FCC&IC Radio Test Report

FCC ID: Q3N-2564

IC: 5121A-2564

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

Project No.	:	1612074
Equipment	:	BT Scanner
Test Model	:	2564
Series Model	:	N/A
Applicant	:	CIPHERLAB CO., LTD.
Address	:	12F, 333, Dunhua S. Rd., Sec. 2, Taipei, Taiwan

Date of Receipt	:	Jan. 13, 2017
Date of Test	:	Jan. 13, 2017 ~ Feb. 02, 2017
Issued Date	:	Feb. 09, 2017
Tested by	:	BTL Inc.

Testing Engineer : Rush Kao
(Rush Kao)

Technical Manager : Jeff Yang
(Jeff Yang)

Authorized Signatory :
(Andy Chiu)

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

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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-FICP-2-1612074	Original Issue.	Feb. 09, 2017

1. CERTIFICATION

Equipment	:	BT Scanner
Brand Name	:	CIPHERLAB
Test Model	:	2564
Series Model	:	N/A
Applicant	:	CIPHERLAB CO., LTD.
Manufacturer	:	CIPHERLAB CO., LTD.
Address	:	12F, 333, Dunhua S. Rd., Sec. 2, Taipei, Taiwan
Factory Address	:	CIPHERLAB CO., LTD. 2nd 7 F., No. 198 and 7F., No. 196, Sec. 3, Da Tong Rd., Shiji Dist., New Taipei City 221, Taiwan.
Date of Test	:	Jan. 13, 2017 ~ Feb. 02, 2017
Test Sample	:	Engineering Sample
Standard(s)	:	FCC Part15, Subpart C (15.247) / ANSI C63.10-2013 RSS-247 Issue 1, May 2015 RSS-GEN Issue 4, Nov 2014

The above equipment has been tested and found in 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-FICP-2-1612074) 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 Canada RSS-247 Issue 1, May 2015, RSS-GEN Issue 4, Nov				
Standard(s) Section		Test Item	Judgment	Remark
FCC	IC			
15.207	RSS-247 8.8	Conducted Emission	PASS	
15.247(d)	RSS-247 5.5	Antenna conducted Spurious Emission	PASS	
15.247(a)(2)	RSS-247 5.2 (1)	6dB Bandwidth	PASS	
15.247(b)(3)	RSS-247 5.4 (4)	Peak Output Power	PASS	
15.247(e)	RSS-247 5.2 (2)	Power Spectral Density	PASS	
15.203	-	Antenna Requirement	PASS	
15.247(d)/ 15.205/ 15.209	RSS-247 5.5	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:

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:965108; FCC DN:TW1082)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Below 1 GHz):

CB15: (FCC RN:674415; FCC DN:TW0659)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Above 1 GHz):

CB15: (FCC RN:674415; FCC DN:TW0659)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

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 ± 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 emission test:

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	3.06

B. Radiated emission test:

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (3m)	CISPR	9kHz ~ 150kHz	2.96
		150kHz ~ 30MHz	2.74

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	30MHz ~ 200MHz	V	4.76
		30MHz ~ 200MHz	H	4.28
		200MHz ~ 1,000MHz	V	5.08
		200MHz ~ 1,000MHz	H	4.50

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	1GHz ~ 6GHz	V	4.48
		1GHz ~ 6GHz	H	4.50
		6GHz ~ 18GHz	V	4.30
		6GHz ~ 18GHz	H	4.14

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (1m)	CISPR	18 ~ 26.5 GHz	4.72
		26.5 ~ 40 GHz	5.20

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above.
These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz: 3.6 dB
Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz: 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.
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	BT Scanner	
Brand Name	CIPHERLAB	
Test Model	2564	
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.)	5.79 dBm (1Mbps)
Power Source	Battery supplied.(Li-ion Battery Pack: BA-010800)	
Power Rating	3.7V ⎓ 800 mAh 2.96Wh	

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	QuieTek	2560MB_20150830A	Printed	N/A	3.54

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	Final Test Mode
Mode 1	Mode 1

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode **NOTE (1)**

Note:

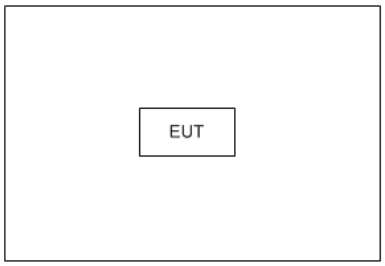
(1) The measurements are performed at the high, middle, low available channels.

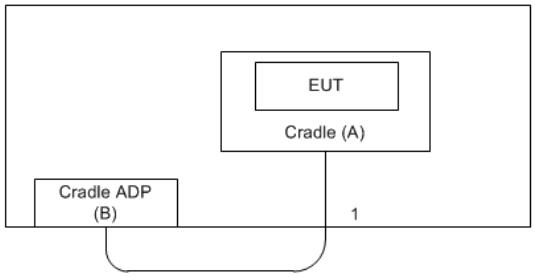
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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	SCAN PAPER		
Frequency (MHz)	2402	2440	2480
BT LE	DEF	DEF	DEF

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.	Note
A	Bluetooth Scanner Cradle	CIPHER LAB	2560 BT BASE	N/A	BSFDV00001054	
B	Cradle Adapter	I.T.E	AU1100506U	DOC	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
1	Yes	No	1m	Power 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	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

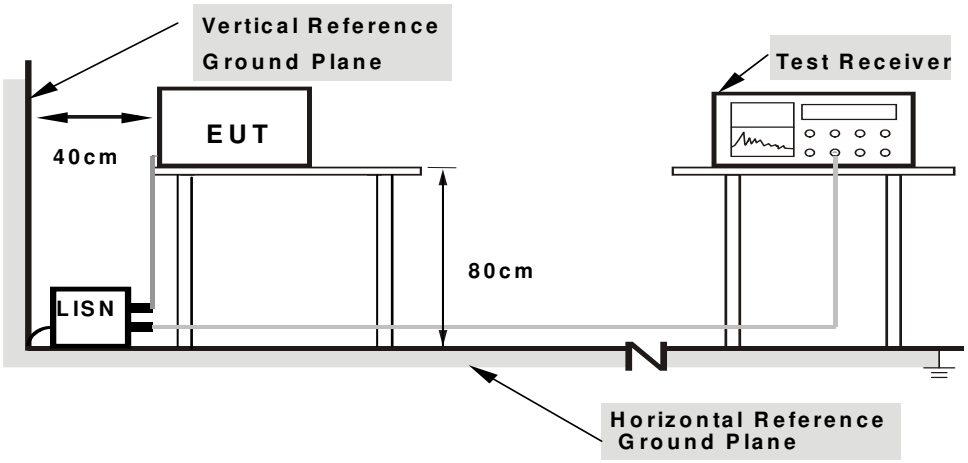
4.1.2 TEST PROCEDURE

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: 25°C Relative Humidity: 55% 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) and RSS-247 5.5, then the 15.209(a) and RSS-Gen 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 and RSS-247.

(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

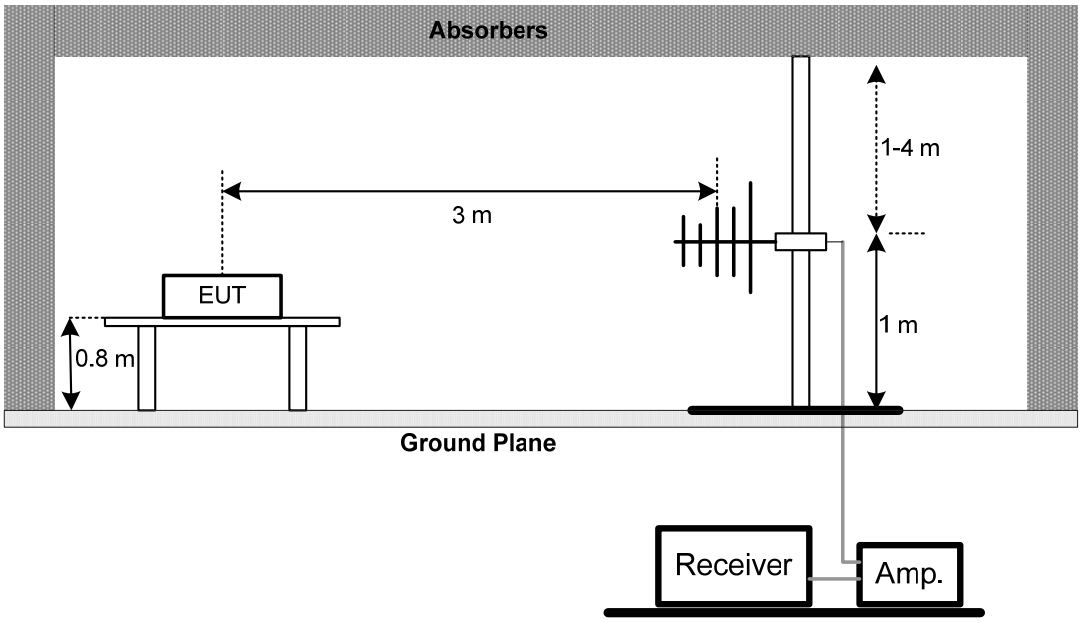
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance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

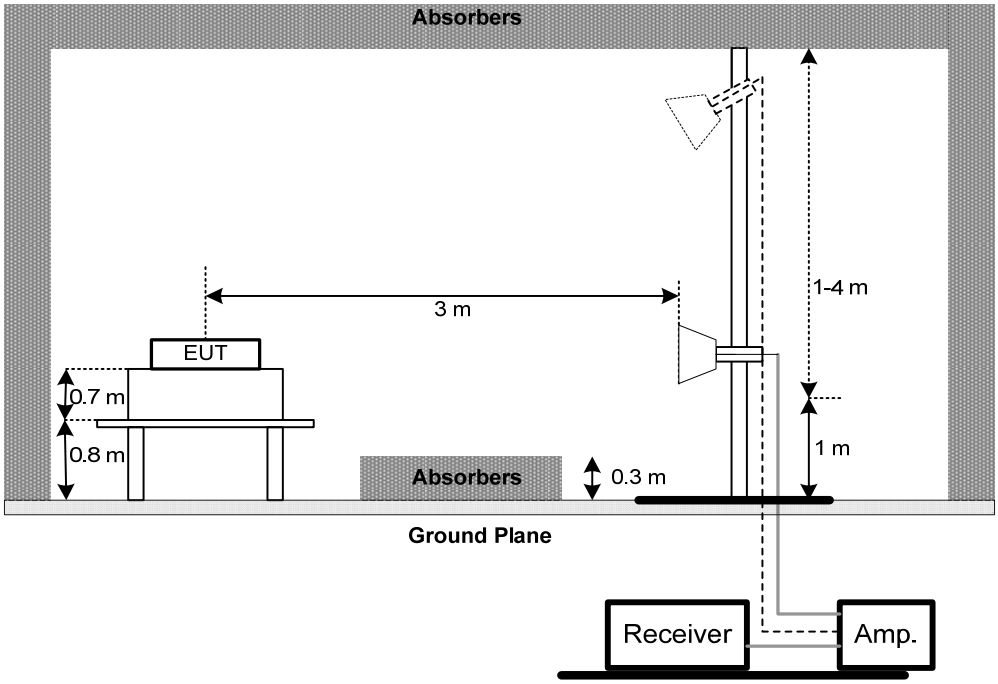
No deviation

4.2.4 TEST SETUP

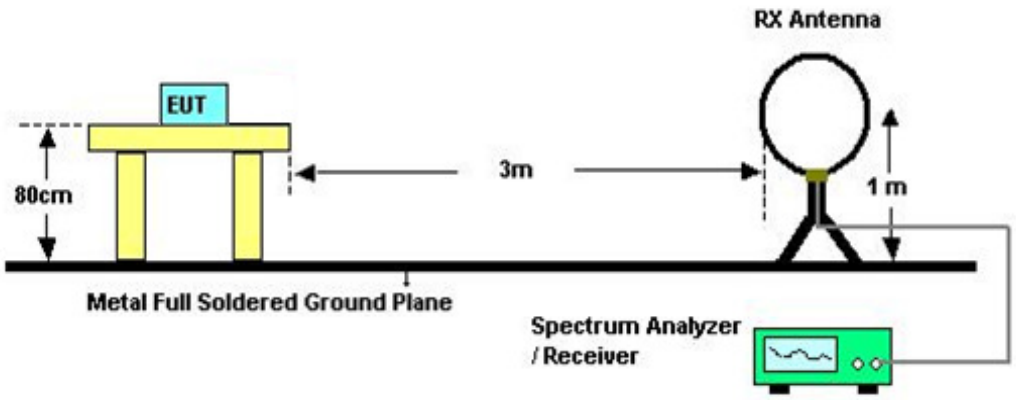
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(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: DC 3.7V

4.2.7TEST RESULTS (9KHZ TO 30MHZ)

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 (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8TEST RESULTS (30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

4.2.9TEST 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 / RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2) RSS-GEN section 6.6 RSS-247 5.2 (1)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

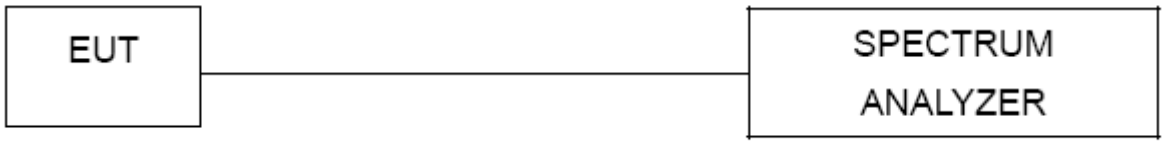
5.1.1 TEST PROCEDURE

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

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

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

5.1.5 EUT TEST CONDITIONS

Temperature: 24°C Relative Humidity: 60% Test Voltage: DC 3.7V

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 / RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3) RSS-247 5.4 (4)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

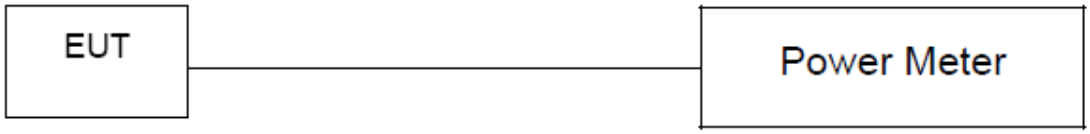
6.1.1 TEST PROCEDURE

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: DC 3.7V

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.

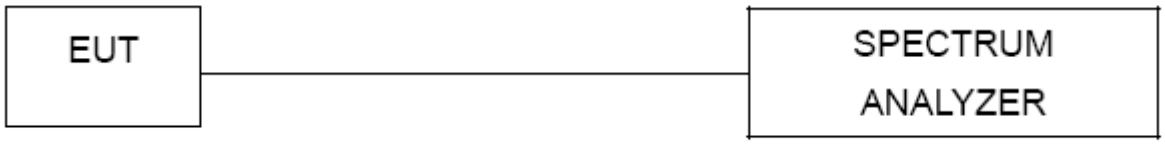
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.
c. Offset=antenna gain+cable loss

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

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

7.1.5 EUT OPERATION CONDITIONS

Temperature: 24°C Relative Humidity: 60% Test Voltage: DC 3.7V

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 / RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e) RSS-247 5.2 (2)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

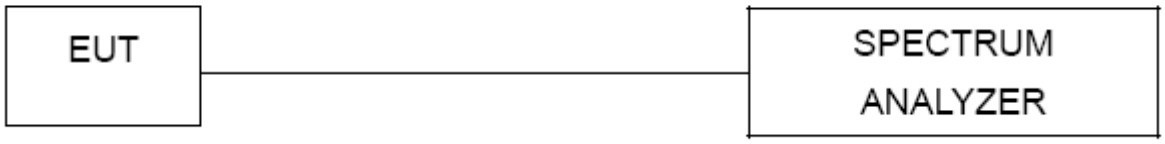
8.1.1 TEST PROCEDURE

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: DC 3.7V

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	LISN	EMCO	3816/2	0052765	Mar. 27, 2017
2	LISN	R&S	ENV216	101447	Mar. 27, 2017
3	Test Cable	emci	RG223(9KHz-30 MHz)	C_17	Mar. 10, 2017
4	EMI Test Receiver	R&S	ESCI	100382	Mar. 27, 2017
5	50Ω Terminator	SHX	TF2-3G-A	08122901	Mar. 27, 2017
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	Preamplifier	EMCI	012645B	980267	Mar. 01, 2017
2	Preamplifier	EMCI	EMC02325	980217	Dec. 29, 2017
3	Test Cable	EMCI	EMC104-SM-SM-8000	8m	Jan. 04, 2018
4	Test Cable	EMCI	EMC104-SM-SM-800	150207	Jan. 04, 2018
5	Test Cable	EMCI	EEMC104-SM-SM-3000	151205	Jan. 04, 2018
6	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018
7	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 23, 2017
8	Loop Ant	EMCO	6502	42960	Nov. 24, 2017
9	Horm Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Mar. 01, 2017
10	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018
11	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018
12	Horm Ant	SCHWARZBECK	BBHA 9170	187	May 12,2017

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 26, 2017

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
3	Power Meter	Anritsu	ML2495A	1128008	Aug. 17, 2017
4	Power Sensor	Anritsu	MA2411B	1126001	Aug. 17, 2017

Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 26, 2017

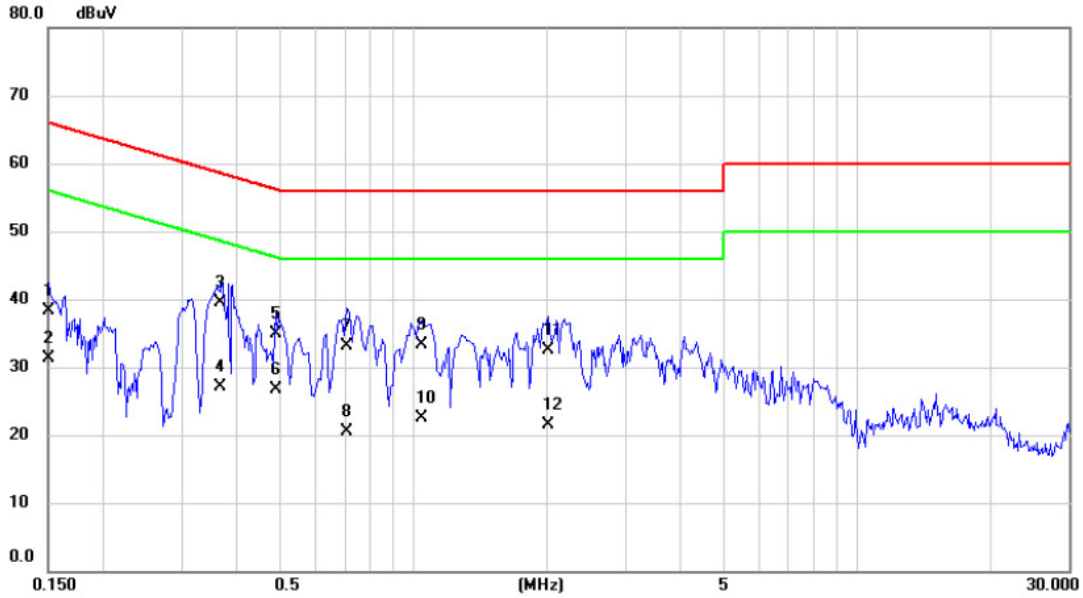
Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 26, 2017

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

ATTACHMENT A - CONDUCTED EMISSION

Test Mode:	TX Mode

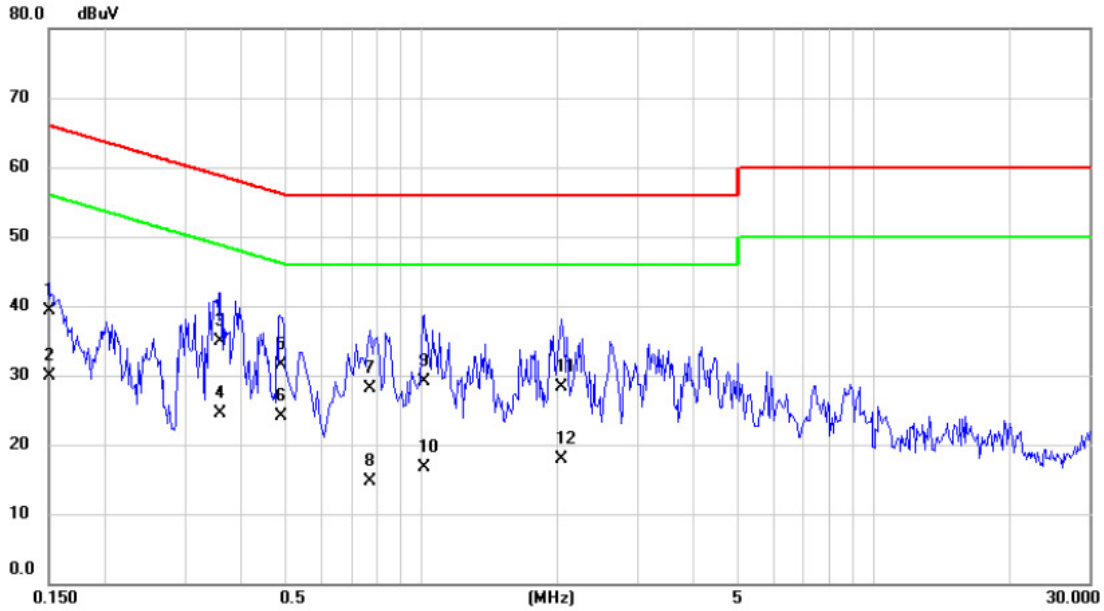
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	28.60	9.76	38.36	66.00	-27.64	QP	
2		0.1500	21.50	9.76	31.26	56.00	-24.74	AVG	
3	*	0.3677	29.80	9.74	39.54	58.55	-19.01	QP	
4		0.3677	17.30	9.74	27.04	48.55	-21.51	AVG	
5		0.4888	25.10	9.75	34.85	56.19	-21.34	QP	
6		0.4888	17.00	9.75	26.75	46.19	-19.44	AVG	
7		0.7070	23.30	9.75	33.05	56.00	-22.95	QP	
8		0.7070	10.80	9.75	20.55	46.00	-25.45	AVG	
9		1.0400	23.50	9.75	33.25	56.00	-22.75	QP	
10		1.0400	12.70	9.75	22.45	46.00	-23.55	AVG	
11		2.0120	22.60	9.82	32.42	56.00	-23.58	QP	
12		2.0120	11.70	9.82	21.52	46.00	-24.48	AVG	

Test Mode:	TX Mode

Neutral

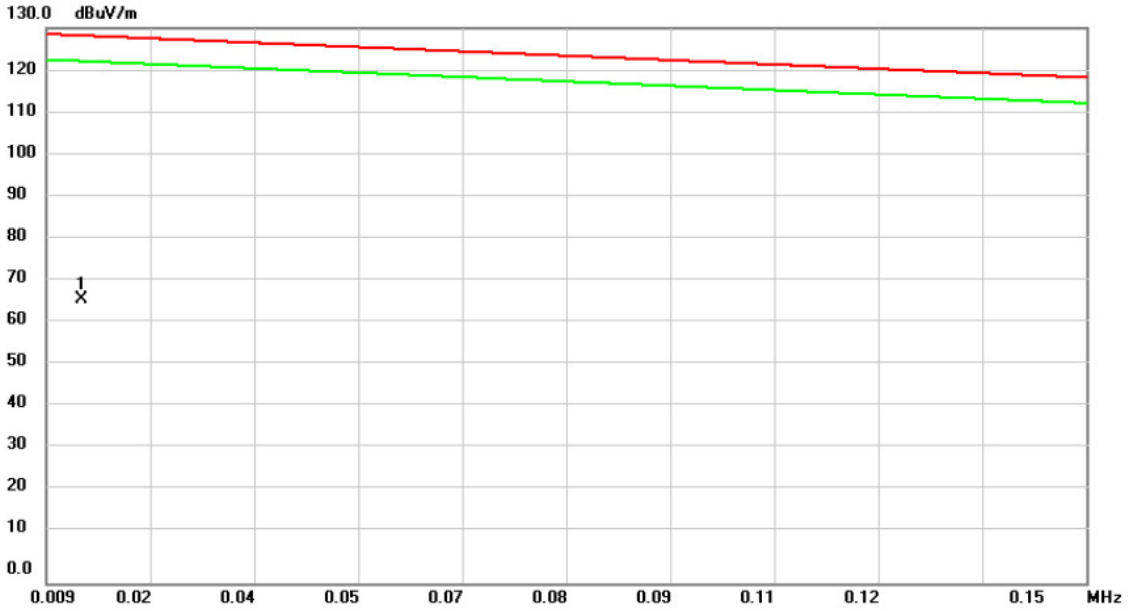


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	29.70	9.68	39.38	66.00	-26.62	QP	
2		0.1500	20.30	9.68	29.98	56.00	-26.02	AVG	
3		0.3593	25.20	9.68	34.88	58.74	-23.86	QP	
4		0.3593	14.90	9.68	24.58	48.74	-24.16	AVG	
5		0.4881	21.80	9.69	31.49	56.20	-24.71	QP	
6	*	0.4881	14.50	9.69	24.19	46.20	-22.01	AVG	
7		0.7700	18.50	9.70	28.20	56.00	-27.80	QP	
8		0.7700	5.10	9.70	14.80	46.00	-31.20	AVG	
9		1.0130	19.50	9.70	29.20	56.00	-26.80	QP	
10		1.0130	7.10	9.70	16.80	46.00	-29.20	AVG	
11		2.0390	18.60	9.76	28.36	56.00	-27.64	QP	
12		2.0390	8.10	9.76	17.86	46.00	-28.14	AVG	

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

Test Mode:	TX Mode_ NORMAL OPERATION

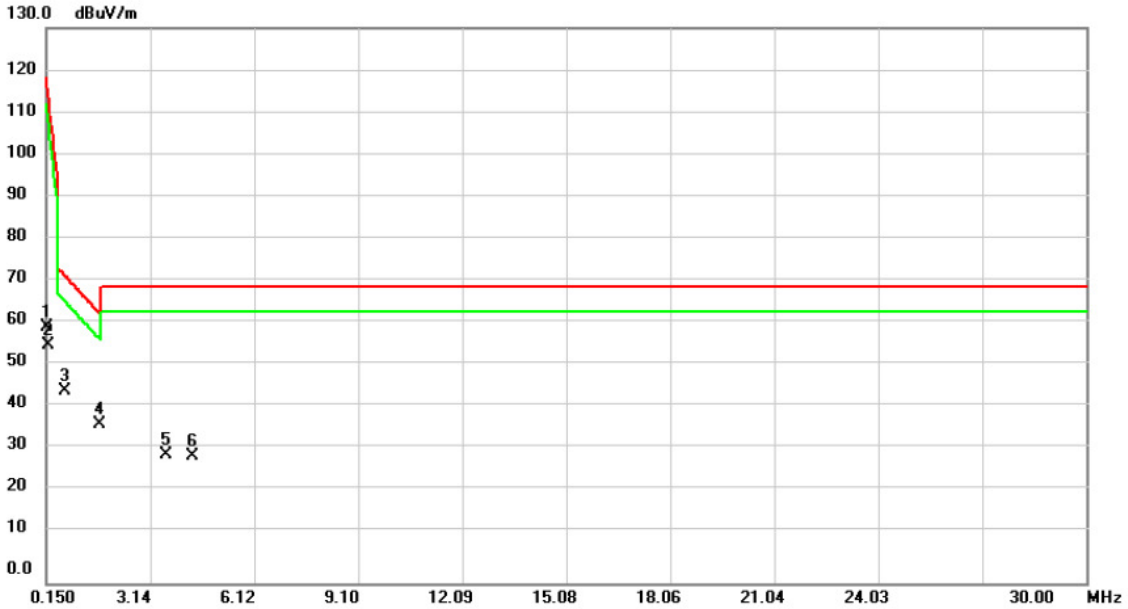
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0137	47.07	19.48	66.55	128.18	-61.63	peak	

Test Mode:	TX Mode_ NORMAL OPERATION

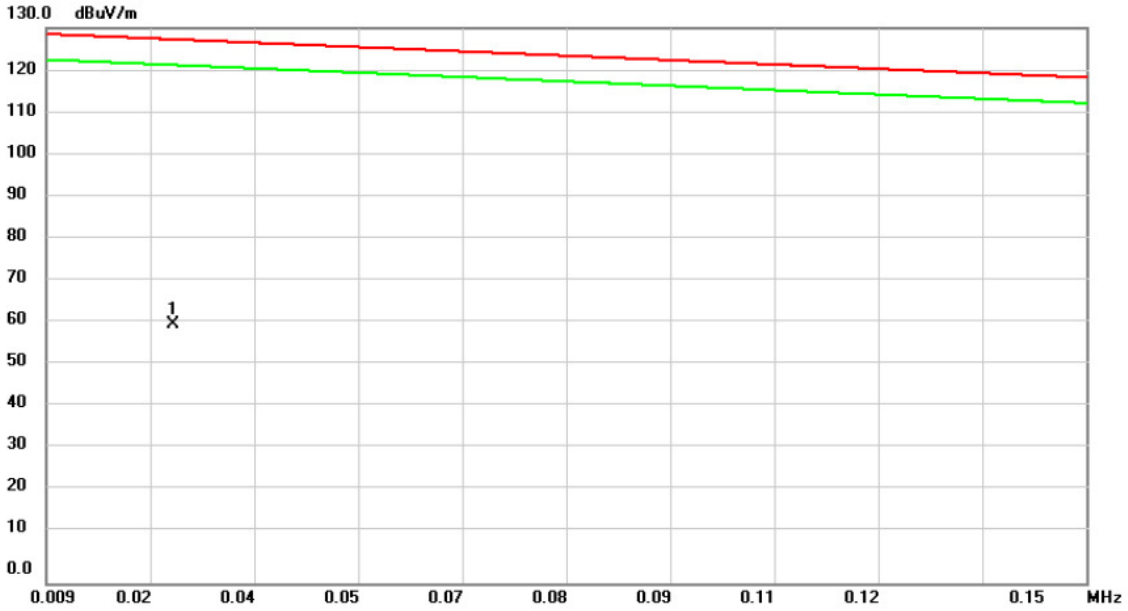
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.1500	47.93	12.03	59.96	118.34	-58.38	peak	
2		0.2096	43.96	11.94	55.90	114.04	-58.14	peak	
3		0.6873	33.26	11.87	45.13	72.04	-26.91	peak	
4	*	1.7020	25.41	11.68	37.09	63.00	-25.91	peak	
5		3.5825	18.91	11.19	30.10	69.54	-39.44	peak	
6		4.3290	18.38	11.30	29.68	69.54	-39.86	peak	

Test Mode:	TX Mode_ NORMAL OPERATION

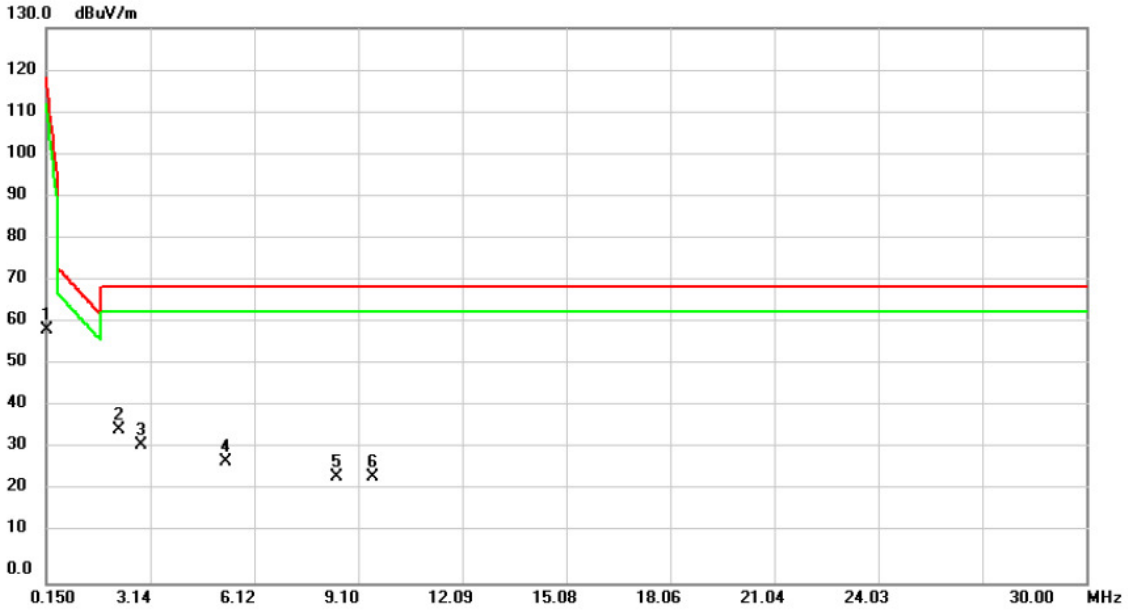
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0262	44.44	16.04	60.48	127.28	-66.80	peak	

Test Mode:	TX Mode_ NORMAL OPERATION

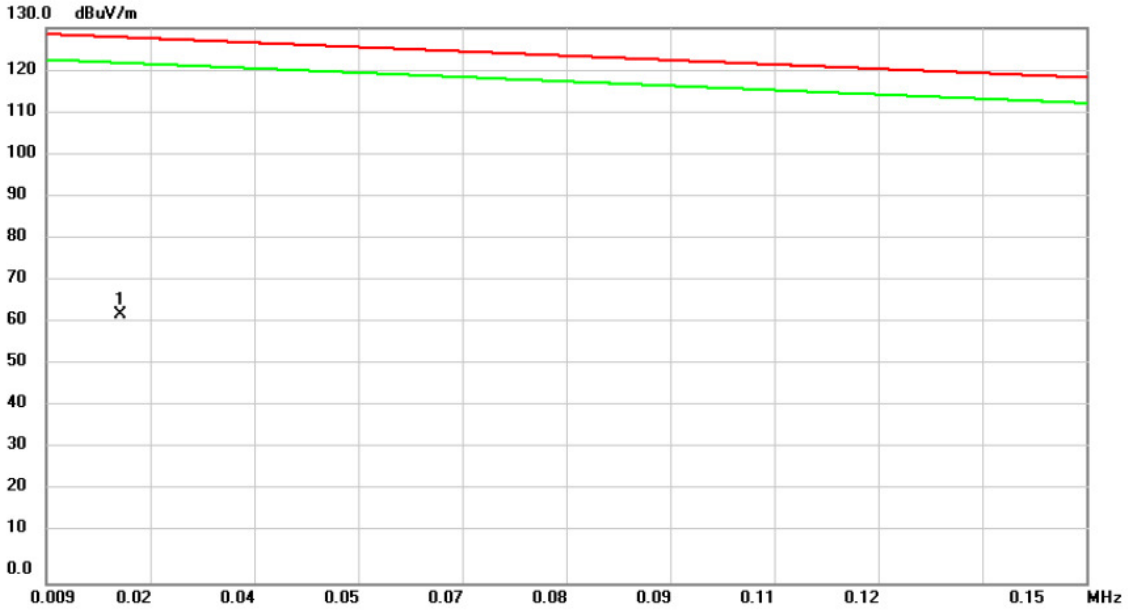
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.1500	47.16	12.03	59.19	118.34	-59.15	peak	
2	*	2.2395	24.62	11.44	36.06	69.54	-33.48	peak	
3		2.8664	21.25	11.16	32.41	69.54	-37.13	peak	
4		5.2842	16.97	11.39	28.36	69.54	-41.18	peak	
5		8.4780	13.54	11.33	24.87	69.54	-44.67	peak	
6		9.5228	13.44	11.31	24.75	69.54	-44.79	peak	

Test Mode:	TX Mode_ CHARGE

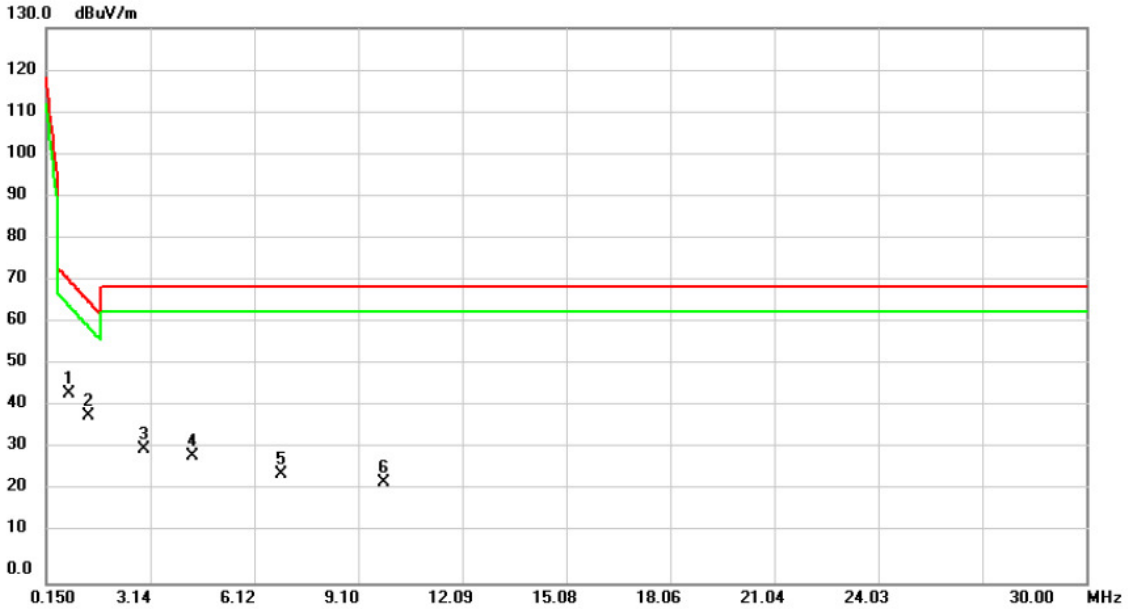
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0190	44.79	18.02	62.81	127.80	-64.99	peak	

Test Mode:	TX Mode_ CHARGE

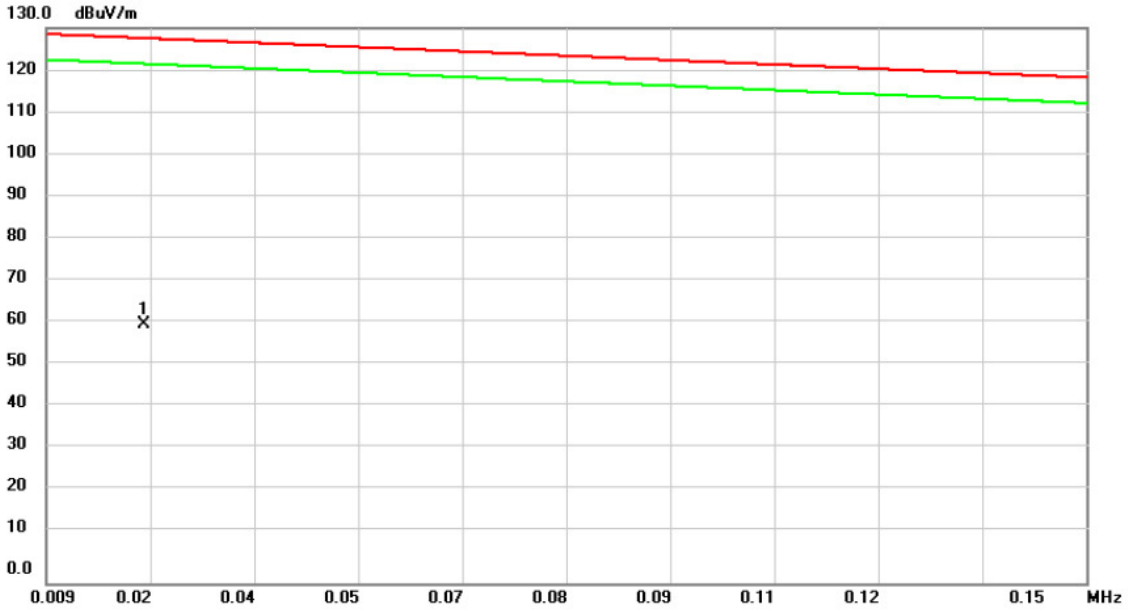
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.8064	32.31	11.92	44.23	70.98	-26.75	peak	
2		1.3440	27.36	11.85	39.21	66.19	-26.98	peak	
3		2.9560	20.15	11.12	31.27	69.54	-38.27	peak	
4		4.3290	18.38	11.30	29.68	69.54	-39.86	peak	
5		6.8960	14.14	11.36	25.50	69.54	-44.04	peak	
6		9.8513	12.20	11.30	23.50	69.54	-46.04	peak	

Test Mode:	TX Mode_ CHARGE

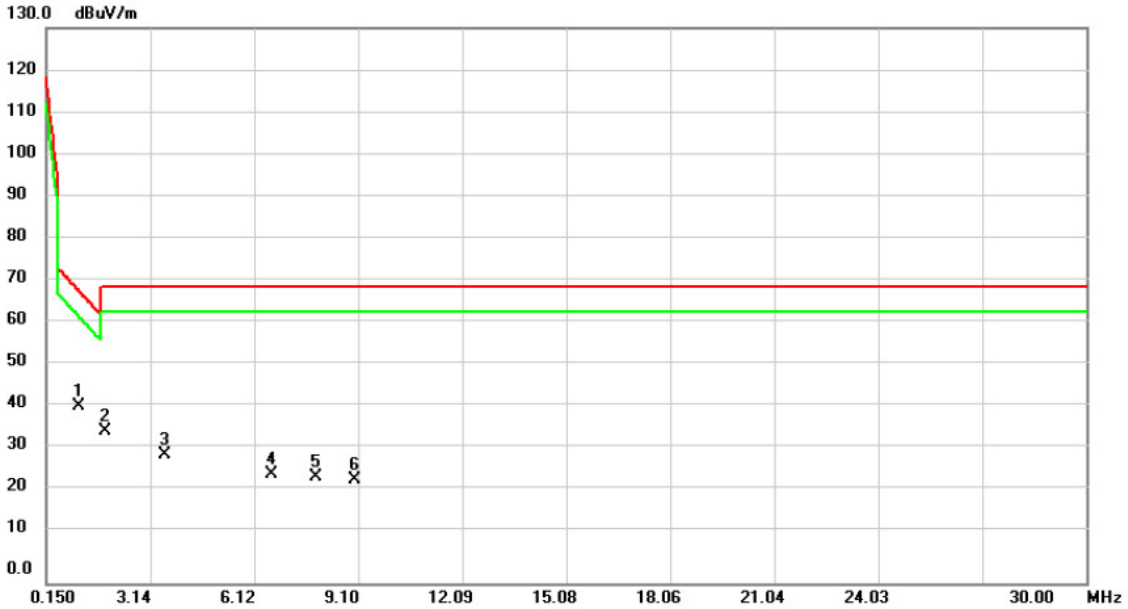
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0223	43.54	17.12	60.66	127.56	-66.90	peak	

Test Mode:	TX Mode_ CHARGE

Ant 90°

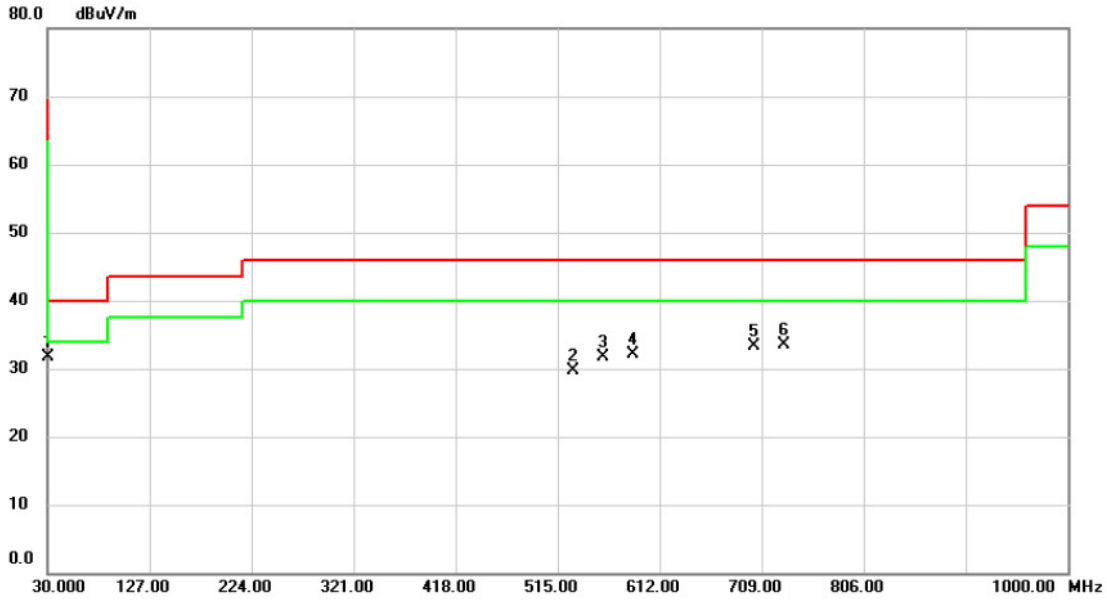


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	1.1050	29.36	11.95	41.31	68.32	-27.01	peak	
2		1.8216	24.07	11.63	35.70	69.54	-33.84	peak	
3		3.5530	18.85	11.18	30.03	69.54	-39.51	peak	
4		6.6272	14.15	11.37	25.52	69.54	-44.02	peak	
5		7.8810	13.41	11.34	24.75	69.54	-44.79	peak	
6		9.0152	12.79	11.32	24.11	69.54	-45.43	peak	

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

Test Mode:	TX Mode_ NORMAL OPERATION

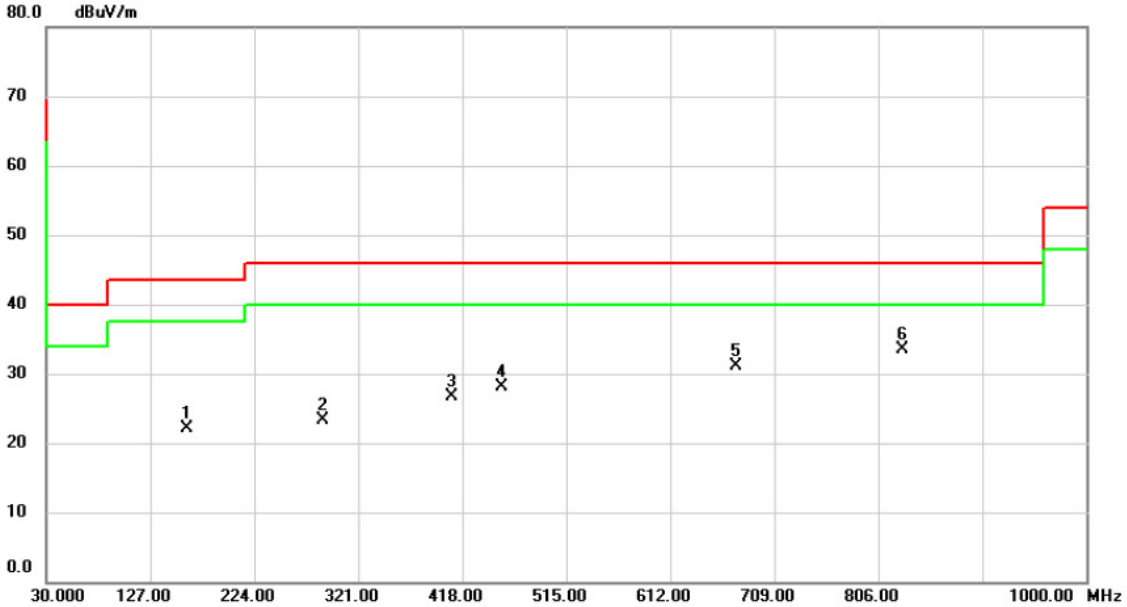
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	30.9700	40.74	-9.03	31.71	40.00	-8.29	peak	
2		529.5500	32.08	-2.38	29.70	46.00	-16.30	peak	
3		558.6500	33.46	-1.69	31.77	46.00	-14.23	peak	
4		586.7800	33.08	-0.97	32.11	46.00	-13.89	peak	
5		701.2400	32.41	0.88	33.29	46.00	-12.71	peak	
6		730.3400	31.96	1.49	33.45	46.00	-12.55	peak	

Test Mode:	TX Mode_ NORMAL OPERATION

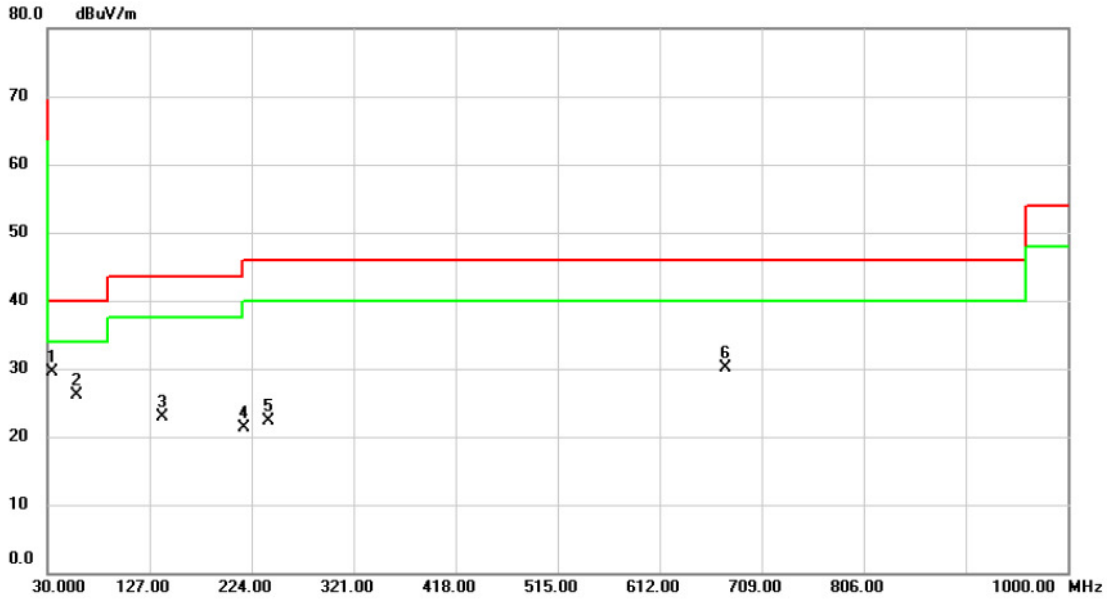
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		160.9500	30.91	-8.81	22.10	43.50	-21.40	peak	
2		288.0200	31.28	-7.97	23.31	46.00	-22.69	peak	
3		408.3000	31.81	-5.01	26.80	46.00	-19.20	peak	
4		454.8600	31.82	-3.78	28.04	46.00	-17.96	peak	
5		673.1100	30.73	0.28	31.01	46.00	-14.99	peak	
6	*	828.3100	30.64	2.81	33.45	46.00	-12.55	peak	

Test Mode:	TX Mode_ CHARGE

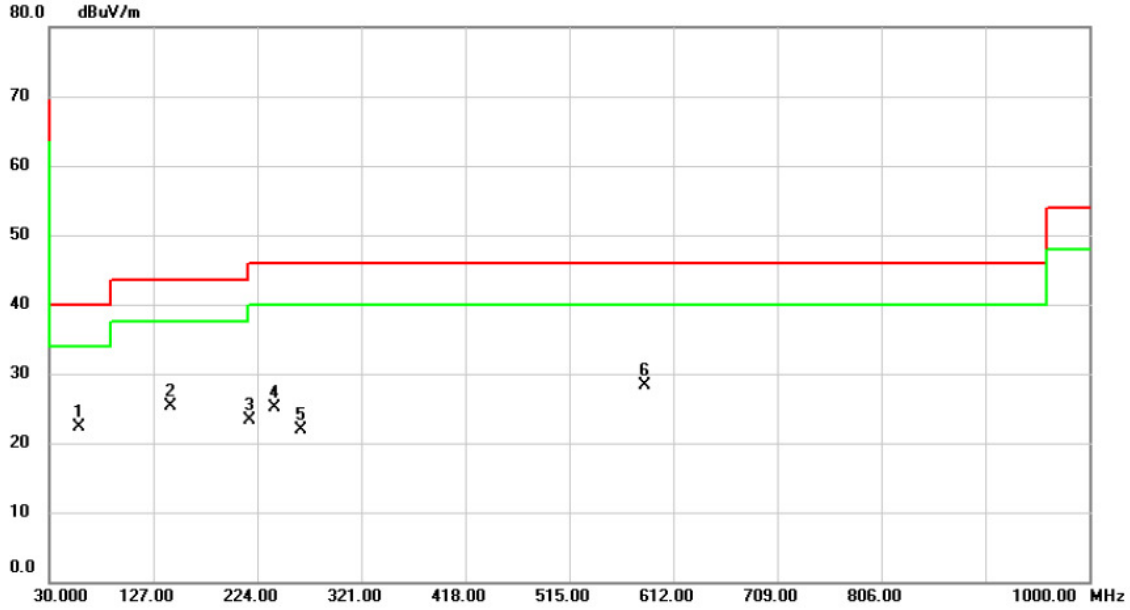
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	34.8500	38.61	-9.10	29.51	40.00	-10.49	peak	
2		58.1300	35.01	-8.89	26.12	40.00	-13.88	peak	
3		139.6100	31.85	-8.91	22.94	43.50	-20.56	peak	
4		216.2400	32.40	-11.13	21.27	46.00	-24.73	peak	
5		240.4900	32.07	-9.68	22.39	46.00	-23.61	peak	
6		674.0800	29.84	0.29	30.13	46.00	-15.87	peak	

Test Mode:	TX Mode_ CHARGE

Horizontal

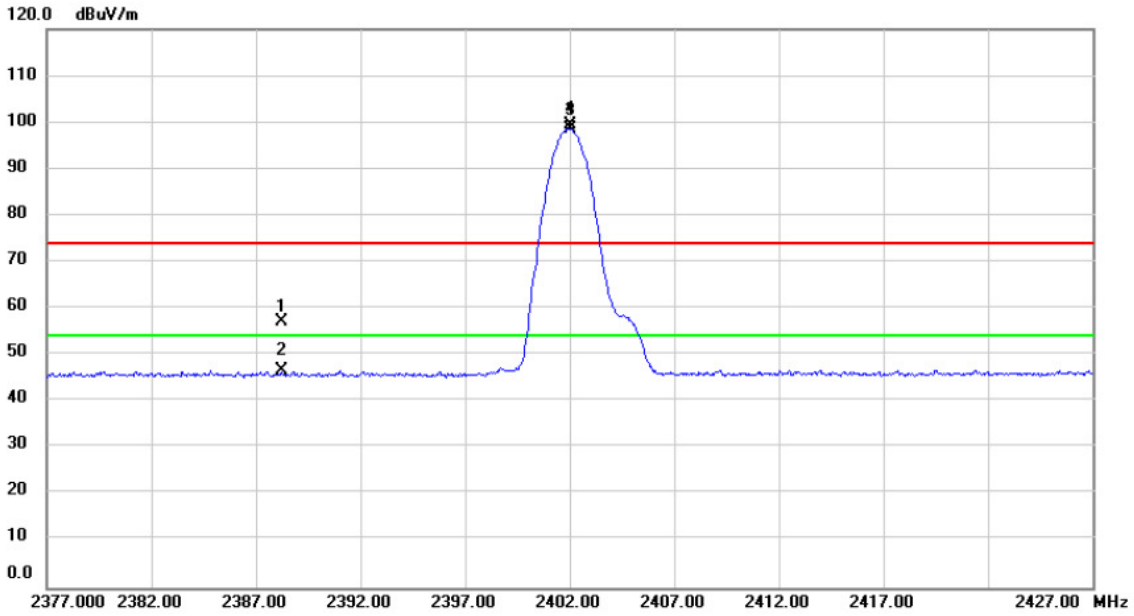


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	57.1600	31.19	-8.83	22.36	40.00	-17.64	peak	
2		142.5200	34.26	-8.89	25.37	43.50	-18.13	peak	
3		216.2400	34.52	-11.13	23.39	46.00	-22.61	peak	
4		240.4900	34.84	-9.68	25.16	46.00	-20.84	peak	
5		264.7400	30.86	-8.86	22.00	46.00	-24.00	peak	
6		584.8400	29.25	-1.01	28.24	46.00	-17.76	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode :	TX 2402MHz _CH00_1Mbps

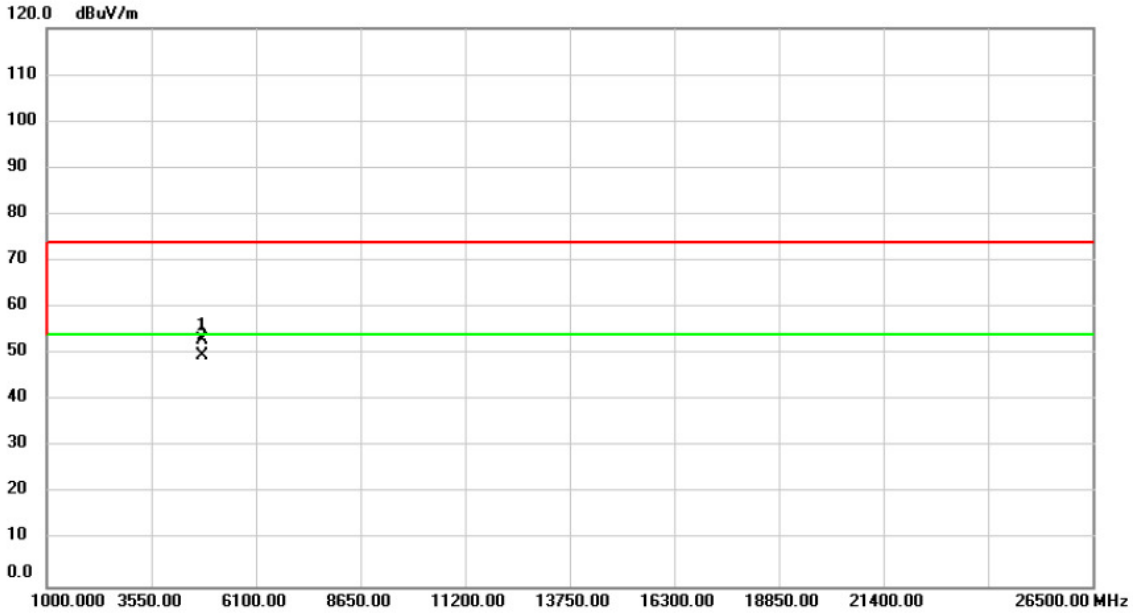
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2388.258	26.32	30.96	57.28	74.00	-16.72	peak	
2		2388.258	15.70	30.96	46.66	54.00	-7.34	AVG	
3	X	2402.000	68.40	31.01	99.41	74.00	25.41	peak	No Limit
4	*	2402.000	67.59	31.01	98.60	54.00	44.60	AVG	No Limit

Test Mode :	TX 2402MHz _CH00_1Mbps

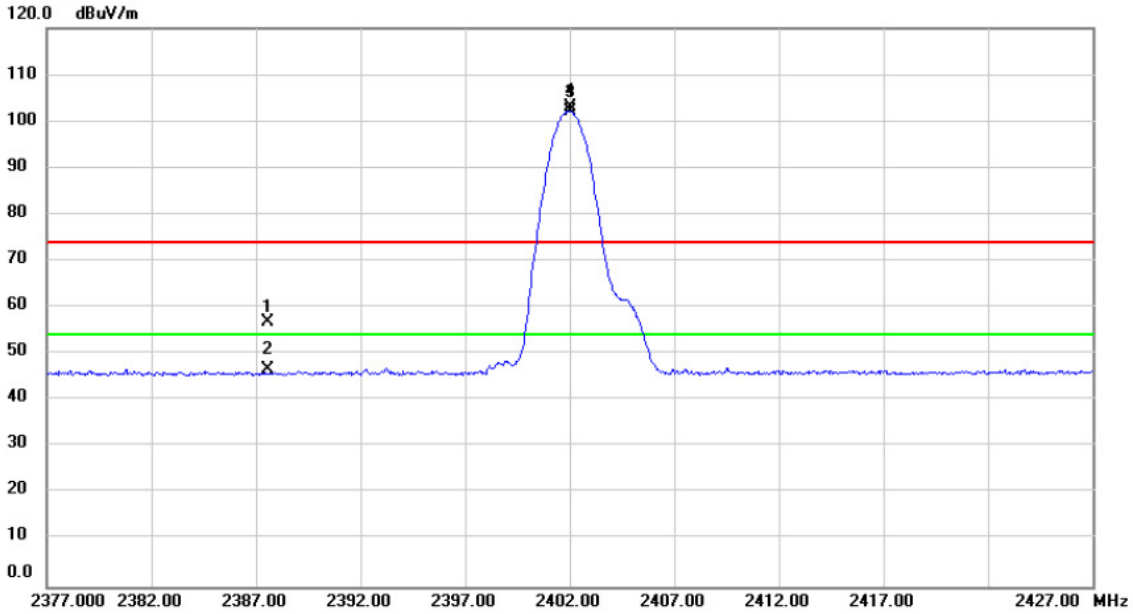
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	64.40	-11.50	52.90	74.00	-21.10	peak	
2	*	4804.000	61.05	-11.50	49.55	54.00	-4.45	AVG	

Test Mode :	TX 2402MHz _CH00_1Mbps

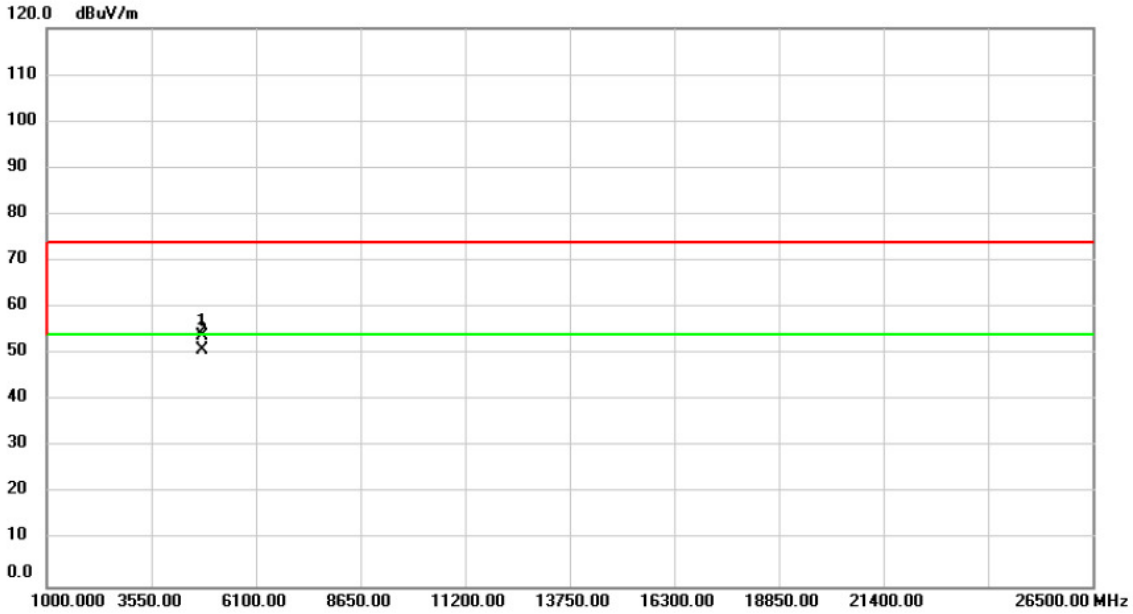
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2387.569	25.87	30.96	56.83	74.00	-17.17	peak	
2		2387.569	15.65	30.96	46.61	54.00	-7.39	AVG	
3	X	2402.000	71.95	31.01	102.96	74.00	28.96	peak	No Limit
4	*	2402.000	71.19	31.01	102.20	54.00	48.20	AVG	No Limit

Test Mode :	TX 2402MHz _CH00_1Mbps

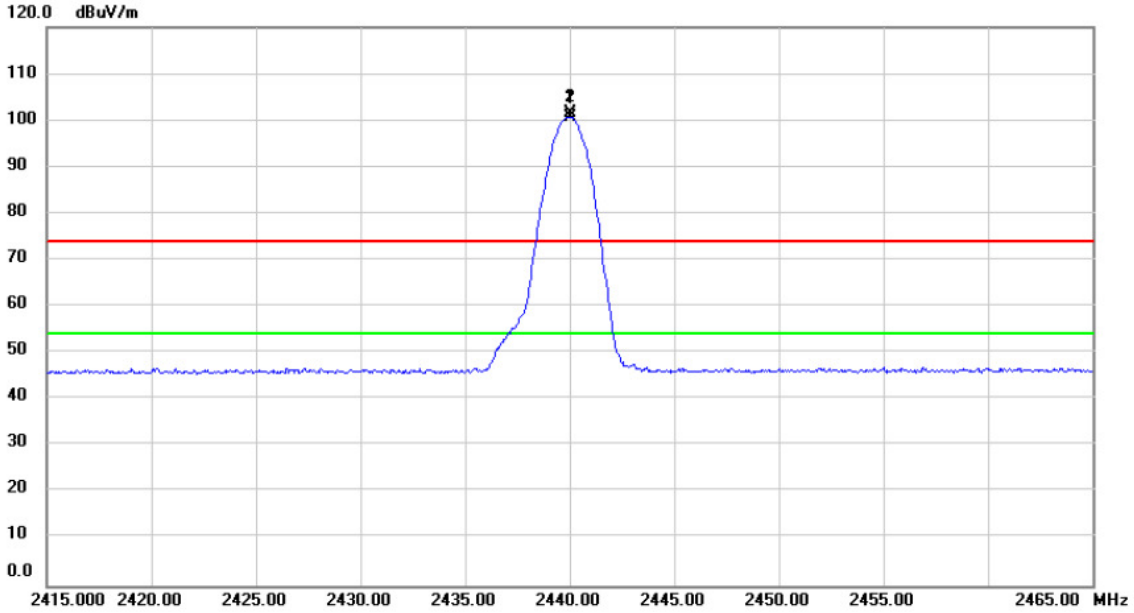
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	65.50	-11.50	54.00	74.00	-20.00	peak	
2	*	4804.000	62.32	-11.50	50.82	54.00	-3.18	AVG	

Test Mode :	TX 2440MHz _CH19_1Mbps

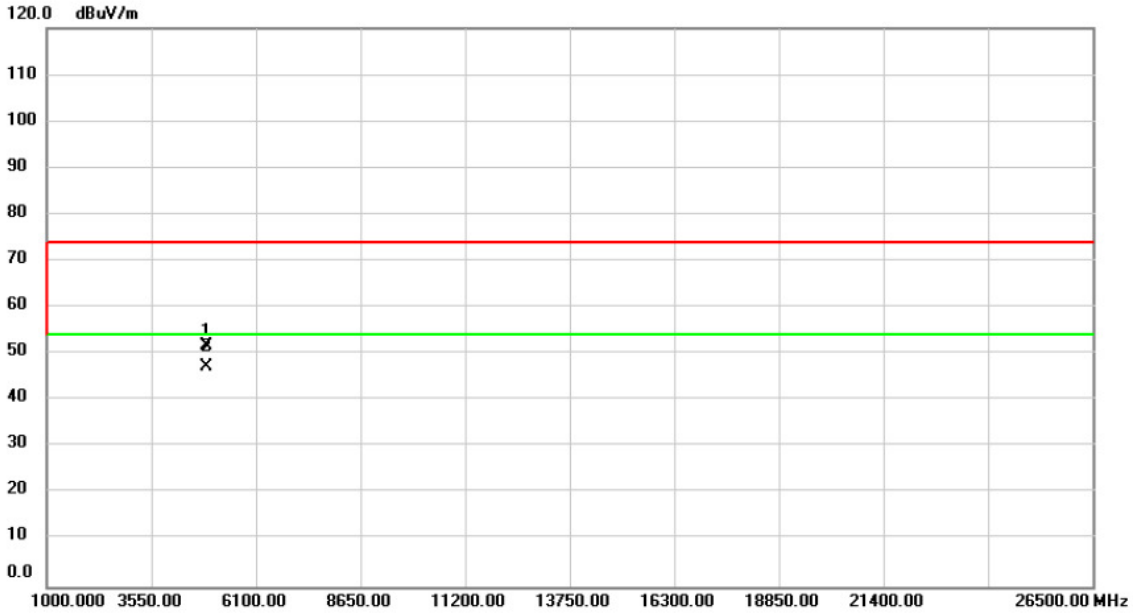
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	70.34	31.15	101.49	74.00	27.49	peak	No Limit
2	*	2440.000	69.63	31.15	100.78	54.00	46.78	AVG	No Limit

Test Mode :	TX 2440MHz _CH19_1Mbps

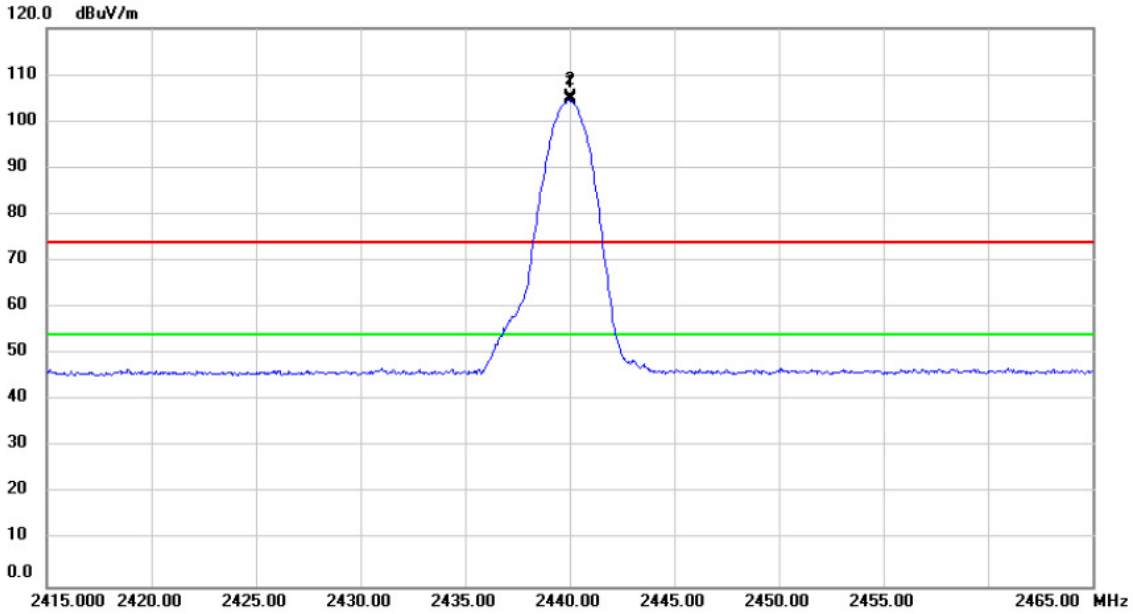
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	63.07	-11.38	51.69	74.00	-22.31	peak	
2	*	4880.000	58.67	-11.38	47.29	54.00	-6.71	AVG	

Test Mode :	TX 2440MHz _CH19_1Mbps

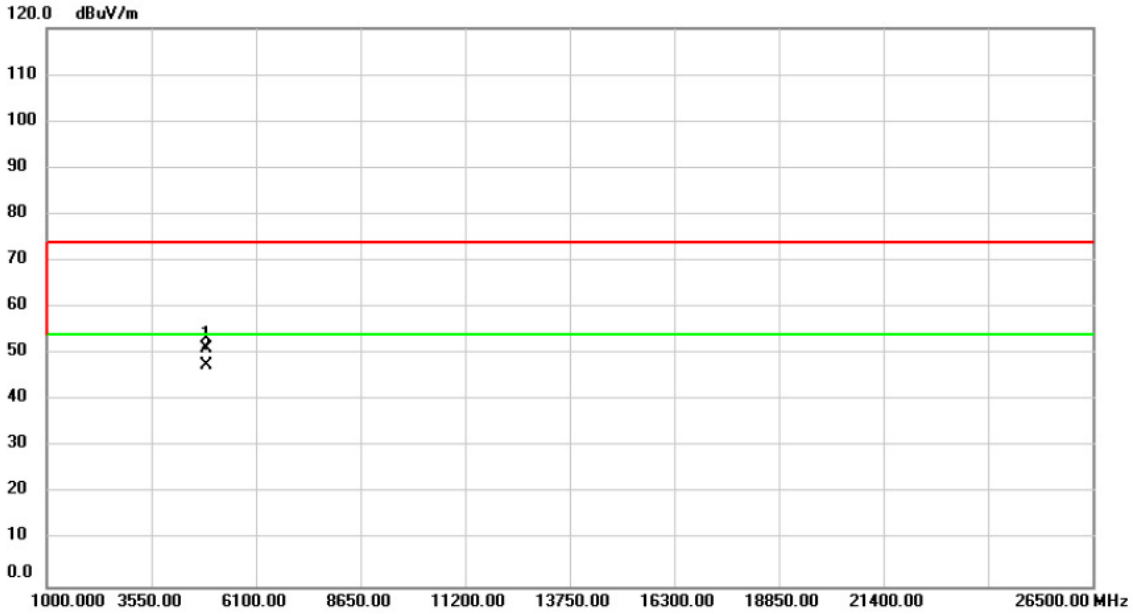
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	73.95	31.15	105.10	74.00	31.10	peak	No Limit
2	*	2440.000	73.29	31.15	104.44	54.00	50.44	AVG	No Limit

Test Mode :	TX 2440MHz _CH19_1Mbps

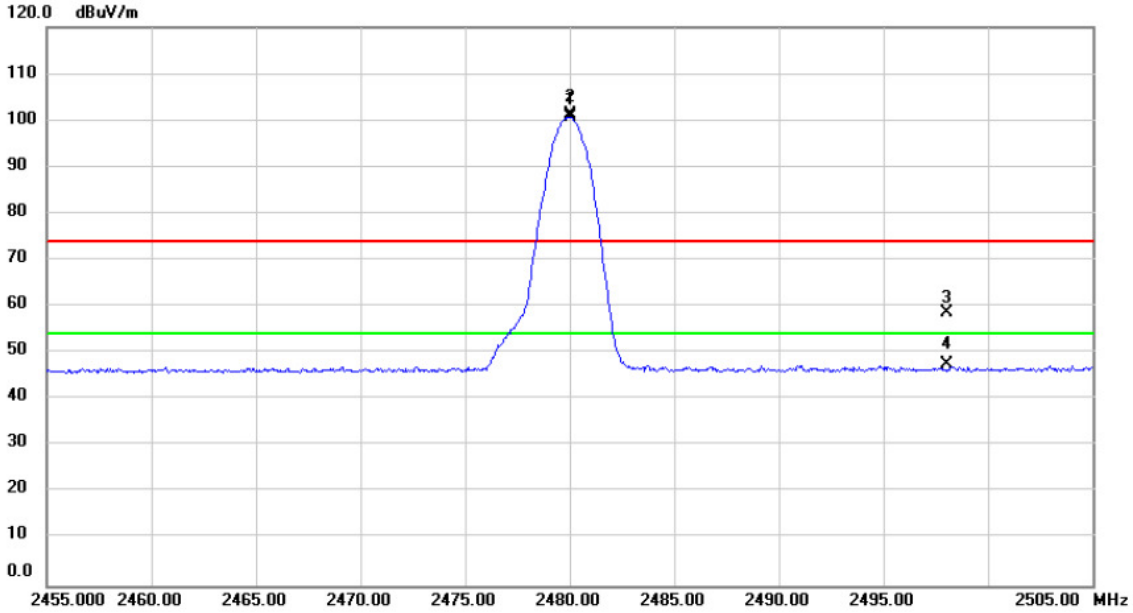
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	62.64	-11.38	51.26	74.00	-22.74	peak	
2	*	4880.000	58.83	-11.38	47.45	54.00	-6.55	AVG	

Test Mode :	TX 2480MHz _CH39_1Mbps

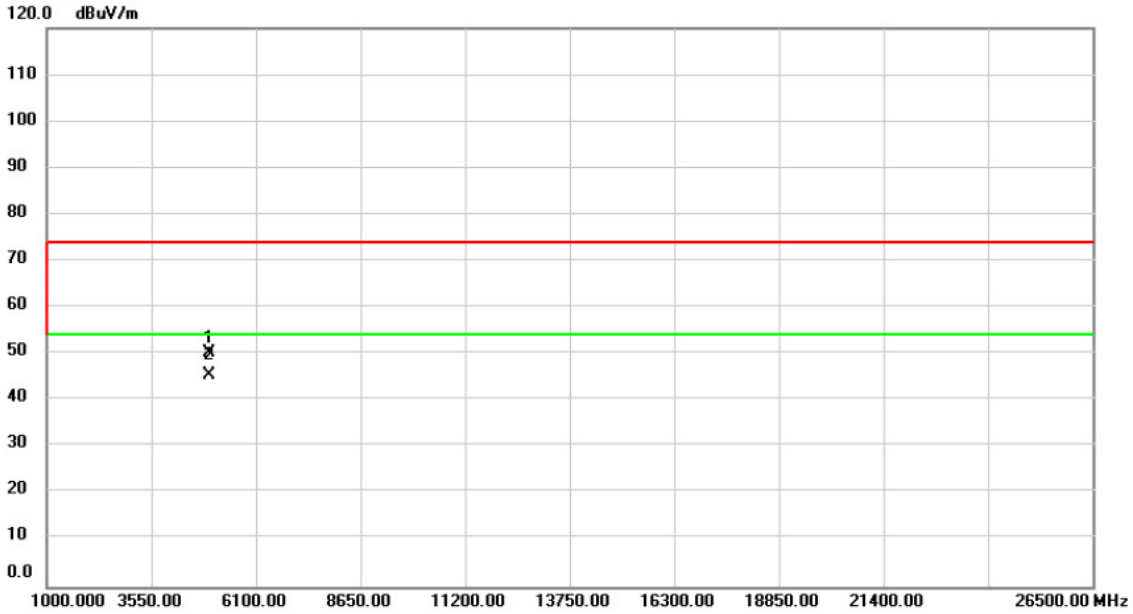
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	70.05	31.29	101.34	74.00	27.34	peak	No Limit
2	*	2480.000	69.38	31.29	100.67	54.00	46.67	AVG	No Limit
3		2498.037	27.34	31.36	58.70	74.00	-15.30	peak	
4		2498.037	16.05	31.36	47.41	54.00	-6.59	AVG	

Test Mode :	TX 2480MHz _CH39_1Mbps

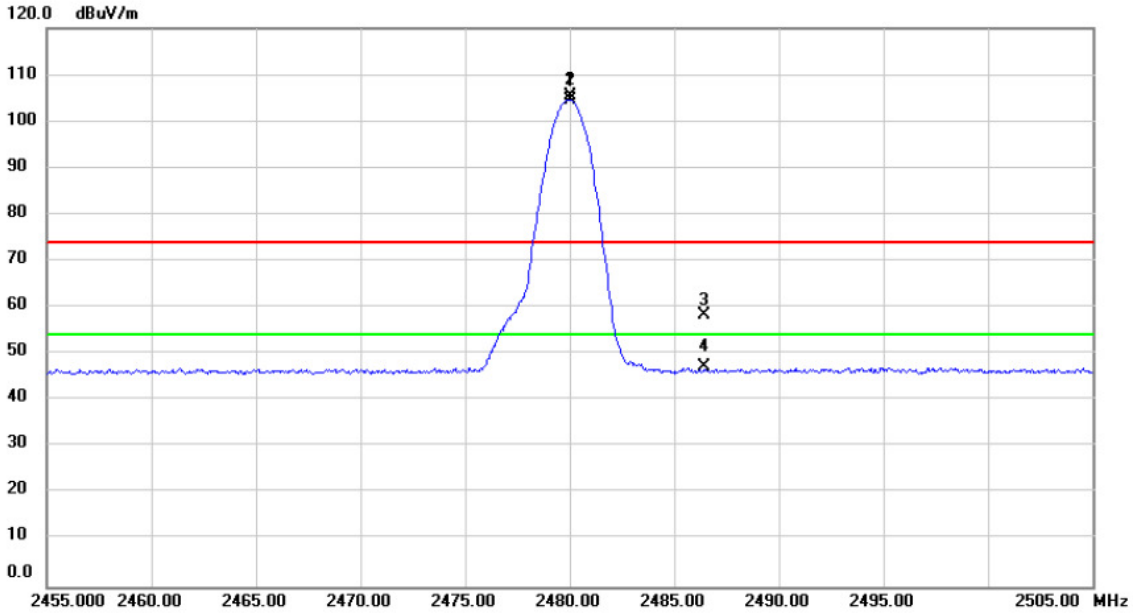
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	61.55	-11.25	50.30	74.00	-23.70	peak	
2	*	4960.000	56.81	-11.25	45.56	54.00	-8.44	AVG	

Test Mode :	TX 2480MHz _CH39_1Mbps

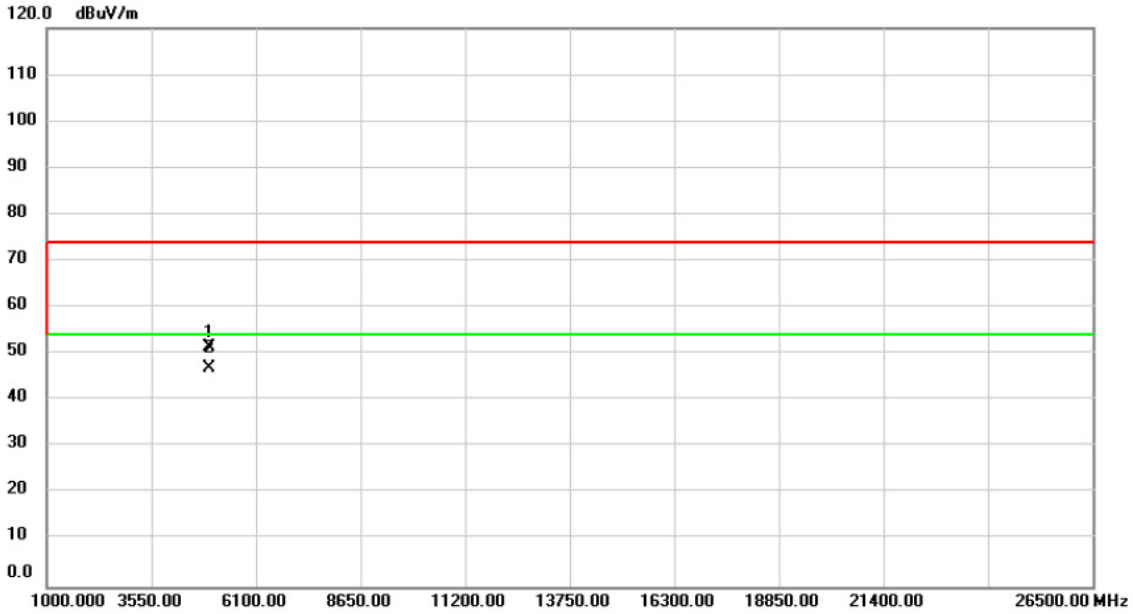
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	74.05	31.29	105.34	74.00	31.34	peak	No Limit
2	*	2480.000	73.38	31.29	104.67	54.00	50.67	AVG	No Limit
3		2486.454	27.08	31.32	58.40	74.00	-15.60	peak	
4		2486.454	15.85	31.32	47.17	54.00	-6.83	AVG	

Test Mode :	TX 2480MHz _CH39_1Mbps

Horizontal



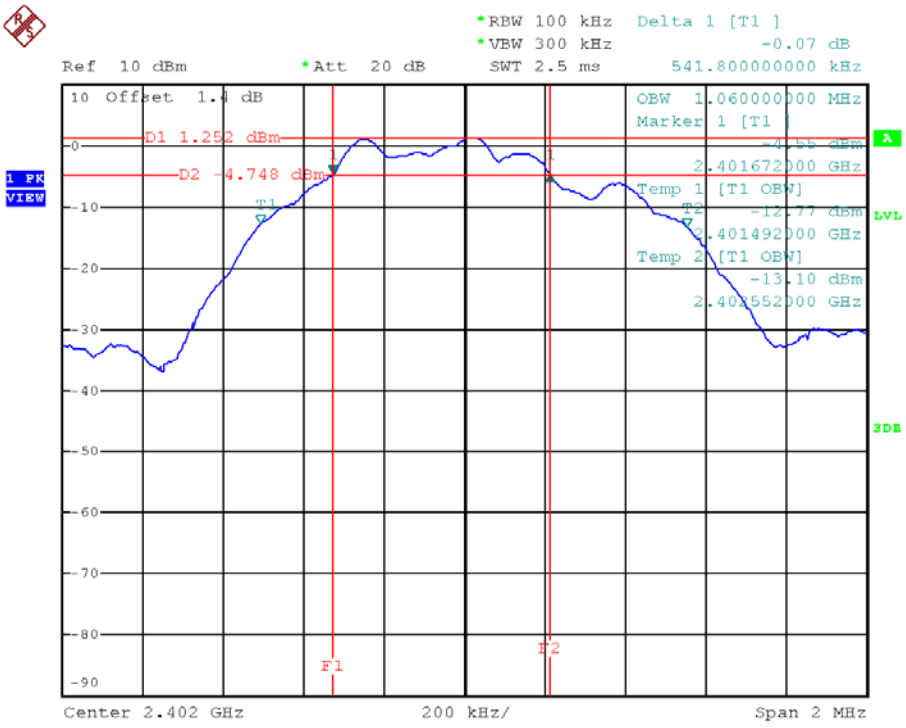
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	62.78	-11.25	51.53	74.00	-22.47	peak	
2	*	4960.000	58.07	-11.25	46.82	54.00	-7.18	AVG	

ATTACHMENT E - BANDWIDTH

Test Mode:	TX Mode

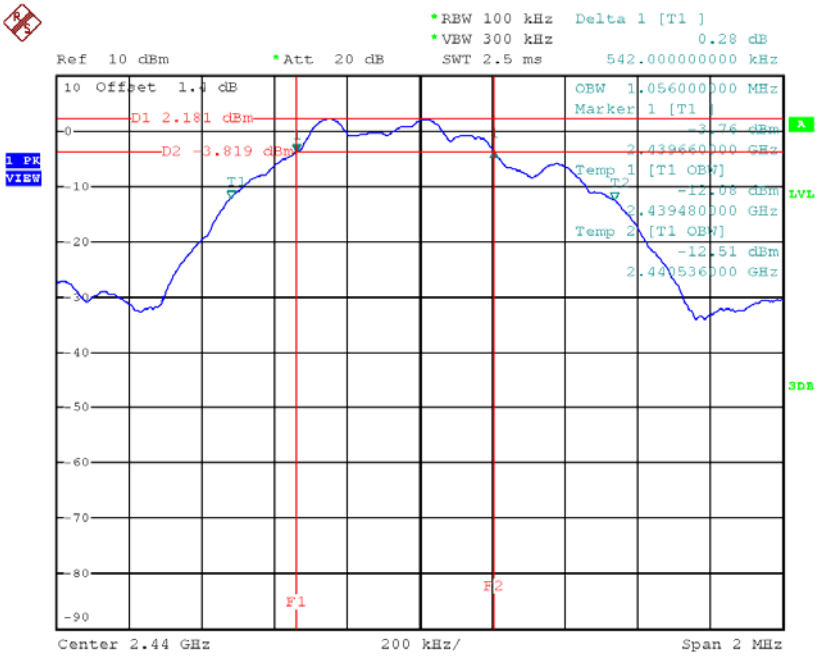
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.542	1.060	500	Pass
2440	0.542	1.056	500	Pass
2480	0.554	1.056	500	Pass

TX CH00



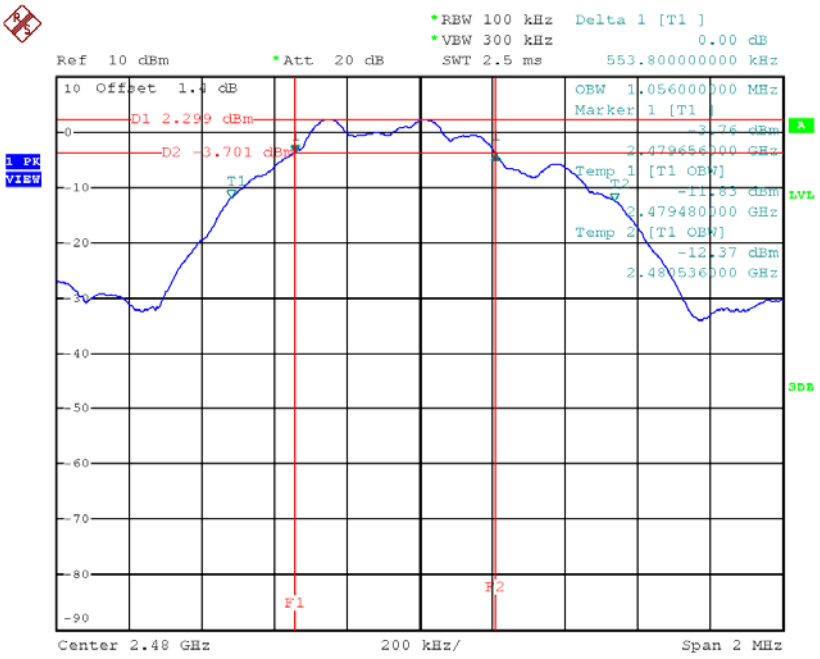
Date: 22.JAN.2017 15:29:15

TX CH19



Date: 22.JAN.2017 15:32:44

TX CH39



Date: 22.JAN.2017 15:36:57

ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

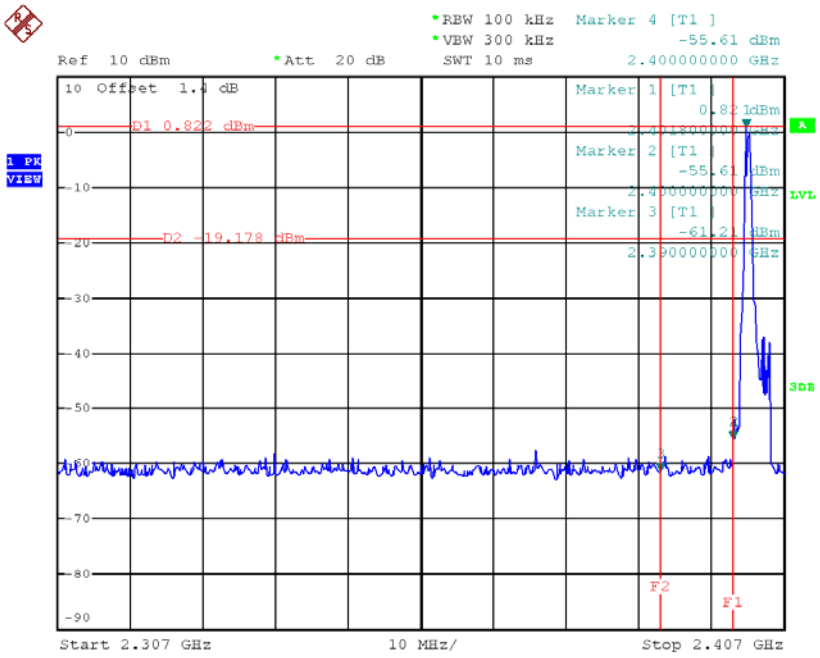
Test Mode :	CH00, CH19 , CH39 - 1Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	4.86	0.0031	30.00	1.00	Pass
2440	5.79	0.0038	30.00	1.00	Pass
2480	5.48	0.0035	30.00	1.00	Pass

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

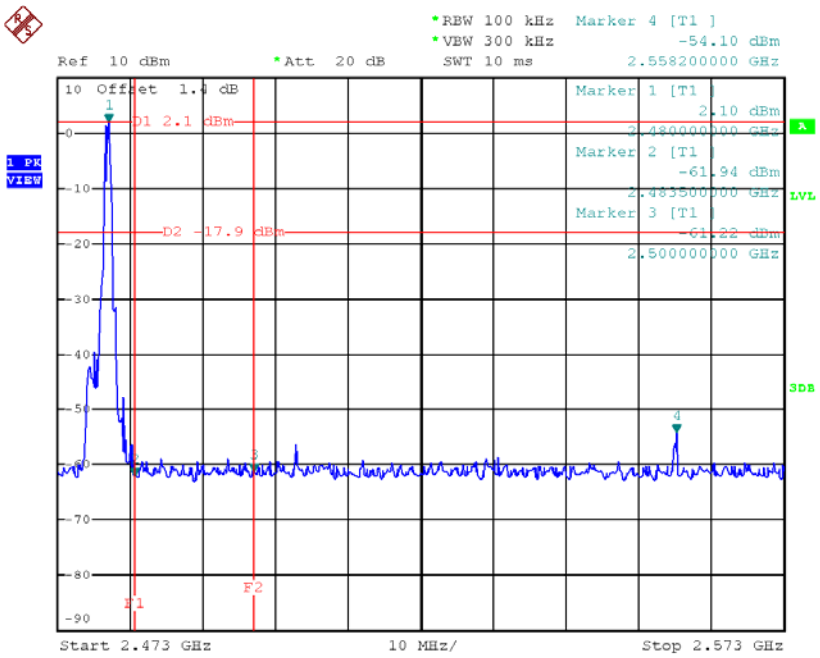
Test Mode :	CH00, CH19 , CH39 - 1Mbps

CH00 (Lower) - 1Mbps



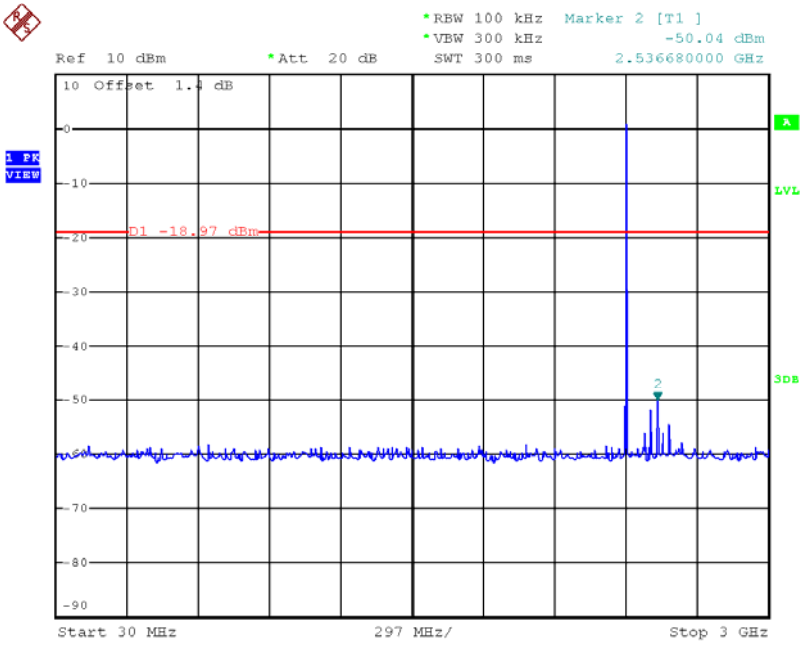
Date: 22.JAN.2017 15:29:39

CH39 (upper) - 1Mbps



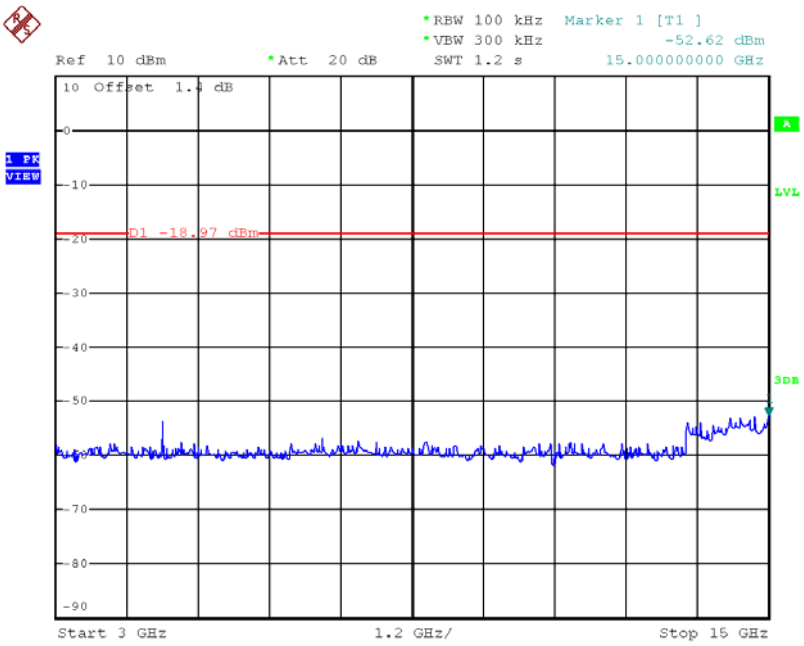
Date: 22.JAN.2017 15:37:05

CH00 (10 Harmonic of the frequency) 1



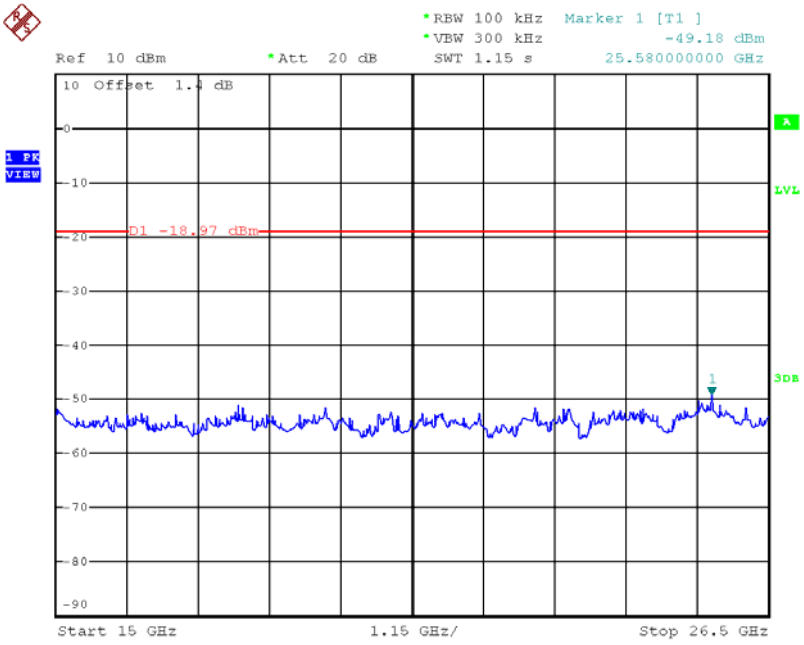
Date: 22.JAN.2017 15:29:54

CH00 (10 Harmonic of the frequency) 2



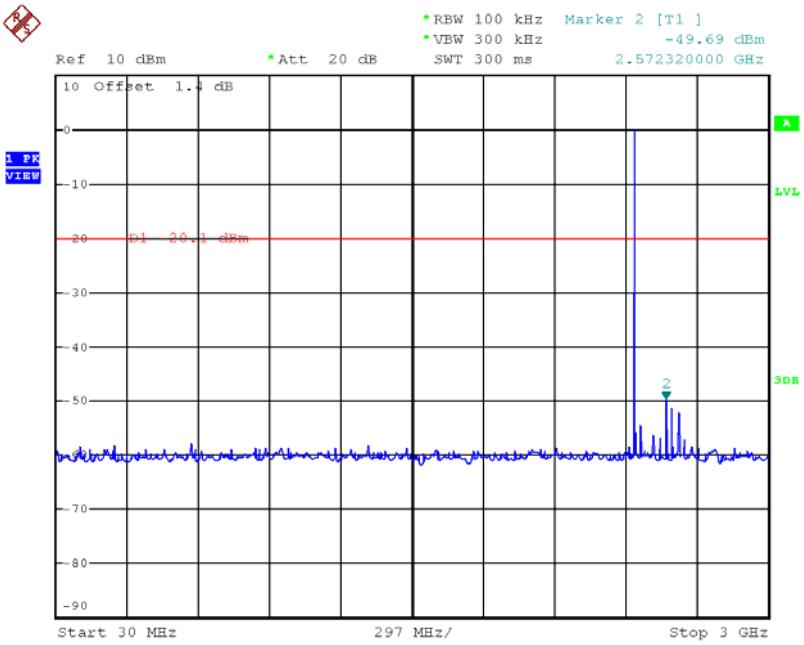
Date: 22.JAN.2017 15:30:02

CH00 (10 Harmonic of the frequency) 3



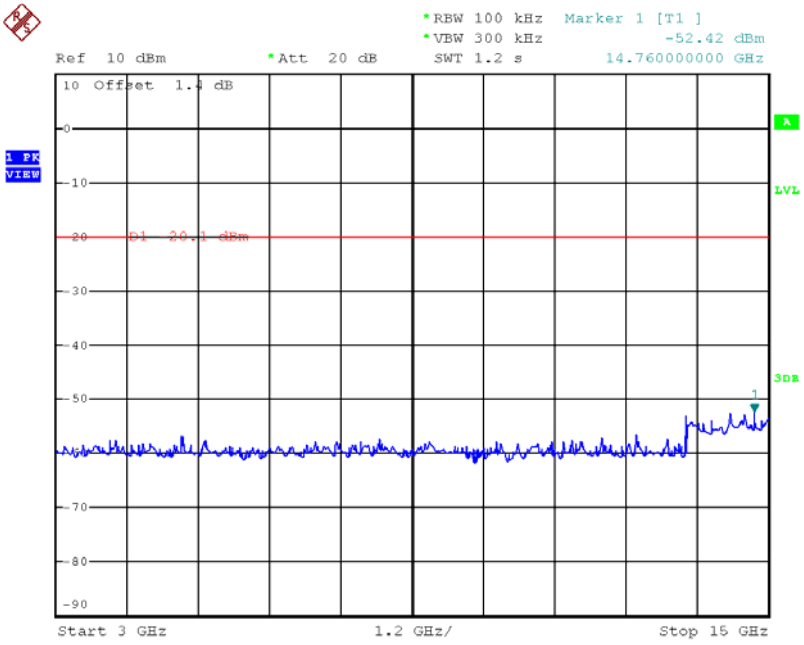
Date: 22.JAN.2017 15:30:09

CH19 (10 Harmonic of the frequency) 1



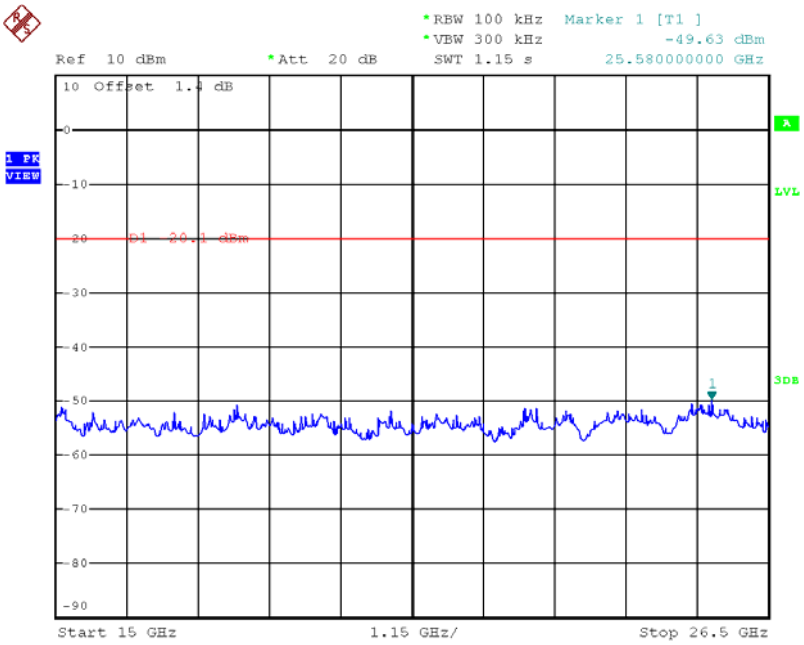
Date: 22.JAN.2017 15:32:57

CH19 (10 Harmonic of the frequency) 2



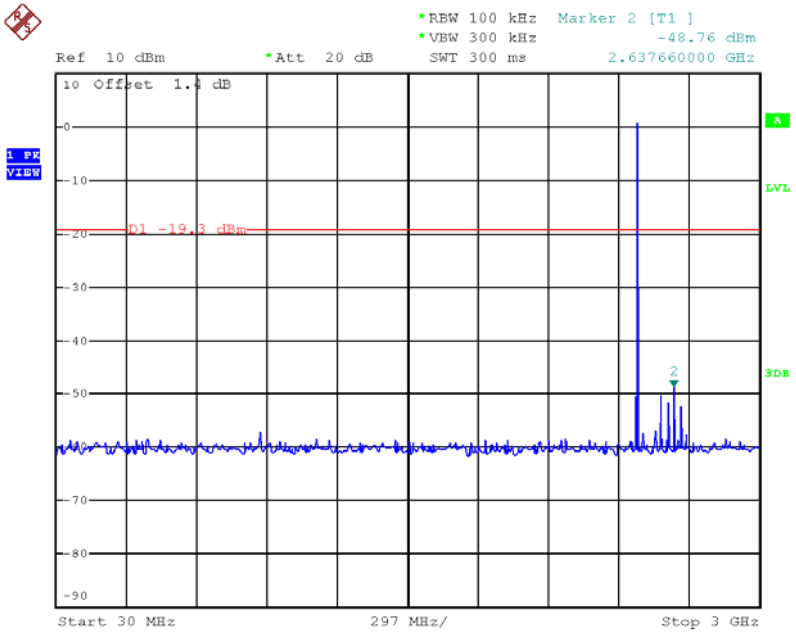
Date: 22.JAN.2017 15:33:05

CH19 (10 Harmonic of the frequency) 3



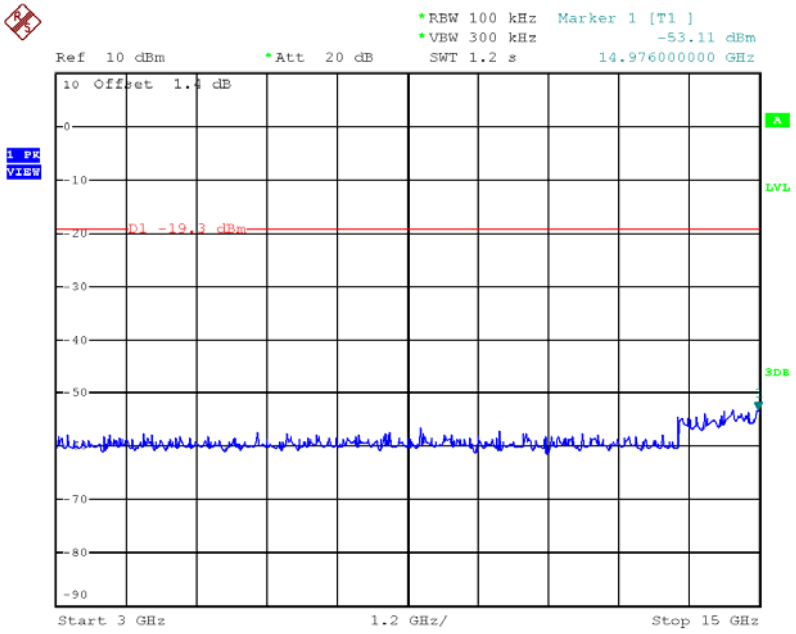
Date: 22.JAN.2017 15:33:12

CH39 (10 Harmonic of the frequency) 1



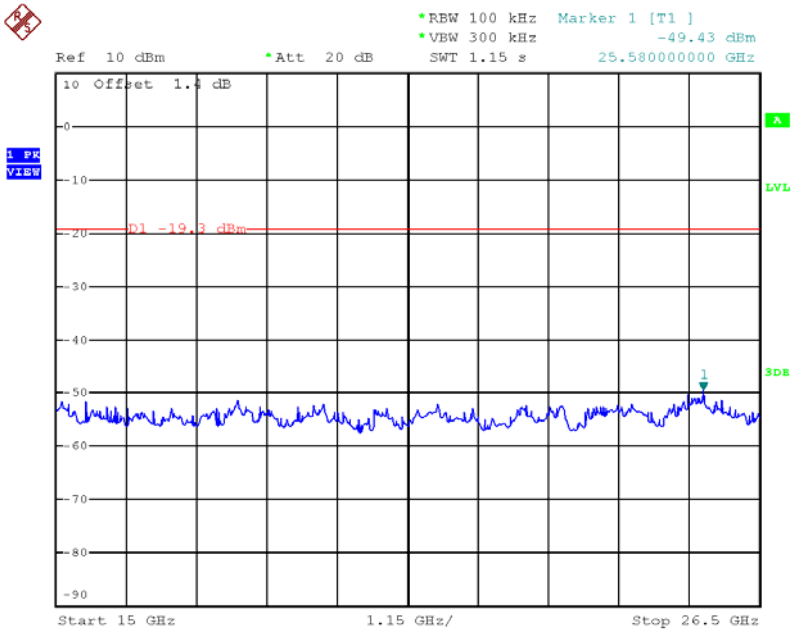
Date: 22.JAN.2017 15:37:18

CH39 (10 Harmonic of the frequency) 2



Date: 22.JAN.2017 15:37:25

CH39 (10 Harmonic of the frequency) 3



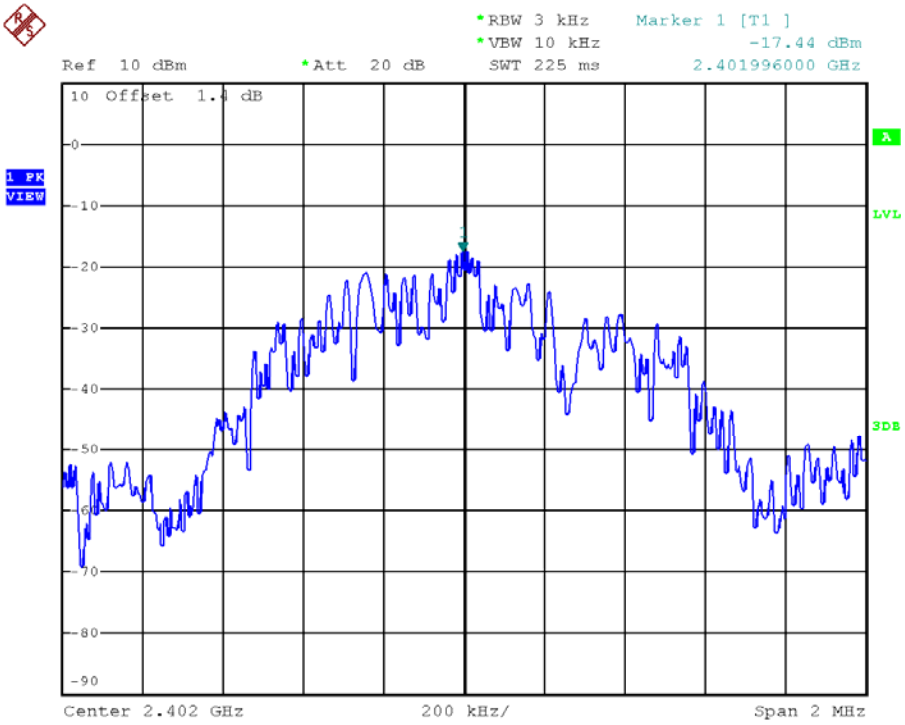
Date: 22.JAN.2017 15:37:32

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

Test Mode:	CH00, CH19 , CH39 - 1Mbps

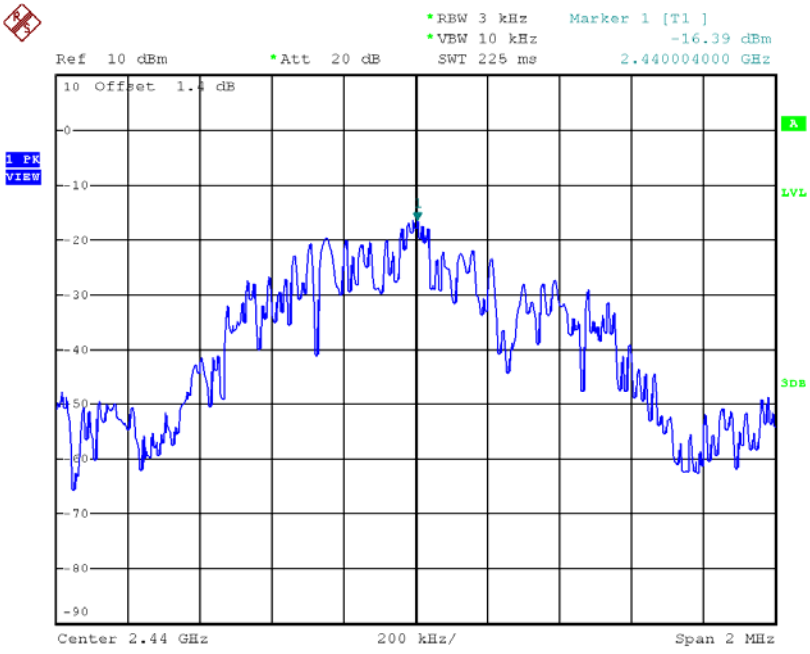
Frequency (MHz)	Power Density (dBm/3kHz)	Power Density (mW/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-17.440	0.018	8.00	Pass
2440	-16.390	0.023	8.00	Pass
2480	-16.220	0.024	8.00	Pass

TX CH00



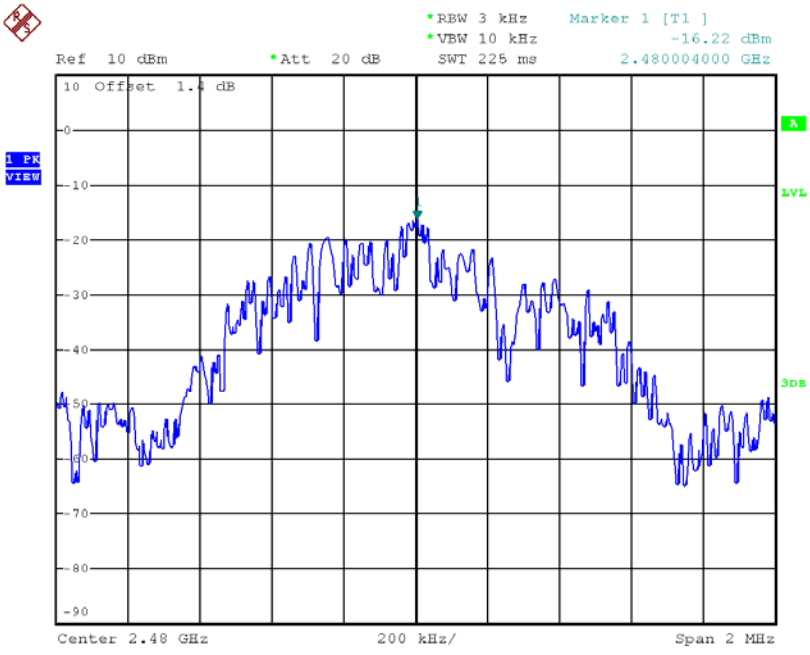
Date: 22.JAN.2017 15:30:25

TX CH19



Date: 22.JAN.2017 15:33:28

TX CH39



Date: 22.JAN.2017 15:37:48