FCC TEST REPORT

FCC ID	: 2AABVWVCMSQ1B
Applicant	: ASA ELECTRONICS
Address	: 2602 MARINA DRIVE, ELKHART, Indiana 46514
Manufacturer	: ASA ELECTRONICS
Address	: 2602 MARINA DRIVE, ELKHART, Indiana 46514

Equipment Under Test (EUT) :

Product Name	: VOYAGER TOUGHCAM DIGITAL WIRELESS OBSERVATION SYSTEM
Model No.	: WVCMSQ1B
Rules	: FCC CFR47 Part 15 Section 15.247:2010
Date of Test	: June 24~26, 2013
Date of Issue	: July 08, 2013
Test Result	**: PASS**

Remark:

* The sample described above has been tested to be in compliance with the requirements of ANSI C63.4:2003. The test results have been reviewed and comply with the rules listed above and found to meet their essential requirements.

The 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.

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,

Shenzhen 518105, China

Tel: +86-755-83551033 Fax: +86-755-83552400

Compiled by: Approved by:

Maikou.zhang/ Project Engineer

Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	N/A
Radiated Emissions	15.205(a) 15.209 15.247(d)	PASS
Duty Cycle	15.35	PASS
Band edge	15.247(d) 15.205(a)	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separated	15.247(a)(1)	PASS
Hopping Channel Number	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: VOYAGER TOUGHCAM DIGITAL WIRELESS OBSERVATION SYSTEM
Model No.	: WVCMSQ1B
Type of Modulation	: GFSK
Operation Frequency	: 2402MHz ~ 2480MHz, 40 channels
Oscillator	: Crystal 16MHz for RF module; 24MHz for MCU
Antenna Gain	: 3dBi & 5dBi (with 3m shielding cable and 9m shielding cable ,This two cables only apply to 5dBi antenna.Cable loss : 3m cable is -1.5632dB, 9m cable is -4.7267dB, the cable use connector of RP SMA with nonstandard whorl).

4.2 Details of E.U.T.

Technical Data	: DC 12~24V
Adapter	: N/A

4.3 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A**

  Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.4 Test Location

All the tests were performed at:
Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd.,Songgang Street, Baoan District, Shenzhen, China

4.5 Test Mode

Test Item	Test Mode
Conducted Emissions	Normal linking
Radiated Emissions	Normal linking

4.6 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2404	3	2406	4	2408
5	2410	6	2412	7	2414	8	2416
9	2418	10	2420	11	2422	12	2424
13	2426	14	2428	15	2430	16	2432
17	2434	18	2436	19	2438	20	2440
21	2442	22	2444	23	2446	24	2448
25	2450	26	2452	27	2454	28	2456
29	2458	30	2460	31	2462	32	2464
33	2466	34	2468	35	2470	36	2472
37	2474	38	2476	39	2478	40	2480

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Aug. 13,2012	Aug. 12,2013
2.	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 12,2013
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr. 20,2013	Apr. 19,2014
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr. 20,2013	Apr. 19,2014
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 12,2013
6.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.06,2014
7.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 12,2013
8.	Cable	Top	EWO2014-7	-	Apr. 20,2013	Apr. 19,2014
9.	Cable	Top	TYPE16(13M)	-	Aug. 13,2012	Aug. 12,2013

5.2 Measurement Uncertainty

Parameter	**Uncertainty**
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit
Test Results:	N/A
Remark:	This device powered by battery,this test is not applicable.

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Frequency Range: 16MHz to 25GHz

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation :

Operating Environment:

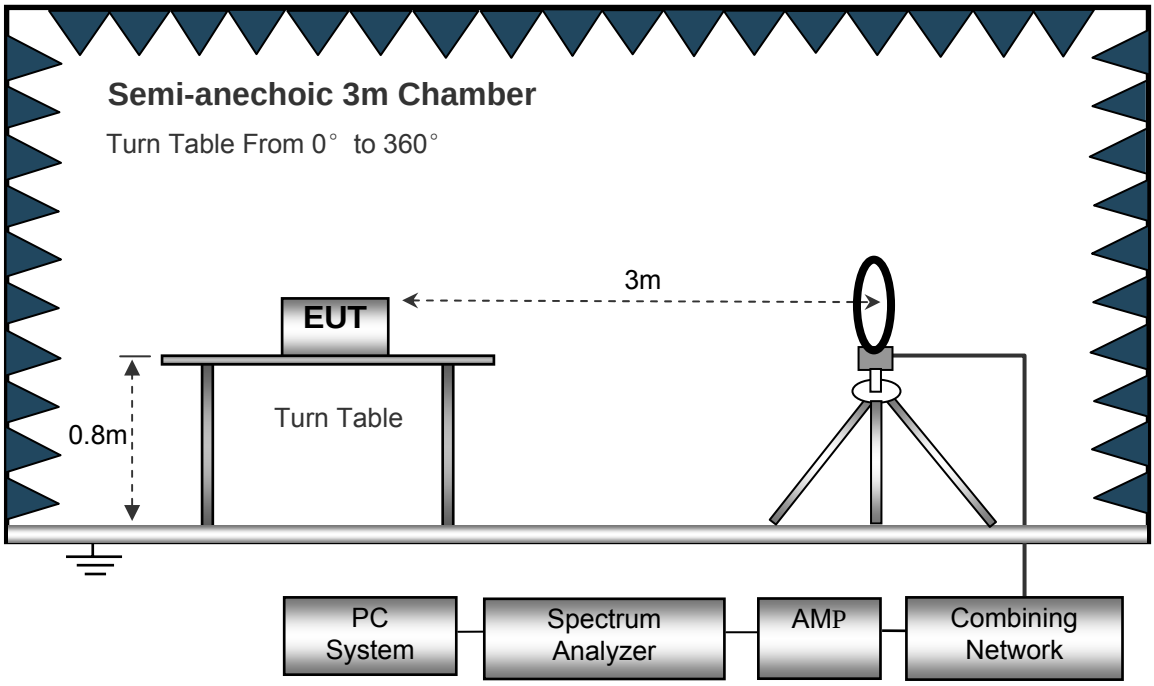
Temperature: 25.5 °C

Humidity: 51 % RH

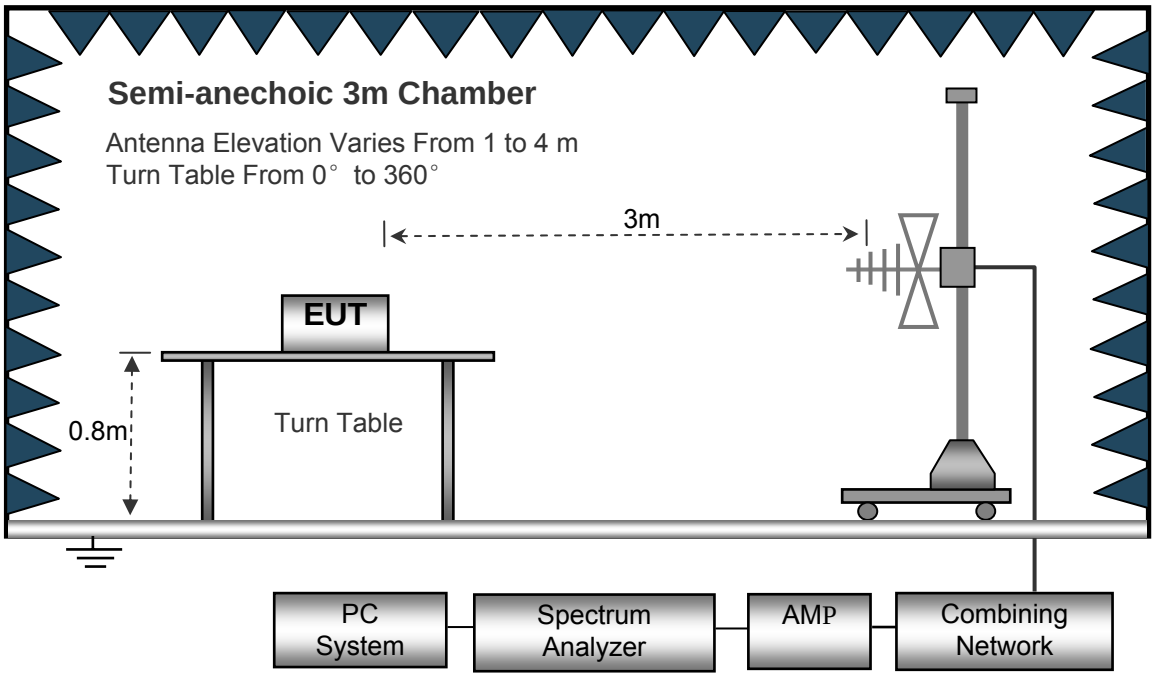
Atmospheric Pressure:1010 mbar

7.2 Test Setup

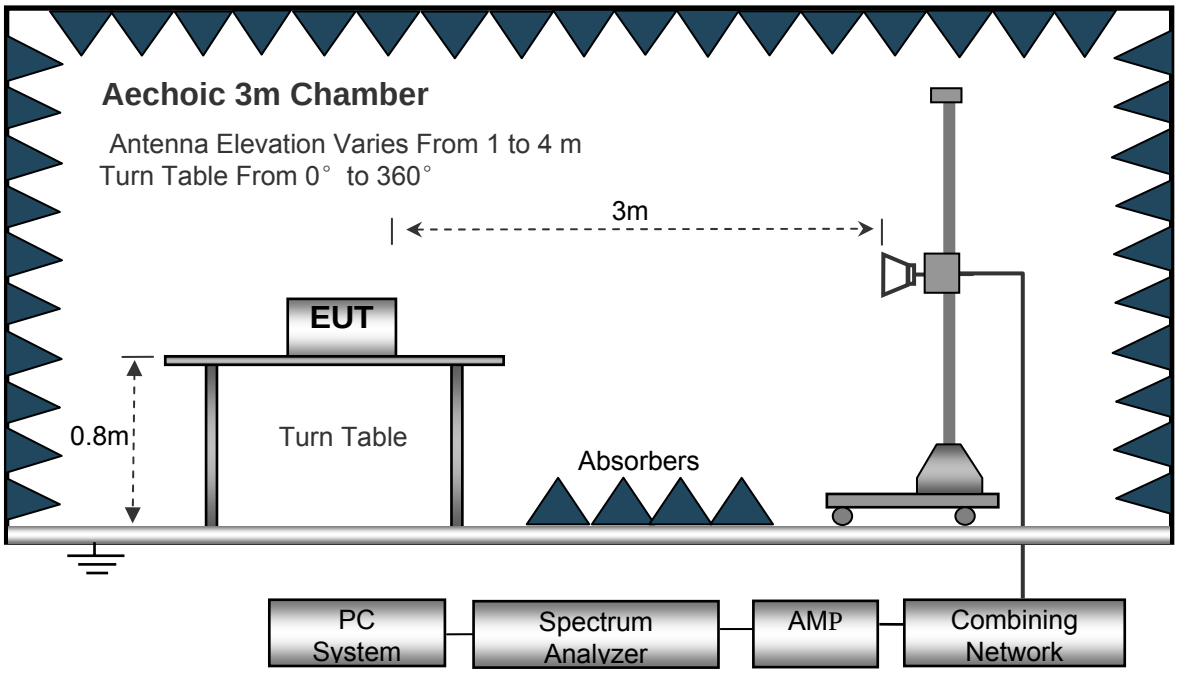
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 16MHz to 25000MHz.

Below 30MHz

Sweep Speed .....Auto
IF Bandwidth.....10KHz
Video Bandwidth.....10KHz

Resolution Bandwidth.....10KHz

30MHz ~ 1GHz

Sweep Speed .....Auto
IF Bandwidth.....120KHz
Video Bandwidth.....100KHz
Quasi-Peak Adapter Bandwidth 120KHz
Quasi-Peak Adapter Mode .....Normal
Resolution Bandwidth.....100KHz

Above 1GHz

Sweep Speed .....Auto
IF Bandwidth.....120 KHz
Video Bandwidth.....3MHz
Quasi-Peak Adapter Bandwidth .....120 KHz
Quasi-Peak Adapter Mode .....Normal
Resolution Bandwidth.....1MHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under X-axes position(X denotes lying on the table).

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test mode: normal operation mode

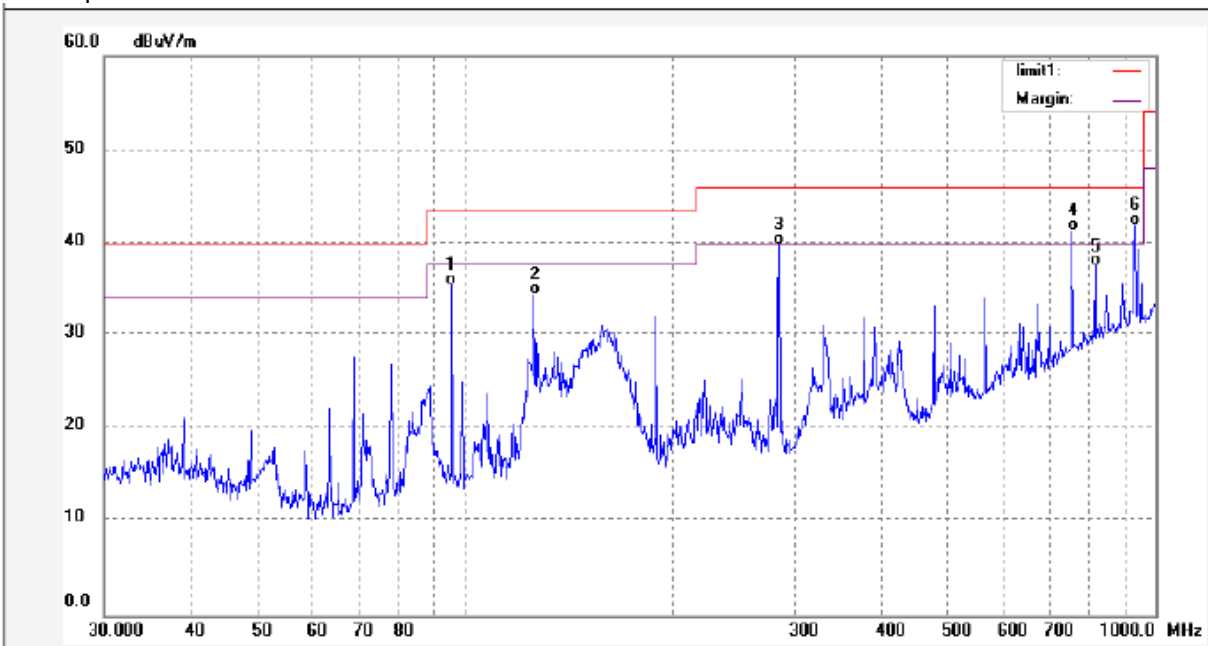
Test Frequency Range : Below 30MHz
The measurements were more than 20 dB below the limit and not reported.

Test Frequency Range : 30MHz ~ 1000MHz

Remark: the EUT was pretested at the highest, middle and lowest channel , and powered by DC 12 V, DC 24V, and the worst case was the lowest Channel with DC 24V powered, so the data show was the lowest channel only.

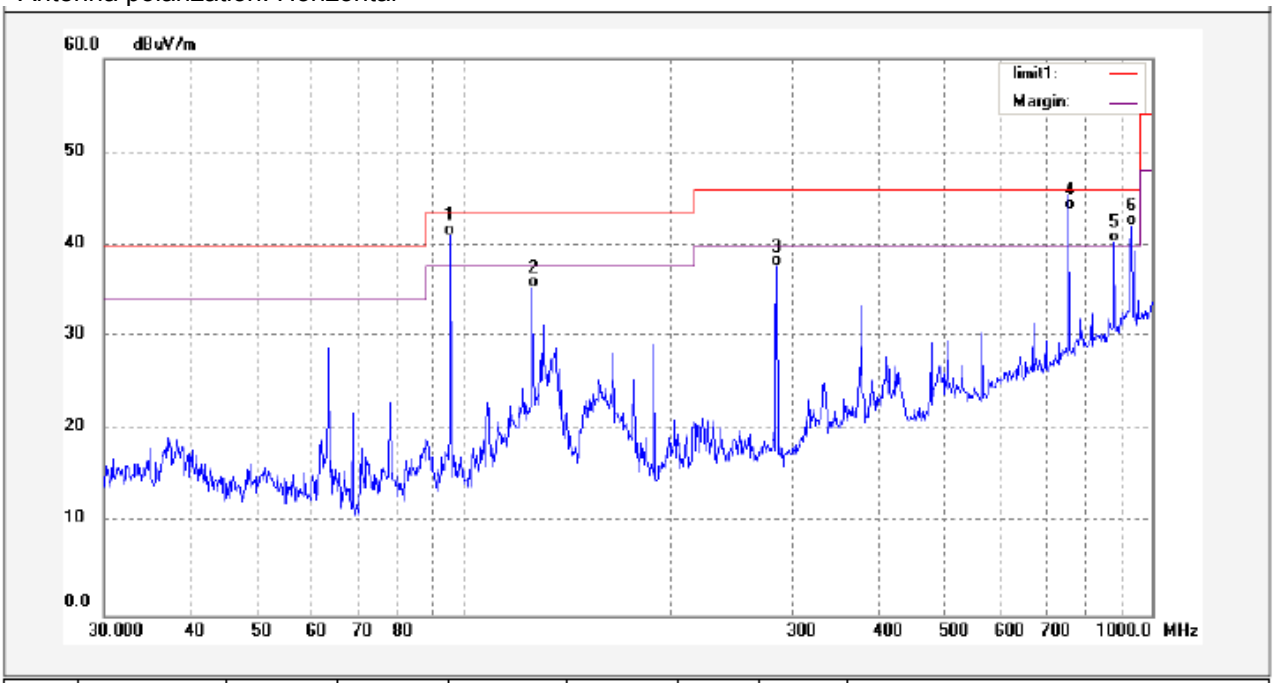
Test Mode: Transmitting mode (5dBi antenna with 3m cable)

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	95.6485	21.98	13.29	35.27	43.50	-8.23	QP	
2	125.8059	22.71	11.59	34.30	43.50	-9.20	QP	
3	285.2611	23.71	16.11	39.82	46.00	-6.18	QP	
4	757.6201	13.87	27.50	41.37	46.00	-4.63	QP	
5	818.5062	8.53	28.97	37.50	46.00	-8.50	QP	
6	935.4214	10.49	31.37	41.86	46.00	-4.14	QP	

Antenna polarization: Horizontal

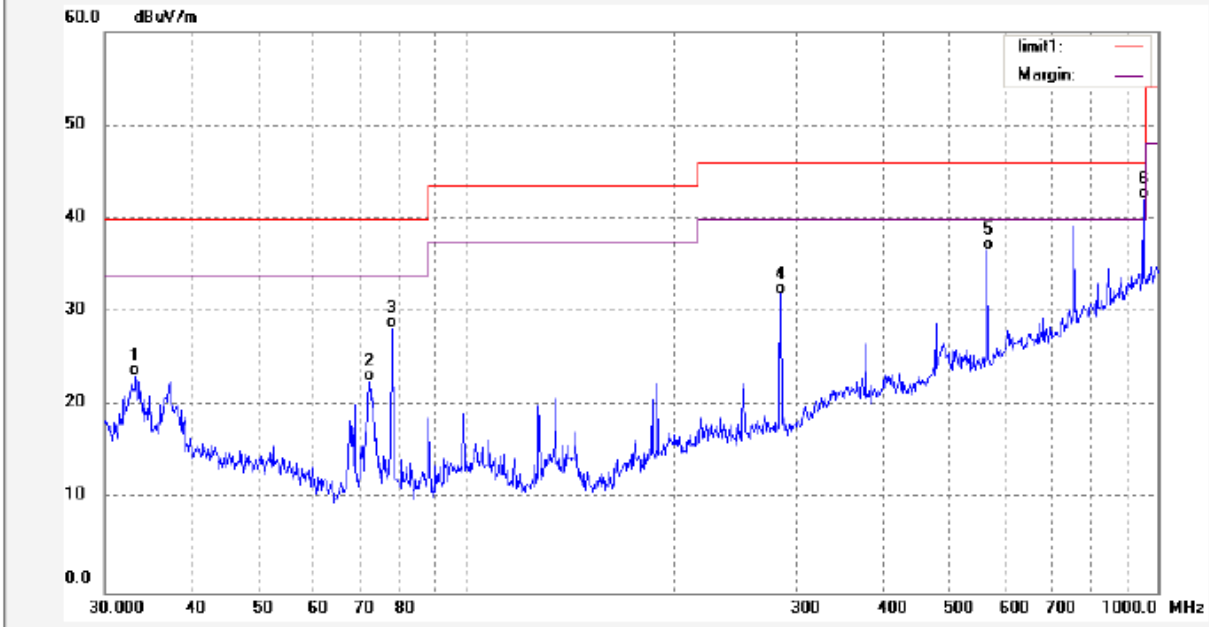


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	95.6485	27.80	13.29	41.09	43.50	-2.41	QP	
2	125.8059	23.58	11.59	35.17	43.50	-8.33	QP	
3	285.2611	21.44	16.11	37.55	46.00	-8.45	QP	
4	757.6201	16.25	27.50	43.75	46.00	-2.25	QP	
5	881.1838	10.47	29.86	40.33	46.00	-5.67	QP	
6	935.4214	10.67	31.37	42.04	46.00	-3.96	QP	

Test Frequency Range : 30MHz ~ 1000MHz

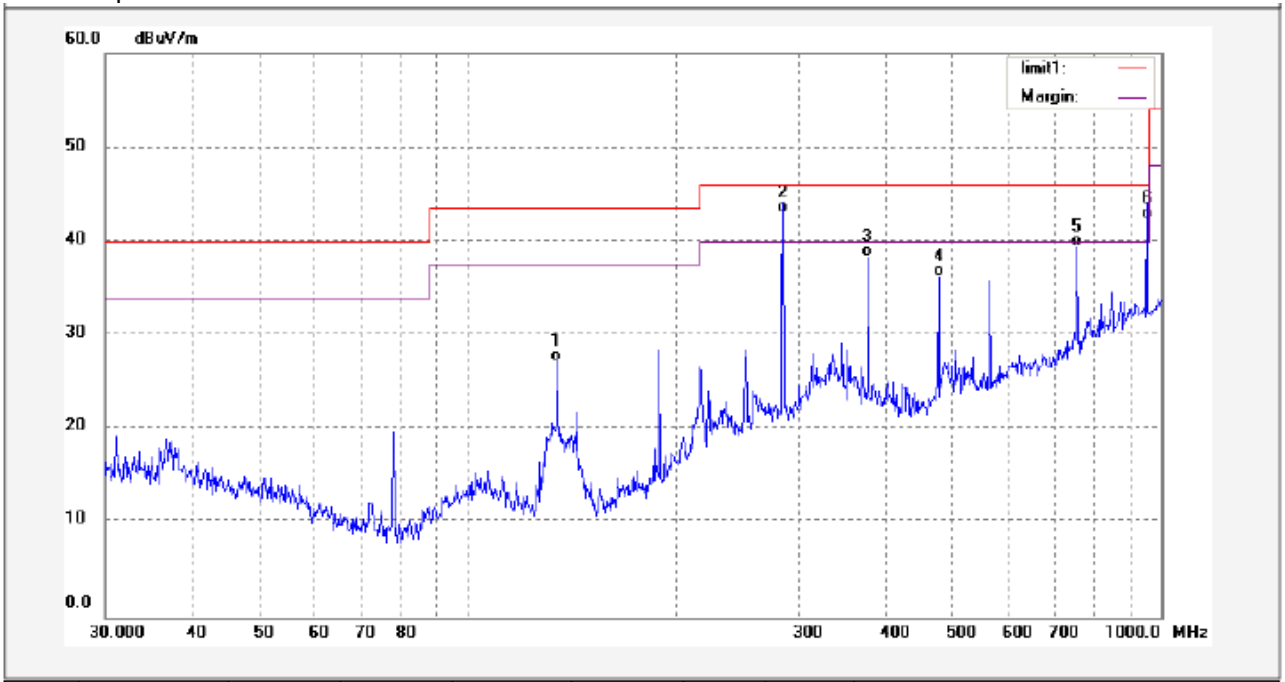
Test Mode: Transmitting mode (5dBi antenna with 9m cable)

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2179	6.62	16.56	23.18	40.00	-16.82	QP	
2	72.4652	13.03	9.55	22.58	40.00	-17.42	QP	
3	78.0143	19.07	9.16	28.23	40.00	-11.77	QP	
4	285.2611	15.44	16.51	31.95	46.00	-14.05	QP	
5	565.9776	13.13	23.48	36.61	46.00	-9.39	QP	
6	955.3509	10.58	31.47	42.05	46.00	-3.95	QP	

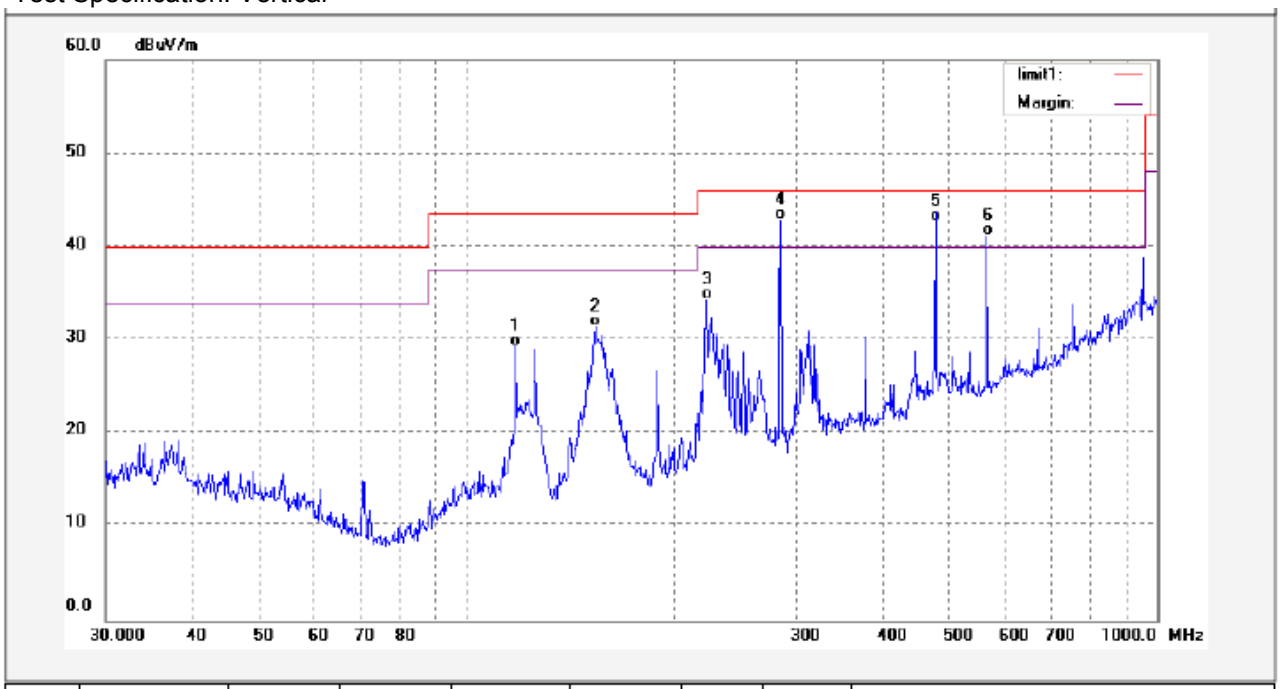
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	134.4910	15.13	12.11	27.24	43.50	-16.26	QP	
2	285.2611	26.40	16.51	42.91	46.00	-3.09	QP	
3	377.8480	18.27	20.12	38.39	46.00	-7.61	QP	
4	478.1394	13.76	22.52	36.28	46.00	-9.72	QP	
5	757.6200	11.31	28.03	39.34	46.00	-6.66	QP	
6	955.3508	10.96	31.47	42.43	46.00	-3.57	QP	

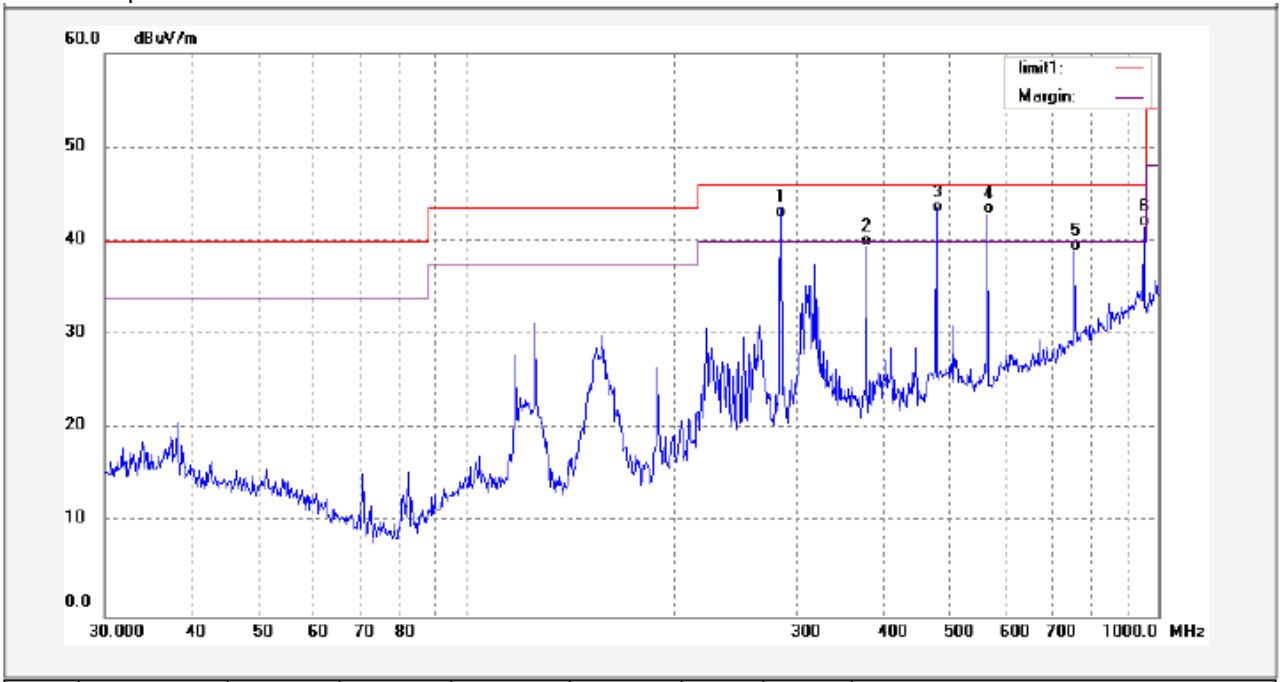
Test Mode: Transmitting mode (3dBi antenna)

Test Specification: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	117.6815	17.13	12.24	29.37	43.50	-14.13	QP	
2	153.7017	20.57	10.89	31.46	43.50	-12.04	QP	
3	222.2807	18.00	16.23	34.23	46.00	-11.77	QP	
4	285.2611	26.28	16.51	42.79	46.00	-3.21	QP	
5	478.1394	20.16	22.52	42.68	46.00	-3.32	QP	
6	565.9776	17.71	23.48	41.19	46.00	-4.81	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	285.2611	26.00	16.51	42.51	46.00	-3.49	QP	
2	377.8481	19.32	20.12	39.44	46.00	-6.56	QP	
3	480.1394	20.20	22.74	42.94	46.00	-3.06	QP	
4	565.9776	19.40	23.48	42.88	46.00	-3.12	QP	
5	757.6201	10.85	28.03	38.88	46.00	-7.12	QP	
6	955.3509	10.06	31.47	41.53	46.00	-4.47	QP	

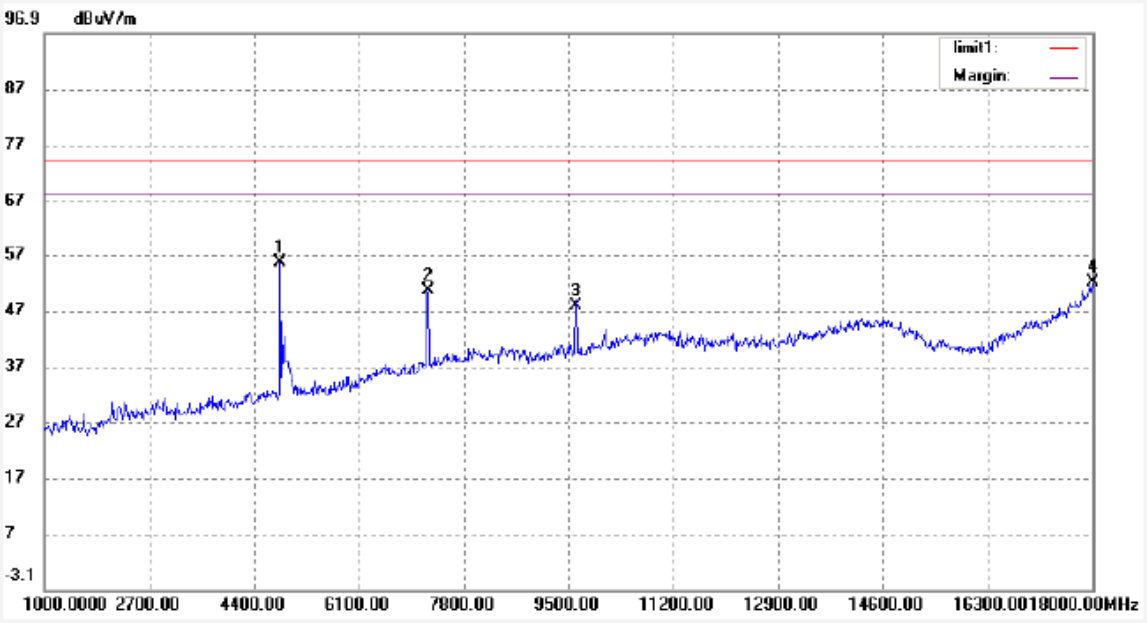
Test Frequency Range: 1GHz ~ 18GHz

Remark: the EUT was pretested powered by DC 12V and DC 24V, the worse case is DC 24V power input condition and the data are shown in as follow.

Test Mode:Continuous Transmitting(5dBi antenna with 9m cable)

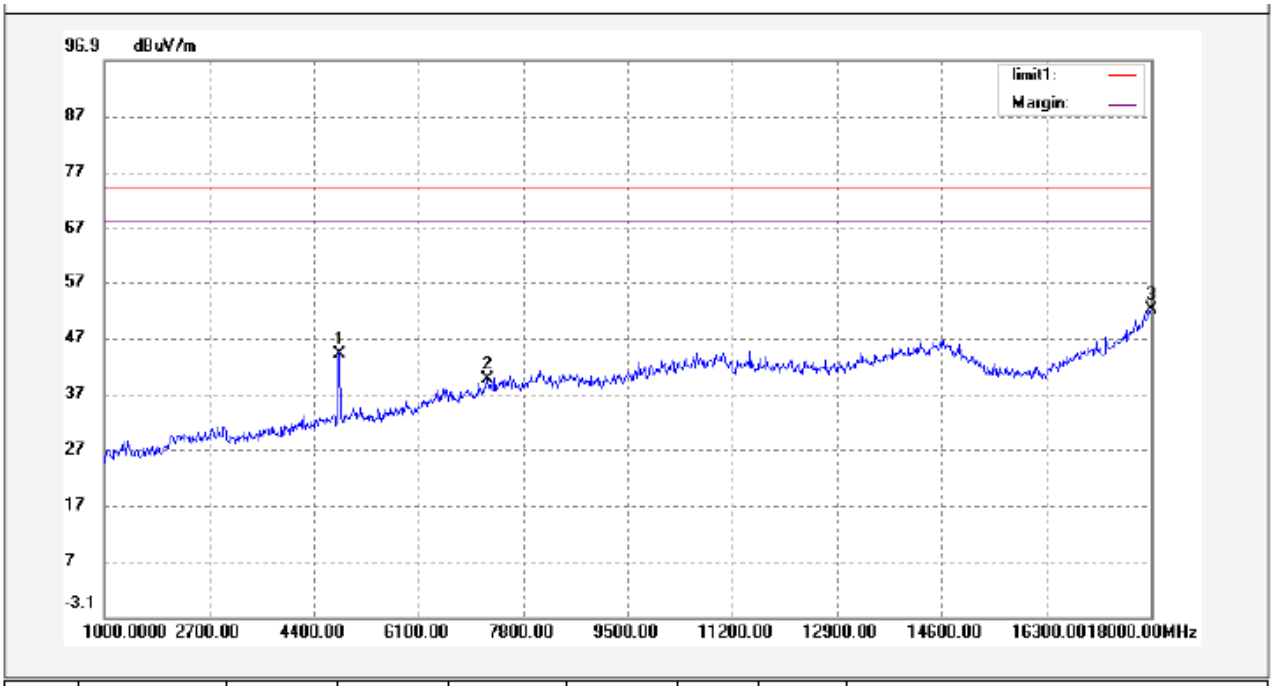
Test Channel: 2402MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4804.000	67.44	-11.97	55.47	74.00	-18.53	peak	
2	7206.000	57.62	-7.21	50.41	74.00	-23.59	peak	
3	9608.000	53.41	-5.71	47.70	74.00	-26.30	peak	
4	18000.000	45.02	7.08	52.10	74.00	-21.90	peak	

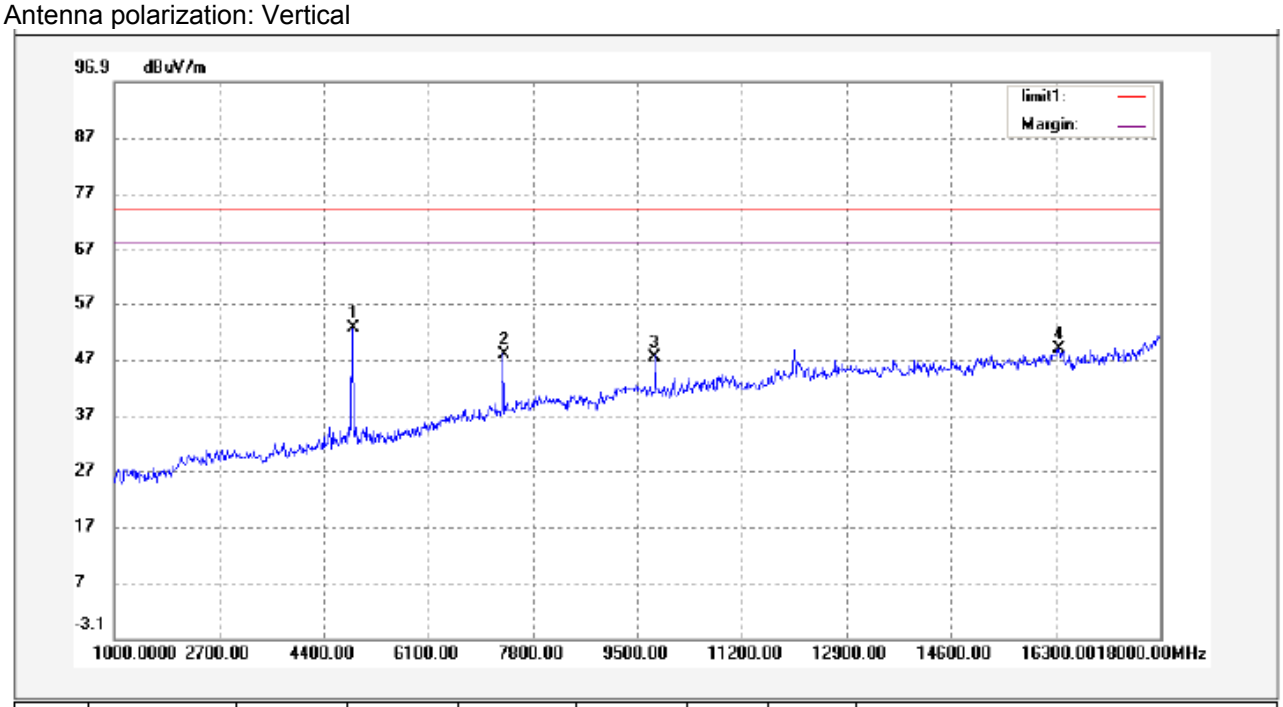
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4804.000	55.99	-11.97	44.02	74.00	-29.98	peak	
2	7206.000	46.85	-7.21	39.64	74.00	-34.36	peak	
3	18000.000	44.97	7.08	52.05	74.00	-21.95	peak	

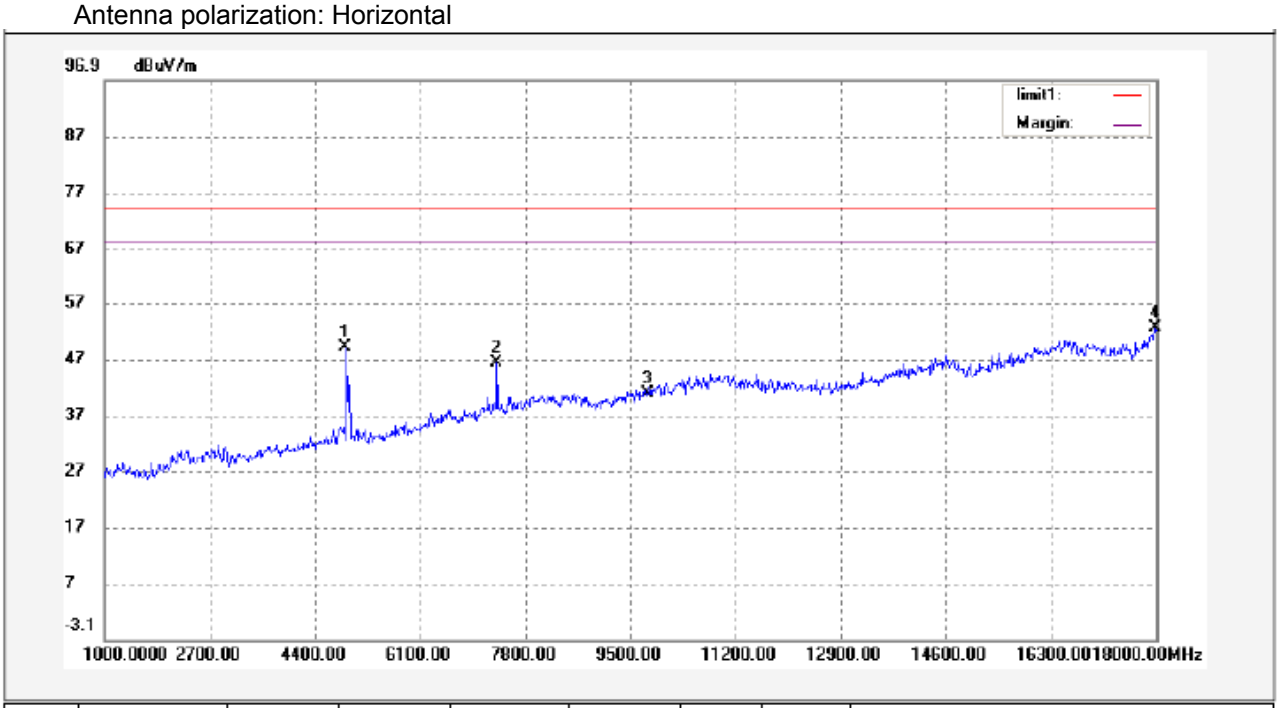
Test Channel: 2440MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	64.51	-11.92	52.59	74.00	-21.41	peak	
2	7320.000	55.03	-7.13	47.90	74.00	-26.10	peak	
3	9760.000	52.60	-5.32	47.28	74.00	-26.72	peak	
4	16351.000	51.28	-2.48	48.80	74.00	-25.20	peak	

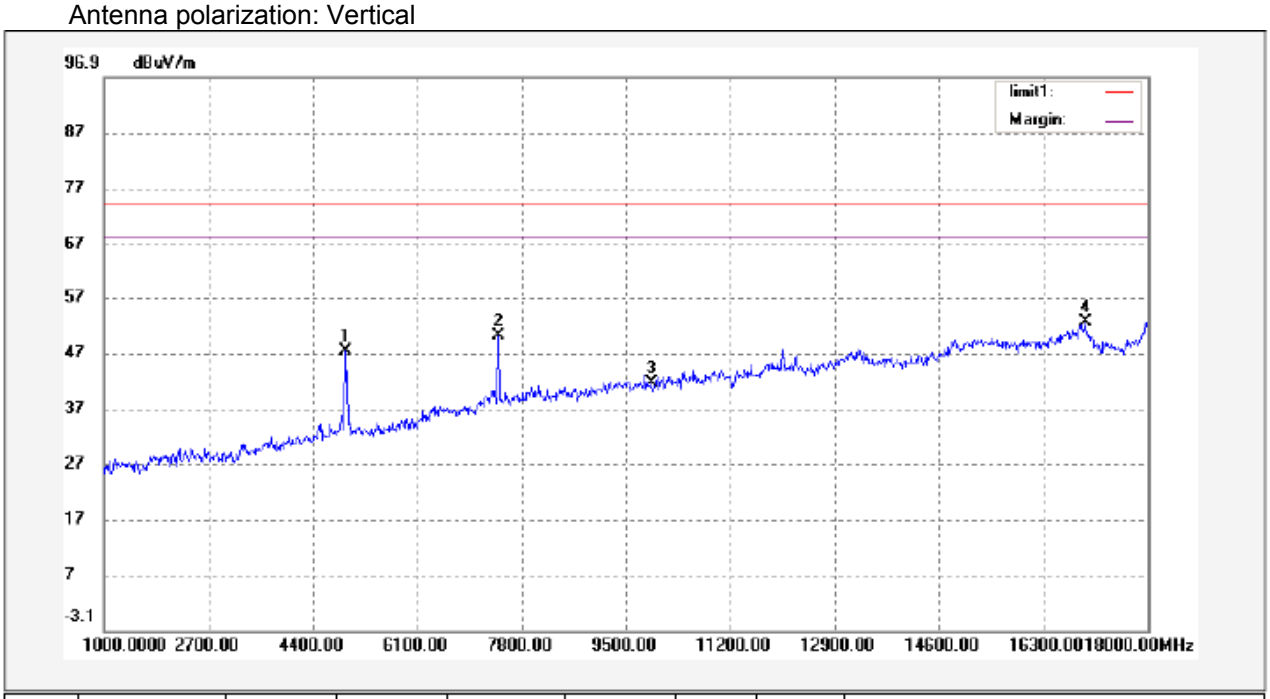
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	60.85	-11.92	48.93	74.00	-25.07	peak	
2	7320.000	53.36	-7.13	46.23	74.00	-27.77	peak	
3	9760.000	46.22	-5.32	40.90	74.00	-33.10	peak	
4	17983.000	45.72	6.83	52.55	74.00	-21.45	peak	

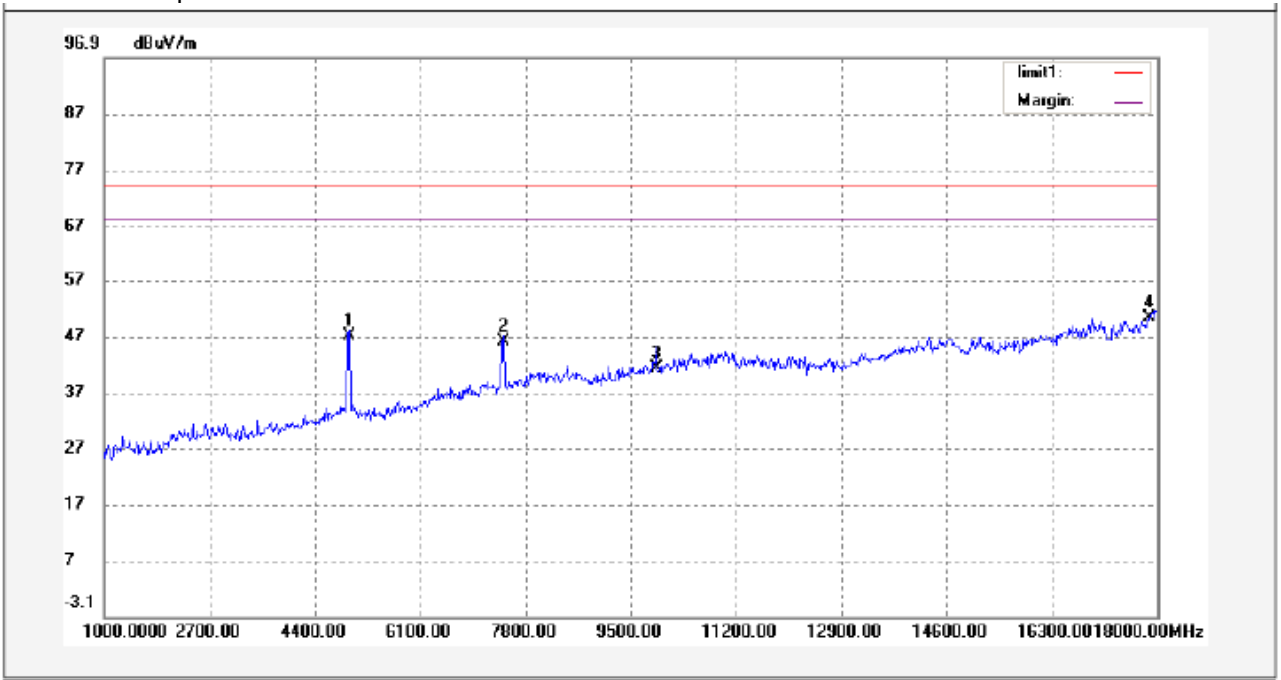
Test Channel: 2480MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4927.000	59.08	-11.83	47.25	74.00	-26.75	peak	
2	7426.000	56.97	-6.95	50.02	74.00	-23.98	peak	
3	9920.000	46.56	-5.14	41.42	74.00	-32.58	peak	
4	16980.000	52.08	0.39	52.47	74.00	-21.53	peak	

Antenna polarization: Horizontal

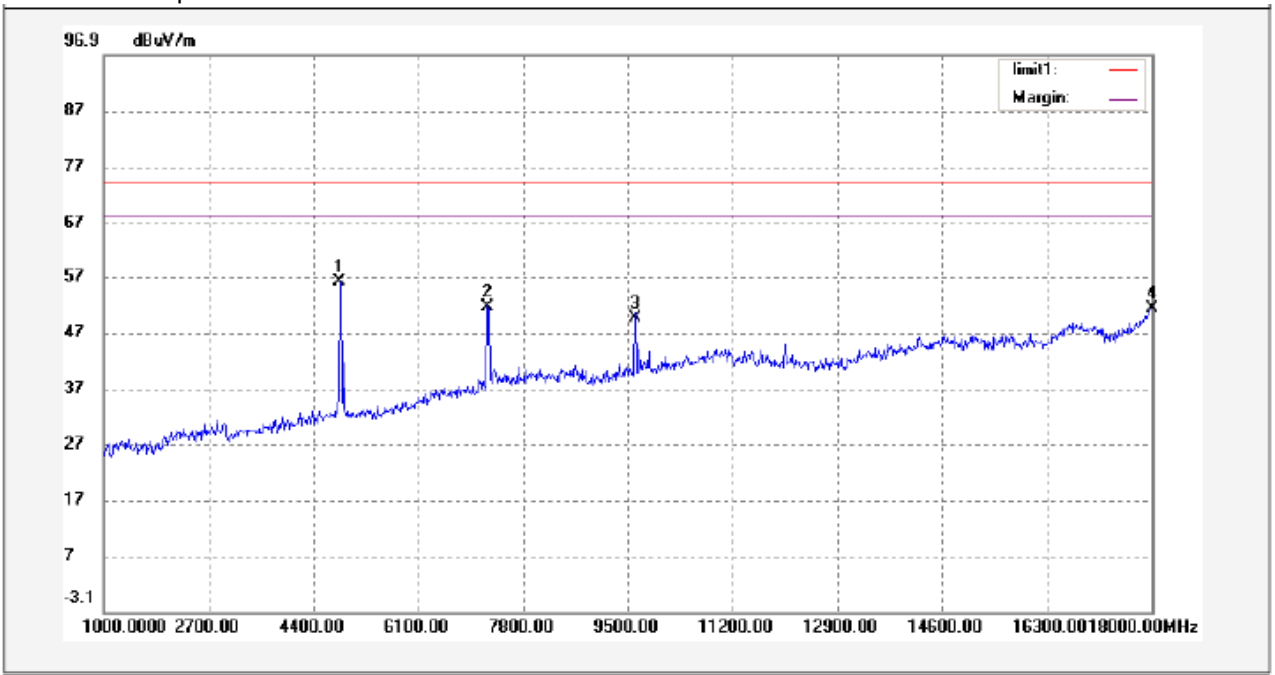


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4960.000	58.77	-11.77	47.00	74.00	-27.00	peak	
2	7440.000	52.90	-6.93	45.97	74.00	-28.03	peak	
3	9920.000	46.30	-5.14	41.16	74.00	-32.84	peak	
4	17864.000	45.77	4.46	50.23	74.00	-23.77	peak	

Test mode: Continuously Transmit(5dBi antenna with 3m cable)

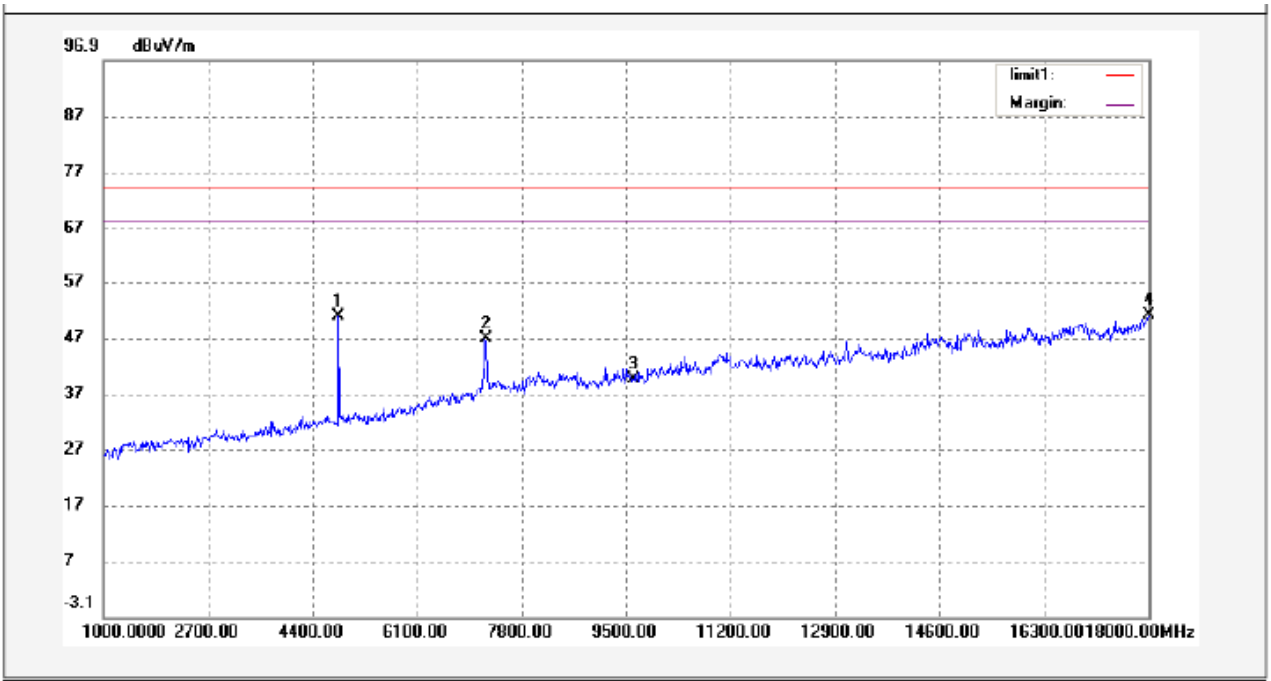
Modulation: Test Channel: 2402MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4808.000	68.08	-11.97	56.11	74.00	-17.89	peak	
2	7206.000	58.75	-7.21	51.54	74.00	-22.46	peak	
3	9608.000	55.29	-5.71	49.58	74.00	-24.42	peak	
4	18000.000	44.25	7.08	51.33	74.00	-22.67	peak	

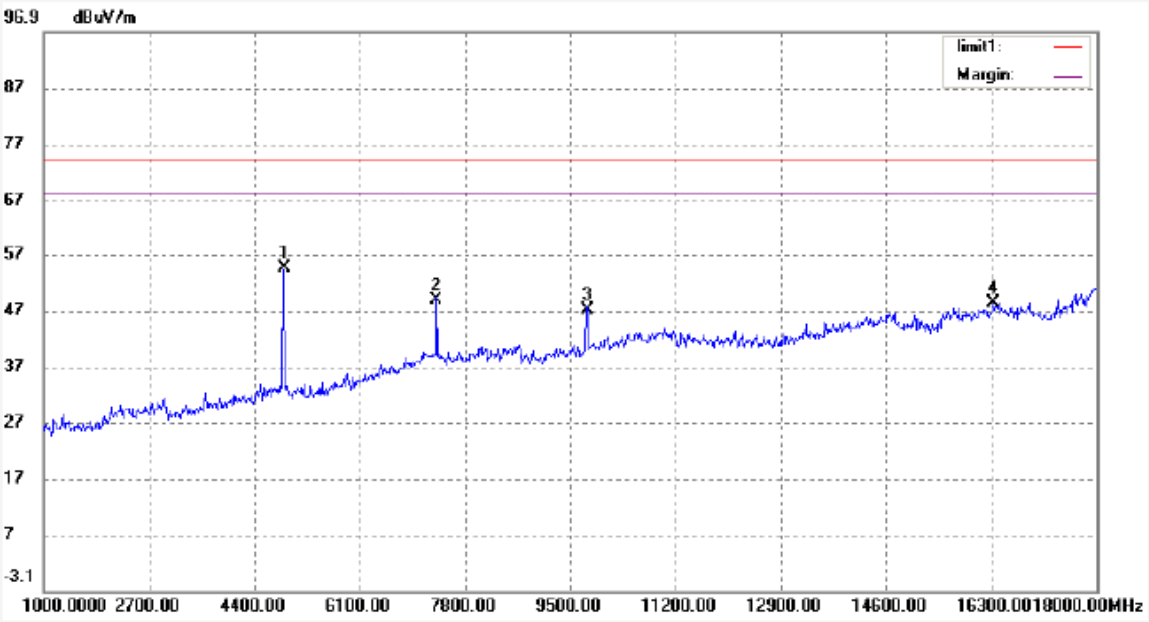
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4804.000	62.84	-11.97	50.87	74.00	-23.13	peak	
2	7206.000	53.95	-7.21	46.74	74.00	-27.26	peak	
3	9608.000	45.25	-5.71	39.54	74.00	-34.46	peak	
4	18000.000	43.97	7.08	51.05	74.00	-22.95	peak	

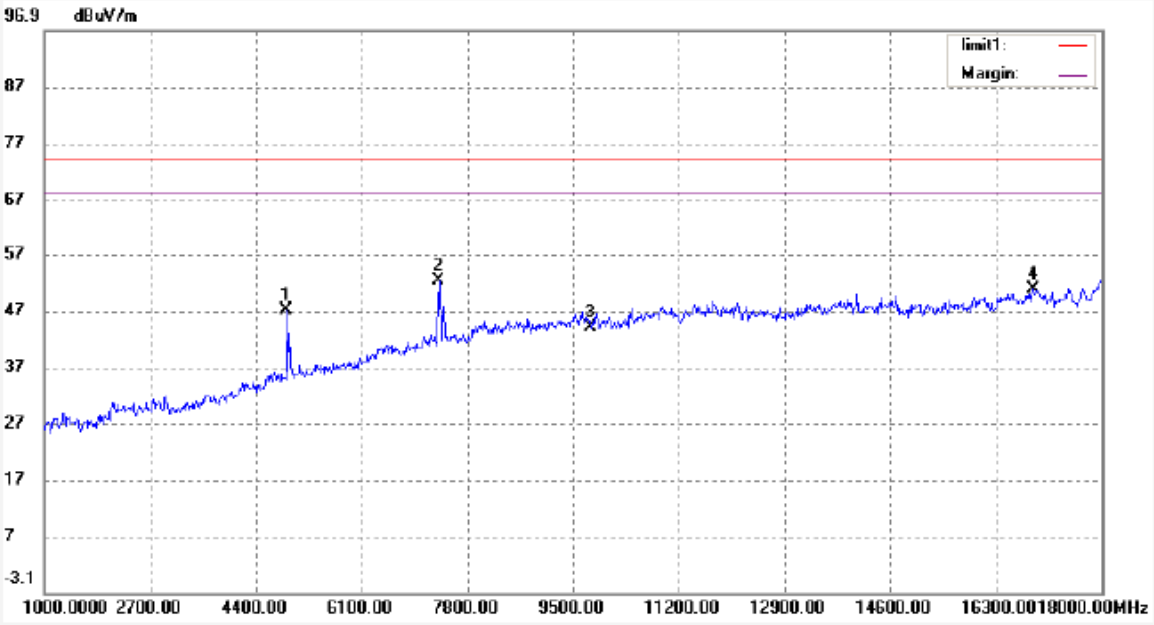
Test Channel: 2440MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	66.47	-11.92	54.55	74.00	-19.45	peak	
2	7320.000	55.97	-7.13	48.84	74.00	-25.16	peak	
3	9760.000	52.44	-5.32	47.12	74.00	-26.88	peak	
4	16334.000	50.79	-2.53	48.26	74.00	-25.74	peak	

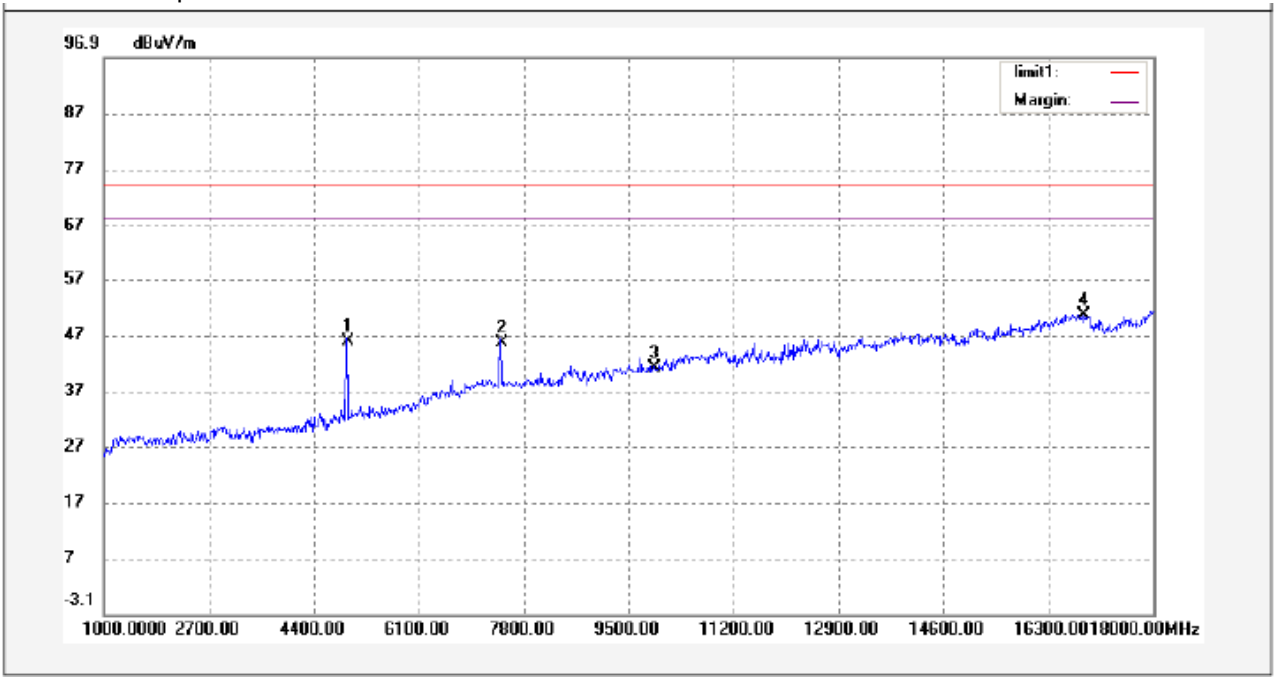
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	59.05	-11.92	47.13	74.00	-26.87	peak	
2	7320.000	59.46	-7.13	52.33	74.00	-21.67	peak	
3	9760.000	49.47	-5.32	44.15	74.00	-29.85	peak	
4	16895.000	50.67	0.12	50.79	74.00	-23.21	peak	

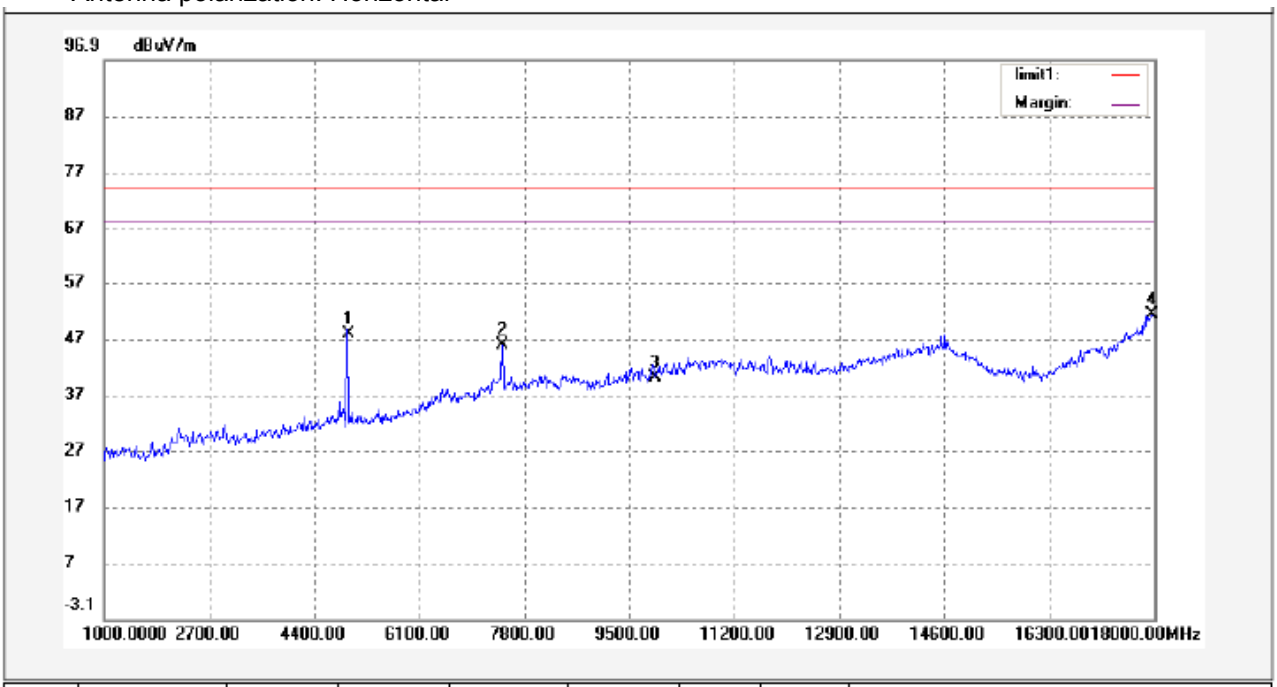
Test Channel: 2480MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4960.000	57.49	-11.77	45.72	74.00	-28.28	peak	
2	7440.000	52.35	-6.93	45.42	74.00	-28.58	peak	
3	9920.000	46.11	-5.14	40.97	74.00	-33.03	peak	
4	16878.000	50.56	0.05	50.61	74.00	-23.39	peak	

Antenna polarization: Horizontal

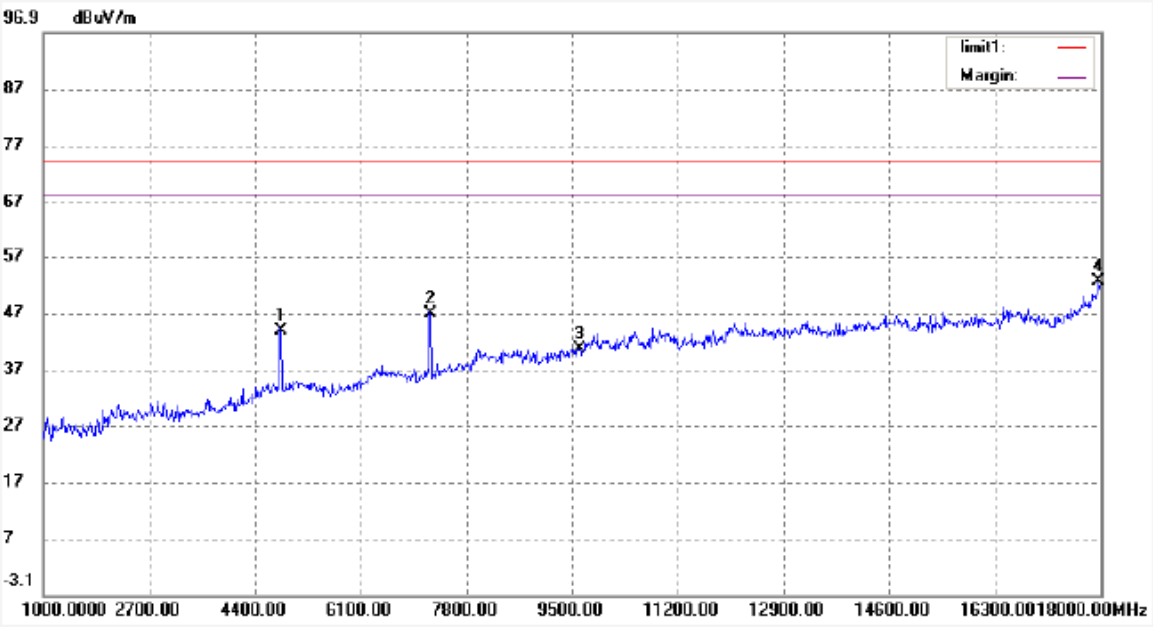


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4960.000	59.49	-11.77	47.72	74.00	-26.28	peak	
2	7440.000	52.79	-6.93	45.86	74.00	-28.14	peak	
3	9920.000	45.10	-5.14	39.96	74.00	-34.04	peak	
4	17966.000	44.74	6.57	51.31	74.00	-22.69	peak	

Test mode: Continuously Transmit (3dBi antenna)

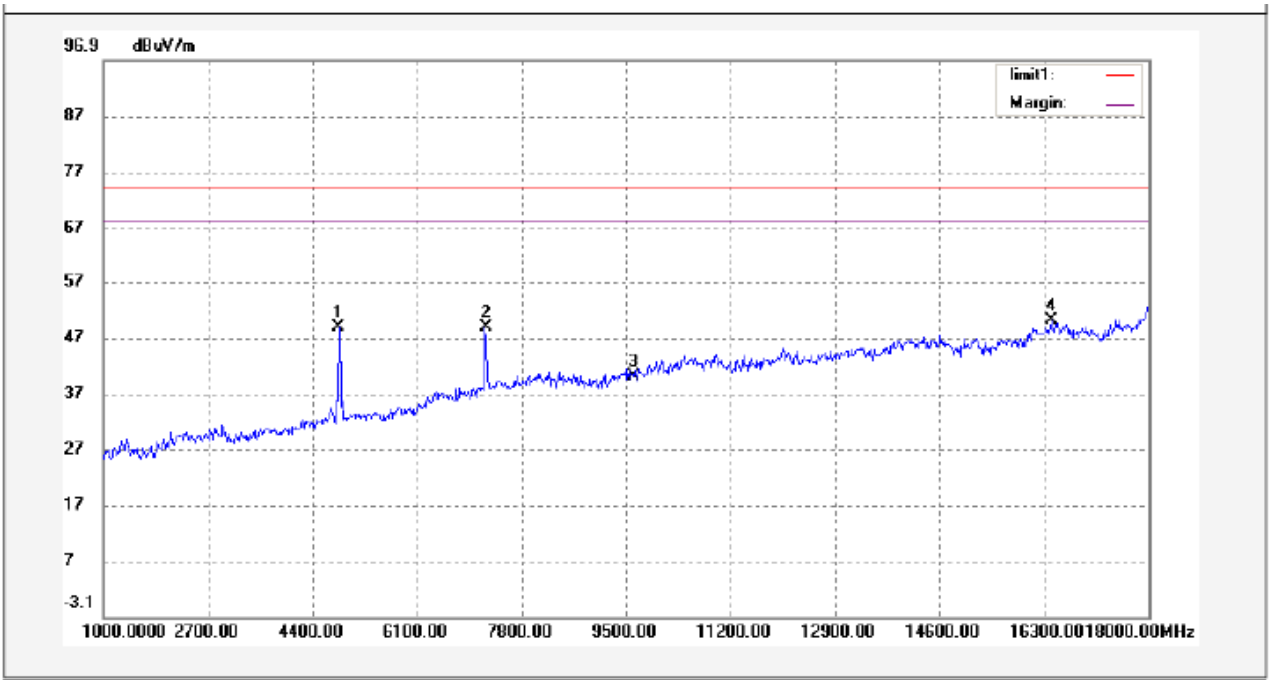
Modulation: Test Channel: 2402MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4804.000	55.84	-11.97	43.87	74.00	-30.13	peak	
2	7206.000	53.93	-7.21	46.72	74.00	-27.28	peak	
3	9608.000	46.17	-5.71	40.46	74.00	-33.54	peak	
4	17966.000	45.90	6.57	52.47	74.00	-21.53	peak	

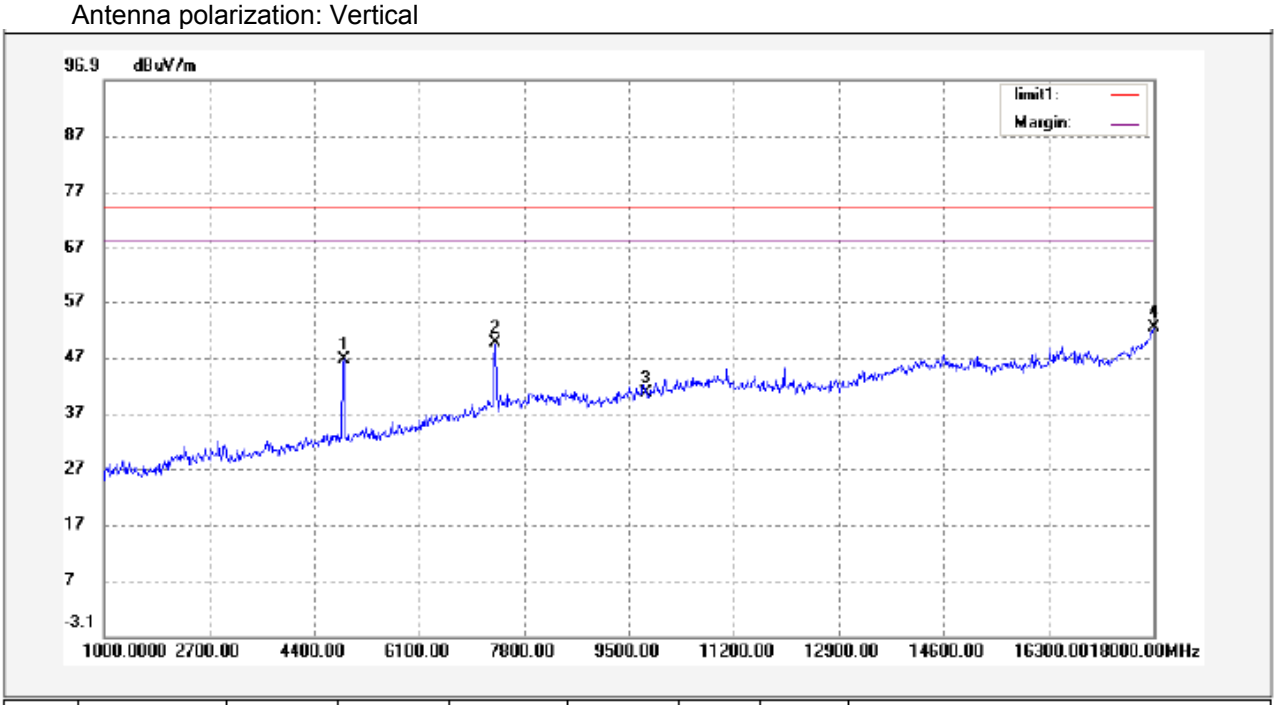
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4804.000	60.76	-11.97	48.79	74.00	-25.21	peak	
2	7206.000	56.10	-7.21	48.89	74.00	-25.11	peak	
3	9608.000	45.80	-5.71	40.09	74.00	-33.91	peak	
4	16419.000	52.40	-2.25	50.15	74.00	-23.85	peak	

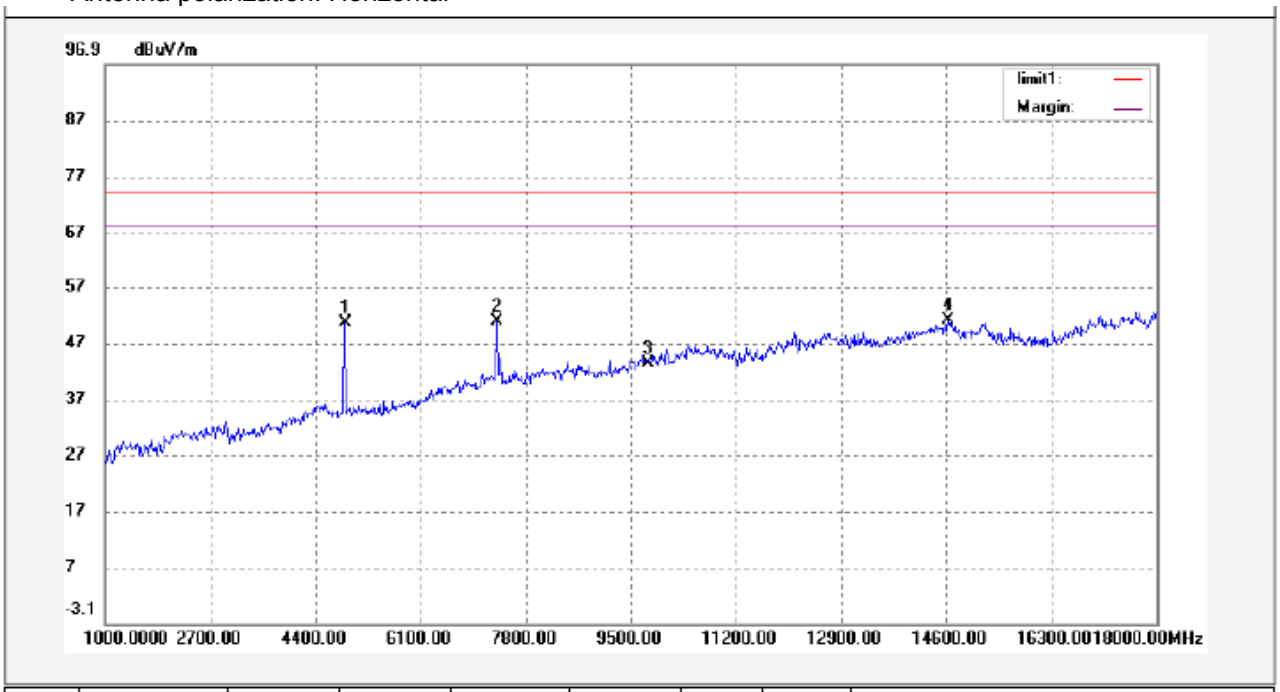
Test Channel: 2440MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	58.54	-11.92	46.62	74.00	-27.38	peak	
2	7320.000	56.55	-7.13	49.42	74.00	-24.58	peak	
3	9760.000	45.86	-5.32	40.54	74.00	-33.46	peak	
4	18000.000	45.23	7.08	52.31	74.00	-21.69	peak	

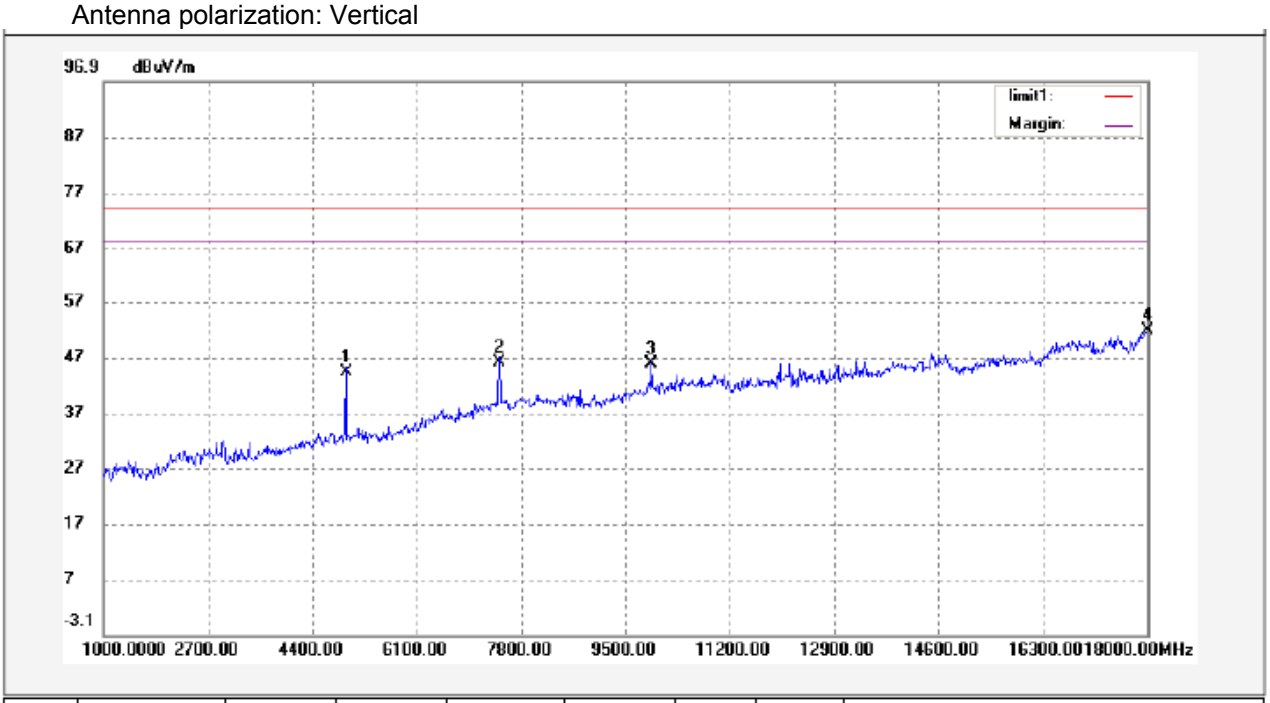
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4880.000	62.50	-11.92	50.58	74.00	-23.42	peak	
2	7320.000	58.01	-7.13	50.88	74.00	-23.12	peak	
3	9760.000	48.54	-5.32	43.22	74.00	-30.78	peak	
4	14634.000	50.52	0.39	50.91	74.00	-23.09	peak	

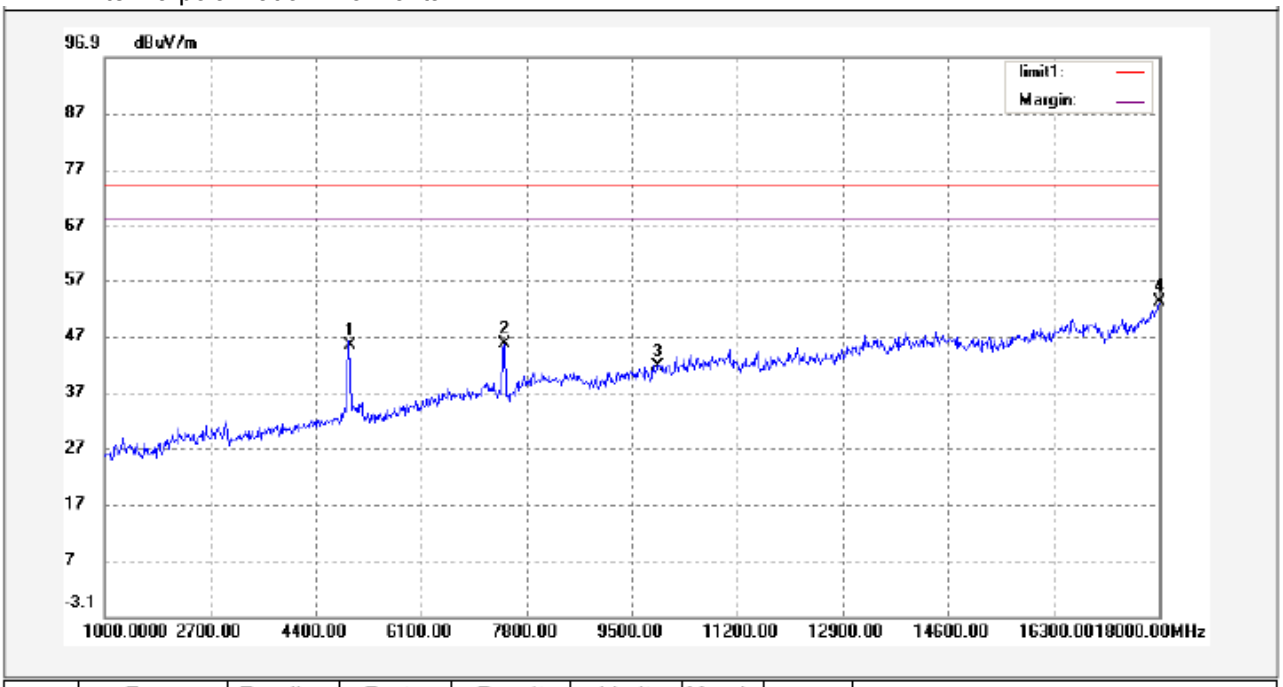
Test Channel: 2480MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4960.000	56.02	-11.77	44.25	74.00	-29.75	peak	
2	7440.000	52.98	-6.93	46.05	74.00	-27.95	peak	
3	9920.000	50.86	-5.14	45.72	74.00	-28.28	peak	
4	18000.000	44.81	7.08	51.89	74.00	-22.11	peak	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4960.000	57.09	-11.77	45.32	74.00	-28.68	peak	
2	7440.000	52.47	-6.93	45.54	74.00	-28.46	peak	
3	9920.000	46.68	-5.14	41.54	74.00	-32.46	peak	
4	18000.000	45.87	7.08	52.95	74.00	-21.05	peak	

Test Frequency: Above 18GHz(Remark: During testing with the 2.4GHz filter)

The measurements were more than 20 dB below the limit. The channels 2402MHz, 2440MHz, 2480MHz were tested. test Channel 2402MHz data was the worse, so the worst mode were shown as follow.

Test Frequency Range: 18GHz ~ 25GHz

Test Mode:Continuous Transmitting(5dBi antenna with 9m cable)

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
19216.00	PK	Vertical	51.79	74.00	-22.21	1.5	190
21618.00	PK	Vertical	50.62	74.00	-23.38	1.7	100
24020.00	PK	Vertical	50.50	74.00	-23.50	1.7	100
19216.00	PK	Horizontal	37.91	74.00	-36.09	1.7	60
21618.00	PK	Horizontal	39.26	74.00	-34.74	1.0	150
24020.00	PK	Horizontal	39.13	74.00	-34.87	1.0	150

Test Mode:Continuous Transmitting(5dBi antenna with 3m cable)

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
19503.00	PK	Vertical	51.07	74	-22.93	1.1	143
21940.88	PK	Vertical	51.34	74	-22.66	1.3	86
24020.00	PK	Vertical	51.30	74	-22.70	1.3	87
19503.00	PK	Horizontal	38.89	74	-35.11	1.2	246
21940.87	PK	Horizontal	50.24	74	-23.76	1.8	154
24020.00	PK	Horizontal	50.30	74	-23.60	1.8	156

Test Mode:Continuous Transmitting(3dBi antenna)

And the below is the Fundamental and Harmonic

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
19503.00	PK	Vertical	50.78	74	-23.22	1.3	234
21940.88	PK	Vertical	49.97	74	-24.03	1.7	218
24020.00	PK	Vertical	49.60	74	-23.40	1.7	219
19503.00	PK	Horizontal	38.99	74	-35.01	1.2	53
21940.87	PK	Horizontal	50.11	74	-23.89	1.2	85
24020.00	PK	Horizontal	34.50	74	-39.50	1.2	87

8 Duty Cycle

Test Requirement: FCC Part 15.35

Test Mothed: ANSI C63.4:2003

Test Status: TX mode.

8.1 Test Procedure

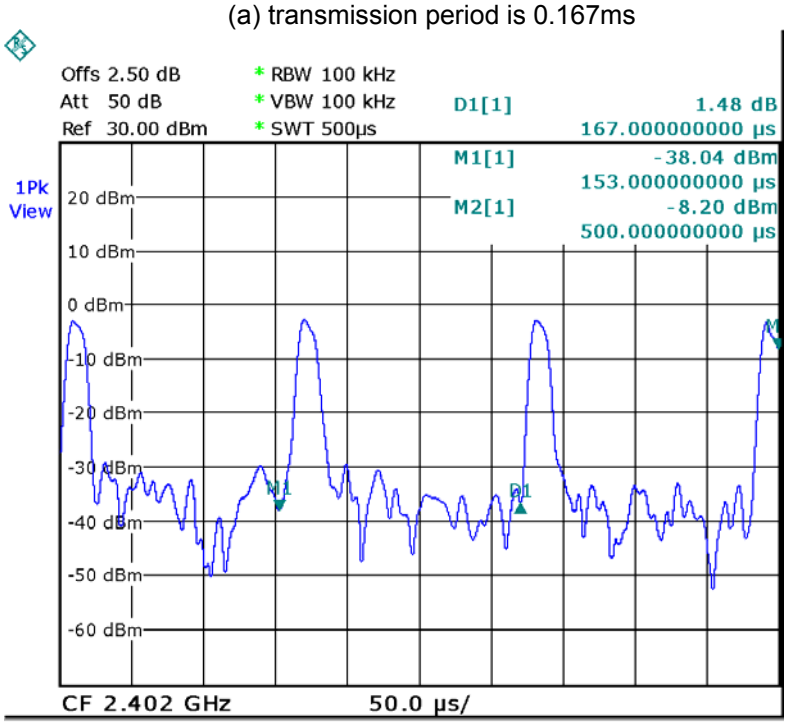
1. The EUT was placed on a turntable which is 0.8m above ground plane

2. Set EUT as normal wrking mode

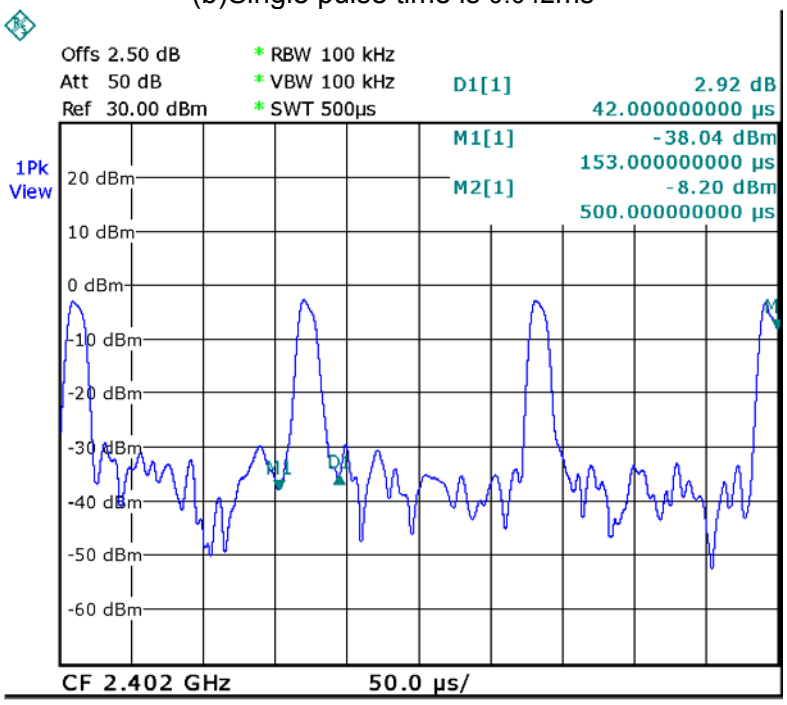
3. Set SPA center frequency = fundamental frequency, RBW = 100 kHz, VBW = 100 kHz, Span = 0 Hz, Adjacent sweep time.

8.2 Test Result

(a) transmission period is 0.167ms



(b)Single pulse time is 0.042ms



The EUT is auto. operation for transmitter，it is declared by the manufacturer as a duty cycle ratio of less than 100%.

The EUT's work time : T_{on} =pulse time=0.042 ms

The EUT's work period :$T=T_{ON}+T_{OFF}$= transmission period =0.167 ms

The EUT's duty cycle : $D = T_{on} /T$ = 0.042/0.167*100% =25.15%

Duty Cycle Correction Factor(dB)=20 * Log_{10}(Duty Cycle)=20* Log_{10}(25.15 %)

= -12dB

9 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	For Peak value: RBW = 1 MHz for f ≥ 1 GHz VBW ≥ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for f ≥ 1 GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

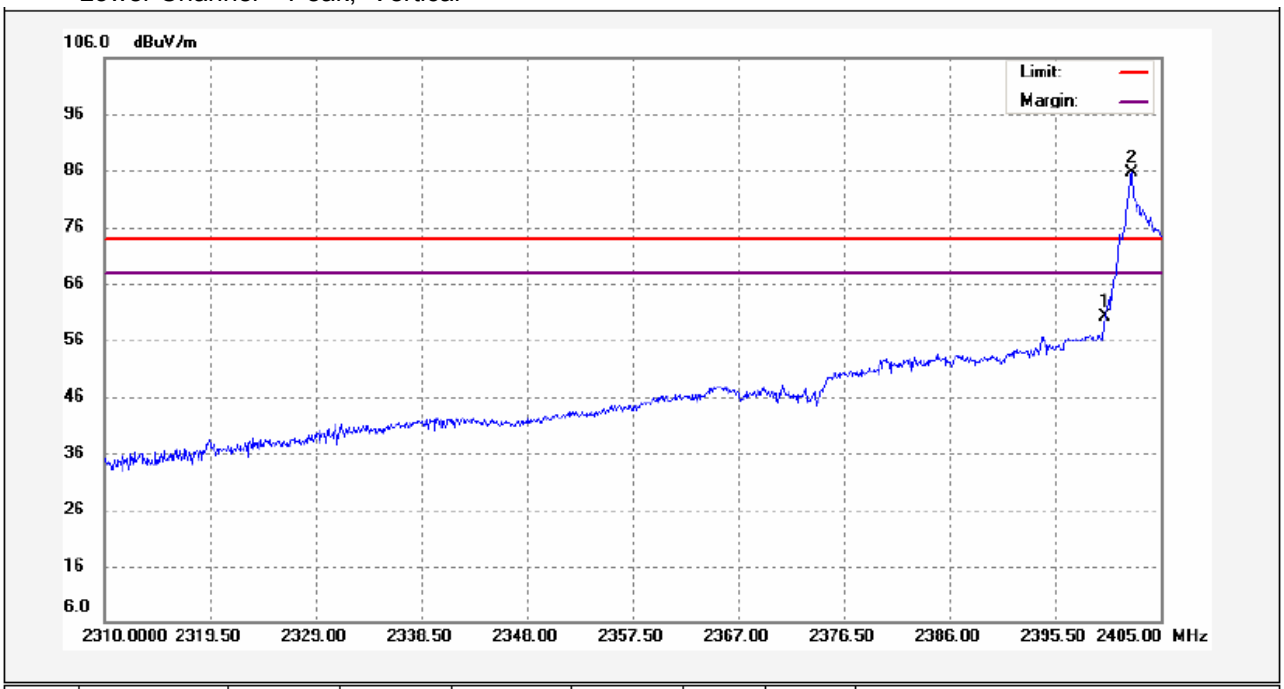
9.1 Test Result:

Continuous transmitting:

Remark: the EUT was pretested powered by DC 12V and DC 24V, the worse case is DC 24V power input condition and the data are shown in as follow.

5dBi antenna with 9m cable:

Lower Channel – Peak, Vertical

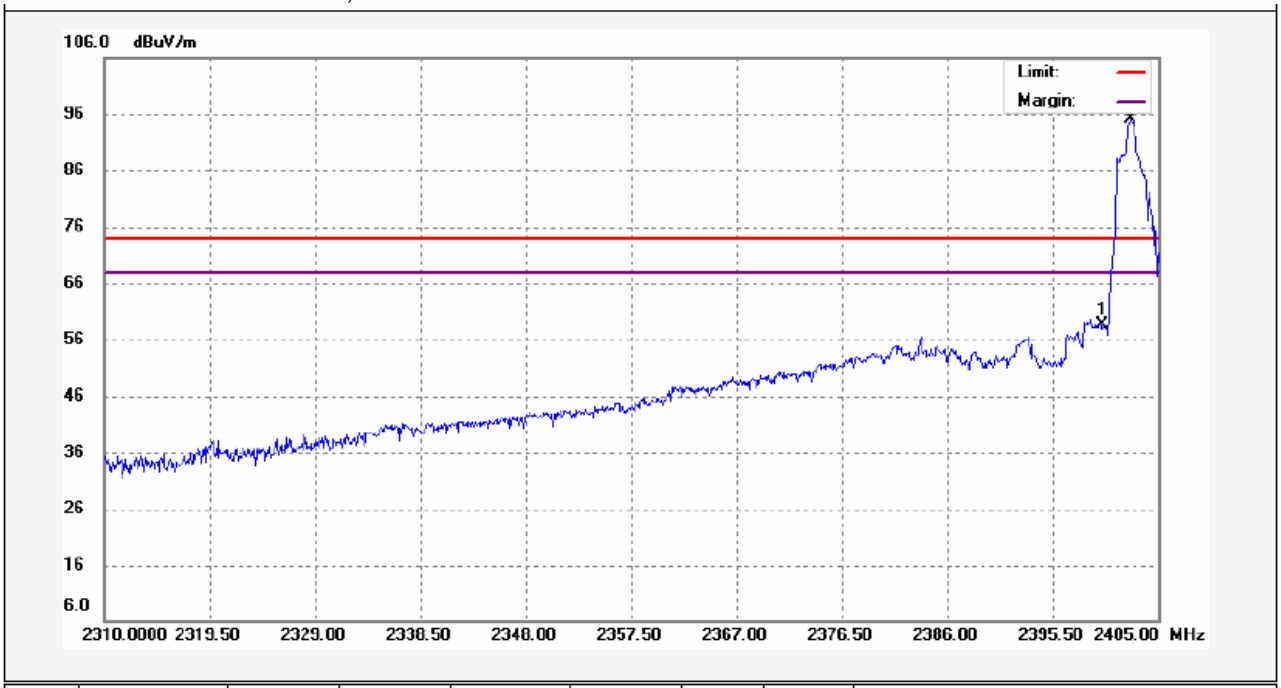


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	75.75	-15.58	60.17	74.00	-13.83	peak	
2	2402.340	101.10	-15.59	85.51	74.00	11.51	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	48.17	54	-5.83	AV	
2	2401.770	-12	73.51	54	19.51	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

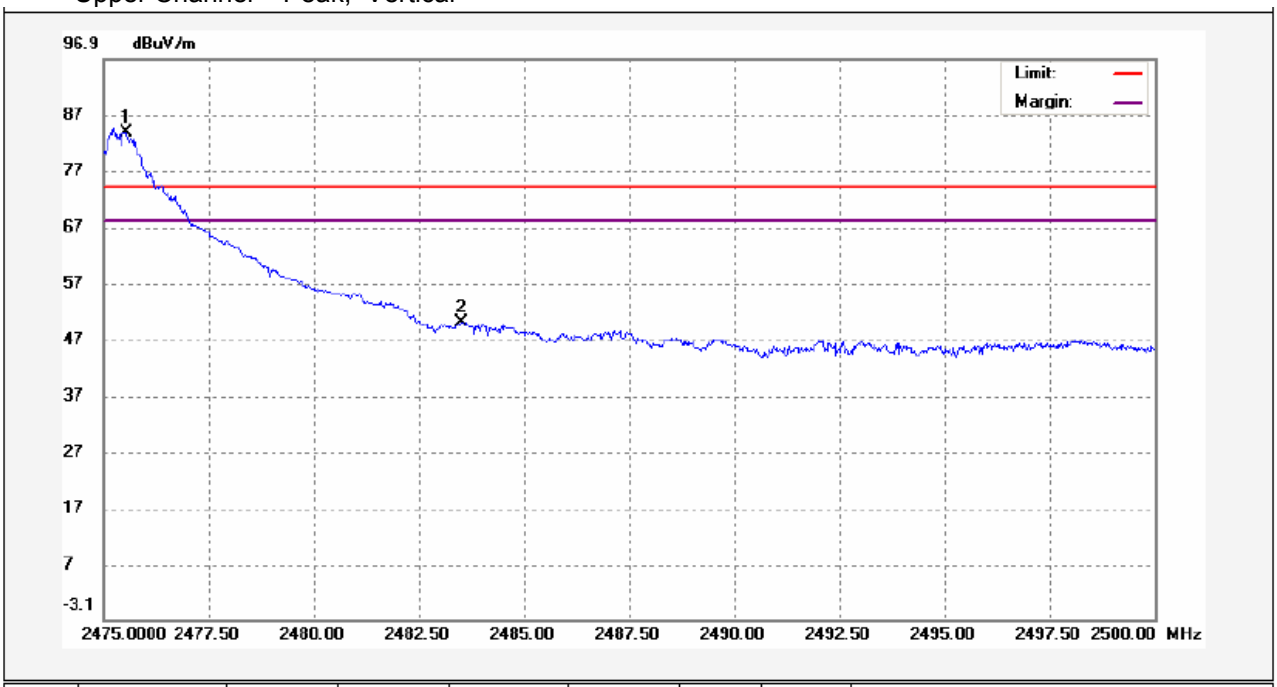


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	74.25	-15.58	58.67	74.00	-15.33	peak	
2	2402.530	110.66	-15.59	95.07	74.00	21.07	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	46.67	54	-7.33	AV	
2	2401.770	-12	83.07	54	29.07	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical

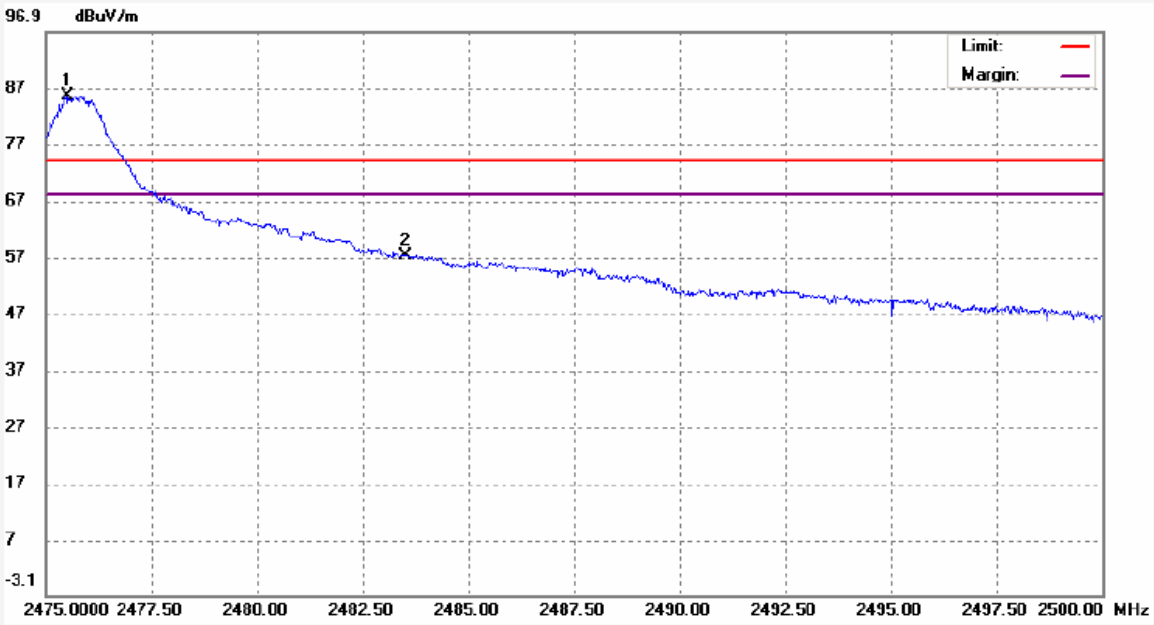


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	99.44	-15.68	83.76	74.00	9.76	peak	
2	2483.500	65.68	-15.67	50.01	74.00	-23.99	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	-12	71.76	54	17.76	AV	
2	2483.500	-12	38.01	54	-15.99	AV	

Remark:the marker 1 is the fundamental

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.500	101.25	-15.68	85.57	74.00	11.57	peak	
2	2483.500	73.01	-15.67	57.34	74.00	-16.66	peak	

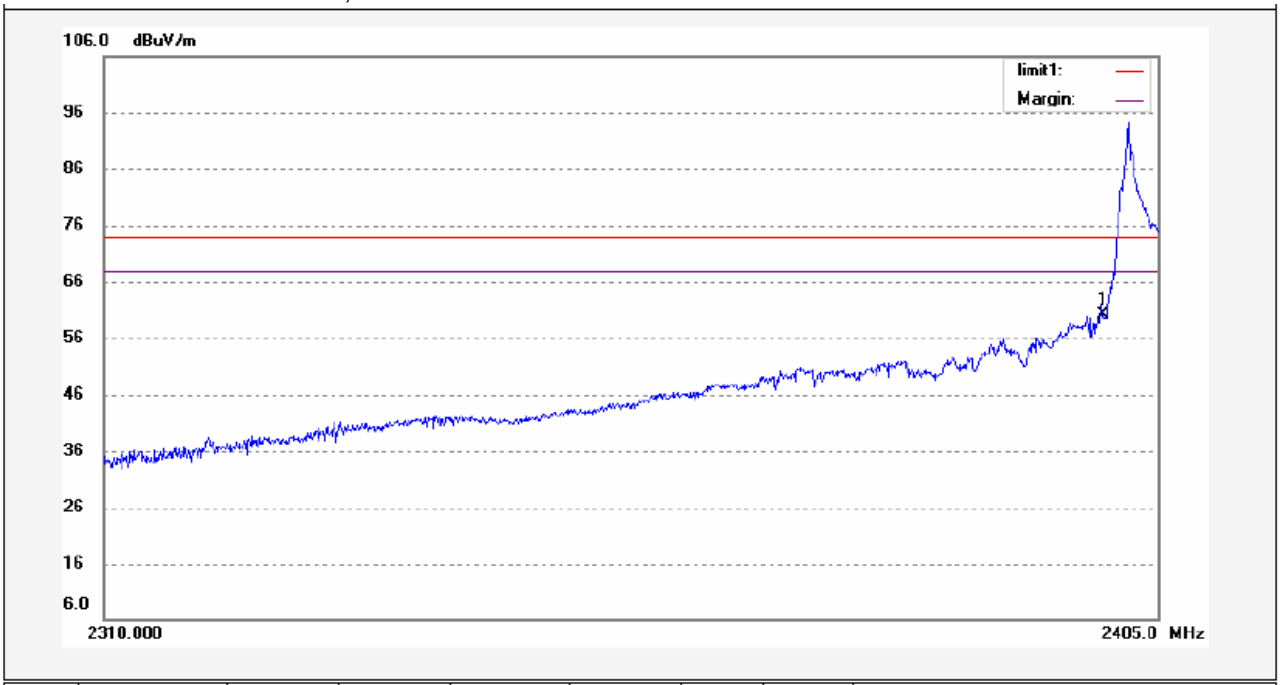
No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.500	-12	73.57	54	19.57	AV	
2	2483.500	-12	45.34	54	-8.66	AV	

Remark:the marker 1 is the fundamental

Hopping transmitting:

5dBi antenna with 9m cable:

Lower Channel – Peak, Vertical

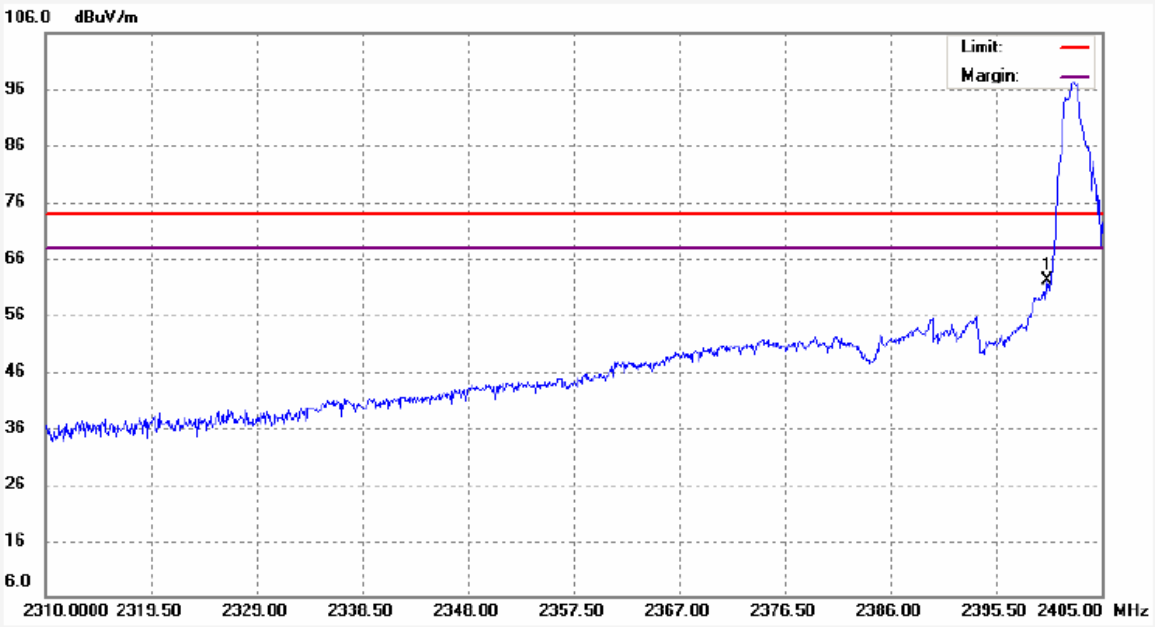


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	75.75	-15.58	60.17	74.00	-13.83	peak	
2	2401.770	114.18	-15.58	98.60	74.00	24.60	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	48.17	54	-5.83	AV	
2	2401.770	-12	86.60	54	32.6	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

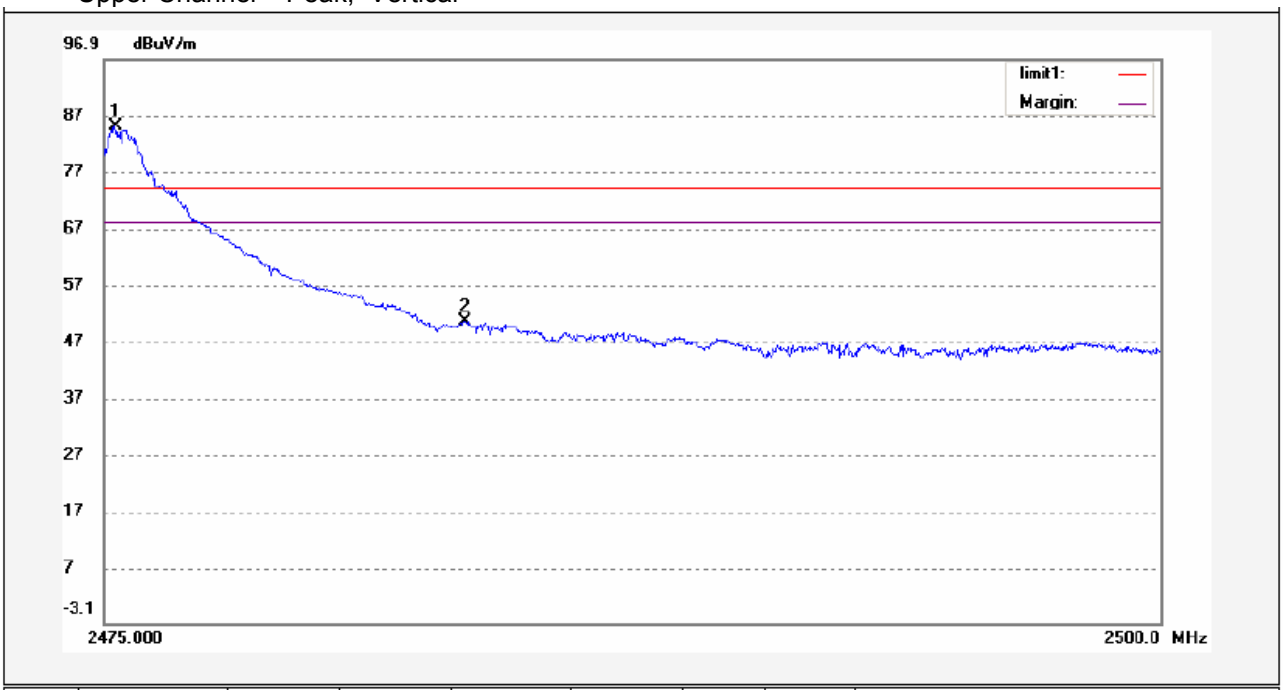


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	77.75	-15.58	62.17	74.00	-11.83	peak	
2	2402.435	112.66	-15.59	97.07	74.00	23.07	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	50.17	54	-3.83	AV	
2	2401.770	-12	85.07	54	31.07	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.250	100.68	-15.68	85.00	74.00	11.00	peak	
2	2483.500	66.18	-15.67	50.51	74.00	-23.49	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.250	-12	73	54	19	AV	
2	2483.500	-12	38.51	54	-15.49	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Horizontal

No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.500	101.75	-15.68	86.07	74.00	12.07	peak	
2	2483.500	74.01	-15.67	58.34	74.00	-15.66	peak	

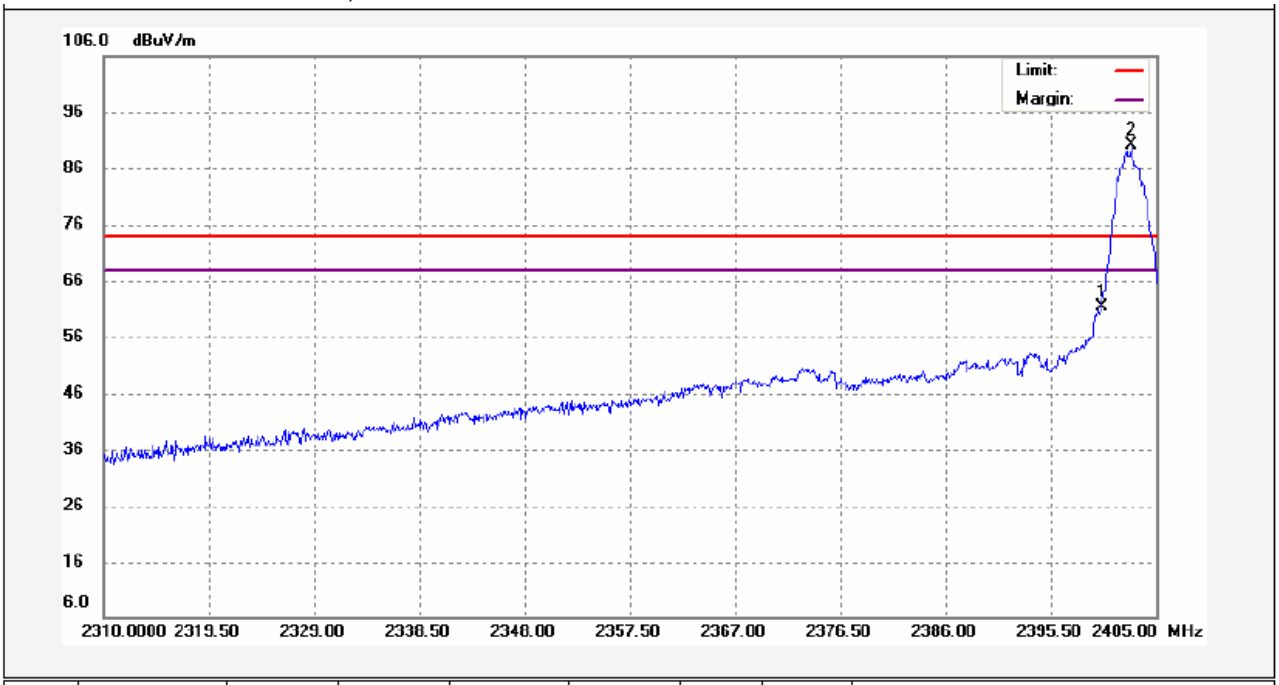
No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.500	-12	74.07	54	20.07	AV	
2	2483.500	-12	46.34	54	-7.66	AV	

Remark:the marker 1 is the fundamental

Continuous transmitting:

5dBi antenna with 3m cable:

Lower Channel – Peak, Vertical

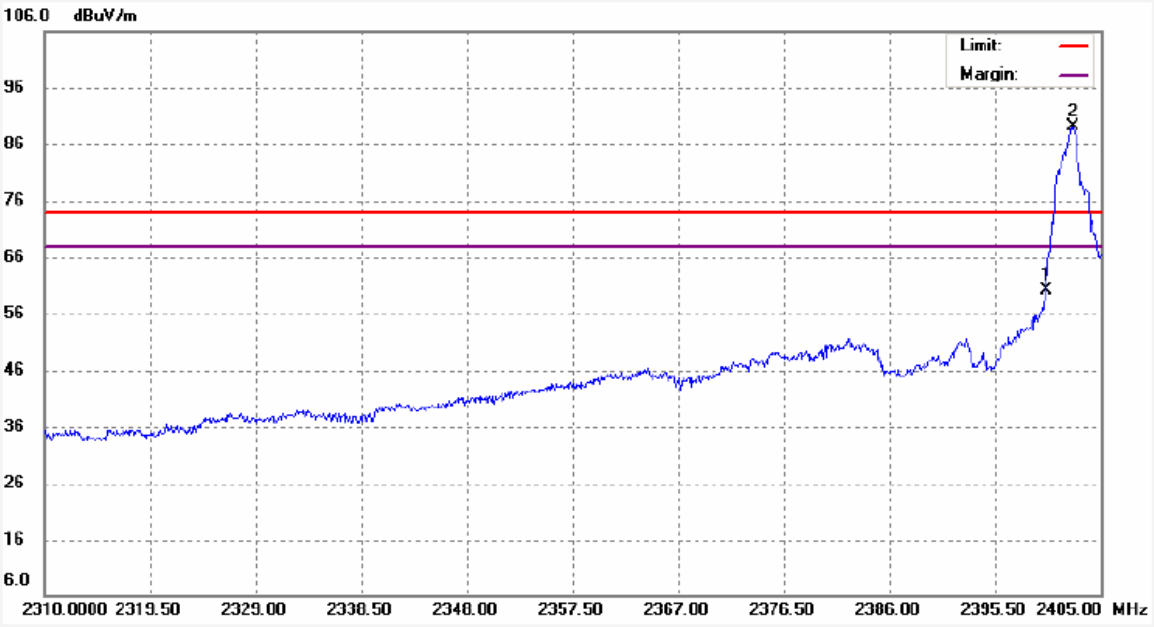


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	77.05	-15.58	61.47	74.00	-12.53	peak	
2	2402.815	105.83	-15.59	90.24	74.00	16.24	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	49.47	54	-4.53	AV	
2	2402.150	-12	82.24	54	28.24	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

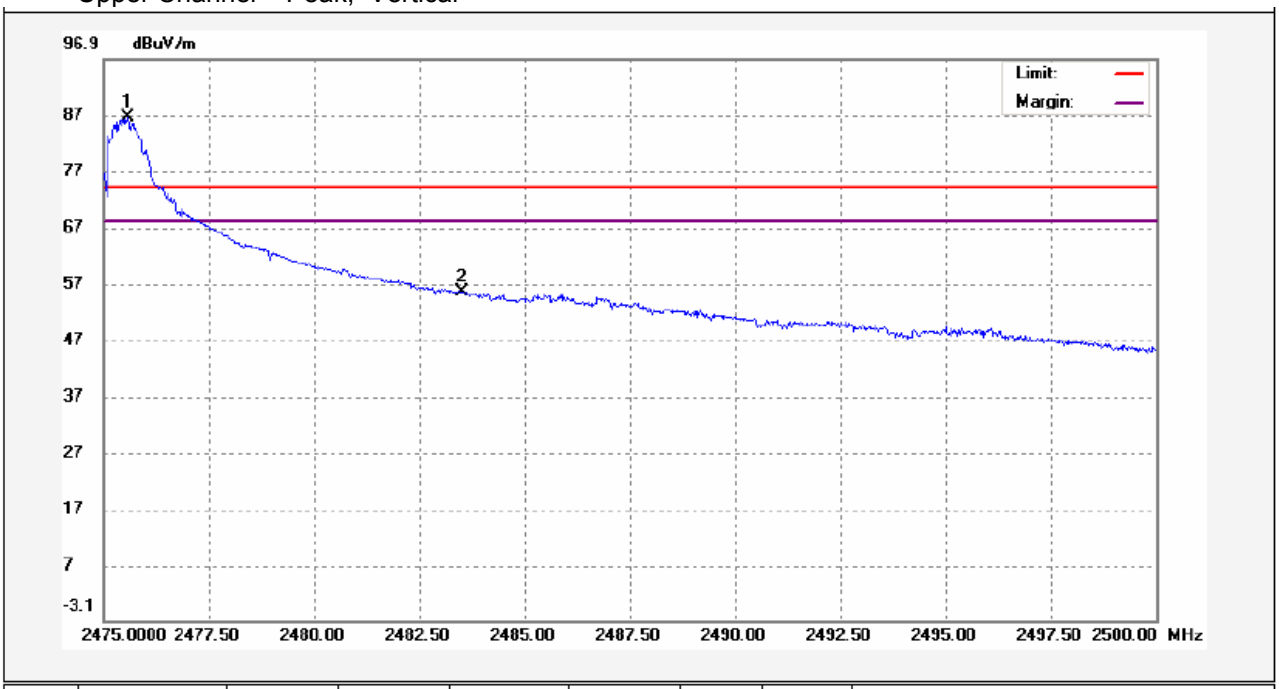


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	75.75	-15.58	60.17	74.00	-13.83	peak	
2	2402.435	104.66	-15.59	89.07	74.00	15.07	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2390.000	-12	48.17	54	-5.83	AV	
2	2402.245	-12	77.07	54	23.07	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical

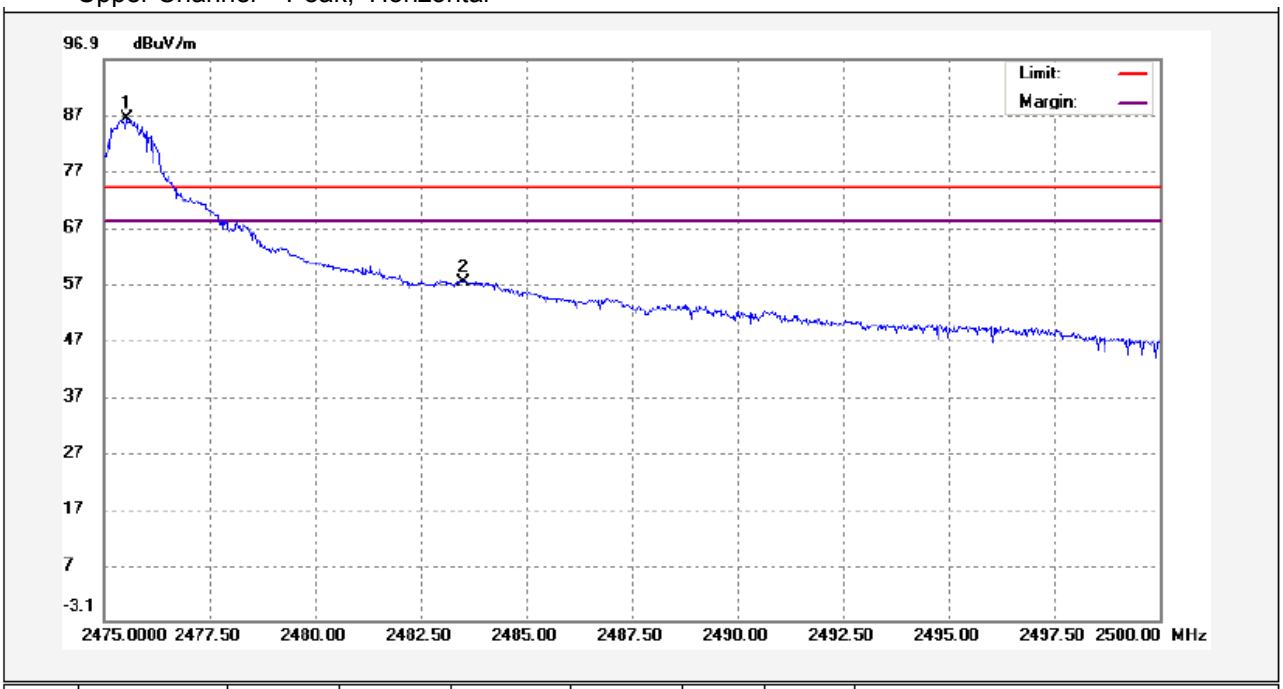


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.575	102.12	-15.68	86.44	74.00	12.44	peak	
2	2483.500	71.18	-15.67	55.51	74.00	-18.49	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.575	-12	74.44	54	20.44	AV	
2	2583.500	-12	43.51	54	-10.49	AV	

Remark:the marker 1 is the fundamental

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	102.00	-15.68	86.32	74.00	12.32	peak	
2	2483.500	72.85	-15.67	57.18	74.00	-16.82	peak	

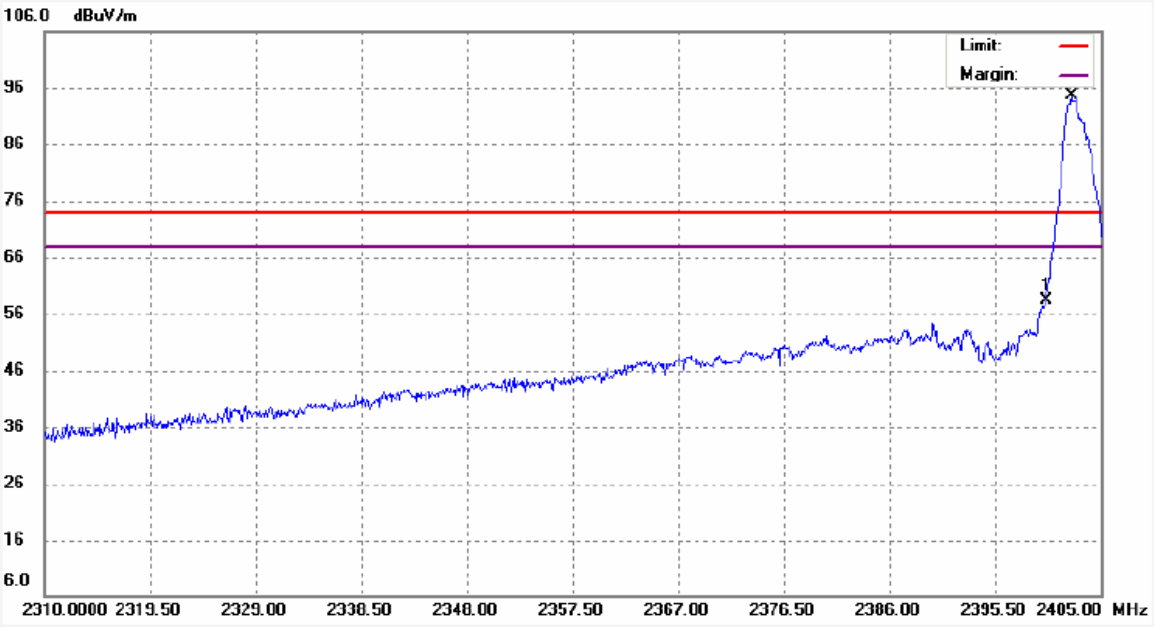
No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	-12	74.32	54	20.32	AV	
2	2483.500	-12	45.18	54	-8.82	AV	

Remark:the marker 1 is the fundamental

Hopping transmitting:

5dBi antenna with 3m cable:

Lower Channel – Peak, Vertical

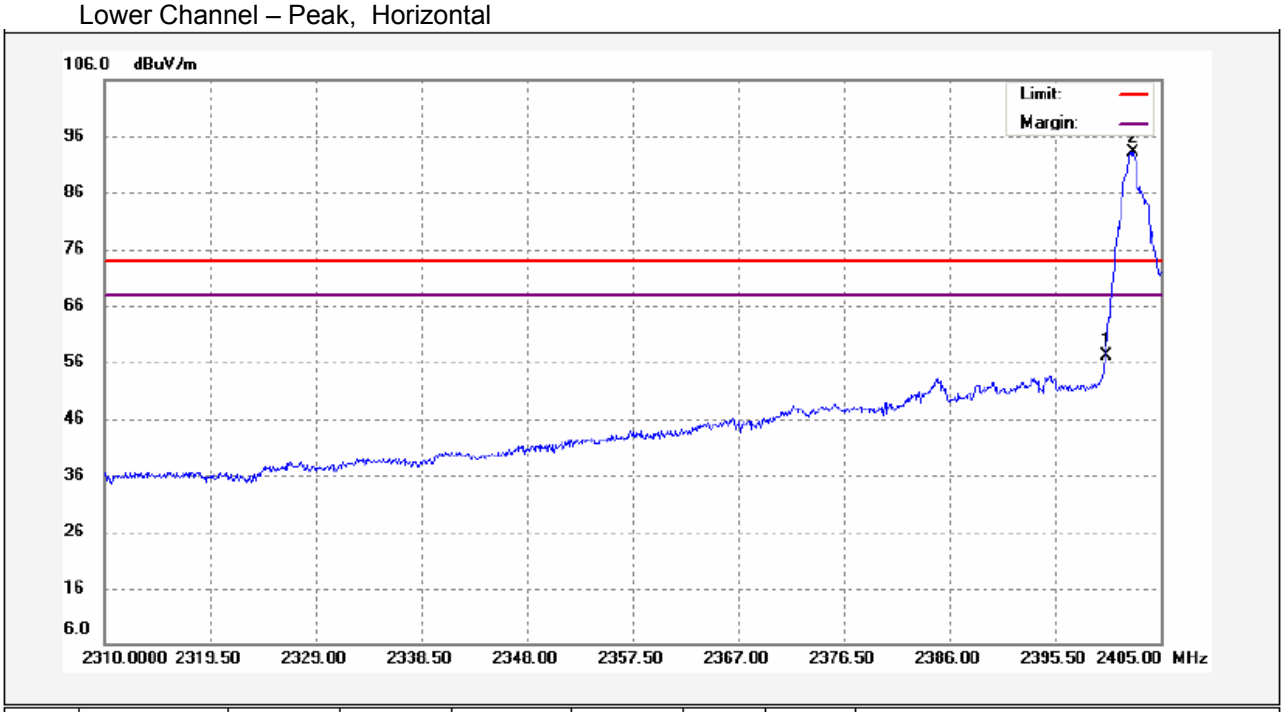


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	74.05	-15.58	58.47	74.00	-15.53	peak	
2	2402.340	110.15	-15.59	94.56	74.00	20.56	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	46.47	54	-7.53	AV	
2	2402.150	-12	82.56	54	28.56	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

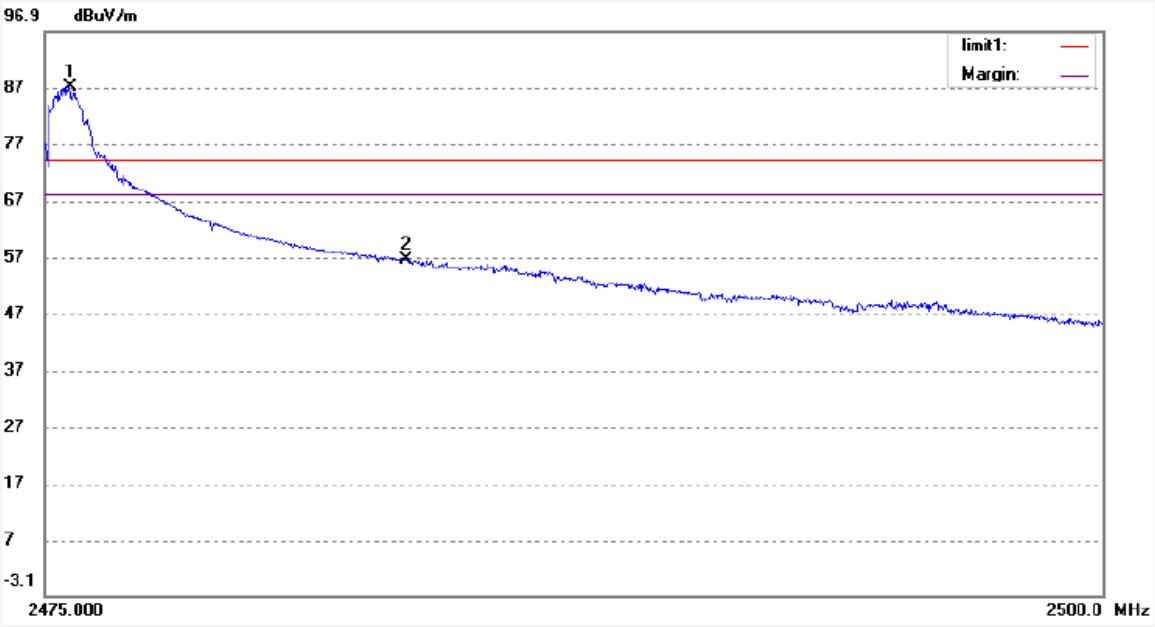


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	72.75	-15.58	57.17	74.00	-16.83	peak	
2	2402.435	108.66	-15.59	93.07	74.00	19.07	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	45.17	54	-8.83	AV	
2	2401.770	-12	81.07	54	27.07	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical

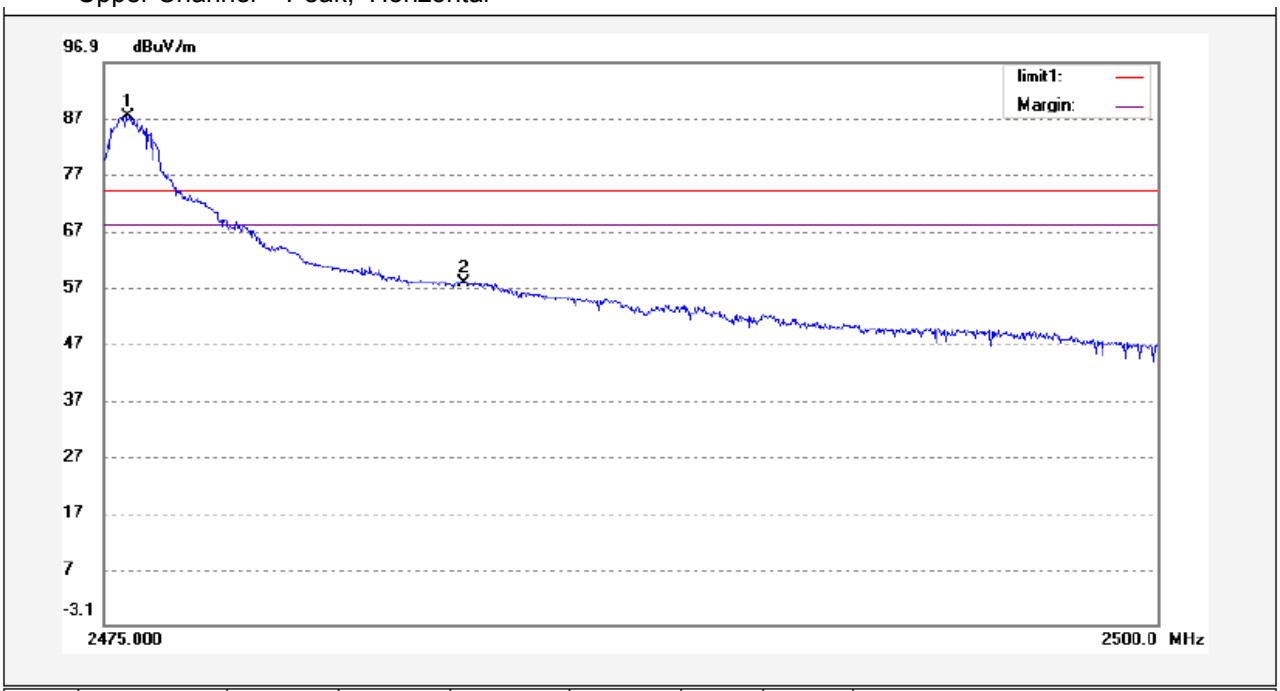


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.575	102.62	-15.68	86.94	74.00	12.94	peak	
2	2483.500	72.18	-15.67	56.51	74.00	-17.49	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.575	-12	74.94	54	20.94	AV	
2	2483.500	-12	44.51	54	-9.49	AV	

Remark:the marker 1 is the fundamental

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	103.00	-15.68	87.32	74.00	13.32	peak	
2	2483.500	73.35	-15.67	57.68	74.00	-16.32	peak	

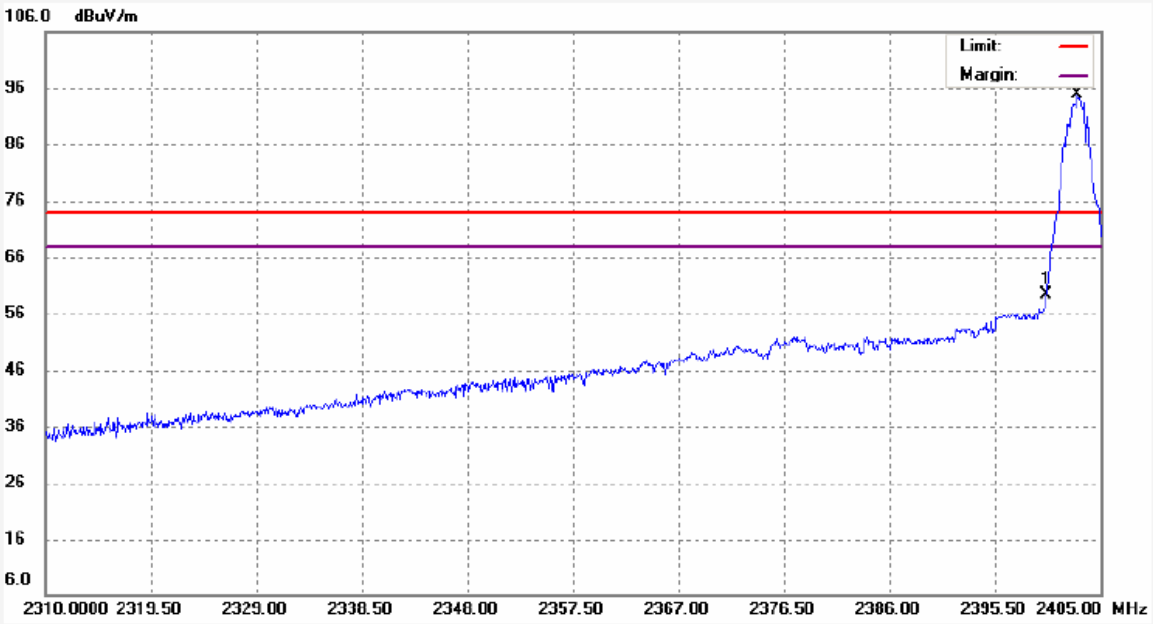
No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.550	-12	75.32	54	21.32	AV	
2	2483.500	-12	45.68	54	-8.32	AV	

Remark:the marker 1 is the fundamental

Continuous transmitting:

3dBi antenna:

Lower Channel – Peak, Vertical

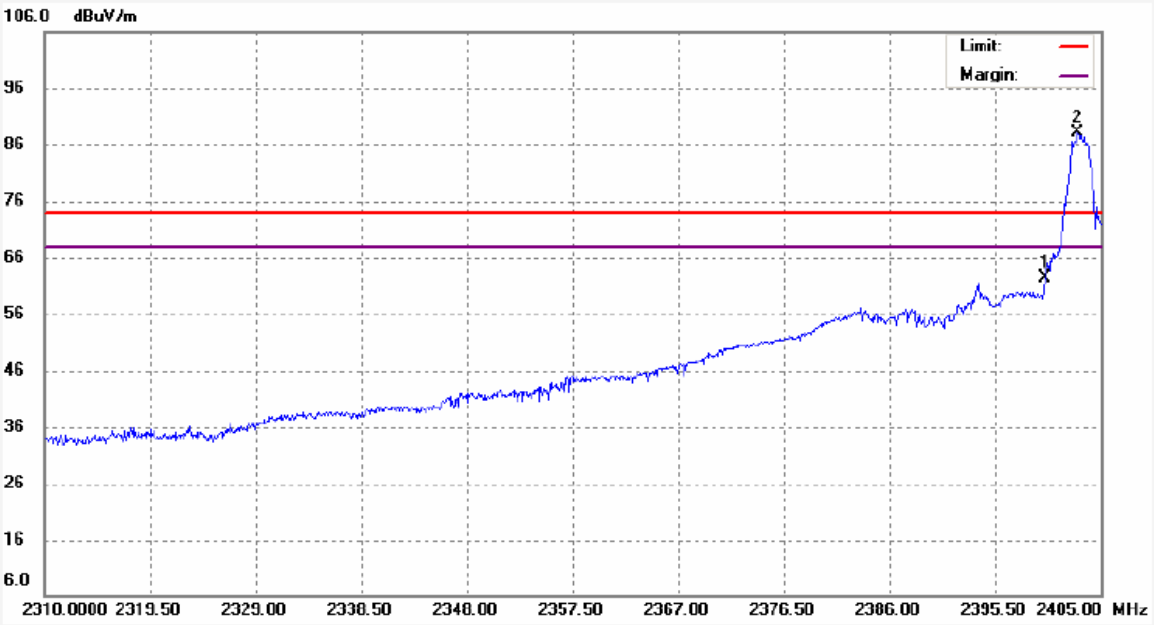


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	75.05	-15.58	59.47	74.00	-14.53	peak	
2	2402.910	110.47	-15.59	94.88	74.00	20.88	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	47.47	54	-6.53	AV	
2	2402.150	-12	82.88	54	28.88	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

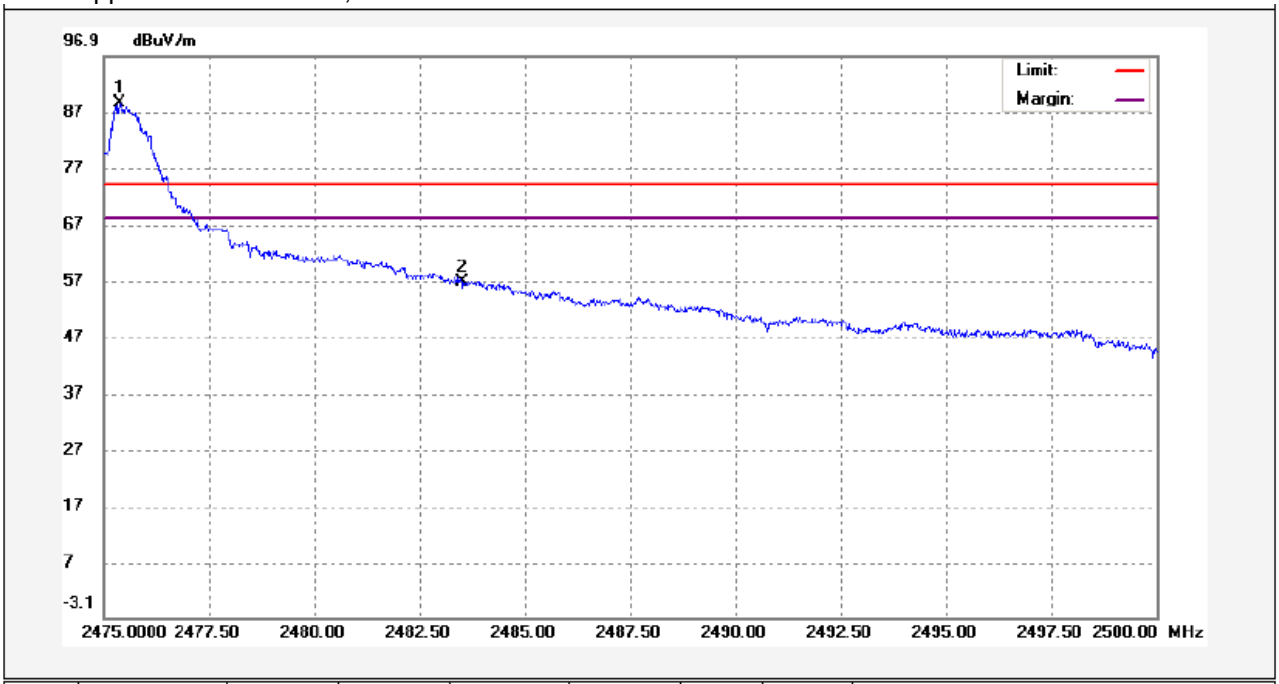


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	77.86	-15.58	62.28	74.00	-11.72	peak	
2	2402.910	103.75	-15.59	88.16	74.00	14.16	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	50.28	54	-3.72	AV	
2	2402.435	-12	76.16	54	22.16	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical

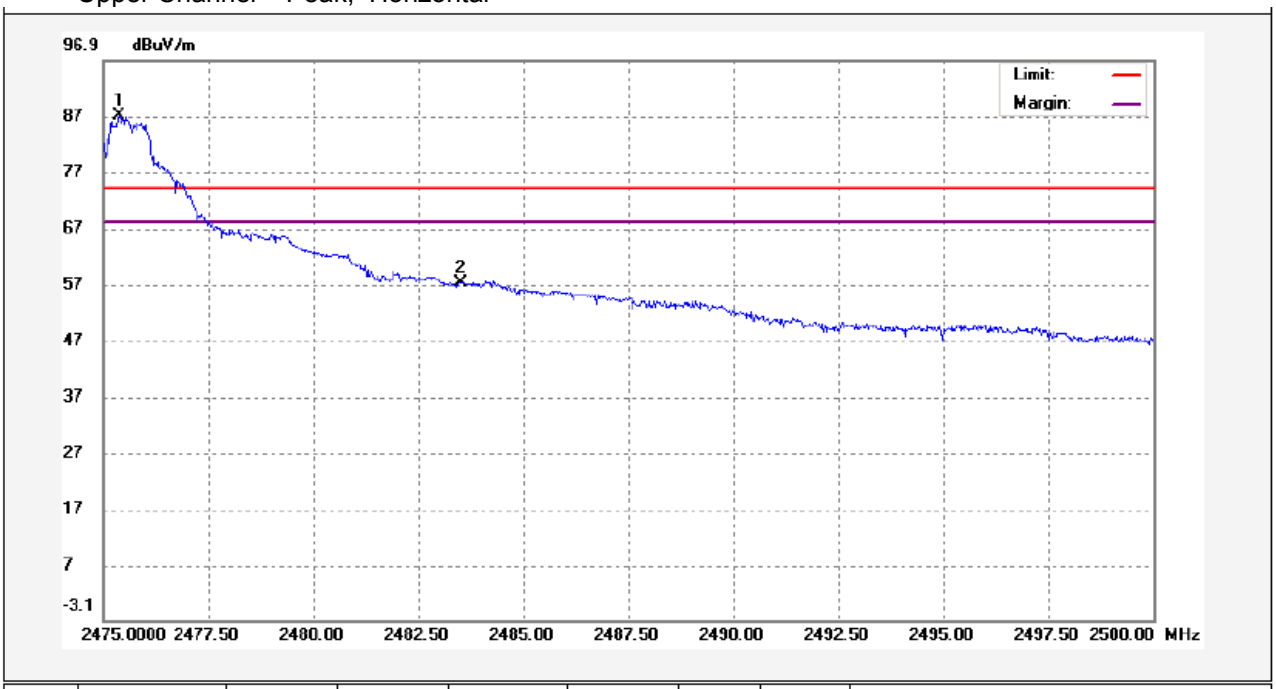


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	104.13	-15.68	88.45	74.00	14.45	peak	
2	2483.500	72.46	-15.67	56.79	74.00	-17.21	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	-12	76.45	54	22.45	AV	
2	2483.500	-12	44.79	54	-9.21	AV	

Remark:the marker 1 is the fundamental

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	102.62	-15.68	86.94	74.00	12.94	peak	
2	2483.500	72.85	-15.67	57.18	74.00	-16.82	peak	

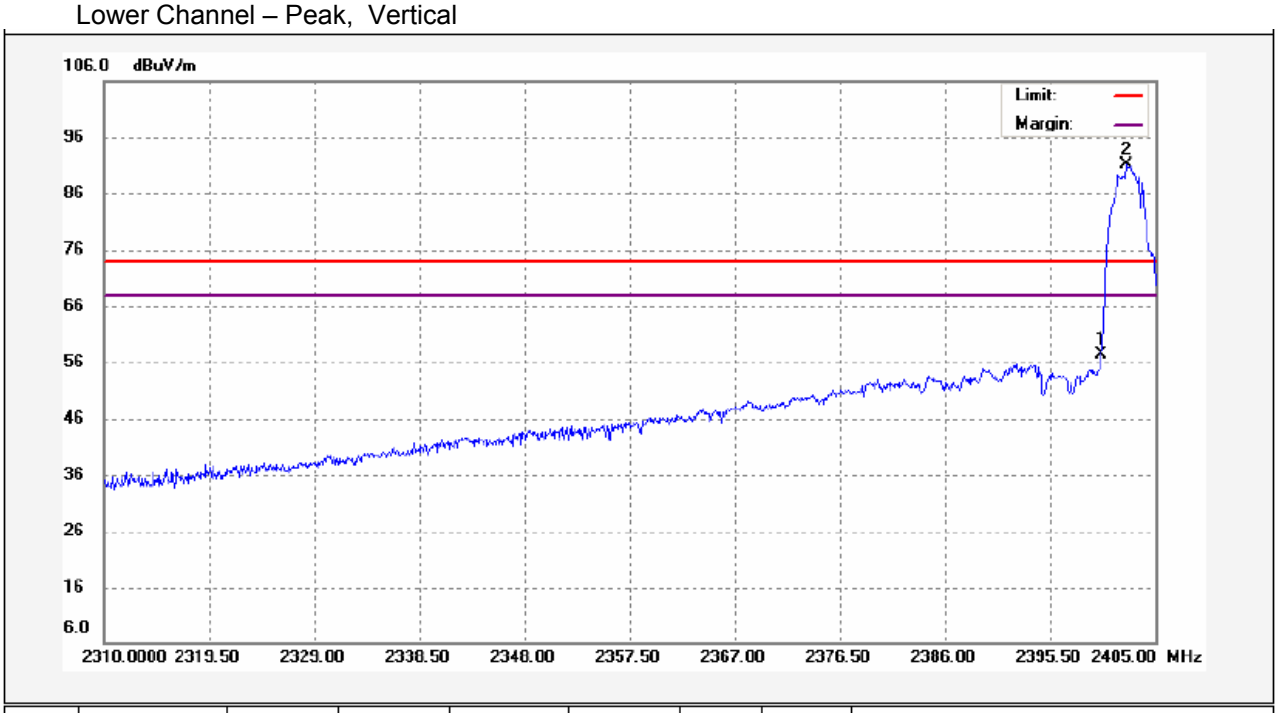
No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	-12	74.94	54	20.94	AV	
2	2483.500	-12	45.18	54	-8.82	AV	

Remark:the marker 1 is the fundamental

Hopping transmitting:

3dBi antenna:

Lower Channel – Peak, Vertical

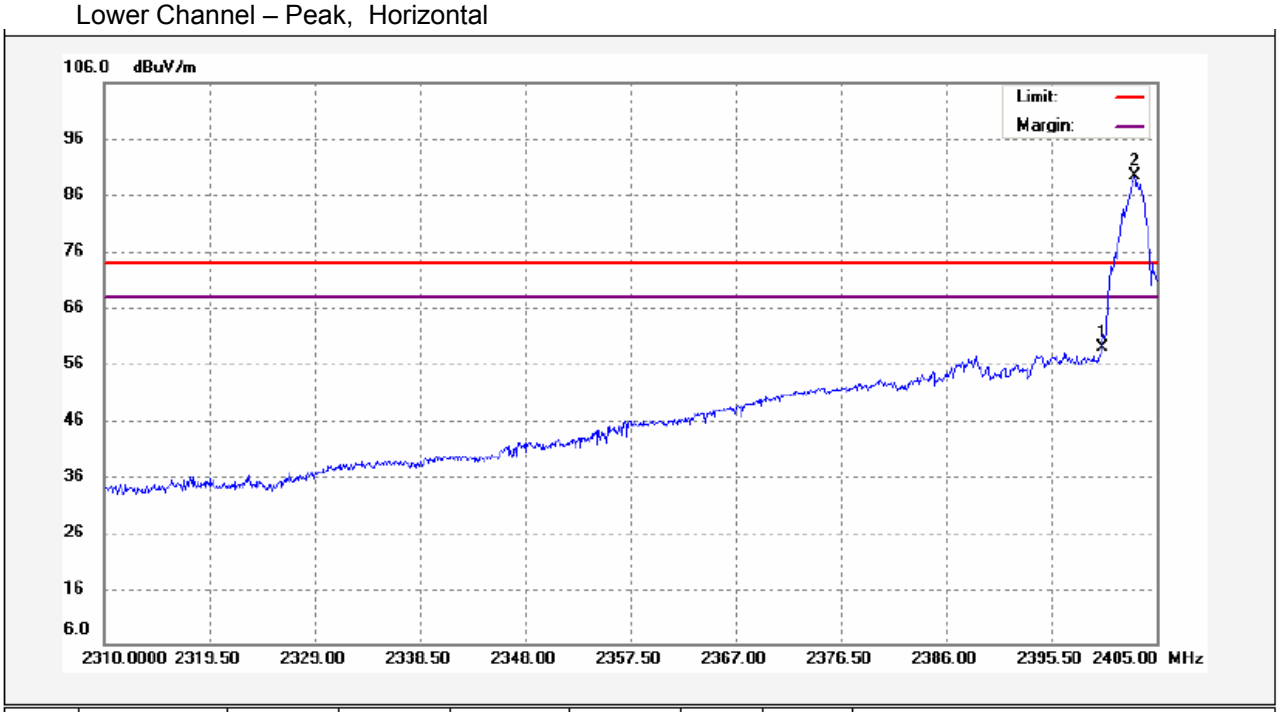


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	73.05	-15.58	57.47	74.00	-16.53	peak	
2	2402.435	106.68	-15.59	91.09	74.00	17.09	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	45.47	54	-8.53	AV	
2	2402.720	-12	79.09	54	25.09	AV	

Remark:the marker 2 is the fundamental

Lower Channel – Peak, Horizontal

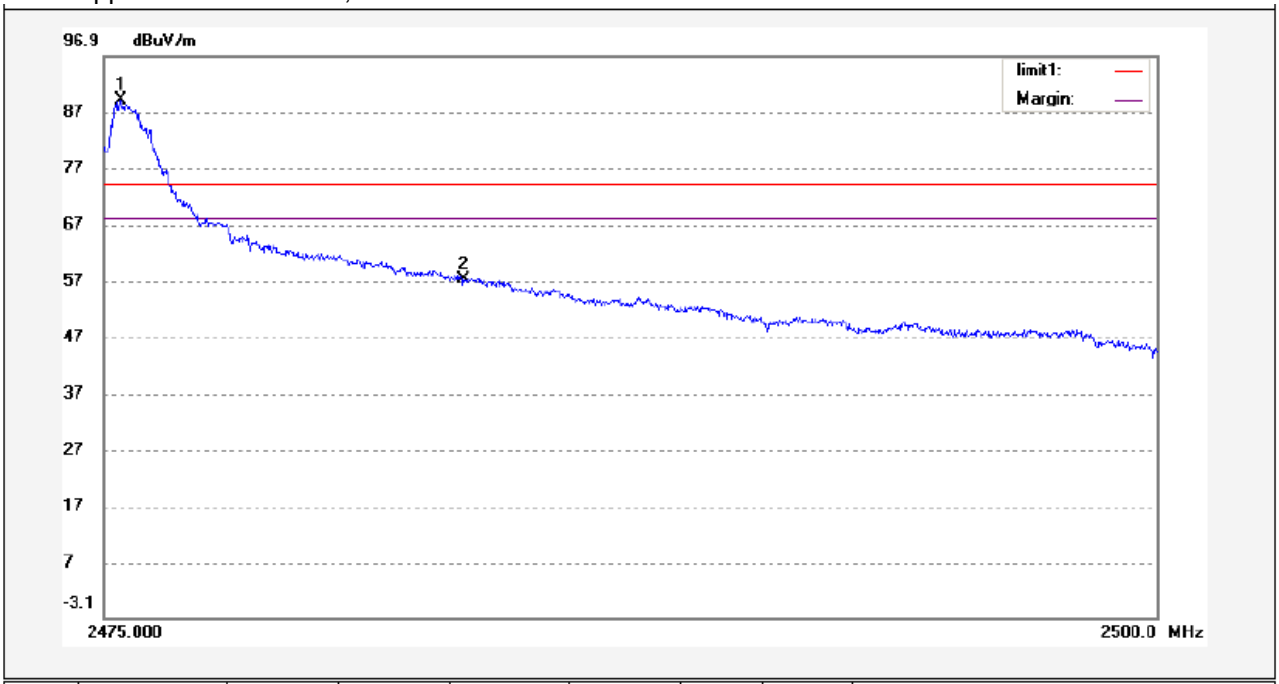


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	74.36	-15.58	58.78	74.00	-15.22	peak	
2	2403.005	104.92	-15.59	89.33	74.00	15.33	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-12	46.78	54	-7.22	AV	
2	2402.720	-12	77.33	54	23.33	AV	

Remark:the marker 2 is the fundamental

Upper Channel – Peak, Vertical

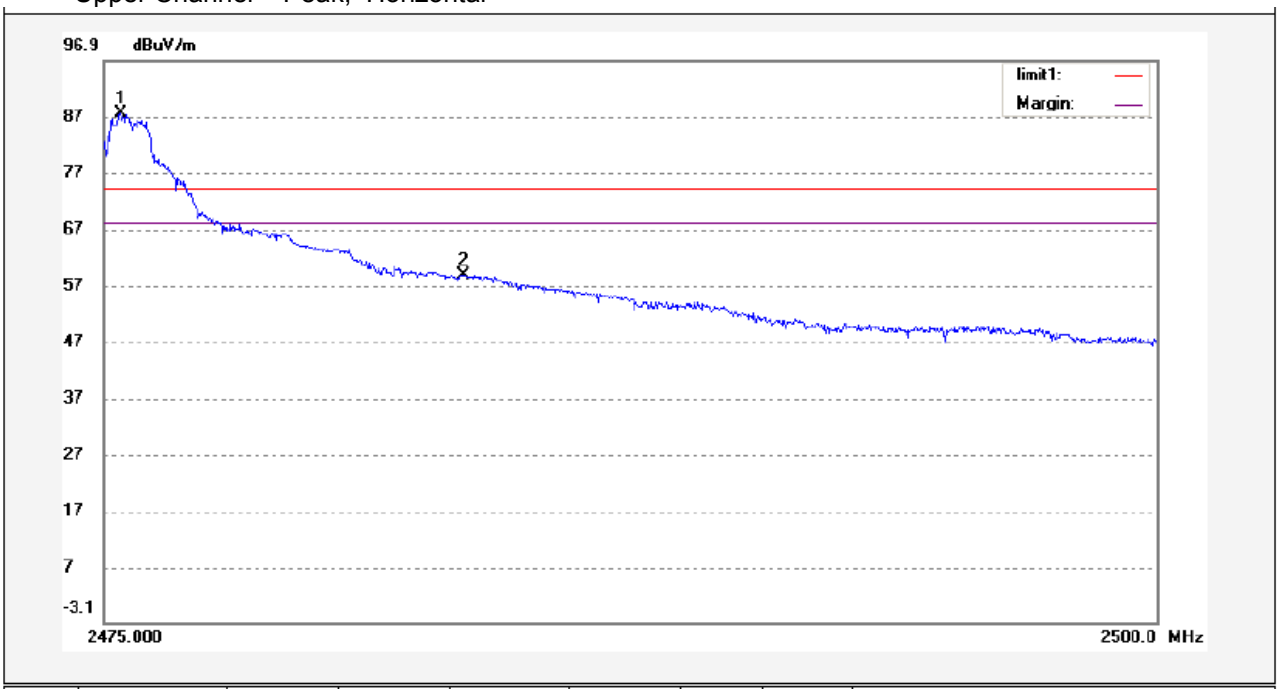


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	104.63	-15.68	88.95	74.00	14.95	peak	
2	2483.500	72.96	-15.67	57.29	74.00	-16.71	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	-12	76.95	54	22.95	AV	
2	2483.500	-12	45.29	54	-8.71	AV	

Remark:the marker 1 is the fundamental

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	103.12	-15.68	87.44	74.00	13.44	peak	
2	2483.500	74.35	-15.67	58.68	74.00	-15.32	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.375	-12	75.44	54	21.44	AV	
2	2483.500	-12	46.68	54	-7.32	AV	

Remark:the marker 1 is the fundamental

10 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

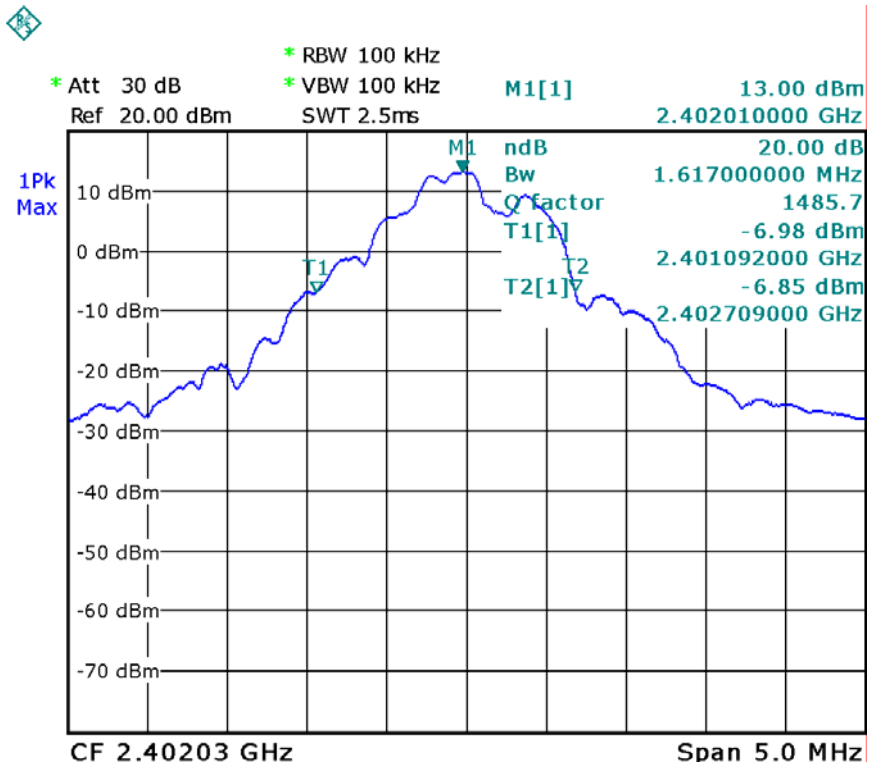
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

10.2 Test Result:

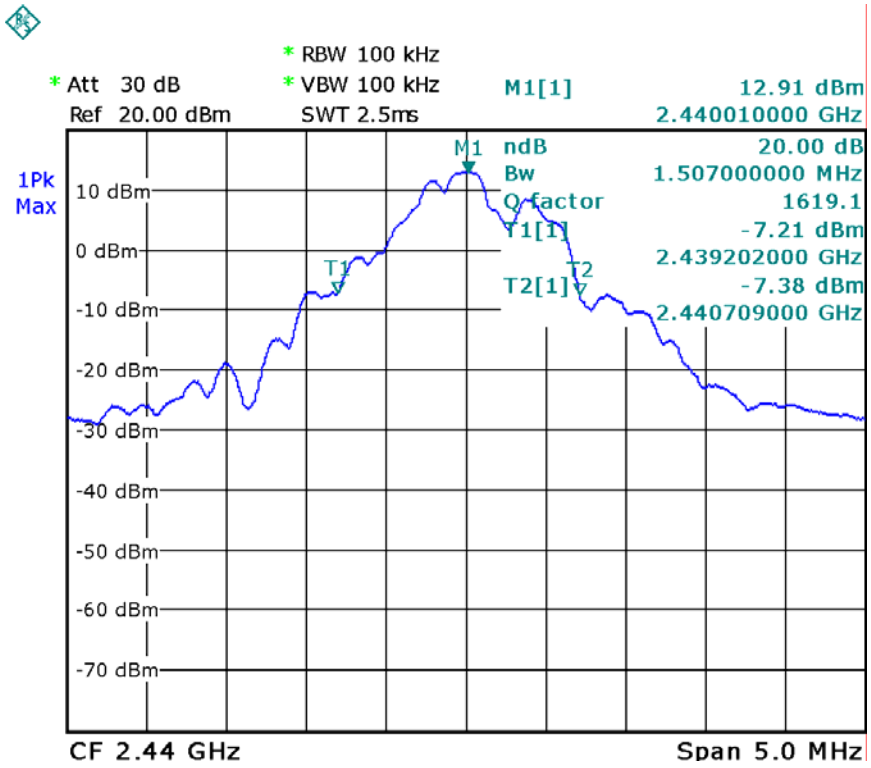
Test Channel	Bandwidth
Low	1.617MHz
Middle	1.507MHz
High	1.527MHz

Test result plot as follows:

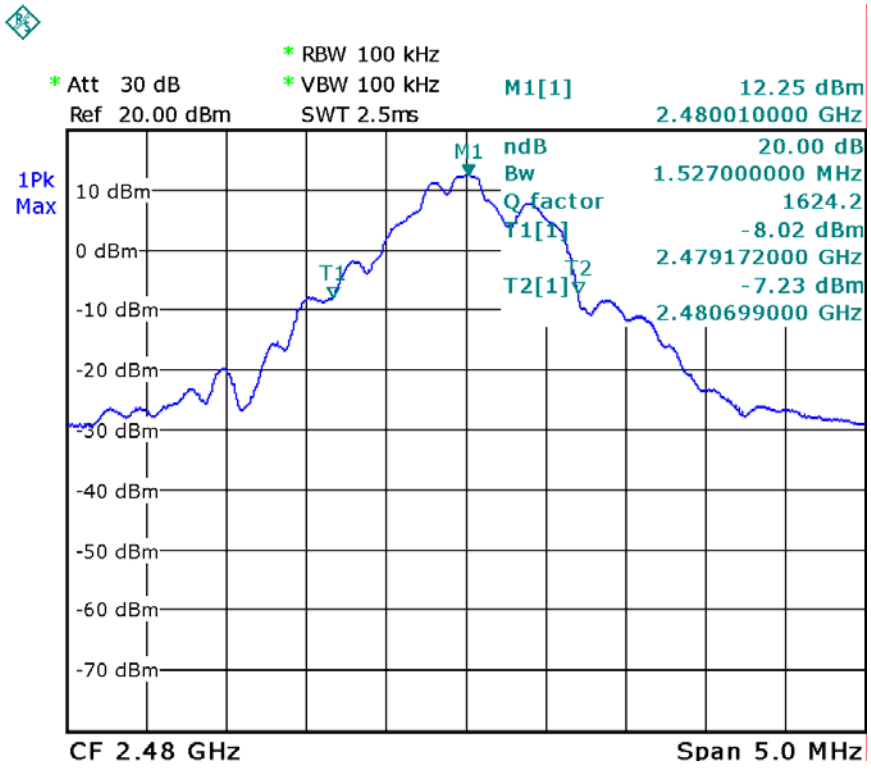
Low Channel



Middle Channel



High Channel



11 Spurious RF Conducted Emissions from out of band

Test Requirement: FCC Part 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Mothed: DA 00-705

Test Status: TX mode

11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency.
3. Set RBW = 100kHz and VBW = 300kHz.Sweep =auto.
4. mark the worst point and record.

11.2 Test Result

Test Frequency: Below 30MHz

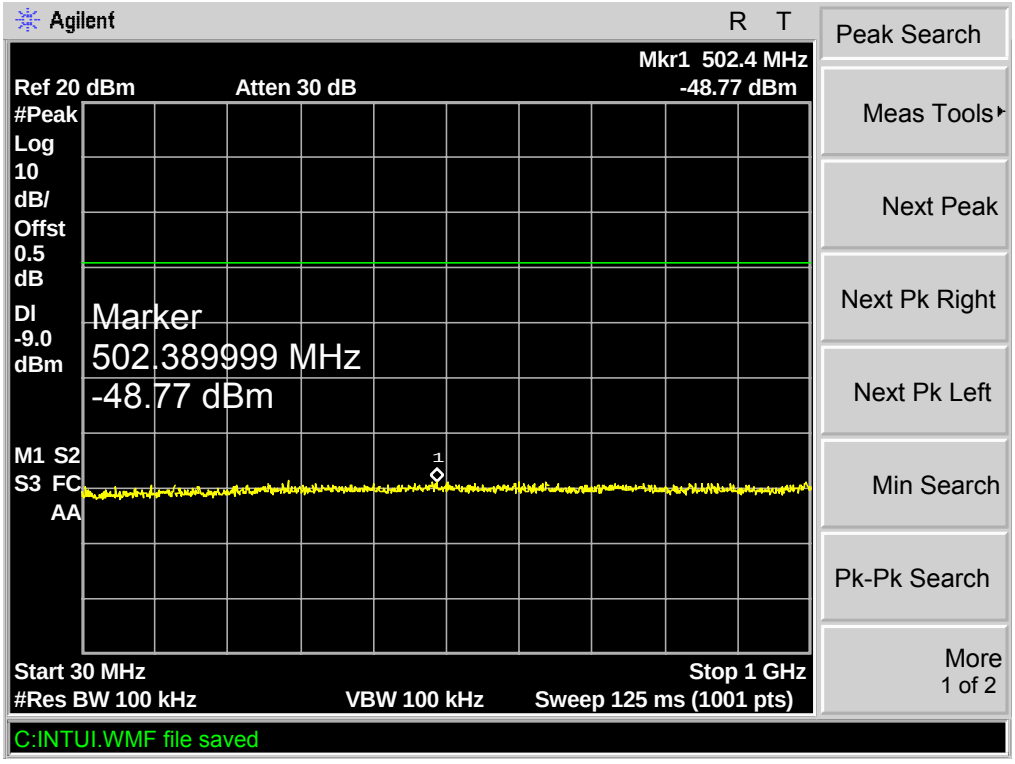
Remark: For emissions below 30MHz,no emission higher than background level, so the data does not show in the report.

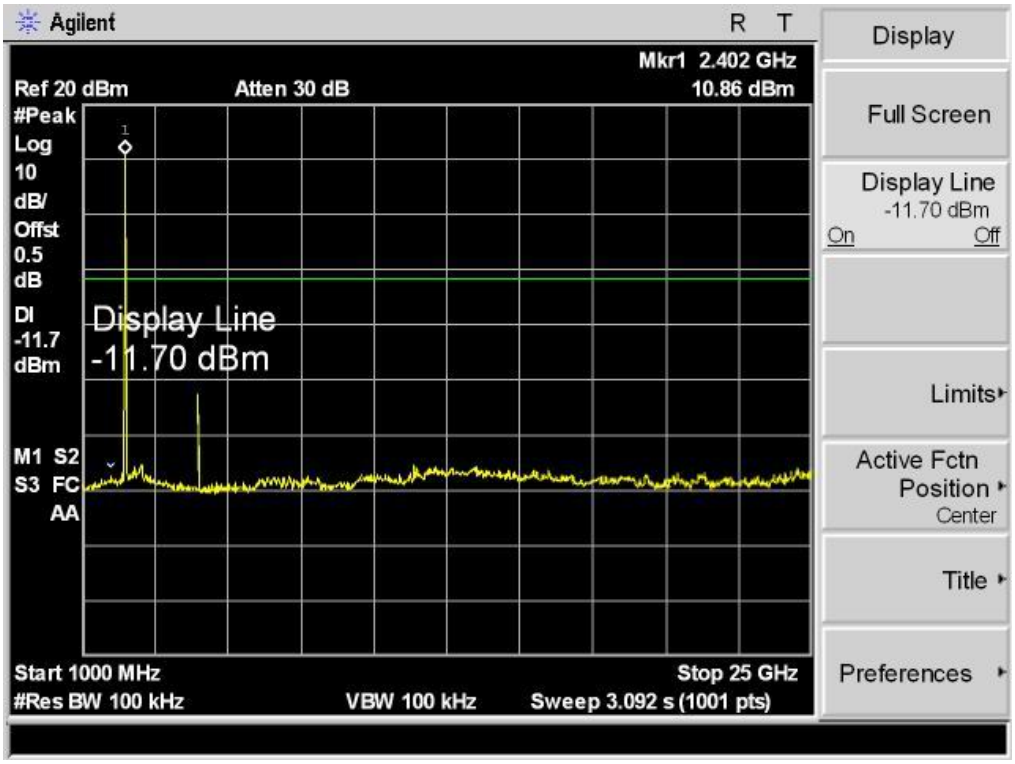
Test Frequency: 30MHz ~ 25GHz

Test result plots shown as follows:

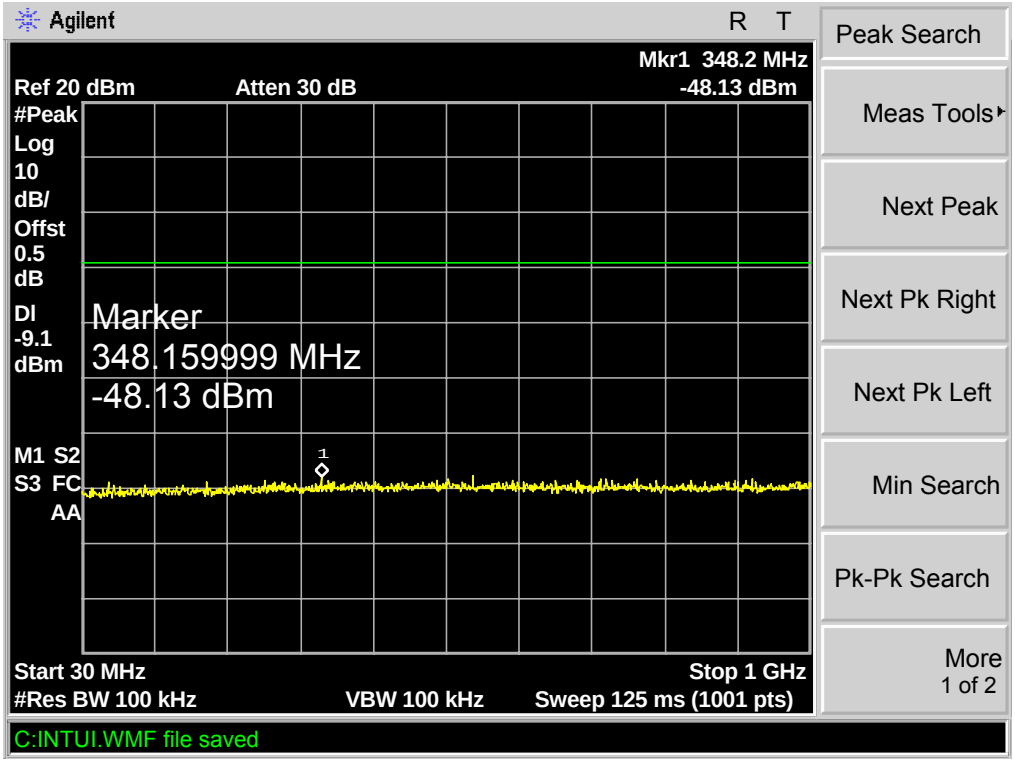
Modulation:GFSK

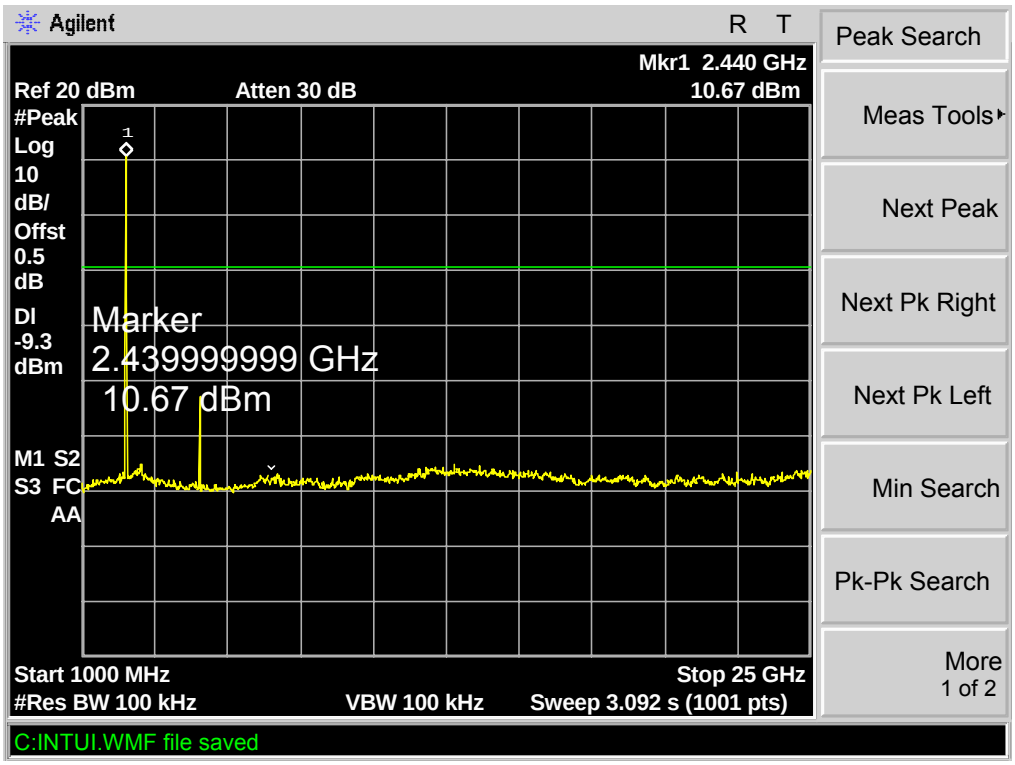
Lower Channel



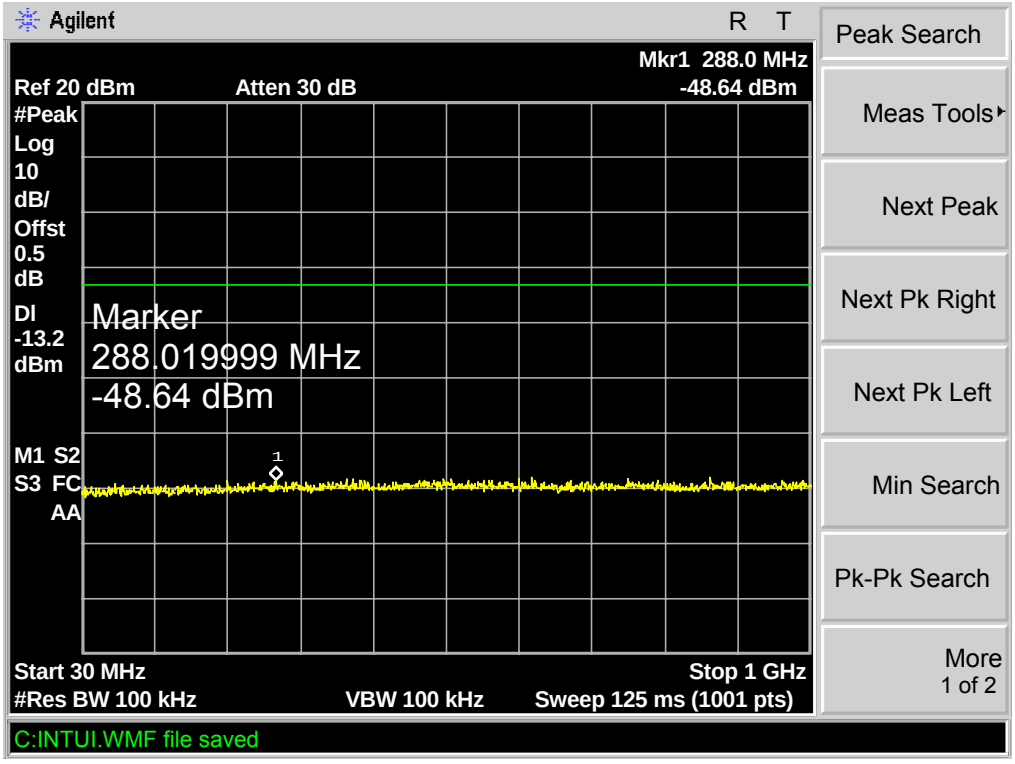


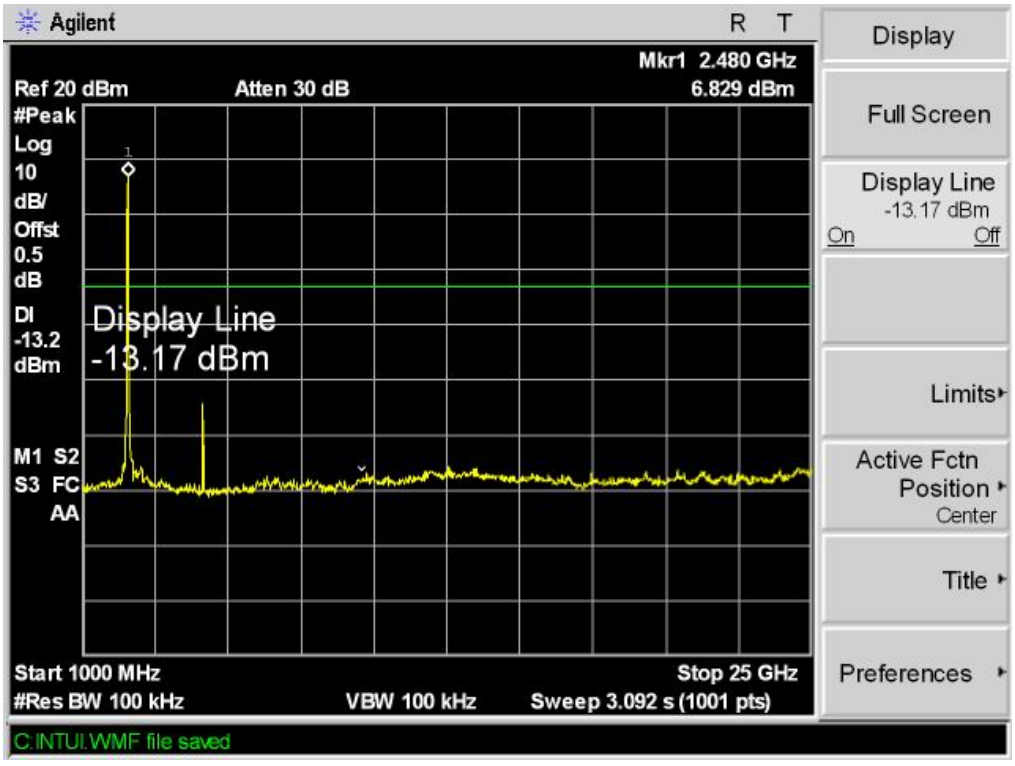
Middle Channel





Upper Channel





12 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.4:2003
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result "Number of Hopping Frequency" of this document. The 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 10 MHz. Sweep = auto; Detector Function = Peak.

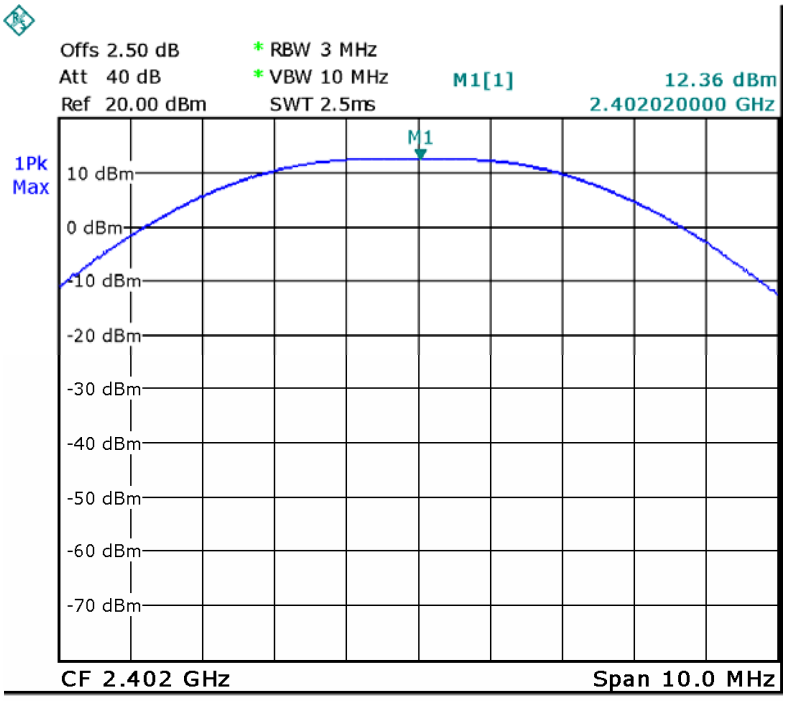
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

12.2 Test Result:

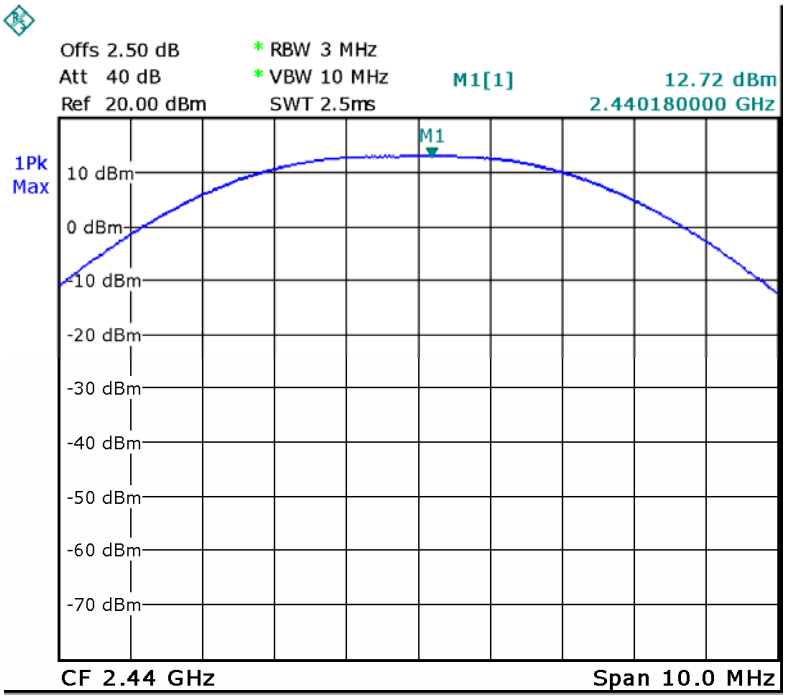
Test Channel	Output Power (dBm)	Limit (dBm)
Low	12.36	20.97
Middle	12.72	20.97
High	12.50	20.97

Test result plot as follows:

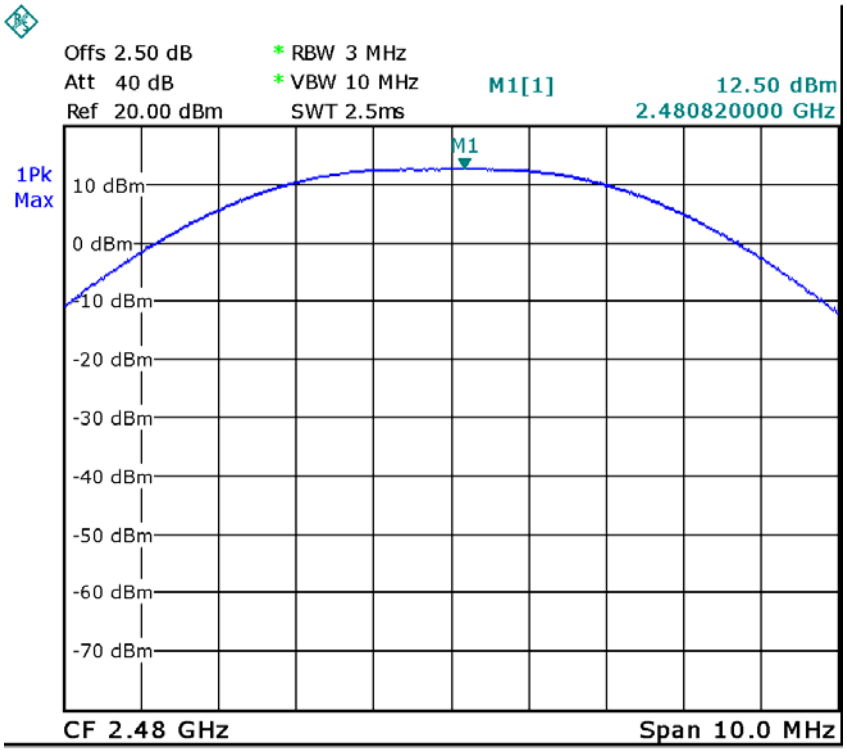
Low Channel



Middle Channel



High Channel



13 Channel Separated

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.

Test Mode: Test in hopping transmitting operating mode.

13.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz , Span = 10MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

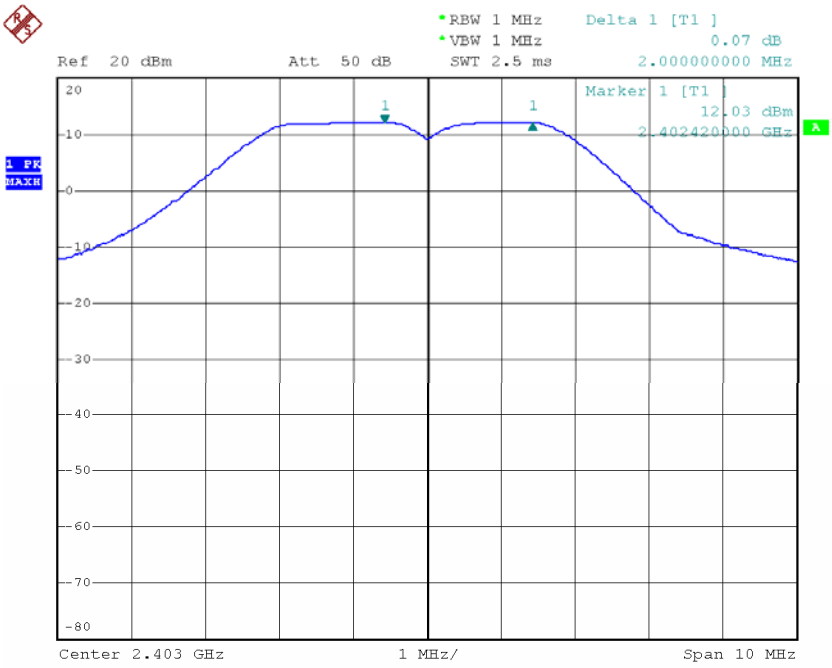
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

13.2 Test Result:

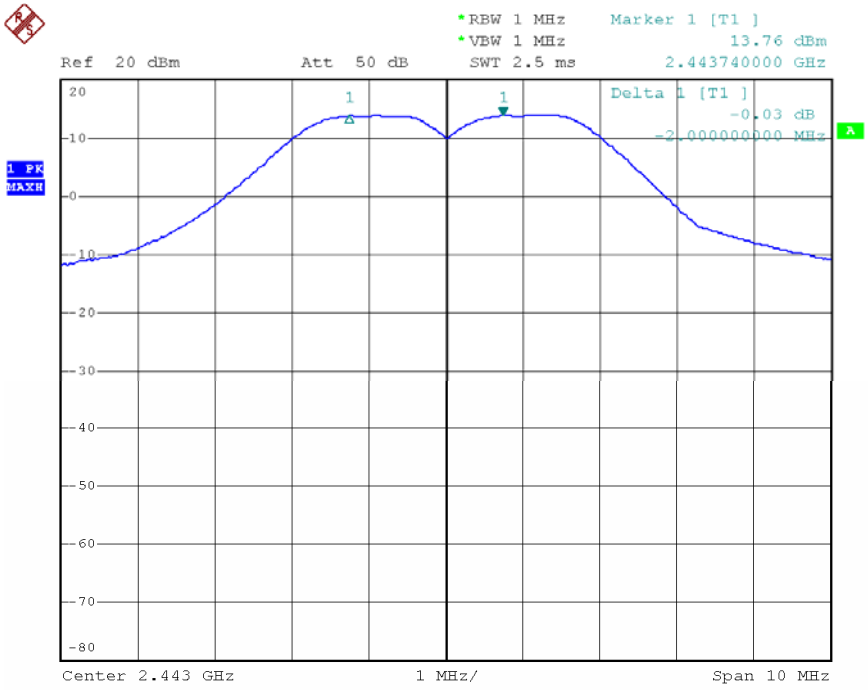
Test Channel	Separation (MHz)	Result
Low	2.000MHz	PASS
Middle	2.000MHz	PASS
High	2.000MHz	PASS

Test result plot as follows:

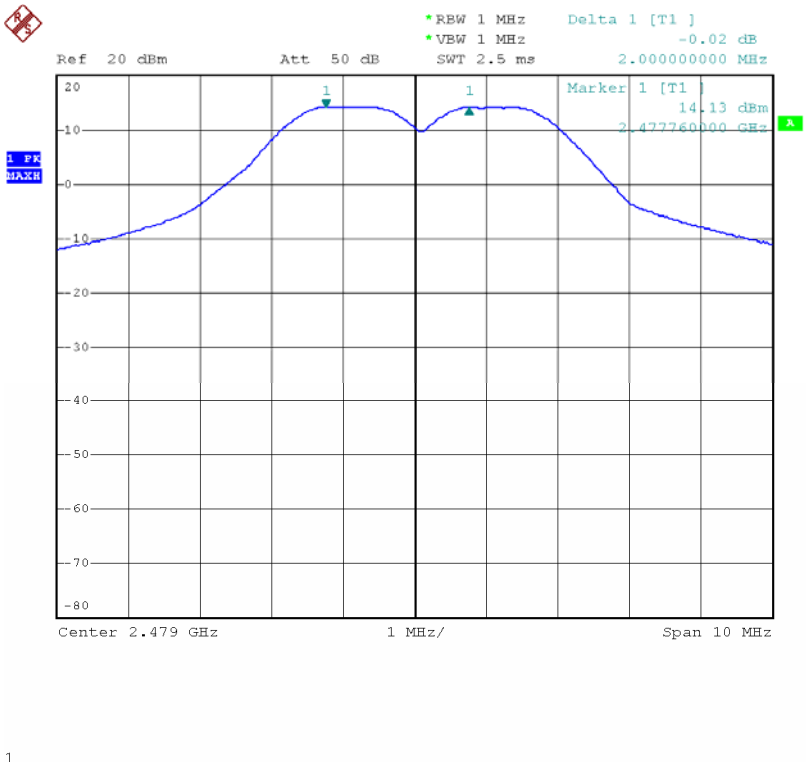
Low Channel



Middle Channel



High Channel



14 Hopping Channel number

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Test Mode: Test in hopping transmitting operating mode.

14.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

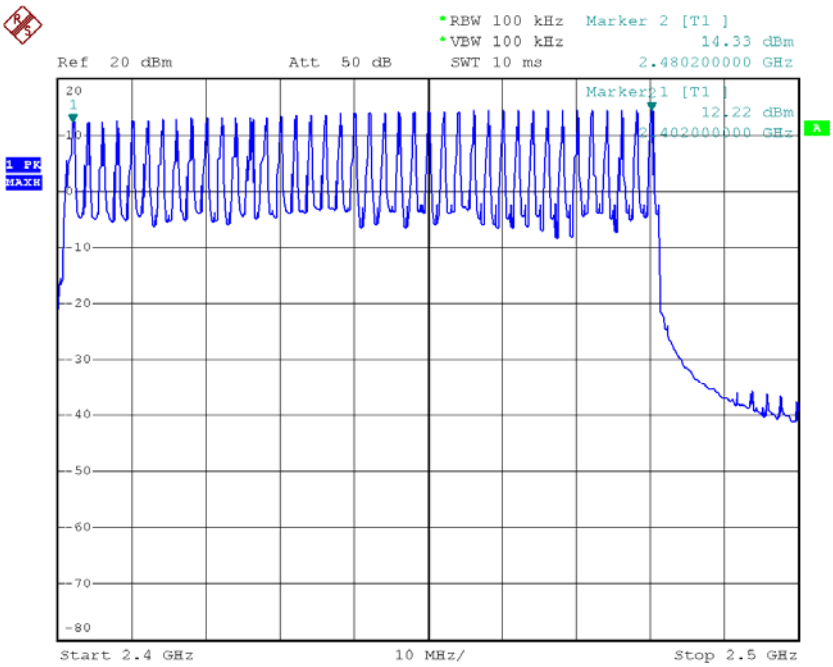
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Center Frequency = 2441MHz, Span = 86MHz. Submit the test result graph.

14.2 Test Result

Total Channels are 40 Channels.



15 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Mode:	Test in hopping transmitting operating mode.

15.1 Test Procedure:

1.Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2.Set spectrum analyzer span = 0. centered on a hopping channel;

3.Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.

4.Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

15.2 Test Result

The test period: T= 0.4(s) * 40 = 16 (s)

So, the Dwell Time can be calculated as follows:

Low channel: slot time=12(times)/1(s)*0.210(ms)*16(s)=0.040(s)

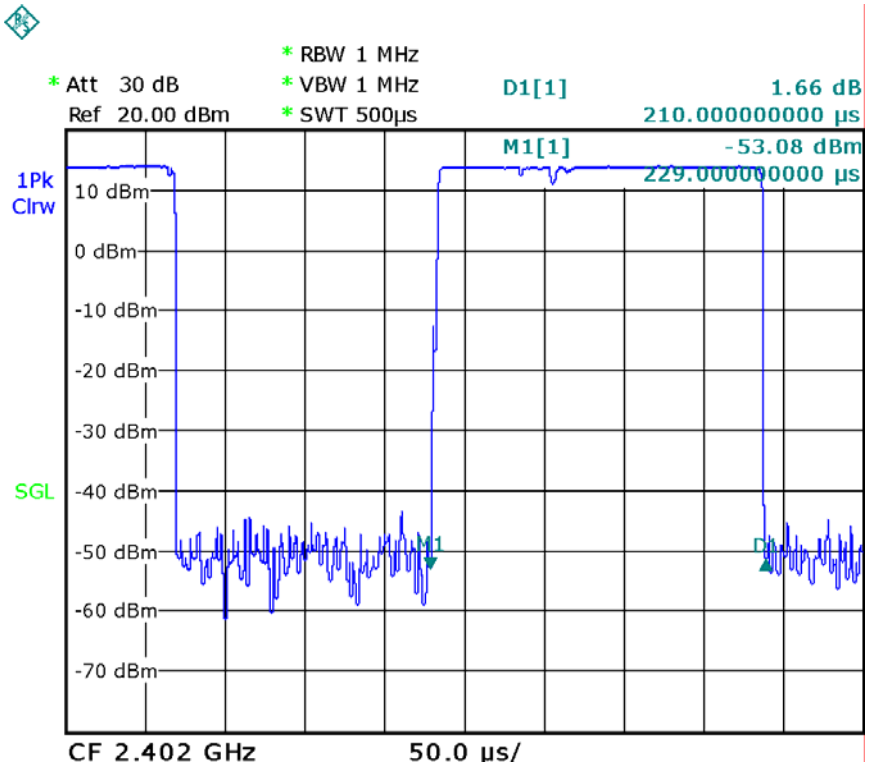
Middle channel: slot time=15(times)/1(s)*0.209(ms)*16(s)=0.050(s)

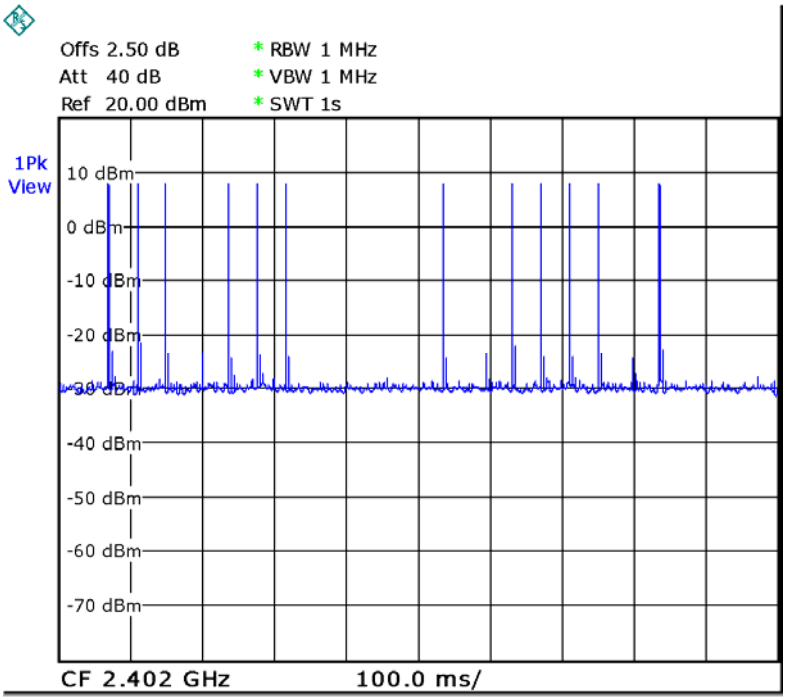
High channel: slot time=15(times)/1(s)*0.212(ms)*16(s)=0.051(s)

Note : Mkr Delta is once pulse time.

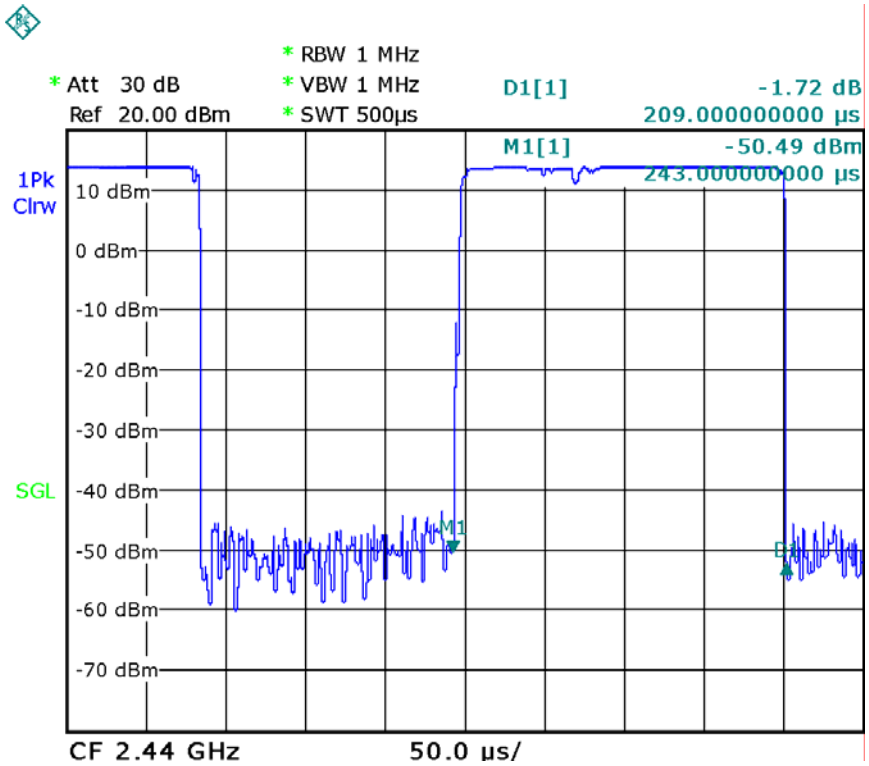
Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2402 MHz	0.210	0.040	0.400	Pass
2440 MHz	0.209	0.050	0.400	Pass
2480 MHz	0.212	0.051	0.400	Pass

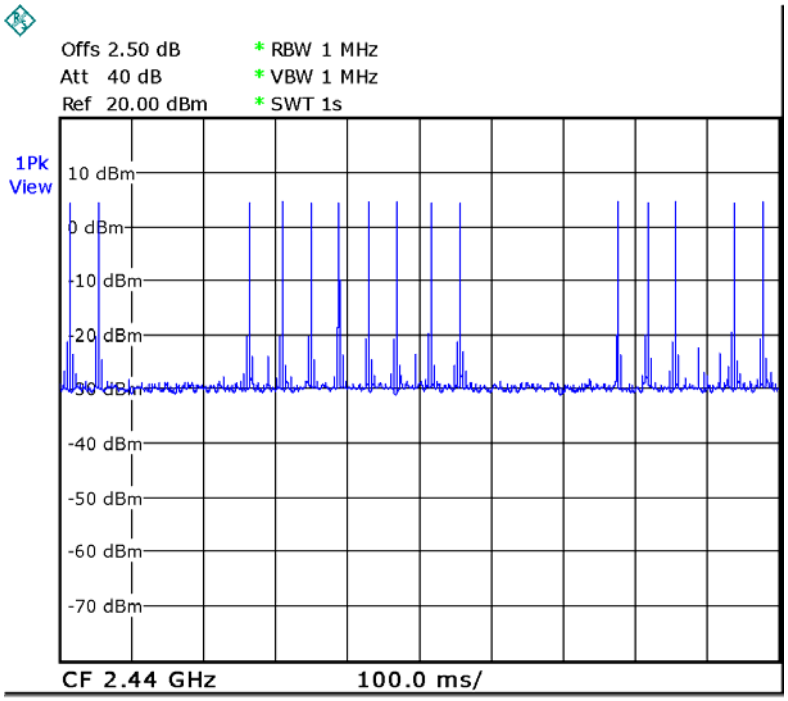
Low Channel


* RBW 1 MHz
* Att 30 dB
* VBW 1 MHz
D1[1] 1.66 dB
Ref 20.00 dBm
* SWT 500µs
210.000000000 µs
M1[1] -53.08 dBm
229.000000000 µs
1Pk
Clrw
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
SGL
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1
CF 2.402 GHz
50.0 µs/

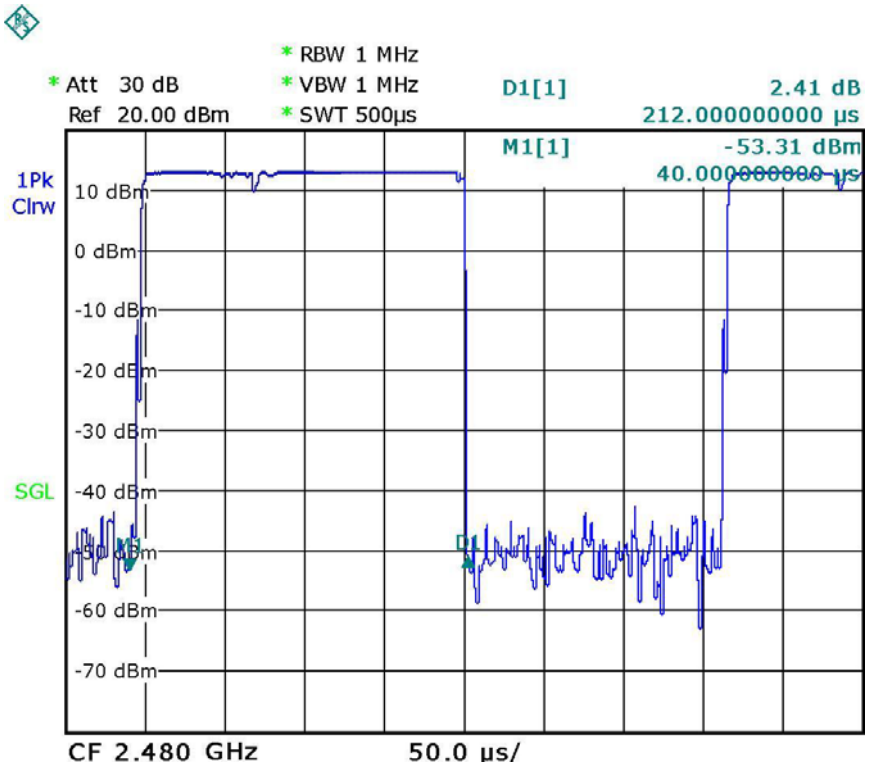

Offs 2.50 dB
* RBW 1 MHz
Att 40 dB
* VBW 1 MHz
Ref 20.00 dBm
* SWT 1s
1Pk
View
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.402 GHz
100.0 ms/

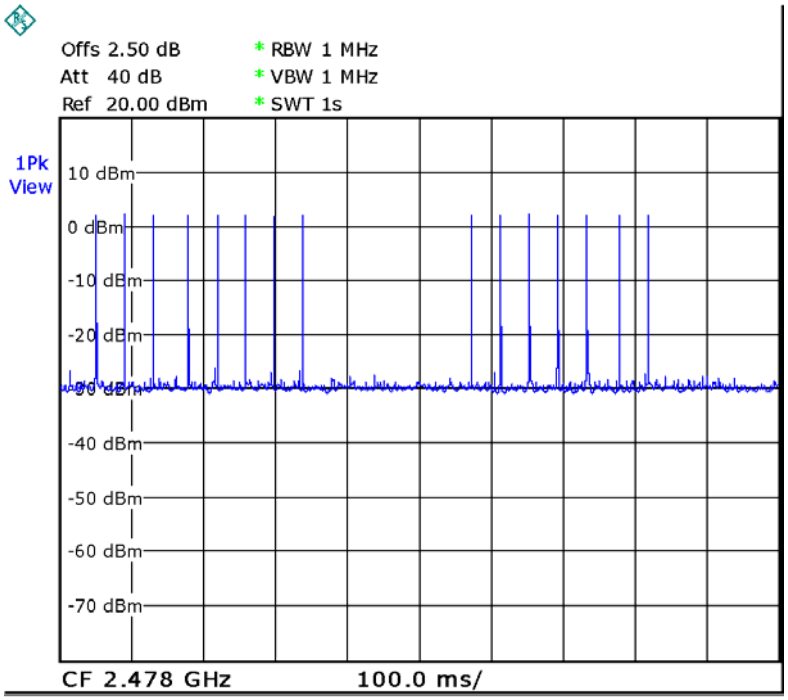
Middle Channel





High Channel





16 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has a detachable antenna with RP SMA connector (The whorl is nonstandard , it only apply to this model), fulfill the requirement of this section.

17 RF Exposure

Test Requirement: **FCC Part 1.1307**

Test Mode: **The EUT work in test mode(Tx).**

17.1 Requiments:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

17.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

17.3 MPE Calculation Method

$$\text{E (V/m)} = \frac{\sqrt{30 \times P \times G} / C}{d} \qquad \text{Power Density: } Pd \text{ (W/m²)} = \frac{E^2}{377}$$

E = Electric field (V/m)
P = Peak RF output power (W)
G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

$$\boldsymbol{Pd} = \frac{30 \times P \times G / C}{377 \times d^2}$$

dBm=10lgmW

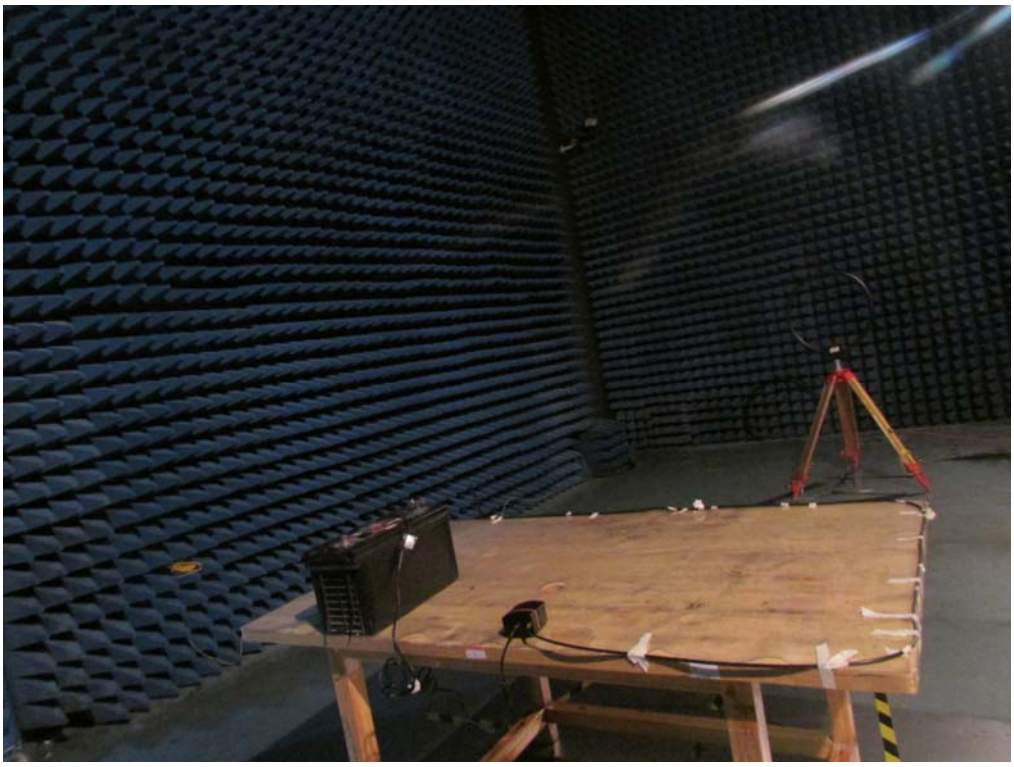
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Cable (m)	Peak Output Power (mW)	Antenna Gain (numeric)	Cable loss (numeric)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)
--	18.71	1.995	--	0.0074	1
3	18.71	3.162	1.433	0.0082	1
9	18.71	3.162	2.967	0.0040	1

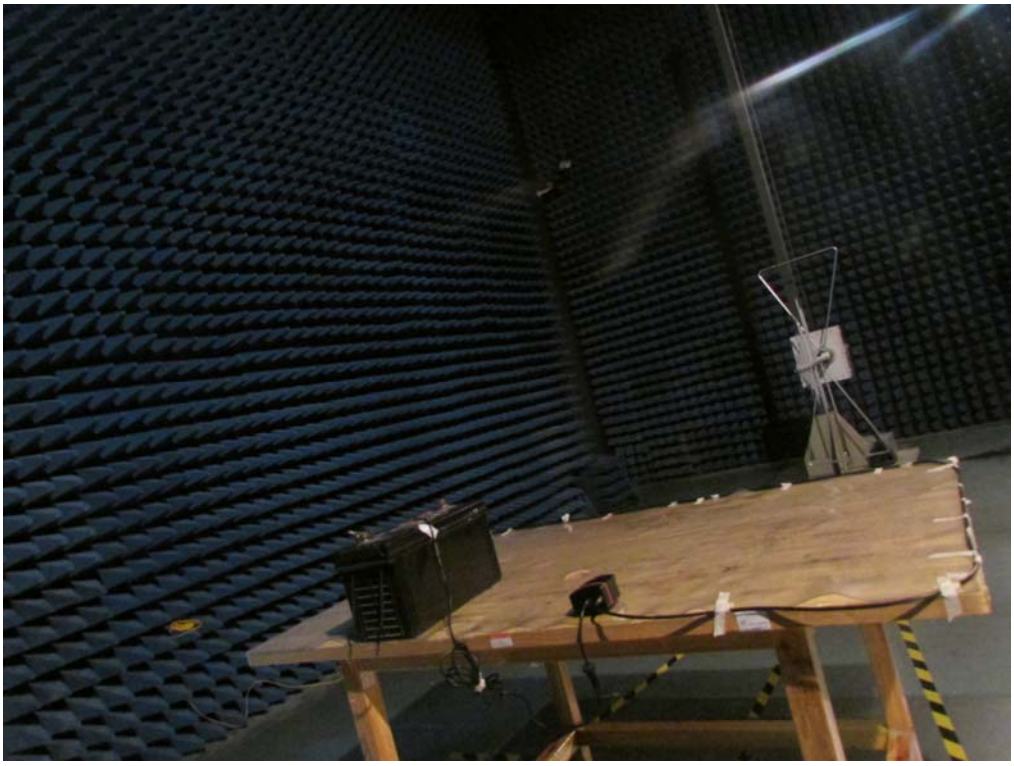
18 Photographs – Test Setup

18.1 Photograph –Radiated Emissions Test Setup

Below 30MHz



30MHz ~ 1GHz



Above 1GHz

19 Photographs - Constructional Details

19.1EUT –Appearance View

Detail reference to "2AABVWVCMSQ1B_external photos"

19.2EUT – Open View

Detail reference to "2AABVWVCMSQ1B_Internal photos"

=End of report=