

# TEST REPORT

**Applicant:** JSP GROUP INTL BV- TEAM CORALLY

**Address of Applicant:** GEELSEWEG 80, 2250, OLEN, Belgium

**Manufacturer/Factory:** JSP GROUP INTL BV- TEAM CORALLY

**Address of Manufacturer/Factory:** GEELSEWEG 80, 2250, OLEN, Belgium

**Equipment Under Test (EUT)**

Product Name: Digital proportional radio control system

Model No.: CT3P(for transmitter),R-323(for receiver)

Trade Mark: TEAM CORALLY

**FCC ID:** 2A2FS-C59065

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247

**Date of sample receipt:** June 24, 2021

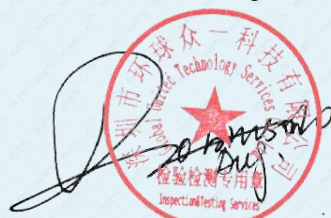
**Date of Test:** June 25, 2021-August 11, 2021

**Date of report issued:** August 11, 2021

**Test Result :** PASS \*

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

Authorized Signature:



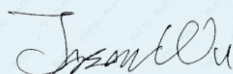
**Robinson Luo**  
**Laboratory Manager**

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 11, 2021	Original

Prepared By:

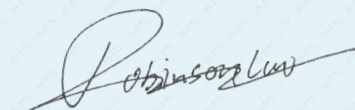


Date:

August 11, 2021

Project Engineer

Check By:



Date:

August 11, 2021

Reviewer

## 3 Contents

Page

1	COVER PAGE .....	1
2	VERSION .....	2
3	CONTENTS .....	3
4	TEST SUMMARY .....	4
4.1	MEASUREMENT UNCERTAINTY .....	4
5	GENERAL INFORMATION .....	5
5.1	GENERAL DESCRIPTION OF EUT .....	5
5.2	TEST MODE .....	7
5.3	TEST FACILITY.....	7
5.4	TEST LOCATION .....	7
5.5	DESCRIPTION OF SUPPORT UNITS .....	7
5.6	DEVIATION FROM STANDARDS.....	7
5.7	ABNORMALITIES FROM STANDARD CONDITIONS.....	7
5.8	ADDITIONAL INSTRUCTIONS.....	7
6	TEST INSTRUMENTS LIST .....	8
7	TEST RESULTS AND MEASUREMENT DATA.....	10
7.1	ANTENNA REQUIREMENT .....	10
7.2	CONDUCTED EMISSIONS .....	11
7.3	CONDUCTED PEAK OUTPUT POWER .....	14
7.4	20dB EMISSION BANDWIDTH .....	16
7.5	CARRIER FREQUENCIES SEPARATION.....	18
7.6	HOPPING CHANNEL NUMBER .....	20
7.7	DWELL TIME.....	21
7.8	BAND EDGE .....	25
7.8.1	Conducted Emission Method.....	25
7.8.2	Radiated Emission Method.....	27
7.9	SPURIOUS EMISSION.....	32
7.9.1	Conducted Emission Method.....	32
7.9.2	Radiated Emission Method.....	34
8	TEST SETUP PHOTO .....	49
9	EUT CONSTRUCTIONAL DETAILS .....	49

## 4 Test Summary

Test Item	Section	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

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

N/A: Not applicable

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 Name:	Digital proportional radio control system
Model No.:	CT3P(for transmitter),R-323(for receiver)
Serial No.:	N/A
Hardware Version:	ABS-GT3B-V1.0
Software Version:	FS-GT3B V1.0.5
Test sample(s) ID:	GTS202106000262-1
Sample(s) Status	Engineer sample
Operation Frequency:	2405.5MHz~2475MHz
Channel numbers:	140
Modulation technology:	GFSK
Antenna Type:	Integral Antenna
Antenna gain:	2.0dBi
Power supply:	DC 6V(4*1.5V "AA" Size Battery) for transmitter DC 4.8-6.6V for receiver

Remark: The system works in the frequency range of 2405.5MHz to 2475.0MHz. This band has been divided to 140 independent channels. Each radio system uses 16 different channels; the minimum channel separation is  $\geq 2.5$ MHz. By using various switch-on times, hopping scheme and channel frequencies, the system can guarantee a jamming free radio transmission. The channel list is below.

The report only for transmitter

The test frequencies are below:

Channel	Frequency
The lowest channel	2405.5MHz
The middle channel	2440.0MHz
The Highest channel	2475.0MHz



Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405.50	36	2423.00	71	2440.50	106	2458.00
2	2406.00	37	2423.50	72	2441.00	107	2458.50
3	2406.50	38	2424.00	73	2441.50	108	2459.00
4	2407.00	39	2424.50	74	2442.00	109	2459.50
5	2407.50	40	2425.00	75	2442.50	110	2460.00
6	2408.00	41	2425.50	76	2443.00	111	2460.50
7	2408.50	42	2426.00	77	2443.50	112	2461.00
8	2409.00	43	2426.50	78	2444.00	113	2461.50
9	2409.50	44	2427.00	79	2444.50	114	2462.00
10	2410.00	45	2427.50	80	2445.00	115	2462.50
11	2410.50	46	2428.00	81	2445.50	116	2463.00
12	2411.00	47	2428.50	82	2446.00	117	2463.50
13	2411.50	48	2429.00	83	2446.50	118	2464.00
14	2412.00	49	2429.50	84	2447.00	119	2464.50
15	2412.50	50	2430.00	85	2447.50	120	2465.00
16	2413.00	51	2430.50	86	2448.00	121	2465.50
17	2413.50	52	2431.00	87	2448.50	122	2466.00
18	2414.00	53	2431.50	88	2449.00	123	2466.50
19	2414.50	54	2432.00	89	2449.50	124	2467.00
20	2415.00	55	2432.50	90	2450.00	125	2467.50
21	2415.50	56	2433.00	91	2450.50	126	2468.00
22	2416.00	57	2433.50	92	2451.00	127	2468.50
23	2416.50	58	2434.00	93	2451.50	128	2469.00
24	2417.00	59	2434.50	94	2452.00	129	2469.50
25	2417.50	60	2435.00	95	2452.50	130	2470.00
26	2418.00	61	2435.50	96	2453.00	131	2470.50
27	2418.50	62	2436.00	97	2453.50	132	2471.00
28	2419.00	63	2436.50	98	2454.00	133	2471.50
29	2419.50	64	2437.00	99	2454.50	134	2472.00
30	2420.00	65	2437.50	100	2455.00	135	2472.50
31	2420.50	66	2438.00	101	2455.50	136	2473.00
32	2421.00	67	2438.50	102	2456.00	137	2473.50
33	2421.50	68	2439.00	103	2456.50	138	2474.00
34	2422.00	69	2439.50	104	2457.00	139	2474.50
35	2422.50	70	2440.00	105	2457.50	140	2475.00

## 5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Remark: New battery is used during all test.	

## 5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations: <ul style="list-style-type: none"><li>● <b>FCC—Registration No.: 381383</b> Designation Number: CN5029 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.</li><li>● <b>IC —Registration No.: 9079A</b> CAB identifier: CN0091 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</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).</li></ul>
---

## 5.4 Test Location

All other 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

## 5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number
MEILI	DC POWER SUPPLY	MCH-305A	011121168

## 5.6 Deviation from Standards

None.
-------

## 5.7 Abnormalities from Standard Conditions

None.
-------

## 5.8 Additional Instructions

Software (Used for test) from client
Built-in by manufacturer, power set 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. 24 2021	June. 23 2022
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022
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. 24 2021	June. 23 2022



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. 24 2021	June. 23 2022
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 24 2021	June. 23 2022
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 24 2021	June. 23 2022
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. 24 2021	June. 23 2022
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 24 2021	June. 23 2022
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	June. 24 2021	June. 23 2022
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	July. 09 2021	July. 08 2022

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. 24 2021	June. 23 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022

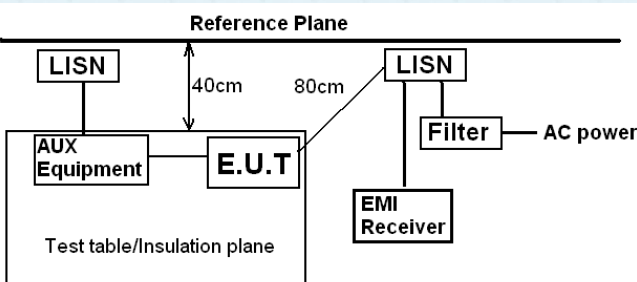
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

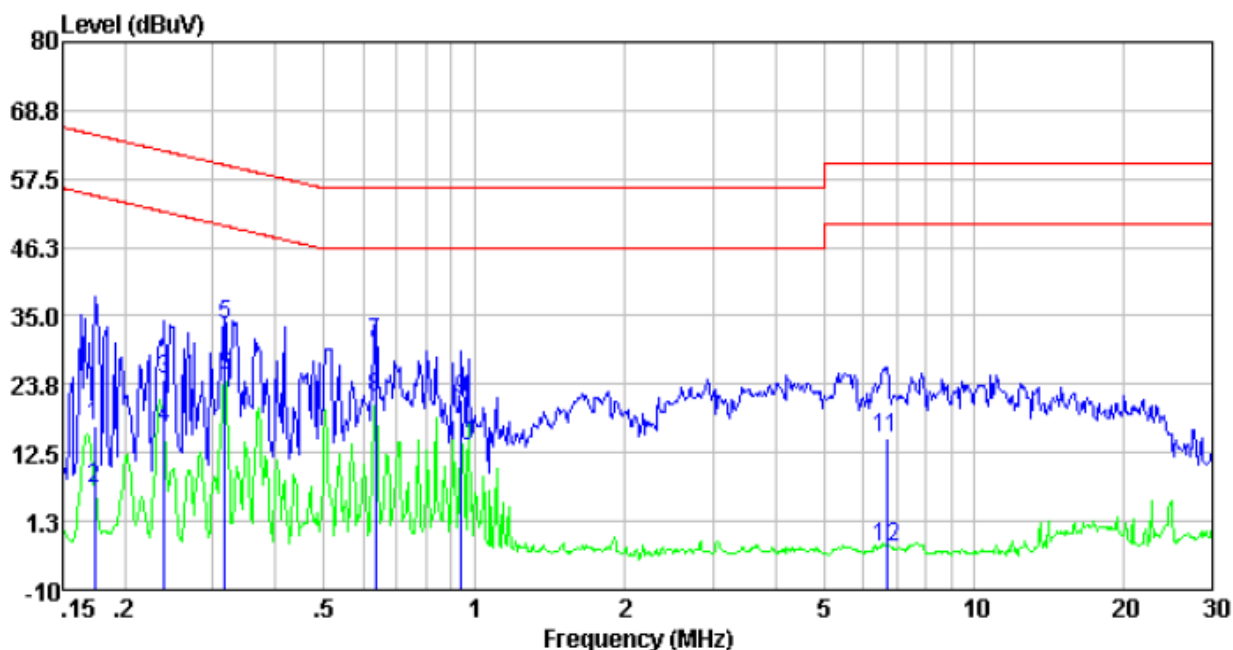
<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
<b>15.203 requirement:</b> An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna 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>EUT Antenna:</b>	
<i>The antenna is integral antenna, the best case gain of the antenna is 2.0dBi, reference to the appendix II for details.</i>	

## 7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																			
Test Method:	ANSI C63.10:2013																			
Test Frequency Range:	150KHz to 30MHz																			
Class / Severity:	Class B																			
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																			
Limit:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> <p>* Decreases with the logarithm of the frequency.</p>						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
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																		
Test setup:	<div><p><b>Reference Plane</b></p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>																			
Test procedure:	<ol style="list-style-type: none"><li>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.</li><li>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).</li><li>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 C63.10:2009 on conducted measurement.</li></ol>																			
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:	DC 6V																			
Test results:	Pass																			

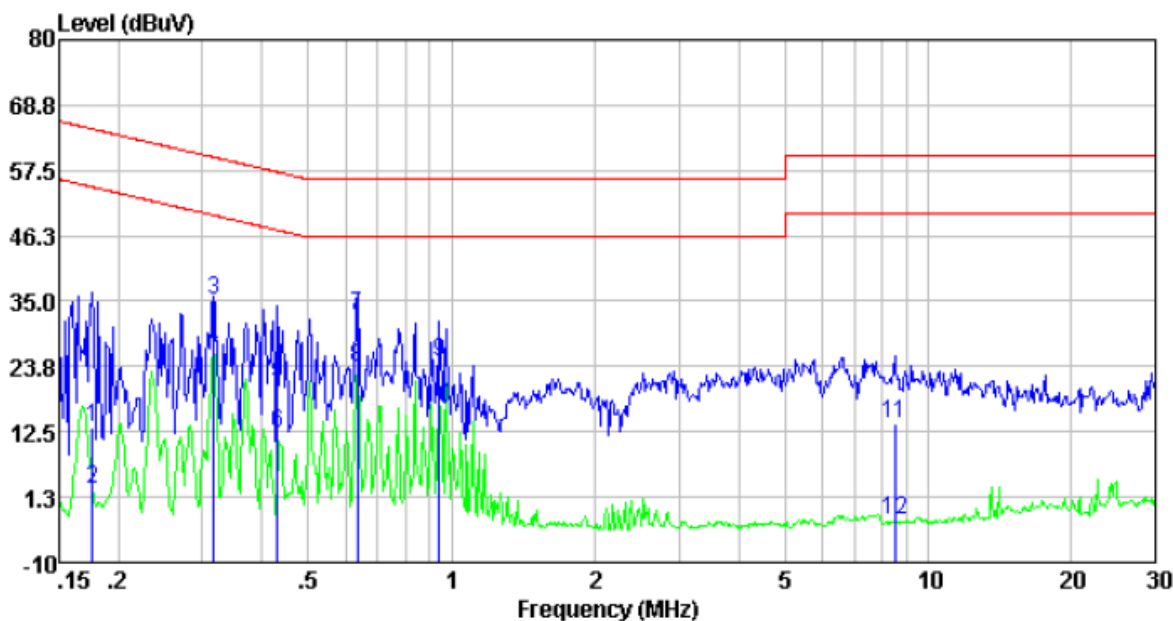
## Measurement data

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.17	6.42	10.40	0.01	16.83	64.77	-47.94	QP
0.17	-3.93	10.40	0.01	6.48	54.77	-48.29	Average
0.24	14.03	10.40	0.01	24.44	62.13	-37.69	QP
0.24	6.10	10.40	0.01	16.51	52.13	-35.62	Average
0.32	23.21	10.39	0.01	33.61	59.80	-26.19	QP
0.32	14.79	10.39	0.01	25.19	49.80	-24.61	Average
0.63	20.10	10.28	0.02	30.40	56.00	-25.60	QP
0.63	11.29	10.28	0.02	21.59	46.00	-24.41	Average
0.94	11.12	10.21	0.03	21.36	56.00	-34.64	QP
0.94	3.28	10.21	0.03	13.52	46.00	-32.48	Average
6.70	4.55	10.20	0.08	14.83	60.00	-45.17	QP
6.70	-13.16	10.20	0.08	-2.88	50.00	-52.88	Average

Neutral:



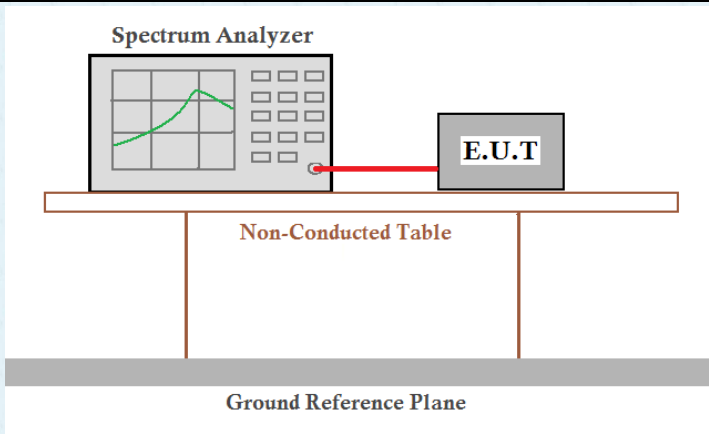
Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.18	2.87	10.40	0.01	13.28	64.68	-51.40	QP
0.18	-7.92	10.40	0.01	2.49	54.68	-52.19	Average
0.32	24.72	10.39	0.01	35.12	59.80	-24.68	QP
0.32	16.35	10.39	0.01	26.75	49.80	-23.05	Average
0.43	10.60	10.34	0.01	20.95	57.24	-36.29	QP
0.43	1.99	10.34	0.01	12.34	47.24	-34.90	Average
0.63	22.14	10.28	0.02	32.44	56.00	-23.56	QP
0.63	13.39	10.28	0.02	23.69	46.00	-22.31	Average
0.94	14.41	10.21	0.03	24.65	56.00	-31.35	QP
0.94	6.33	10.21	0.03	16.57	46.00	-29.43	Average
8.50	3.66	10.20	0.10	13.96	60.00	-46.04	QP
8.50	-13.14	10.20	0.10	-2.84	50.00	-52.84	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.



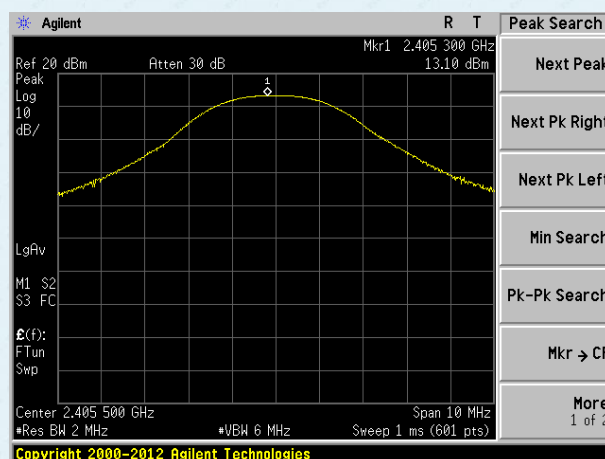
## 7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Limit:	20.97dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

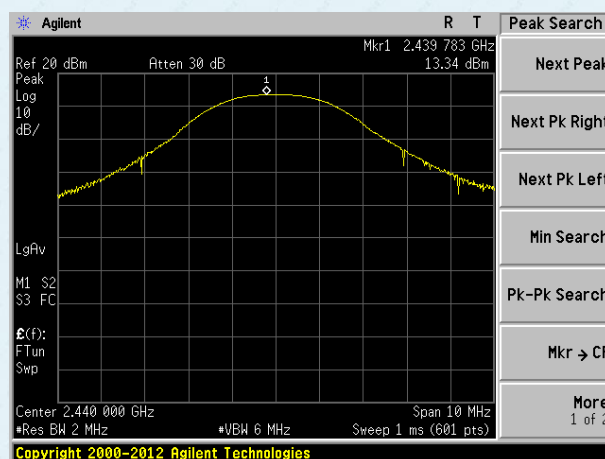
### Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	13.10	20.97	Pass
Middle	13.34		
Highest	13.27		

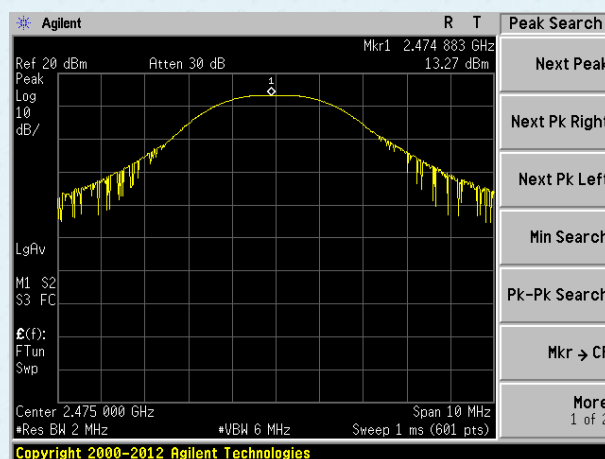
Test plot as follows:



Lowest channel

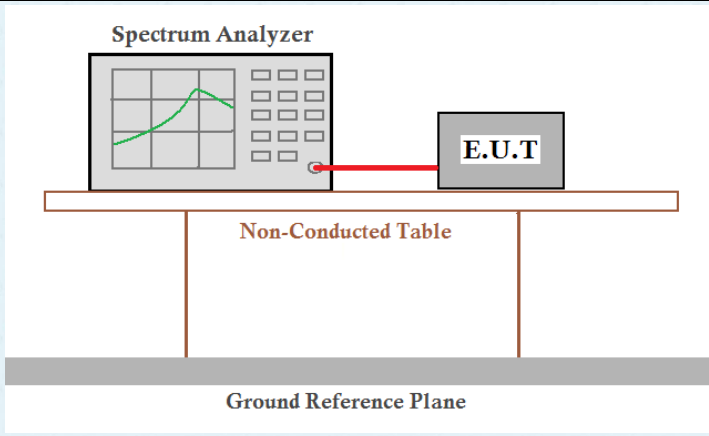


Middle channel



Highest channel

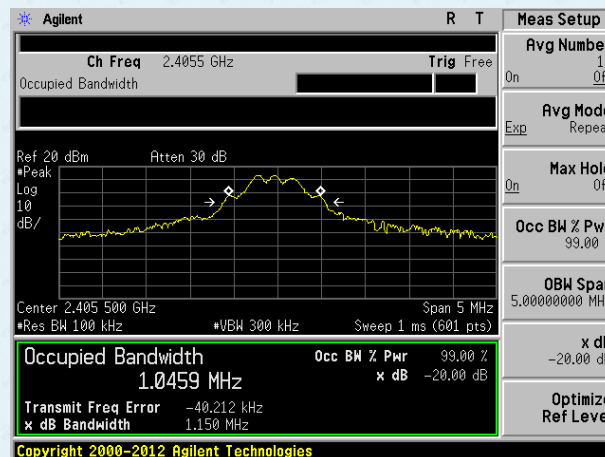
## 7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

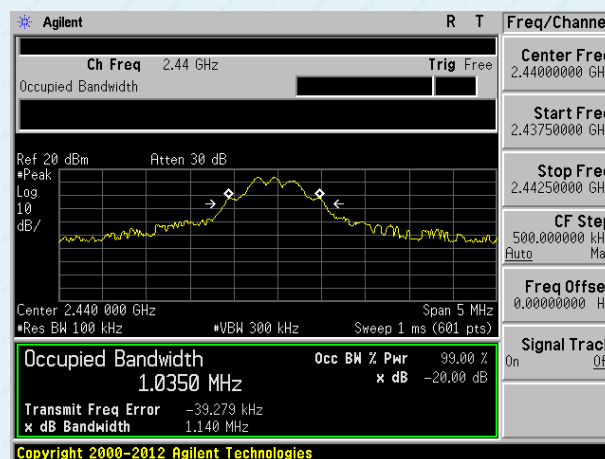
### Measurement Data

Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	1.150	Pass
Middle	1.140	
Highest	1.143	

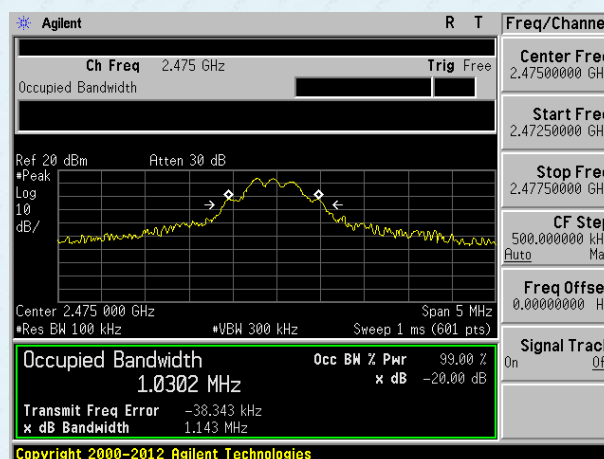
Test plot as follows:



Lowest channel

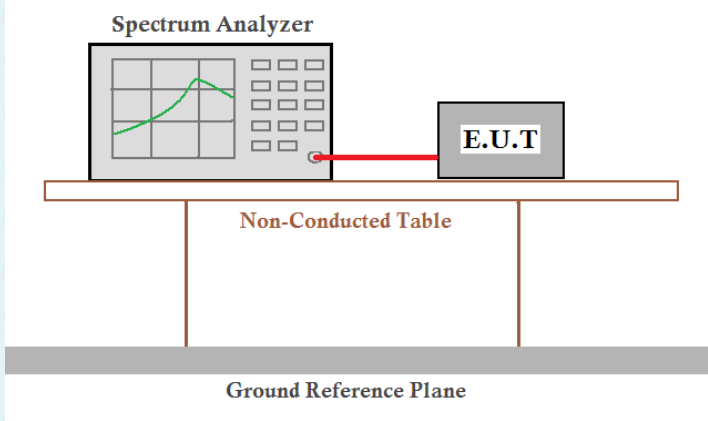


Middle channel



Highest channel

## 7.5 Carrier Frequencies Separation

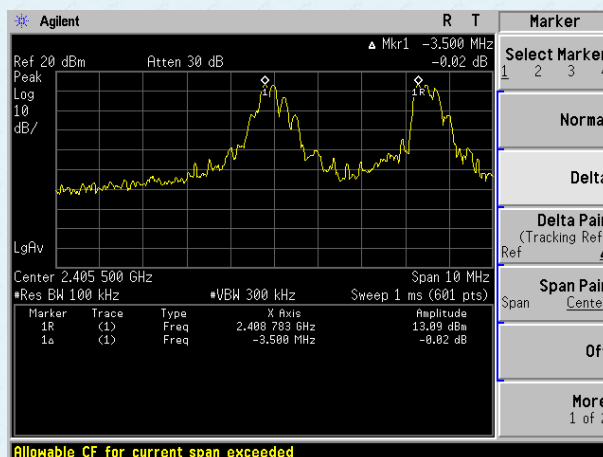
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

### Measurement Data

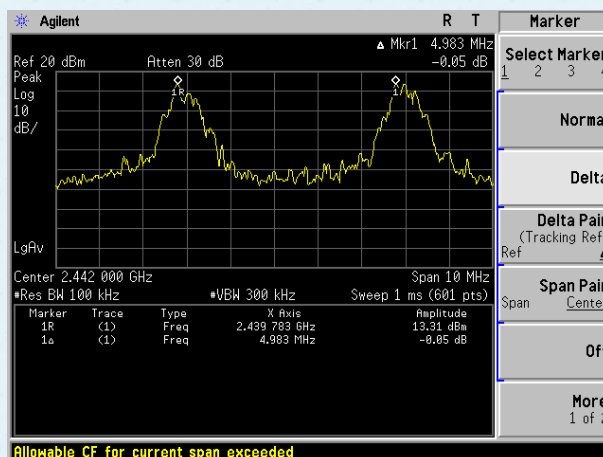
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3500	767	Pass
Middle	4983	767	Pass
Highest	6017	767	Pass



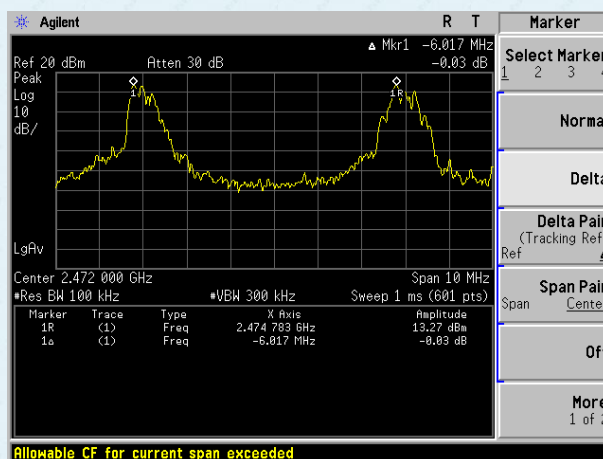
Test plot as follows:



Lowest channel

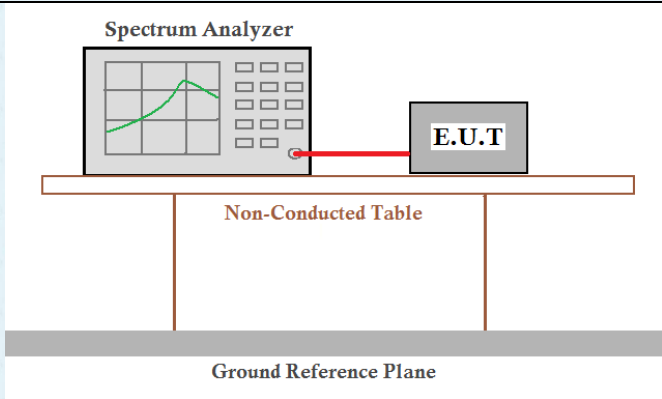


Middle channel



Highest channel

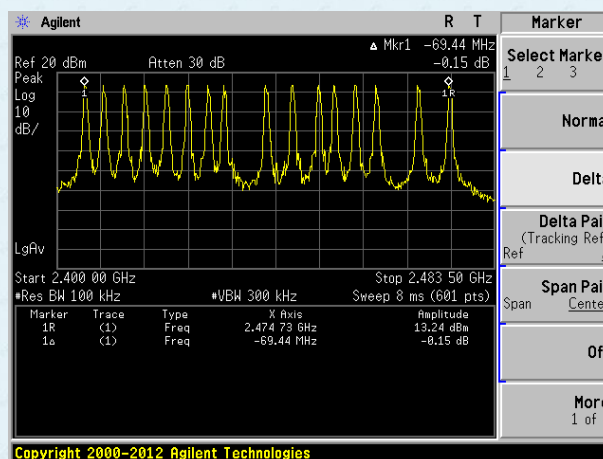
## 7.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

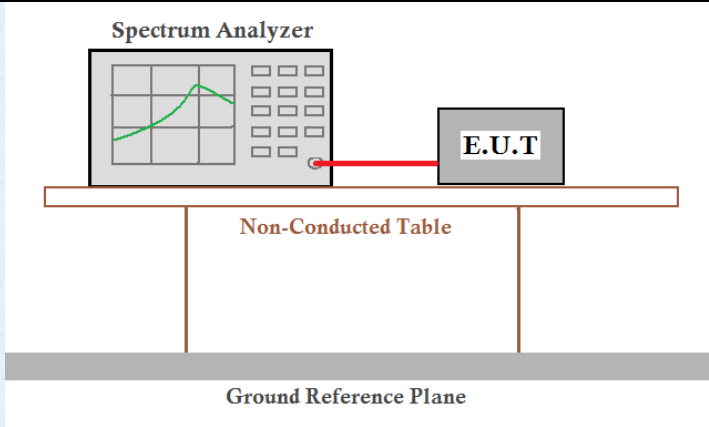
### Measurement Data:

Hopping channel numbers	Limit	Result
16	15	Pass

### Test plot as follows:



## 7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

### Measurement Data

Channel	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
Lowest	1.317	33.7152	400	Pass
Middle	1.317	33.7152	400	Pass
Highest	1.317	33.7152	400	Pass

The formula as below:

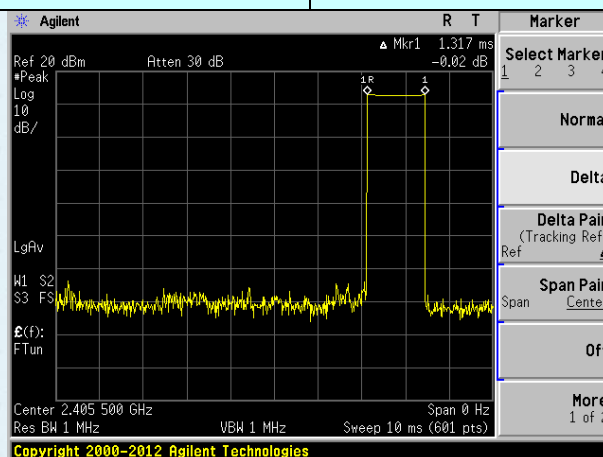
Lowest: Dwell time = Ton \* Ton times in 1s \* 0.4s \* channel numbers=1.317ms\*4\*0.4\*16=33.7152ms

Middle: Dwell time = Ton \* Ton times in 1s \* 0.4s \* channel numbers=1.317ms\*4\*0.4\*16=33.7152ms

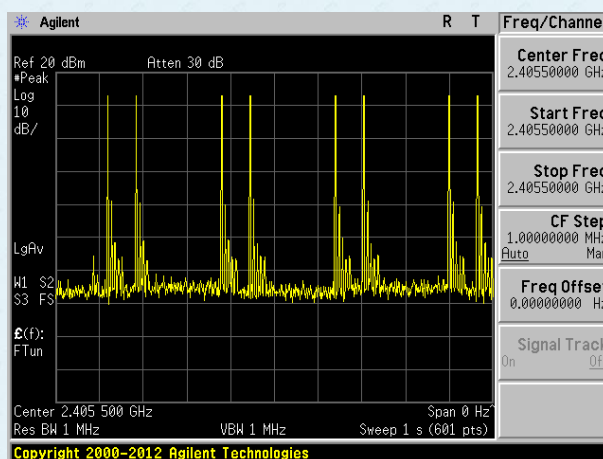
Highest: Dwell time = Ton \* Ton times in 1s \* 0.4s \* channel numbers=1.317ms\*4\*0.4\*16=33.7152ms

Test plot as follows:

Channel	Lowest
---------	--------

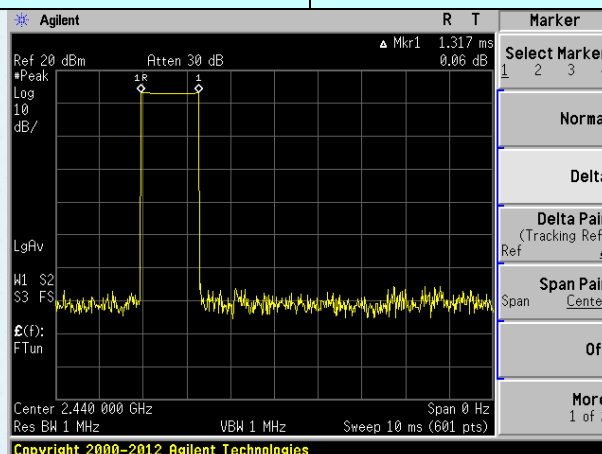


Ton

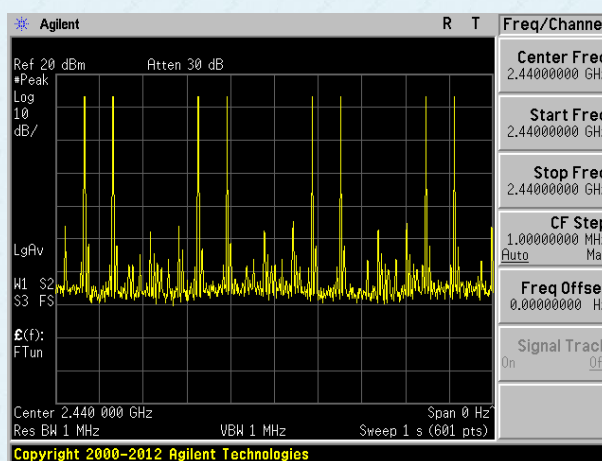


Ton times in 1s

Channel	Middle
---------	--------



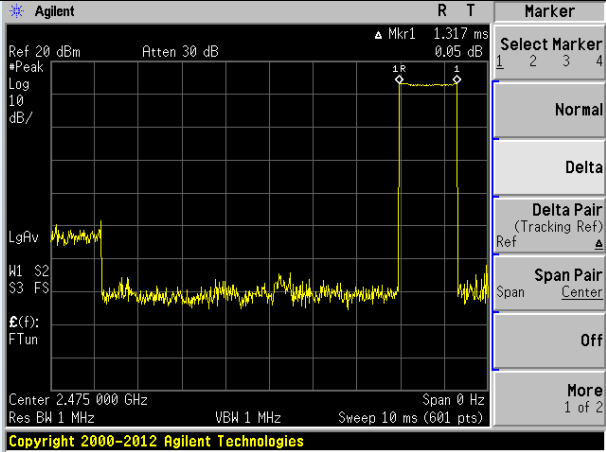
Ton



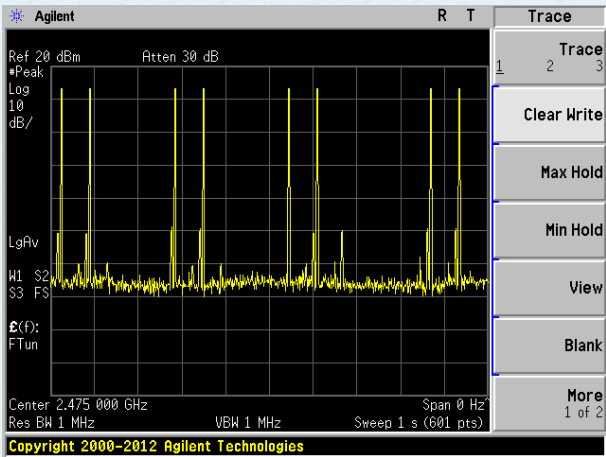
Ton times in 1s



Channel	Highest
---------	---------



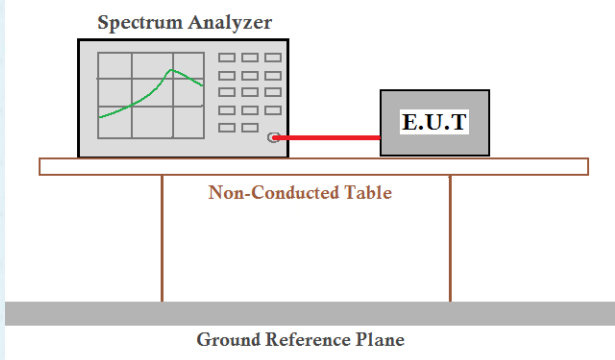
Ton



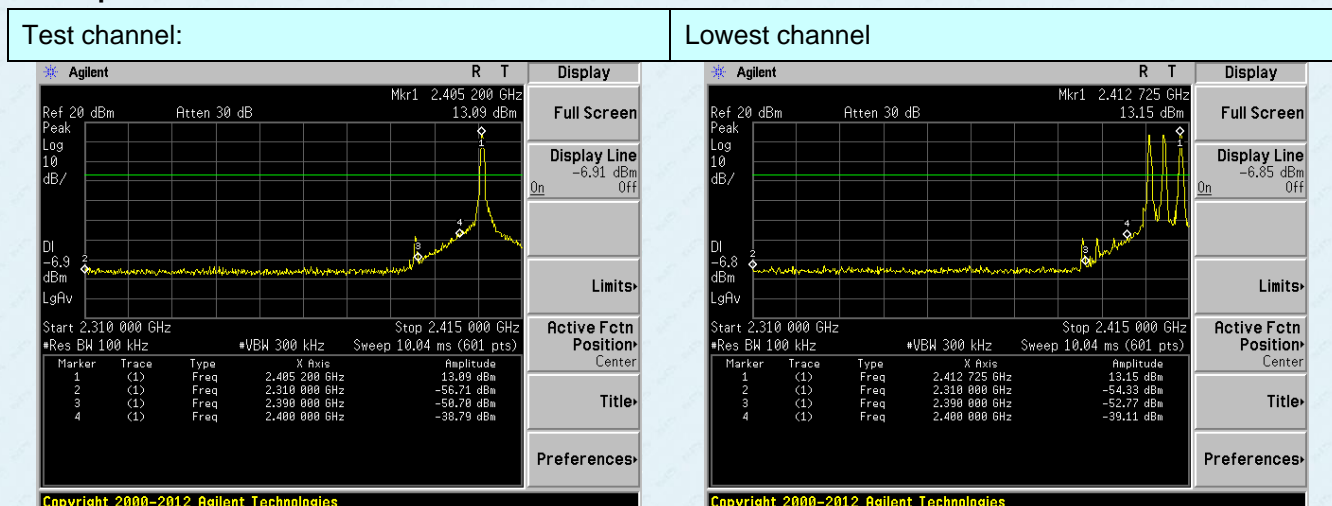
Ton times in 1s

## 7.8 Band Edge

### 7.8.1 Conducted Emission Method

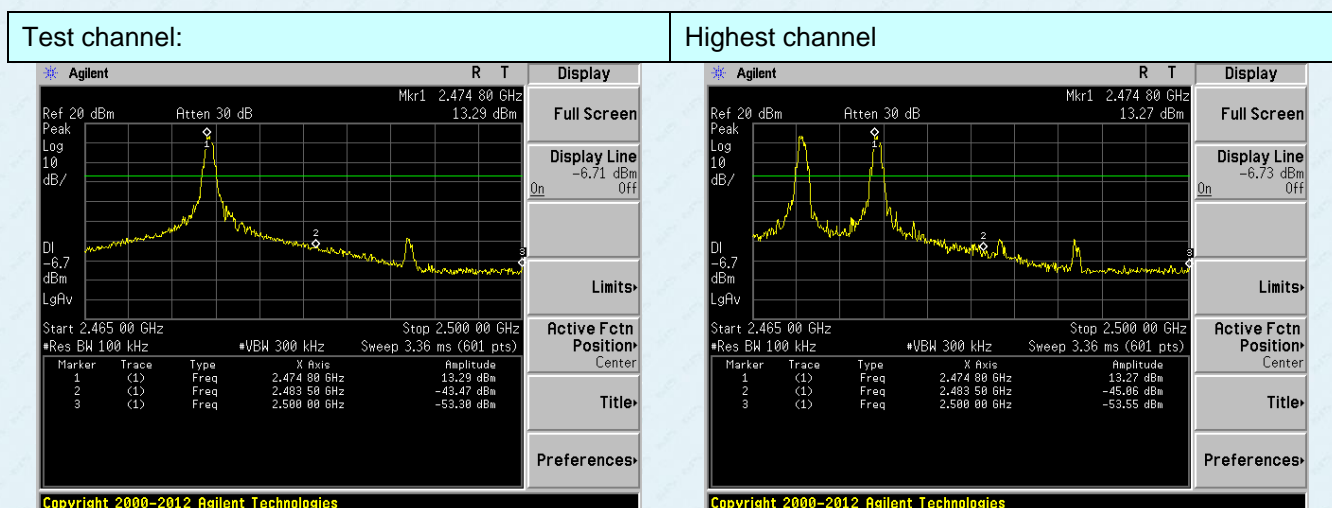
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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 section6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:



No-hopping mode

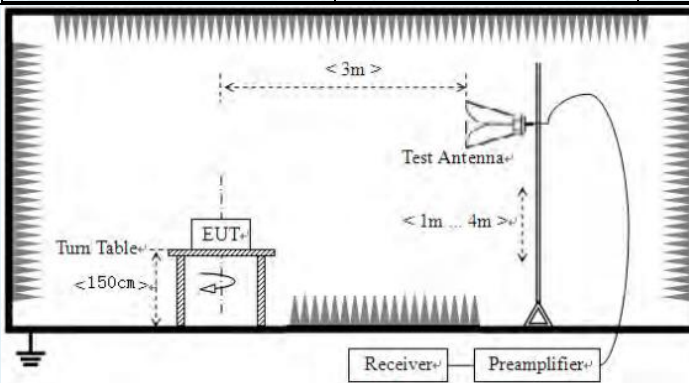
Hopping mode



No-hopping mode

Hopping mode

## 7.8.2 Radiated Emission Method

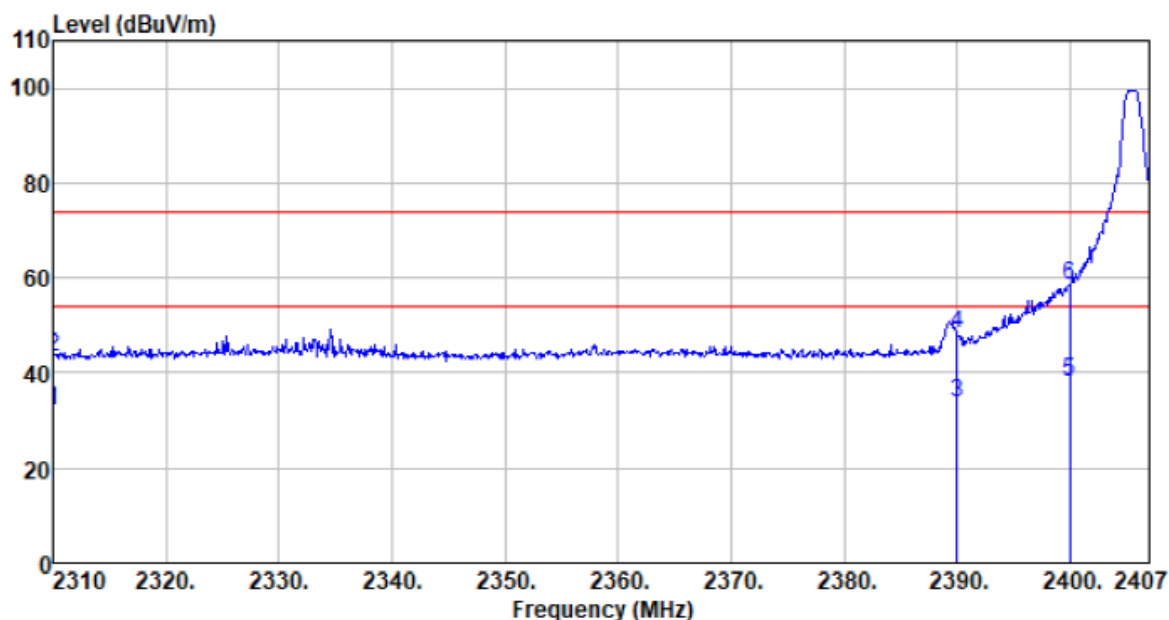
Test Requirement:	FCC Part15 C Section 15.209 and 15.205					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.					
Test site:	Measurement Distance: 3m					
Receiver setup:	Frequency	Detector	RBW	VBW	Remark	
	Above 1GHz	Peak	1MHz	3MHz	Peak Value	
		Peak	1MHz	10Hz	Average Value	
Limit:	Frequency		Limit (dBuV/m @3m)		Remark	
	Above 1GHz		54.00		Average Value	
			74.00		Peak Value	
Test setup:						
Test Procedure:	<div>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.</div> <div>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.</div> <div>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.</div> <div>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.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>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.</div>					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Temp. / Hum.	Temp.:	25 °C	Humid.:	52%	Press.:	1 012mbar
Test results:	Pass					

## Measurement Data

Remark:

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

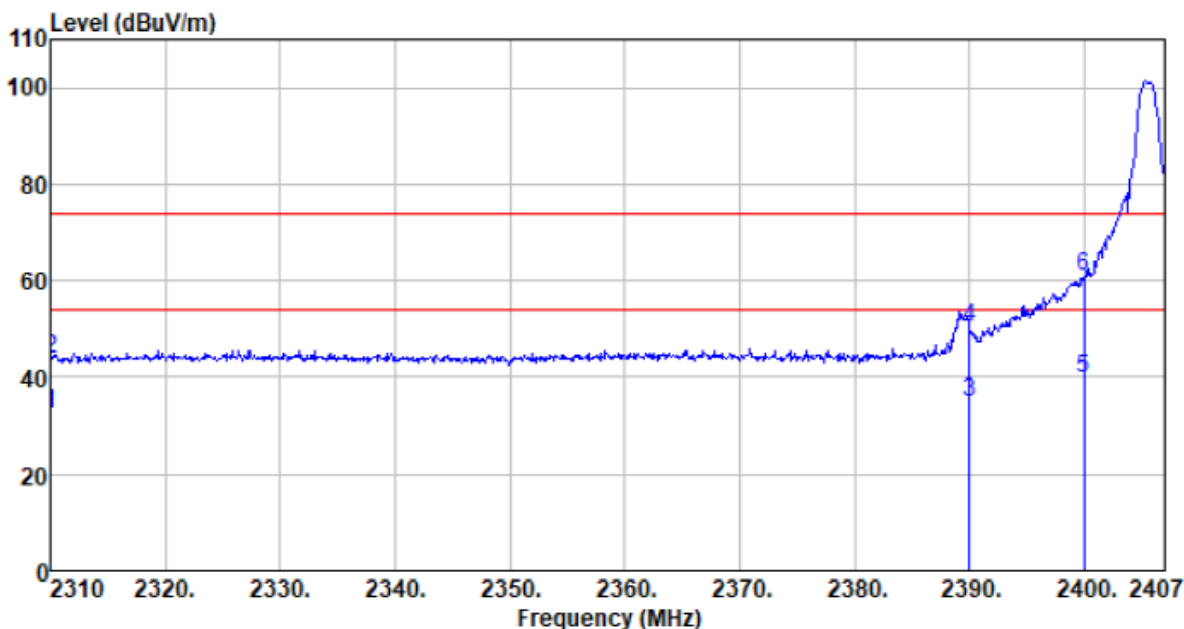
Test channel:	Lowest	Polarization:	Horizontal
---------------	--------	---------------	------------



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	32.69	27.14	2.81	30.43	32.21	54.00	-21.79	Average
2310.000	43.73	27.14	2.81	30.43	43.25	74.00	-30.75	Peak
2390.000	33.68	27.37	2.91	30.24	33.72	54.00	-20.28	Average
2390.000	48.38	27.37	2.91	30.24	48.42	74.00	-25.58	Peak
2400.000	38.15	27.41	2.91	30.26	38.21	54.00	-15.79	Average
2400.000	58.23	27.41	2.91	30.26	58.29	74.00	-15.71	Peak

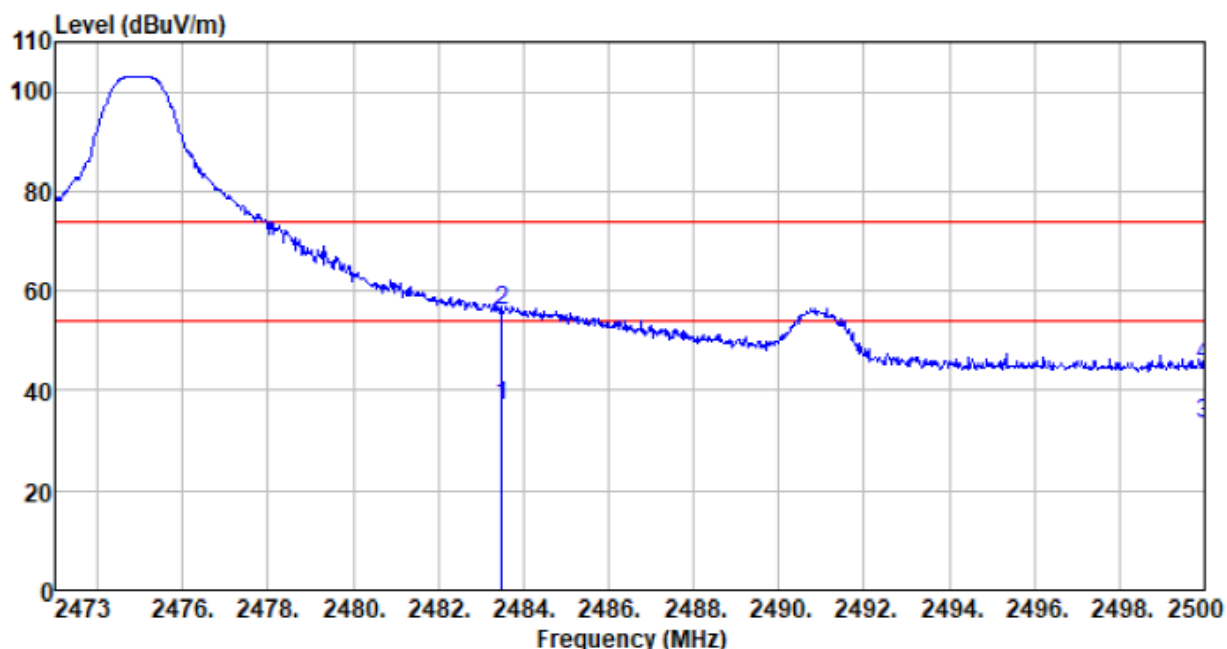


Test channel:	Lowest	Polarization:	Vertical
---------------	--------	---------------	----------



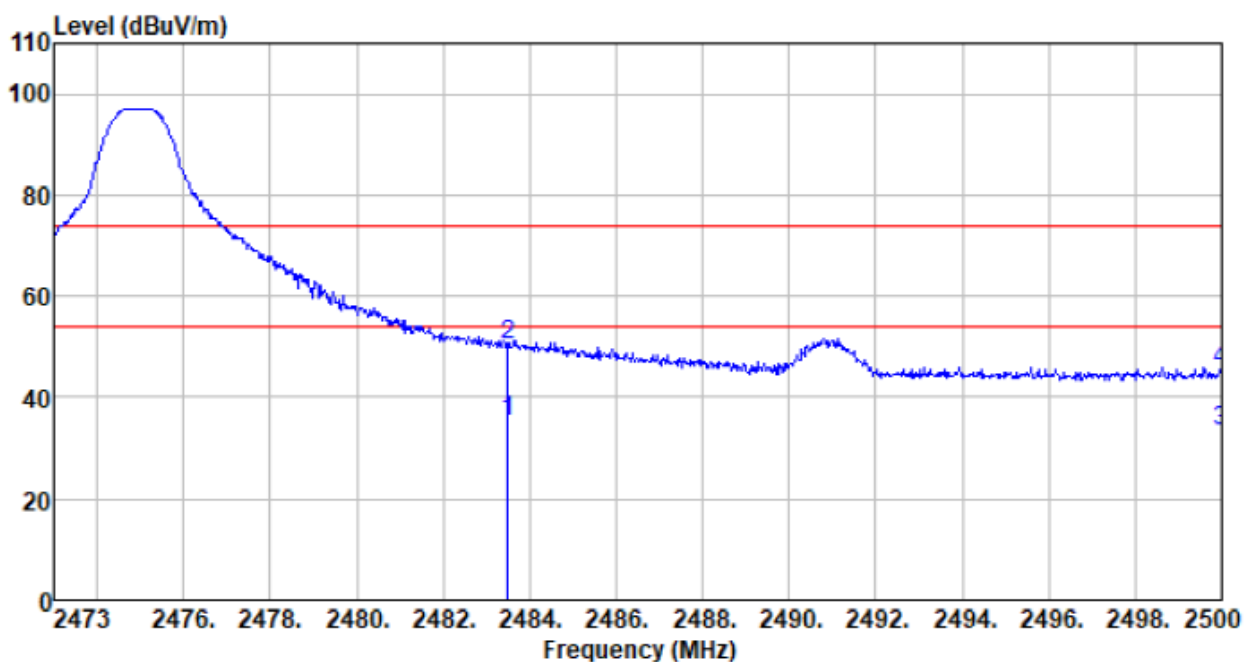
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	32.78	27.14	2.81	30.43	32.30	54.00	-21.70	Average
2310.000	44.16	27.14	2.81	30.43	43.68	74.00	-30.32	Peak
2390.000	34.68	27.37	2.91	30.24	34.72	54.00	-19.28	Average
2390.000	50.31	27.37	2.91	30.24	50.35	74.00	-23.65	Peak
2400.000	39.66	27.41	2.91	30.26	39.72	54.00	-14.28	Average
2400.000	60.69	27.41	2.91	30.26	60.75	74.00	-13.25	Peak

Test channel:	Highest	Polarization:	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	36.59	27.66	2.99	30.12	37.12	54.00	-16.88	Average
2483.500	55.58	27.66	2.99	30.12	56.11	74.00	-17.89	Peak
2500.000	32.69	27.70	3.01	30.13	33.27	54.00	-20.73	Average
2500.000	44.29	27.70	3.01	30.13	44.87	74.00	-29.13	Peak

Test channel:	Highest	Polarization:	Vertical
---------------	---------	---------------	----------



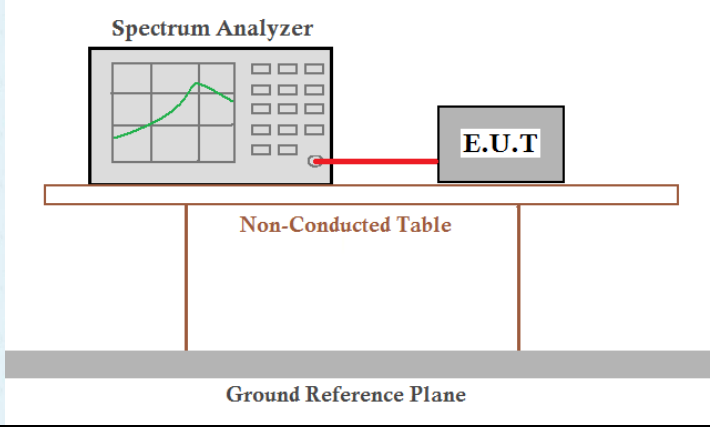
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	34.69	27.66	2.99	30.12	35.22	54.00	-18.78	Average
2483.500	49.78	27.66	2.99	30.12	50.31	74.00	-23.69	Peak
2500.000	32.59	27.70	3.01	30.13	33.17	54.00	-20.83	Average
2500.000	44.74	27.70	3.01	30.13	45.32	74.00	-28.68	Peak

#### Remark:

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

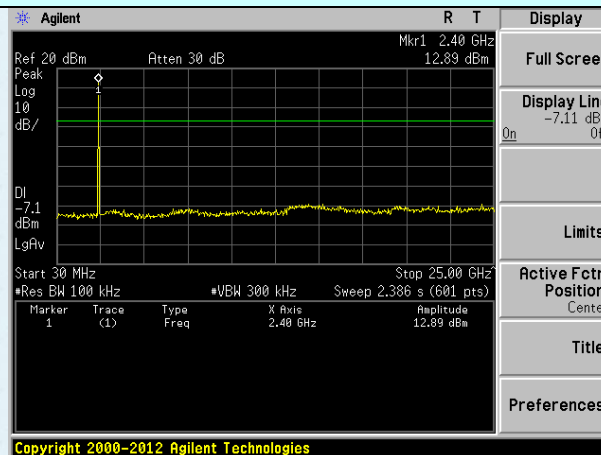
## 7.9 Spurious Emission

### 7.9.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
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 emission measurement. 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, which 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

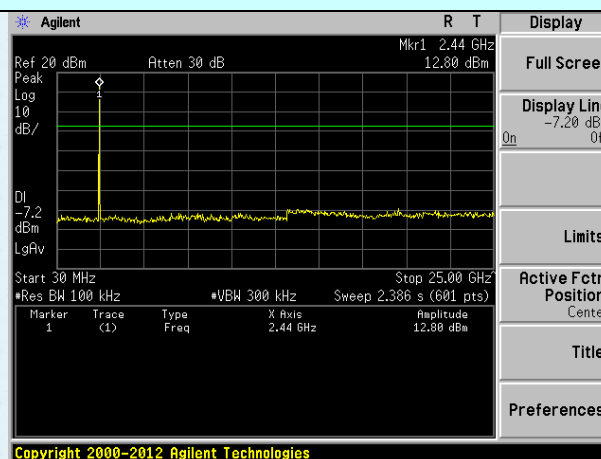
Test plot as follows:

Lowest channel



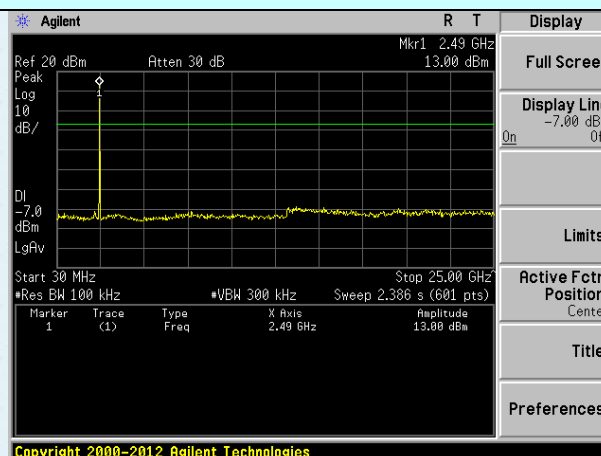
30MHz~25GHz

Middle channel



30MHz~25GHz

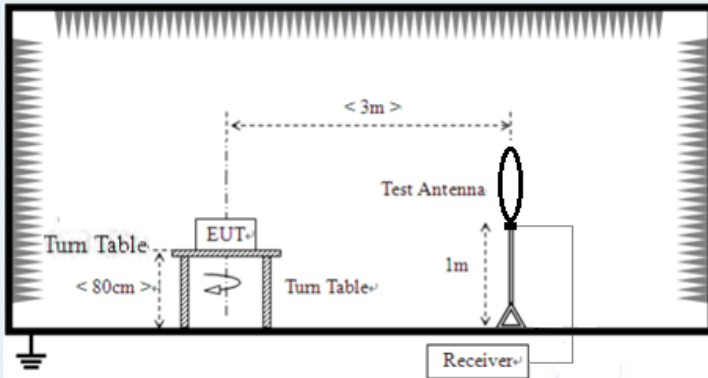
Highest channel

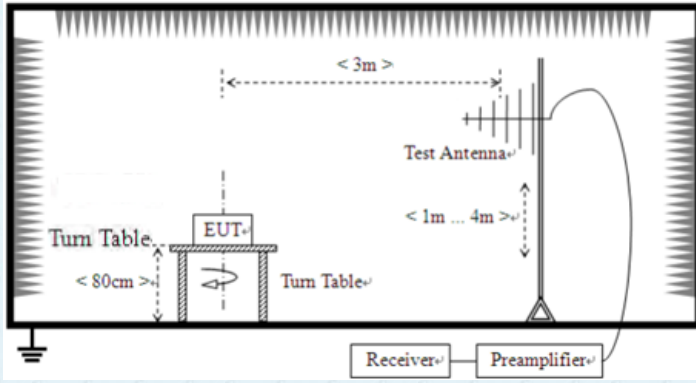
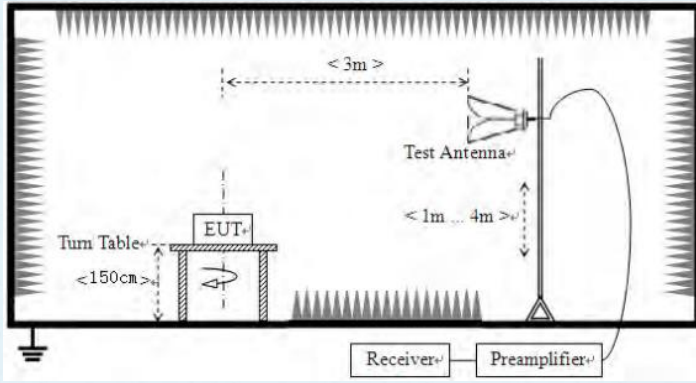


30MHz~25GHz



## 7.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
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	30m
	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	
Test setup:	Below 30MHz				
					
Below 1GHz					

	<div>Report No.: CPO2021000002021</div>  <p>Above 1GHz</p> 					
Test Procedure:	<ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5meters for above 1GHz) 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></ol>					
Test Instruments:	Refer to section 5.8 for details					
Test mode:	Refer to section 5.2 for details					
Temp. / Hum.	Temp.:	25 °C	Humid.:	52%	Press.:	1 012mbar

Test results:

Pass

**Remark:**

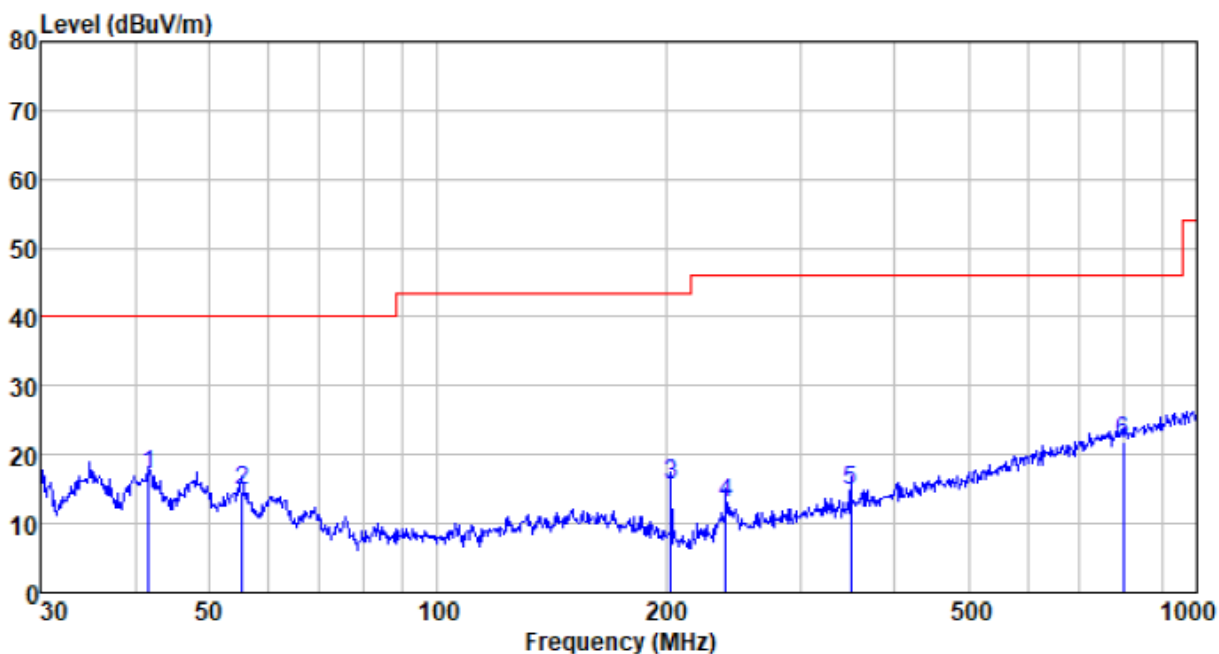
1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

**Measurement data:****■ Below 30MHz**

The 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.

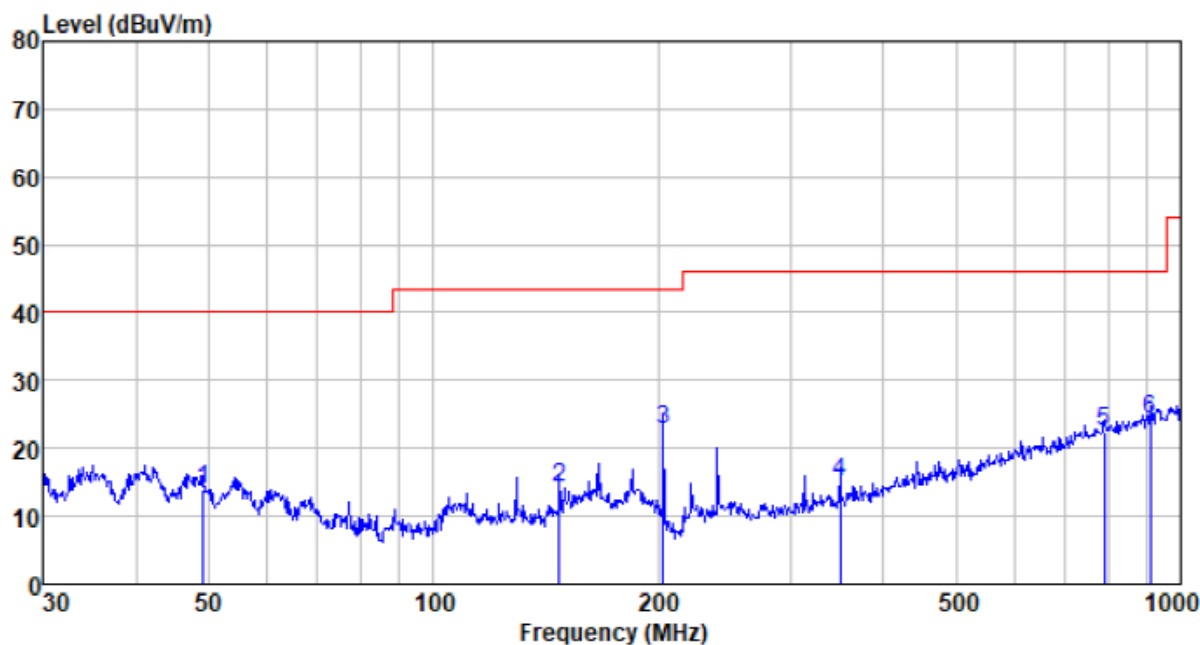
■ 30MHz ~ 1GHz

Test channel:	Lowest	Polarization:	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
41.713	39.16	13.16	0.68	35.76	17.24	40.00	-22.76	QP
55.221	37.63	12.54	0.82	36.26	14.73	40.00	-25.27	QP
202.810	41.84	9.16	1.86	37.33	15.53	43.50	-27.97	QP
239.987	37.98	10.45	2.07	37.37	13.13	46.00	-32.87	QP
350.477	36.15	13.56	2.62	37.47	14.86	46.00	-31.14	QP
798.980	32.90	22.23	4.45	37.62	21.96	46.00	-24.04	QP

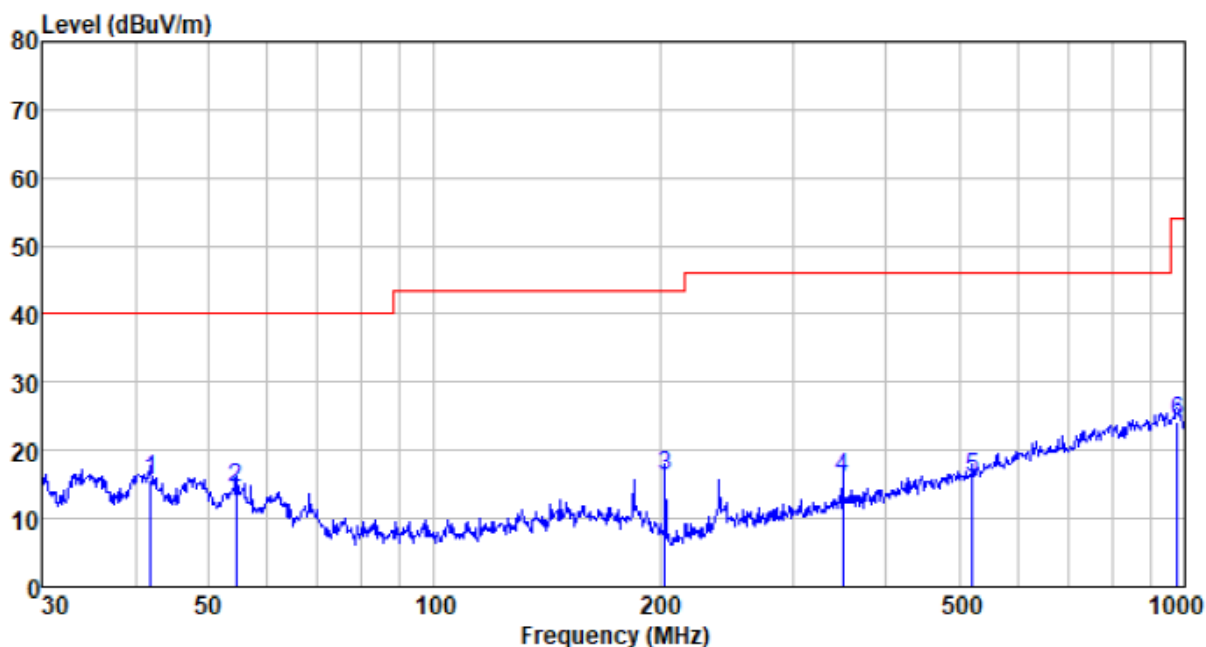
Test channel:	Lowest	Polarization:	Vertical
---------------	--------	---------------	----------



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
49.187	36.30	13.03	0.76	36.14	13.95	40.00	-26.05	QP
147.404	37.14	12.60	1.55	37.06	14.23	43.50	-29.27	QP
202.810	49.04	9.16	1.86	37.33	22.73	43.50	-20.77	QP
350.477	36.39	13.56	2.62	37.47	15.10	46.00	-30.90	QP
790.619	33.39	22.11	4.42	37.62	22.30	46.00	-23.70	QP
909.667	33.80	23.15	4.88	37.59	24.24	46.00	-21.76	QP

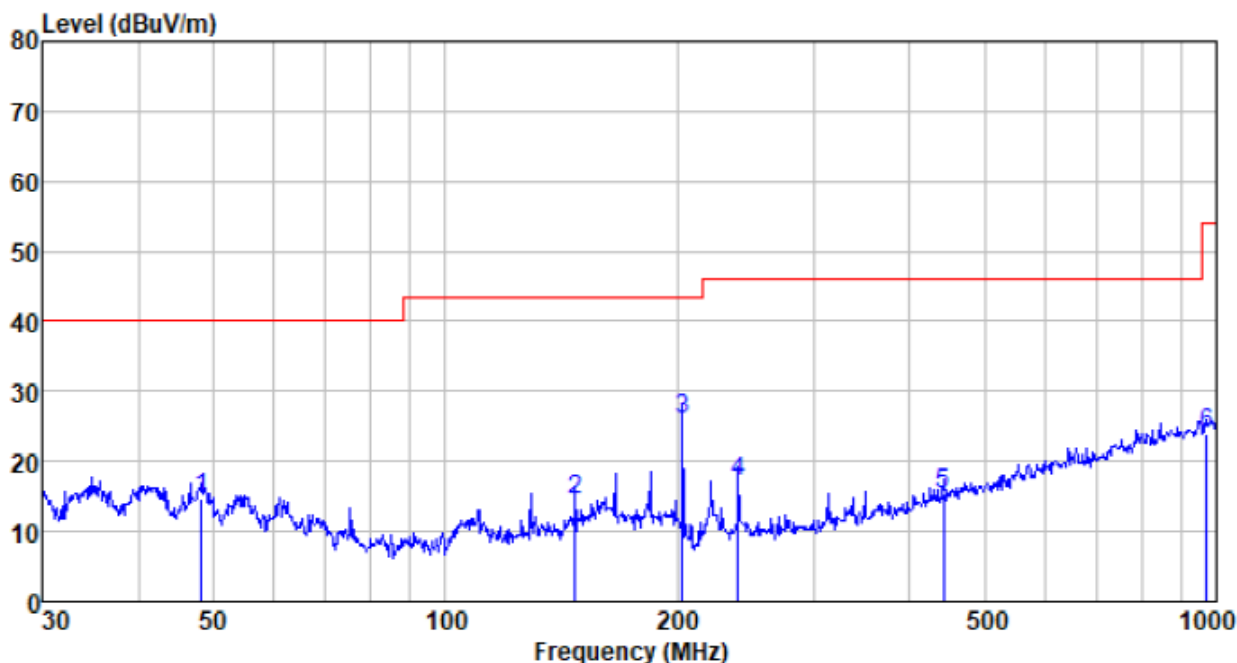


Test channel:	Middle	Polarization:	Horizontal
---------------	--------	---------------	------------



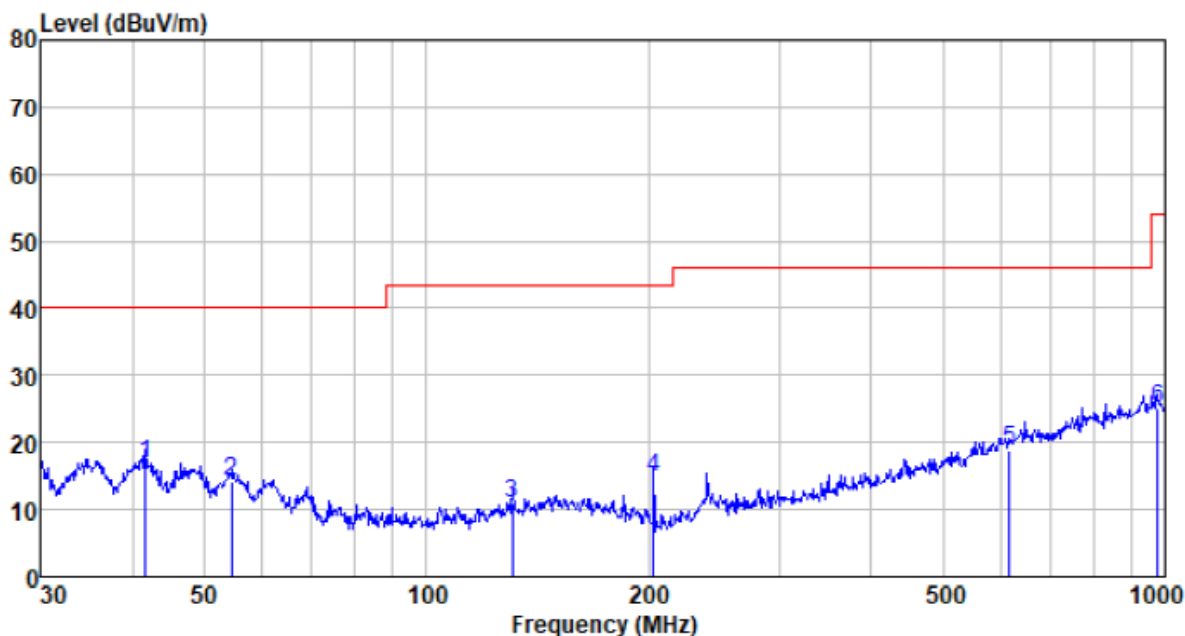
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
41.860	37.53	13.15	0.68	35.77	15.59	40.00	-24.41	QP
54.452	37.18	12.60	0.81	36.25	14.34	40.00	-25.66	QP
202.810	42.44	9.16	1.86	37.33	16.13	43.50	-27.37	QP
350.477	37.11	13.56	2.62	37.47	15.82	46.00	-30.18	QP
520.888	33.09	17.11	3.39	37.52	16.07	46.00	-29.93	QP
975.753	32.69	23.99	5.14	37.53	24.29	54.00	-29.71	QP

Test channel:	Middle	Polarization:	Vertical
---------------	--------	---------------	----------



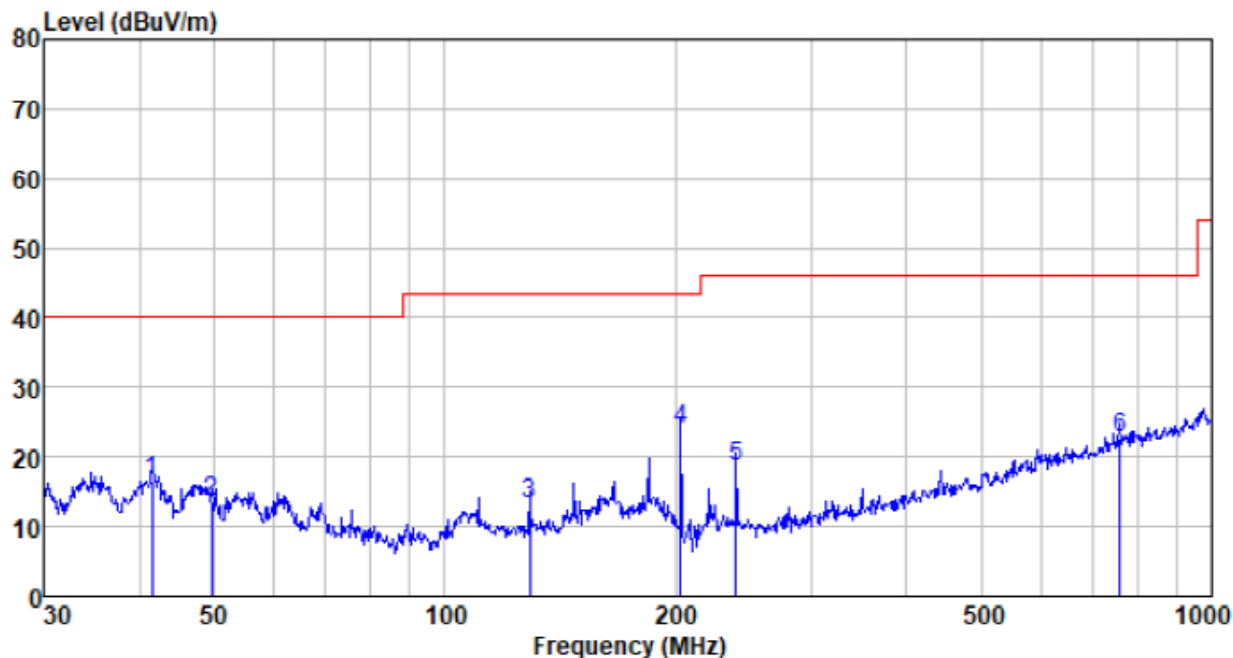
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
48.332	37.08	13.01	0.75	36.10	14.74	40.00	-25.26	QP
147.404	37.36	12.60	1.55	37.06	14.45	43.50	-29.05	QP
202.810	52.37	9.16	1.86	37.33	26.06	43.50	-17.44	QP
239.987	42.10	10.45	2.07	37.37	17.25	46.00	-28.75	QP
443.294	34.06	15.83	3.06	37.52	15.43	46.00	-30.57	QP
972.337	32.37	23.99	5.12	37.53	23.95	54.00	-30.05	QP

Test channel:	Highest	Polarization:	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
41.713	38.82	13.16	0.68	35.76	16.90	40.00	-23.10	QP
54.452	36.87	12.60	0.81	36.25	14.03	40.00	-25.97	QP
130.837	34.78	11.66	1.44	36.96	10.92	43.50	-32.58	QP
202.810	40.99	9.16	1.86	37.33	14.68	43.50	-28.82	QP
616.372	33.02	19.54	3.79	37.56	18.79	46.00	-27.21	QP
975.753	33.45	23.99	5.14	37.53	25.05	54.00	-28.95	QP

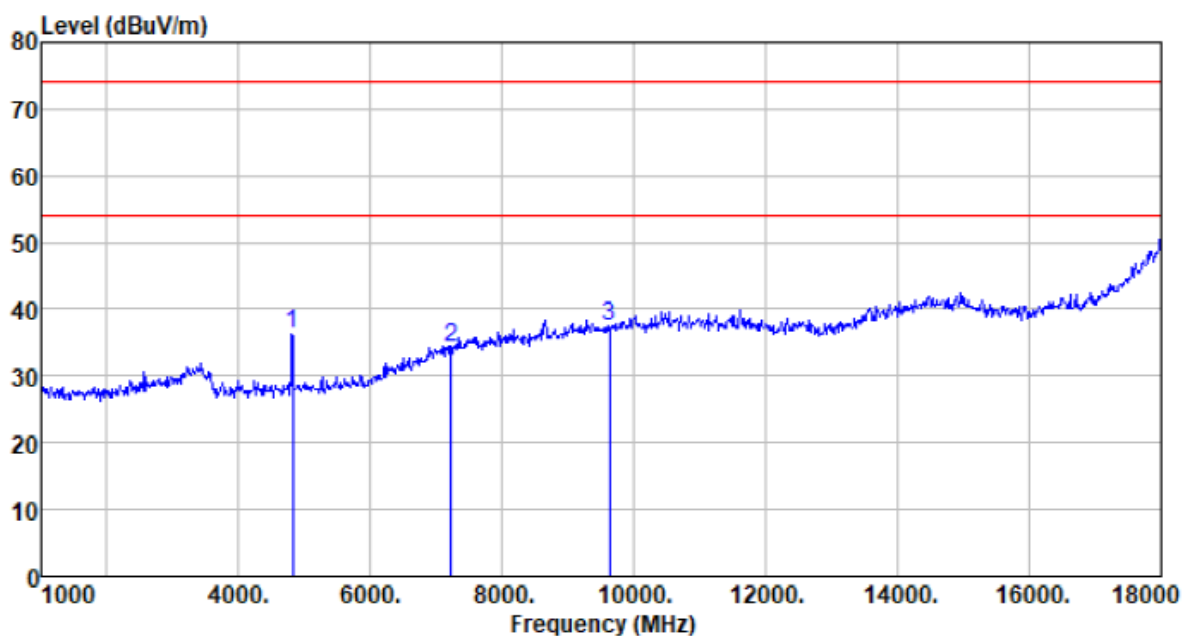
Test channel:	Highest	Polarization:	Vertical
---------------	---------	---------------	----------



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
41.567	38.50	13.17	0.68	35.75	16.60	40.00	-23.40	QP
49.707	35.83	13.04	0.77	36.17	13.47	40.00	-26.53	QP
129.015	37.09	11.57	1.43	36.94	13.15	43.50	-30.35	QP
202.810	50.13	9.16	1.86	37.33	23.82	43.50	-19.68	QP
239.987	43.58	10.45	2.07	37.37	18.73	46.00	-27.27	QP
758.041	34.45	21.66	4.31	37.62	22.80	46.00	-23.20	QP

- Unwanted Emissions in Restricted Frequency Bands
- Above 1GHz

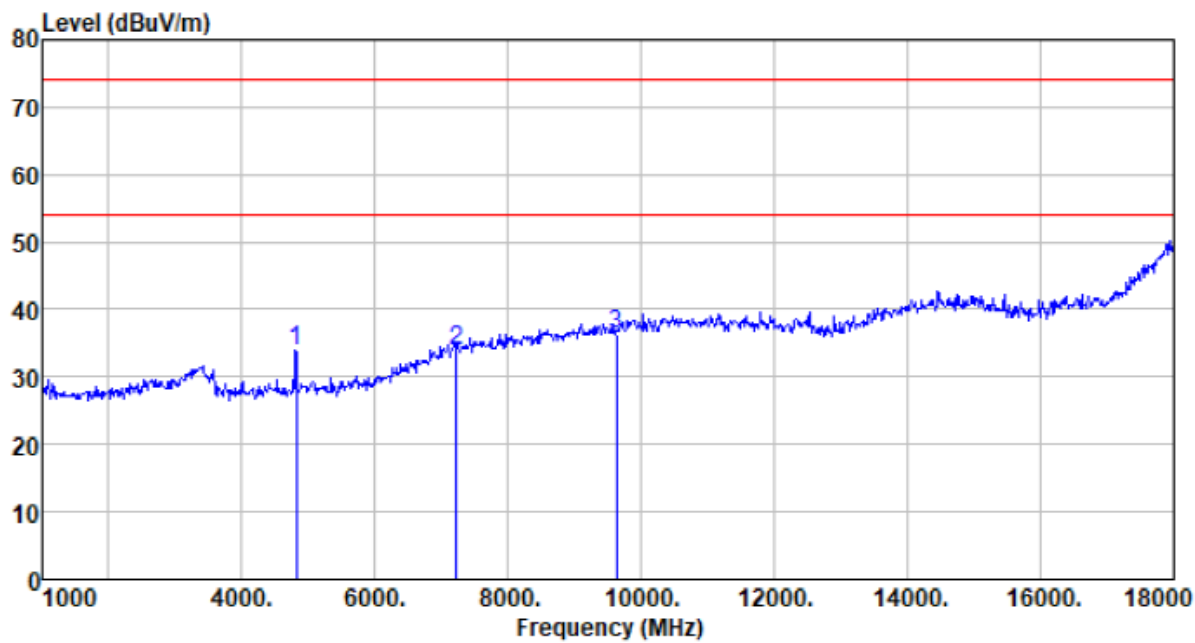
Test channel:	Lowest	Polarization:	Horizontal
---------------	--------	---------------	------------



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
4811.000	38.18	31.20	4.61	37.73	36.26	74.00	-37.74	Peak
7216.500	27.09	36.20	6.50	35.63	34.16	74.00	-39.84	Peak
9622.000	26.37	37.93	7.98	34.94	37.34	74.00	-36.66	Peak

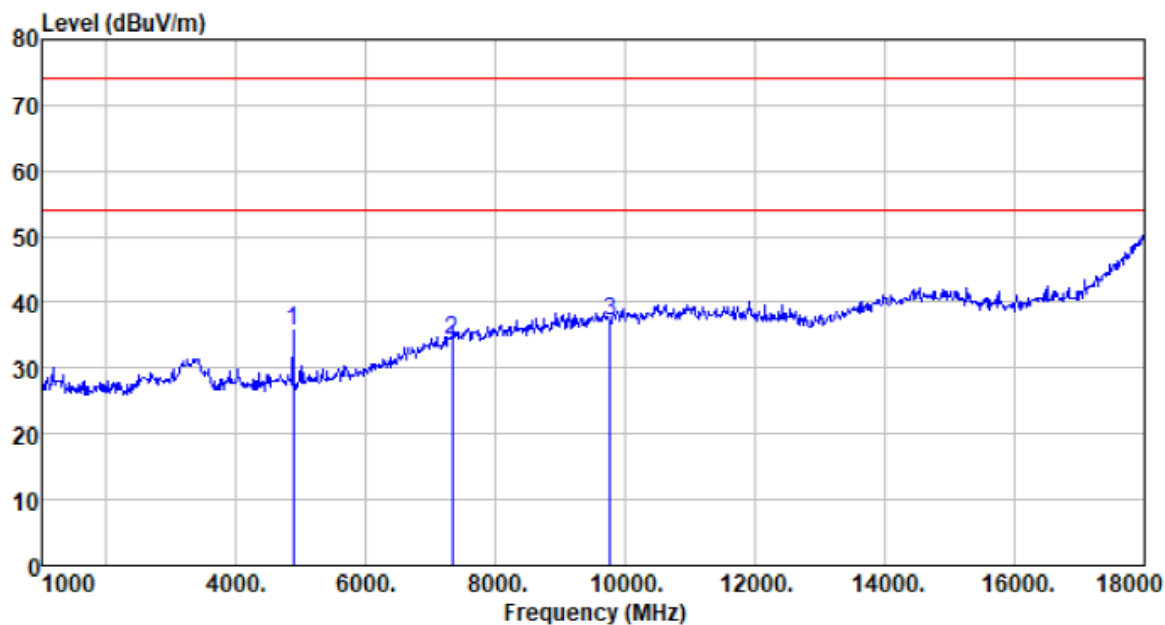


Test channel:	Lowest	Polarization:	Vertical
---------------	--------	---------------	----------



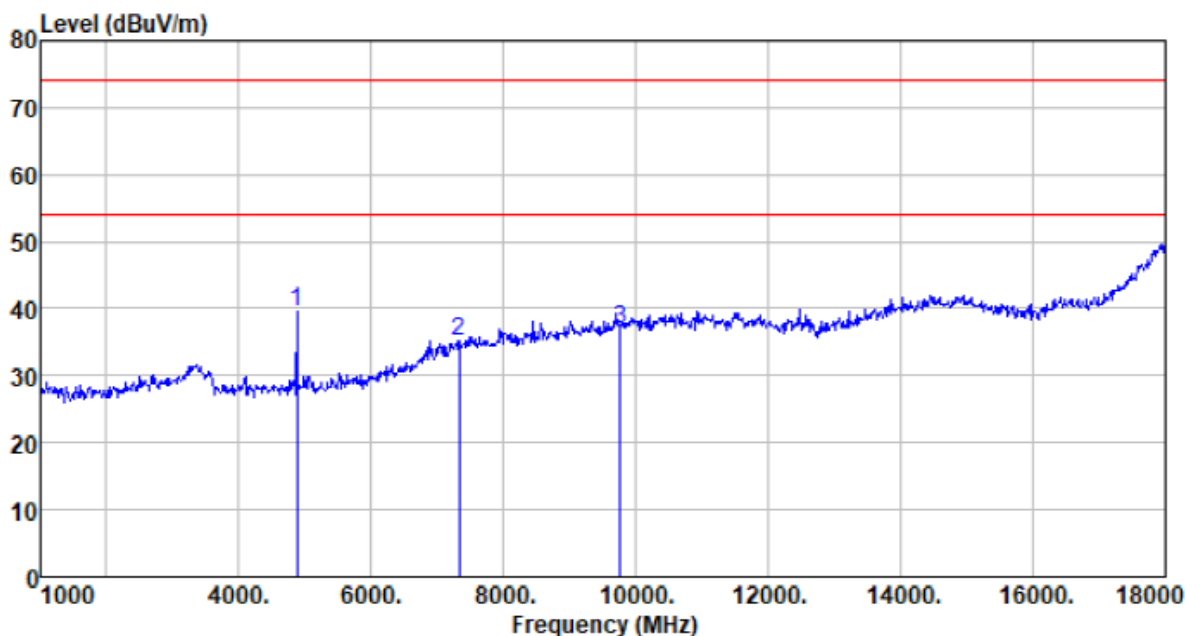
Freq MHz	Reading level dBUV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBUV/m	Limit level dBUV/m	Over limit dB	Remark
4811.000	35.92	31.20	4.61	37.73	34.00	74.00	-40.00	Peak
7216.500	27.01	36.20	6.50	35.63	34.08	74.00	-39.92	Peak
9622.000	25.44	37.93	7.98	34.94	36.41	74.00	-37.59	Peak

Test channel:	Middle	Polarization:	Horizontal
---------------	--------	---------------	------------



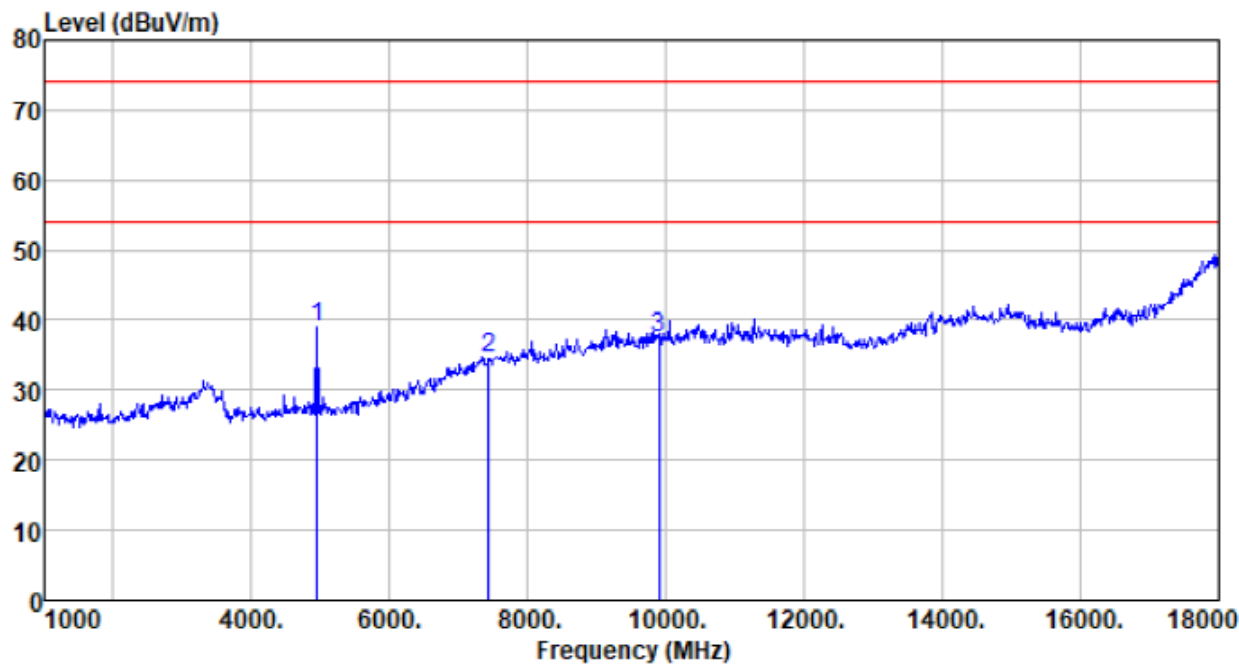
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	37.33	31.31	4.69	37.75	35.58	74.00	-38.42	Peak
7320.000	26.71	36.43	6.63	35.60	34.17	74.00	-39.83	Peak
9760.000	26.13	38.10	8.03	35.03	37.23	74.00	-36.77	Peak

Test channel:	Middle	Polarization:	Vertical
---------------	--------	---------------	----------



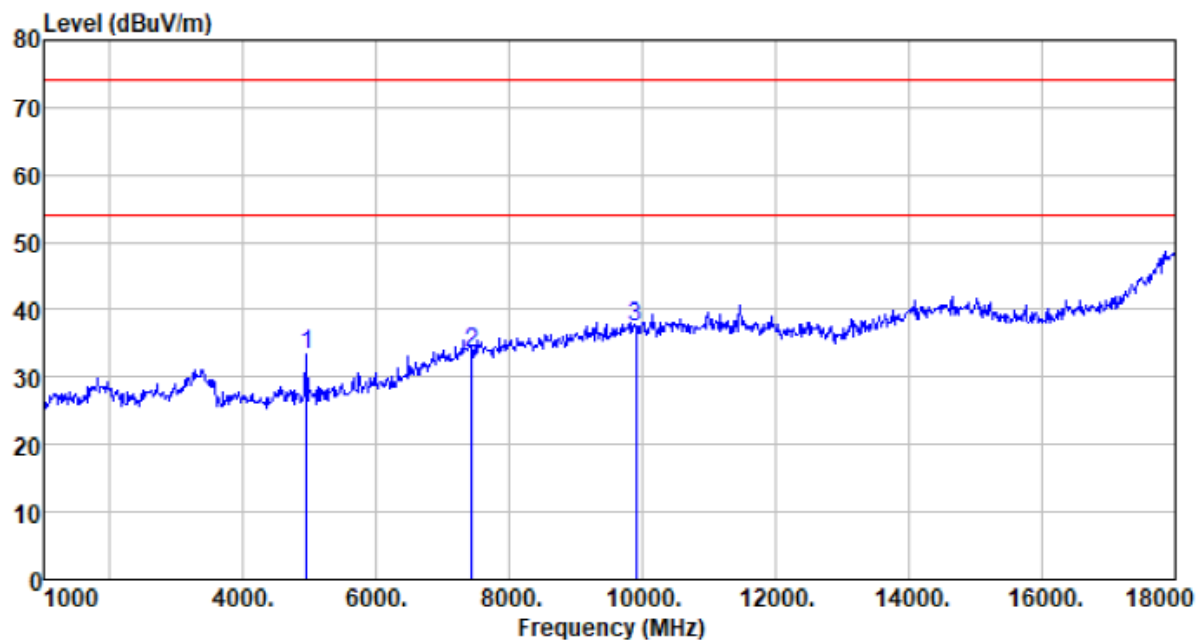
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	41.41	31.31	4.69	37.75	39.66	74.00	-34.34	Peak
7320.000	27.76	36.43	6.63	35.60	35.22	74.00	-38.78	Peak
9760.000	25.66	38.10	8.03	35.03	36.76	74.00	-37.24	Peak

Test channel:	Highest	Polarization:	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
4950.000	40.56	31.41	4.77	37.78	38.96	74.00	-35.04	Peak
7425.000	26.60	36.66	6.75	35.56	34.45	74.00	-39.55	Peak
9900.000	26.13	38.27	8.09	35.12	37.37	74.00	-36.63	Peak

Test channel:	Highest	Polarization:	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
4950.000	34.90	31.41	4.77	37.78	33.30	74.00	-40.70	Peak
7425.000	25.87	36.66	6.75	35.56	33.72	74.00	-40.28	Peak
9900.000	26.31	38.27	8.09	35.12	37.55	74.00	-36.45	Peak

#### Remark:

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.



## 8 Test Setup Photo

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

## 9 EUT Constructional Details

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

---End---