

FCC Radio Test Report

FCC ID: RWO-RZ30026901

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

Project No. : 1807C144
Equipment : Gaming Headset
Test Model : RC30-026901
Series Model : N/A
Applicant : Razer Inc.
Address : 201 3rd Street, Suite 900, San Francisco, CA 94103, USA

Date of Receipt : Jul. 27, 2018
Date of Test : Jul. 30, 2018 ~ Aug. 08, 2018
Issued Date : Sep. 05, 2018
Tested by : BTL Inc.

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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-1-1807C144	Original Issue.	Sep. 05, 2018

1. CERTIFICATION

Equipment : Gaming Headset
Brand Name : RAZER
Test Model : RC30-026901
Series Model : N/A
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 : Jul. 30, 2018 ~ Aug. 08, 2018
Test Sample : Engineering Sample No.: D180706283 for conducted, D180706282 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-1-1807C144) 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)	Maximum Output Power	PASS	
15.247(e)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	
15.209/15.205	Transmitter Radiated Emissions	PASS	
15.209/15.205	Band Edge 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 Headset	
Brand Name	RAZER	
Test Model	RC30-026901	
Series Model	N/A	
Model Difference	The system model name is RZ04-0269, it consists of a Gaming Headset (Model name: RC30-026901) and a USB WIRELESS TRANSCEIVER (Model name: RC30-026902).	
Product Description	Operation Frequency	2403.35 MHz – 2477.35 MHz
	Modulation Technology	$\pi/4$ -DQPSK
	Bit Rate of Transmitter	2 Mbps
	Output Power (Max.)	3.15 dBm
Power Source	#1 Supplied from USB port. #2 Supplied from battery. Model: 553450	
Power Rating	#1 5V \equiv 500mA #2 DC 3.7V, 1000mAh, 3.7Wh	

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)	Channel	Frequency (MHz)
01	2403.35	15	2431.35	29	2459.35
02	2405.35	16	2433.35	30	2461.35
03	2407.35	17	2435.35	31	2463.35
04	2409.35	18	2437.35	32	2465.35
05	2411.35	19	2439.35	33	2467.35
06	2413.35	20	2441.35	34	2469.35
07	2415.35	21	2443.35	35	2471.35
08	2417.35	22	2445.35	36	2473.35
09	2419.35	23	2447.35	37	2475.35
10	2421.35	24	2449.35	38	2477.35
11	2423.35	25	2451.35		
12	2425.35	26	2453.35		
13	2427.35	27	2455.35		
14	2429.35	28	2457.35		

3. Table for Filed Antenna:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PIFA	N/A	3.64
2	N/A	N/A	PIFA	N/A	3.64

Note: There are two antennas but only one antenna works at a time.

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 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:

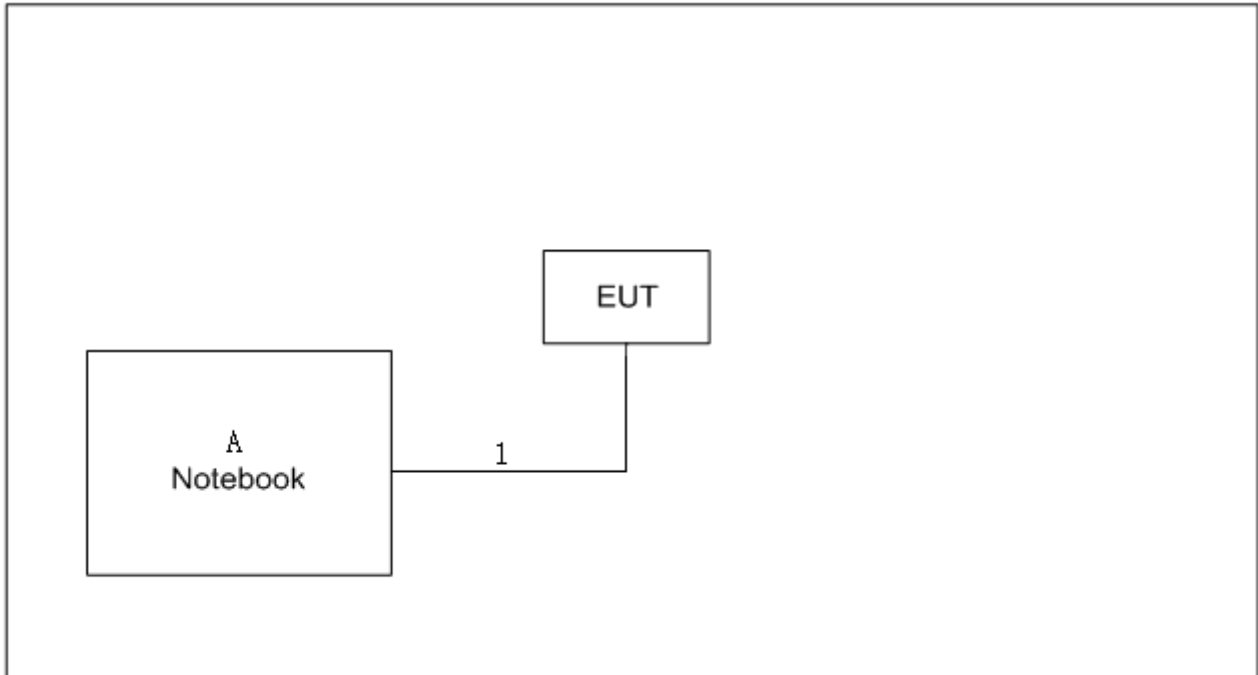
(1) The measurements are performed at the high, middle, low available channels.

3.3 TABLE OF PARAMETERS OF 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.

Test Software Version	VMI Test Software		
Frequency (MHz)	2403.35	2441.35	2477.35
Parameters	0x08	0x08	0x08

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	ThinkPadT410	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	NO	1.5m	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 -0.50	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

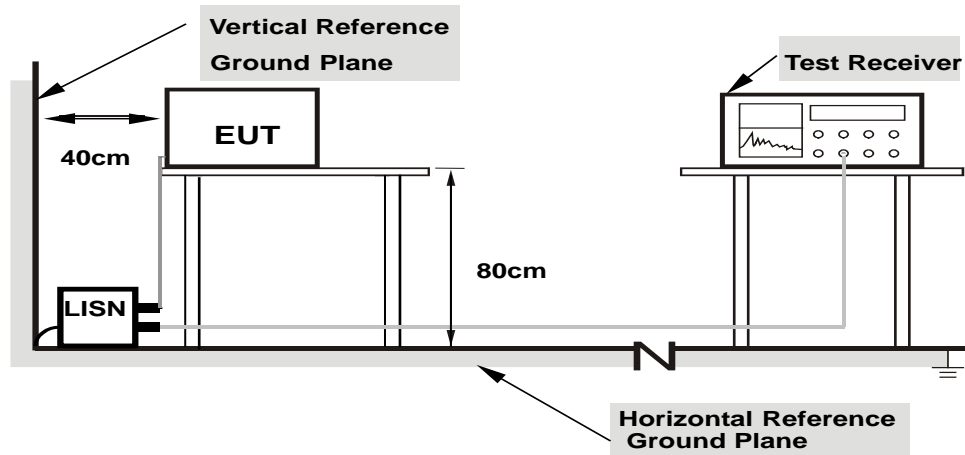
4.1.2 TEST PROCEDURE

- 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 equipments 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: 25°C Relative Humidity: 53% 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 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	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

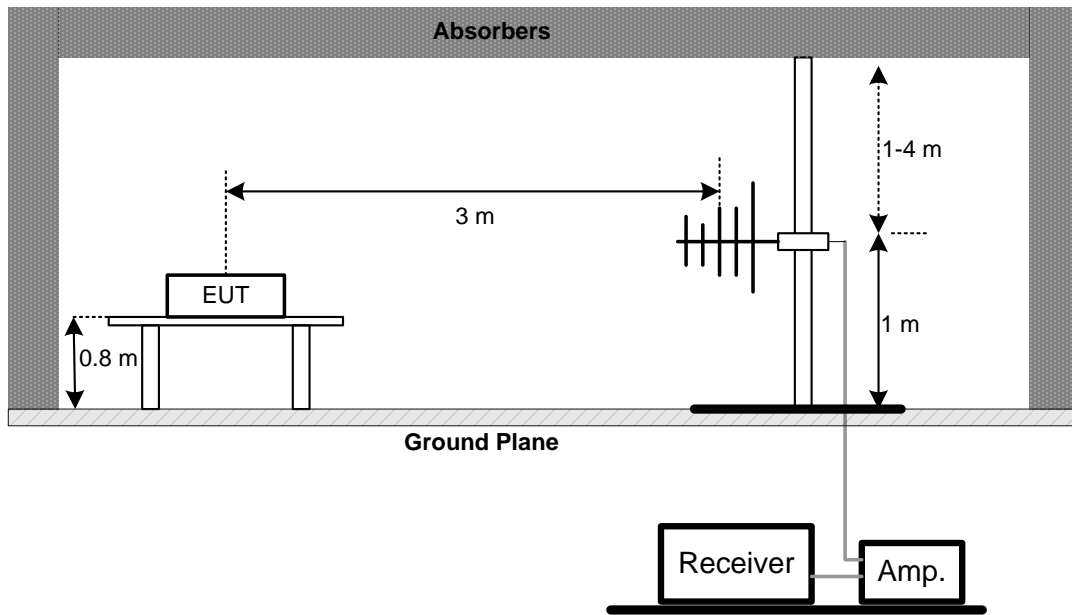
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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 0.8 m or 1.5 m, 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. 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.
- e. 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)
- f. 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)
- g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

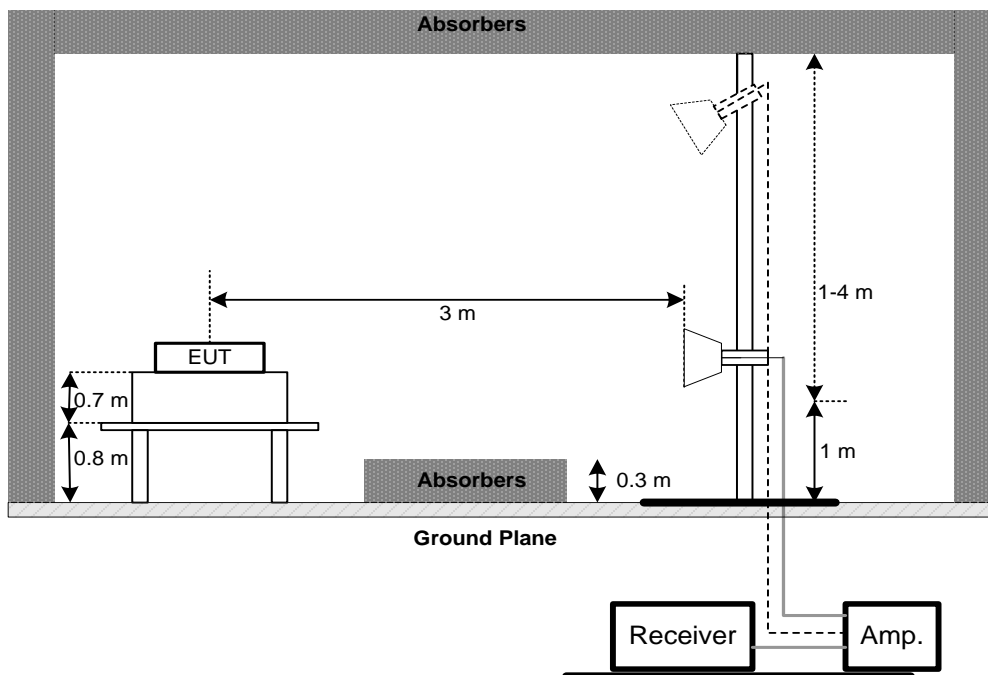
No deviation

4.2.4 TEST SETUP

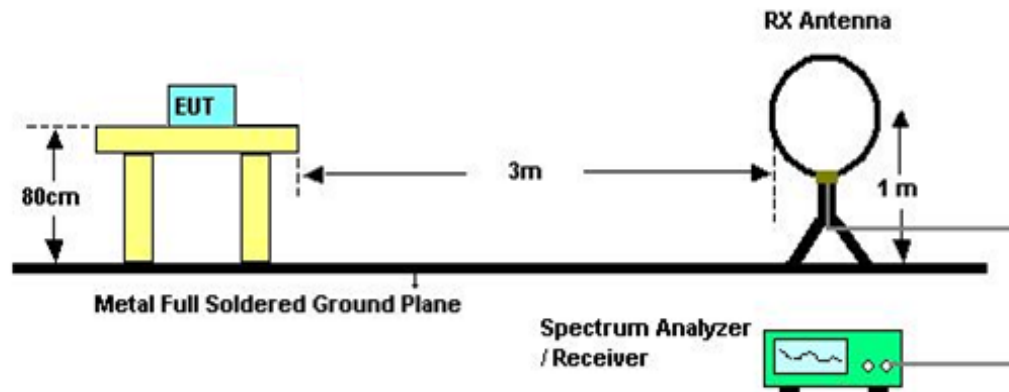
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT 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.

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 60% Test Voltage: DC 5V

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 1000 MHZ)

Please refer to the Appendix C.

Remark:

- (1) 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.
- (2) Measuring frequency range from 30MHz to 1000MHz.
- (3) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Appendix D.

Remark:

- (1) 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.
- (2) Radiated emissions measured in frequency range above 1000 MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
- (3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (4) EUT Orthogonal Axis:
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (5) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (6) 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 (6dB bandwidth)	2400-2483.5	PASS

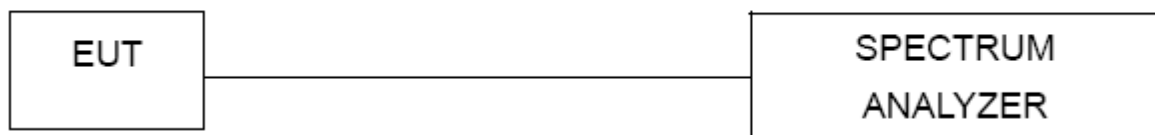
5.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5 ms.

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: 25°C Relative Humidity: 60% Test Voltage: DC 5V

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 spectrum analyzer and antenna output port as show in the block diagram below,
- b. The maximum conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance v03r05.

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: 25°C Relative Humidity: 60% Test Voltage: DC 5V

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= 100 kHz, VBW=300 kHz, Sweep time = auto.

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: 25°C Relative Humidity: 60% Test Voltage: DC 5V

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: 25°C Relative Humidity: 60% Test Voltage: DC 5V

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 - Below 1GHz					
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
8	Antenna	EM	EM-6876-1	230	Feb. 07, 2019

Radiated Emission Measurement - Above 1GHz					
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

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

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

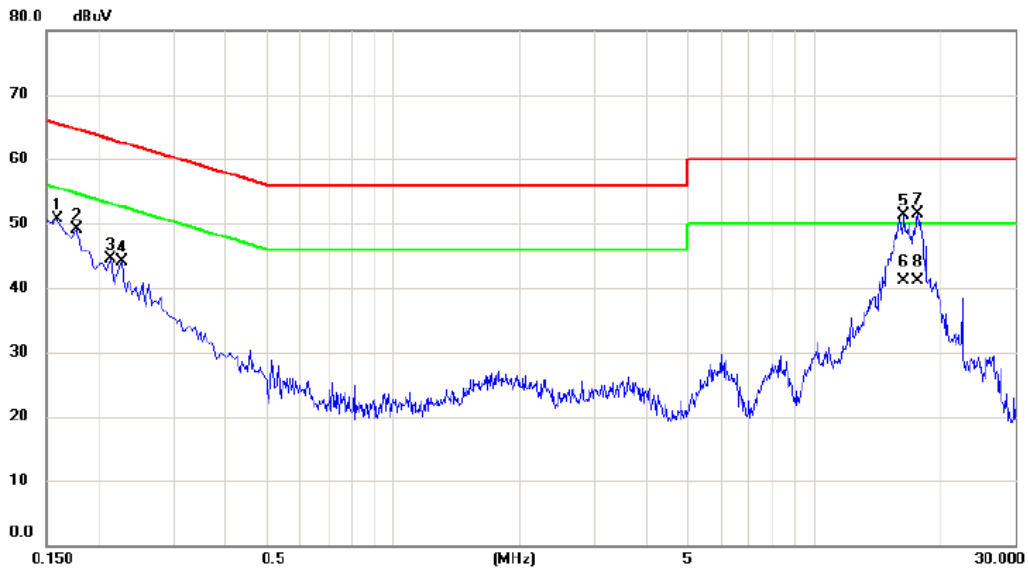
Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

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

APPENDIX A - CONDUCTED EMISSION

Test Mode: TX MODE

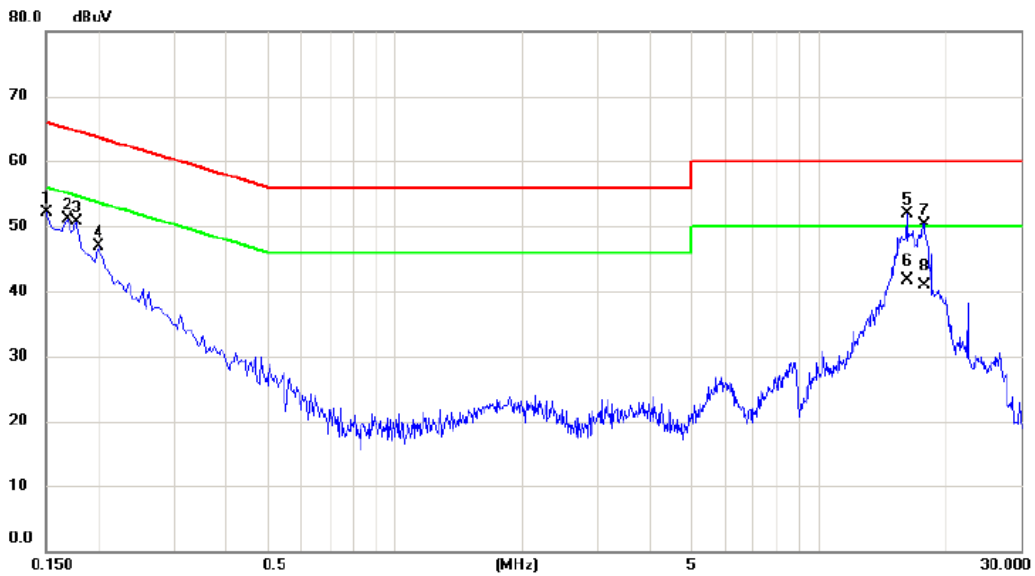
Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1590	40.94	9.82	50.76	65.52	-14.76	peak	
2		0.1770	39.35	9.83	49.18	64.63	-15.45	peak	
3		0.2130	34.71	9.82	44.53	63.09	-18.56	peak	
4		0.2265	34.21	9.82	44.03	62.58	-18.55	peak	
5		16.3320	40.42	10.87	51.29	60.00	-8.71	peak	
6		16.3320	30.30	10.87	41.17	50.00	-8.83	AVG	
7	*	17.5785	40.48	10.98	51.46	60.00	-8.54	peak	
8		17.5785	30.20	10.98	41.18	50.00	-8.82	AVG	

Test Mode: TX MODE

Neutral

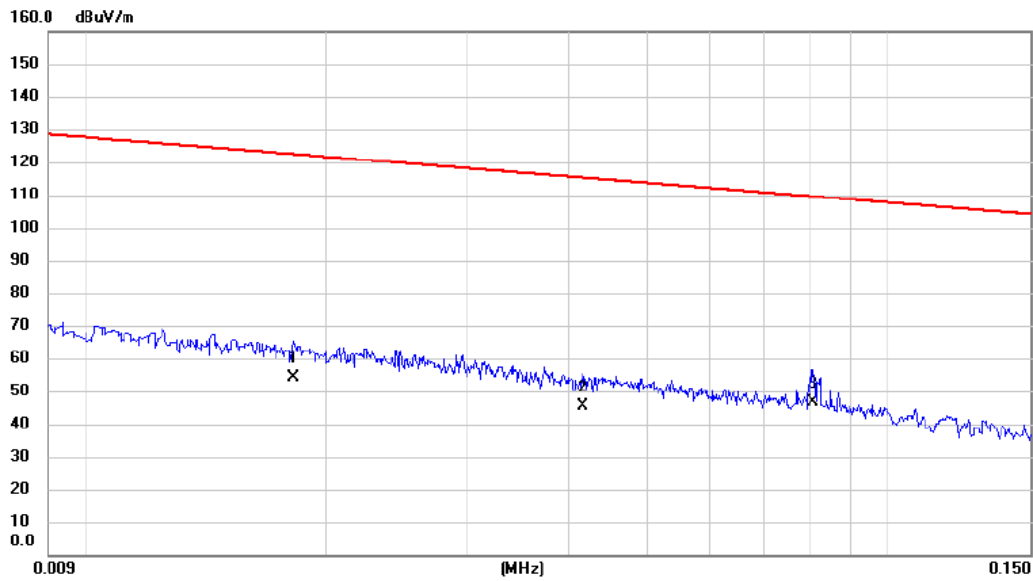


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	42.27	9.91	52.18	66.00	-13.82	peak	
2		0.1680	41.24	9.91	51.15	65.06	-13.91	peak	
3		0.1770	40.77	9.92	50.69	64.63	-13.94	peak	
4		0.1995	36.90	9.91	46.81	63.63	-16.82	peak	
5	*	16.1160	40.65	11.17	51.82	60.00	-8.18	peak	
6		16.1160	30.60	11.17	41.77	50.00	-8.23	AVG	
7		17.6865	39.01	11.30	50.31	60.00	-9.69	peak	
8		17.6865	29.70	11.30	41.00	50.00	-9.00	AVG	

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

Test Mode: TX MODE

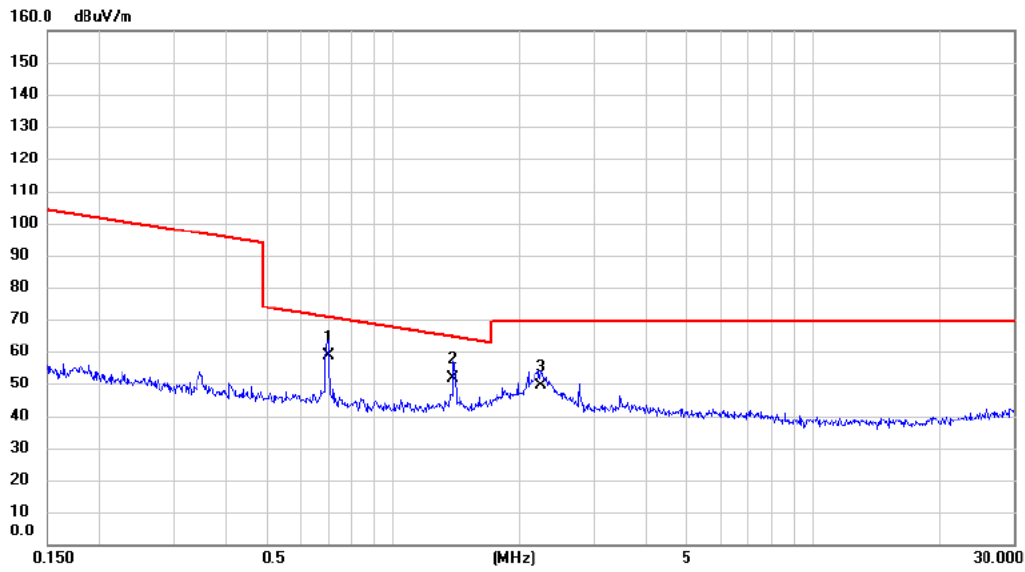
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0182	33.90	20.27	54.17	122.40	-68.23	AVG	
2		0.0416	25.80	19.66	45.46	115.22	-69.76	AVG	
3	*	0.0805	27.80	18.90	46.70	109.49	-62.79	AVG	

Test Mode: TX MODE

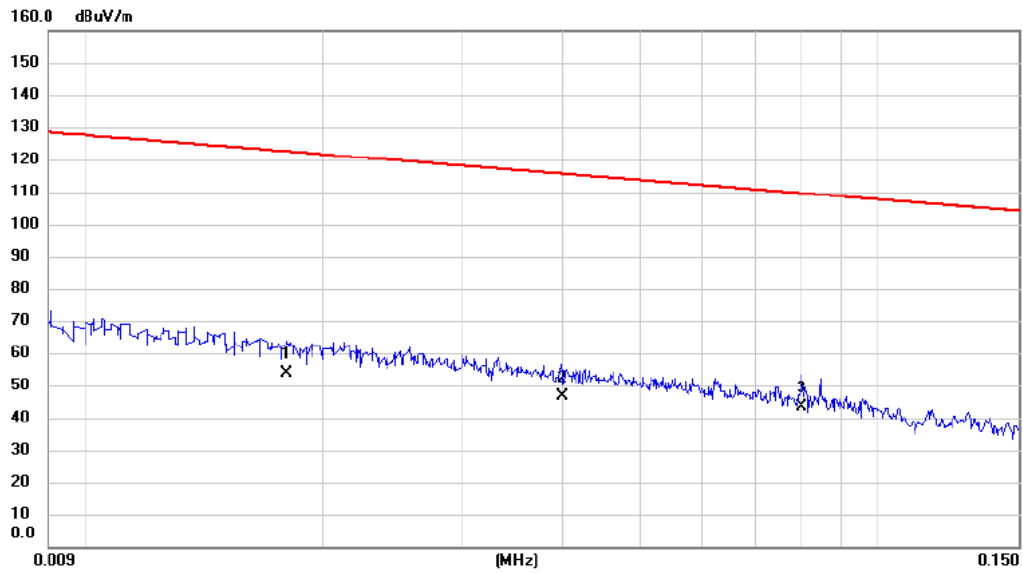
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.7010	41.80	16.90	58.70	70.69	-11.99	QP	
2		1.3884	35.10	16.79	51.89	64.75	-12.86	QP	
3		2.2486	32.30	16.96	49.26	69.54	-20.28	QP	

Test Mode: TX MODE

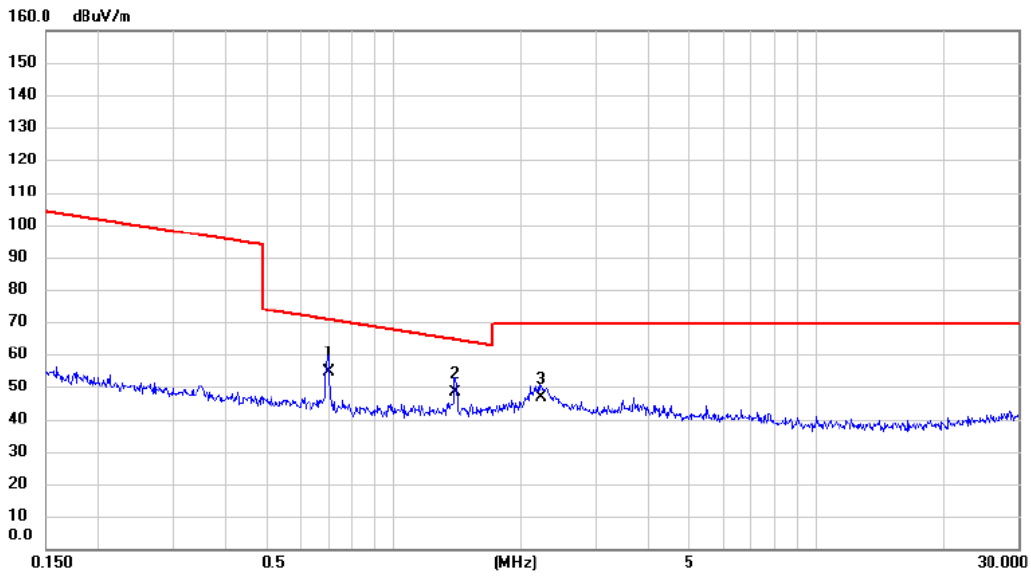
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0180	33.60	20.30	53.90	122.50	-68.60	AVG	
2		0.0400	27.10	19.69	46.79	115.56	-68.77	AVG	
3	*	0.0801	24.60	18.91	43.51	109.53	-66.02	AVG	

Test Mode: TX MODE

Ant 90°

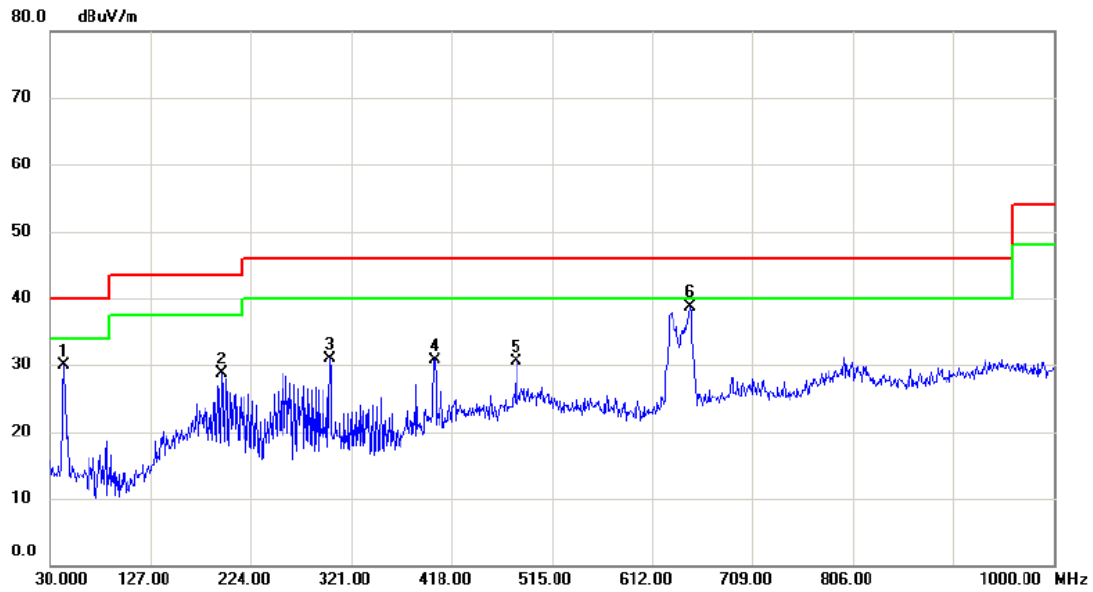


No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.7010	37.80	16.90	54.70	70.69	-15.99	QP	
2		1.3958	31.40	16.80	48.20	64.71	-16.51	QP	
3		2.2367	29.70	16.97	46.67	69.54	-22.87	QP	

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

Test Mode: TX 2403.35 MHz

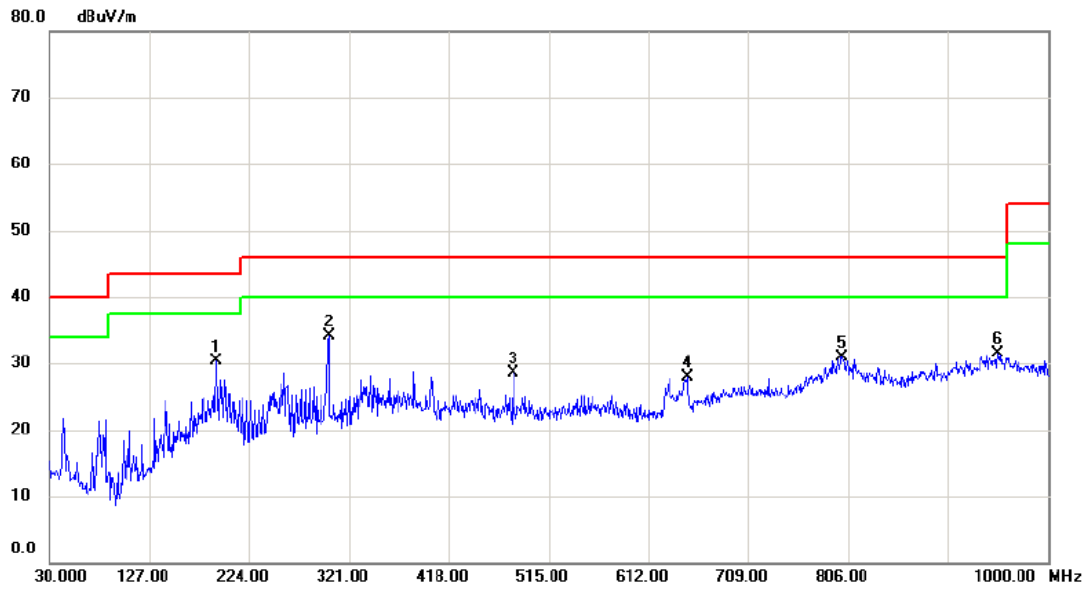
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		43.580	44.62	-14.69	29.93	40.00	-10.07	peak	
2		195.870	43.62	-14.84	28.78	43.50	-14.72	peak	
3		300.630	41.21	-10.38	30.83	46.00	-15.17	peak	
4		401.510	40.10	-9.32	30.78	46.00	-15.22	peak	
5		480.080	38.60	-8.08	30.52	46.00	-15.48	peak	
6	*	648.860	43.92	-5.19	38.73	46.00	-7.27	peak	

Test Mode: TX 2403.35 MHz

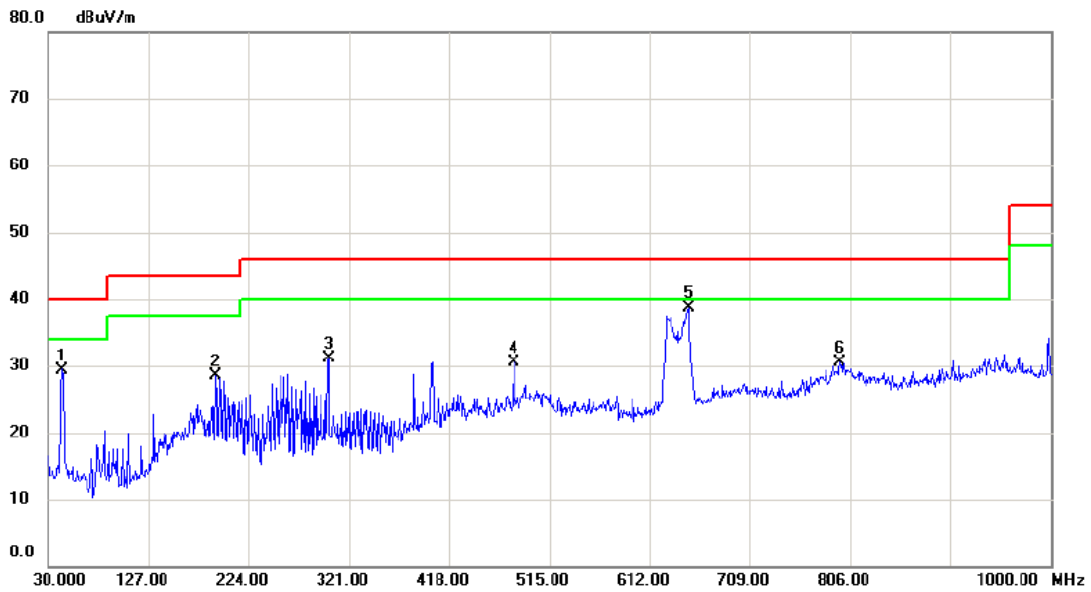
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		191.990	44.84	-14.48	30.36	43.50	-13.14	peak	
2	*	301.600	44.44	-10.39	34.05	46.00	-11.95	peak	
3		480.080	36.60	-8.08	28.52	46.00	-17.48	peak	
4		649.830	33.07	-5.17	27.90	46.00	-18.10	peak	
5		800.180	31.97	-1.04	30.93	46.00	-15.07	peak	
6		951.500	30.15	1.37	31.52	46.00	-14.48	peak	

Test Mode: TX 2441.35 MHz

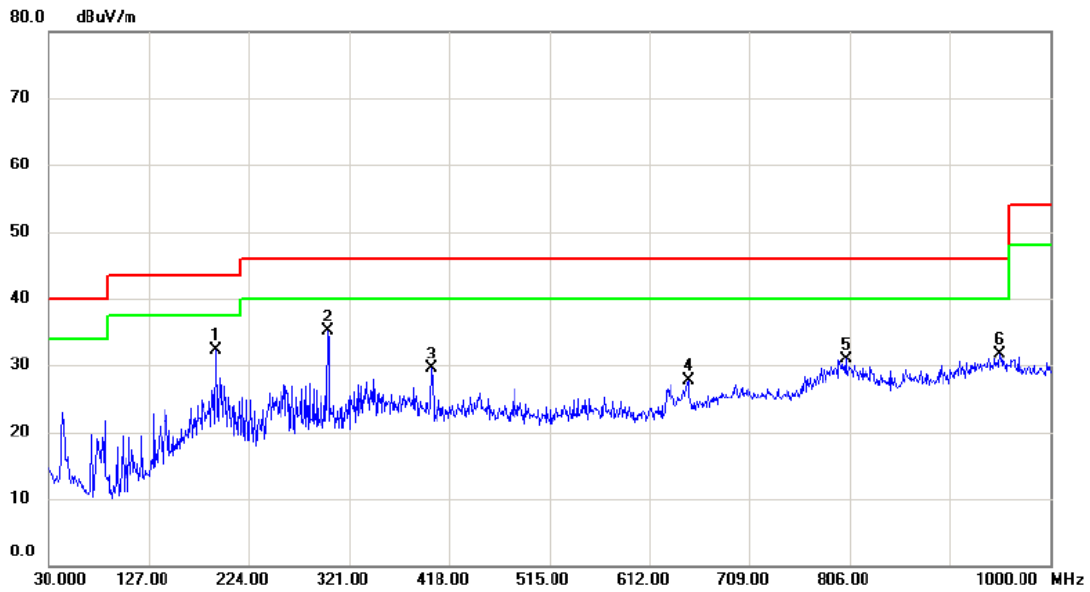
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		43.580	44.09	-14.69	29.40	40.00	-10.60	peak	
2		191.990	42.93	-14.48	28.45	43.50	-15.05	peak	
3		301.600	41.48	-10.39	31.09	46.00	-14.91	peak	
4		480.080	38.64	-8.08	30.56	46.00	-15.44	peak	
5	*	649.830	43.88	-5.17	38.71	46.00	-7.29	peak	
6		796.300	31.75	-1.26	30.49	46.00	-15.51	peak	

Test Mode: TX 2441.35 MHz

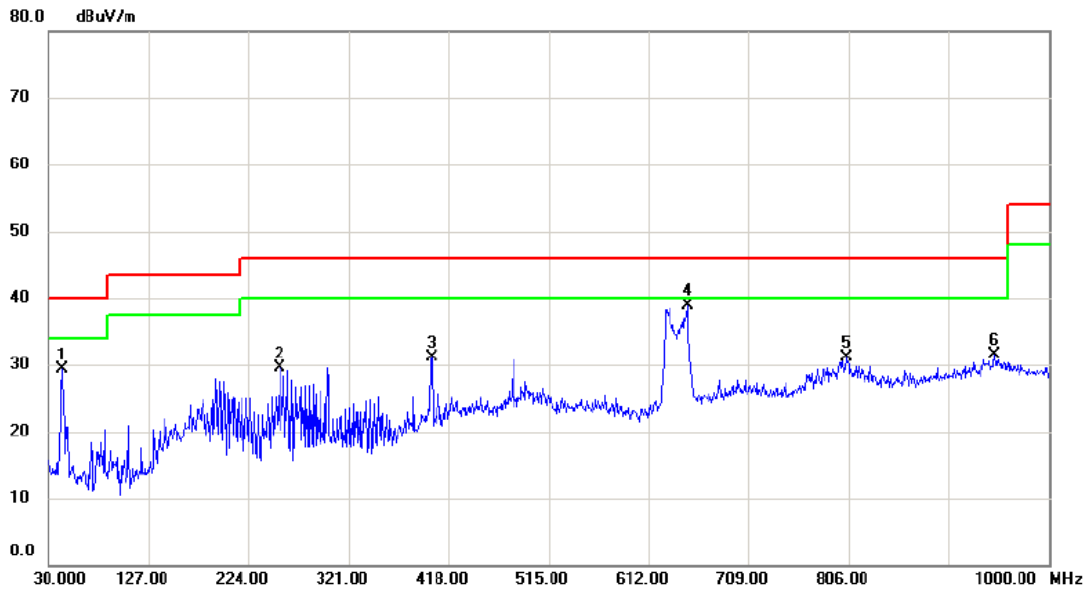
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		191.990	46.74	-14.48	32.26	43.50	-11.24	peak	
2	*	300.630	45.43	-10.38	35.05	46.00	-10.95	peak	
3		400.540	38.82	-9.37	29.45	46.00	-16.55	peak	
4		649.830	32.87	-5.17	27.70	46.00	-18.30	peak	
5		802.120	31.96	-1.07	30.89	46.00	-15.11	peak	
6		951.500	30.33	1.37	31.70	46.00	-14.30	peak	

Test Mode: TX 2477.35 MHz

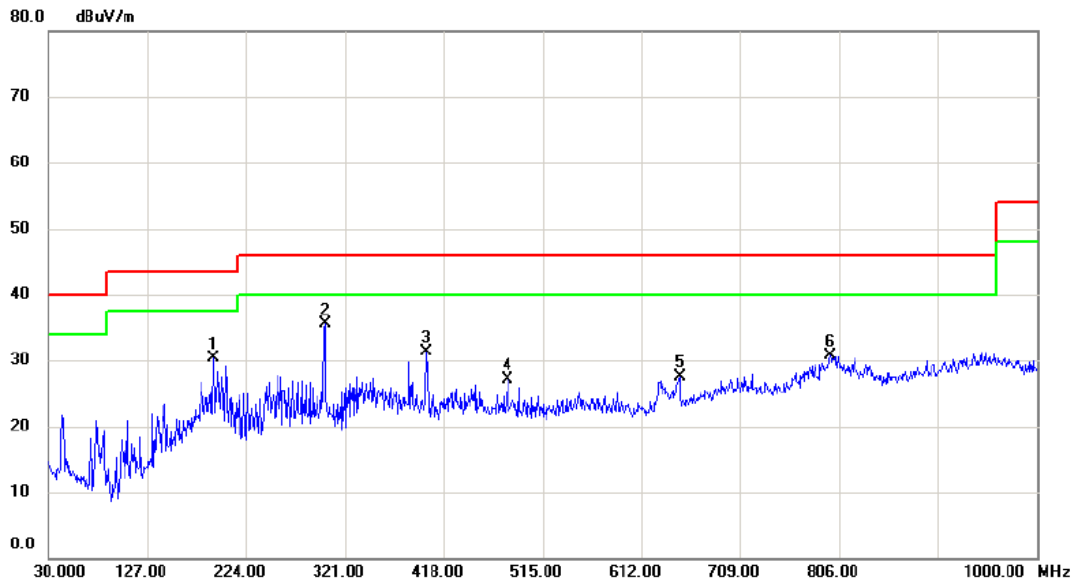
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		43.580	43.90	-14.69	29.21	40.00	-10.79	peak	
2		254.070	43.41	-13.98	29.43	46.00	-16.57	peak	
3		401.510	40.45	-9.32	31.13	46.00	-14.87	peak	
4	*	649.830	44.13	-5.17	38.96	46.00	-7.04	peak	
5		804.060	32.29	-1.10	31.19	46.00	-14.81	peak	
6		947.620	30.21	1.32	31.53	46.00	-14.47	peak	

Test Mode: TX 2477.35 MHz

Horizontal

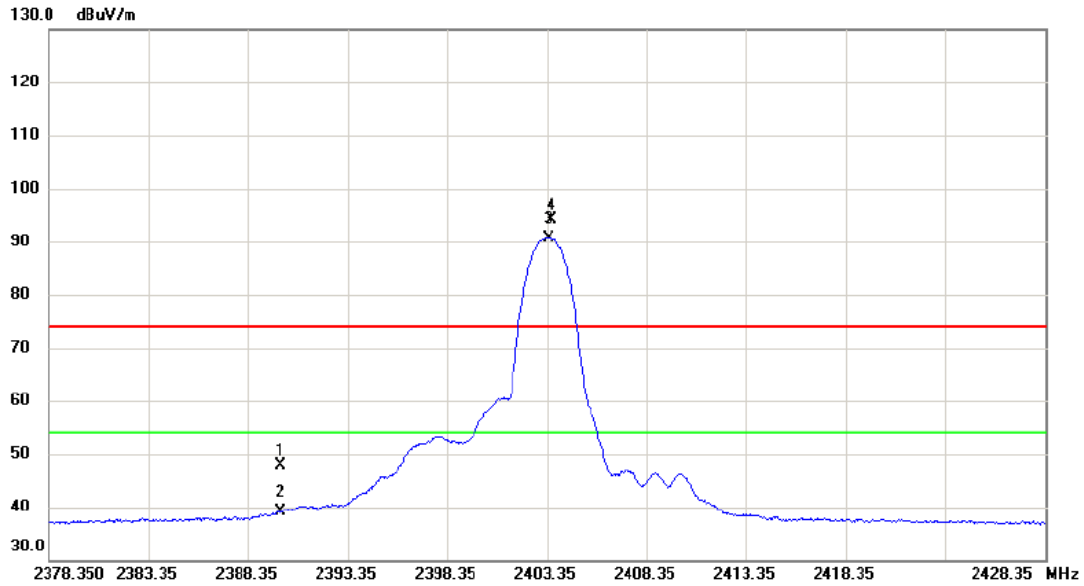


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	191.990	44.78	-14.48	30.30	43.50	-13.20	peak	
2 *	301.600	45.86	-10.39	35.47	46.00	-10.53	peak	
3	400.540	40.64	-9.37	31.27	46.00	-14.73	peak	
4	480.080	35.12	-8.08	27.04	46.00	-18.96	peak	
5	649.830	32.71	-5.17	27.54	46.00	-18.46	peak	
6	797.270	31.87	-1.20	30.67	46.00	-15.33	peak	

APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode TX Mode_2403.35 MHz

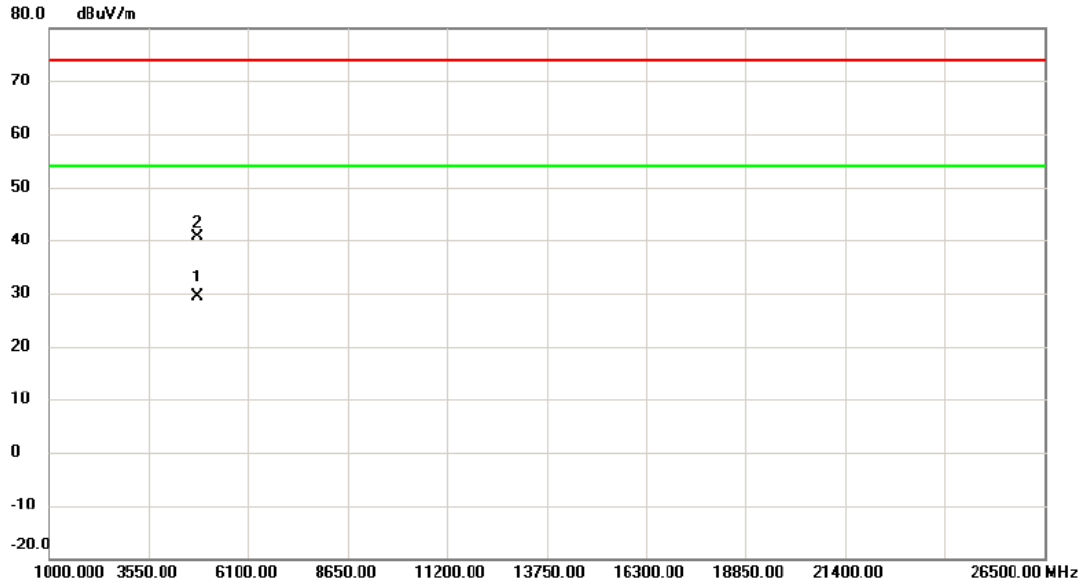
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2390.000	36.67	11.29	47.96	74.00	-26.04	peak	
2		2390.000	27.87	11.29	39.16	54.00	-14.84	AVG	
3	*	2403.450	79.38	11.31	90.69	54.00	36.69	AVG	No Limit
4	X	2403.550	82.74	11.31	94.05	74.00	20.05	peak	No Limit

Test Mode TX Mode_2403.35 MHz

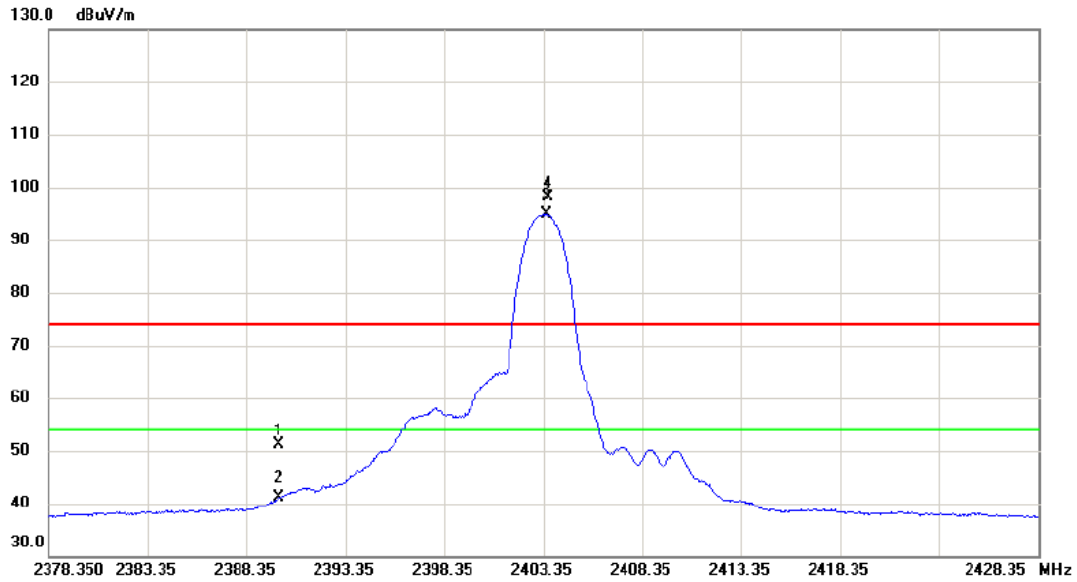
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	4805.980	19.43	9.86	29.29	54.00	-24.71	AVG	
2		4806.760	30.64	9.87	40.51	74.00	-33.49	peak	

Test Mode TX Mode_2403.35 MHz

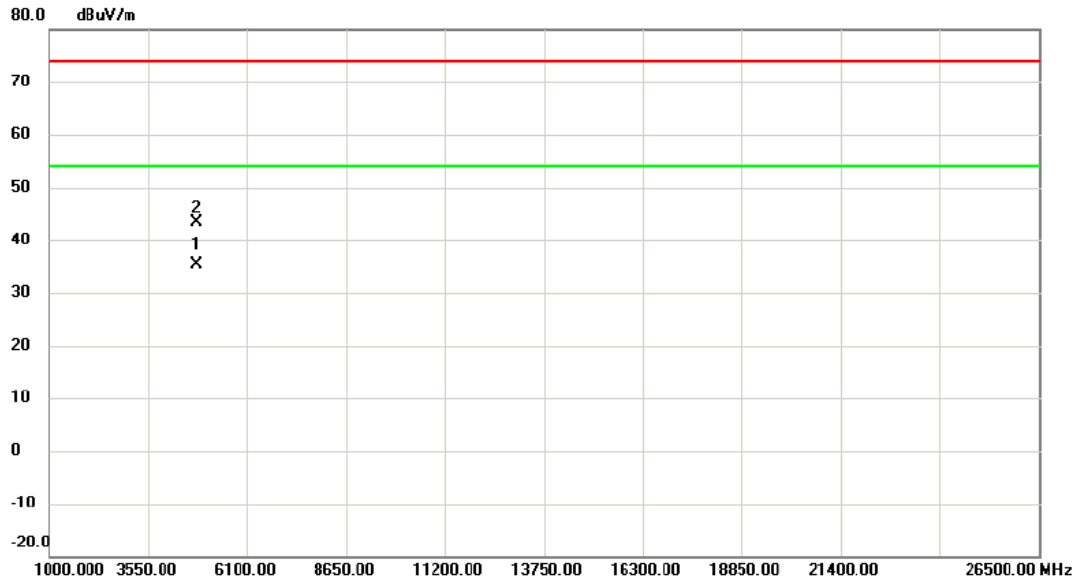
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2390.000	39.92	11.29	51.21	74.00	-22.79	peak	
2		2390.000	29.88	11.29	41.17	54.00	-12.83	AVG	
3	*	2403.500	83.50	11.31	94.81	54.00	40.81	AVG	No Limit
4	X	2403.600	86.77	11.30	98.07	74.00	24.07	peak	No Limit

Test Mode	TX Mode_2403.35 MHz
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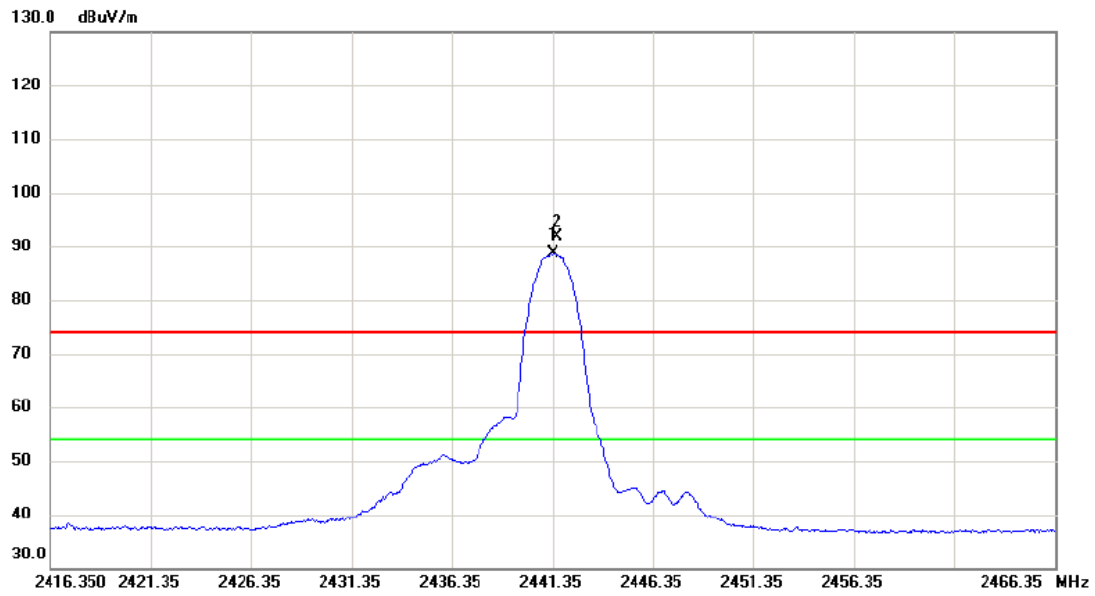
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	4806.660	25.61	9.87	35.48	54.00	-18.52	AVG	
2		4807.240	33.40	9.87	43.27	74.00	-30.73	peak	

Test Mode TX Mode_2441.35 MHz

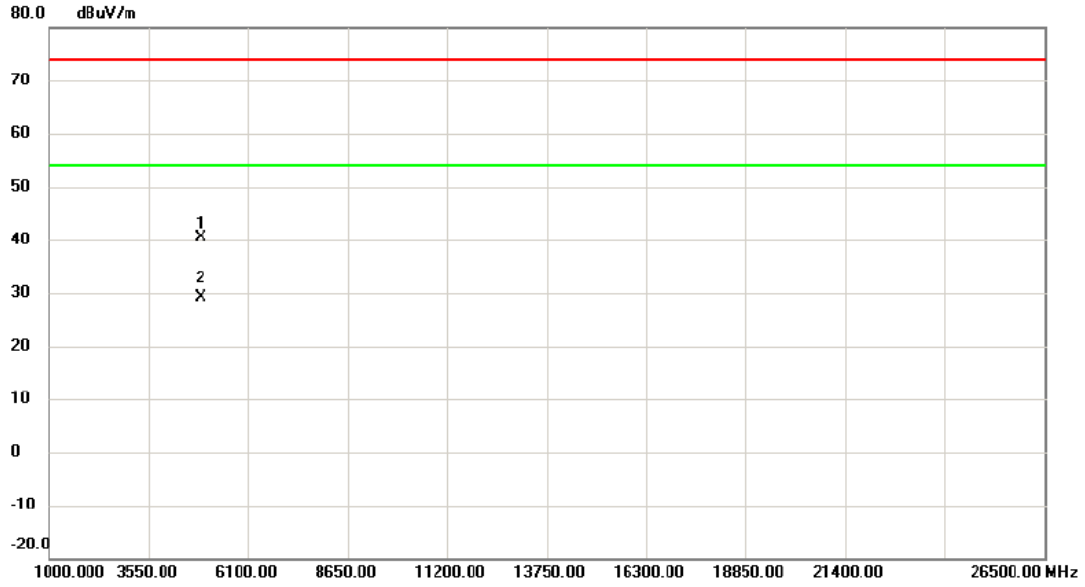
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2441.400	77.35	11.31	88.66	54.00	34.66	AVG	No Limit
2	X	2441.600	80.53	11.31	91.84	74.00	17.84	peak	No Limit

Test Mode TX Mode_2441.35 MHz

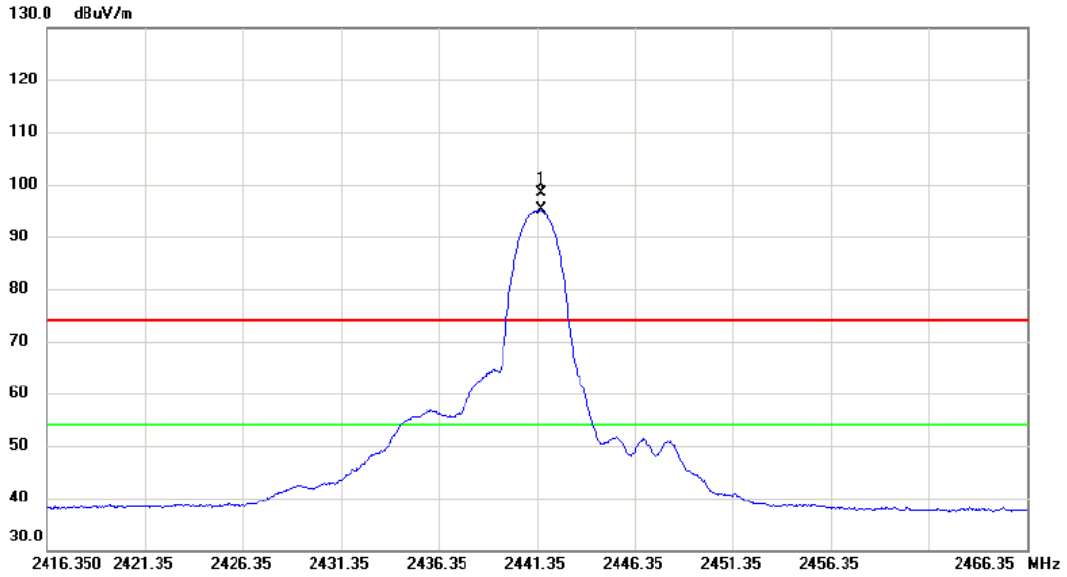
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4880.100	30.21	10.06	40.27	74.00	-33.73	peak	
2	*	4882.060	19.08	10.08	29.16	54.00	-24.84	AVG	

Test Mode TX Mode_2441.35 MHz

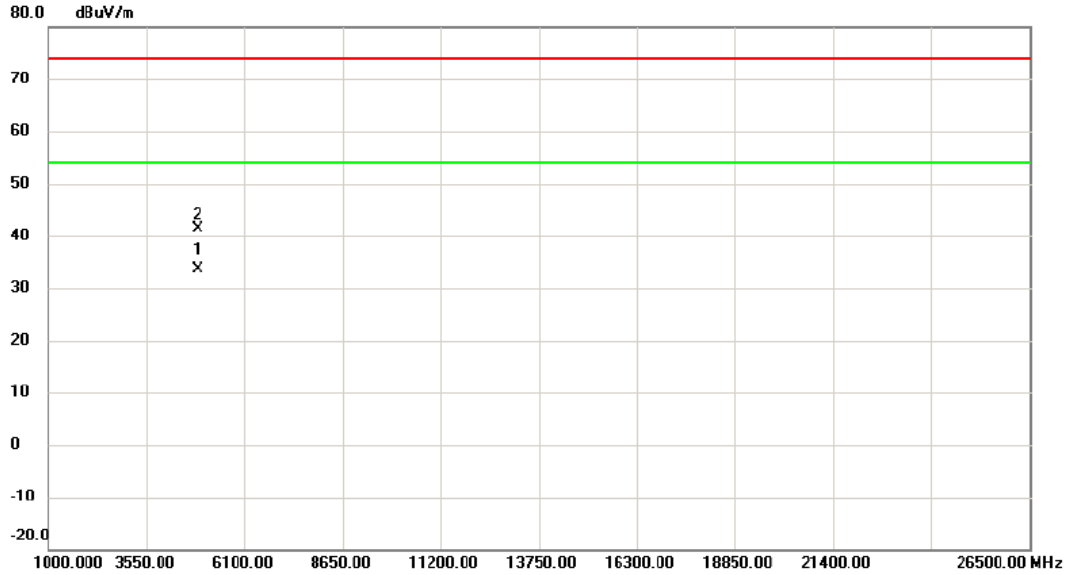
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2441.600	87.04	11.31	98.35	74.00	24.35	peak	No Limit
2	*	2441.600	83.82	11.31	95.13	54.00	41.13	AVG	No Limit

Test Mode TX Mode_2441.35 MHz

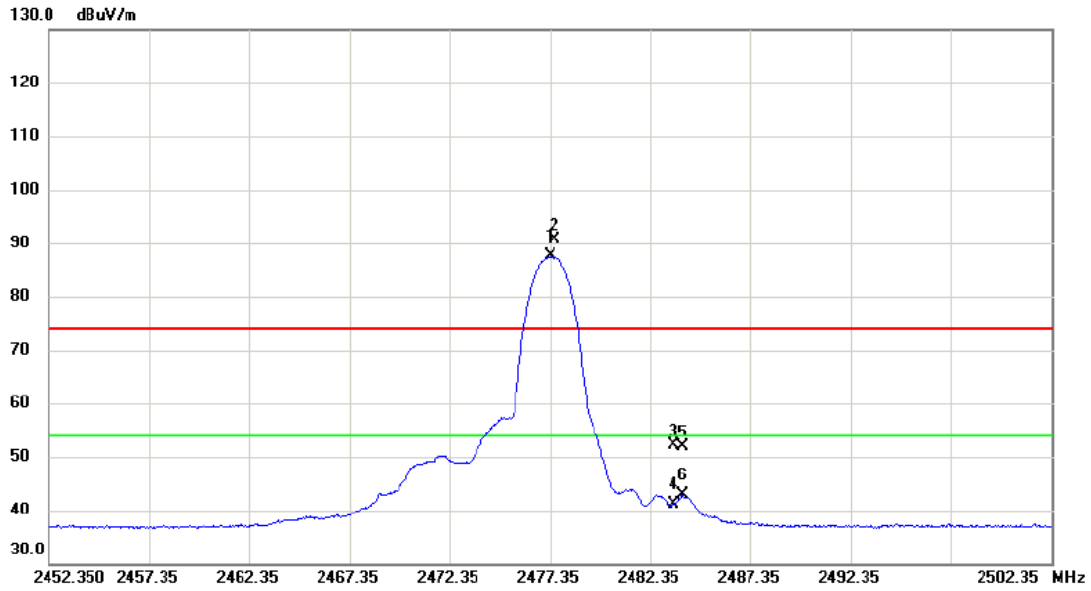
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	4880.020	23.60	10.06	33.66	54.00	-20.34	AVG	
2		4882.620	31.40	10.08	41.48	74.00	-32.52	peak	

Test Mode TX Mode_2477.35 MHz

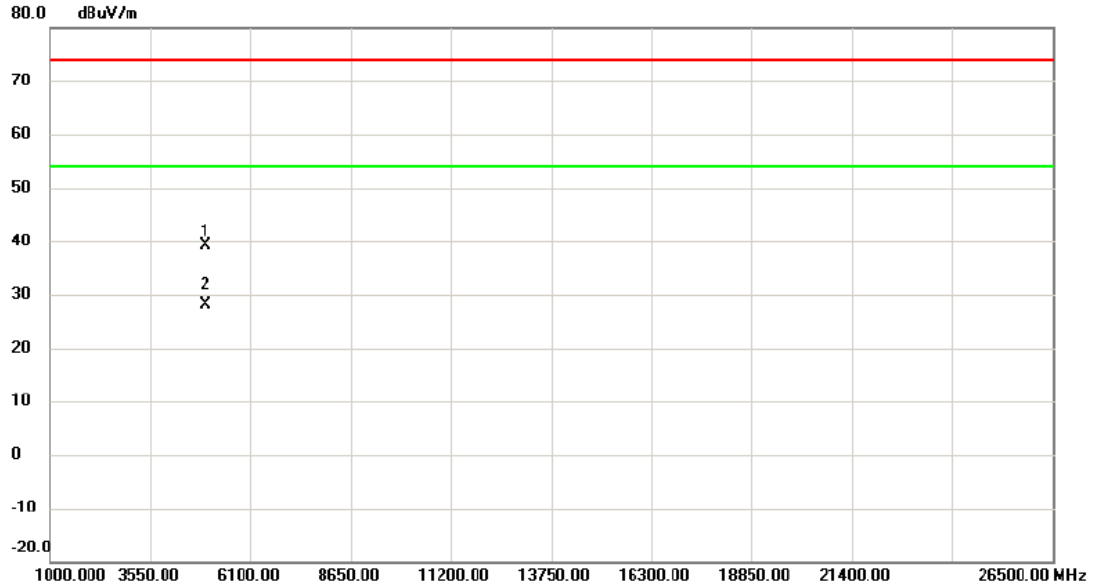
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2477.350	76.19	11.32	87.51	54.00	33.51	AVG	No Limit
2	X	2477.550	79.39	11.32	90.71	74.00	16.71	peak	No Limit
3		2483.500	40.80	11.32	52.12	74.00	-21.88	peak	
4		2483.500	29.71	11.32	41.03	54.00	-12.97	AVG	
5		2484.000	40.52	11.32	51.84	74.00	-22.16	peak	
6		2484.000	31.46	11.32	42.78	54.00	-11.22	AVG	

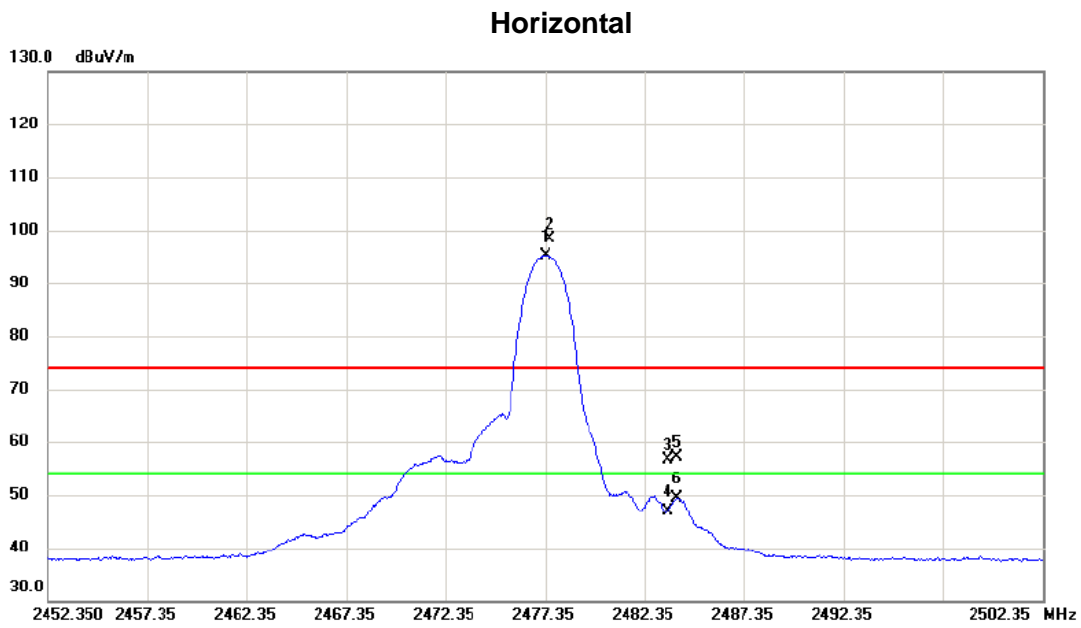
Test Mode	TX Mode_2477.35 MHz
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Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4951.860	28.85	10.26	39.11	74.00	-34.89	peak	
2	*	4955.040	17.76	10.27	28.03	54.00	-25.97	AVG	

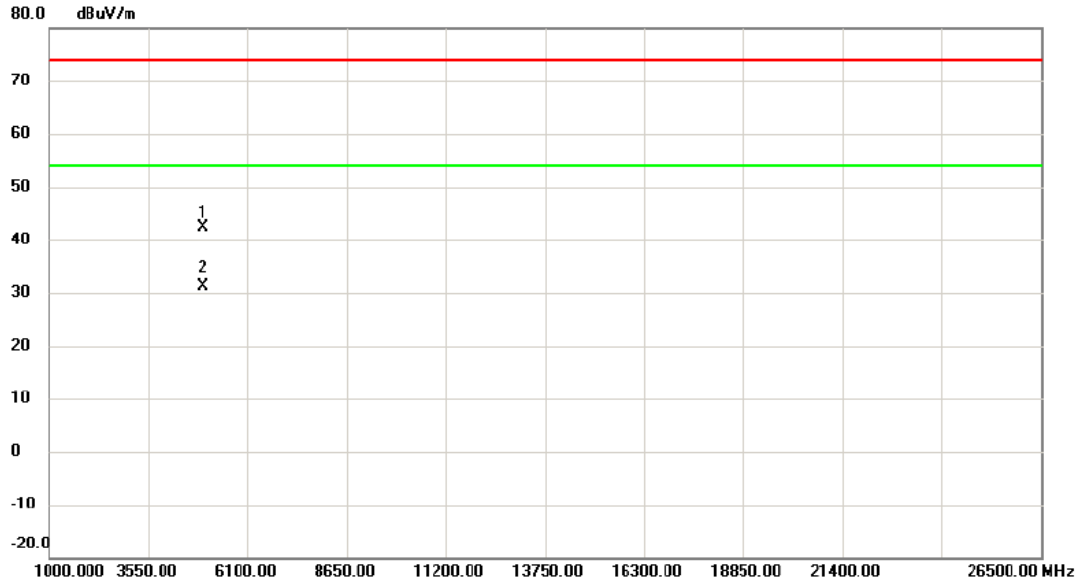
Test Mode TX Mode_2477.35 MHz



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2477.350	83.89	11.32	95.21	54.00	41.21	AVG	No Limit
2	X	2477.600	87.11	11.32	98.43	74.00	24.43	peak	No Limit
3		2483.500	45.37	11.32	56.69	74.00	-17.31	peak	
4		2483.500	35.45	11.32	46.77	54.00	-7.23	AVG	
5		2484.000	45.71	11.32	57.03	74.00	-16.97	peak	
6		2484.000	38.05	11.32	49.37	54.00	-4.63	AVG	

Test Mode TX Mode_2477.35 MHz

Horizontal



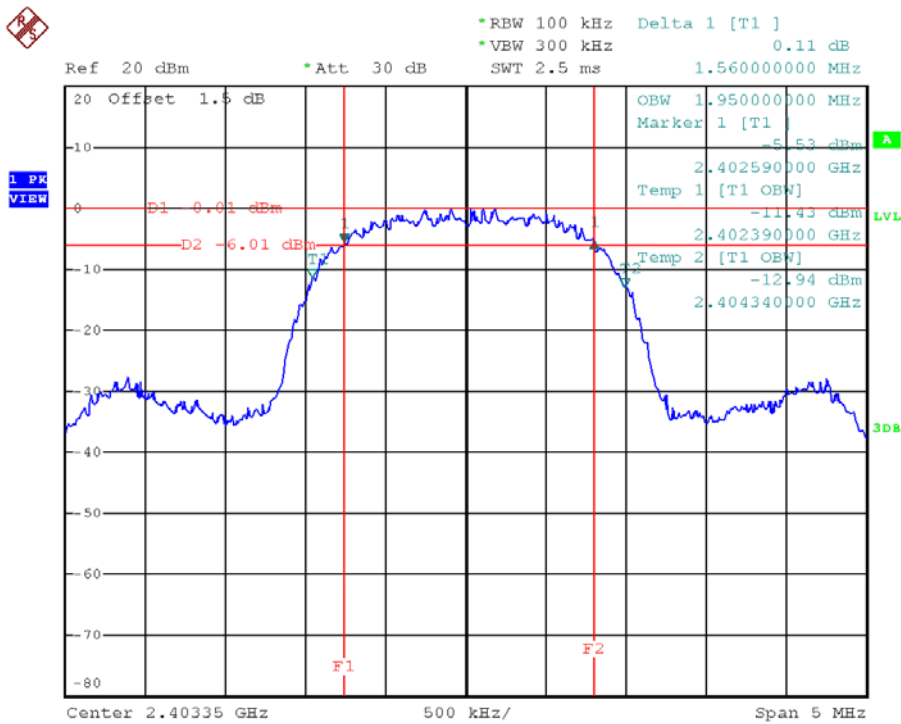
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4952.300	32.02	10.26	42.28	74.00	-31.72	peak	
2	*	4954.720	20.90	10.27	31.17	54.00	-22.83	AVG	

APPENDIX E - BANDWIDTH

Test Mode:	TX Mode
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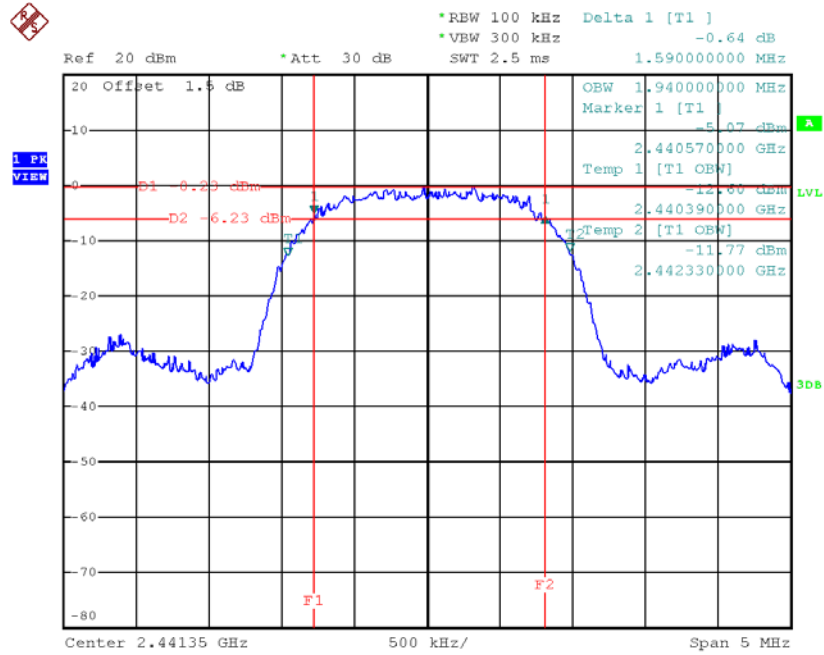
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2403.35	1.56	1.95	500	Complies
2441.35	1.59	1.94	500	Complies
2477.35	1.56	1.96	500	Complies

TX Mode 2403.35 MHz



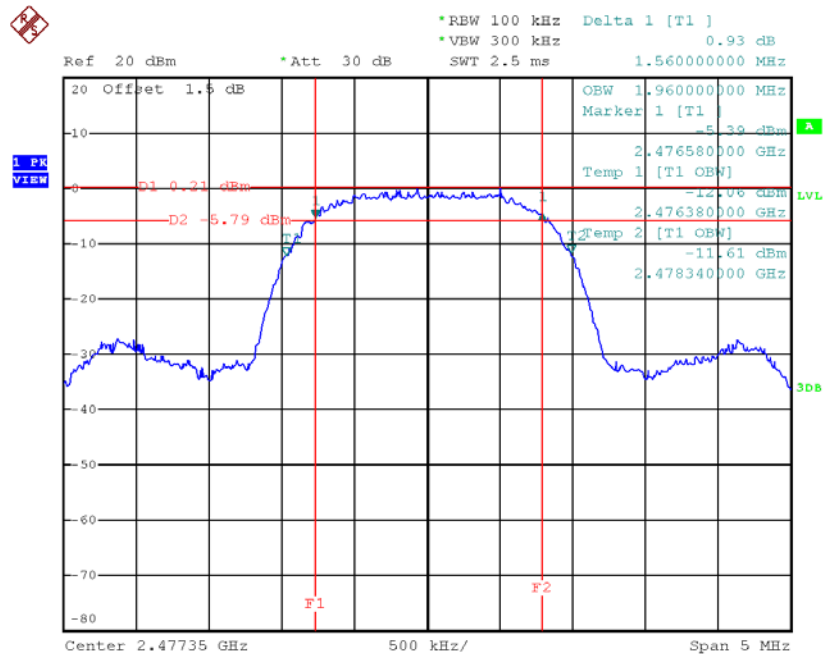
Date: 3.AUG.2018 21:01:55

TX Mode_2441.35 MHz



Date: 3.AUG.2018 20:54:19

TX Mode_2477.35 MHz

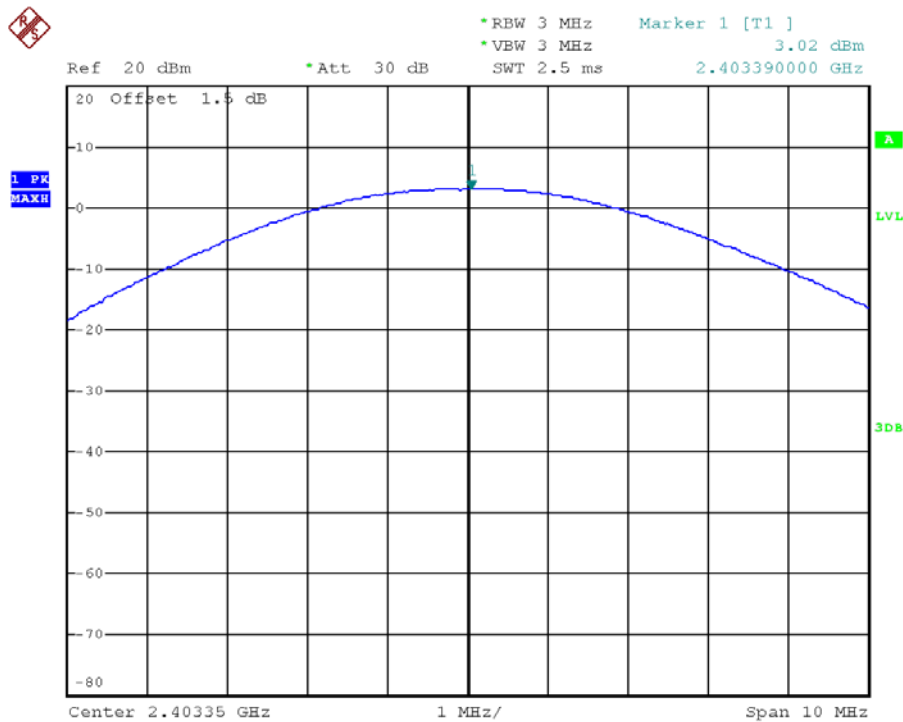


Date: 3.AUG.2018 20:52:11

APPENDIX F - OUTPUT POWER TEST

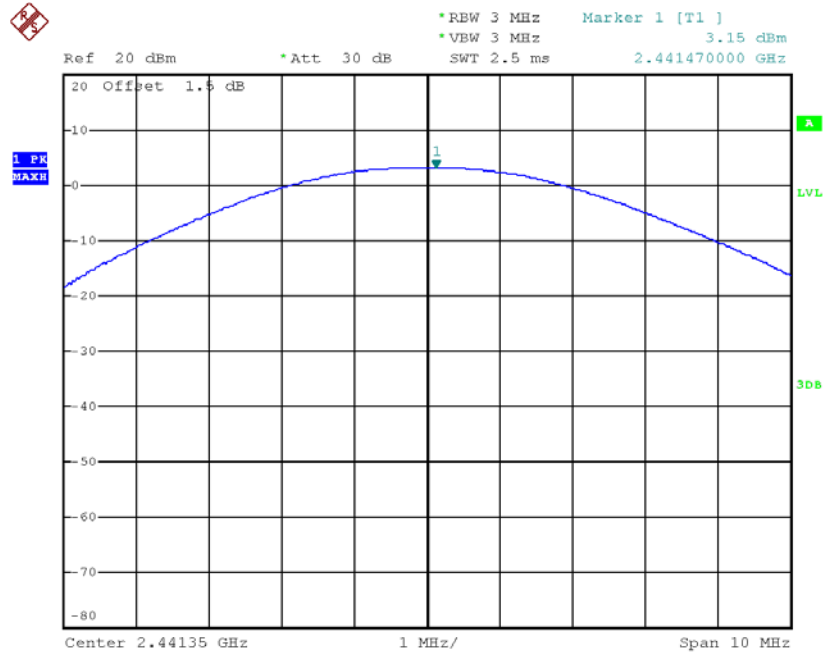
Test Mode					
Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Result
2403.35	3.02	0.0020	30.00	1.00	Complies
2441.35	3.15	0.0021	30.00	1.00	Complies
2477.35	3.00	0.0020	30.00	1.00	Complies

TX Mode_2403.35MHz



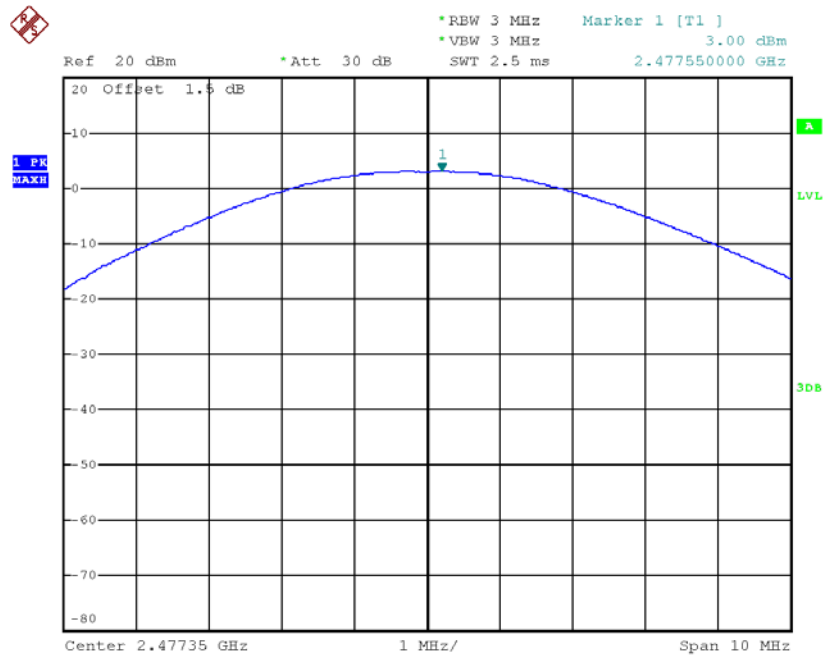
Date: 3.AUG.2018 20:14:21

TX Mode_2441.35 MHz



Date: 3.AUG.2018 20:13:26

TX Mode_2477.35 MHz

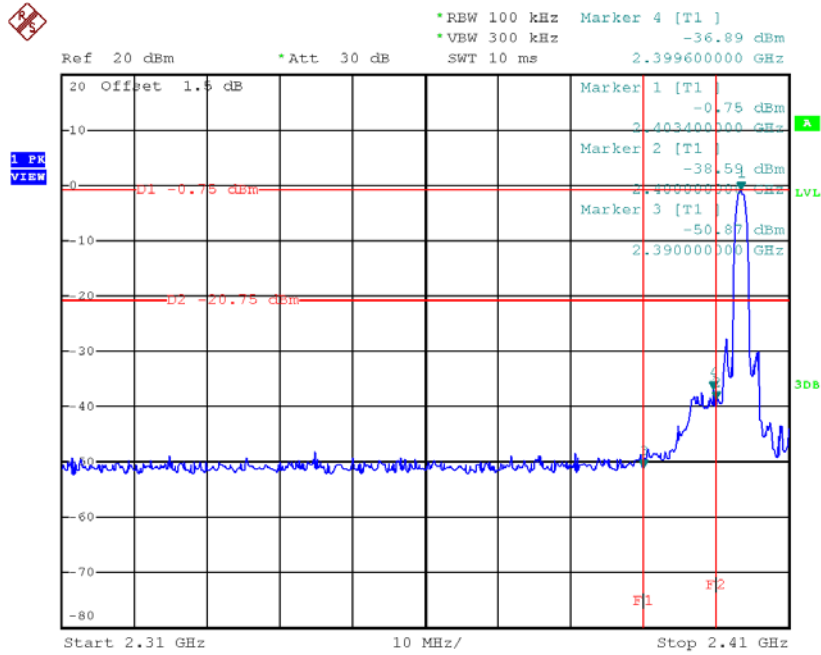


Date: 3.AUG.2018 20:11:16

APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION

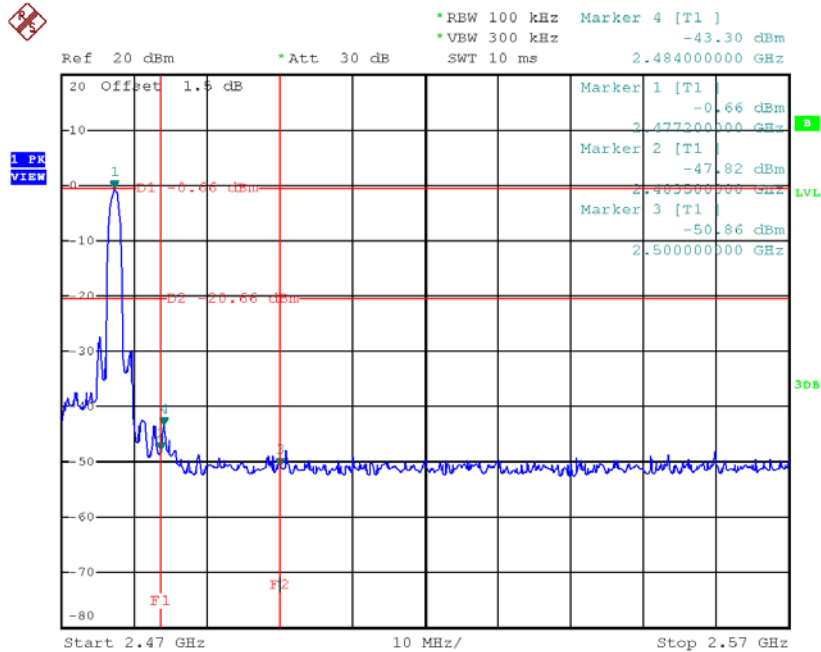
Test Mode : CH01, CH20 , CH38

CH01 (Lower)



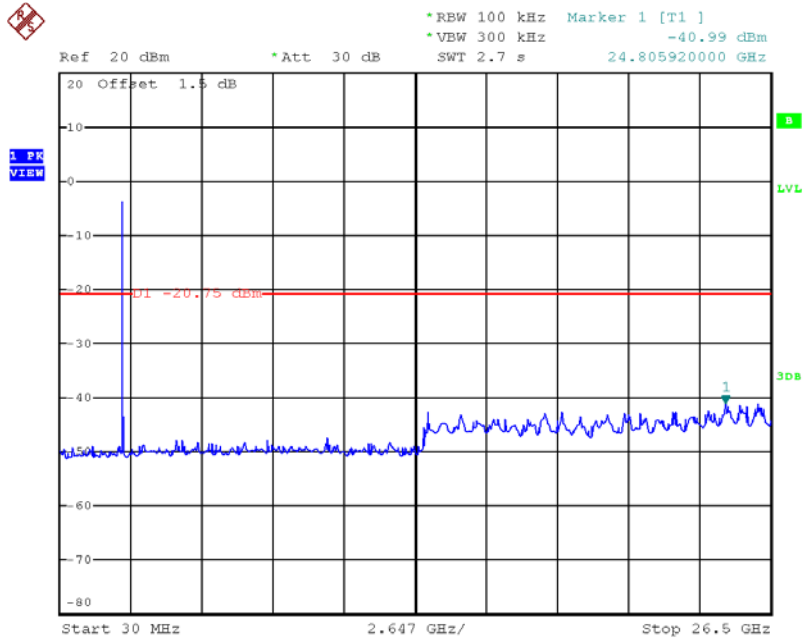
Date: 2.AUG.2018 15:16:41

CH38 (upper)



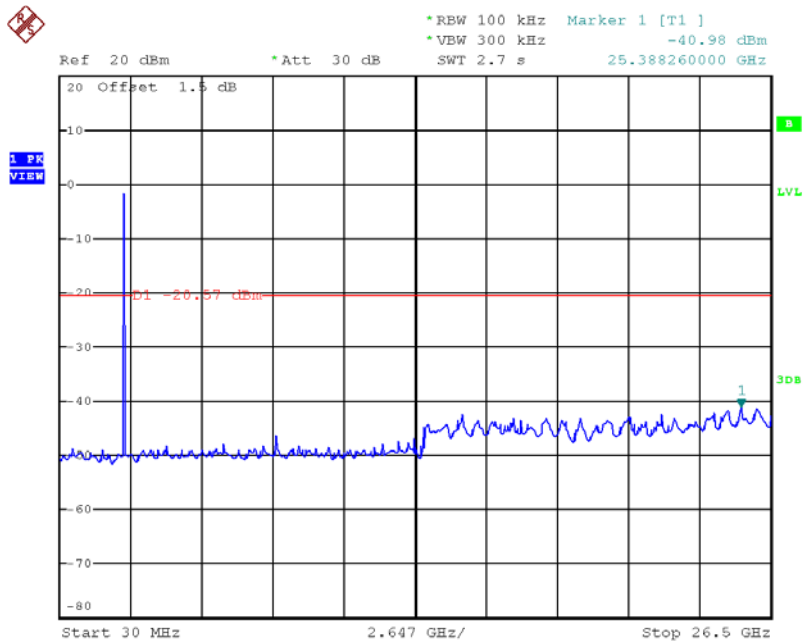
Date: 3.AUG.2018 19:55:40

CH01 (10 Harmonic of the frequency)



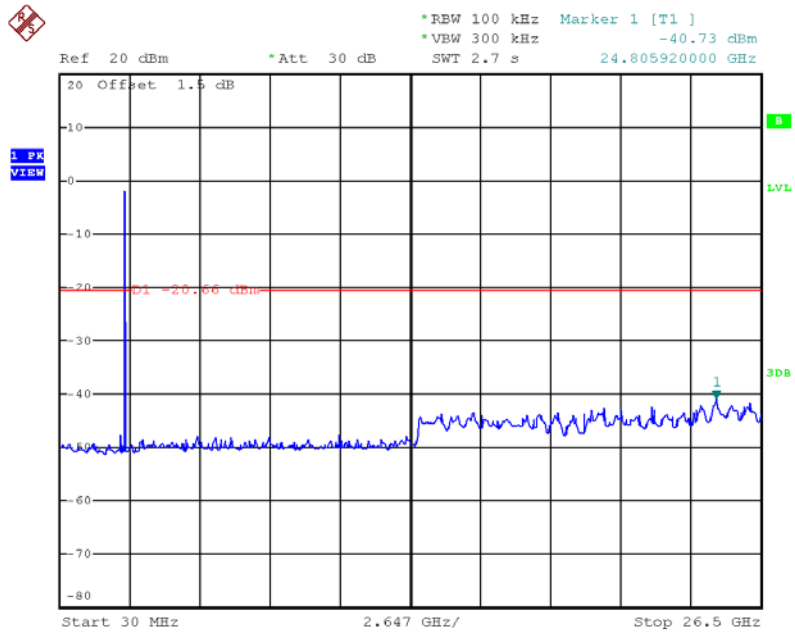
Date: 3.AUG.2018 20:01:49

CH20 (10 Harmonic of the frequency)



Date: 3.AUG.2018 20:00:11

CH38 (10 Harmonic of the frequency)



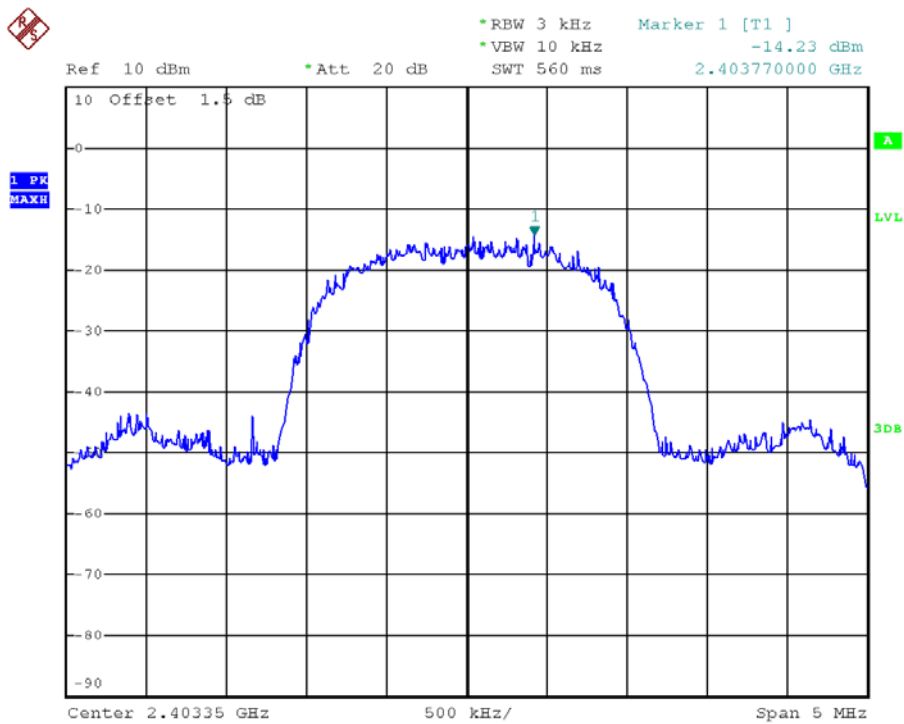
Date: 3.AUG.2018 20:03:22

APPENDIX H - POWER SPECTRAL DENSITY TEST

Test Mode:	TX Mode
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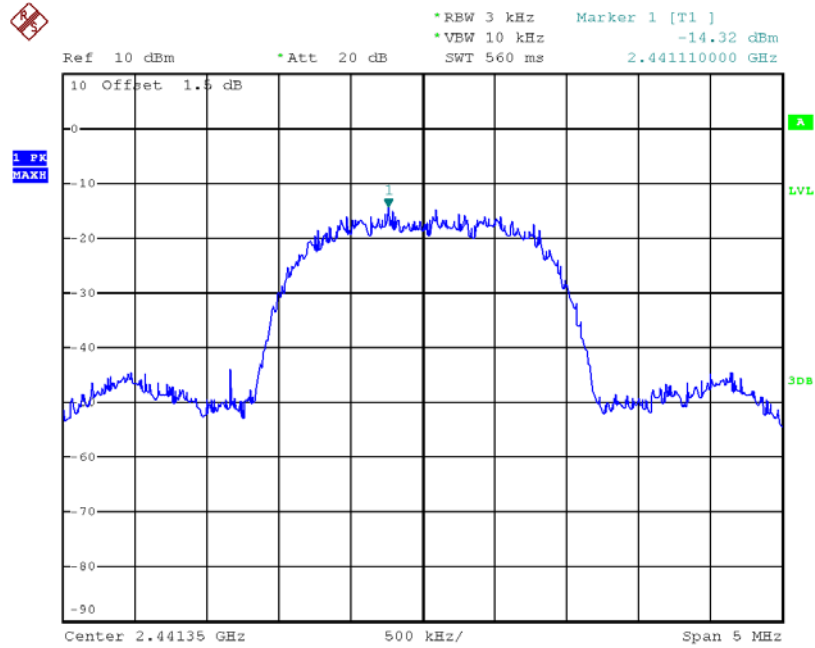
Frequency (MHz)	Power Density (dBm/3 kHz)	Power Density (mW/3 kHz)	Max. Limit (dBm/3 kHz)	Result
2403.35	-14.23	0.0378	8.00	Complies
2441.35	-14.32	0.0370	8.00	Complies
2477.35	-14.28	0.0373	8.00	Complies

TX CH01



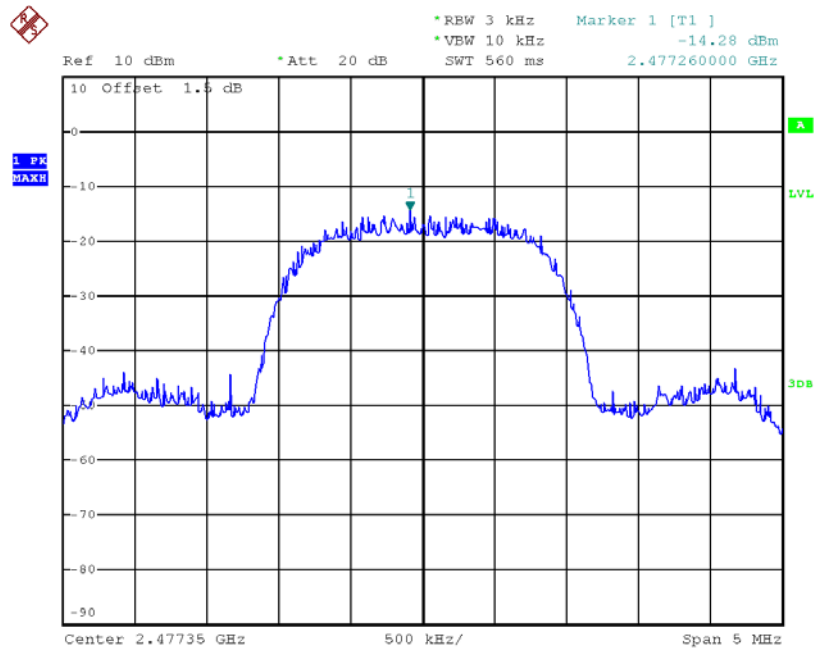
Date: 3.AUG.2018 19:49:51

TX CH20



Date: 3.AUG.2018 19:50:37

TX CH38



Date: 3.AUG.2018 19:51:13