

FCC Radio Test Report

FCC ID: RWO-RZ060280

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

Project No. : 1808C132
Equipment : Gaming Controller
Test Model : RZ06-0280
Series Model : RZ06-0280XXXX-XXXX(X:Can be 0-9, A-Z)
Applicant : Razer Inc.
Address : 201 3rd Street, Suite 900, San Francisco,CA
94103,USA

Date of Receipt : Aug. 13, 2018
Date of Test : Aug. 15, 2018 ~ Sep. 17, 2018
Issued Date : Sep. 20, 2018
Tested by : BTL Inc.

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Declaration

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

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

The information, data and test plan are provided by manufacturer, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements 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.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1808C132	Original Issue.	Sep. 20, 2018

1. CERTIFICATION

Equipment : Gaming Controller
Brand Name : RAZER
Test Model : RZ06-0280
Series Model : RZ06-0280XXXX-XXXX(X:Can be 0-9, A-Z)
Applicant : Razer Inc.
Manufacturer : Razer (Asia-Pacific) Pte.,Ltd.
Address : 514 Chai Chee Lane #07-01 ~ 06 Singapore 469029
Factory : RAZER TECHNOLOGY AND DEVELOPMENT (SHENZHEN) CO., LTD
Address : East Wing, 3rd Floor, Block 2, Phase 1 of Vision Shenzhen Business Park Keji
South Road, Hi-Tech Industrial Park, Shenzhen 518057, China
Date of Test : Aug. 15, 2018 ~ Sep. 17, 2018
Test Sample : Engineering Sample
No.:D180806862 for Conducted, D180907808 for Radiated.
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-1-1808C132) 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):

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)	6 dB Bandwidth	PASS	
15.247(b)(3)	Maximum 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 ~ 30 MHz	2.32

B. Radiated Measurement:

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

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Gaming Controller	
Brand Name	RAZER	
Test Model	RZ06-0280	
Series Model	RZ06-0280XXXX-XXXX(X:Can be 0-9, A-Z)	
Model Difference(s)	It is the same as the basic model and X is used to define which country it is for under the same family series	
Software Version	0.02.02.01	
Hardware Version	EVT	
Product Description	Operation Frequency	2402 MHz ~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	1.62 dBm
Power Source	1. Supplied from USB port. 2. Supplied from Li-ion Rechargeable Battery. Model: FT363291P	
Power Rating	1. DC5V 500mA 2. DC3.8V 1550mAh 5.89Wh	

Note:

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

2. Channel List:

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

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Chip	N/A	2.78

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible 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 NOTE (1)

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 NOTE (1)

Note:

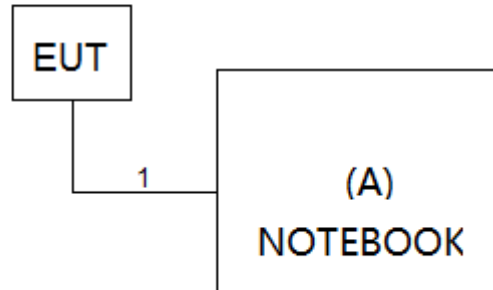
(1) The measurements are performed at the high, middle, low available channels.

3.3 TABLE OF PARAMETERS OF TEXT 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	N/A		
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.
A	Notebook	Lenovo	V310-14ISK	N/A	LR07GZNB

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	NO	2m	USB Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

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

Frequency of Emission (MHz)	Conducted Limit (dB μ 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

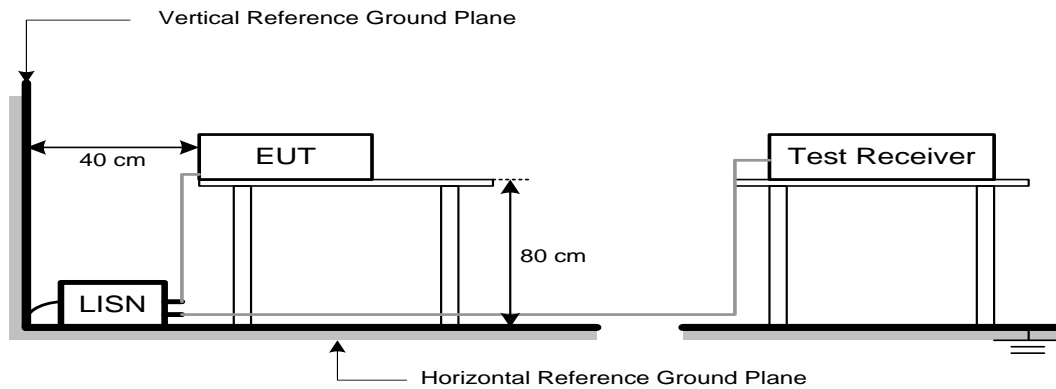
4.1.2 TEST PROCEDURE

- 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



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 150 kHz to 30 MHz.
- (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 (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
960 ~ 1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m) (at 3 meters)	
	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).
- (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 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

4.2.2 TEST PROCEDURE

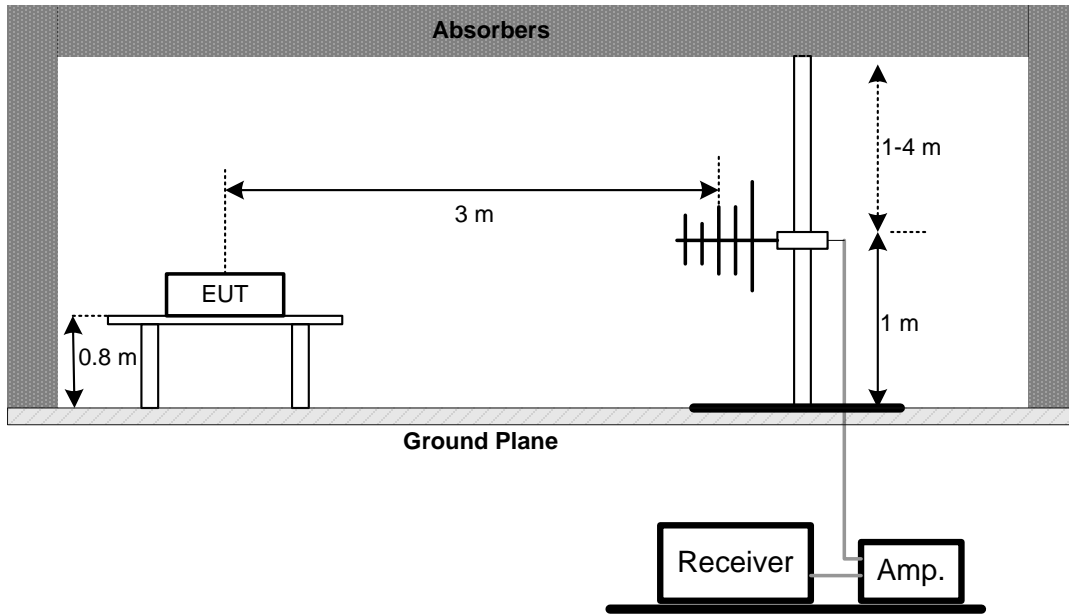
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance 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.

4.2.3 DEVIATION FROM TEST STANDARD

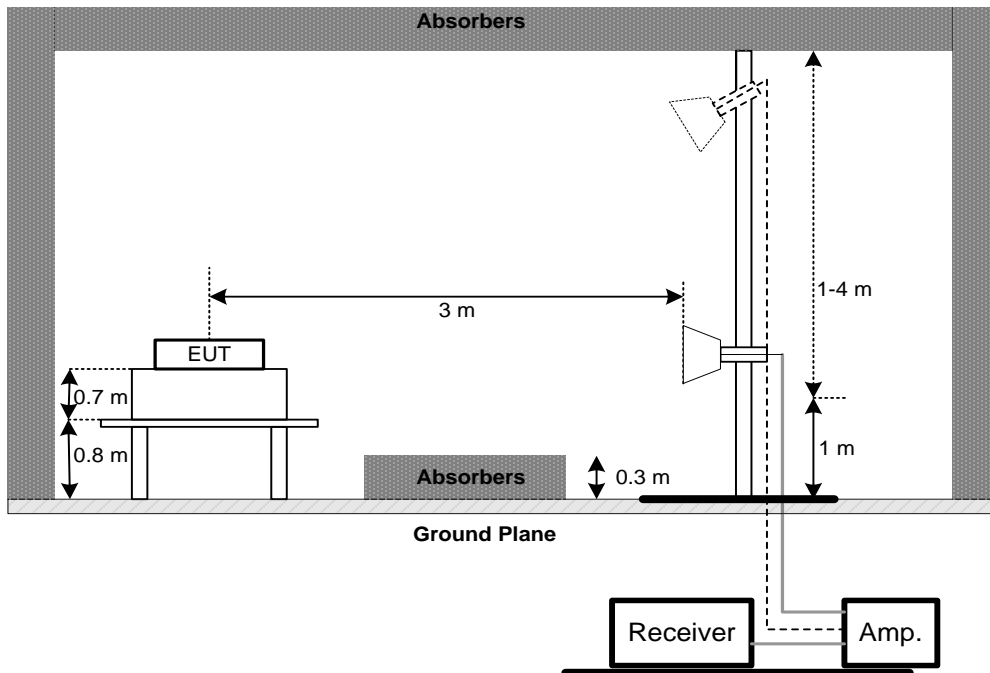
No deviation

4.2.4 TEST SETUP

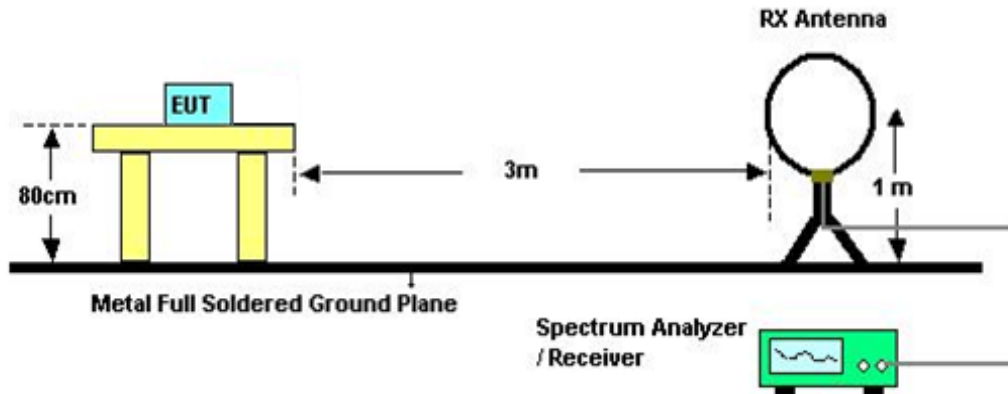
(A) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



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



(C) For radiated emissions 9 kHz-30 MHz



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 RESULT (9 kHz TO 30 MHz)

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 RESULT (30 MHz TO 1000 MHz)

Please refer to the Appendix C.

4.2.9 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 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	≥ 500 kHz (6 dB 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= 100 kHz, VBW=300 kHz, 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 30 dBm	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 9.1.2 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 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. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

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= 100 kHz, VBW=300 kHz, Sweep time = 10 ms.

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 3 kHz)	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=3 kHz, 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 Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 11, 2019
2	LISN	EMCO	3816/2	52765	Mar. 11, 2019
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 11, 2019
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 11, 2019
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 23, 2019

Radiated Emission Measurement - 9kHz TO 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EM	EM-6876-1	230	Feb. 07, 2019
2	Cable	N/A	RG 213/U	C-102	Jun. 01, 2019
3	EMI Test Receiver	R&S	ESCI	100382	Mar. 11, 2019
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement – 30 MHz TO 1000 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 11, 2019
2	Amplifier	HP	8447D	2944A09673	Aug. 11, 2019
3	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 25, 2019
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement - Above 1 GHz

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 11, 2019
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2019
3	Amplifier	Agilent	8449B	3008A02274	Mar. 11, 2019
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 11, 2019
5	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Jul. 30, 2019
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

6 dB Bandwidth Measurement

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

Output Power Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	ANRITSU	ML2495A	1128009	Mar. 11, 2019
2	Pulse Power Sensor	ANRITSU	MA 2411B	1027500	Mar. 11, 2019

Antenna Conducted Spurious Emission Measurement

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

Power Spectral Density Measurement

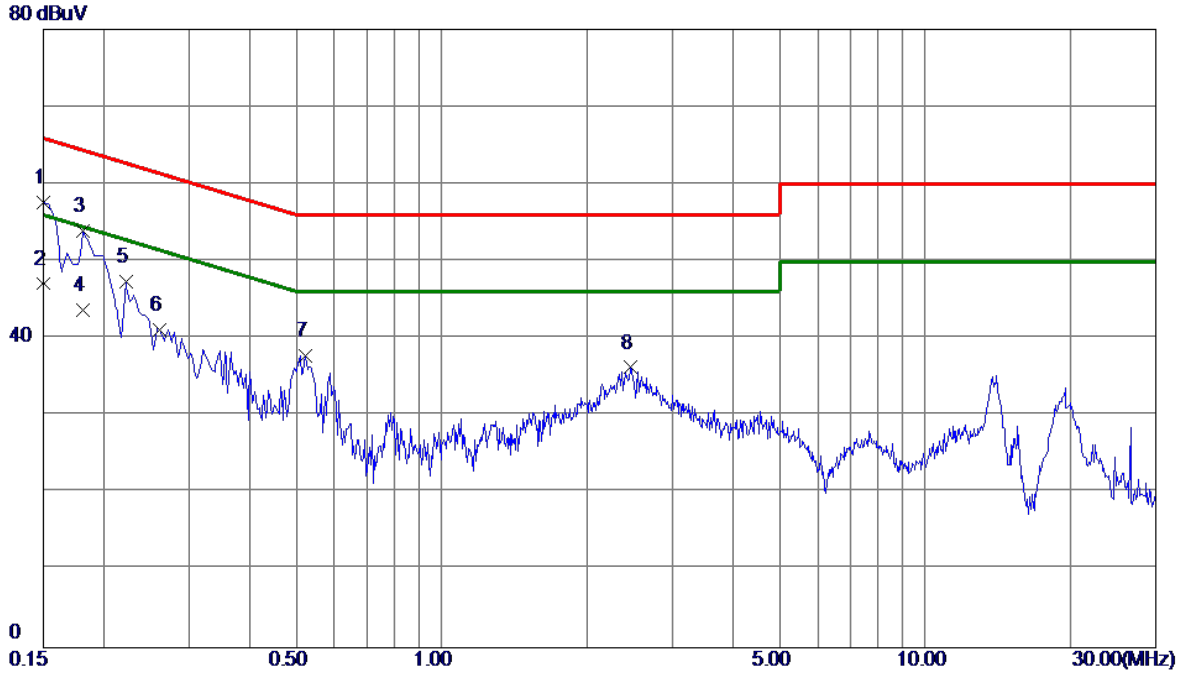
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

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

APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

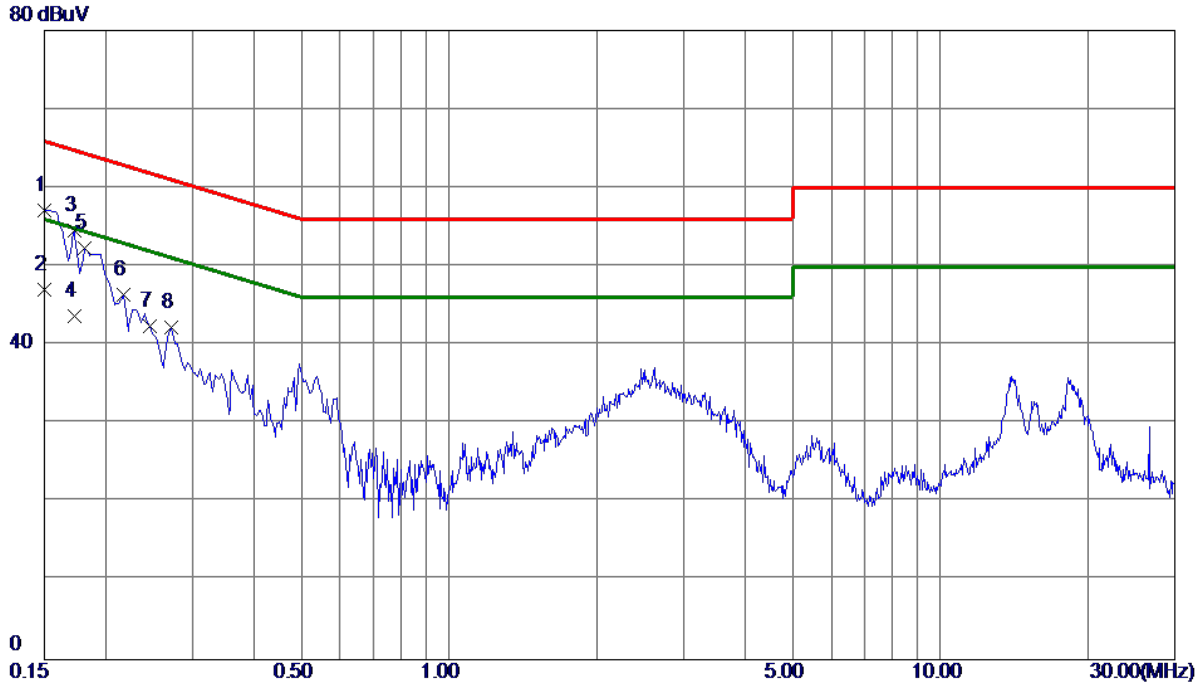
Line



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	47.78	9.82	57.60	66.00	-8.40	Peak	
2	0.1500	37.30	9.82	47.12	56.00	-8.88	AVG	
3	0.1815	44.06	9.82	53.88	64.42	-10.54	Peak	
4	0.1815	33.81	9.82	43.63	54.42	-10.79	AVG	
5	0.2220	37.52	9.82	47.34	62.74	-15.40	Peak	
6	0.2603	31.28	9.82	41.10	61.42	-20.32	Peak	
7	0.5235	27.91	9.80	37.71	56.00	-18.29	Peak	
8	2.4585	26.22	10.02	36.24	56.00	-19.76	Peak	

Test Mode: TX Mode

Neutral

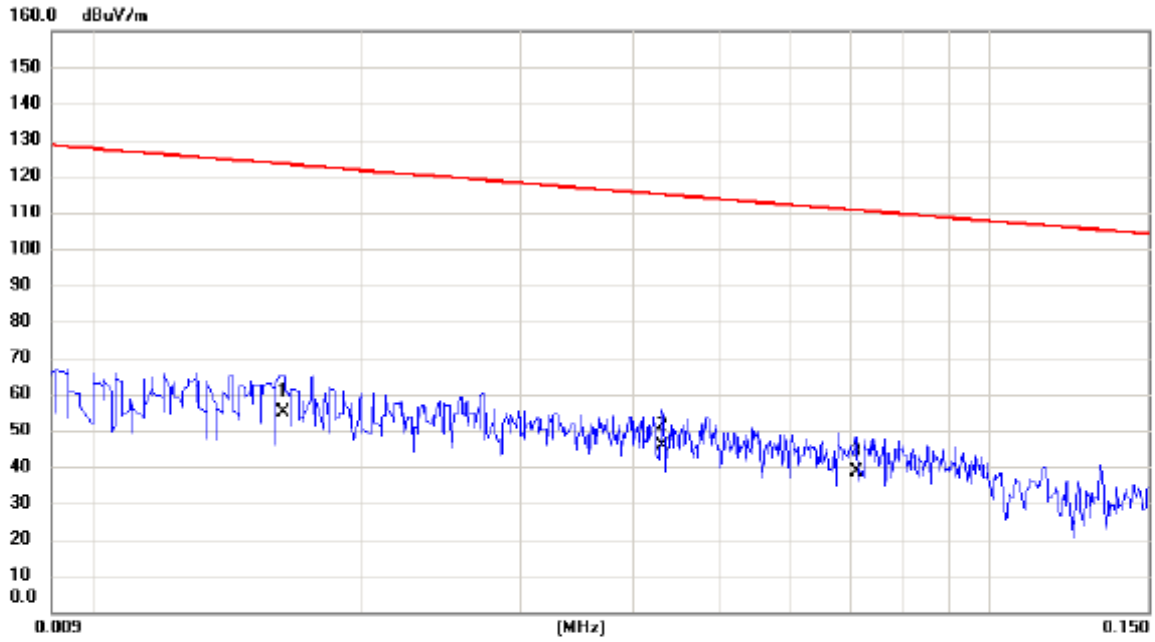


No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1 *	0.1500	47.20	9.91	57.11	66.00	-8.89	Peak	
2	0.1500	37.10	9.91	47.01	56.00	-8.99	AVG	
3	0.1725	44.69	9.91	54.60	64.84	-10.24	Peak	
4	0.1725	33.80	9.91	43.71	54.84	-11.13	AVG	
5	0.1815	42.46	9.91	52.37	64.42	-12.05	Peak	
6	0.2175	36.54	9.91	46.45	62.91	-16.46	Peak	
7	0.2455	32.41	9.92	42.33	61.91	-19.58	Peak	
8	0.2714	32.26	9.92	42.18	61.07	-18.89	Peak	

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

Test Mode: TX Mode

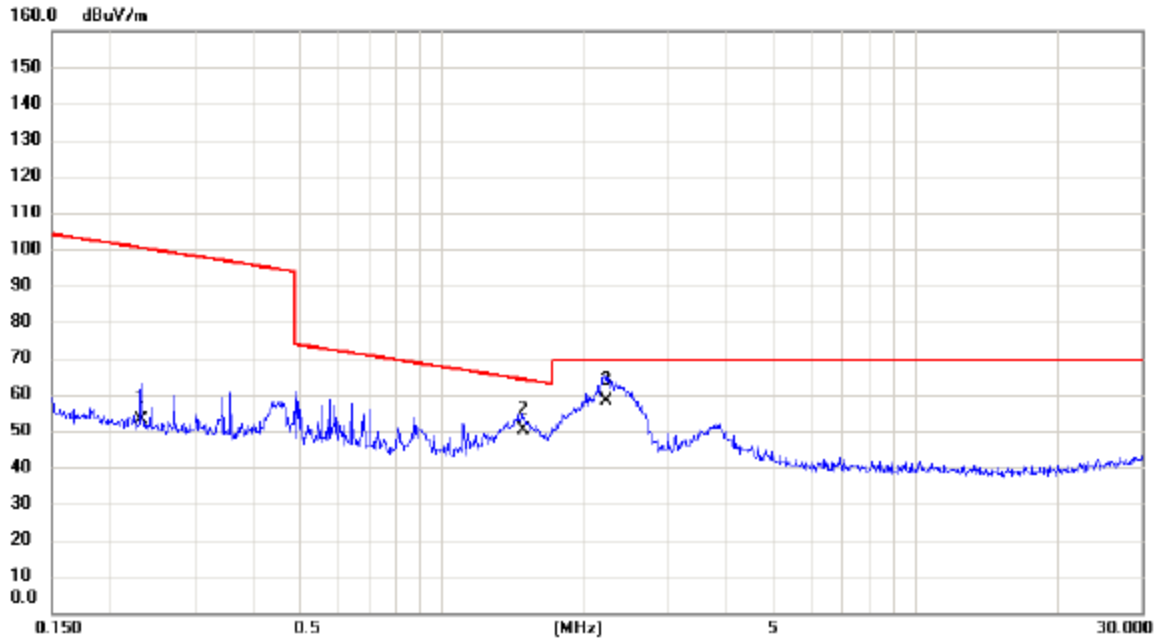
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0163	34.60	20.54	55.14	123.36	-68.22	AVG	
2		0.0431	26.20	19.63	45.83	114.92	-69.09	AVG	
3		0.0711	19.30	19.11	38.41	110.57	-72.16	AVG	

Test Mode: TX Mode

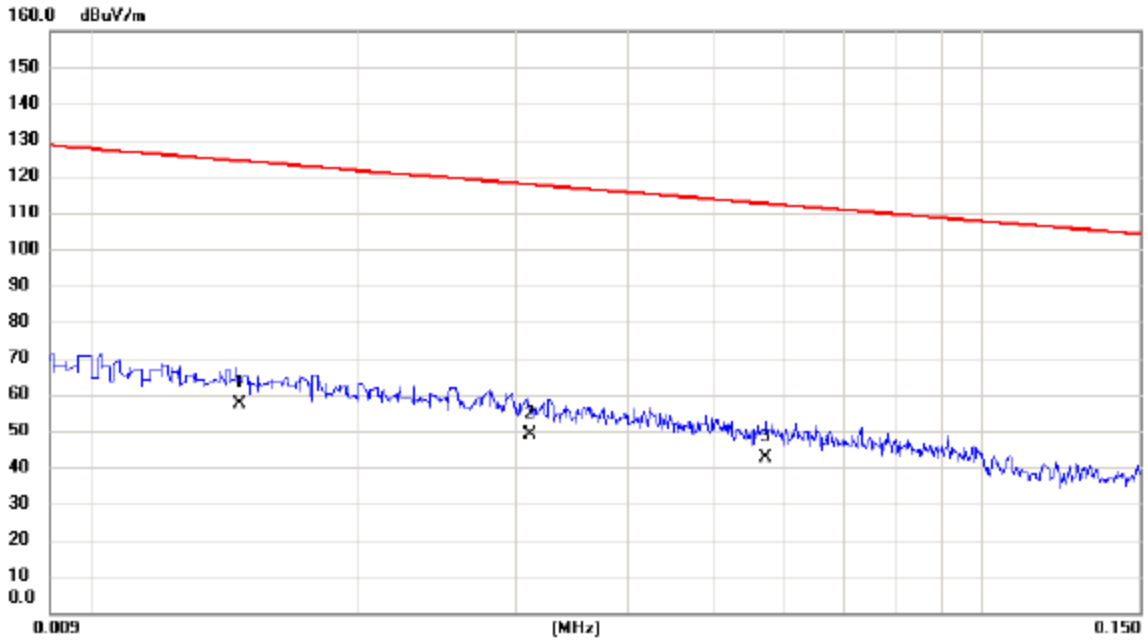
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.2316	35.80	17.09	52.89	100.31	-47.42	AVG	
2		1.4796	33.20	16.84	50.04	64.20	-14.16	QP	
3	*	2.2250	41.31	16.97	58.28	69.54	-11.26	QP	

Test Mode: TX Mode

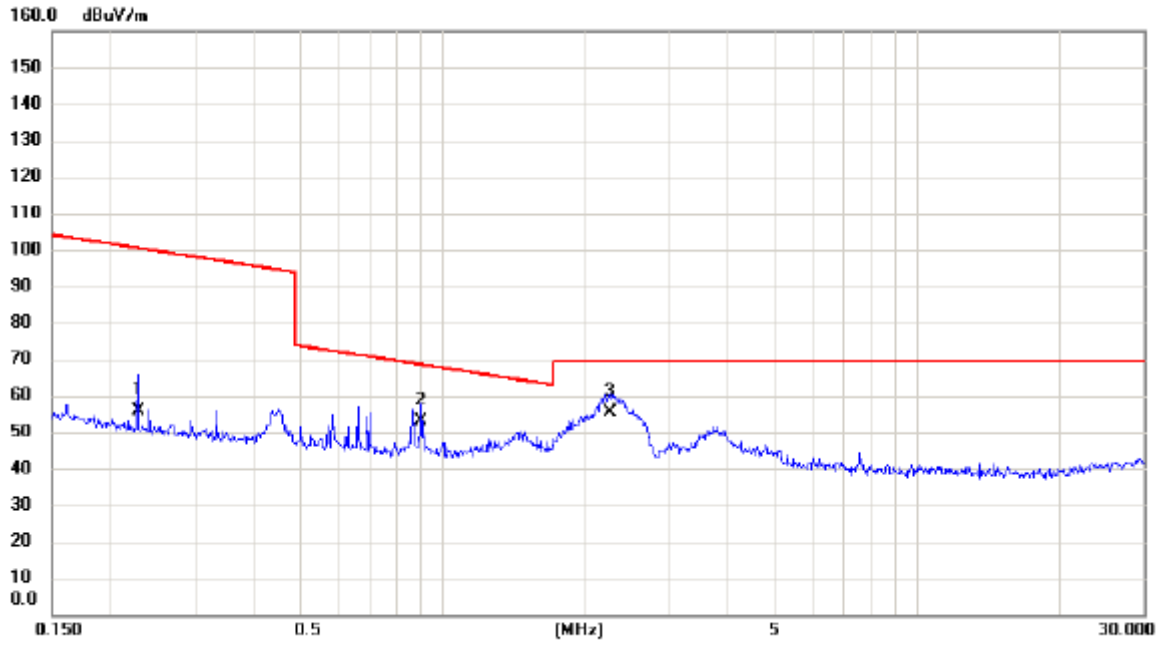
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0147	36.60	20.76	57.36	124.26	-66.90	AVG	
2		0.0311	29.30	19.84	49.14	117.75	-68.61	AVG	
3		0.0571	23.30	19.39	42.69	112.47	-69.78	AVG	

Test Mode: TX Mode

Ant 90°

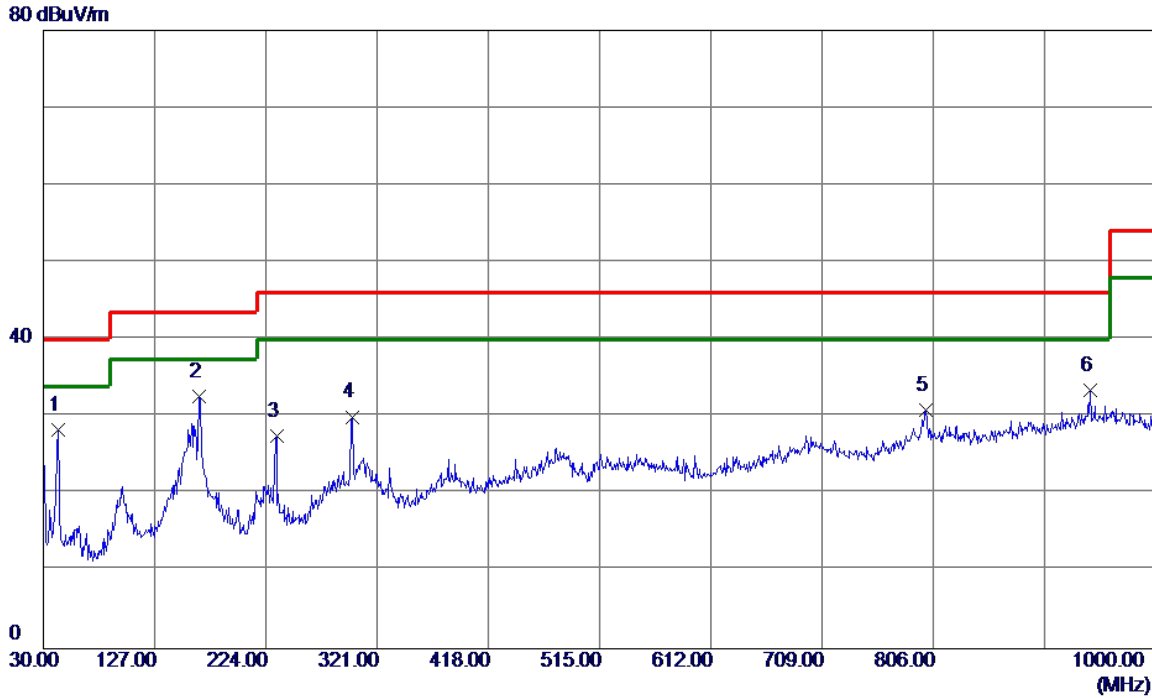


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2280	38.70	17.09	55.79	100.45	-44.66	AVG	
2		0.8992	36.20	16.71	52.91	68.53	-15.62	QP	
3	*	2.2486	38.60	16.96	55.56	69.54	-13.98	QP	

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

Test Mode: TX 2402 MHz _CH00_1Mbps

Vertical

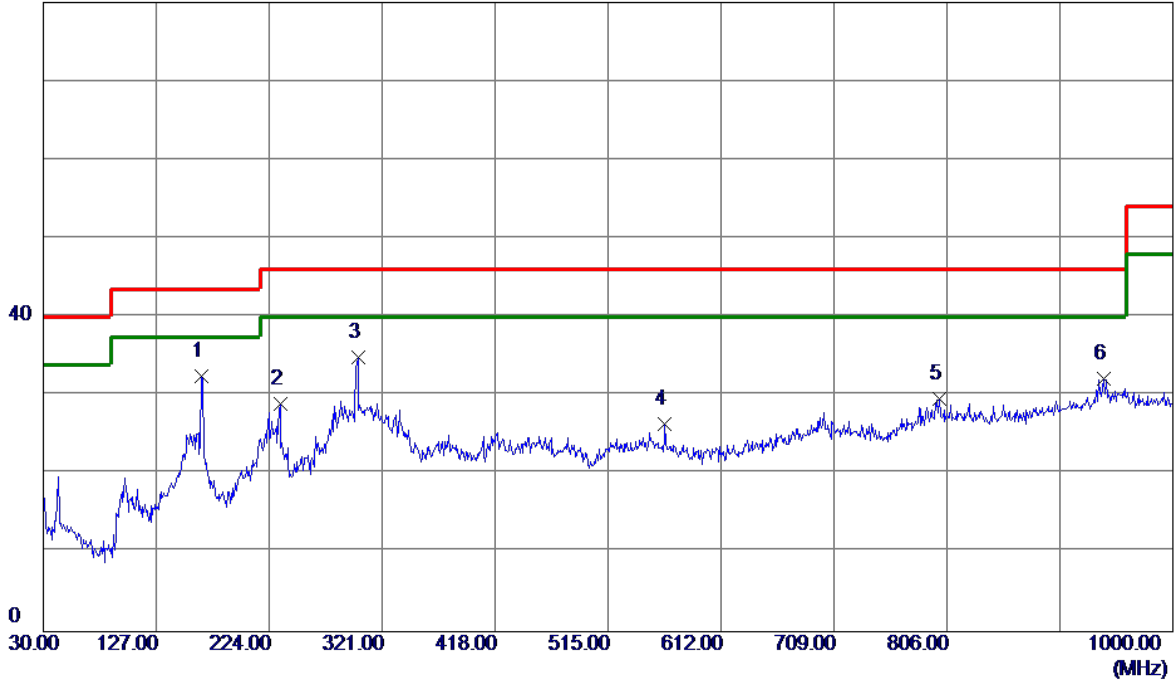


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	42.6100	43.06	-14.70	28.36	40.00	-11.64	Peak	
2 *	165.8000	43.65	-10.95	32.70	43.50	-10.80	Peak	
3	233.2150	42.44	-14.87	27.57	46.00	-18.43	Peak	
4	299.6600	40.39	-10.39	30.00	46.00	-16.00	Peak	
5	799.6950	31.92	-1.06	30.86	46.00	-15.14	Peak	
6	943.2550	32.33	1.14	33.47	46.00	-12.53	Peak	

Test Mode: TX 2402 MHz _CH00_1Mbps

Horizontal

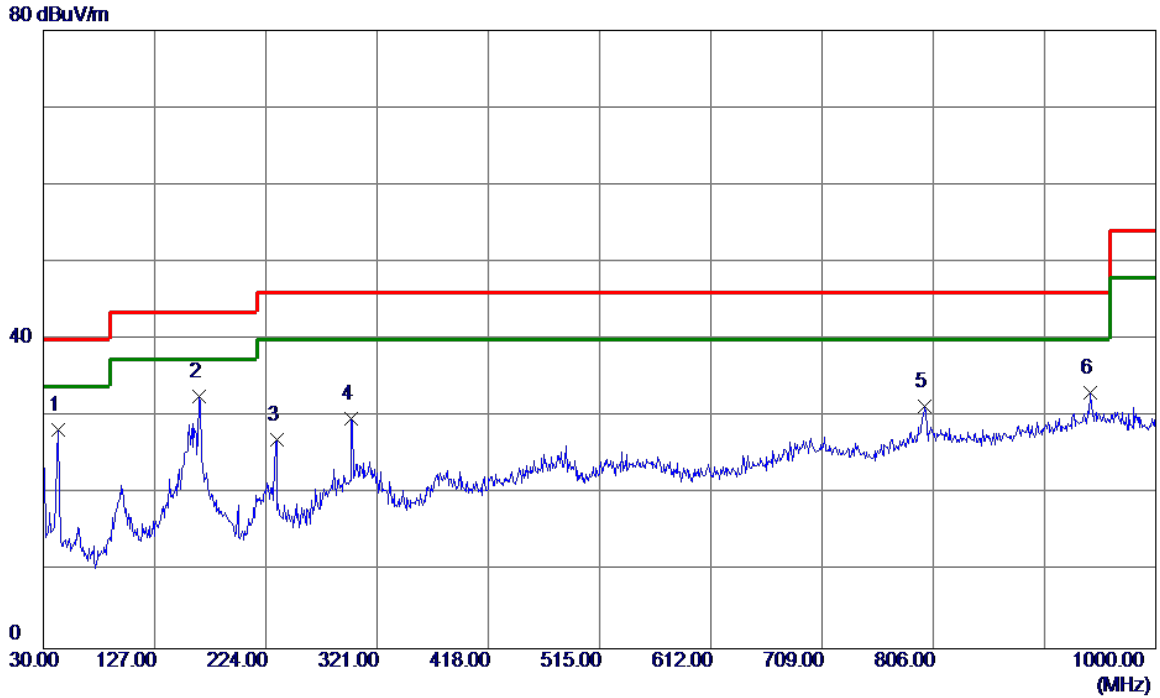
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	165.8000	43.41	-10.95	32.46	43.50	-11.04	Peak	
2	233.2150	43.84	-14.87	28.97	46.00	-17.03	Peak	
3	300.1450	45.31	-10.37	34.94	46.00	-11.06	Peak	
4	563.9850	32.07	-5.70	26.37	46.00	-19.63	Peak	
5	799.6950	30.70	-1.06	29.64	46.00	-16.36	Peak	
6	940.3450	31.08	1.02	32.10	46.00	-13.90	Peak	

Test Mode: TX 2440 MHz _CH19_1Mbps

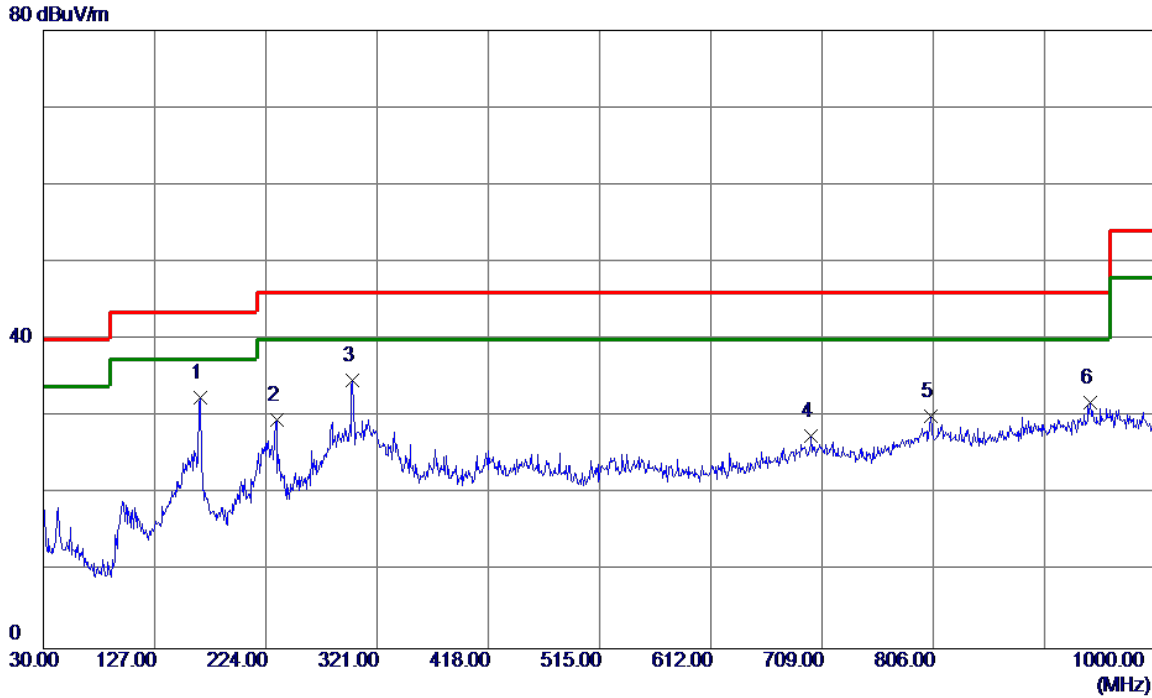
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	42.6100	43.05	-14.70	28.35	40.00	-11.65	Peak	
2 *	165.8000	43.64	-10.95	32.69	43.50	-10.81	Peak	
3	233.2150	41.85	-14.87	26.98	46.00	-19.02	Peak	
4	298.6900	40.17	-10.45	29.72	46.00	-16.28	Peak	
5	798.7250	32.53	-1.12	31.41	46.00	-14.59	Peak	
6	943.2550	32.04	1.14	33.18	46.00	-12.82	Peak	

Test Mode: TX 2440 MHz _CH19_1Mbps

Horizontal

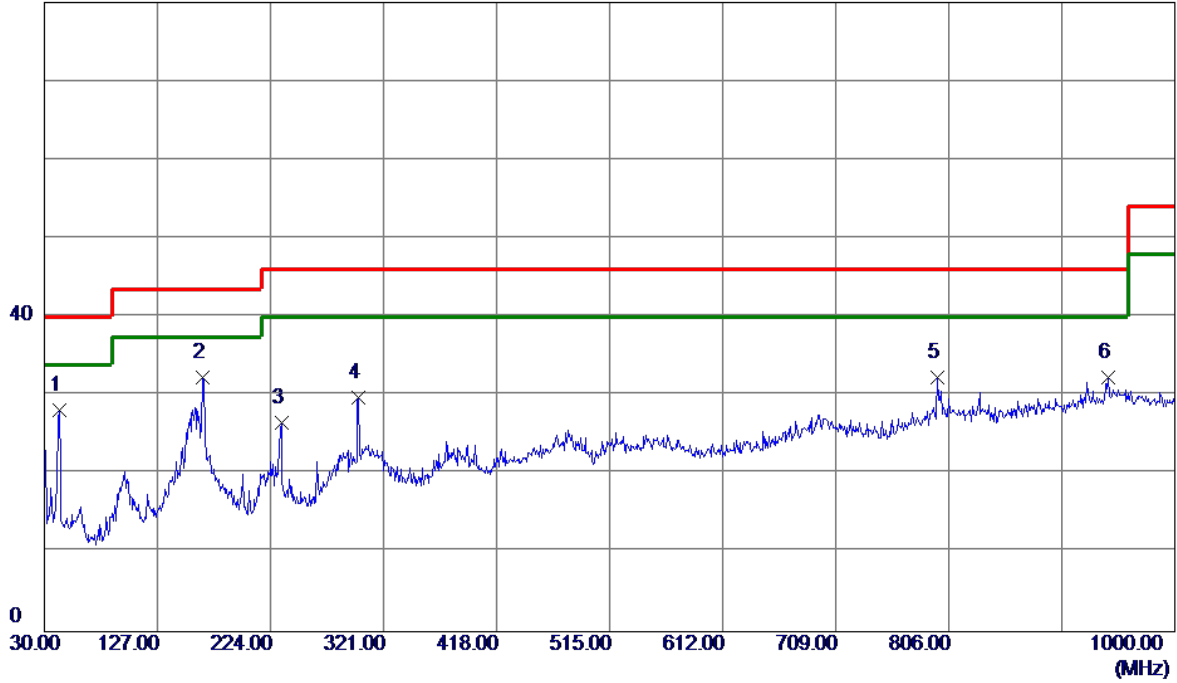


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	166.7700	43.56	-11.01	32.55	43.50	-10.95	Peak	
2	233.2150	44.47	-14.87	29.60	46.00	-16.40	Peak	
3	299.6600	45.11	-10.39	34.72	46.00	-11.28	Peak	
4	699.7849	30.25	-2.76	27.49	46.00	-18.51	Peak	
5	803.5750	31.11	-1.10	30.01	46.00	-15.99	Peak	
6	943.2550	30.69	1.14	31.83	46.00	-14.17	Peak	

Test Mode: TX 2480 MHz _CH39_1Mbps

Vertical

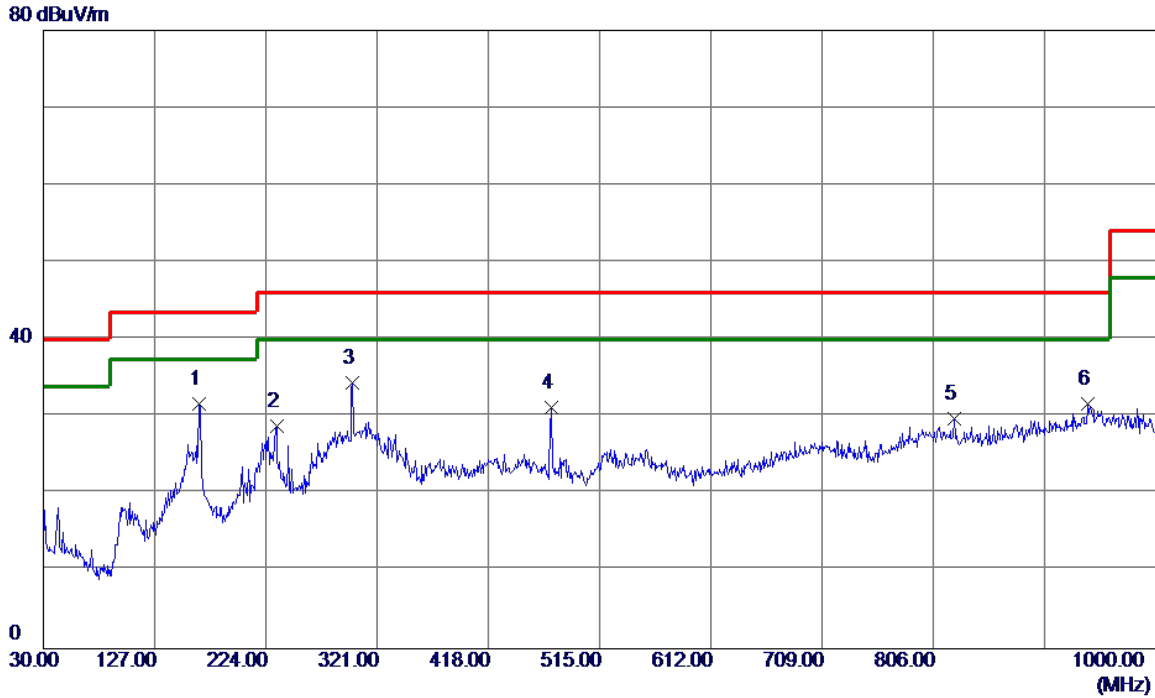
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	42.6100	42.83	-14.70	28.13	40.00	-11.87	Peak	
2 *	166.2850	43.30	-10.98	32.32	43.50	-11.18	Peak	
3	233.2150	41.50	-14.87	26.63	46.00	-19.37	Peak	
4	299.6600	40.10	-10.39	29.71	46.00	-16.29	Peak	
5	796.7849	33.54	-1.23	32.31	46.00	-13.69	Peak	
6	943.2550	31.12	1.14	32.26	46.00	-13.74	Peak	

Test Mode: TX 2480 MHz _CH39_1Mbps

Horizontal



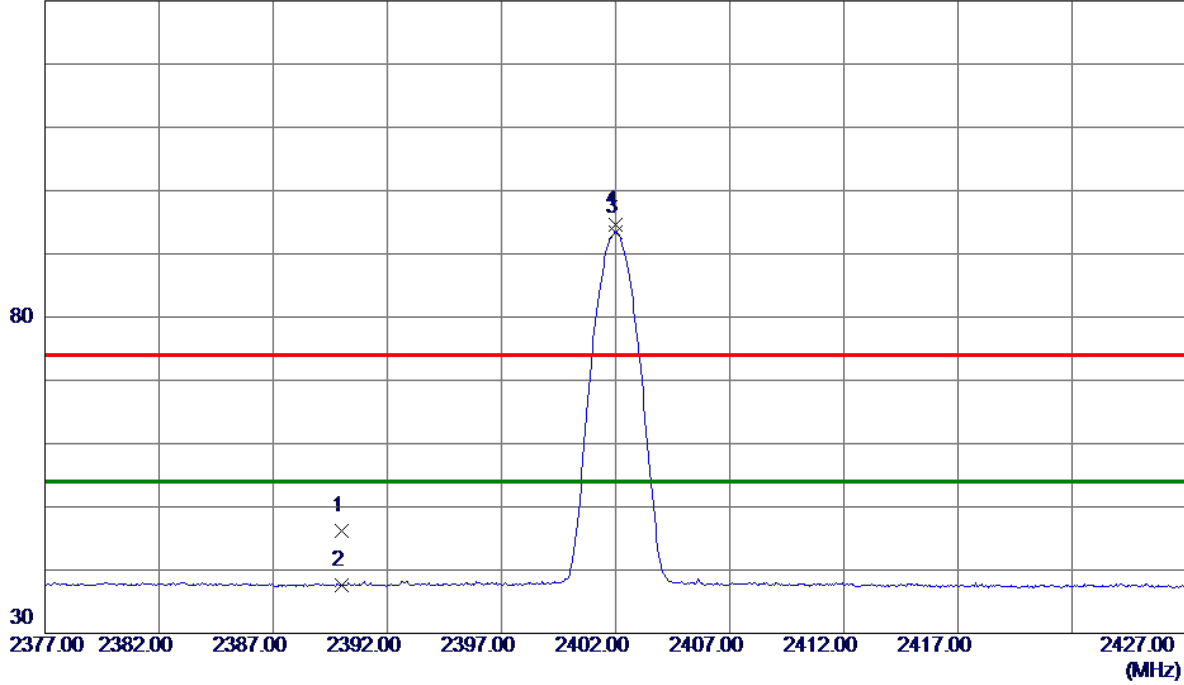
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	165.8000	42.66	-10.95	31.71	43.50	-11.79	Peak	
2	233.2150	43.69	-14.87	28.82	46.00	-17.18	Peak	
3 *	299.6600	44.77	-10.39	34.38	46.00	-11.62	Peak	
4	473.2900	39.13	-7.93	31.20	46.00	-14.80	Peak	
5	823.9450	31.12	-1.41	29.71	46.00	-16.29	Peak	
6	940.8300	30.66	1.04	31.70	46.00	-14.30	Peak	

APPENDIX D - RADIATED EMISSION (ABOVE 1000 MHZ)

Test Mode : TX 2402 MHz _CH00_1Mbps

Vertical

130 dBuV/m

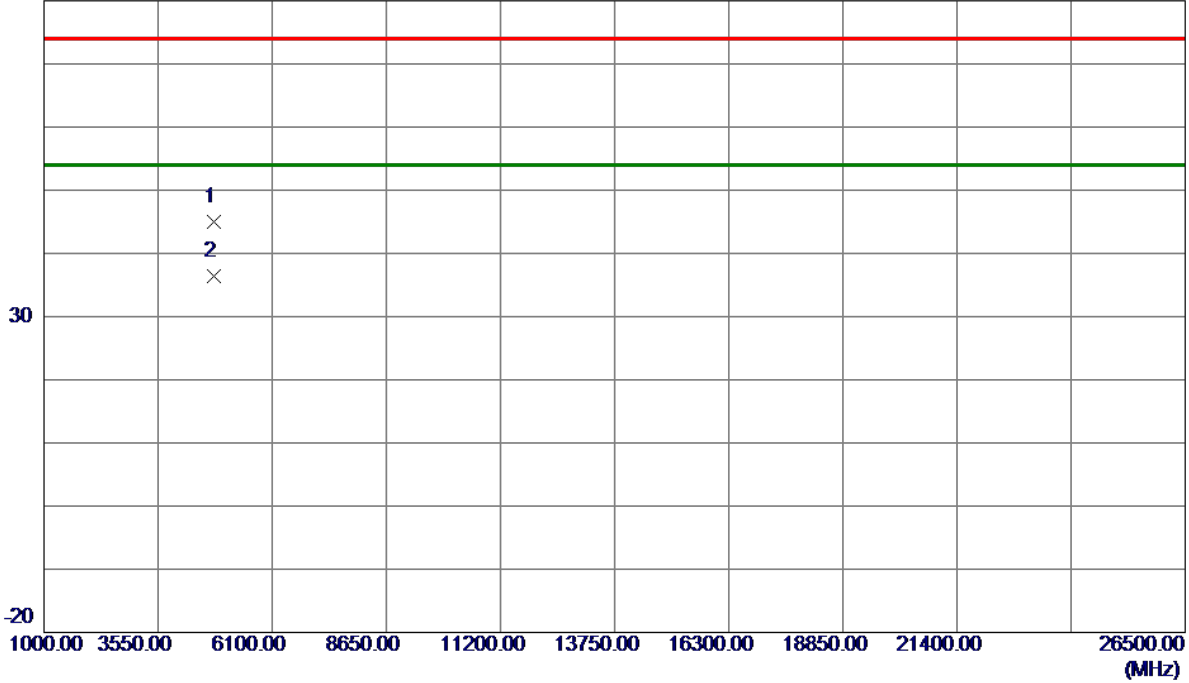


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	38.78	7.39	46.17	74.00	-27.83	Peak	
2	2390.0000	30.28	7.39	37.67	54.00	-16.33	AVG	
3 *	2401.9750	86.00	7.38	93.38	54.00	39.38	AVG	No Limit
4	2402.0250	87.27	7.38	94.65	74.00	20.65	Peak	No Limit

Test Mode : TX 2402 MHz _CH00_1Mbps

Vertical

80 dBuV/m

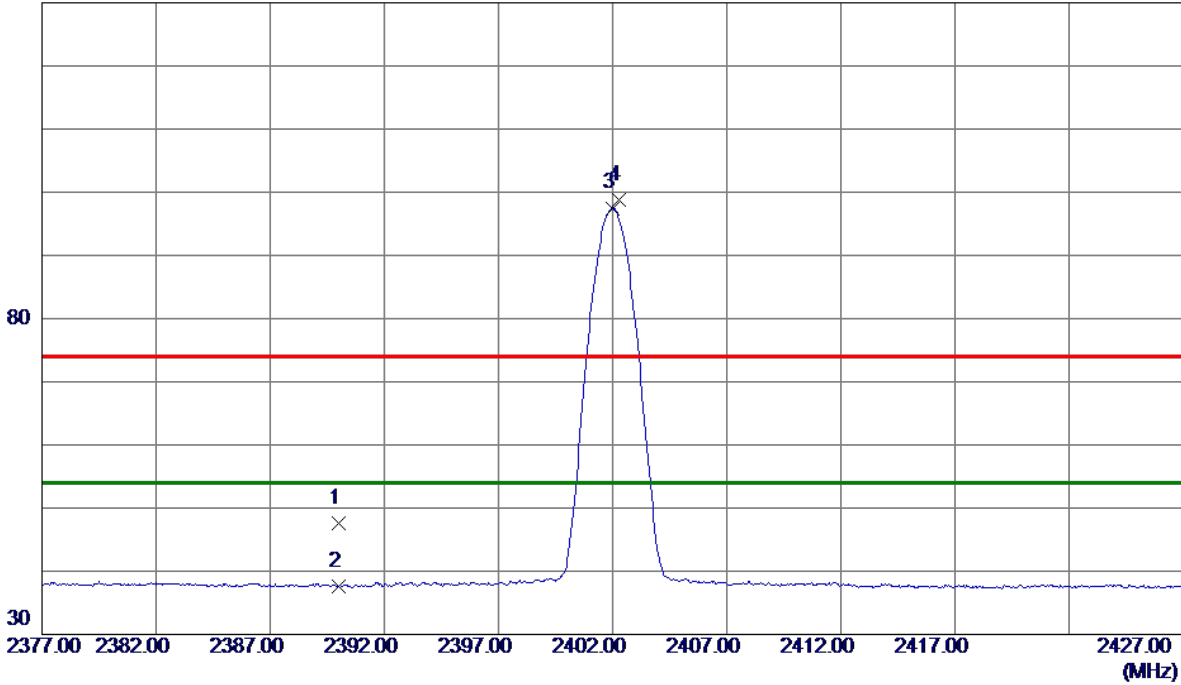


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4803.6150	41.61	3.45	45.06	74.00	-28.94	Peak	
2 *	4803.9500	32.87	3.45	36.32	54.00	-17.68	AVG	

Test Mode : TX 2402 MHz _CH00_1Mbps

Horizontal

130 dBuV/m

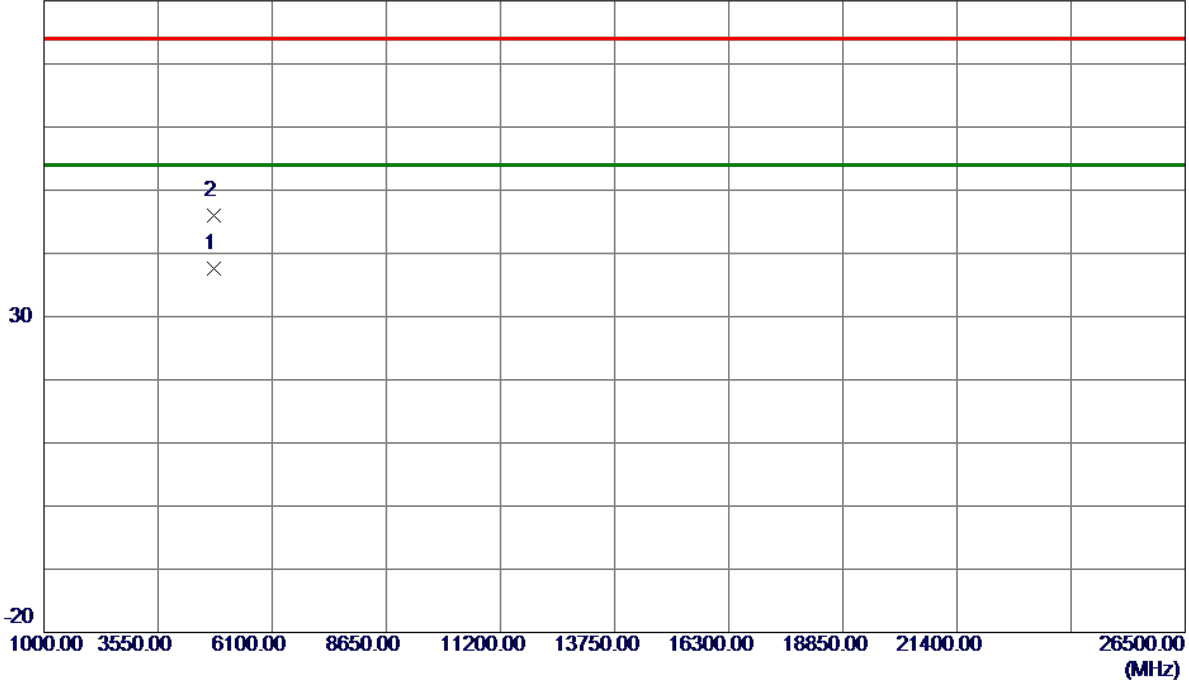


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	40.30	7.39	47.69	74.00	-26.31	Peak	
2	2390.0000	30.26	7.39	37.65	54.00	-16.35	AVG	
3 *	2402.0000	90.12	7.38	97.50	54.00	43.50	AVG	No Limit
4	2402.2750	91.35	7.38	98.73	74.00	24.73	Peak	No Limit

Test Mode : TX 2402 MHz _CH00_1Mbps

Horizontal

80 dBuV/m

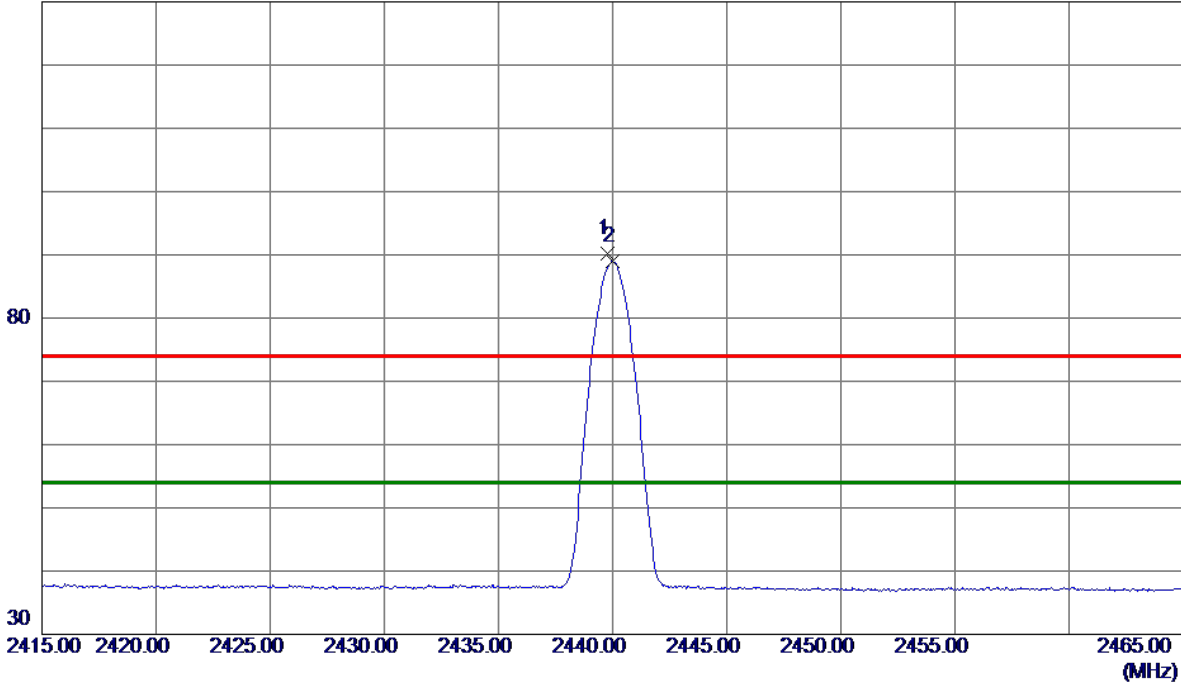


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4803.8650	34.22	3.45	37.67	54.00	-16.33	AVG	
2	4804.5800	42.58	3.45	46.03	74.00	-27.97	Peak	

Test Mode : TX 2440 MHz _CH19_1Mbps

Vertical

130 dBuV/m

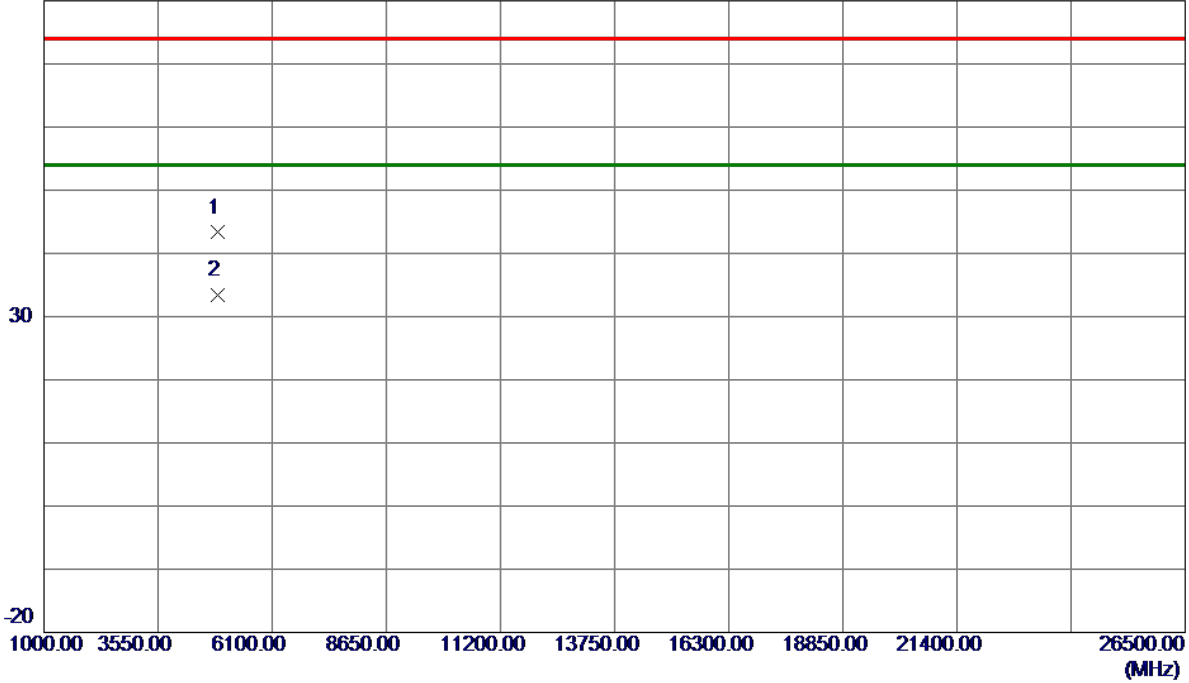


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7750	82.80	7.35	90.15	74.00	16.15	Peak	No Limit
2 *	2440.0000	81.57	7.35	88.92	54.00	34.92	AVG	No Limit

Test Mode : TX 2440 MHz _CH19_1Mbps

Vertical

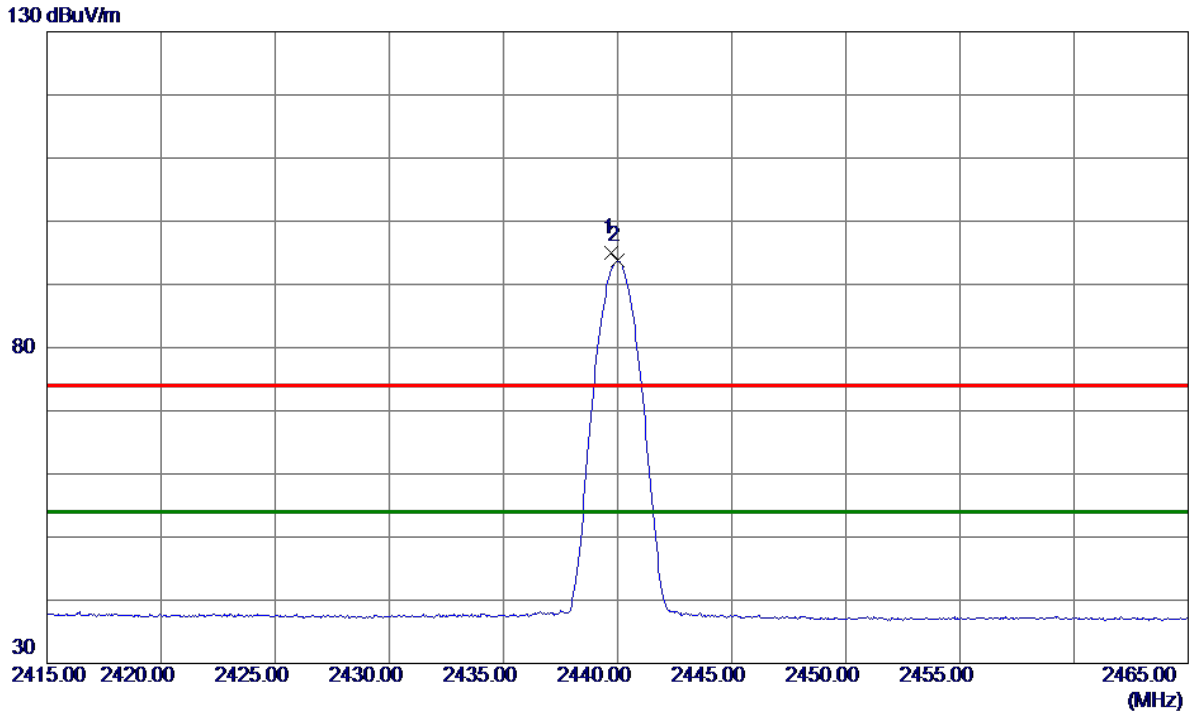
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4879.5280	39.67	3.63	43.30	74.00	-30.70	Peak	
2 *	4879.6770	29.74	3.63	33.37	54.00	-20.63	AVG	

Test Mode : TX 2440 MHz _CH19_1Mbps

Horizontal

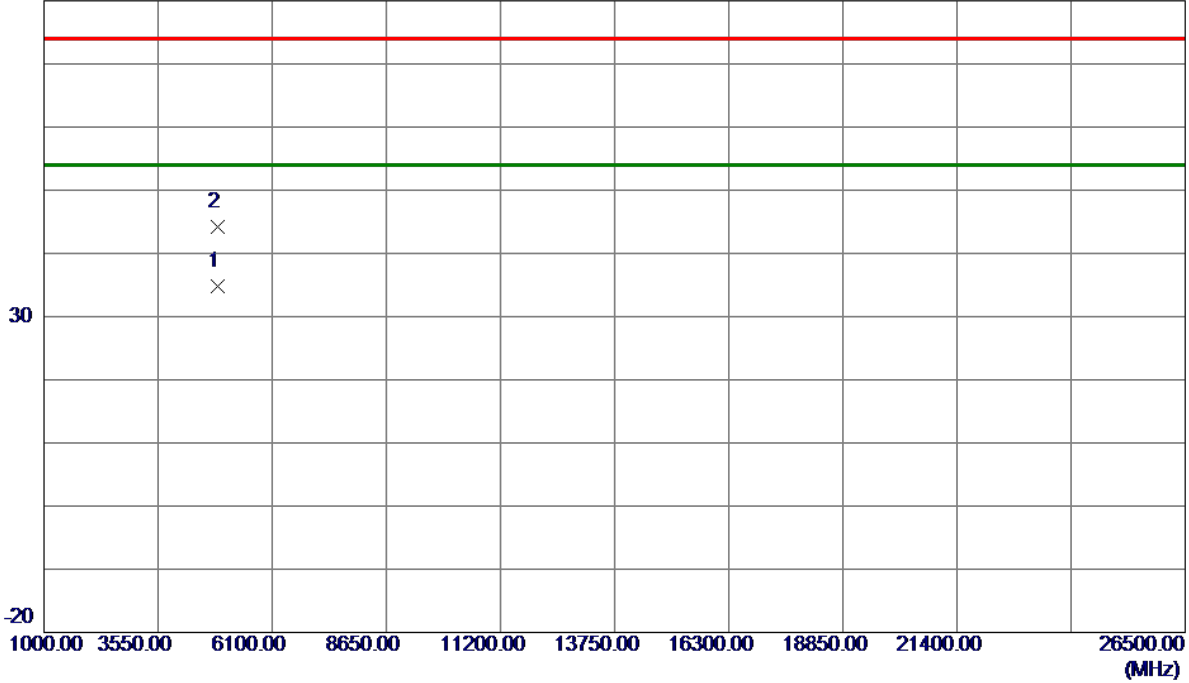


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.7500	87.61	7.35	94.96	74.00	20.96	Peak	No Limit
2 *	2440.0000	86.36	7.35	93.71	54.00	39.71	AVG	No Limit

Test Mode : TX 2440 MHz _CH19_1Mbps

Horizontal

80 dBuV/m

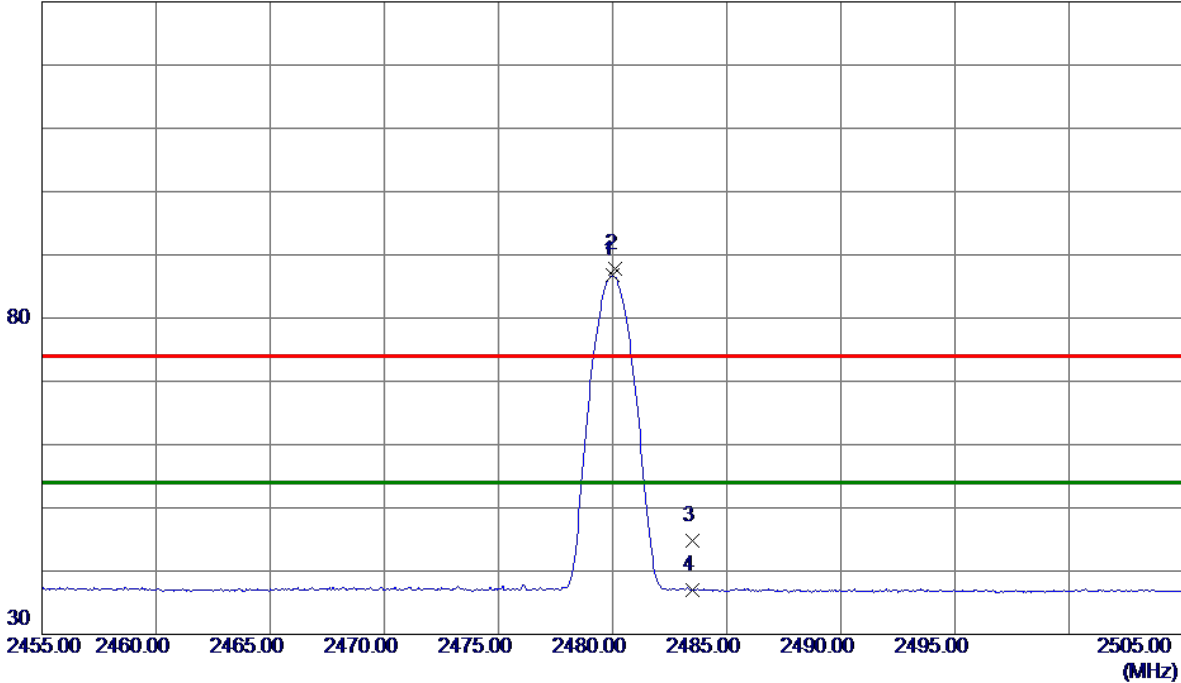


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4879.9169	31.13	3.63	34.76	54.00	-19.24	AVG	
2	4880.5000	40.55	3.63	44.18	74.00	-29.82	Peak	

Test Mode : TX 2480 MHz _CH39_1Mbps

Vertical

130 dBuV/m

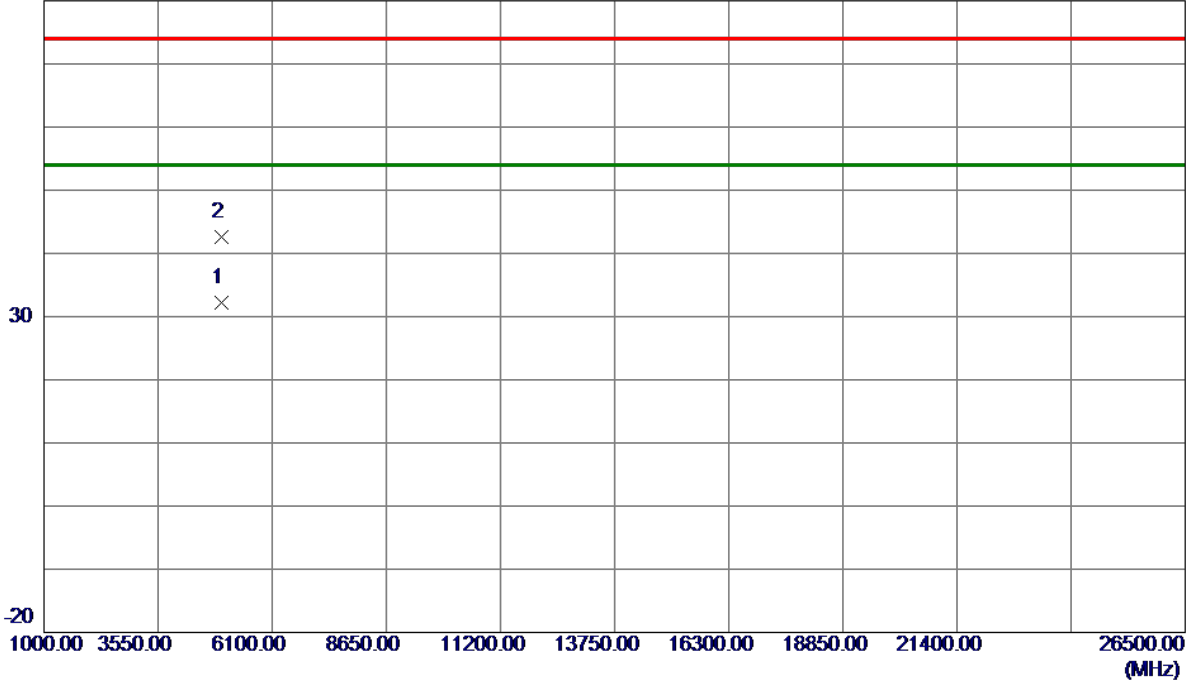


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0250	79.41	7.32	86.73	54.00	32.73	AVG	No Limit
2	2480.1000	80.53	7.32	87.85	74.00	13.85	Peak	No Limit
3	2483.5000	37.49	7.32	44.81	74.00	-29.19	Peak	
4	2483.5000	29.75	7.32	37.07	54.00	-16.93	AVG	

Test Mode : TX 2480 MHz _CH39_1Mbps

Vertical

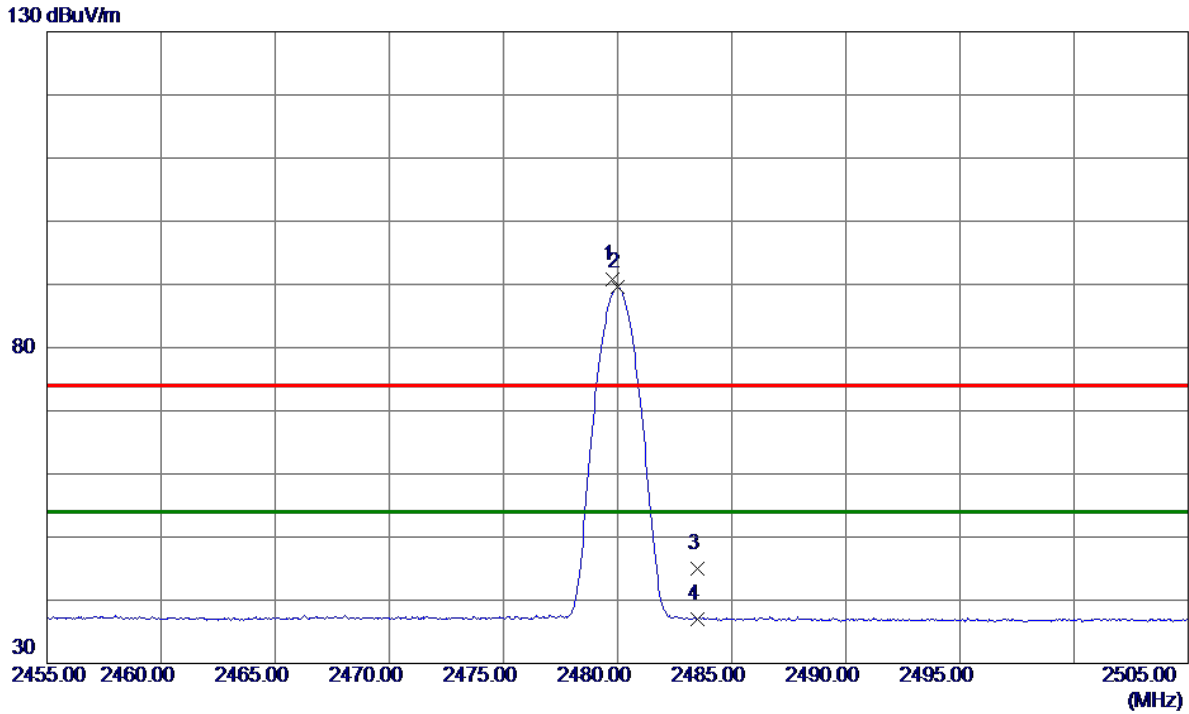
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4959.9030	28.43	3.82	32.25	54.00	-21.75	AVG	
2	4960.2550	38.83	3.82	42.65	74.00	-31.35	Peak	

Test Mode : TX 2480 MHz _CH39_1Mbps

Horizontal

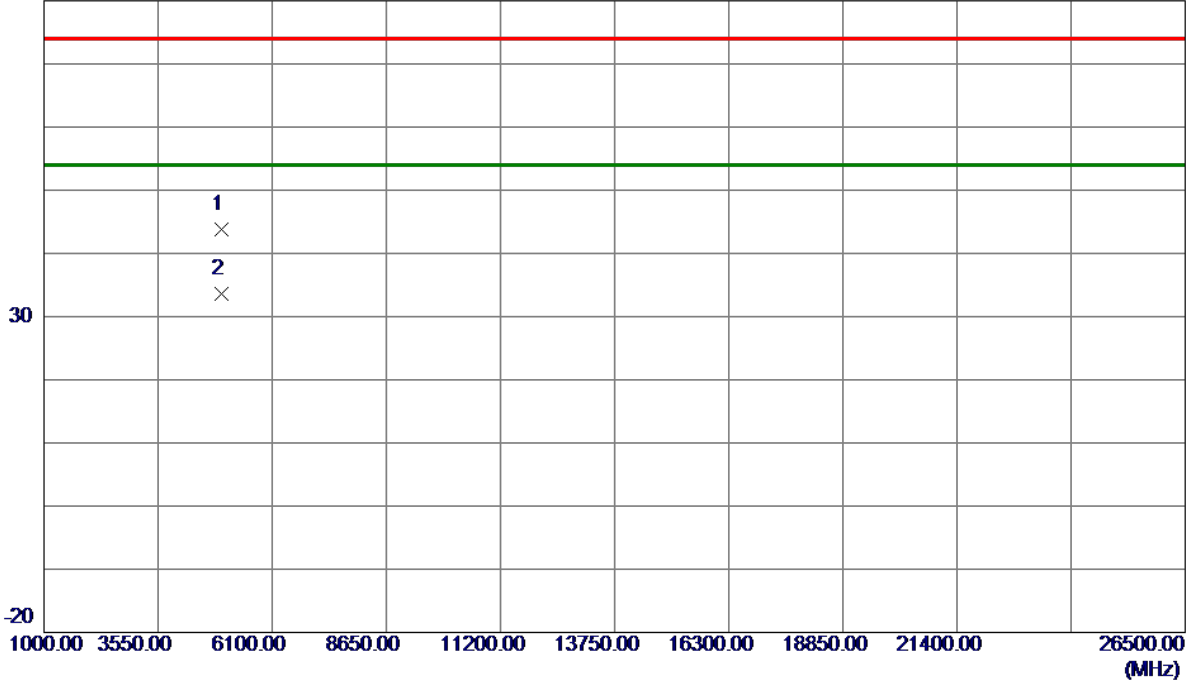


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7750	83.42	7.32	90.74	74.00	16.74	Peak	No Limit
2 *	2479.9750	82.19	7.32	89.51	54.00	35.51	AVG	No Limit
3	2483.5000	37.69	7.32	45.01	74.00	-28.99	Peak	
4	2483.5000	29.67	7.32	36.99	54.00	-17.01	AVG	

Test Mode : TX 2480 MHz _CH39_1Mbps

Horizontal

80 dBuV/m



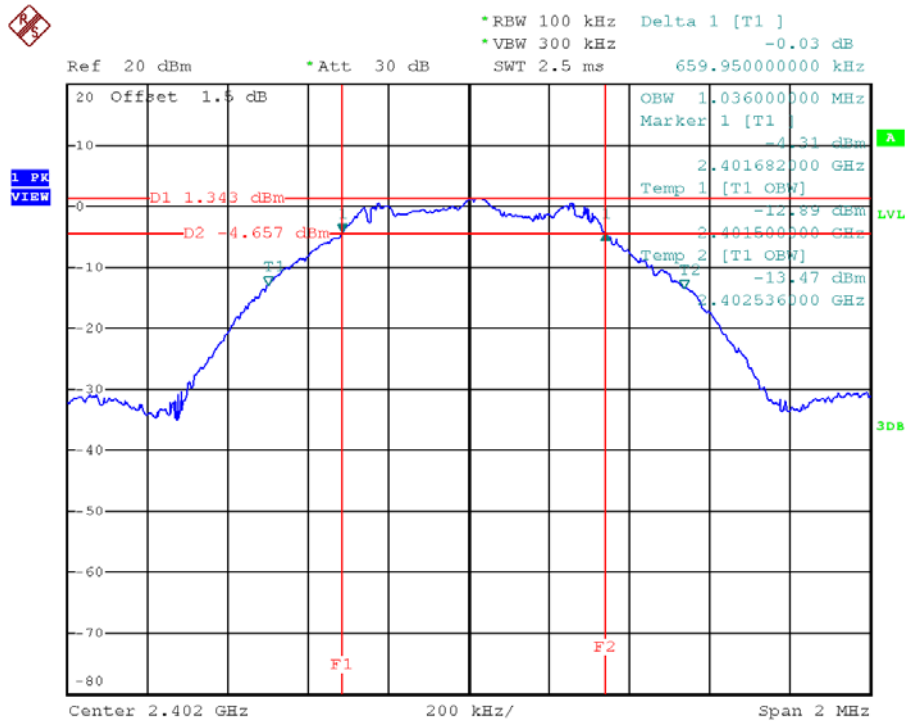
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4959.5450	39.95	3.81	43.76	74.00	-30.24	Peak	
2 *	4959.7430	29.88	3.81	33.69	54.00	-20.31	AVG	

APPENDIX E - BANDWIDTH

Test Mode: TX Mode

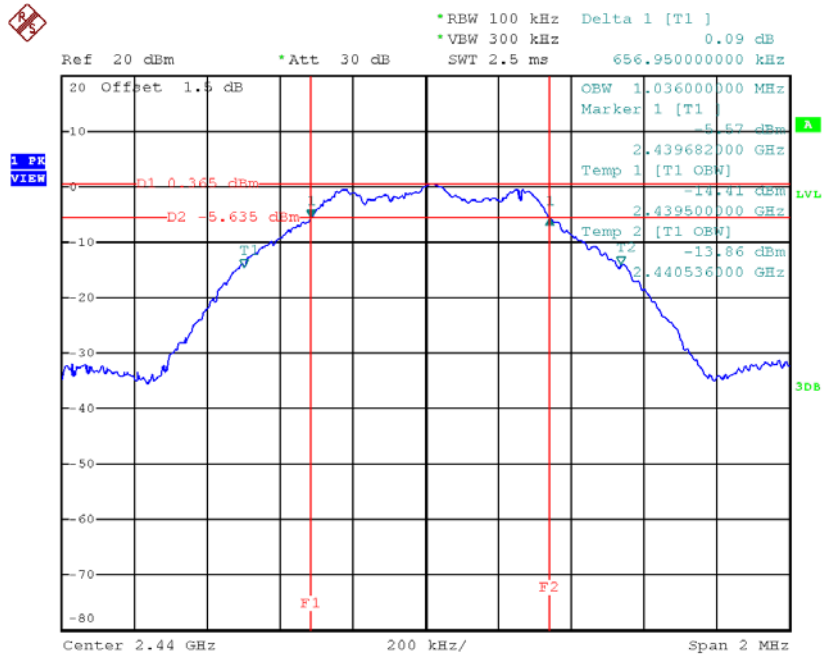
Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.660	1.036	500	Pass
2440	0.657	1.036	500	Pass
2480	0.658	1.036	500	Pass

TX CH00



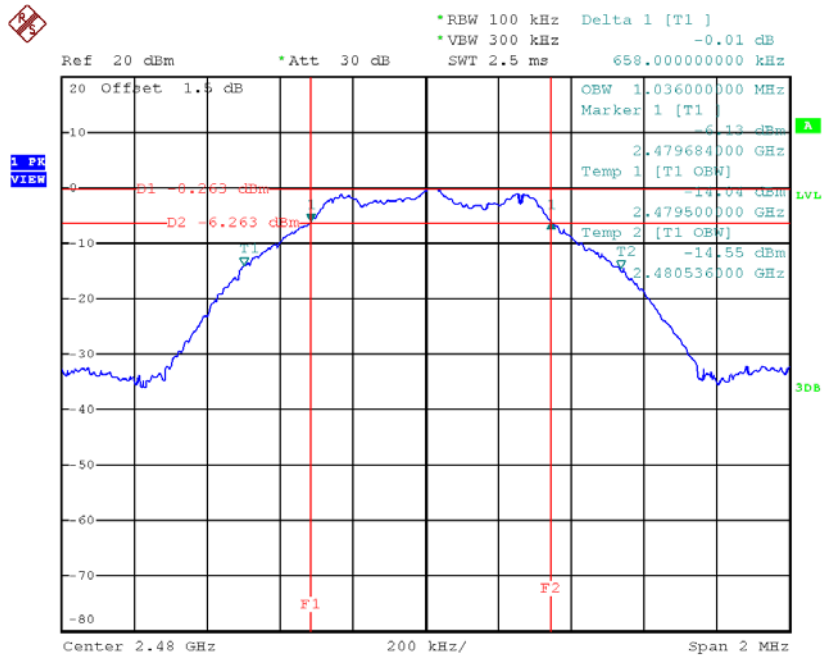
Date: 16.AUG.2018 15:33:35

TX CH19



Date: 16.AUG.2018 15:35:11

TX CH39



Date: 16.AUG.2018 15:36:46

APPENDIX F - MAXIMUM OUTPUT POWER TEST

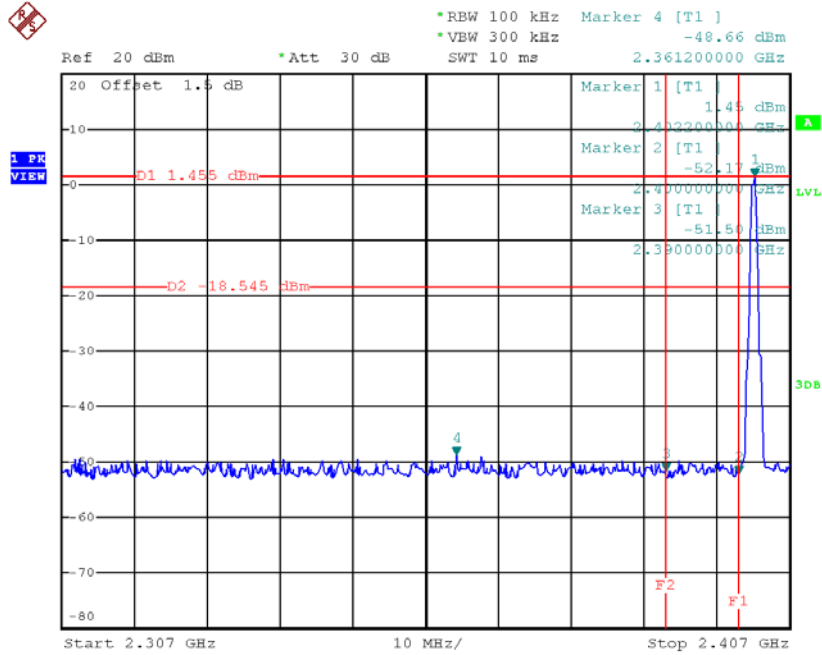
Test Mode : CH00, CH19 , CH39 - 1Mbps

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	1.62	0.0015	30.00	1.00	Pass
2440	0.67	0.0012	30.00	1.00	Pass
2480	0.14	0.0010	30.00	1.00	Pass

APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION

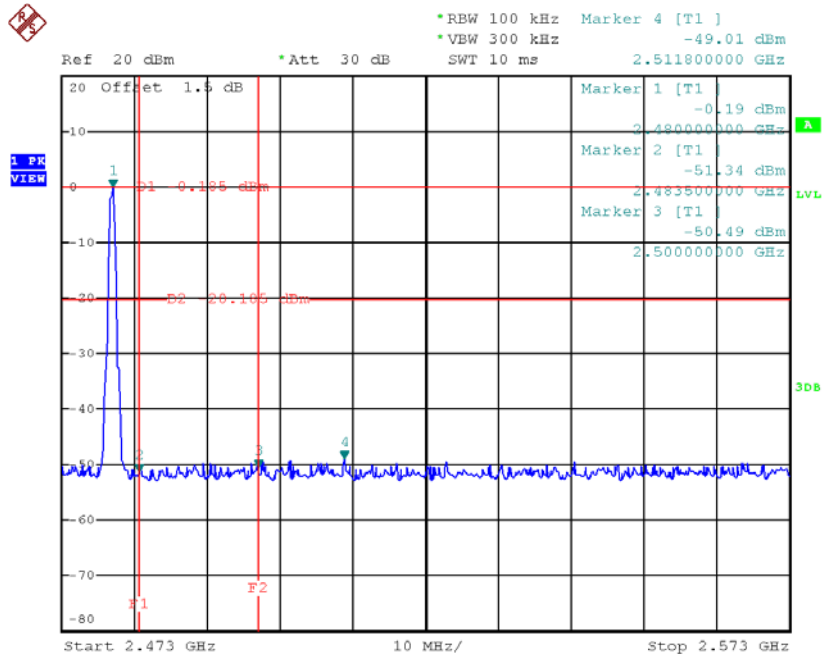
Test Mode : CH00, CH19 , CH39 - 1Mbps

CH00 (Lower) - 1Mbps



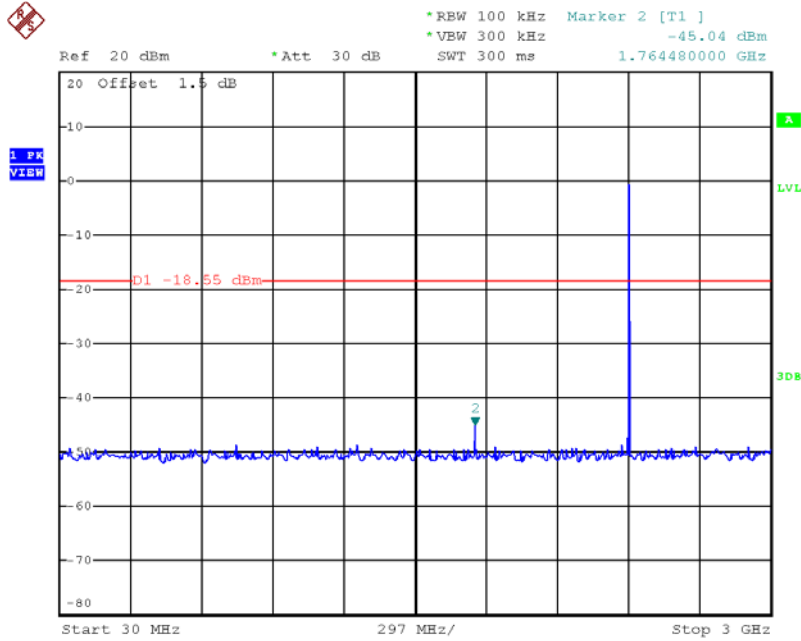
Date: 16.AUG.2018 15:33:43

CH39 (upper) - 1Mbps



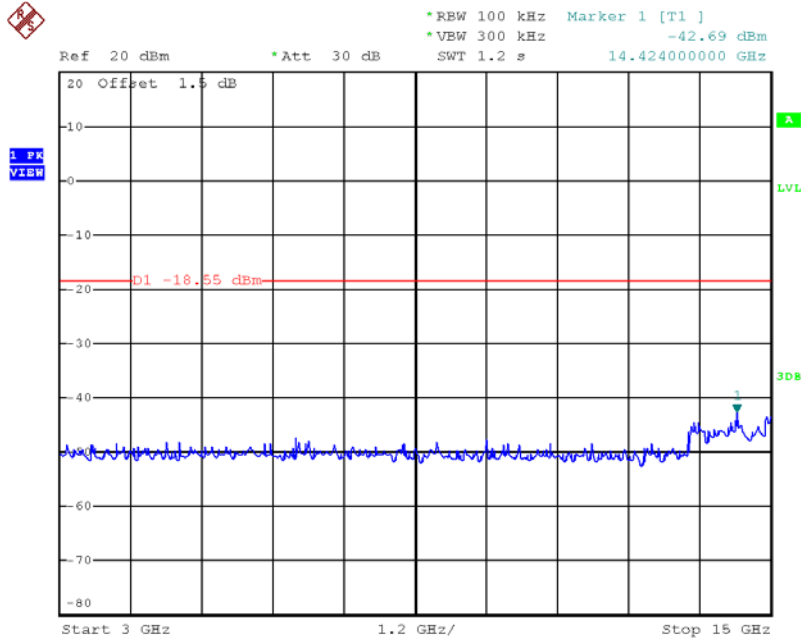
Date: 16.AUG.2018 15:36:53

CH00 (10 Harmonic of the frequency) 1



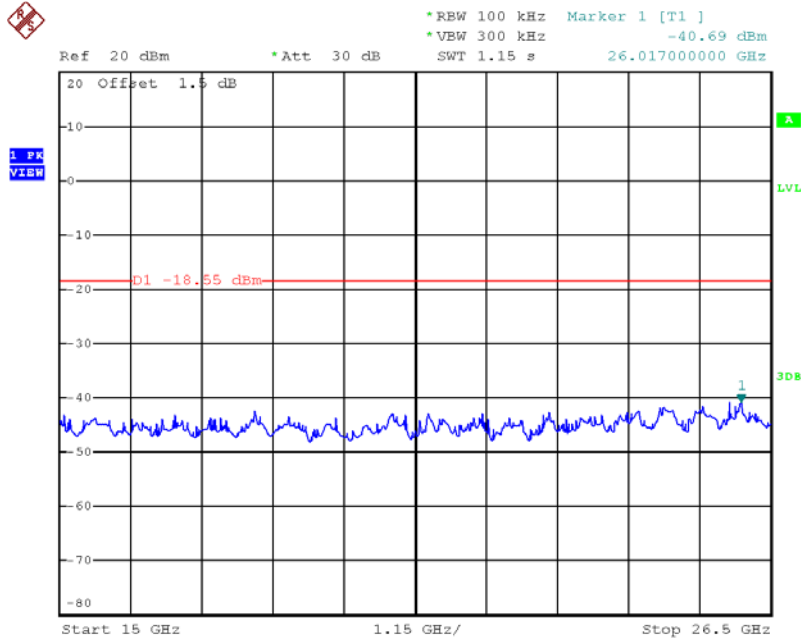
Date: 16.AUG.2018 15:33:56

CH00 (10 Harmonic of the frequency) 2



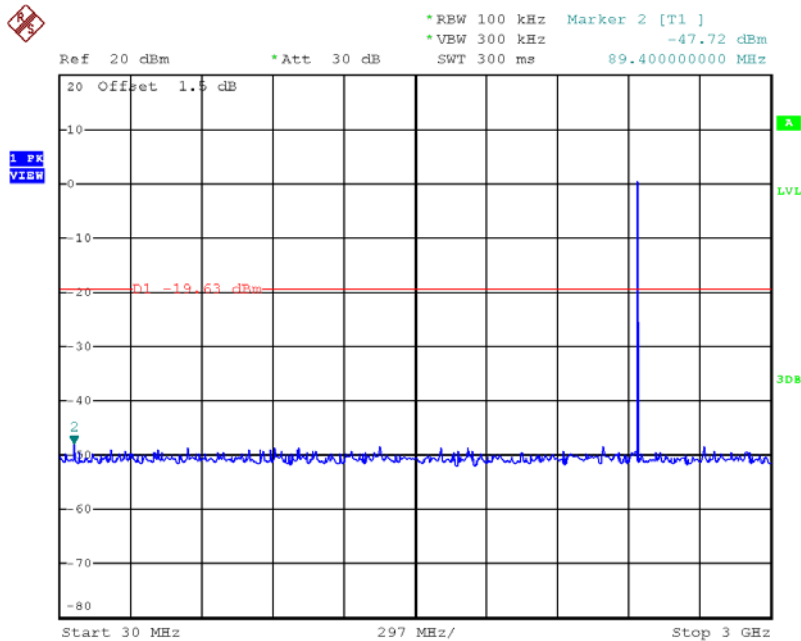
Date: 16.AUG.2018 15:34:03

CH00 (10 Harmonic of the frequency) 3



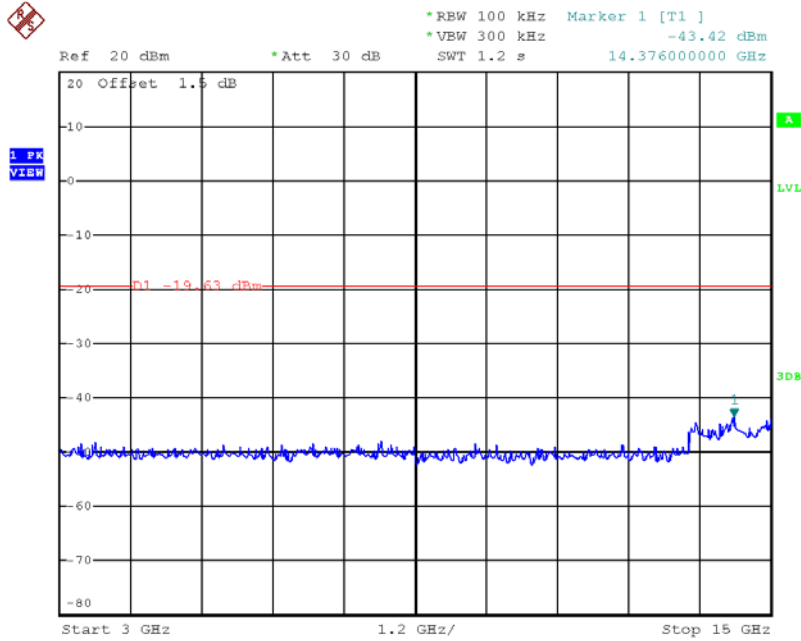
Date: 16.AUG.2018 15:34:10

CH19 (10 Harmonic of the frequency) 1



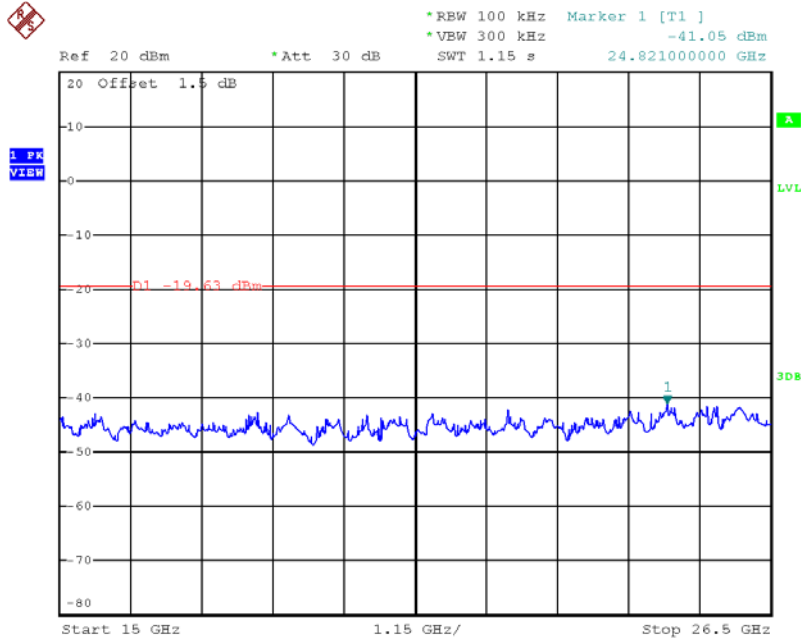
Date: 16.AUG.2018 15:35:32

CH19 (10 Harmonic of the frequency) 2



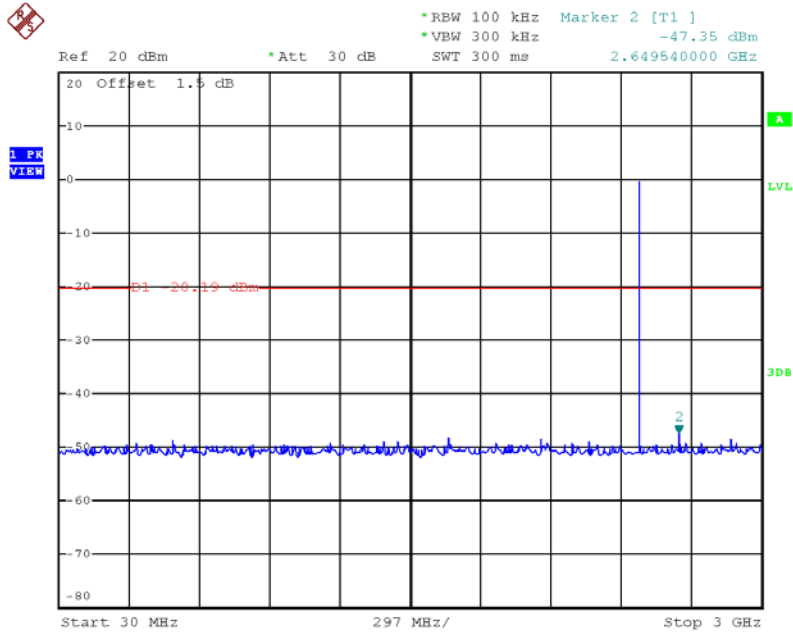
Date: 16.AUG.2018 15:35:39

CH19 (10 Harmonic of the frequency) 3



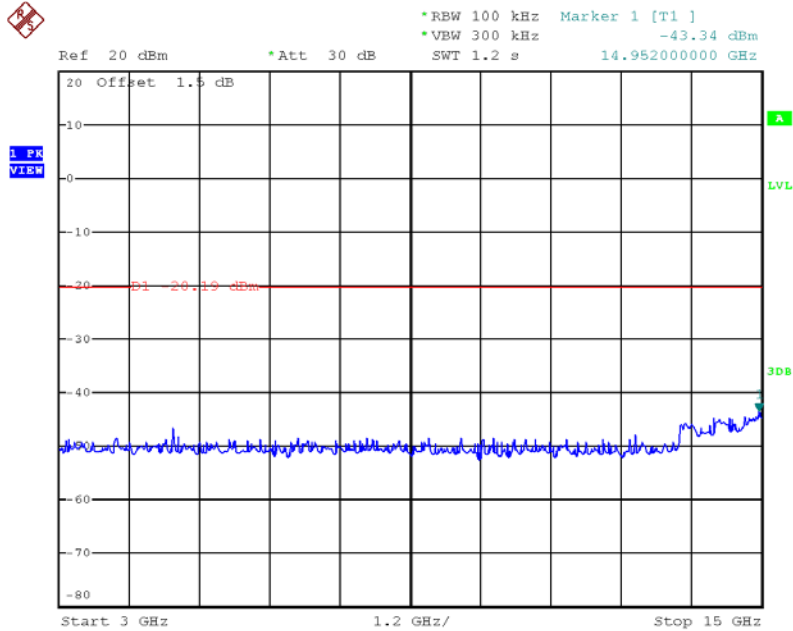
Date: 16.AUG.2018 15:35:46

CH39 (10 Harmonic of the frequency) 1



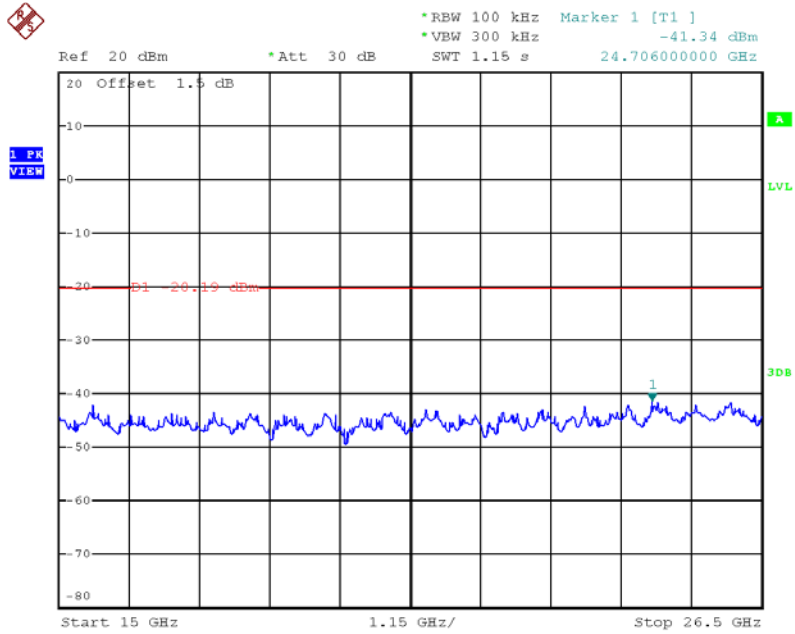
Date: 16.AUG.2018 15:37:06

CH39 (10 Harmonic of the frequency) 2



Date: 16.AUG.2018 15:37:14

CH39 (10 Harmonic of the frequency) 3



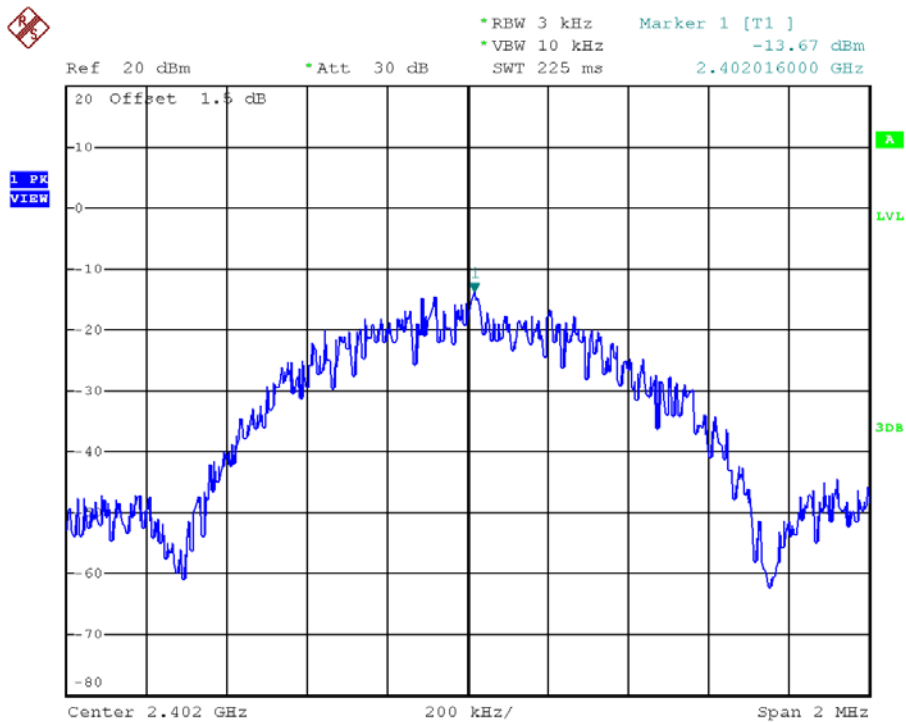
Date: 16.AUG.2018 15:37:21

APPENDIX H - POWER SPECTRAL DENSITY TEST

Test Mode: CH00, CH19 , CH39 - 1Mbps

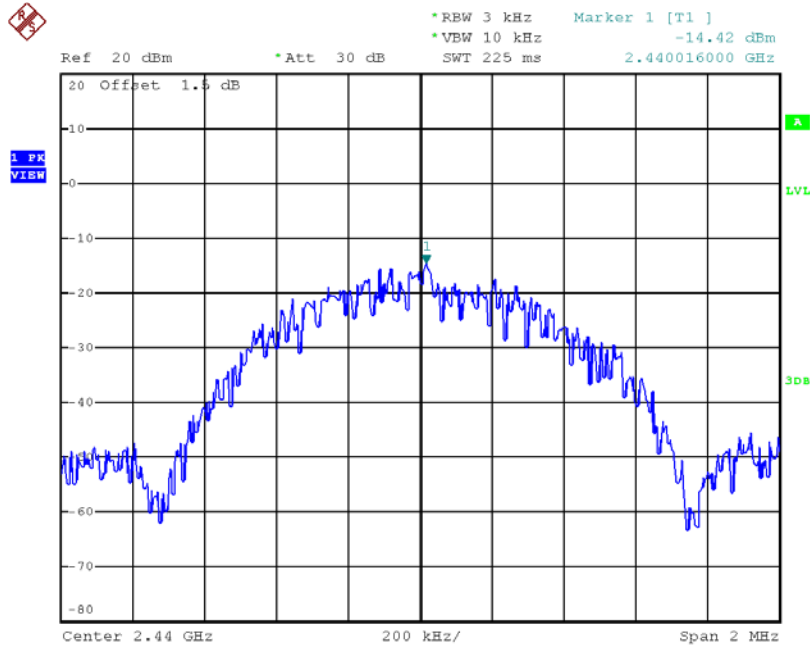
Frequency (MHz)	Power Density (dBm/3 kHz)	Power Density (mW/3 kHz)	Max. Limit (dBm/3 kHz)	Test Result
2402	-13.670	0.043	8.00	Pass
2440	-14.420	0.036	8.00	Pass
2480	-15.080	0.031	8.00	Pass

TX CH00



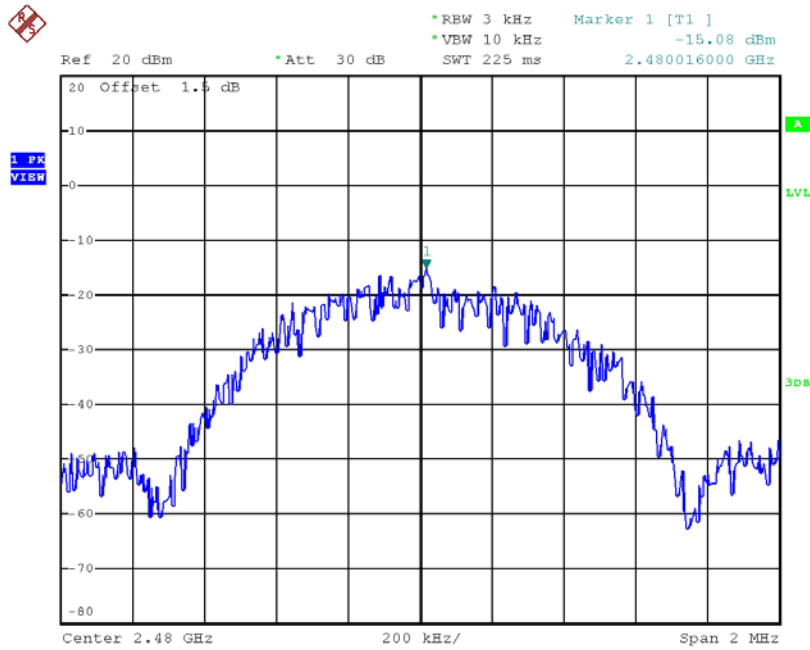
Date: 16.AUG.2018 15:32:47

TX CH19



Date: 16.AUG.2018 15:34:25

TX CH39



Date: 16.AUG.2018 15:35:58