

# FCC Radio Test Report

## FCC ID: UZZYAS108

This report concerns (check one): Original Grant Class I Change Class II Change

**Project No.** : 1801C257  
**Equipment** : FRONT SURROUND SYSTEM  
**Test Model** : YAS-108  
**Series Model** : ATS-1080  
**Applicant** : Beautiful Enterprise Co., Ltd.  
**Address** : 27th Floor, Beautiful Group Tower, 77 Connaught Road Central, Hong Kong

**Date of Receipt** : Jan. 31, 2018  
**Date of Test** : Feb. 05, 2018 ~ Feb. 28, 2018  
**Issued Date** : Apr. 03, 2018  
**Tested by** : BTL Inc.

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### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-2-1801C257	Original Issue.	Apr. 03, 2018

## 1. CERTIFICATION

Equipment : FRONT SURROUND SYSTEM  
Brand Name :  **YAMAHA**  
Test Model : YAS-108  
Series Model : ATS-1080  
Applicant : Beautiful Enterprise Co., Ltd.  
Manufacturer : Beautiful Enterprise Co., Ltd.  
Address : 27th Floor, Beautiful Group Tower, 77 Connaught Road Central, Hong Kong  
Factory : Shenzhen Synchron Electronics Co., Ltd.  
Address : No.9 Mei Li Road, Xia Mei Lin, Fu Tian Area, Shenzhen, Guangdong, P.R.  
China.  
Date of Test : Feb. 05, 2018 ~ Feb. 28, 2018  
Test Sample : Engineering Sample  
Standard(s) : FCC Part15, Subpart C (15.247)  
ANSI C63.10-2013

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-2-1801C257) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part15 (15.247) , Subpart C			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(b)(3)	Peak Output Power	PASS	
15.247(e)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	
15.247(d)/ 15.205/ 15.209	Transmitter Radiated Emissions	PASS	

**NOTE:**

(1) "N/A" denotes test is not applicable to this device.

## 2.1 TEST FACILITY

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

BTL's test firm number for FCC: 854385

BTL's designation number for FCC: CN5020

## 2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor)  $k=1.96$  or  $k=2$ (which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2xUc(y)$ .

The BTL measurement uncertainty as below table:

### A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 KHz ~ 30MHz	2.32

### B. Radiated 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	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06
		1GHz~18GHz	V	3.12
		1GHz~18GHz	H	3.68
		18GHz~40GHz	V	4.15
		18GHz~40GHz	H	4.14

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



### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	FRONT SURROUND SYSTEM	
Brand Name	YAMAHA	
Test Model	YAS-108	
Series Model	ATS-1080	
Model Difference	Only differ in model number.	
Identification No. of EUT(S/N)	Z000098YO, Z000108YO, Z000118YO	
Product Description	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	3.10 dBm (1Mbps)
Power Source	AC Mains.	
Power Rating	120V~ 60Hz 27W	


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	 <b>YAMAHA</b>	N/A	Printed	N/A	2.32

### 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode <b>NOTE (1)</b>

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
Mode 1	TX Mode

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode <b>NOTE (1)</b>

Note:

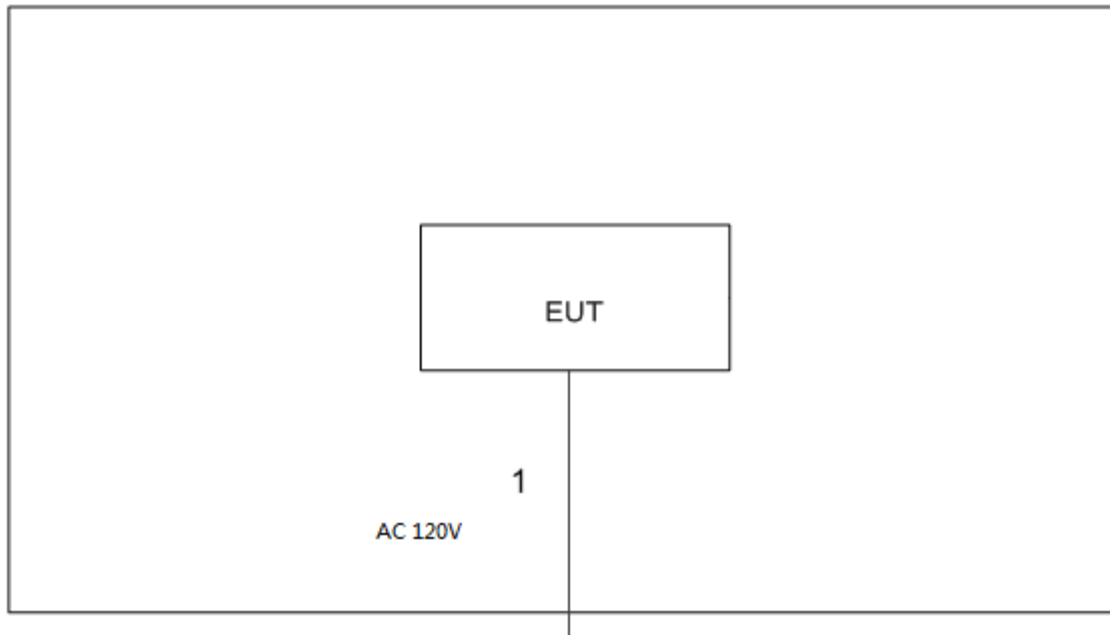
(1) The measurements are performed at the high, middle, low available channels.

### 3.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

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 Version	BlueTest3		
Frequency (MHz)	2402	2440	2480
BT LE	N/A	N/A	N/A

### 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.2m	AC Cable

## 4. EMC EMISSION TEST

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 POWER LINE CONDUCTED EMISSION LIMITS (Frequency Range 150KHz-30MHz)

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 -0.5	66 to 56*	56 to 46*
0.50 -5.0	56	46
5.0 -30.0	60	50

Note:

- (1) The limit of " \* " decreases with the logarithm of the frequency
- (2) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)  
 Margin Level = Measurement Value - Limit Value

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

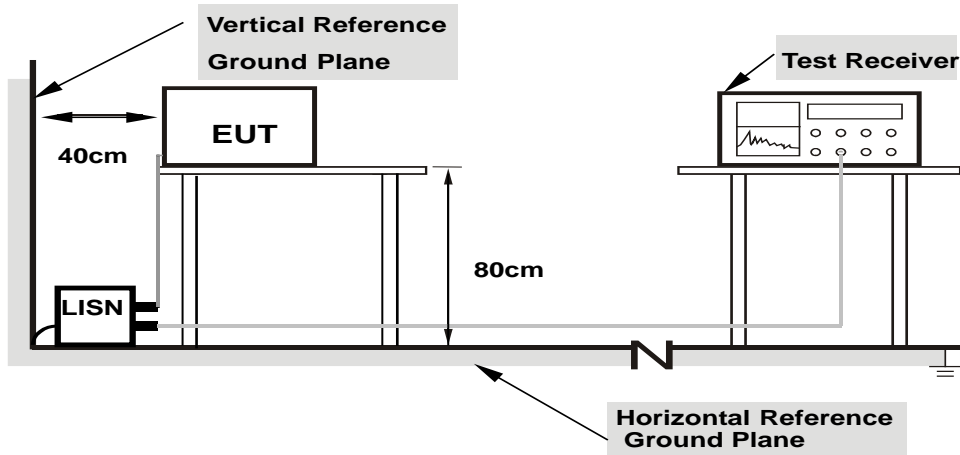
#### 4.1.2 TEST PROCEDURE

- 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.

#### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.4 TEST SETUP



- Note:**
- 1.Support units were connected to second LISN.
  - 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

#### 4.1.5 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.

#### 4.1.6 EUT TEST CONDITIONS

Temperature: 24°C    Relative Humidity: 60%    Test Voltage: AC 120V/60Hz

#### 4.1.7 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 150KHz to 30MHz.
- (3) “ N/A ” denotes test is not applicable to this device.

## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 RADIATED EMISSION LIMITS

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 (9KHz-1000MHz)

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
960~1000	500	3

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	(dBuV/m) (at 3 meters)	
	PEAK	AVERAGE
Above 1000	74	54

#### Notes:

- (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).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)  
 Margin Level = Measurement Value - Limit Value

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

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

#### 4.2.2 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 1GHz)
- 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 1GHz)
- 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 1GHz.
- 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 1GHz)
- 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 1GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

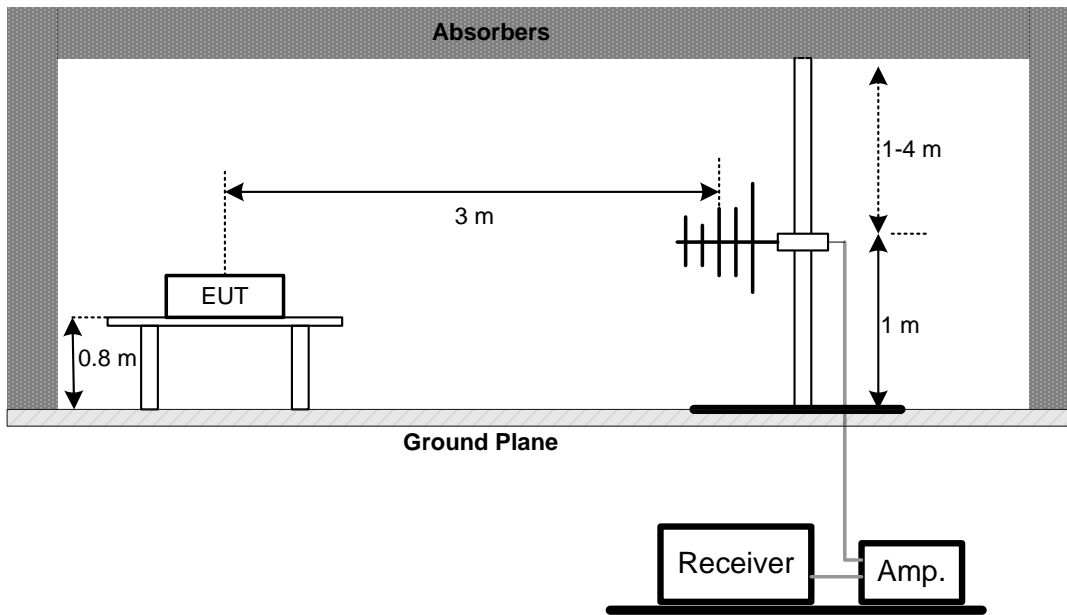
#### 4.2.3 DEVIATION FROM TEST STANDARD

No deviation

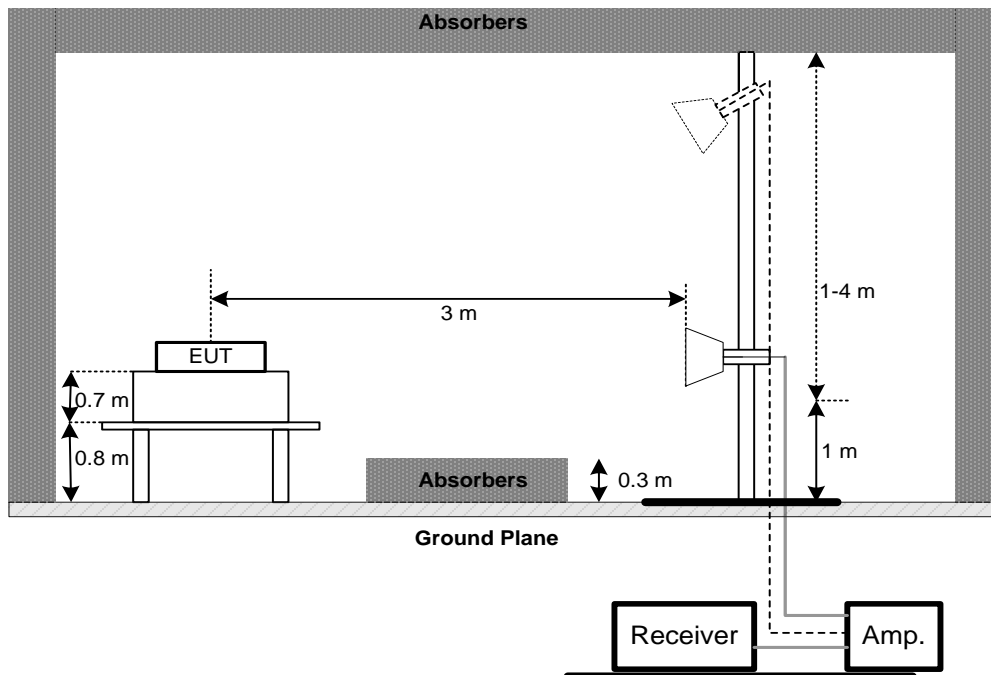


#### 4.2.4 TEST SETUP

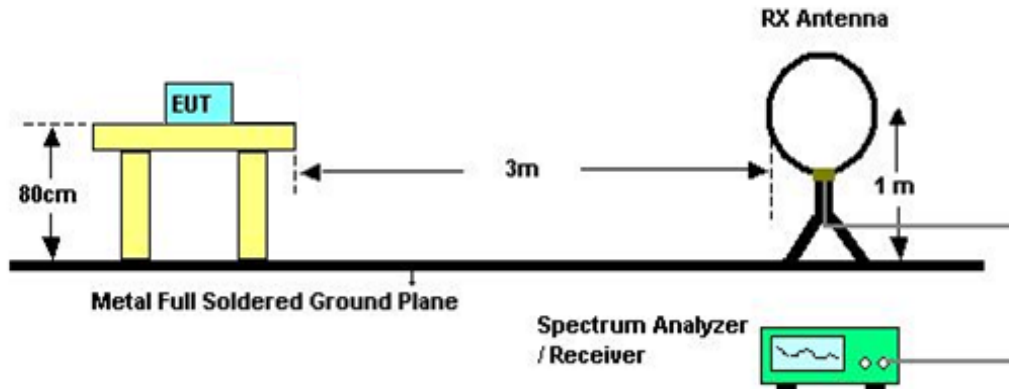
##### (A) Radiated Emission Test Set-Up Frequency Below 1 GHz



##### (B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) For radiated emissions below 30MHz



#### 4.2.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.2.6 EUT TEST CONDITIONS

Temperature: 22°C Relative Humidity: 56% Test Voltage: AC 120V/60Hz

#### 4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Appendix B

Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

#### 4.2.8 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the Appendix C.

#### 4.2.9 TEST RESULTS (ABOVE 1000MHZ)

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 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

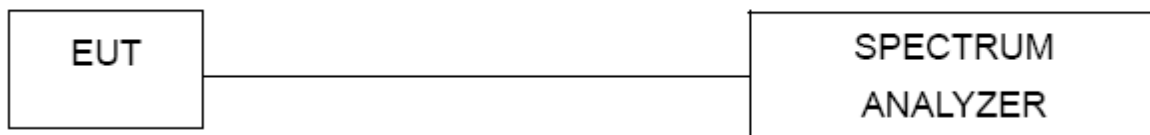
#### 5.1.1 TEST PROCEDURE

- 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= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



#### 5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 5.1.5 EUT TEST CONDITIONS

Temperature: 24°C    Relative Humidity: 60%    Test Voltage: AC 120V/60Hz

#### 5.1.6 TEST RESULTS

Please refer to the Appendix E.

## 6. MAXIMUM OUTPUT POWER TEST

### 6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

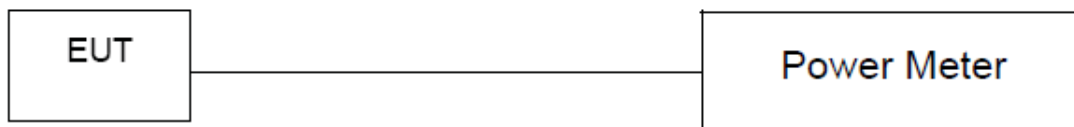
#### 6.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- b. The maximum peak conducted output power was performed in accordance with method 9.1.3 of FCC KDB 558074 D01 DTS Meas Guidance.

#### 6.1.2 DEVIATION FROM STANDARD

No deviation.

#### 6.1.3 TEST SETUP



#### 6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 6.1.5 EUT TEST CONDITIONS

Temperature: 24°C    Relative Humidity: 60%    Test Voltage: AC 120V/60Hz

#### 6.1.6 TEST RESULTS

Please refer to the Appendix F.

## 7. ANTENNA CONDUCTED SPURIOUS EMISSION

### 7.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

#### 7.1.1 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= 100KHz, VBW=300KHz, Sweep time = 10 ms.
- c. Offset=antenna gain+cable loss

#### 7.1.2 DEVIATION FROM STANDARD

No deviation.

#### 7.1.3 TEST SETUP



#### 7.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 7.1.5 EUT OPERATION CONDITIONS

Temperature: 24°C    Relative Humidity: 60%    Test Voltage: AC 120V/60Hz

#### 7.1.6 TEST RESULTS

Please refer to the Appendix G.

## 8. POWER SPECTRAL DENSITY TEST

### 8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

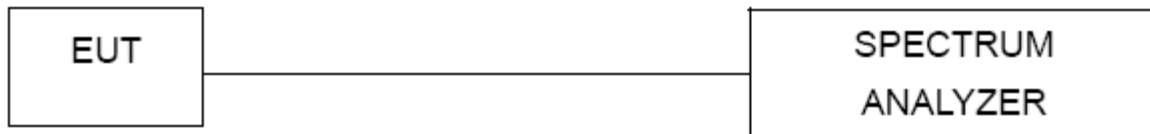
#### 8.1.1 TEST PROCEDURE

- 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=3KHz, VBW=10 KHz, Sweep time = auto.

#### 8.1.2 DEVIATION FROM STANDARD

No deviation.

#### 8.1.3 TEST SETUP



#### 8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 8.1.5 EUT TEST CONDITIONS

Temperature: 24°C    Relative Humidity: 60%    Test Voltage: AC 120V/60Hz

#### 8.1.6 TEST RESULTS

Please refer to the Appendix H.

## 9. MEASUREMENT INSTRUMENTS LIST

Conducted Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 26, 2018
2	LISN	EMCO	3816/2	52765	Mar. 26, 2018
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 26, 2018
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 26, 2018
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Oct. 19, 2018

Radiated Emission Below 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 26, 2018
2	Amplifier	HP	8447D	2944A09673	Oct. 19, 2018
3	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	Jun. 26, 2018
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	Antenna	EM	EM-6876-1	230	Mar. 06, 2018

Radiated Emission Above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 26, 2018
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 08, 2018
3	Amplifier	Agilent	8449B	3008A02274	May. 16, 2018
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 26, 2018
5	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018
6	Antenna	EM	EM-6876-1	230	Mar. 06, 2018
7	Controller	CT	SC100	N/A	N/A
8	Controller	MF	MF-7802	MF780208416	N/A
9	Cable	emci	EMC104-SM-SM-1 2000(12m)	N/A	Jun. 26, 2018
10	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A



**6dB Bandwidth Measurement**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Peak Output Power Measurement**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	ANRITSU	ML2495A	1128009	Mar. 26, 2018
2	Pulse Power Sensor	ANRITSU	MA 2411B	1027500	Mar. 26, 2018

**Antenna Conducted Spurious Emission Measurement**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Power Spectral Density Measurement**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

Remark: "N/A" denotes no model name, serial no. or calibration specified.  
 All calibration period of equipment list is one year.

## 10. EUT TEST PHOTO

### Conducted Measurement Photos



**Radiated Measurement Photos**

**9KHz to 30MHz**





**Radiated Measurement Photos**

**30MHz to 1000MHz**



**Radiated Measurement Photos**

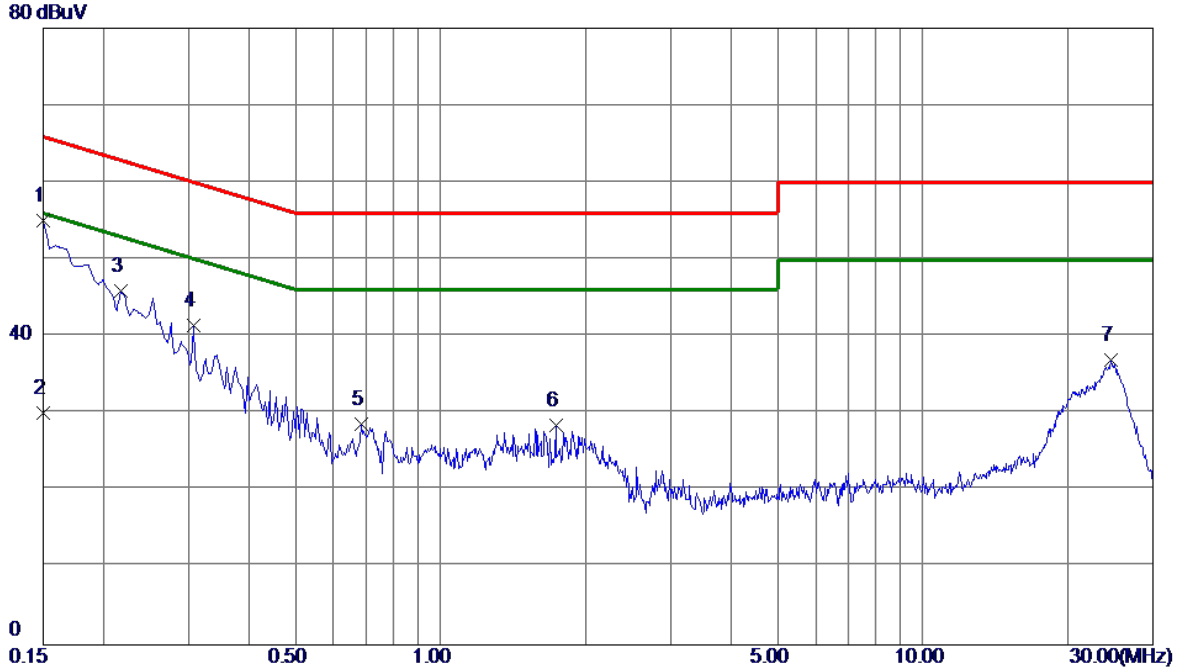
**Above 1000MHz**



## APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

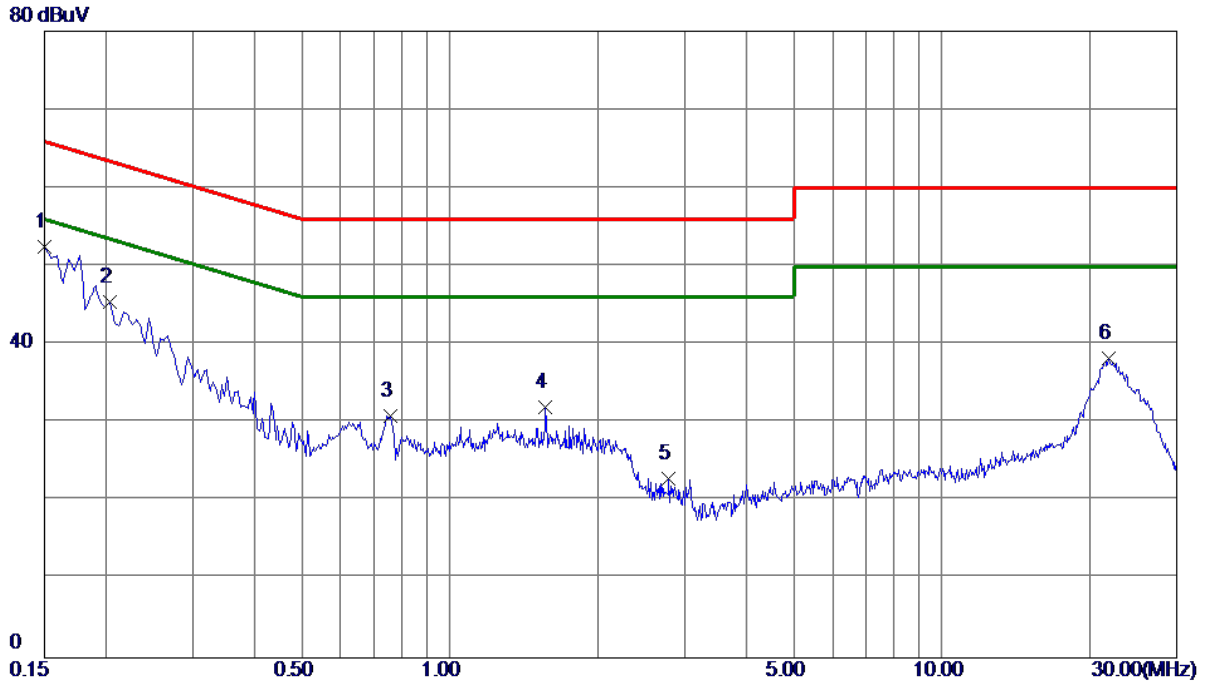
**Line**



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	45.27	9.79	55.06	66.00	-10.94	Peak	
2	0.1500	20.30	9.79	30.09	56.00	-25.91	AVG	
3	0.2175	36.12	9.76	45.88	62.91	-17.03	Peak	
4	0.3075	31.61	9.76	41.37	60.04	-18.67	Peak	
5	0.6855	18.86	9.82	28.68	56.00	-27.32	Peak	
6	1.7340	18.63	9.91	28.54	56.00	-27.46	Peak	
7	24.6299	26.12	10.78	36.90	60.00	-23.10	Peak	

Test Mode: TX Mode

### Neutral



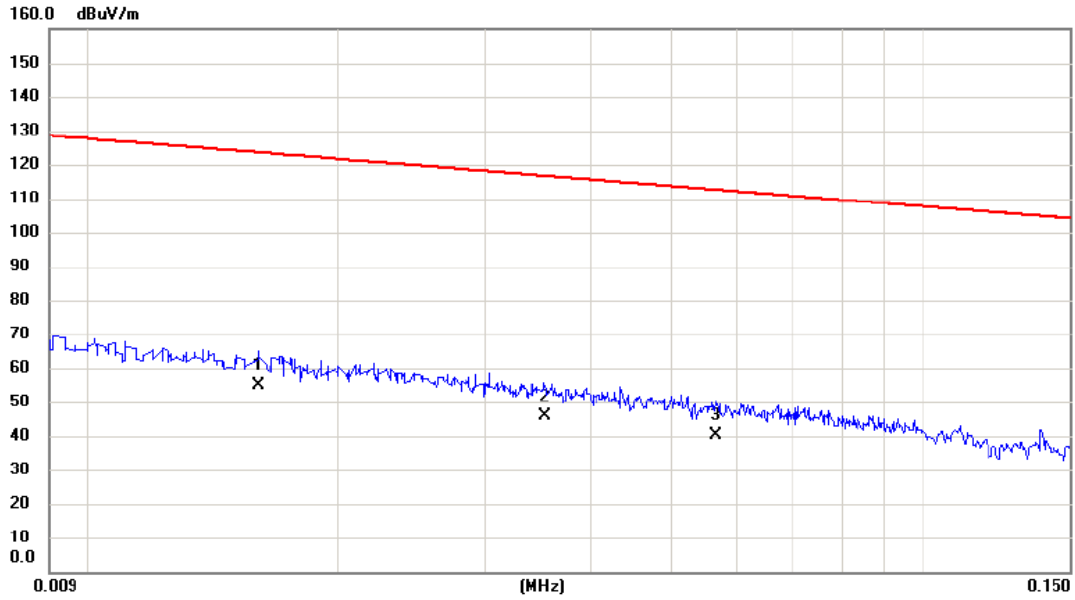
No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	42.84	9.68	52.52	66.00	-13.48	Peak	
2	0.2040	35.74	9.69	45.43	63.45	-18.02	Peak	
3	0.7575	21.23	9.72	30.95	56.00	-25.05	Peak	
4	1.5630	22.16	9.79	31.95	56.00	-24.05	Peak	
5	2.7825	12.97	9.88	22.85	56.00	-33.15	Peak	
6	21.8535	27.40	10.82	38.22	60.00	-21.78	Peak	



## APPENDIX B - RADIATED EMISSION (9KHZ TO 30MHZ)

Test Mode: TX Mode

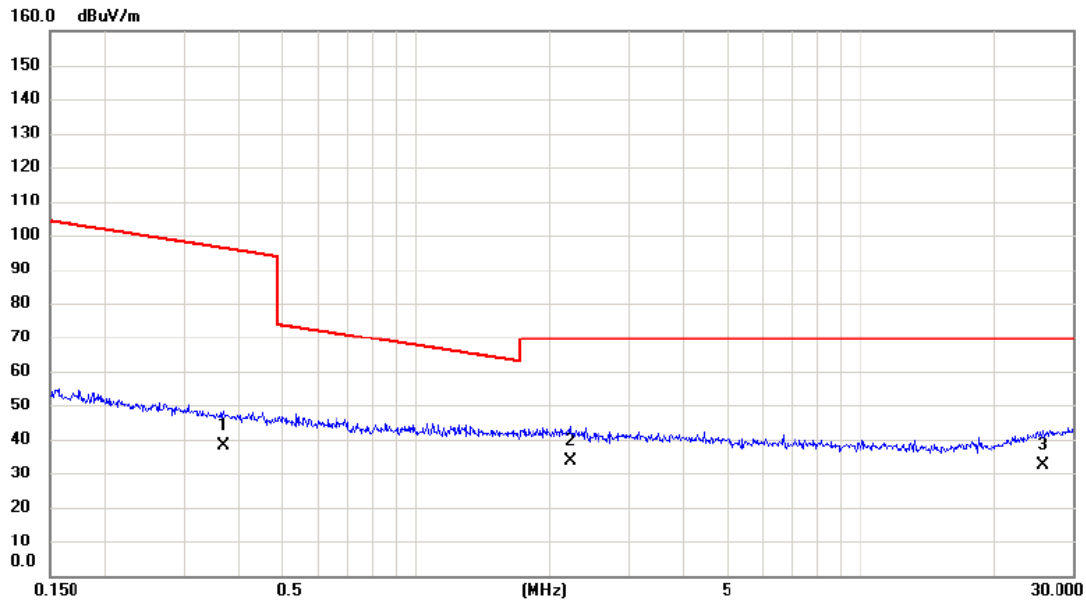
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0160	34.97	20.14	55.11	123.52	-68.41	AVG	
2		0.0353	26.68	19.16	45.84	116.65	-70.81	AVG	
3		0.0565	21.53	18.60	40.13	112.56	-72.43	AVG	

Test Mode: TX Mode

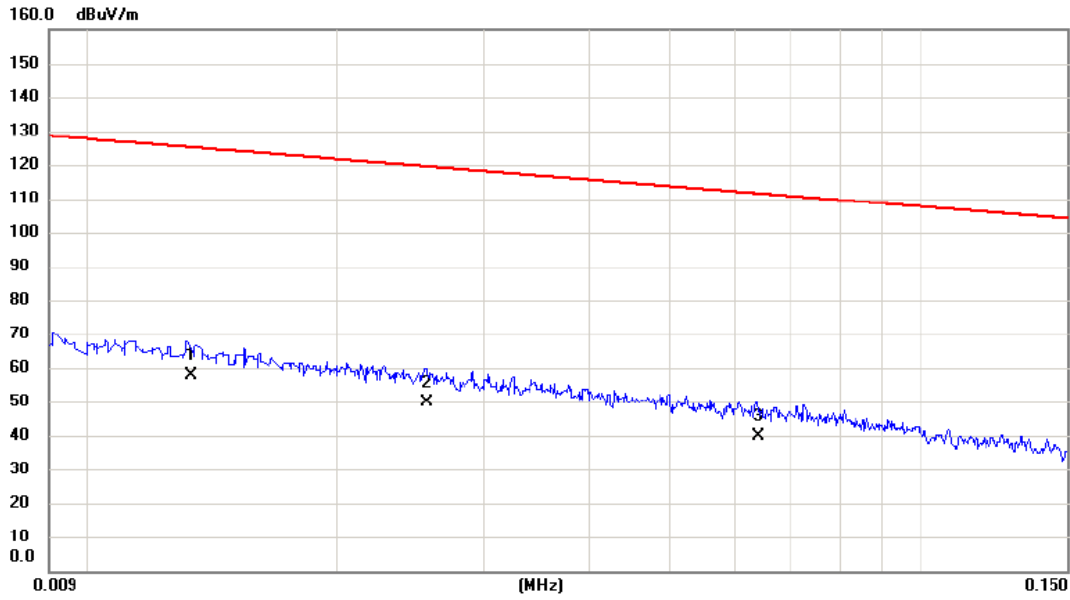
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.3692	21.70	16.56	38.26	96.26	-58.00	AVG	
2	*	2.2132	18.24	15.45	33.69	69.54	-35.85	QP	
3		25.5912	12.58	19.86	32.44	69.54	-37.10	QP	

Test Mode: TX Mode

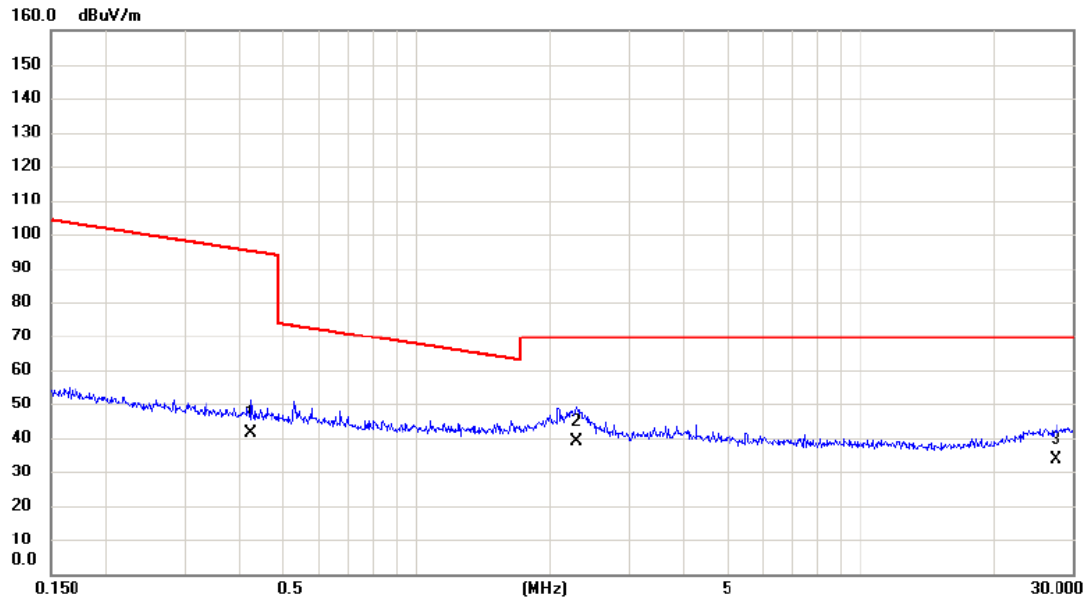
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0133	37.15	20.49	57.64	125.13	-67.49	AVG	
2		0.0256	30.41	19.45	49.86	119.44	-69.58	AVG	
3		0.0638	21.53	18.45	39.98	111.51	-71.53	AVG	

Test Mode: TX Mode

Ant 90°



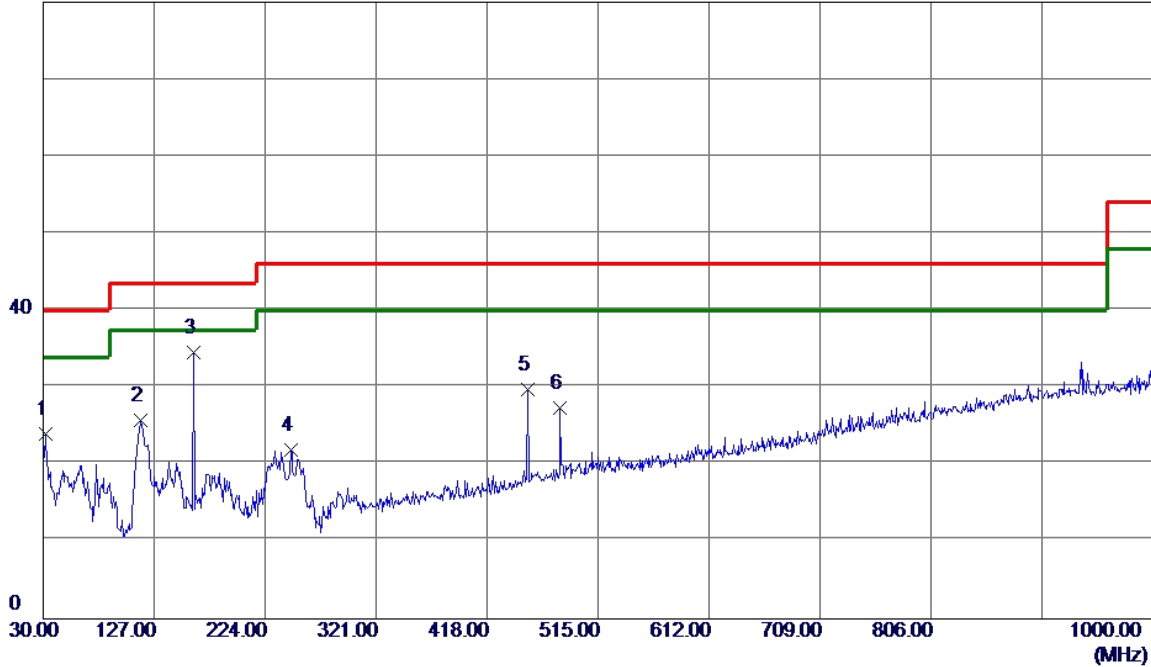
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4215	24.98	16.53	41.51	95.11	-53.60	AVG	
2	*	2.2847	23.52	15.43	38.95	69.54	-30.59	QP	
3		27.5616	13.41	20.41	33.82	69.54	-35.72	QP	

# APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)

Test Mode: TX 2402MHz \_CH00\_1Mbps

**Vertical**

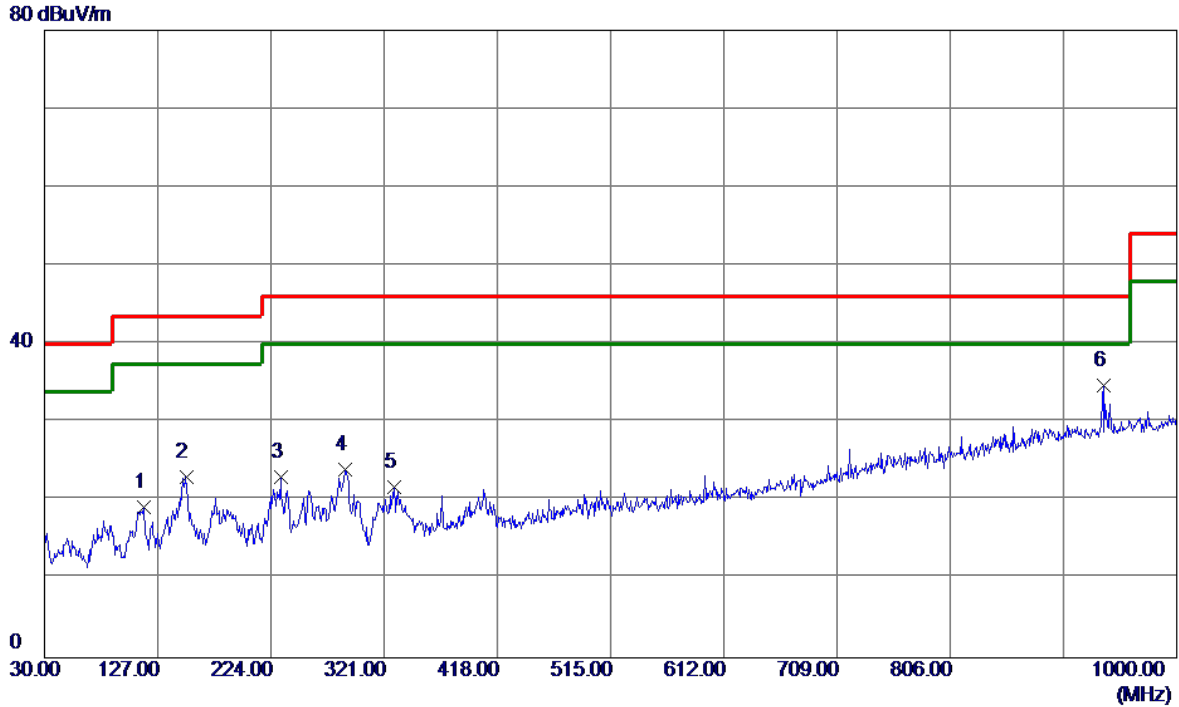
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	31.9400	39.10	-15.04	24.06	40.00	-15.94	Peak	
2	115.3600	41.57	-15.77	25.80	43.50	-17.70	Peak	
3 *	161.4350	47.40	-12.84	34.56	43.50	-8.94	Peak	
4	246.3100	36.66	-14.69	21.97	46.00	-24.03	Peak	
5	453.8900	39.54	-9.85	29.69	46.00	-16.31	Peak	
6	482.0200	36.47	-9.16	27.31	46.00	-18.69	Peak	

Test Mode: TX 2402MHz \_CH00\_1Mbps

### Horizontal

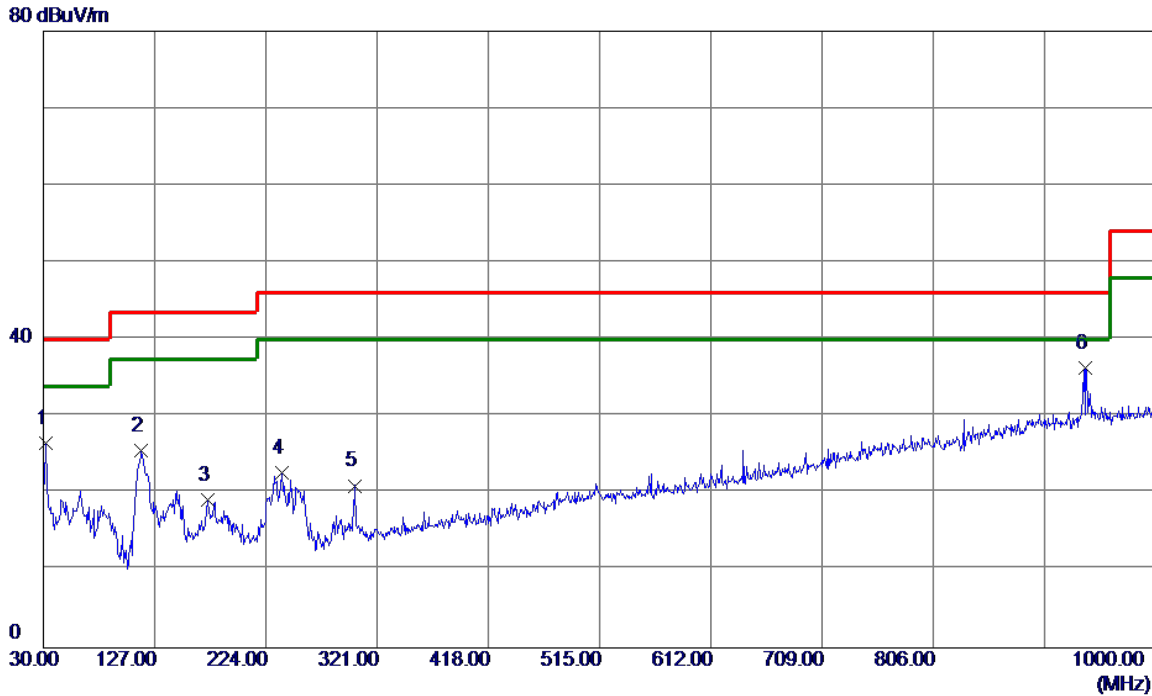


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	114.8750	35.04	-15.80	19.24	43.50	-24.26	Peak	
2	151.2500	36.56	-13.45	23.11	43.50	-20.39	Peak	
3	232.2450	37.19	-14.18	23.01	46.00	-22.99	Peak	
4	287.5350	38.38	-14.34	24.04	46.00	-21.96	Peak	
5	329.2450	34.06	-12.32	21.74	46.00	-24.26	Peak	
6 *	936.9500	32.99	1.74	34.73	46.00	-11.27	Peak	



Test Mode: TX 2440MHz \_CH19\_1Mbps

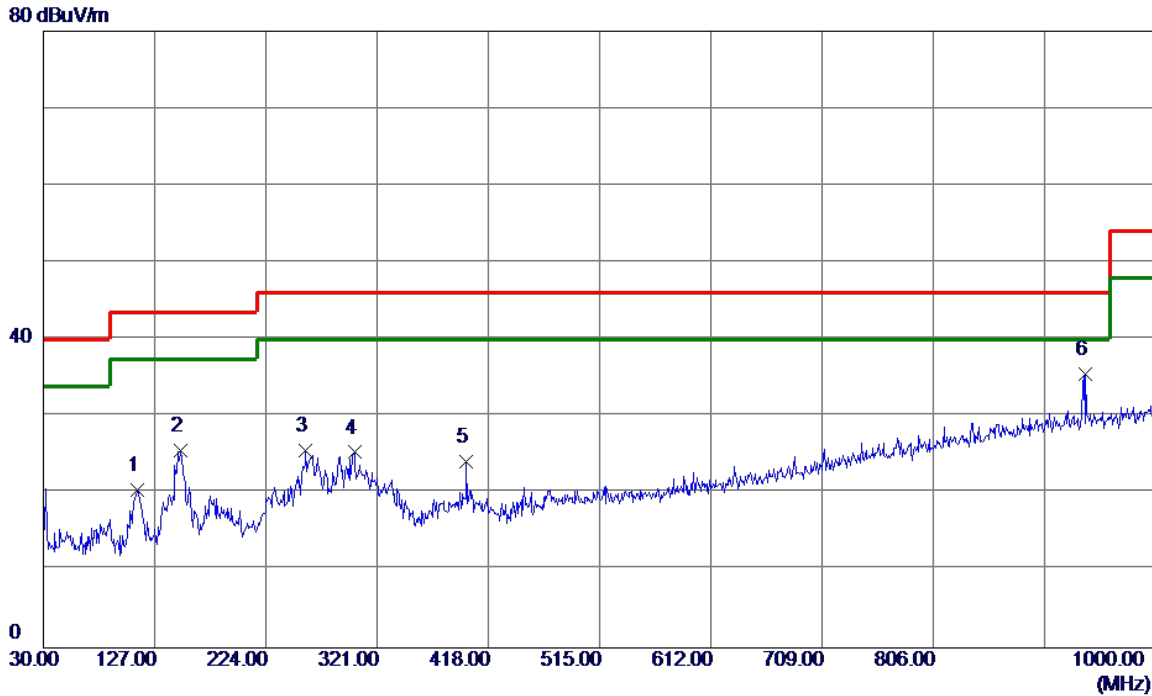
**Vertical**



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	32.4250	41.54	-14.96	26.58	40.00	-13.42	Peak	
2	115.3600	41.36	-15.77	25.59	43.50	-17.91	Peak	
3	173.0750	31.40	-12.24	19.16	43.50	-24.34	Peak	
4	237.5800	37.03	-14.30	22.73	46.00	-23.27	Peak	
5	301.6000	33.84	-12.80	21.04	46.00	-24.96	Peak	
6 *	938.8900	34.52	1.78	36.30	46.00	-9.70	Peak	

Test Mode: TX 2440MHz \_CH19\_1Mbps

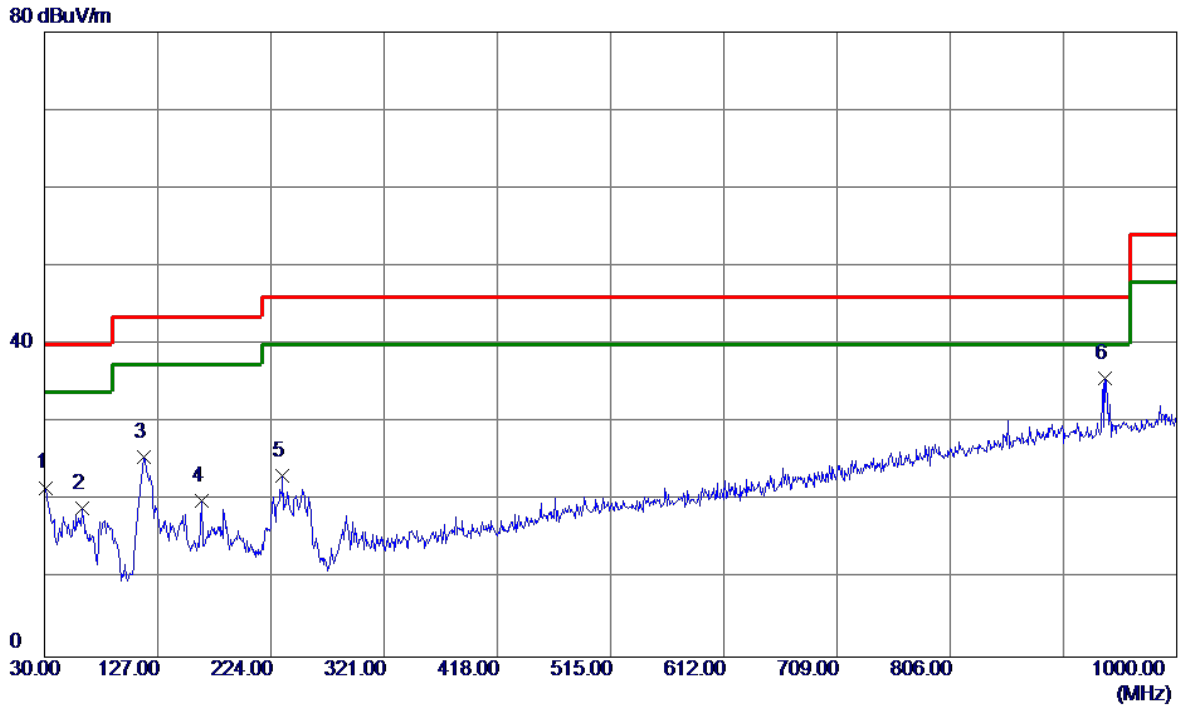
### Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	111.4800	36.48	-16.07	20.41	43.50	-23.09	Peak	
2	149.7950	39.16	-13.54	25.62	43.50	-17.88	Peak	
3	258.9200	41.22	-15.62	25.60	46.00	-20.40	Peak	
4	301.1150	38.17	-12.81	25.36	46.00	-20.64	Peak	
5	399.0850	35.54	-11.37	24.17	46.00	-21.83	Peak	
6 *	938.8900	33.76	1.78	35.54	46.00	-10.46	Peak	

Test Mode: TX 2480MHz \_CH39\_1Mbps

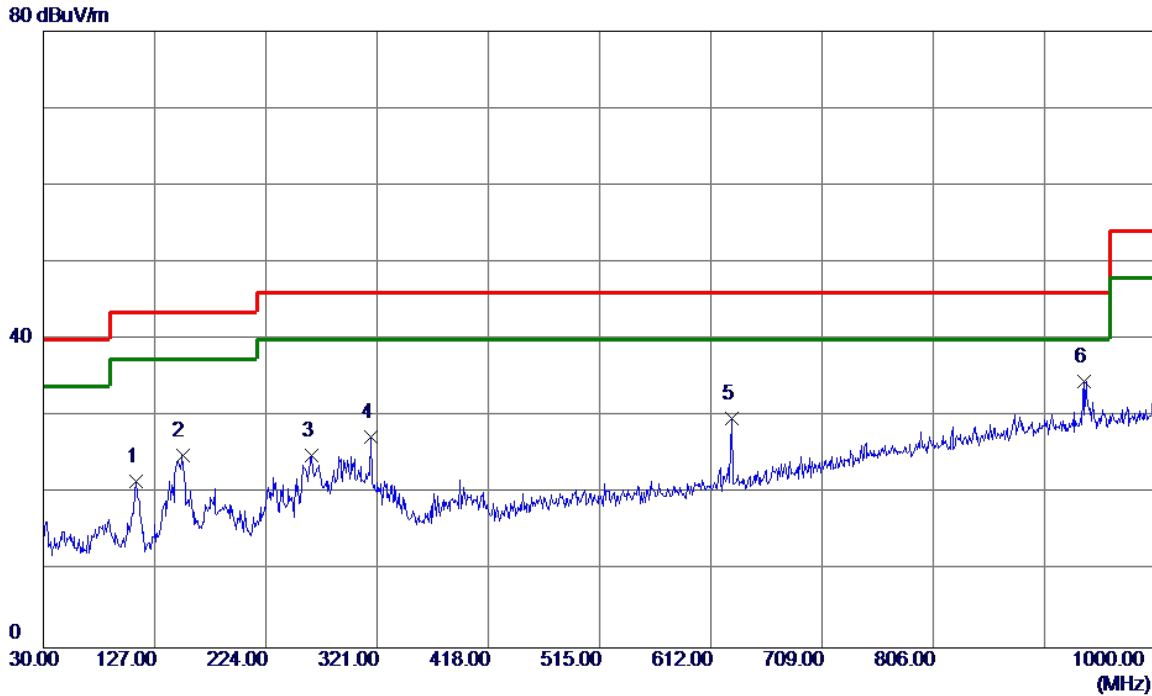
### Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	31.4550	36.77	-15.09	21.68	40.00	-18.32	Peak	
2	62.4950	33.79	-14.73	19.06	40.00	-20.94	Peak	
3	115.3600	41.40	-15.77	25.63	43.50	-17.87	Peak	
4	164.3450	32.74	-12.67	20.07	43.50	-23.43	Peak	
5	233.7000	37.48	-14.22	23.26	46.00	-22.74	Peak	
6 *	938.8900	33.92	1.78	35.70	46.00	-10.30	Peak	

Test Mode: TX 2480MHz \_CH39\_1Mbps

### Horizontal



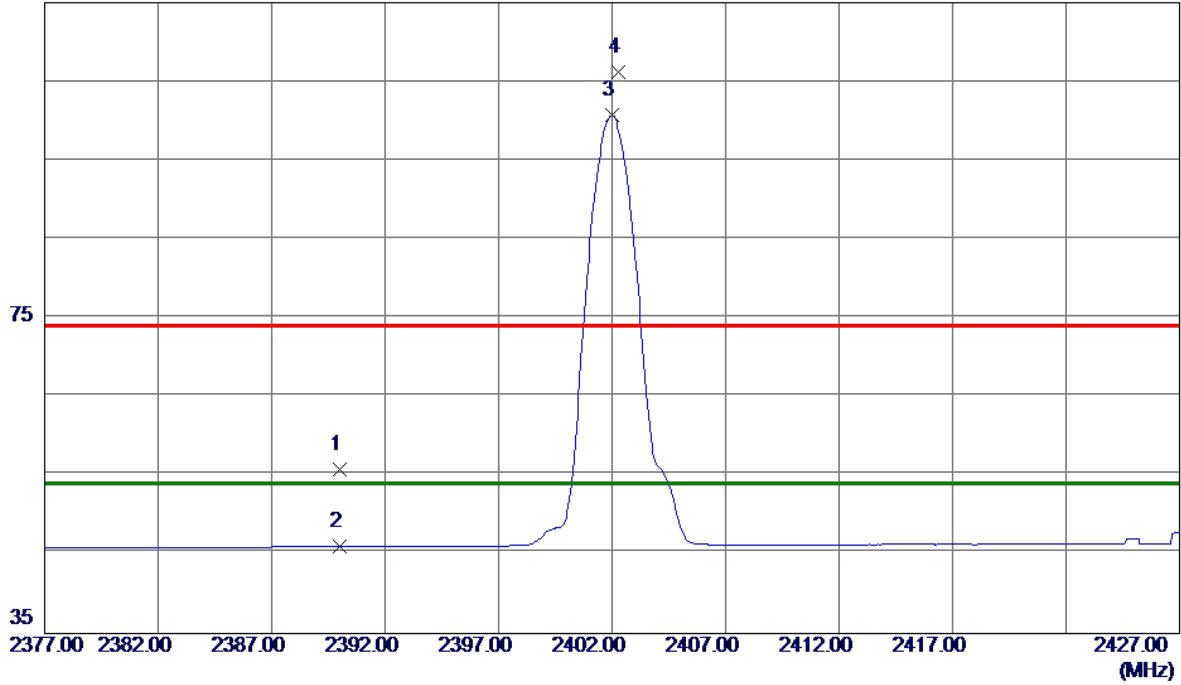
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	110.5100	37.72	-16.15	21.57	43.50	-21.93	Peak	
2	151.2500	38.36	-13.45	24.91	43.50	-18.59	Peak	
3	263.7700	40.77	-15.76	25.01	46.00	-20.99	Peak	
4	315.1800	39.85	-12.56	27.29	46.00	-18.71	Peak	
5	629.9450	35.58	-5.85	29.73	46.00	-16.27	Peak	
6 *	936.9500	32.89	1.74	34.63	46.00	-11.37	Peak	

## APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Vertical**

115 dBuV/m

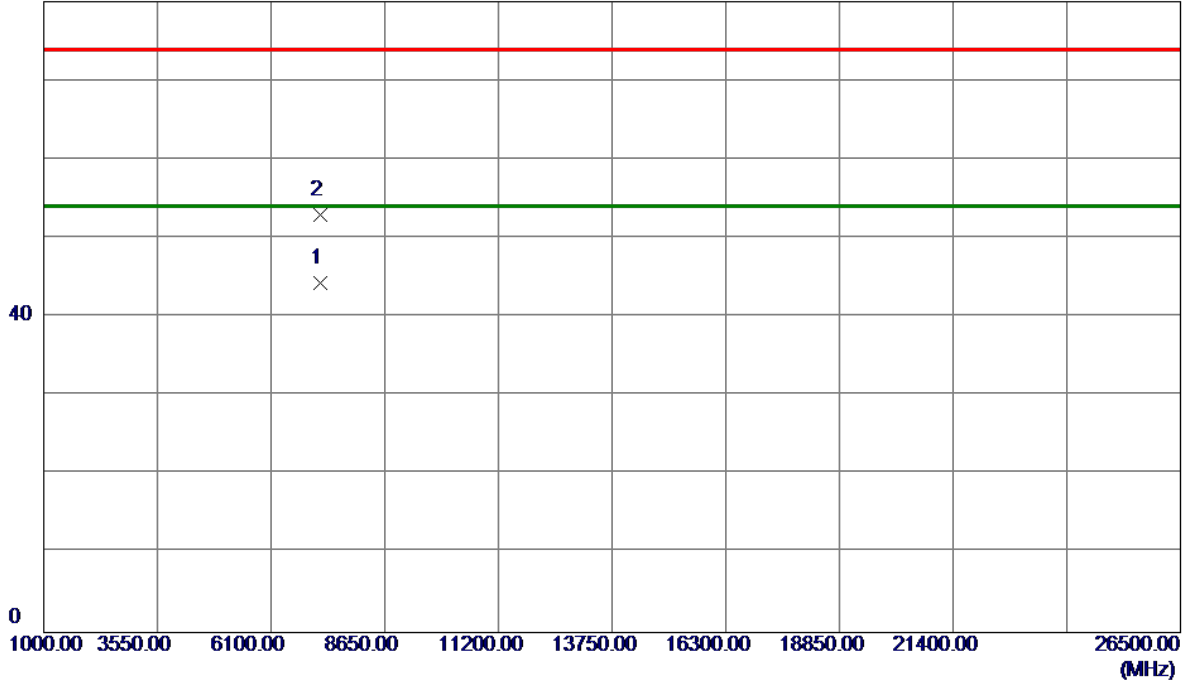


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	22.76	33.06	55.82	74.00	-18.18	Peak	
2	2390.0000	12.93	33.06	45.99	54.00	-8.01	AVG	
3 *	2402.0000	67.61	33.10	100.71	54.00	46.71	AVG	No Limit
4	2402.2750	73.03	33.10	106.13	74.00	32.13	Peak	No Limit

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Vertical**

80 dBuV/m

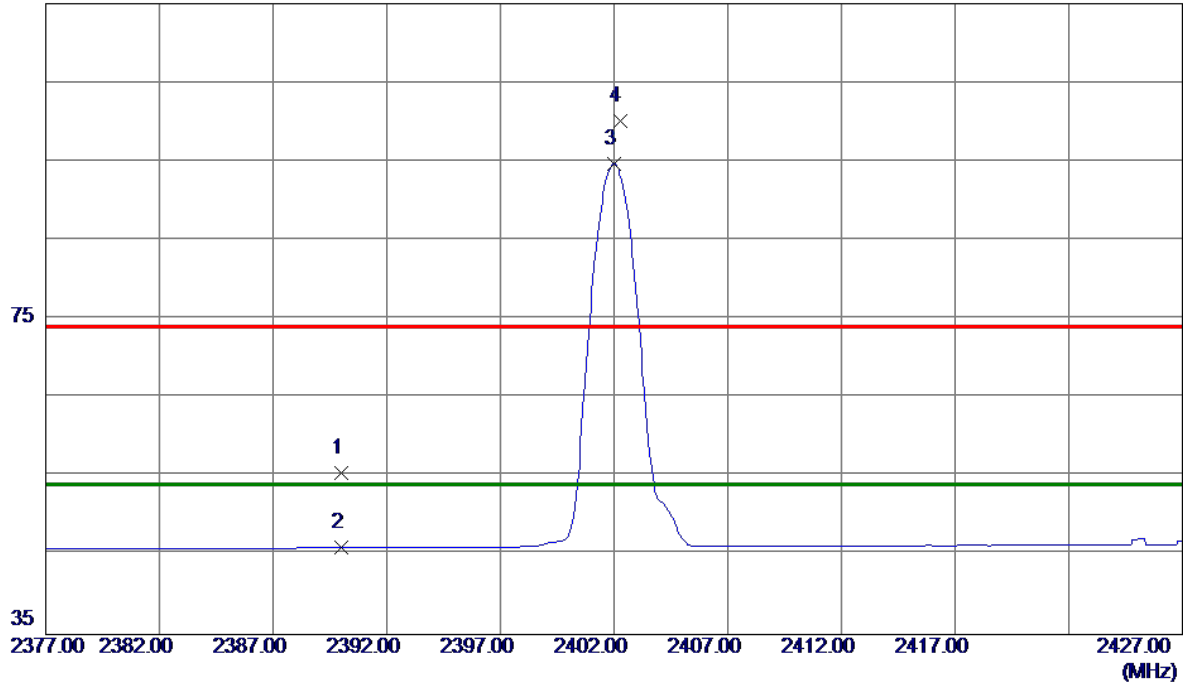


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.3490	31.14	13.13	44.27	54.00	-9.73	AVG	
2	7206.6180	39.81	13.13	52.94	74.00	-21.06	Peak	

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Horizontal**

115 dBuV/m



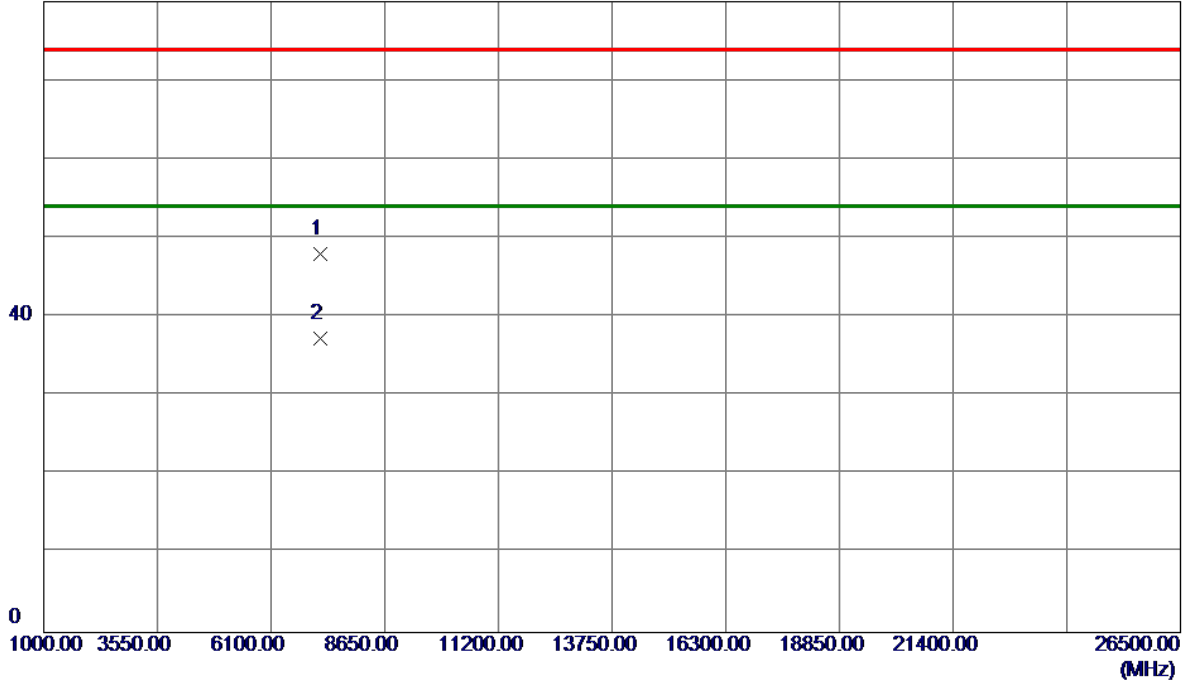
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	22.47	33.06	55.53	74.00	-18.47	Peak	
2	2390.0000	12.95	33.06	46.01	54.00	-7.99	AVG	
3 *	2402.0000	61.58	33.10	94.68	54.00	40.68	AVG	No Limit
4	2402.2500	67.02	33.10	100.12	74.00	26.12	Peak	No Limit



Test Mode : TX 2402MHz \_CH00\_1Mbps

**Horizontal**

80 dBuV/m

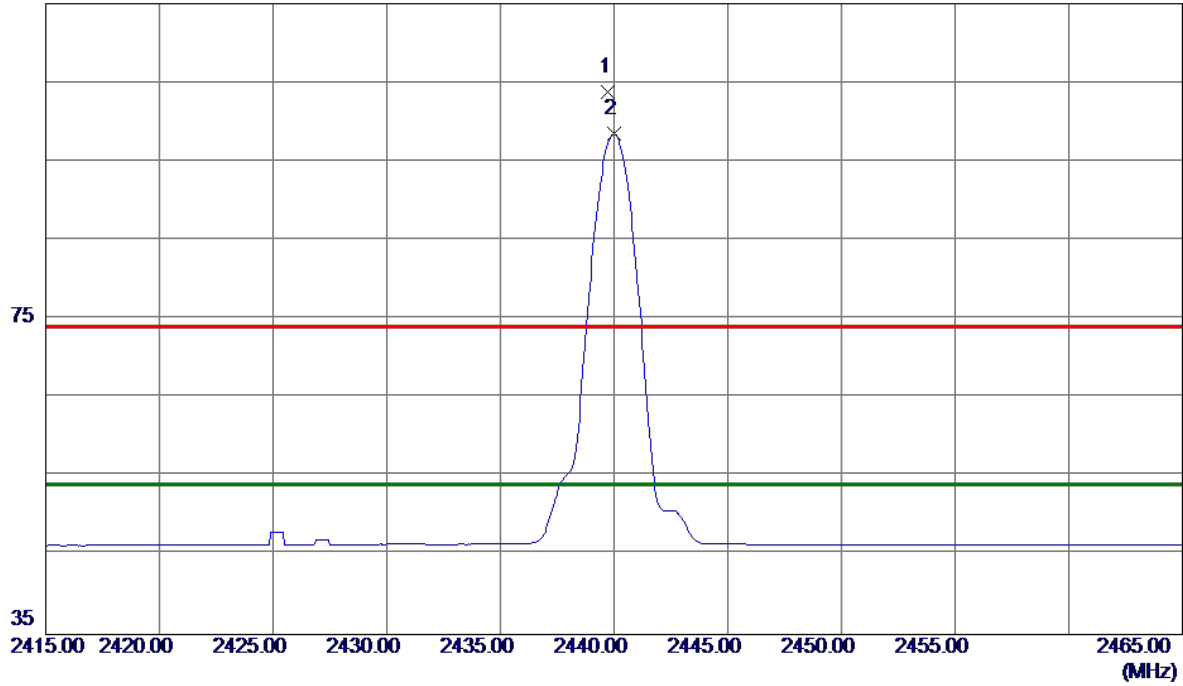


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7205.0230	34.85	13.13	47.98	74.00	-26.02	Peak	
2 *	7205.3750	24.11	13.13	37.24	54.00	-16.76	AVG	

Test Mode : TX 2440MHz \_CH19\_1Mbps

**Vertical**

115 dBuV/m

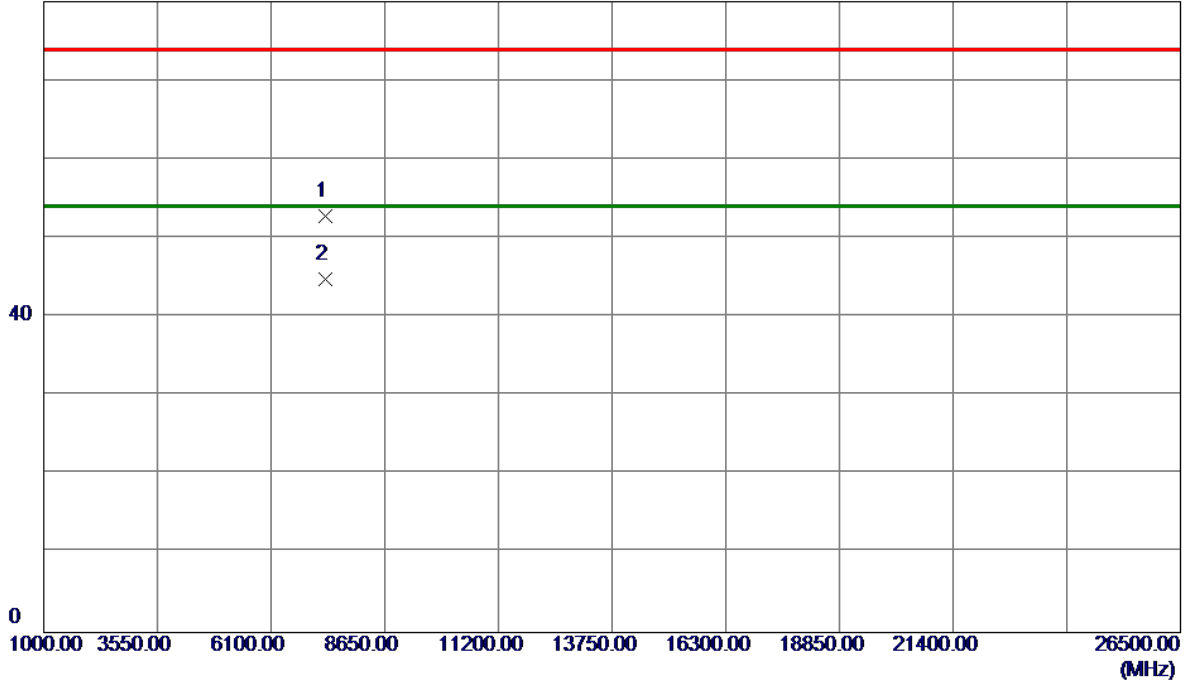


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7500	70.63	33.24	103.87	74.00	29.87	Peak	No Limit
2 *	2440.0000	65.24	33.24	98.48	54.00	44.48	AVG	No Limit

Test Mode : TX 2440MHz \_CH19\_1Mbps

**Vertical**

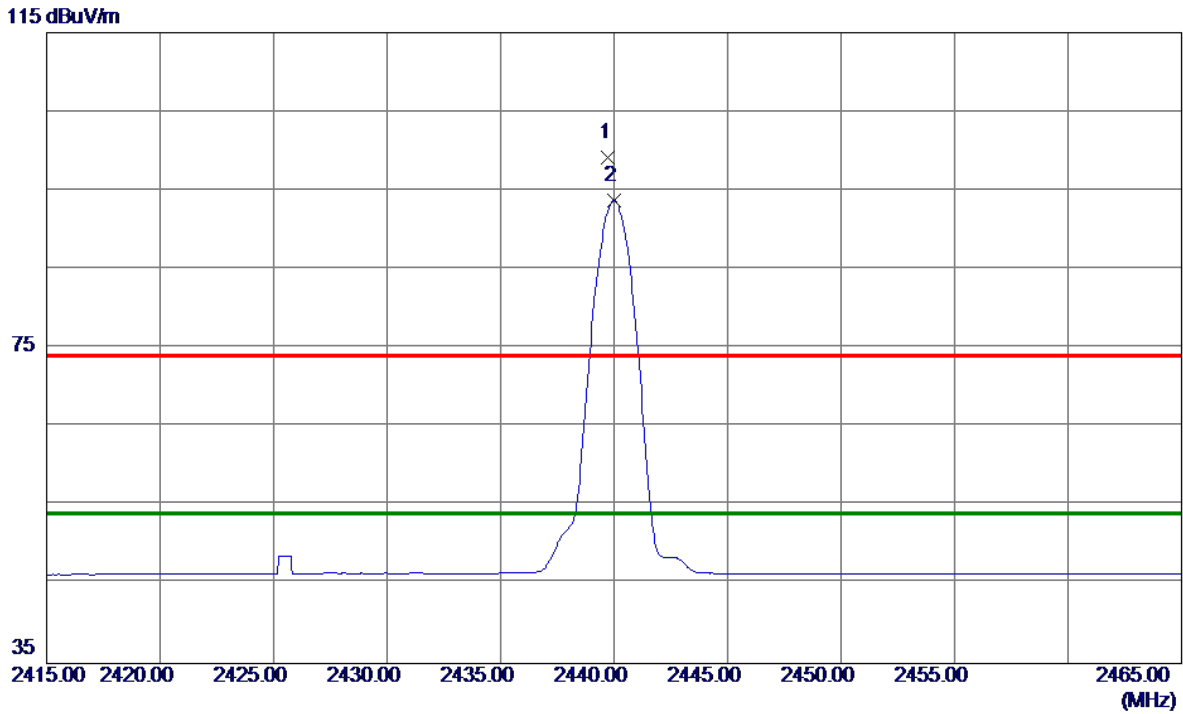
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7320.0440	39.59	13.22	52.81	74.00	-21.19	Peak	
2 *	7320.7670	31.53	13.22	44.75	54.00	-9.25	AVG	

Test Mode : TX 2440MHz \_CH19\_1Mbps

**Horizontal**

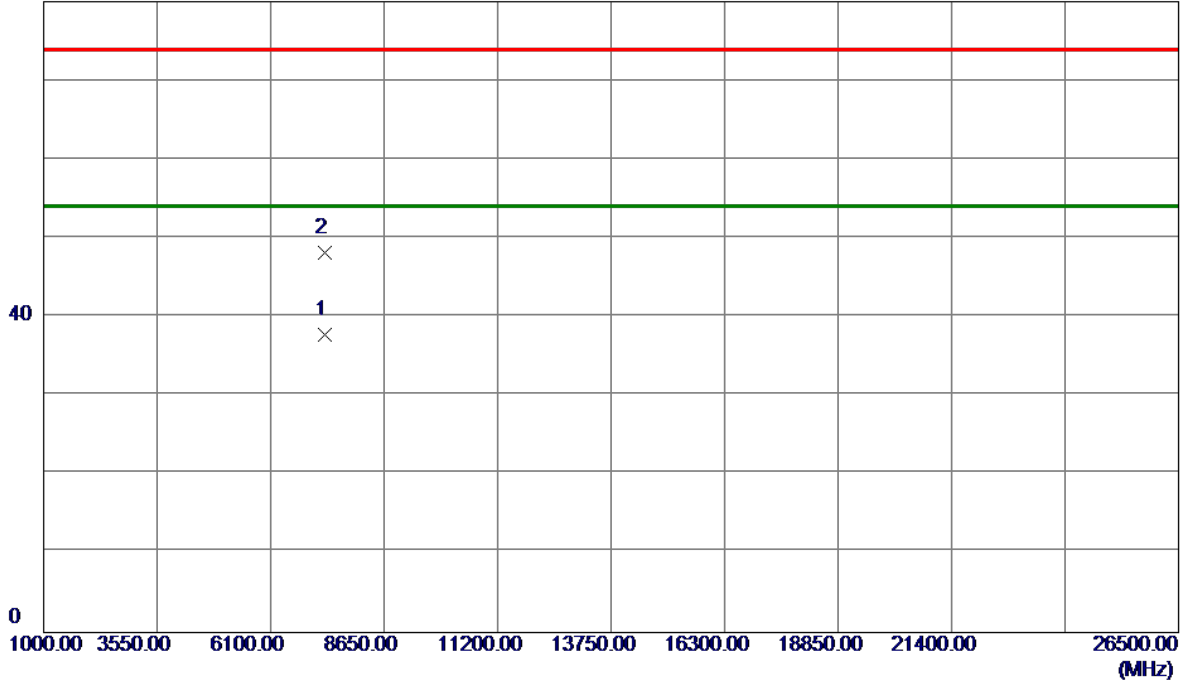


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7500	65.88	33.24	99.12	74.00	25.12	Peak	No Limit
2 *	2440.0000	60.50	33.24	93.74	54.00	39.74	AVG	No Limit

Test Mode : TX 2440MHz \_CH19\_1Mbps

**Horizontal**

80 dBuV/m

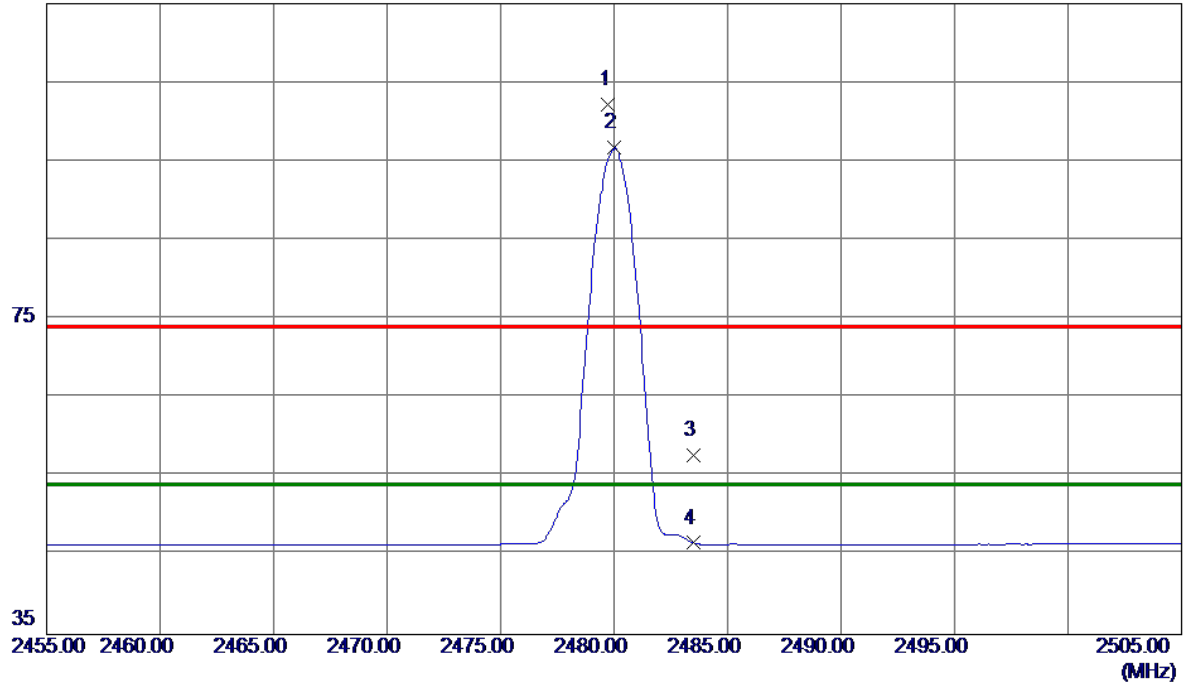


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7319.9490	24.55	13.22	37.77	54.00	-16.23	AVG	
2	7320.6970	34.98	13.22	48.20	74.00	-25.80	Peak	

Test Mode : TX 2480MHz \_CH39\_1Mbps

**Vertical**

115 dBuV/m

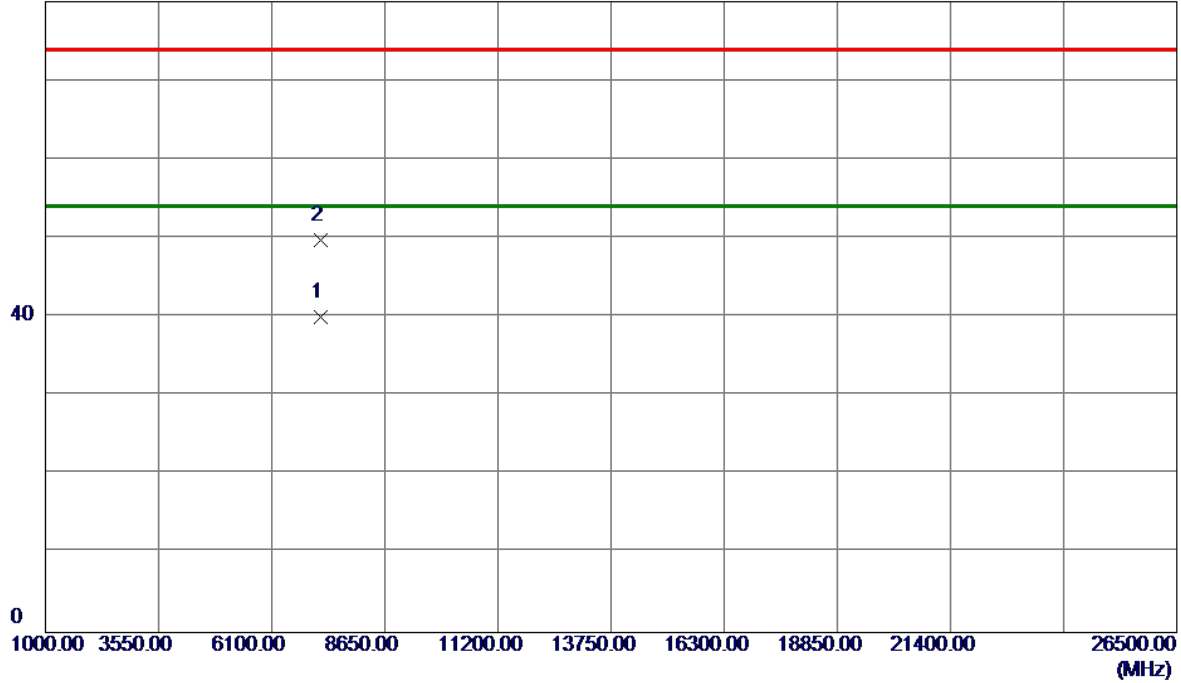


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7500	68.76	33.39	102.15	74.00	28.15	Peak	No Limit
2 *	2480.0250	63.36	33.39	96.75	54.00	42.75	AVG	No Limit
3	2483.5000	24.28	33.41	57.69	74.00	-16.31	Peak	
4	2483.5000	13.19	33.41	46.60	54.00	-7.40	AVG	

Test Mode : TX 2480MHz \_CH39\_1Mbps

**Vertical**

80 dBuV/m

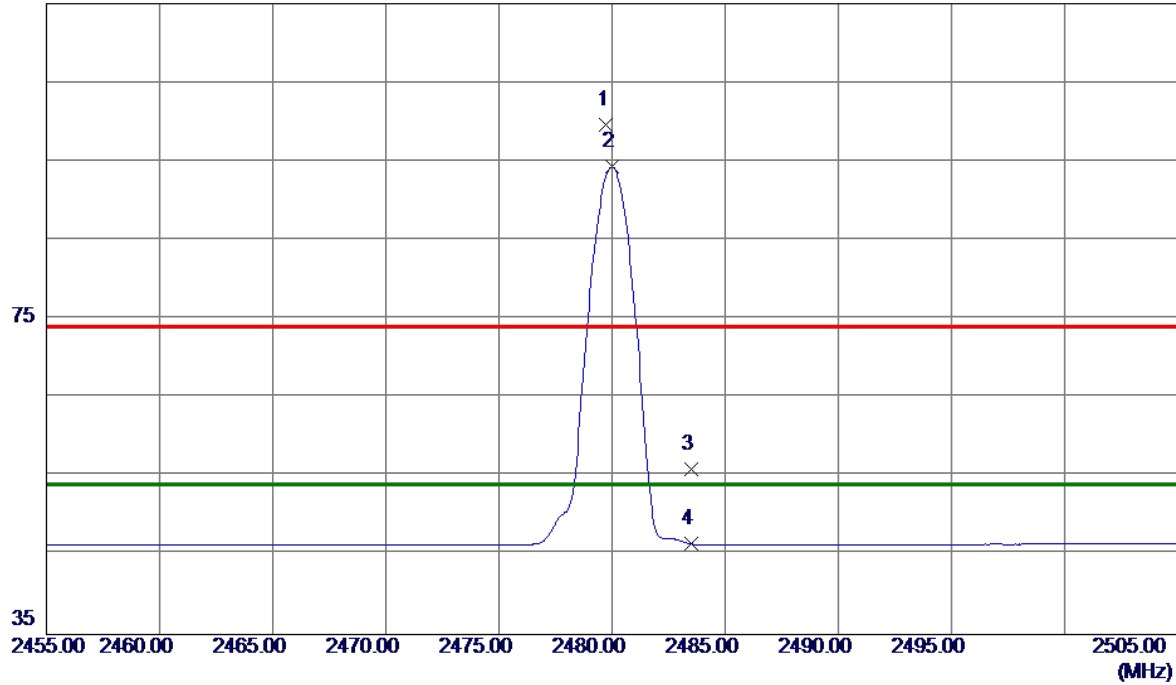


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.9650	26.89	13.13	40.02	54.00	-13.98	AVG	
2	7206.5660	36.66	13.13	49.79	74.00	-24.21	Peak	

Test Mode : TX 2480MHz \_CH39\_1Mbps

### Horizontal

115 dBuV/m



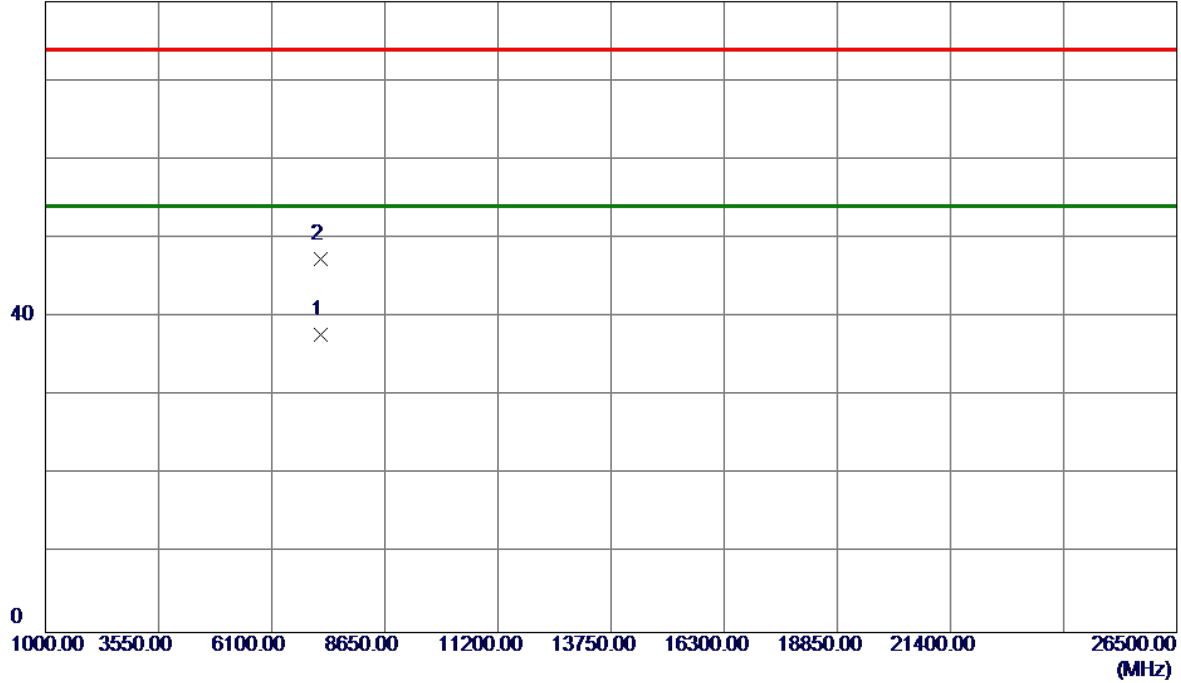
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7500	66.29	33.39	99.68	74.00	25.68	Peak	No Limit
2 *	2479.9750	60.90	33.39	94.29	54.00	40.29	AVG	No Limit
3	2483.5000	22.51	33.41	55.92	74.00	-18.08	Peak	
4	2483.5000	13.05	33.41	46.46	54.00	-7.54	AVG	



Test Mode : TX 2480MHz \_CH39\_1Mbps

**Horizontal**

80 dBuV/m



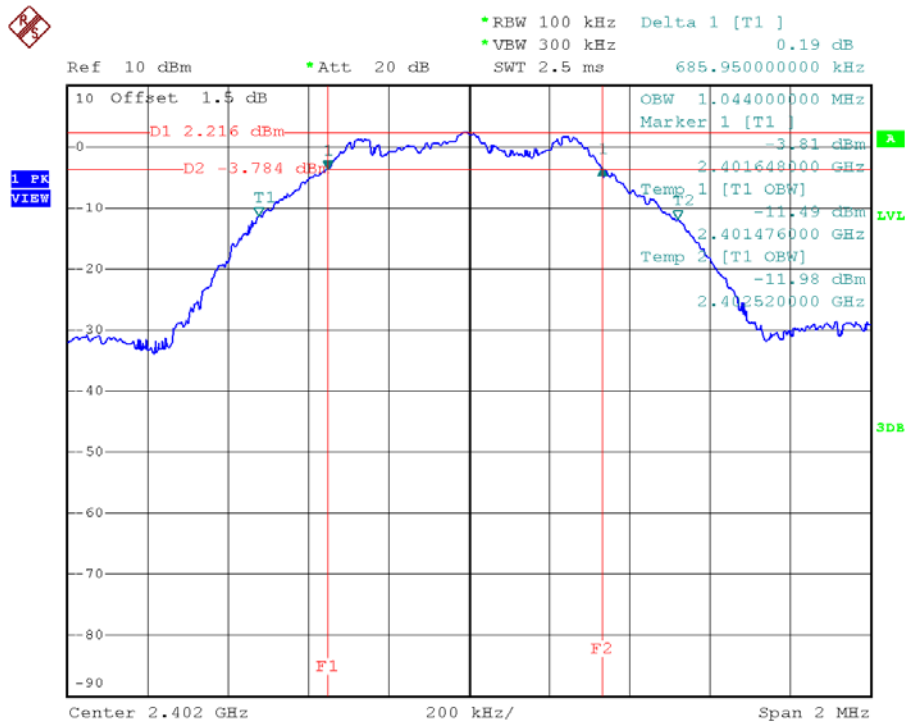
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.7520	24.65	13.13	37.78	54.00	-16.22	AVG	
2	7206.0700	34.24	13.13	47.37	74.00	-26.63	Peak	

## APPENDIX E - BANDWIDTH

Test Mode: TX Mode

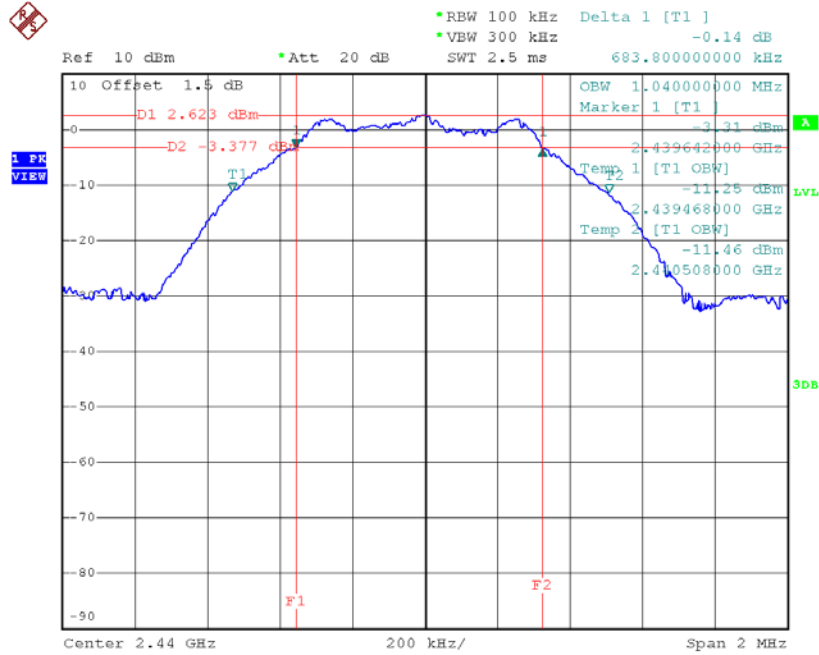
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.686	1.044	500	Pass
2440	0.684	1.040	500	Pass
2480	0.688	1.040	500	Pass

TX CH00



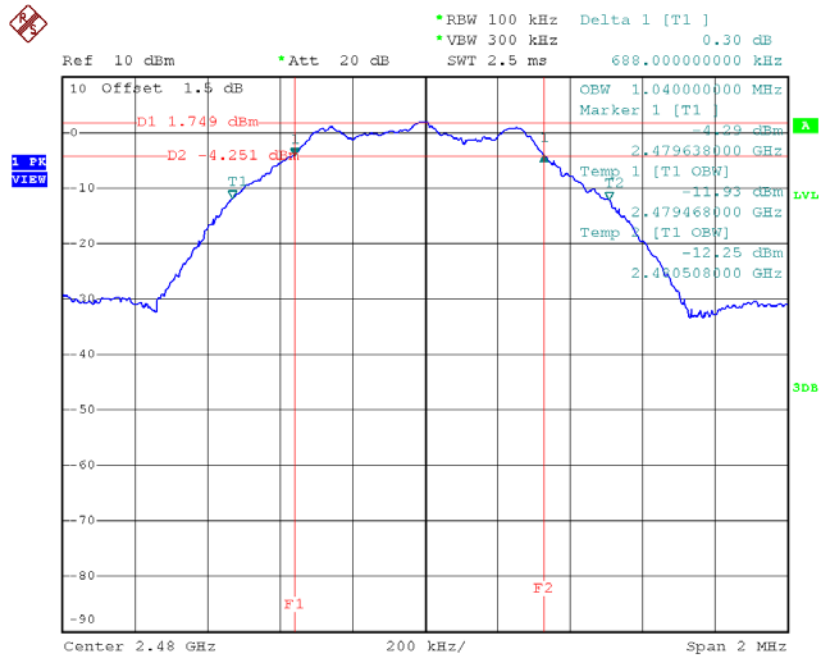
Date: 28.FEB.2018 08:31:11

**TX CH19**



Date: 28.FEB.2018 08:36:34

**TX CH39**



Date: 28.FEB.2018 08:38:15

## APPENDIX F - MAXIMUM OUTPUT POWER TEST

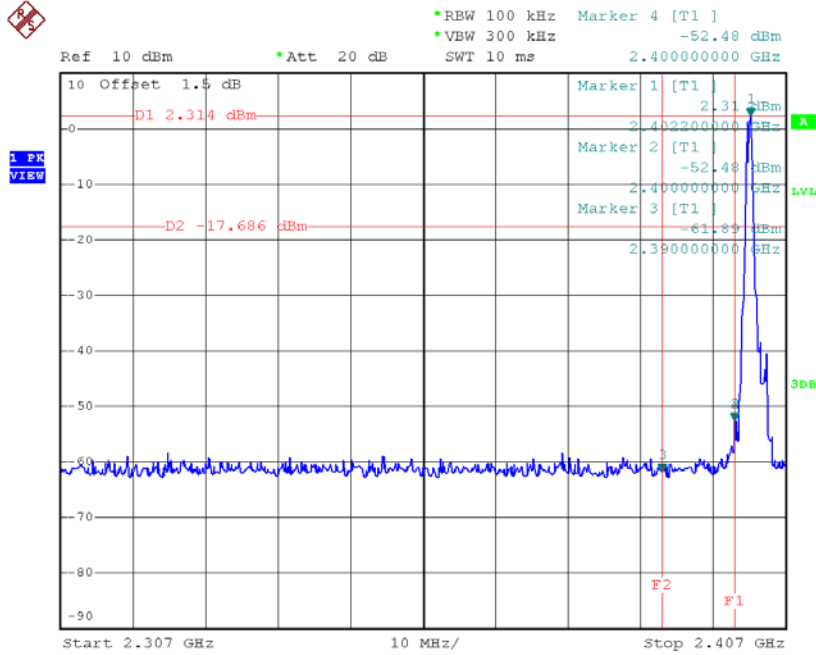
Test Mode : CH00, CH19 , CH39 - 1Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	2.57	0.0018	30.00	1.00	Pass
2440	3.10	0.0020	30.00	1.00	Pass
2480	2.15	0.0016	30.00	1.00	Pass

# APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION

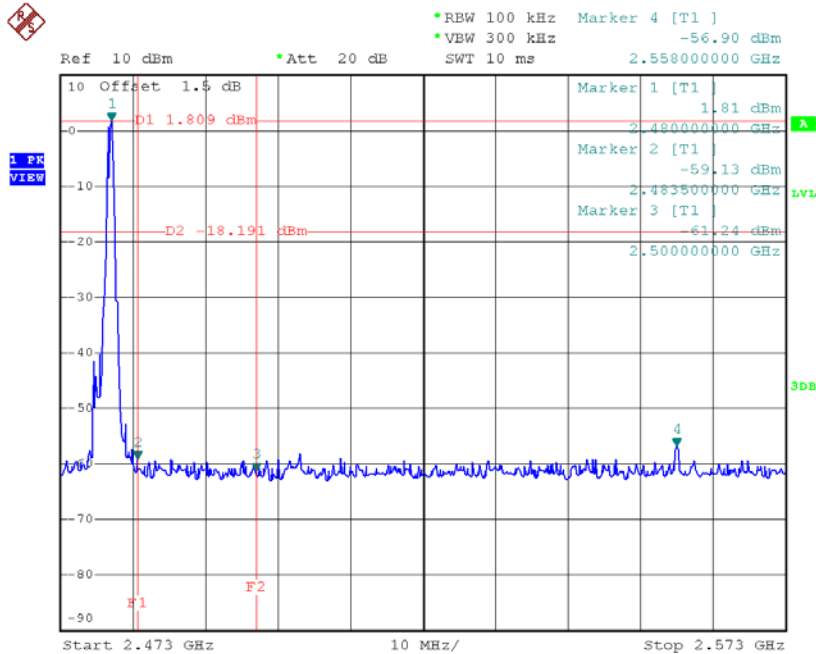
Test Mode : CH00, CH19 , CH39 - 1Mbps

**CH00 (Lower) - 1Mbps**



Date: 28.FEB.2018 08:31:19

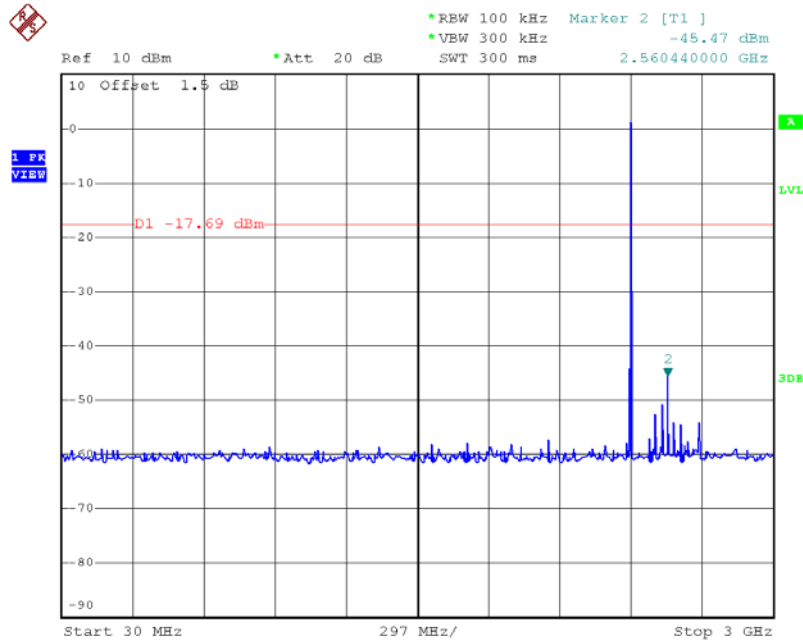
**CH39 (upper) - 1Mbps**



Date: 28.FEB.2018 08:38:49

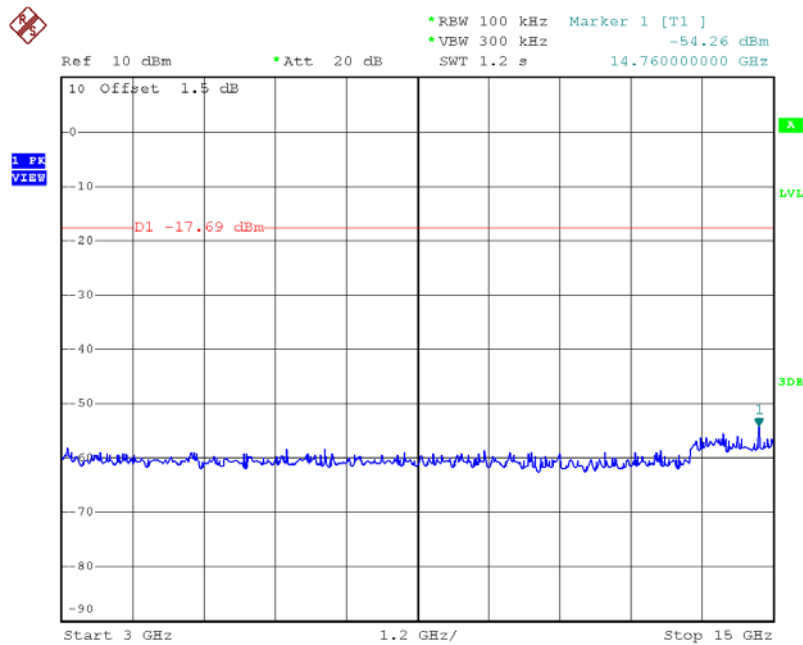


### CH00 (10 Harmonic of the frequency) 1



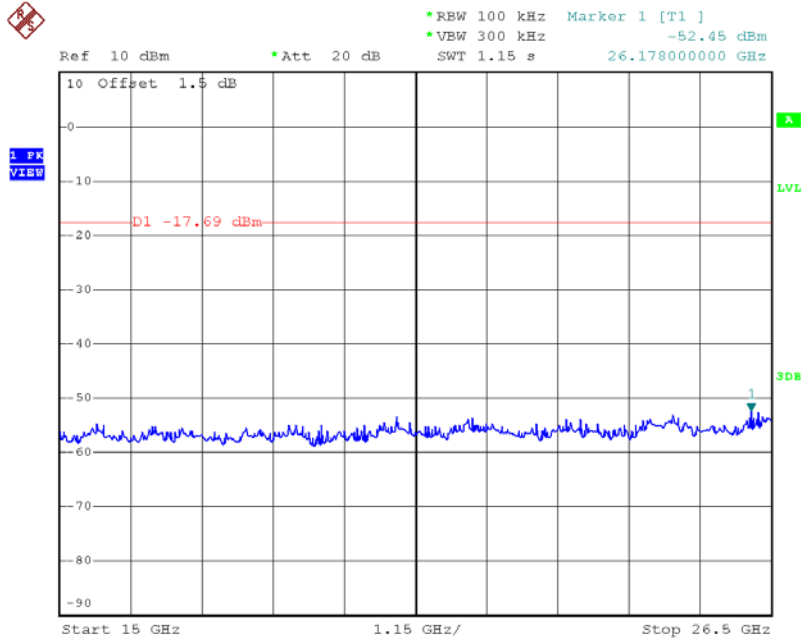
Date: 28.FEB.2018 08:31:33

### CH00 (10 Harmonic of the frequency) 2



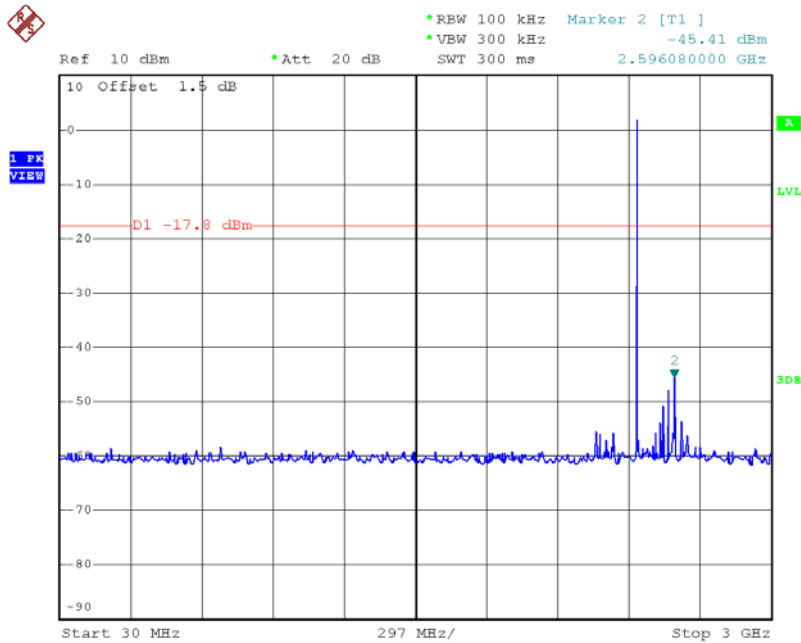
Date: 28.FEB.2018 08:31:42

### CH00 (10 Harmonic of the frequency) 3



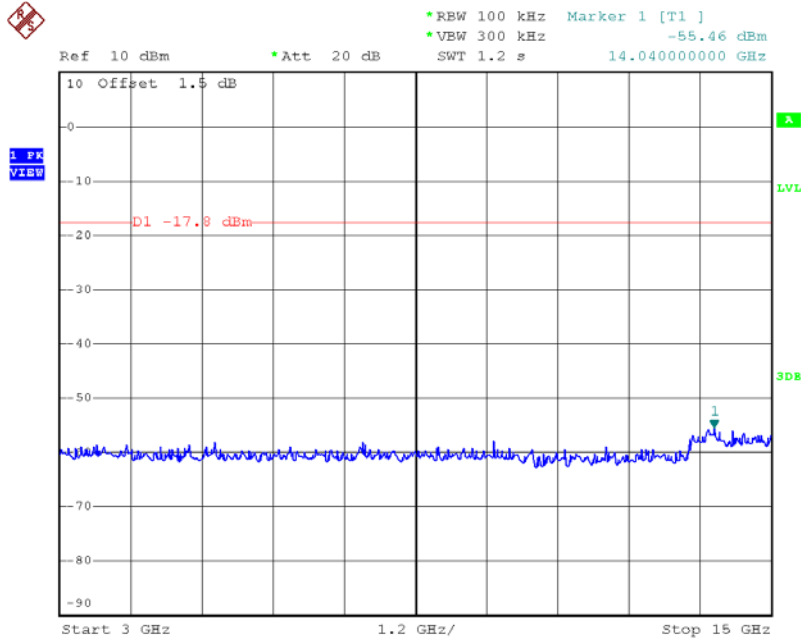
Date: 28.FEB.2018 08:31:50

### CH19 (10 Harmonic of the frequency) 1



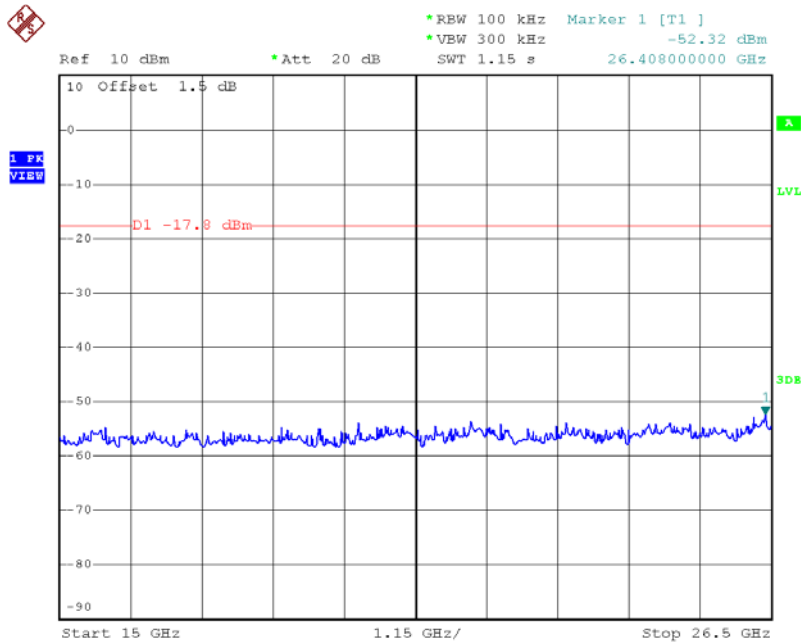
Date: 28.FEB.2018 08:37:11

### CH19 (10 Harmonic of the frequency) 2



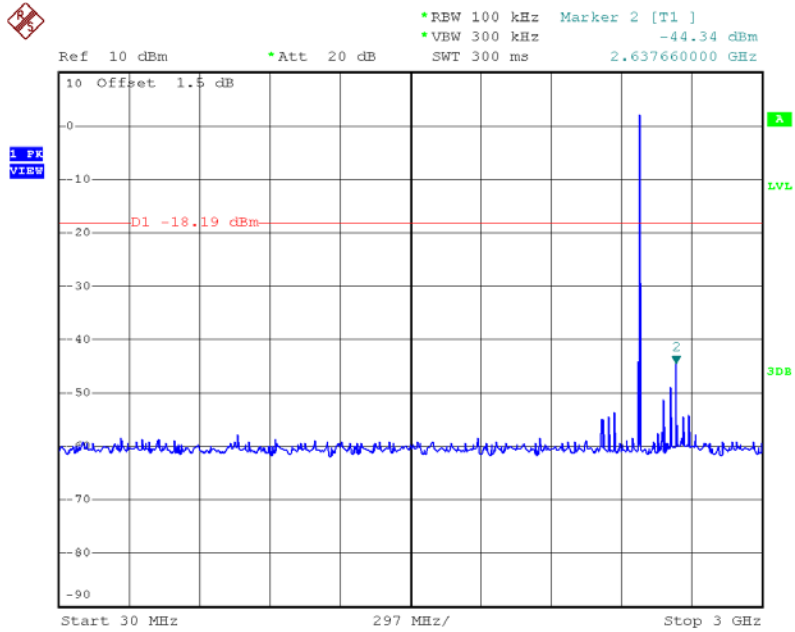
Date: 28.FEB.2018 08:37:19

### CH19 (10 Harmonic of the frequency) 3



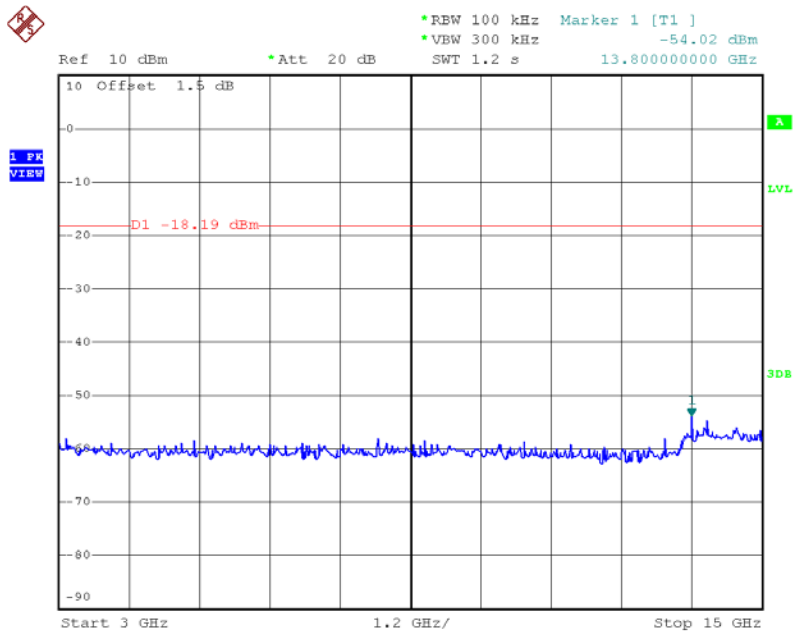
Date: 28.FEB.2018 08:37:27

### CH39 (10 Harmonic of the frequency) 1



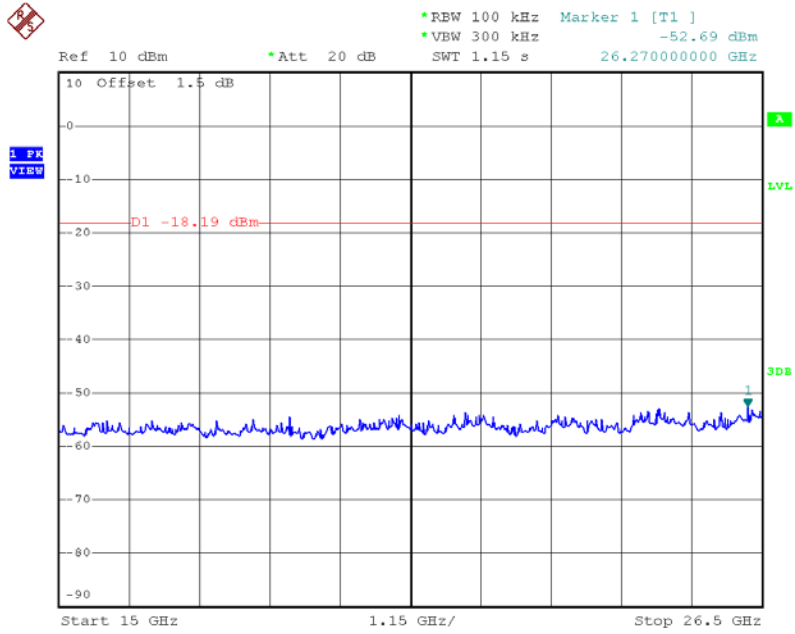
Date: 28.FEB.2018 08:39:03

### CH39 (10 Harmonic of the frequency) 2



Date: 28.FEB.2018 08:39:12

### CH39 (10 Harmonic of the frequency) 3



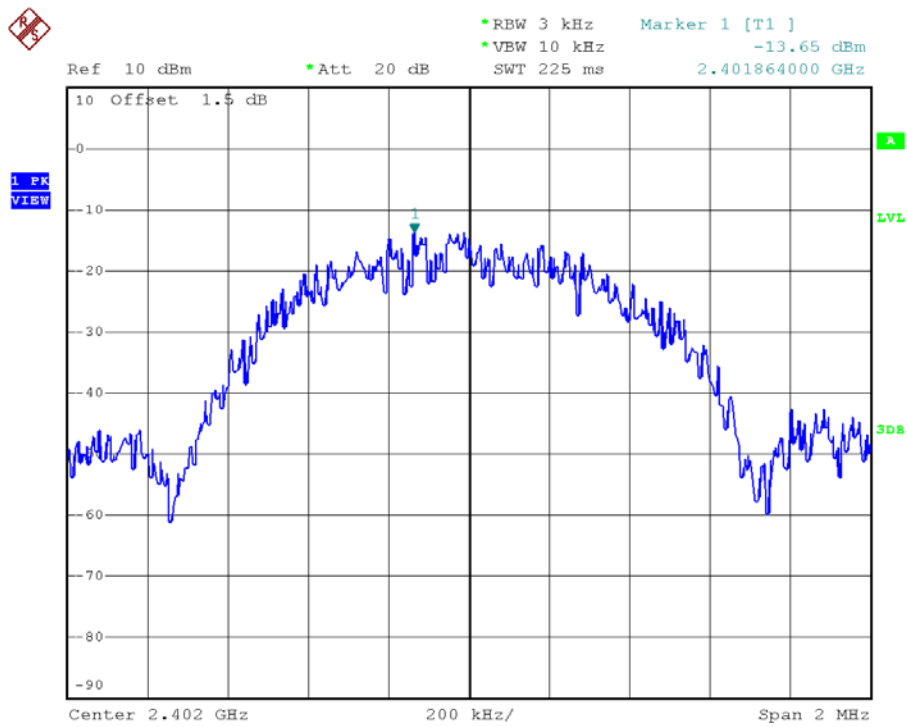
Date: 28.FEB.2018 08:39:20

## APPENDIX H - POWER SPECTRAL DENSITY TEST

Test Mode: CH00, CH19 , CH39 - 1Mbps

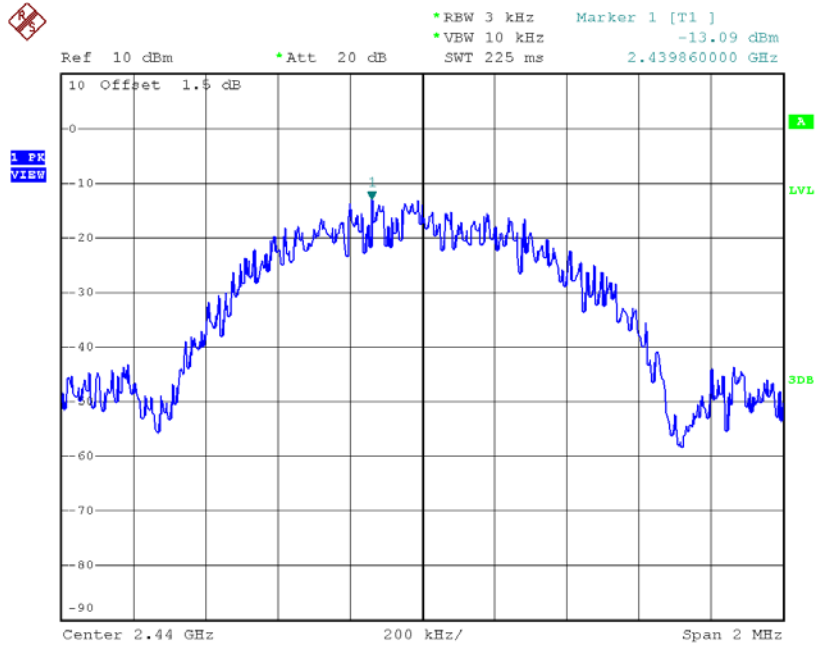
Frequency (MHz)	Power Density (dBm/3kHz)	Power Density (mW/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-13.65	0.043	8.00	Pass
2440	-13.09	0.049	8.00	Pass
2480	-13.97	0.040	8.00	Pass

### TX CH00



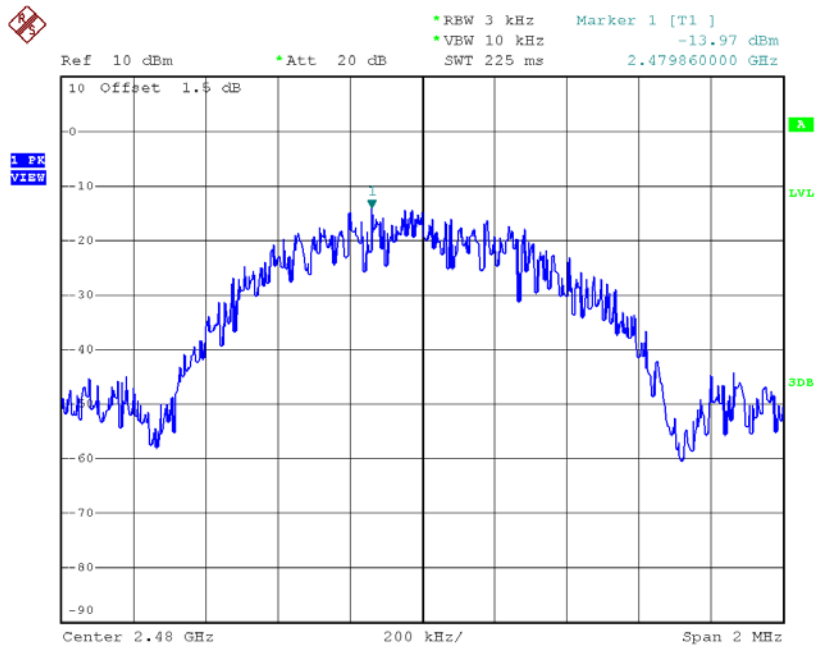
Date: 28.FEB.2018 08:31:56

### TX CH19



Date: 28.FEB.2018 08:37:34

### TX CH39



Date: 28.FEB.2018 08:39:26