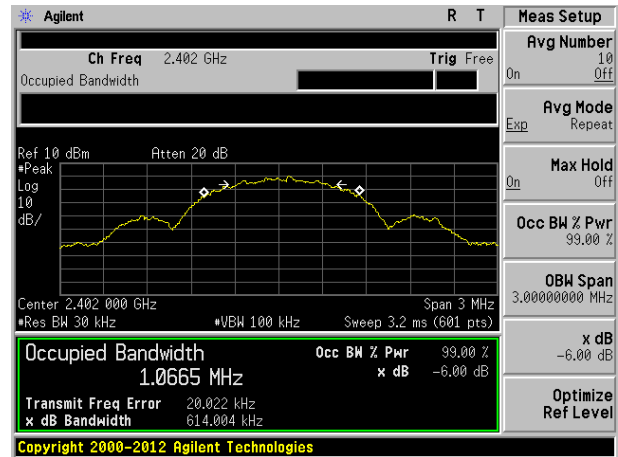


Test plot as follows:

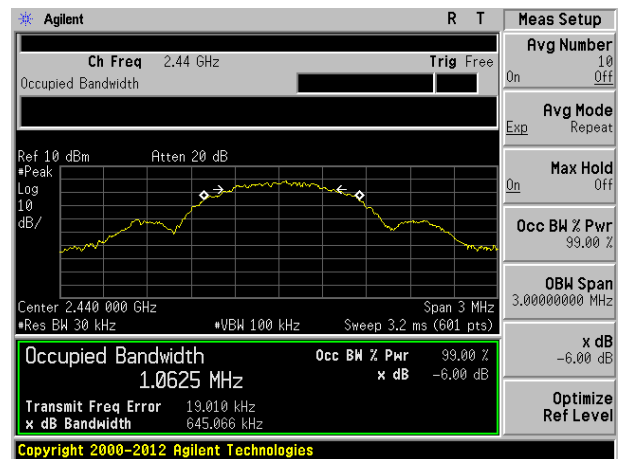
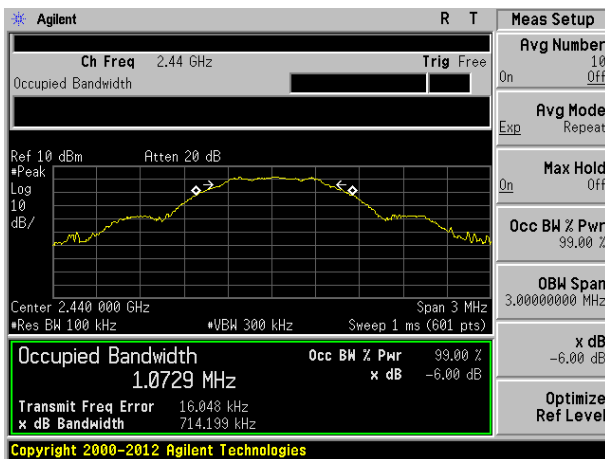
-6dB BW



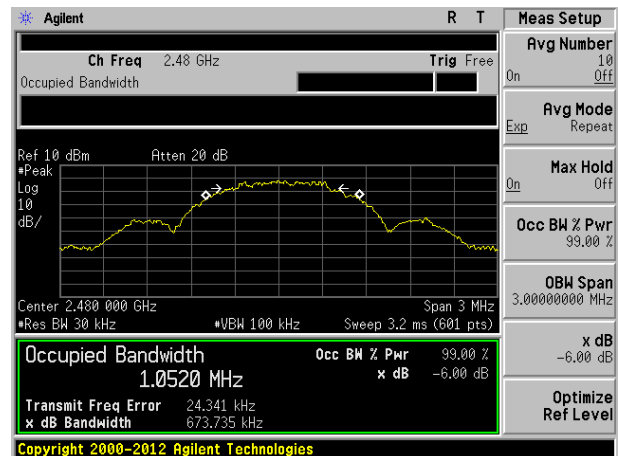
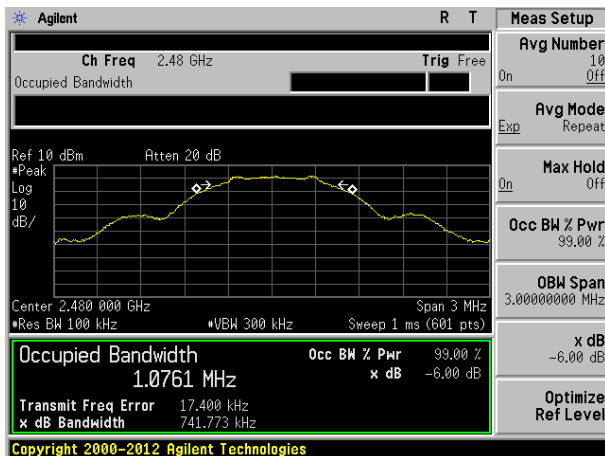
99% BW



Lowest channel



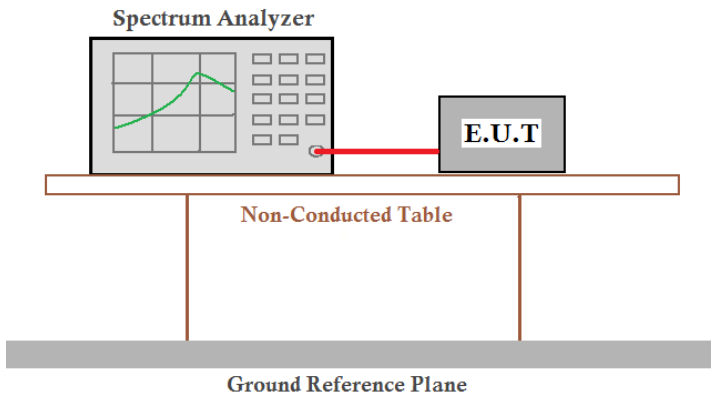
Middle channel



Highest channel



## 7.4 Power Spectral Density

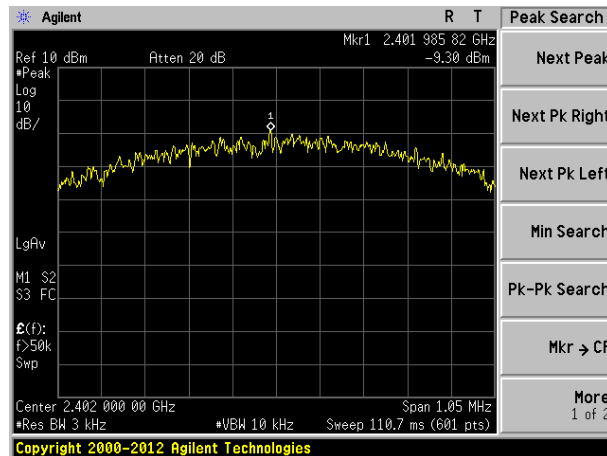
Test Requirement:	FCC Part15 C Section 15.247 (e) RSS-247 Section 5.2(b)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02 and RSS-Gen
Limit:	8dBm/3kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via 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

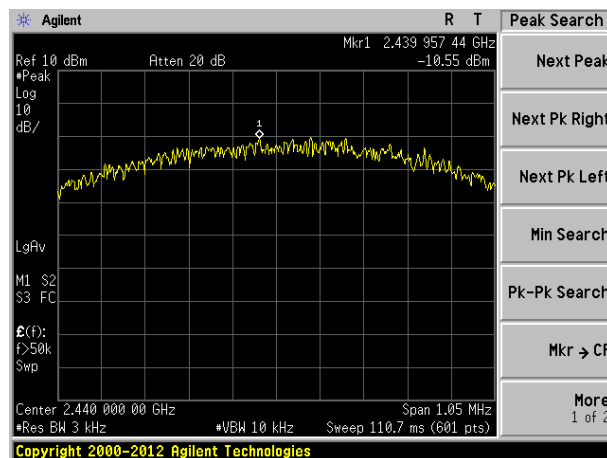
Test channel	Power Spectral Density (dBm/3kHz)	Limit(dBm/3kHz)	Result
Lowest	-9.3	8.00	Pass
Middle	-10.55		
Highest	-10.64		



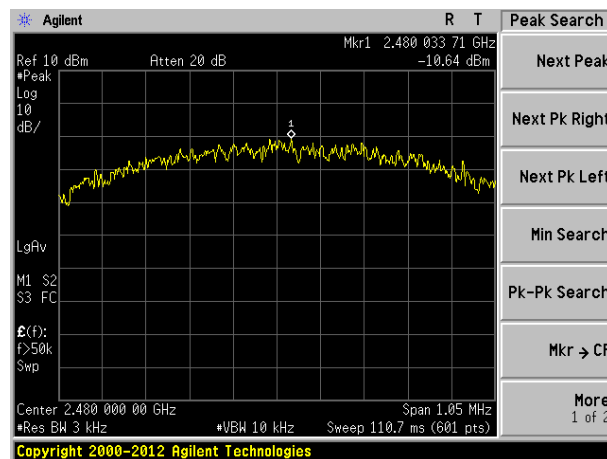
Test plot as follows:



Lowest channel



Middle channel

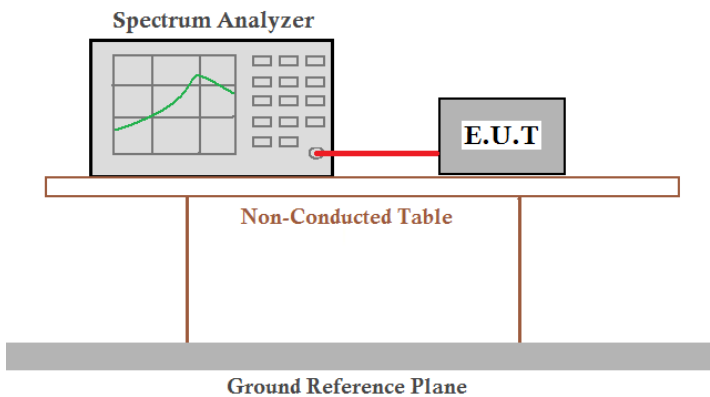


Highest channel

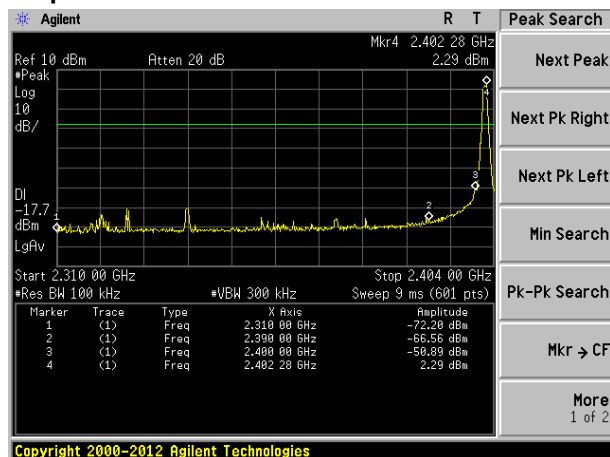


## 7.5 Band edges

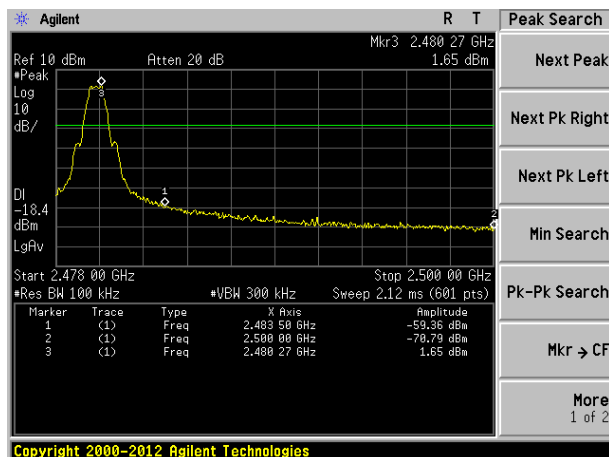
### 7.5.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02 & RSS-Gen
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 via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on 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:



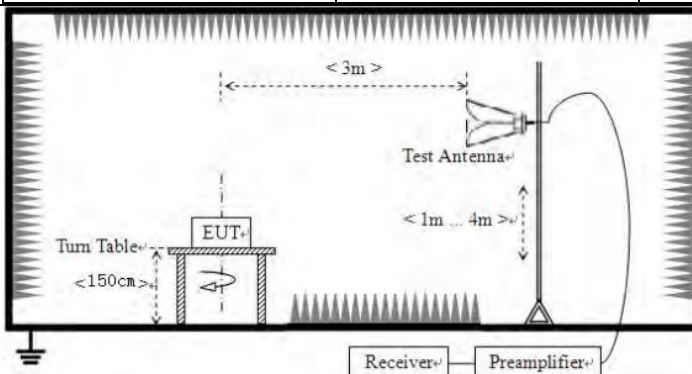
Lowest channel



Highest channel



## 7.5.2 Radiated Emission Method

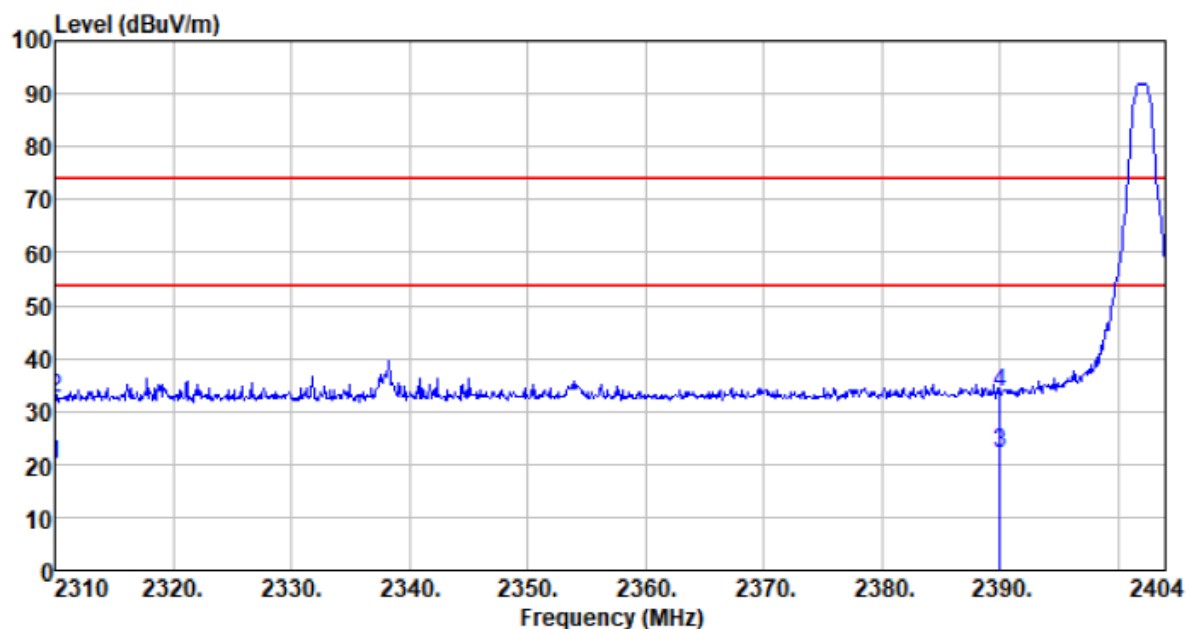
Test Requirement:	FCC Part15 C Section 15.209 and 15.205 RSS-247 Section 3.3 & RSS-Gen Section 8.10				
Test Method:	ANSI C63.10:2013 & RSS-Gen				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 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"><li>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.</li><li>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.</li><li>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.</li><li>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.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>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.</li><li>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.</li></ol>				
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test results:	Pass				



## Measurement Data

Test channel:	Lowest
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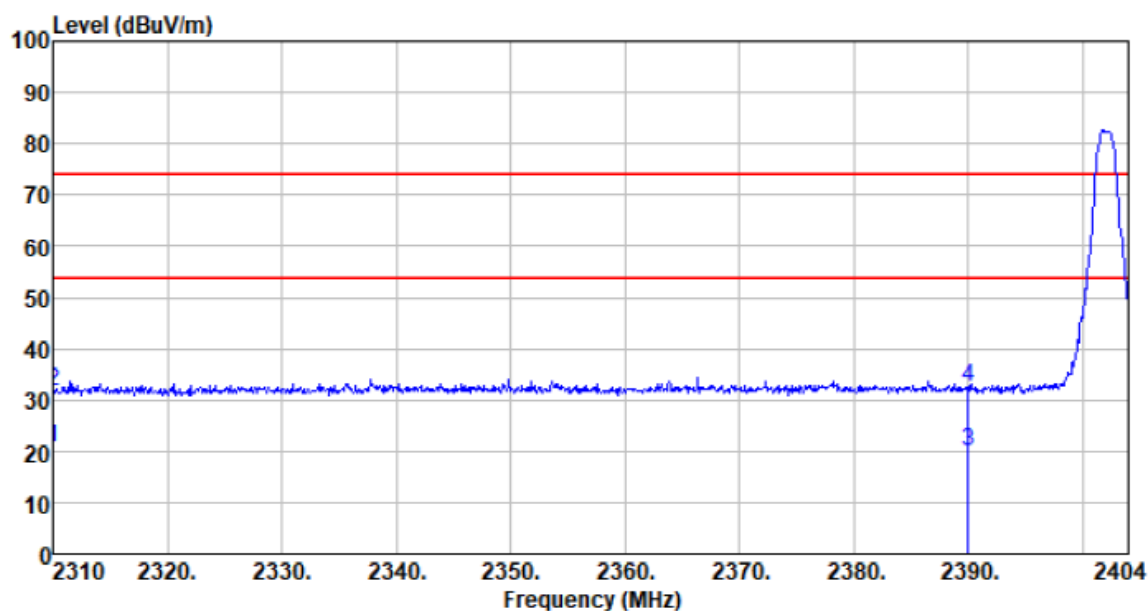
Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamplifier factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	24.41	27.21	5.30	36.95	19.97	54.00	-34.03	Average
2310.000	36.94	27.21	5.30	36.95	32.50	74.00	-41.50	Peak
2390.000	26.18	27.41	5.38	37.01	21.96	54.00	-32.04	Average
2390.000	37.72	27.41	5.38	37.01	33.50	74.00	-40.50	Peak



Vertical:

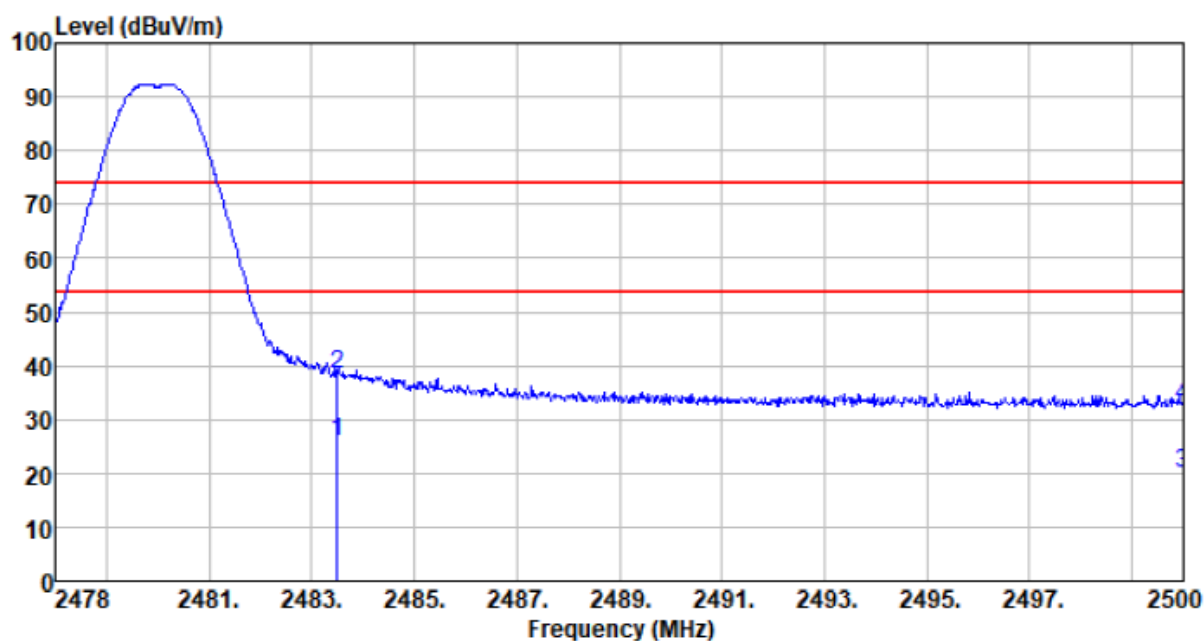


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	25.27	27.21	5.30	36.95	20.83	54.00	-33.17	Average
2310.000	36.03	27.21	5.30	36.95	31.59	74.00	-42.41	Peak
2390.000	24.18	27.41	5.38	37.01	19.96	54.00	-34.04	Average
2390.000	36.62	27.41	5.38	37.01	32.40	74.00	-41.60	Peak



Test channel:	Highest
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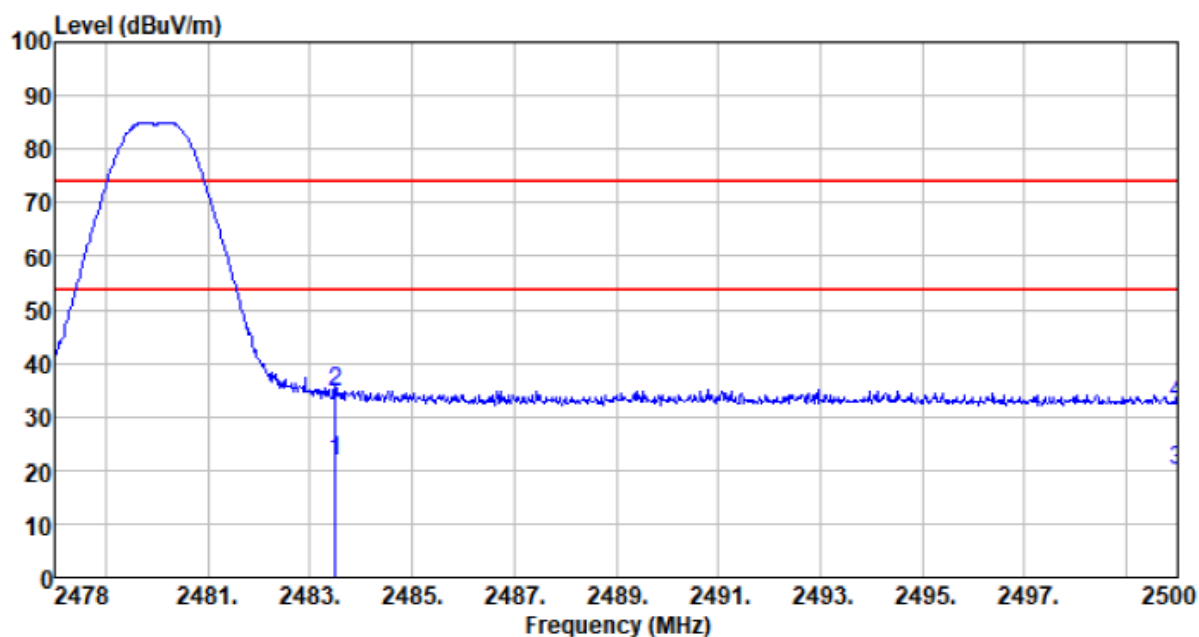
Horizontal:



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
2483.500	29.65	27.66	5.47	37.07	25.71	54.00	-28.29	Average
2483.500	42.36	27.66	5.47	37.07	38.42	74.00	-35.58	Peak
2500.000	23.75	27.70	5.49	37.09	19.85	54.00	-34.15	Average
2500.000	36.48	27.70	5.49	37.09	32.58	74.00	-41.42	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	25.60	27.66	5.47	37.07	21.66	54.00	-32.34	Average
2483.500	38.66	27.66	5.47	37.07	34.72	74.00	-39.28	Peak
2500.000	23.99	27.70	5.49	37.09	20.09	54.00	-33.91	Average
2500.000	36.30	27.70	5.49	37.09	32.40	74.00	-41.60	Peak

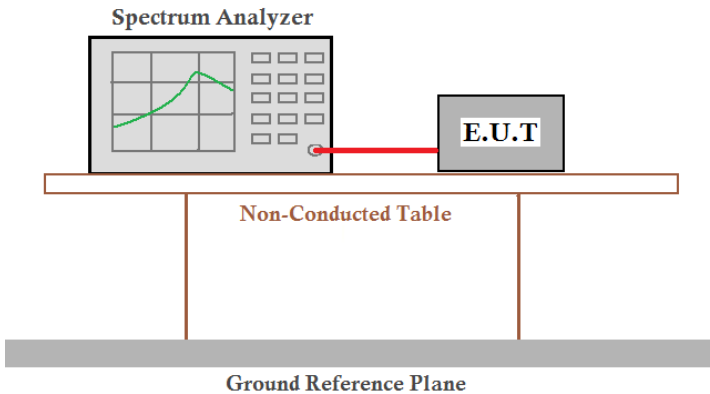
**Remarks:**

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



## 7.6 Spurious Emission

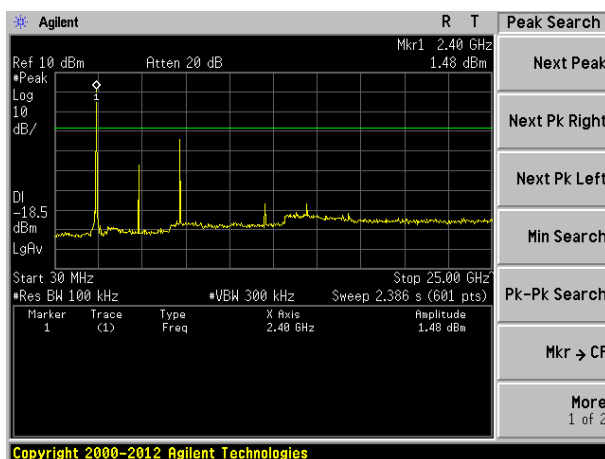
### 7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance v05r02 & RSS-Gen
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 for conducted emissions. A Spectrum Analyzer, shown with a green trace on its screen, is connected to an Equipment Under Test (E.U.T.) by a red cable. Both the Spectrum Analyzer and the E.U.T. are positioned on a Non-Conducted Table. This table is supported by two vertical legs and rests on a Ground Reference Plane, which is represented by a thick grey bar at the bottom of the setup.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



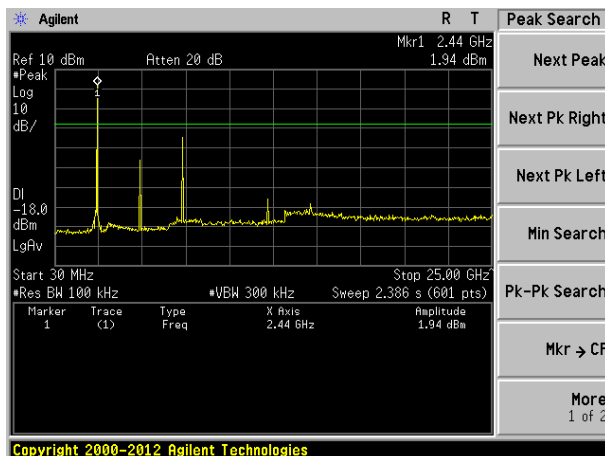
## Test plot as follows:

Lowest channel



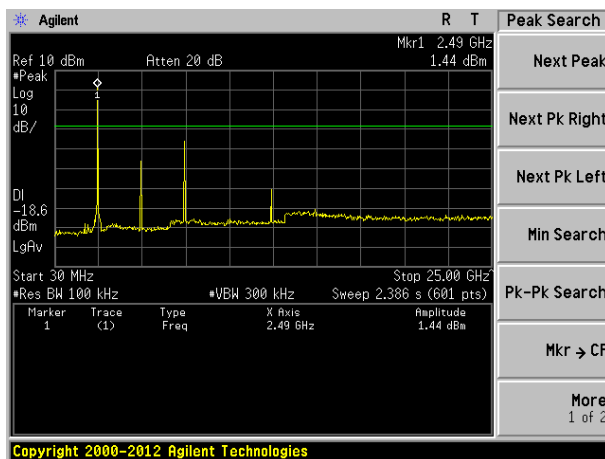
30MHz~25GHz

Middle channel



30MHz~25GHz

Highest channel



30MHz~25GHz



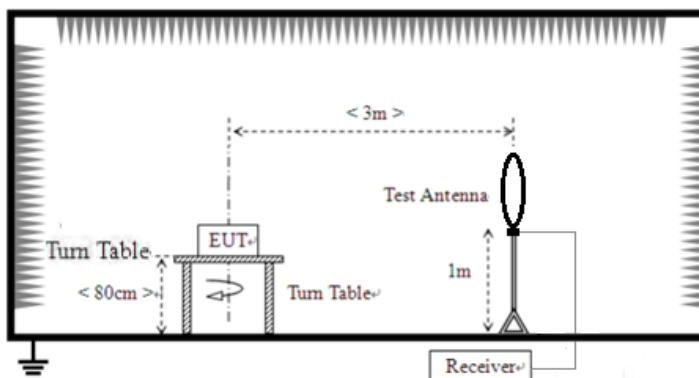
## 7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 RSS-247 Section 3.3 & RSS-Gen Section 8.9																												
Test Method:	ANSI C63.10:2013 & 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																								
FCC Limit:	<table><tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr><tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr><tr><td>1.705-30.0</td><td>30</td><td>30</td></tr><tr><td>30-88</td><td>100**</td><td>3</td></tr><tr><td>88-216</td><td>150**</td><td>3</td></tr><tr><td>216-960</td><td>200**</td><td>3</td></tr><tr><td>Above 960</td><td>500</td><td>3</td></tr></table> <p>The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.</p>					Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	0.009-0.490	2400/F(kHz)	300	0.490-1.705	24000/F(kHz)	30	1.705-30.0	30	30	30-88	100**	3	88-216	150**	3	216-960	200**	3	Above 960	500	3
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)																											
0.009-0.490	2400/F(kHz)	300																											
0.490-1.705	24000/F(kHz)	30																											
1.705-30.0	30	30																											
30-88	100**	3																											
88-216	150**	3																											
216-960	200**	3																											
Above 960	500	3																											
IC Limit:	<p>Table 5 – General field strength limits at frequencies above 30 MHz</p> <table><tr><th>Frequency (MHz)</th><th>Field strength (µV/m at 3 m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 – 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table> <p>Table 6 – General field strength limits at frequencies below 30 MHz</p> <table><tr><th>Frequency</th><th>Magnetic field strength (H-Field) (µA/m)</th><th>Measurement distance (m)</th></tr><tr><td>9 - 490 kHz <sup>1</sup></td><td>6.37/F (F in kHz)</td><td>300</td></tr><tr><td>490 - 1705 kHz</td><td>63.7/F (F in kHz)</td><td>30</td></tr><tr><td>1.705 - 30 MHz</td><td>0.08</td><td>30</td></tr></table> <p><b>Note 1:</b> The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.</p>					Frequency (MHz)	Field strength (µV/m at 3 m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960	500	Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)	9 - 490 kHz <sup>1</sup>	6.37/F (F in kHz)	300	490 - 1705 kHz	63.7/F (F in kHz)	30	1.705 - 30 MHz	0.08	30		
Frequency (MHz)	Field strength (µV/m at 3 m)																												
30 – 88	100																												
88 – 216	150																												
216 – 960	200																												
Above 960	500																												
Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)																											
9 - 490 kHz <sup>1</sup>	6.37/F (F in kHz)	300																											
490 - 1705 kHz	63.7/F (F in kHz)	30																											
1.705 - 30 MHz	0.08	30																											

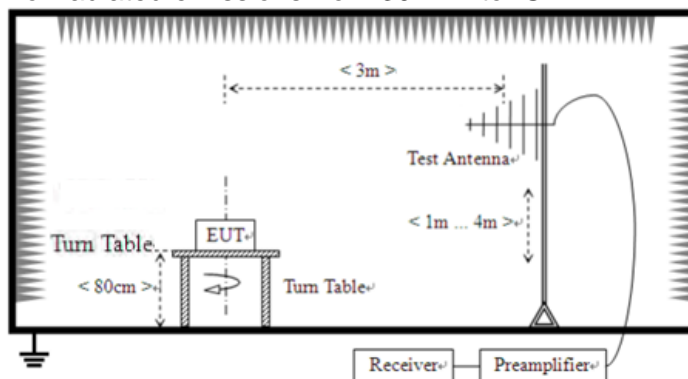


Test setup:

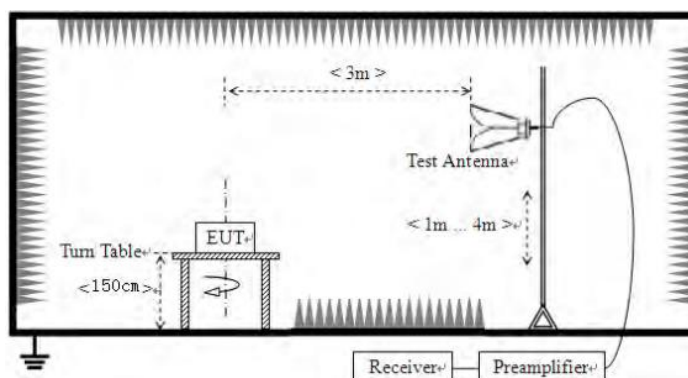
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



Test Procedure:

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 results:	Pass					

## Measurement data:

### 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.

## ■ 9kHz~30MHz

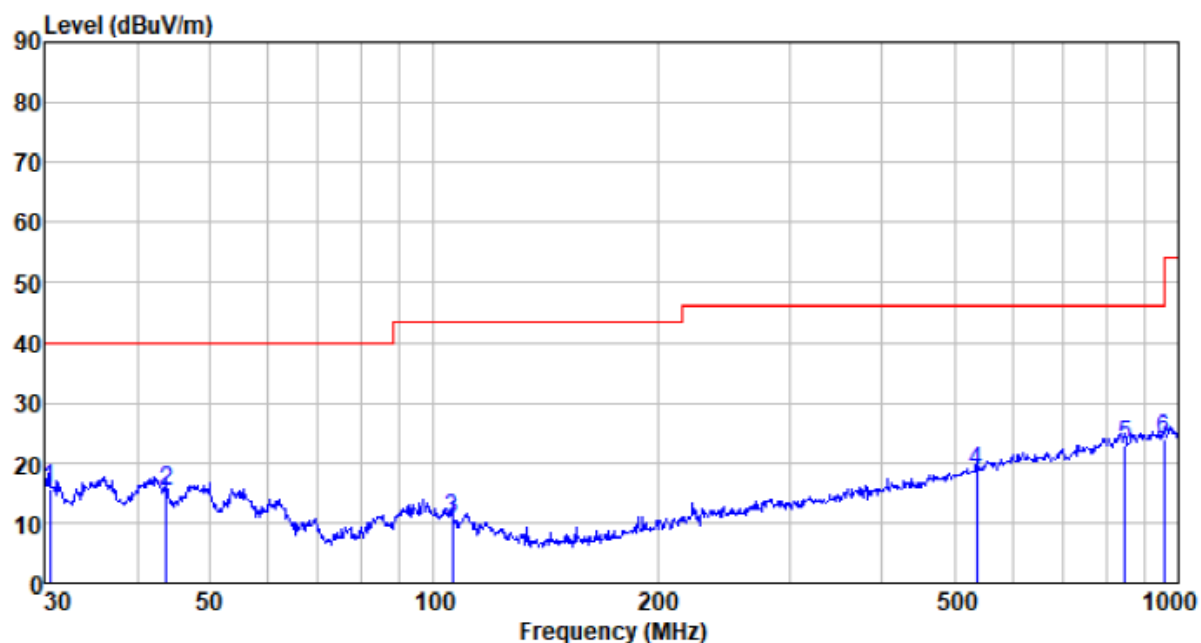
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.



## ■ Below 1GHz

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

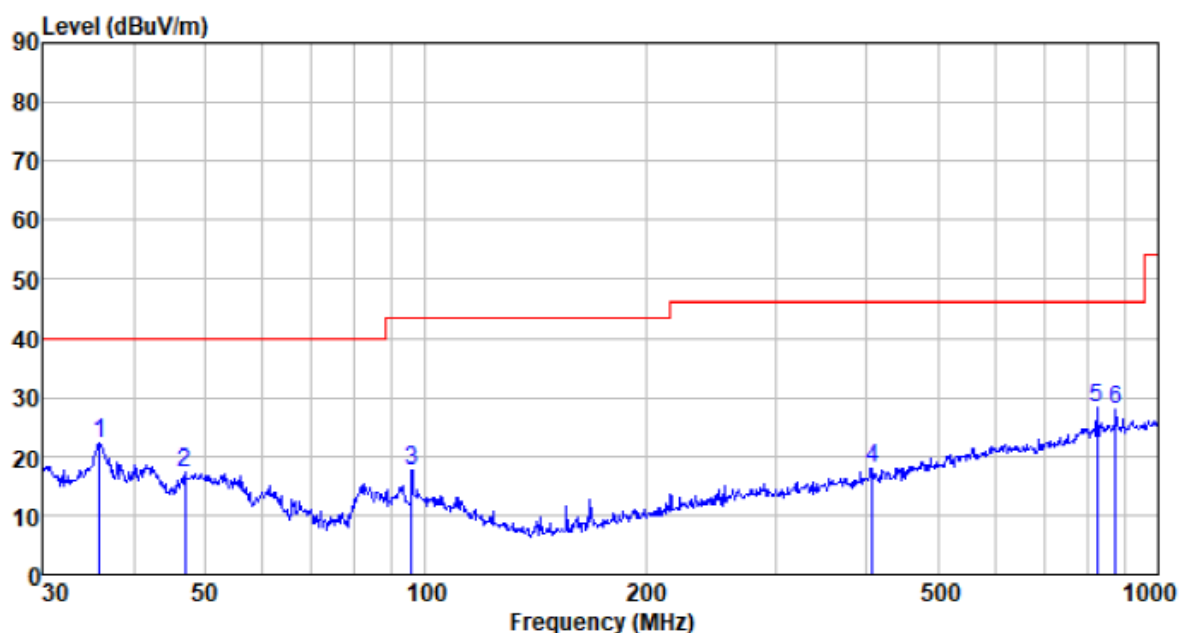
Horizontal:



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
30.531	38.75	11.21	0.56	35.04	15.48	40.00	-24.52	QP
43.812	38.34	12.24	0.71	35.87	15.42	40.00	-24.58	QP
106.013	34.77	11.52	1.25	36.77	10.77	43.50	-32.73	QP
535.707	34.66	18.12	3.46	37.52	18.72	46.00	-27.28	QP
848.056	33.90	21.85	4.65	37.61	22.79	46.00	-23.21	QP
955.438	33.78	22.54	5.06	37.55	23.83	46.00	-22.17	QP



Vertical:



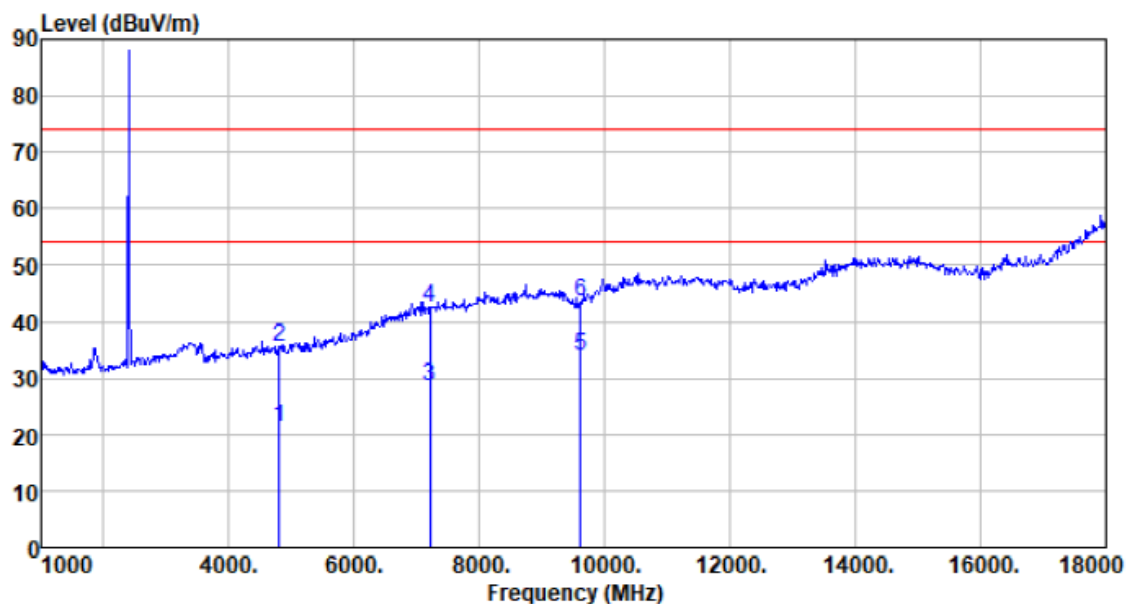
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
35.875	45.50	11.49	0.62	35.41	22.20	40.00	-17.80	QP
46.995	40.21	12.27	0.74	36.04	17.18	40.00	-22.82	QP
95.762	41.48	11.59	1.16	36.69	17.54	43.50	-25.96	QP
407.515	37.10	15.50	2.89	37.52	17.97	46.00	-28.03	QP
824.597	39.49	21.64	4.55	37.61	28.07	46.00	-17.93	QP
875.247	38.63	22.09	4.76	37.60	27.88	46.00	-18.12	QP



## ■ Above 1GHz

Test channel:	Lowest
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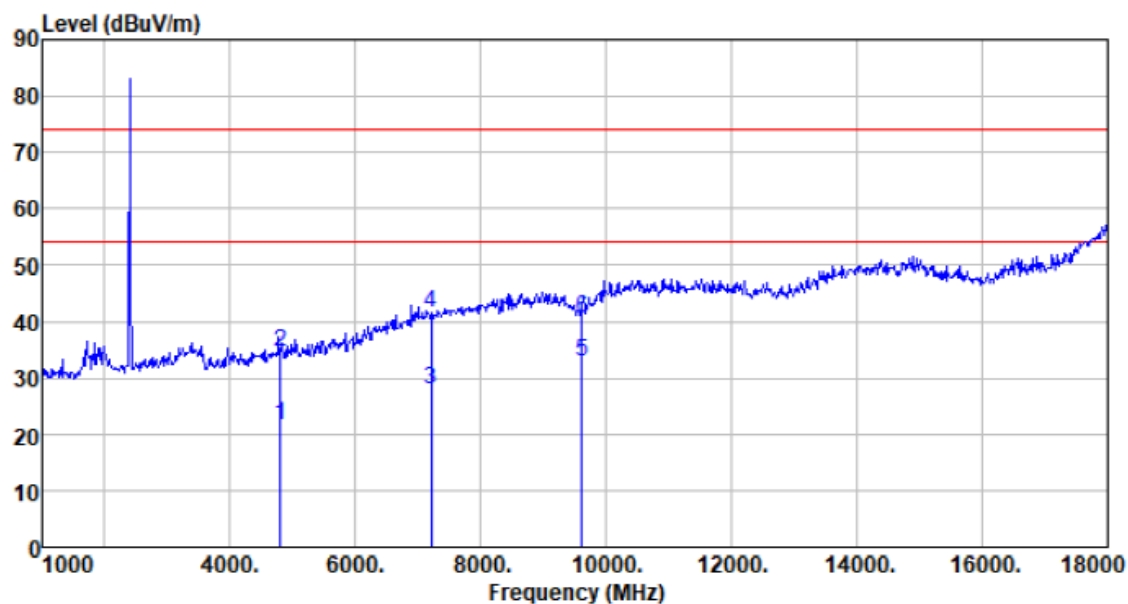
Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamplifier factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4804.000	18.85	31.35	8.60	37.58	21.22	54.00	-32.78	Average
4804.000	33.12	31.35	8.60	37.58	35.49	74.00	-38.51	Peak
7206.000	16.41	35.89	11.65	35.44	28.51	54.00	-25.49	Average
7206.000	30.48	35.89	11.65	35.44	42.58	74.00	-31.42	Peak
9608.000	17.01	37.74	14.14	34.96	33.93	54.00	-20.07	Average
9608.000	26.52	37.74	14.14	34.96	43.44	74.00	-30.56	Peak



Vertical:

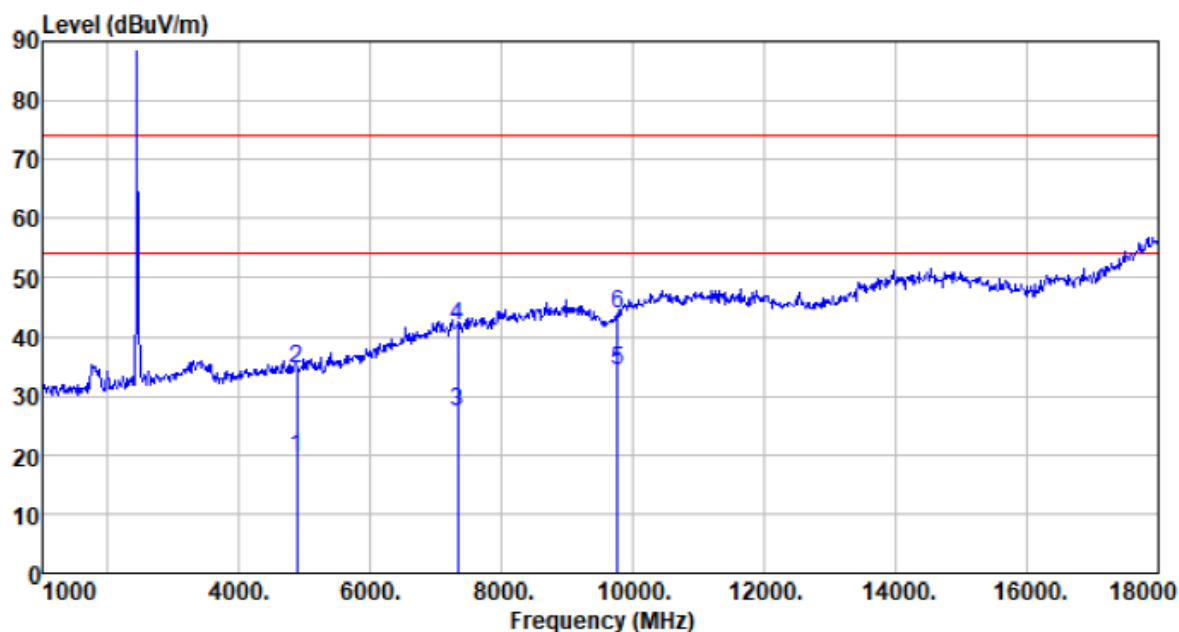


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4804.000	19.17	31.35	8.60	37.58	21.54	54.00	-32.46	Average
4804.000	32.25	31.35	8.60	37.58	34.62	74.00	-39.38	Peak
7206.000	15.81	35.89	11.65	35.44	27.91	54.00	-26.09	Average
7206.000	29.50	35.89	11.65	35.44	41.60	74.00	-32.40	Peak
9608.000	15.96	37.74	14.14	34.96	32.88	54.00	-21.12	Average
9608.000	23.73	37.74	14.14	34.96	40.65	74.00	-33.35	Peak



Test channel:	Middle
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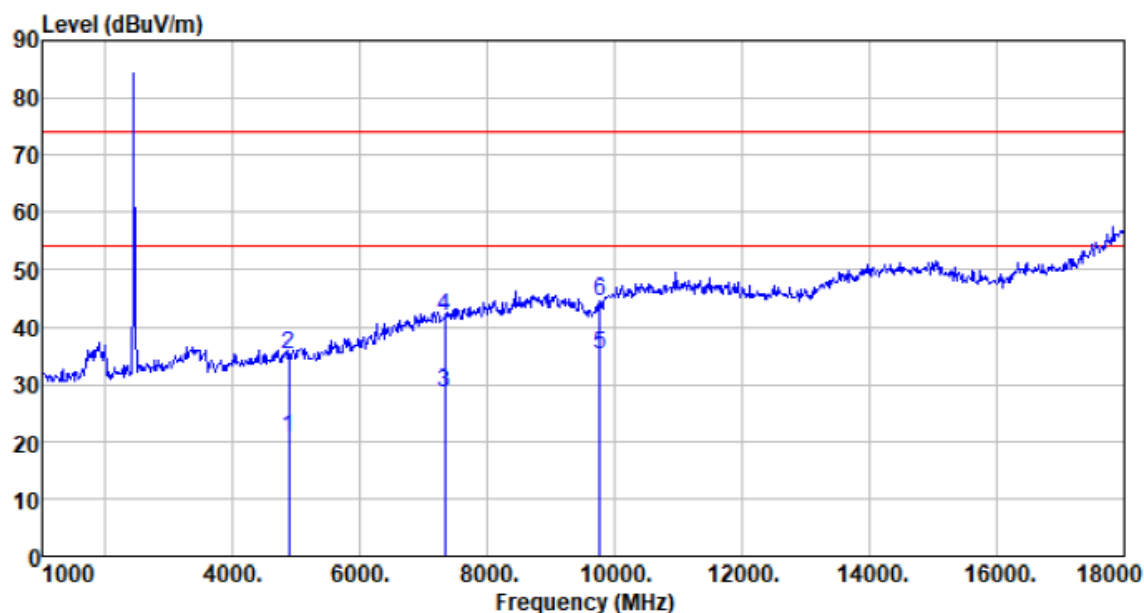
Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamplifier factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	17.01	31.48	8.66	37.59	19.56	54.00	-34.44	Average
4880.000	31.90	31.48	8.66	37.59	34.45	74.00	-39.55	Peak
7320.000	14.76	36.17	11.72	35.47	27.18	54.00	-26.82	Average
7320.000	29.38	36.17	11.72	35.47	41.80	74.00	-32.20	Peak
9760.000	16.85	38.07	14.25	35.09	34.08	54.00	-19.92	Average
9760.000	26.48	38.07	14.25	35.09	43.71	74.00	-30.29	Peak



Vertical:

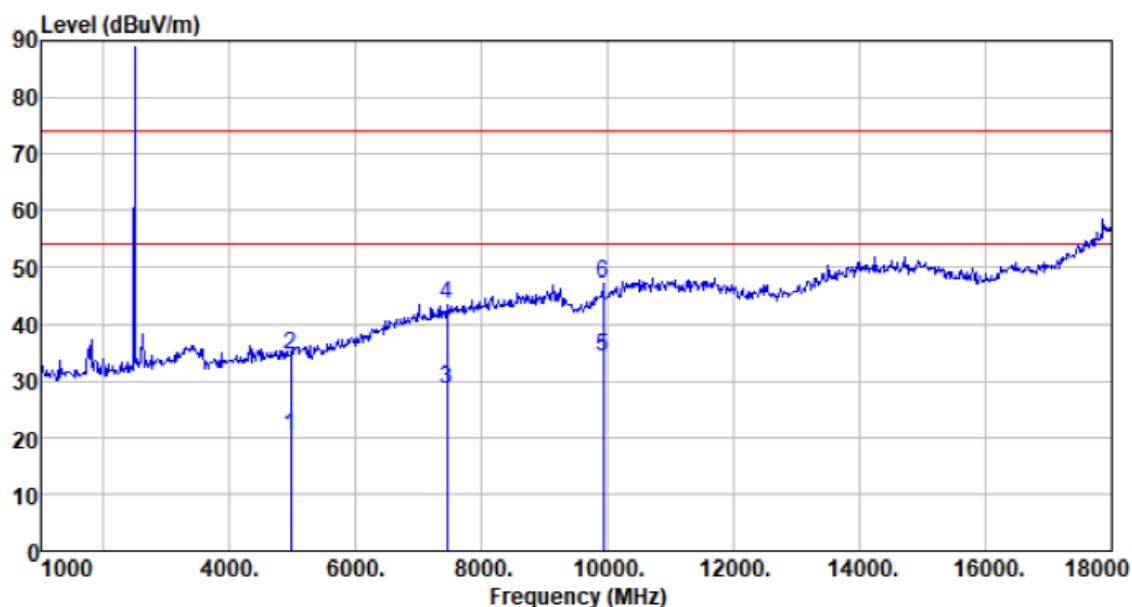


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	18.13	31.48	8.66	37.59	20.68	54.00	-33.32	Average
4880.000	32.55	31.48	8.66	37.59	35.10	74.00	-38.90	Peak
7320.000	16.24	36.17	11.72	35.47	28.66	54.00	-25.34	Average
7320.000	29.45	36.17	11.72	35.47	41.87	74.00	-32.13	Peak
9760.000	17.90	38.07	14.25	35.09	35.13	54.00	-18.87	Average
9760.000	27.26	38.07	14.25	35.09	44.49	74.00	-29.51	Peak



Test channel:	Highest
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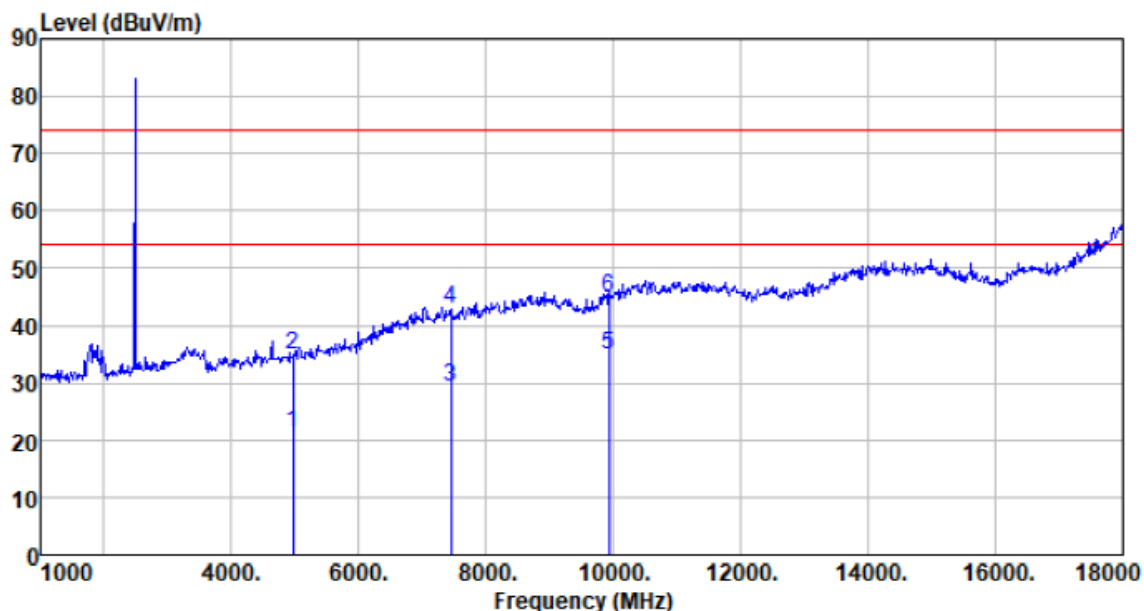
Horizontal:



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	17.50	31.63	8.73	37.60	20.26	54.00	-33.74	Average
4960.000	31.75	31.63	8.73	37.60	34.51	74.00	-39.49	Peak
7440.000	15.97	36.46	11.79	35.49	28.73	54.00	-25.27	Average
7440.000	30.79	36.46	11.79	35.49	43.55	74.00	-30.45	Peak
9920.000	16.64	38.42	14.38	35.23	34.21	54.00	-19.79	Average
9920.000	29.46	38.42	14.38	35.23	47.03	74.00	-26.97	Peak



Vertical::



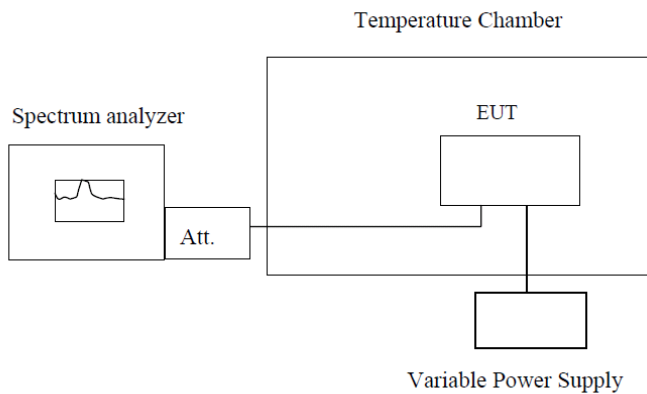
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	18.51	31.63	8.73	37.60	21.27	54.00	-32.73	Average
4960.000	31.98	31.63	8.73	37.60	34.74	74.00	-39.26	Peak
7440.000	16.34	36.46	11.79	35.49	29.10	54.00	-24.90	Average
7440.000	29.98	36.46	11.79	35.49	42.74	74.00	-31.26	Peak
9920.000	17.43	38.42	14.38	35.23	35.00	54.00	-19.00	Average
9920.000	27.23	38.42	14.38	35.23	44.80	74.00	-29.20	Peak

Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.



## 7.7 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><b>Note :</b> 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: DC 3V						
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	2402	2402.501	2402.749	2402.821	2402.099	Pass
	2440	2440.675	2440.950	2440.281	2440.920	Pass
	2480	2480.389	2480.666	2480.794	2480.421	Pass
-20	2402	2402.123	2402.243	2402.982	2402.071	Pass
	2440	2440.144	2440.729	2440.035	2440.056	Pass
	2480	2480.165	2480.122	2480.633	2480.593	Pass
-10	2402	2402.381	2402.606	2402.903	2402.950	Pass
	2440	2440.334	2440.049	2440.941	2440.886	Pass
	2480	2480.688	2480.559	2480.545	2480.183	Pass
0	2402	2402.284	2402.722	2402.578	2402.844	Pass
	2440	2440.711	2440.647	2440.305	2440.596	Pass
	2480	2480.603	2480.444	2480.207	2480.403	Pass
10	2402	2402.991	2402.332	2402.886	2402.509	Pass
	2440	2440.489	2440.593	2440.416	2440.117	Pass
	2480	2480.051	2480.658	2480.117	2480.968	Pass
20	2402	2402.128	2402.387	2402.171	2402.025	Pass
	2440	2440.837	2440.946	2440.439	2440.058	Pass
	2480	2480.785	2480.380	2480.461	2480.618	Pass
30	2402	2402.140	2402.780	2402.941	2402.452	Pass
	2440	2440.108	2440.274	2440.329	2440.053	Pass
	2480	2480.063	2480.548	2480.366	2480.866	Pass
40	2402	2402.621	2402.271	2402.235	2402.382	Pass
	2440	2440.372	2440.986	2440.937	2440.039	Pass
	2480	2480.412	2480.620	2480.922	2480.186	Pass
50	2402	2402.511	2402.350	2402.425	2402.648	Pass
	2440	2440.586	2440.704	2440.120	2440.338	Pass
	2480	2480.136	2480.101	2480.639	2480.956	Pass
Frequency stability versus Voltage						
Temperature: 25°C						
Power Supply (VDC)	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
2.3 end-point voltage	2402	2402.218	2402.673	2402.084	2402.859	Pass
	2440	2440.853	2440.030	2440.749	2440.143	Pass
	2480	2480.675	2480.050	2480.452	2480.935	Pass
3.3	2402	2402.958	2402.766	2402.751	2402.231	Pass
	2440	2440.729	2440.078	2440.607	2440.570	Pass
	2480	2480.543	2480.720	2480.368	2480.944	Pass



## 8 Test Setup Photo

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

## 9 EUT Constructional Details

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

-----End-----