FCC/IC Test Report

FCC EVALUATION REPORT FOR VERIFICATION	
Project Reference No.	161398
Product	Baby monitor
Brand Name	N/A
Model	28000-TX
Alternate Model	N/A
Tested according to	FCC Rules and Regulations Part 15 Subpart C 2008 15.247,RSS-210 ISSUE 8, ANSI C63.4-2009

Tested in period	2011/1/17 to 2011/1/27
Issued date	2011/1/28
Name and address of the Test House	Nemko Nemko Shanghai Ltd. 9A No. 528 Ruiqing Road, PuDong New Area, Shanghai, China P.C. Phone : +86 21 5072 0988 Fax : +86 21 5072 0950
Tested by	2011/1/28
Zone Peng	***date***
Verified by	2011/1/28
Daria Liu	***date***

Contents of This Report

1. Client Information

1.1 Applicant

Company Name:	Summer Infant, Inc.
Company Address:	582 Great Road North Smithfield, RI 02896 USA

1.2 Manufacturer

Company Name:	Foshan Shunde Alford Electronics Co. Ltd.
Company Address:	Xinjiao Industrial Park, Daliang, Shunde,Foshan City, Guangdong Province, China

1.3 Scope

●Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

2. Equipment under Test (EUT)

2.1 Identification of EUT

Category:	Baby Monitor
Model Name:	28000-TX
Alternate model:	N/A
Brand name:	N/A
Technical data (Rating, etc.):	100-240VAC 50/60Hz
AC to DC adapter:	Model : BLJ5W075075P-U Input: 100-240VAC 50/60Hz 150mA Output : 7.5VDC 750mA

2.2 Detail spec:

Carrier Frequency： 2404.125MHz to 2478.375 MHz

Number of Channel： 64

Output Power： 18.92 dBm

Modulation Type： GFSK

Mode of operation (duplex, simplex, half duplex) ： Duplex

Antenna Type： Integral PCB Antenna

Antenna gain： 1 dBi

Only TX function ,no RX function

2.3 Additional Information Related to Testing

CH 1 : 2404.125 MHz

CH 50: 2436.75 MHz

CH 64: 2478.375 MHz

2.4 Picture Documentation

●N/A

3. General Test Conditions

3.1 Location

These measurement tests were conducted at Shenzhen Timeway Technology Consulting Co., Ltd. East 5/Block 4, Anhua Industrial Zone, No.8, Tairan Rd. Chegongmiao, Futian District, Shenzhen, China—ELA 611

FCC-Registration No.: 899988

IC- Registration No.: IC5205A-01

Note: all test are witnessed by NEMKO engineer

3.2 Operating Environment

All tests and measurements were performed in a shielded enclosure or a controlled environment suitable for the tests conducted. The climatic conditions in the test area are automatically controlled and recorded continuously.

Parameters	Recording during test	Accepted deviation
Ambient temperature	22-25°C	15 – 35 ºC
Relative humidity	50-56%	30 - 60%
Atmospheric pressure	101.2 kPa -101.3kPa	86-106kPa

3.3 Operating During Test

Test mode:120VAC 60Hz

TM1 : continuance TX MODE GFSK CH 1

TM2 : continuance TX MODE GFSK CH 50

TM3: continuance TX MODE GFSK CH 64

Remark : When measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, have been performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. No findable change appear.And only choose the worse mode to be the representative test mode

3.4 Test Equipment

The test equipments used in testing are calibrated on a regular basis. For most of the testing equipments accredited calibration is conducted once a year. For certain equipment the calibration interval is longer. Between the calibrations all test equipment are controlled and verified on a regular basis. The test equipments used are defined in each test section of this report.

4. Measurement Uncertainty

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95 %.

No.	Item	Uncertainty	Remark
1	Conducted Emission Test	3.6dB	
2	Radiated Emission Test	4.7dB	3m chamber

5. Radiated Electromagnetic Disturbances

5.1 Test Procedure

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m or 10m from the EUT on an adjustable mast.

The EUT were rotated 0 to 360 degree and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. The test result are reported as below.

For below 1GHz

RBW=120 kHz; VBW=300KHz.The frequency range from 30MHz to 1000MHz is checked.

For above 1GHz. The frequency range from 1GHz to 25GHz(10^{th} harmonics) is checked.

RBW=1MHz ; VBW=1MHz,PK detector for peak emissions measurement above 1GHz

For CW product :RBW=1MHz ; VBW=10Hz, PK detector for average emissions measure above 1GHz or AV value = PK – duty cycle factor and the duty cycle factor = 20log(1/dutycycle).

The dutycycle is 9.789 , Refer to Appendix A.

5.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS
☒	Test Receiver	2010-5-14	ESCS30	100139	ROHDE&SCHWARZ
☒	Ultra Broadband ANT	2010-5-14	VULB9163	9163/340	Schwarebeck
☒	Pre-amplifier	2010-5-14	8447D	2727A05017	HP
☒	Pre-amplifier	2010-5-14	EM30265	2727A05017	EM
☒	Horn Antenna	2010-5-14	BBHA 9170	BBHA9170265	Schwarebeck
☒	Horn Antenna	2010-5-14	BBHA9120D	9120D-631	Schwarebeck

5.3 Test Result

Connect mode	Antenna Polarity	Remark	Test Data	Test Result
TM1	Horizontal	30-1000MHz	Diagram 5-1	Pass
	Vertical	30-1000MHz	Diagram 5-2	Pass
TM2	Horizontal	30-1000MHz	Diagram 5-3	Pass
	Vertical	30-1000MHz	Diagram 5-4	Pass
TM3	Horizontal	30-1000MHz	Diagram 5-5	Pass
	Vertical	30-1000MHz	Diagram 5-6	Pass
TM1	Horizontal	1GHz-18GHz	Diagram 5-7	Pass
	Vertical	1GHz-18GHz	Diagram 5-8	Pass
TM2	Horizontal	1GHz-18GHz	Diagram 5-9	Pass
	Vertical	1GHz-18GHz	Diagram 5-10	Pass
TM3	Horizontal	1GHz-18GHz	Diagram 5-11	Pass
	Vertical	1GHz-18GHz	Diagram 5-12	Pass
TX MODE[1) 2)]	Horizontal	18GHz-25GHz	Diagram 5-13	Pass
	Vertical	18GHz-25GHz	Diagram 5-14	Pass

Remark:

If PK value is lower than AV limit , then only show PK value as below .

If PK value is more lower than AV limit for 6dB, then only show PK diagram as below.

1) All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
2) Because no spurious found at 18-25GHz, so no diagram and reading record listed.

NOTES:

1.All modes were measured and the worst case emission was reported.

2. H =Horizontal V=Vertical

3. Emission = Reading +Antenna Factor + Cable Loss –Amp Factor

4. Emission level dBμV = 20 log Emission level μV/m

5. The lower limit shall apply at the transition frequencies

6. All the emissions appearing within 15.205 Restricted bands shall not exceed the limits shown in 15.209,all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

Remark :

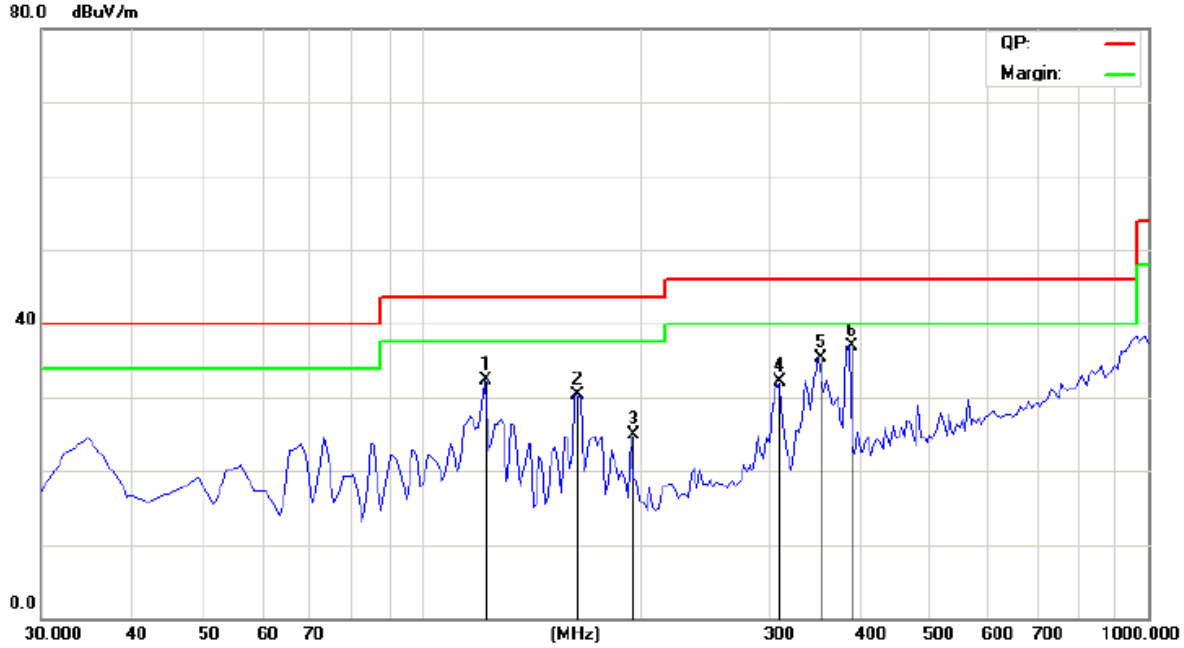
The limit of 15.209(a) of 3 meter distance is

Frequency MHz	Distance m	Field strength		Distance m	Field strength dBμV/m(QP)
		μV/m	dBμV/m(QP)		
30-88	3	100	40.0	10	30.0
88-216	3	150	43.5	10	33.5
216-960	3	200	46.0	10	36.0
960-1000	3	500	54.0	10	44.0
Above 1000	3	74.0 dBμV/m (PK) 54.0 dBμV/m (AV)		/	/

15.205 Restricted bands of operation:

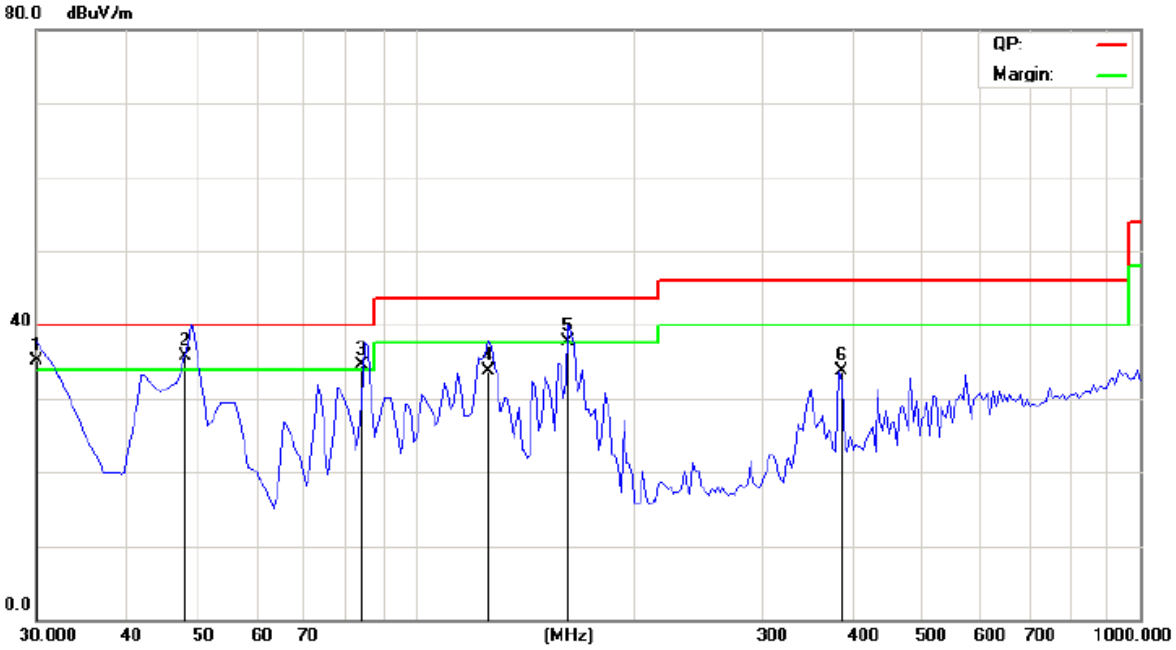
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

5.3.1 Diagram 5-1



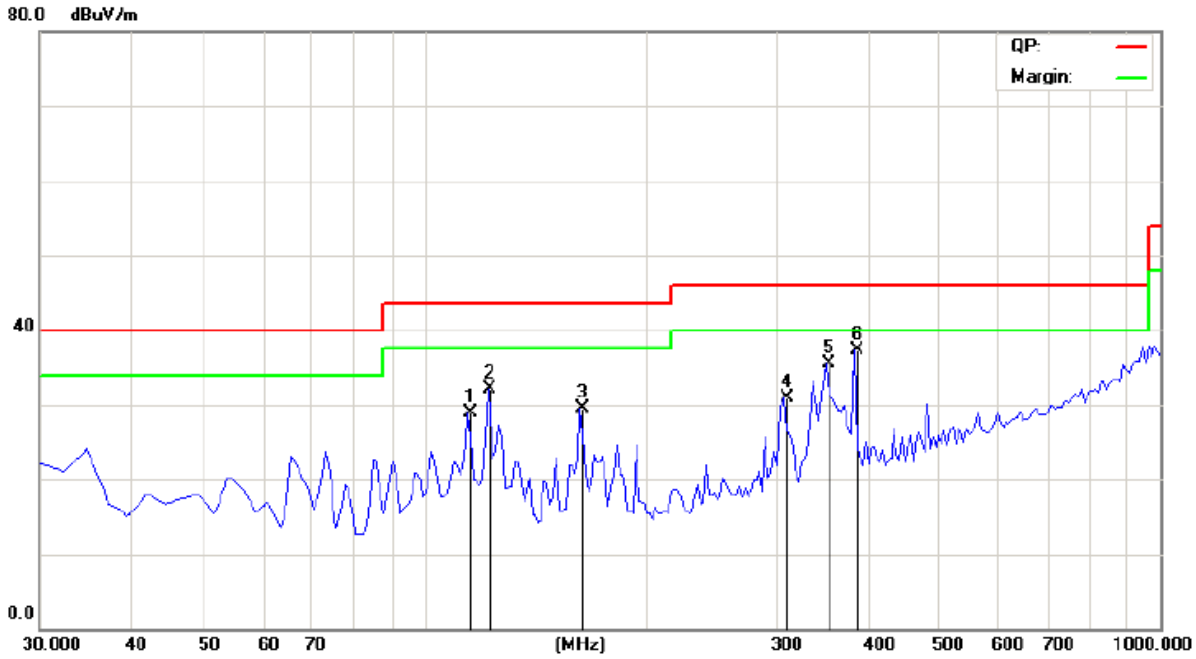
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		122.1500	46.12	-13.80	32.32	43.50	-11.18	peak
2		163.3750	44.49	-14.23	30.26	43.50	-13.24	peak
3		194.9000	37.17	-12.28	24.89	43.50	-18.61	peak
4		311.3000	40.03	-8.02	32.01	46.00	-13.99	peak
5		354.9500	41.71	-6.36	35.35	46.00	-10.65	peak
6	*	388.9000	42.52	-5.62	36.90	46.00	-9.10	peak

5.3.2 Diagram 5-2



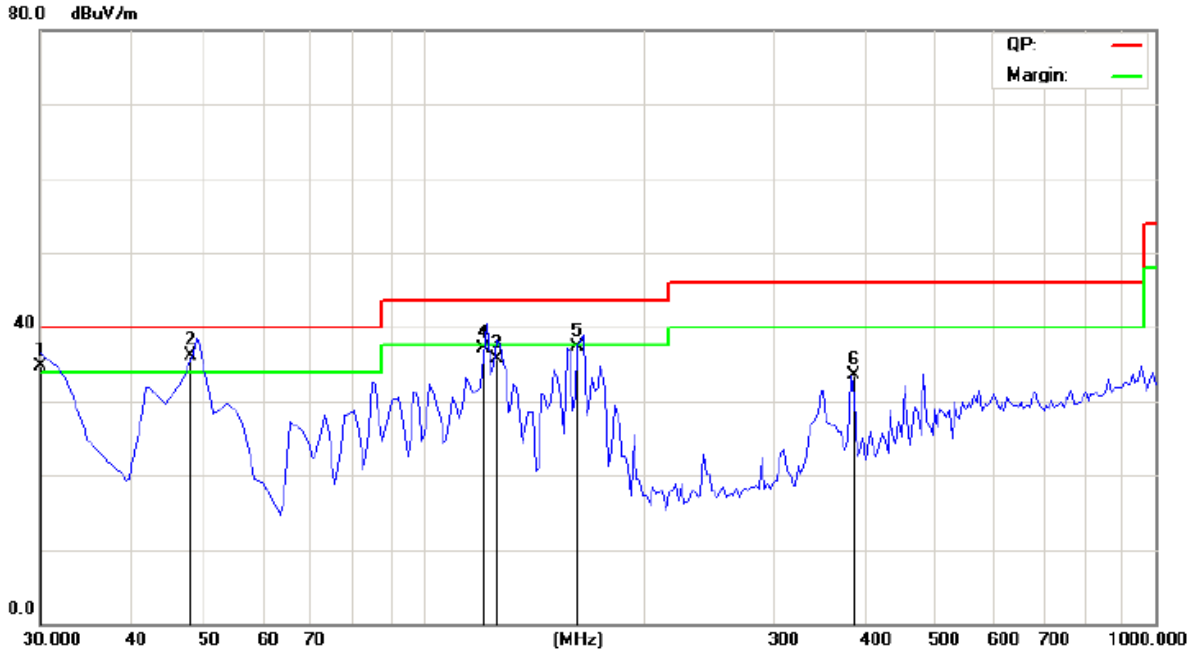
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	!	30.0000	48.03	-12.92	35.11	40.00	-4.89	QP
2	*	48.0360	47.33	-11.71	35.62	40.00	-4.38	QP
3	!	84.0200	49.04	-14.56	34.48	40.00	-5.52	QP
4		126.0510	48.13	-14.37	33.76	43.50	-9.74	QP
5	!	162.0430	51.97	-14.29	37.68	43.50	-5.82	QP
6		386.4750	39.30	-5.69	33.61	46.00	-12.39	QP

5.3.3 Diagram 5-3



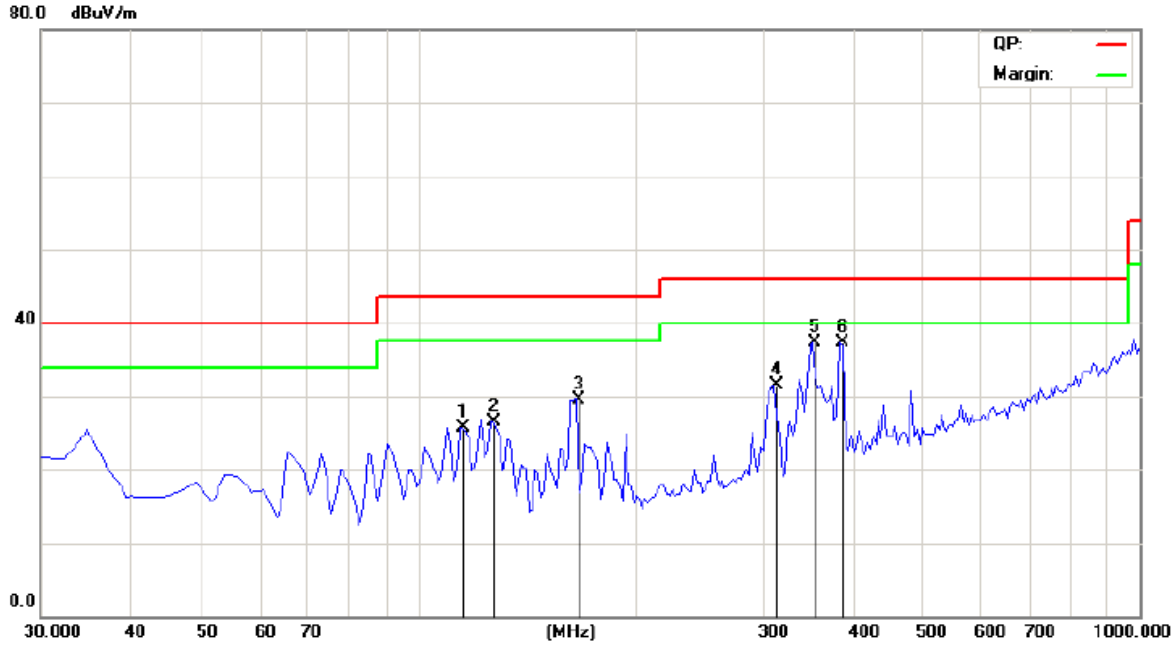
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		114.8750	41.76	-12.81	28.95	43.50	-14.55	peak
2		122.1500	45.93	-13.80	32.13	43.50	-11.37	peak
3		163.3750	43.65	-14.23	29.42	43.50	-14.08	peak
4		311.3000	38.84	-8.02	30.82	46.00	-15.18	peak
5		354.9500	41.91	-6.36	35.55	46.00	-10.45	peak
6	*	386.4750	42.92	-5.69	37.23	46.00	-8.77	peak

5.3.4 Diagram 5-4



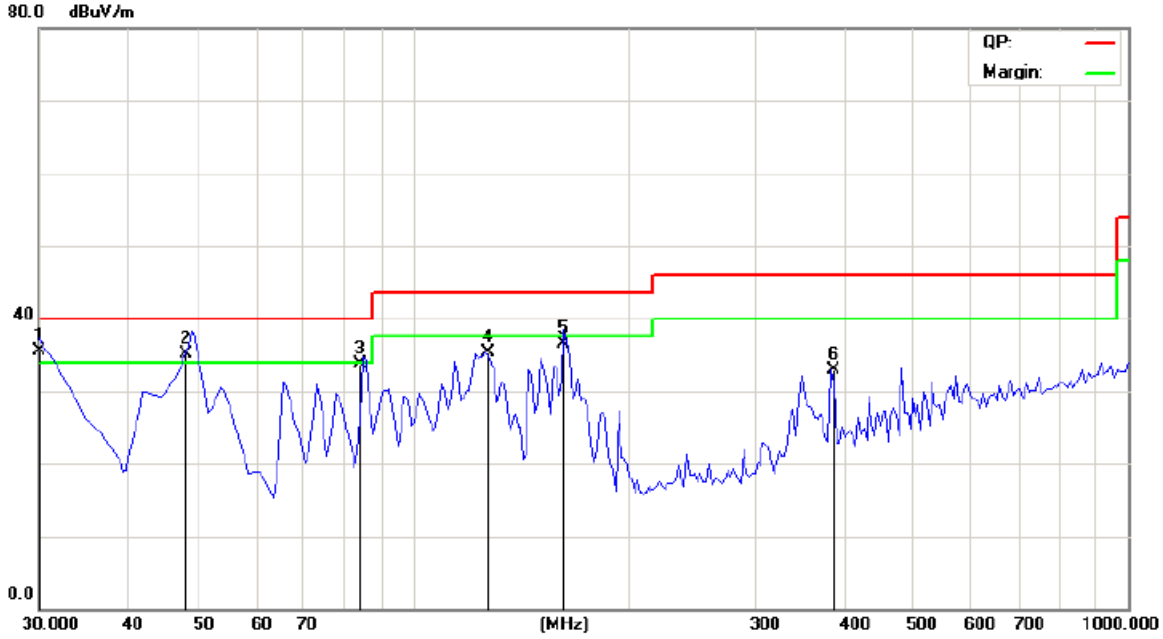
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	!	30.0000	47.65	-12.92	34.73	40.00	-5.27	QP
2	*	48.0350	47.87	-11.71	36.16	40.00	-3.84	QP
3		126.0560	50.16	-14.37	35.79	43.50	-7.71	QP
4		120.0190	50.67	-13.47	37.20	43.50	-6.30	QP
5		162.0460	51.59	-14.29	37.30	43.50	-6.20	QP
6		386.4750	39.14	-5.69	33.45	46.00	-12.55	QP

5.3.5 Diagram 5-5



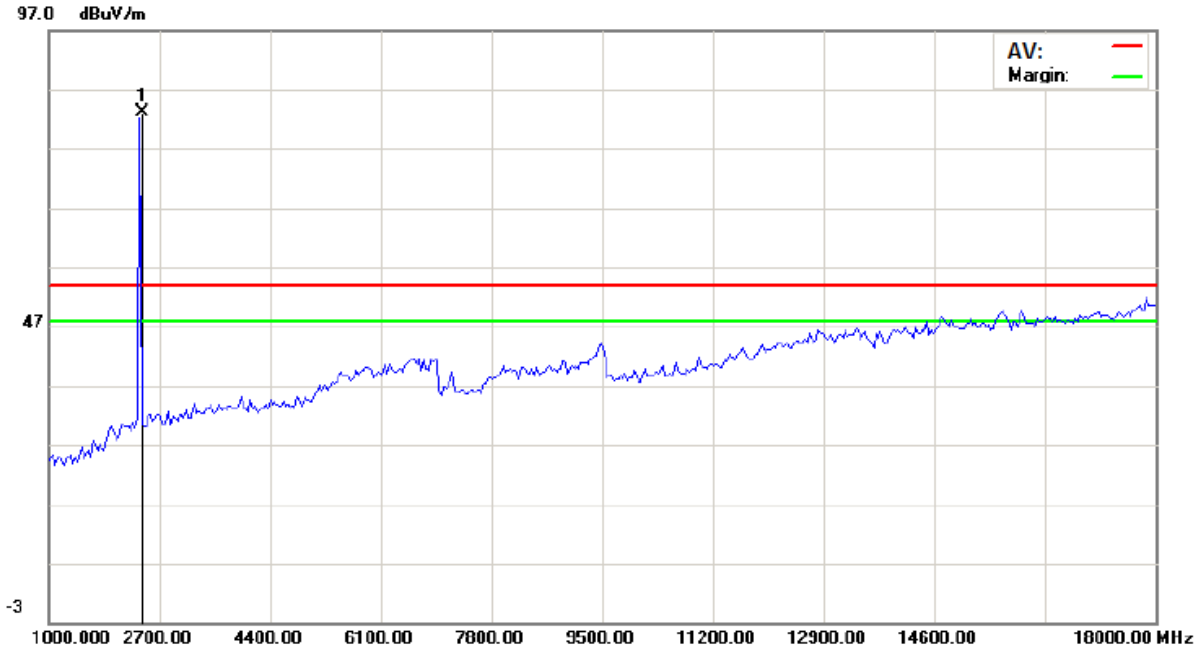
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		114.8750	38.53	-12.81	25.72	43.50	-17.78	peak
2		127.0000	41.05	-14.47	26.58	43.50	-16.92	peak
3		165.8000	43.73	-14.13	29.60	43.50	-13.90	peak
4		313.7250	39.51	-8.01	31.50	46.00	-14.50	peak
5		352.5250	43.67	-6.44	37.23	46.00	-8.77	peak
6	*	386.4750	43.04	-5.69	37.35	46.00	-8.65	peak

5.3.6 Diagram 5-6



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	30.0000	48.46	-12.92	35.54	40.00	-4.46	QP
2	!	48.0200	46.78	-11.71	35.07	40.00	-4.93	QP
3		84.0350	48.22	-14.56	33.66	40.00	-6.34	QP
4		127.0000	49.78	-14.47	35.31	43.50	-8.19	QP
5		162.0450	50.75	-14.29	36.46	43.50	-7.04	QP
6		386.4750	38.55	-5.69	32.86	46.00	-13.14	QP

5.3.7 Diagram 5-7

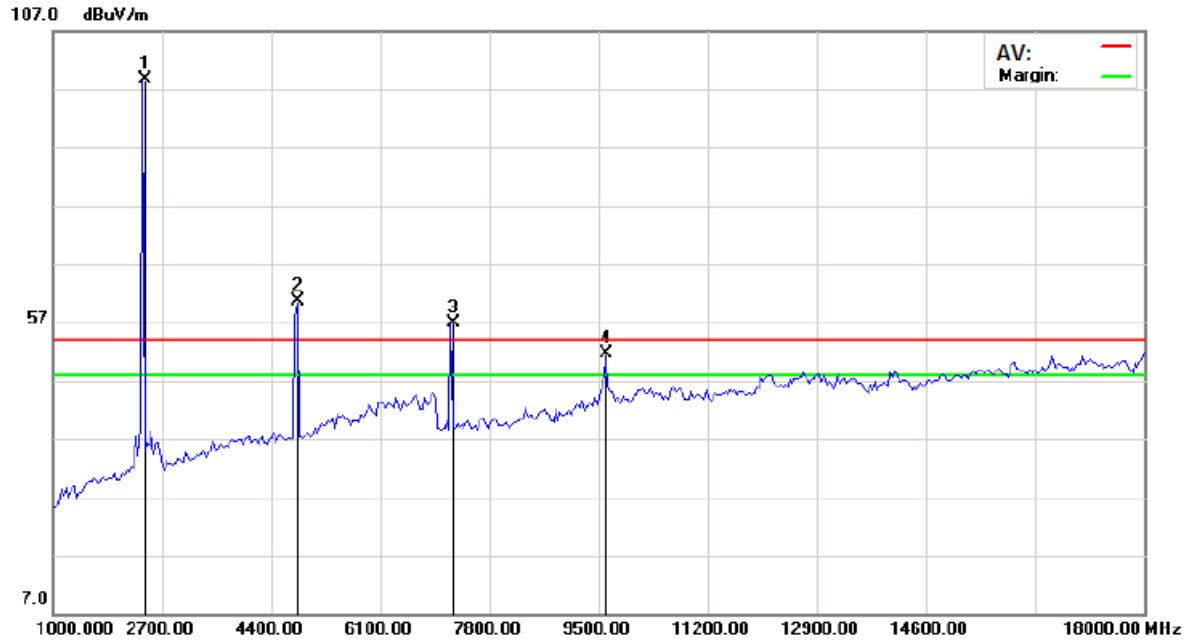


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2404.180	89.77	-6.75	83.02	peak

Scan: PK detector

Except the fundamental emission No emission was founded

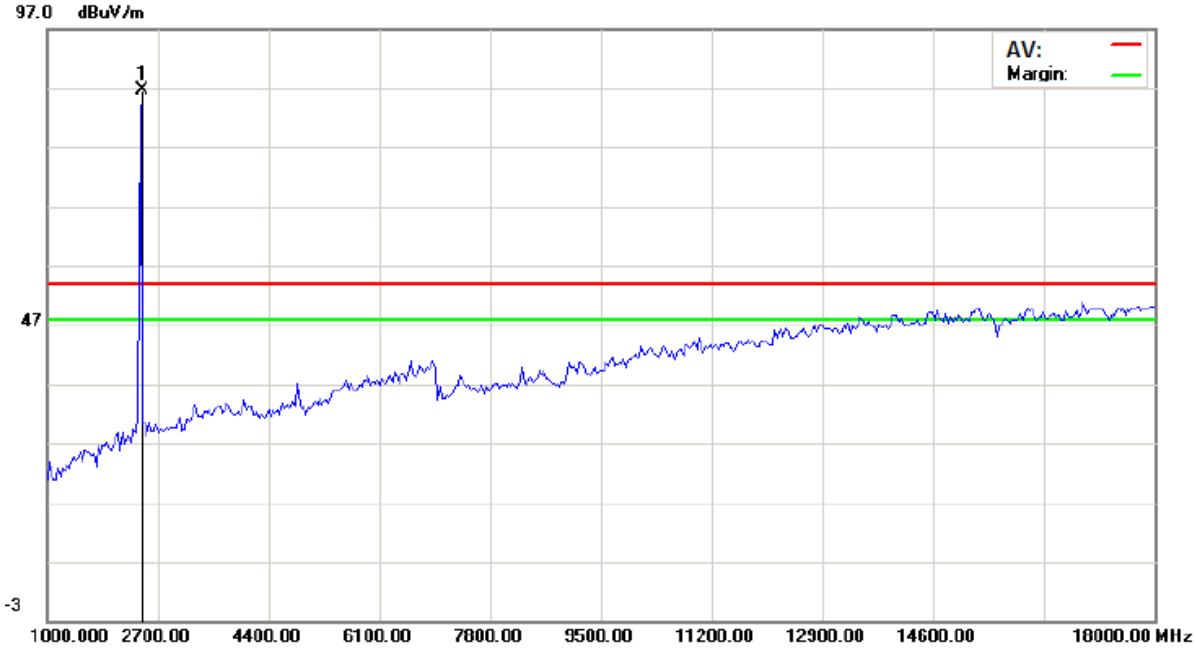
5.3.8 Diagram 5-8



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2404.220	105.43	-6.75	98.68	peak
2	X	4808.381	60.32	0.25	60.57	peak
3	X	7212.501	53.48	3.44	56.92	peak
4	!	9616.661	43.15	8.39	51.54	peak

Remark : All value as below are lower than 54 dB μ V/m, so Pass.
For point No.2: AV Value =60.57 –9.789 =50.781 dB μ V/m
For point No.3: AV Value = 56.92 –9.789 =47.131 dB μ V/m
For point No.4: PK value is lower than AV limit , so AV value is deemed to comply AV limit .

5.3.9 Diagram 5-9

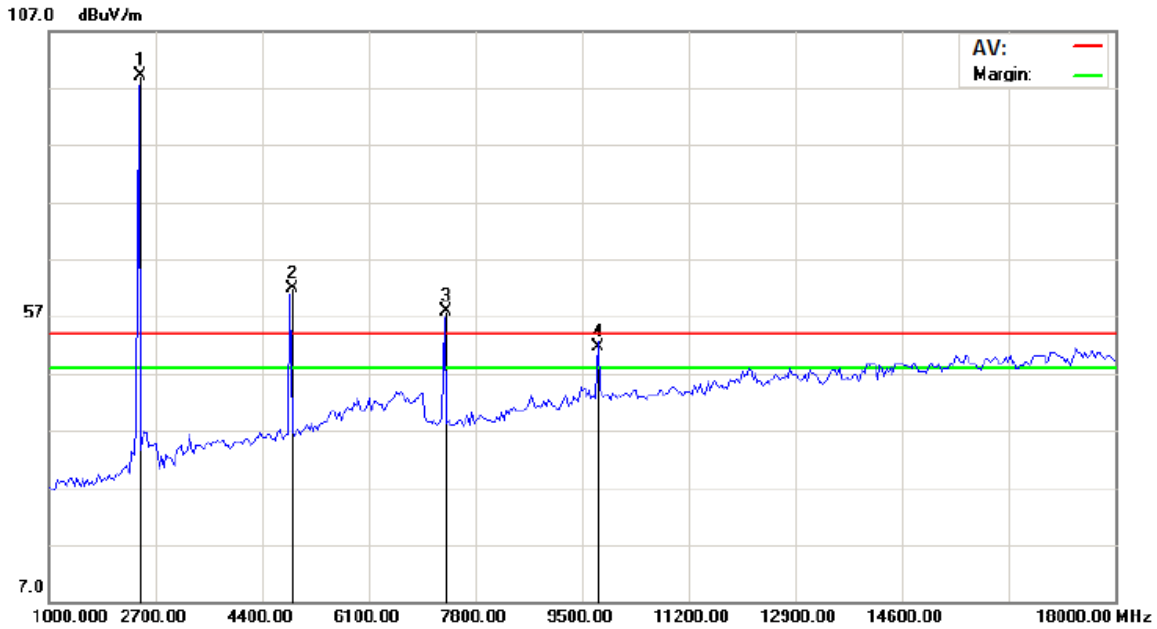


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2436.862	93.33	-6.66	86.67	peak

Scan: PK detector

Except the fundamental emission No emission was founded

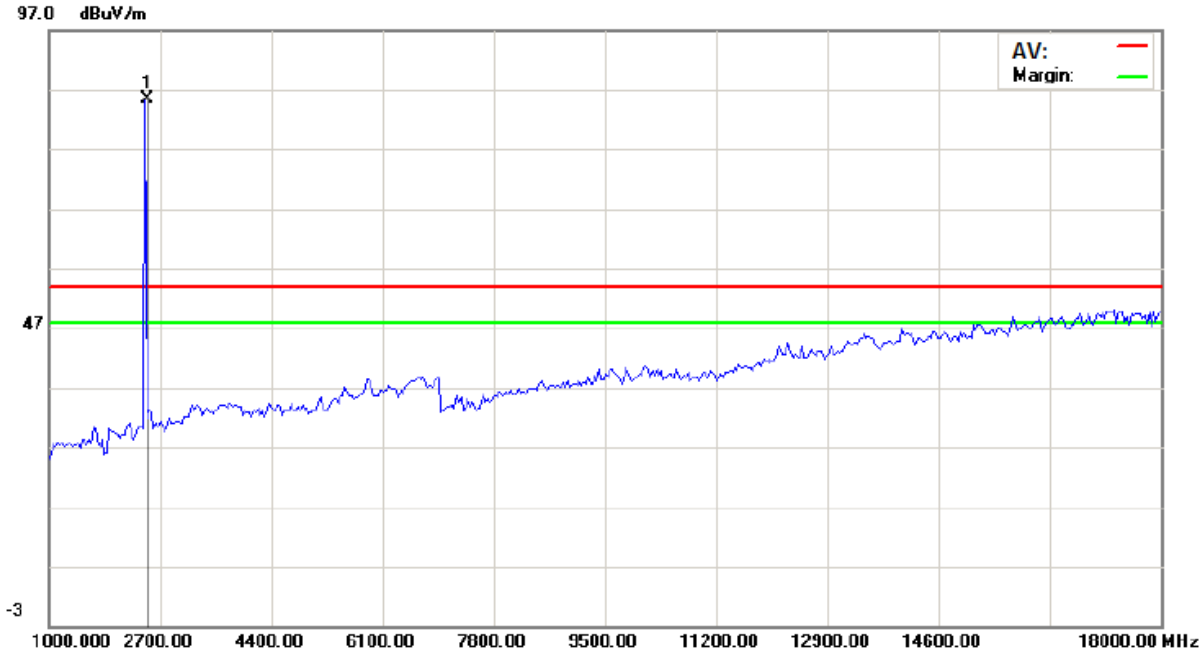
5.3.10 Diagram 5-10



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2436.822	105.75	-6.66	99.09	peak
2	X	4873.543	61.44	0.37	61.81	peak
3	X	7310.385	54.16	3.61	57.77	peak
4	!	9747.146	42.91	8.67	51.58	peak

Remark : All value as below are lower than 54 dB μ V/m, so Pass.
For point No.2: AV Value =61.81 –9.789 = 52.021 dB μ V/m
For point No.3: AV Value = 57.77 –9.789 = 47.981 dB μ V/m
For point No.4: PK value is lower than AV limit , so AV value is deemed to comply AV limit .

5.3.11 Diagram 5-11

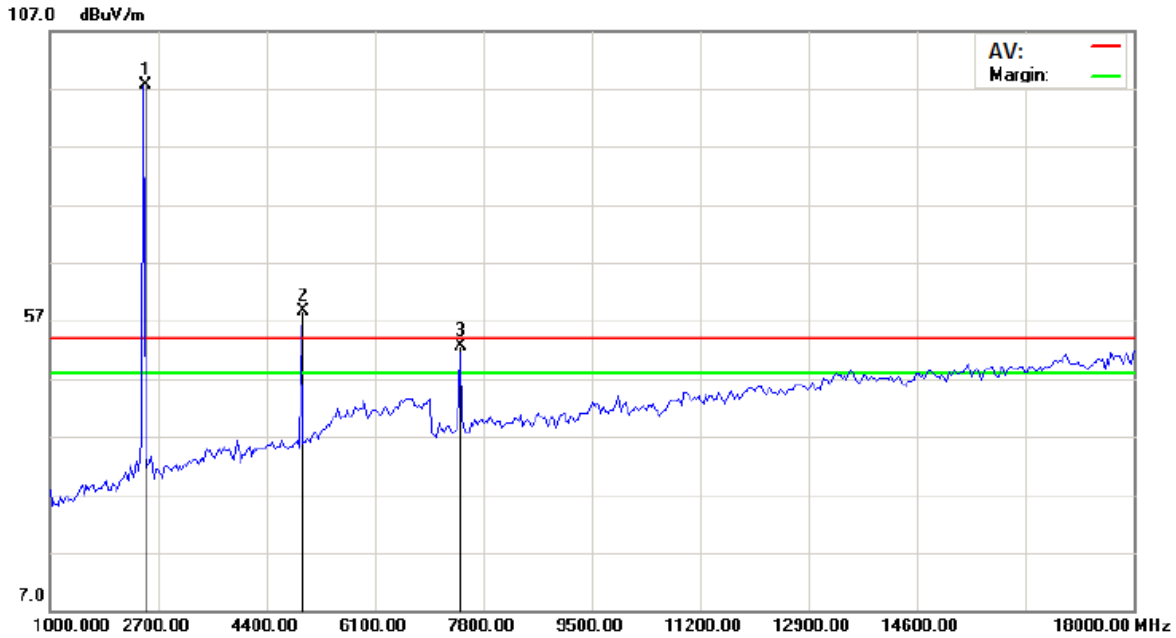


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2478.461	92.03	-6.54	85.49	peak

Scan: PK detector

Except the fundamental emission No emission was founded

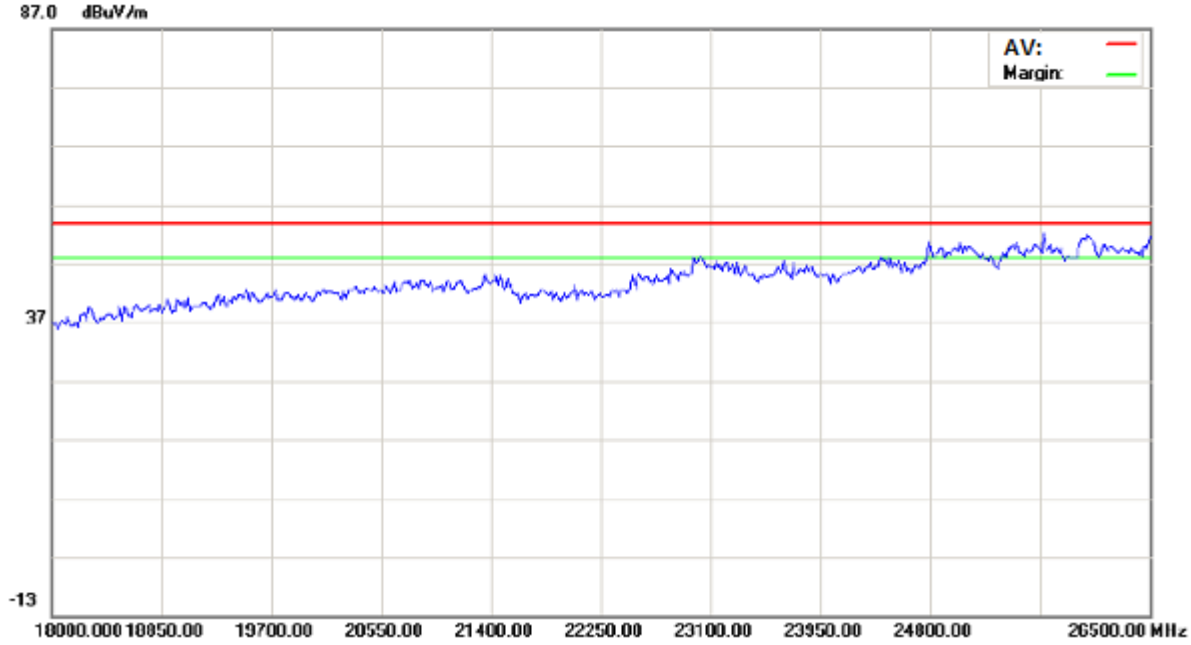
5.3.12 Diagram 5-12



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	
		MHz	dBuV	dB	dBuV/m	Detector
1	*	2478.421	104.08	-6.54	97.54	peak
2	X	4956.902	58.04	0.53	58.57	peak
3	!	7435.182	48.81	3.81	52.62	peak

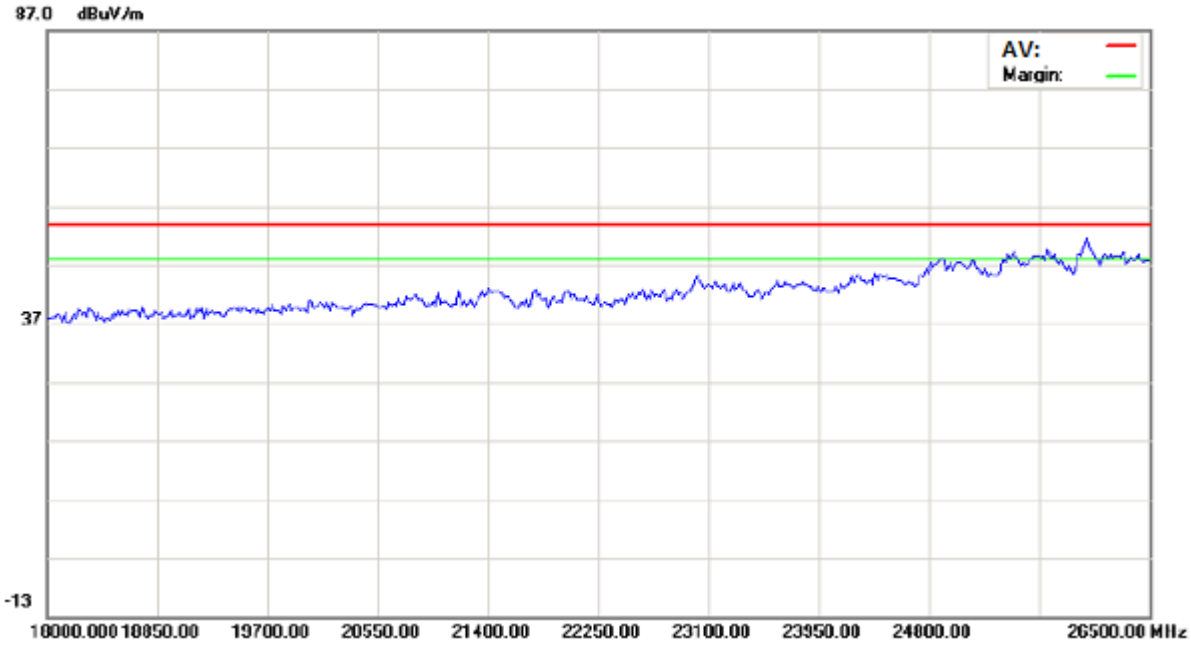
Remark : All value as below are lower than 54 dB μ V/m, so Pass.
For point No.2: AV Value =58.57 –9.789 = 48.781 dB μ V/m
For point No.3: PK value is lower than AV limit , so AV value is deemed to comply AV limit .

5.3.13 Diagram 5-13



Scan: PK detector
No emission was founded

5.3.14 Diagram 5-14



Scan: PK detector
No emission was founded

6. 20 dB bandwidth and 99% bandwidthTest

6.1 Test Procedure

Clause 15.215(c) 20dB Bandwidth:

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

99% bandwidth test of RSS-GEN:

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.
The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

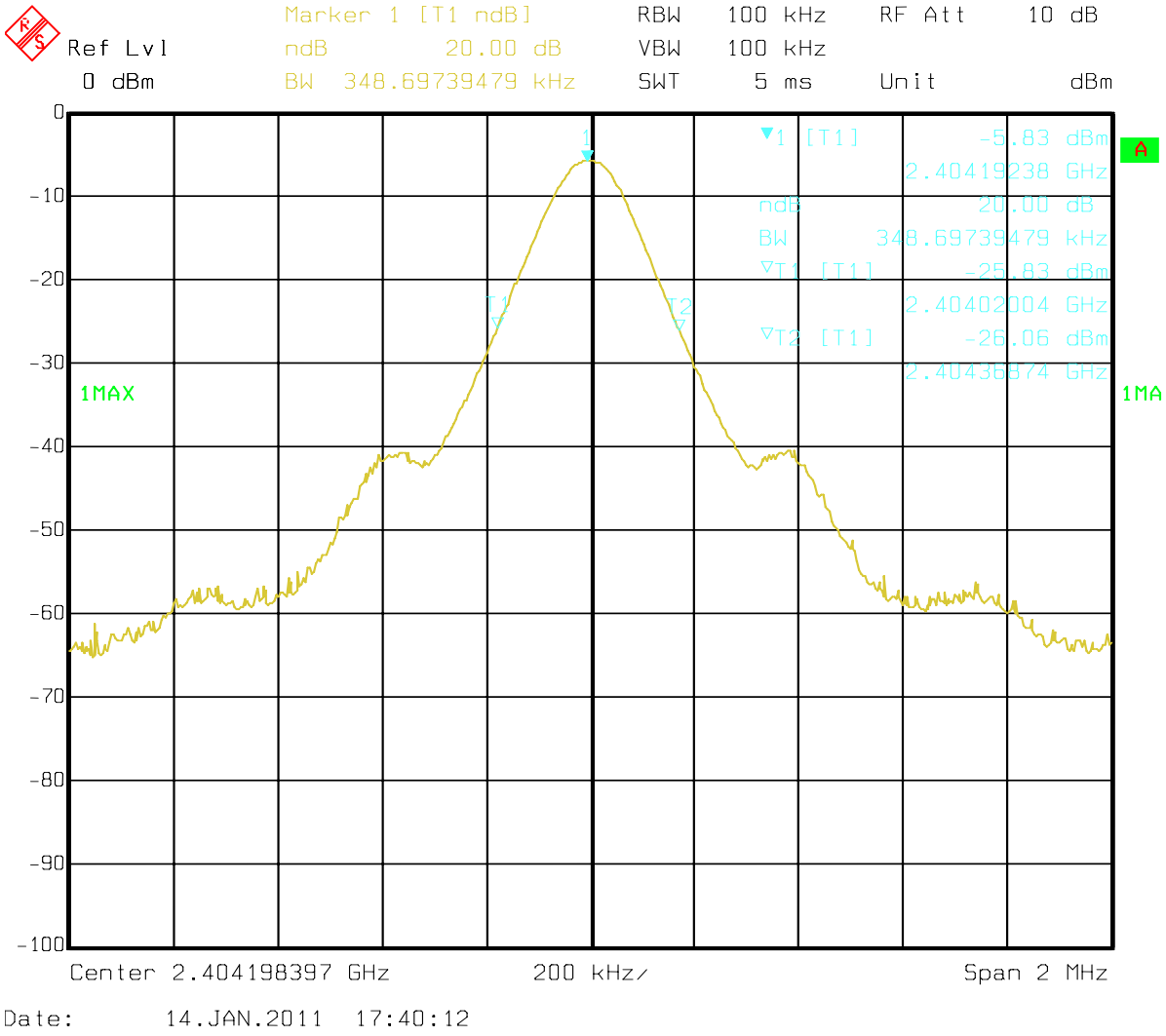
6.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS

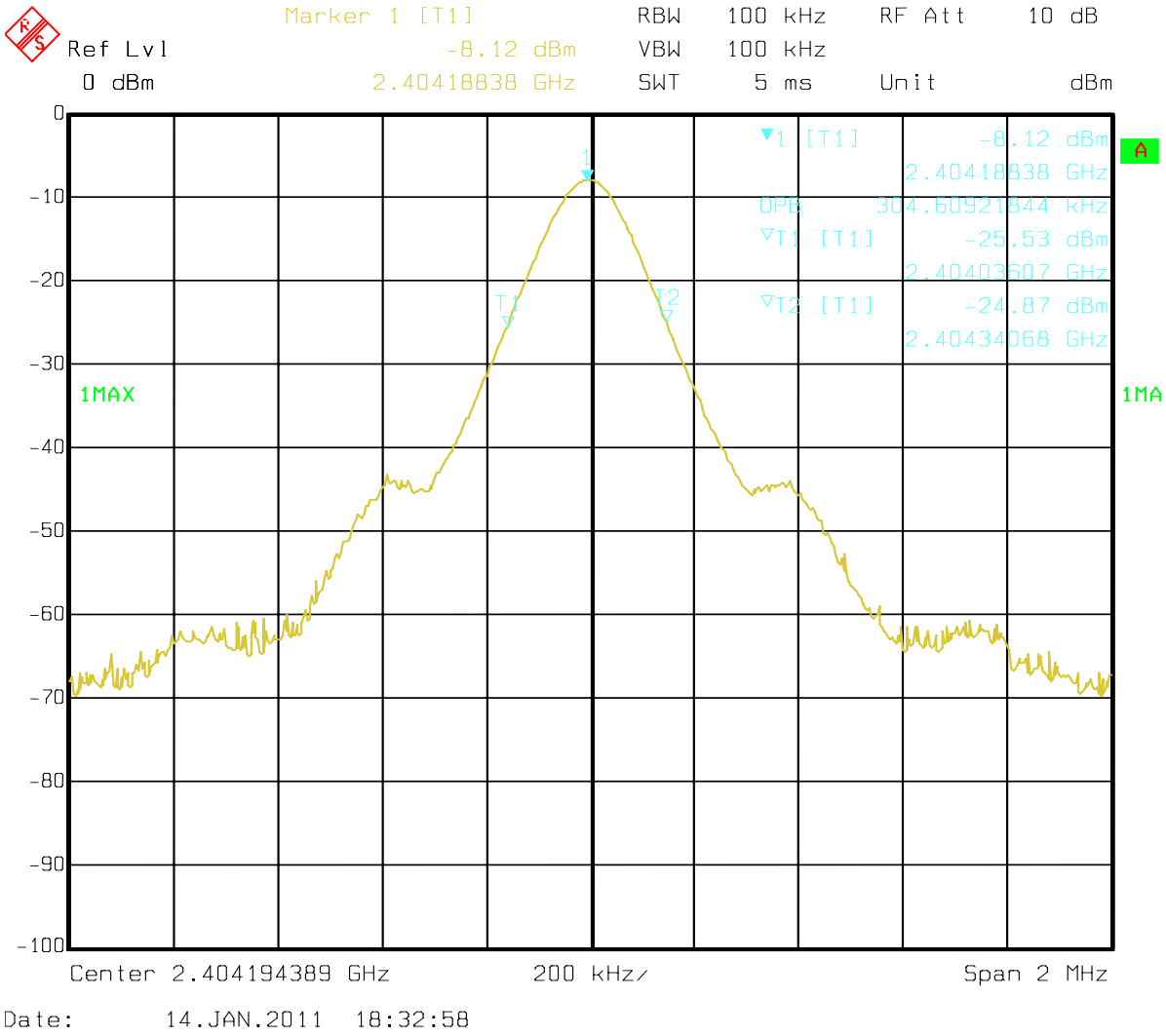
6.3 Test Result:

Test mode	Diagram	20dB bandwidth	99% bandwidth
TM1	6-1	348.697kHz	N/A
TM1	6-2	N/A	304.609kHz
TM2	6-3	344.689kHz	N/A
TM2	6-4	N/A	308.617kHz
TM3	6-5	340.681kHz	N/A
TM3	6-6	N/A	304.609kHz

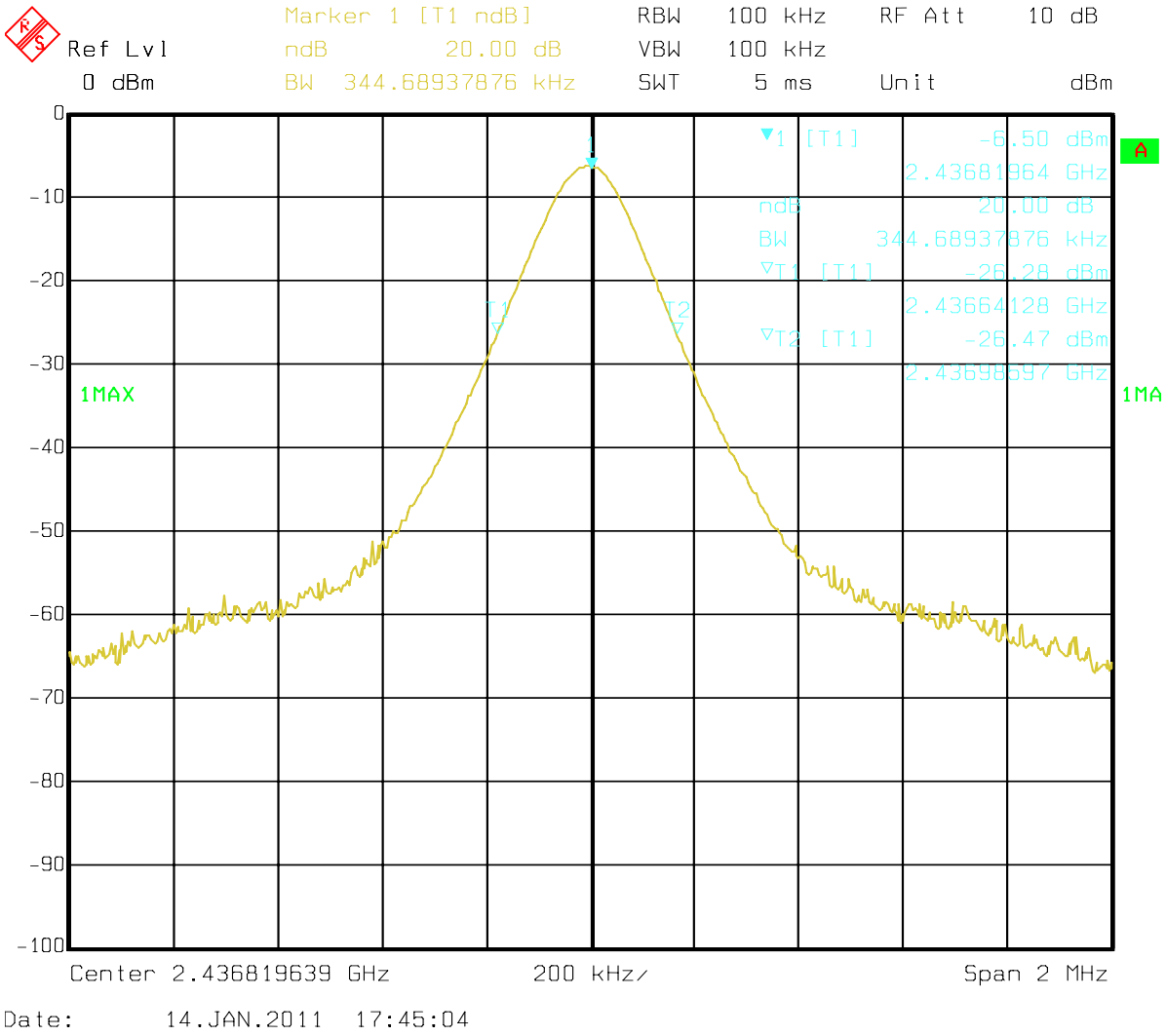
6.3.1 Diagram 6-1



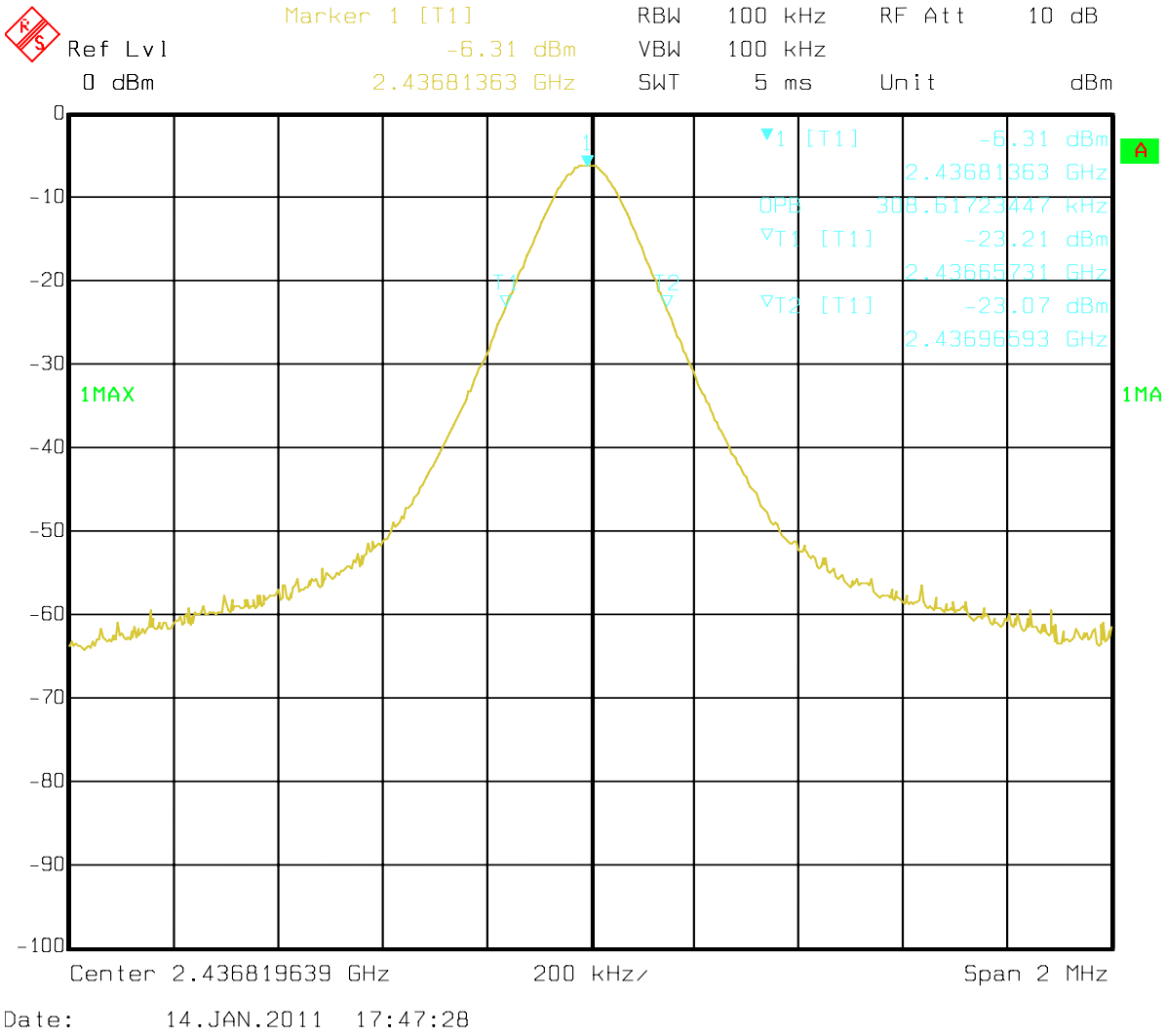
6.3.2 Diagram 6-2



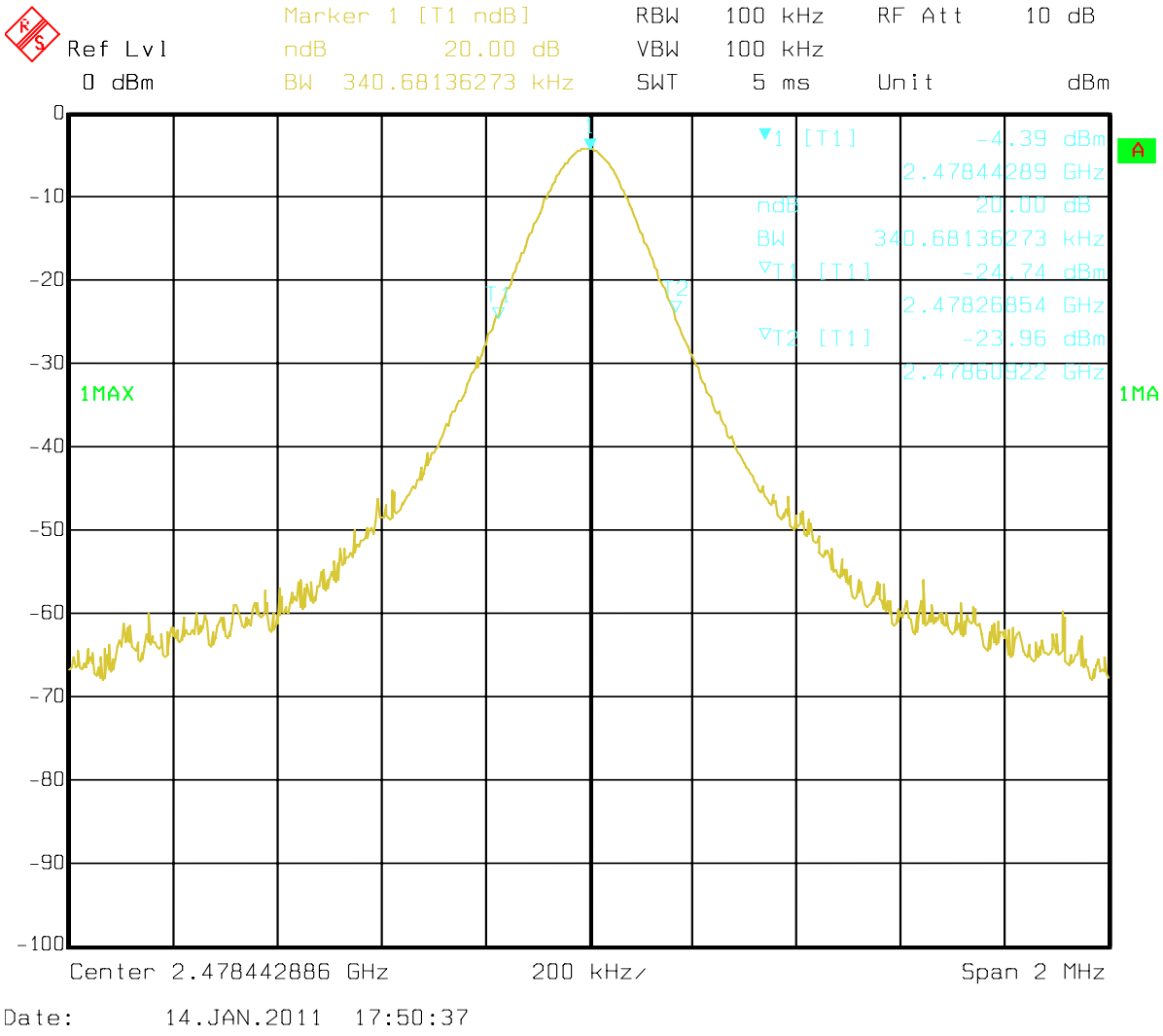
6.3.3 Diagram 6-3



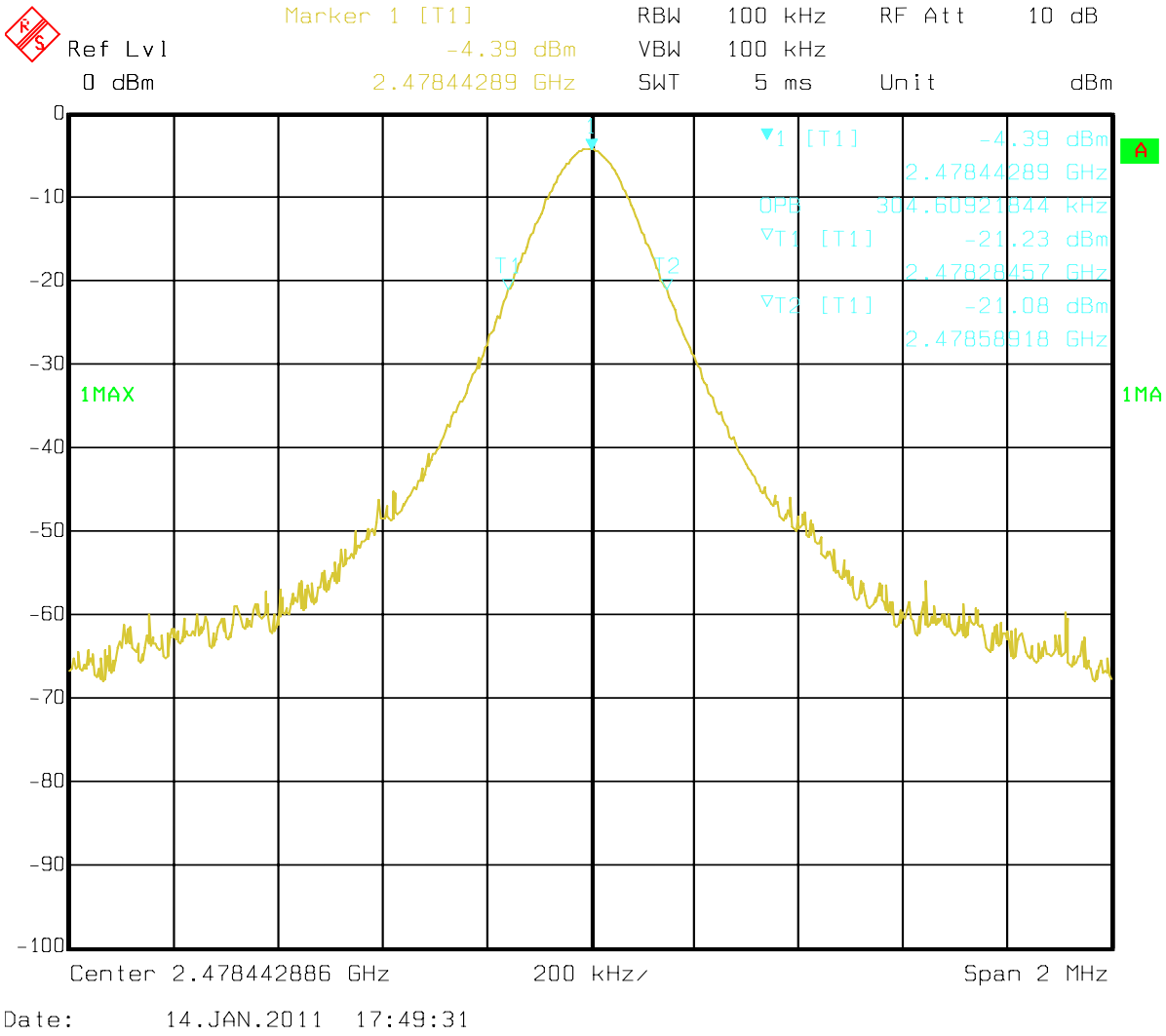
6.3.4 Diagram 6-4



6.3.5 Diagram 6-5



6.3.6 Diagram 6-6



7. Band Edge Compliance Test

7.1 Test Procedure

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power,In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast.

The EUT were rotated 0 to 360 degree and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. The test result are reported as below.

RBW=1MHz ; VBW=1MHz, ,Sweep=AUTO,PK detector for peak emissions measurement

AV value = PK – duty cycle factor and the duty cycle factor = 20log(1/dutycycle).

The dutycycle is 9.789 , Refer to Appendix A.

7.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS
☒	Test Receiver	2010-5-14	ESCS30	100139	ROHDE&SCHWARZ
☒	Ultra Broadband ANT	2010-5-14	VULB9163	9163/340	Schwarebeck
☒	Pre-amplifier	2010-5-14	8447D	2727A05017	HP
☒	Pre-amplifier	2010-5-14	EM30265	2727A05017	EM
☒	Horn Antenna	2010-5-14	BBHA 9170	BBHA9170265	Schwarebeck
☒	Horn Antenna	2010-5-14	BBHA9120D	9120D-631	Schwarebeck

7.3 Test Result

Connect mode	Antenna Polarity	Remark	Test Data	Test Result
TM1	Vertical	Hopping off	Diagram 7-1	Pass
	Horizontal	Hopping off	Diagram 7-2	Pass
TM3	Vertical	Hopping off	Diagram 7-3	Pass
	Horizontal	Hopping off	Diagram 7-4	Pass

Remark : Hopping on and Hopping off are pretested, and Hopping off mode is the worse cases and only worse case is reported.

NOTES:

1.All modes were measured and the worst case emission was reported.

2. H =Horizontal V=Vertical

3. Emission = Reading +Antenna Factor + Cable Loss –Amp Factor

4. Emission level dBμV = 20 log Emission level μV/m

5. All the emissions appearing within 15.205 Restricted bands shall not exceed the limits shown in 15.209,all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

Remark :

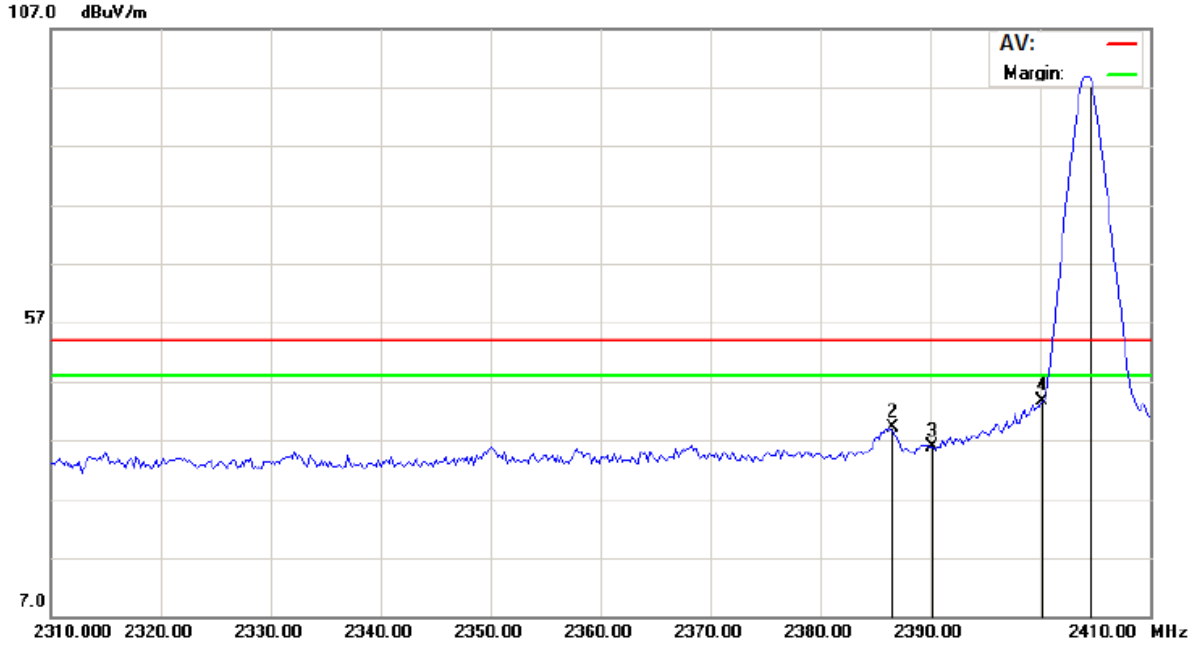
The limit of 15.209(a) of 3 meter distance is

Frequency MHz	Distance m	Field strength		Distance m	Field strength dBμV/m(QP)
		μV/m	dBμV/m(QP)		
30-88	3	100	40.0	10	30.0
88-216	3	150	43.5	10	33.5
216-960	3	200	46.0	10	36.0
960-1000	3	500	54.0	10	44.0
Above 1000	3	74.0 dBμV/m (PK) 54.0 dBμV/m (AV)		/	/

15.205 Restricted bands of operation:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

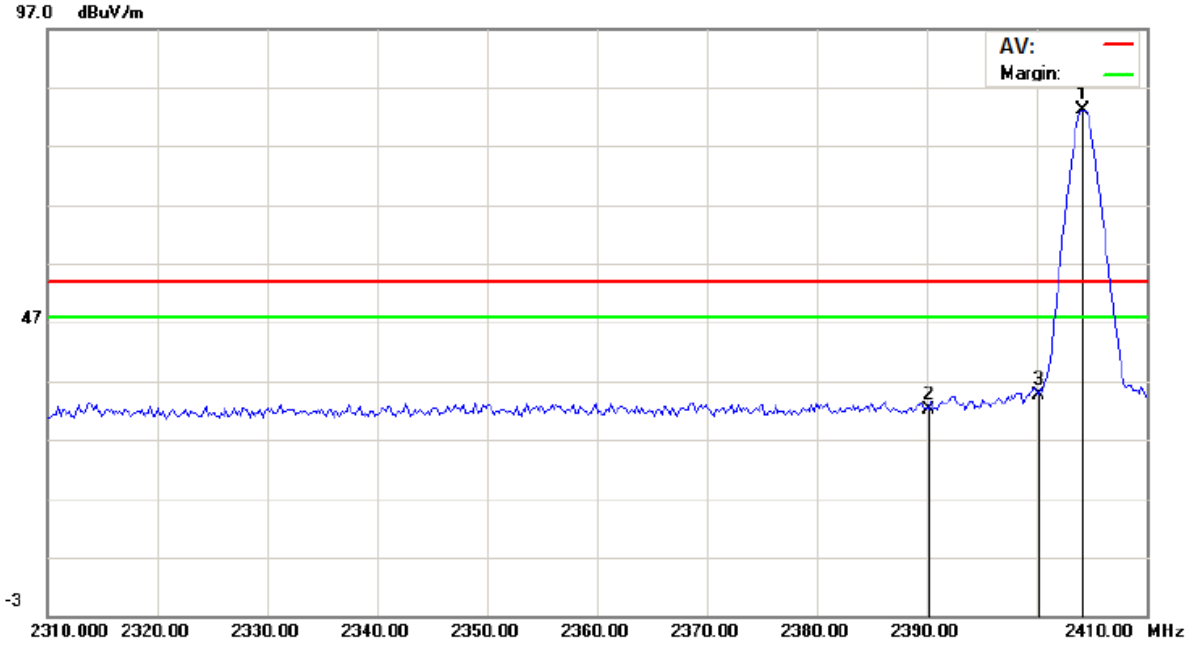
7.3.1 Diagram 7-1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	AV limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	2404.389	105.74	-6.75	98.99			peak
2		2386.353	45.83	-6.80	39.03	54.00	-14.97	peak
3		2390.000	42.68	-6.78	35.90	54.00	-18.10	peak
4		2400.000	50.32	-6.76	43.56	54.00	-10.44	peak

Remark : PK value are lower than AV limit , so AV value is deemed to comply with AV limit .

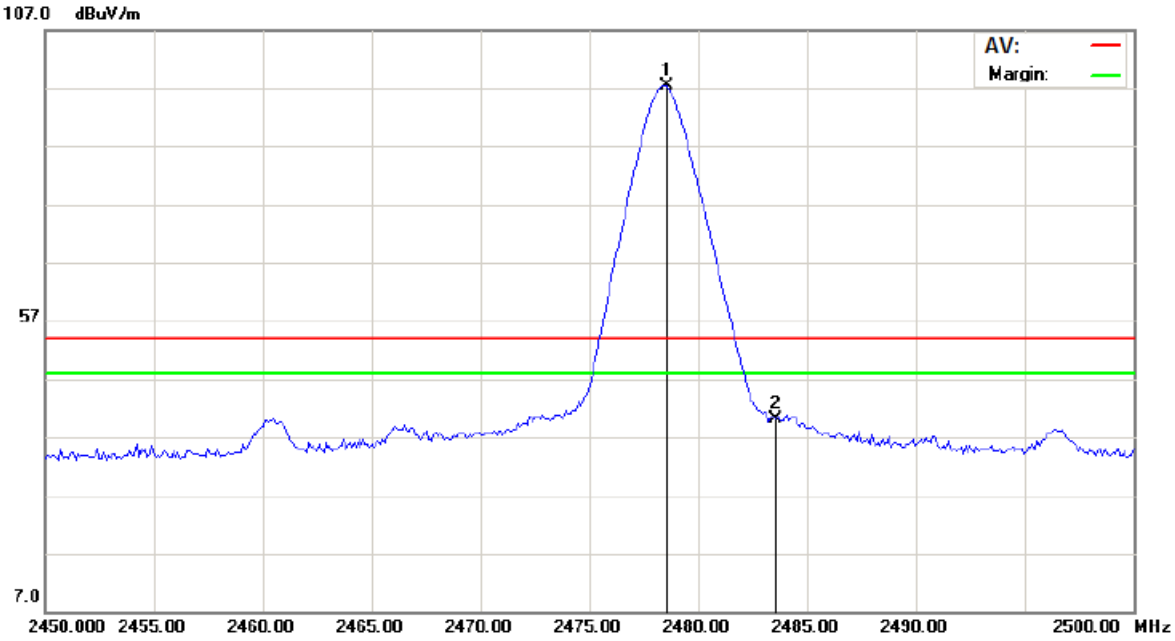
7.3.2 Diagram 7-2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	AV limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	2404.188	89.94	-6.75	83.19			peak
2		2390.000	38.87	-6.78	32.09	54.00	-21.91	peak
3		2400.000	41.46	-6.76	34.70	54.00	-19.30	peak

Remark : PK value are lower than AV limit , so AV value is deemed to comply with AV limit .

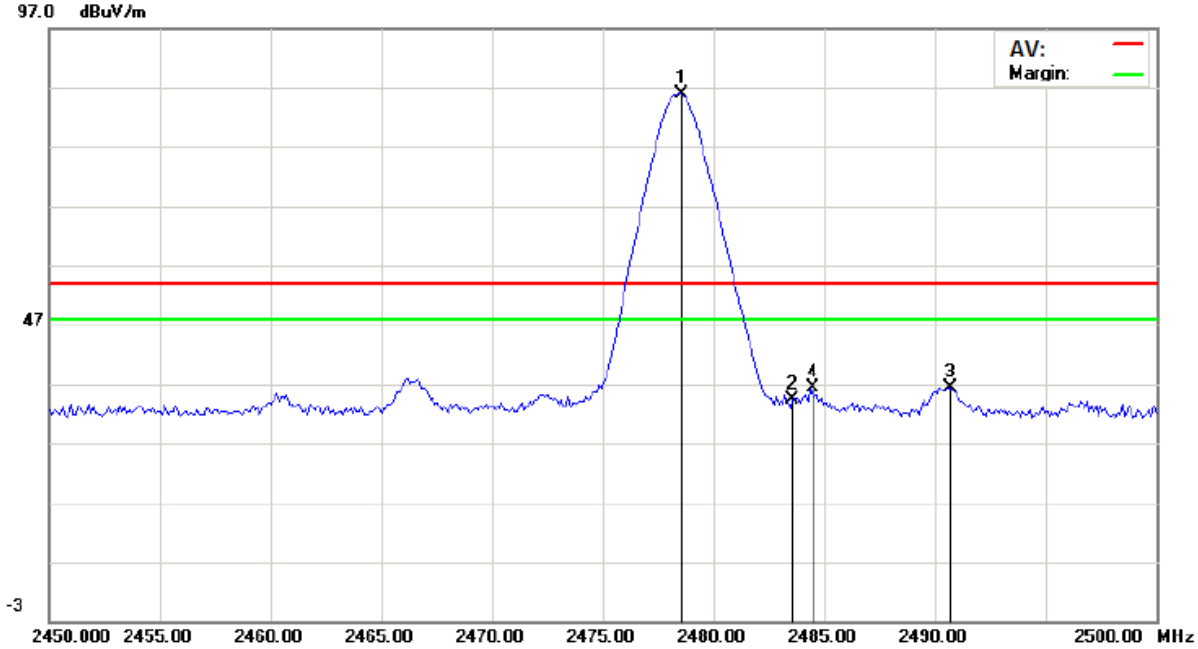
7.3.3 Diagram 7-3



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	AV limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	2478.457	103.98	-6.54	97.44			peak
2		2483.500	46.61	-6.53	40.08	54.00	-13.92	peak

Remark : PK value are lower than AV limit , so AV value is deemed to comply with AV limit .

7.3.4 Diagram 7-4



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	AV limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	2478.457	92.54	-6.54	86.00			peak
2		2483.500	40.96	-6.53	34.43	54.00	-19.57	peak
3		2490.681	42.99	-6.50	36.49	54.00	-17.51	peak
4		2484.369	42.81	-6.53	36.28	54.00	-17.72	peak

Remark : PK value are lower than AV limit , so AV value is deemed to comply with AV limit .

8. Carrier Frequency Separation Test

8.1 Test Procedure

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, freq 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 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

The peak detector was used with 100 kHz/100 kHz RBW/VBW

8.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS

8.3 Test Result

Pass

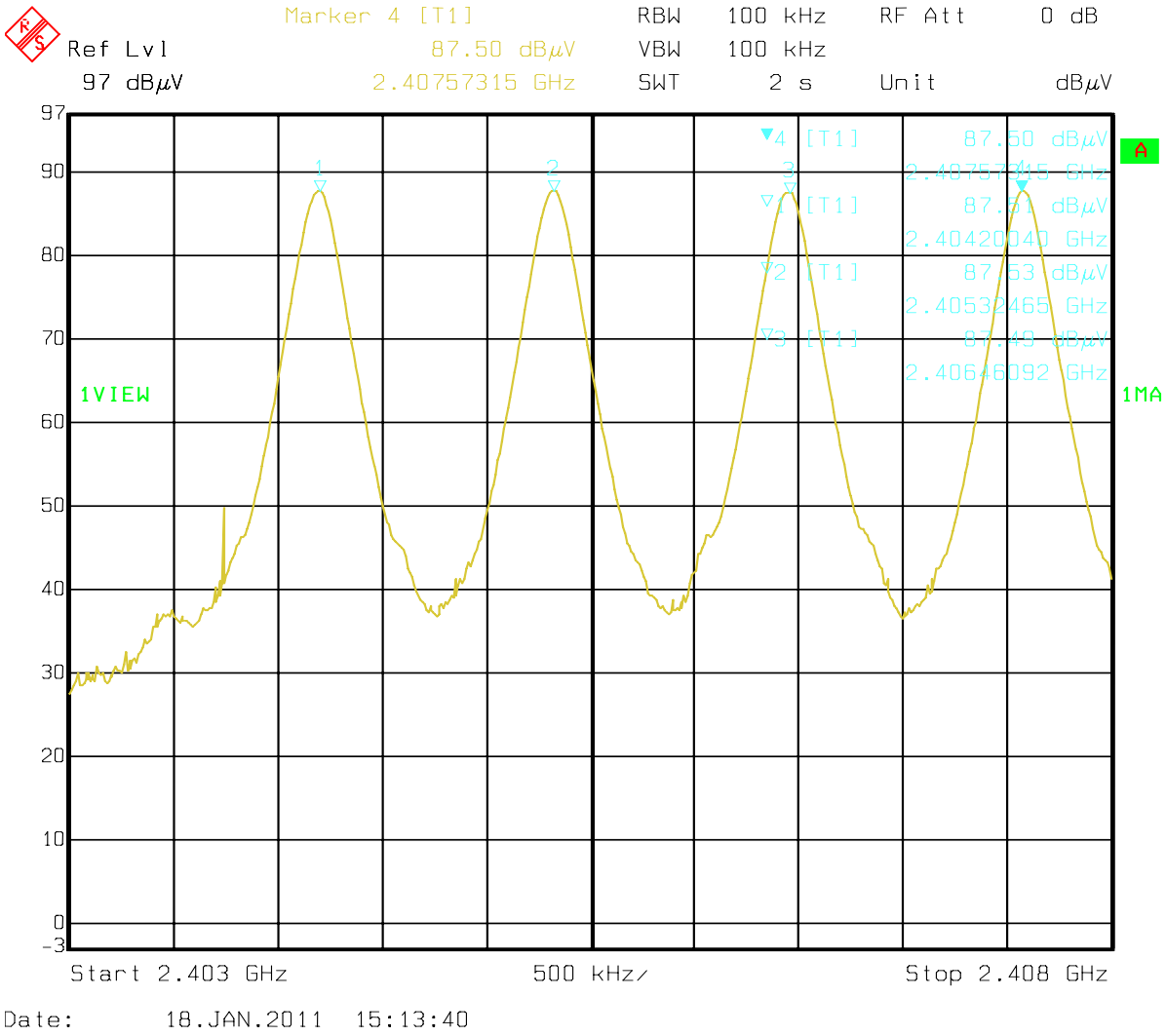
Channel separation is refered to 8.3.1

Widest channel bandwidth was 348.697kHz. refer to 6.3

Two-thirds is 232.5kHz and greater than 25kHz .

Channel separation, kHz	Minimum limit, kHz	Margin, kHz
1100kHz	232.5 kHz	867.5 kHz

8.3.1 Diagram 8-1



9. Output Power Test

9.1 Test Procedure

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(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 W. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 W.
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

9.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS

9.3 Test Result

Remark :RBW=1MHz VBW=1MHz PK detector conducted measurement

Output power calculation

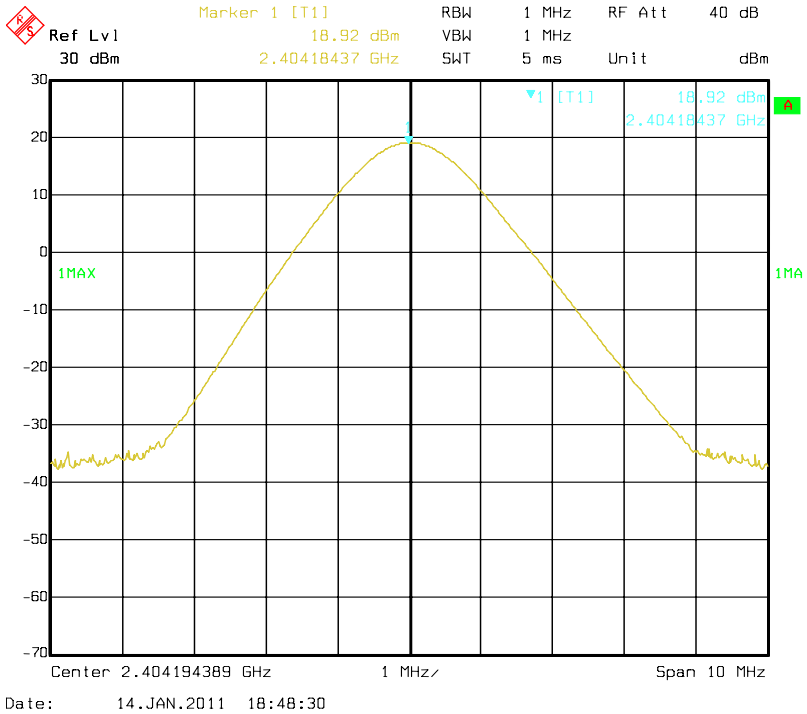
Frequency, GHz	Output power, dBm	Power Limit, dBm
CH 1: 2404.125 MHz	18.92	20.97
CH 50: 2436.75 MHz	18.15	20.97
CH 64: 2478.375 MHz	16.44	20.97

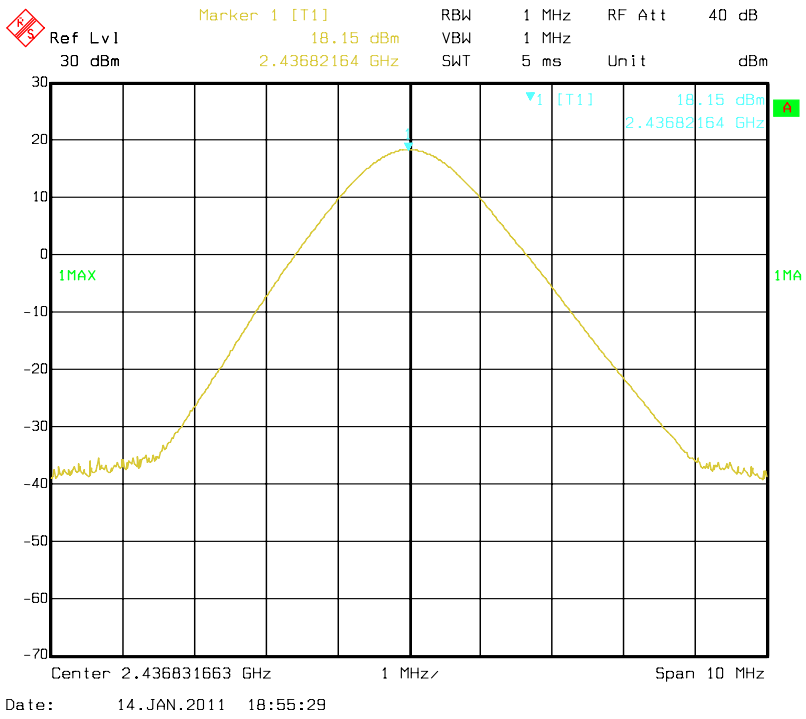
EIRP measurement

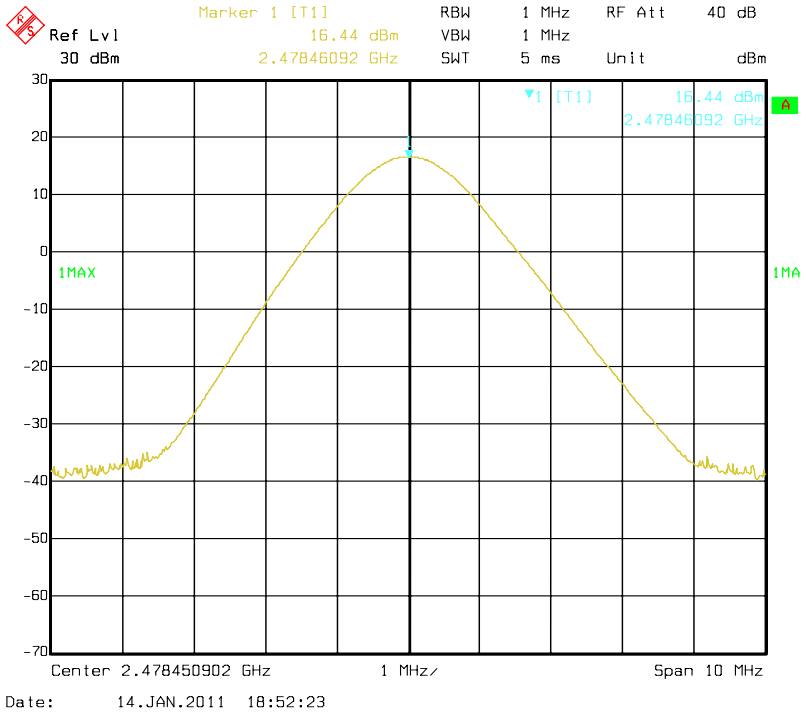
Frequency, GHz	Output power, dBm	Antenna gain, dBi	EIRP dBm	EIRP Limit, dBm
CH 1: 2404.125 MHz	18.92	1	19.92	26.97
CH 50: 2436.75 MHz	18.15	1	19.15	26.97
CH 64: 2478.375 MHz	16.44	1	17.44	26.97

EIRP [dBm] = Output power [dBm] + antenna gain [dBi]

9.3.1 diagram 9-1




Marker 1 [T1]
18.15 dBm
2.43682164 GHz
RBW 1 MHz
VBW 1 MHz
SWT 5 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
1MAX
1MA
Center 2.436831663 GHz
1 MHz/
Span 10 MHz
Date: 14.JAN.2011 18:55:29


Marker 1 [T1]
16.44 dBm
2.47846092 GHz
RBW 1 MHz
VBW 1 MHz
SWT 5 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
1MAX
1MA
Center 2.478450902 GHz
1 MHz/
Span 10 MHz
Date: 14.JAN.2011 18:52:23

10. NUMBER OF HOPPING FREQUENCY TEST

10.1 Test Procedure

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.

10.2 Measurement Equipment

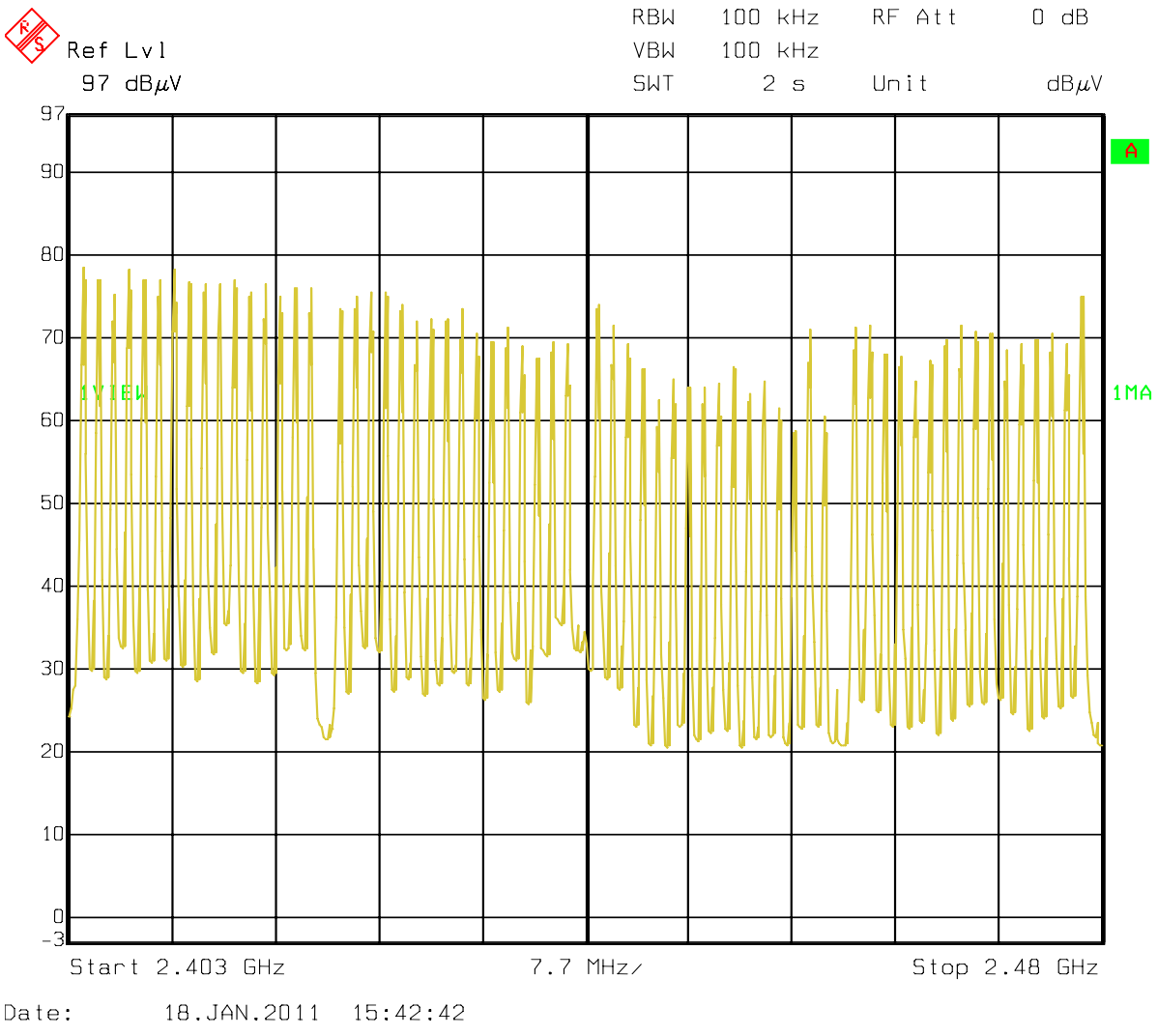
	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS

10.3 Test Result

Test mode: Transmitter Hopping on

Number of channels used	Minimum number of channels limit	Margin
64	15	49

10.3.1 Diagram 10-1



11. DWELL TIME TEST

11.1 Test Procedure

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.

11.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	2010-5-14	FSEM	848597、001	RS

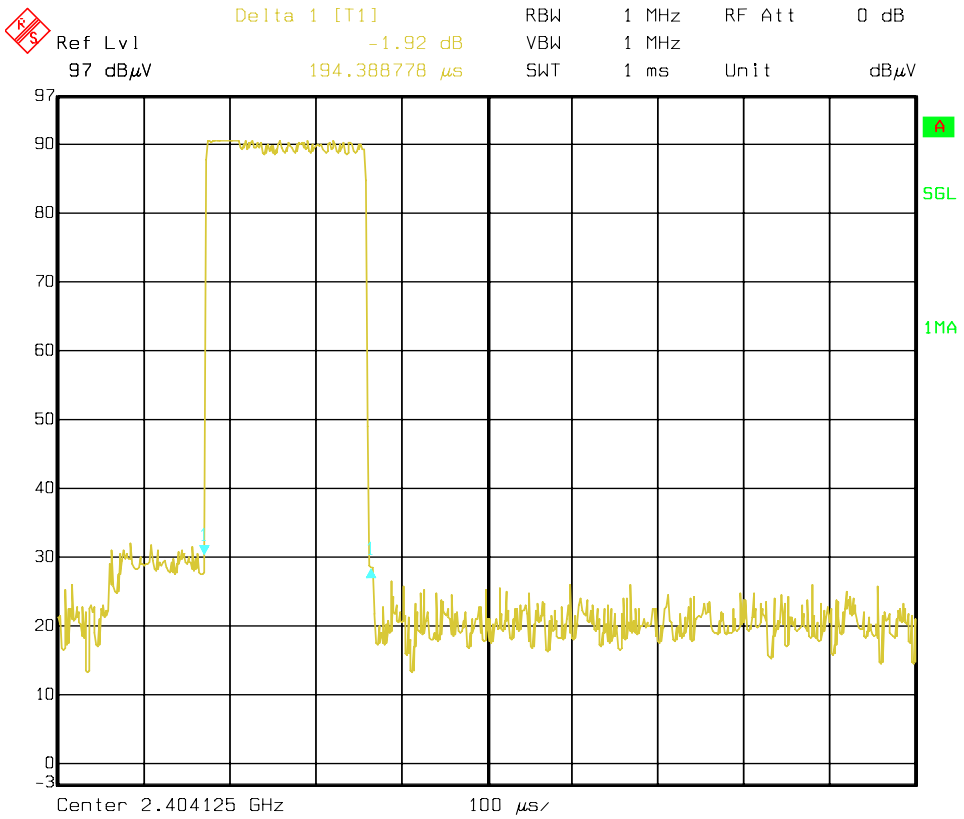
11.3 Test Result

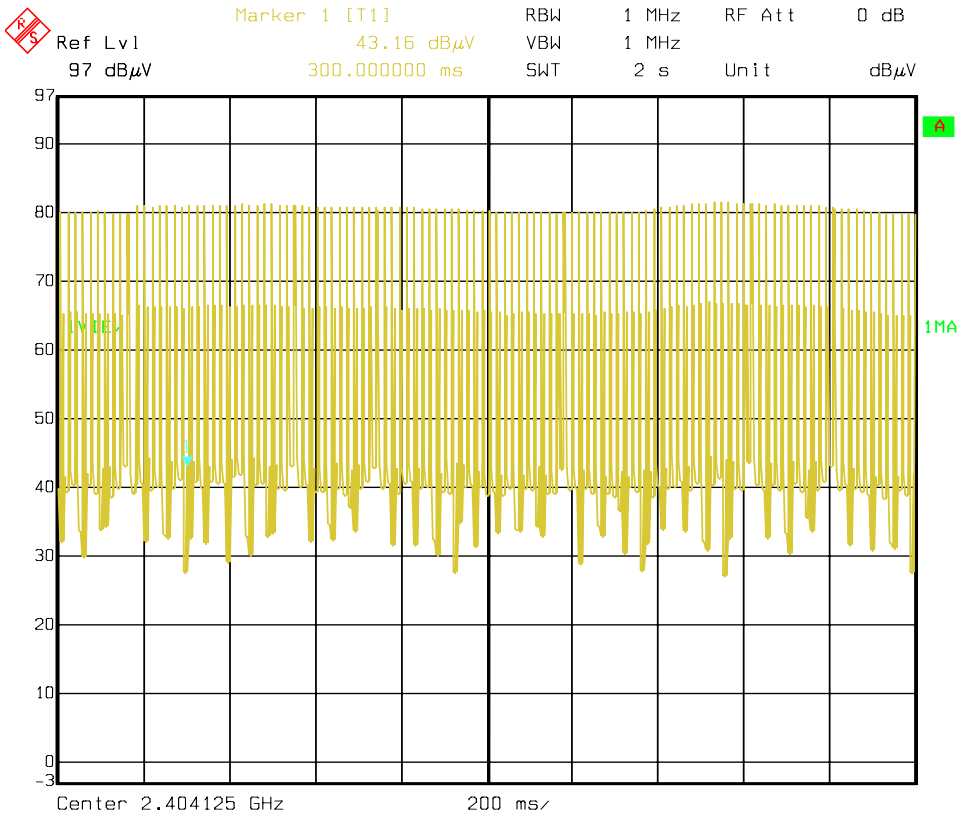
Limit:

Total time of occupancy is 0.4 s within a period of time equals number of hopping channels employed multiplied by 0.4 s, which is 0.4 s within the period of time 0.4 × 64 = 25.6 s

Modulation	Diagram	Time of occupancy ms	Limit ms	Margin ms	Remark
GFSK	11-1	286	400	114	115hits per 2s So (25.6/2) * 115 *0.194= 286

11.3.1 Diagram 11-1





12 POWER LINE CONDUCTED EMISSION TEST

12.1 Test Procedure

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Section 15.207 Conducted limits.(a):

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

12.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	EMI Receiver	2010.5.14	ESH3	860905/006	R & S
☒	Spectrum Analyzer	2010.5.14	ESA-L1500A	US37451154	R & S
☒	PULSE LIMITER	2010.5.14	ESH3-Z2	100281	R & S
☒	LISN	2010.5.14	ESH3-Z5	100294	R & S

12.3 Test Result

The EUT was placed on a non-metallic table, 80cm above the ground plane. The other peripheral devices power cord connected to the power mains through another line impedance stabilization network.In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4-2009 on conducted Emission test.

Preview measurements:
0.15 MHz to 30 MHz
Receiver settings: PK&AV detector

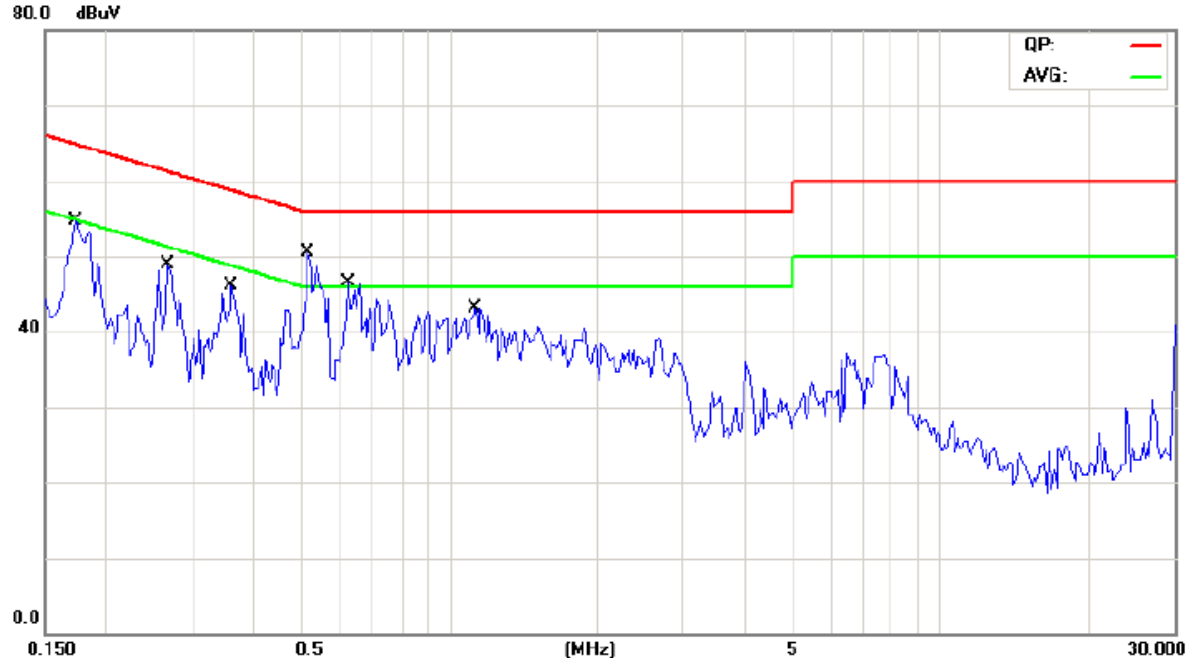
Final measurement:
0.15 MHz to 30 MHz
Receiver settings:QP&AV detector

RBW:9 kHz

Test mode	Power Line	Test Data	Test Result
TX MODE	Line	Diagram 12-1	Pass
	Neutral	Diagram 12-2	Pass

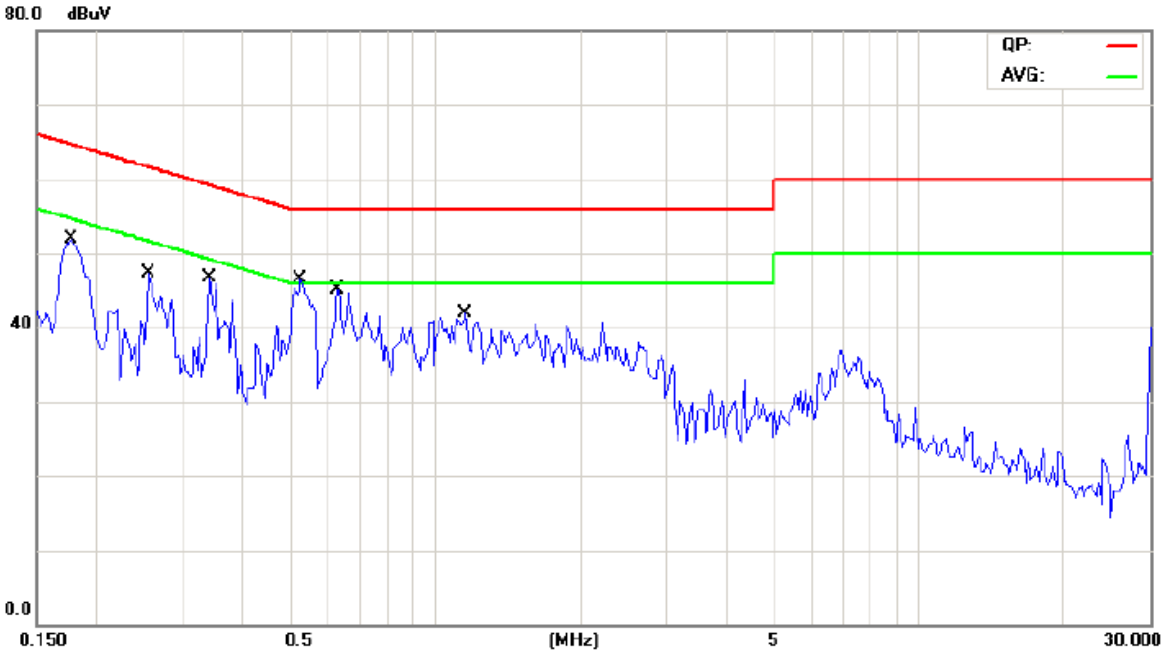
NOTES:
1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3: If PK value is lower than AV limit then no reading value listed in report .If QP value is Lower than AV limit ,then AV value don't listed in report.

12.3.1 Diagram 12-1



No.	Mk.	Freq.	Measure-ment	Limit	Over	
		MHz	dBuV	dBuV	dB	Detector
1		0.1734	46.20	64.79	-18.59	QP
2		0.1734	23.58	54.79	-31.21	AVG
3		0.2672	39.69	61.20	-21.51	QP
4		0.2672	18.52	51.20	-32.68	AVG
5		0.3608	38.06	58.71	-20.65	QP
6		0.3608	16.73	48.71	-31.98	AVG
7	*	0.5172	40.49	56.00	-15.51	QP
8		0.5172	22.30	46.00	-23.70	AVG
9		0.6227	34.95	56.00	-21.05	QP
10		0.6227	15.84	46.00	-30.16	AVG
11		1.1344	32.84	56.00	-23.16	QP
12		1.1344	16.25	46.00	-29.75	AVG

12.3.2 Diagram 12-2



No.	Mk.	Freq.	Measure-ment	Limit	Over	
		MHz	dBuV	dBuV	dB	Detector
1		0.1773	44.43	64.61	-20.18	QP
2		0.1773	23.66	54.61	-30.95	AVG
3		0.2555	37.97	61.57	-23.60	QP
4		0.2555	17.99	51.57	-33.58	AVG
5		0.3414	36.51	59.17	-22.66	QP
6		0.3414	16.77	49.17	-32.40	AVG
7	*	0.5289	39.18	56.00	-16.82	QP
8		0.5289	22.05	46.00	-23.95	AVG
9		0.6305	34.18	56.00	-21.82	QP
10		0.6305	15.38	46.00	-30.62	AVG
11		1.1539	31.94	56.00	-24.06	QP
12		1.1539	16.25	46.00	-29.75	AVG

13 Antenna requirement

13.1 Requirement

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

13.2 Result

The antenna used for this product is Internal Patch antenna that no antenna other than that furnished by the responsible party shall be used with the device, The maximum peak gain of this antenna is 1dBi.

14.MPE

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:(18.92) dBm

Maximum peak output power at antenna input terminal: (77.983)mW

Antenna gain(typical): 1.0(dBi)

Maximum antenna gain:(1.2589)numeric

Time Averaging: 100 (%)

Prediction distance: 20 (cm)

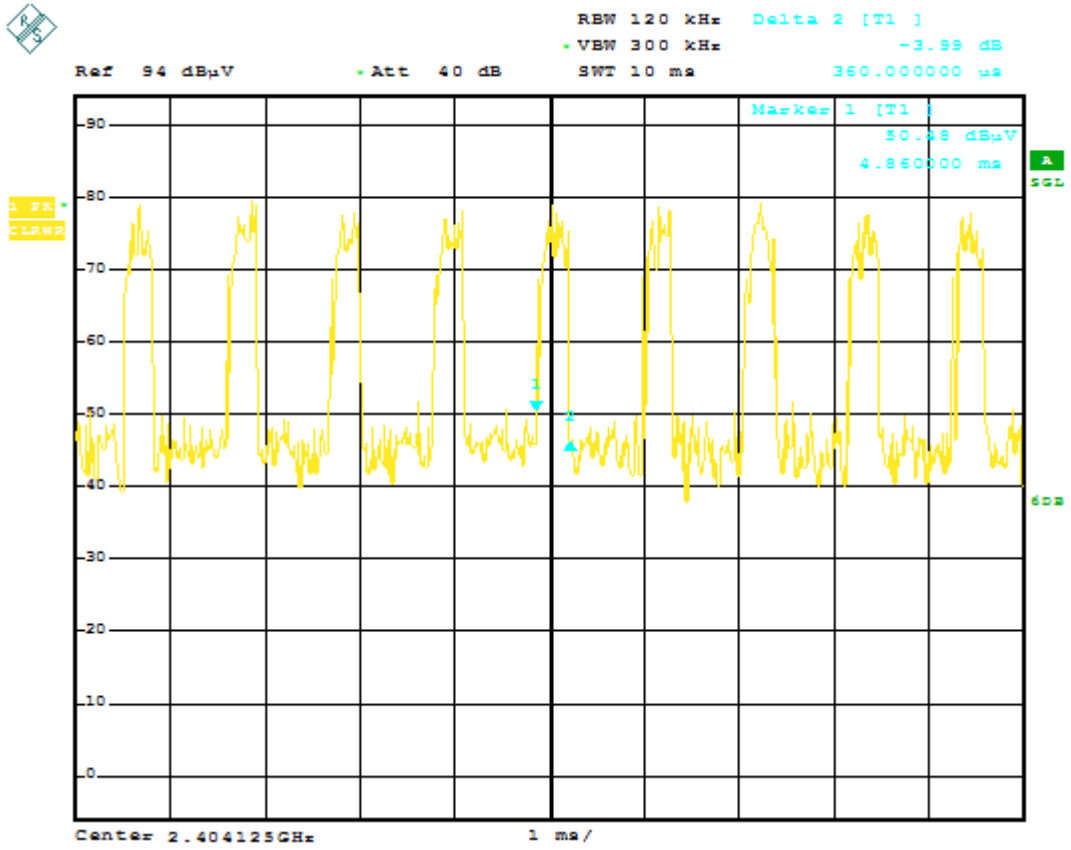
Prediction frequency: (2.404) MHz

MPE limit for uncontrolled exposure at prediction frequency: **1** (mW/cm^2)

Power density at prediction frequency: (0.0195) mW/cm^2

Margin of compliance:(17) dB

Appendix A Duty cycle



So the duty cycle is (0.36x9)x100/10/100=32.4%; So duty cycle factor = -9.789

Appendix B Sample Label

Labelling Requirements

The sample label shown shall be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.

*** The following paragraph specified in the user manual.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

END OF REPORT