

FCC Radio Test Report

FCC ID: 2AMSUTB155

This report concerns: Original Grant

Project No. : 2002C032B
Equipment : Wireless Trackball Mouse
Brand Name : SANWA
Test Model : GMATB155
Series Model : N/A
Applicant : Sanwa Supply Inc.
Address : 1-10-1,Tamachi,Kita-ku,Okayama-shi,Okayama,700-0825,Japan
Manufacturer : iOne Electronic Technology co., LTD. Taiwan Branch
Address : Rm. 2, 8F., No. 75, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei city, Taiwan
Factory : Dong Guan Ione Electronic Co.,Ltd.
Address : Yong Jun 2rd Rd, Jin Qian Ling Ind. District, Jitigang, Huang Jiang Town, Dong Guan, Guang Dong Province, China (Post Code:523715)
Date of Receipt : Mar. 24, 2020
Date of Test : Mar. 25, 2020 ~ Mar. 28, 2020
Issued Date : Apr. 13, 2020
Report Version : R00
Test Sample : Engineering Sample No.: DG2020022044
Standard(s) : FCC Part15, Subpart C (15.247)
ANSI C63.10-2013
FCC 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.

Nick Chen

Prepared by : Nick Chen

Ethan Ma

Approved by : Ethan Ma



Certificate #5123.02

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

Tel: +86-769-8318-3000

Web: www.newbtl.com

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 . SUMMARY OF TEST RESULTS	6
1.1 TEST FACILITY	7
1.2 MEASUREMENT UNCERTAINTY	7
1.3 TEST ENVIRONMENT CONDITIONS	7
2 . GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 DESCRIPTION OF TEST MODES	10
2.3 PARAMETERS OF TEST SOFTWARE	10
2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.5 SUPPORT UNITS	11
3 . RADIATED EMISSION TEST	12
3.1 LIMIT	12
3.2 TEST PROCEDURE	13
3.3 DEVIATION FROM TEST STANDARD	13
3.4 TEST SETUP	14
3.5 EUT OPERATING CONDITIONS	15
3.6 TEST RESULT - 9 KHZ TO 30 MHZ	15
3.7 TEST RESULT - 30 MHZ TO 1000 MHZ	15
3.8 TEST RESULT - ABOVE 1000 MHZ	15
4 . BANDWIDTH TEST	16
4.1 LIMIT	16
4.2 TEST PROCEDURE	16
4.3 DEVIATION FROM STANDARD	16
4.4 TEST SETUP	16
4.5 EUT OPERATION CONDITIONS	16
4.6 TEST RESULTS	16
5 . MAXIMUM OUTPUT POWER	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

Table of Contents	Page
5.6 TEST RESULTS	17
6 . CONDUCTED SPURIOUS EMISSION	18
6.1 LIMIT	18
6.2 TEST PROCEDURE	18
6.3 DEVIATION FROM STANDARD	18
6.4 TEST SETUP	18
6.5 EUT OPERATION CONDITIONS	18
6.6 TEST RESULTS	18
7 . POWER SPECTRAL DENSITY TEST	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 TEST RESULTS	19
8 . MEASUREMENT INSTRUMENTS LIST	20
9 . EUT TEST PHOTO	21
APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ	24
APPENDIX B - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	29
APPENDIX C - RADIATED EMISSION - ABOVE 1000 MHZ	32
APPENDIX D - BANDWIDTH	57
APPENDIX E - MAXIMUM OUTPUT POWER	59
APPENDIX F - CONDUCTED SPURIOUS EMISSION	61
APPENDIX G - POWER SPECTRAL DENSITY	64

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Apr. 13, 2020

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247)				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions	-----	N/A	-----
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX A APPENDIX B APPENDIX C	PASS	-----
15.247(a)(2)	Bandwidth	APPENDIX D	PASS	-----
15.247(b)(3)	Maximum Output Power	APPENDIX E	PASS	-----
15.247(d)	Conducted Spurious Emission	APPENDIX F	PASS	-----
15.247(e)	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.

1.1 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

1.2 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	9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18GHz ~ 26.5GHz	-	3.62
		26.5GHz ~ 40GHz	-	4.00

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

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Radiated Emissions-9K-30MHz	25°C	60%	DC 1.5V	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	24°C	68%	DC 1.5V	Kwok Guo
Radiated Emissions-Above 1000 MHz	24°C	68%	DC 1.5V	Kwok Guo
Bandwidth	25°C	60%	DC 1.5V	Hayden Chen
Maximum Output Power	25°C	60%	DC 1.5V	Damon Deng
Conducted Spurious Emission	25°C	60%	DC 1.5V	Hayden Chen
Power Spectral Density	25°C	60%	DC 1.5V	Hayden Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Trackball Mouse
Brand Name	SANWA
Test Model	GMATB155
Series Model	N/A
Model Difference(s)	N/A
Software Version	TLSR8251F512ET32 lone_W12_Mouse_SDK2.4.5_V15.bin
Hardware Version	C1T139A30_V1.2
Power Source	Battery supplied.
Power Rating	DC 1.5V
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter	1Mbps, 2Mbps
Max. Output Power	-9.01 dBm (0.000126 W) For 1Mbps -5.14 dBm (0.000306 W) For 2Mbps


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		LYNX-W11BT	Internal	N/A	0.71

2.2 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 _2Mbps

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

AC power line conducted emissions test	
Final Test Mode	Description
Mode 2	TX Mode Channel 39 _2Mbps

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode Channel 39 _2Mbps

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.

2.3 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	EMI_Test_Tool_V1.5		
Frequency (MHz)	2402	2440	2480
Parameters(1Mbps)	-13.2	-13.2	-11.4
Parameters(2Mbps)	-9.8	-9.8	-7.6

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED**2.5 SUPPORT UNITS**

Item	Equipment	Brand	Model No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
-	-	-	-	-

3. RADIATED EMISSION TEST

3.1 LIMIT

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

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

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.
- (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

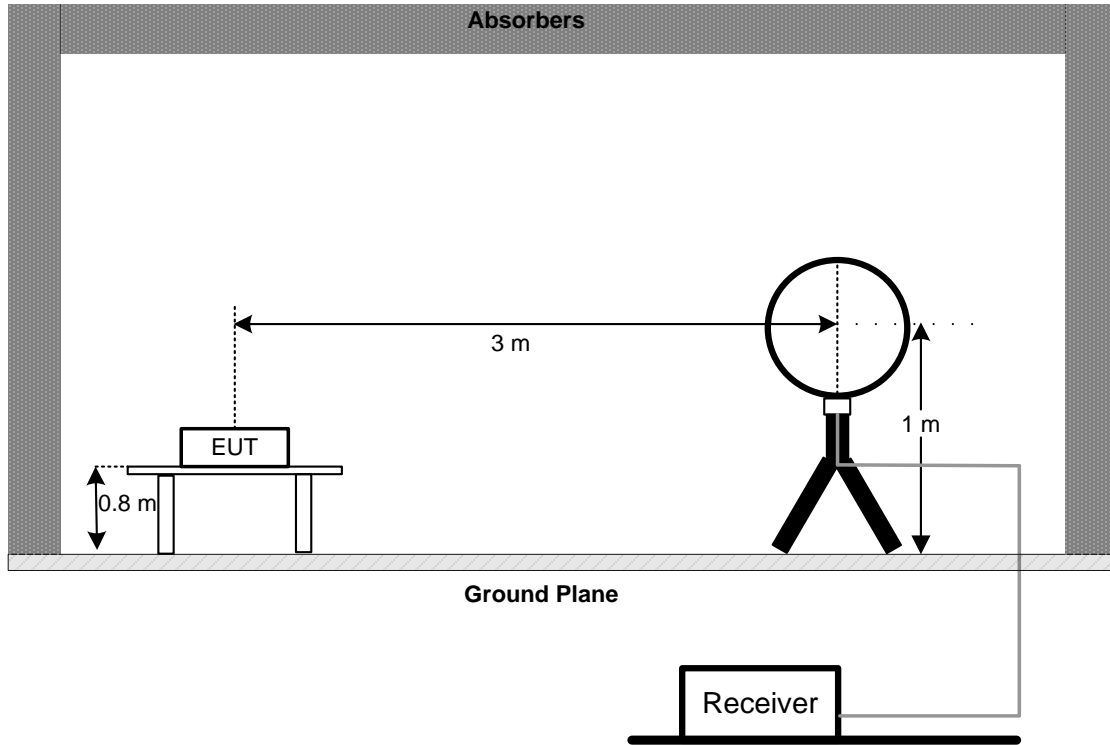
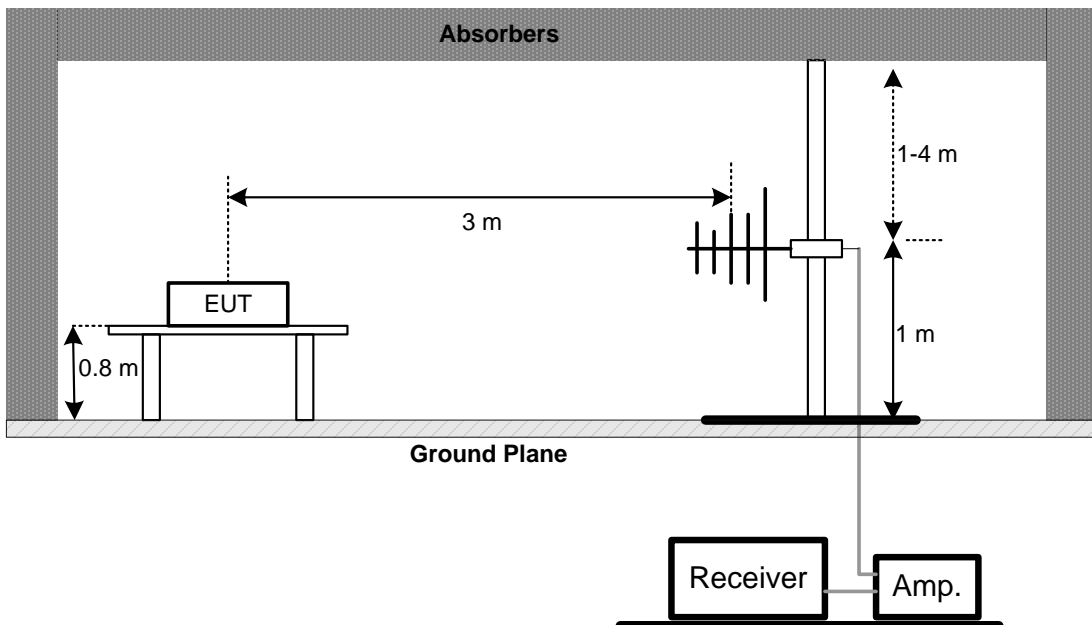
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000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

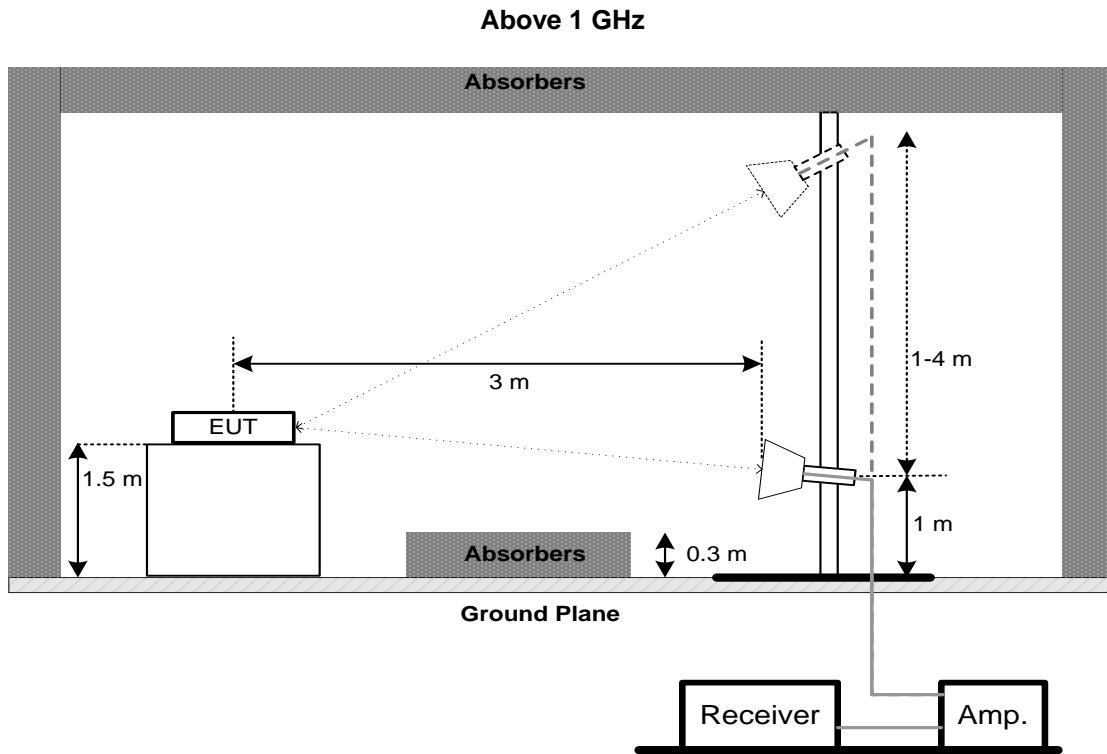
3.2 TEST PROCEDURE

- a. 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)
- b. 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)
- c. 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.
- d. 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).
- e. 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.
- f. 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.
- g. 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)
- h. 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)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

No deviation

3.4 TEST SETUP**9 kHz-30 MHz****30 MHz to 1 GHz**



3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 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.

3.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX B.

3.8 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.

4. BANDWIDTH TEST

4.1 LIMIT

FCC Part15, Subpart C (15.247)		
Section	Test Item	Limit
15.247(a)(2)	Bandwidth	≥ 500 kHz (6 dB bandwidth)

4.2 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 = 2.5 ms.

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

Please refer to the APPENDIX D.

5. MAXIMUM OUTPUT POWER

5.1 LIMIT

FCC Part15, Subpart C (15.247)		
Section	Test Item	Limit
15.247(b)(3)	Maximum Output Power	1 watt or 30 dBm

5.2 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.

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 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. CONDUCTED SPURIOUS EMISSION

6.1 LIMIT

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.

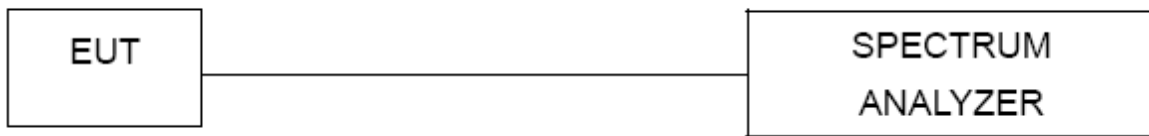
6.2 TEST PROCEDURE

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

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 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. POWER SPECTRAL DENSITY TEST

7.1 LIMIT

FCC Part15, Subpart C (15.247)		
Section	Test Item	Limit
15.247(e)	Power Spectral Density	8 dBm (in any 3 kHz)

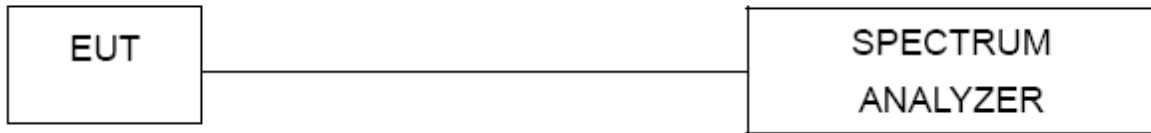
7.2 TEST PROCEDURE

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

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 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. MEASUREMENT INSTRUMENTS LIST

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1*	Antenna	EM	EM-6876-1	230	Jan. 15, 2022
2	Cable	N/A	RG 213/U (3kHz~1Gz)	N/A	May 31, 2020
3	EMI Test Receiver	R&S	ESCI	100895	Feb. 28, 2021
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, 2021
2*	Amplifier	HP	8447D	2944A08742	Mar. 01, 2021
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May. 25, 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. 19, 2021
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020
3	Amplifier	Agilent	8449B	3008A02333	Aug. 03, 2020
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 07, 2021
5	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Nov. 25, 2020
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

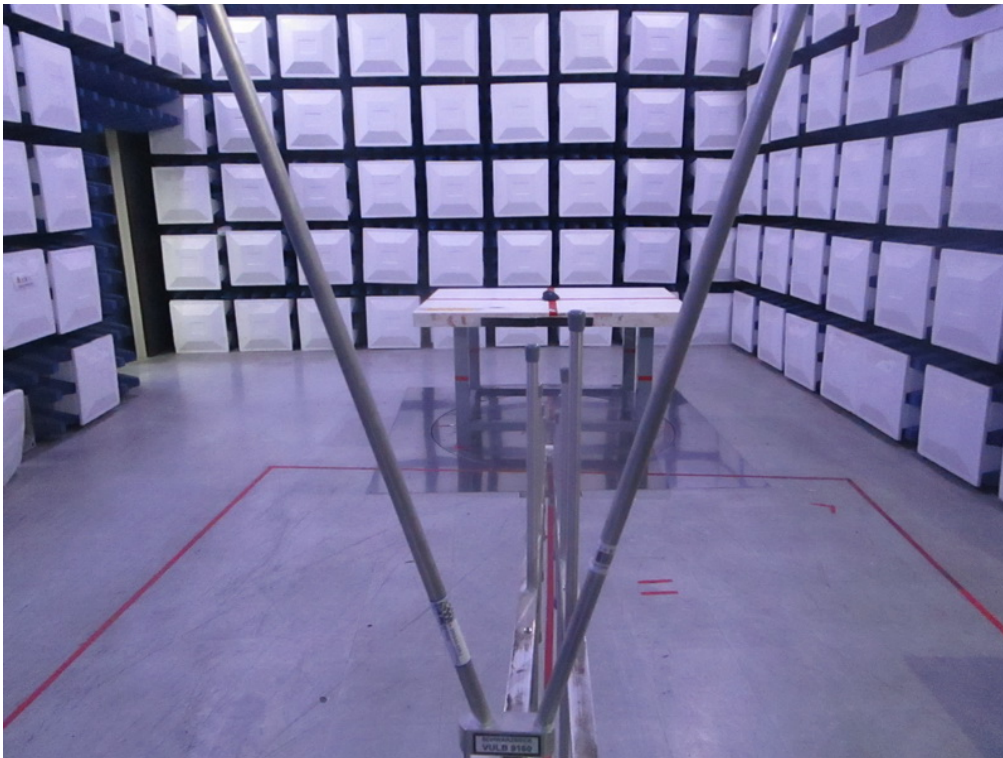
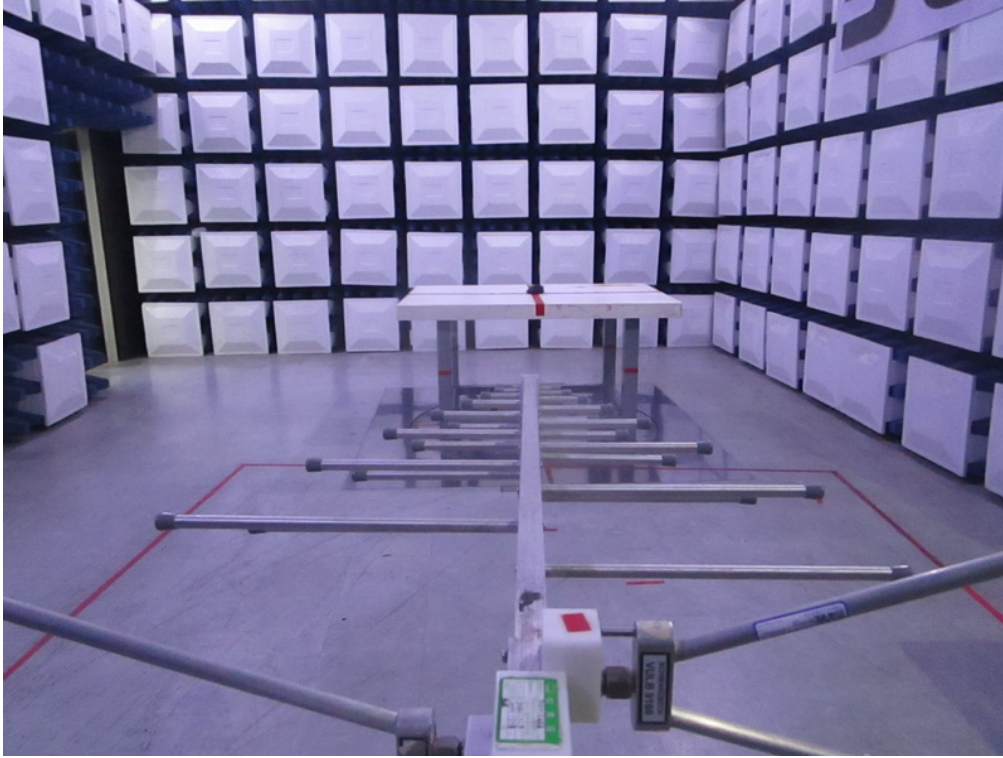
Bandwidth & Maximum Output Power & Conducted Spurious Emission & Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

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

*** calibration period of equipment list is three year.

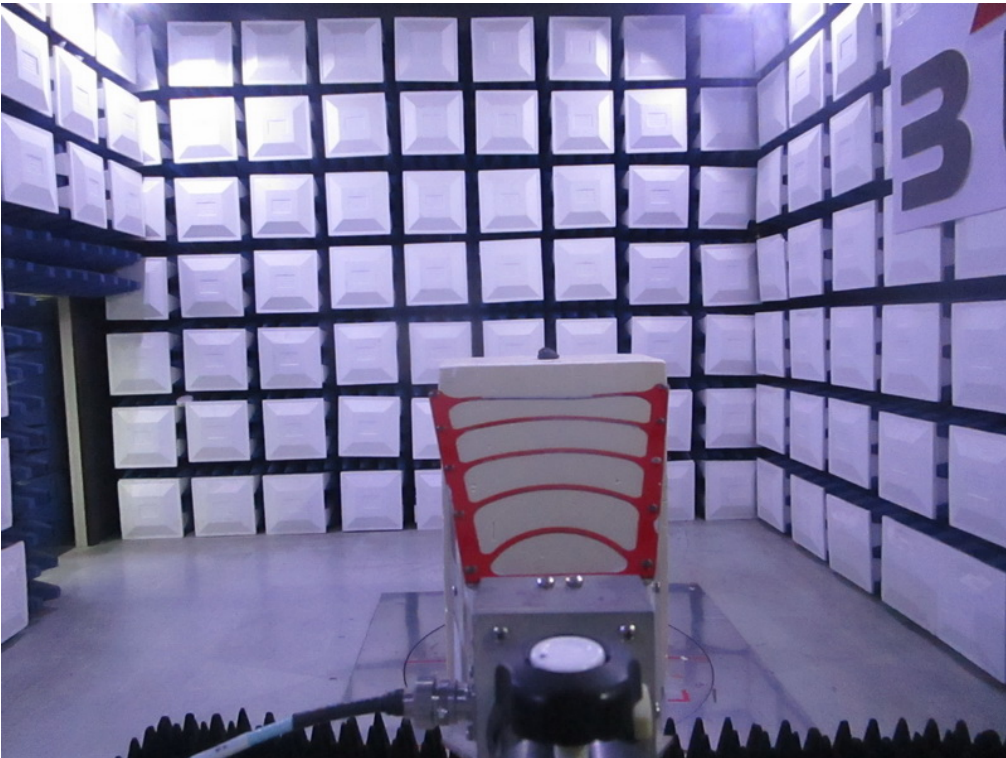
Except * item, all calibration period of equipment list is one year.

9. EUT TEST PHOTO**Radiated Emissions Test Photos****9 kHz to 30 MHz**

Radiated Emissions Test Photos**30 MHz to 1000 MHz**

Radiated Emissions Test Photos

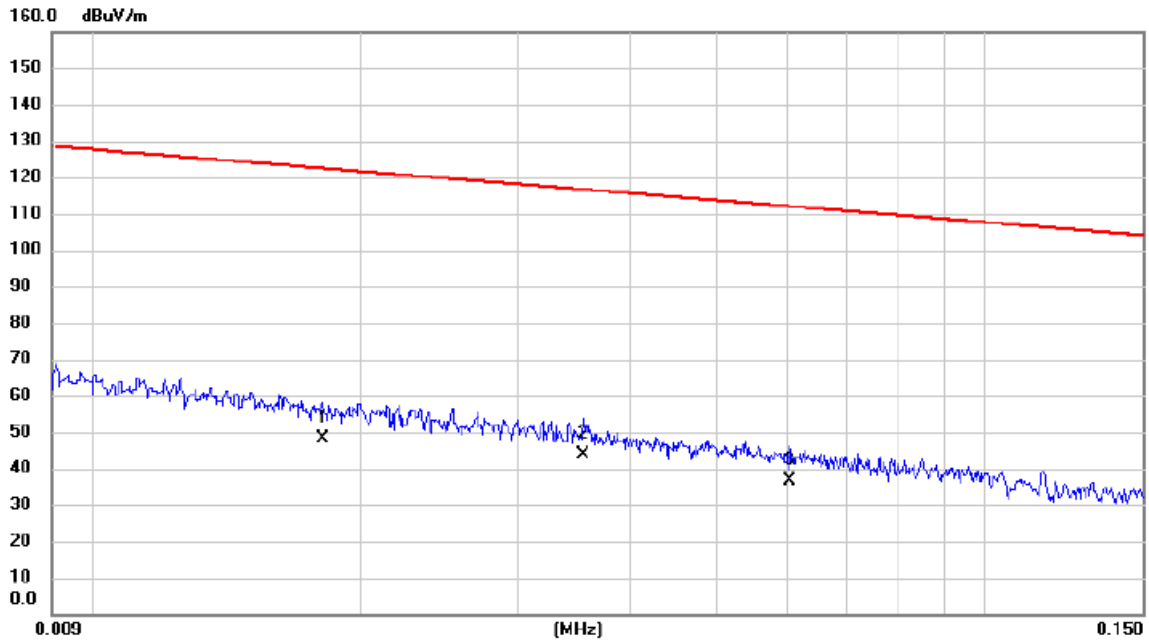
Above 1 GHz



APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Test Mode: TX Mode Channel 39 _2Mbps

Ant 0°



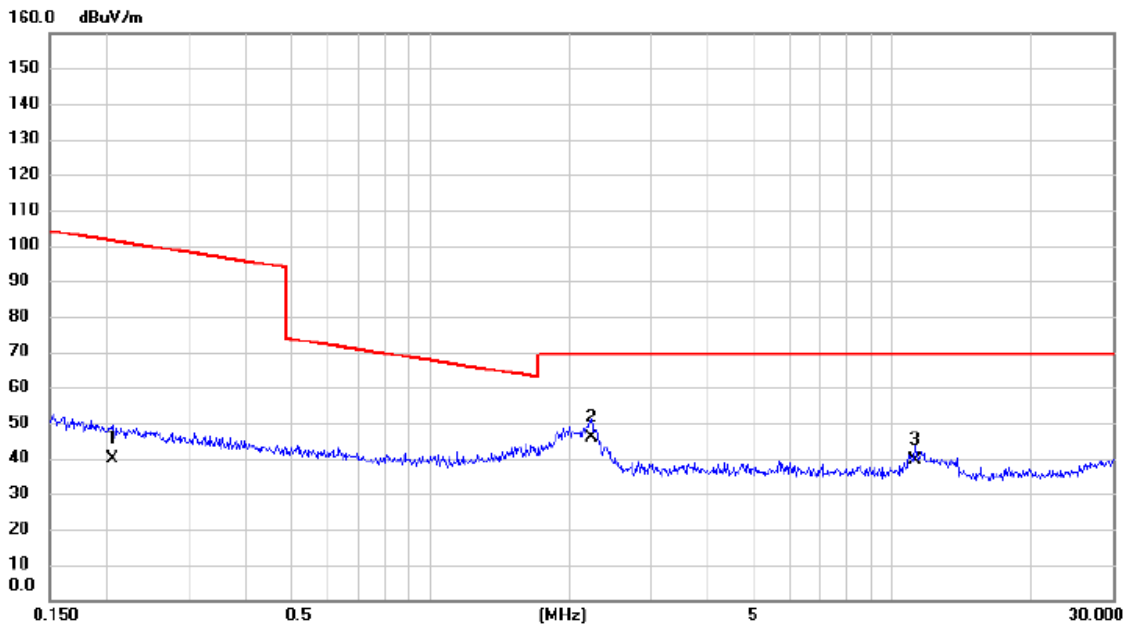
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0181	33.80	14.39	48.19	122.45	-74.26	AVG	
2	*	0.0355	30.10	13.88	43.98	116.60	-72.62	AVG	
3		0.0605	22.90	13.76	36.66	111.97	-75.31	AVG	

REMARKS:

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

Test Mode: TX Mode Channel 39 _2Mbps

Ant 0°



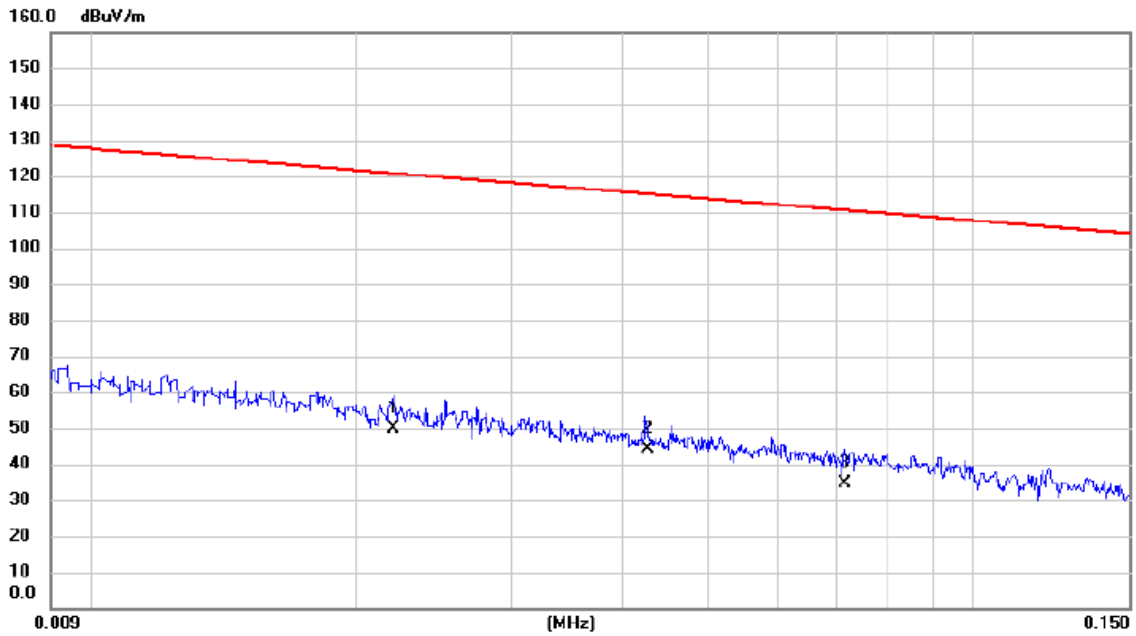
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2050	26.10	13.61	39.71	101.37	-61.66	AVG	
2	*	2.2367	34.30	11.68	45.98	69.54	-23.56	QP	
3		11.1977	27.80	11.62	39.42	69.54	-30.12	QP	

REMARKS:

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

Test Mode: TX Mode Channel 39 _2Mbps

Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0220	36.10	13.83	49.93	120.76	-70.83	AVG	
2	*	0.0427	30.30	13.91	44.21	115.00	-70.79	AVG	
3		0.0716	20.90	13.58	34.48	110.51	-76.03	AVG	

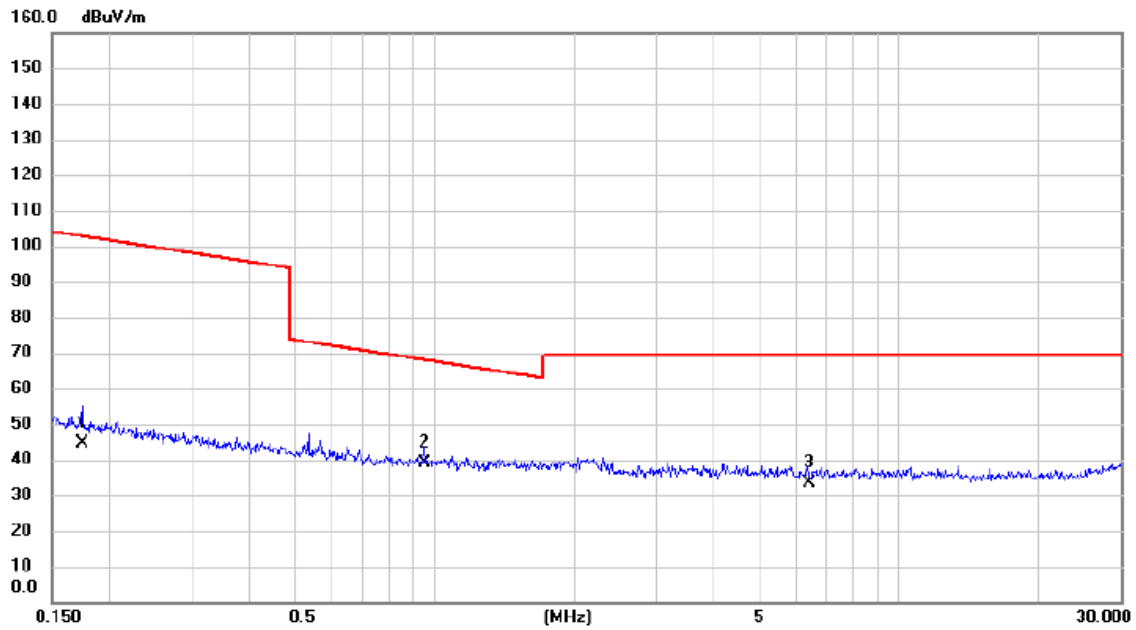
REMARKS:

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

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

Test Mode: TX Mode Channel 39 _2Mbps

Ant 90°



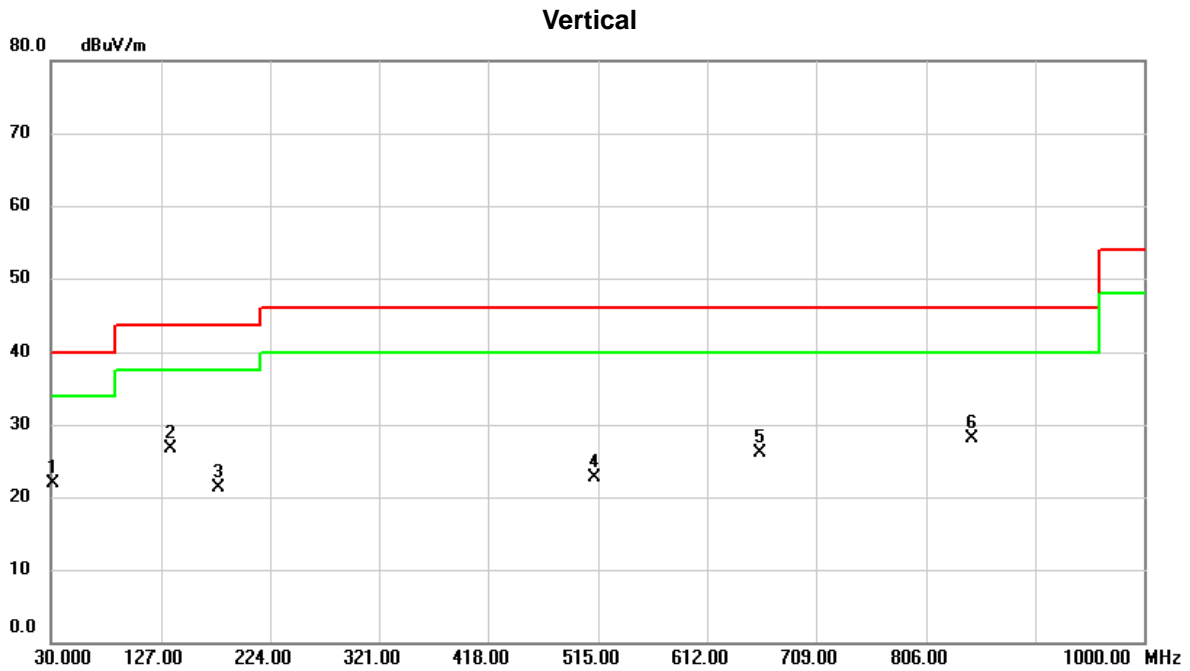
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.1740	31.20	13.58	44.78	102.80	-58.02	AVG	
2	*	0.9531	26.30	12.52	38.82	68.02	-29.20	QP	
3		6.3860	22.50	11.07	33.57	69.54	-35.97	QP	

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 39 _2Mbps



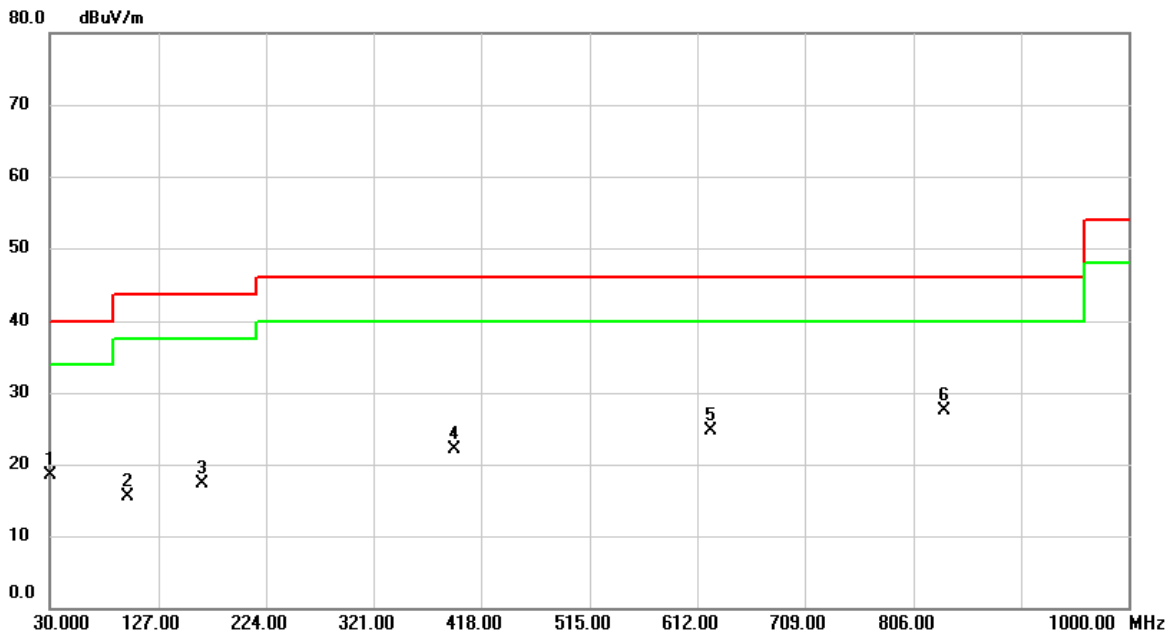
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		31.940	36.45	-14.54	21.91	40.00	-18.09	peak	
2	*	135.730	39.74	-13.04	26.70	43.50	-16.80	peak	
3		177.440	34.33	-13.09	21.24	43.50	-22.26	peak	
4		511.120	30.67	-7.94	22.73	46.00	-23.27	peak	
5		659.530	31.17	-4.99	26.18	46.00	-19.82	peak	
6		846.740	30.77	-2.75	28.02	46.00	-17.98	peak	

REMARKS:

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

Test Mode: TX Mode Channel 39 _2Mbps

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		30.000	33.34	-14.75	18.59	40.00	-21.41	peak	
2		100.810	30.63	-15.22	15.41	43.50	-28.09	peak	
3		165.800	29.22	-11.95	17.27	43.50	-26.23	peak	
4		393.750	32.01	-9.86	22.15	46.00	-23.85	peak	
5		624.610	30.30	-5.66	24.64	46.00	-21.36	peak	
6	*	834.130	30.52	-2.94	27.58	46.00	-18.42	peak	

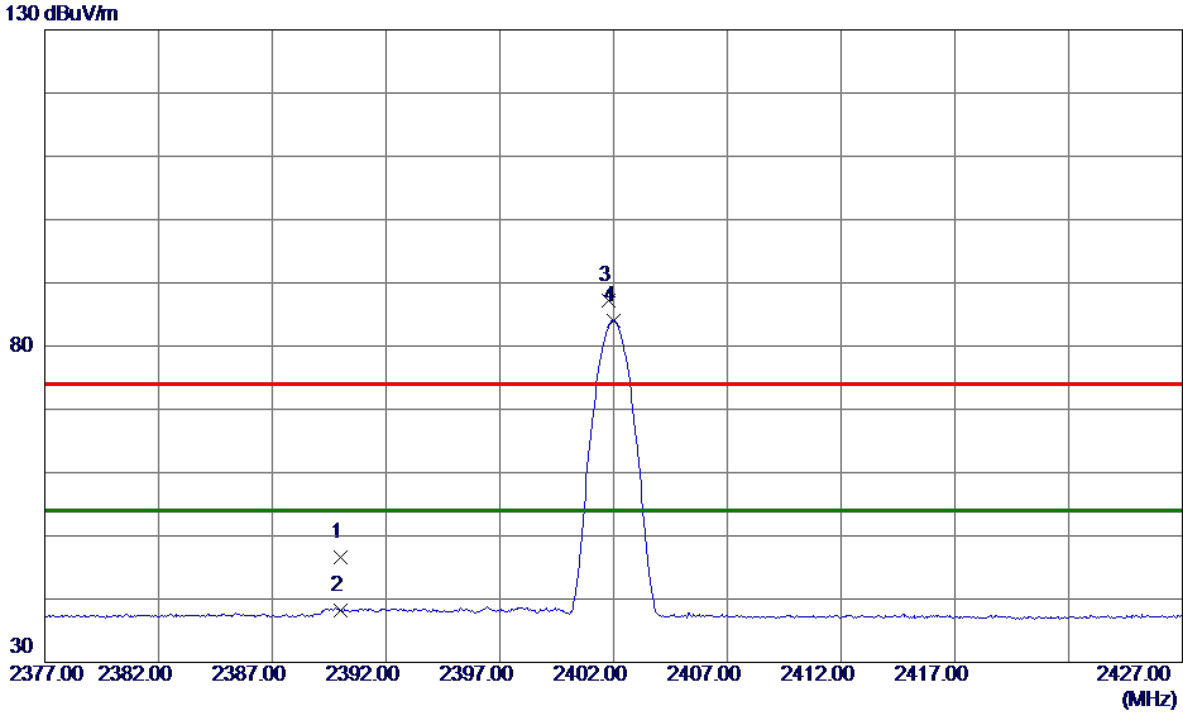
REMARKS:

- (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



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	39.75	6.89	46.64	74.00	-27.36	Peak	
2	2390.0000	31.24	6.89	38.13	54.00	-15.87	AVG	
3	2401.8000	80.25	6.88	87.13	74.00	13.13	Peak	No Limit
4 *	2402.0000	77.17	6.88	84.05	54.00	30.05	AVG	No Limit

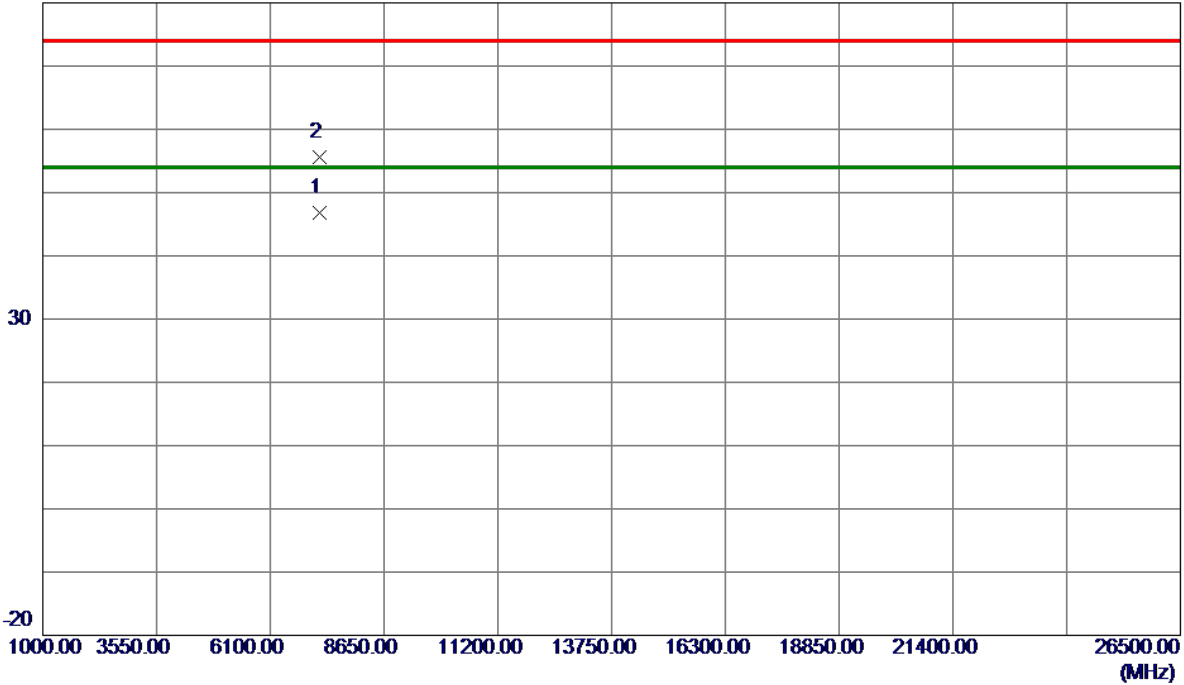
REMARKS:

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

Test Mode : TX 2402 MHz _CH00_1Mbps

Vertical

80 dBuV/m



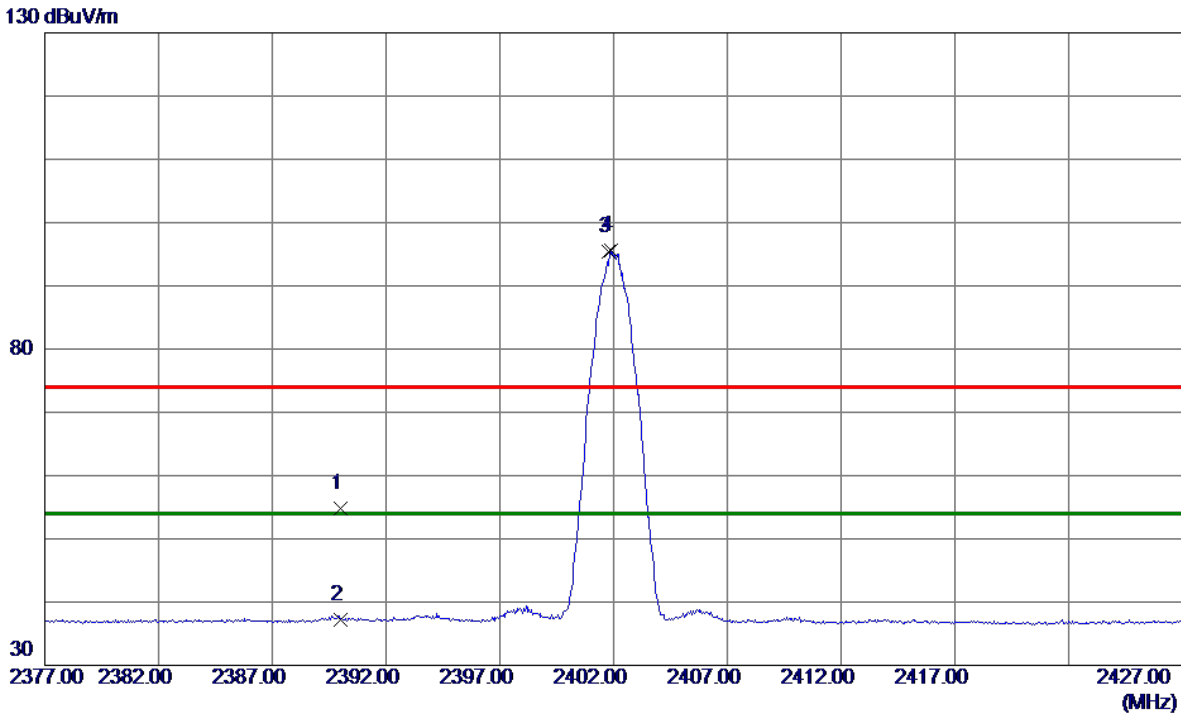
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.4750	37.70	9.16	46.86	54.00	-7.14	AVG	
2	7206.6900	46.43	9.16	55.59	74.00	-18.41	Peak	

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	47.90	6.89	54.79	74.00	-19.21	Peak	
2	2390.0000	30.31	6.89	37.20	54.00	-16.80	AVG	
3	2401.8000	88.56	6.88	95.44	74.00	21.44	Peak	No Limit
4 *	2401.9000	88.69	6.88	95.57	54.00	41.57	AVG	No Limit

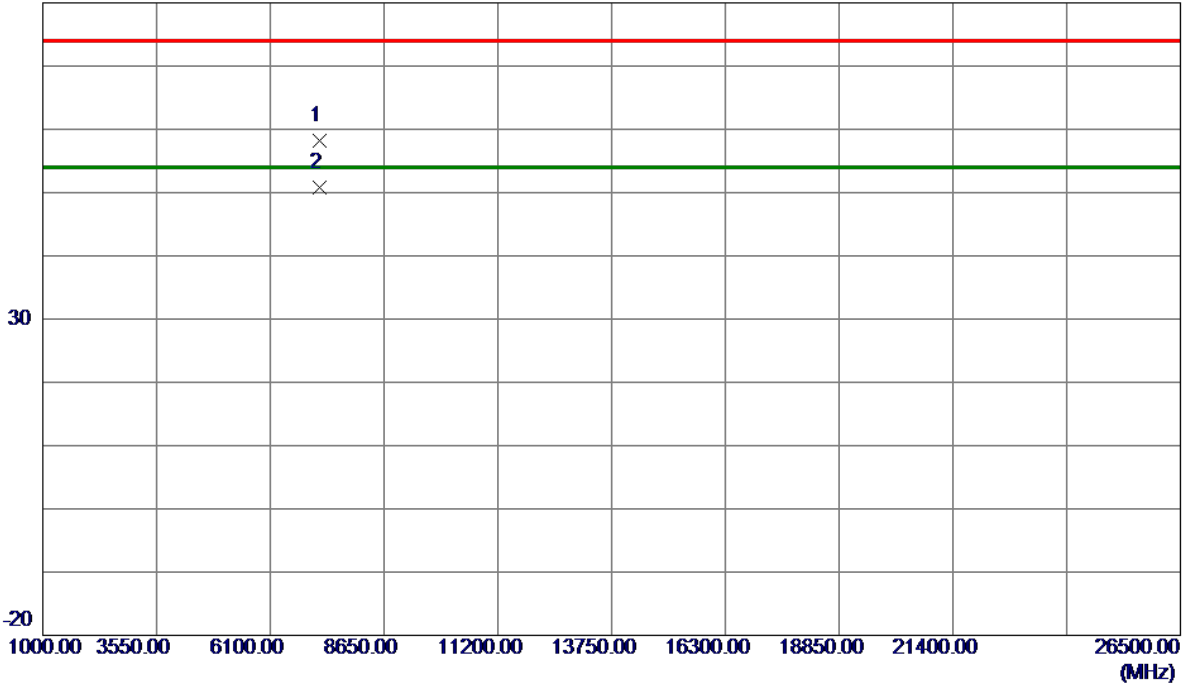
REMARKS:

- (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



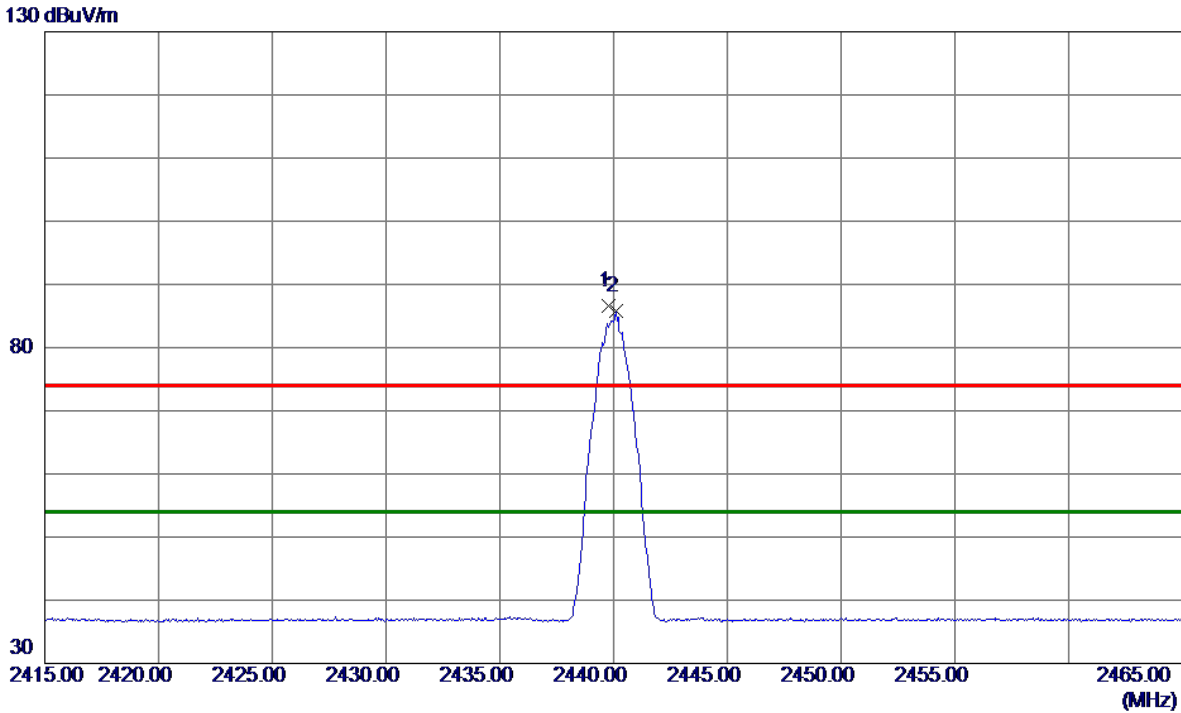
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7205.2300	48.98	9.16	58.14	74.00	-15.86	Peak	
2 *	7205.3750	41.68	9.16	50.84	54.00	-3.16	AVG	

REMARKS:

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

Test Mode : TX 2440 MHz _CH19_1Mbps

Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.8000	79.82	6.84	86.66	74.00	12.66	Peak	No Limit
2 *	2440.1000	78.91	6.84	85.75	54.00	31.75	AVG	No Limit

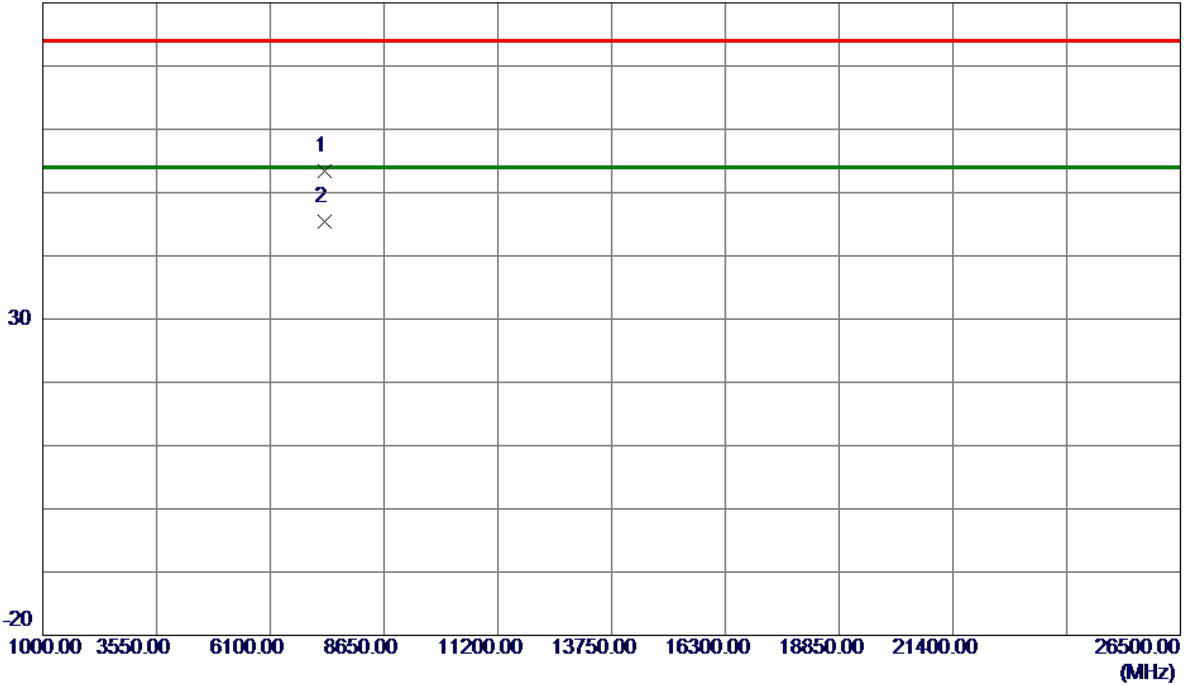
REMARKS:

- (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



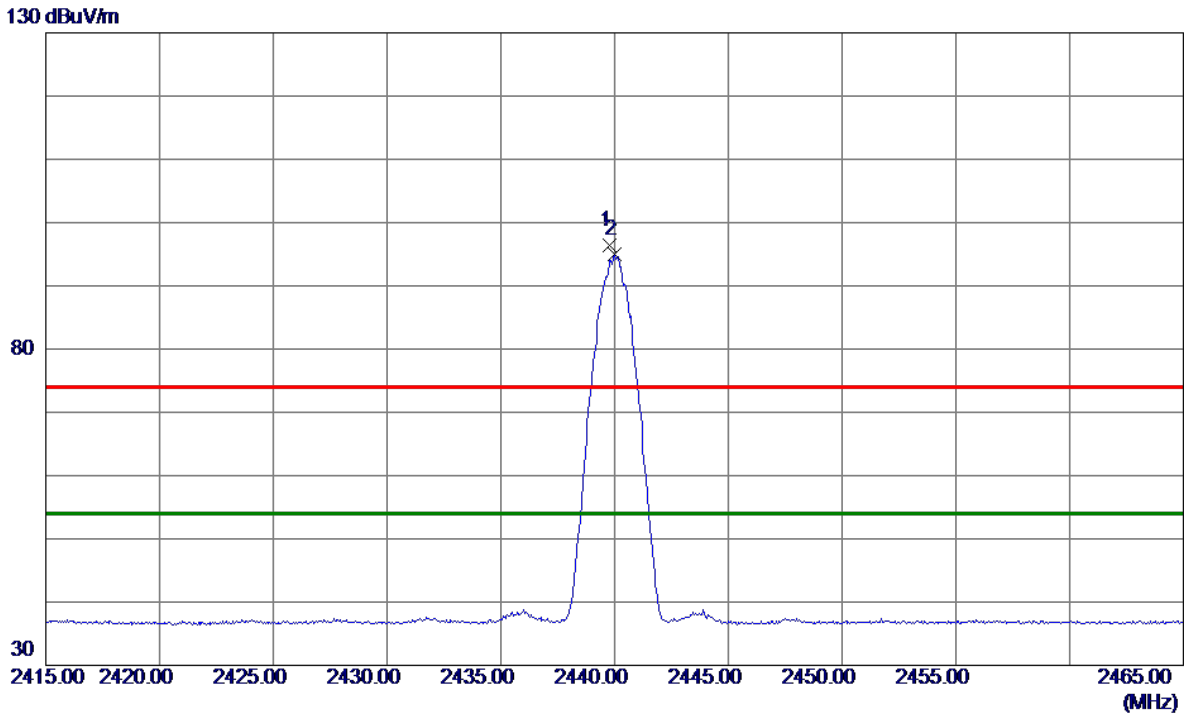
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7319.3400	44.10	9.32	53.42	74.00	-20.58	Peak	
2 *	7319.4900	36.15	9.32	45.47	54.00	-8.53	AVG	

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	2439.8000	89.62	6.84	96.46	74.00	22.46	Peak	No Limit
2 *	2440.0000	88.24	6.84	95.08	54.00	41.08	AVG	No Limit

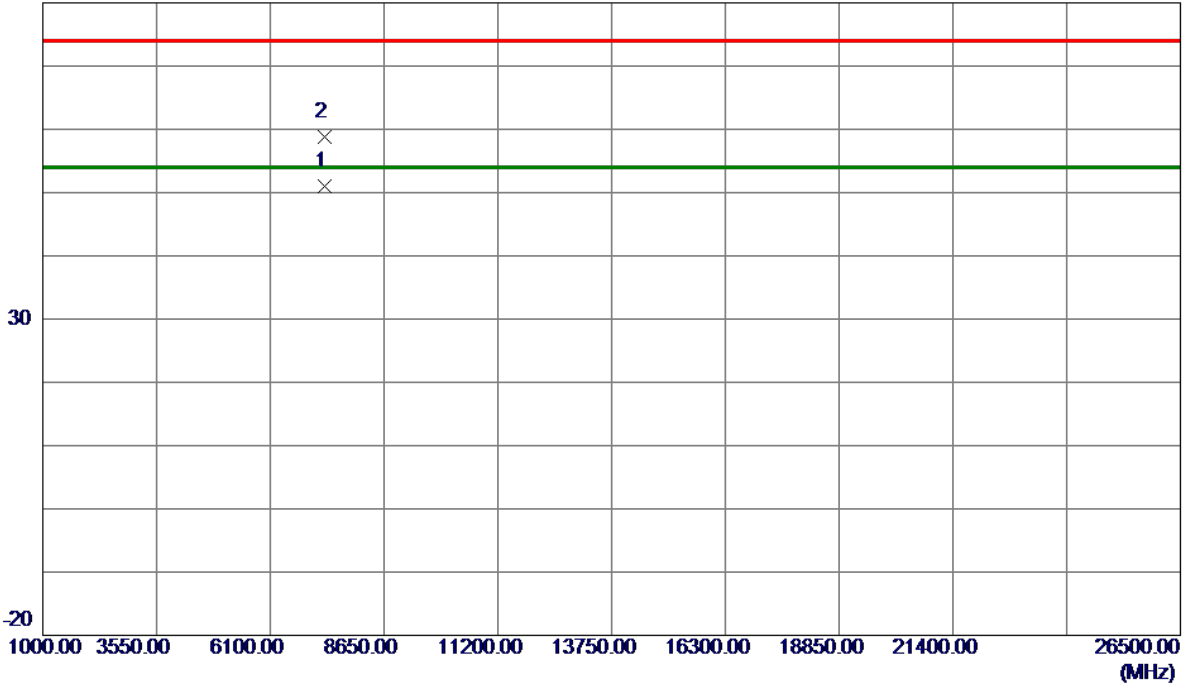
REMARKS:

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

Test Mode : TX 2440 MHz _CH19_1Mbps

Horizontal

80 dBuV/m



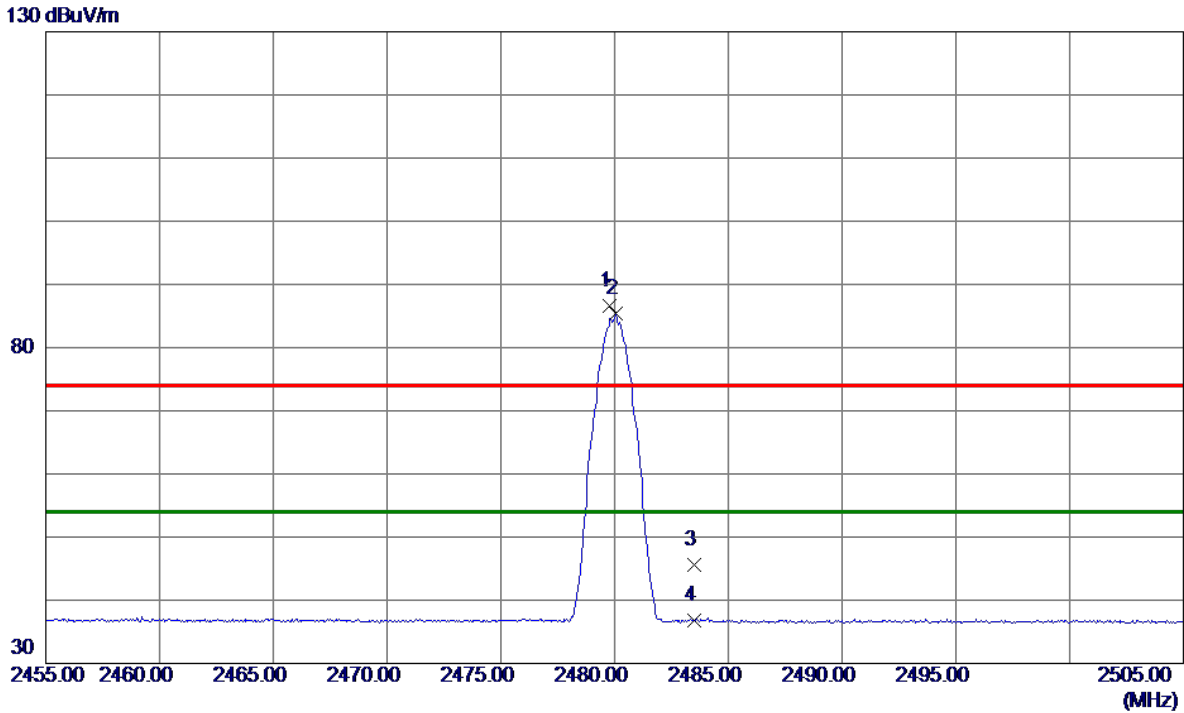
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7319.4500	41.70	9.32	51.02	54.00	-2.98	AVG	
2	7320.7200	49.43	9.33	58.76	74.00	-15.24	Peak	

REMARKS:

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

Test Mode : TX 2480 MHz _CH39_1Mbps

Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.8000	79.72	6.80	86.52	74.00	12.52	Peak	No Limit
2 *	2480.0500	78.60	6.80	85.40	54.00	31.40	AVG	No Limit
3	2483.5000	38.83	6.79	45.62	74.00	-28.38	Peak	
4	2483.5000	30.08	6.79	36.87	54.00	-17.13	AVG	

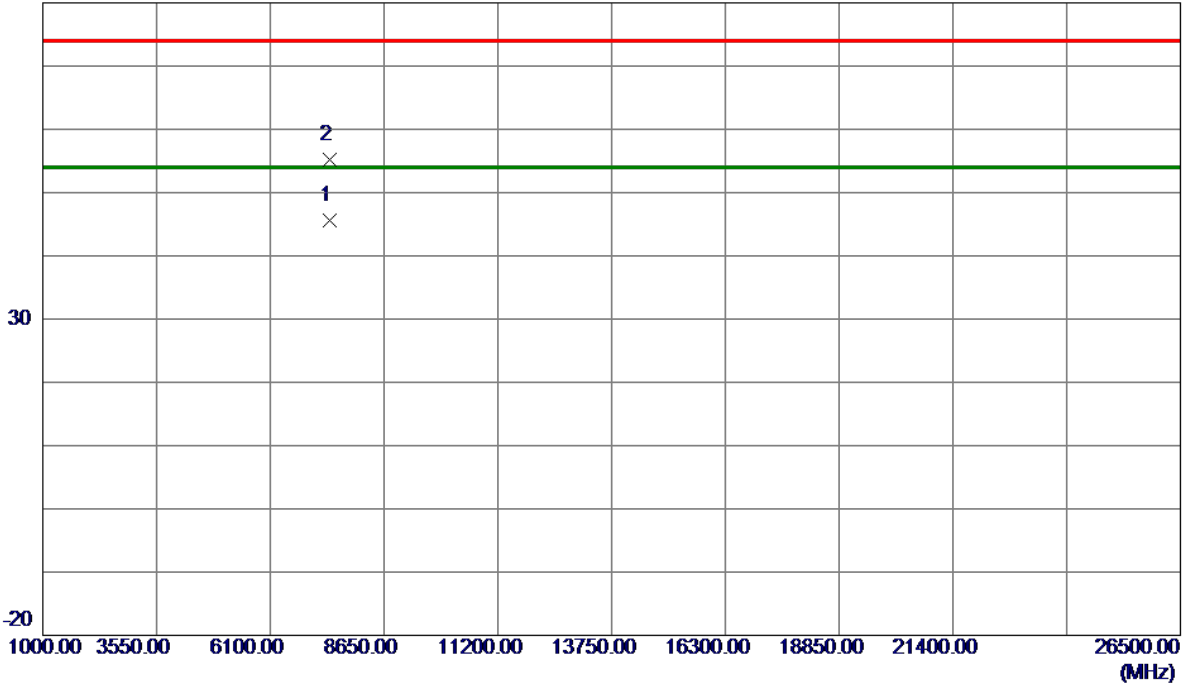
REMARKS:

- (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



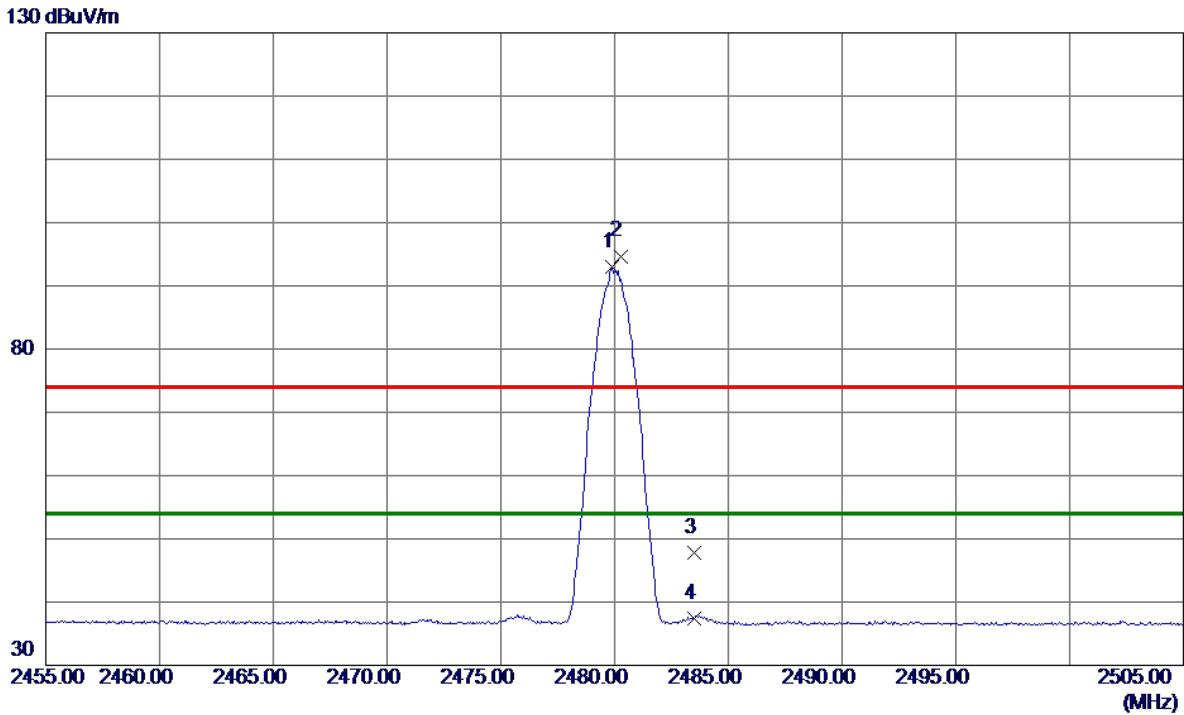
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7439.4250	36.12	9.49	45.61	54.00	-8.39	AVG	
2	7440.8350	45.69	9.50	55.19	74.00	-18.81	Peak	

REMARKS:

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

Test Mode : TX 2480 MHz _CH39_1Mbps

Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2479.9000	86.10	6.80	92.90	54.00	38.90	AVG	No Limit
2	2480.2500	87.90	6.80	94.70	74.00	20.70	Peak	No Limit
3	2483.5000	41.00	6.79	47.79	74.00	-26.21	Peak	
4	2483.5000	30.68	6.79	37.47	54.00	-16.53	AVG	

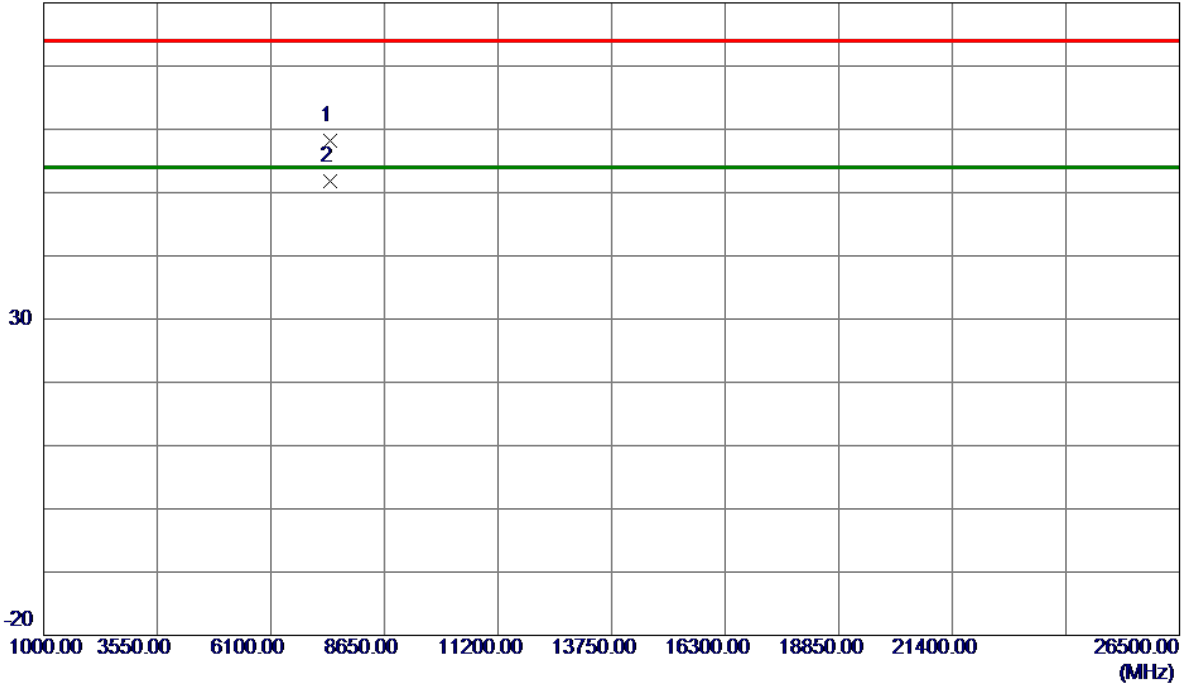
REMARKS:

- (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	7439.1850	48.77	9.49	58.26	74.00	-15.74	Peak	
2 *	7439.3950	42.32	9.49	51.81	54.00	-2.19	AVG	

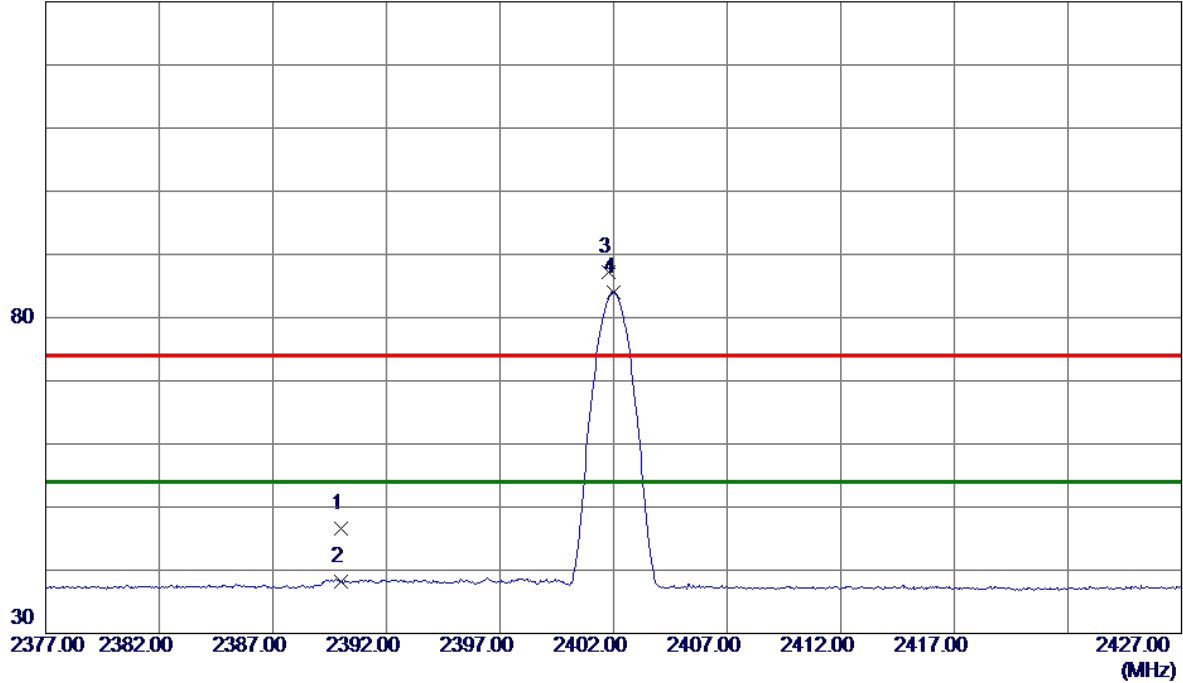
REMARKS:

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

Test Mode : TX 2402 MHz _CH00_2Mbps

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	39.75	6.89	46.64	74.00	-27.36	Peak	
2	2390.0000	31.24	6.89	38.13	54.00	-15.87	AVG	
3	2401.8000	80.25	6.88	87.13	74.00	13.13	Peak	No Limit
4 *	2402.0000	77.17	6.88	84.05	54.00	30.05	AVG	No Limit

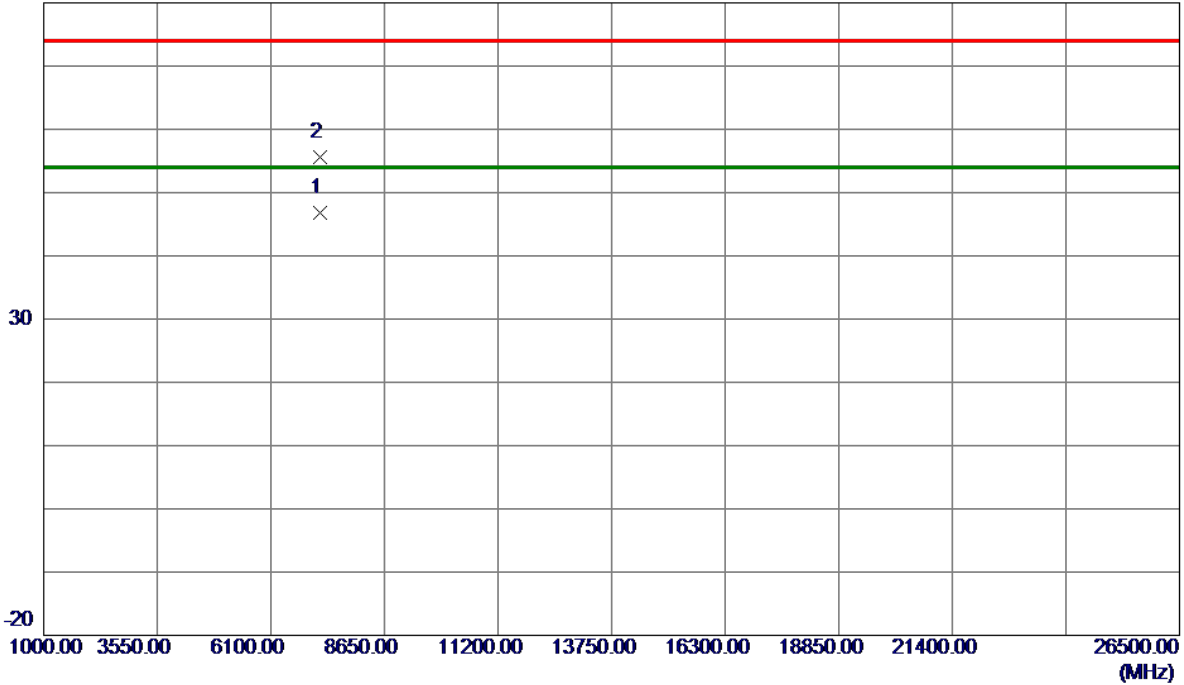
REMARKS:

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

Test Mode : TX 2402 MHz _CH00_2Mbps

Vertical

80 dBuV/m



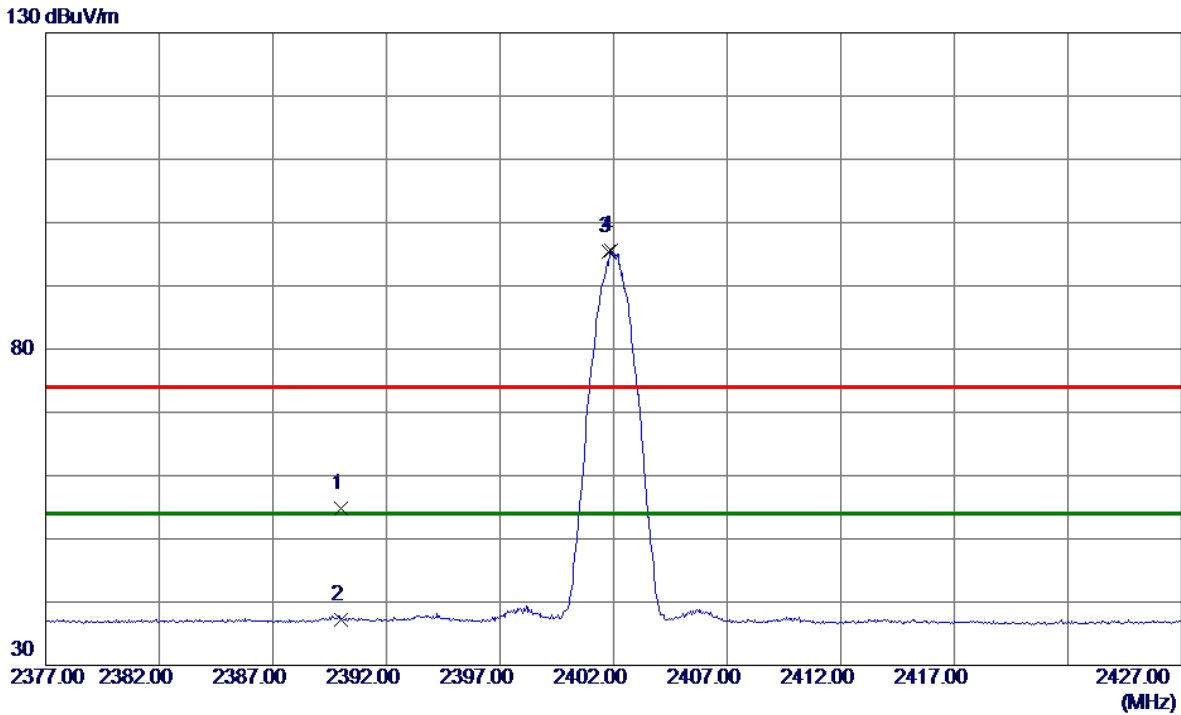
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.4750	37.70	9.16	46.86	54.00	-7.14	AVG	
2	7206.6900	46.43	9.16	55.59	74.00	-18.41	Peak	

REMARKS:

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

Test Mode : TX 2402 MHz _CH00_2Mbps

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	47.90	6.89	54.79	74.00	-19.21	Peak	
2	2390.0000	30.31	6.89	37.20	54.00	-16.80	AVG	
3	2401.8000	88.56	6.88	95.44	74.00	21.44	Peak	No Limit
4 *	2401.9000	88.69	6.88	95.57	54.00	41.57	AVG	No Limit

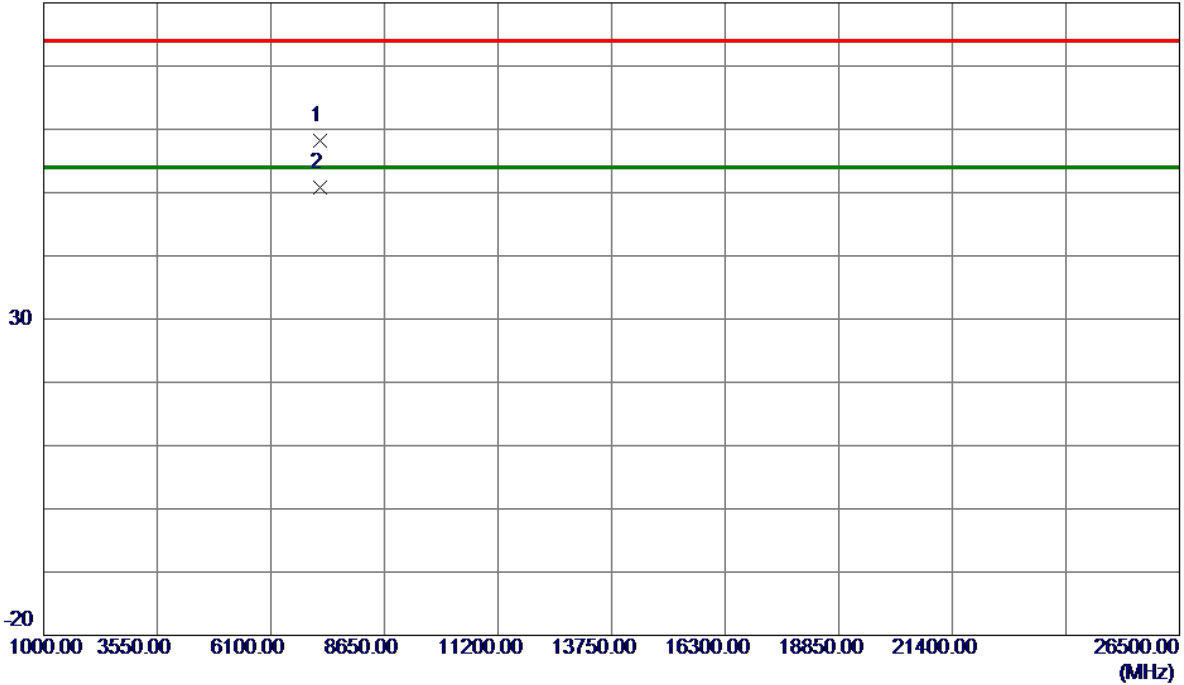
REMARKS:

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

Test Mode : TX 2402 MHz _CH00_2Mbps

Horizontal

80 dBuV/m



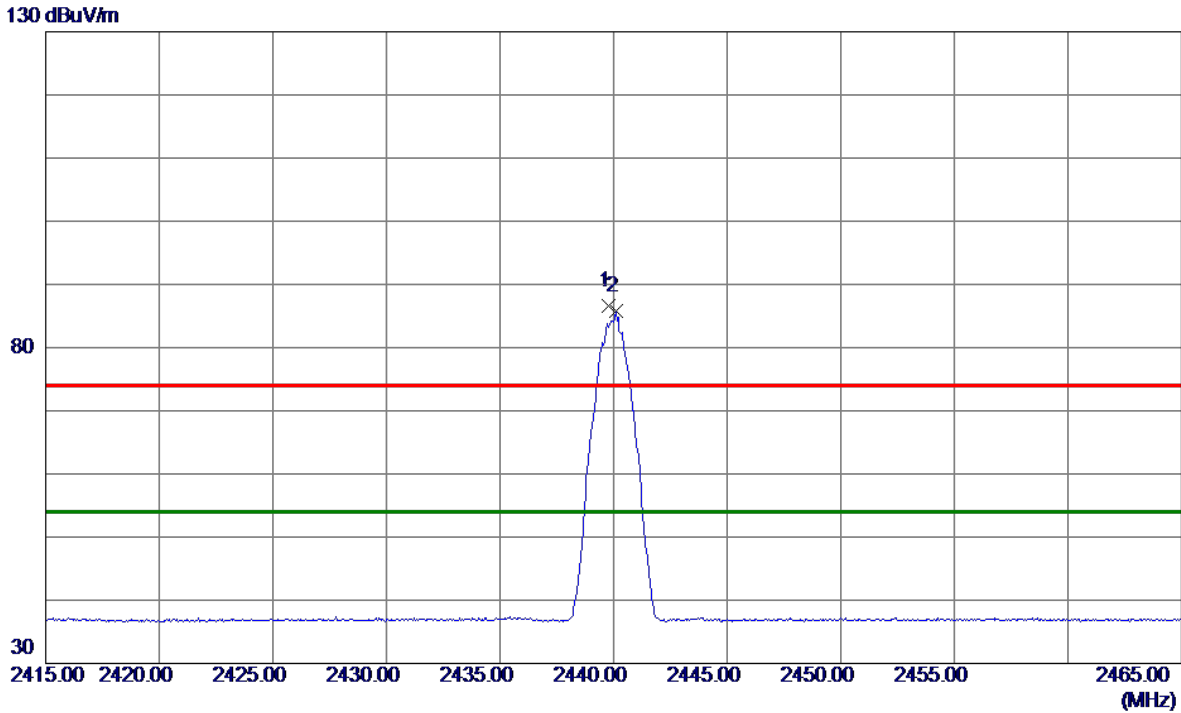
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7205.2300	48.98	9.16	58.14	74.00	-15.86	Peak	
2 *	7205.3750	41.68	9.16	50.84	54.00	-3.16	AVG	

REMARKS:

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

Test Mode : TX 2440 MHz _CH19_2Mbps

Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.8000	79.82	6.84	86.66	74.00	12.66	Peak	No Limit
2 *	2440.1000	78.91	6.84	85.75	54.00	31.75	AVG	No Limit

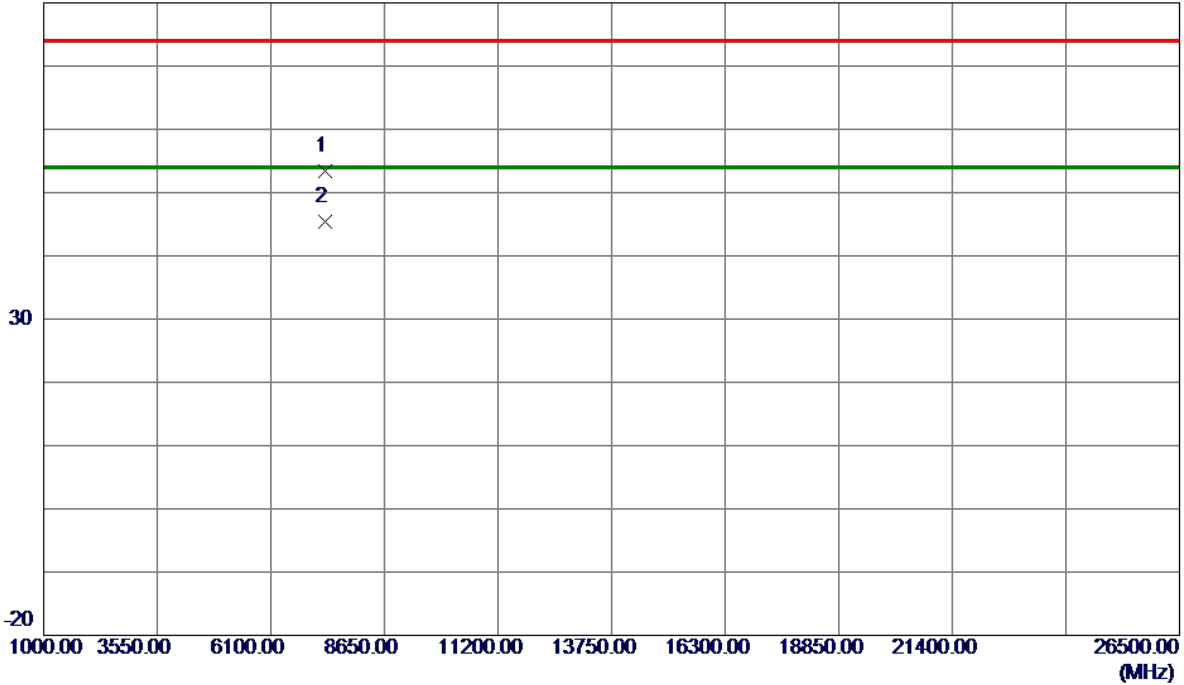
REMARKS:

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

Test Mode : TX 2440 MHz _CH19_2Mbps

Vertical

80 dBuV/m



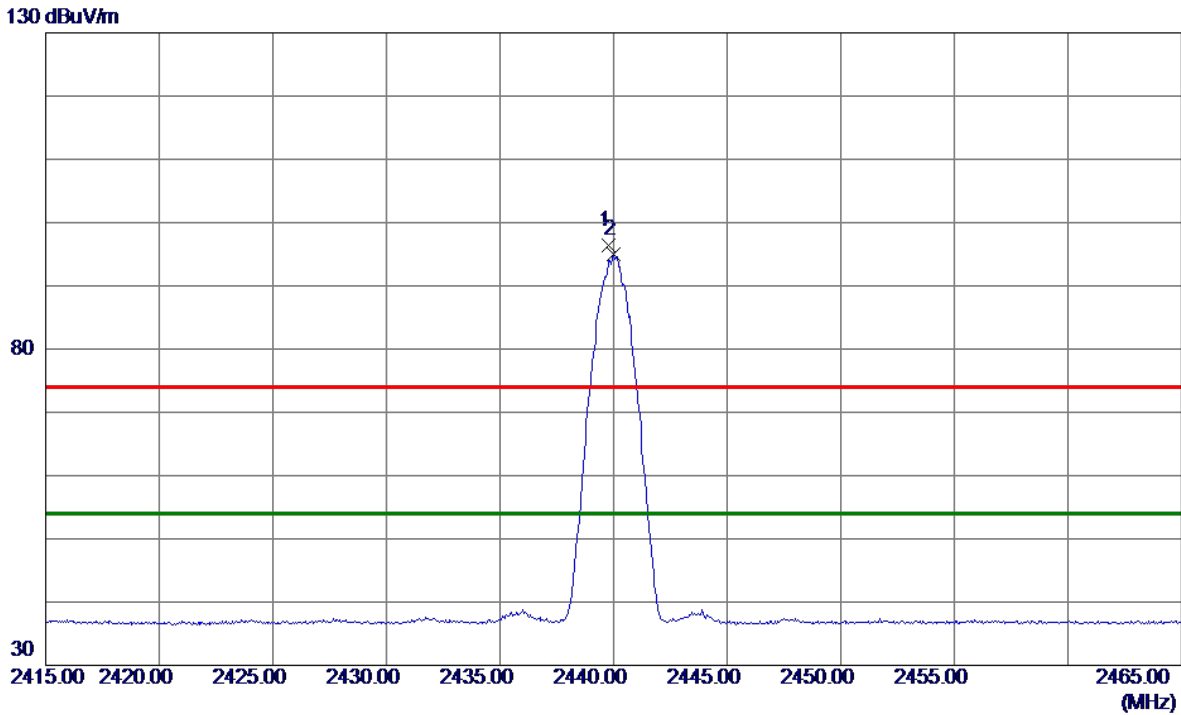
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7319.3400	44.10	9.32	53.42	74.00	-20.58	Peak	
2 *	7319.4900	36.15	9.32	45.47	54.00	-8.53	AVG	

REMARKS:

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

Test Mode : TX 2440 MHz _CH19_2Mbps

Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.8000	89.62	6.84	96.46	74.00	22.46	Peak	No Limit
2 *	2440.0000	88.24	6.84	95.08	54.00	41.08	AVG	No Limit

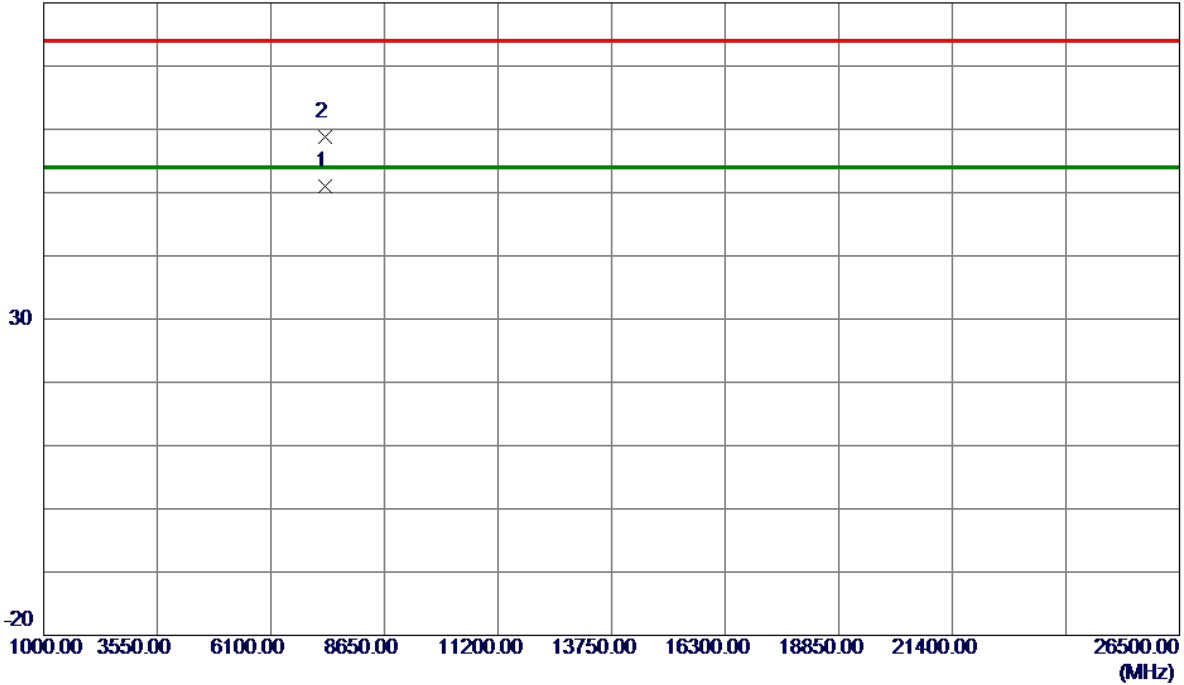
REMARKS:

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

Test Mode : TX 2440 MHz _CH19_2Mbps

Horizontal

80 dBuV/m



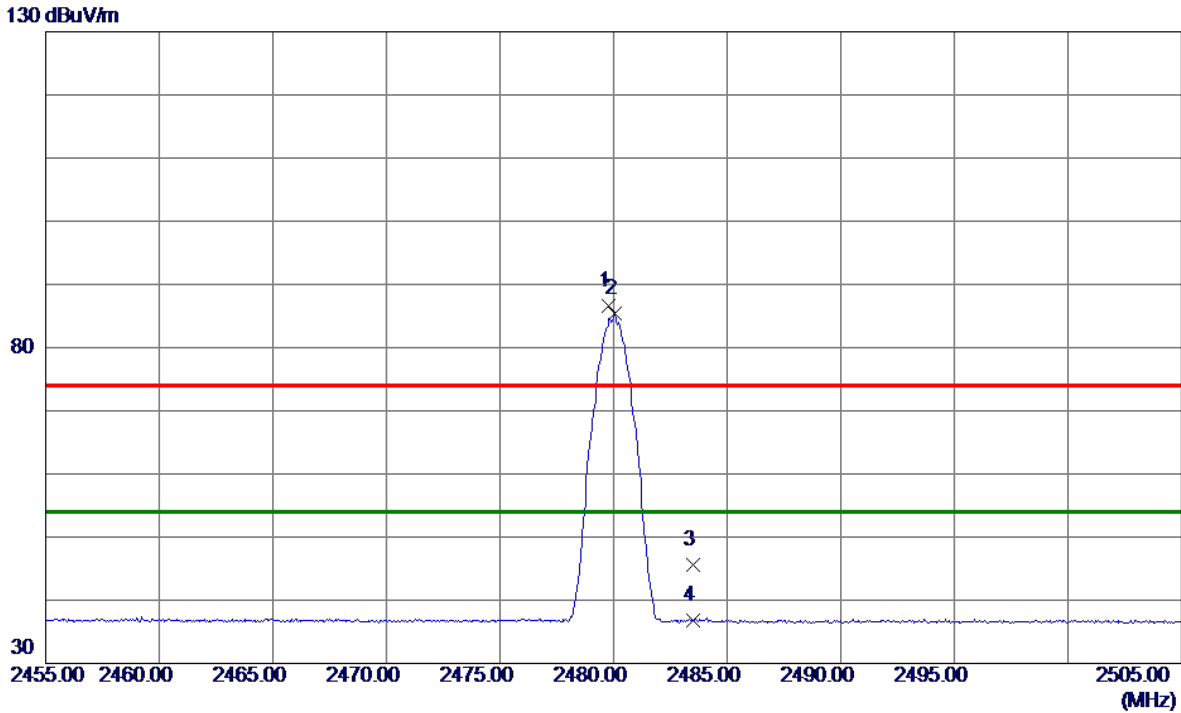
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7319.4500	41.70	9.32	51.02	54.00	-2.98	AVG	
2	7320.7200	49.43	9.33	58.76	74.00	-15.24	Peak	

REMARKS:

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

Test Mode : TX 2480 MHz _CH39_2Mbps

Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.8000	79.72	6.80	86.52	74.00	12.52	Peak	No Limit
2 *	2480.0500	78.60	6.80	85.40	54.00	31.40	AVG	No Limit
3	2483.5000	38.83	6.79	45.62	74.00	-28.38	Peak	
4	2483.5000	30.08	6.79	36.87	54.00	-17.13	AVG	

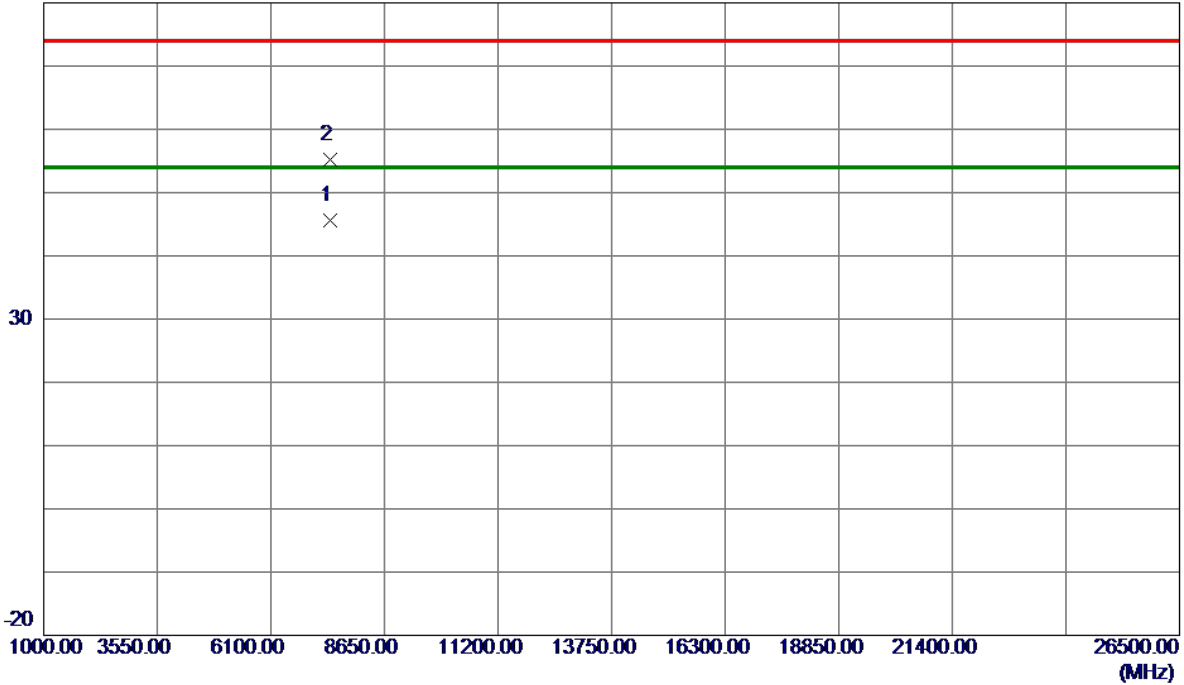
REMARKS:

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

Test Mode : TX 2480 MHz _CH39_2Mbps

Vertical

80 dBuV/m



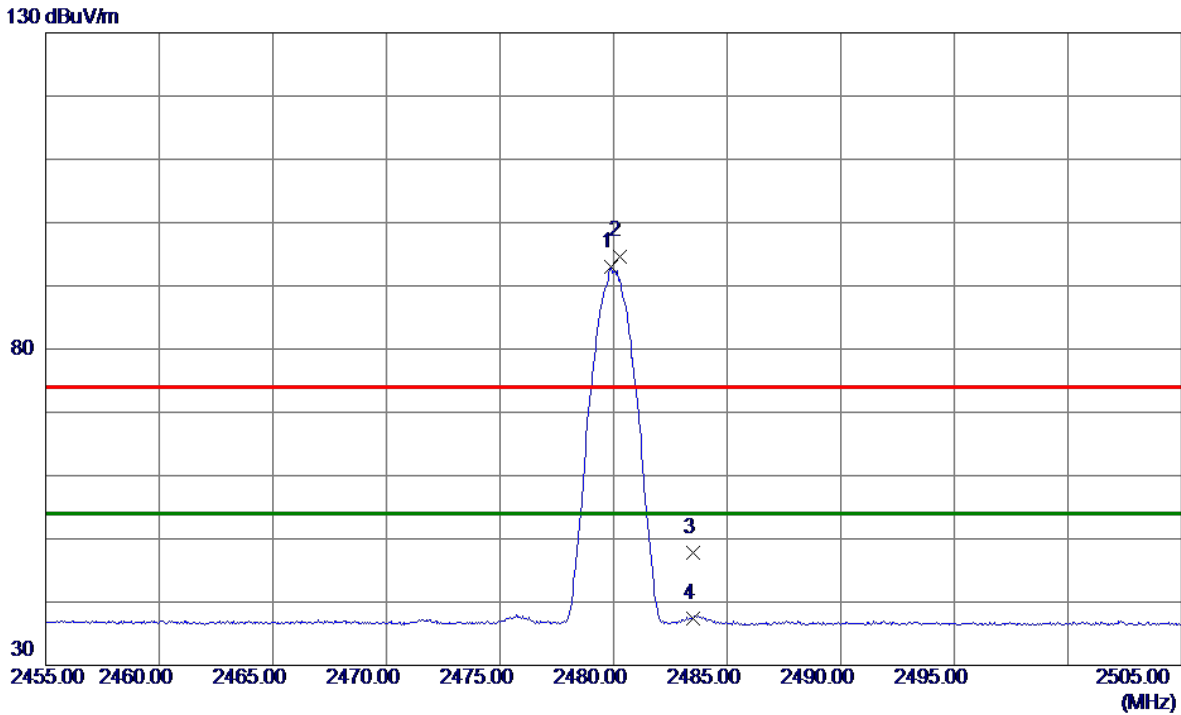
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7439.4250	36.12	9.49	45.61	54.00	-8.39	AVG	
2	7440.8350	45.69	9.50	55.19	74.00	-18.81	Peak	

REMARKS:

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

Test Mode : TX 2480 MHz _CH39_2Mbps

Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2479.9000	86.10	6.80	92.90	54.00	38.90	AVG	No Limit
2	2480.2500	87.90	6.80	94.70	74.00	20.70	Peak	No Limit
3	2483.5000	41.00	6.79	47.79	74.00	-26.21	Peak	
4	2483.5000	30.68	6.79	37.47	54.00	-16.53	AVG	

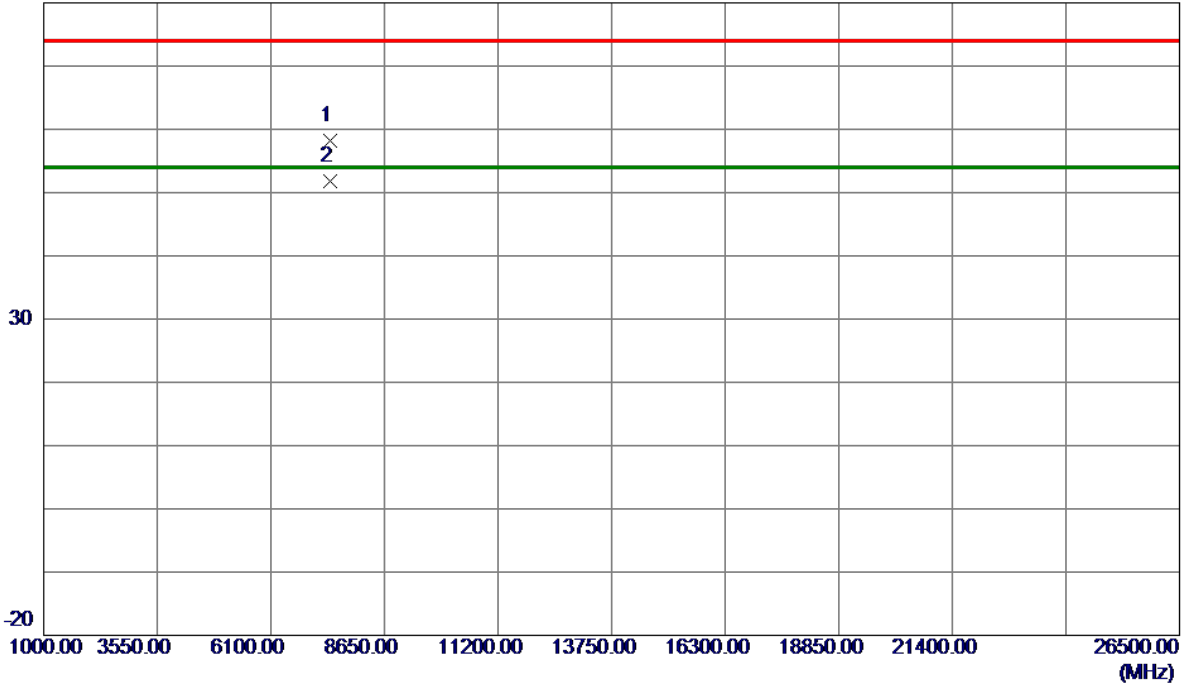
REMARKS:

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

Test Mode : TX 2480 MHz _CH39_2Mbps

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	7439.1850	48.77	9.49	58.26	74.00	-15.74	Peak	
2 *	7439.3950	42.32	9.49	51.81	54.00	-2.19	AVG	

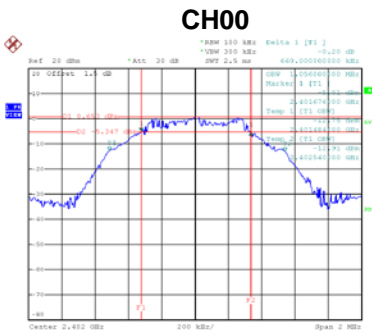
REMARKS:

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

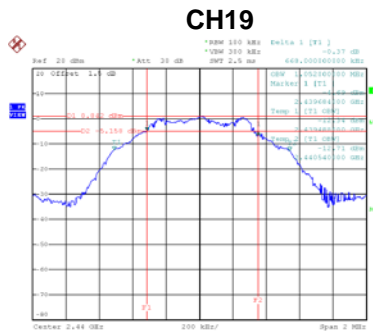
APPENDIX D - BANDWIDTH

Test Mode: CH00, CH19, CH39 - 1Mbps

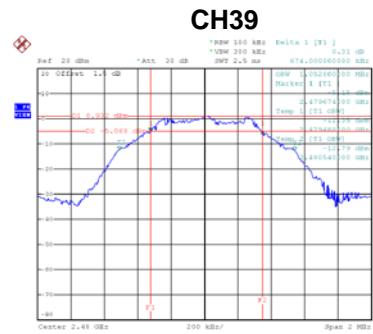
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	0.660	1.056	500	Pass
19	2440	0.668	1.052	500	Pass
39	2480	0.674	1.052	500	Pass



Date: 24_MAR_2020 13142150



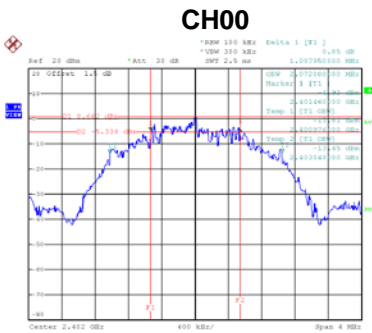
Date: 24_MAR_2020 13144138



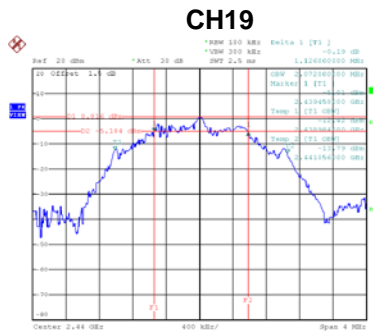
Date: 24_MAR_2020 13146110

Test Mode: CH00, CH19, CH39 - 2Mbps

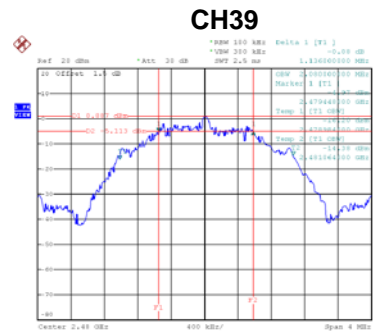
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
00	2402	1.088	2.072	500	Pass
19	2440	1.126	2.072	500	Pass
39	2480	1.136	2.080	500	Pass



Date: 24_MAR_2020 13147150



Date: 24_MAR_2020 13149117



Date: 24_MAR_2020 13151140

APPENDIX E - MAXIMUM OUTPUT POWER

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

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-11.66	0.000068	30.00	1.00	Pass
2440	-11.22	0.000076	30.00	1.00	Pass
2480	-9.01	0.000126	30.00	1.00	Pass

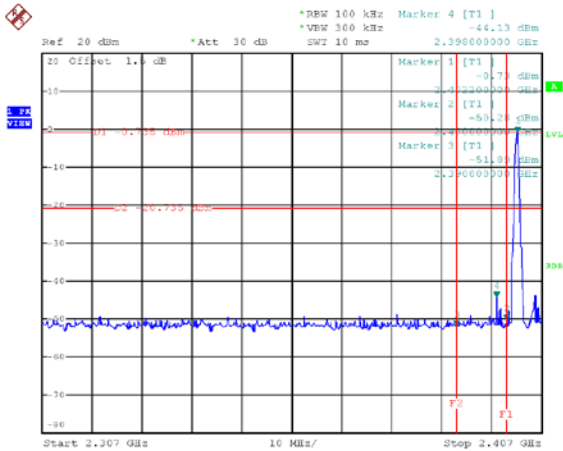
Test Mode :	CH00, CH19 , CH39 - 2Mbps
-------------	---------------------------

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-8.37	0.000146	30.00	1.00	Pass
2440	-7.96	0.000160	30.00	1.00	Pass
2480	-5.14	0.000306	30.00	1.00	Pass

APPENDIX F - CONDUCTED SPURIOUS EMISSION

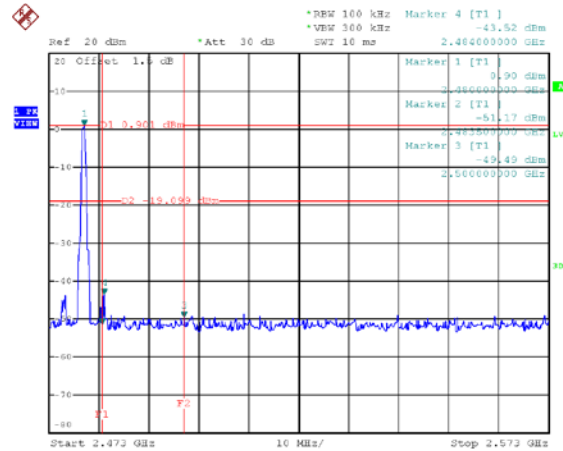
Test Mode : CH00, CH19 , CH39 - 1Mbps

Bandedge CH00 (Lower)



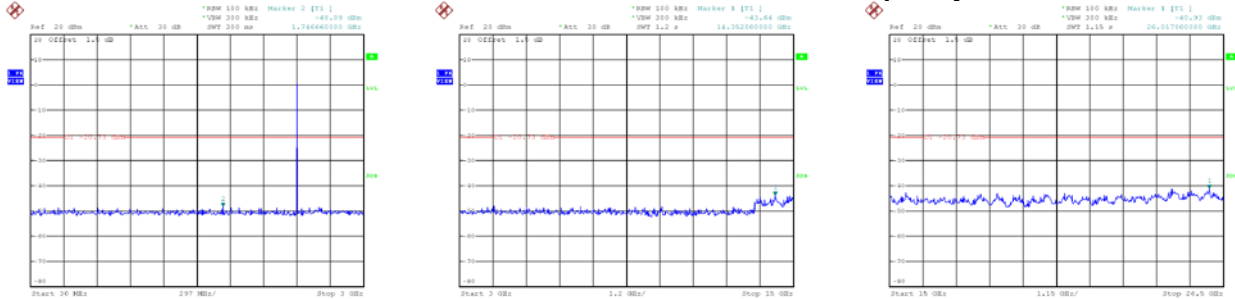
Date: 24.MAR.2020 13:42:58

Bandedge CH39 (Upper)



Date: 24.MAR.2020 13:46:17

CH00 10th Harmonic of the fundamental frequency

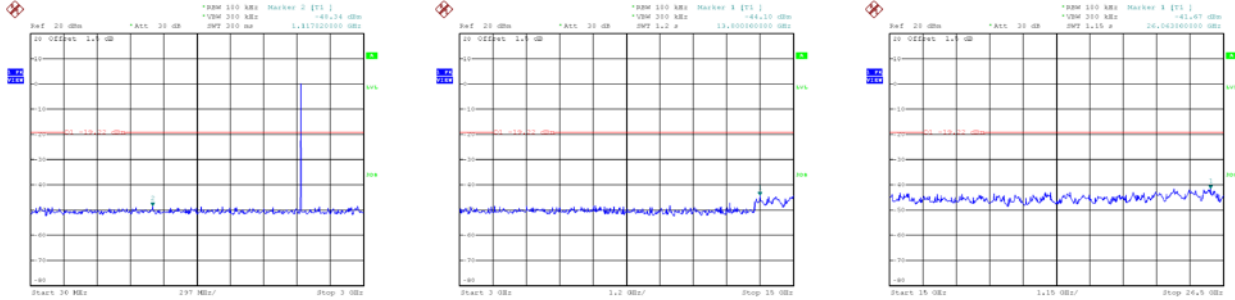


Date: 24.MAR.2020 13:43:10

Date: 24.MAR.2020 13:43:17

Date: 24.MAR.2020 13:43:24

CH19 10th Harmonic of the fundamental frequency

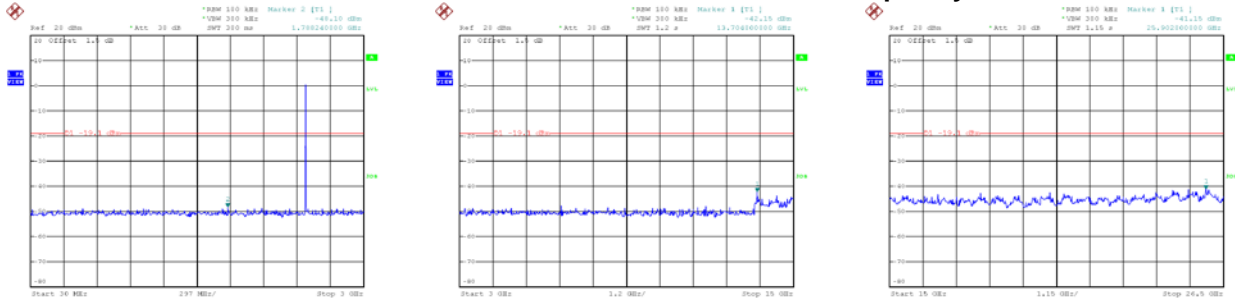


Date: 24.MAR.2020 13:44:58

Date: 24.MAR.2020 13:45:06

Date: 24.MAR.2020 13:45:12

CH39 10th Harmonic of the fundamental frequency



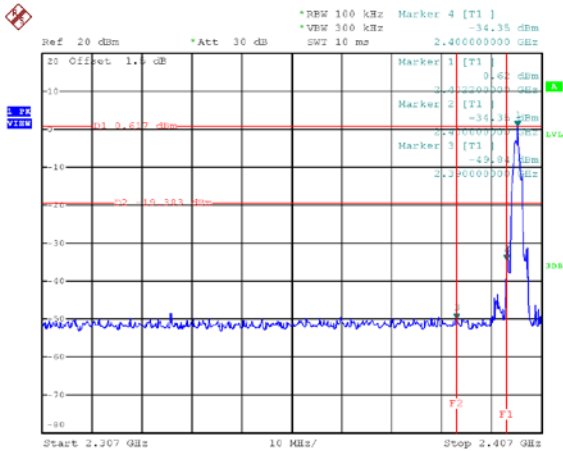
Date: 24.MAR.2020 13:46:30

Date: 24.MAR.2020 13:46:37

Date: 24.MAR.2020 13:46:44

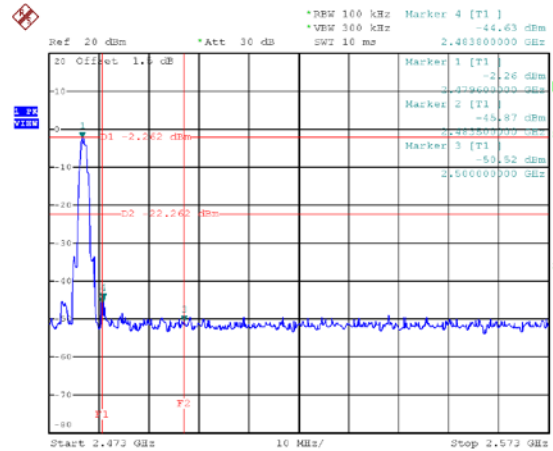
Test Mode : CH00, CH19 , CH39 - 2Mbps

Bandedge CH00 (Lower)



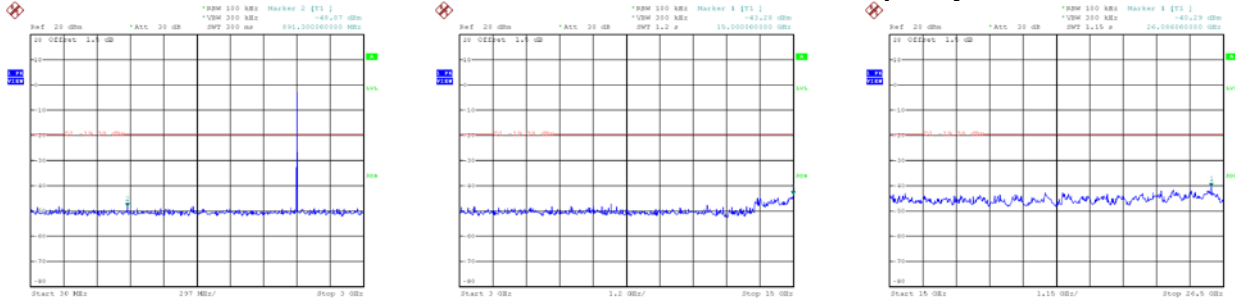
Date: 24.MAR.2020 13:47:57

Bandedge CH39 (Upper)



Date: 24.MAR.2020 13:51:47

CH00 10th Harmonic of the fundamental frequency

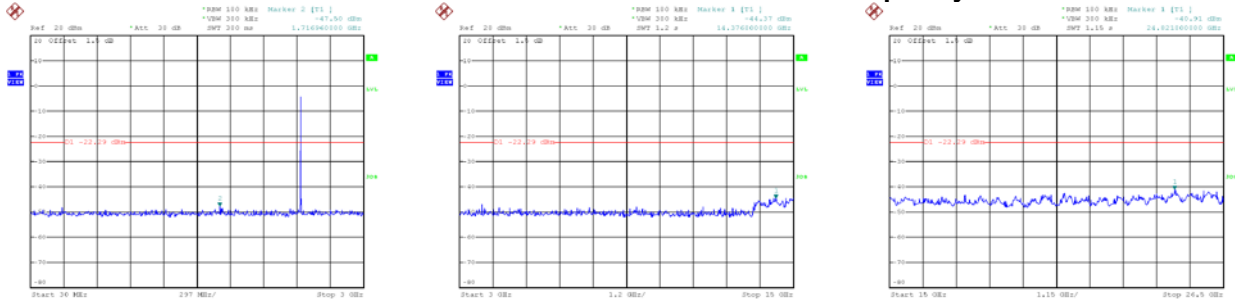


Date: 24.MAR.2020 13:48:11

Date: 24.MAR.2020 13:48:18

Date: 24.MAR.2020 13:48:25

CH19 10th Harmonic of the fundamental frequency

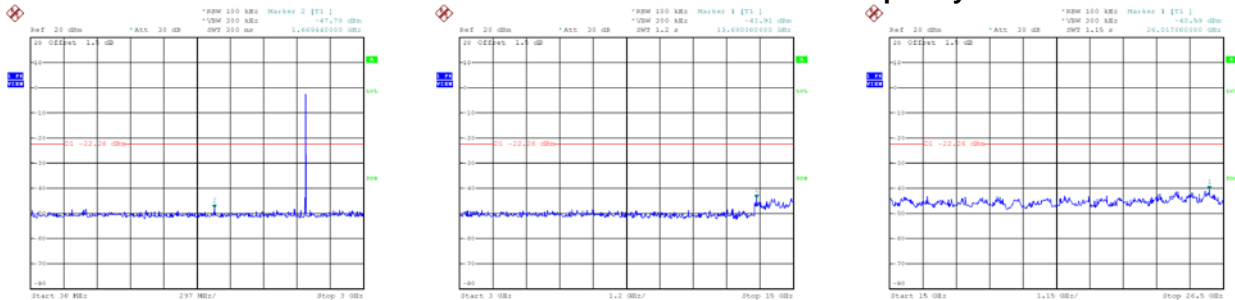


Date: 24.MAR.2020 13:49:19

Date: 24.MAR.2020 13:49:16

Date: 24.MAR.2020 13:49:53

CH39 10th Harmonic of the fundamental frequency



Date: 24.MAR.2020 13:52:01

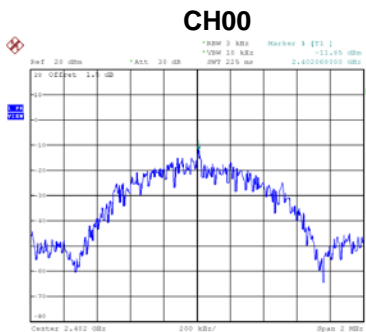
Date: 24.MAR.2020 13:52:08

Date: 24.MAR.2020 13:52:15

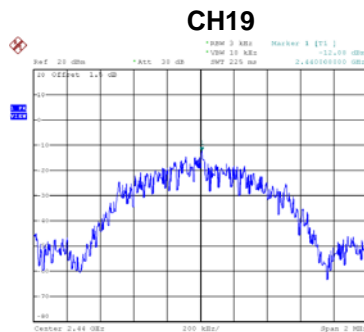
APPENDIX G - POWER SPECTRAL DENSITY

Test Mode: CH00, CH19, CH39 - 1Mbps

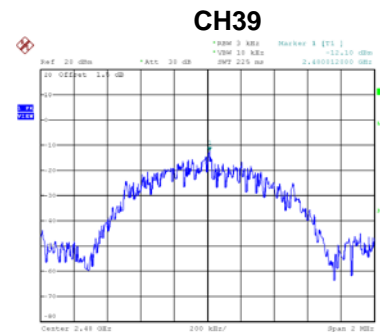
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-11.85	8.00	Pass
19	2440	-12.08	8.00	Pass
39	2480	-12.10	8.00	Pass



Date: 24.MAR.2020 13:15:154



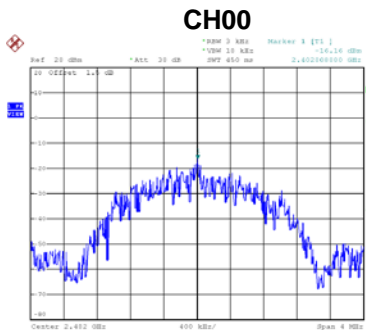
Date: 24.MAR.2020 13:15:118



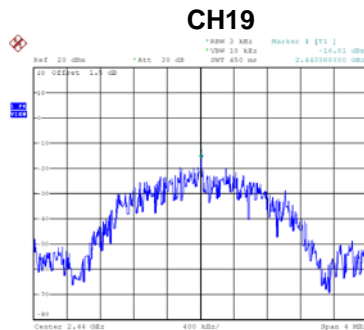
Date: 24.MAR.2020 13:14:650

Test Mode: CH00, CH19, CH39 - 2Mbps

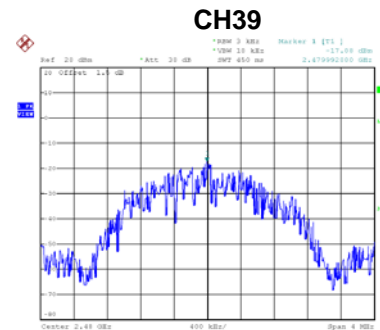
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
00	2402	-16.16	8.00	Pass
19	2440	-16.01	8.00	Pass
39	2480	-17.08	8.00	Pass



Date: 24.MAR.2020 13:14:130



Date: 24.MAR.2020 13:14:159



Date: 24.MAR.2020 13:15:221

End of Test Report