

FCC Radio Test Report

FCC ID: QWHIP300

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

Project No. : 1705C233
Equipment : Loudspeaker System
Model Name : iP300
Applicant : MUSIC Group Manufacturing PH Ltd.
Address : 17A Brunswick Street Hamilton HM 10 Bermuda

Date of Receipt : May 25, 2017
Date of Test : May 25, 2017 ~ Jul. 10, 2017
Issued Date : Jul. 11, 2017
Tested by : BTL Inc.

Testing Engineer : Shawn Xiao
(Shawn Xiao)

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-2-1705C233	Original Issue.	Jul. 11, 2017

1. CERTIFICATION

Equipment : Loudspeaker System
Brand Name : TURBOSOUND
Model Name : iP300
Applicant : MUSIC Group Manufacturing PH Ltd.
Manufacturer : MUSIC Group Manufacturing PH Ltd.
Address : 17A Brunswick Street Hamilton HM 10 Bermuda
Factory : Zhongshan Eurotec Electronics Ltd.
Address : Eurotec Industrial Park #1 Junjing Rd., Min Zhong Town, Zhongshan,
Guangdong 528441 China.
Date of Test : May 25, 2017 ~ Jul. 10, 2017
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C (15.247)
ANSI C63.10-2013

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-2-1705C233) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test results 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: 319330

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

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	Loudspeaker System	
Brand Name	TURBOSOUND	
Model Name	iP300	
Model Difference	N/A	
Product Description	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	11.83 dBm (1Mbps)
Power Source	AC Mains	
Power Rating	100-120V, 50/60Hz	

Note:

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

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 of BT LE

Test Software Version	CC256x_Bluetooth_Hardware_Evaluation_Tool_V1.0_Setup		
Frequency (MHz)	2402	2440	2480
BT LE	15	15	15

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:

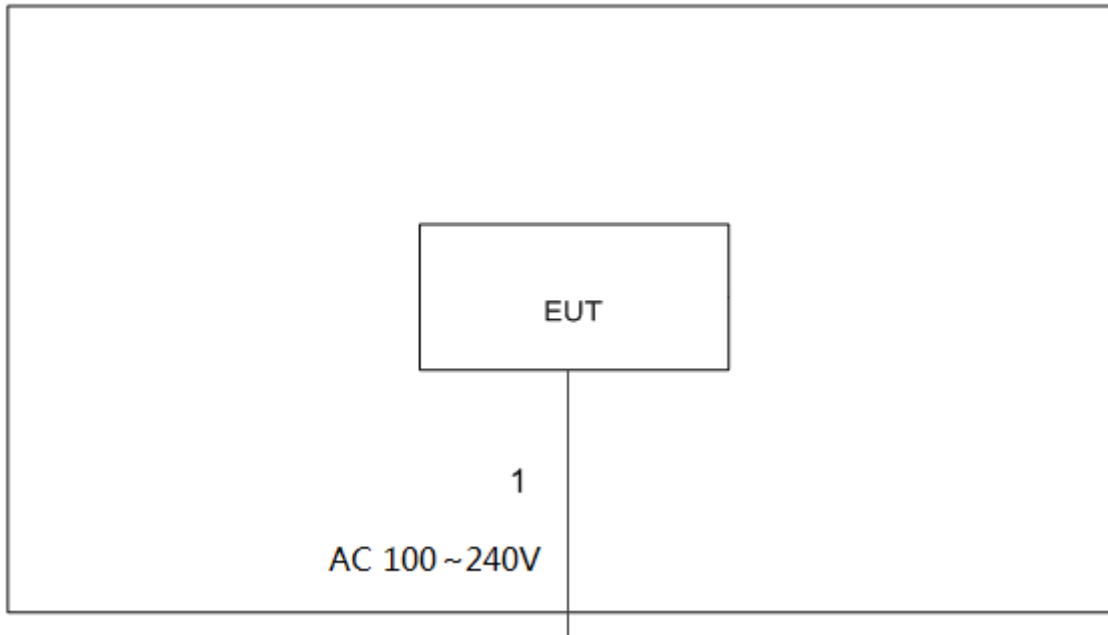
(1) The measurements are performed at the high, middle, low available channels.

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 of BT LE

Test Software Version	BluetoothTools5.2.0		
Frequency (MHz)	2402	2440	2480
BT LE	15	15	15

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

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

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

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

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

Frequency of Emission (MHz)	Conducted Limit (dB 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	0	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

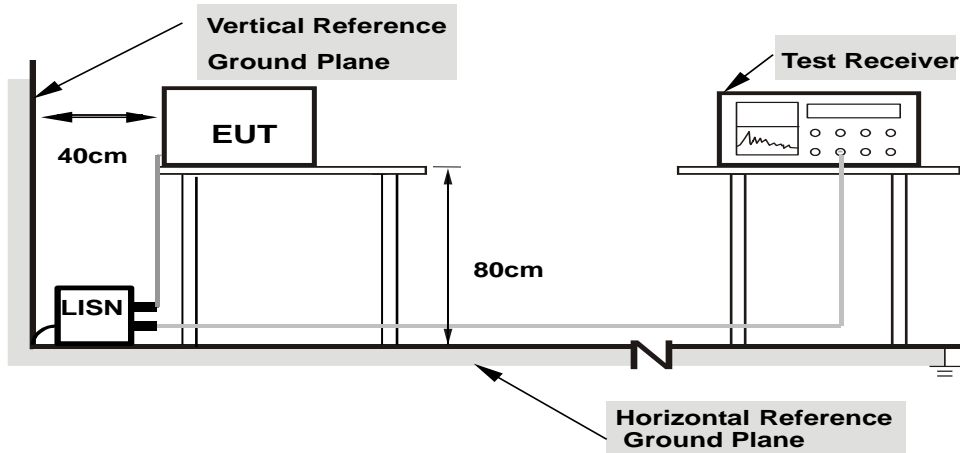
4.1.2 TEST PROCEDURE

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

4.1.7 TEST RESULTS

Please refer to the Attachment A.

Remark:

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

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9KHz-1000MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

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

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

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

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

4.2.2 TEST PROCEDURE

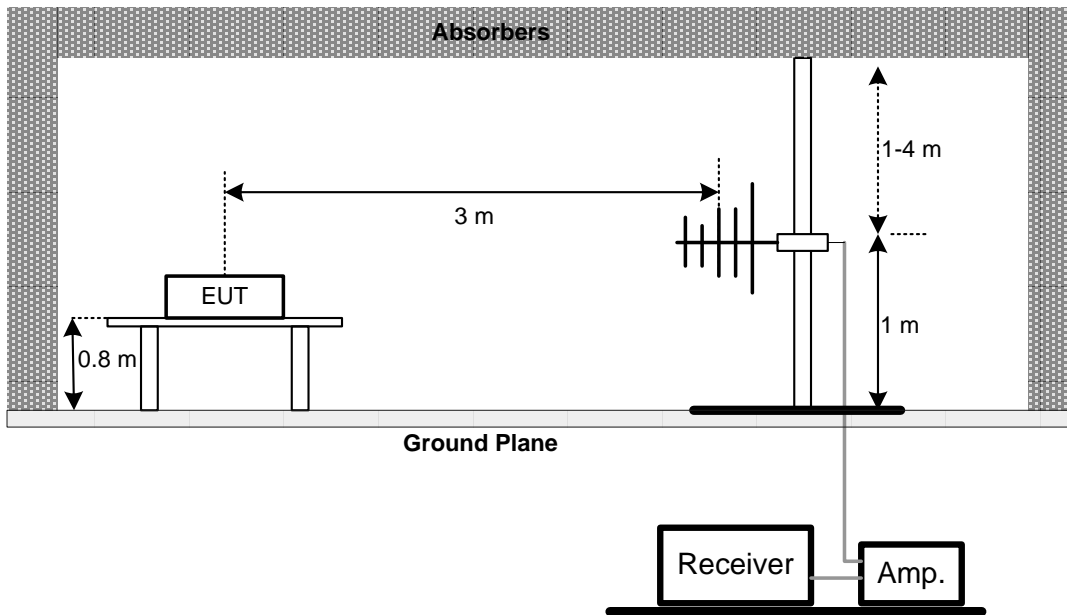
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

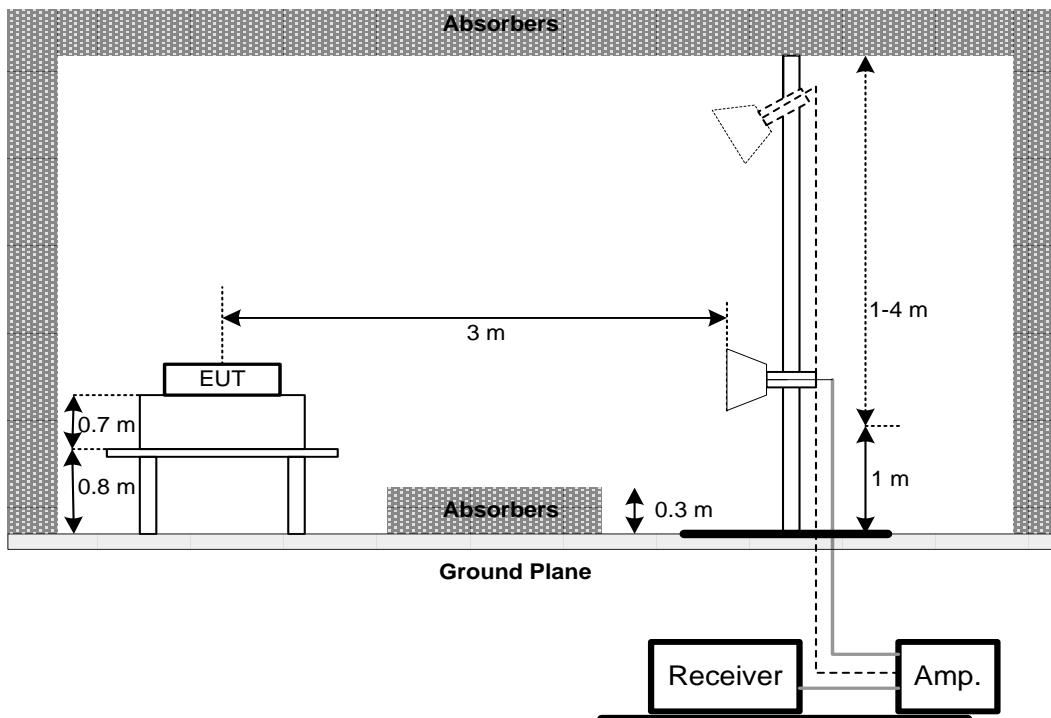
No deviation

4.2.4 TEST SETUP

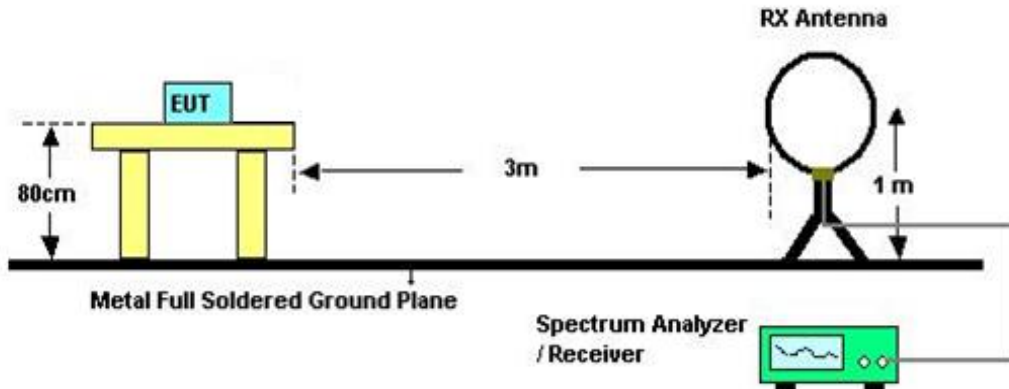
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.2.6 EUT TEST CONDITIONS

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

4.2.7 TEST RESULTS (9 KHZ TO 30 MHZ)

Please refer to the Attachment 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 (30 MHZ TO 1000 MHZ)

Please refer to the Attachment C.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment 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 Attachment E.

6. MAXIMUM OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

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

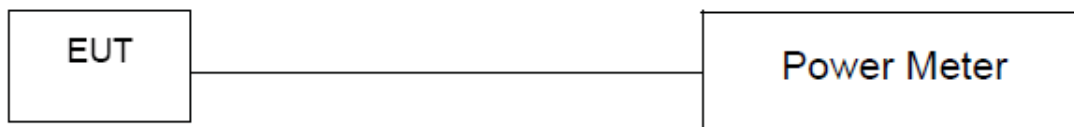
6.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- b. The maximum peak conducted output power was performed in accordance with method 9.1.2 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 Attachment 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 Attachment G.

8. POWER SPECTRAL DENSITY TEST

8.1 APPLIED PROCEDURES / LIMIT

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

8.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

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

8.1.5 EUT TEST CONDITIONS

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

8.1.6 TEST RESULTS

Please refer to the Attachment 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. 26, 2018
2	LISN	EMCO	3816/2	52765	Mar. 26, 2018
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 26, 2018
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 26, 2018
5	Cable	emci	RG223(9KHz-30MHz)(5m)	N/A	Mar. 07, 2018
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 26, 2018
2	Amplifier	HP	8447D	2944A09673	Oct. 20, 2017
3	Receiver	AGILENT	N9038A	MY52130039	Sep. 04, 2017
4	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	Jun. 27, 2017
5	Control	CT	SC100	N/A	N/A
6	Position Control	MF	MF-7802	MF780208416	N/A
7	Antenna	ETS	3115	00075789	Mar. 26, 2018
8	Amplifier	Agilent	8449B	3008A02274	Feb. 22, 2018
9	Receiver	AGILENT	N9038A	MY52130039	Sep. 04, 2017
10	Test Cable	emci	EMC104-SM-SM-10000(1GHz-26.5GHz)	C-68	Jun. 26, 2017
11	Controller	CT	SC100	N/A	N/A
12	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Apr. 22, 2018
13	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 26, 2018
14	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 06, 2017
15	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	FSP 40	100185	Sep. 04, 2017

Peak Output Power Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	P-series Power meter	Agilent	N1911A	MY45100473	Mar. 26, 2018
2	Wireband Power sensor	Agilent	N1921A	MY51100041	Mar. 26, 2018

Antenna Conducted Spurious Emission Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Sep. 04, 2017

Power Spectral Density Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Sep. 04, 2017

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



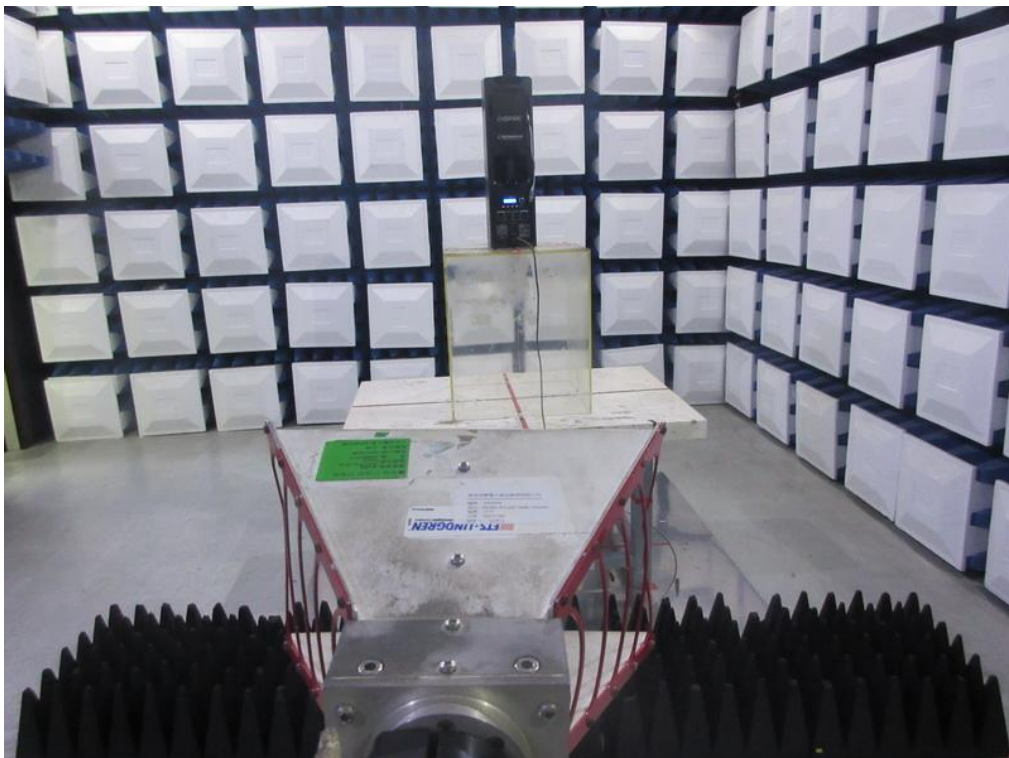
Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

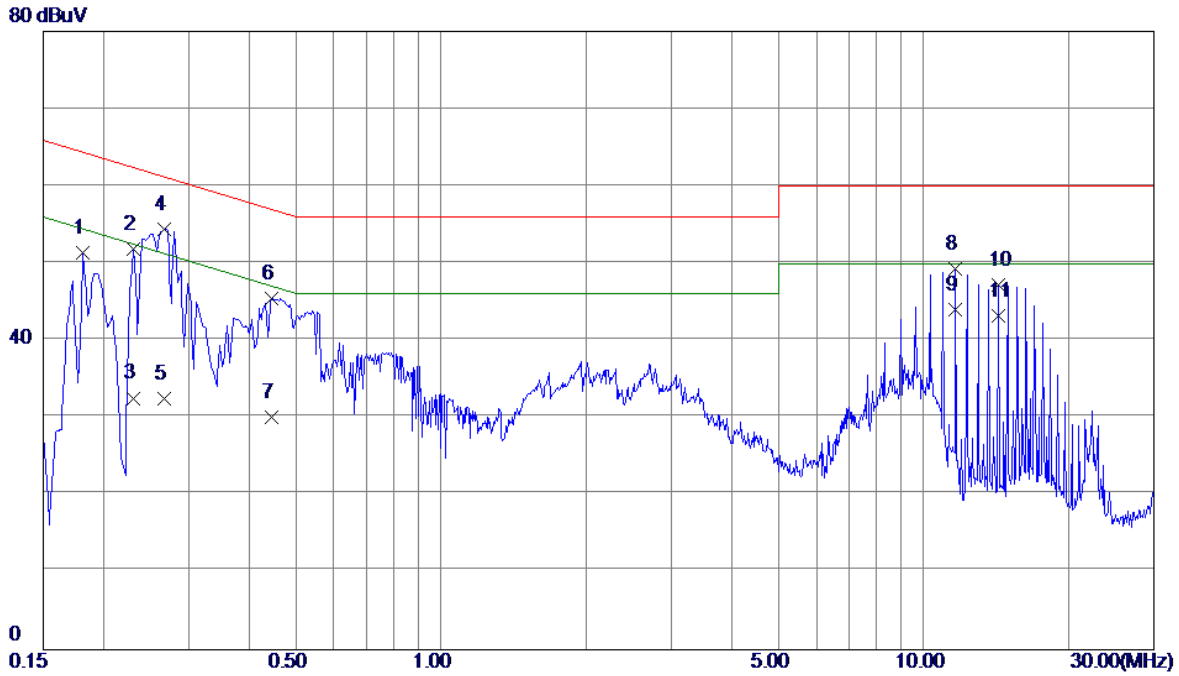
Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: TX Mode

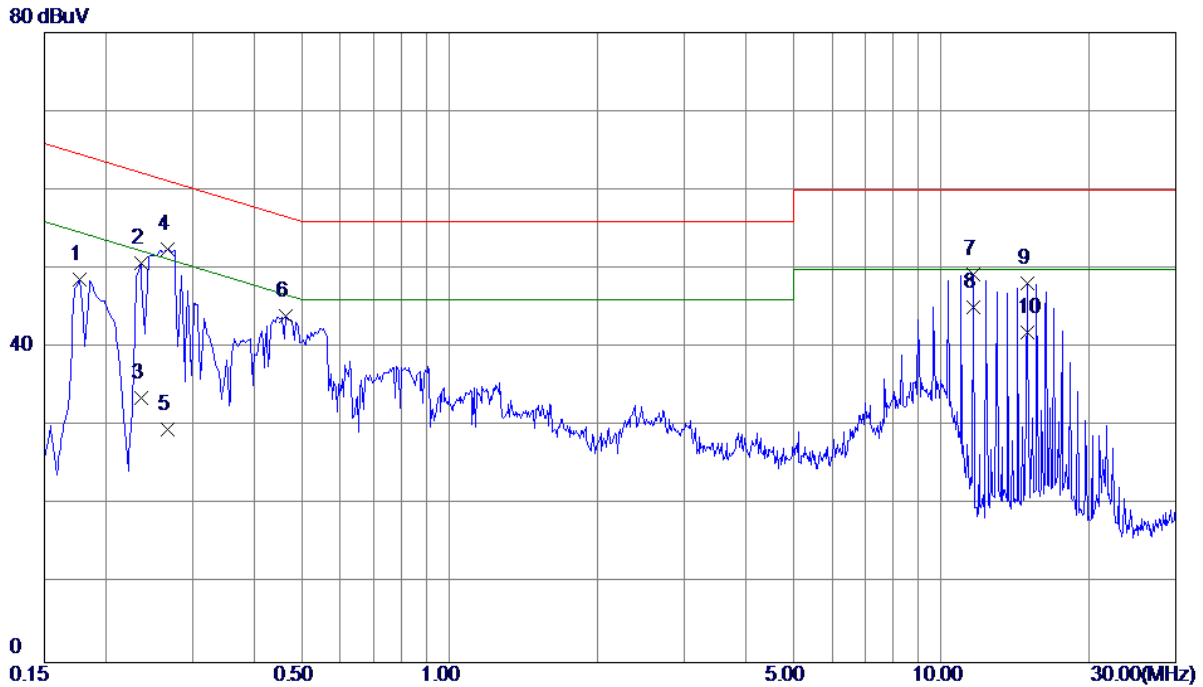
Line



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1815	41.52	9.77	51.29	64.42	-13.13	Peak	
2	0.2310	42.05	9.76	51.81	62.41	-10.60	Peak	
3	0.2310	22.80	9.76	32.56	52.41	-19.85	AVG	
4	0.2670	44.64	9.76	54.40	61.21	-6.81	Peak	
5	0.2670	22.70	9.76	32.46	51.21	-18.75	AVG	
6	0.4470	35.57	9.80	45.37	56.93	-11.56	Peak	
7	0.4470	20.30	9.80	30.10	46.93	-16.83	AVG	
8	11.6475	38.91	10.41	49.32	60.00	-10.68	Peak	
9 *	11.6475	33.61	10.41	44.02	50.00	-5.98	AVG	
10	14.3115	36.57	10.56	47.13	60.00	-12.87	Peak	
11	14.3115	32.70	10.56	43.26	50.00	-6.74	AVG	

Test Mode: TX Mode

Neutral

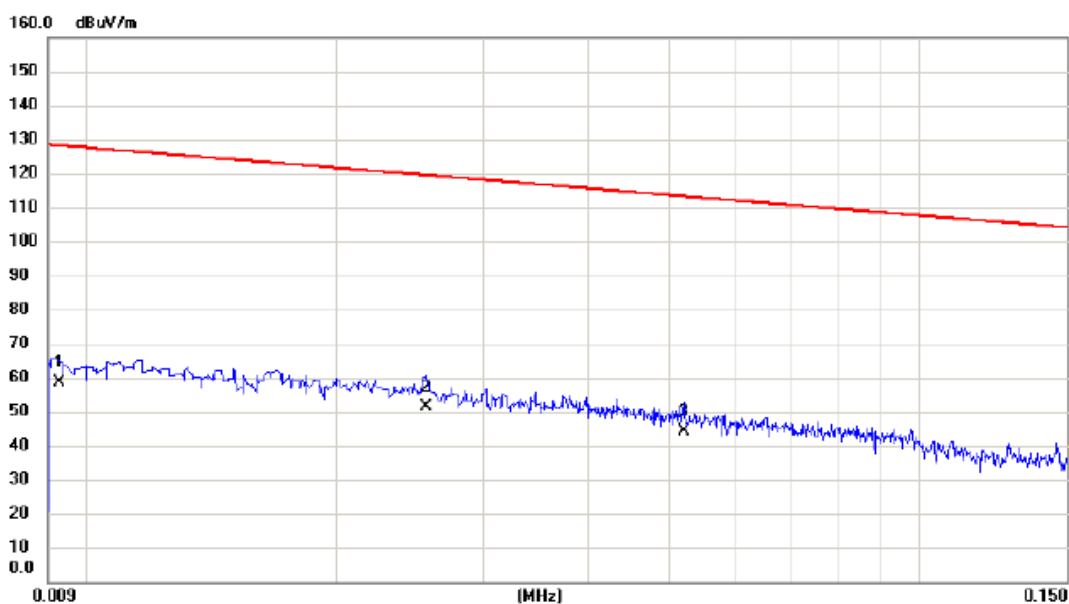


No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1770	38.92	9.68	48.60	64.63	-16.03	Peak	
2	0.2355	41.10	9.68	50.78	62.25	-11.47	Peak	
3	0.2355	23.90	9.68	33.58	52.25	-18.67	AVG	
4	0.2670	42.88	9.67	52.55	61.21	-8.66	Peak	
5	0.2670	20.00	9.67	29.67	51.21	-21.54	AVG	
6	0.4650	34.34	9.69	44.03	56.60	-12.57	Peak	
7	11.6520	38.81	10.39	49.20	60.00	-10.80	Peak	
8 *	11.6520	34.70	10.39	45.09	50.00	-4.91	AVG	
9	14.9820	37.46	10.63	48.09	60.00	-11.91	Peak	
10	14.9820	31.30	10.63	41.93	50.00	-8.07	AVG	

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

Test Mode: TX Mode

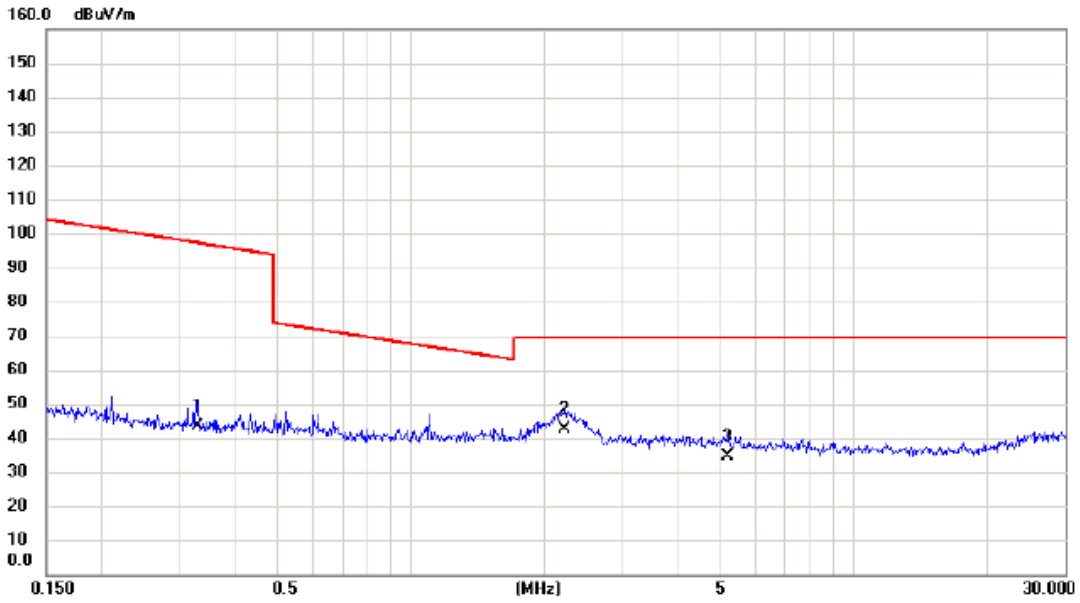
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0093	37.44	21.06	58.50	128.24	-69.74	AVG	
2	*	0.0256	32.09	19.45	51.54	119.44	-67.90	AVG	
3		0.0522	25.47	18.68	44.15	113.25	-69.10	AVG	

Test Mode: TX Mode

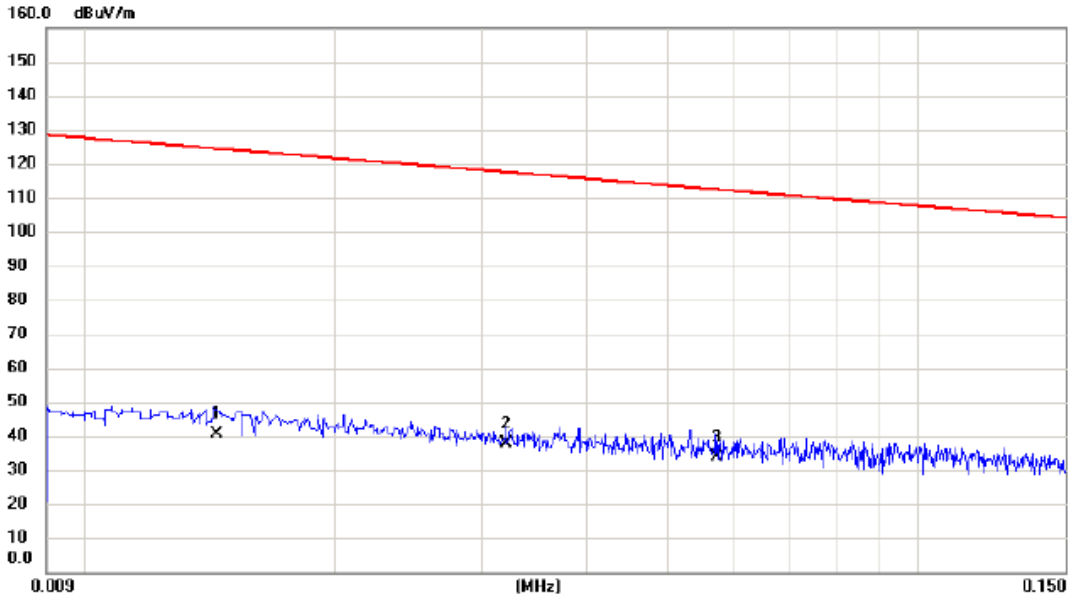
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.3286	26.90	16.60	43.50	97.27	-53.77	AVG	
2	*	2.2250	27.18	15.44	42.62	69.54	-26.92	QP	
3		5.1800	20.34	14.34	34.68	69.54	-34.86	QP	

Test Mode: TX Mode

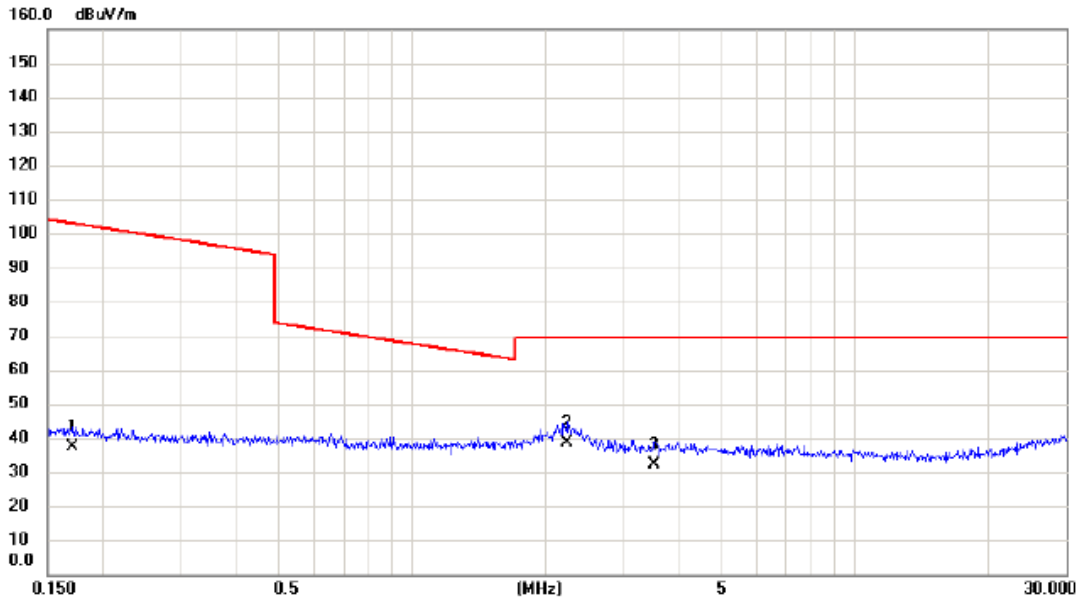
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0144	20.21	20.35	40.56	124.44	-83.88	AVG	
2		0.0321	18.46	19.26	37.72	117.47	-79.75	AVG	
3	*	0.0574	15.08	18.58	33.66	112.43	-78.77	AVG	

Test Mode: TX Mode

Ant 90°

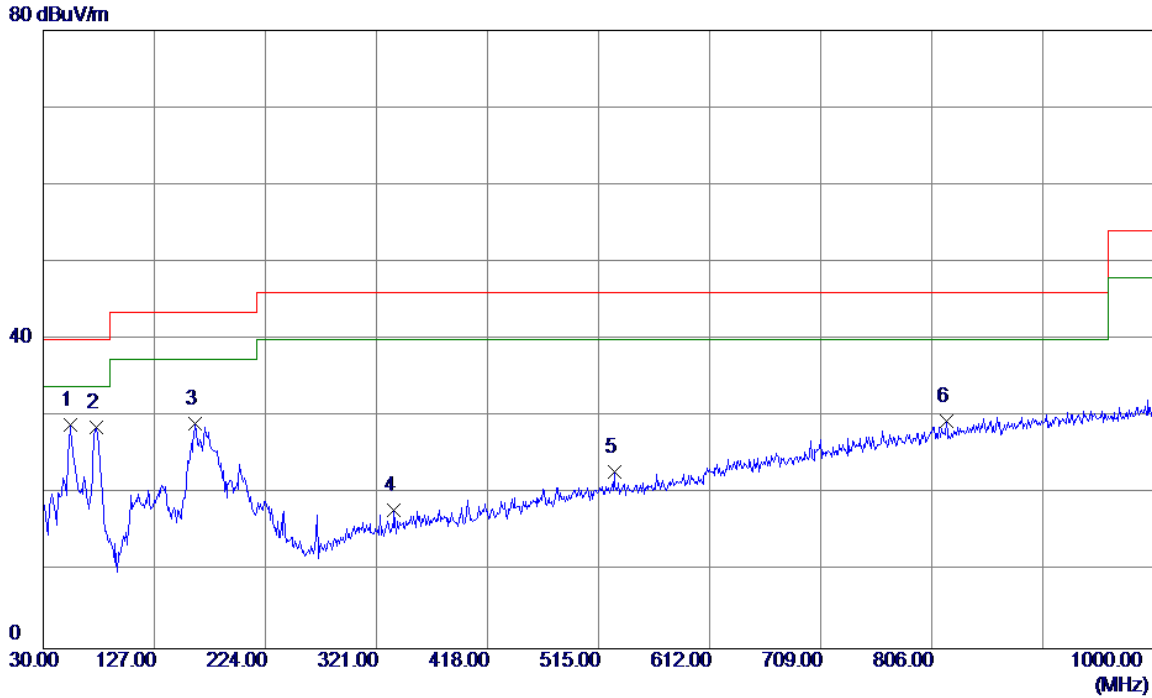


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.1712	20.57	16.89	37.46	102.94	-65.48	AVG	
2	*	2.2427	23.03	15.44	38.47	69.54	-31.07	QP	
3		3.5278	17.09	15.08	32.17	69.54	-37.37	QP	

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

Test Mode: TX 2402MHz _CH00_1Mbps

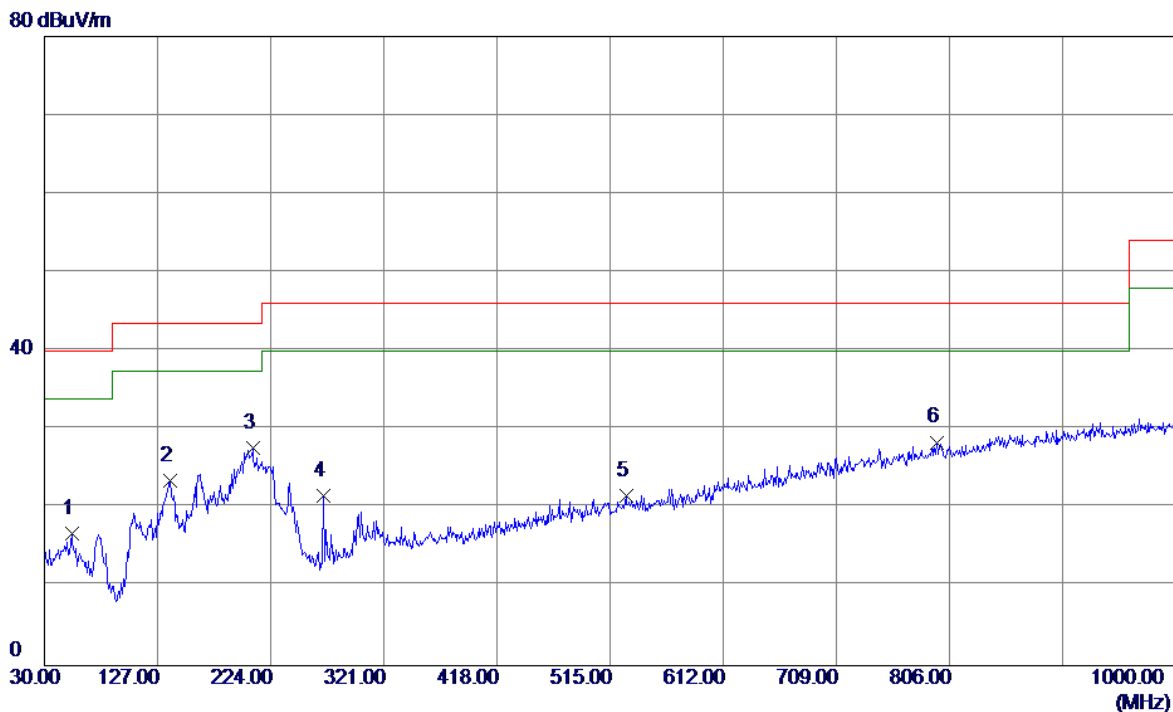
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	53.2800	42.81	-13.88	28.93	40.00	-11.07	Peak	
2	76.5600	46.07	-17.44	28.63	40.00	-11.37	Peak	
3	162.8900	41.90	-12.76	29.14	43.50	-14.36	Peak	
4	336.5200	30.05	-12.19	17.86	46.00	-28.14	Peak	
5	528.5800	31.07	-8.15	22.92	46.00	-23.08	Peak	
6	818.6100	30.30	-0.85	29.45	46.00	-16.55	Peak	

Test Mode: TX 2402MHz _CH00_1Mbps

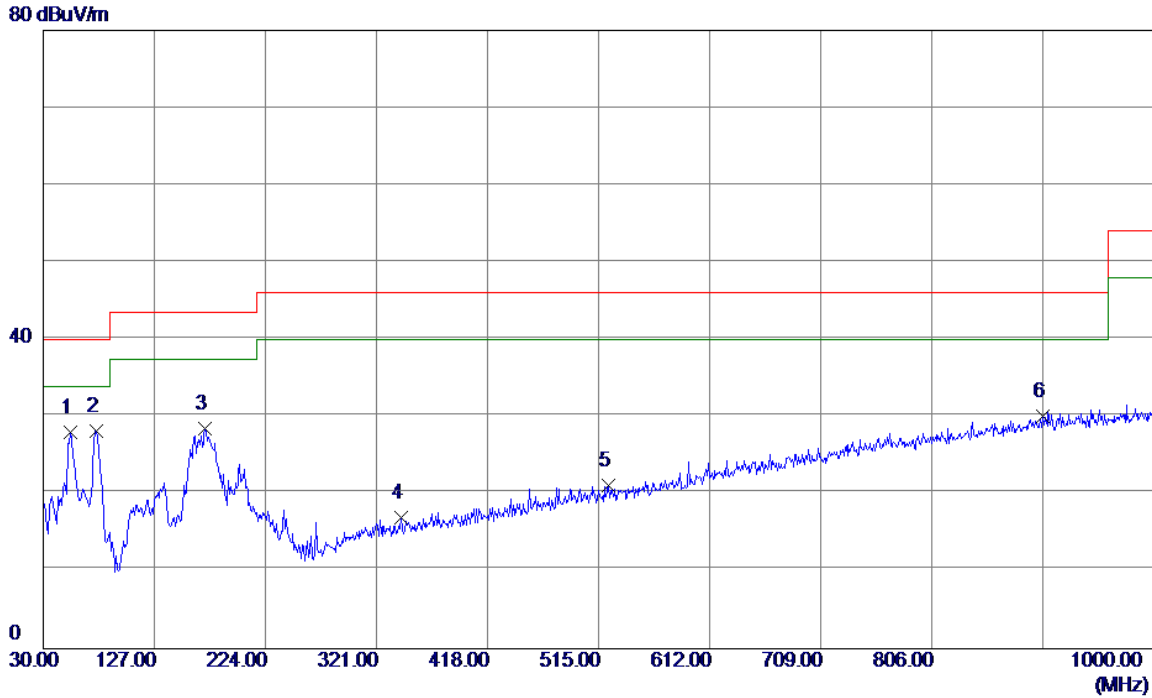
Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	53.2800	30.63	-13.88	16.75	40.00	-23.25	Peak	
2	137.6700	37.82	-14.33	23.49	43.50	-20.01	Peak	
3 *	208.4800	41.56	-13.94	27.62	43.50	-15.88	Peak	
4	269.5900	37.38	-15.84	21.54	46.00	-24.46	Peak	
5	528.5800	29.82	-8.15	21.67	46.00	-24.33	Peak	
6	795.3300	29.86	-1.46	28.40	46.00	-17.60	Peak	

Test Mode: TX 2440MHz _CH19_1Mbps

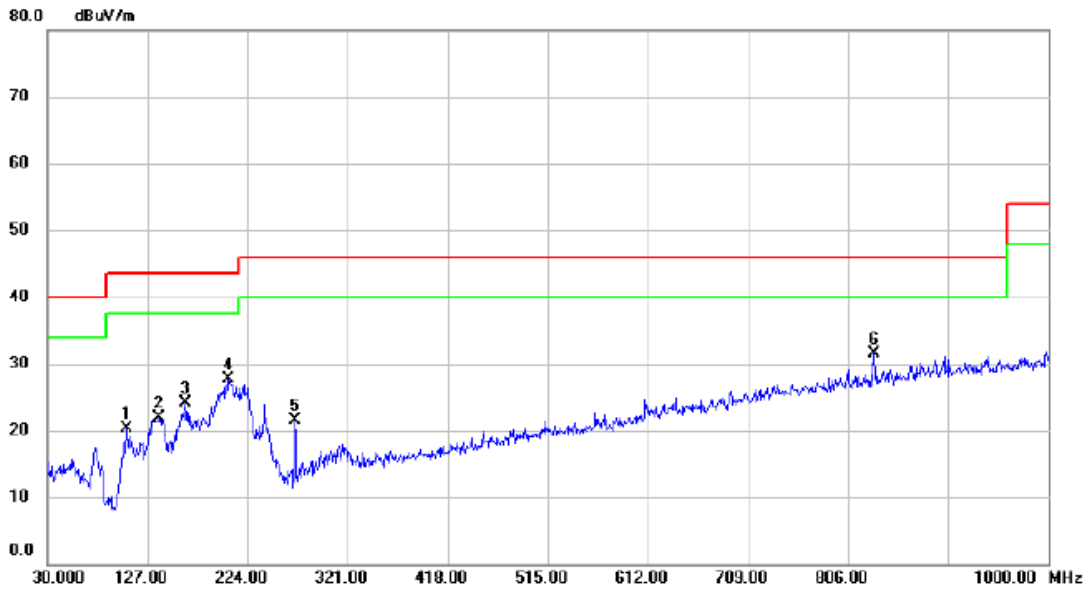
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	53.2800	41.87	-13.88	27.99	40.00	-12.01	Peak	
2 *	76.5600	45.54	-17.44	28.10	40.00	-11.90	Peak	
3	171.6200	40.70	-12.29	28.41	43.50	-15.09	Peak	
4	342.3400	29.04	-12.09	16.95	46.00	-29.05	Peak	
5	523.7300	29.34	-8.24	21.10	46.00	-24.90	Peak	
6	903.0000	28.98	1.09	30.07	46.00	-15.93	Peak	

Test Mode: TX 2440MHz _CH19_1Mbps

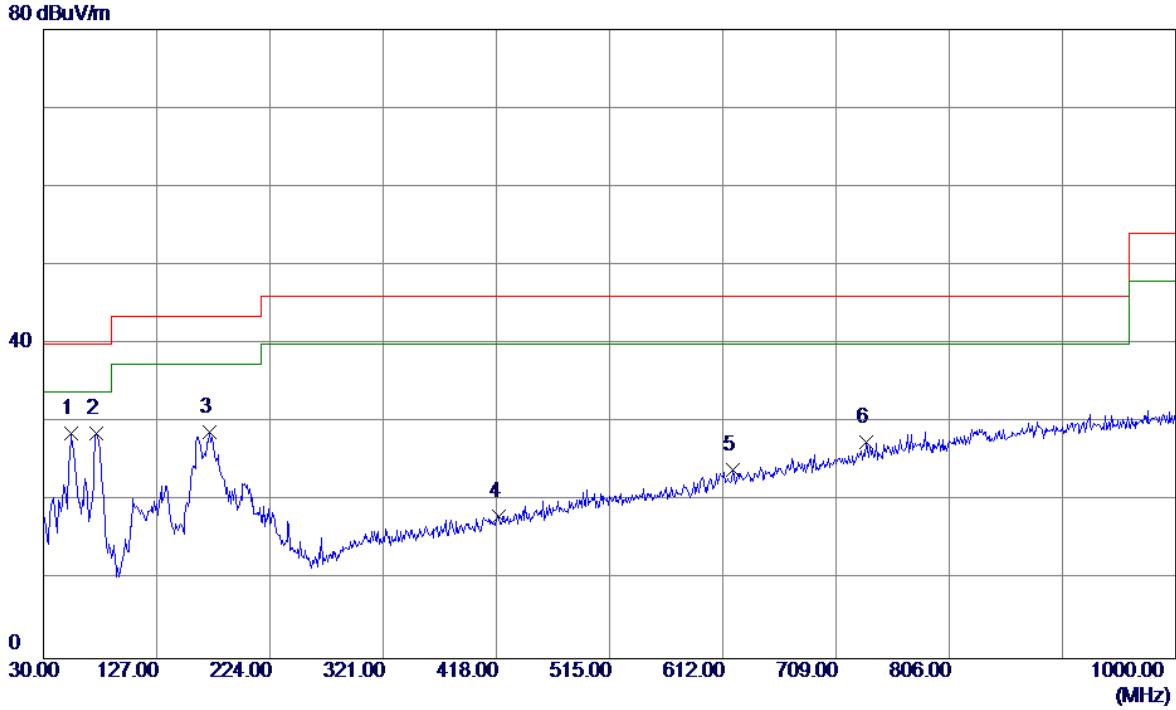
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		106.630	36.98	-16.62	20.36	43.50	-23.14	peak	
2		137.670	36.20	-14.32	21.88	43.50	-21.62	peak	
3		163.860	36.83	-12.70	24.13	43.50	-19.37	peak	
4		205.570	41.60	-13.88	27.72	43.50	-15.78	peak	
5		269.590	37.29	-15.84	21.45	46.00	-24.55	peak	
6	*	831.220	32.12	-0.52	31.60	46.00	-14.40	peak	

Test Mode: TX 2480MHz _CH39_1Mbps

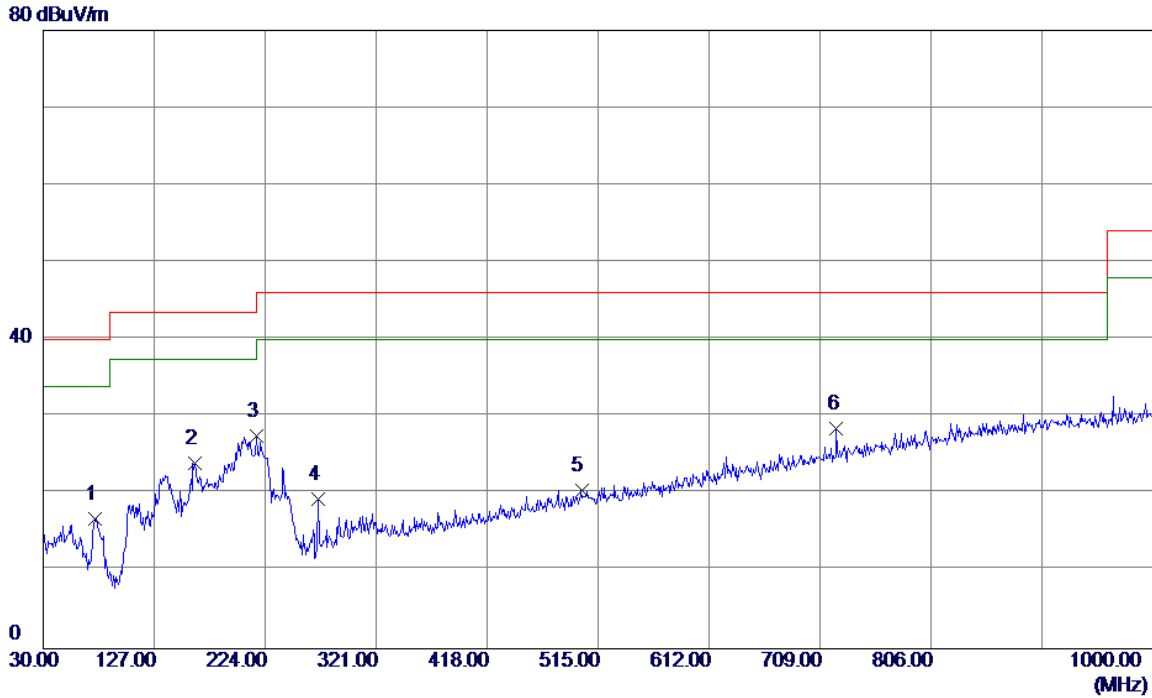
Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	53.2800	42.59	-13.88	28.71	40.00	-11.29	Peak	
2	75.5899	45.79	-17.22	28.57	40.00	-11.43	Peak	
3	172.5900	41.07	-12.26	28.81	43.50	-14.69	Peak	
4	419.9400	28.87	-10.79	18.08	46.00	-27.92	Peak	
5	620.7300	30.04	-6.03	24.01	46.00	-21.99	Peak	
6	735.1900	30.36	-2.89	27.47	46.00	-18.53	Peak	

Test Mode: TX 2480MHz _CH39_1Mbps

Horizontal



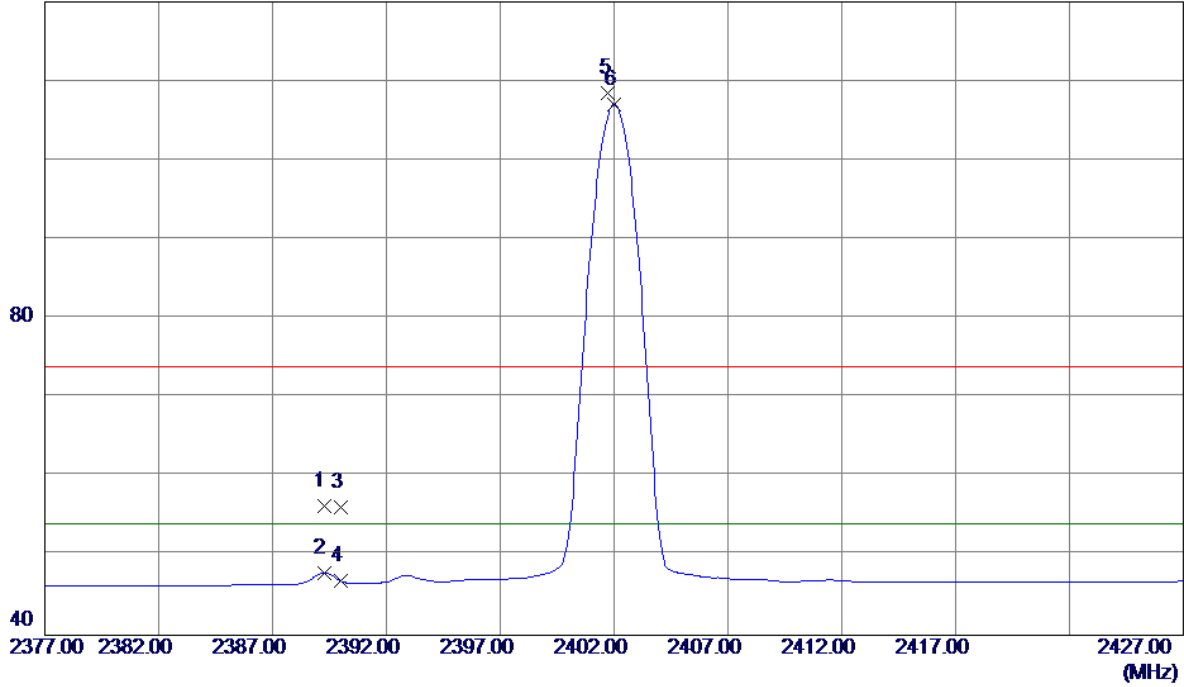
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	75.5899	34.06	-17.22	16.84	40.00	-23.16	Peak	
2	162.8900	36.78	-12.76	24.02	43.50	-19.48	Peak	
3	216.2400	41.41	-13.93	27.48	46.00	-18.52	Peak	
4	270.5600	35.12	-15.78	19.34	46.00	-26.66	Peak	
5	500.4500	29.24	-8.71	20.53	46.00	-25.47	Peak	
6 *	723.5500	31.70	-3.24	28.46	46.00	-17.54	Peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode : TX 2402MHz _CH00_1Mbps

Vertical

120 dBuV/m

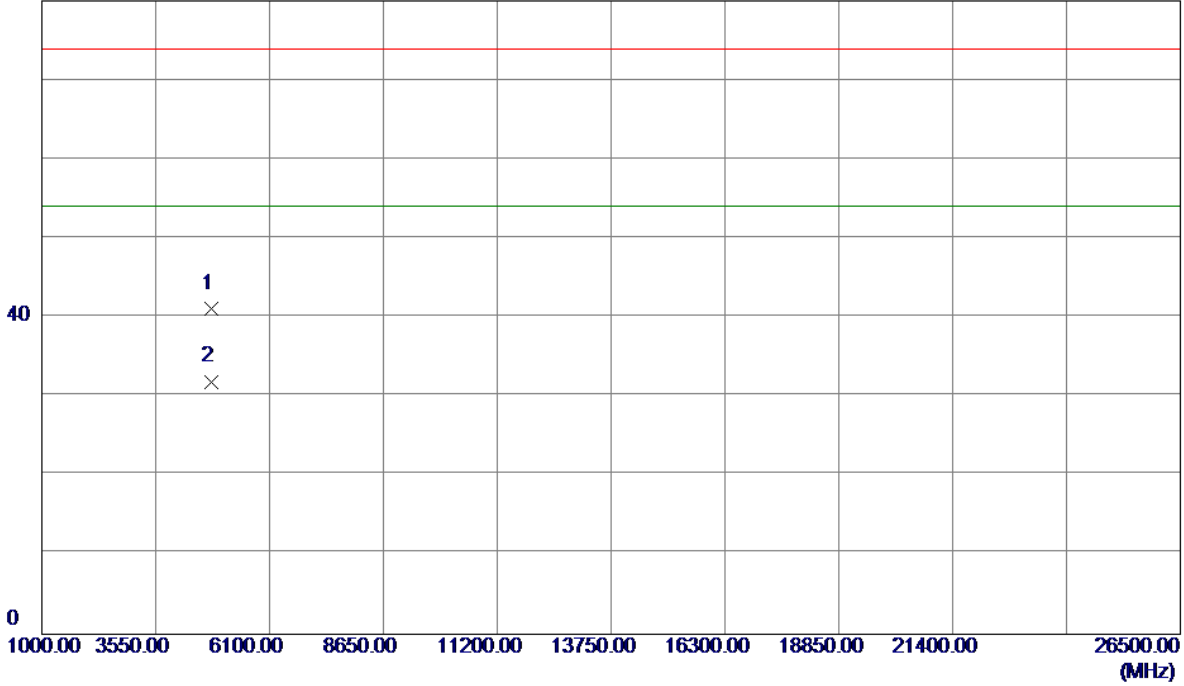


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2389.2500	23.32	33.05	56.37	74.00	-17.63	Peak	
2	2389.2500	14.82	33.05	47.87	54.00	-6.13	AVG	
3	2390.0000	23.11	33.06	56.17	74.00	-17.83	Peak	
4	2390.0000	13.78	33.06	46.84	54.00	-7.16	AVG	
5	2401.7500	75.41	33.10	108.51	74.00	34.51	Peak	No Limit
6 *	2402.0000	73.92	33.10	107.02	54.00	53.02	AVG	No Limit

Test Mode : TX 2402MHz _CH00_1Mbps

Vertical

80 dBuV/m

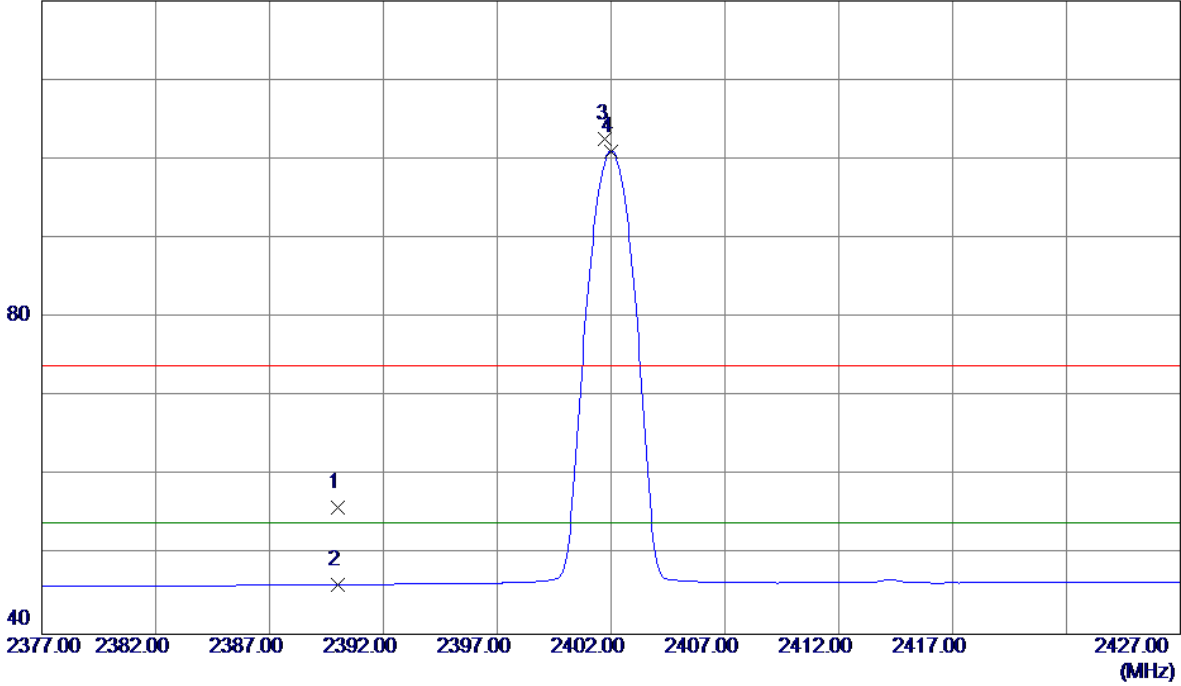


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4803.4500	34.86	6.26	41.12	74.00	-32.88	Peak	
2 *	4803.7799	25.65	6.27	31.92	54.00	-22.08	AVG	

Test Mode : TX 2402MHz _CH00_1Mbps

Horizontal

120 dBuV/m

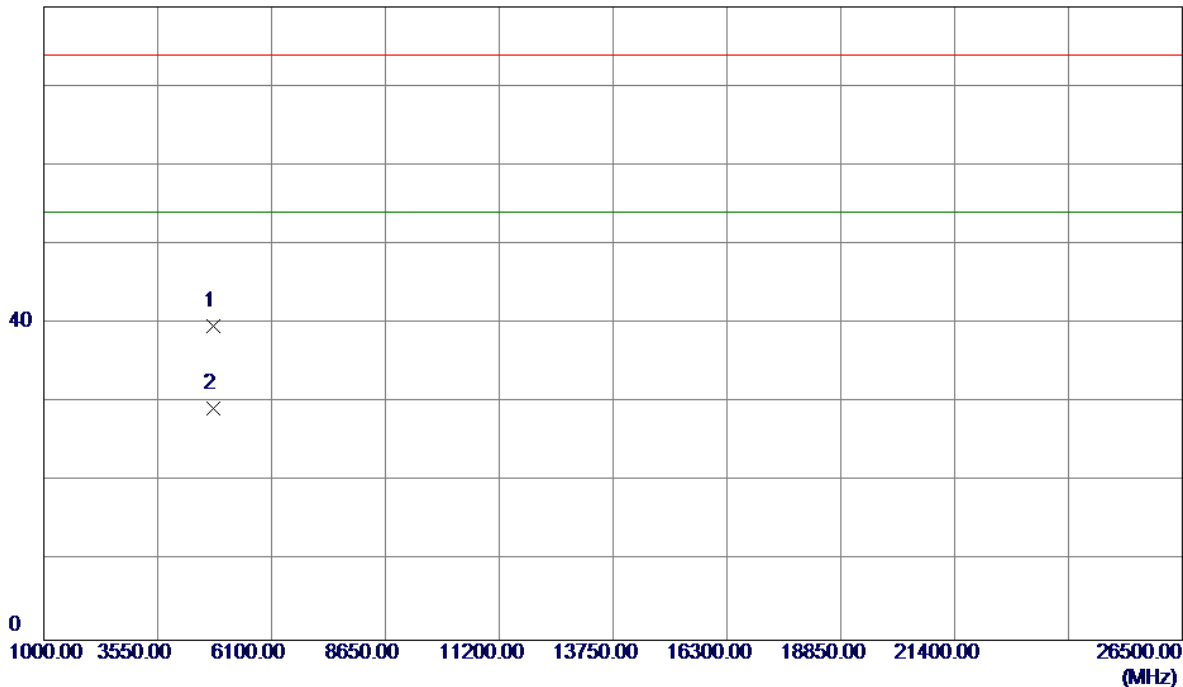


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	22.98	33.06	56.04	74.00	-17.96	Peak	
2	2390.0000	13.16	33.06	46.22	54.00	-7.78	AVG	
3	2401.7500	69.42	33.10	102.52	74.00	28.52	Peak	No Limit
4 *	2402.0000	67.93	33.10	101.03	54.00	47.03	AVG	No Limit

Test Mode : TX 2402MHz _CH00_1Mbps

Horizontal

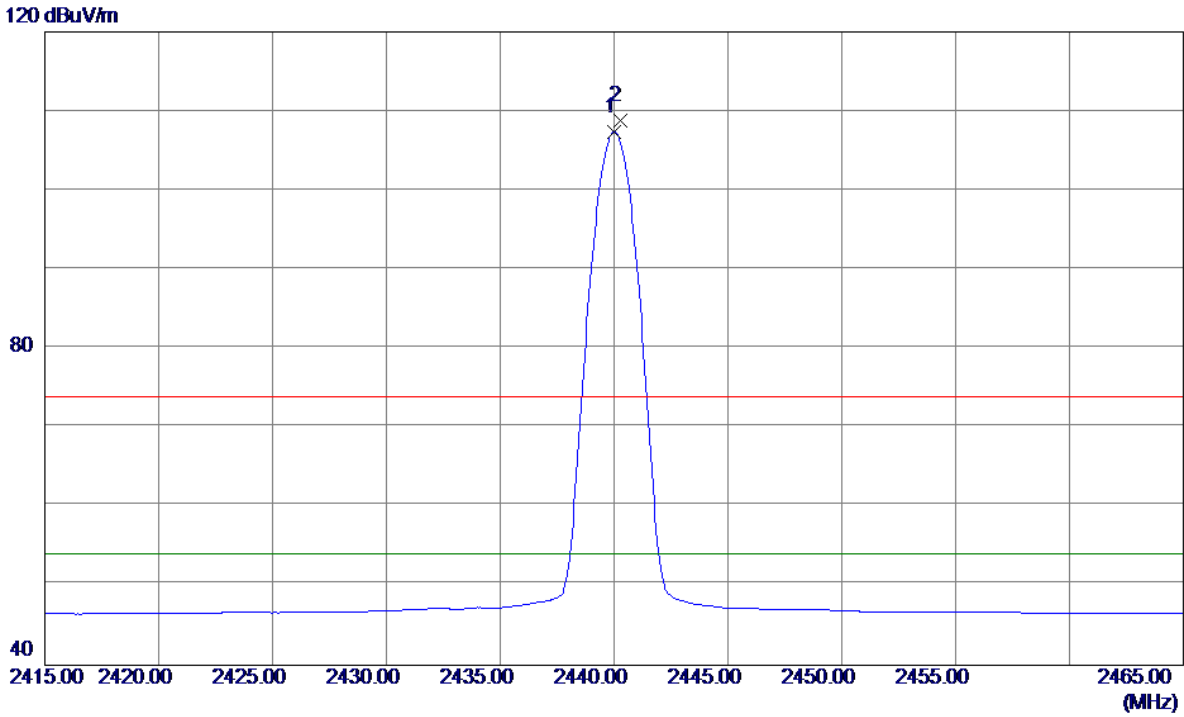
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4804.0450	33.44	6.27	39.71	74.00	-34.29	Peak	
2 *	4804.0500	23.01	6.27	29.28	54.00	-24.72	AVG	

Test Mode : TX 2440MHz _CH19_1Mbps

Vertical

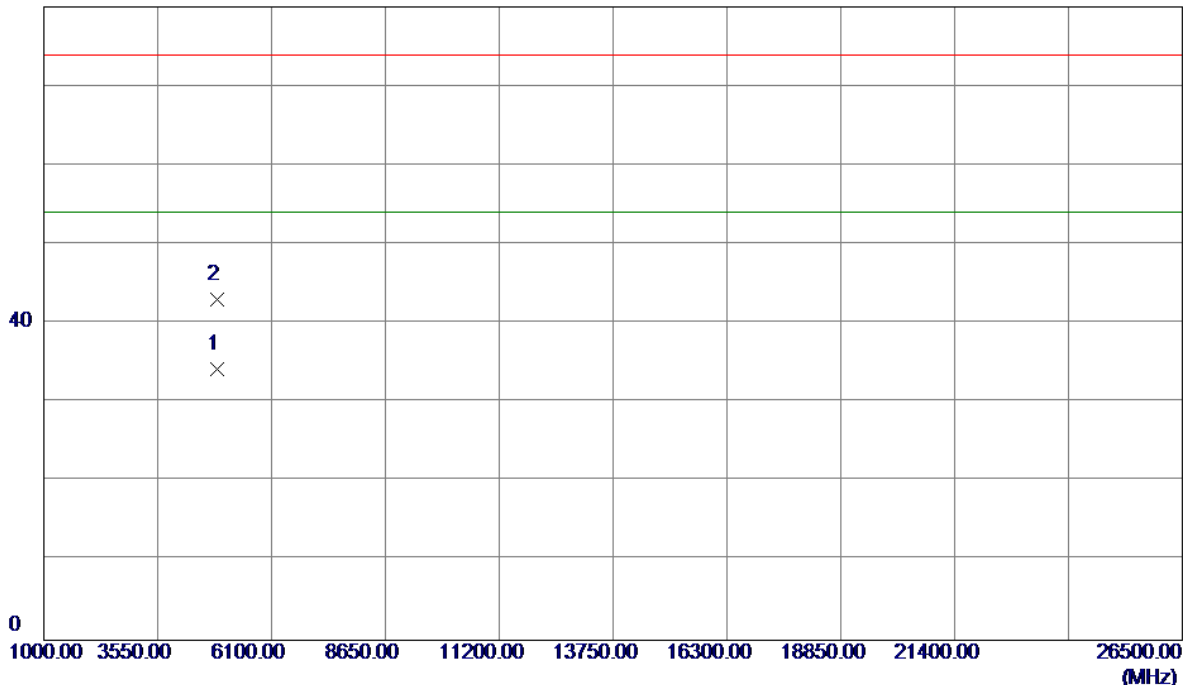


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.0000	74.10	33.24	107.34	54.00	53.34	AVG	No Limit
2	2440.2500	75.57	33.25	108.82	74.00	34.82	Peak	No Limit

Test Mode : TX 2440MHz _CH19_1Mbps

Vertical

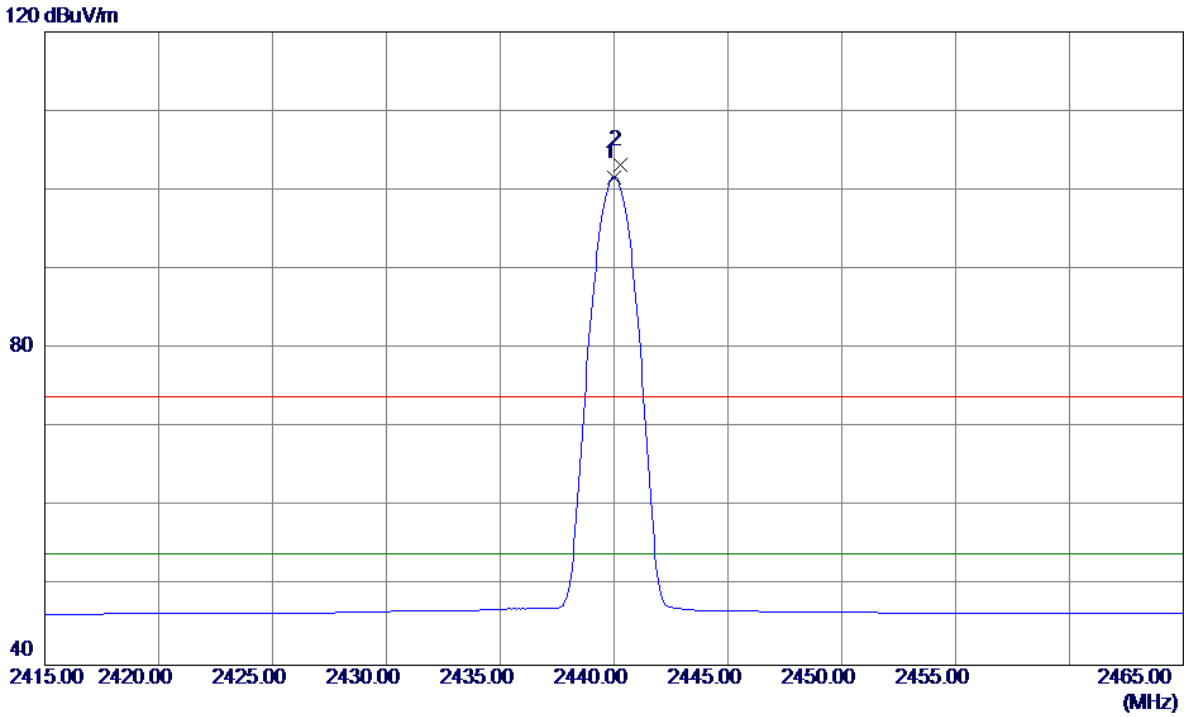
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4879.9150	27.76	6.46	34.22	54.00	-19.78	AVG	
2	4880.1800	36.51	6.46	42.97	74.00	-31.03	Peak	

Test Mode : TX 2440MHz _CH19_ 1Mbps

Horizontal

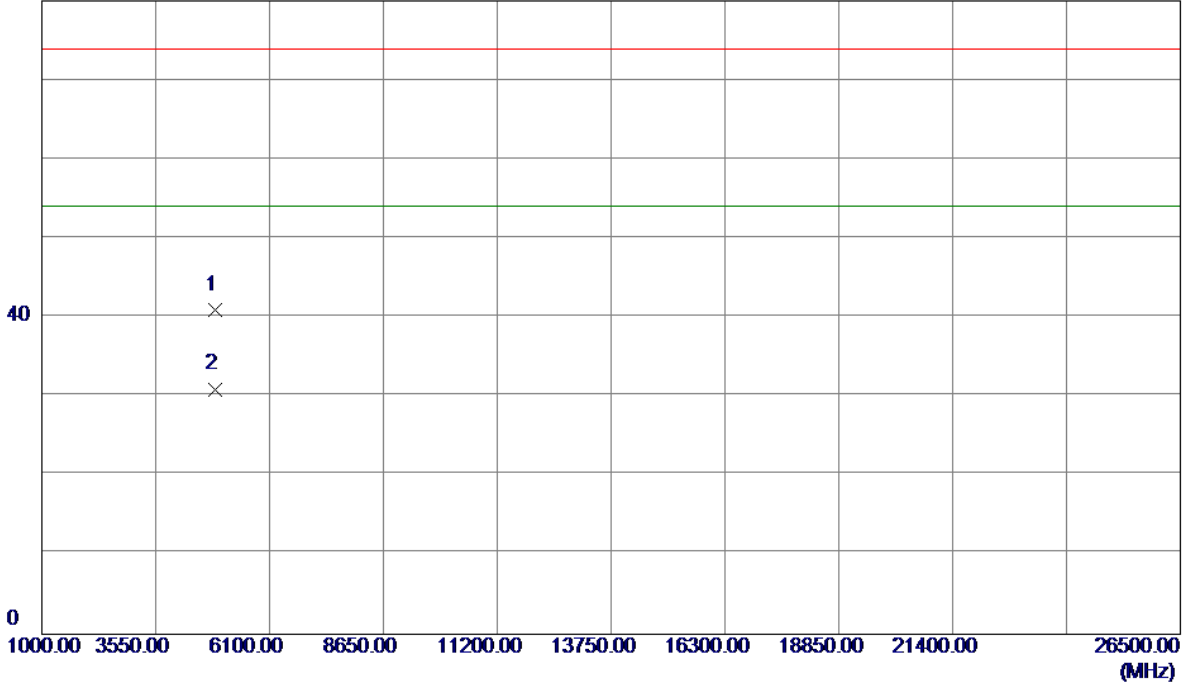


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2440.0000	68.42	33.24	101.66	54.00	47.66	AVG	No Limit
2	2440.2500	69.93	33.25	103.18	74.00	29.18	Peak	No Limit

Test Mode : TX 2440MHz _CH19_1Mbps

Horizontal

80 dBuV/m

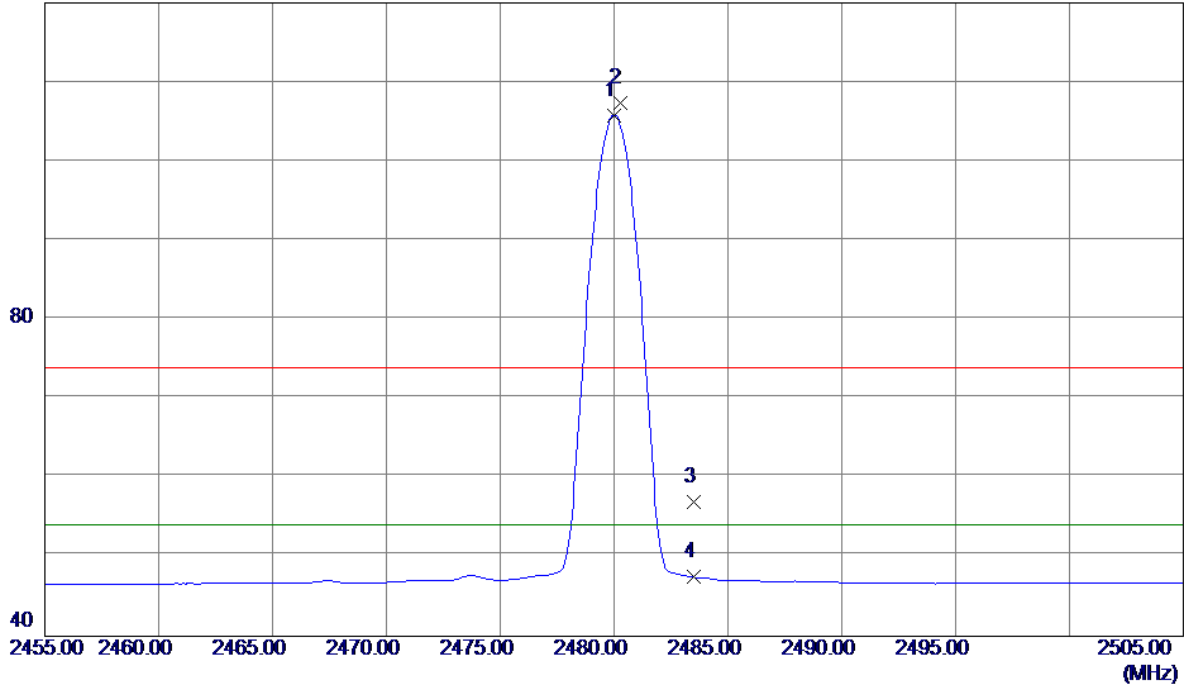


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4879.6100	34.48	6.46	40.94	74.00	-33.06	Peak	
2 *	4879.8000	24.50	6.46	30.96	54.00	-23.04	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Vertical

120 dBuV/m

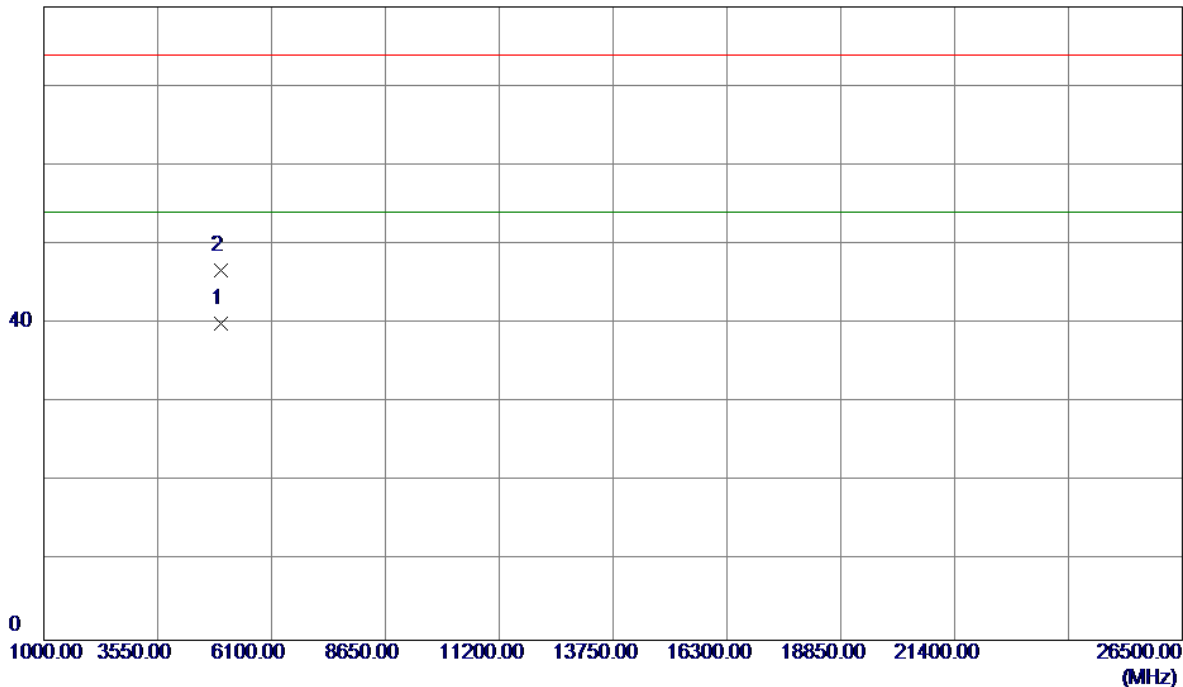


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	72.43	33.39	105.82	54.00	51.82	AVG	No Limit
2	2480.2500	73.91	33.40	107.31	74.00	33.31	Peak	No Limit
3	2483.5000	23.52	33.41	56.93	74.00	-17.07	Peak	
4	2483.5000	14.04	33.41	47.45	54.00	-6.55	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Vertical

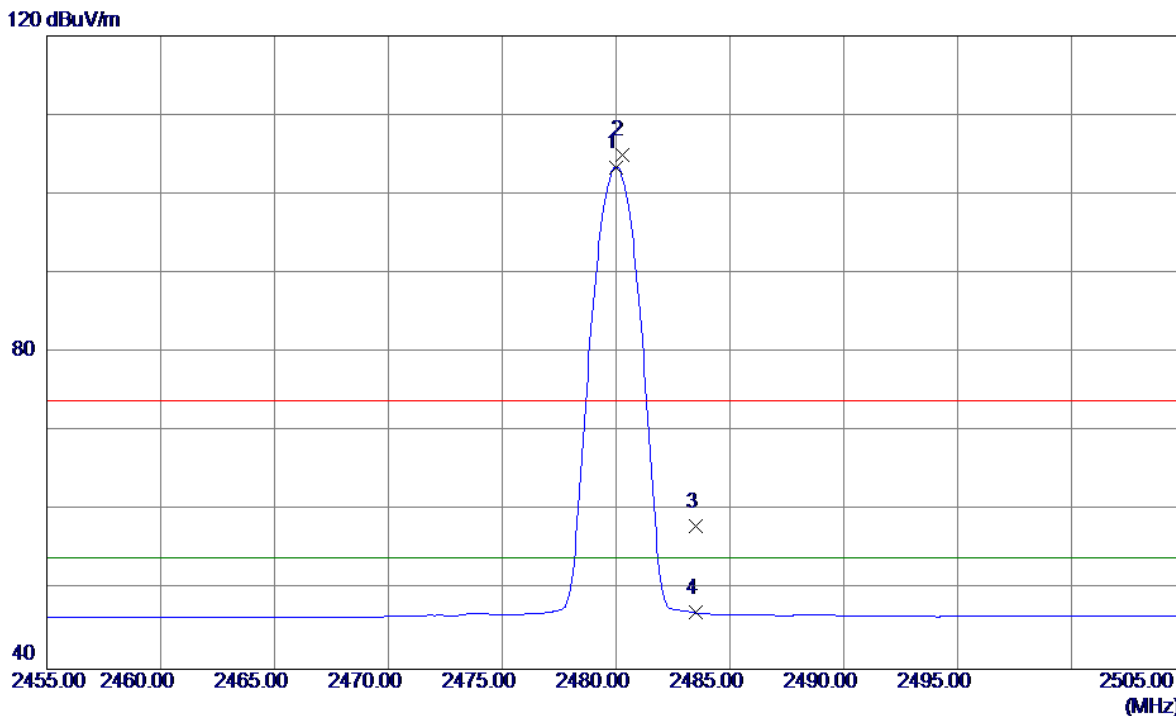
80 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4959.9300	33.40	6.66	40.06	54.00	-13.94	AVG	
2	4960.2550	40.10	6.66	46.76	74.00	-27.24	Peak	

Test Mode : TX 2480MHz _CH39_1Mbps

Horizontal

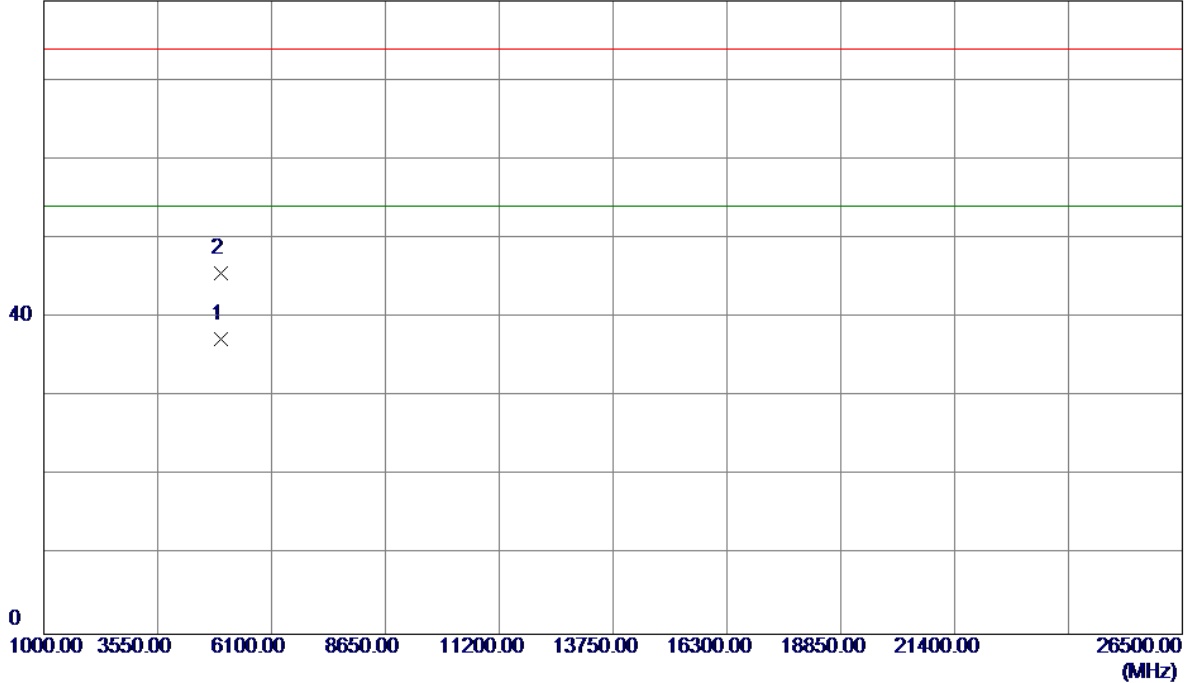


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	70.02	33.39	103.41	54.00	49.41	AVG	No Limit
2	2480.2500	71.55	33.40	104.95	74.00	30.95	Peak	No Limit
3	2483.5000	24.59	33.41	58.00	74.00	-16.00	Peak	
4	2483.5000	13.71	33.41	47.12	54.00	-6.88	AVG	

Test Mode : TX 2480MHz _CH39_1Mbps

Horizontal

80 dBuV/m



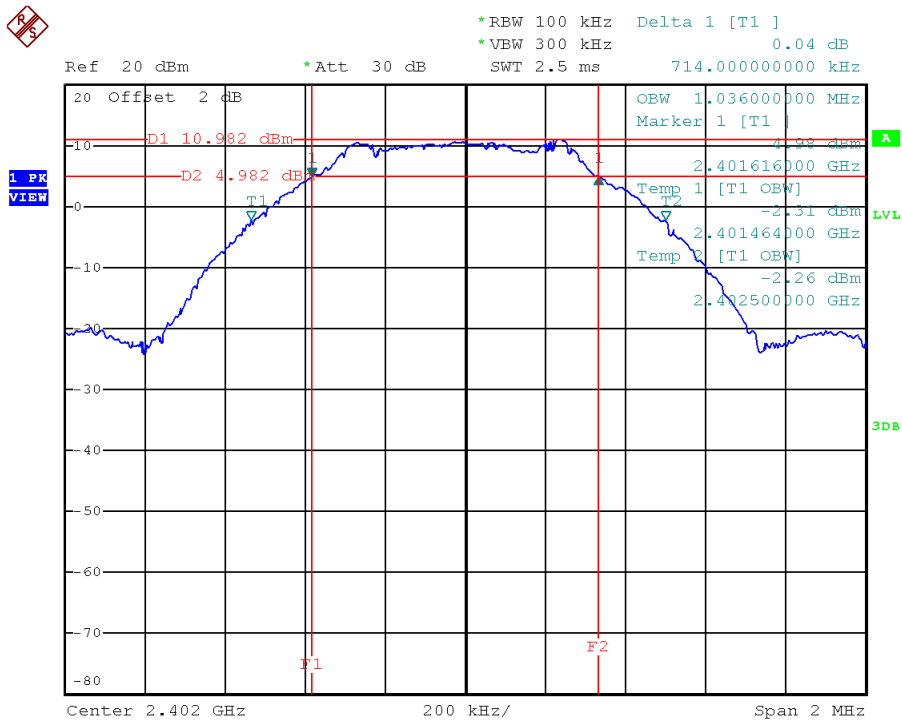
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	4959.9049	30.69	6.66	37.35	54.00	-16.65	AVG	
2	4960.2599	38.92	6.66	45.58	74.00	-28.42	Peak	

ATTACHMENT E - BANDWIDTH

Test Mode: TX Mode

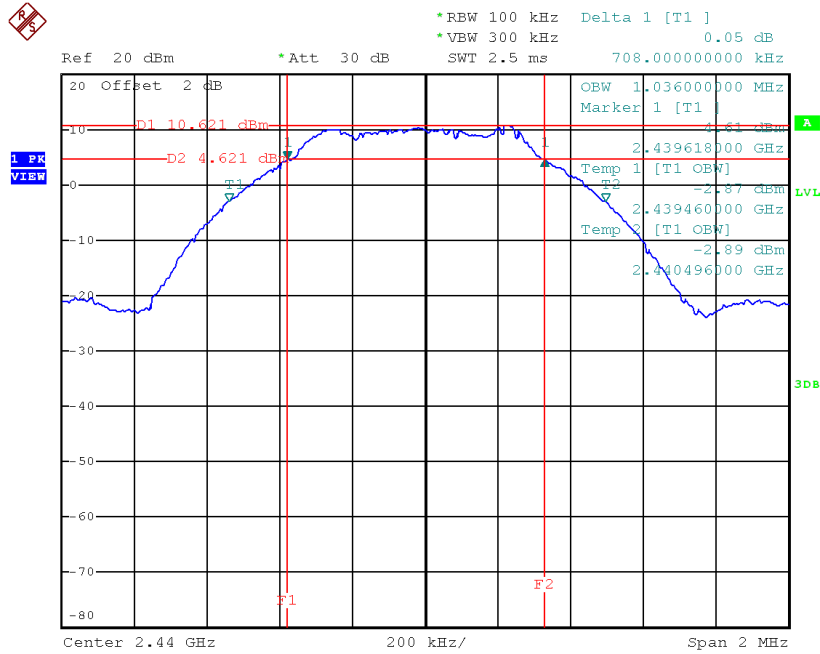
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.714	1.036	500	Pass
2440	0.708	1.036	500	Pass
2480	0.714	1.040	500	Pass

TX CH00



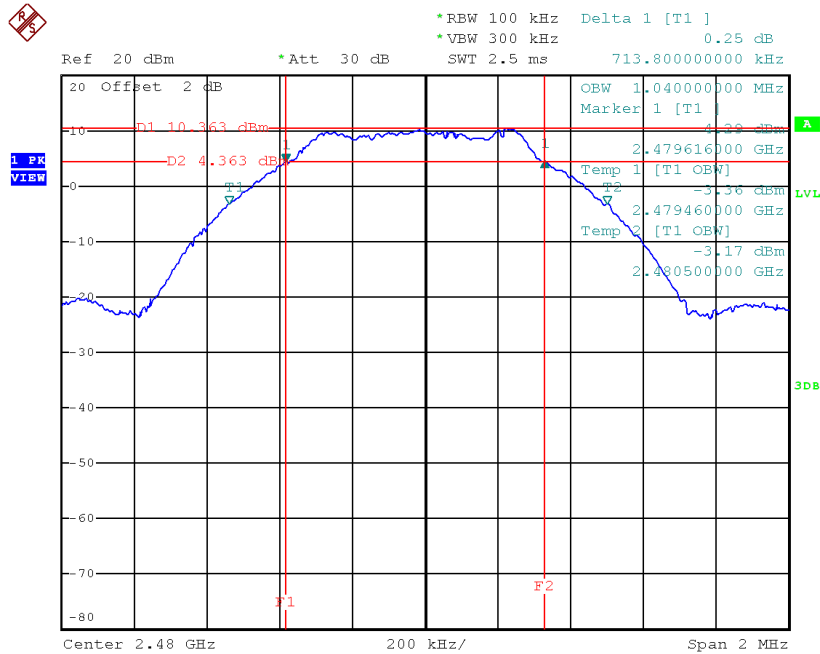
Date: 3.JUL.2017 15:29:56

TX CH19



Date: 3.JUL.2017 15:31:15

TX CH39



Date: 3.JUL.2017 15:32:33

ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

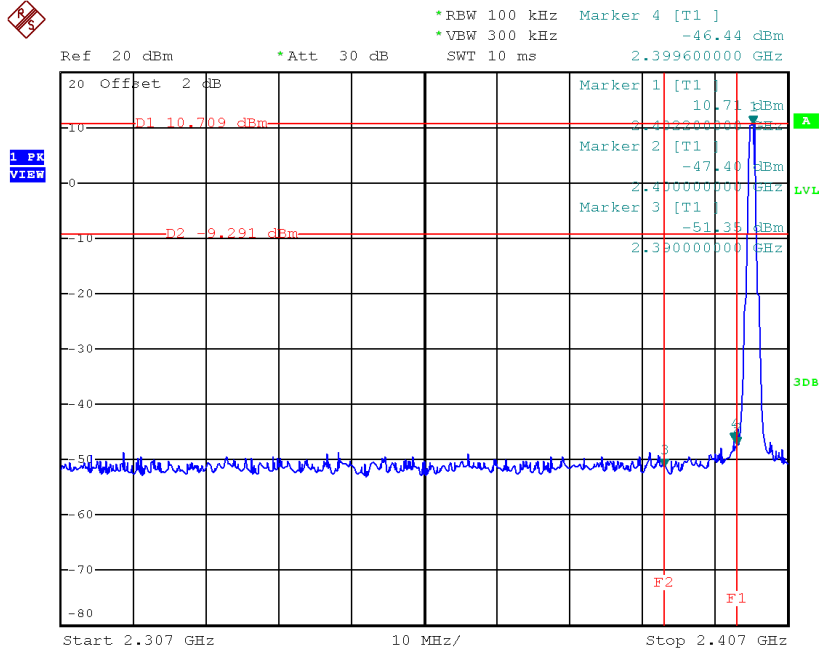
Test Mode :	CH00, CH19 , CH39 - 1Mbps
-------------	---------------------------

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	11.83	0.0152	30.00	1.00	Pass
2440	11.55	0.0143	30.00	1.00	Pass
2480	11.31	0.0135	30.00	1.00	Pass

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

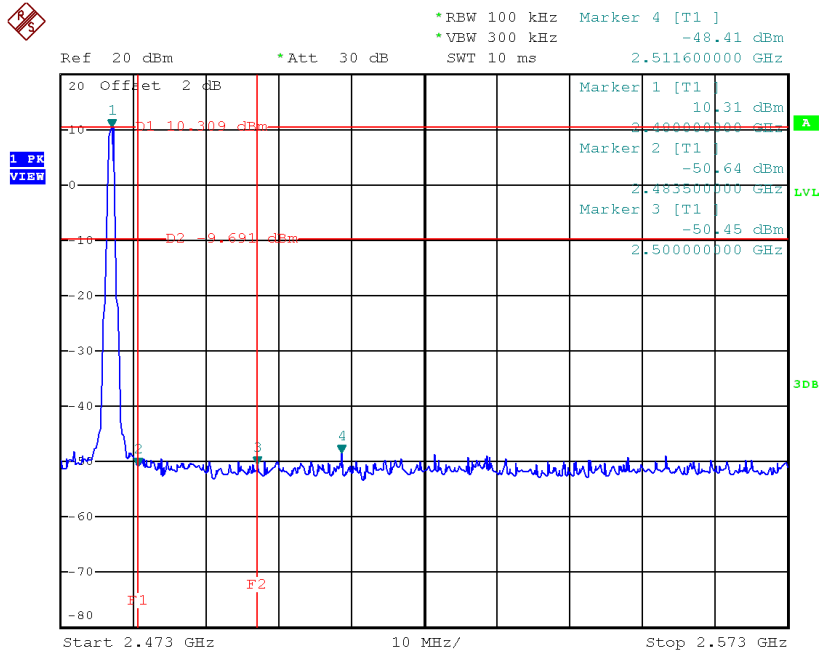
Test Mode : CH00, CH19 , CH39 - 1Mbps

CH00 (Lower) - 1Mbps



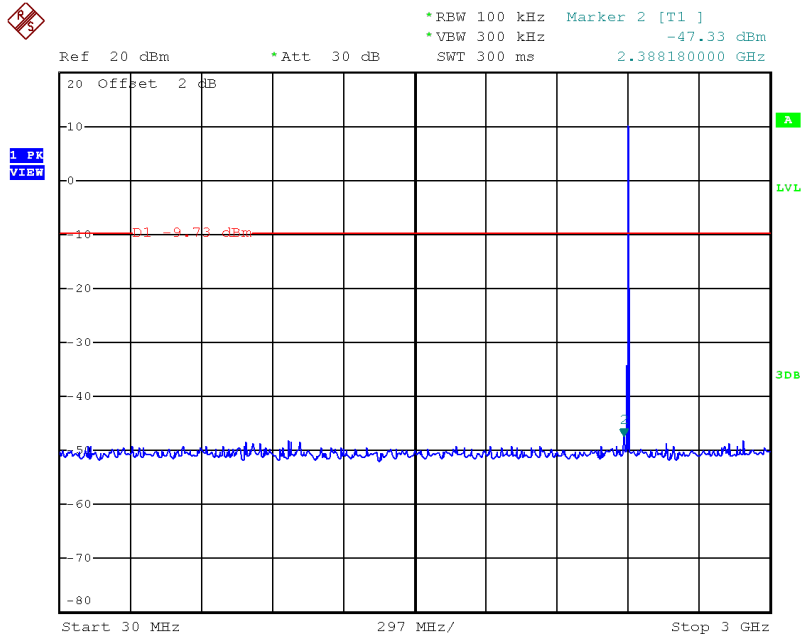
Date: 3.JUL.2017 15:30:03

CH39 (upper) - 1Mbps



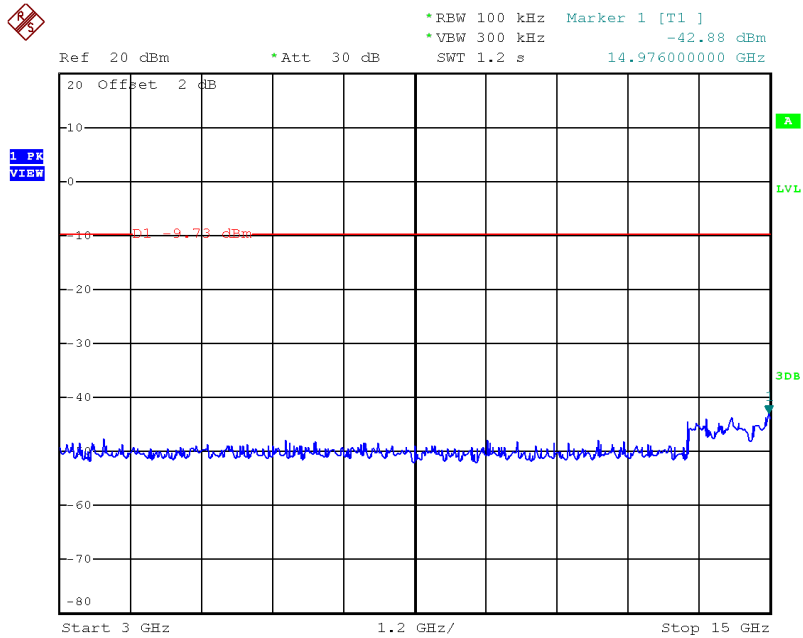
Date: 3.JUL.2017 15:32:40

CH00 (10 Harmonic of the frequency) 1



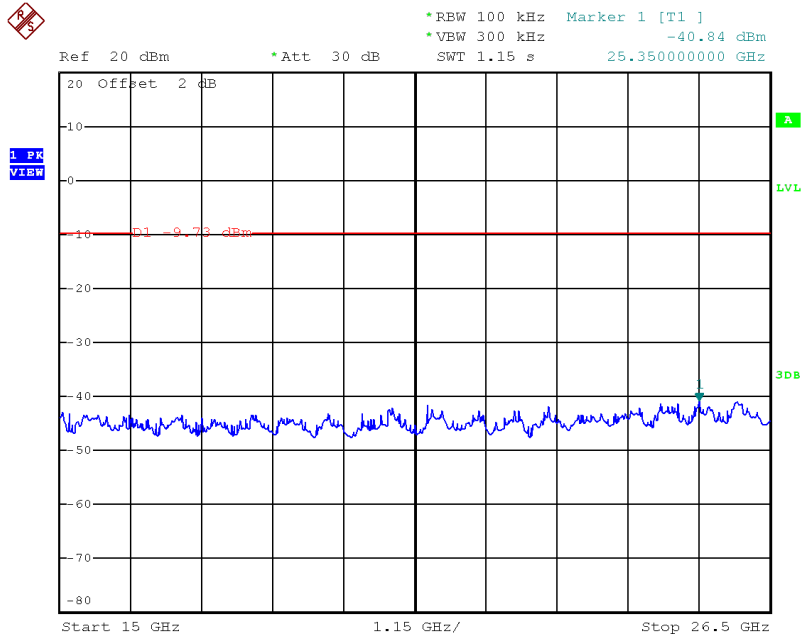
Date: 3.JUL.2017 15:30:15

CH00 (10 Harmonic of the frequency) 2



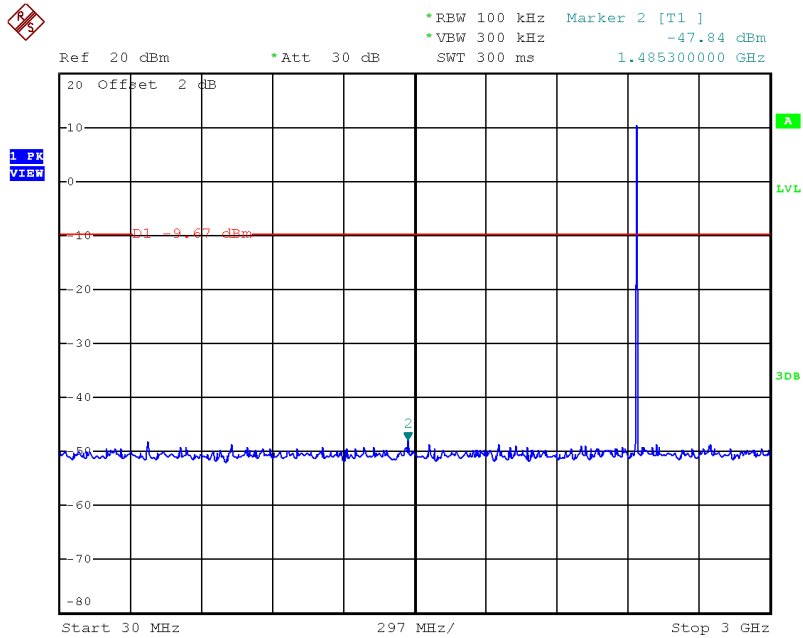
Date: 3.JUL.2017 15:30:22

CH00 (10 Harmonic of the frequency) 3



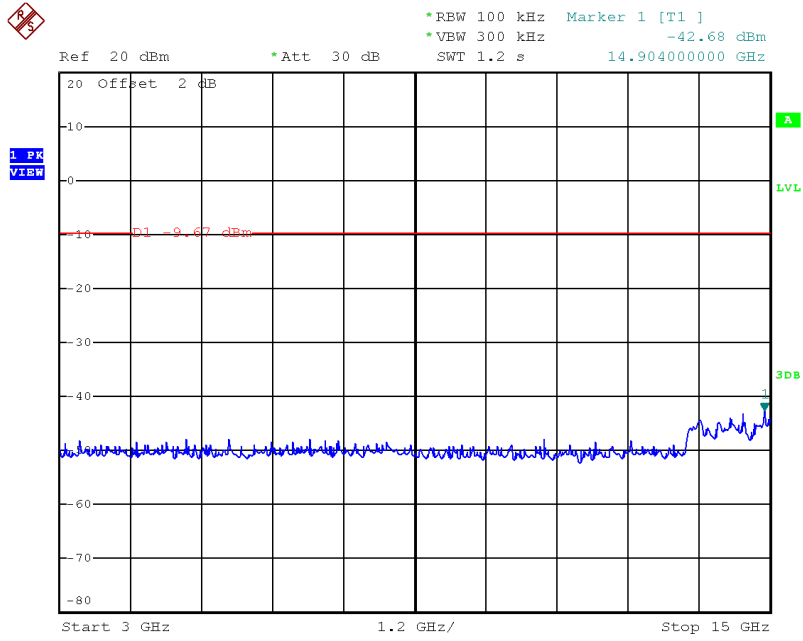
Date: 3.JUL.2017 15:30:29

CH19 (10 Harmonic of the frequency) 1



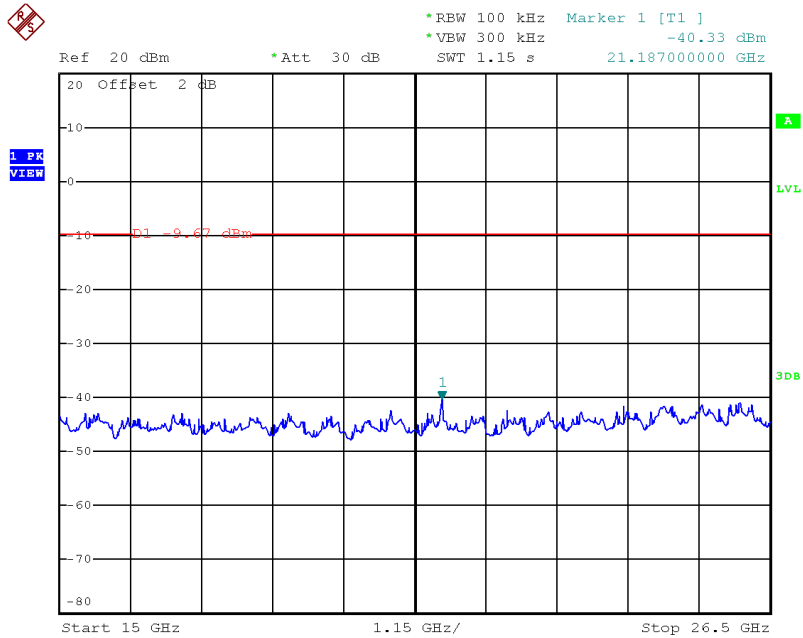
Date: 3.JUL.2017 15:31:28

CH19 (10 Harmonic of the frequency) 2



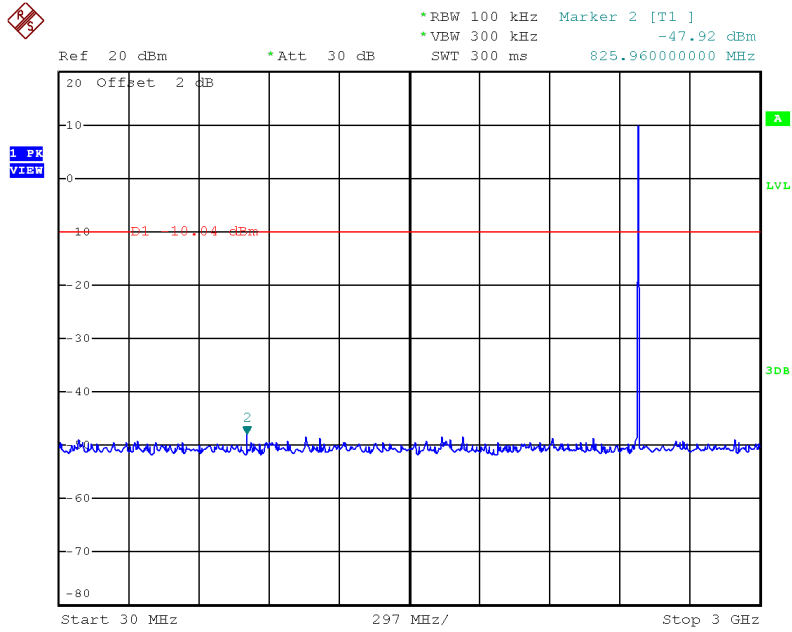
Date: 3.JUL.2017 15:31:34

CH19 (10 Harmonic of the frequency) 3



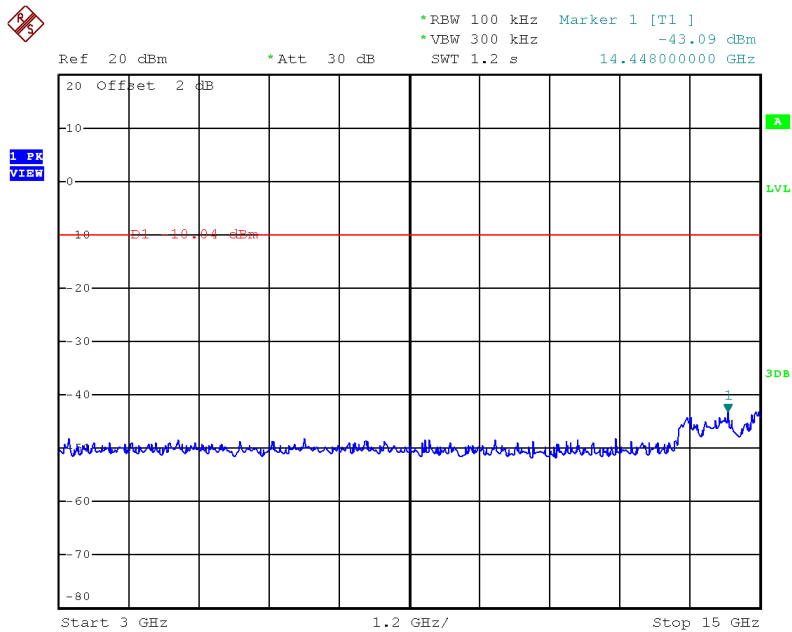
Date: 3.JUL.2017 15:31:41

CH39 (10 Harmonic of the frequency) 1



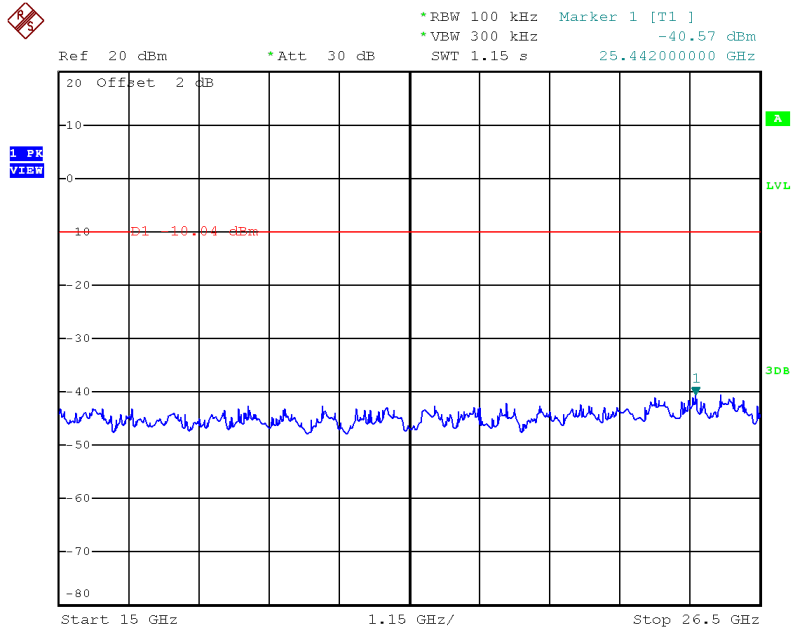
Date: 3.JUL.2017 15:32:53

CH39 (10 Harmonic of the frequency) 2



Date: 3.JUL.2017 15:32:59

CH39 (10 Harmonic of the frequency) 3

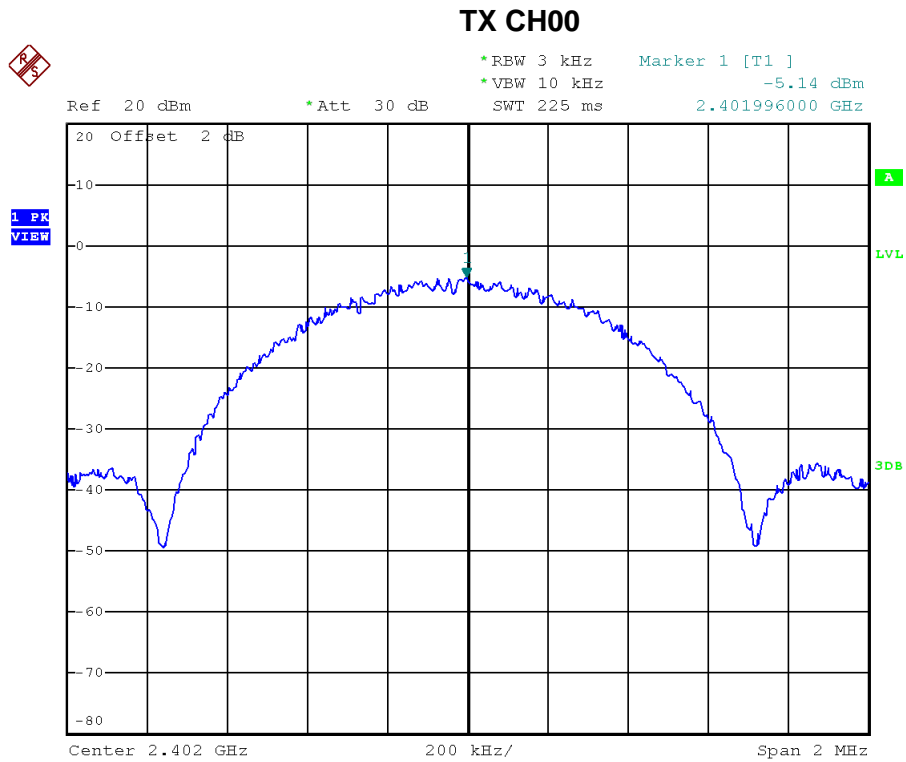


Date: 3.JUL.2017 15:33:06

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

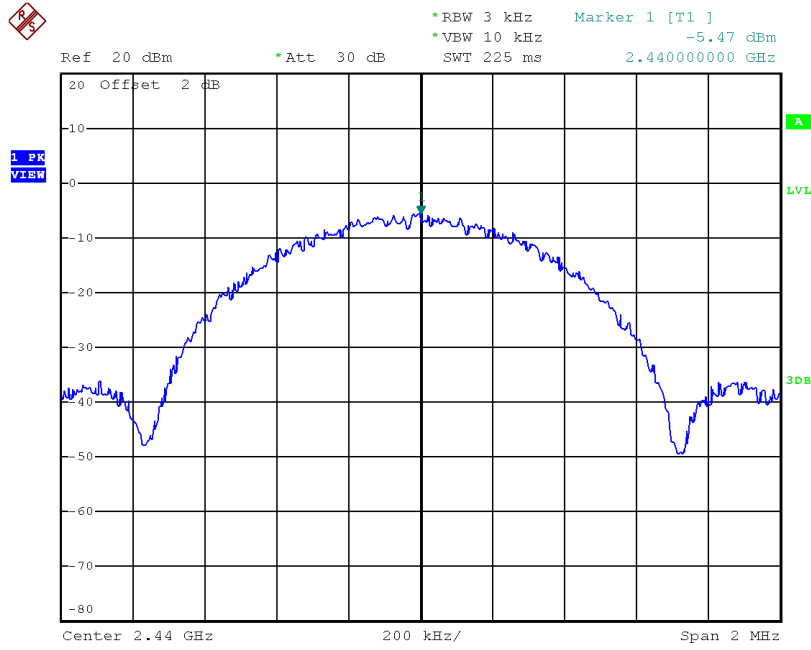
Test Mode: CH00, CH19 , CH39 - 1Mbps

Frequency (MHz)	Power Density (dBm/3kHz)	Power Density (mW/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-5.14	0.306	8.00	Pass
2440	-5.47	0.284	8.00	Pass
2480	-5.64	0.273	8.00	Pass



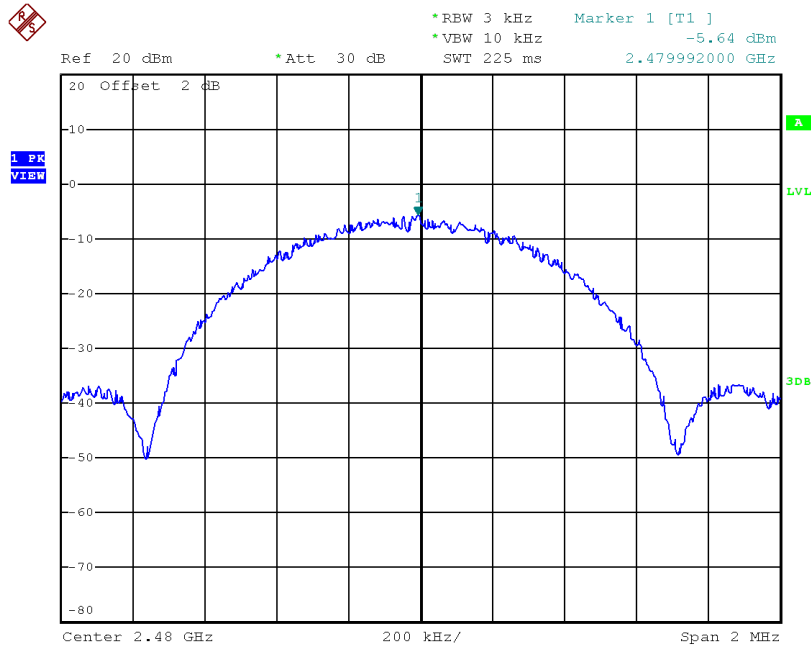
Date: 3.JUL.2017 15:30:34

TX CH19



Date: 3.JUL.2017 15:31:46

TX CH39



Date: 3.JUL.2017 15:33:11