

# FCC Radio Test Report

## FCC ID: I4L-DN01

This report concerns: **Original Grant**

**Project No.** : 2011C074  
**Equipment** : 2.4GHz Transceiver  
**Brand Name** : MSI  
**Test Model** : DN01  
**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.  
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**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. 13, 2020 ~ Nov. 27, 2020  
**Issued Date** : Dec. 25, 2020  
**Report Version** : R01  
**Test Sample** : Engineering Sample No.: DG2020111156 for conducted,  
DG2020111157 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	APPENDIX A	PASS	-----
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	-----
15.247(a)(2)	Bandwidth	APPENDIX E	PASS	-----
15.247(b)(3)	Maximum Output Power	APPENDIX F	PASS	-----
15.247(d)	Conducted Spurious Emission	APPENDIX G	PASS	-----
15.247(e)	Power Spectral Density	APPENDIX H	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. AC power line conducted emissions Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150kHz ~ 30MHz	2.68

### B. 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

### C. 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
AC Power Line Conducted Emissions	25°C	53%	AC 120V/60Hz	Hand Huang
Radiated Emissions-9K-30MHz	25°C	60%	DC 5V	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	26°C	52%	DC 5V	Kwok Guo
Radiated Emissions-Above 1000 MHz	26°C	52%	DC 5V	Kwok Guo
Bandwidth	24°C	52%	DC 5V	Jesse Wang
Maximum Output Power	24°C	52%	DC 5V	Hand Huang
Conducted Spurious Emission	24°C	52%	DC 5V	Jesse Wang
Power Spectral Density	24°C	52%	DC 5V	Jesse Wang

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4GHz Transceiver
Brand Name	MSI
Test Model	DN01
Series Model	N/A
Model Difference(s)	N/A
Power Source	Supplied from USB port.
Power Rating	DC 5V 100mA
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Bit Rate of Transmitter	2Mbps
Max. Output Power	-0.24 dBm (0.0009 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)
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	-2.36

## 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.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 2	TX Mode Channel 40

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>

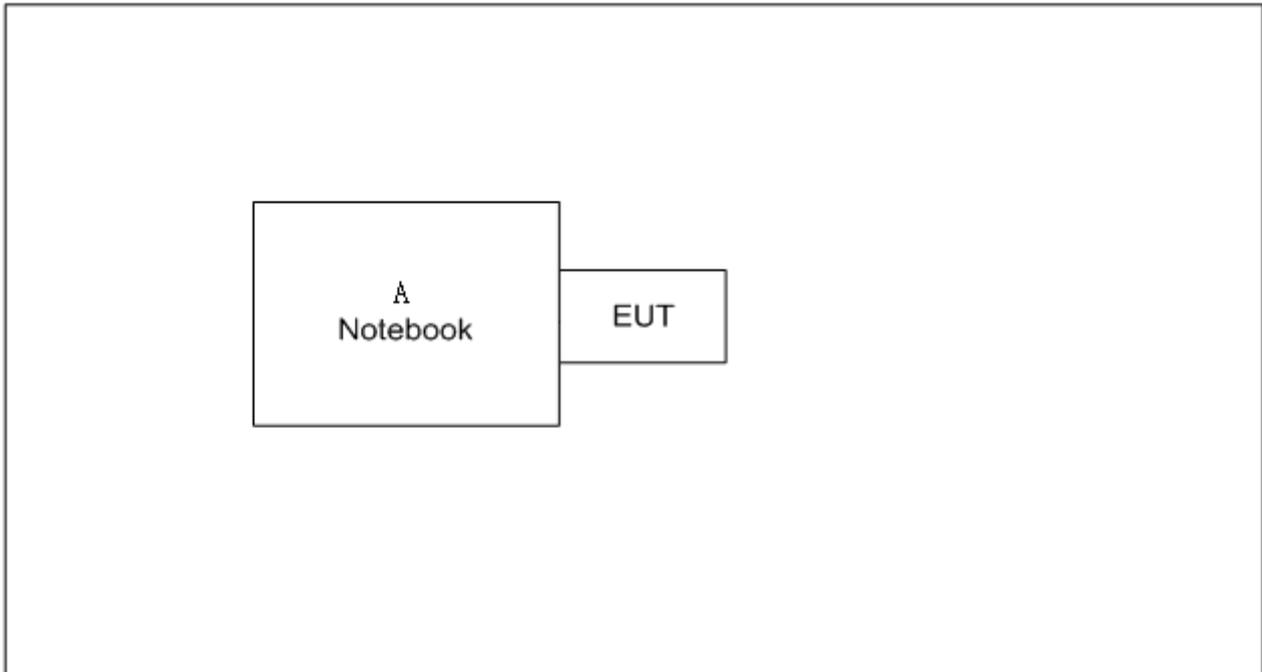
Note:

- (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 AC power line conducted emissions and radiated spurious emissions below 1 GHz test, the channel 40 is found to be the worst case and recorded

## 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	SE67T_FccTest_V6.9.0		
Frequency (MHz)	2402	2440	2480
2Mbps	6	6	7

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

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

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

### 3. AC POWER LINE CONDUCTED EMISSIONS TEST

#### 3.1 LIMIT

Frequency of Emission (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

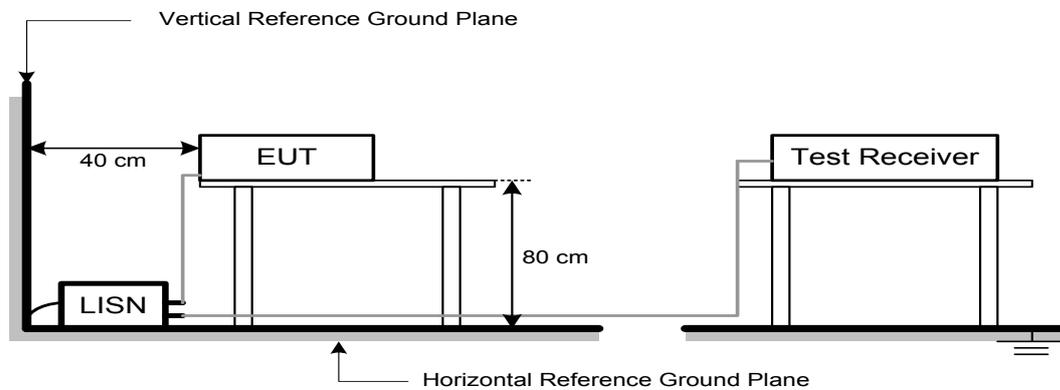
#### 3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. 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



### 3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

### 3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of [Note] . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a "\*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.

#### 4. RADIATED EMISSION TEST

##### 4.1 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

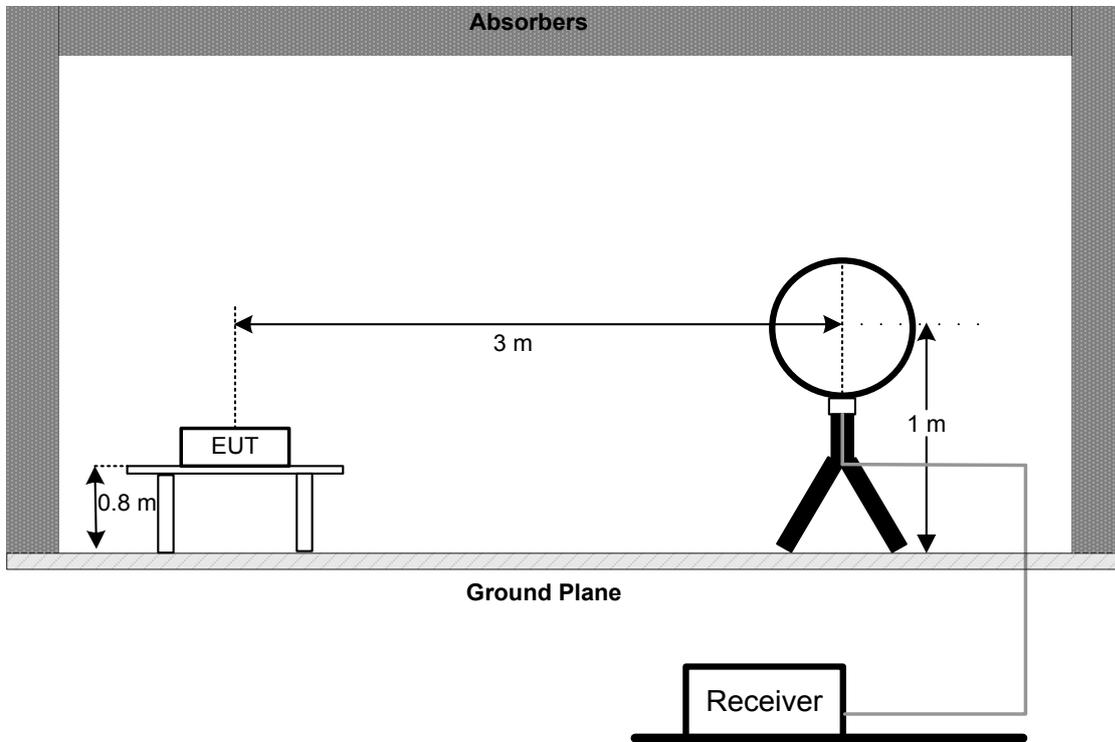
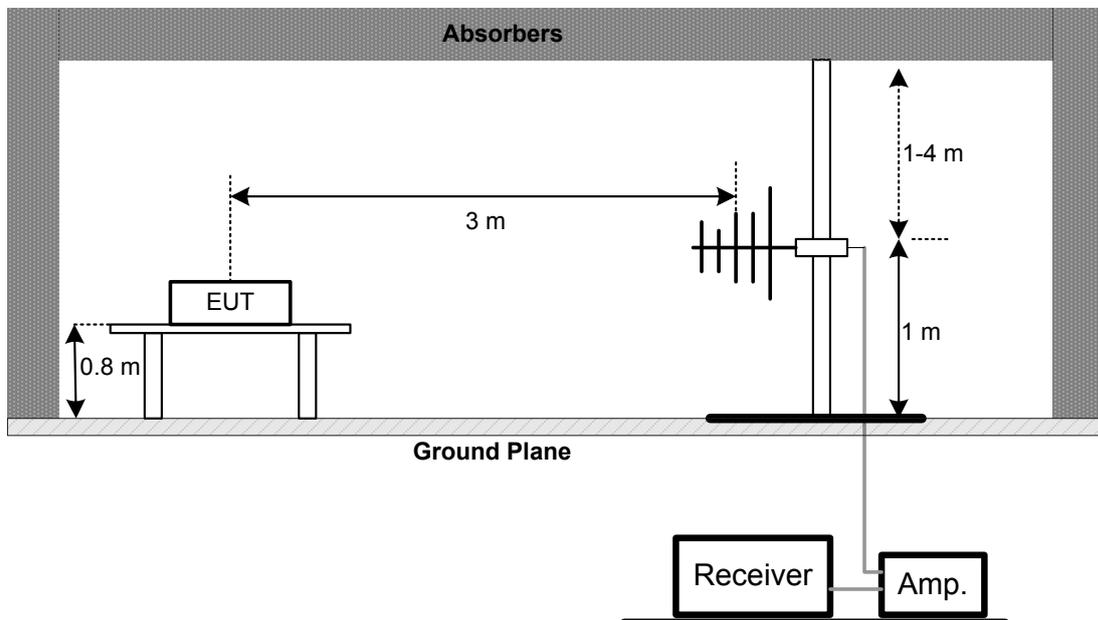
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000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

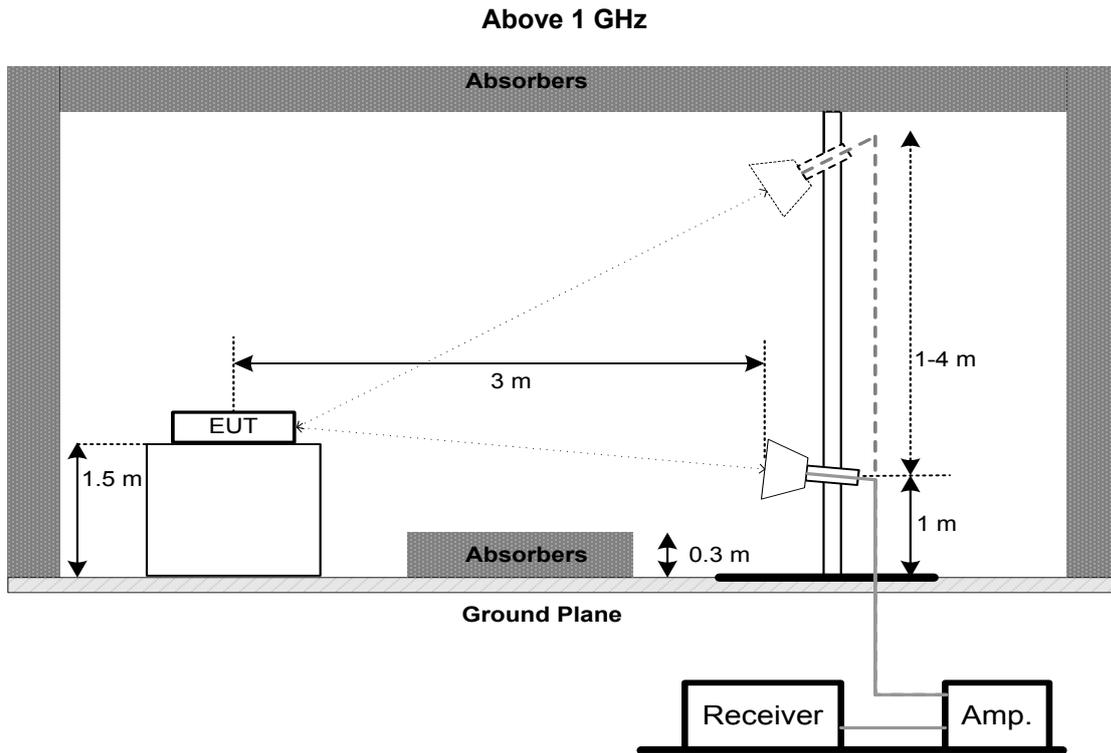
#### 4.2 TEST PROCEDURE

- 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.

#### 4.3 DEVIATION FROM TEST STANDARD

No deviation

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



#### 4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.6 TEST RESULT - 9 kHz TO 30 MHz

Please refer to the APPENDIX B

Remark:

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

#### 4.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

#### 4.8 TEST RESULT - ABOVE 1000 MHz

Please refer to the APPENDIX D.

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)		
Section	Test Item	Limit
15.247(a)(2)	Bandwidth	>= 500 kHz (6 dB bandwidth)

**5.2 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:  
 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.

**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. MAXIMUM OUTPUT POWER****6.1 LIMIT**

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

### 7.1 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.

### 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= 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 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. POWER SPECTRAL DENSITY TEST

### 8.1 LIMIT

FCC Part15, Subpart C (15.247)		
Section	Test Item	Limit
15.247(e)	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 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 8.6 TEST RESULTS

Please refer to the APPENDIX H.

**9. MEASUREMENT INSTRUMENTS LIST**

AC Power Line Conducted Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Feb. 28, 2021
2	LISN	EMCO	3816/2	52765	Mar. 01, 2021
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Feb. 28, 2021
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 01, 2021
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 10, 2021
7	643 Shield Room	ETS	6*4*3m	N/A	N/A

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 Preamplifier 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

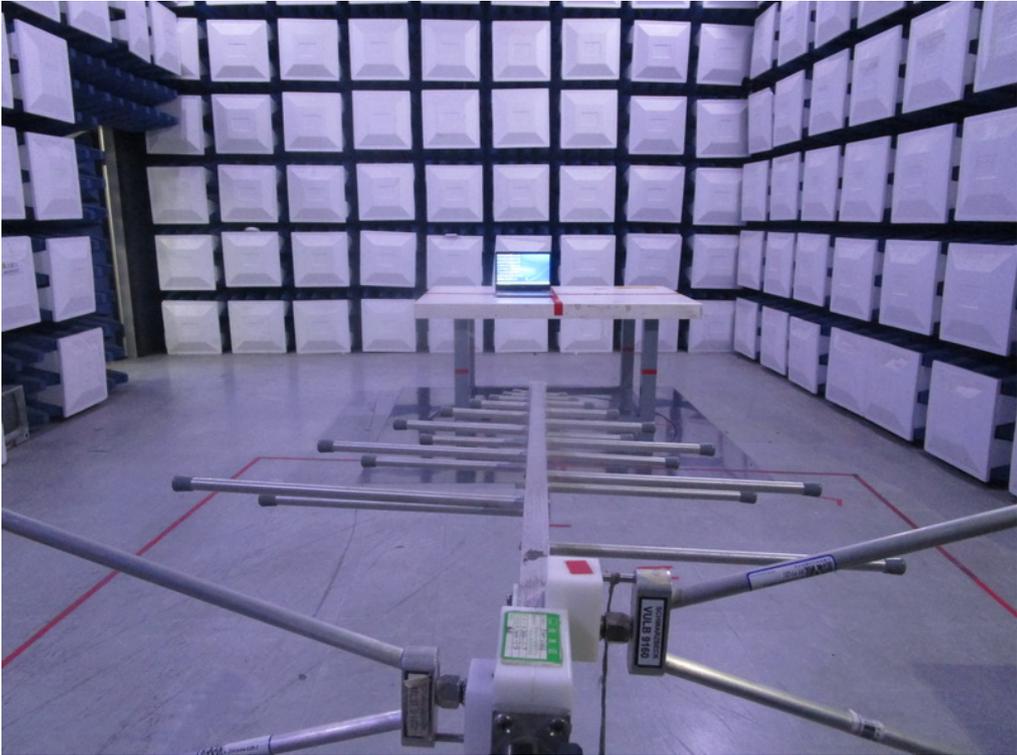
Remark: "N/A" denotes no model name, serial no. or calibration specified.

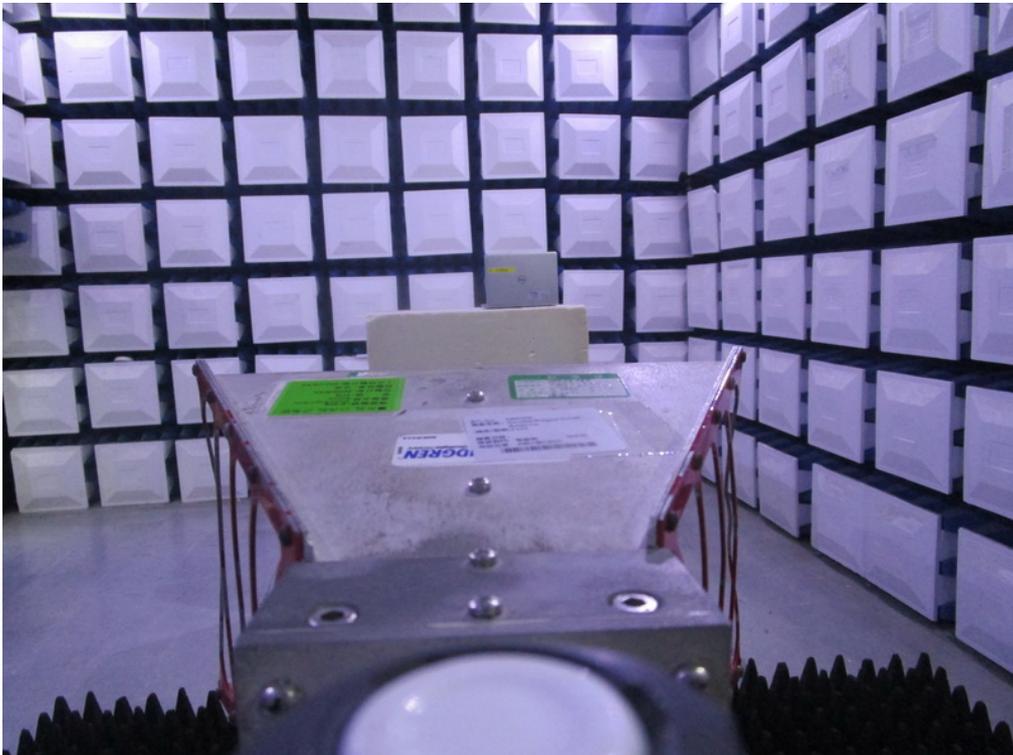
"\*" calibration period of equipment list is three year.

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

**10. EUT TEST PHOTO****AC Power Line Conducted Emissions Test Photos**

**Radiated Emissions Test Photos****9 kHz to 30 MHz**

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

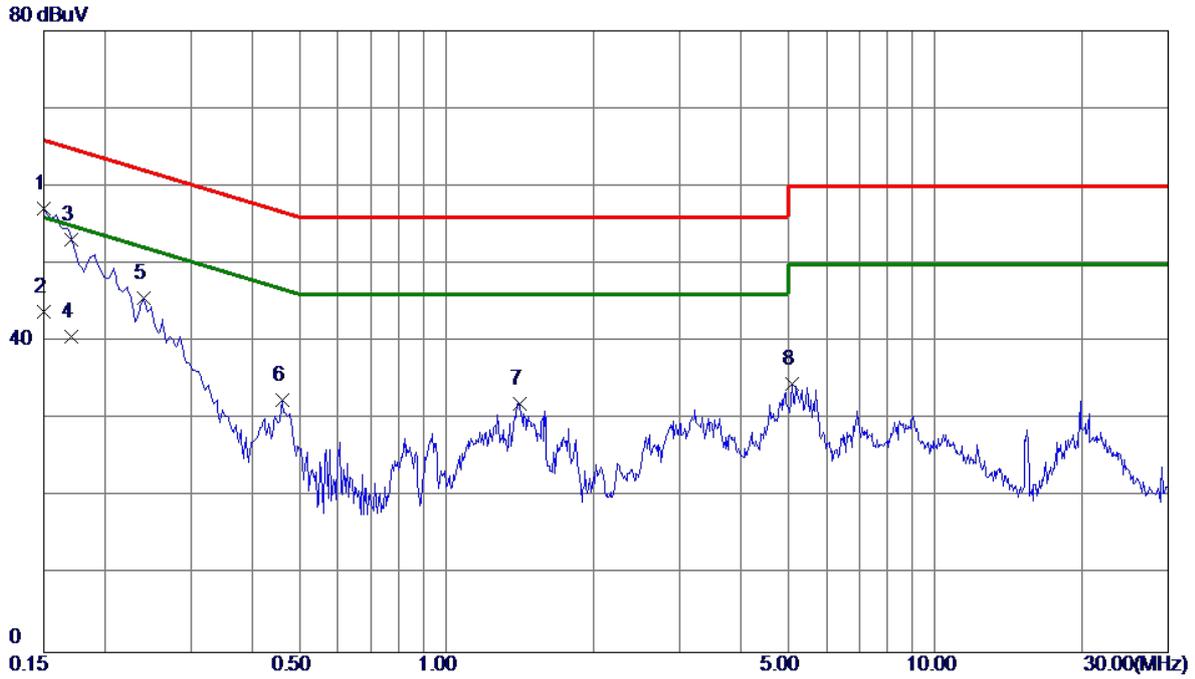
**Radiated Emissions Test Photos****Above 1 GHz**



**APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**

Test Mode: TX Mode Channel 40

Line



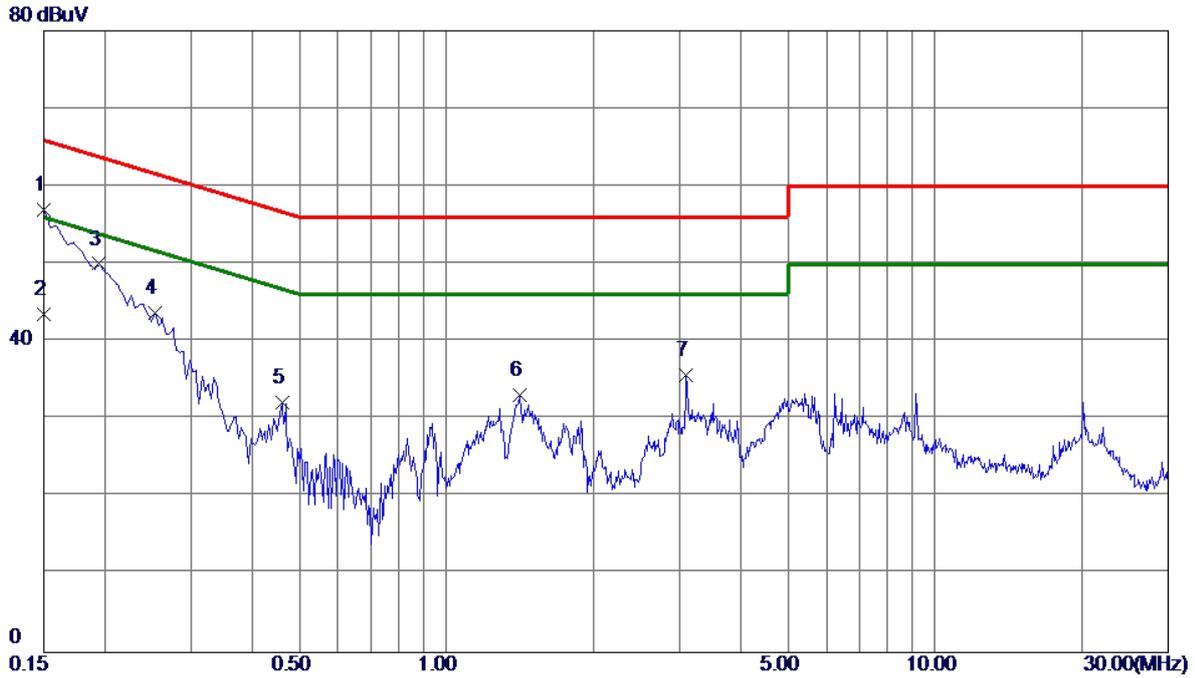
No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	47.41	9.67	57.08	66.00	-8.92	Peak	
2	0.1500	34.20	9.67	43.87	56.00	-12.13	AVG	
3	0.1712	43.30	9.82	53.12	64.90	-11.78	Peak	
4	0.1712	30.80	9.82	40.62	54.90	-14.28	AVG	
5	0.2400	35.77	9.88	45.65	62.10	-16.45	Peak	
6	0.4605	22.54	9.94	32.48	56.68	-24.20	Peak	
7	1.4100	21.93	10.04	31.97	56.00	-24.03	Peak	
8	5.1045	24.27	10.34	34.61	60.00	-25.39	Peak	

REMARKS:

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

Test Mode: TX Mode Channel 40

### Neutral



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	47.29	9.74	57.03	66.00	-8.97	Peak	
2	0.1500	33.80	9.74	43.54	56.00	-12.46	AVG	
3	0.1949	40.01	9.99	50.00	63.83	-13.83	Peak	
4	0.2535	33.63	9.98	43.61	61.64	-18.03	Peak	
5	0.4605	22.06	10.12	32.18	56.68	-24.50	Peak	
6	1.4100	22.83	10.35	33.18	56.00	-22.82	Peak	
7	3.0930	25.19	10.53	35.72	56.00	-20.28	Peak	

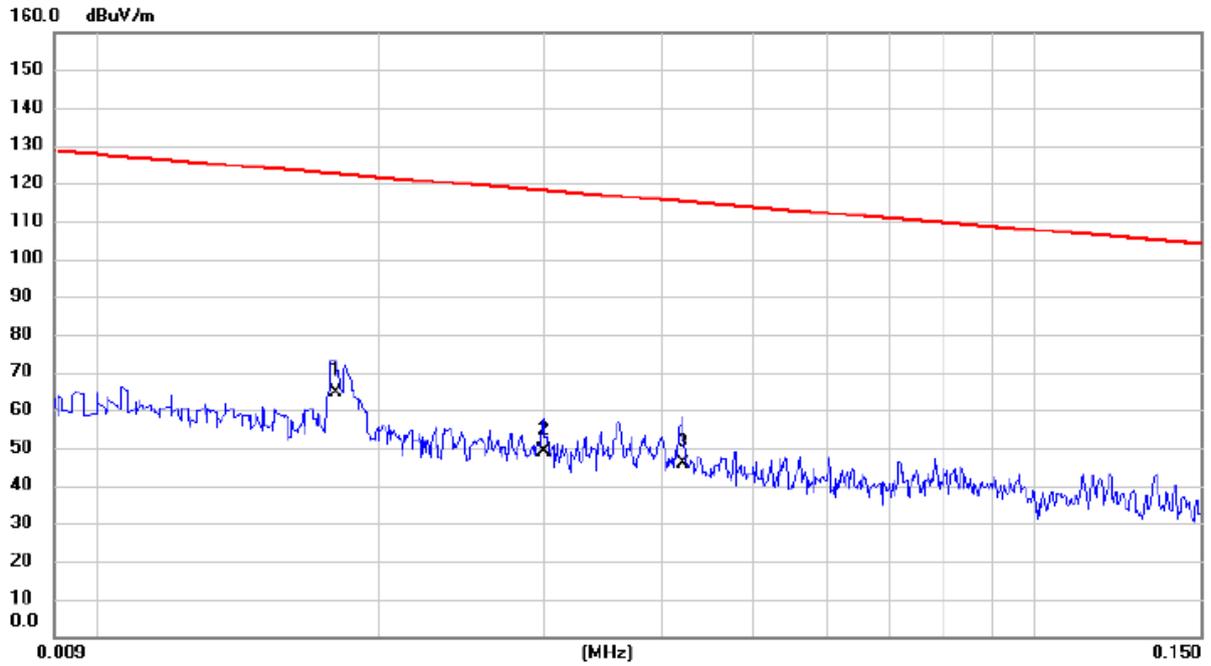
**REMARKS:**

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

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

Test Mode: TX Mode Channel 40

Ant 0°



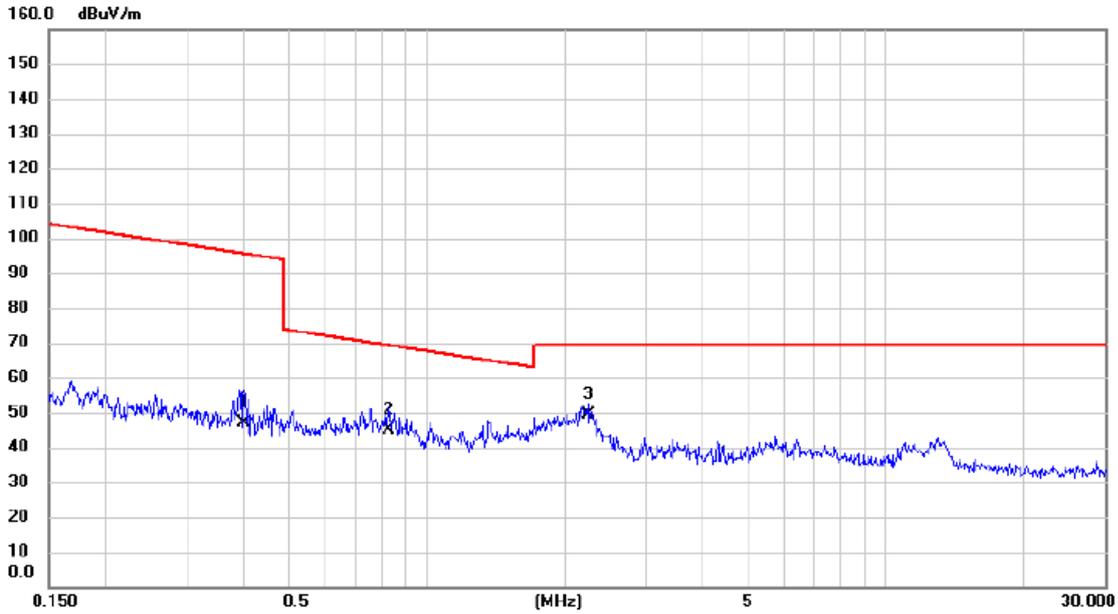
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0180	50.75	13.84	64.59	122.50	-57.91	AVG	
2		0.0300	35.90	12.95	48.85	118.06	-69.21	AVG	
3		0.0422	33.17	12.63	45.80	115.10	-69.30	AVG	

**REMARKS:**

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

Test Mode: TX Mode Channel 40

Ant 0°



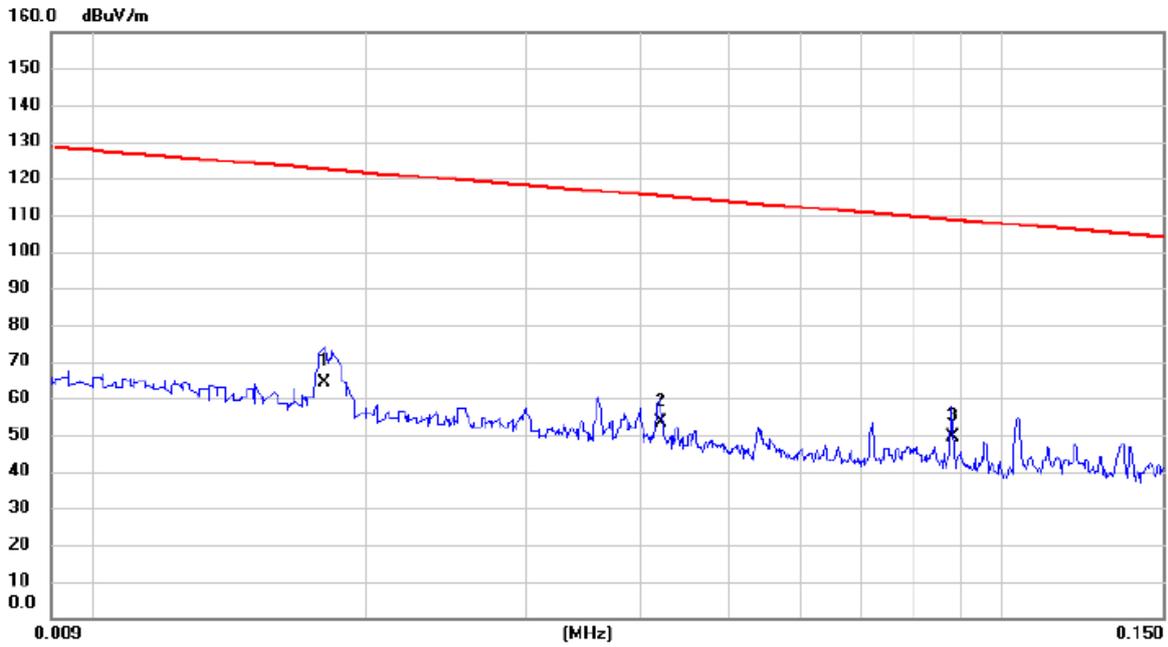
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.3997	34.55	12.26	46.81	95.57	-48.76	AVG	
2		0.8261	32.95	11.87	44.82	69.26	-24.44	QP	
3	*	2.2486	38.17	11.18	49.35	69.54	-20.19	QP	

REMARKS:

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

Test Mode: TX Mode Channel 40

Ant 90°



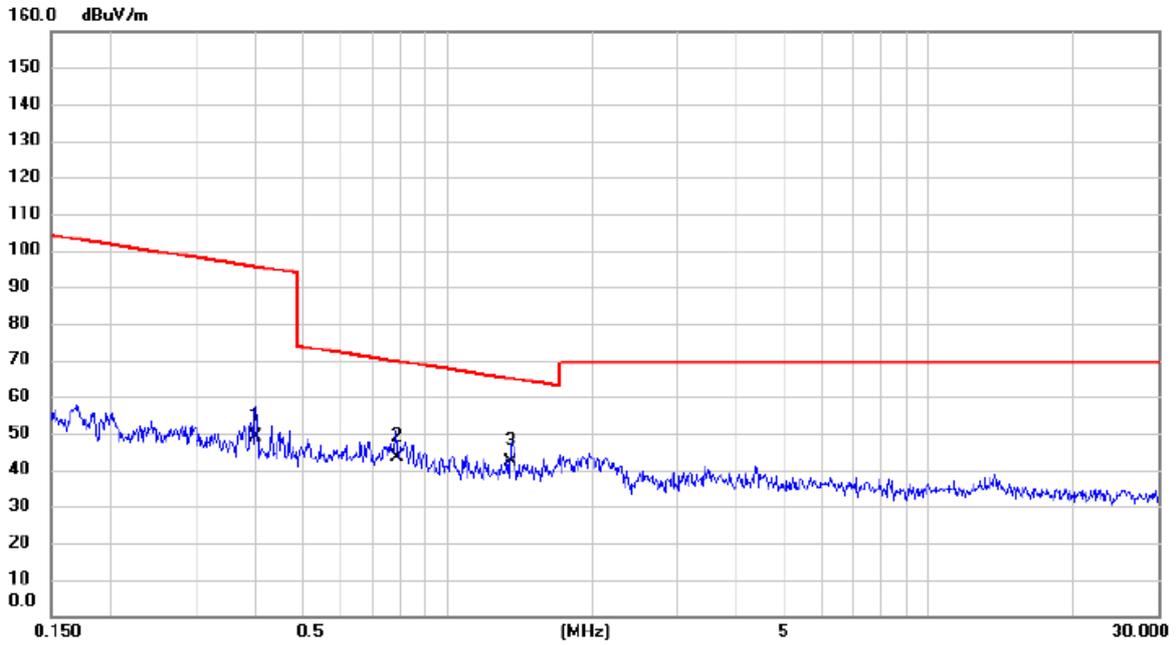
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0180	50.27	13.84	64.11	122.50	-58.39	AVG	
2		0.0421	40.95	12.63	53.58	115.12	-61.54	AVG	
3		0.0881	36.91	12.65	49.56	108.71	-59.15	AVG	

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		0.3997	36.82	12.26	49.08	95.57	-46.49	AVG	
2		0.7835	31.49	11.89	43.38	69.72	-26.34	QP	
3	*	1.3593	30.58	11.62	42.20	64.94	-22.74	QP	

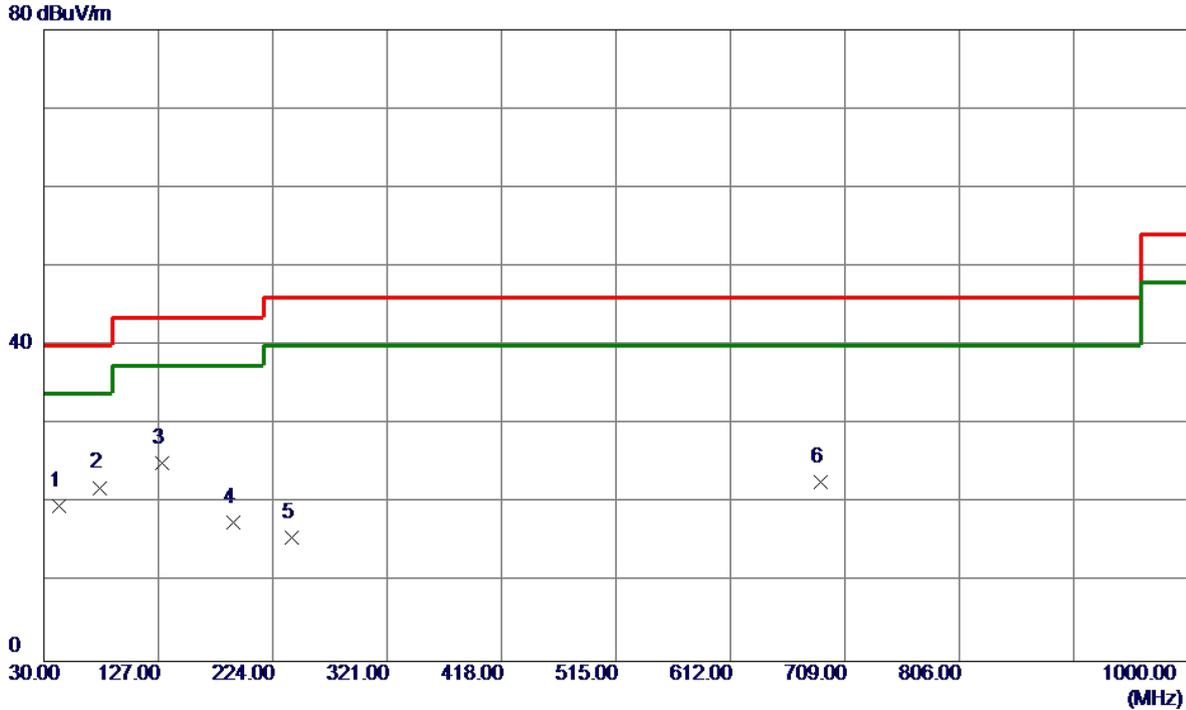
REMARKS:

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

**APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ**

Test Mode: TX Mode Channel 40

### Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	42.6100	34.85	-15.10	19.75	40.00	-20.25	Peak	
2 *	77.5300	40.53	-18.53	22.00	40.00	-18.00	Peak	
3	129.9100	39.49	-14.35	25.14	43.50	-18.36	Peak	
4	191.0200	33.73	-16.14	17.59	43.50	-25.91	Peak	
5	240.4900	31.41	-15.80	15.61	46.00	-30.39	Peak	
6	688.6300	30.51	-7.80	22.71	46.00	-23.29	Peak	

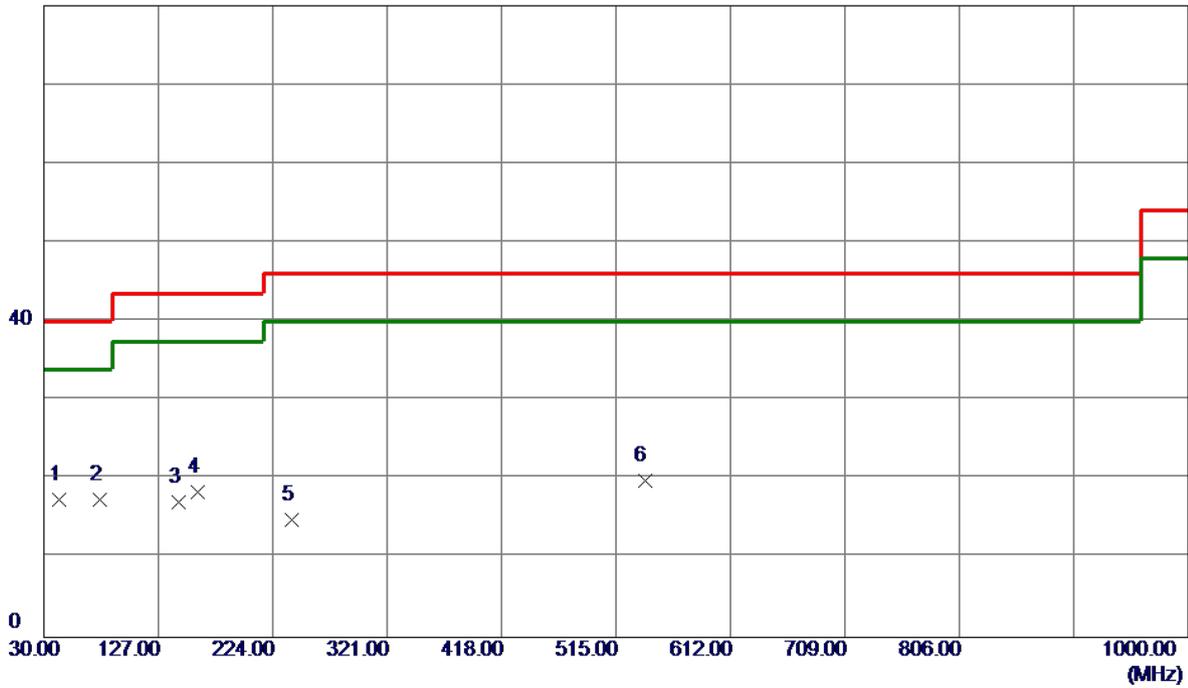
**REMARKS:**

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

Test Mode: TX Mode Channel 40

### 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 *	42.6100	32.59	-15.10	17.49	40.00	-22.51	Peak	
2	77.5300	35.98	-18.53	17.45	40.00	-22.55	Peak	
3	144.4600	31.03	-13.98	17.05	43.50	-26.45	Peak	
4	159.9800	30.91	-12.46	18.45	43.50	-25.05	Peak	
5	240.4900	30.70	-15.80	14.90	46.00	-31.10	Peak	
6	539.2500	30.26	-10.43	19.83	46.00	-26.17	Peak	

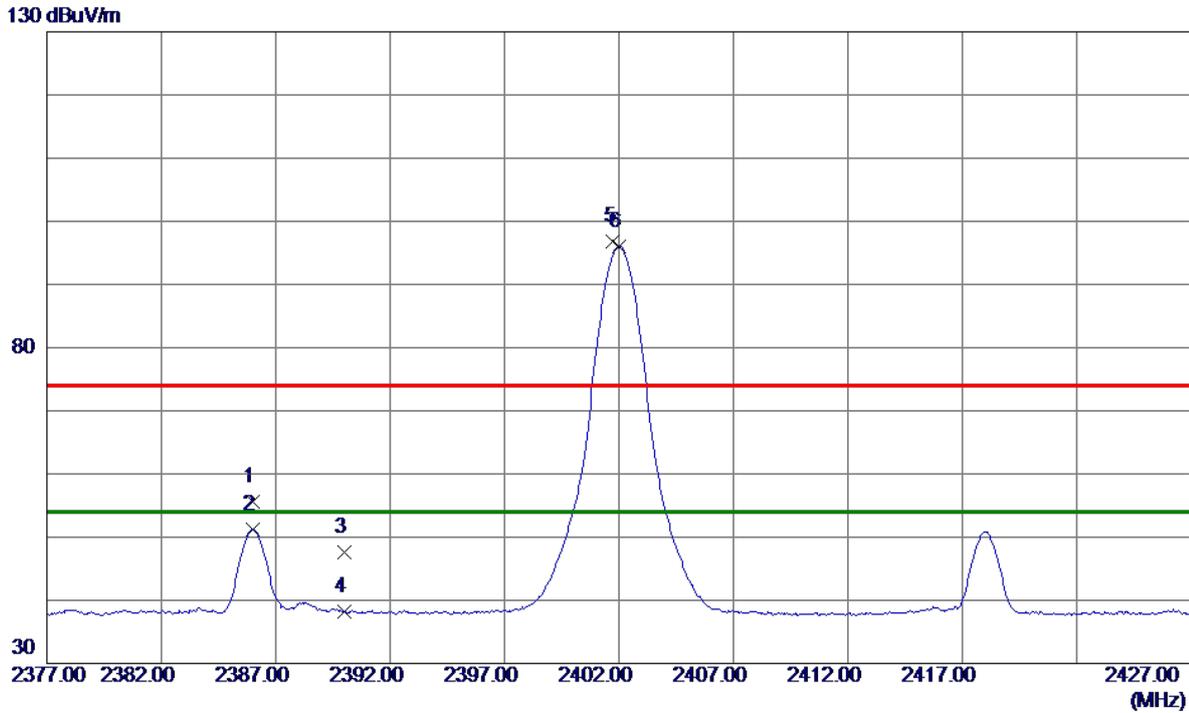
**REMARKS:**

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

**APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ**

Test Mode : TX 2402 MHz \_CH01

**Vertical**

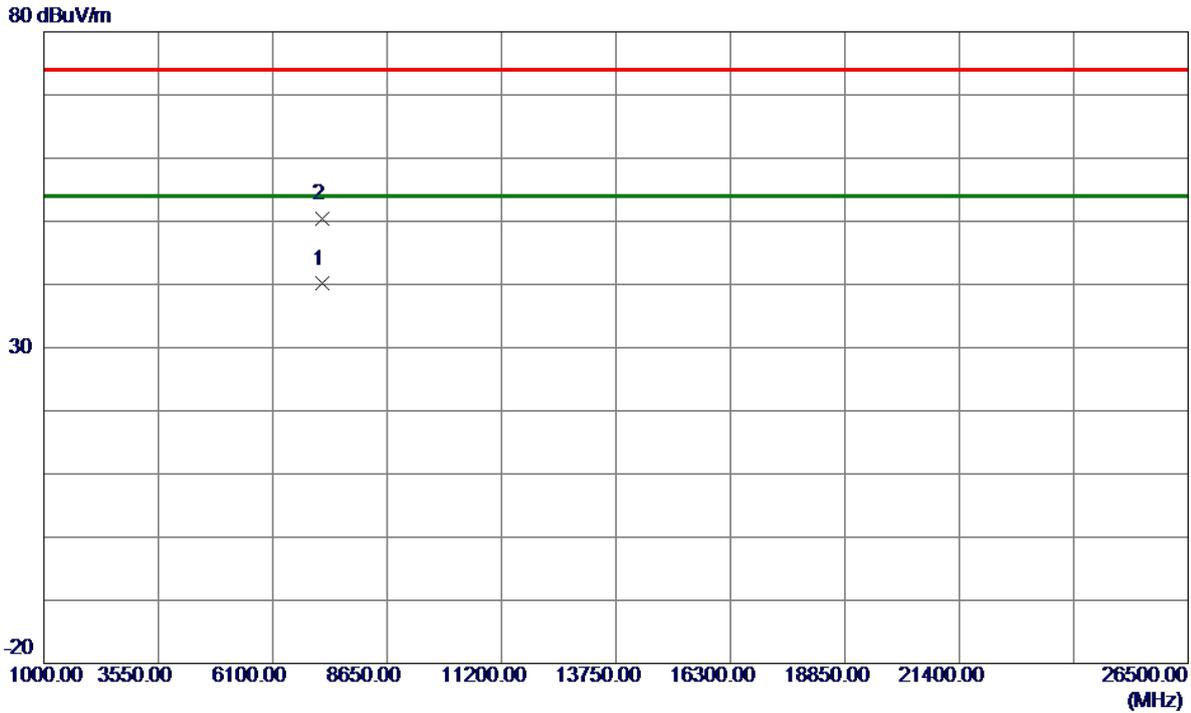


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2386.0000	48.27	7.26	55.53	74.00	-18.47	Peak	
2	2386.0000	43.89	7.26	51.15	54.00	-2.85	AVG	
3	2390.0000	40.34	7.26	47.60	74.00	-26.40	Peak	
4	2390.0000	31.00	7.26	38.26	54.00	-15.74	AVG	
5	2401.7500	89.53	7.26	96.79	74.00	22.79	Peak	No Limit
6 *	2402.0000	88.76	7.26	96.02	54.00	42.02	AVG	No Limit

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

Test Mode : TX 2402 MHz \_CH01

### Vertical

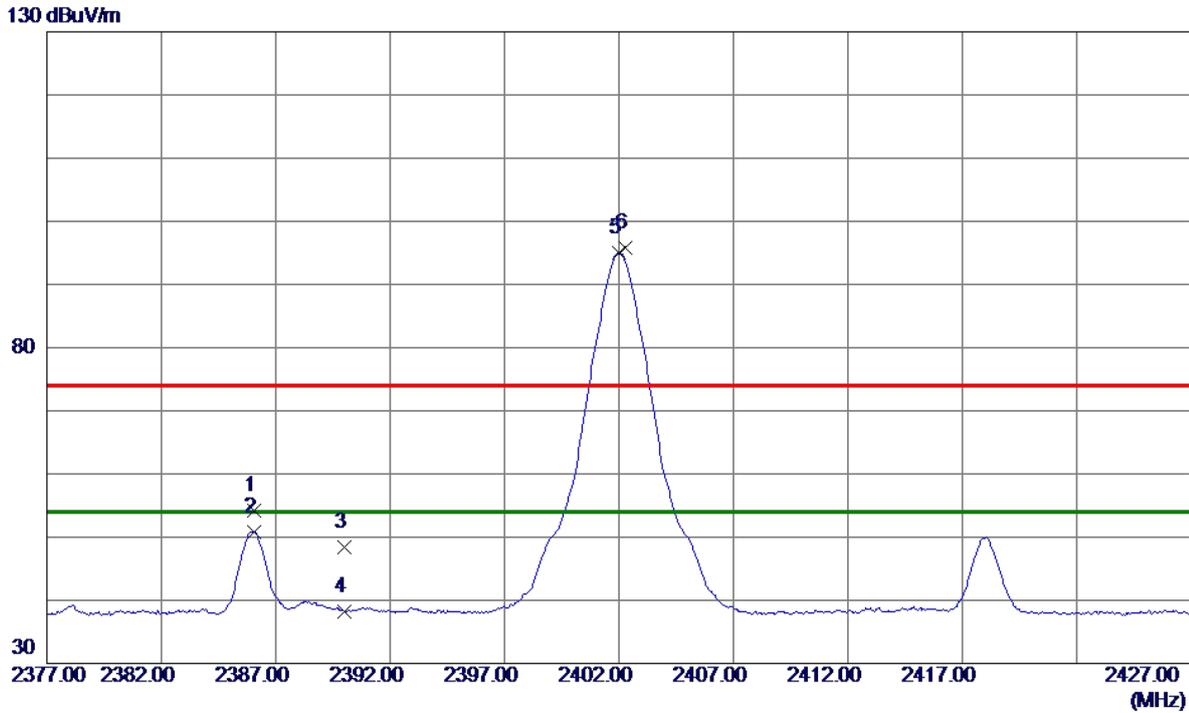


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.0050	29.96	10.14	40.10	54.00	-13.90	AVG	
2	7207.0330	40.22	10.14	50.36	74.00	-23.64	Peak	

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

Test Mode : TX 2402 MHz \_CH01

### Horizontal

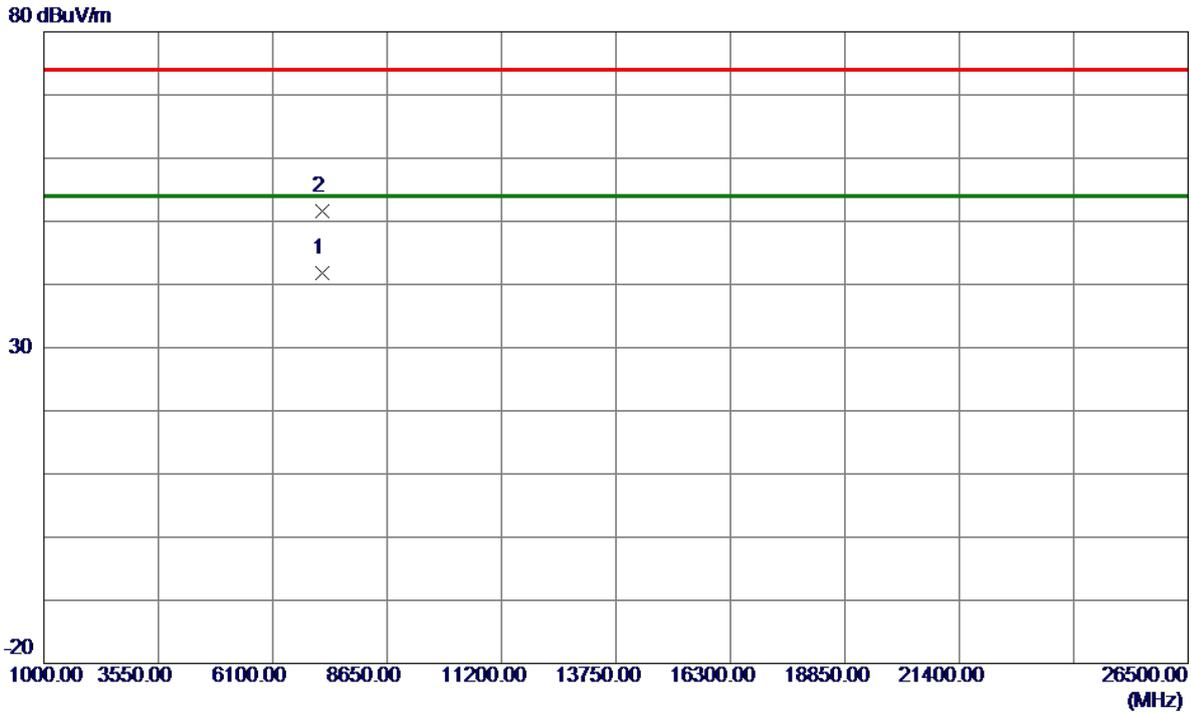


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2386.0500	46.93	7.26	54.19	74.00	-19.81	Peak	
2	2386.0500	43.61	7.26	50.87	54.00	-3.13	AVG	
3	2390.0000	41.19	7.26	48.45	74.00	-25.55	Peak	
4	2390.0000	31.00	7.26	38.26	54.00	-15.74	AVG	
5 *	2402.0000	87.72	7.26	94.98	54.00	40.98	AVG	No Limit
6	2402.3000	88.61	7.26	95.87	74.00	21.87	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

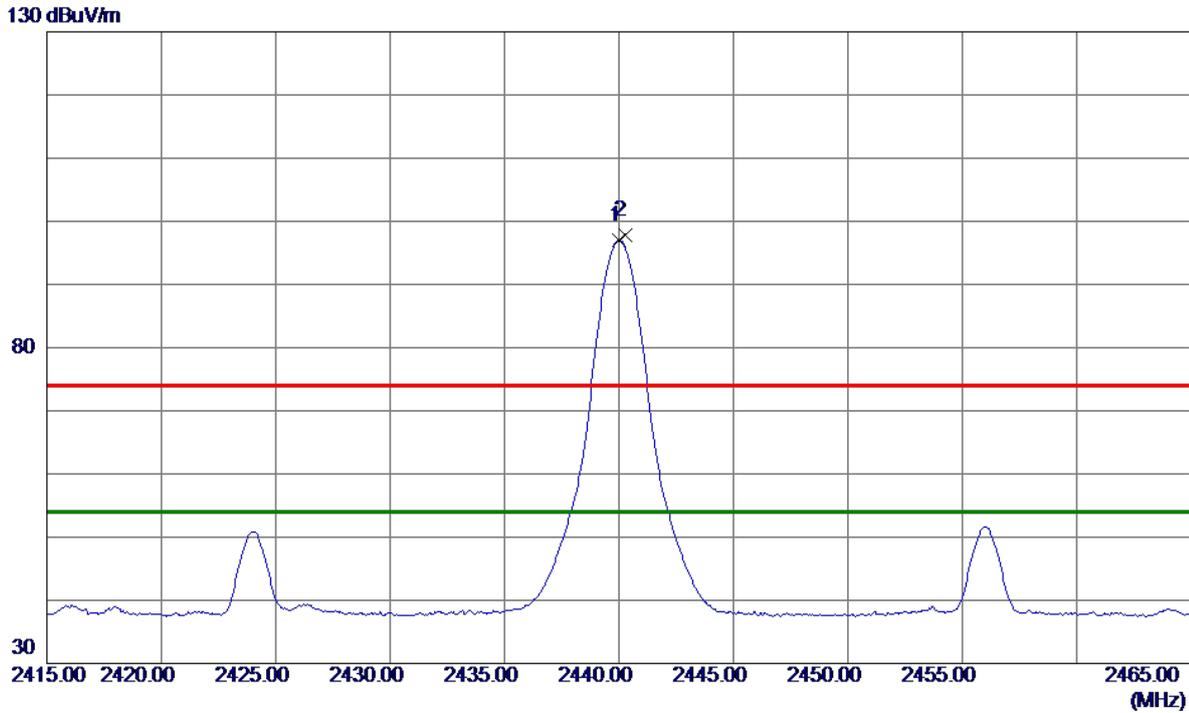


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.0800	31.71	10.14	41.85	54.00	-12.15	AVG	
2	7206.8630	41.41	10.14	51.55	74.00	-22.45	Peak	

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

Test Mode : TX 2440 MHz \_CH20

**Vertical**

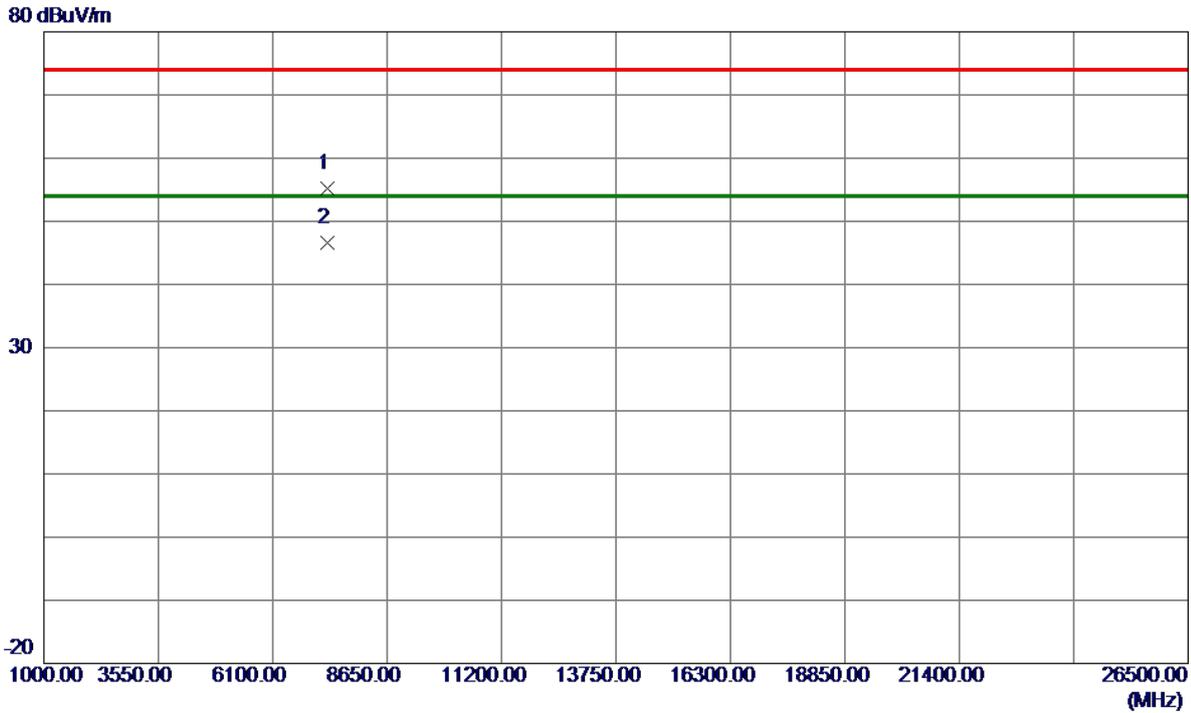


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.0000	89.70	7.25	96.95	54.00	42.95	AVG	No Limit
2	2440.2500	90.61	7.25	97.86	74.00	23.86	Peak	No Limit

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

Test Mode : TX 2440 MHz \_CH20

### Vertical

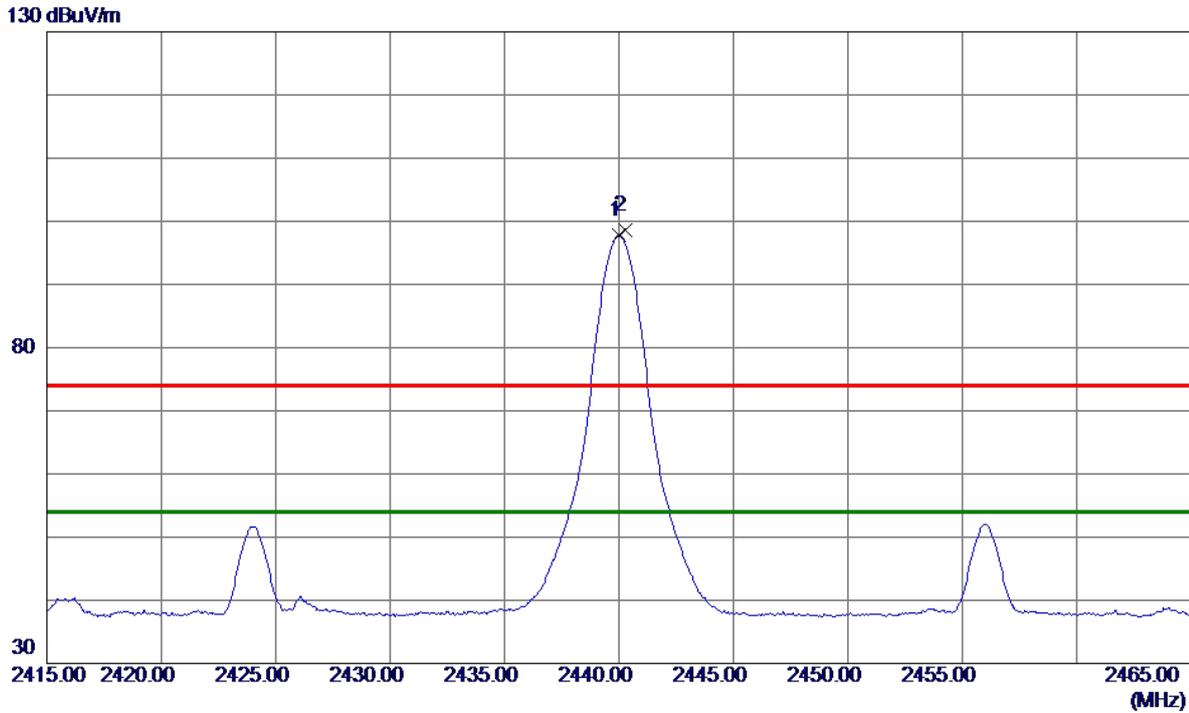


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7319.0070	44.92	10.33	55.25	74.00	-18.75	Peak	
2 *	7319.0630	36.36	10.33	46.69	54.00	-7.31	AVG	

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

Test Mode : TX 2440 MHz \_CH20

### Horizontal

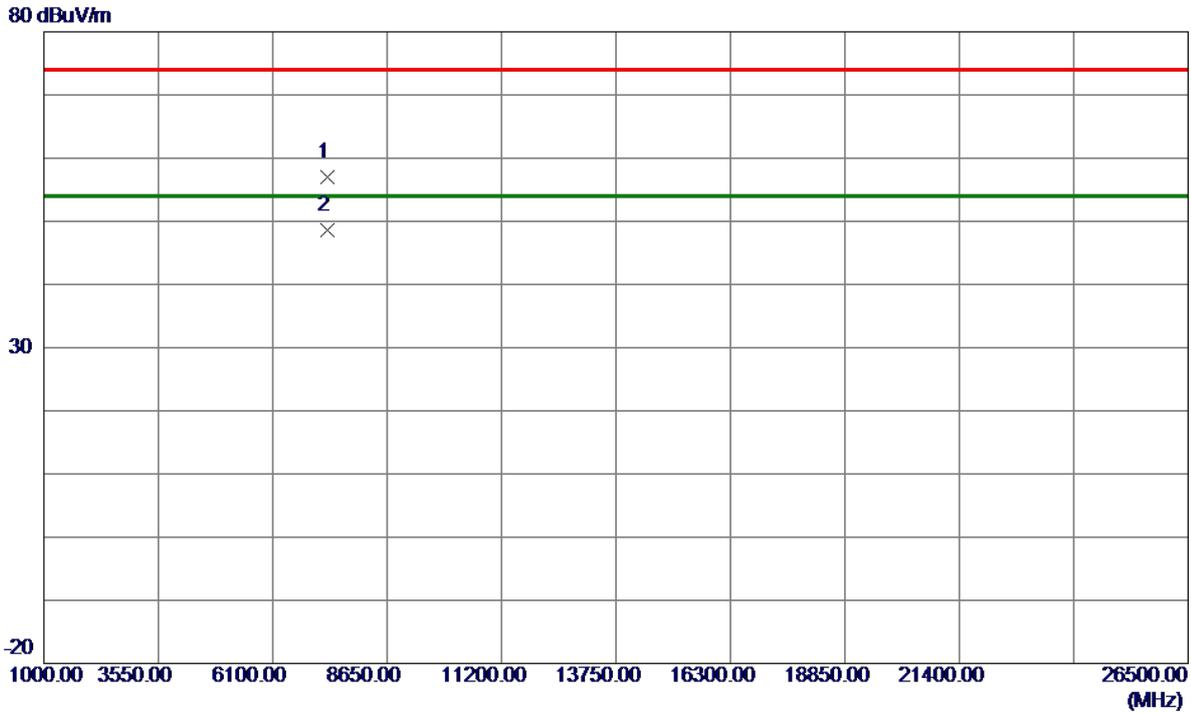


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.0000	90.50	7.25	97.75	54.00	43.75	AVG	No Limit
2	2440.2500	91.40	7.25	98.65	74.00	24.65	Peak	No Limit

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

Test Mode : TX 2440 MHz \_CH20

### Horizontal

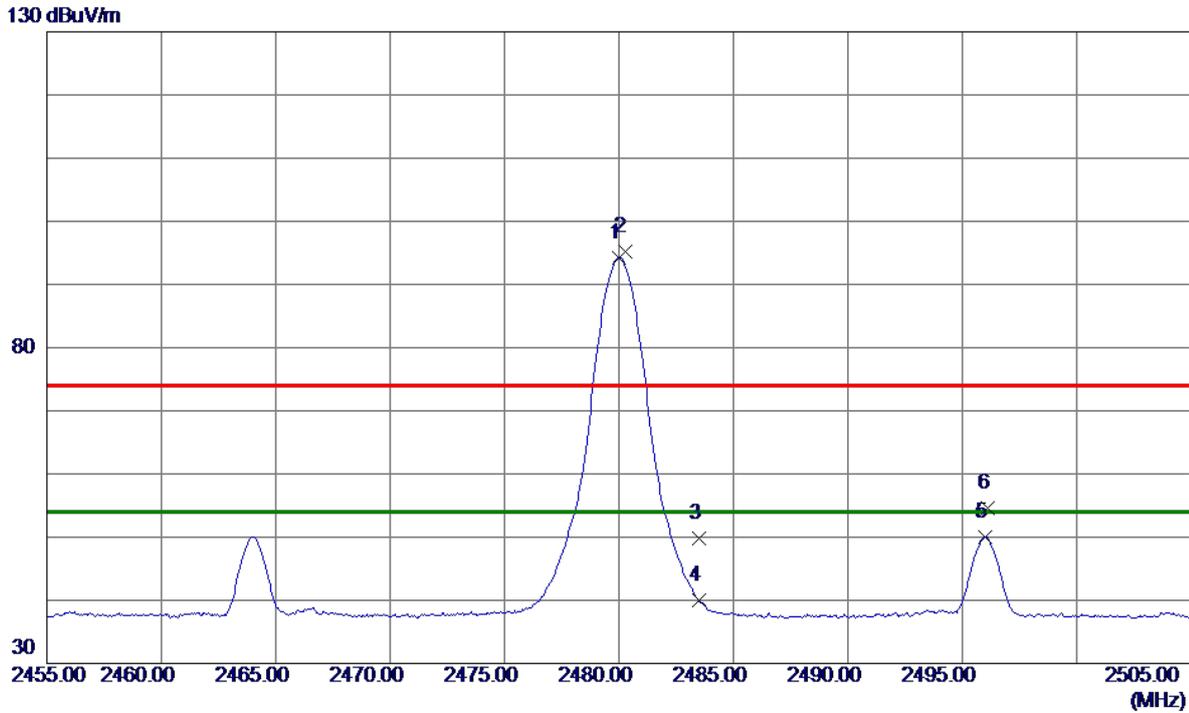


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7318.9850	46.60	10.33	56.93	74.00	-17.07	Peak	
2 *	7319.0330	38.31	10.33	48.64	54.00	-5.36	AVG	

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

Test Mode : TX 2480 MHz \_CH40

**Vertical**



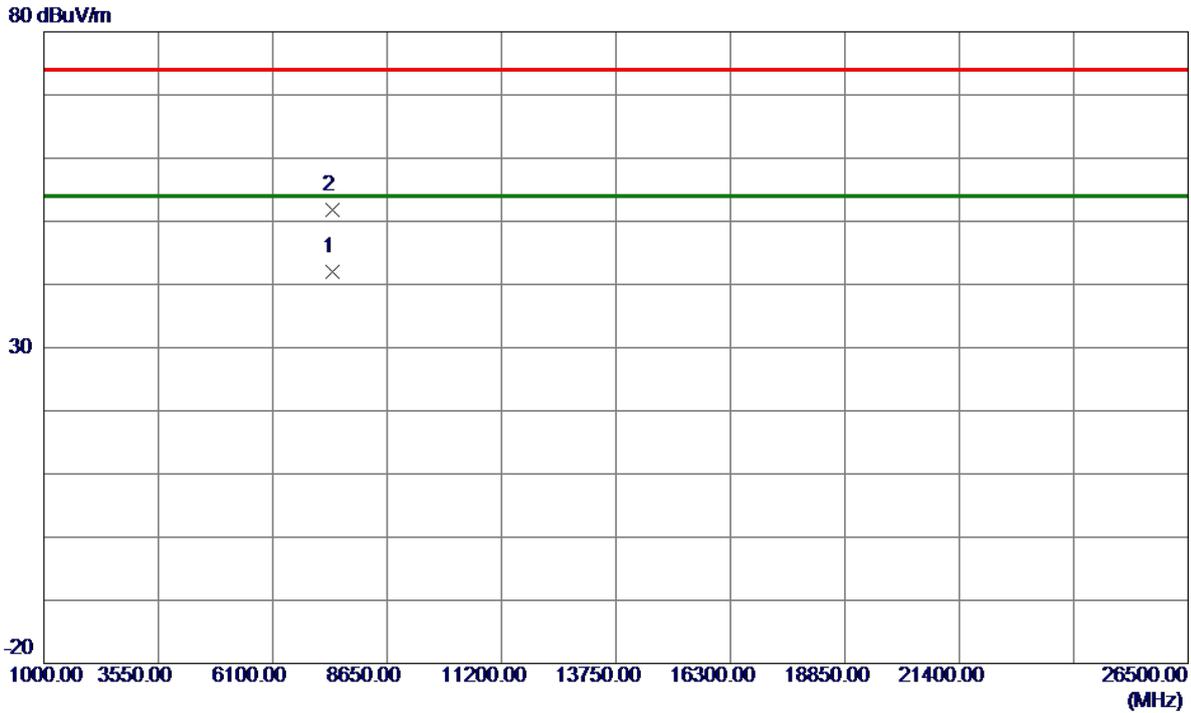
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	86.95	7.25	94.20	54.00	40.20	AVG	No Limit
2	2480.2500	87.89	7.25	95.14	74.00	21.14	Peak	No Limit
3	2483.5000	42.47	7.25	49.72	74.00	-24.28	Peak	
4	2483.5000	32.76	7.25	40.01	54.00	-13.99	AVG	
5	2496.0000	42.81	7.25	50.06	54.00	-3.94	AVG	
6	2496.1000	47.43	7.25	54.68	74.00	-19.32	Peak	

**REMARKS:**

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

Test Mode : TX 2480 MHz \_CH40

### Vertical

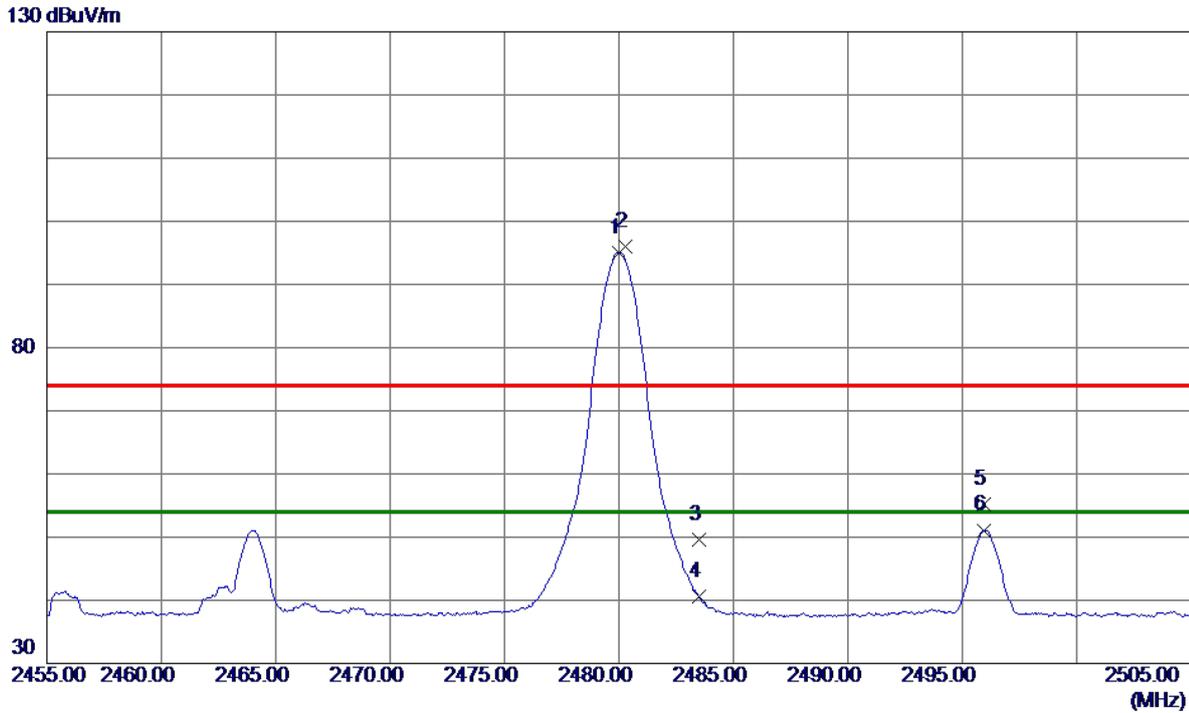


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7440.7920	31.53	10.54	42.07	54.00	-11.93	AVG	
2	7441.0050	41.28	10.54	51.82	74.00	-22.18	Peak	

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

Test Mode : TX 2480 MHz \_CH40

### Horizontal



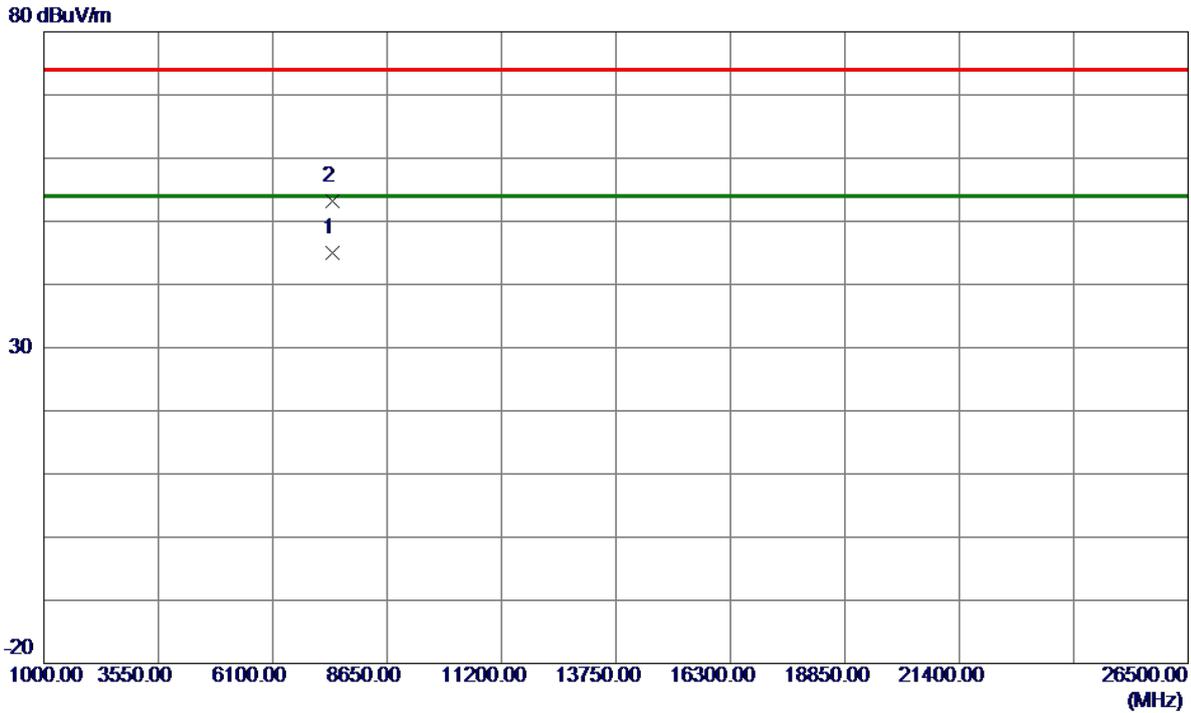
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	87.85	7.25	95.10	54.00	41.10	AVG	No Limit
2	2480.3000	88.82	7.25	96.07	74.00	22.07	Peak	No Limit
3	2483.5000	42.43	7.25	49.68	74.00	-24.32	Peak	
4	2483.5000	33.37	7.25	40.62	54.00	-13.38	AVG	
5	2495.9500	47.93	7.25	55.18	74.00	-18.82	Peak	
6	2495.9500	43.85	7.25	51.10	54.00	-2.90	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 *	7439.2570	34.40	10.54	44.94	54.00	-9.06	AVG	
2	7440.7620	42.67	10.54	53.21	74.00	-20.79	Peak	

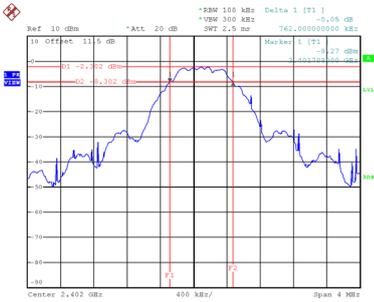
REMARKS:  
 (1) Measurement Value = Reading Level + Correct Factor.  
 (2) Margin Level = Measurement Value - Limit Value.

## APPENDIX E - BANDWIDTH

Test Mode: CH01, CH20, CH40

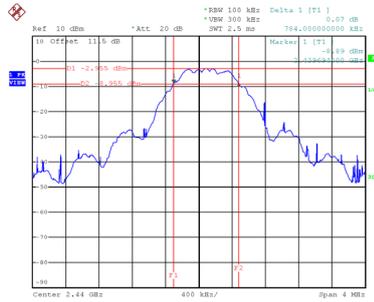
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Test Result
01	2402	0.762	1.160	500	Pass
20	2440	0.784	1.168	500	Pass
40	2480	0.808	1.184	500	Pass

**CH01**



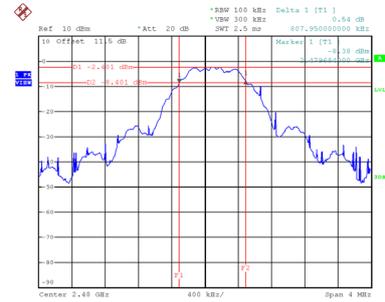
Date: 24.NOV.2020 14:19:15

**CH20  
6 dB Bandwidth**



Date: 24.NOV.2020 14:20:41

**CH40**



Date: 24.NOV.2020 14:26:09

**99 % Emission Bandwidth**



Date: 24.NOV.2020 14:18:45



Date: 24.NOV.2020 14:20:46

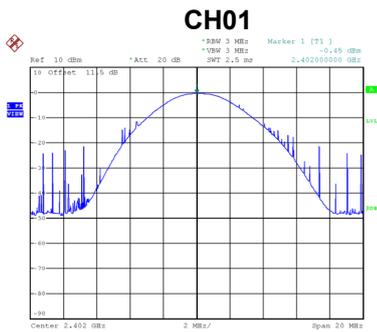


Date: 24.NOV.2020 14:26:15

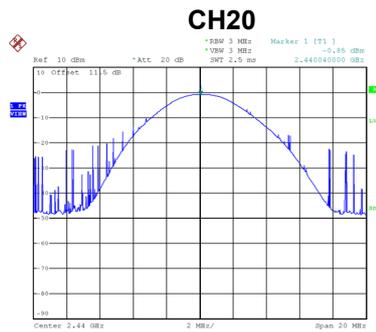
**APPENDIX F - MAXIMUM OUTPUT POWER**

Test Mode : CH01, CH20, CH40

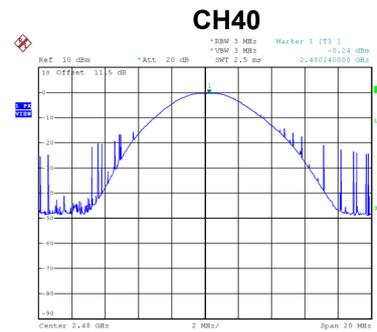
Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-0.45	0.0009	30.00	1.00	Pass
2440	-0.85	0.0008	30.00	1.00	Pass
2480	-0.24	0.0009	30.00	1.00	Pass



Date: 24.NOV.2020 14:18:40



Date: 24.NOV.2020 14:27:51

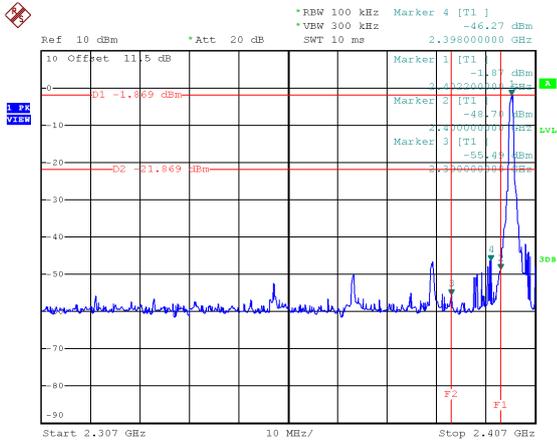


Date: 24.NOV.2020 14:27:09

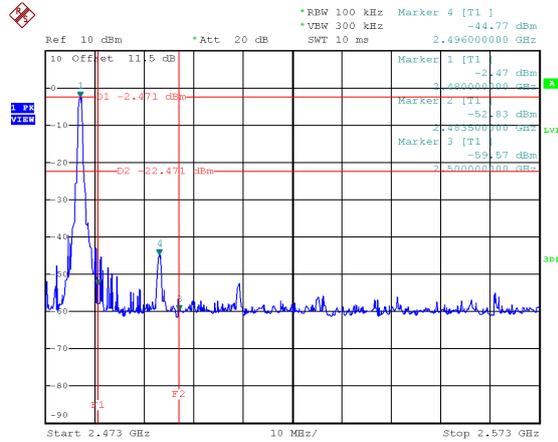
## **APPENDIX G - CONDUCTED SPURIOUS EMISSION**

Test Mode : CH01, CH20, CH40

### Bandedge CH01 (Lower)



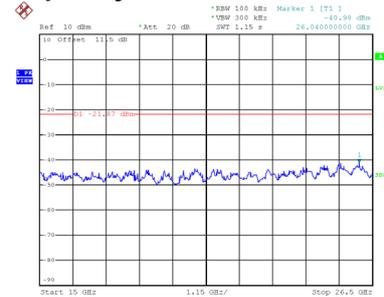
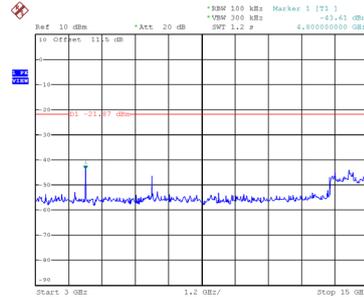
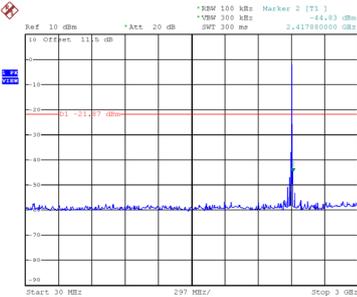
### Bandedge CH40 (Upper)



Date: 24.NOV.2020 14:19:22

Date: 24.NOV.2020 14:26:22

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

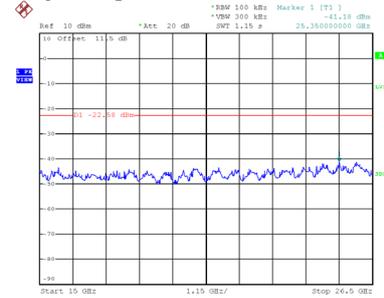
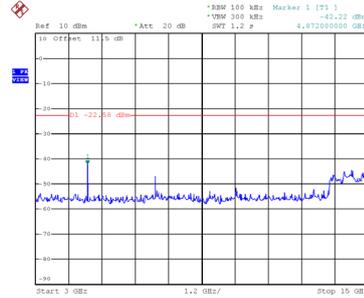
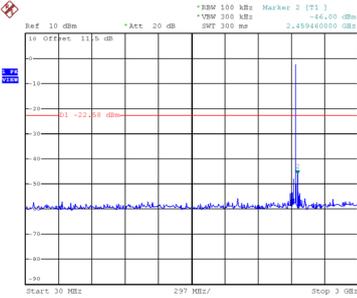


Date: 24.NOV.2020 14:19:35

Date: 24.NOV.2020 14:19:41

Date: 24.NOV.2020 14:19:48

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

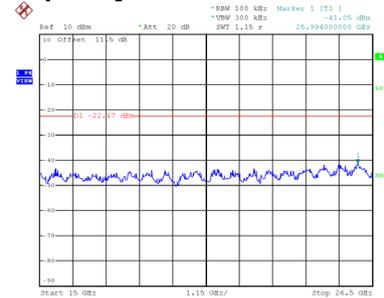
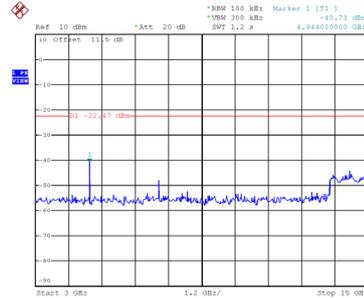
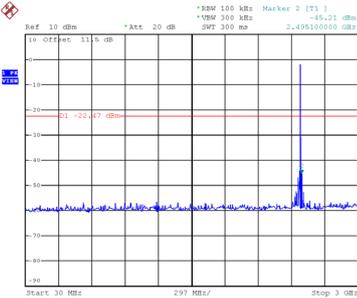


Date: 24.NOV.2020 14:21:06

Date: 24.NOV.2020 14:21:13

Date: 24.NOV.2020 14:21:20

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



Date: 24.NOV.2020 14:26:35

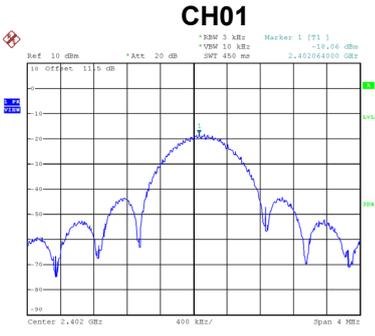
Date: 24.NOV.2020 14:26:42

Date: 24.NOV.2020 14:26:49

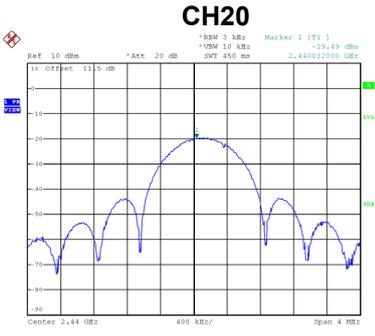
## **APPENDIX H - POWER SPECTRAL DENSITY**

Test Mode: CH01, CH20, CH40

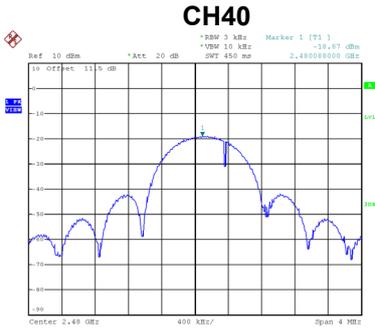
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
01	2402	-18.06	8.00	Pass
20	2440	-19.49	8.00	Pass
40	2480	-18.87	8.00	Pass



Date: 24\_NOV\_2020 14:19:53



Date: 24\_NOV\_2020 14:21:25



Date: 24\_NOV\_2020 14:27:04

End of Test Report