

FCC & ISED Radio Test Report

FCC ID: 2ALJ6-OBEDU09AIQI

IC: 25212-OBEDU09AIQI

Project No. : 1905C156A
Equipment : ONEBOT Educational Mini Robot
Test Model : OBEDU09AIQI
Series Model : N/A
Applicant : Beijing AIQI Technology Co., LTD.
Address : Room.D1203, The 11th floor, Block D, No.9 Shangdi
3rd St., Haidian District, Beijing, 100085, China

Date of Receipt : May 31, 2019
Jun. 20, 2019
Date of Test : Jun. 05, 2019 ~ Jun. 14, 2019
Jun. 21, 2019 ~ Jul. 18, 2019
Issued Date : Jul. 18, 2019
Tested by : BTL Inc.

Testing Engineer

: Rose Liu
(Rose Liu)

Technical Manager

: Steven Lu
(Steven Lu)

Authorized Signatory

: Ethan Ma
(Ethan Ma)

B T L I N C .

No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan,
Guangdong, China.

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000



Certificate #5123.02

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents

Page

REPORT ISSUED HISTORY	5
1 . GENERAL SUMMARY	6
2 . SUMMARY OF TEST RESULTS	7
2.1 TEST FACILITY	8
2.2 MEASUREMENT UNCERTAINTY	8
3 . GENERAL INFORMATION	9
3.1 GENERAL DESCRIPTION OF EUT	9
3.2 DESCRIPTION OF TEST MODES	10
3.3 PARAMETERS OF TEST SOFTWARE	11
3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	12
3.5 SUPPORT UNITS	12
4 . RADIATED EMISSION TEST	13
4.1 LIMIT	13
4.2 TEST PROCEDURE	14
4.3 DEVIATION FROM TEST STANDARD	14
4.4 TEST SETUP	15
4.5 EUT OPERATING CONDITIONS	16
4.6 EUT TEST CONDITIONS	16
4.7 TEST RESULT - 9 KHZ TO 30 MHZ	16
4.8 TEST RESULT - 30 MHZ TO 1000 MHZ	16
4.9 TEST RESULT - ABOVE 1000 MHZ	16
5 . BANDWIDTH TEST	17
5.1 LIMIT	17
5.2 TEST PROCEDURE	17
5.3 DEVIATION FROM STANDARD	17
5.4 TEST SETUP	17
5.5 EUT OPERATION CONDITIONS	17
5.6 EUT TEST CONDITIONS	17
5.7 TEST RESULTS	17
6 . MAXIMUM OUTPUT POWER TEST & E.I.R.P. TEST	18
6.1 LIMIT	18
6.2 TEST PROCEDURE	18

Table of Contents	Page
6.3 DEVIATION FROM STANDARD	18
6.4 TEST SETUP	18
6.5 EUT OPERATION CONDITIONS	18
6.6 EUT TEST CONDITIONS	18
6.7 TEST RESULTS	18
7 . CONDUCTED SPURIOUS EMISSION	19
7.1 LIMIT	19
7.2 TEST PROCEDURE	19
7.3 DEVIATION FROM STANDARD	19
7.4 TEST SETUP	19
7.5 EUT OPERATION CONDITIONS	19
7.6 EUT TEST CONDITIONS	19
7.7 TEST RESULTS	19
8 . POWER SPECTRAL DENSITY TEST	20
8.1 LIMIT	20
8.2 TEST PROCEDURE	20
8.3 DEVIATION FROM STANDARD	20
8.4 TEST SETUP	20
8.5 EUT OPERATION CONDITIONS	20
8.6 EUT TEST CONDITIONS	20
8.7 TEST RESULTS	20
9 . MEASUREMENT INSTRUMENTS LIST	21
APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ	23
APPENDIX B - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	28
APPENDIX C - RADIATED EMISSION - ABOVE 1000 MHZ	35
APPENDIX D - BANDWIDTH	48
APPENDIX E - MAXIMUM OUTPUT POWER & E.I.R.P.	50
APPENDIX F - CONDUCTED SPURIOUS EMISSION	52
APPENDIX G - POWER SPECTRAL DENSITY	54

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	<p>This is a supplementary report to the original test report (BTL-FICP-1-1905C156).</p> <p>Based on original test report,</p> <ol style="list-style-type: none"> 1. The product name and model name are changed. 2. The modules except radio frequency module of the product are changed. <p>So the radiated emissions below 1GHz have been retested and recorded in this test report.</p>	Jul. 09, 2019
R01	Updated the data for Appendix D and Appendix G.	Jul. 18, 2019

1. GENERAL SUMMARY

Equipment : ONEBOT Educational Mini Robot
Brand Name : ONEBOT
Test Model : OBEDU09AIQI
Series Model : N/A
Applicant : Beijing AIQI Technology Co., LTD.
Manufacturer : Beijing AIQI Technology Co., LTD.
Address : Room.D1203, The 11th floor, Block D, No.9 Shangdi 3rd St., Haidian District, Beijing, 100085, China
Date of Test : Jun. 05, 2019 ~ Jun. 14, 2019
Jun. 21, 2019 ~ Jul. 18, 2019
Test Sample : Engineering Sample No.: DG19053143 for conducted, DG19053144 and DG1906246 for radiated
Standard(s) : FCC Part15, Subpart C (15.247)
RSS-247 Issue 2, Feb. 2017
RSS-Gen Issue 5, Apr. 2018
ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance V05r02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FICP-1-1905C156A) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247) RSS-247 Issue 2, Feb. 2017, RSS-Gen Issue 5, Apr. 2018					
Standard(s) Section		Test Item	Test Result	Judgment	Remark
FCC	ISED				
15.207	RSS-Gen 8.8	AC Power Line Conducted Emissions	-----	N/A	-----
15.247(d) 15.205(a) 15.209(a)	RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	Radiated Emissions	APPENDIX A APPENDIX B APPENDIX C	PASS	-----
15.247(a)(2)	RSS-247 5.2 (a) RSS-Gen 6.7	Bandwidth	APPENDIX D	PASS	-----
15.247(b)(3)	RSS-247 5.4 (d)	Maximum Output Power & e.i.r.p.	APPENDIX E	PASS	-----
15.247(d)	RSS-247 5.5	Conducted Spurious Emission	APPENDIX F	PASS	-----
15.247(e)	RSS-247 5.2 (b)	Power Spectral Density	APPENDIX G	PASS	-----
15.203	-	Antenna Requirement	-----	PASS	Note(2)

NOTE:

- (1) "N/A" denotes test is not applicable to this device.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's Test Firm Registration Number for FCC: 357015

BTL's Designation Number for FCC: CN1240

BTL's Test Firm Registration Number for ISCED: 4428B

2.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

The BTL measurement uncertainty as below table:

A. Radiated emissions Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9 KHz~30 MHz	V	3.79
		9 KHz~30 MHz	H	3.57
		30 MHz~200 MHz	V	3.82
		30 MHz~200 MHz	H	3.78
		200 MHz~1,000 MHz	V	4.10
		200 MHz~1,000 MHz	H	4.06
		1 GHz~18 GHz	V	3.12
		1 GHz~18 GHz	H	3.68
		18 GHz~40 GHz	V	4.15
		18 GHz~40 GHz	H	4.14

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	ONEBOT Educational Mini Robot
Brand Name	ONEBOT
Test Model	OBEDU09AIQI
Series Model	N/A
Model Difference(s)	N/A
Power Source	Battery supplied.
Power Rating	DC 3V
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter	1Mbps
Output Power (Max.)	-8.54 dBm (0.0001 W)
e.i.r.p. (Max.)	-8.62 dBm (0.0001 W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Internal	N/A	-0.081

3.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode NOTE (1)
Mode 2	TX Mode Channel 39 _1Mbps

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

Radiated emissions test - 9 kHz to 30 MHz	
Final Test Mode	Description
Mode 2	TX Mode Channel 39 _1Mbps

Radiated emissions test - 30 MHz to 1 GHz	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Note:

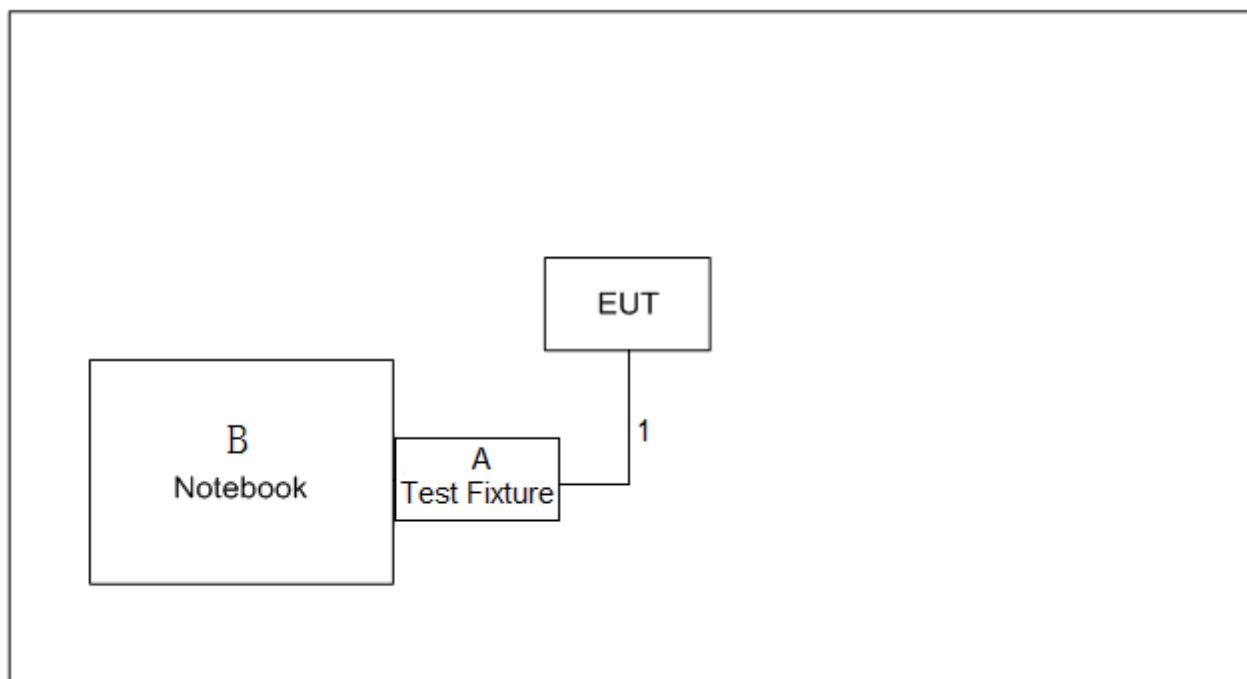
- (1) The measurements are performed at the high, middle, low available channels.
- (2) For radiated emission above 1 GHz test, 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

3.3 PARAMETERS OF TEST SOFTWARE

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of BT LE

Test Software	nRFgo Studio		
Frequency (MHz)	2402	2440	2480
Parameters	N/A	N/A	N/A

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
A	Test Fixture	N/A	N/A	N/A
B	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	Data Cable	NO	NO	0.2m

4. RADIATED EMISSION TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a) and RSS-Gen 8.10, then the 15.209(a) and RSS-Gen 8.9 limit in the table below has to be followed.

For FCC:

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

For ISD:

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-30 MHz)

Frequency (MHz)	Magnetic field strength (H-Field) (μA/m)	Measurement Distance (meters)
0.009-0.490	6.37/F(kHz)	300
0.490-1.705	6.37/F(kHz)	30
1.705-30.0	0.08	30

LIMITS OF RADIATED EMISSION MEASUREMENT (30 MHz-1000 MHz)

Frequency (MHz)	Field Strength (μV/m at 3m)
30-88	100
88-216	150
216-960	200
Above 960	500

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m at 3 m)	
	Peak	Average
Above 1000	74	54

Note:

- (1) The limit for radiated test was performed according to FCC PART 15C & RSS-247.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	RBW 1 MHz VBW 3 MHz peak detector for Pk value RMS detector for AV value

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector

4.2 TEST PROCEDURE

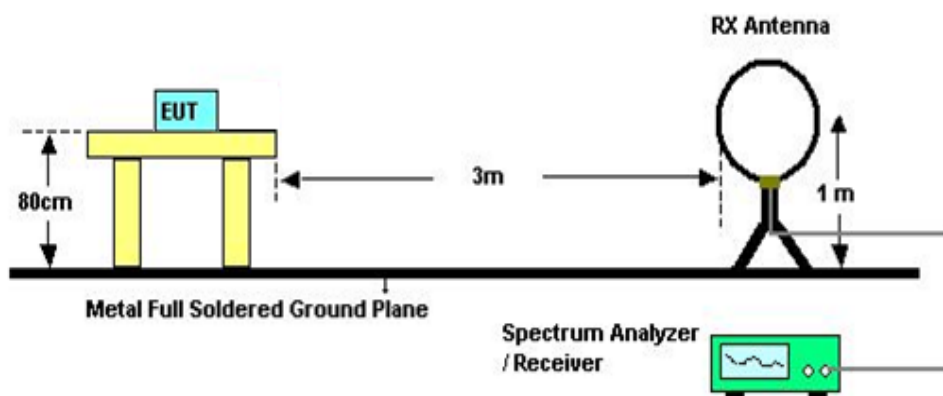
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.3 DEVIATION FROM TEST STANDARD

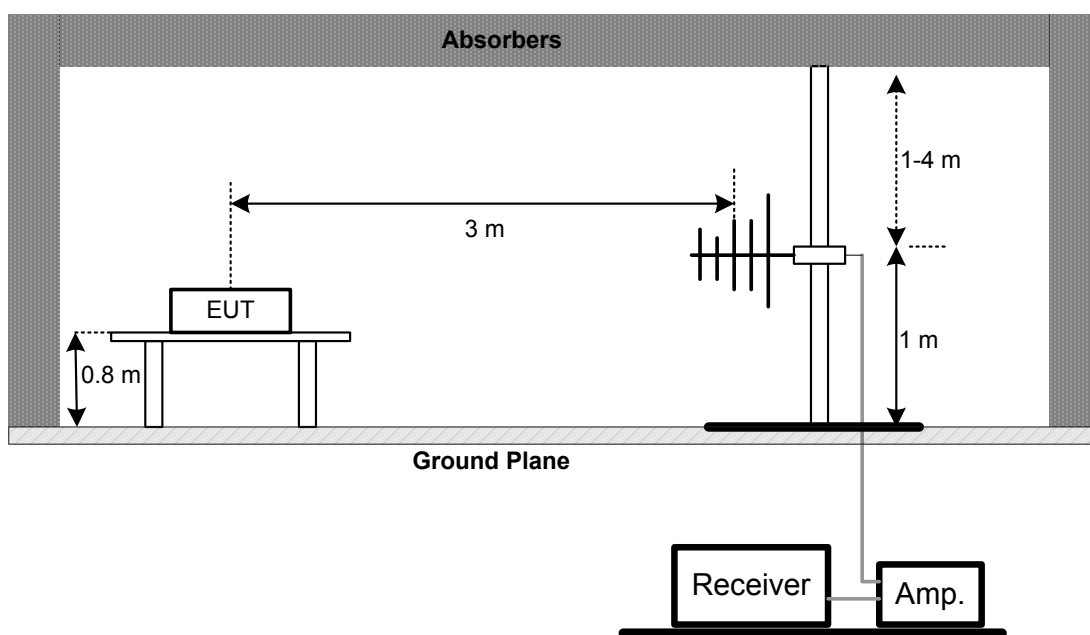
No deviation

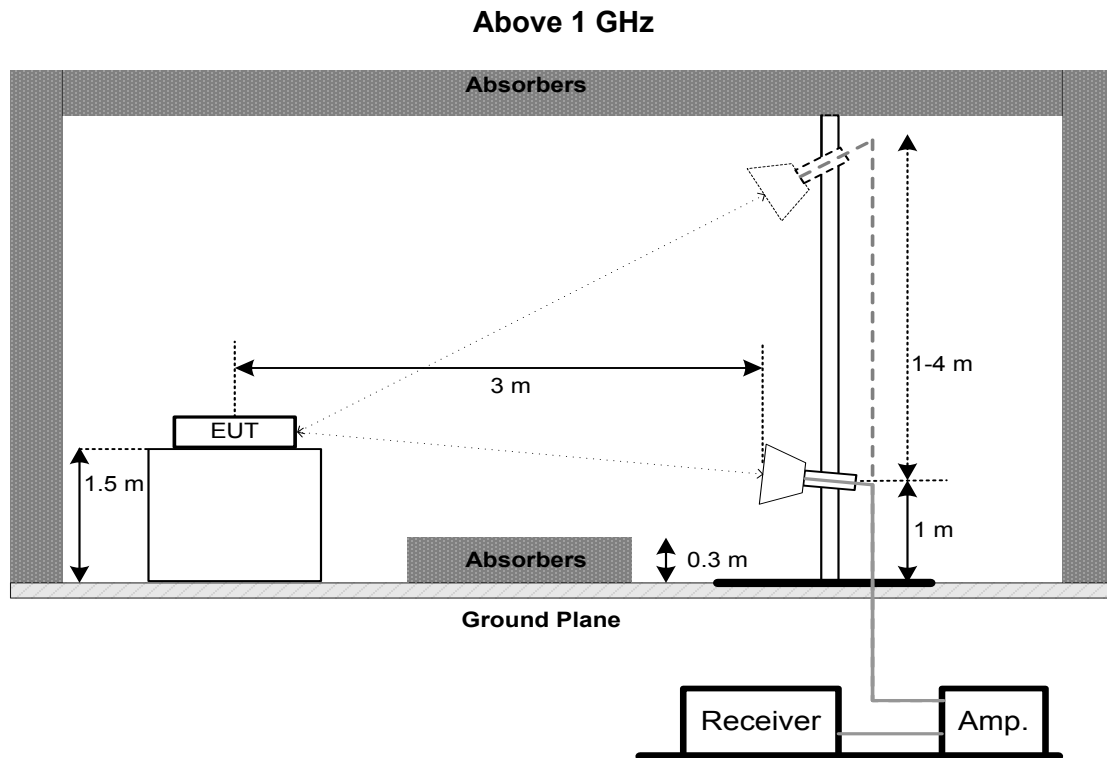
4.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 EUT TEST CONDITIONS

Temperature: 24°C Relative Humidity: 68% Test Voltage: DC 3V

4.7 TEST RESULT - 9 kHz TO 30 MHz

Please refer to the APPENDIX A.

Remark:

- (1) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.8 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX B.

4.9 TEST RESULT - ABOVE 1000 MHz

Please refer to the APPENDIX C.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH TEST

5.1 LIMIT

FCC Part15, Subpart C (15.247) / RSS-Gen and RSS-247		
Section	Test Item	Limit
15.247(a)(2) RSS-Gen 6.7 RSS-247 5.2 (a)	Bandwidth	≥ 500 kHz (6 dB bandwidth)
	99% Emission Bandwidth	-

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting :
For Bandwidth : RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5 ms.
For 99% Emission Bandwidth: RBW= 30 kHz, VBW=300 kHz, Sweep time = 2.5 ms.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 EUT TEST CONDITIONS

Temperature: 24.6°C Relative Humidity: 58% Test Voltage: DC 3V

5.7 TEST RESULTS

Please refer to the APPENDIX D.

6. MAXIMUM OUTPUT POWER TEST & E.I.R.P. TEST

6.1 LIMIT

FCC Part15, Subpart C (15.247) / RSS-247		
Section	Test Item	Limit
15.247(b)(3) RSS-247 5.4 (d)	Maximum Output Power	1 watt or 30 dBm
RSS-247 5.4 (d)	Maximum e.i.r.p.	4 watt or 36 dBm

6.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The maximum conducted output power was performed in accordance with method 11.9.1.1 of ANSI C63.10-2013.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 EUT TEST CONDITIONS

Temperature: 24.6°C Relative Humidity: 58% Test Voltage: DC 3V

6.7 TEST RESULTS

Please refer to the APPENDIX E.

7. CONDUCTED SPURIOUS EMISSION

7.1 LIMIT

For FCC

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 Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

For ISCED

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

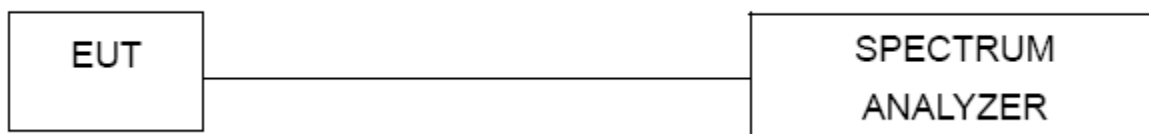
7.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting : RBW= 100 kHz, VBW=300 kHz, Sweep time = 10 ms.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.6 EUT TEST CONDITIONS

Temperature: 24.6°C Relative Humidity: 58% Test Voltage: DC 3V

7.7 TEST RESULTS

Please refer to the APPENDIX F.

8. POWER SPECTRAL DENSITY TEST

8.1 LIMIT

FCC Part15, Subpart C (15.247) / RSS-247		
Section	Test Item	Limit
15.247(e) RSS-247 5.2 (b)	Power Spectral Density	8 dBm (in any 3 kHz)

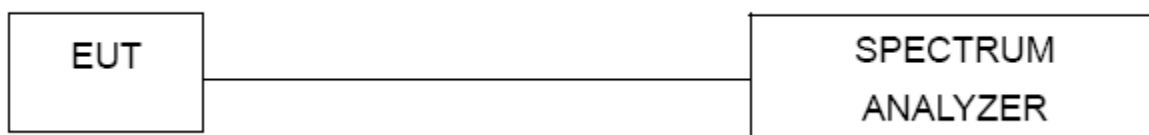
8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW=3 kHz, VBW=10 kHz, Sweep time = auto.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.6 EUT TEST CONDITIONS

Temperature: 24.6°C Relative Humidity: 58% Test Voltage: DC 3V

8.7 TEST RESULTS

Please refer to the APPENDIX G.

9. MEASUREMENT INSTRUMENTS LIST

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EM	EM-6876-1	230	Jan. 15, 2020
2	Cable	N/A	RG 213/U	C-102	May 31, 2020
3	EMI Test Receiver	R&S	ESCI	100895	Mar. 10, 2020
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020
2	Amplifier	HP	8447D	2944A09673	Aug. 11, 2019
3	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
4	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	May 24, 2020
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2019
3	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020
5	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Jul. 30, 2019
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Maximum Output Power & e.i.r.p.					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Antenna Conducted Spurious Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

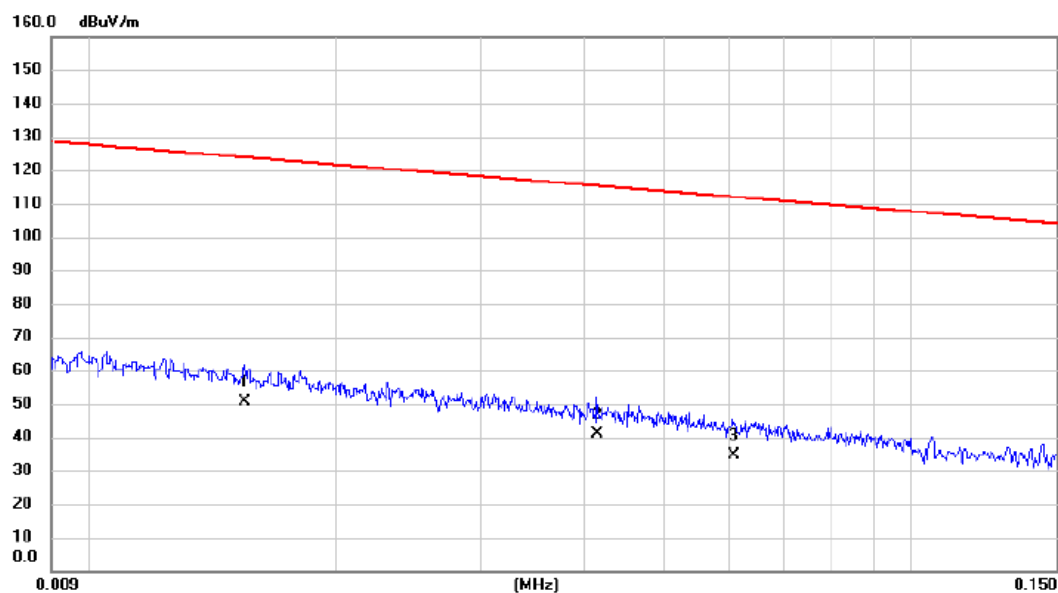
Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Test Mode: TX Mode Channel 39 _1Mbps

Ant 0°



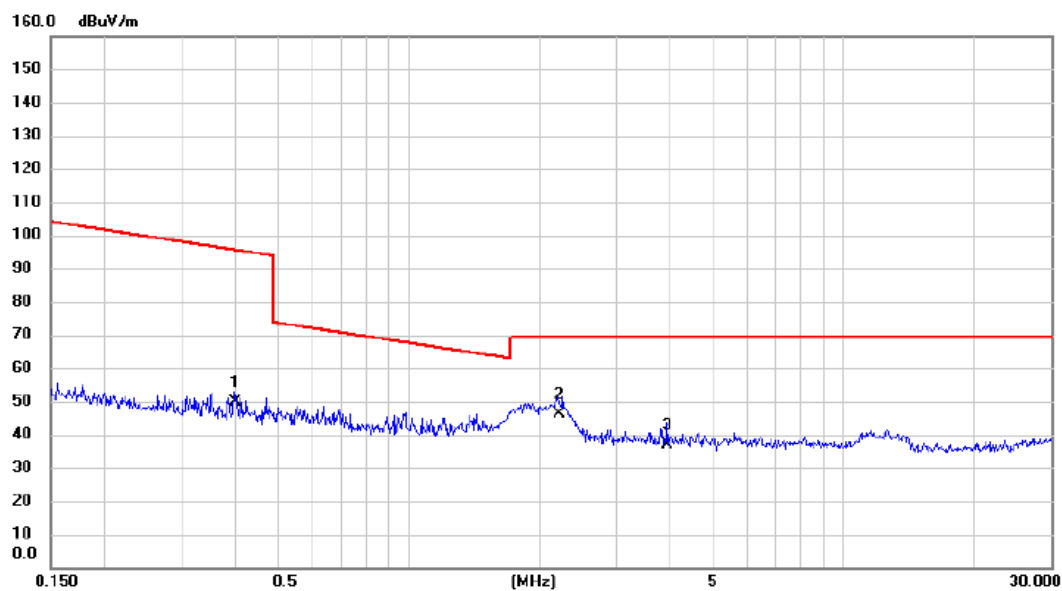
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0155	35.30	15.17	50.47	123.80	-73.33	AVG	
2		0.0415	27.20	13.90	41.10	115.24	-74.14	AVG	
3		0.0608	20.80	13.76	34.56	111.93	-77.37	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 39 _1Mbps

Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.3997	36.50	13.30	49.80	95.57	-45.77	AVG	
2	*	2.2132	34.70	11.69	46.39	69.54	-23.15	QP	
3		3.9222	26.20	10.96	37.16	69.54	-32.38	QP	

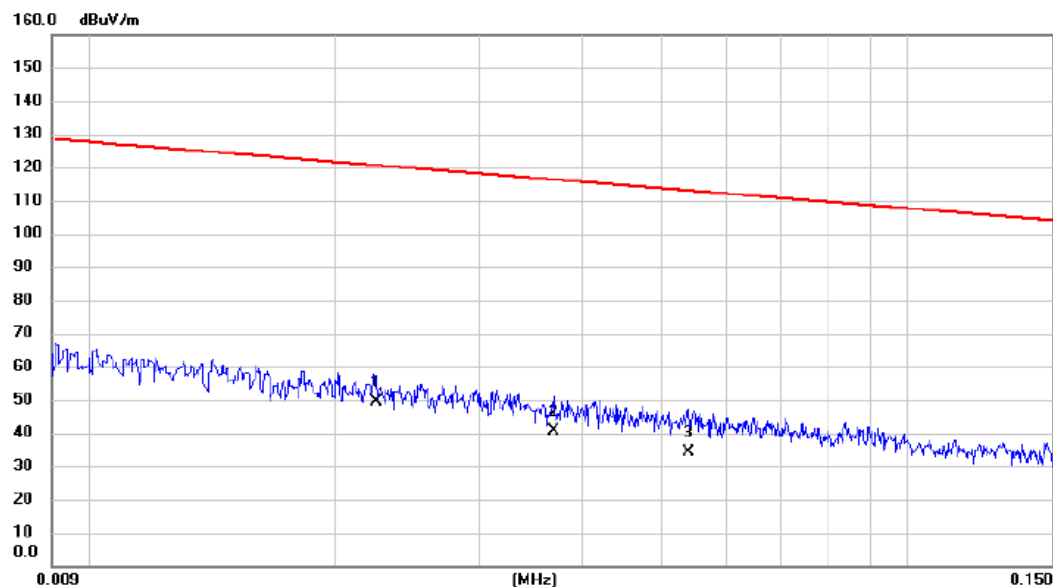
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 39 _1Mbps

Ant 90°



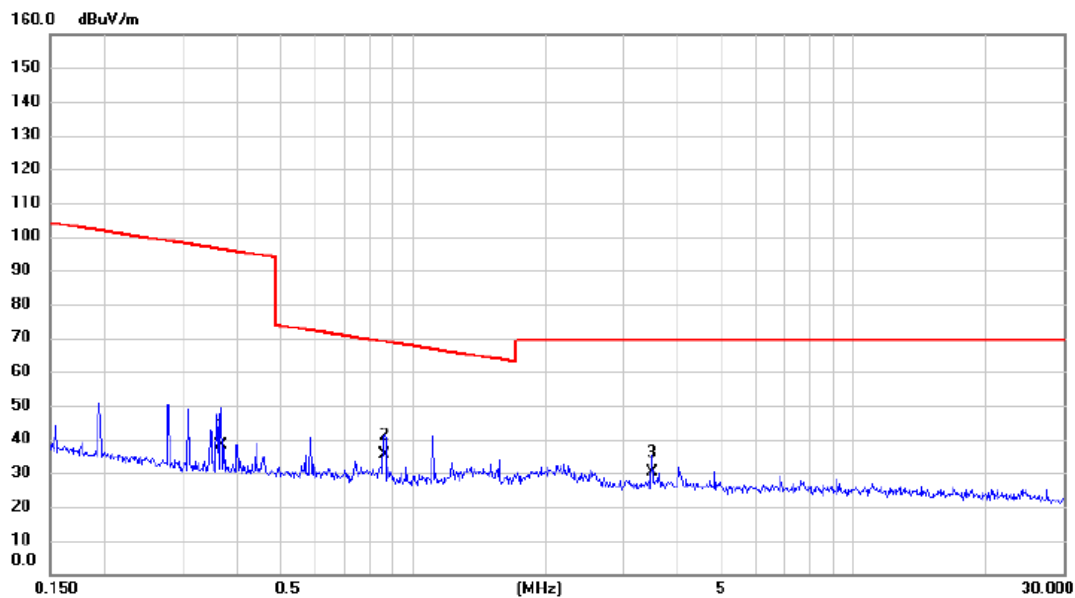
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0224	35.70	13.83	49.53	120.60	-71.07	AVG	
2		0.0370	26.80	13.89	40.69	116.24	-75.55	AVG	
3		0.0540	20.20	13.87	34.07	112.96	-78.89	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 39 _1Mbps

Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.3673	38.20	0.00	38.20	96.30	-58.10	AVG	
2	*	0.8618	35.60	0.00	35.60	68.90	-33.30	QP	
3		3.4906	30.30	0.00	30.30	69.54	-39.24	QP	

REMARKS:

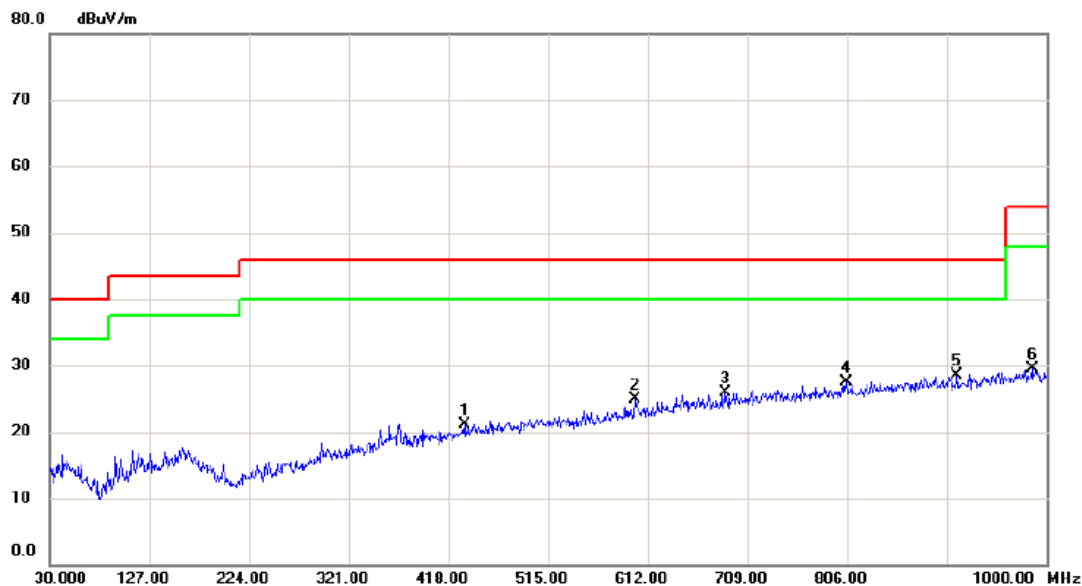
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX B - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode: TX Mode Channel 00 _1Mbps

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		434.005	29.62	-8.53	21.09	46.00	-24.91	peak	
2		599.875	30.65	-5.74	24.91	46.00	-21.09	peak	
3		687.175	30.03	-4.18	25.85	46.00	-20.15	peak	
4		805.030	30.44	-2.93	27.51	46.00	-18.49	peak	
5	*	912.700	30.19	-1.64	28.55	46.00	-17.45	peak	
6		985.935	29.68	-0.17	29.51	54.00	-24.49	peak	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 00 _1Mbps

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	359.800	42.41	-10.42	31.99	46.00	-14.01	peak	
2		511.120	30.75	-7.58	23.17	46.00	-22.83	peak	
3		639.160	30.93	-4.91	26.02	46.00	-19.98	peak	
4		701.725	31.57	-3.99	27.58	46.00	-18.42	peak	
5		831.705	32.29	-2.59	29.70	46.00	-16.30	peak	
6		960.230	30.47	-0.61	29.86	54.00	-24.14	peak	

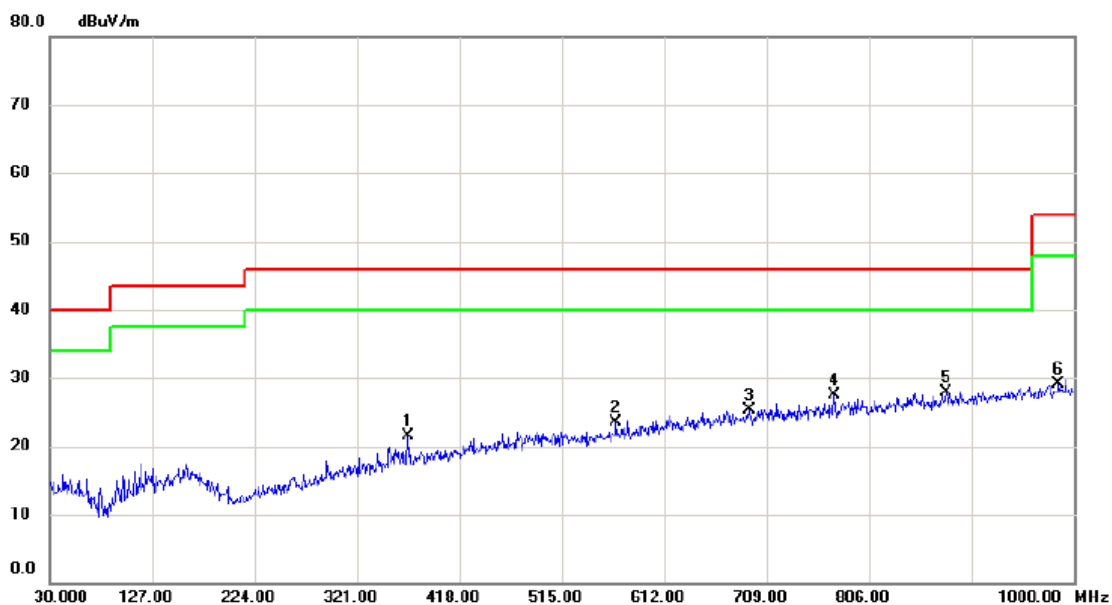
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 19 _1Mbps

Vertical



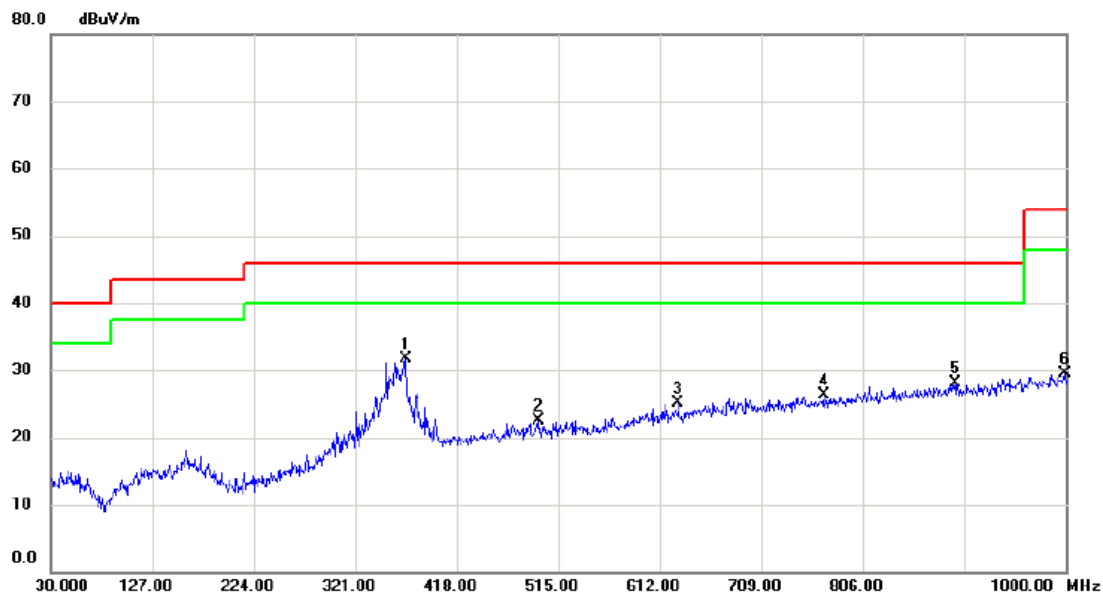
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		369.500	31.64	-10.19	21.45	46.00	-24.55	peak	
2		566.410	30.15	-6.72	23.43	46.00	-22.57	peak	
3		692.995	29.42	-4.11	25.31	46.00	-20.69	peak	
4		773.505	30.89	-3.35	27.54	46.00	-18.46	peak	
5	*	878.750	30.01	-2.11	27.90	46.00	-18.10	peak	
6		985.450	29.34	-0.17	29.17	54.00	-24.83	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 19 _1Mbps

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	369.015	41.95	-10.20	31.75	46.00	-14.25	peak	
2		496.085	30.26	-7.72	22.54	46.00	-23.46	peak	
3		629.460	30.16	-5.11	25.05	46.00	-20.95	peak	
4		768.655	29.76	-3.40	26.36	46.00	-19.64	peak	
5		894.755	30.02	-1.97	28.05	46.00	-17.95	peak	
6		999.515	29.38	0.06	29.44	54.00	-24.56	peak	

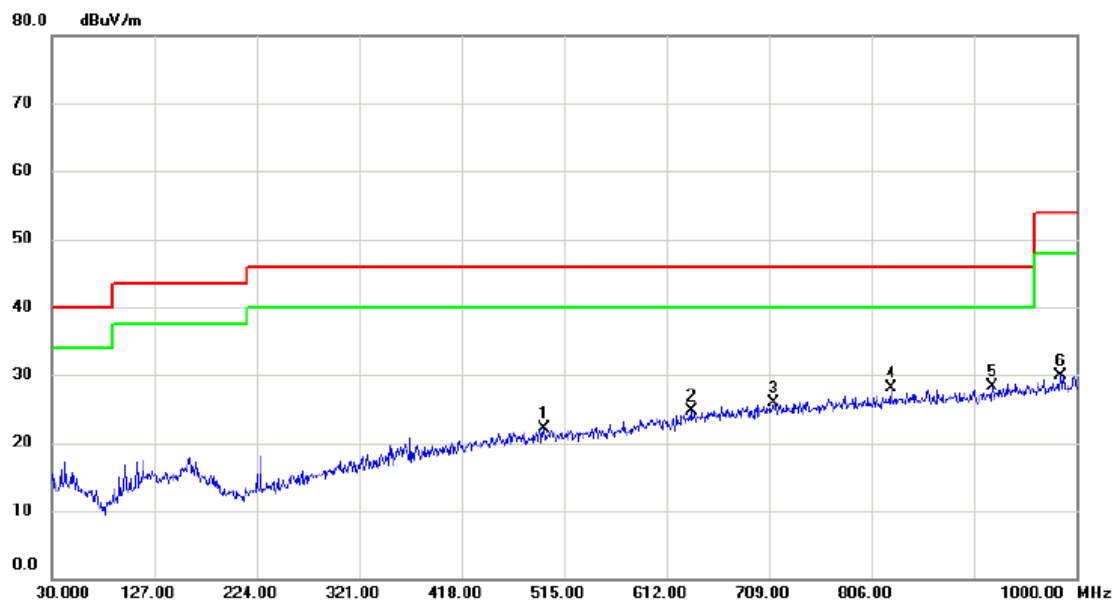
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 39 _1Mbps

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		495.600	29.88	-7.72	22.16	46.00	-23.84	peak	
2		635.765	29.59	-4.98	24.61	46.00	-21.39	peak	
3		713.850	29.82	-3.91	25.91	46.00	-20.09	peak	
4		824.430	30.70	-2.69	28.01	46.00	-17.99	peak	
5	*	920.460	29.83	-1.45	28.38	46.00	-17.62	peak	
6		984.480	30.08	-0.19	29.89	54.00	-24.11	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX Mode Channel 39 _1Mbps

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	369.015	43.44	-10.20	33.24	46.00	-12.76	peak	
2		547.495	30.03	-7.23	22.80	46.00	-23.20	peak	
3		692.510	29.81	-4.11	25.70	46.00	-20.30	peak	
4		757.985	30.23	-3.55	26.68	46.00	-19.32	peak	
5		811.335	30.41	-2.86	27.55	46.00	-18.45	peak	
6		998.545	29.16	0.05	29.21	54.00	-24.79	peak	

REMARKS:

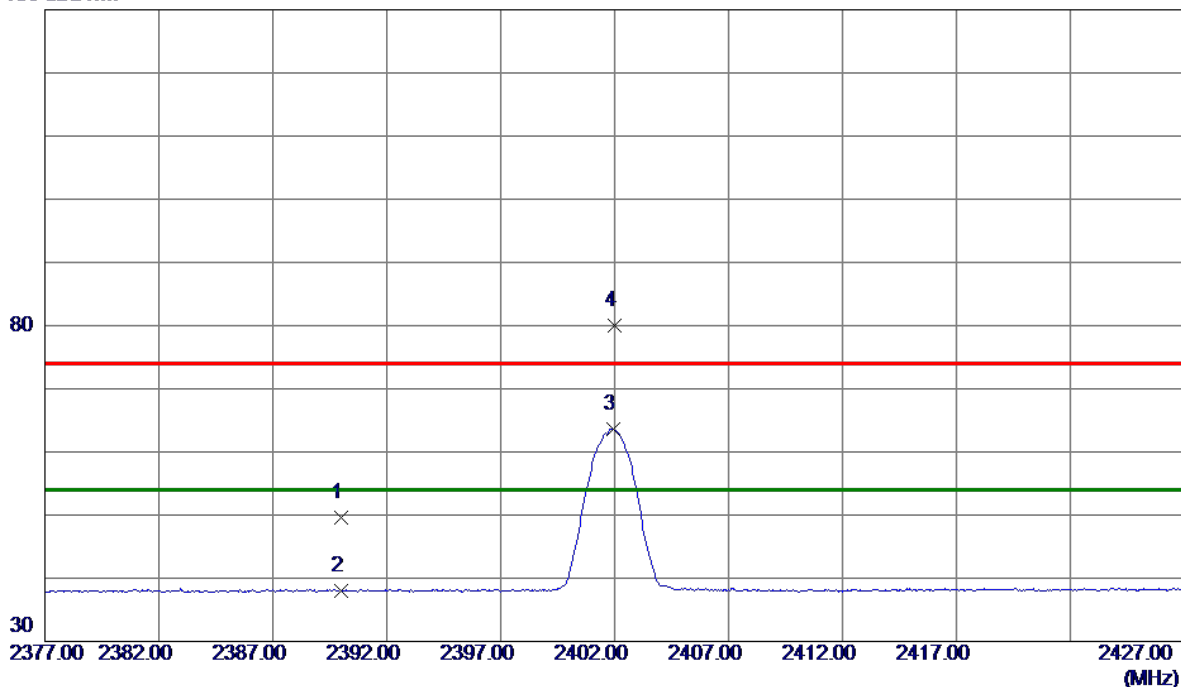
- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

APPENDIX C - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode : TX 2402 MHz _CH00_1Mbps

Vertical

130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	42.08	7.56	49.64	74.00	-24.36	Peak	
2	2390.0000	30.36	7.56	37.92	54.00	-16.08	AVG	
3 *	2401.9250	56.09	7.60	63.69	54.00	9.69	AVG	No Limit
4	2401.9750	72.34	7.60	79.94	74.00	5.94	Peak	No Limit

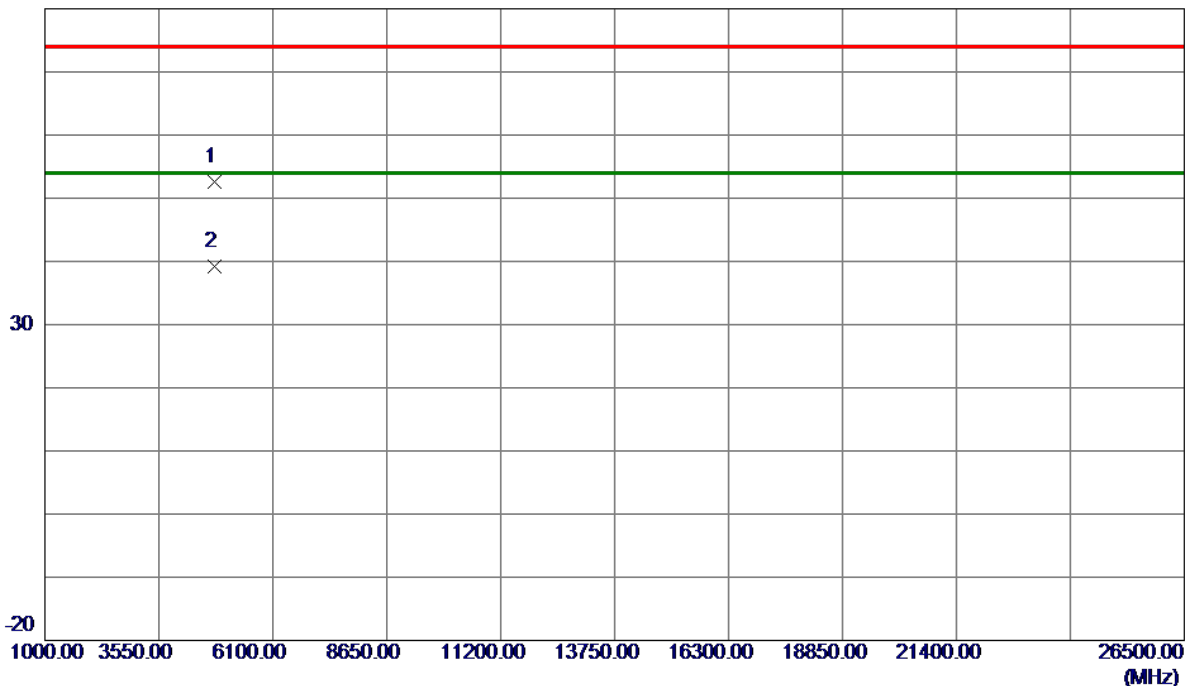
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2402 MHz _CH00_1Mbps
-------------	-------------------------

Vertical

80 dBuV/m



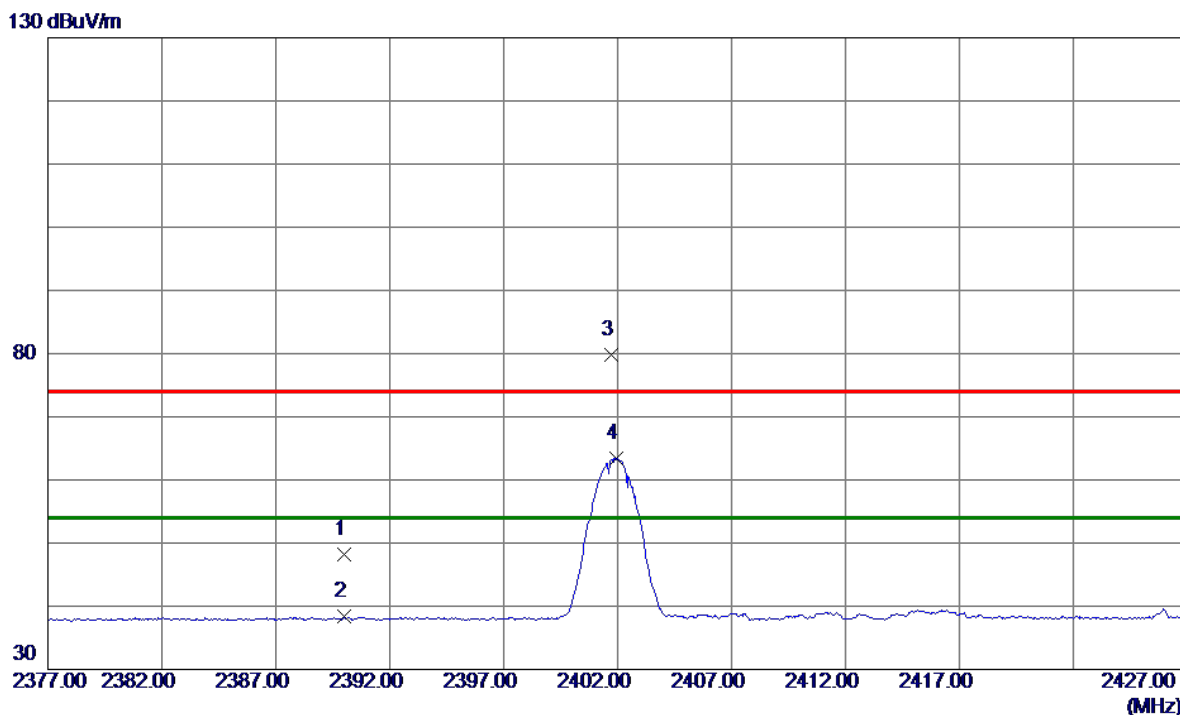
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4803.2150	48.34	4.18	52.52	74.00	-21.48	Peak	
2 *	4803.7370	35.03	4.18	39.21	54.00	-14.79	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode : TX 2402 MHz _CH00_1Mbps

Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	40.66	7.56	48.22	74.00	-25.78	Peak	
2	2390.0000	30.76	7.56	38.32	54.00	-15.68	AVG	
3	2401.7250	72.29	7.60	79.89	74.00	5.89	Peak	No Limit
4 *	2401.9500	55.88	7.60	63.48	54.00	9.48	AVG	No Limit

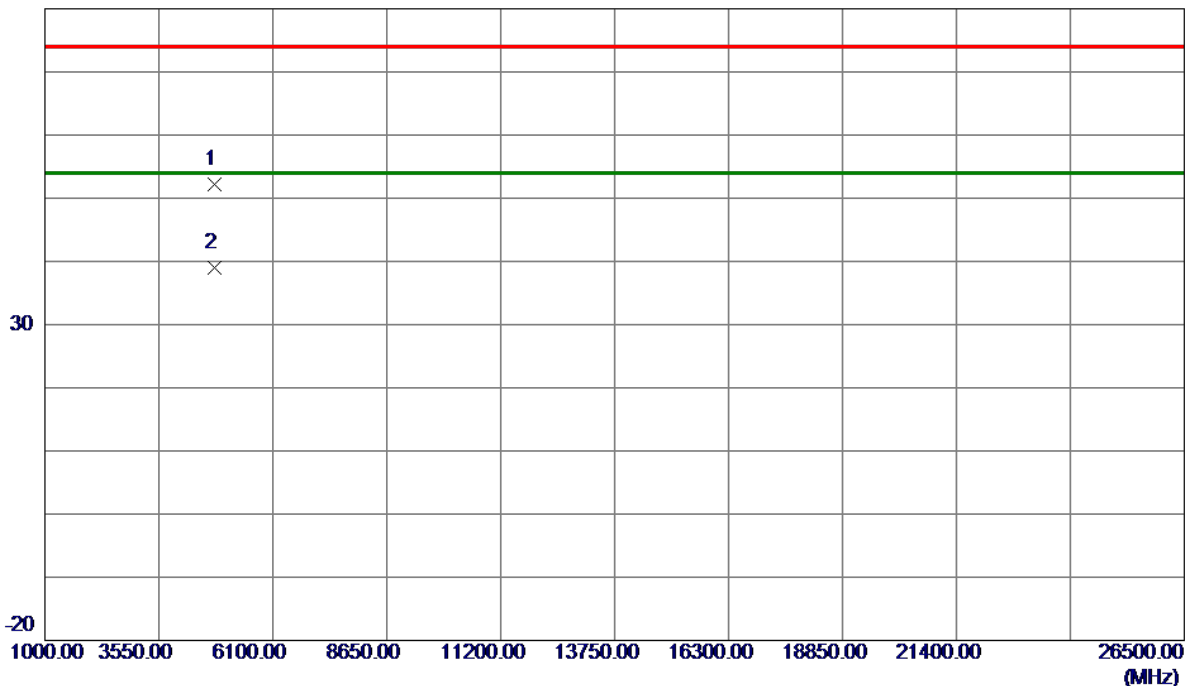
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2402 MHz _CH00_1Mbps
-------------	-------------------------

Horizontal

80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4803.2530	47.96	4.18	52.14	74.00	-21.86	Peak	
2 *	4803.6690	34.86	4.18	39.04	54.00	-14.96	AVG	

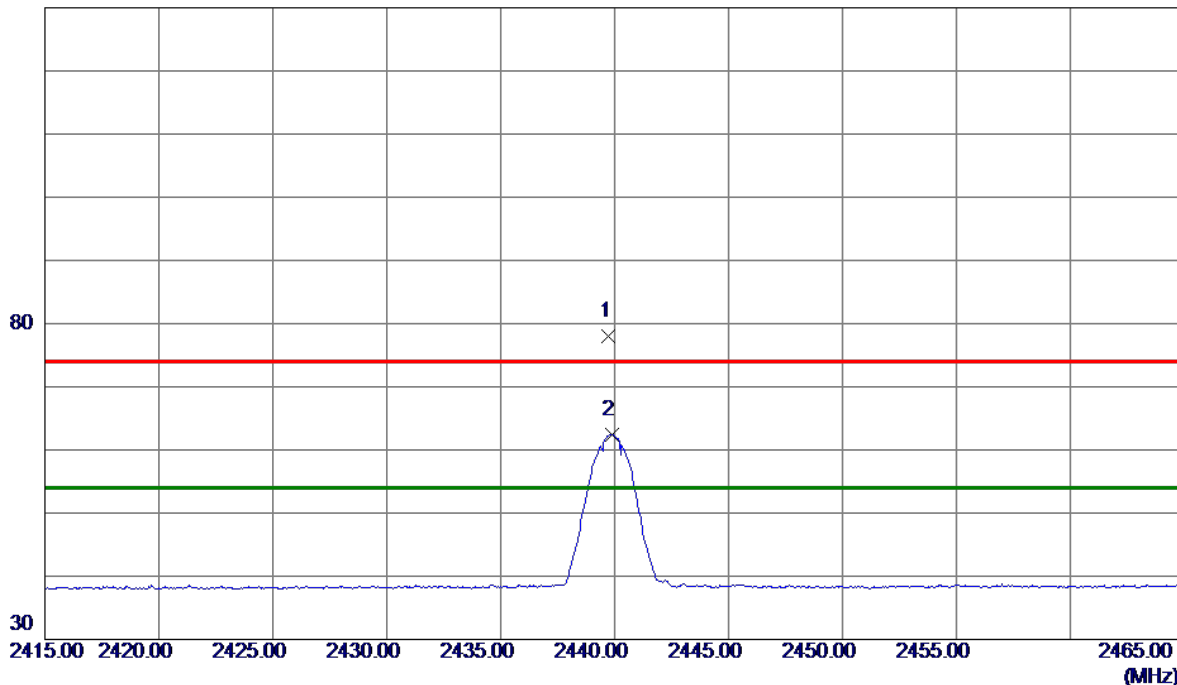
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode : TX 2440 MHz _CH19_1Mbps

Vertical

130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7500	70.23	7.73	77.96	74.00	3.96	Peak	No Limit
2 *	2439.8750	54.72	7.73	62.45	54.00	8.45	AVG	No Limit

REMARKS:

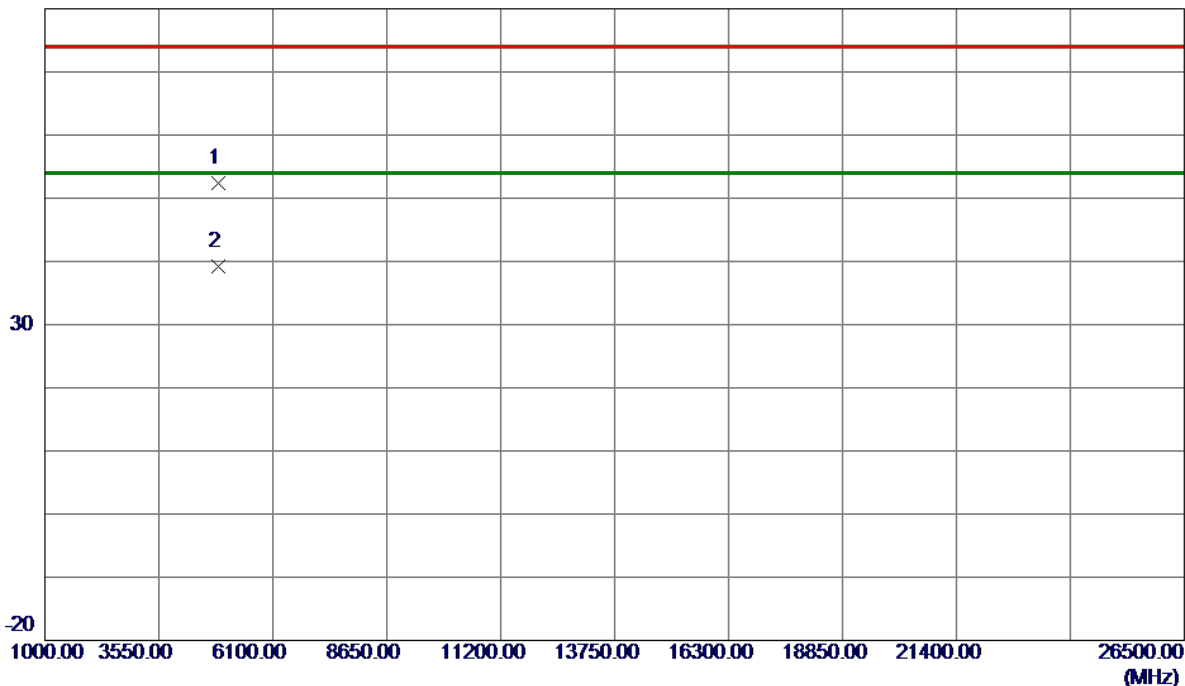
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2440 MHz _CH19_ 1Mbps
-------------	--------------------------

Vertical

80 dBuV/m



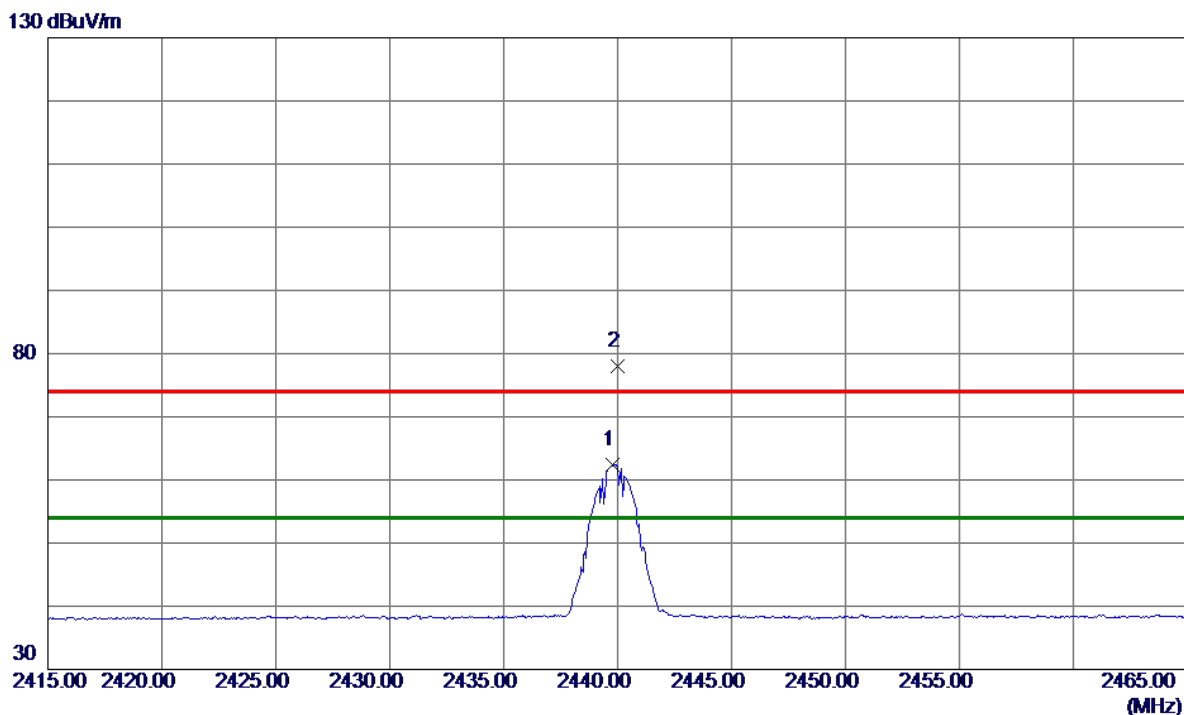
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4879.1020	47.87	4.46	52.33	74.00	-21.67	Peak	
2 *	4879.8870	34.75	4.46	39.21	54.00	-14.79	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2440 MHz _CH19_1Mbps
-------------	-------------------------

Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2439.7750	54.61	7.73	62.34	54.00	8.34	AVG	No Limit
2	2440.0000	70.23	7.73	77.96	74.00	3.96	Peak	No Limit

REMARKS:

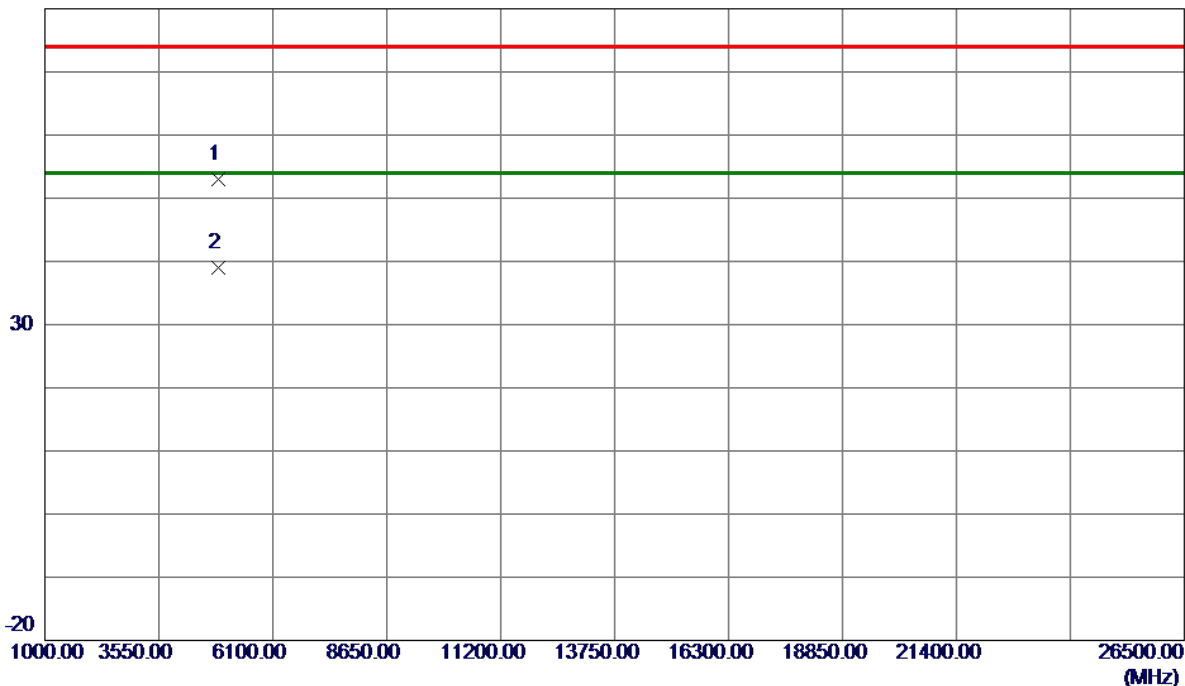
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2440 MHz _CH19_ 1Mbps
-------------	--------------------------

Horizontal

80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4879.0850	48.63	4.46	53.09	74.00	-20.91	Peak	
2 *	4879.7240	34.47	4.46	38.93	54.00	-15.07	AVG	

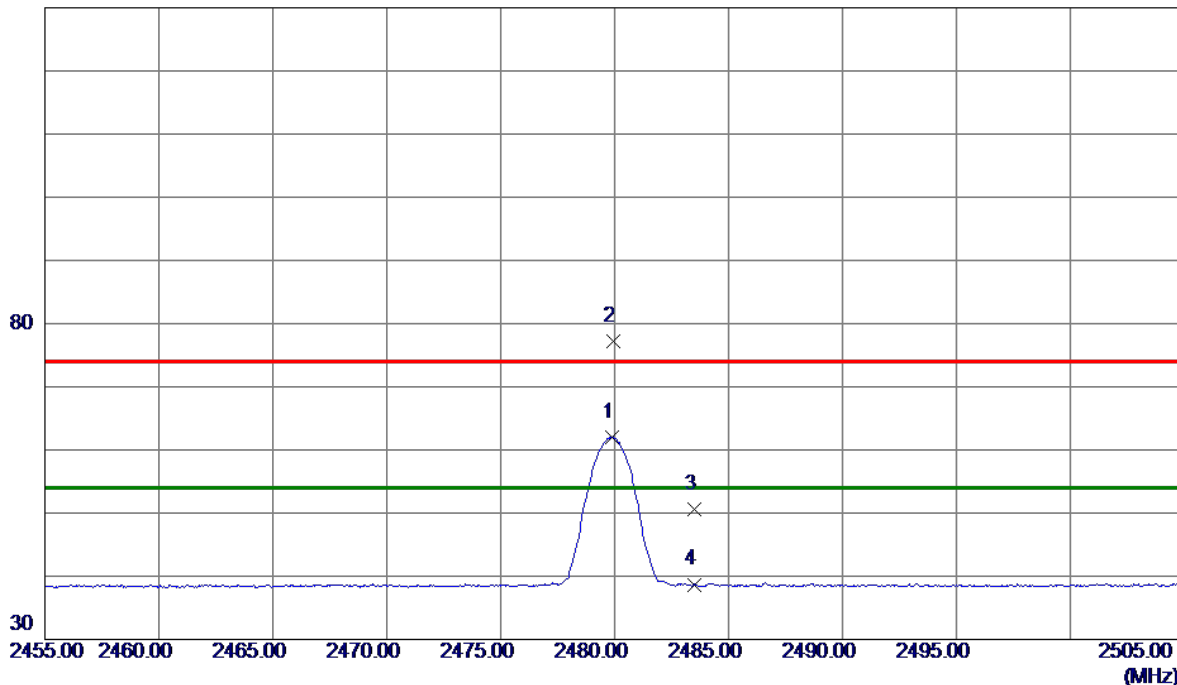
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode : TX 2480 MHz _CH39_1Mbps

Vertical

130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2479.8750	54.21	7.86	62.07	54.00	8.07	AVG	No Limit
2	2479.9250	69.38	7.86	77.24	74.00	3.24	Peak	No Limit
3	2483.5000	42.78	7.88	50.66	74.00	-23.34	Peak	
4	2483.5000	30.82	7.88	38.70	54.00	-15.30	AVG	

REMARKS:

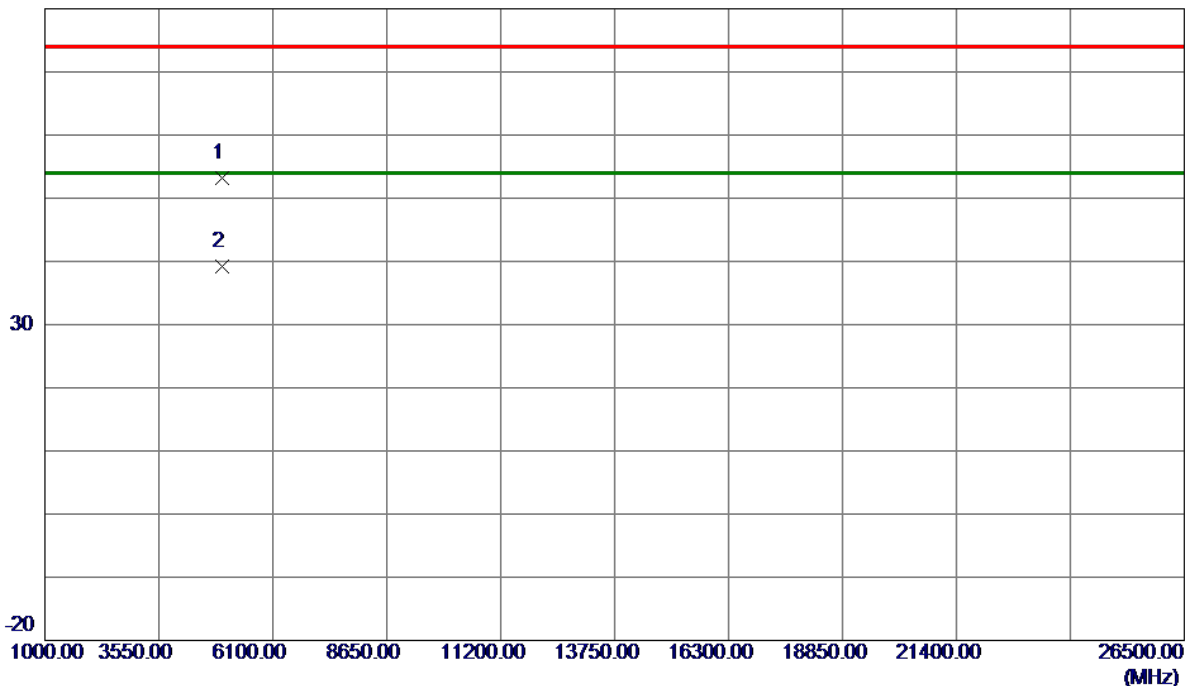
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2480 MHz _CH39_1Mbps
-------------	-------------------------

Vertical

80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4959.2500	48.52	4.76	53.28	74.00	-20.72	Peak	
2 *	4959.8010	34.36	4.76	39.12	54.00	-14.88	AVG	

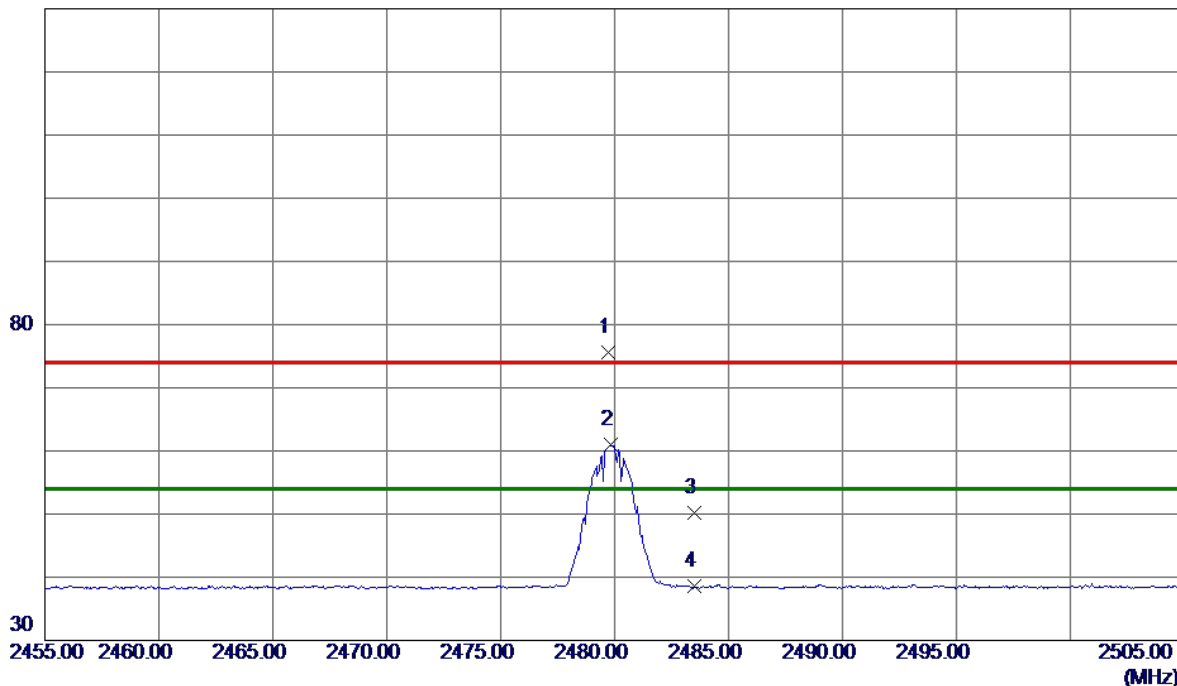
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode : TX 2480 MHz _CH39_1Mbps

Horizontal

130 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7250	67.78	7.86	75.64	74.00	1.64	Peak	No Limit
2 *	2479.8250	53.16	7.86	61.02	54.00	7.02	AVG	No Limit
3	2483.5000	42.34	7.88	50.22	74.00	-23.78	Peak	
4	2483.5000	30.63	7.88	38.51	54.00	-15.49	AVG	

REMARKS:

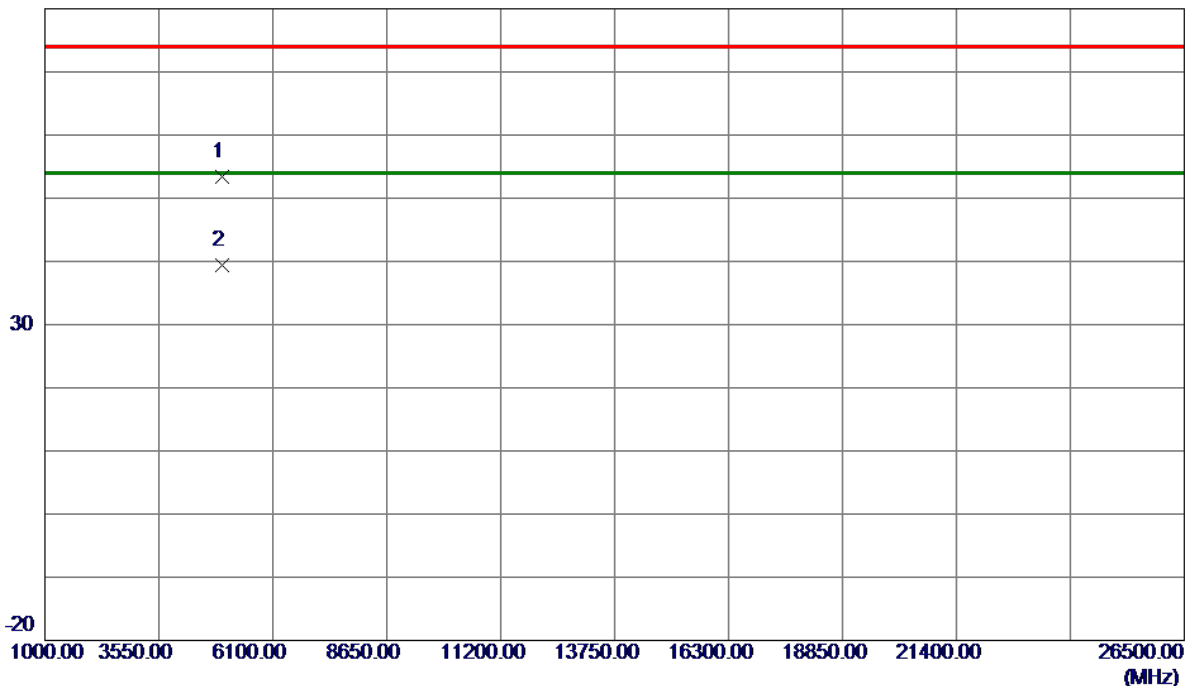
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode :	TX 2480 MHz _CH39_1Mbps
-------------	-------------------------

Horizontal

80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4959.1020	48.69	4.76	53.45	74.00	-20.55	Peak	
2 *	4959.7350	34.62	4.76	39.38	54.00	-14.62	AVG	

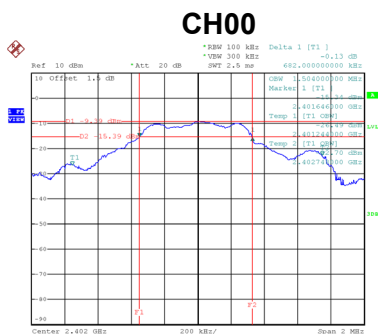
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

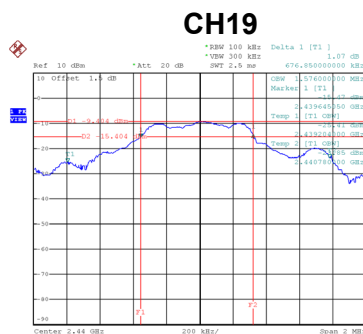
APPENDIX D - BANDWIDTH

Test Mode:	CH00, CH19 , CH39 - 1Mbps
------------	---------------------------

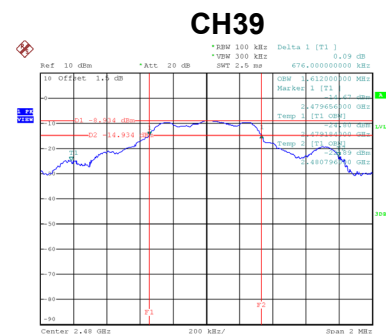
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	0.682	500	Pass
19	2440	0.677	500	Pass
39	2480	0.676	500	Pass



Date: 11.JUN.2019 09:49:16

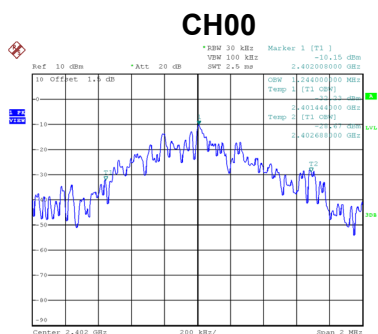


Date: 11.JUN.2019 09:53:01



Date: 11.JUN.2019 09:56:27

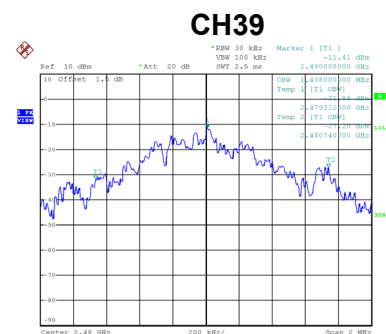
Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Test Result
00	2402	1.244	Pass
19	2440	1.392	Pass
39	2480	1.408	Pass



Date: 17.JUL.2019 19:09:19



Date: 17.JUL.2019 19:08:48



Date: 17.JUL.2019 19:08:07

APPENDIX E - MAXIMUM OUTPUT POWER & E.I.R.P.

Test Mode :	CH00, CH19 , CH39 - 1Mbps
-------------	---------------------------

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-9.21	0.0001	30.00	1.00	Pass
2440	-9.01	0.0001	30.00	1.00	Pass
2480	-8.54	0.0001	30.00	1.00	Pass

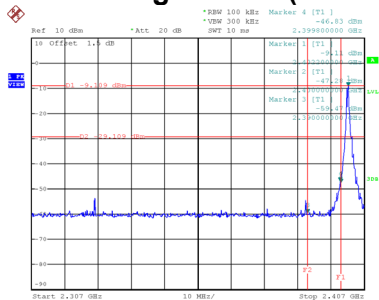
Test Mode :	CH00, CH19 , CH39 - 1Mbps
-------------	---------------------------

Frequency (MHz)	e.i.r.p. (dBm)	e.i.r.p. (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-9.29	0.0001	36.00	4.000	Pass
2440	-9.09	0.0001	36.00	4.000	Pass
2480	-8.62	0.0001	36.00	4.000	Pass

APPENDIX F - CONDUCTED SPURIOUS EMISSION

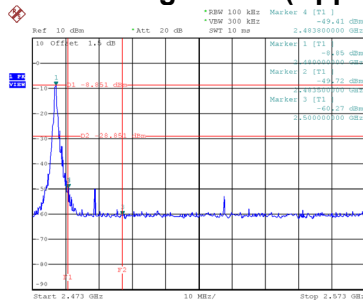
Test Mode : CH00, CH19 , CH39 - 1Mbps

Bandedge- CH00 (Lower)



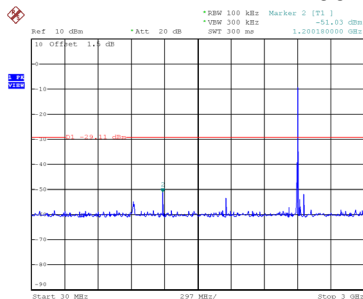
Date: 11.JUN.2019 09:49:44

Bandedge CH39 (Upper)

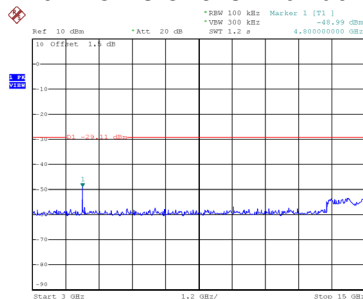


Date: 11.JUN.2019 09:56:55

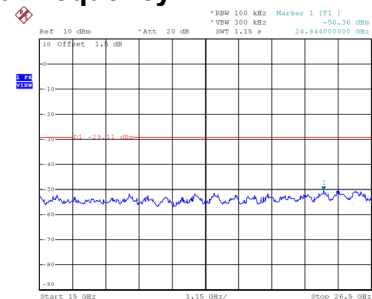
CH00 – 10th Harmonic of the fundamental frequency



Date: 11.JUN.2019 09:50:18

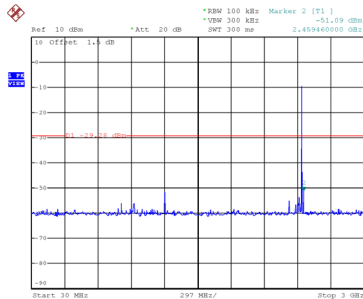


Date: 11.JUN.2019 09:50:45

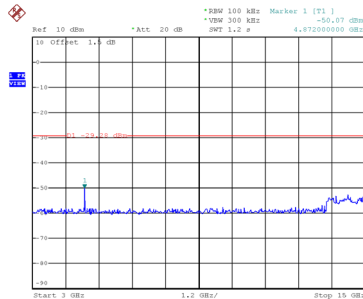


Date: 11.JUN.2019 09:51:12

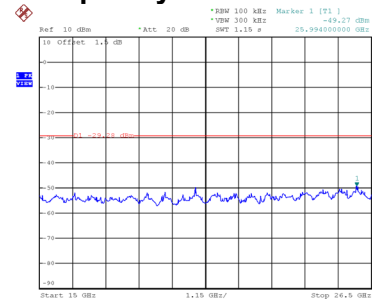
CH19 – 10th Harmonic of the fundamental frequency



Date: 11.JUN.2019 09:54:02

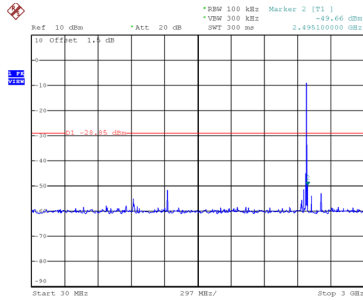


Date: 11.JUN.2019 09:54:29

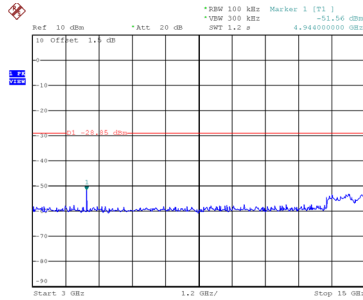


Date: 11.JUN.2019 09:54:56

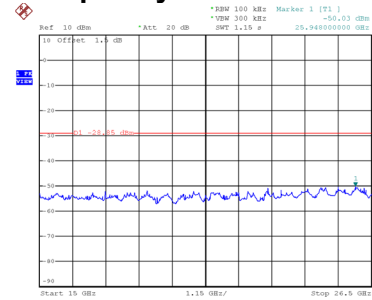
CH39 – 10th Harmonic of the fundamental frequency



Date: 11.JUN.2019 09:57:28



Date: 11.JUN.2019 09:57:56

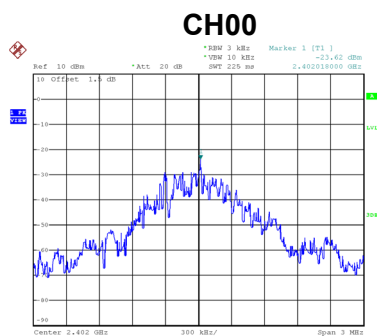


Date: 11.JUN.2019 09:58:23

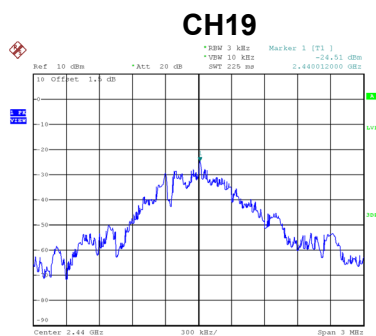
APPENDIX G - POWER SPECTRAL DENSITY

Test Mode:	CH00, CH19 , CH39 - 1Mbps
------------	---------------------------

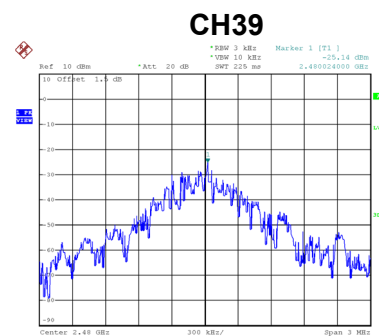
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-23.62	8.00	Pass
19	2440	-24.51	8.00	Pass
39	2480	-25.14	8.00	Pass



Date: 17.JUL.2019 19:00:30



Date: 17.JUL.2019 19:01:29



Date: 17.JUL.2019 19:02:15

End of Test Report