

FCC Radio Test Report

FCC ID: ZVA10

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

Project No. : 1804C068
Equipment : WIFI+BT Audio Module
Test Model : TWM-A8516+MT6630T
Series Model : N/A
Applicant : TCL Technoly Electronics (Huizhou) Co., Ltd.
Address : Section 37, Zhongkai High-tech Development Zone,
Huizhou City, Guang Dong Province, P.R. China.

Date of Receipt : Apr. 12, 2018
Date of Test : Apr. 16, 2018 ~ May 03, 2018
Issued Date : May 21, 2018
Tested by : BTL Inc.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1804C068	Original Issue.	May 16, 2018
MDG1805036	Update the Conducted Emission.	May 21, 2018

1. CERTIFICATION

Equipment : WIFI+BT Audio Module
Brand Name : TCL
Test Model : TWM-A8516+MT6630T
Series Model : N/A
Applicant : TCL Technoly Electronics (Huizhou) Co., Ltd.
Manufacturer : TCL Technoly Electronics (Huizhou) Co., Ltd.
Address : Section 37, Zhongkai High-tech Development Zone, Huizhou City, Guang
Dong Province, P.R. China.
Factory : TCL Technoly Electronics (Huizhou) Co., Ltd.
Address : Section 37, Zhongkai High-tech Development Zone, Huizhou City, Guang
Dong Province, P.R. China.
Date of Test : Apr. 16, 2018 ~ May 03, 2018
Test Sample : Engineering Sample NO.: D180403056
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-1-1804C068) 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).

Test result included in this report is only for the Bluetooth LE part.

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 %, $U=2 \times U_c(y)$.

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	WIFI+BT Audio Module	
Brand Name	TCL	
Test Model	TWM-A8516+MT6630T	
Series Model	N/A	
Model Difference	N/A	
Product Description	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	3.61 dBm
Power Source	Supplied from PC USB port.	
Power Rating	DC 5V	

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	TCL	N/A	PIFA	IPEX	3.00

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:

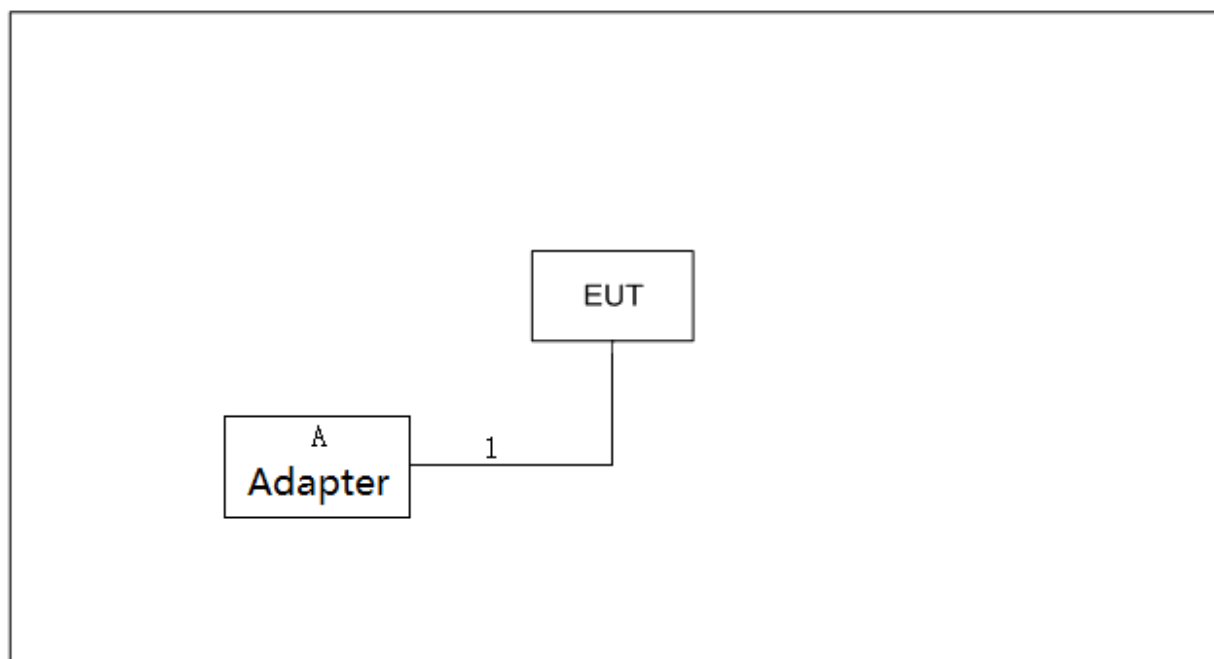
(1) The measurements are performed at the high, middle, low available channels.

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	WCN_Combo_Tool		
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	0.8m	USB 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 (dBμV)	
	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

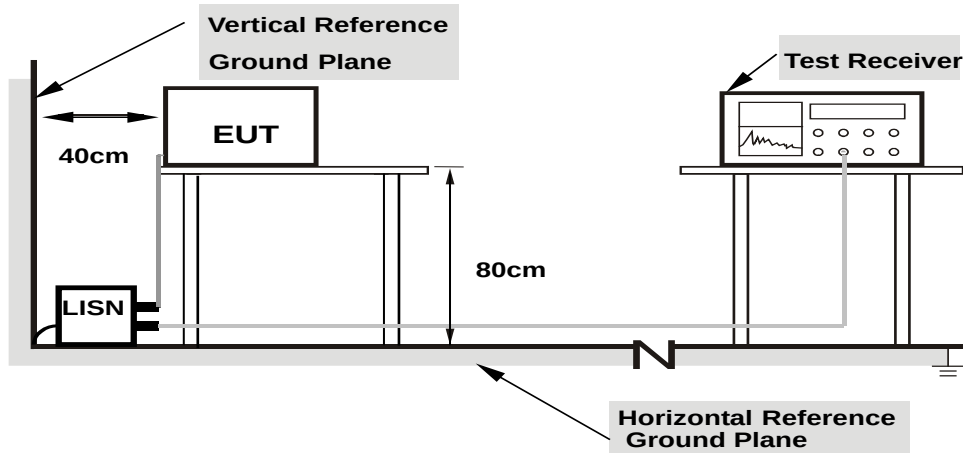
4.1.2 TEST PROCEDURE

- 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

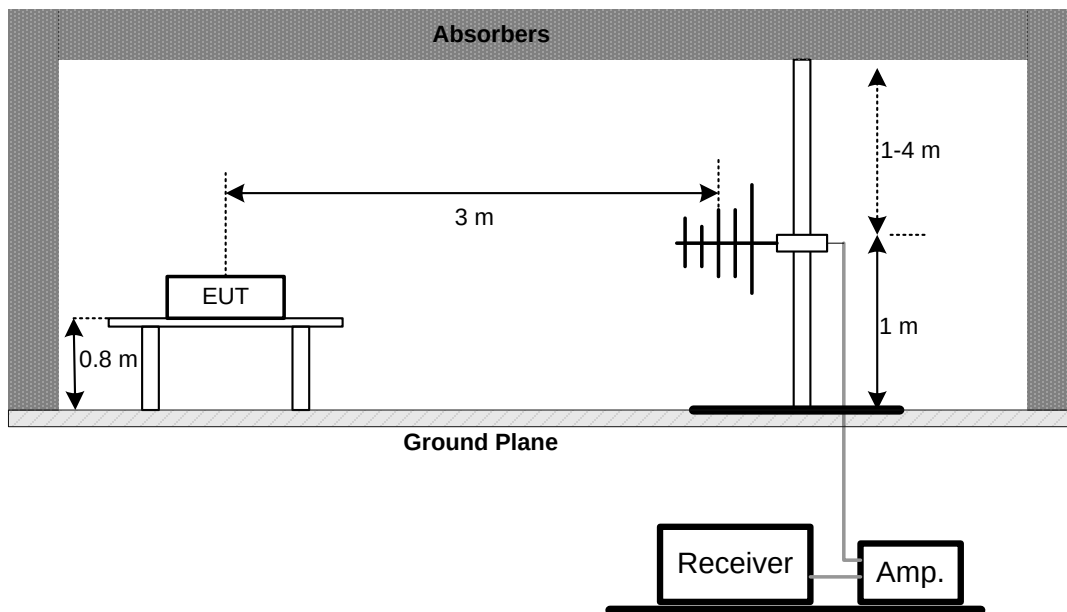
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of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

4.2.3 DEVIATION FROM TEST STANDARD

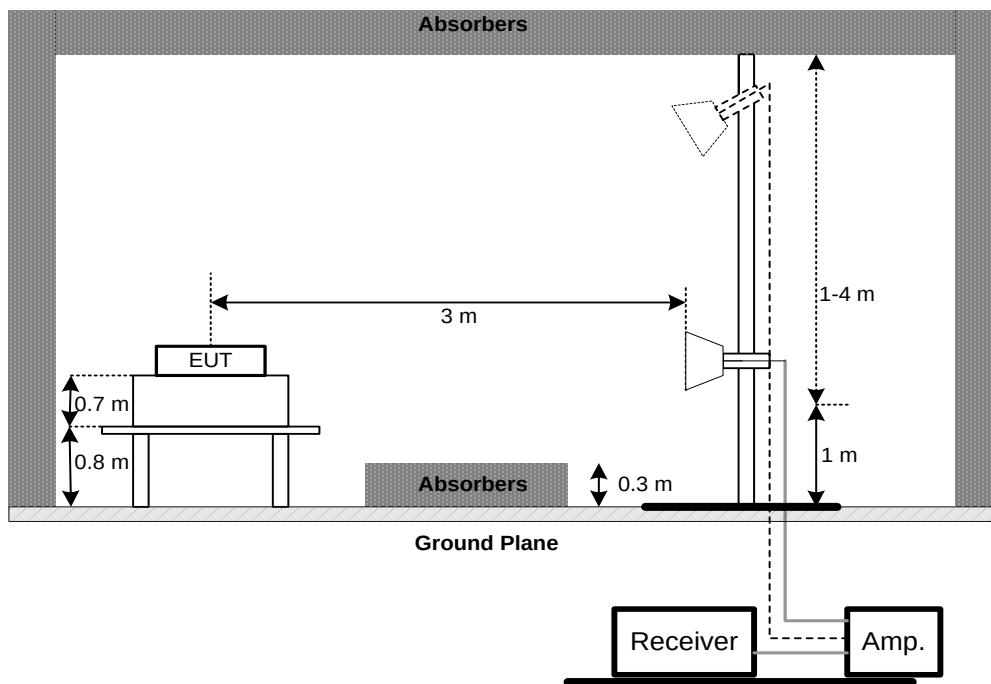
No deviation

4.2.4 TEST SETUP

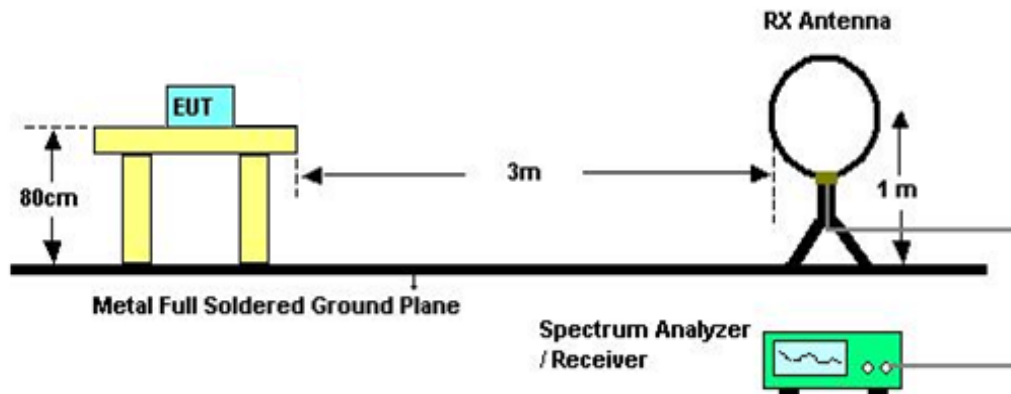
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(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

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- 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 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.

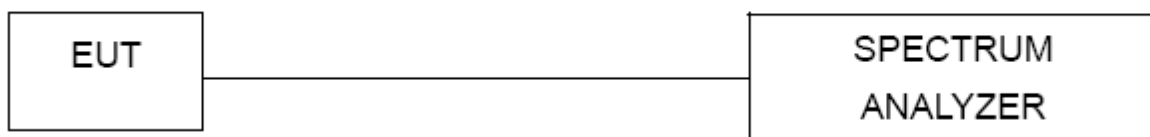
7.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.
- 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

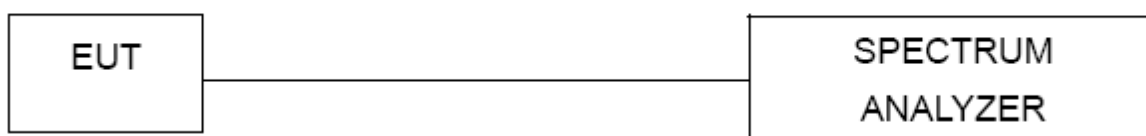
8.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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 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	Oct. 19, 2018

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	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	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. 08, 2018
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. 20, 2018
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	emci	EMC104-SM-SM-1 2000(12m)	N/A	Jun. 26, 2018
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

Peak Output Power Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	P-series Power meter	Agilent	N1911A	MY45100473	Aug. 20, 2018
2	Wireband Power sensor	Agilent	N1921A	MY51100041	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

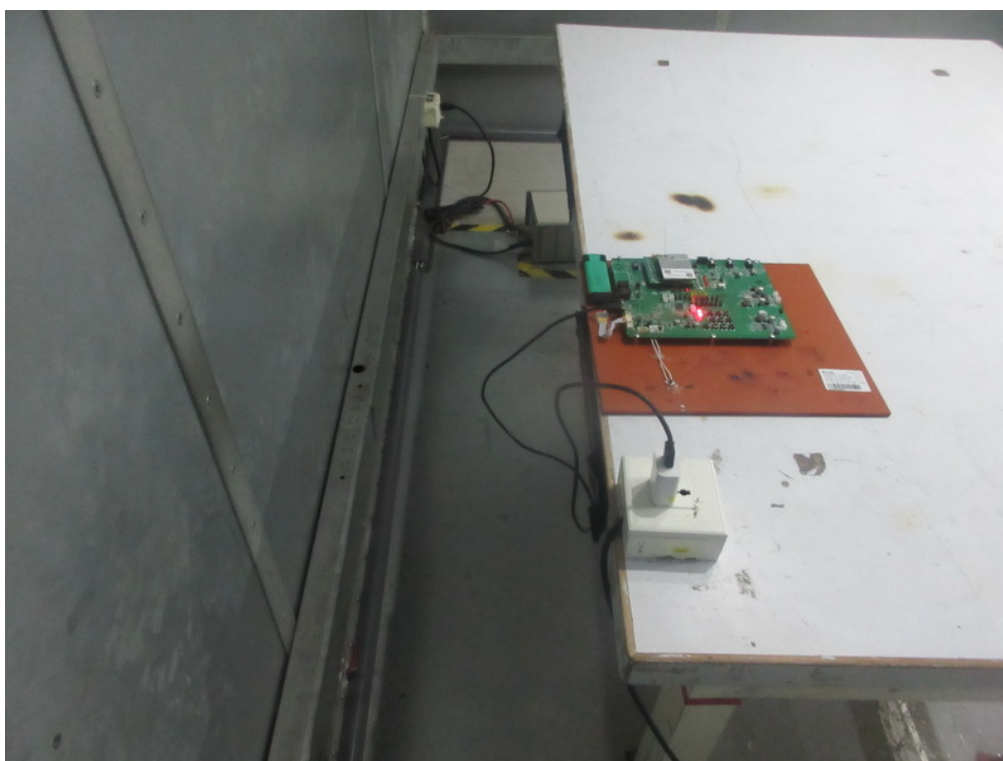
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

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

All calibration period of equipment list is one year.

10. EUT TEST PHOTO

Conducted Measurement Photos



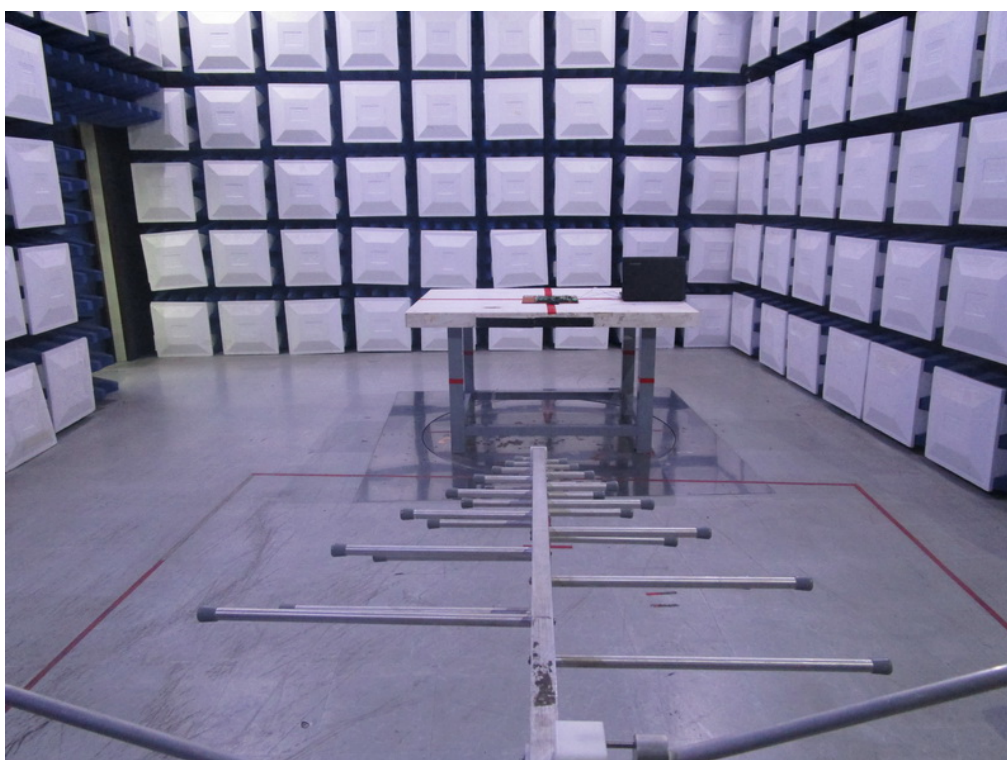
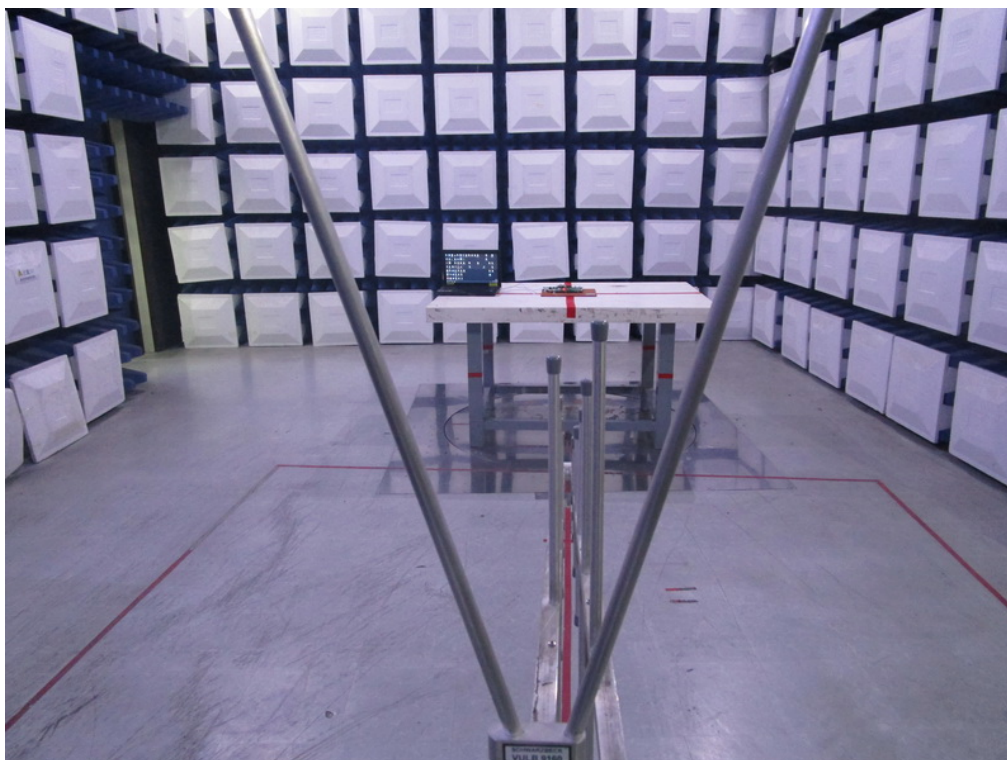
Radiated Measurement Photos

9KHz to 30MHz



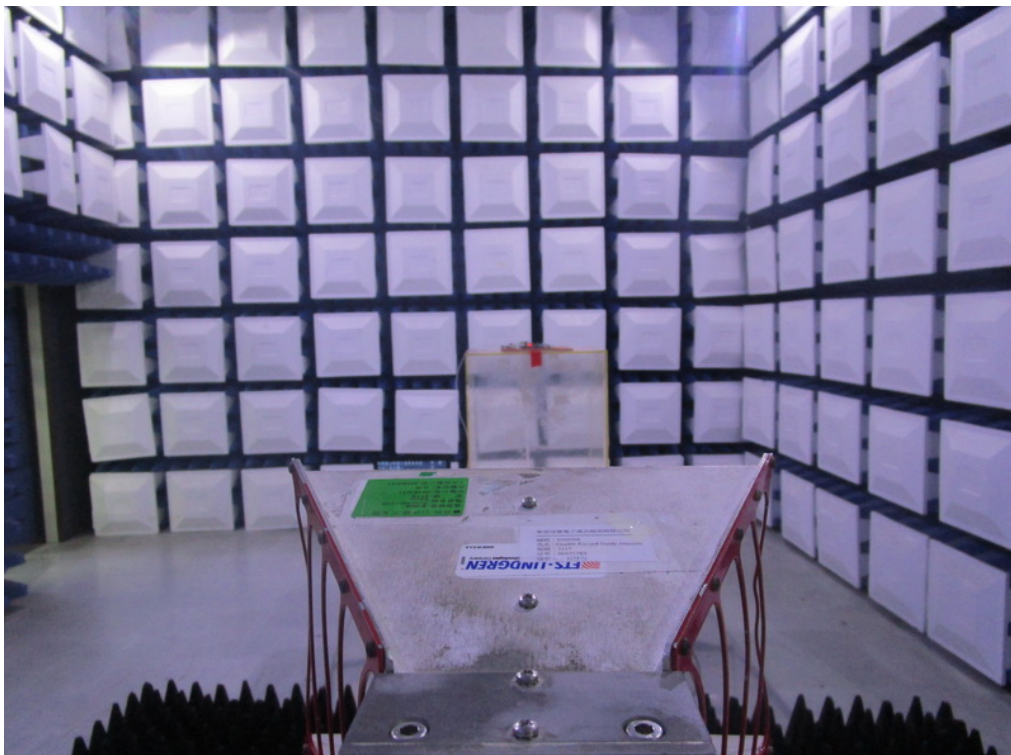
Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

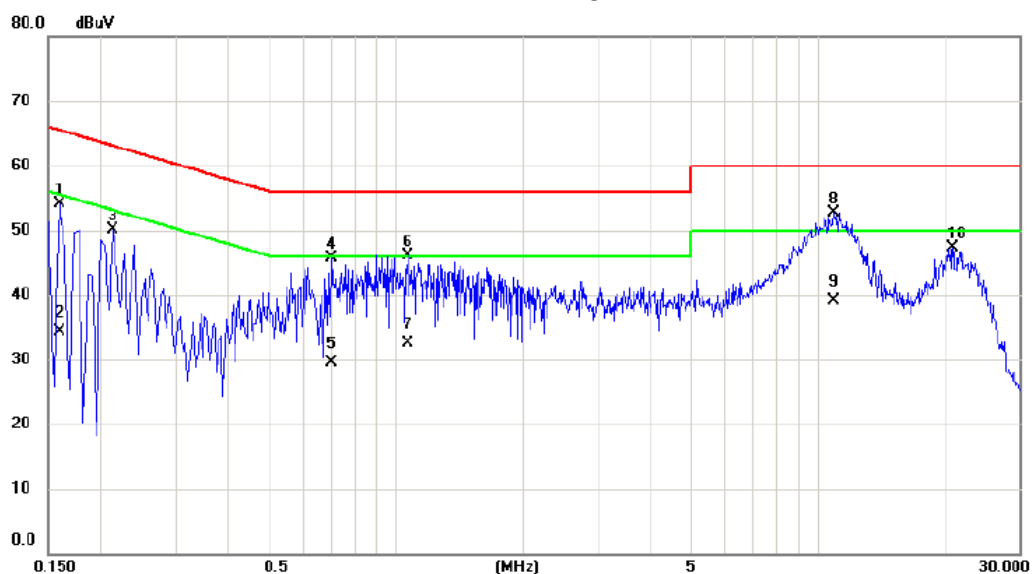
Above 1000MHz



APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

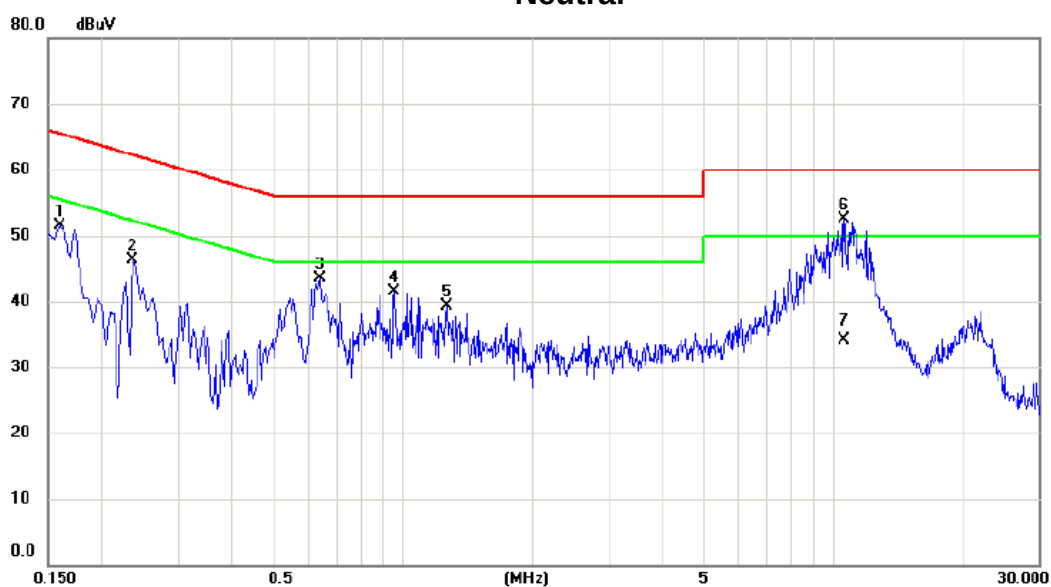
Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1590	44.32	9.82	54.14	65.52	-11.38	peak	
2		0.1590	24.50	9.82	34.32	55.52	-21.20	AVG	
3		0.2130	40.21	9.82	50.03	63.09	-13.06	peak	
4		0.7035	35.76	9.87	45.63	56.00	-10.37	peak	
5		0.7035	19.60	9.87	29.47	46.00	-16.53	AVG	
6		1.0635	36.16	9.92	46.08	56.00	-9.92	peak	
7		1.0635	22.60	9.92	32.52	46.00	-13.48	AVG	
8	*	10.8600	42.22	10.53	52.75	60.00	-7.25	peak	
9		10.8600	28.50	10.53	39.03	50.00	-10.97	AVG	
10		20.9130	36.12	11.17	47.29	60.00	-12.71	peak	

Test Mode: TX Mode

Neutral

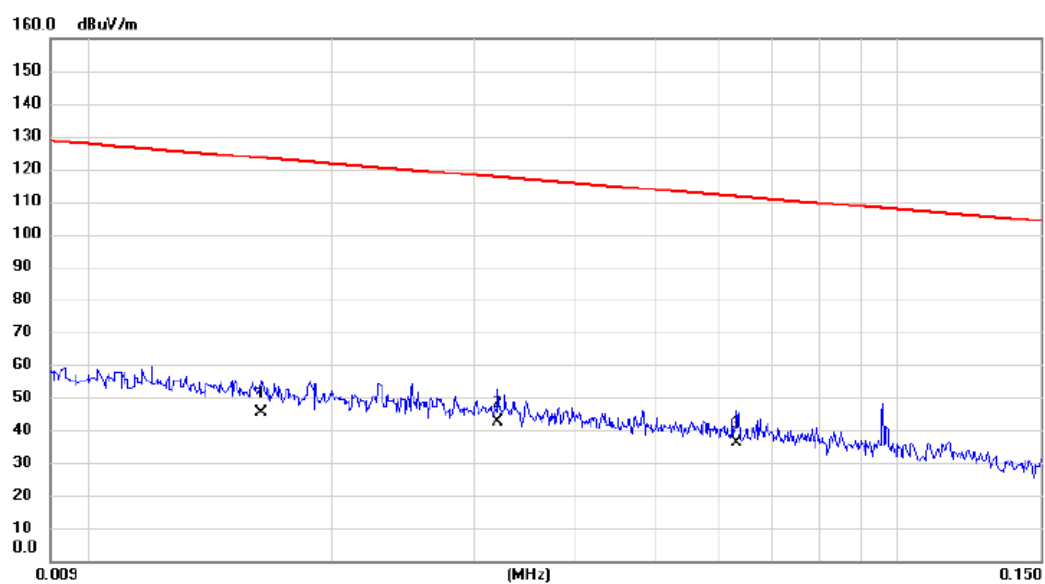


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1590	41.54	9.91	51.45	65.52	-14.07	peak	
2		0.2355	36.34	9.91	46.25	62.25	-16.00	peak	
3		0.6405	33.51	10.01	43.52	56.00	-12.48	peak	
4		0.9510	31.41	10.11	41.52	56.00	-14.48	peak	
5		1.2660	29.10	10.14	39.24	56.00	-16.76	peak	
6	*	10.6080	41.77	10.78	52.55	60.00	-7.45	peak	
7		10.6080	23.30	10.78	34.08	50.00	-15.92	AVG	

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

Test Mode: TX Mode

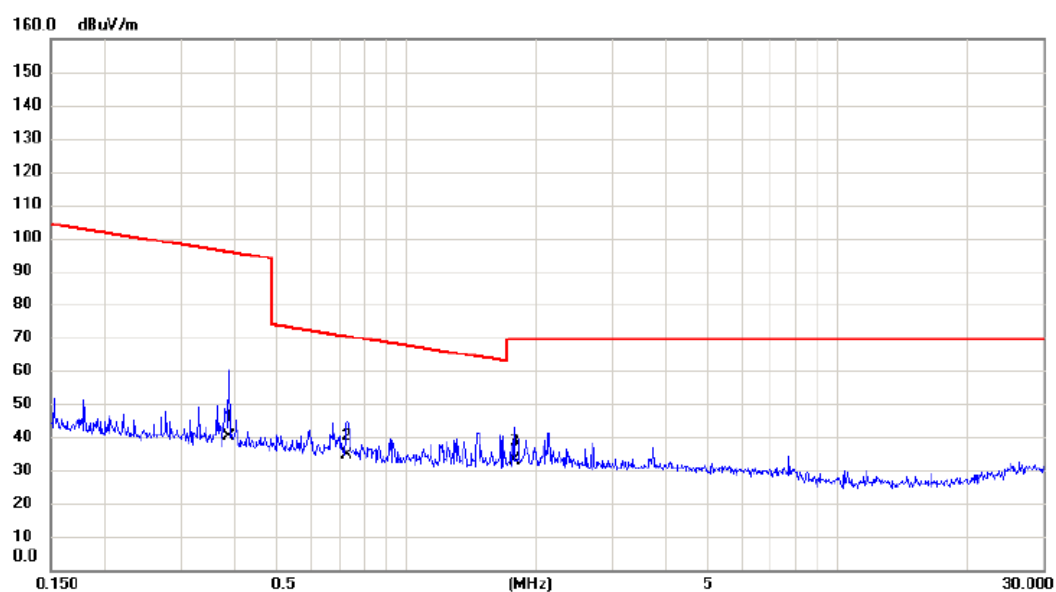
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0164	25.47	20.09	45.56	123.31	-77.75	AVG	
2	*	0.0321	23.30	19.26	42.56	117.47	-74.91	AVG	
3		0.0632	17.84	18.47	36.31	111.59	-75.28	AVG	

Test Mode: TX Mode

Ant 0°

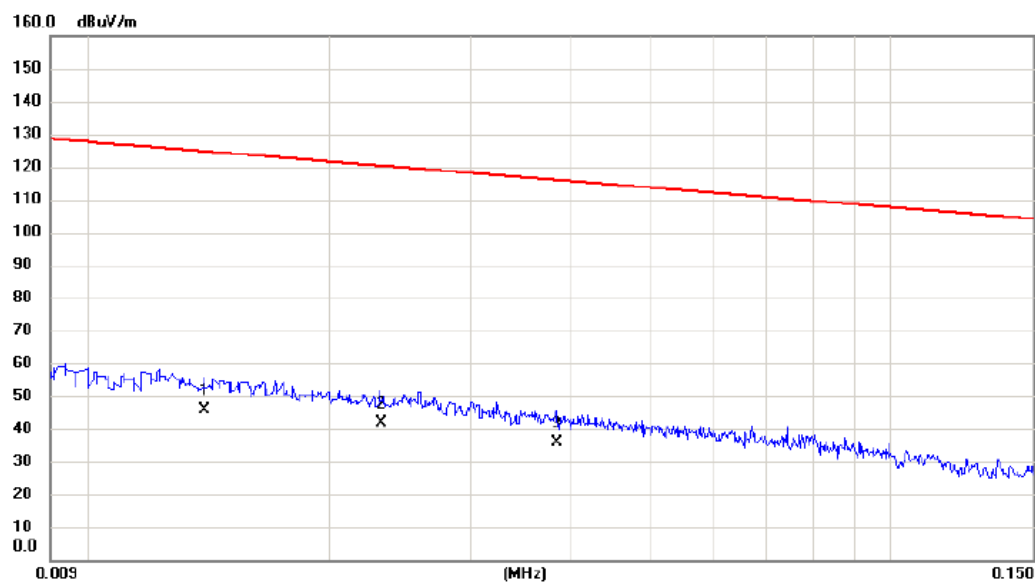


No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.3871	23.67	16.55	40.22	95.85	-55.63	AVG	
2	*	0.7273	18.36	16.21	34.57	70.37	-35.80	QP	
3		1.7810	17.42	15.60	33.02	69.54	-36.52	QP	

Test Mode:

TX Mode

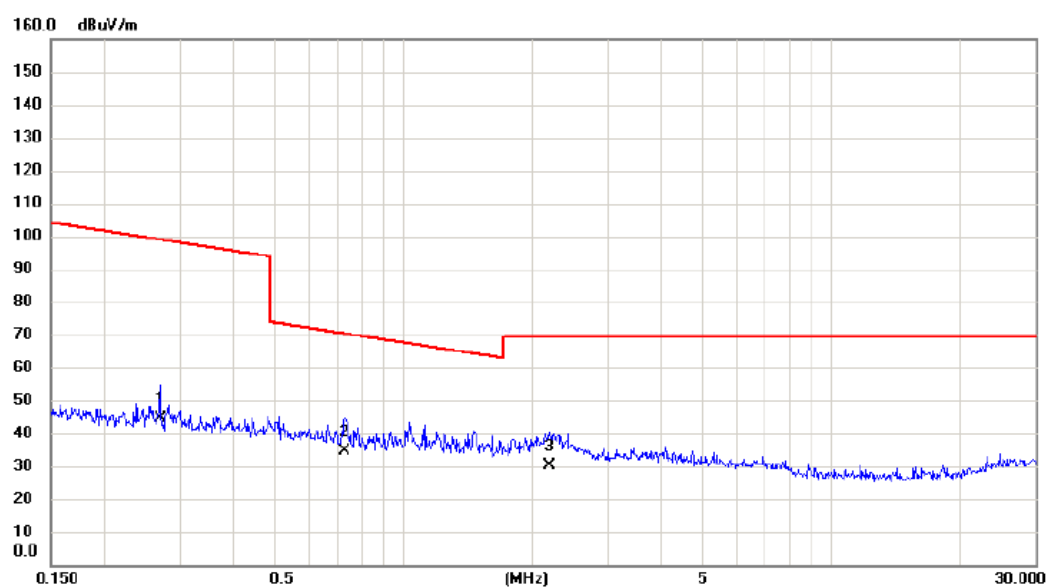
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0140	25.30	20.40	45.70	124.68	-78.98	AVG	
2	*	0.0232	22.11	19.52	41.63	120.30	-78.67	AVG	
3		0.0383	16.61	19.07	35.68	115.94	-80.26	AVG	

Test Mode: TX Mode

Ant 90°

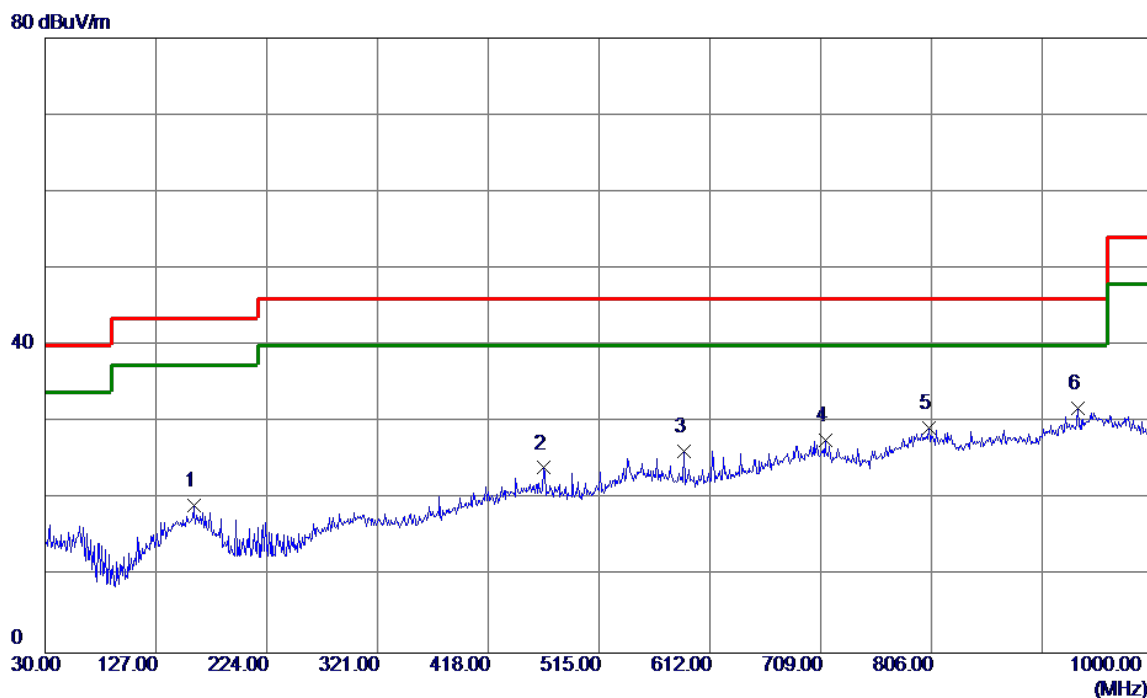


No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2701	27.99	16.64	44.63	98.97	-54.34	AVG	
2	*	0.7273	18.59	16.21	34.80	70.37	-35.57	QP	
3		2.1898	14.64	15.45	30.09	69.54	-39.45	QP	

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

Test Mode: TX 2402MHz _CH00_1Mbps

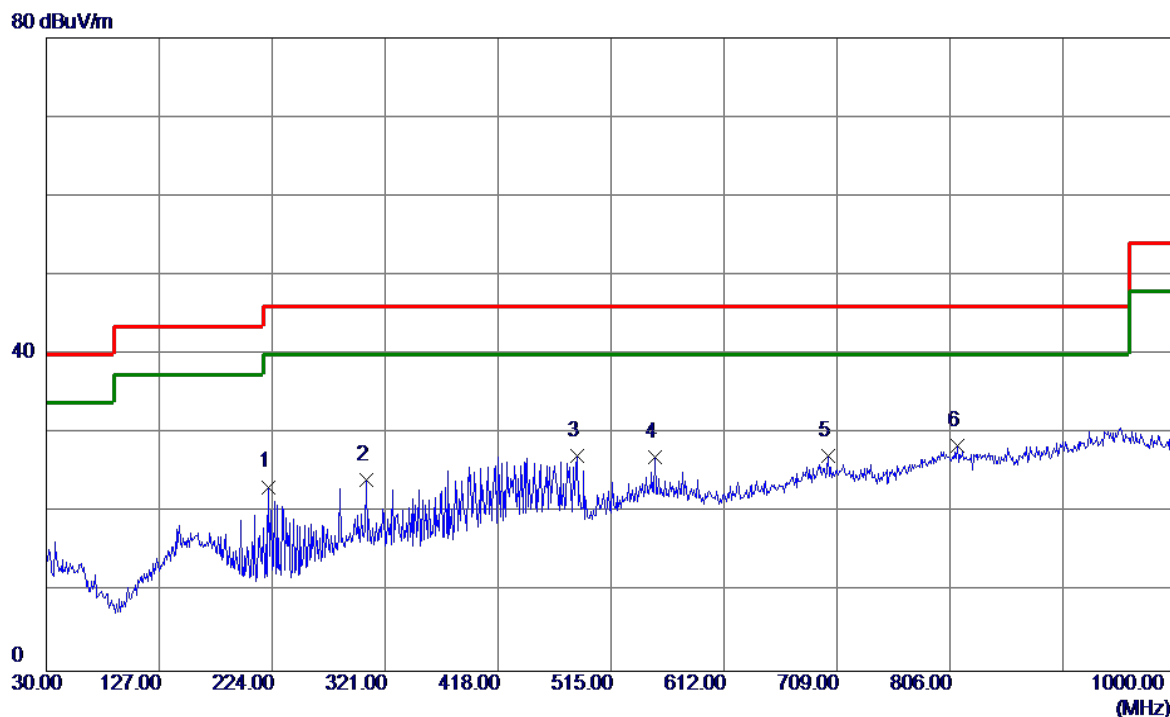
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	159.9800	30.57	-11.30	19.27	43.50	-24.23	Peak	
2	466.5000	32.56	-8.48	24.08	46.00	-21.92	Peak	
3	589.6900	33.05	-6.82	26.23	46.00	-19.77	Peak	
4	712.8800	31.48	-3.73	27.75	46.00	-18.25	Peak	
5	804.0600	30.95	-1.68	29.27	46.00	-16.73	Peak	
6 *	934.0400	31.52	0.27	31.79	46.00	-14.21	Peak	

Test Mode: TX 2402MHz _CH00_1Mbps

Horizontal

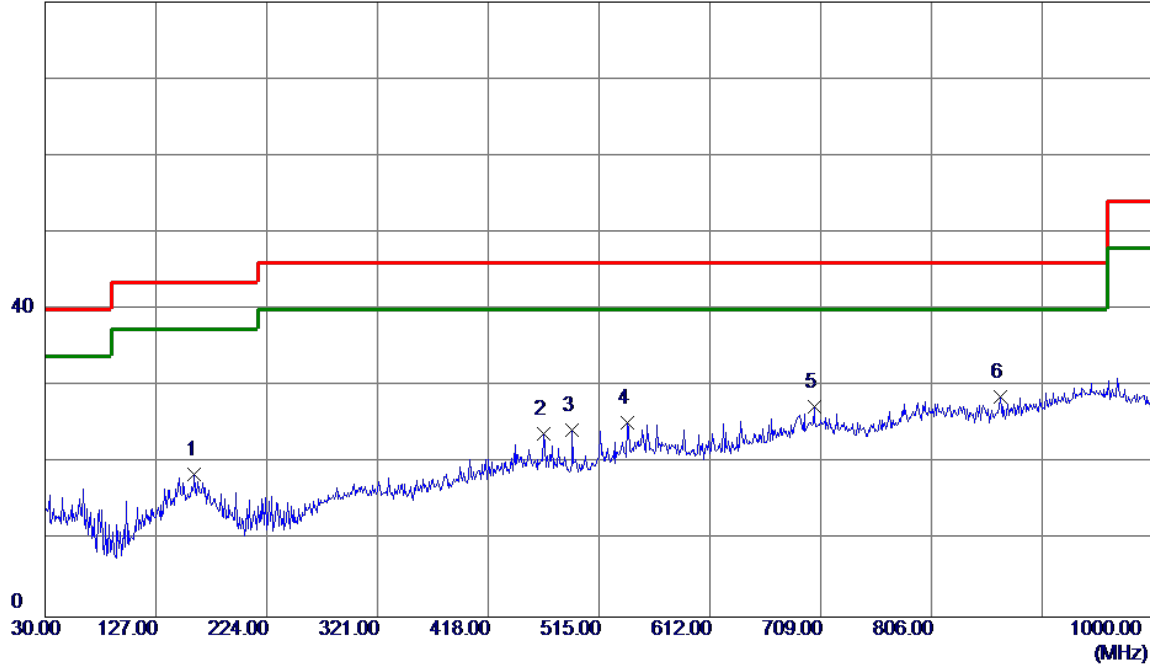


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	221.0900	38.87	-15.59	23.28	46.00	-22.72	Peak	
2	304.5100	35.35	-11.18	24.17	46.00	-21.83	Peak	
3	485.9000	36.08	-8.91	27.17	46.00	-18.83	Peak	
4	552.8300	33.26	-6.20	27.06	46.00	-18.94	Peak	
5	701.2400	30.69	-3.44	27.25	46.00	-18.75	Peak	
6 *	812.7900	30.33	-1.81	28.52	46.00	-17.48	Peak	

Test Mode: TX 2440MHz _CH19_1Mbps

Vertical

80 dBuV/m

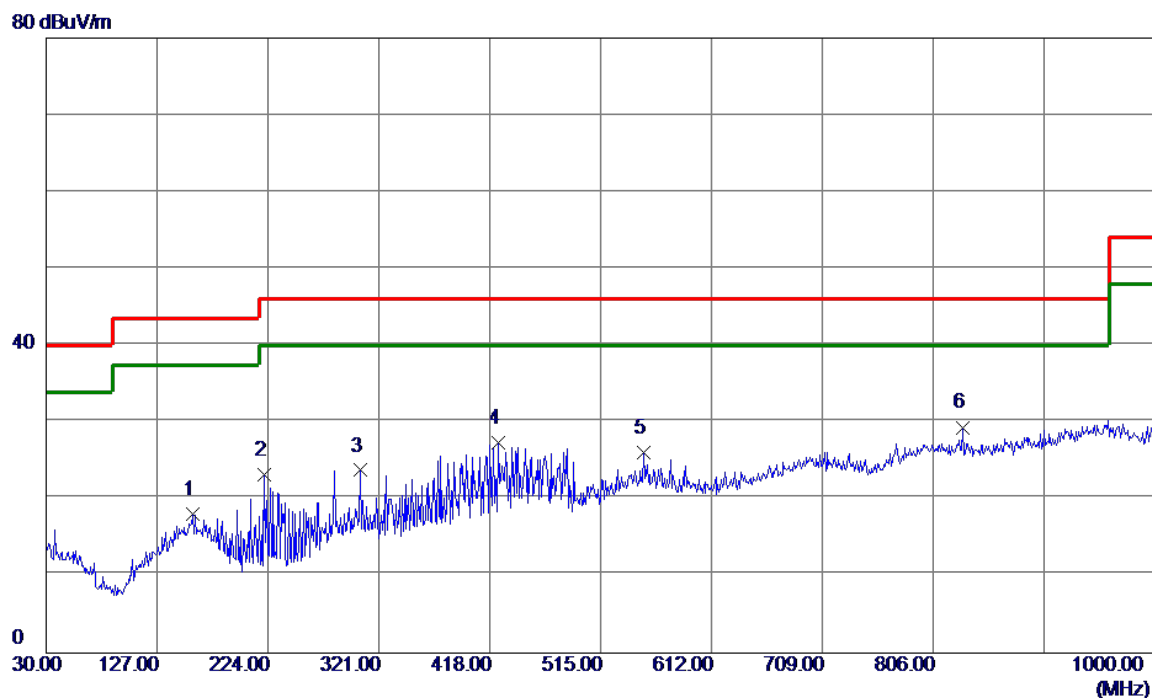


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	160.9500	29.92	-11.35	18.57	43.50	-24.93	Peak	
2	466.5000	32.33	-8.48	23.85	46.00	-22.15	Peak	
3	491.7200	33.42	-9.04	24.38	46.00	-21.62	Peak	
4	540.2199	31.98	-6.75	25.23	46.00	-20.77	Peak	
5	703.1800	30.91	-3.48	27.43	46.00	-18.57	Peak	
6 *	866.1400	30.63	-1.96	28.67	46.00	-17.33	Peak	

Test Mode:

TX 2440MHz _CH19_1Mbps

Horizontal

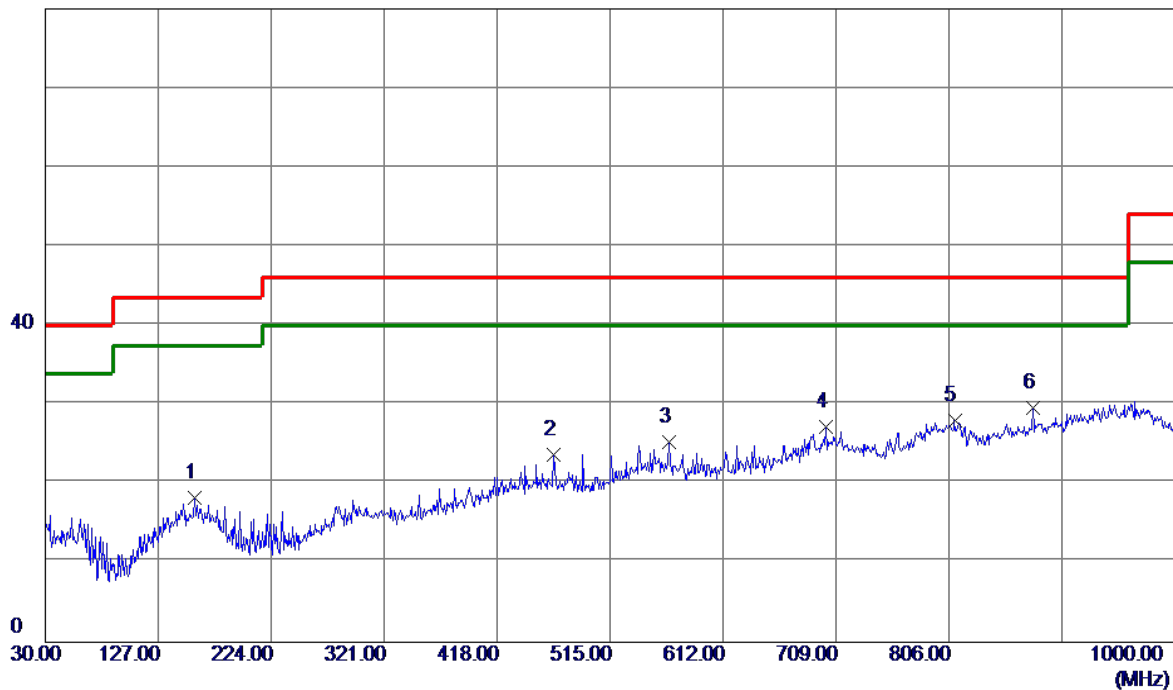


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	158.0399	29.60	-11.47	18.13	43.50	-25.37	Peak	
2	221.0900	38.75	-15.59	23.16	46.00	-22.84	Peak	
3	304.5100	34.94	-11.18	23.76	46.00	-22.24	Peak	
4	425.7600	36.38	-9.07	27.31	46.00	-18.69	Peak	
5	552.8300	32.30	-6.20	26.10	46.00	-19.90	Peak	
6 *	832.1900	31.45	-2.09	29.36	46.00	-16.64	Peak	

Test Mode: TX 2480MHz _CH39_1Mbps

Vertical

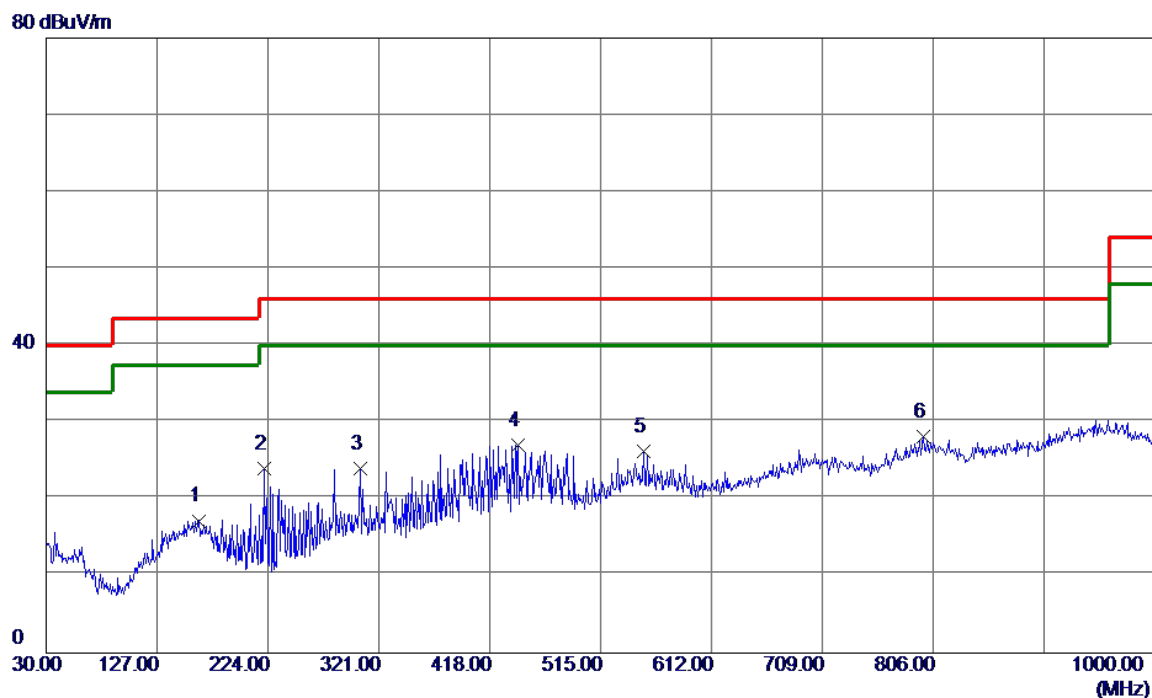
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	158.0399	29.70	-11.47	18.23	43.50	-25.27	Peak	
2	466.5000	32.19	-8.48	23.71	46.00	-22.29	Peak	
3	565.4400	31.67	-6.41	25.26	46.00	-20.74	Peak	
4	700.2700	30.64	-3.41	27.23	46.00	-18.77	Peak	
5	810.8500	29.84	-1.78	28.06	46.00	-17.94	Peak	
6 *	877.7800	31.21	-1.67	29.54	46.00	-16.46	Peak	

Test Mode: TX 2480MHz _CH39_1Mbps

Horizontal



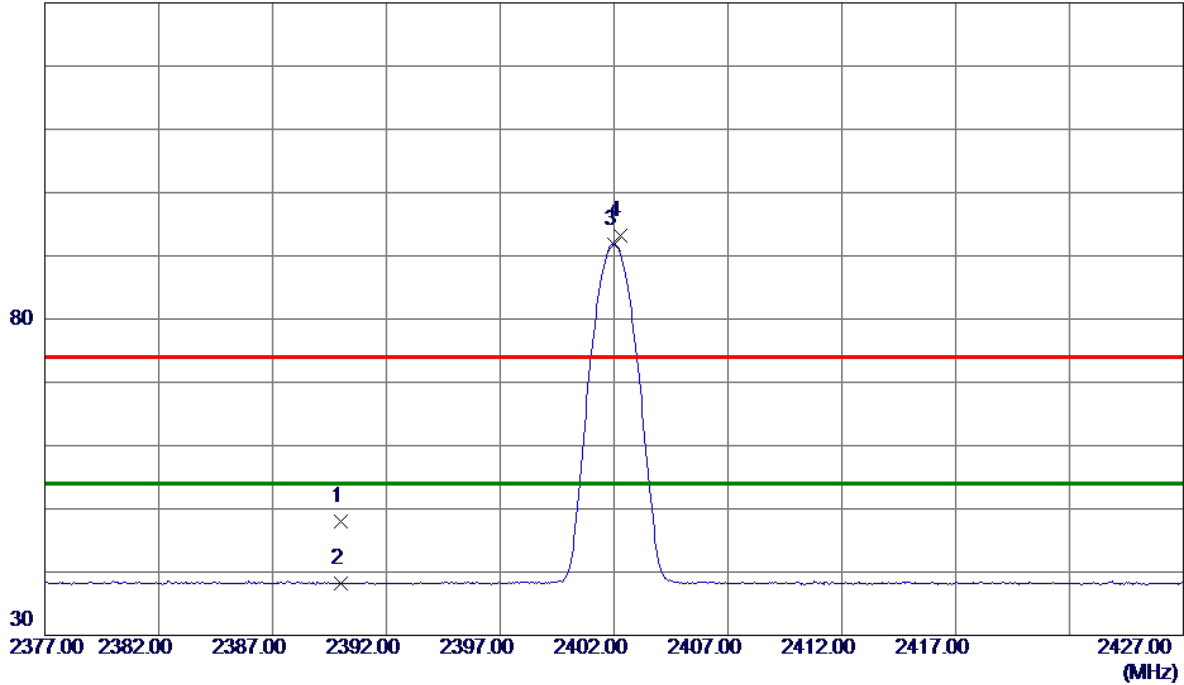
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	163.8600	28.73	-11.53	17.20	43.50	-26.30	Peak	
2	221.0900	39.62	-15.59	24.03	46.00	-21.97	Peak	
3	304.5100	35.23	-11.18	24.05	46.00	-21.95	Peak	
4	443.2200	35.43	-8.38	27.05	46.00	-18.95	Peak	
5	552.8300	32.50	-6.20	26.30	46.00	-19.70	Peak	
6 *	797.2700	29.91	-1.79	28.12	46.00	-17.88	Peak	

APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode : TX 2402MHz _CH00_1Mbps

Vertical

130 dBuV/m

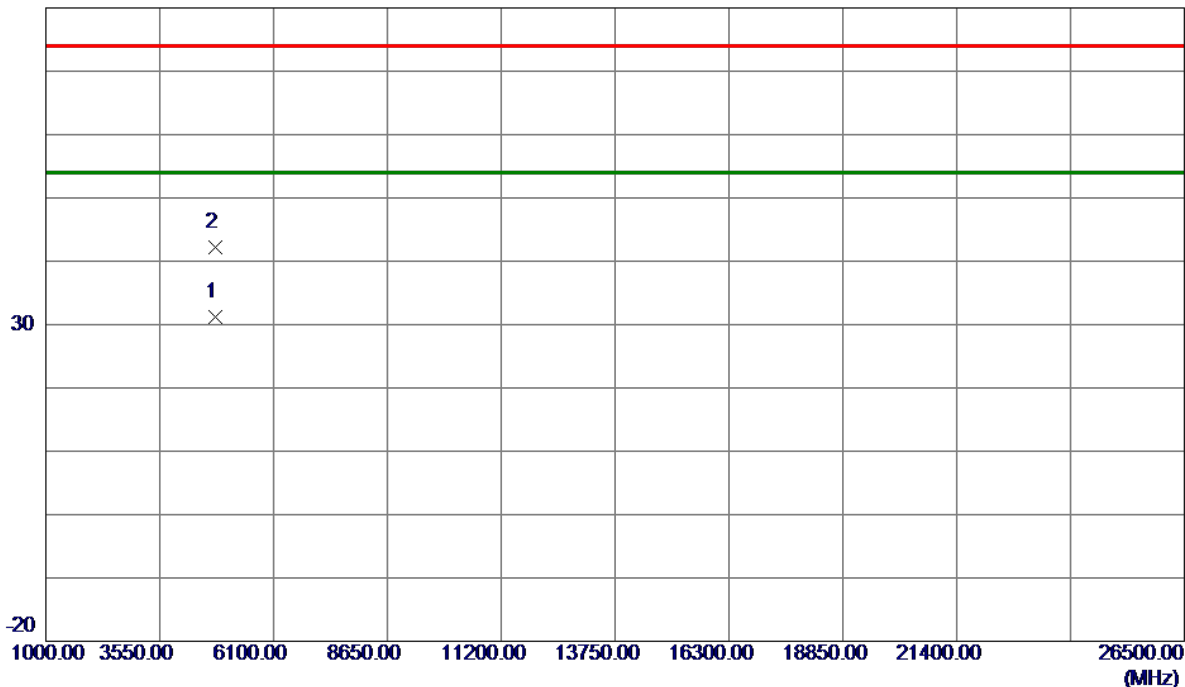


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	39.08	9.00	48.08	74.00	-25.92	Peak	
2	2390.0000	29.17	9.00	38.17	54.00	-15.83	AVG	
3 *	2402.0000	82.86	9.00	91.86	54.00	37.86	AVG	No Limit
4	2402.2500	84.19	9.00	93.19	74.00	19.19	Peak	No Limit

Test Mode :	TX 2402MHz _CH00_1Mbps
-------------	------------------------

Vertical

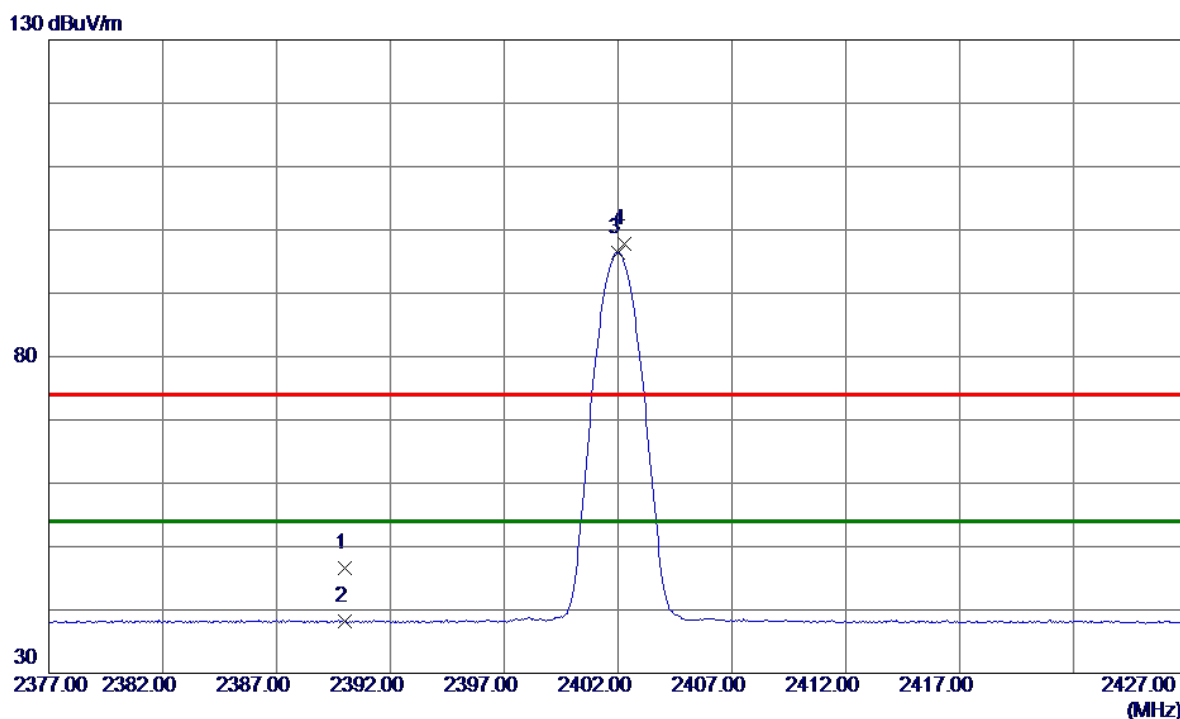
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4803.7150	25.39	5.73	31.12	54.00	-22.88	AVG	
2	4803.9500	36.41	5.73	42.14	74.00	-31.86	Peak	

Test Mode : TX 2402MHz _CH00_1Mbps

Horizontal

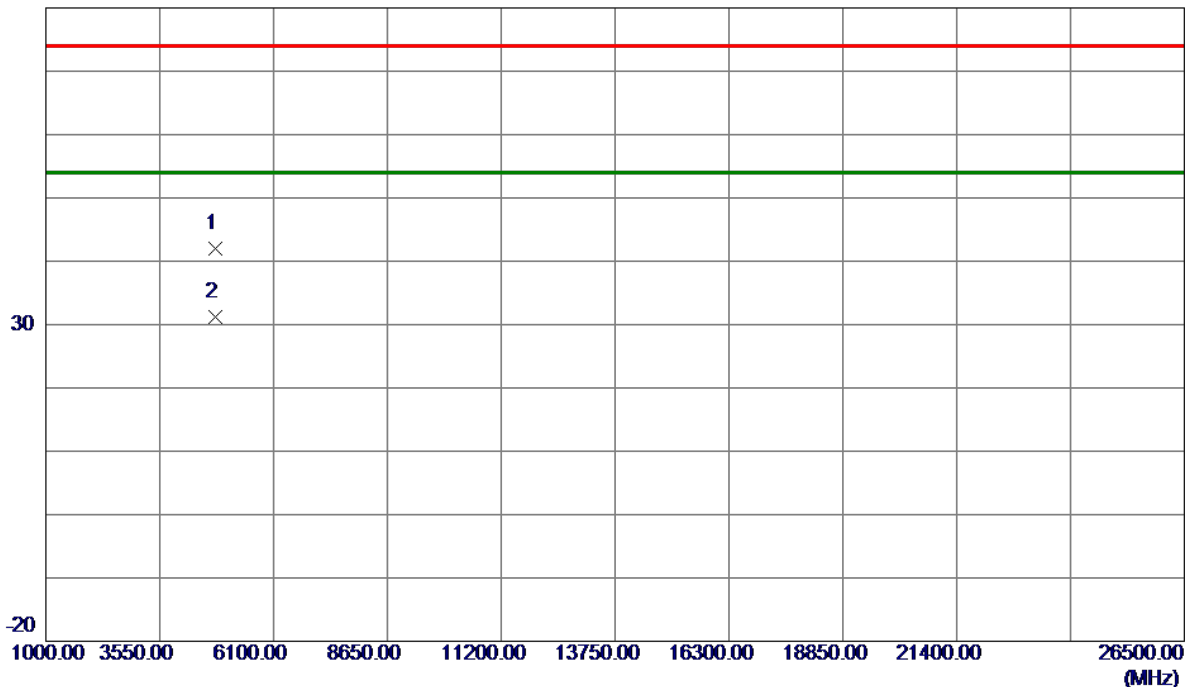


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	37.64	9.00	46.64	74.00	-27.36	Peak	
2	2390.0000	29.11	9.00	38.11	54.00	-15.89	AVG	
3 *	2402.0000	87.45	9.00	96.45	54.00	42.45	AVG	No Limit
4	2402.2500	88.77	9.00	97.77	74.00	23.77	Peak	No Limit

Test Mode : TX 2402MHz _CH00_1Mbps

Horizontal

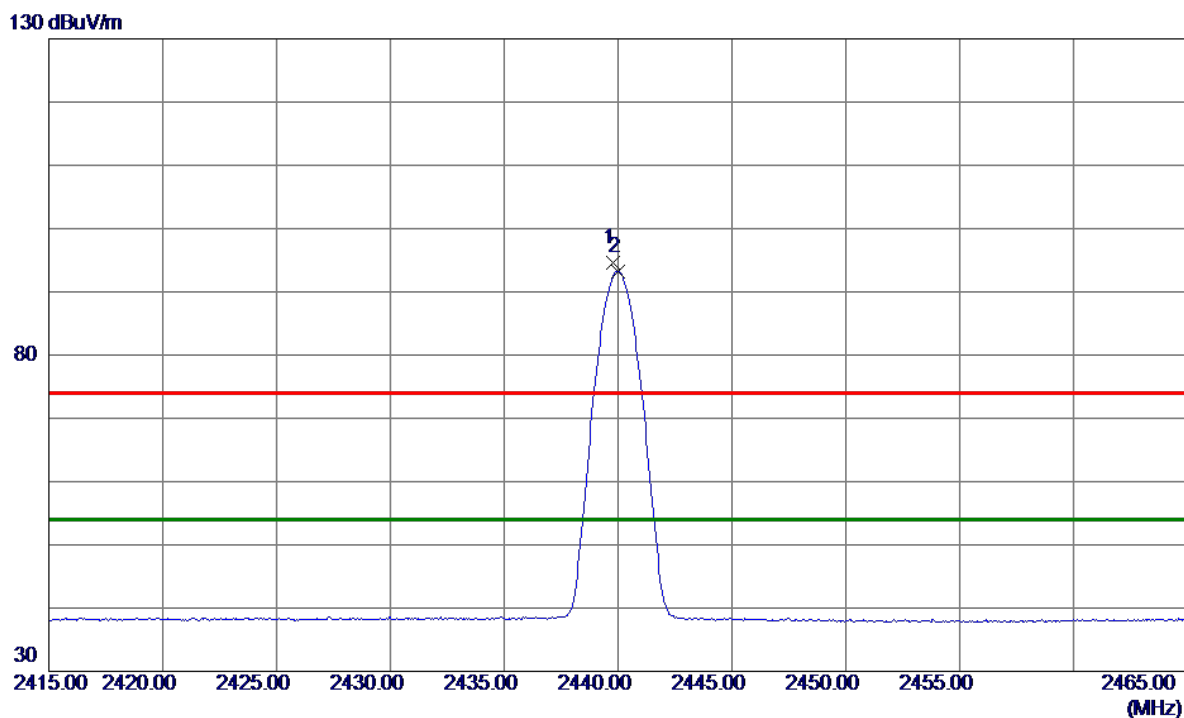
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4805.1500	36.24	5.73	41.97	74.00	-32.03	Peak	
2 *	4806.0550	25.50	5.73	31.23	54.00	-22.77	AVG	

Test Mode : TX 2440MHz _CH19_1Mbps

Vertical

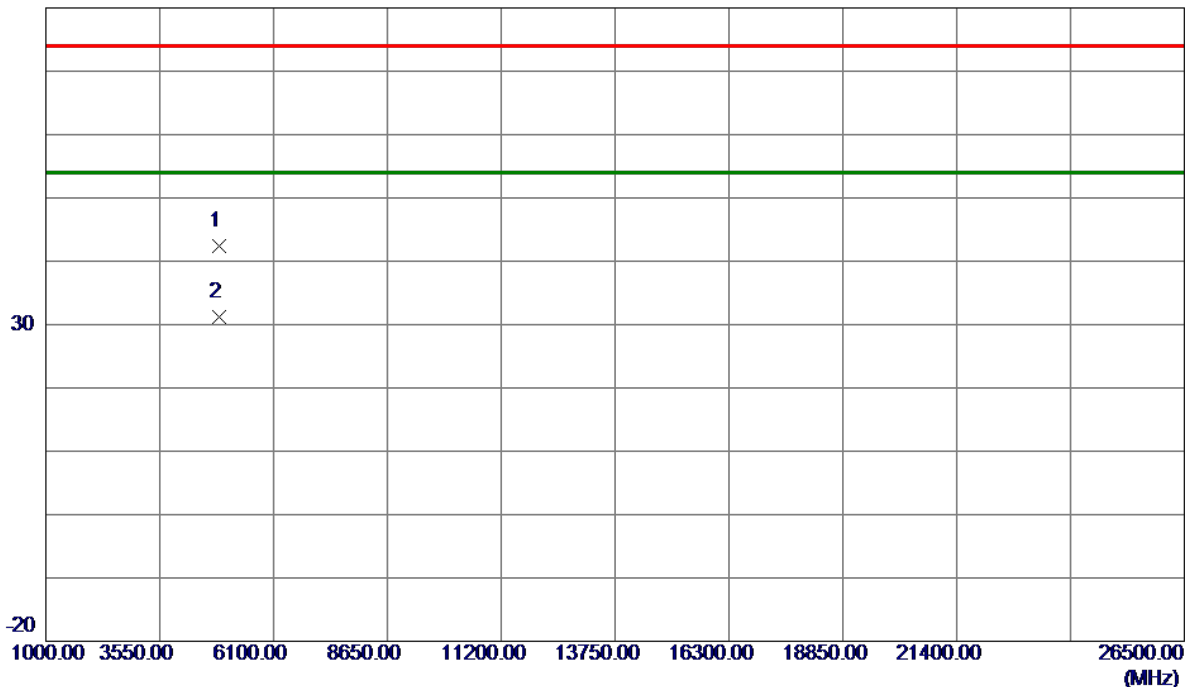


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2439.8000	85.62	8.98	94.60	74.00	20.60	Peak	No Limit
2 *	2440.0000	84.21	8.98	93.19	54.00	39.19	AVG	No Limit

Test Mode :	TX 2440MHz _CH19_ 1Mbps
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Vertical

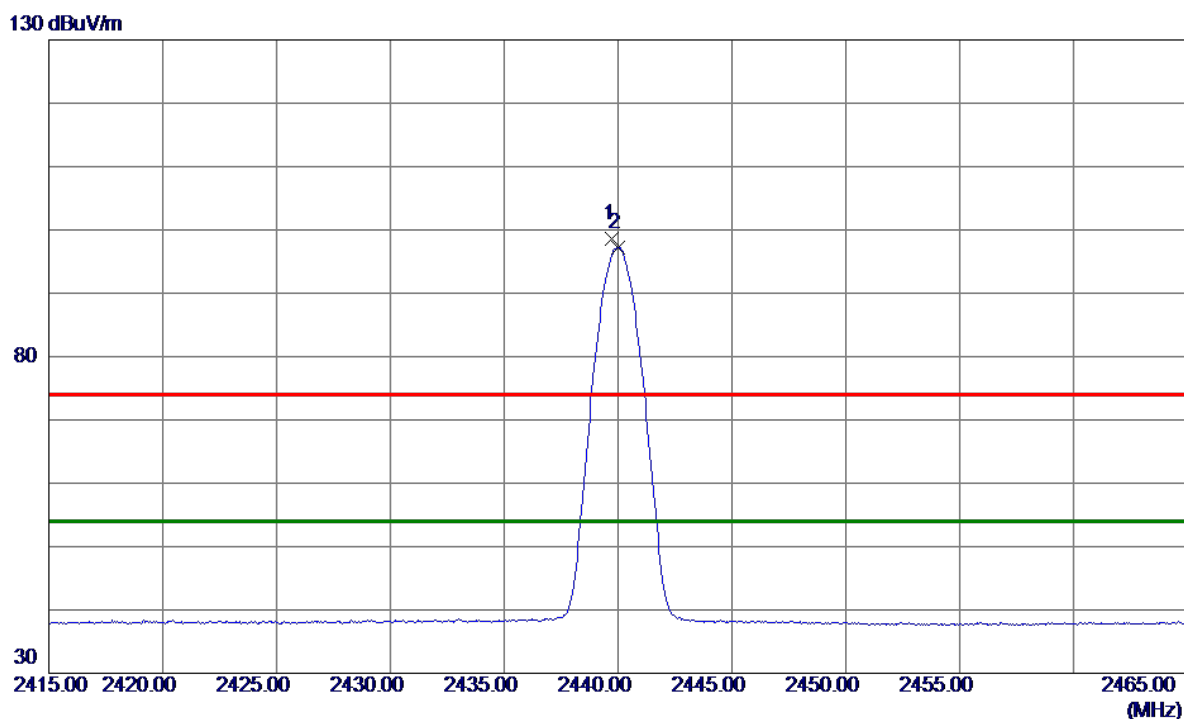
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4881.5050	36.54	5.92	42.46	74.00	-31.54	Peak	
2 *	4881.8000	25.27	5.92	31.19	54.00	-22.81	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	89.68	8.98	98.66	74.00	24.66	Peak	No Limit
2 *	2440.0000	88.27	8.98	97.25	54.00	43.25	AVG	No Limit

Test Mode :	TX 2440MHz _CH19_ 1Mbps
-------------	-------------------------

Horizontal

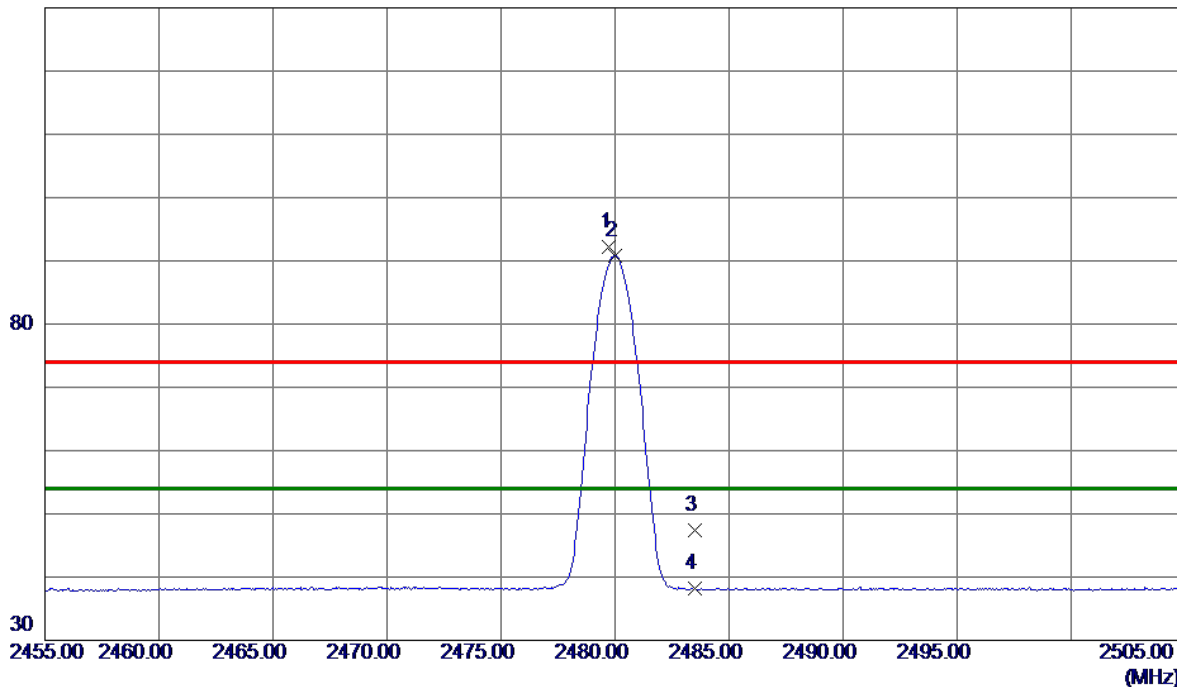


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4879.2400	36.64	5.92	42.56	74.00	-31.44	Peak	
2 *	4879.2850	25.33	5.92	31.25	54.00	-22.75	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Vertical

130 dBuV/m

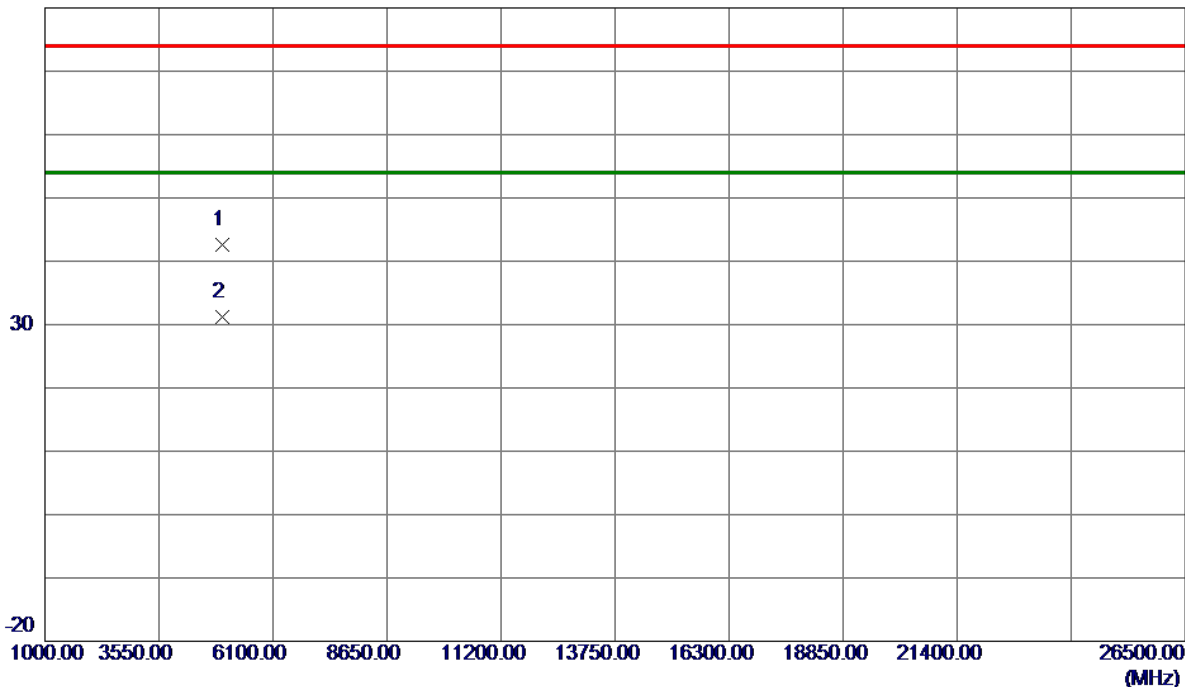


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7500	83.15	8.97	92.12	74.00	18.12	Peak	No Limit
2 *	2480.0000	81.77	8.97	90.74	54.00	36.74	AVG	No Limit
3	2483.5000	38.48	8.97	47.45	74.00	-26.55	Peak	
4	2483.5000	29.17	8.97	38.14	54.00	-15.86	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Vertical

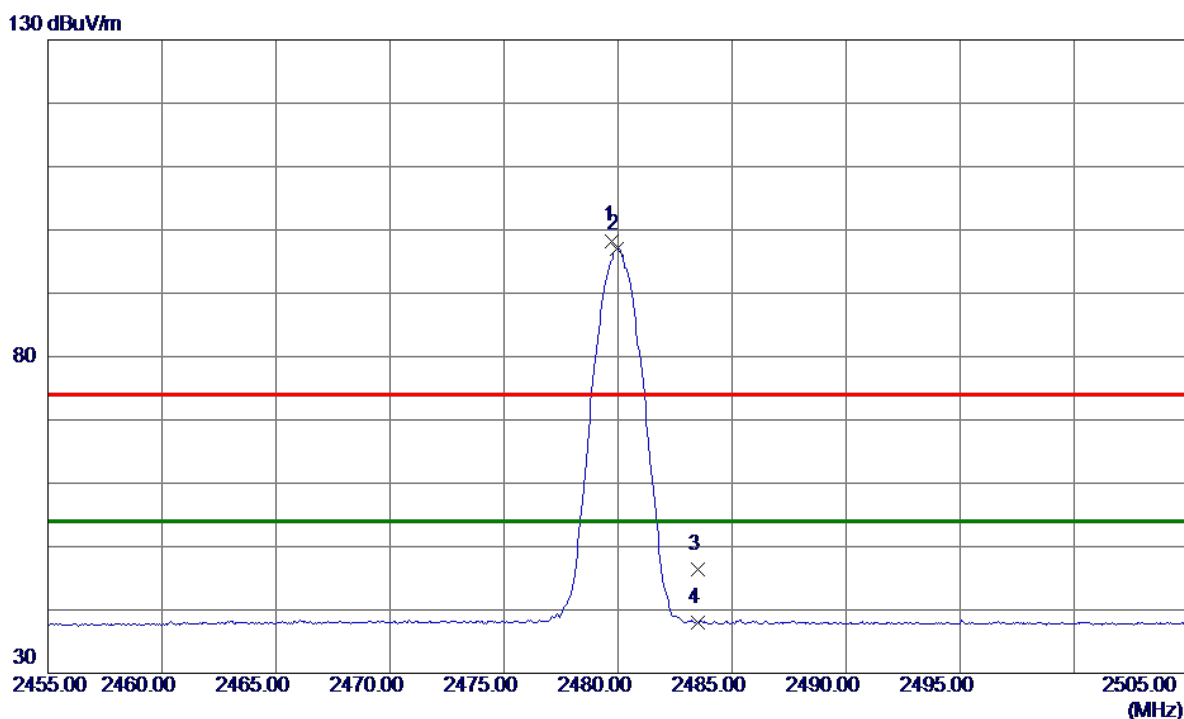
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.0150	36.41	6.12	42.53	74.00	-31.47	Peak	
2 *	4960.2200	25.12	6.12	31.24	54.00	-22.76	AVG	

Test Mode : TX 2480MHz _CH39_ 1Mbps

Horizontal

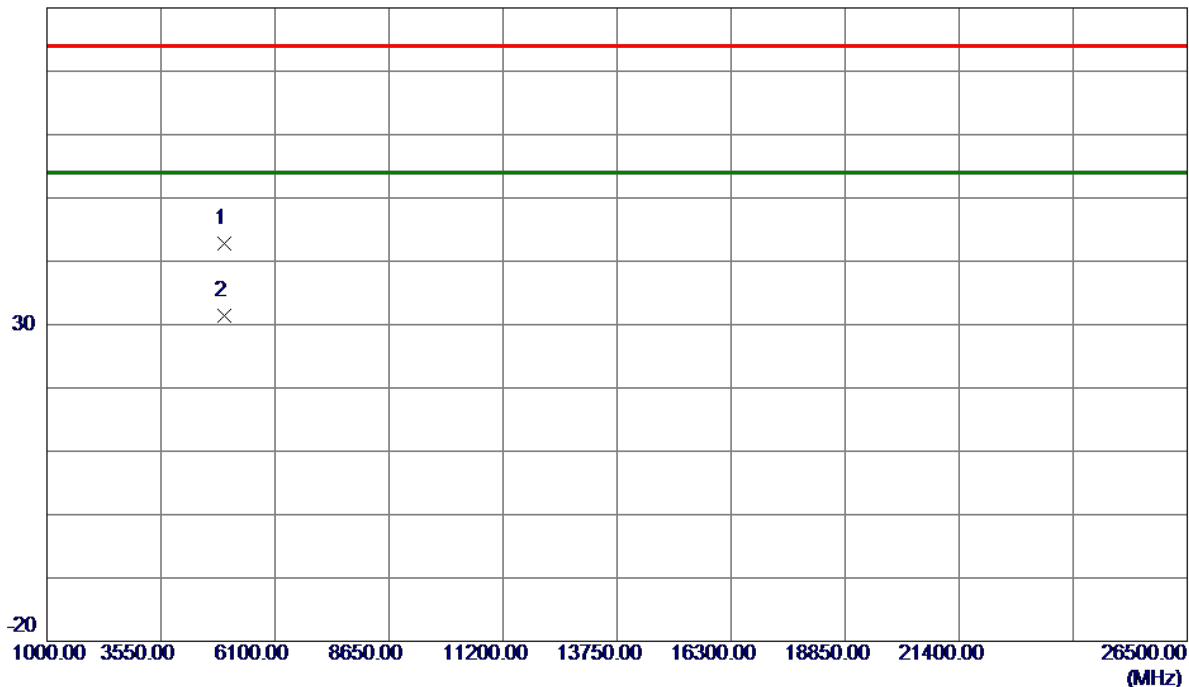


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.7500	89.33	8.97	98.30	74.00	24.30	Peak	No Limit
2 *	2479.9500	87.96	8.97	96.93	54.00	42.93	AVG	No Limit
3	2483.5000	37.49	8.97	46.46	74.00	-27.54	Peak	
4	2483.5000	29.06	8.97	38.03	54.00	-15.97	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Horizontal

80 dBuV/m

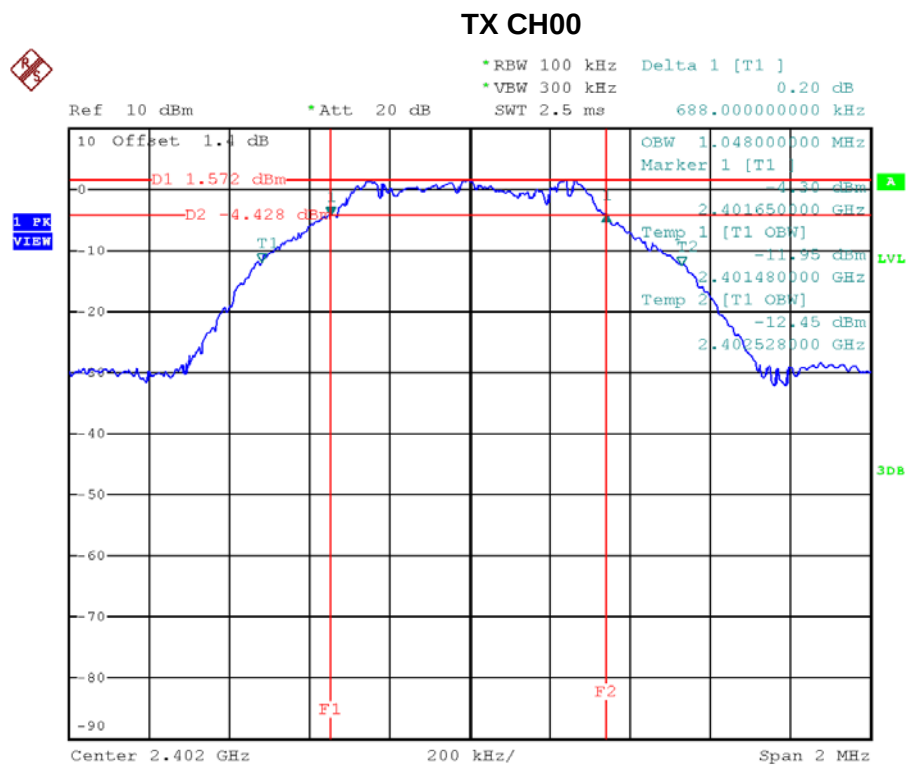


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.1500	36.68	6.12	42.80	74.00	-31.20	Peak	
2 *	4960.3520	25.25	6.12	31.37	54.00	-22.63	AVG	

APPENDIX E - BANDWIDTH

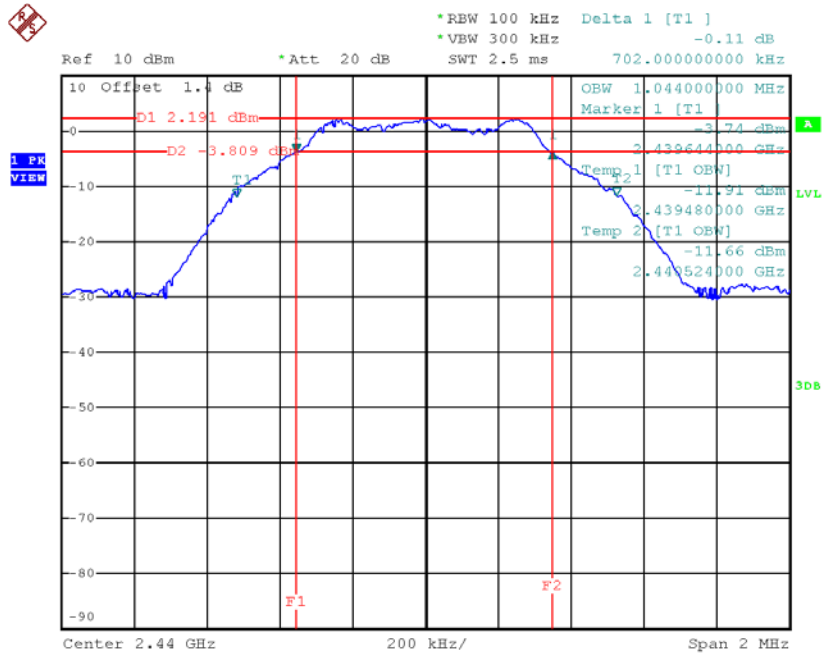
Test Mode:	TX Mode
------------	---------

Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.688	1.048	500	Pass
2440	0.702	1.044	500	Pass
2480	0.686	1.048	500	Pass



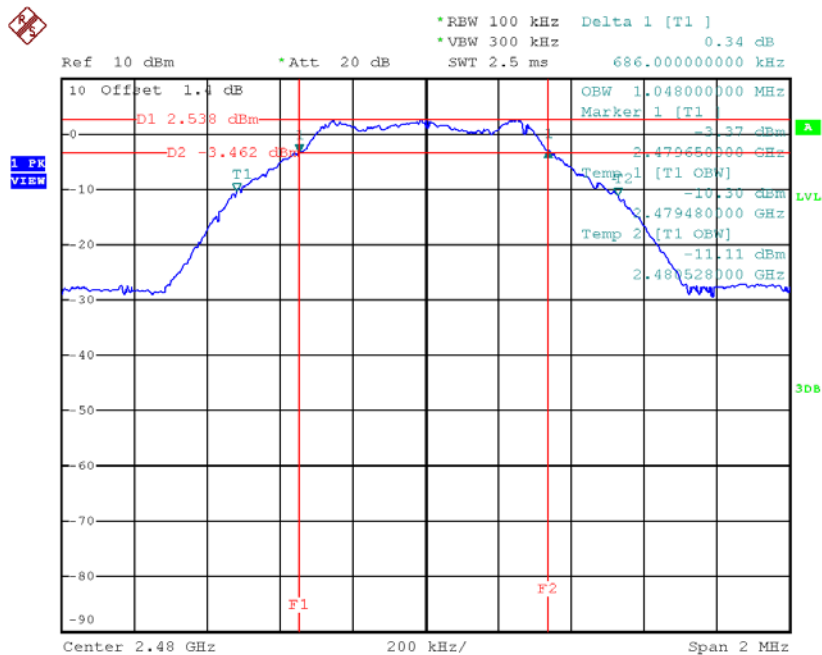
Date: 21.APR.2018 11:22:53

TX CH19



Date: 21.APR.2018 11:25:27

TX CH39



Date: 21.APR.2018 11:27:07

APPENDIX F - MAXIMUM OUTPUT POWER TEST

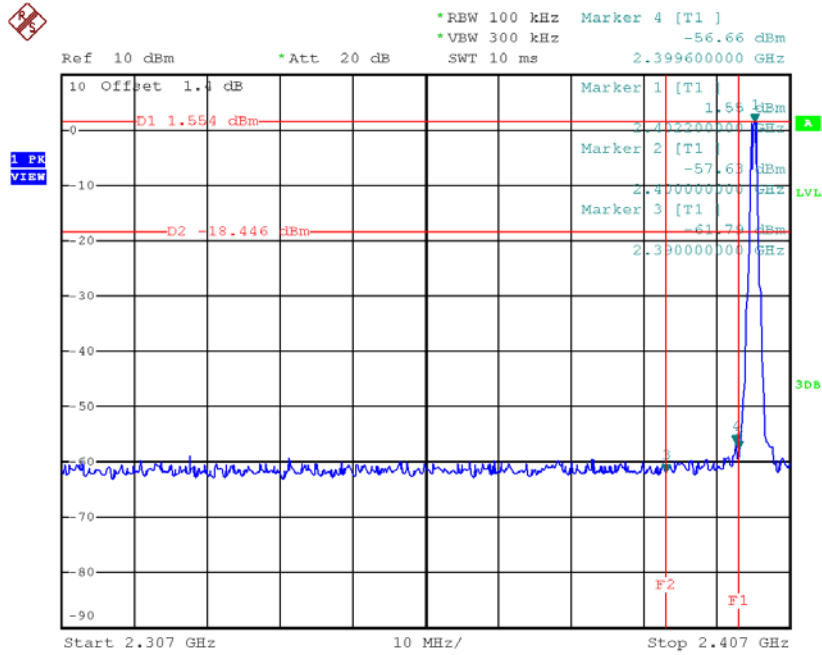
Test Mode :	CH00, CH19 , CH39 - 1Mbps
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	2.60	0.0018	30.00	1.00	Pass
2440	3.25	0.0021	30.00	1.00	Pass
2480	3.61	0.0023	30.00	1.00	Pass

APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION

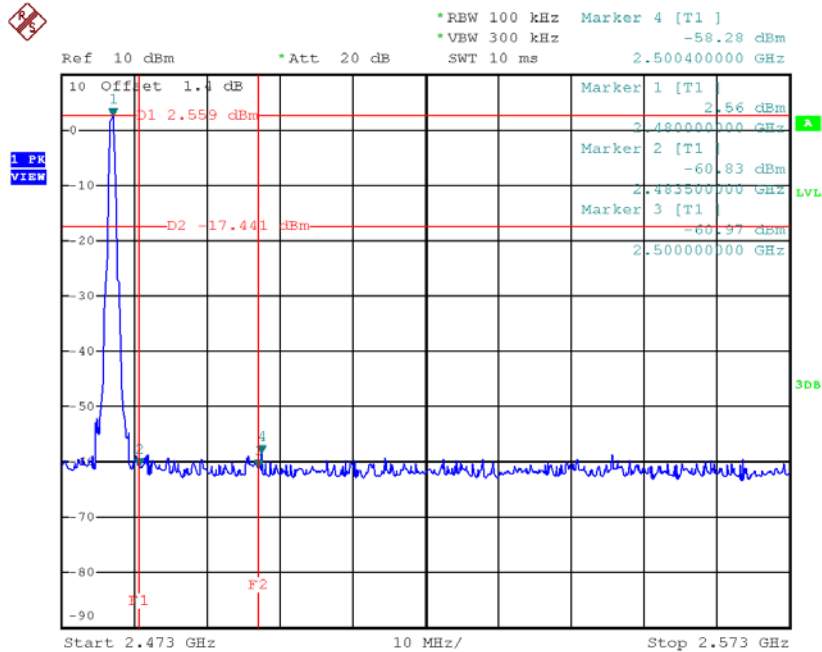
Test Mode : CH00, CH19 , CH39 - 1Mbps

CH00 (Lower) - 1Mbps



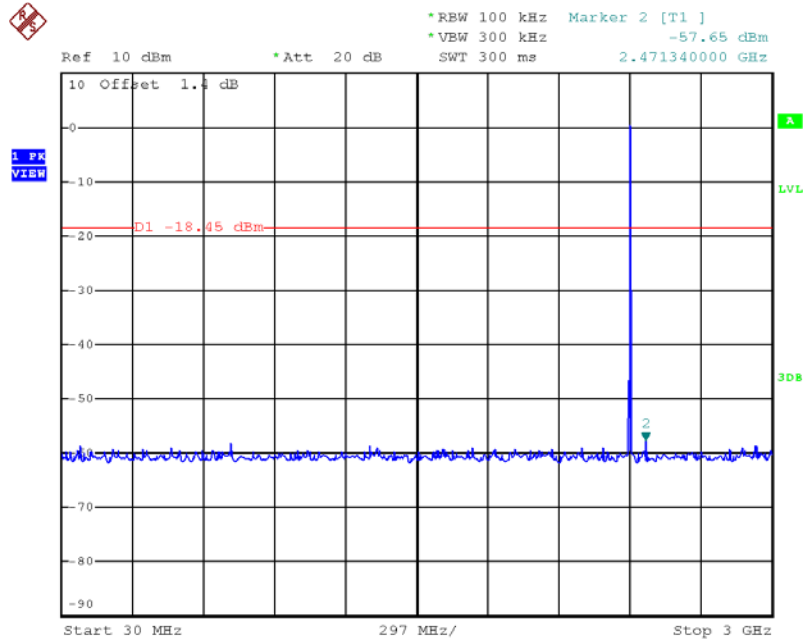
Date: 21.APR.2018 11:23:17

CH39 (upper) - 1Mbps



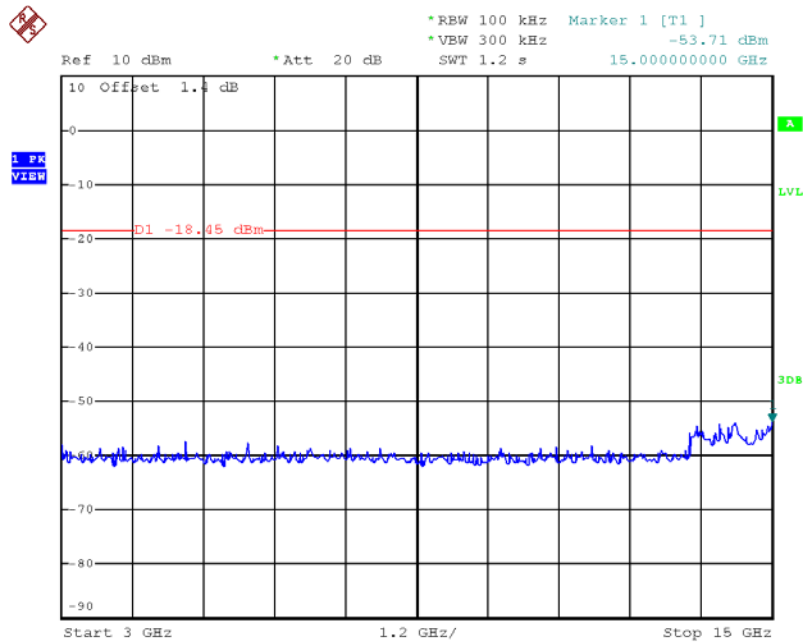
Date: 21.APR.2018 11:27:15

CH00 (10 Harmonic of the frequency) 1



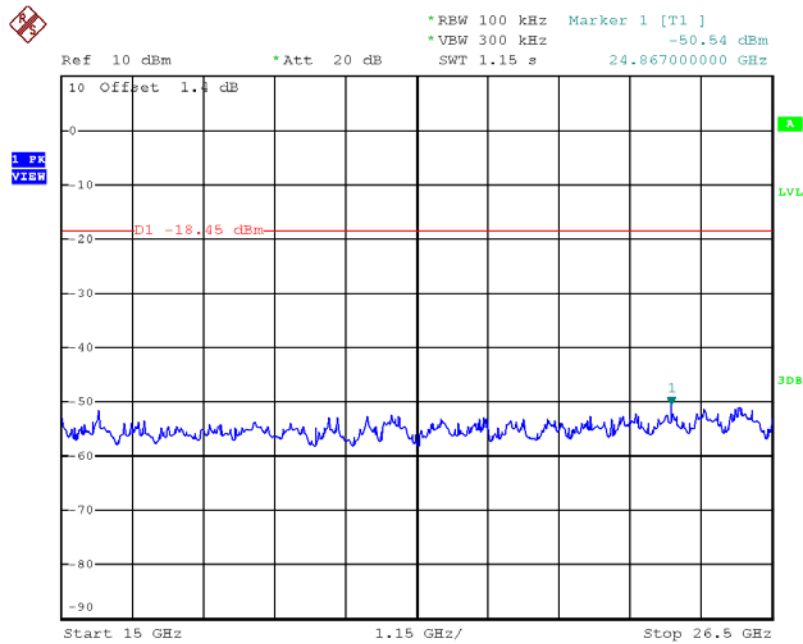
Date: 21.APR.2018 11:23:30

CH00 (10 Harmonic of the frequency) 2



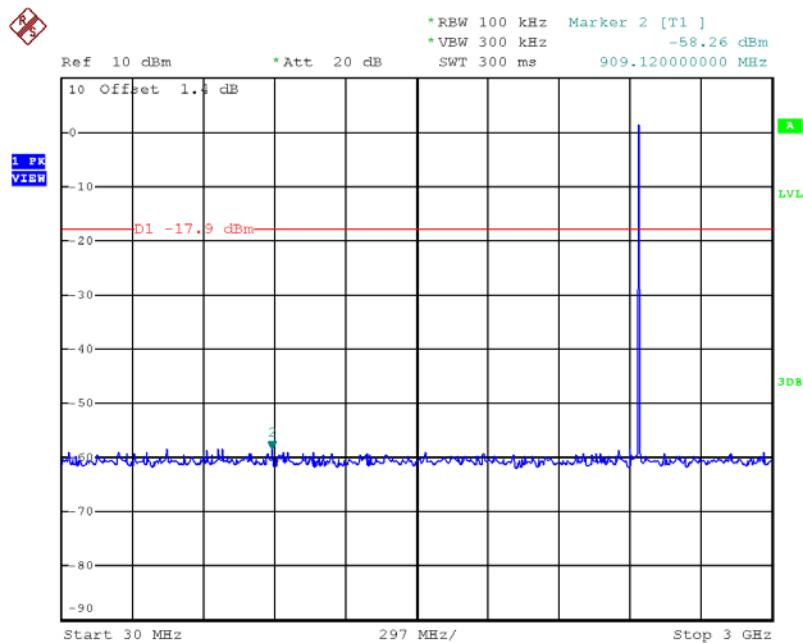
Date: 21.APR.2018 11:23:37

CH00 (10 Harmonic of the frequency) 3



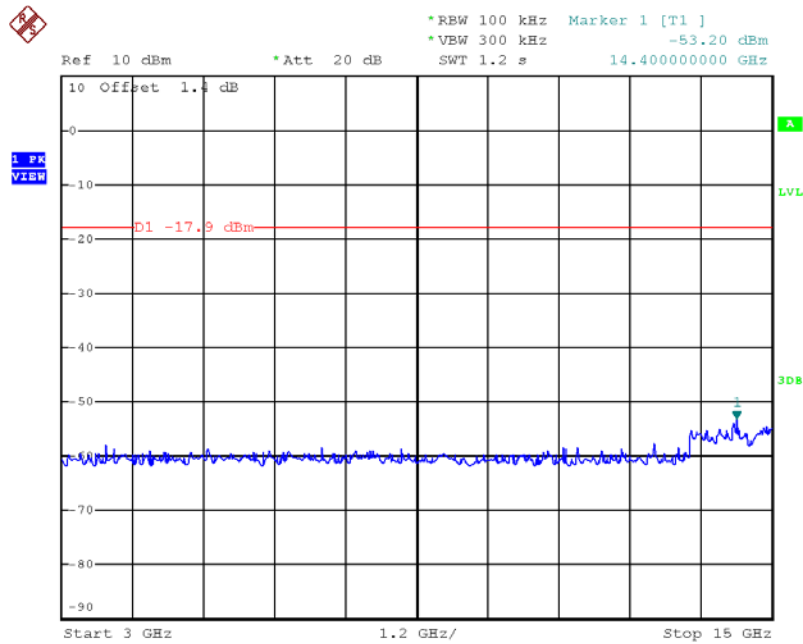
Date: 21.APR.2018 11:23:44

CH19 (10 Harmonic of the frequency) 1



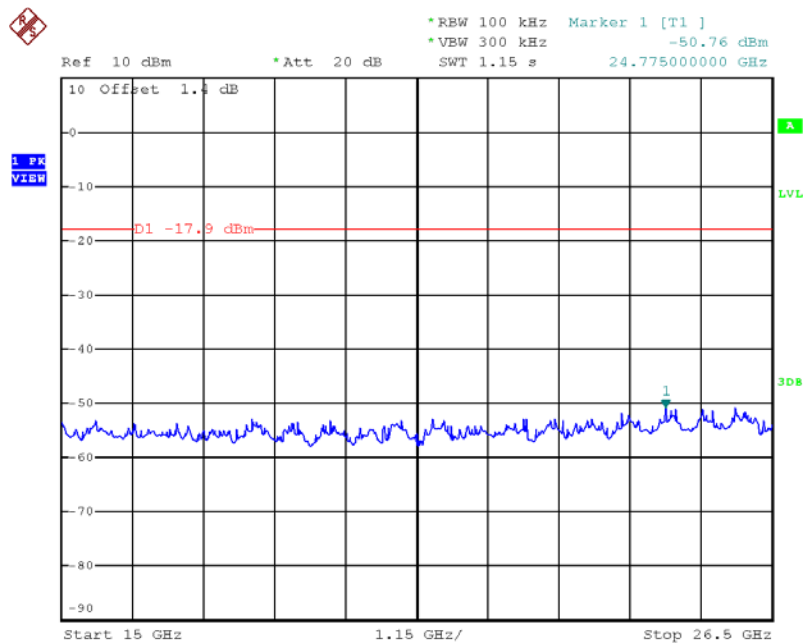
Date: 21.APR.2018 11:25:47

CH19 (10 Harmonic of the frequency) 2



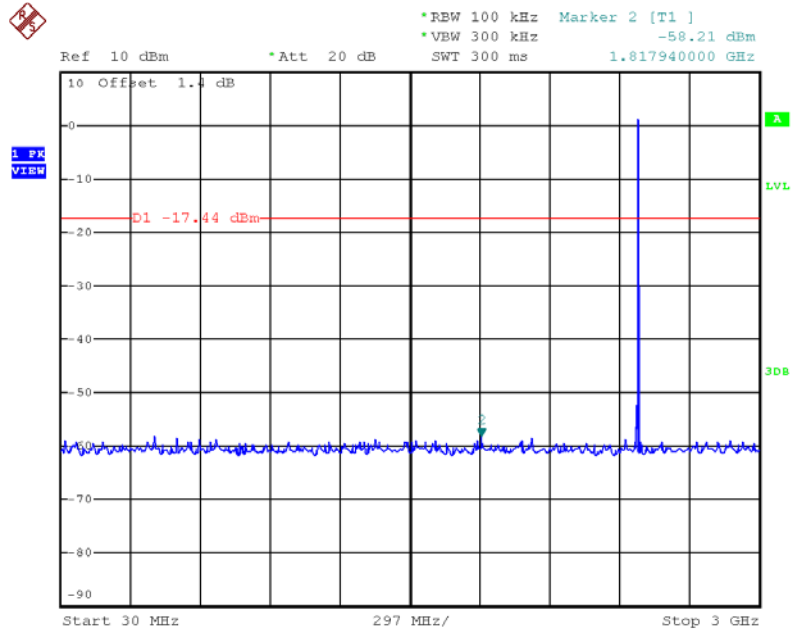
Date: 21.APR.2018 11:25:54

CH19 (10 Harmonic of the frequency) 3



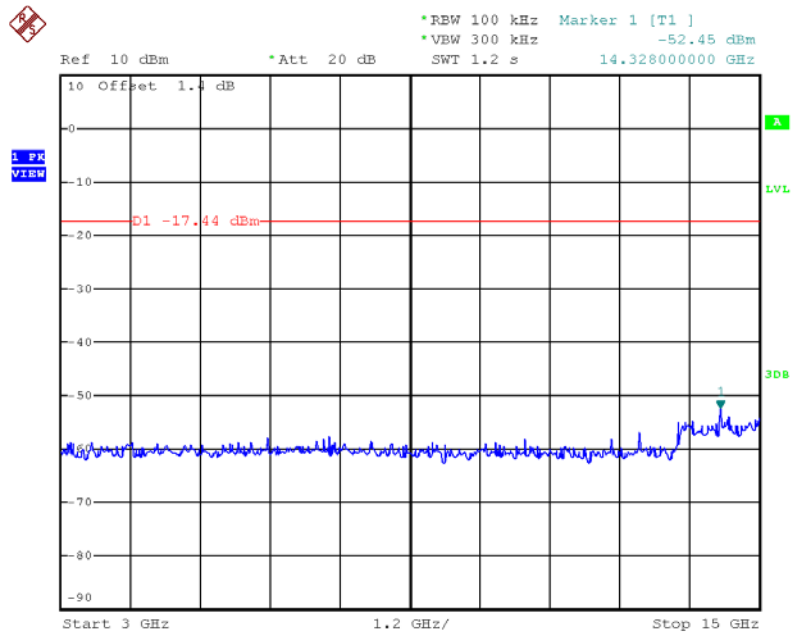
Date: 21.APR.2018 11:26:01

CH39 (10 Harmonic of the frequency) 1



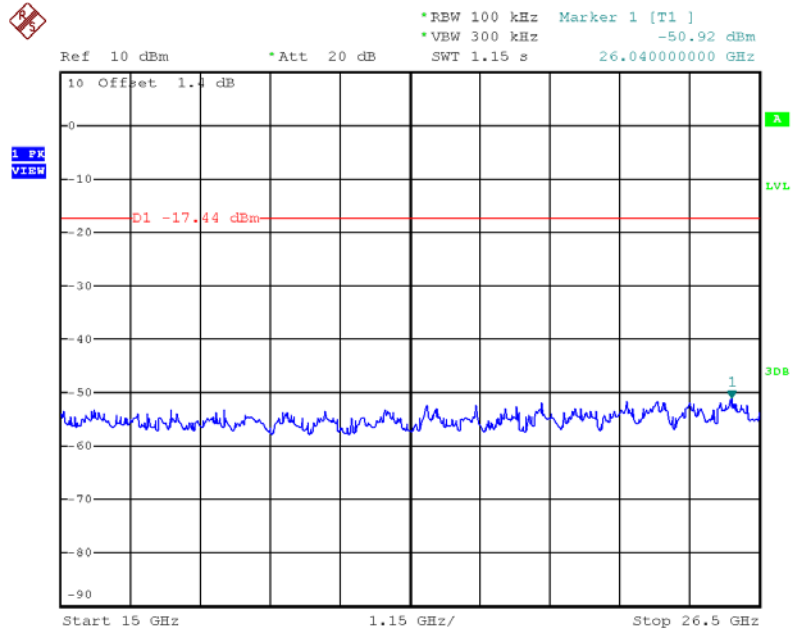
Date: 21.APR.2018 11:27:28

CH39 (10 Harmonic of the frequency) 2



Date: 21.APR.2018 11:27:35

CH39 (10 Harmonic of the frequency) 3

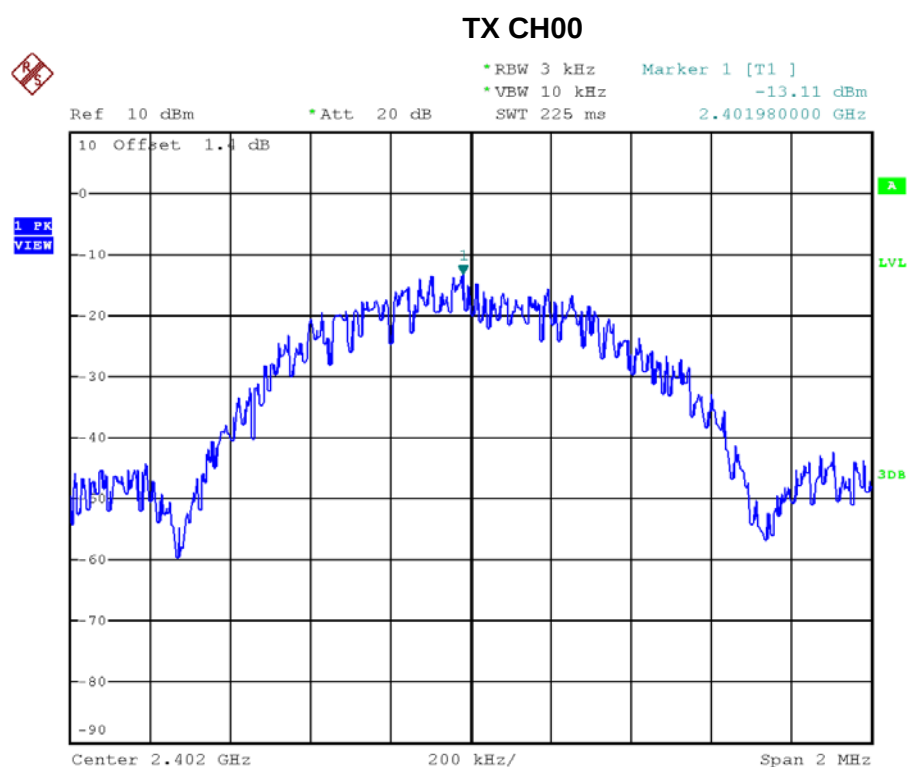


Date: 21.APR.2018 11:27:42

APPENDIX H - POWER SPECTRAL DENSITY TEST

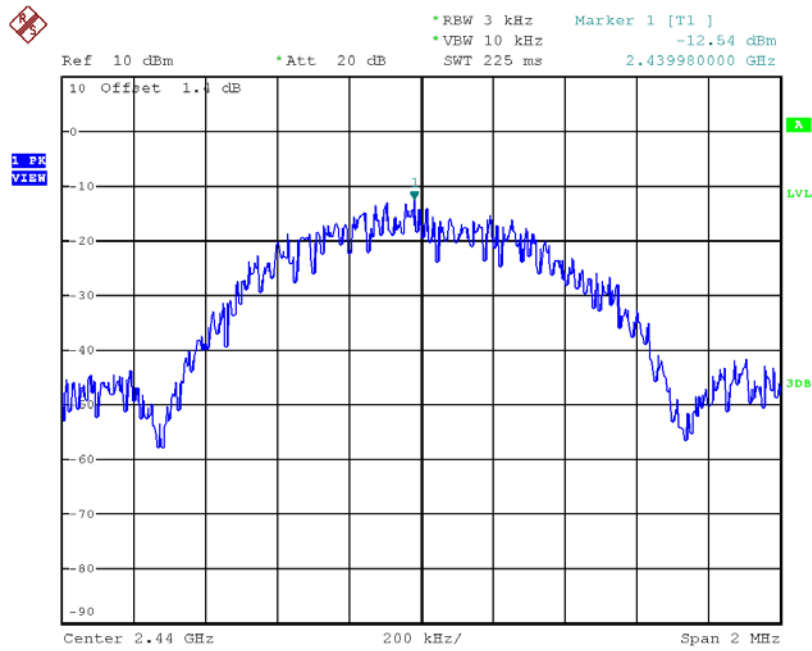
Test Mode:	CH00, CH19 , CH39 - 1Mbps
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Frequency (MHz)	Power Density (dBm/3kHz)	Power Density (mW/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-13.110	0.049	8.00	Pass
2440	-12.540	0.056	8.00	Pass
2480	-12.500	0.056	8.00	Pass



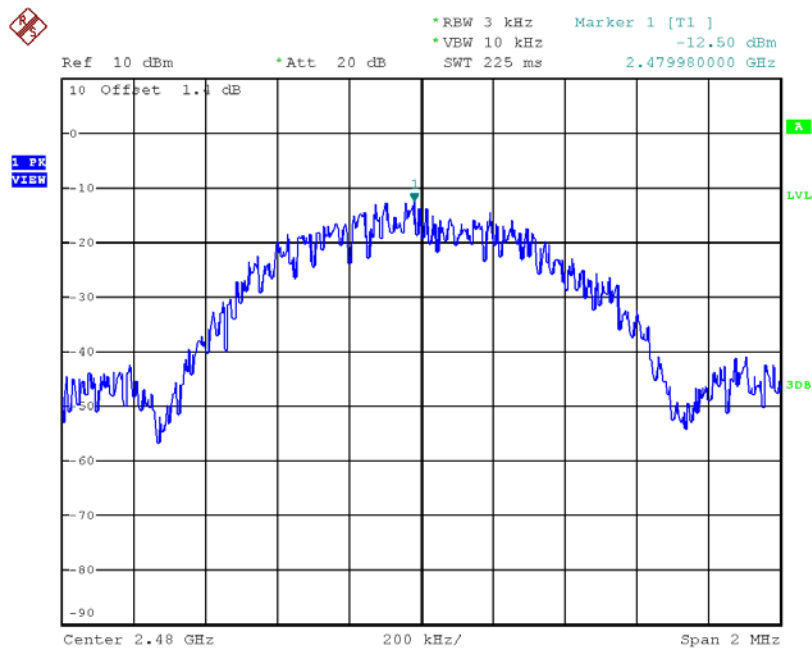
Date: 21.APR.2018 11:23:50

TX CH19



Date: 21.APR.2018 11:26:07

TX CH39



Date: 21.APR.2018 11:27:47