

# FCC Radio Test Report

## FCC ID: 14L-MA04

This report concerns: Original Grant

**Project No.** : 2011C073  
**Equipment** : Wireless Mouse  
**Brand Name** : MSI  
**Test Model** : MA04  
**Series Model** : N/A  
**Applicant** : Micro-Star Int'l Co.,Ltd.  
**Address** : No.69, Lide St., Zhonghe Dist.,New Taipei City 235, Taiwan  
**Manufacturer** : Micro-Star Int'l Co.,Ltd.  
**Address** : No.69, Lide St., Zhonghe Dist.,New Taipei City 235, Taiwan  
**Factory** : Dong Guan You Hong Plastic & Electric Co.,Ltd  
**Address** : Zhen Hua Road, Tie Lu Keng Village,Qi Shi Town,DongGuan city  
**Date of Receipt** : Nov. 10, 2020  
**Date of Test** : Nov. 12, 2020 ~ Dec. 08, 2020  
**Issued Date** : Dec. 25, 2020  
**Report Version** : R01  
**Test Sample** : Engineering Sample No.: DG2020111169 for conducted,  
DG2020111170 for radiated  
**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.

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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.

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**REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Dec. 15, 2020
R01	Changed the information of applicant and manufacturer.	Dec. 25, 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	-	3.02
		30MHz ~ 200MHz	V	4.26
		30MHz ~ 200MHz	H	3.38
		200MHz ~ 1,000MHz	V	3.98
		200MHz ~ 1,000MHz	H	3.94
		1GHz ~ 6GHz	-	3.96
		6GHz ~ 18GHz	-	5.24
		18GHz ~ 26.5GHz	-	3.62
		26.5GHz ~ 40GHz	-	4.00

#### B. Other Measurement:

Test Item	Uncertainty
Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Conducted Spurious Emission	±2.71 dB
Power Spectral Density	±0.86 dB
Temperature	±0.08 °C
Humidity	±1.5%

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 3V	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	26°C	52%	DC 3V	Kwok Guo
Radiated Emissions-Above 1000 MHz	26°C	52%	DC 3V	Kwok Guo
Bandwidth	24°C	52%	DC 3V	Jesse Wang
Maximum Output Power	24°C	52%	DC 3V	Hand Huang
Conducted Spurious Emission	24°C	52%	DC 3V	Jesse Wang
Power Spectral Density	24°C	52%	DC 3V	Jesse Wang

**2. GENERAL INFORMATION****2.1 GENERAL DESCRIPTION OF EUT**

Equipment	Wireless Mouse
Brand Name	MSI
Test Model	MA04
Series Model	N/A
Model Difference(s)	N/A
Power Source	Supplied from Battery.
Power Rating	3V $\approx$ 15mA
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter	2Mbps
Max. Output Power	-25.35 dBm (0.0029W)

**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)
01	2402	21	2442
02	2404	22	2444
03	2406	23	2446
04	2408	24	2448
05	2410	25	2450
06	2412	26	2452
07	2414	27	2454
08	2416	28	2456
09	2418	29	2458
10	2420	30	2460
11	2422	31	2462
12	2424	32	2464
13	2426	33	2466
14	2428	34	2468
15	2430	35	2470
16	2432	36	2472
17	2434	37	2474
18	2436	38	2476
19	2438	39	2478
20	2440	40	2480

## 3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	IBM 2.4 GHz	Internal	N/A	-1.52

## Note:

The antenna gain is provided by the manufacturer.

## 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 <b>NOTE (1)</b>
Mode 2	TX Mode Channel 40

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

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode Channel 40

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode <b>NOTE (1)</b>

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode <b>NOTE (1)</b>

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) For radiated spurious emissions below 1 GHz test, the channel 40 is found to be the worst case and recorded in this report.

## 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.

Test Software	N/A		
Frequency (MHz)	2402	2440	2480
2Mbps	0	0	0

Note: The operating channel is fixed by pressing the button of the mouse. No used the power controlling software to control the operating channel.

**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

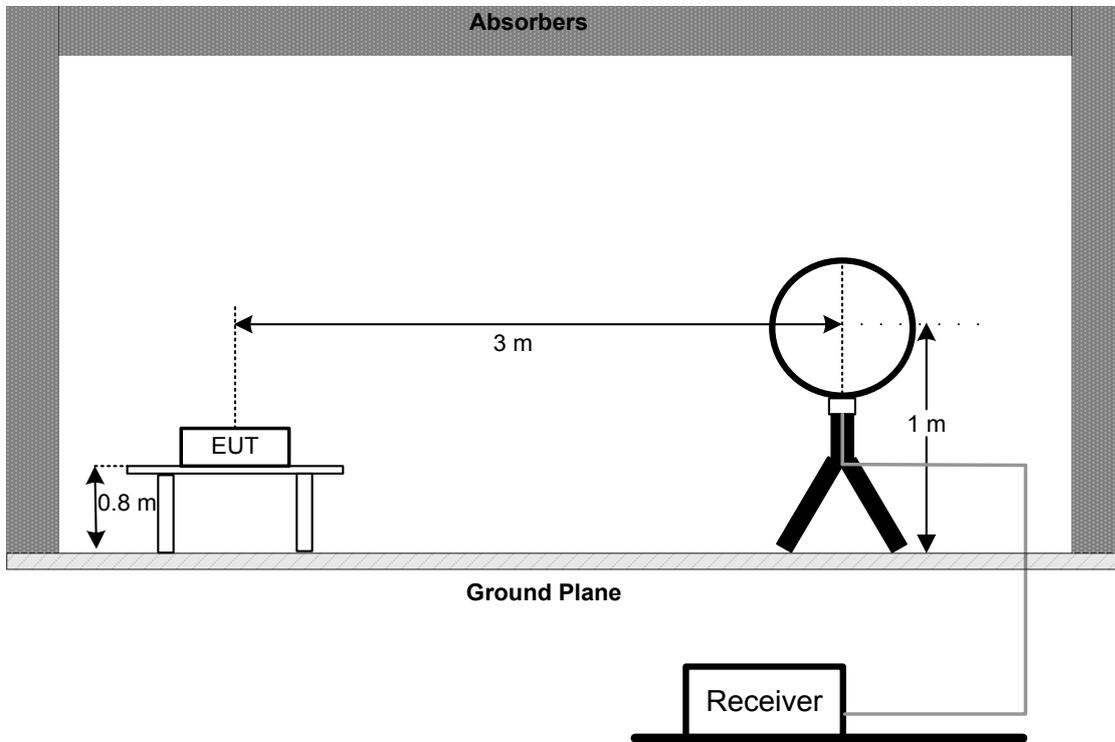
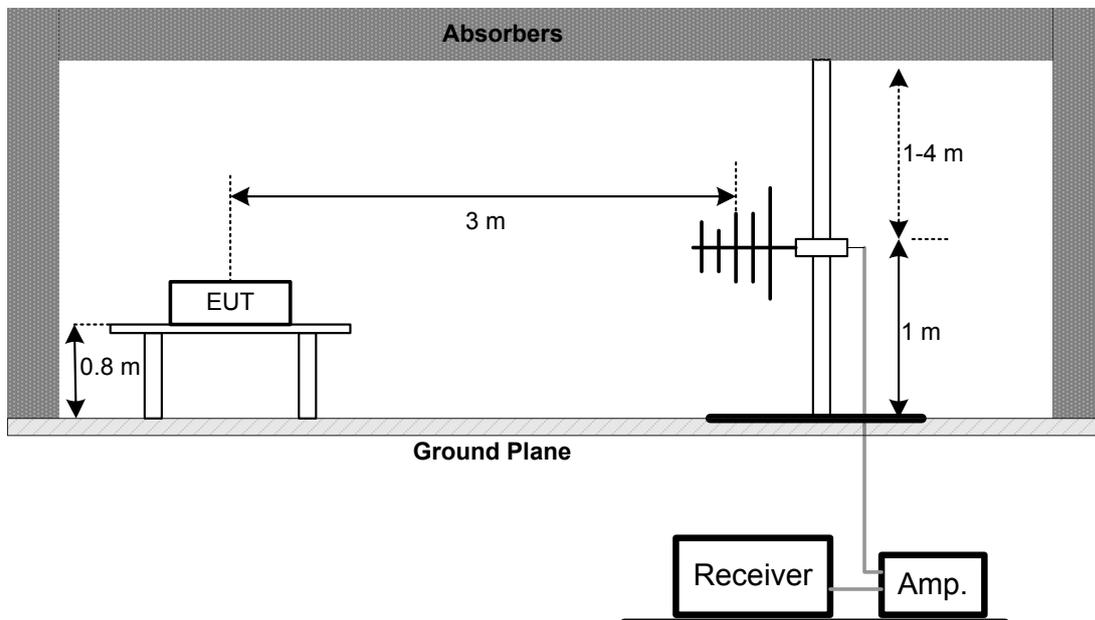
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000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

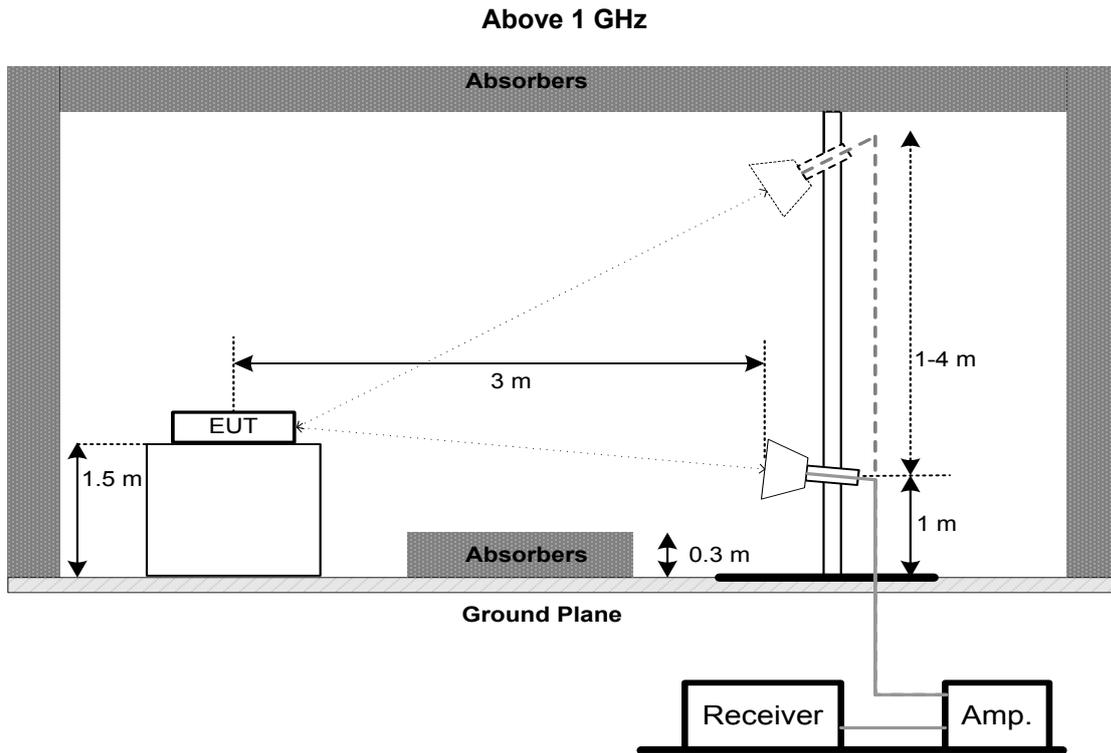
### 3.2 TEST PROCEDURE

- 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	$\geq 500$ 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:  
For 6 dB Bandwidth: RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5 ms  
For 99 % Emission Bandwidth: RBW= 30 kHz, VBW=100 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**

- 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.

**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	Apr. 16, 2021
2	Cable	N/A	RG 213/U	N/A	May 29, 2021
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
5	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

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	2944A09673	Aug. 11, 2021
3	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 22, 2021
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
8	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	May 12, 2021
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jul. 07, 2021
3	Amplifier	Agilent	8449B	3008A02333	Mar. 01, 2021
4	Microwave Preampifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 07, 2021
5	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	N/A	EMC104-SM-SM-6 000	N/A	May 09, 2021
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
10	Filter	STI	STI15-9912	N/A	Jul. 25, 2021
11	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

Bandwidth & Maximum Output Power & Power Spectral Density & Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 25, 2021
2	Attenuator	WOKEN	6SM3502	VAS1214NL	Feb. 11, 2021
3	DC Block	Mini	N/A	N/A	N/A
4	RF Cable	Tongkaichuan	N/A	N/A	N/A

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

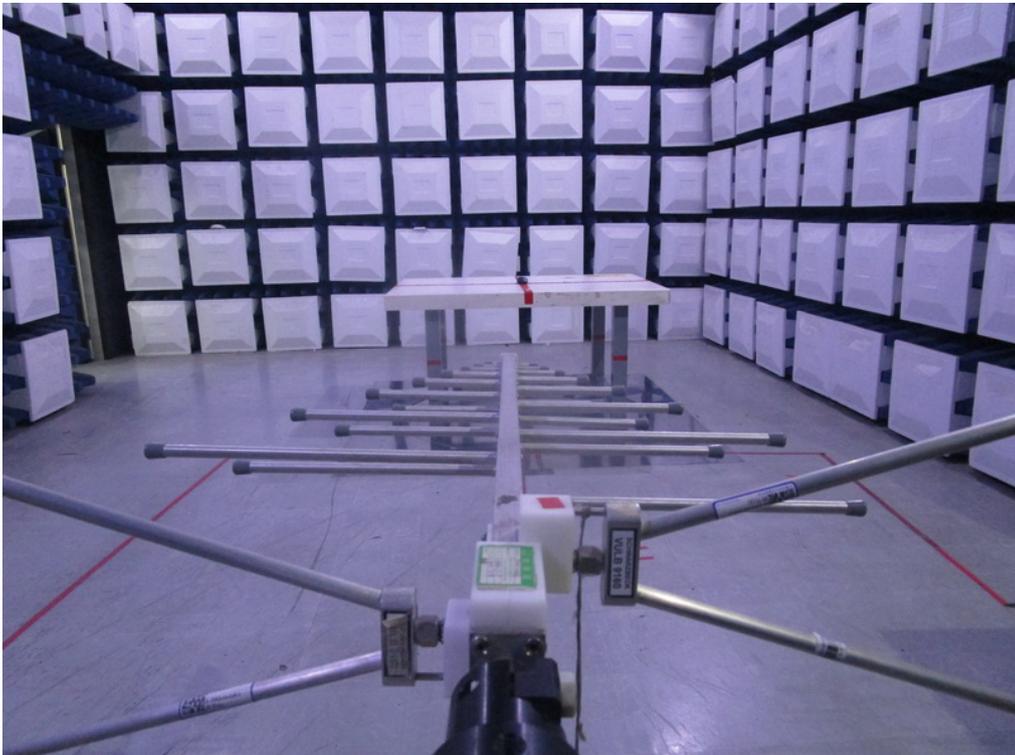
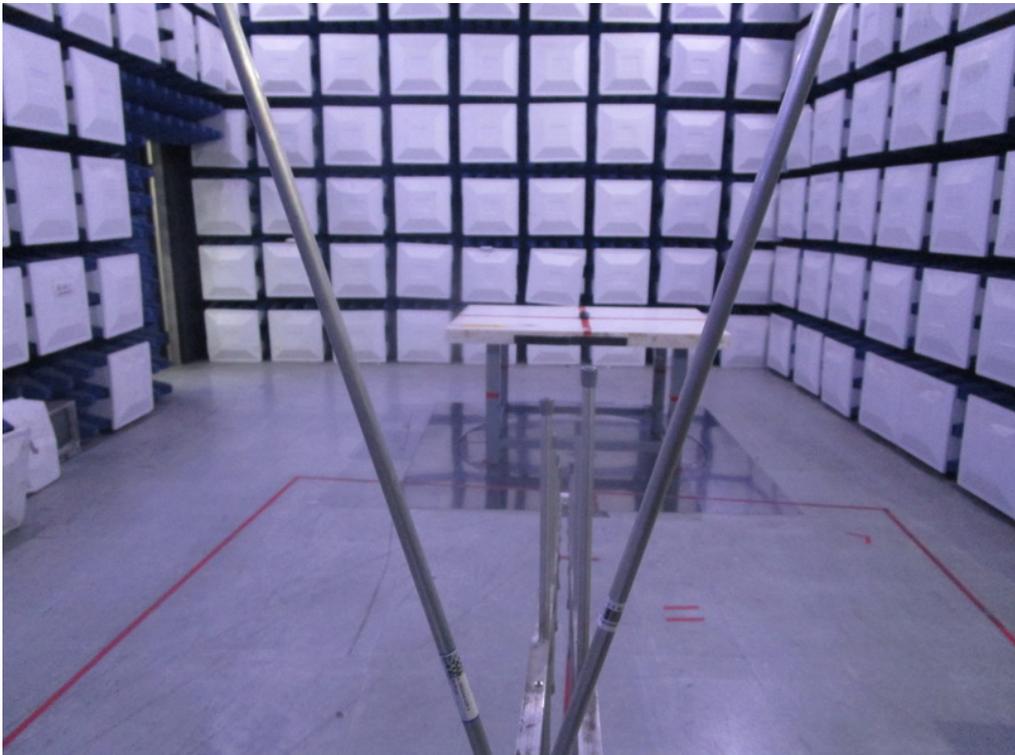
"\*" calibration period of equipment list is three year.

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**

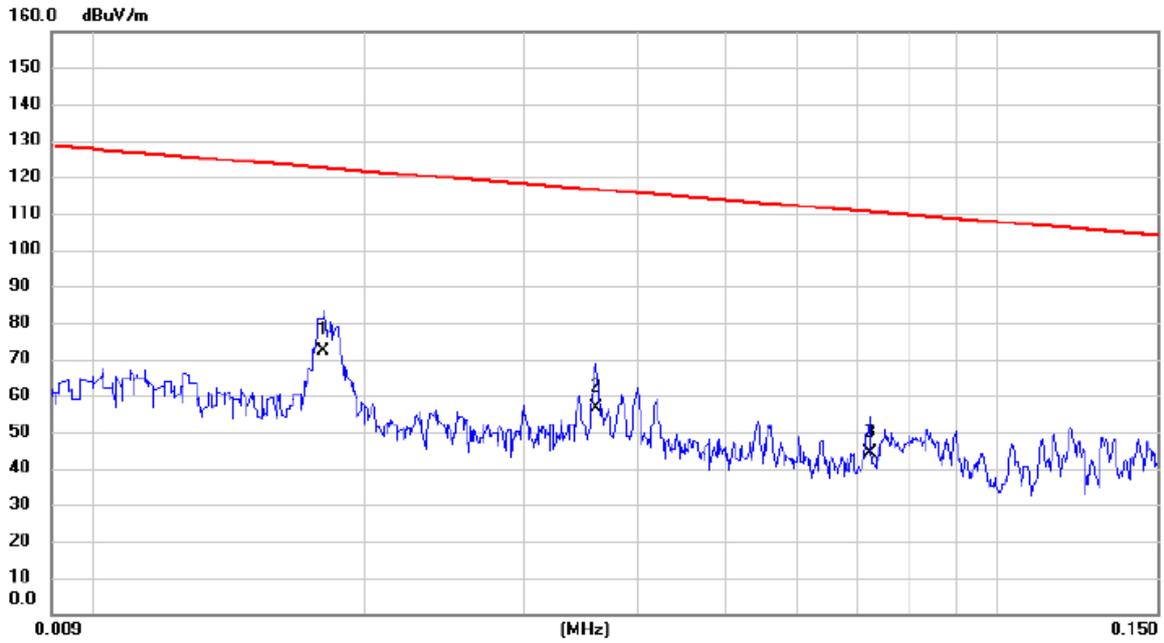


**Radiated Emissions Test Photos****Above 1 GHz**

**APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ**

Test Mode: TX Mode Channel 40

Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	0.0180	58.17	13.84	72.01	122.50	-50.49	AVG	
2		0.0360	43.96	12.79	56.75	116.48	-59.73	AVG	
3		0.0724	31.59	12.55	44.14	110.41	-66.27	AVG	

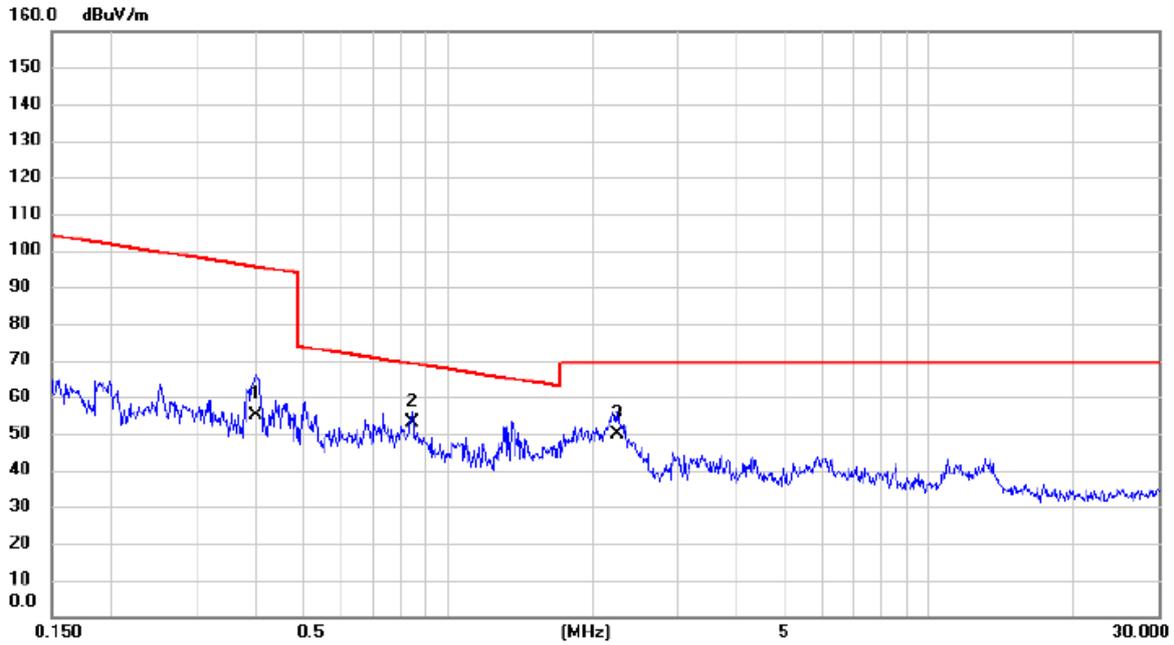
REMARKS:

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

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

Test Mode: TX Mode Channel 40

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	42.59	12.26	54.85	95.57	-40.72	AVG	
2	*	0.8438	40.95	11.86	52.81	69.08	-16.27	QP	
3		2.2486	38.55	11.18	49.73	69.54	-19.81	QP	

REMARKS:

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

Test Mode: TX Mode Channel 40

**Ant 90°**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0181	55.74	13.81	69.55	122.45	-52.90	AVG	
2		0.0360	46.95	12.79	59.74	116.48	-56.74	AVG	
3		0.0716	30.85	12.55	43.40	110.51	-67.11	AVG	

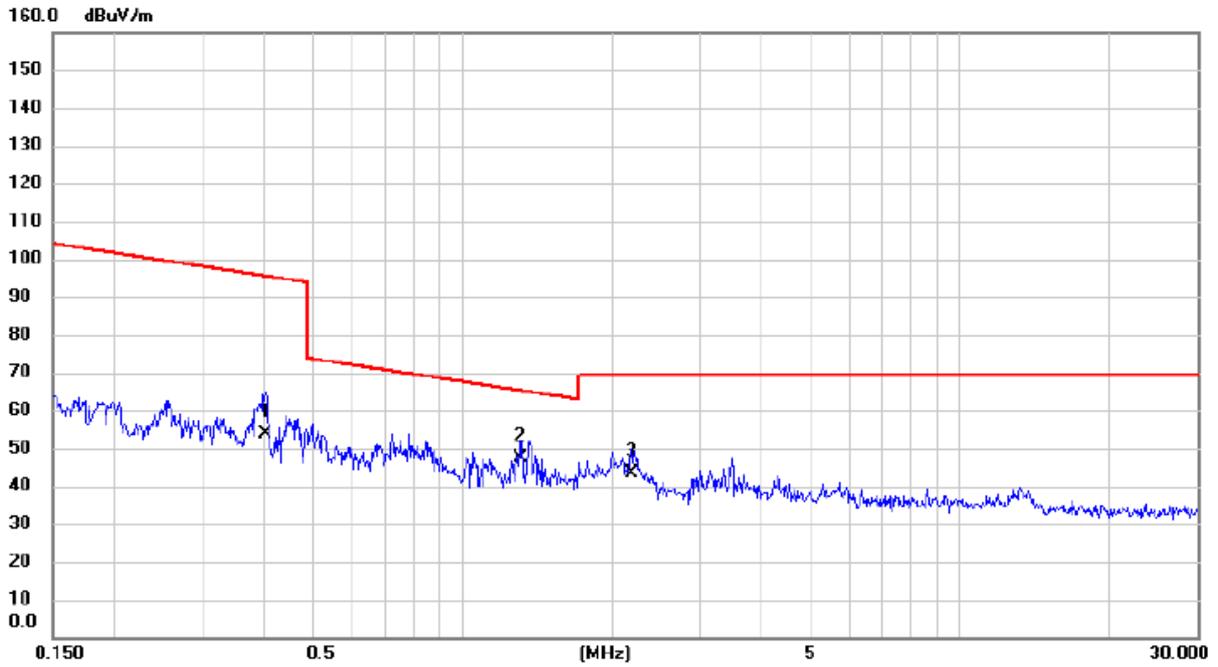
**REMARKS:**

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

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

Test Mode: TX Mode Channel 40

Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4020	41.57	12.25	53.82	95.52	-41.70	AVG	
2	*	1.3098	35.95	11.64	47.59	65.26	-17.67	QP	
3		2.1898	32.36	11.21	43.57	69.54	-25.97	QP	

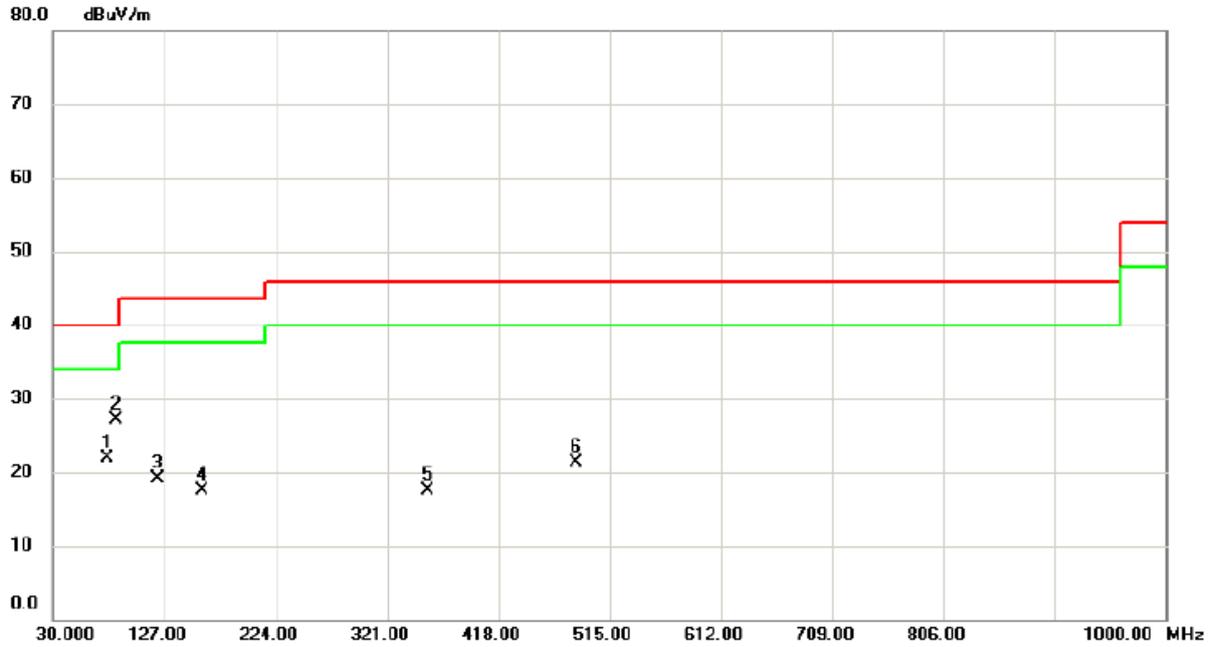
REMARKS:

- (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 40

### Vertical



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	77.530	40.50	-18.54	21.96	40.00	-18.04	peak	
2 *	84.320	45.36	-18.19	27.17	40.00	-12.83	peak	
3	121.180	33.32	-14.29	19.03	43.50	-24.47	peak	
4	159.980	30.01	-12.46	17.55	43.50	-25.95	peak	
5	356.890	30.27	-12.82	17.45	46.00	-28.55	peak	
6	485.900	31.91	-10.69	21.22	46.00	-24.78	peak	

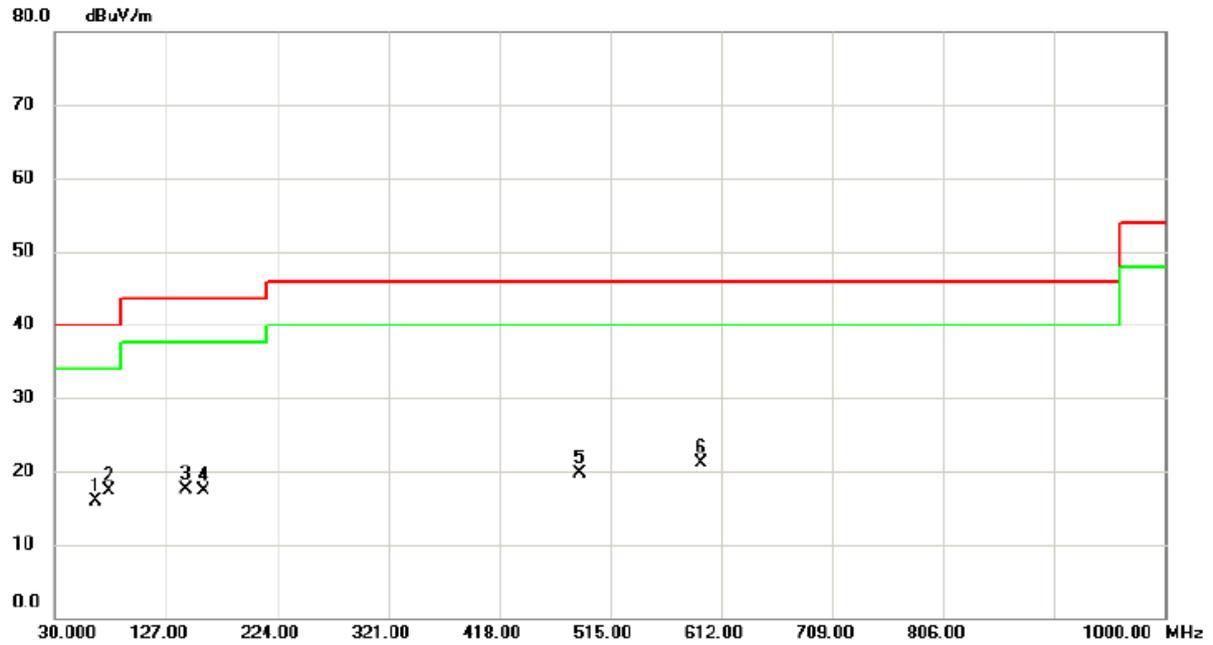
**REMARKS:**

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

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

Test Mode: TX Mode Channel 40

### Horizontal



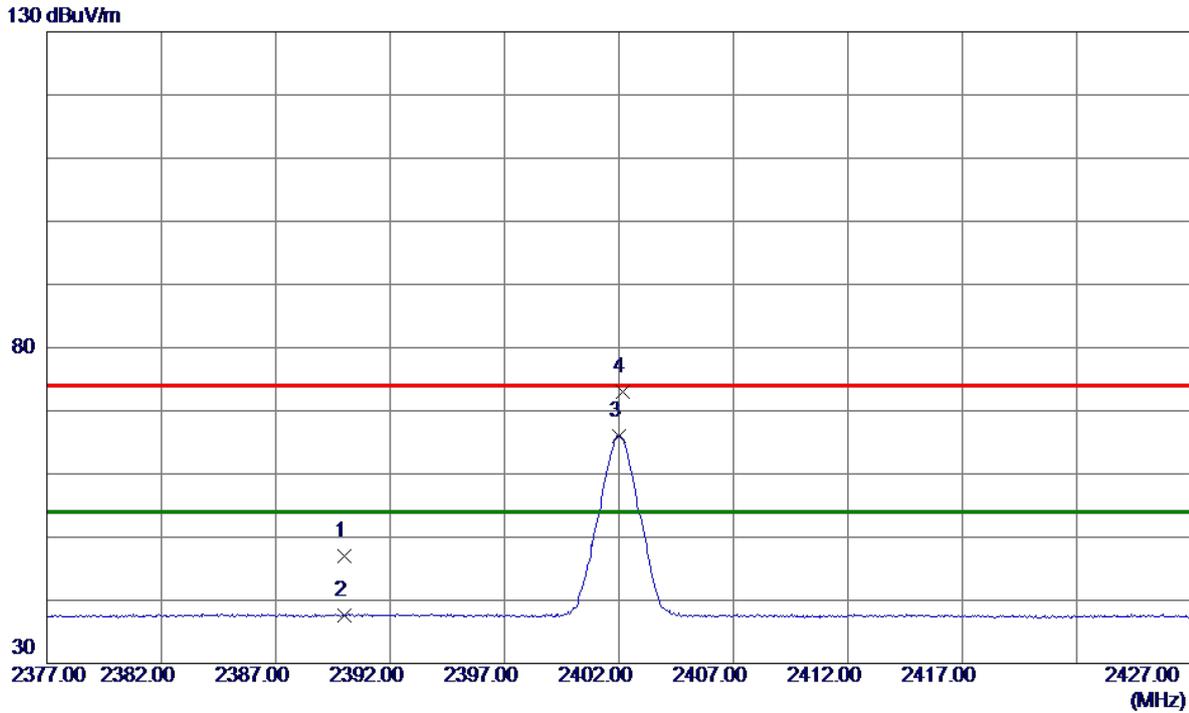
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	64.920	31.81	-15.99	15.82	40.00	-24.18	peak	
2 *	77.530	35.86	-18.54	17.32	40.00	-22.68	peak	
3	144.460	31.46	-13.98	17.48	43.50	-26.02	peak	
4	159.980	29.78	-12.46	17.32	43.50	-26.18	peak	
5	488.810	30.35	-10.68	19.67	46.00	-26.33	peak	
6	594.540	30.30	-9.24	21.06	46.00	-24.94	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 \_CH01

**Vertical**



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	39.71	7.26	46.97	74.00	-27.03	Peak	
2	2390.0000	30.32	7.26	37.58	54.00	-16.42	AVG	
3 *	2402.0000	58.79	7.26	66.05	54.00	12.05	AVG	No Limit
4	2402.1500	65.79	7.26	73.05	74.00	-0.95	Peak	No Limit

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

Test Mode : TX 2402 MHz \_CH01

### Vertical

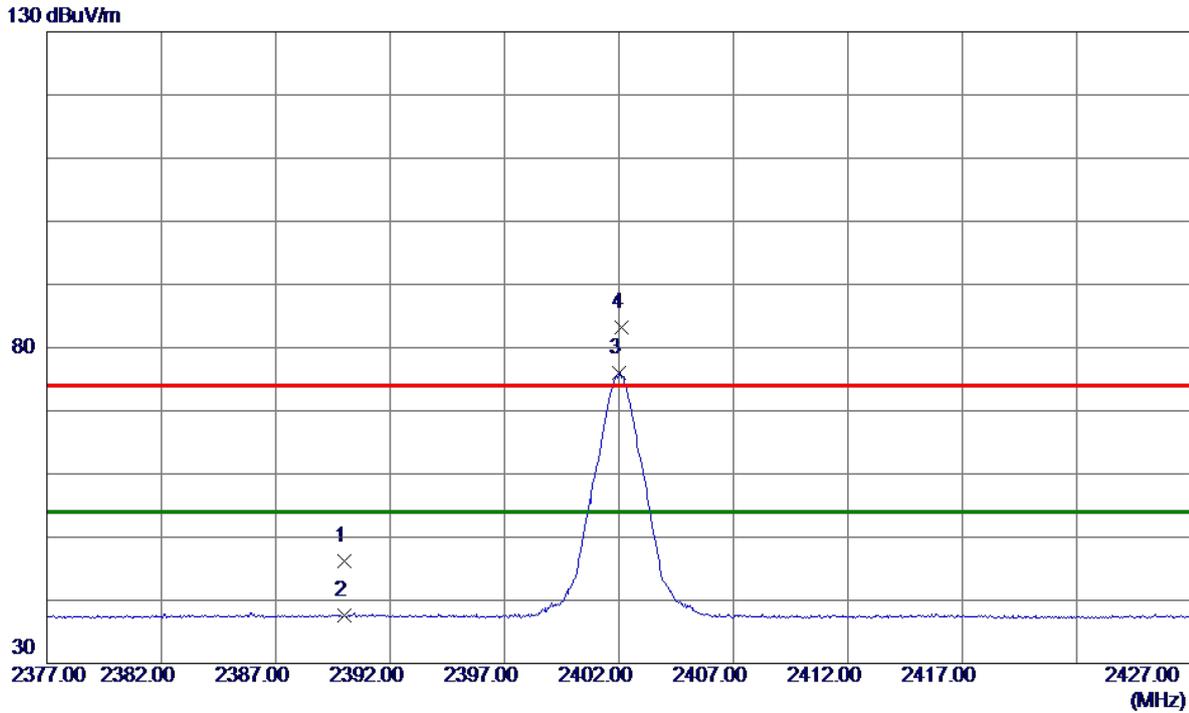


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4804.0700	44.16	4.40	48.56	54.00	-5.44	AVG	
2	4804.1020	51.33	4.40	55.73	74.00	-18.27	Peak	

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

Test Mode : TX 2402 MHz \_CH01

### 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	39.03	7.26	46.29	74.00	-27.71	Peak	
2	2390.0000	30.34	7.26	37.60	54.00	-16.40	AVG	
3 *	2402.0000	68.69	7.26	75.95	54.00	21.95	AVG	No Limit
4	2402.1000	75.97	7.26	83.23	74.00	9.23	Peak	No Limit

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

Test Mode : TX 2402 MHz \_CH01

### Horizontal

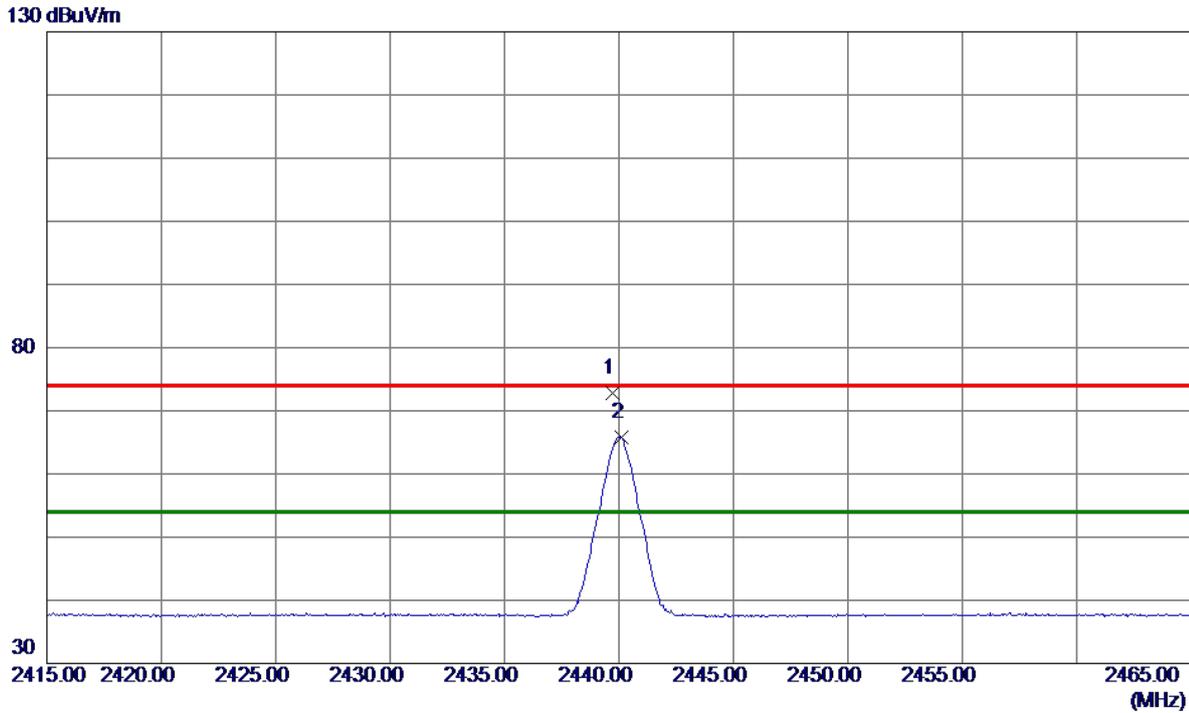


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4803.8350	47.21	4.40	51.61	74.00	-22.39	Peak	
2 *	4803.8870	38.23	4.40	42.63	54.00	-11.37	AVG	

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

Test Mode : TX 2440 MHz \_CH20

**Vertical**



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7000	65.57	7.25	72.82	74.00	-1.18	Peak	No Limit
2 *	2440.1000	58.52	7.25	65.77	54.00	11.77	AVG	No Limit

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

Test Mode : TX 2440 MHz \_CH20

**Vertical**

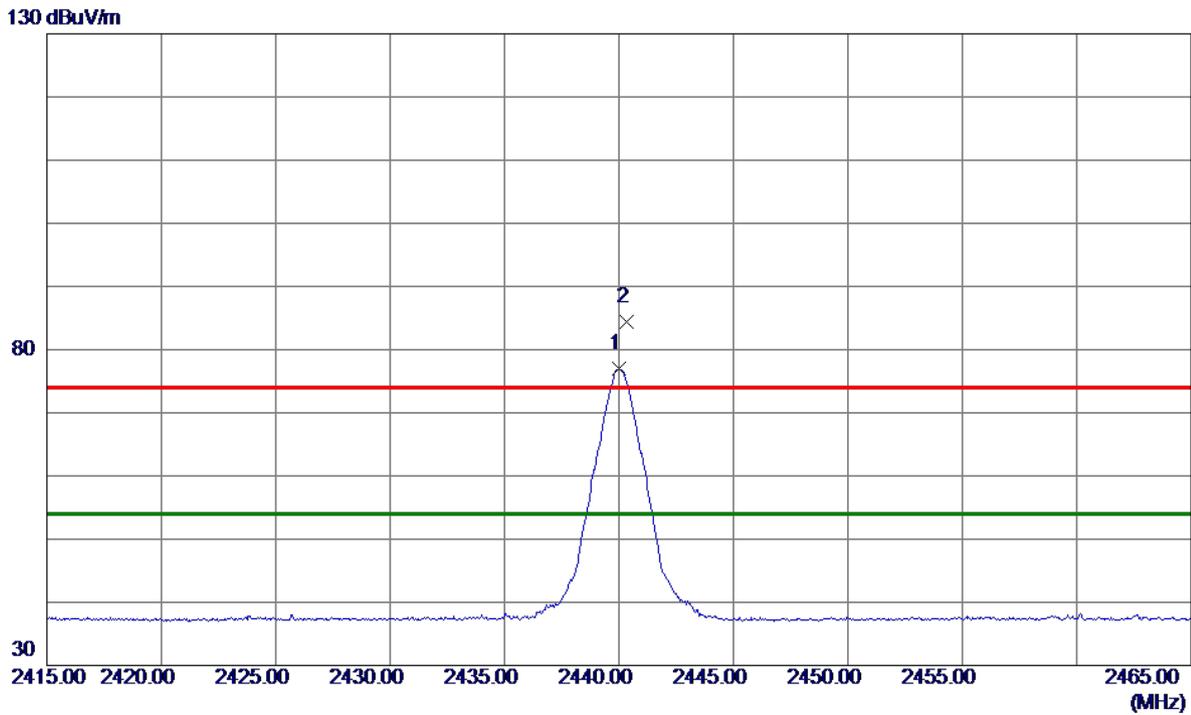


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4880.0070	51.34	4.60	55.94	74.00	-18.06	Peak	
2 *	4880.0350	43.97	4.60	48.57	54.00	-5.43	AVG	

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

Test Mode : TX 2440 MHz \_CH20

### Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.0000	69.69	7.25	76.94	54.00	22.94	AVG	No Limit
2	2440.3500	77.11	7.25	84.36	74.00	10.36	Peak	No Limit

**REMARKS:**

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

Test Mode : TX 2440 MHz \_CH20

### Horizontal



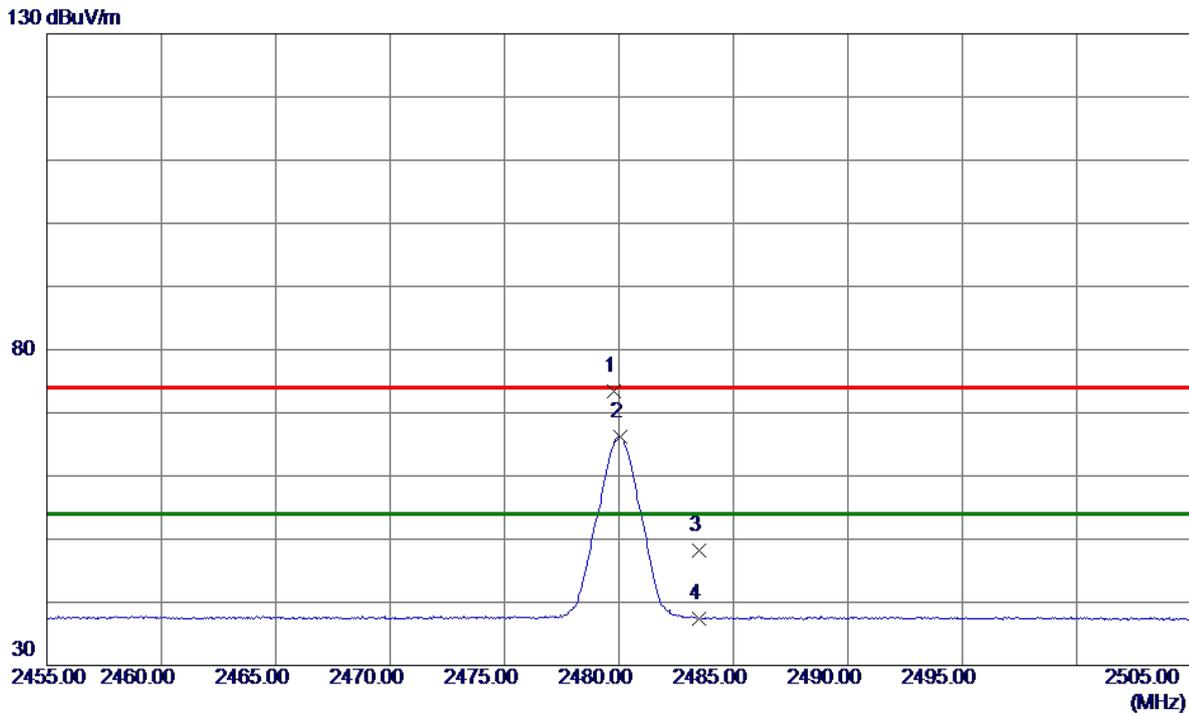
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4880.0000	38.24	4.60	42.84	54.00	-11.16	AVG	
2	4882.0630	47.38	4.61	51.99	74.00	-22.01	Peak	

**REMARKS:**

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

Test Mode : TX 2480 MHz \_CH40

### 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	66.16	7.25	73.41	74.00	-0.59	Peak	No Limit
2 *	2480.0500	58.89	7.25	66.14	54.00	12.14	AVG	No Limit
3	2483.5000	40.93	7.25	48.18	74.00	-25.82	Peak	
4	2483.5000	30.22	7.25	37.47	54.00	-16.53	AVG	

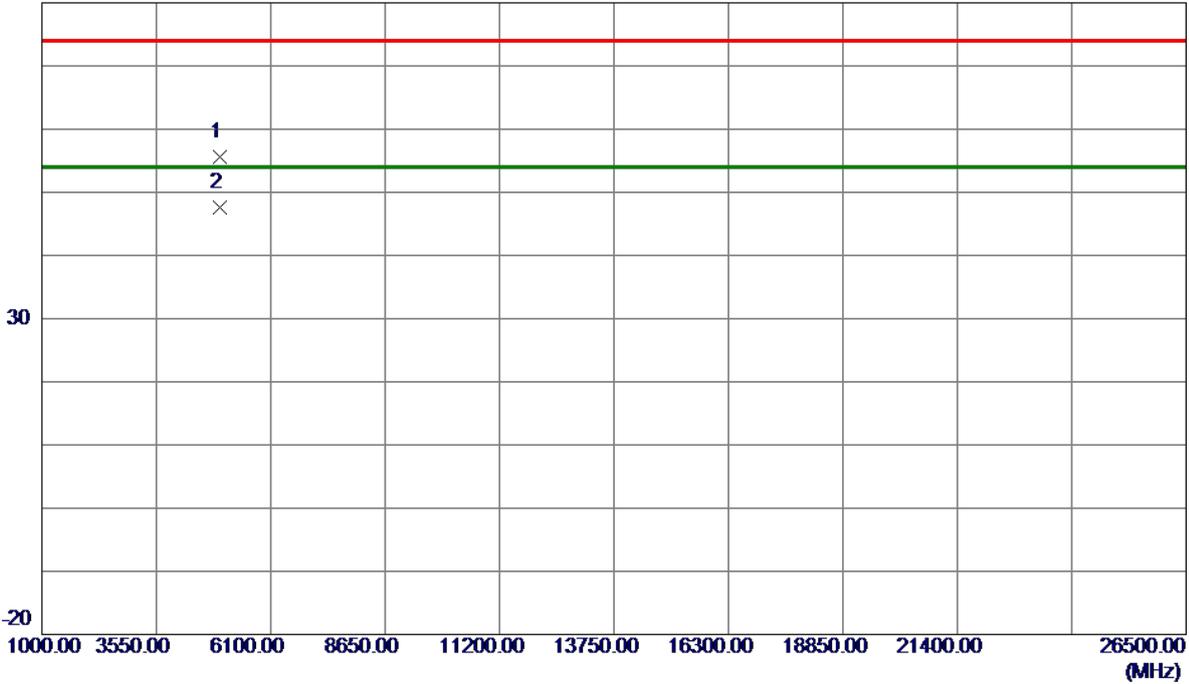
**REMARKS:**

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

Test Mode : TX 2480 MHz \_CH40

**Vertical**

80 dBuV/m



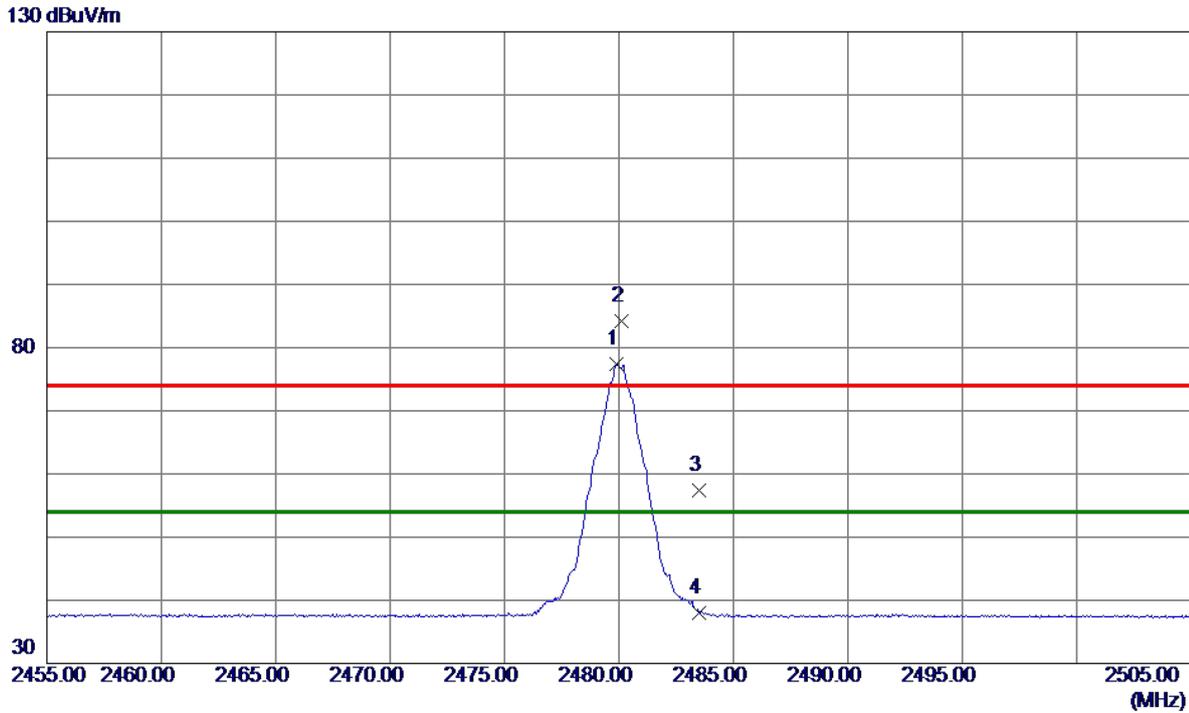
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4959.3300	50.71	4.81	55.52	74.00	-18.48	Peak	
2 *	4960.0120	42.72	4.81	47.53	54.00	-6.47	AVG	

**REMARKS:**

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

Test Mode : TX 2480 MHz \_CH40

### Horizontal

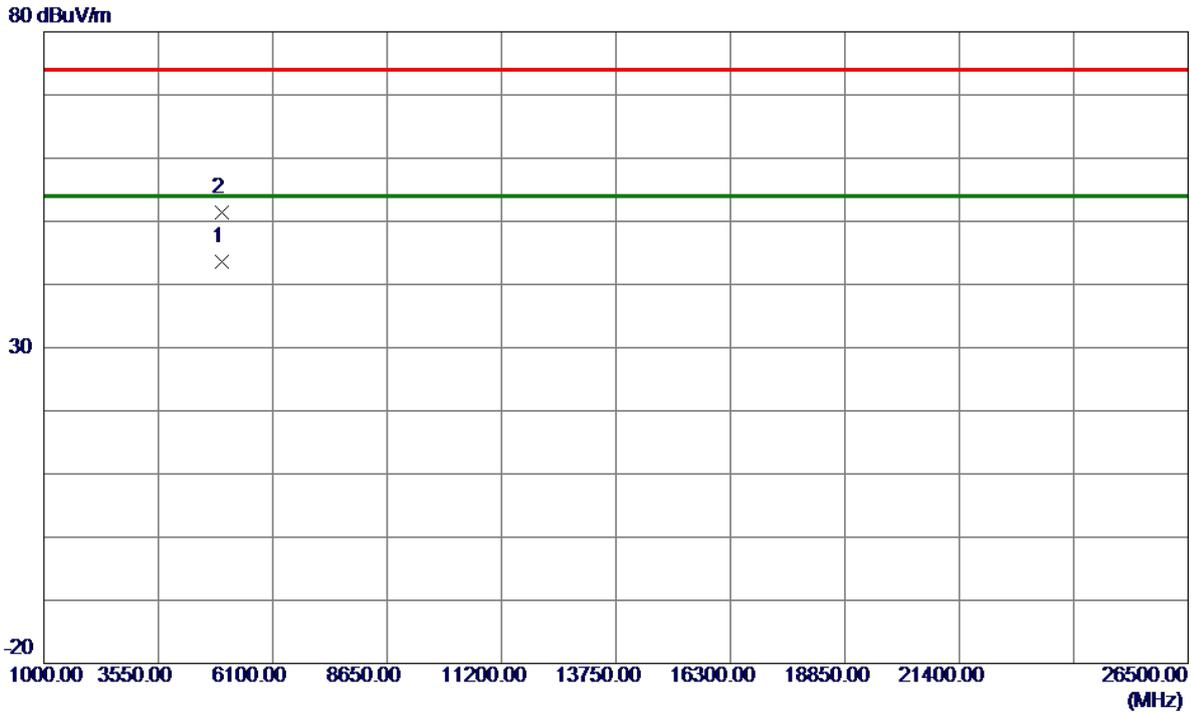


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2479.9000	70.20	7.25	77.45	54.00	23.45	AVG	No Limit
2	2480.1000	76.94	7.25	84.19	74.00	10.19	Peak	No Limit
3	2483.5000	50.22	7.25	57.47	74.00	-16.53	Peak	
4	2483.5000	30.84	7.25	38.09	54.00	-15.91	AVG	

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

Test Mode : TX 2480 MHz \_CH40

### Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4960.0400	38.86	4.81	43.67	54.00	-10.33	AVG	
2	4960.0750	46.62	4.81	51.43	74.00	-22.57	Peak	

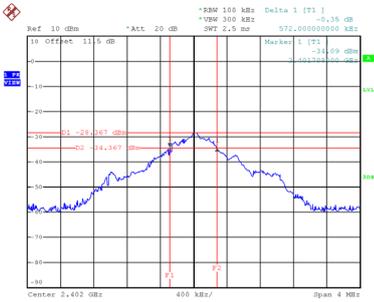
REMARKS:  
 (1) Measurement Value = Reading Level + Correct Factor.  
 (2) Margin Level = Measurement Value - Limit Value.

## APPENDIX D - BANDWIDTH

Test Mode: CH01, CH20, CH40

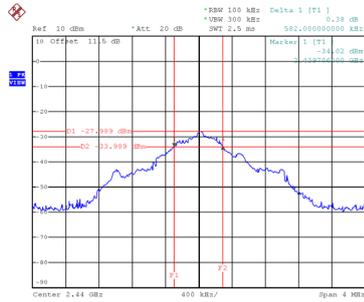
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
01	2402	0.572	2.064	500	Pass
20	2440	0.582	2.080	500	Pass
40	2480	0.596	2.080	500	Pass

**CH01**



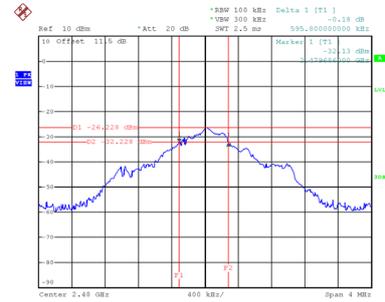
Date: 3.DEC.2020 13:39:50

**CH20  
6 dB Bandwidth**



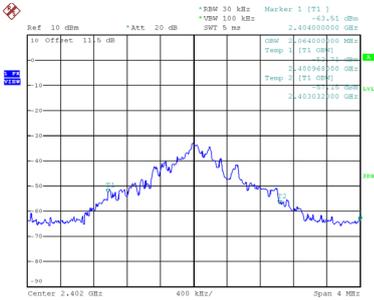
Date: 3.DEC.2020 13:50:46

**CH40**

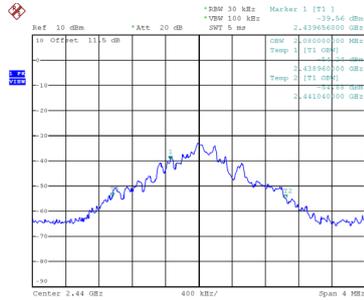


Date: 3.DEC.2020 13:55:05

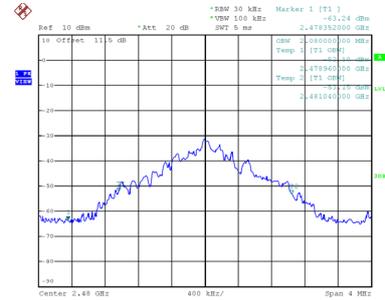
**99 % Emission Bandwidth**



Date: 3.DEC.2020 13:38:25



Date: 3.DEC.2020 13:51:22

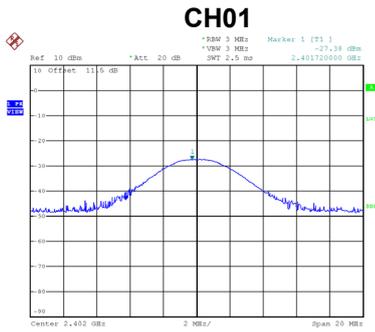


Date: 3.DEC.2020 13:55:41

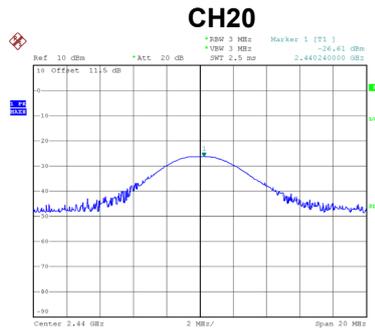
## **APPENDIX E - MAXIMUM OUTPUT POWER**

Test Mode : CH01, CH20, CH40

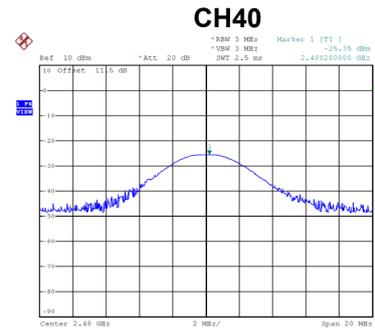
Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-27.38	0.0018	30.00	1.00	Pass
2440	-26.61	0.0022	30.00	1.00	Pass
2480	-25.35	0.0029	30.00	1.00	Pass



Date: 3.DEC.2020 13:37:49



Date: 2.DEC.2020 10:34:15

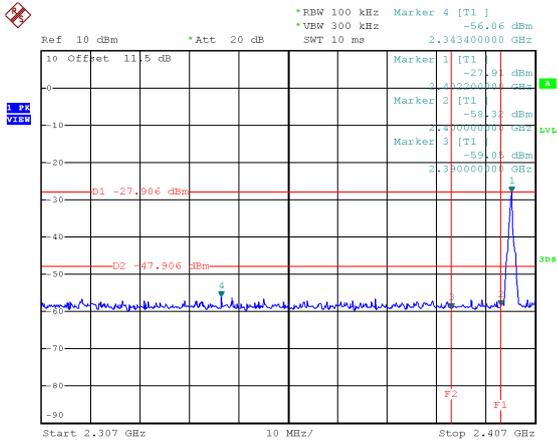


Date: 3.DEC.2020 13:57:31

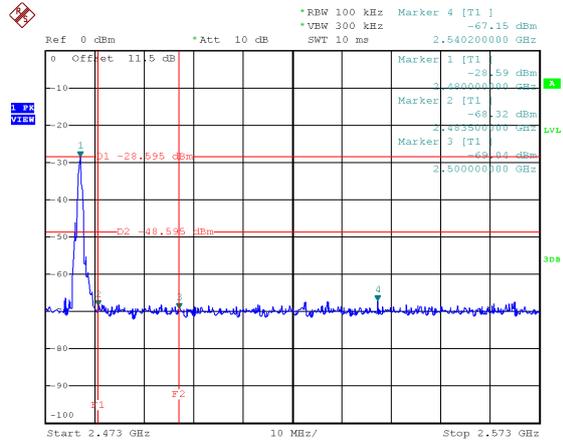
## **APPENDIX F - CONDUCTED SPURIOUS EMISSION**

Test Mode : CH01, CH20, CH40

### Bandedge CH01 (Lower)



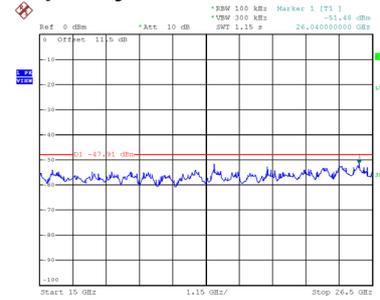
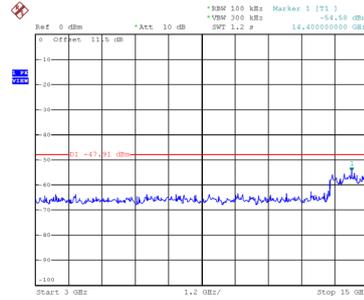
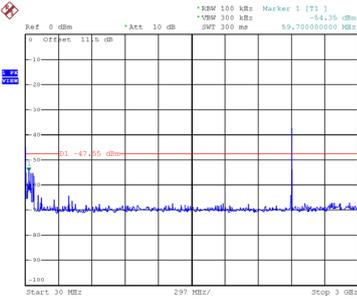
### Bandedge CH40 (Upper)



Date: 3.DEC.2020 13:40:44

Date: 3.DEC.2020 14:20:30

### CH01 – 10th Harmonic of the fundamental frequency

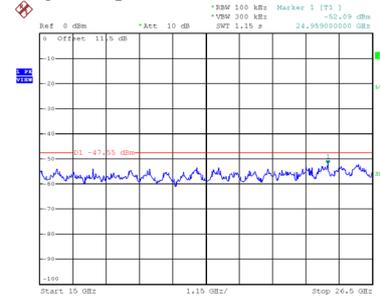
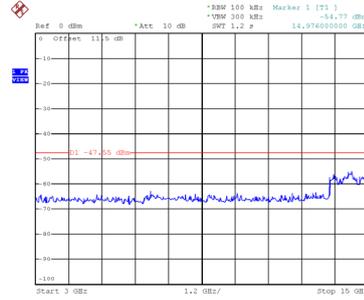
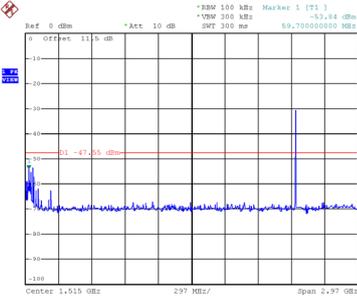


Date: 3.DEC.2020 18:53:46

Date: 3.DEC.2020 17:53:04

Date: 3.DEC.2020 17:53:11

### CH20 – 10th Harmonic of the fundamental frequency

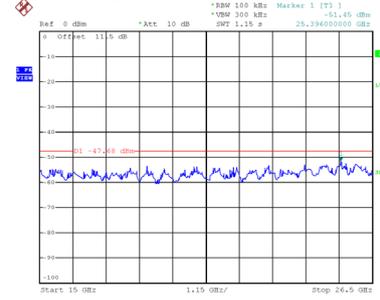
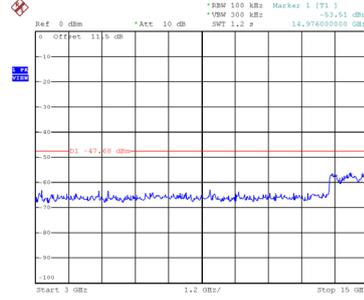
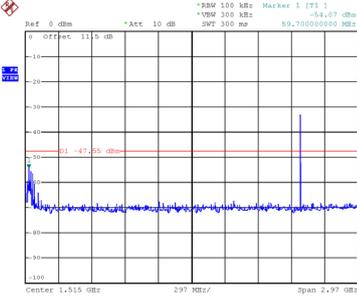


Date: 3.DEC.2020 17:58:13

Date: 3.DEC.2020 17:53:23

Date: 3.DEC.2020 17:53:30

### CH40 – 10th Harmonic of the fundamental frequency



Date: 3.DEC.2020 18:46:19

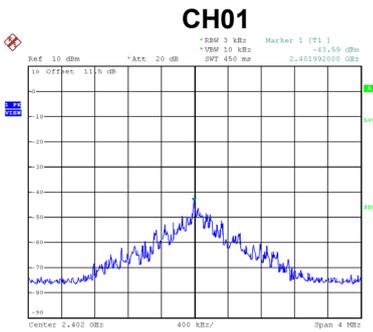
Date: 3.DEC.2020 14:12:09

Date: 3.DEC.2020 14:12:03

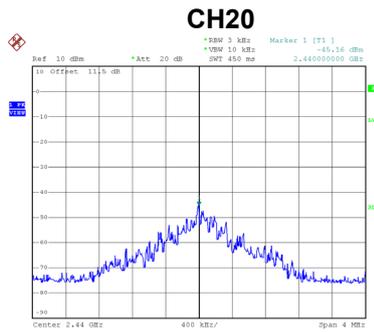
## **APPENDIX G - POWER SPECTRAL DENSITY**

Test Mode: CH01, CH20, CH40

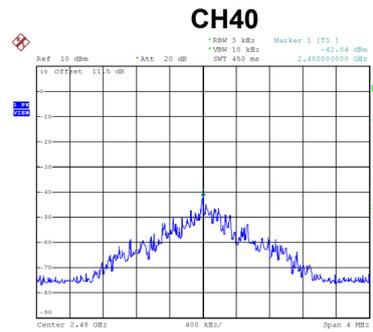
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
01	2402	-43.59	8.00	Pass
20	2440	-45.16	8.00	Pass
40	2480	-42.04	8.00	Pass



Date: 3.DEC.2020 13:37:13



Date: 9.DEC.2020 09:22:52



Date: 3.DEC.2020 13:56:55

End of Test Report