FCC Radio Test Report

FCC ID: H8GR80

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

Project No.	:	1504091
Equipment	:	2.4G RF Gaming Mouse
Model Name	:	R80, R80-1, R80a, R80ma
Applicant	:	A-FOUR TECH CO., LTD.
Address	:	6F., No.108, Min-Chuan Rd., Xindian Dist., New Taipei City, Taiwan R.O.C.

Date of Receipt	:	May 23, 2013, Apr. 21, 2015
Date of Test	:	May 23, 2013 ~ May 30, 2013, Apr. 21, 2015 ~ May 22, 2015
Issued Date	:	Jun. 01, 2015
Tested by	:	BTL Inc.

Testing Engineer : _____ (Josh Lin)

Technical Manager : _____ (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 the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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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-FCCP-1-1504091	Original Issue.	Jun. 01, 2015

1. CERTIFICATION

Equipment	:	2.4G RF Gaming Mouse
Brand Name	:	bloodY,  ,  , A4Tech
Model Name	:	R80, R80-1, R80a, R80ma
Applicant	:	A-FOUR TECH CO., LTD.
Manufacturer	:	5-Link Technology Co.,Ltd.
Address	:	Xiwang Industrial District, Tiantangwei, Fenggang Town, Dongguan City,Guangdong,China
Date of Test	:	Apr. 21, 2015 ~ May 22, 2015
Test Sample	:	ENGINEERING SAMPLE
Standard(s)	:	FCC Part15, Subpart C :2014 (15.247) / ANSI C63.4-2009

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-1-1504091) 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).

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	
15.209/15.205	Transmitter Radiated Emissions	PASS	

NOTE:

(1)" N/A" denotes test is not applicable to this device.

(2) The test follows FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r02 (Measurement Guidelines of DTS)

2.1 TEST FACILITY

Conducted emission Test:

C05: (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):

CB08: (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB08: (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

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:
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	Measurement Frequency Range	U,(dB)	NOTE
C05	150 kHz ~ 30 MHz	1.94	

B. Radiated emission test:

Test Site	Item	Measurement Frequency Range		Uncertainty	NOTE
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB	
			200 - 1000MHz	3.11 dB	
			1 - 18GHz	3.97 dB	
			18 - 40GHz	4.01 dB	
		Vertical Polarization	30 - 200MHz	3.22 dB	
			200 - 1000MHz	3.24 dB	
			1 - 18GHz	4.05 dB	
			18 - 40GHz	4.04 dB	

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}.
If U_{lab} is less than or equal to U_{CISPR}, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{CISPR}, then:

- compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4G RF Gaming Mouse	
Brand Name	bloodY,  ,  , A4Tech	
Model Name	R80, R80-1, R80a, R80ma	
Model Difference	Only differ in model name.	
Product Description	Operation Frequency	2407~2473 MHz
	Modulation Technology	GFSK(500 Kbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	1.69 dBm
Power Source	1. Supplied from PC USB Port. 2. Battery supplied.	
Power Rating	1. I/P: DC 5V 2. I/P: DC 3.7V 600mAh	

Note:

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

2.

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2407	24	2430	47	2453
02	2408	25	2431	48	2454
03	2409	26	2432	49	2455
04	2410	27	2433	50	2456
05	2411	28	2434	51	2457
06	2412	29	2435	52	2458
07	2413	30	2436	53	2459
08	2414	31	2437	54	2460
09	2415	32	2438	55	2461
10	2416	33	2439	56	2462
11	2417	34	2440	57	2463
12	2418	35	2441	58	2464
13	2419	36	2442	59	2465
14	2420	37	2443	60	2466
15	2421	38	2444	61	2467
16	2422	39	2445	62	2468
17	2423	40	2446	63	2469
18	2424	41	2447	64	2470
19	2425	42	2448	65	2471
20	2426	43	2449	66	2472
21	2427	44	2450	67	2473
22	2428	45	2451		
23	2429	46	2452		

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Printed	N/A	-1.20

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)**
Mode 2	TX Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

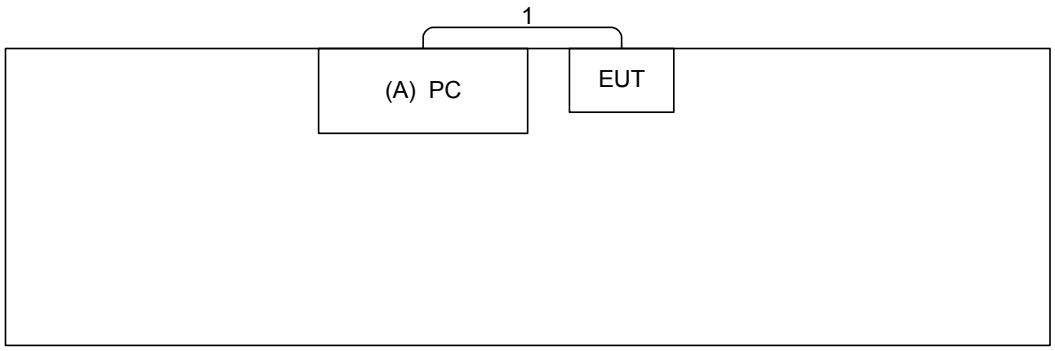
For Conducted Test	
Final Test Mode	Description
Mode 2	TX Mode

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.

3.4 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/IC	Series No.	Note
A	Notebook PC	DELL	PP18L	DOC	PF329 A01	

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	NO	1.2M	USB Cable

Note:

(1) For detachable type I/O cable should be specified the length in m in『Length』column.

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

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

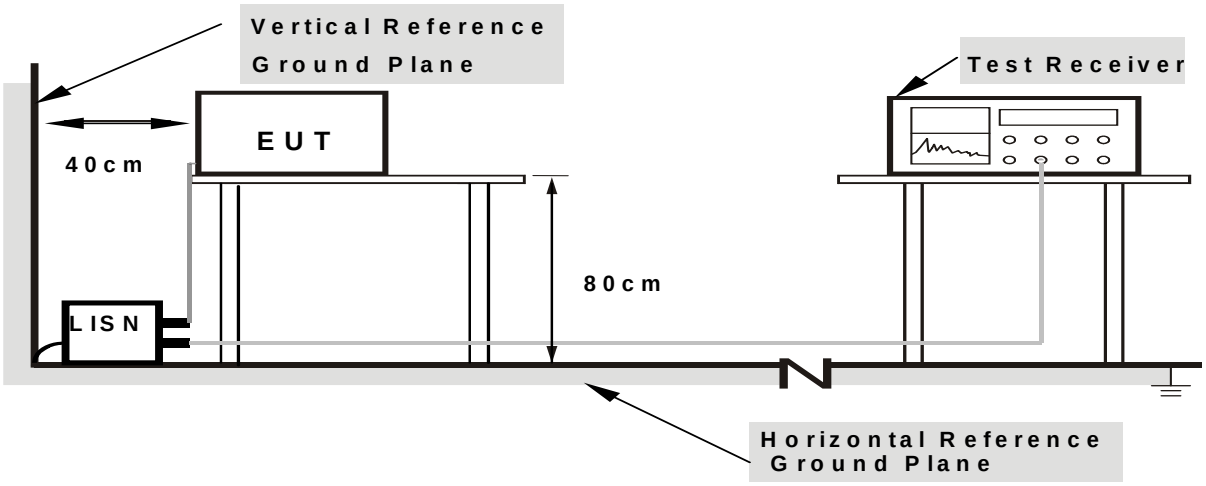
4.1.2 TEST PROCEDURE

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

20dB in any 100 KHz bandwidth outside the operating frequency band. 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

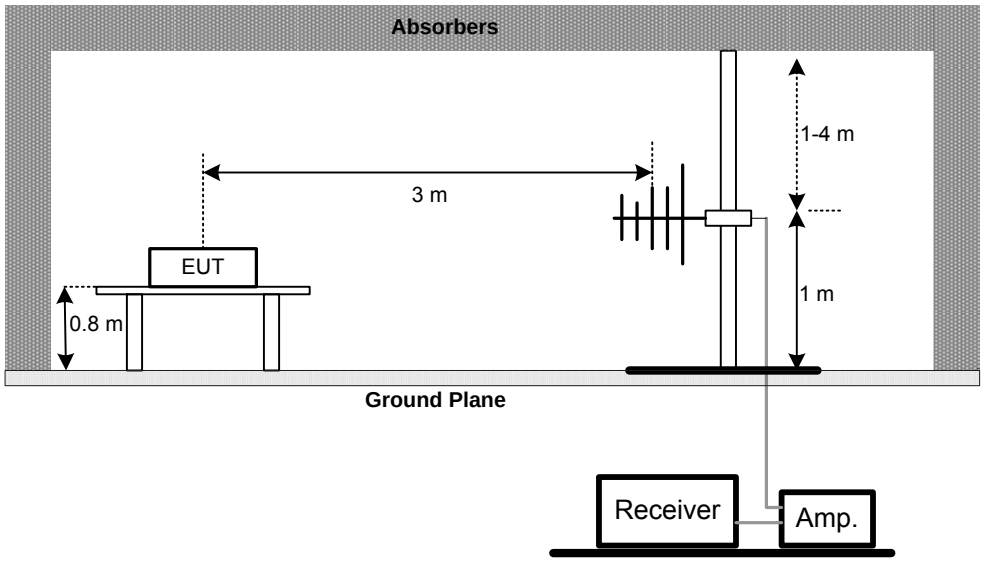
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

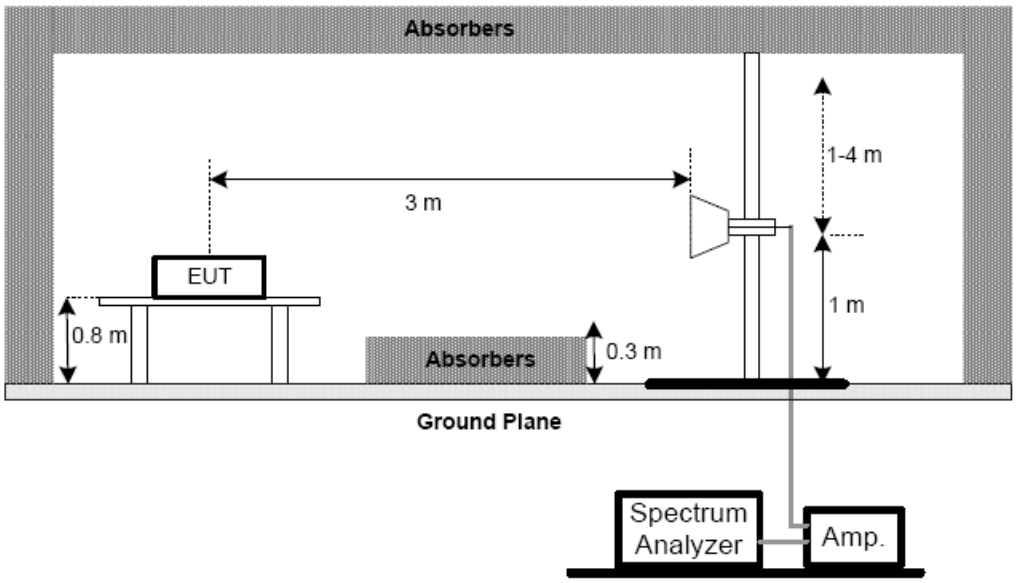
No deviation

4.2.4 TEST SETUP

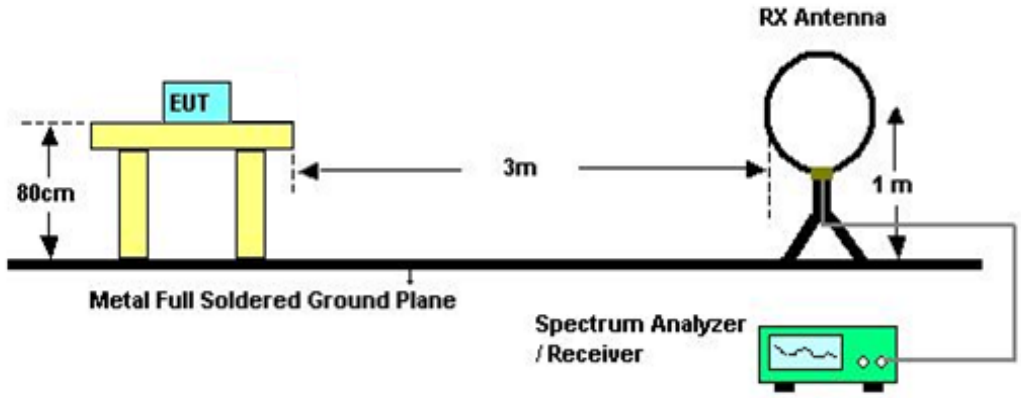
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

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

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
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 (BETWEEN 30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz；SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz.
(2) 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.
(3) Measuring frequency range from 30MHz to 1000MHz.
(4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

(1) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform.
(2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
(3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(4) EUT Orthogonal Axis:
”X” - denotes Laid on Table；”Y” - denotes Vertical Stand；”Z” - denotes Side Stand
(5) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
(6) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2407-2473	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: 25°C
Relative Humidity: 55%
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				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2407-2473	PASS

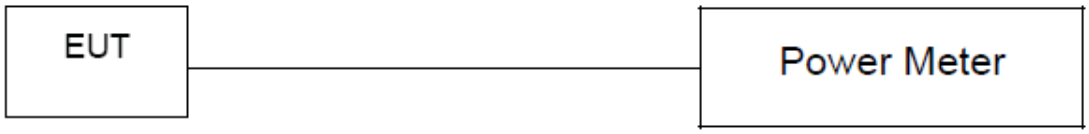
6.1.1 TEST PROCEDURE

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 v03r02.

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.
Transmit output power was measured while the host equipment supply voltage was varied from 85 % to 115 % of the nominal rated supply voltage. No change in transmit output power was observed.

6.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
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 intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

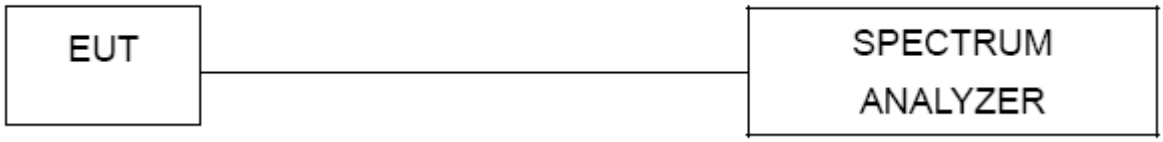
7.1.1 TEST PROCEDURE

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.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

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

7.1.5 EUT OPERATION CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
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				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2407-2473	PASS

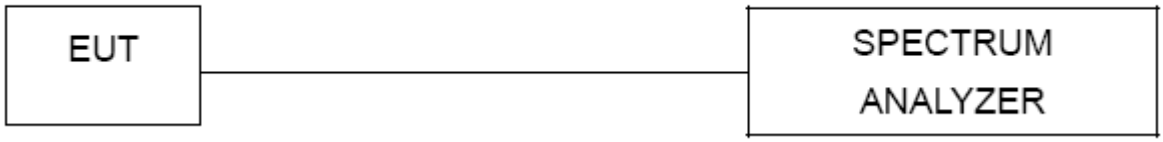
8.1.1 TEST PROCEDURE

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: 25°C
Relative Humidity: 55%
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	R&S	ENV216	101050	Jan. 14, 2016
2	Test Cable	TIMES	CFD300-NL	C01	Jun. 15, 2015
3	EMI Test Receiver	R&S	ESCI	100082	Apr. 12, 2016
4	Measurement Software	EZ	EZ_EMC (Version NB-02A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Oct. 27, 2015
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Jan. 12, 2016
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 15, 2016
4	Microflex Cable	Harbour industries	27478LL142	1m	May. 12, 2016
5	Microflex Cable	EMC	S104-SMA	10m	May. 14, 2016
6	Microflex Cable	Harbour industries	27478LL142	3m	May. 12, 2016
7	Test Cable	LMR	LMR-400	10m	May. 13, 2016
8	Test Cable	LMR	LMR-400	3m	May. 13, 2016
9	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 18, 2015
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jul. 10, 2015
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Feb. 21, 2016
12	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 21, 2016

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 07, 2016

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	Feb. 24, 2016
2	Power Meter Sensor	Anritsu	MA2411B	1126001	Feb. 24, 2016

Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 07, 2016

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 07, 2016

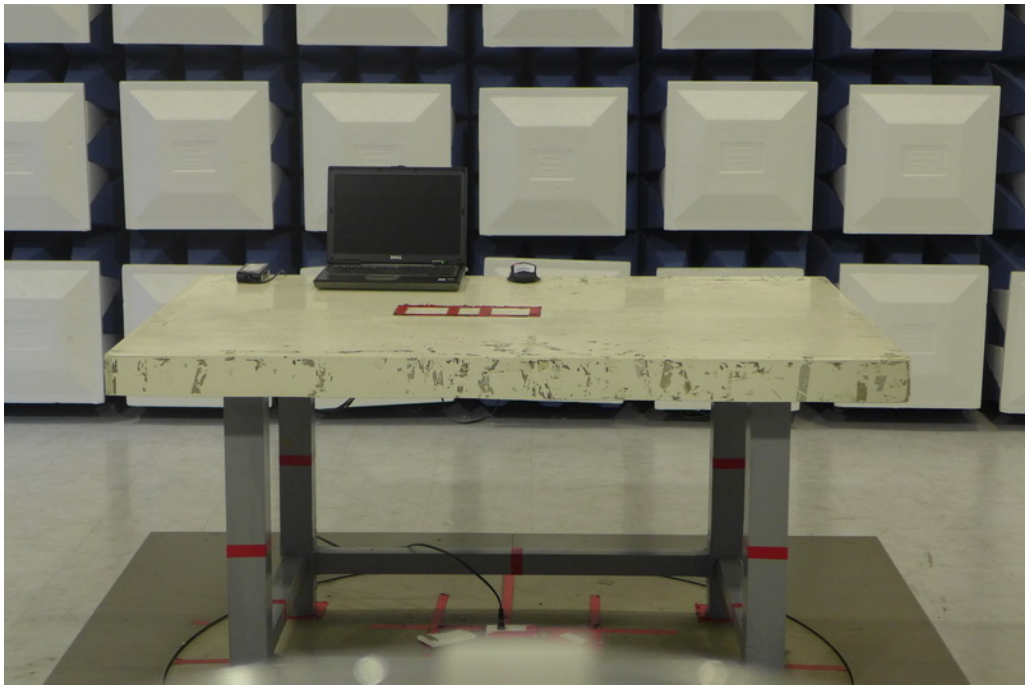
Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

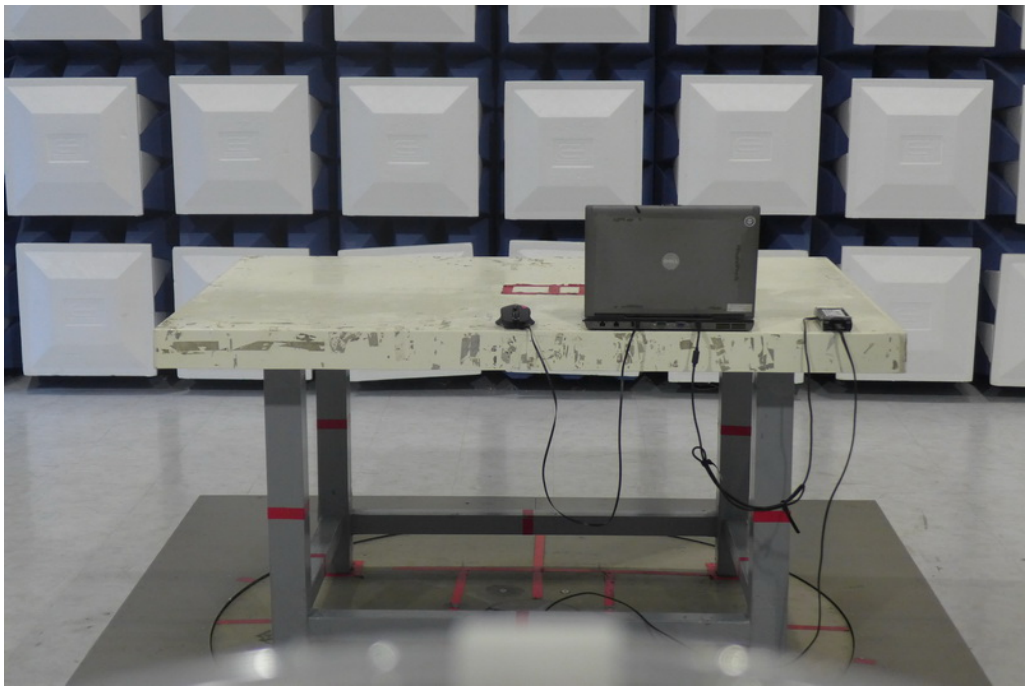
10. EUT TEST PHOTO

Conducted Measurement Photos

Radiated Measurement Photos

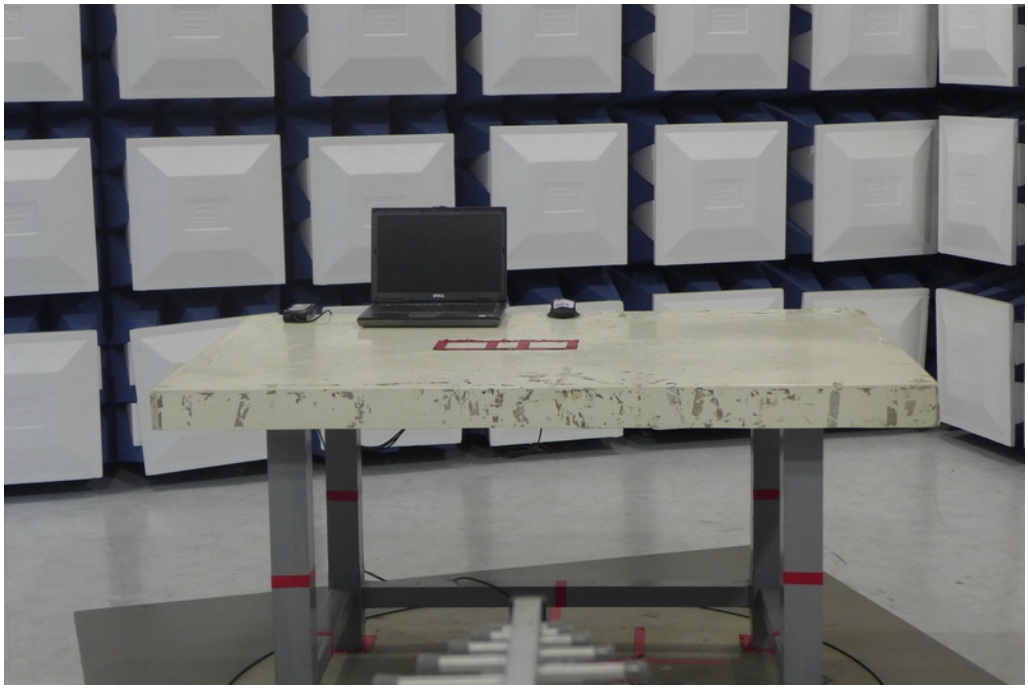
9KHz to 30MHz

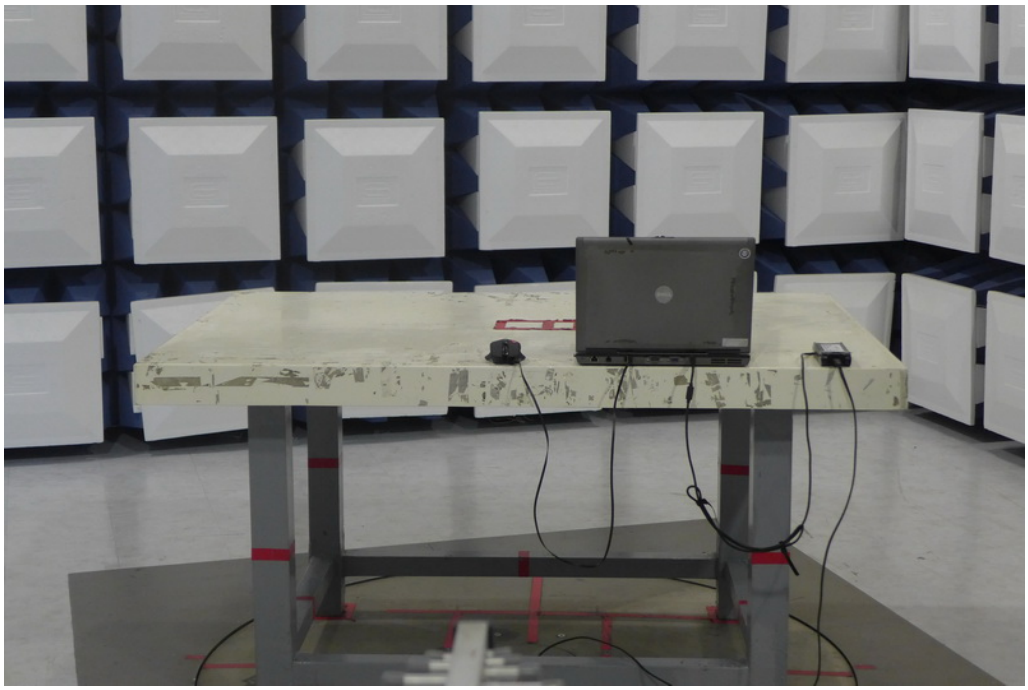




Radiated Measurement Photos

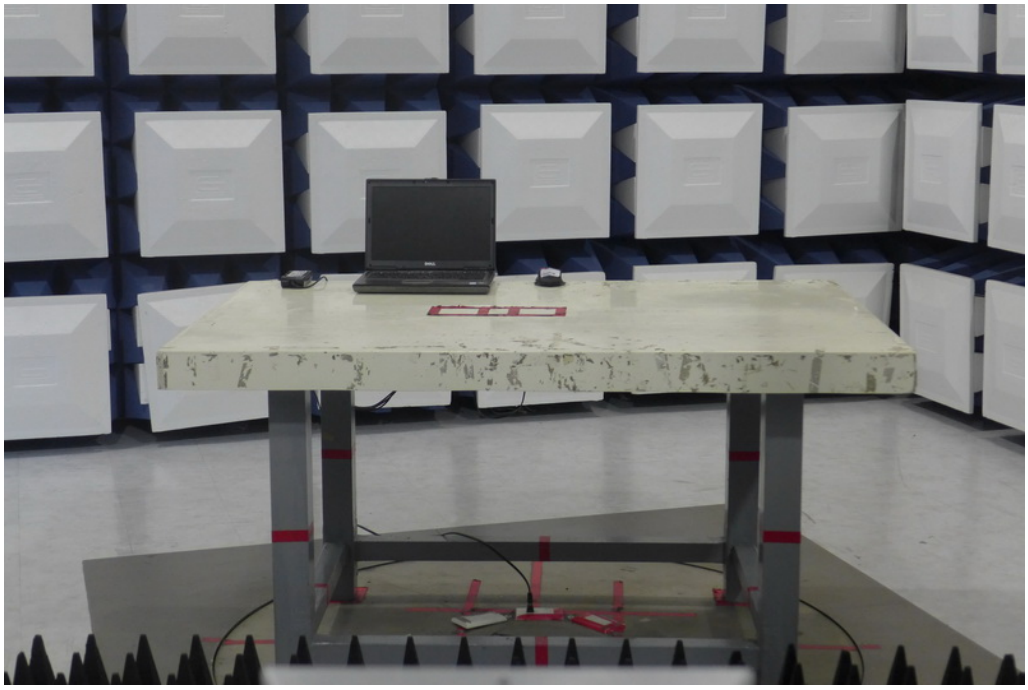
30M to 1000MHz

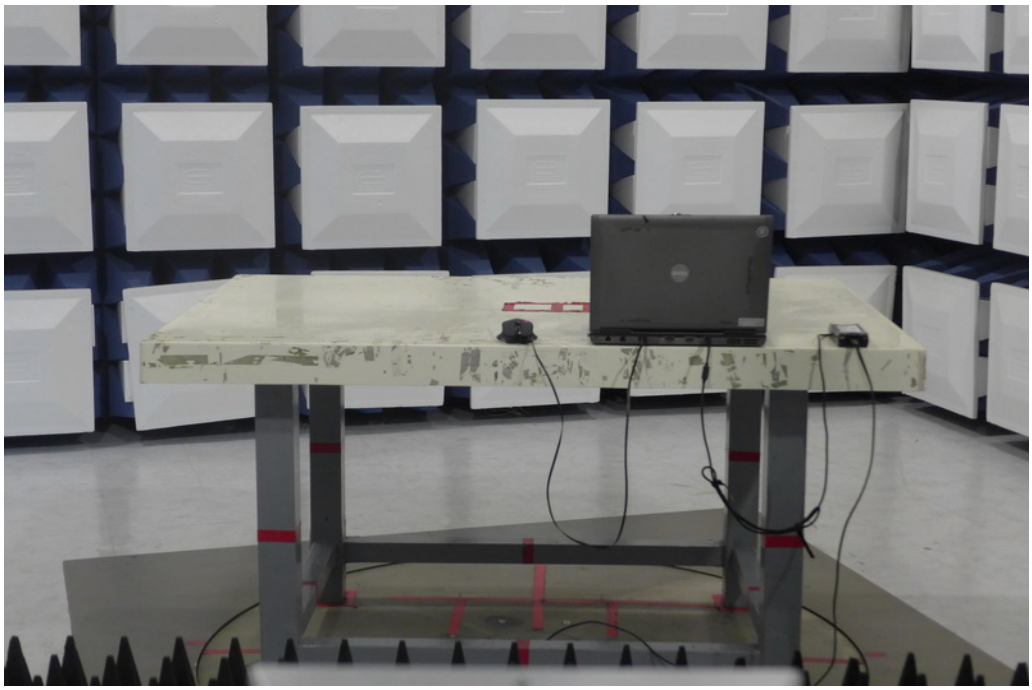




Radiated Measurement Photos

Above 1000MHz

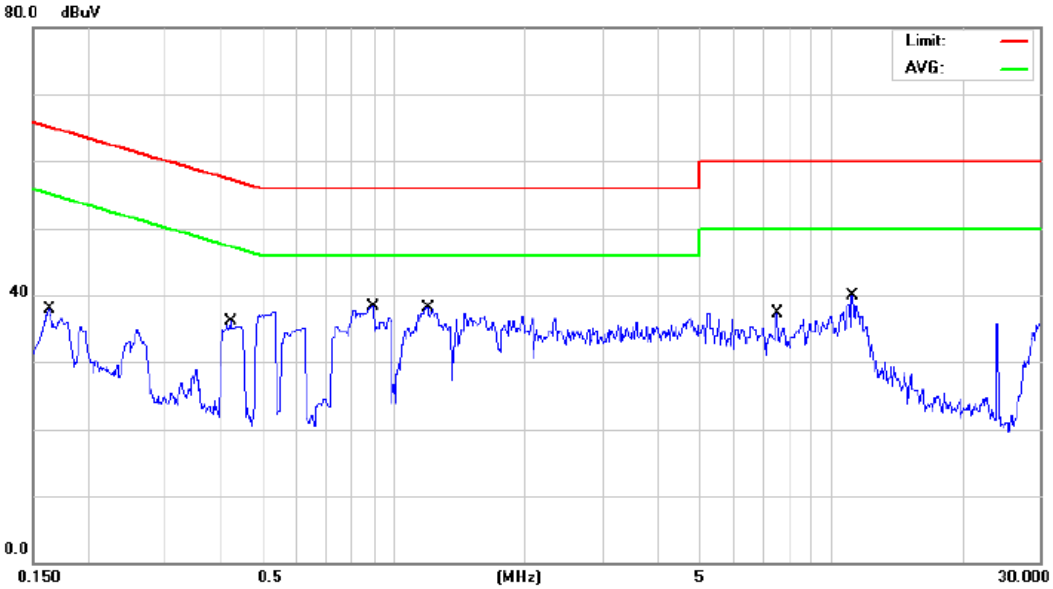




ATTACHMENT A - CONDUCTED EMISSION

Test Mode:	TX Mode

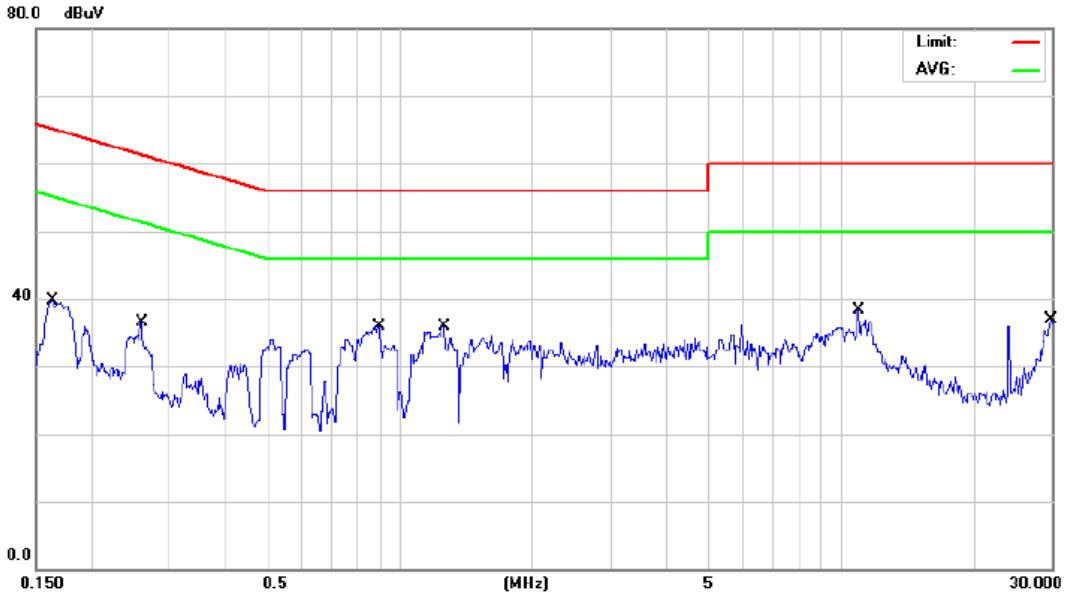
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1626	26.60	9.64	36.24	65.32	-29.08	QP	
2		0.1626	19.80	9.64	29.44	55.32	-25.88	AVG	
3		0.4230	24.10	9.63	33.73	57.39	-23.66	QP	
4		0.4230	12.40	9.63	22.03	47.39	-25.36	AVG	
5		0.8960	26.80	9.67	36.47	56.00	-19.53	QP	
6		0.8960	13.60	9.67	23.27	46.00	-22.73	AVG	
7		1.1930	24.80	9.68	34.48	56.00	-21.52	QP	
8		1.1930	12.70	9.68	22.38	46.00	-23.62	AVG	
9		7.5000	22.10	9.89	31.99	60.00	-28.01	QP	
10		7.5000	15.30	9.89	25.19	50.00	-24.81	AVG	
11		11.1500	26.90	9.89	36.79	60.00	-23.21	QP	
12	*	11.1500	20.60	9.89	30.49	50.00	-19.51	AVG	

Test Mode:	TX Mode

Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1626	30.90	9.63	40.53	65.32	-24.79	QP	
2		0.1626	22.90	9.63	32.53	55.32	-22.79	AVG	
3		0.2592	22.70	9.63	32.33	61.45	-29.12	QP	
4		0.2592	16.70	9.63	26.33	51.45	-25.12	AVG	
5	*	0.8960	24.10	9.67	33.77	56.00	-22.23	QP	
6		0.8960	11.10	9.67	20.77	46.00	-25.23	AVG	
7		1.2560	23.80	9.68	33.48	56.00	-22.52	QP	
8		1.2560	10.50	9.68	20.18	46.00	-25.82	AVG	
9		10.9500	23.50	9.90	33.40	60.00	-26.60	QP	
10		10.9500	17.50	9.90	27.40	50.00	-22.60	AVG	
11		29.8000	22.70	9.91	32.61	60.00	-27.39	QP	
12		29.8000	14.70	9.91	24.61	50.00	-25.39	AVG	

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

Test Mode:	TX Mode

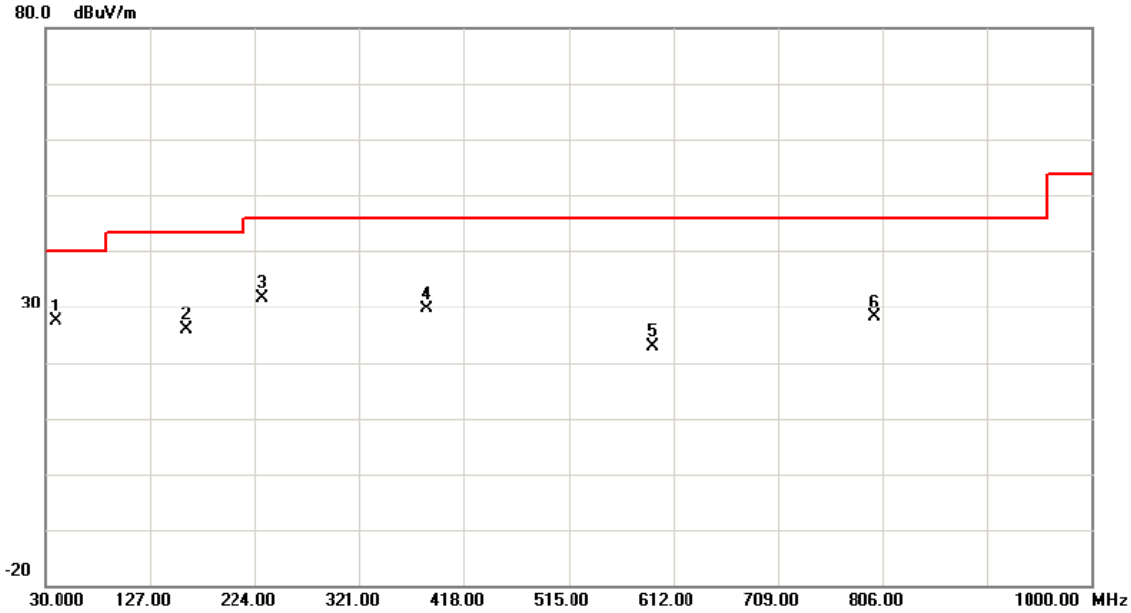
Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.1588	0°	50.26	12.00	62.26	83.59	-21.33	AVG
0.1588	0°	61.11	12.00	73.11	103.59	-30.48	PK
0.3212	0°	40.58	11.11	51.69	77.47	-25.78	AVG
0.3212	0°	47.69	11.11	58.80	97.47	-38.67	PK
0.5537	0°	36.25	11.24	47.49	72.74	-25.25	QP
0.0318	0°	36.24	11.24	47.48	92.74	-45.26	PK
0.7160	0°	35.22	11.31	46.53	70.51	-23.98	QP
0.0429	0°	40.48	11.31	51.79	90.51	-38.72	PK
0.9233	0°	38.71	11.39	50.10	68.30	-18.20	QP
1.3450	0°	36.15	11.52	47.67	65.03	-17.36	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.1569	90°	50.17	12.01	62.18	83.69	-21.51	AVG
0.1569	90°	61.03	12.01	73.04	103.69	-30.65	PK
0.3147	90°	40.55	11.10	51.65	77.65	-25.99	AVG
0.3147	90°	47.82	11.10	58.92	97.65	-38.72	PK
0.5526	90°	36.19	11.24	47.43	72.76	-25.32	QP
0.0318	90°	36.24	11.24	47.48	92.76	-45.27	PK
0.7200	90°	35.46	11.31	46.77	70.46	-23.69	QP
0.0429	90°	40.48	11.31	51.79	90.46	-38.67	PK
0.9245	90°	38.77	11.39	50.16	68.29	-18.13	QP
1.3370	90°	36.29	11.52	47.81	65.08	-17.27	QP

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

Test Mode:	TX 2437MHz

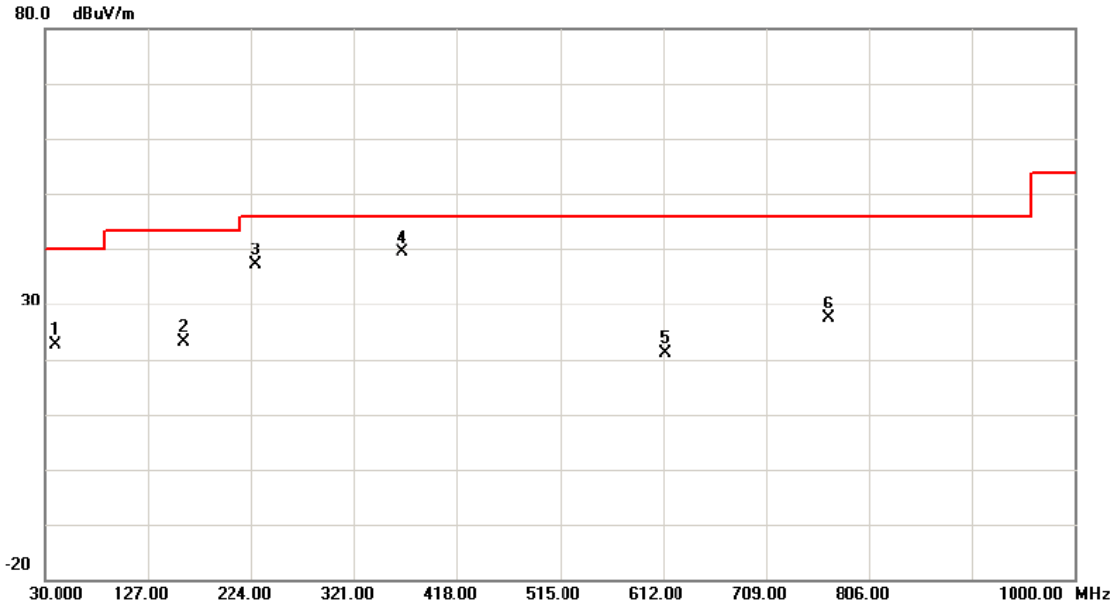
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	39.7000	41.59	-14.25	27.34	40.00	-12.66	peak			
2		160.9500	39.74	-13.97	25.77	43.50	-17.73	peak			
3		231.2750	47.32	-15.75	31.57	46.00	-14.43	peak			
4		384.0500	41.01	-11.50	29.51	46.00	-16.49	peak			
5		592.6000	30.31	-7.54	22.77	46.00	-23.23	peak			
6		798.7250	33.00	-4.75	28.25	46.00	-17.75	peak			

Test Mode:	TX 2437MHz

Horizontal

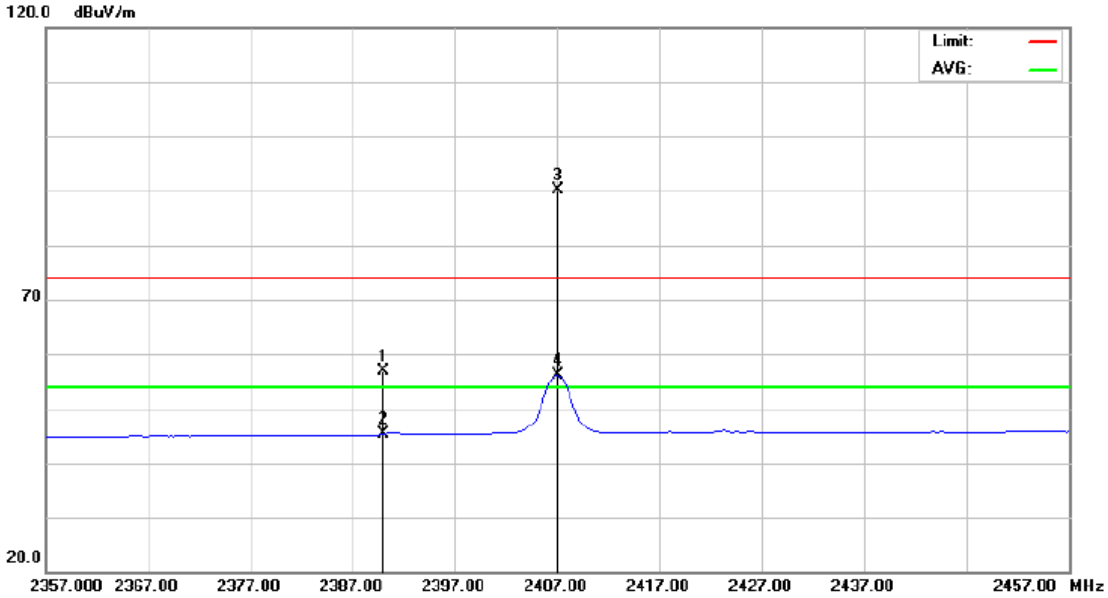


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		39.7000	36.96	-14.25	22.71	40.00	-17.29	peak			
2		160.9500	37.20	-13.97	23.23	43.50	-20.27	peak			
3		228.8500	53.02	-15.92	37.10	46.00	-8.90	peak			
4	*	367.0750	51.21	-11.91	39.30	46.00	-6.70	peak			
5		614.4250	28.45	-7.31	21.14	46.00	-24.86	peak			
6		767.2000	32.19	-4.91	27.28	46.00	-18.72	peak			

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis :	X
Test Mode :	TX 2407MHz

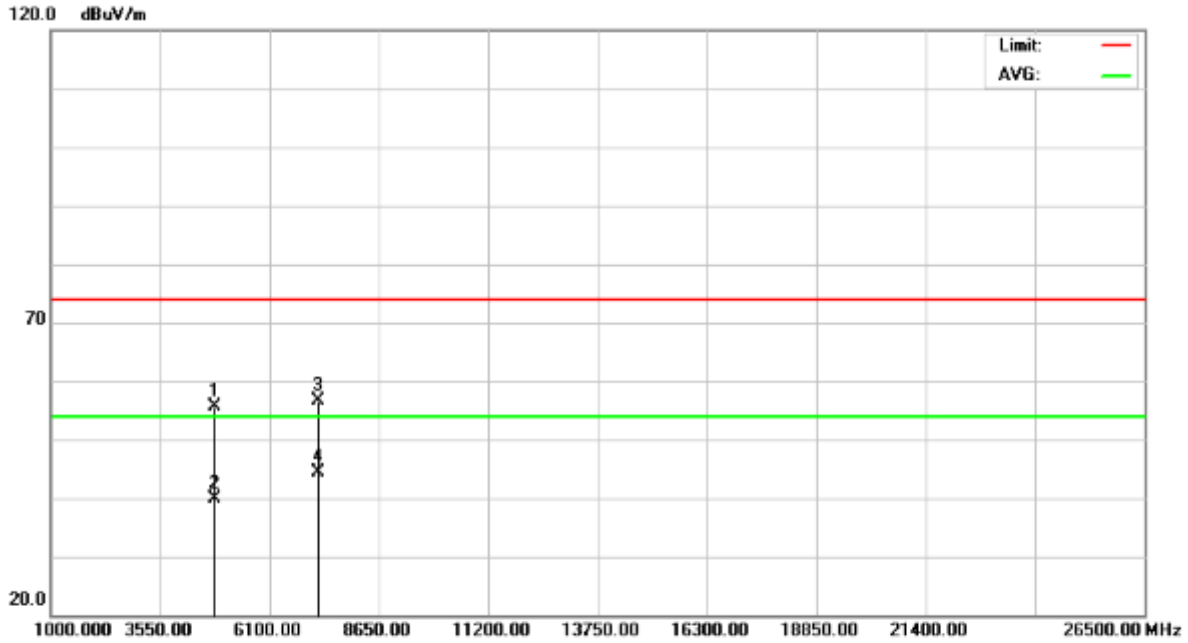
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	25.14	31.67	56.81	74.00	-17.19	peak	
2		2390.000	13.69	31.67	45.36	54.00	-8.64	AVG	
3	*	2407.000	58.38	31.74	90.12	74.00	16.12	peak	no limit
4	X	2407.000	24.40	31.74	56.14	54.00	2.14	AVG	no limit

Orthogonal Axis :	X
Test Mode :	TX 2407MHz

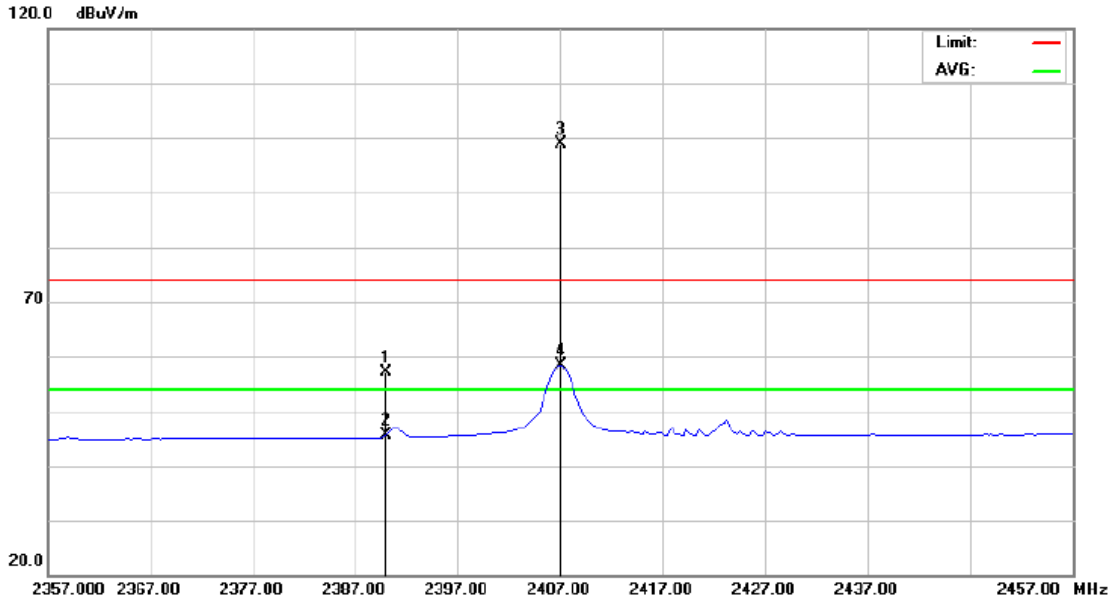
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4813.900	49.94	5.70	55.64	74.00	-18.36	peak	
2		4813.900	34.08	5.70	39.78	54.00	-14.22	AVG	
3		7221.075	44.46	12.23	56.69	74.00	-17.31	peak	
4	*	7221.075	32.13	12.23	44.36	54.00	-9.64	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2407MHz

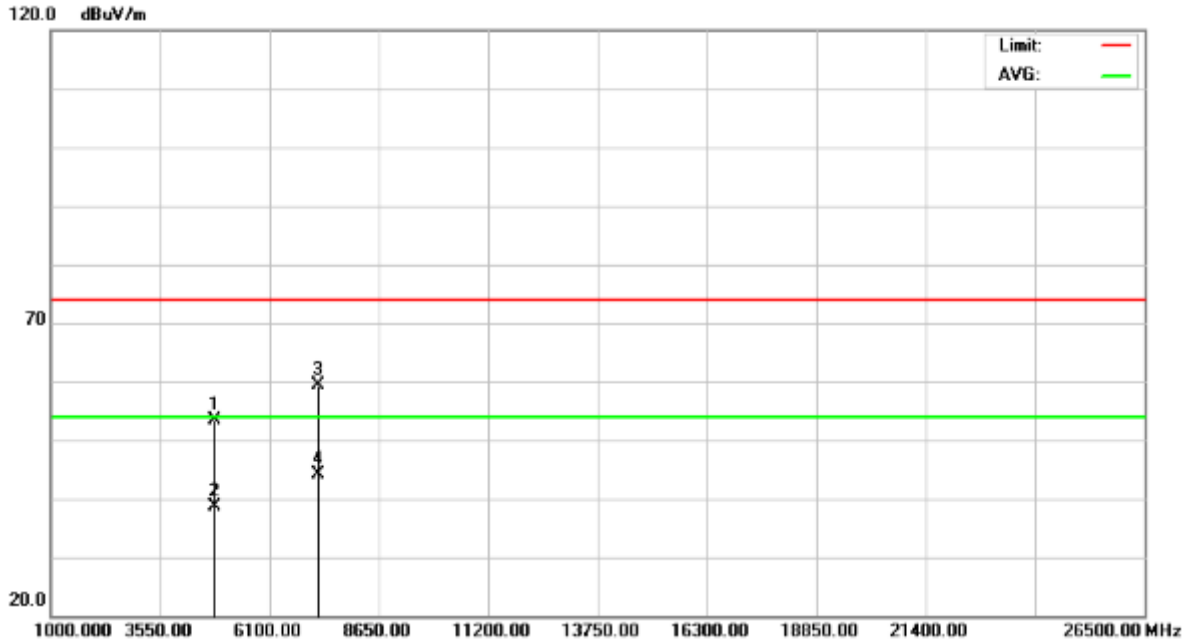
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	25.36	31.67	57.03	74.00	-16.97	peak	
2		2390.000	14.03	31.67	45.70	54.00	-8.30	AVG	
3	*	2407.000	67.05	31.74	98.79	74.00	24.79	peak	no limit
4	X	2407.000	26.66	31.74	58.40	54.00	4.40	AVG	no limit

Orthogonal Axis :	X
Test Mode :	TX 2407MHz

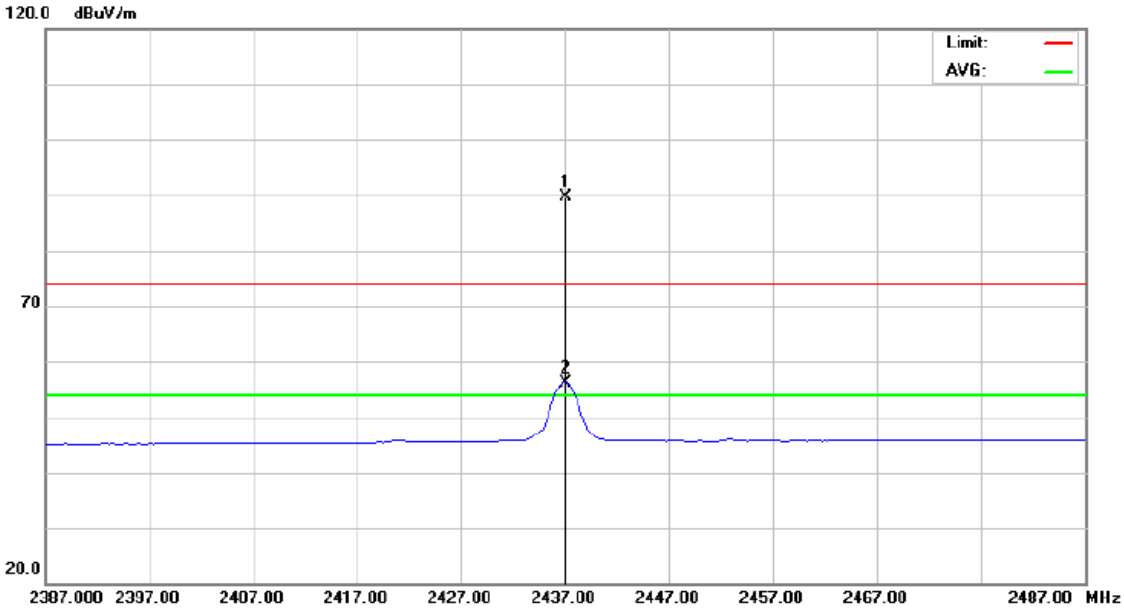
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4813.938	47.71	5.70	53.41	74.00	-20.59	peak	
2		4813.938	32.82	5.70	38.52	54.00	-15.48	AVG	
3		7220.737	47.09	12.23	59.32	74.00	-14.68	peak	
4	*	7220.737	31.82	12.23	44.05	54.00	-9.95	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2437MHz

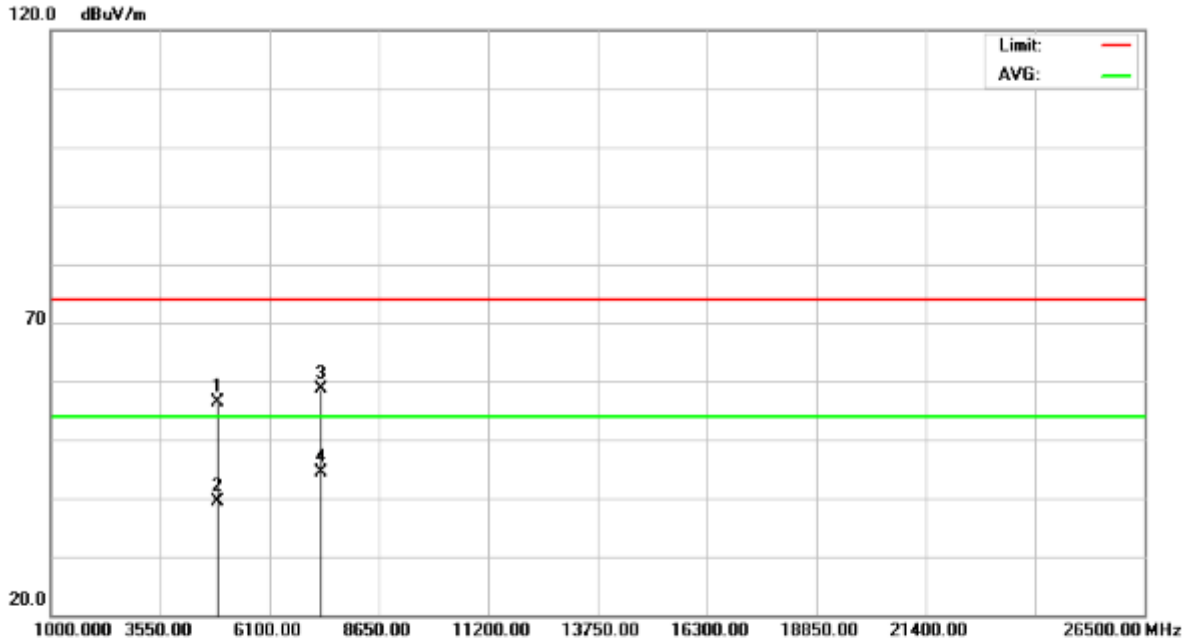
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2437.000	57.87	31.88	89.75	74.00	15.75	peak	no limit
2	X	2437.000	24.37	31.88	56.25	54.00	2.25	AVG	no limit

Orthogonal Axis :	X
Test Mode :	TX 2437MHz

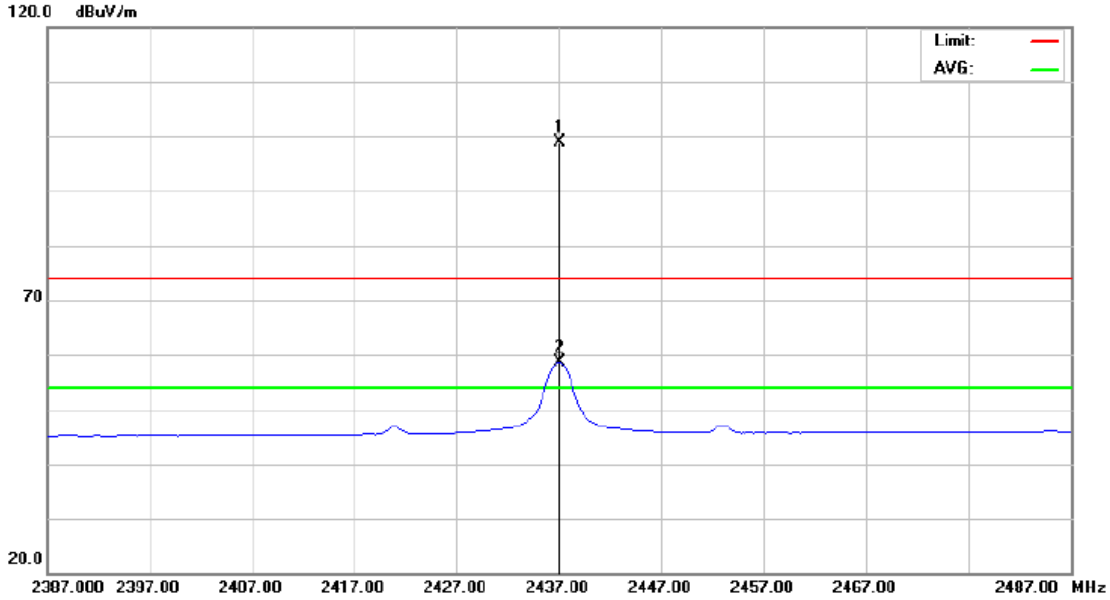
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4873.925	50.68	5.78	56.46	74.00	-17.54	peak	
2		4873.925	33.53	5.78	39.31	54.00	-14.69	AVG	
3		7310.975	45.94	12.57	58.51	74.00	-15.49	peak	
4	*	7310.975	31.84	12.57	44.41	54.00	-9.59	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2437MHz

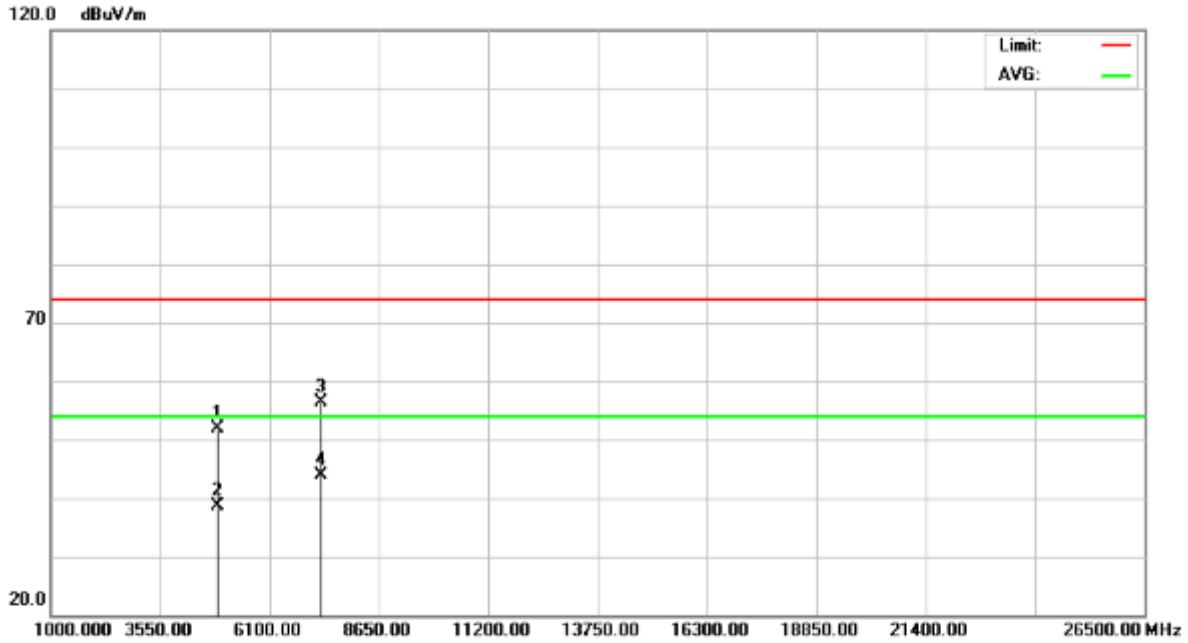
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2437.000	67.12	31.88	99.00	74.00	25.00	peak	no limit
2	X	2437.000	26.82	31.88	58.70	54.00	4.70	AVG	no limit

Orthogonal Axis :	X
Test Mode :	TX 2437MHz

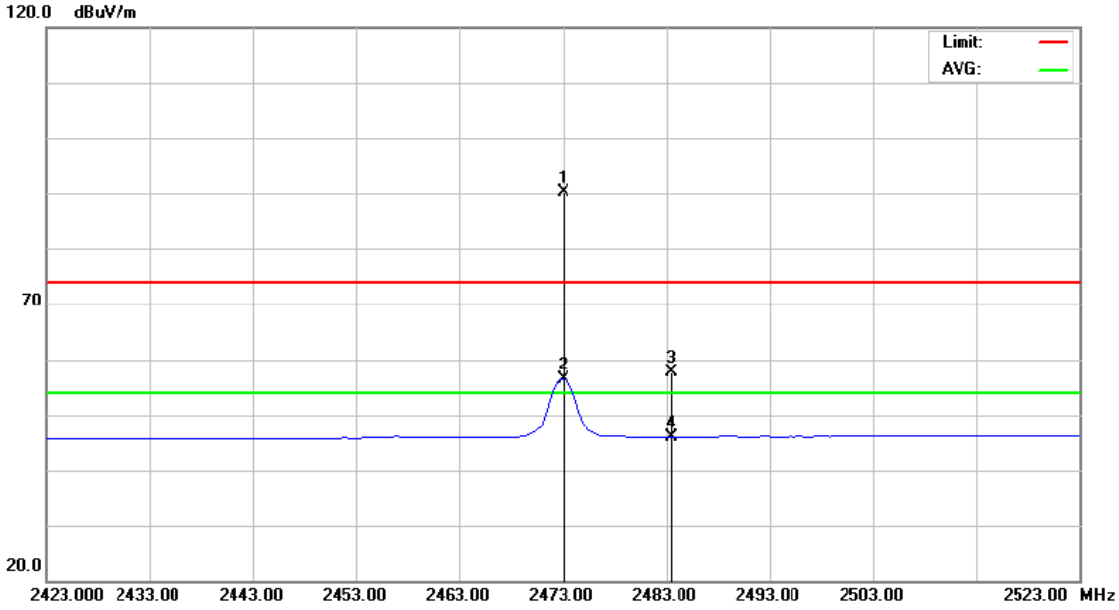
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4873.913	46.22	5.78	52.00	74.00	-22.00	peak	
2		4873.913	32.90	5.78	38.68	54.00	-15.32	AVG	
3		7310.925	43.90	12.57	56.47	74.00	-17.53	peak	
4	*	7310.925	31.36	12.57	43.93	54.00	-10.07	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2473MHz

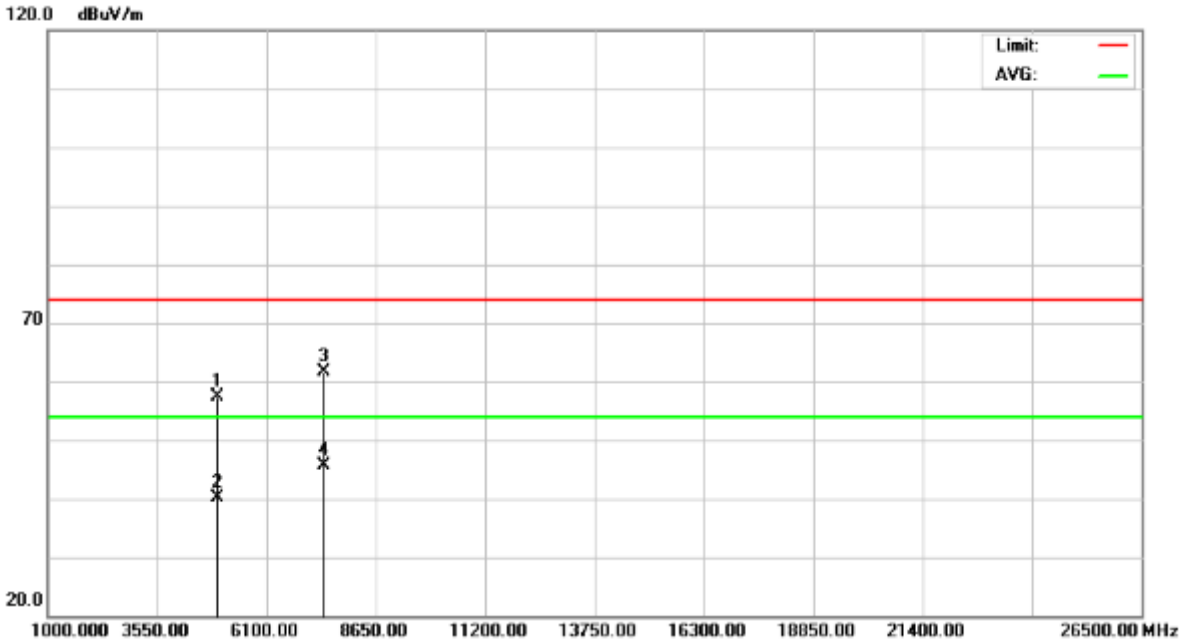
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2473.000	58.01	32.04	90.05	74.00	16.05	peak	no limit
2	X	2473.000	24.45	32.04	56.49	54.00	2.49	AVG	no limit
3		2483.500	25.60	32.09	57.69	74.00	-16.31	peak	
4		2483.500	13.81	32.09	45.90	54.00	-8.10	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2473MHz

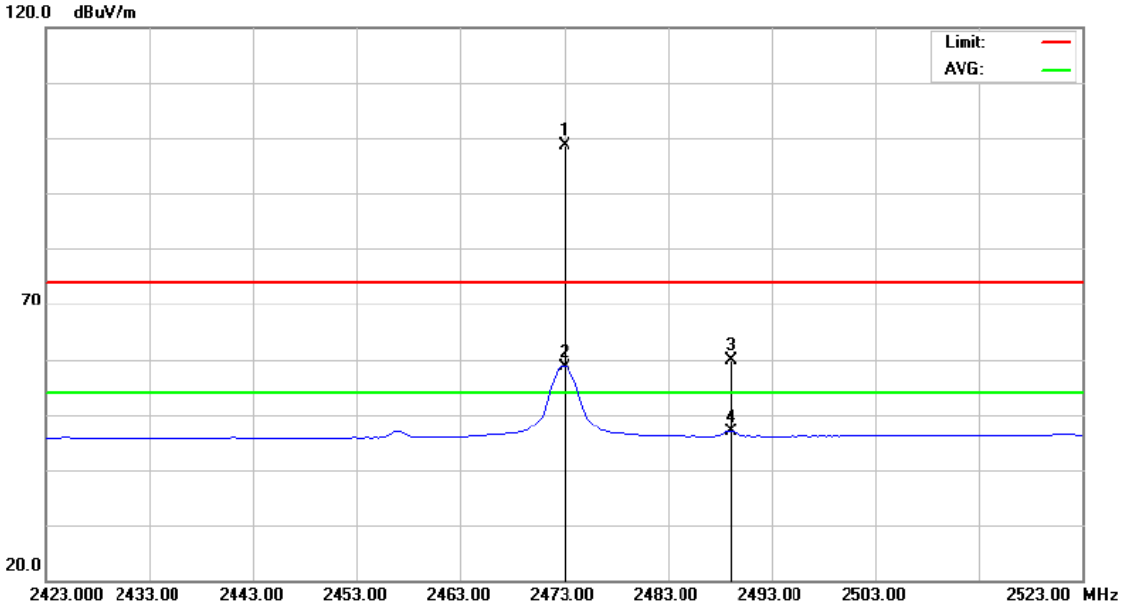
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4946.000	51.41	5.87	57.28	74.00	-16.72	peak	
2		4946.000	34.34	5.87	40.21	54.00	-13.79	AVG	
3		7418.875	48.71	12.97	61.68	74.00	-12.32	peak	
4	*	7418.875	32.72	12.97	45.69	54.00	-8.31	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2473MHz

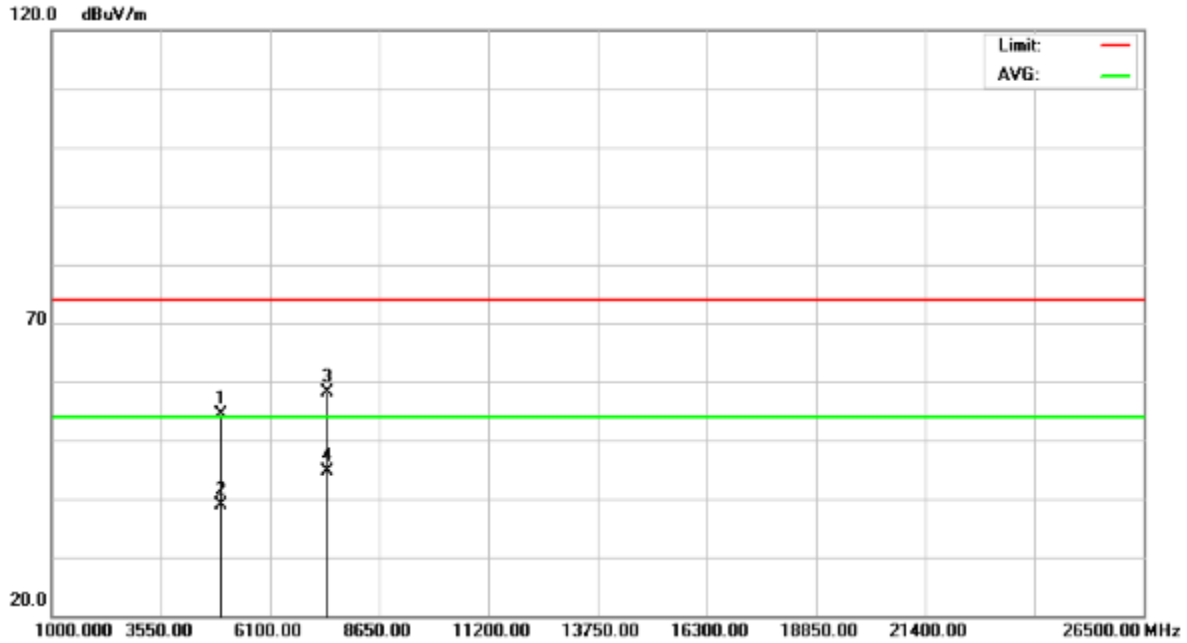
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2473.000	66.70	32.04	98.74	74.00	24.74	peak	no limit
2	X	2473.000	26.67	32.04	58.71	54.00	4.71	AVG	no limit
3		2489.000	27.69	32.11	59.80	74.00	-14.20	peak	
4		2489.000	14.89	32.11	47.00	54.00	-7.00	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2473MHz

Horizontal

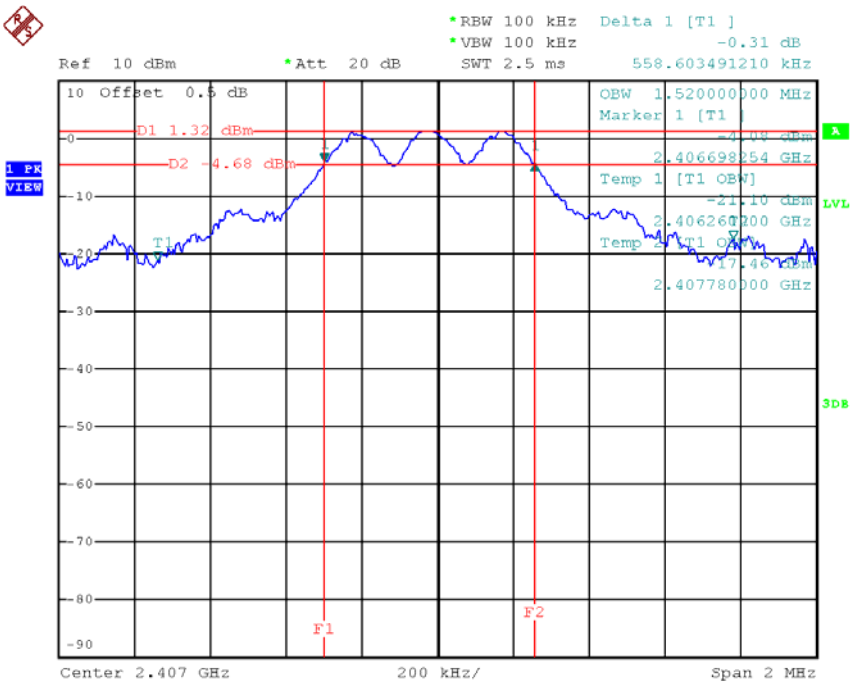


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4945.950	48.52	5.87	54.39	74.00	-19.61	peak	
2		4945.950	32.95	5.87	38.82	54.00	-15.18	AVG	
3		7419.075	45.08	12.97	58.05	74.00	-15.95	peak	
4	*	7419.075	31.71	12.97	44.68	54.00	-9.32	AVG	

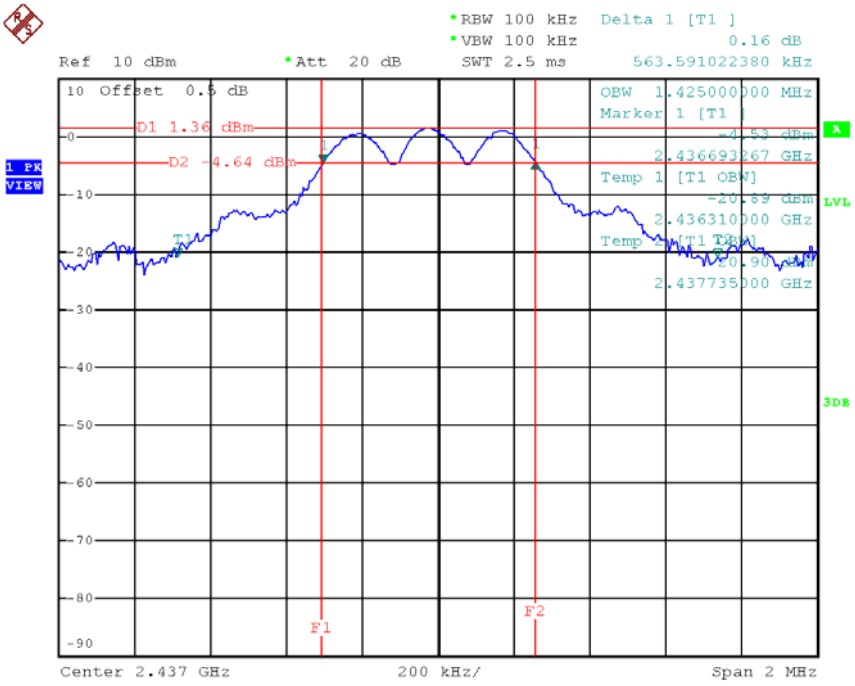
ATTACHMENT E - BANDWIDTH

Frequency	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit	Result
2407 MHz	0.56	1.52	>=500 kHz	PASS
2437 MHz	0.56	1.43	>=500 kHz	PASS
2473 MHz	0.57	1.31	>=500 kHz	PASS

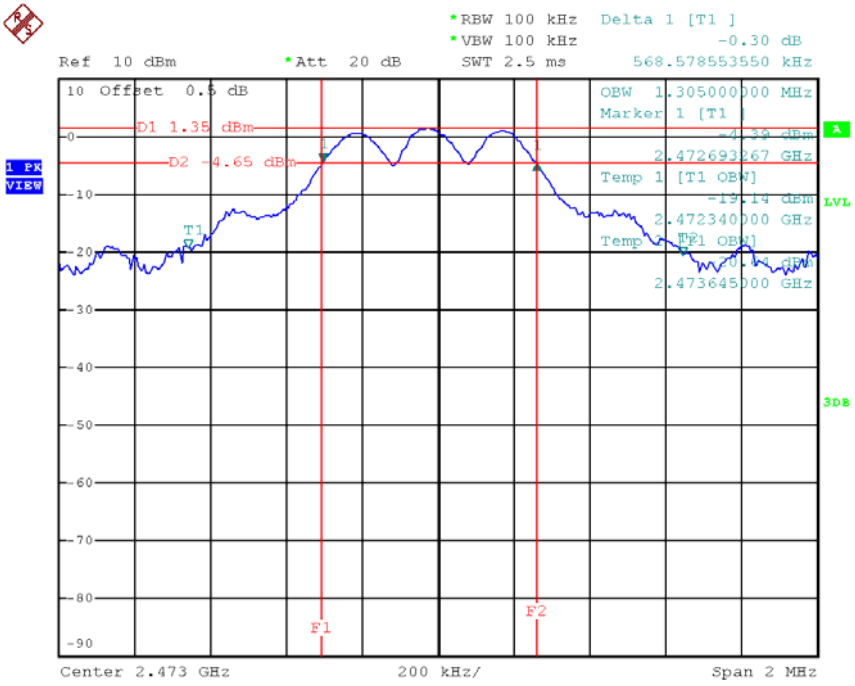
TX CH01



TX CH31



TX CH67



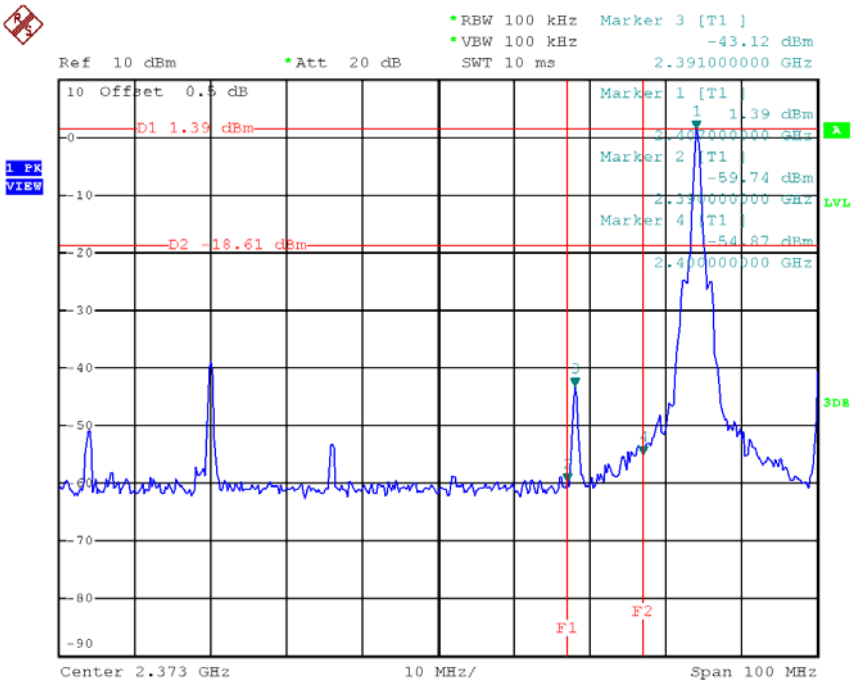
ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

Frequency	Output Power (dBm)	LIMIT (dBm)	Result
2407 MHz	1.66	30	PASS
2437 MHz	1.69	30	PASS
2473 MHz	1.65	30	PASS

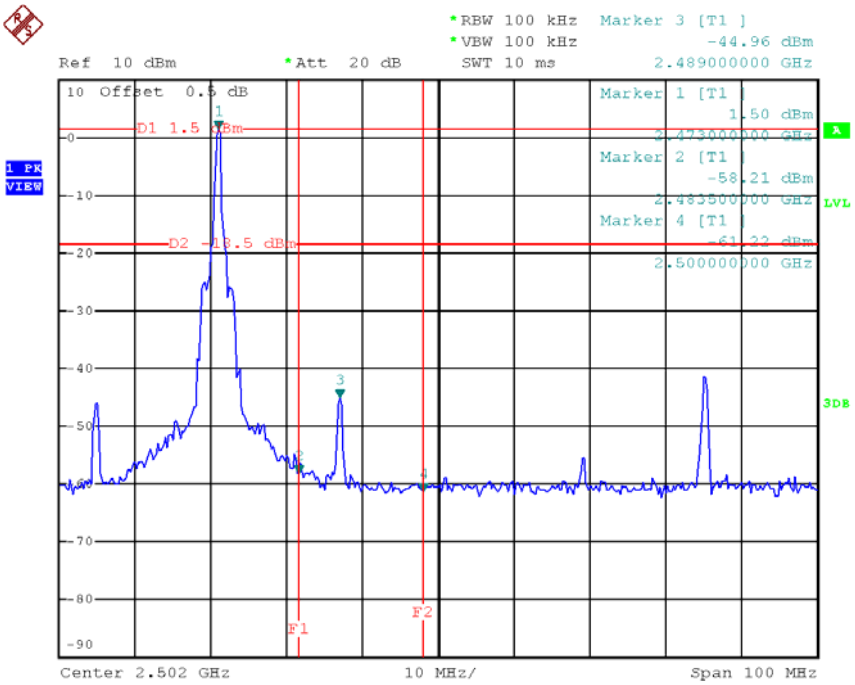
ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

Test Mode :	CH01, CH31 , CH67

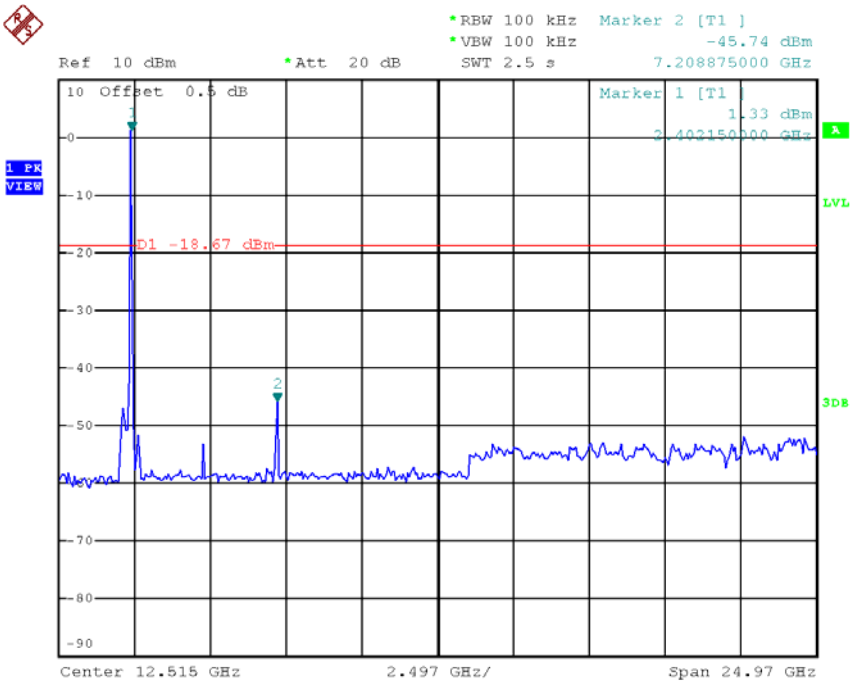
CH01 (Lower)



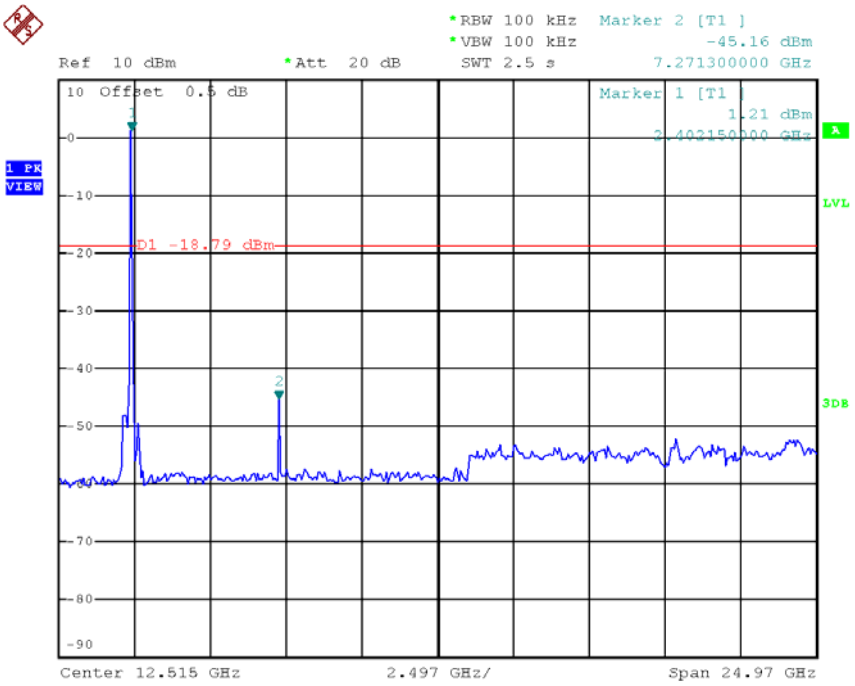
CH67 (upper)



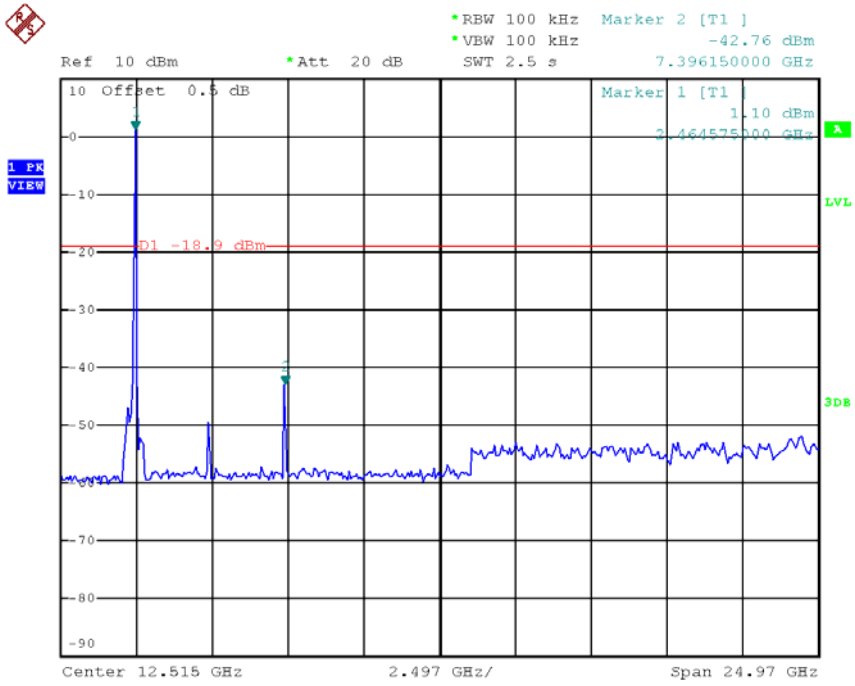
CH01 (10 Harmonic of the frequency)



CH31 (10 Harmonic of the frequency)



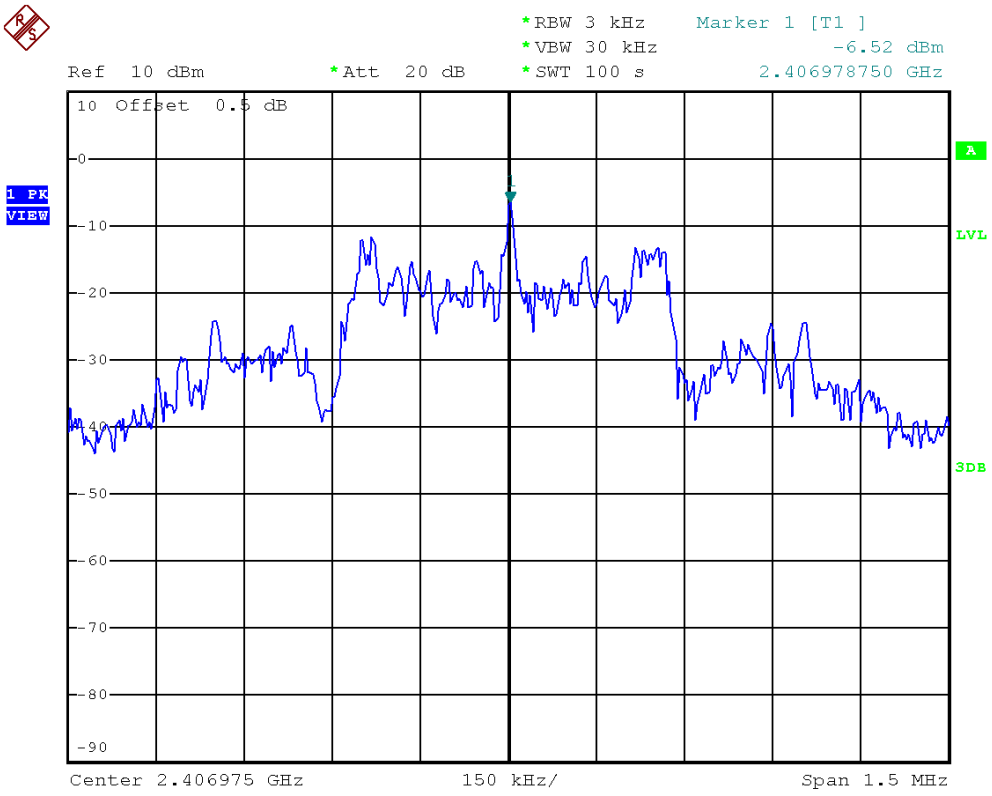
CH67 (10 Harmonic of the frequency)



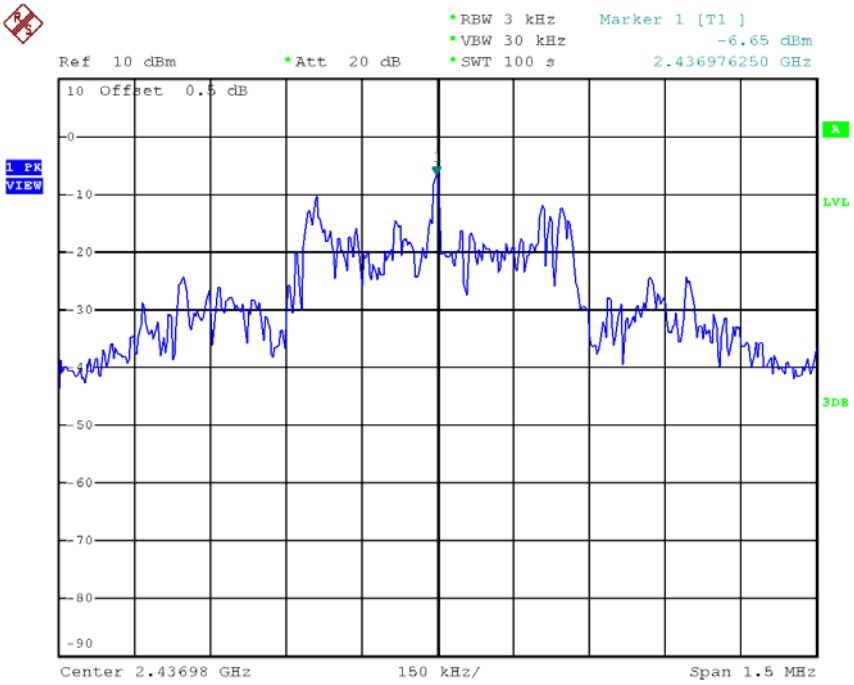
ATTACHMENT H - POWER SPECTRAL DENSITY TEST

Frequency	Power Density (dBm)	Limit (dBm)	Result
2407 MHz	-6.52	8	PASS
2437 MHz	-6.65	8	PASS
2473 MHz	-6.65	8	PASS

TX CH01



TX CH31



TX CH67