FCC Radio Test Report

FCC ID: H8GR30

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

Project No.	:	1510146
Equipment	:	2.4G RF Gaming Mouse
Model Name	:	R30, R30-1, R30a, R30ma
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	:	Oct. 15, 2015
Date of Test	:	Oct. 15, 2015 ~ Oct. 30, 2015
Issued Date	:	Nov. 02, 2015
Tested by	:	BTL Inc.

Testing Engineer : Rush Kao
(Rush Kao)

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(Jeff Yang)

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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-1-1510146	Original Issue.	Nov. 02, 2015

1. CERTIFICATION

Equipment	:	2.4G RF Gaming Mouse
Brand Name	:	bloodY ,  ,  , A4Tech
Model Name	:	R30, R30-1, R30a, R30ma
Applicant	:	A-FOUR TECH CO., LTD.
Date of Test	:	Oct. 15, 2015 ~ Oct. 30, 2015
Standard(s)	:	FCC Part15, Subpart C :2014 (15.247) / ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1510146) 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: 2014			
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.

2.1 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):

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: (VCCI RN: G-91; 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

The measurement uncertainty is not specified by FCC rules and Canada Industury for reference only.

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**%.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	2.04

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U,(dB)
CB08 (3m)	CISPR	9kHz ~ 150kHz	4.00
		150kHz ~ 30MHz	4.00

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
CB08 (3m)	CISPR	30MHz ~ 200MHz	V	3.06
		30MHz ~ 200MHz	H	2.58
		200MHz ~ 1,000MHz	V	3.50
		200MHz ~ 1,000MHz	H	3.10

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
CB08 (3m)	CISPR	1GHz ~ 6GHz	V	4.14
		1GHz ~ 6GHz	H	4.14
		6GHz ~ 18GHz	V	5.34
		6GHz ~ 18GHz	H	5.34

Note: unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

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}.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4G RF Gaming Mouse	
Brand Name	bloodY ,  ,  , A4Tech	
Model Name	R30, R30-1, R30a, R30ma	
Model Difference	Only differ in model name.	
Product Description	Operation Frequency	2407 MHz ~2473 MHz
	Modulation Technology	GFSK
	Bit Rate of Transmitter	500 Kbps
	Output Power (Max.)	-1.30 dBm
Power Source	#1. Supplied from USB DC Source. #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 List:

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	PCB	N/A	-4.05

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

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

For Conducted Test	
Final Test Mode	Description
Mode 1	TX Mode

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

Note:

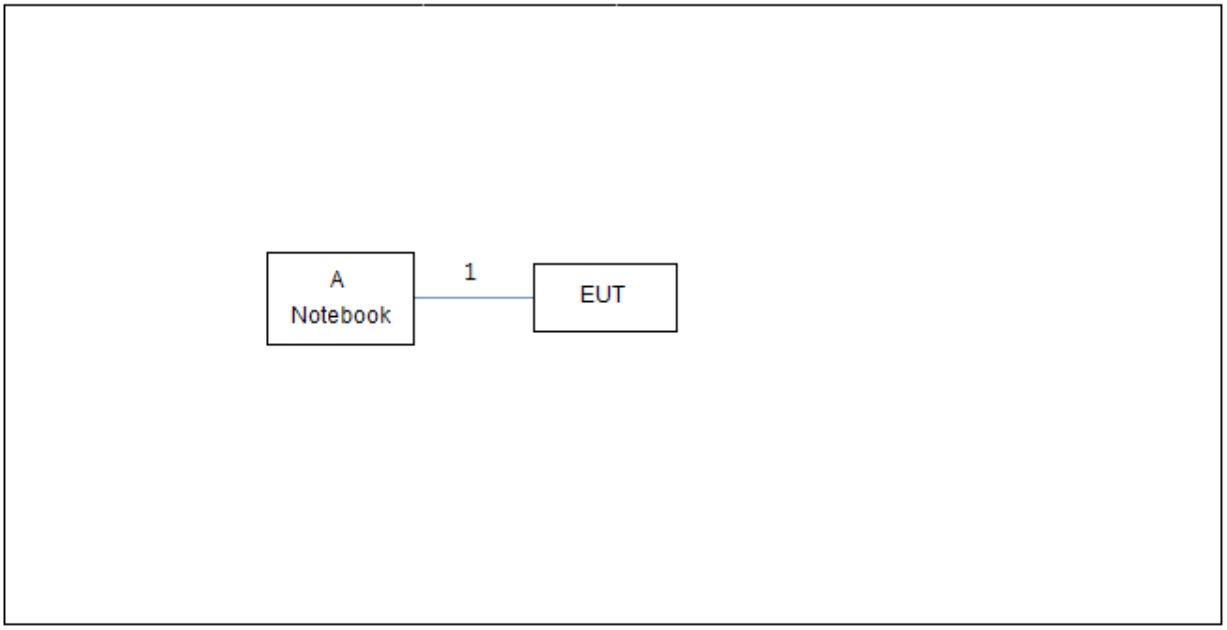
(1) The measurements are performed at the high, middle, low available channels.

3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

Test Software Version	HidCmdApp		
Frequency (MHz)	2407	2437	2473
-	default	default	default

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Notebook PC	DELL	PP18L	DOC	PF329 A01

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	0.55m	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

(2) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss - Amplifier Gain(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

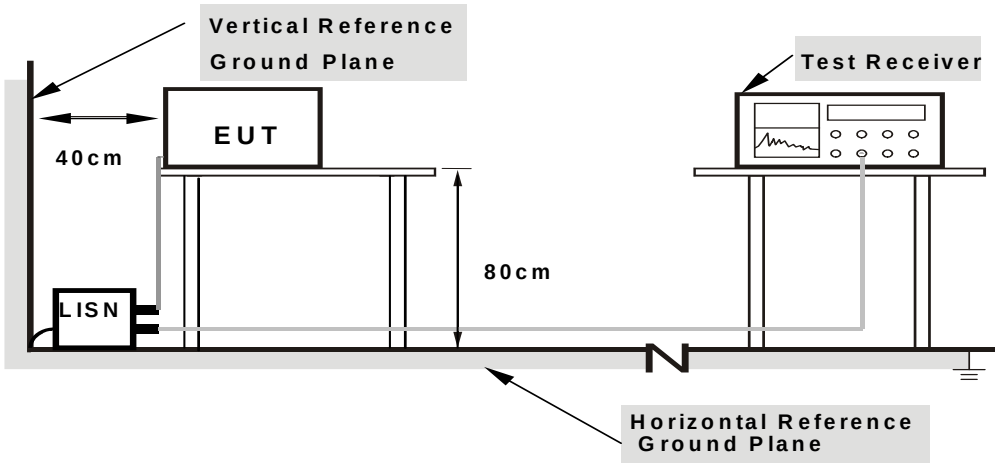
4.1.2 TEST PROCEDURE

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 function (as a customer would normally use it), EUT was programmed to be in continuously transmitting/receiving data or hopping on mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 26°C
Relative Humidity: 59%
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

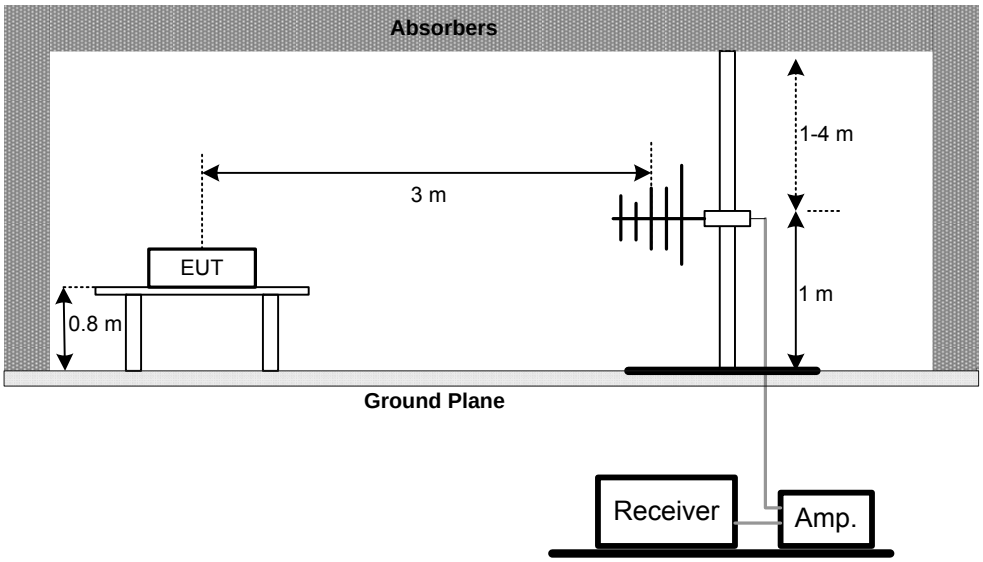
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance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

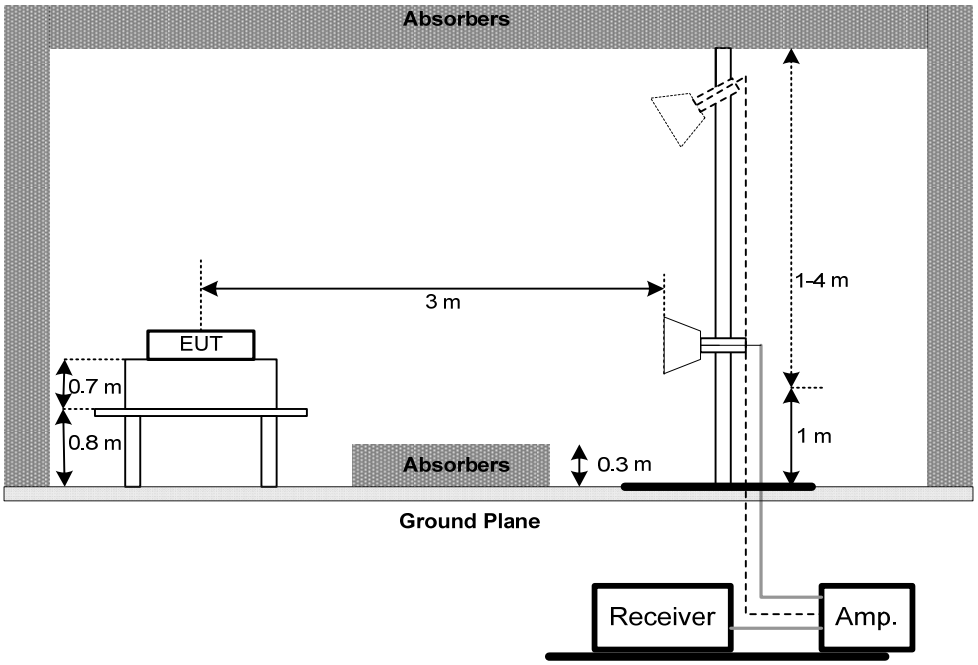
No deviation

4.2.4 TEST SETUP

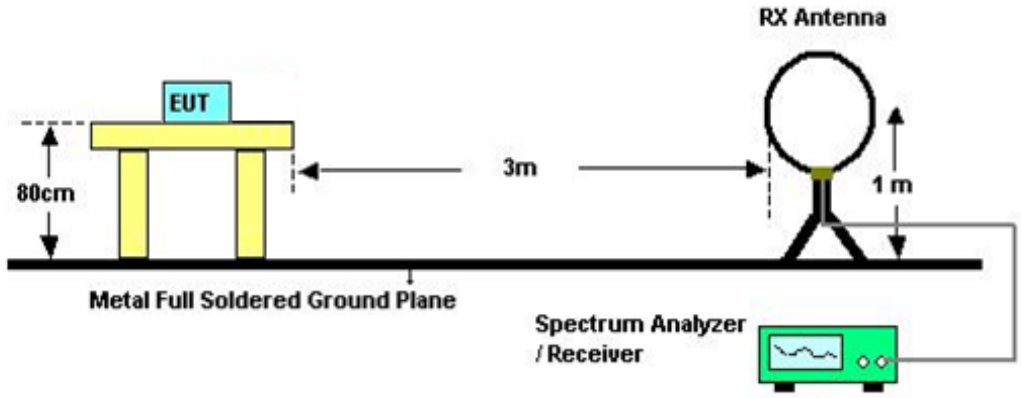
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

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

4.2.7 TEST 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.

4.2.8 TEST RESULTS (BETWEEN 30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) Measuring frequency range from 30MHz to 1000MHz.
(2) 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) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission

(2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(3) EUT Orthogonal Axis:
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(4) 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

(5) 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)	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: 25°C
Relative Humidity: 55%
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

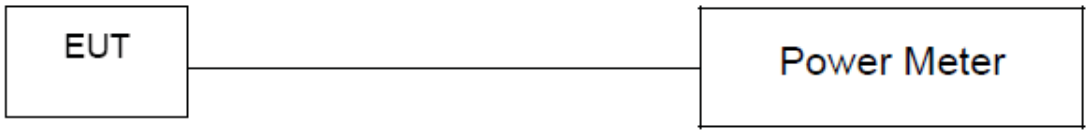
6.1.1 TEST PROCEDURE

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 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.

6.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
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 transmitter demonstrates compliance with the peak conducted power limits.

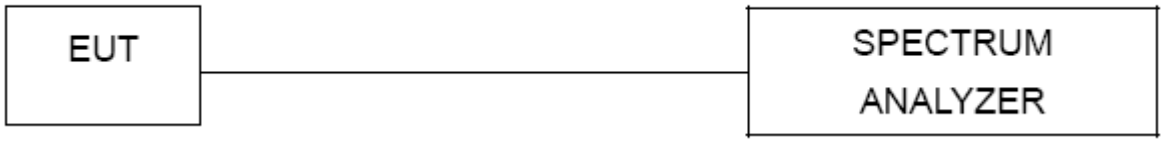
7.1.1 TEST PROCEDURE

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: 25°C
Relative Humidity: 55%
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

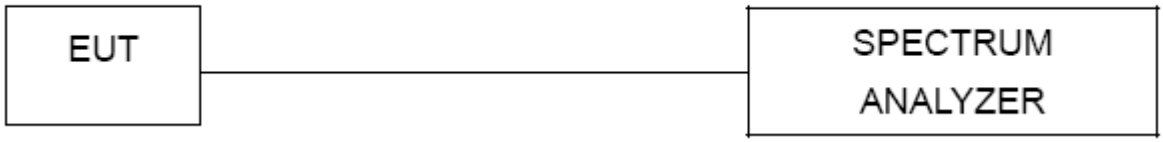
8.1.1 TEST PROCEDURE

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: 25°C
Relative Humidity: 55%
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	TWO-LINE V-NETWORK	R&S	ENV216	101050	Jun. 01, 2016
2	Test Cable	TIMES	CFD300-NL	C03	Mar. 04, 2016
3	EMI Test Receiver	R&S	ESR3	101854	Dec. 09, 2015
4	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY51160196	Aug. 02, 2016
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 20, 2016
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 13, 2016
4	Microflex Cable	Harbour industries	27478LL142	1m	Apr. 13, 2016
5	Microflex Cable	EMC	S104-SMA	8m	May 14, 2016
6	Microflex Cable	Harbour industries	27478LL142	3m	May 13, 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. 16, 2016
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jul. 30, 2016
11	Loop Antenna	EMCO	6502	00042960	Nov. 06, 2015

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	Aug. 16. 2016
2	Power Meter Sensor	Anritsu	MA2411B	1126001	Aug. 16, 2016

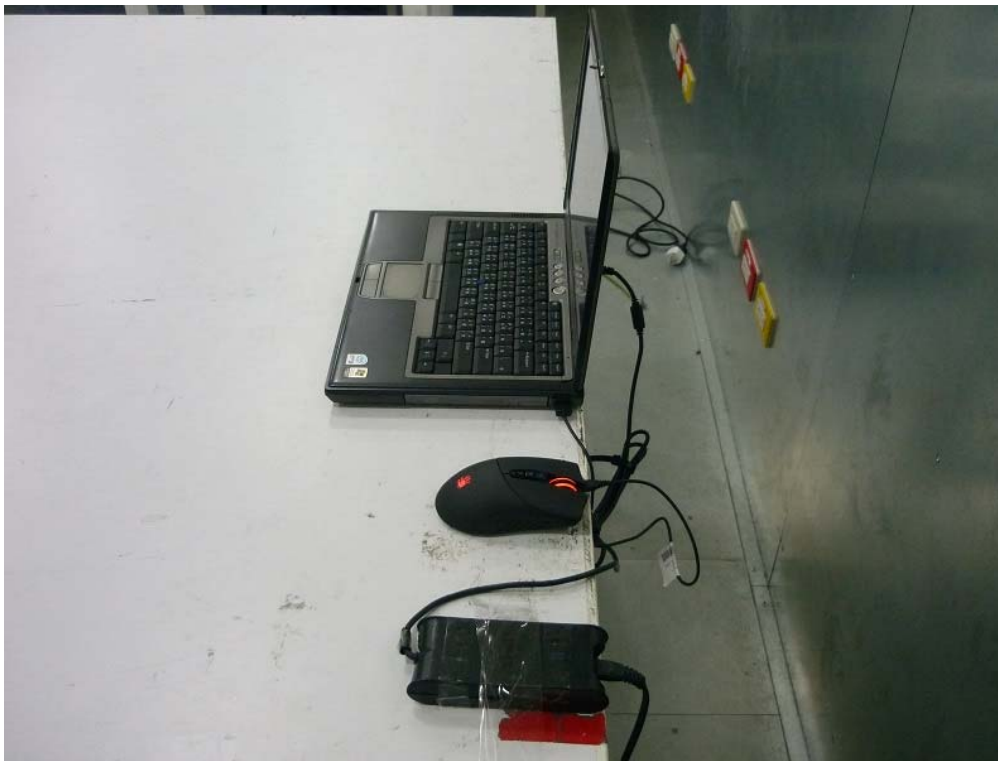
Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 07, 2016

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.

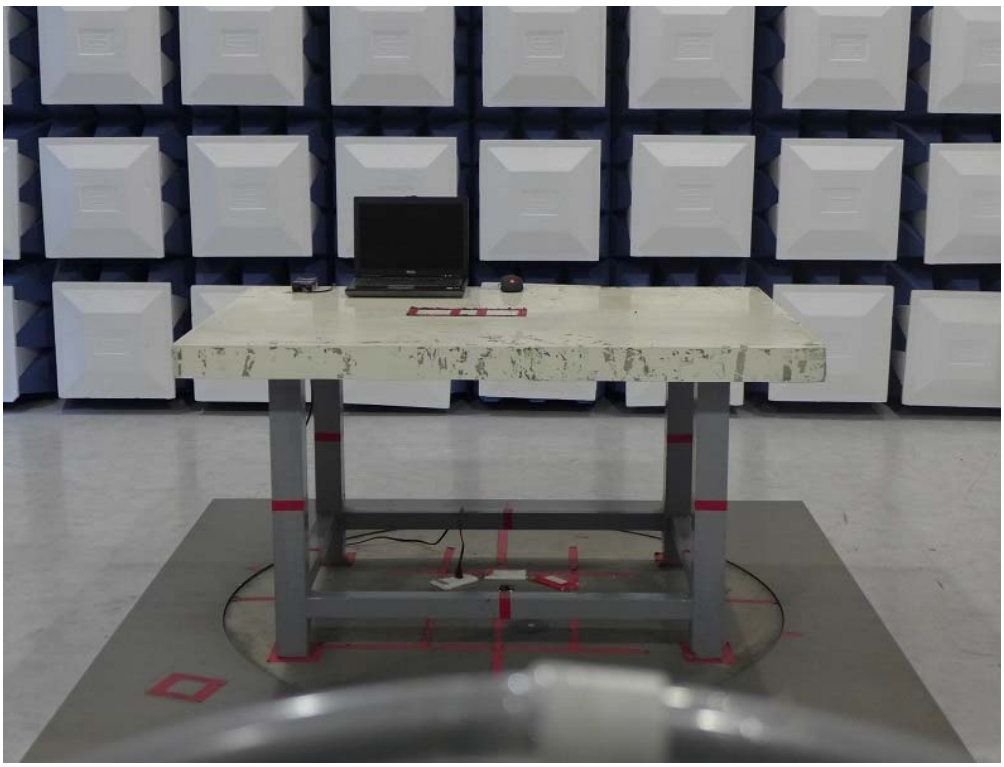
10. EUT TEST PHOTO

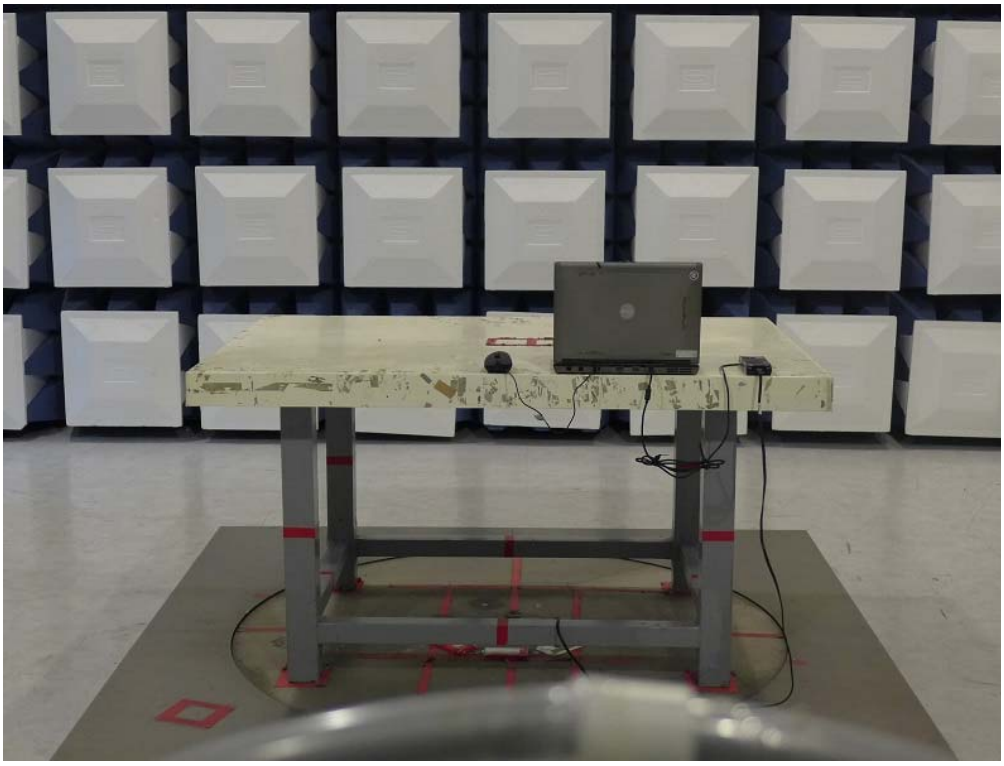
Conducted Measurement Photos



Radiated Measurement Photos

9K-30MHz



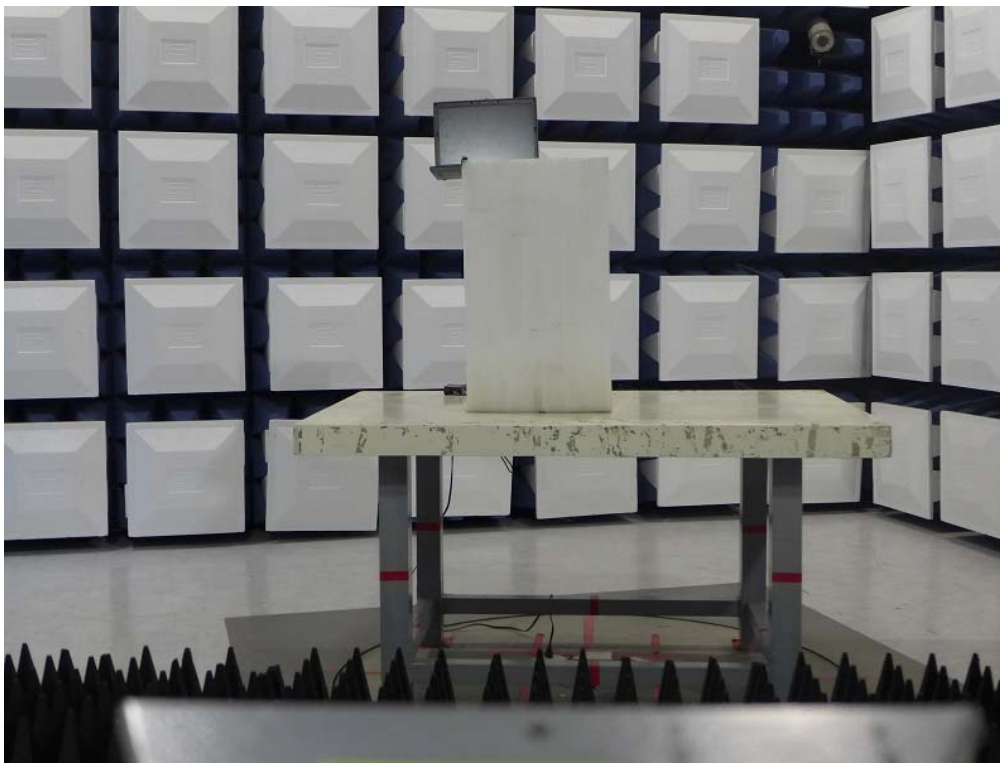


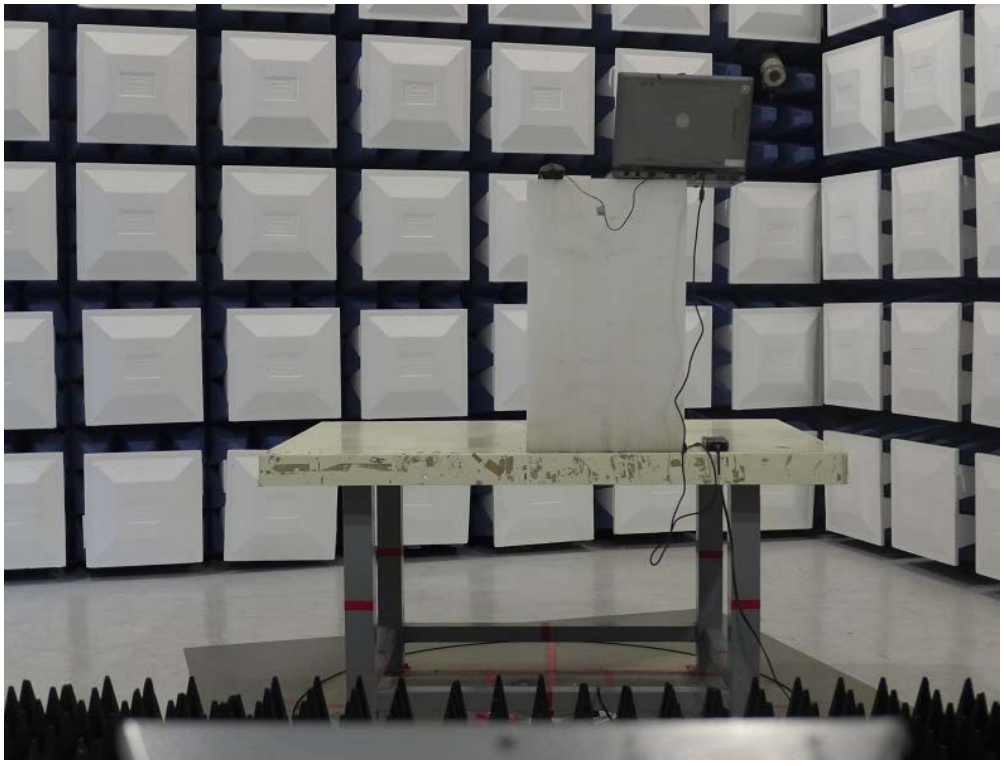
Radiated Measurement Photos

30MHz-1G

Radiated Measurement Photos

Above 1G

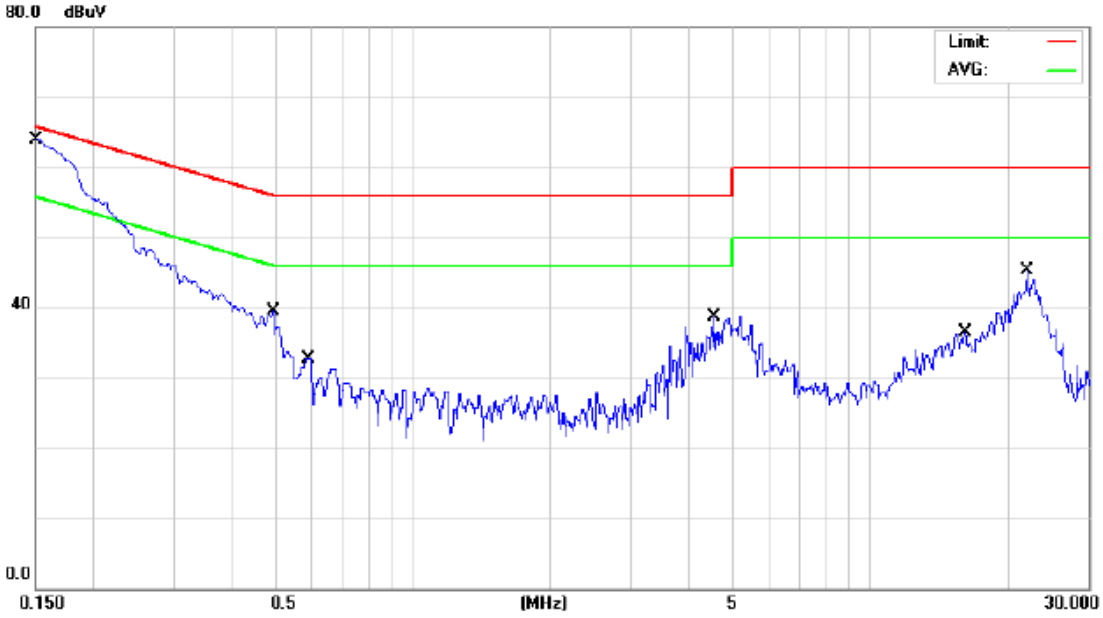




ATTACHMENT A - CONDUCTED EMISSION

Test Mode:	TX Mode

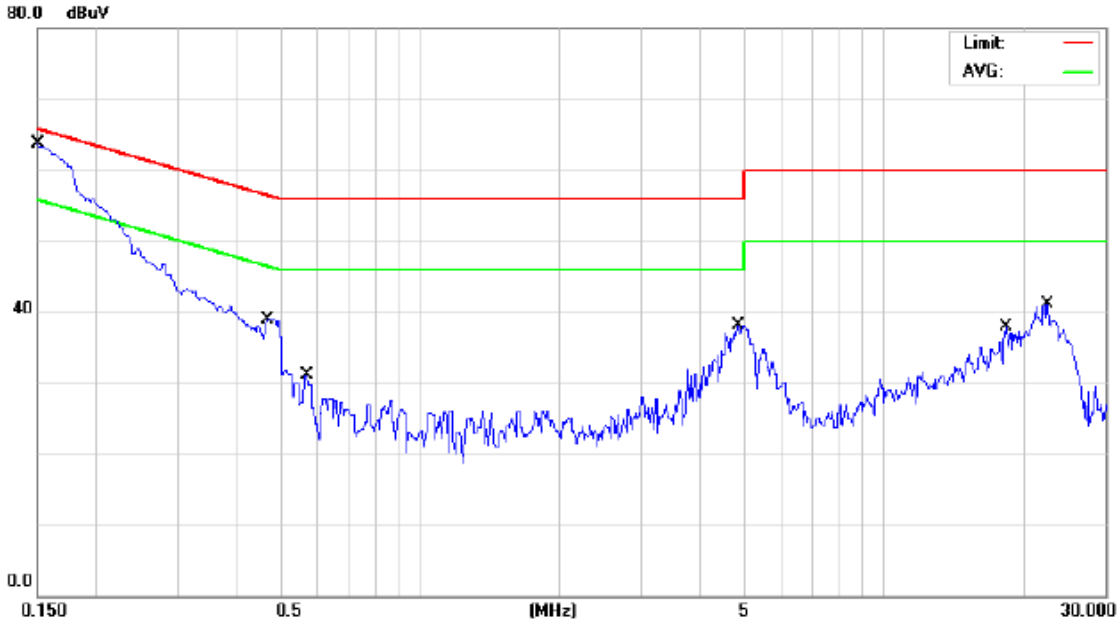
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	47.30	9.64	56.94	65.99	-9.05	QP	
2		0.1500	22.40	9.64	32.04	55.99	-23.95	AVG	
3		0.4951	23.50	9.64	33.14	56.08	-22.94	QP	
4		0.4951	16.30	9.64	25.94	46.08	-20.14	AVG	
5		0.5899	18.70	9.64	28.34	56.00	-27.66	QP	
6		0.5899	10.10	9.64	19.74	46.00	-26.26	AVG	
7		4.5590	19.90	9.84	29.74	56.00	-26.26	QP	
8		4.5590	9.40	9.84	19.24	46.00	-26.76	AVG	
9		16.1000	18.70	9.82	28.52	60.00	-31.48	QP	
10		16.1000	12.10	9.82	21.92	50.00	-28.08	AVG	
11		22.0500	25.80	9.87	35.67	60.00	-24.33	QP	
12		22.0500	18.50	9.87	28.37	50.00	-21.63	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	44.30	9.63	53.93	65.99	-12.06	QP	
2		0.1500	17.70	9.63	27.33	55.99	-28.66	AVG	
3		0.4685	23.20	9.65	32.85	56.54	-23.69	QP	
4		0.4685	11.70	9.65	21.35	46.54	-25.19	AVG	
5		0.5720	17.20	9.65	26.85	56.00	-29.15	QP	
6		0.5720	10.40	9.65	20.05	46.00	-25.95	AVG	
7		4.8290	22.30	9.84	32.14	56.00	-23.86	QP	
8		4.8290	12.50	9.84	22.34	46.00	-23.66	AVG	
9		18.3000	20.30	9.85	30.15	60.00	-29.85	QP	
10		18.3000	14.40	9.85	24.25	50.00	-25.75	AVG	
11		22.4500	27.20	9.89	37.09	60.00	-22.91	QP	
12		22.4500	19.20	9.89	29.09	50.00	-20.91	AVG	

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

Test Mode:	TX Mode

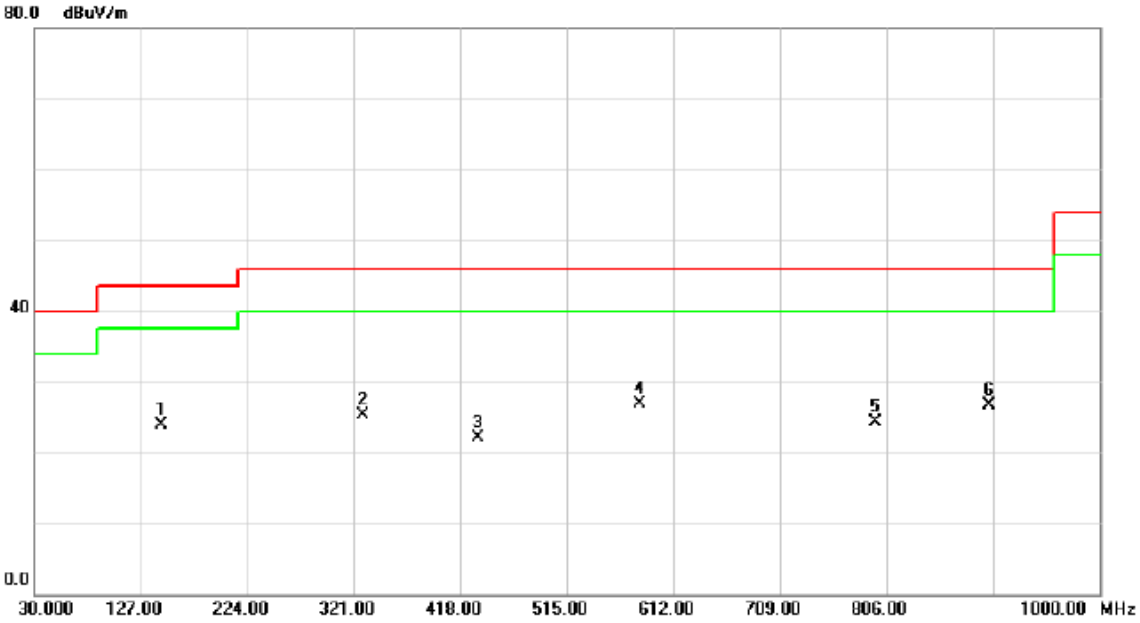
Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0139	0°	28.64	22.30	50.94	104.74	-53.80	AVG
0.0139	0°	27.82	22.30	50.12	124.74	-74.62	PK
0.0269	0°	25.61	21.98	47.59	99.01	-51.42	AVG
0.0269	0°	25.82	21.98	47.80	119.01	-71.21	PK
0.0551	0°	25.67	21.32	46.99	92.78	-45.79	AVG
0.0551	0°	26.89	21.32	48.21	112.78	-64.57	PK
0.0838	0°	24.61	20.86	45.47	89.14	-43.67	AVG
0.0838	0°	26.02	20.86	46.88	109.14	-62.26	PK
1.6200	0°	26.30	19.98	46.28	63.41	-17.13	QP
1.8100	0°	24.65	19.79	44.44	69.54	-25.10	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0180	90°	28.64	22.20	50.84	102.50	-51.66	AVG
0.0180	90°	27.68	22.20	49.88	122.50	-72.62	PK
0.0235	90°	24.04	22.06	46.10	100.18	-54.08	AVG
0.0235	90°	26.59	22.06	48.65	120.18	-71.53	PK
0.0521	90°	24.15	21.37	45.52	93.27	-47.75	AVG
0.0521	90°	26.82	21.37	48.19	113.27	-65.08	PK
0.0620	90°	24.34	21.21	45.55	91.76	-46.21	AVG
0.0620	90°	26.81	21.21	48.02	111.76	-63.74	PK
1.5700	90°	26.28	20.03	46.31	63.69	-17.38	QP
1.7700	90°	25.50	19.83	45.33	69.54	-24.21	QP

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

Test Mode:	TX 2437MHz –CH31

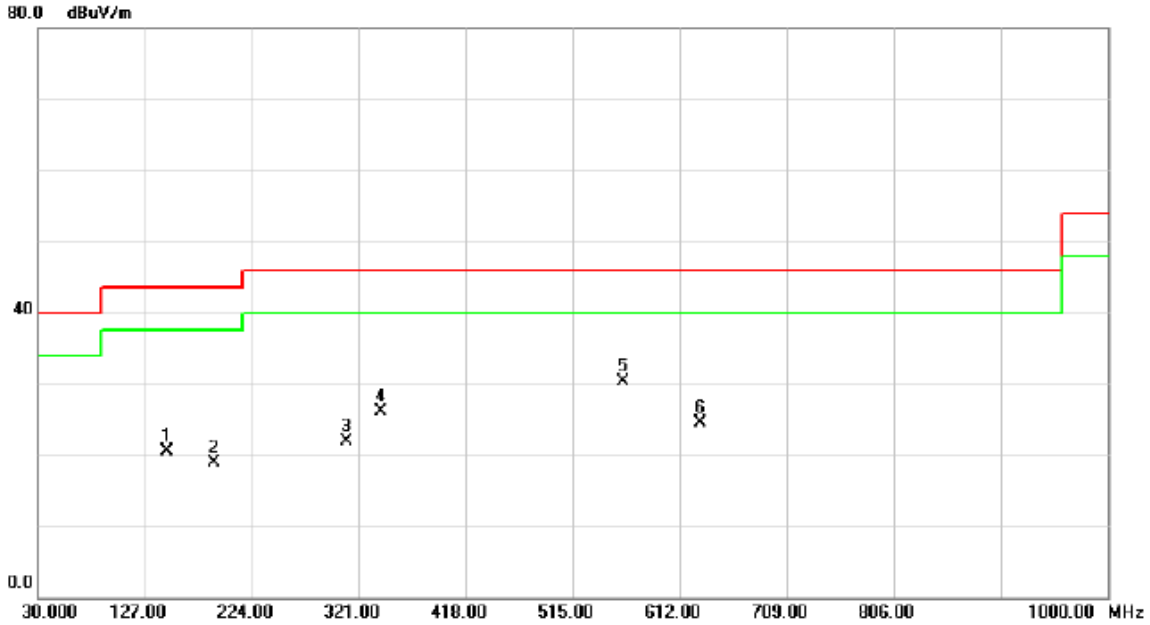
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		145.4300	38.31	-14.31	24.00	43.50	-19.50	peak	
2		328.7600	36.05	-10.81	25.24	46.00	-20.76	peak	
3		434.4900	31.27	-9.22	22.05	46.00	-23.95	peak	
4	*	580.9600	33.95	-7.05	26.90	46.00	-19.10	peak	
5		796.3000	27.81	-3.50	24.31	46.00	-21.69	peak	
6		899.1200	28.28	-1.52	26.76	46.00	-19.24	peak	

Test Mode:	TX 2437MHz –CH31

Horizontal

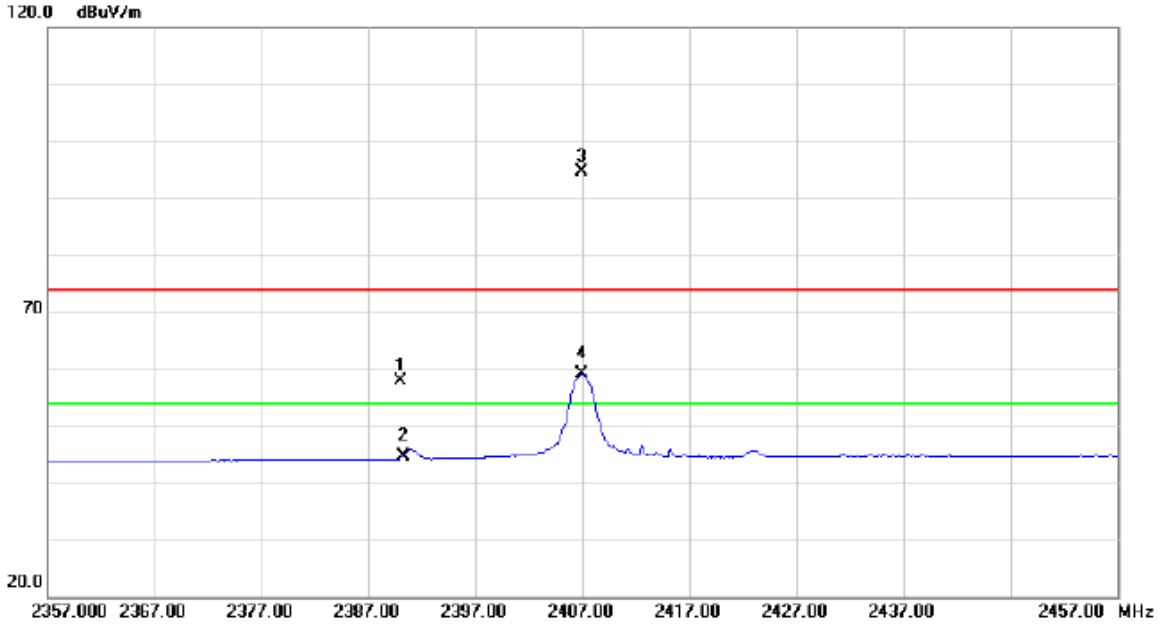


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		147.3700	34.78	-14.23	20.55	43.50	-22.95	peak	
2		190.0500	33.89	-14.97	18.92	43.50	-24.58	peak	
3		309.3600	33.19	-11.21	21.98	46.00	-24.02	peak	
4		341.3700	36.59	-10.55	26.04	46.00	-19.96	peak	
5	*	560.5900	37.71	-7.46	30.25	46.00	-15.75	peak	
6		630.4300	30.42	-5.98	24.44	46.00	-21.56	peak	

ATTACHMENT D -RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode :	TX 2407MHz -CH01

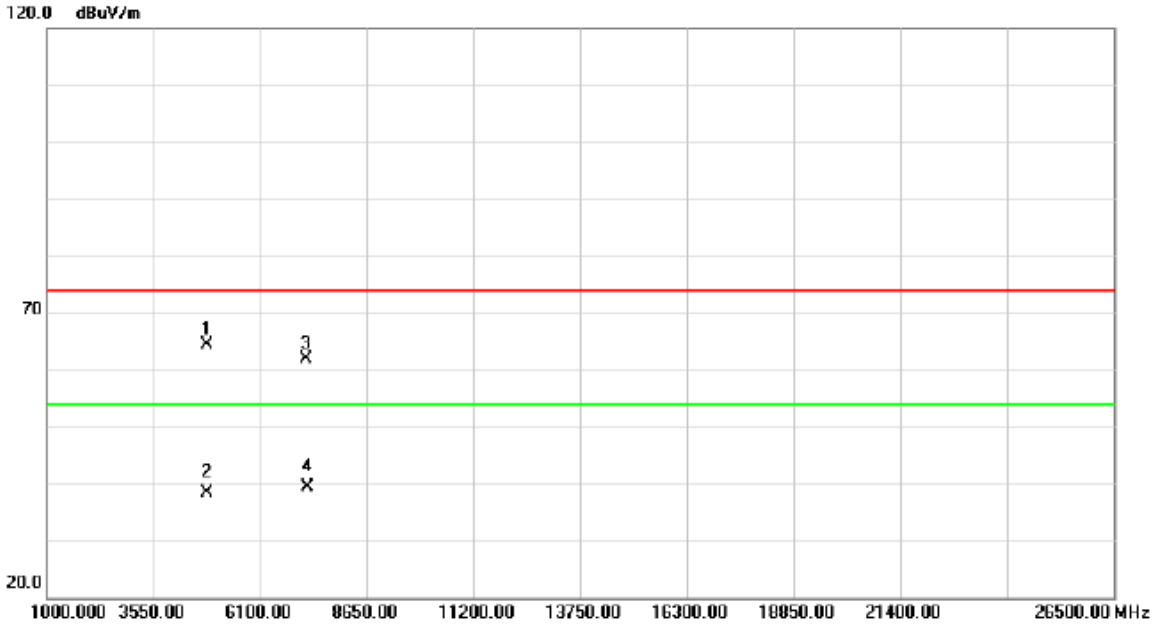
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	27.04	30.79	57.83	74.00	-16.17	peak	
2		2390.000	13.75	30.79	44.54	54.00	-9.46	AVG	
3	*	2406.900	63.90	30.85	94.75	74.00	20.75	peak	no limit
4	X	2406.900	28.25	30.85	59.10	54.00	5.10	AVG	no limit

Test Mode :	TX 2407MHz -CH01

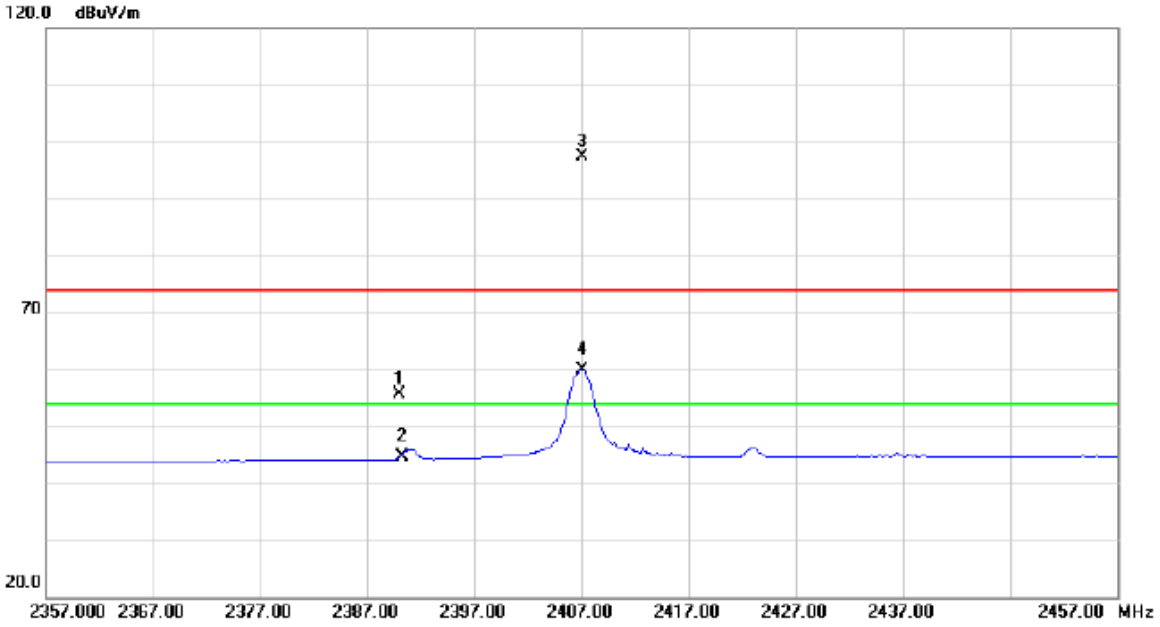
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4813.910	61.03	3.35	64.38	74.00	-9.62	peak	
2		4813.910	35.08	3.35	38.43	54.00	-15.57	AVG	
3		7220.825	53.47	8.41	61.88	74.00	-12.12	peak	
4		7220.825	31.00	8.41	39.41	54.00	-14.59	AVG	

Test Mode :	TX 2407MHz -CH01

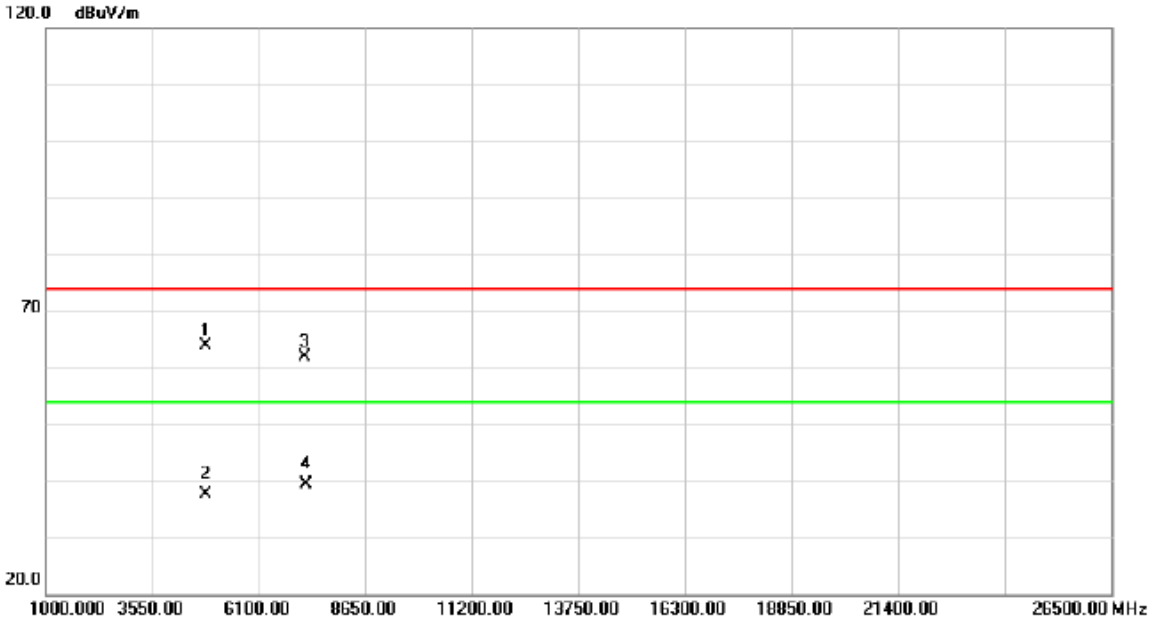
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	24.74	30.79	55.53	74.00	-18.47	peak	
2		2390.000	13.82	30.79	44.61	54.00	-9.39	AVG	
3	*	2407.000	66.53	30.85	97.38	74.00	23.38	peak	no limit
4	X	2407.000	29.07	30.85	59.92	54.00	5.92	AVG	no limit

Test Mode :	TX 2407MHz -CH01

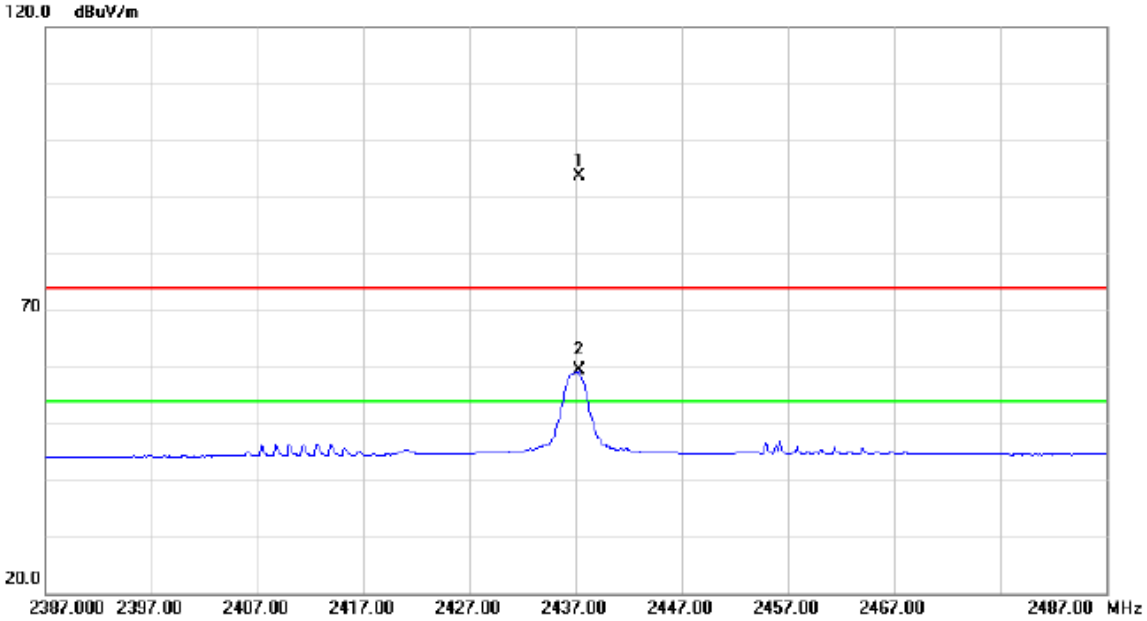
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4813.945	60.45	3.35	63.80	74.00	-10.20	peak	
2		4813.945	34.30	3.35	37.65	54.00	-16.35	AVG	
3		7220.845	53.46	8.41	61.87	74.00	-12.13	peak	
4		7220.845	31.07	8.41	39.48	54.00	-14.52	AVG	

Test Mode :	TX 2437MHz –CH31

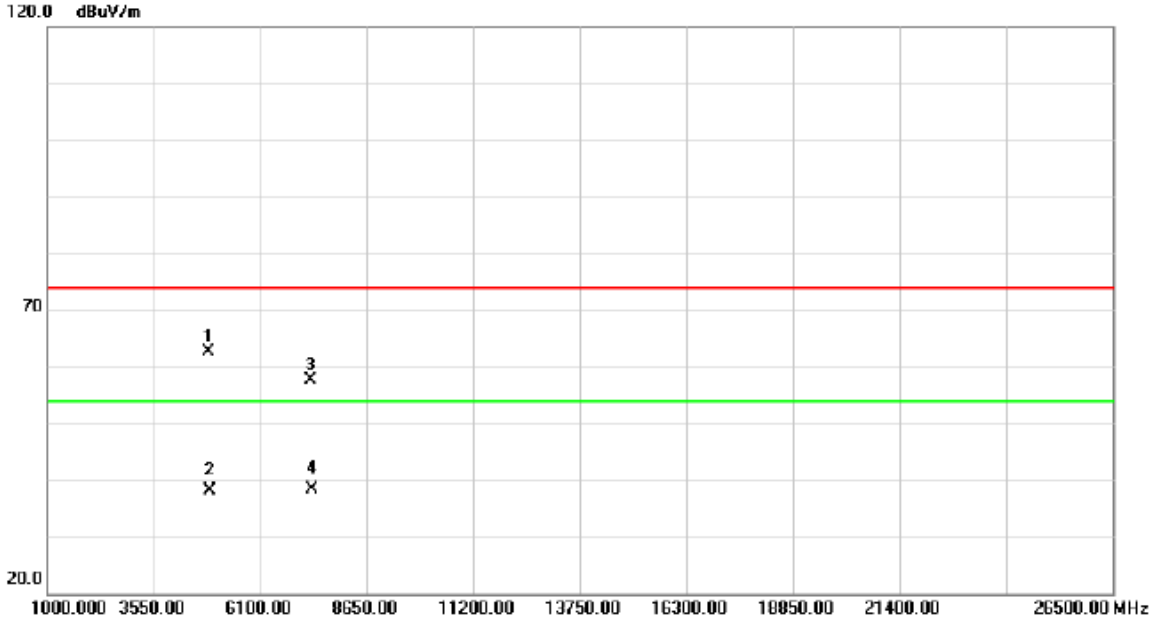
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2437.300	62.59	30.95	93.54	74.00	19.54	peak	no limit
2	X	2437.300	28.32	30.95	59.27	54.00	5.27	AVG	no limit

Test Mode :	TX 2437MHz –CH31

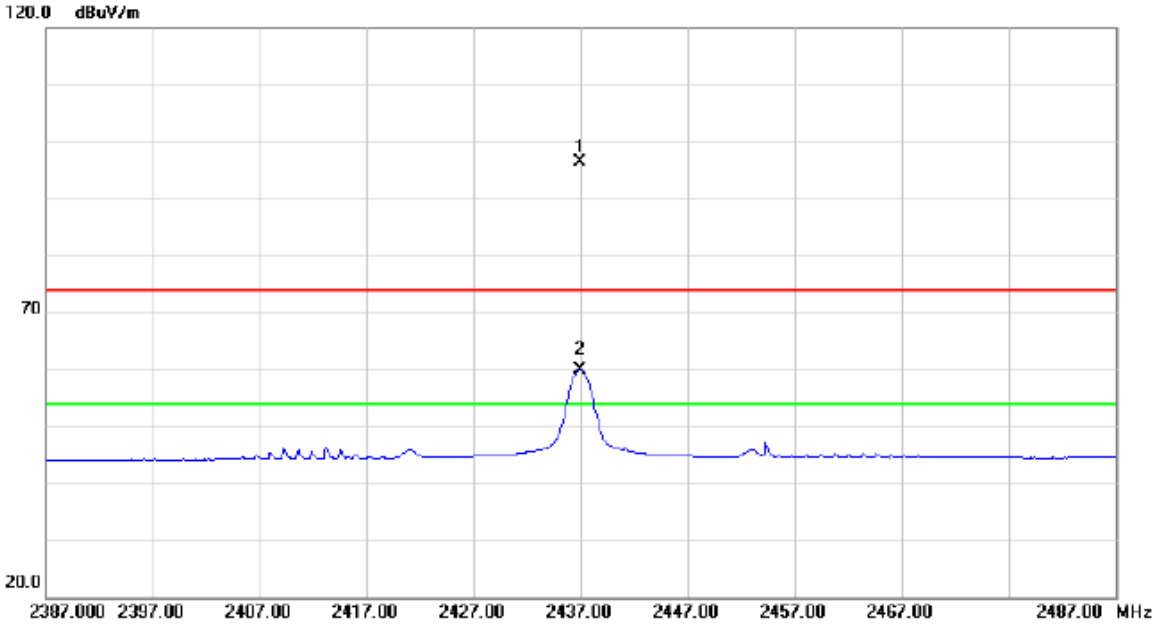
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4873.920	59.13	3.54	62.67	74.00	-11.33	peak	
2		4873.920	34.60	3.54	38.14	54.00	-15.86	AVG	
3		7310.830	49.12	8.55	57.67	74.00	-16.33	peak	
4		7310.830	29.83	8.55	38.38	54.00	-15.62	AVG	

Test Mode :	TX 2437MHz –CH31

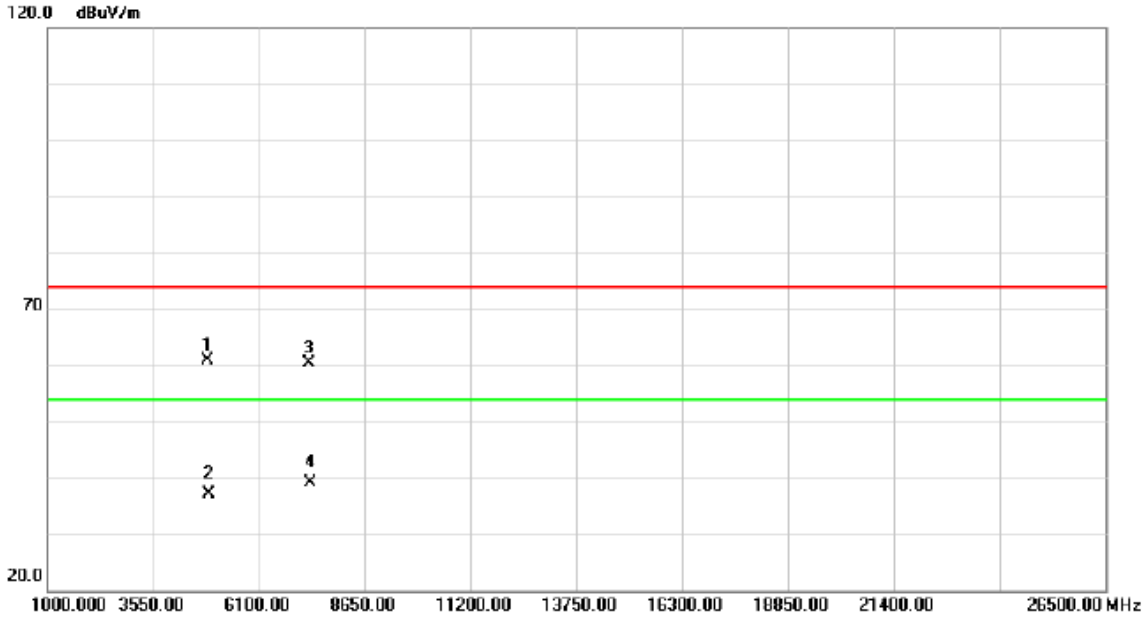
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2436.900	65.54	30.95	96.49	74.00	22.49	peak	no limit
2	X	2436.900	28.99	30.95	59.94	54.00	5.94	AVG	no limit

Test Mode :	TX 2437MHz –CH31

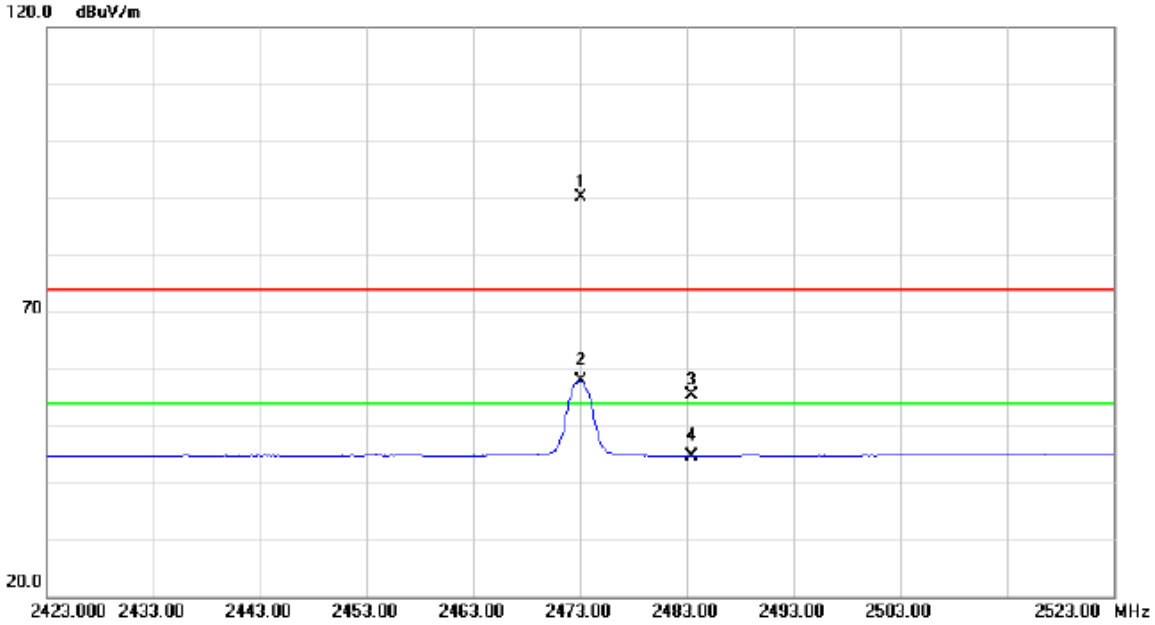
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4873.910	57.43	3.54	60.97	74.00	-13.03	peak	
2		4873.910	33.71	3.54	37.25	54.00	-16.75	AVG	
3		7310.810	51.81	8.55	60.36	74.00	-13.64	peak	
4		7310.810	30.59	8.55	39.14	54.00	-14.86	AVG	

Test Mode :	TX 2473MHz –CH67

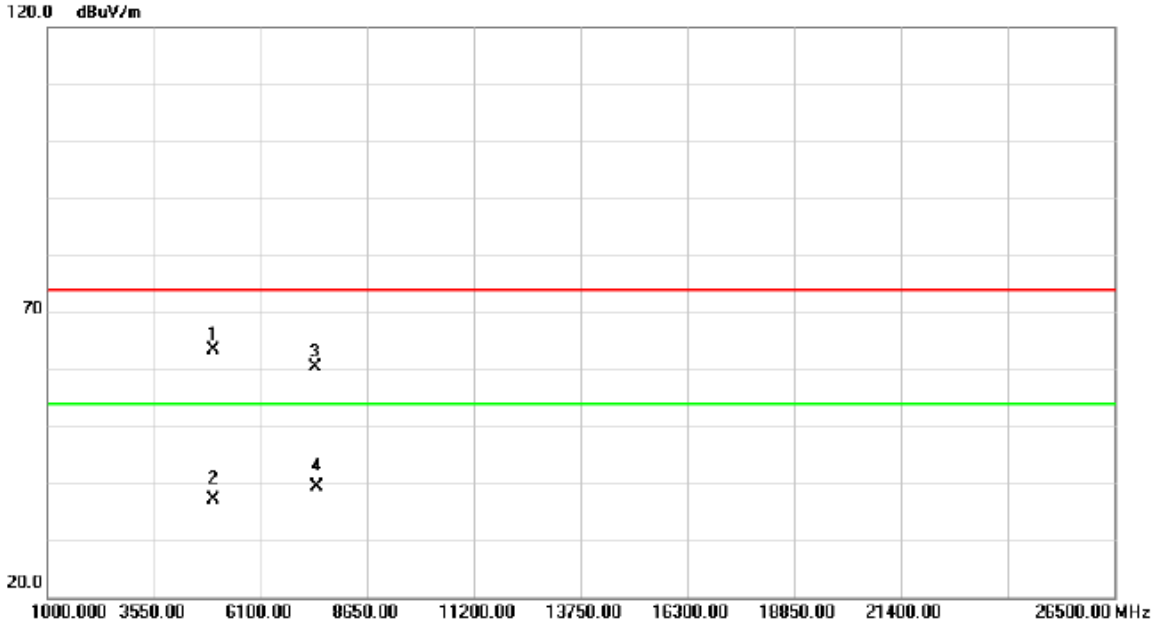
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2473.000	58.95	31.07	90.02	74.00	16.02	peak	no limit
2	X	2473.000	26.85	31.07	57.92	54.00	3.92	AVG	no limit
3		2483.500	24.37	31.11	55.48	74.00	-18.52	peak	
4		2483.500	13.55	31.11	44.66	54.00	-9.34	AVG	

Test Mode :	TX 2473MHz –CH67

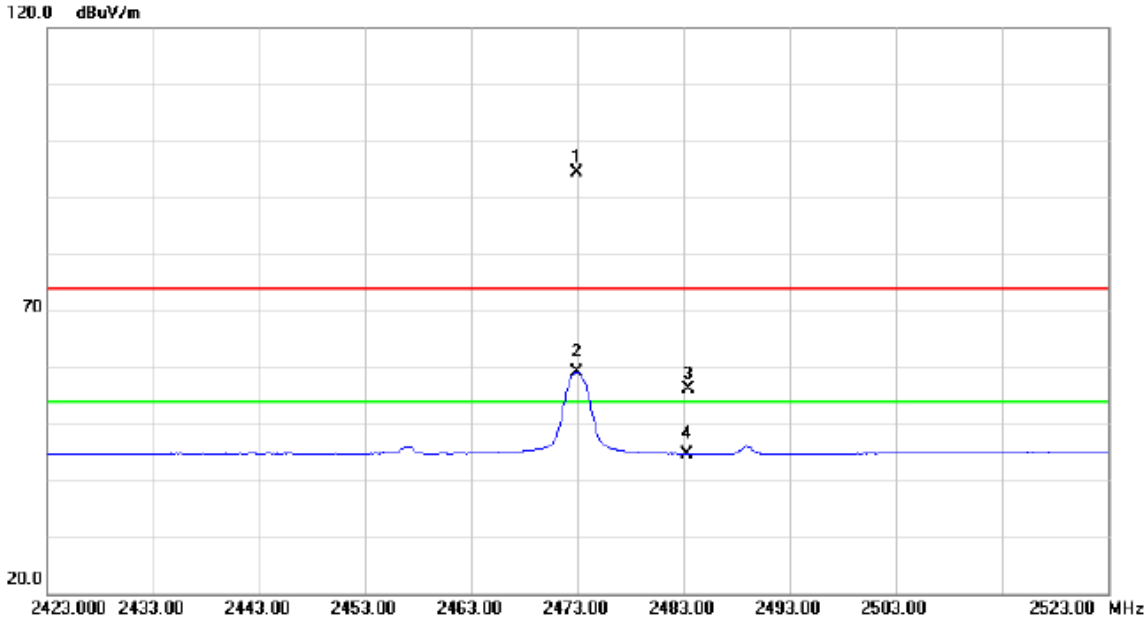
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4945.950	59.55	3.77	63.32	74.00	-10.68	peak	
2		4945.950	33.27	3.77	37.04	54.00	-16.96	AVG	
3		7418.870	51.54	8.72	60.26	74.00	-13.74	peak	
4		7418.870	30.75	8.72	39.47	54.00	-14.53	AVG	

Test Mode :	TX 2473MHz –CH67

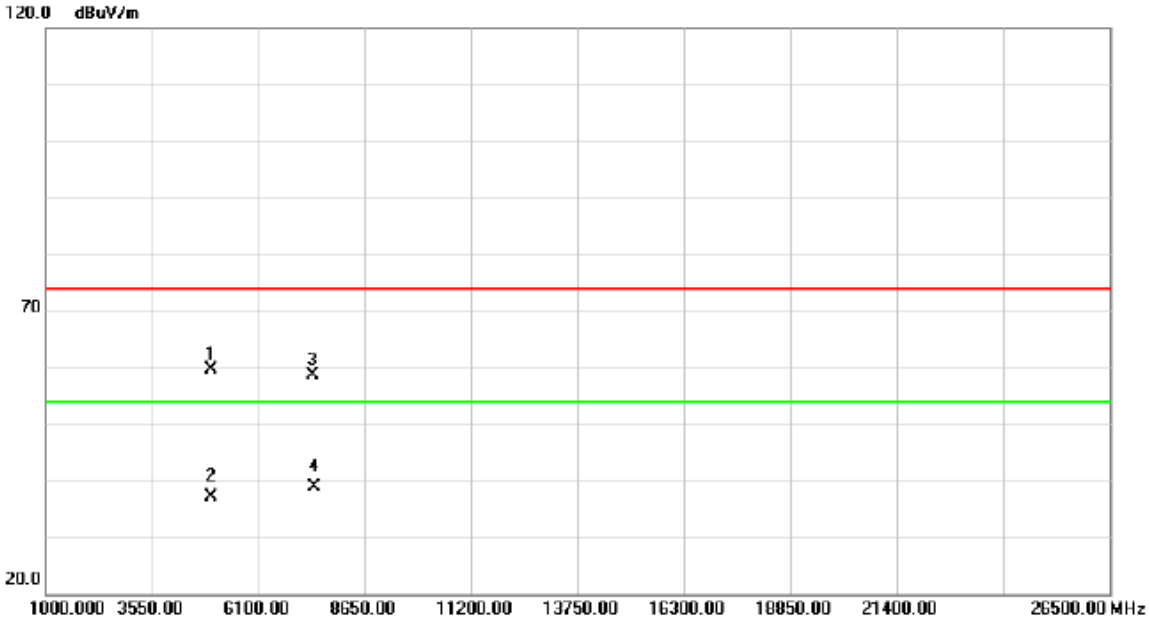
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2472.900	63.43	31.07	94.50	74.00	20.50	peak	no limit
2	X	2472.900	28.17	31.07	59.24	54.00	5.24	AVG	no limit
3		2483.500	24.95	31.11	56.06	74.00	-17.94	peak	
4		2483.500	13.57	31.11	44.68	54.00	-9.32	AVG	

Test Mode :	TX 2473MHz –CH67

Horizontal

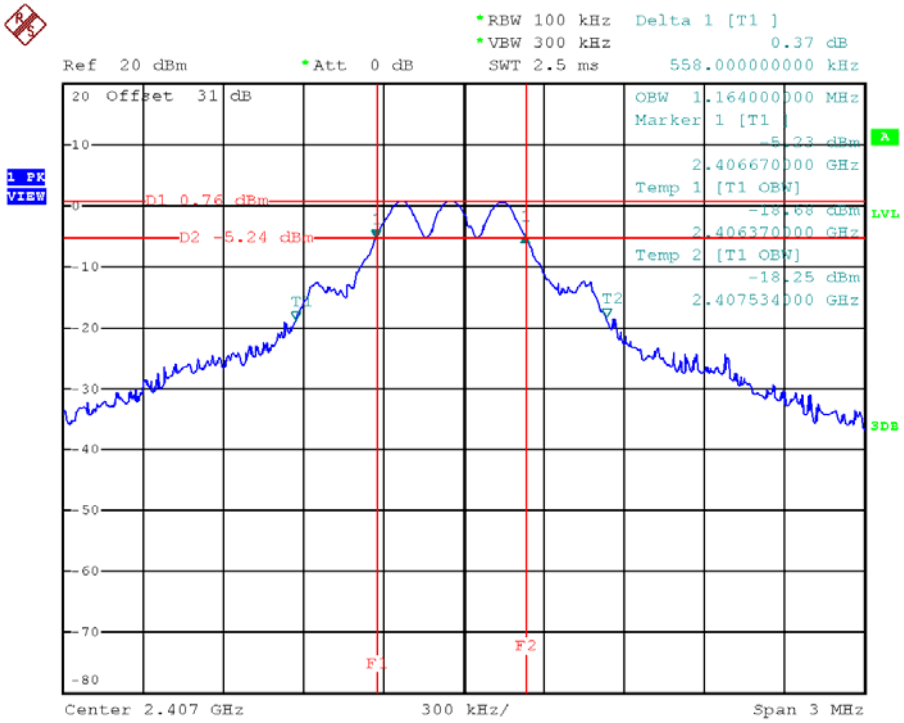


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4945.890	55.98	3.77	59.75	74.00	-14.25	peak	
2		4945.890	33.39	3.77	37.16	54.00	-16.84	AVG	
3		7418.900	49.85	8.72	58.57	74.00	-15.43	peak	
4		7418.900	30.19	8.72	38.91	54.00	-15.09	AVG	

ATTACHMENT E - BANDWIDTH

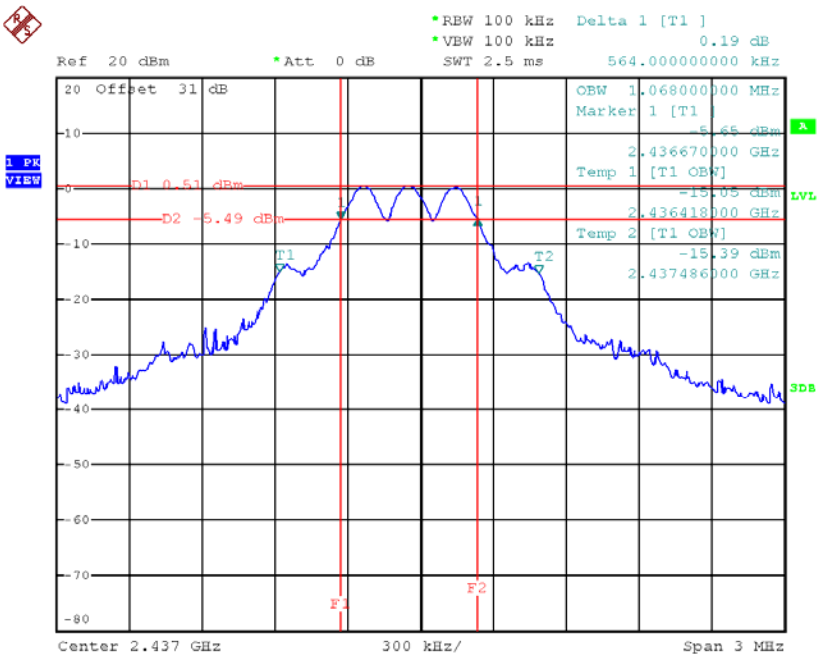
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2407	0.558	1.164	500	Complies
2437	0.564	1.068	500	Complies
2473	0.552	1.050	500	Complies

TX CH01



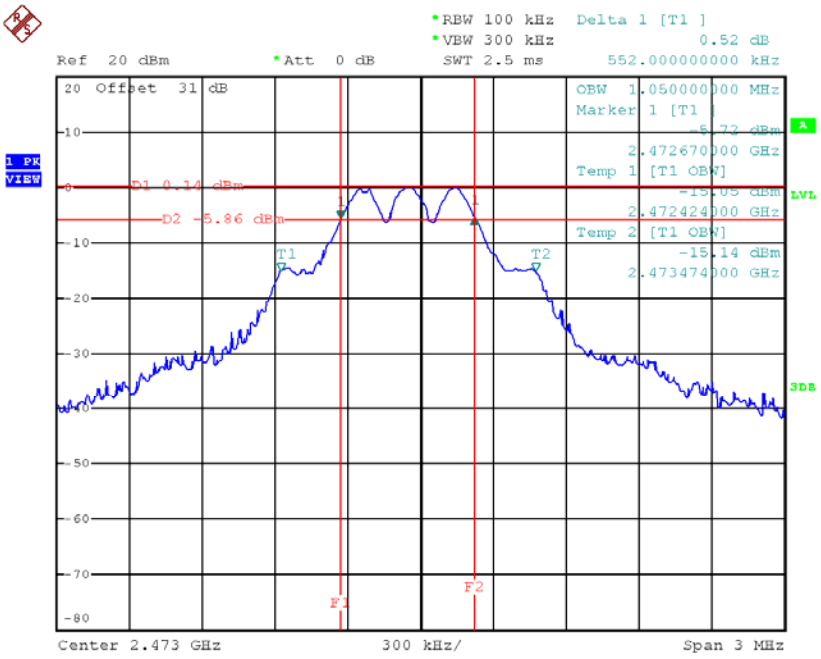
Date: 5.NOV.2015 15:04:03

TX CH31



Date: 5.NOV.2015 15:13:23

TX CH67



Date: 5.NOV.2015 15:11:30

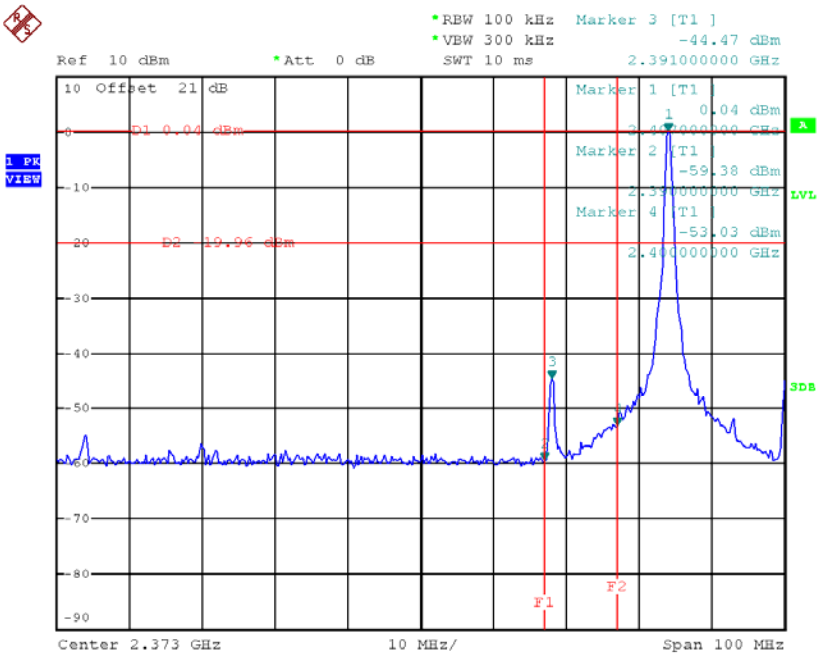
ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
2407	-1.30	0.0007	30.00	1.00	Complies
2437	-1.64	0.0007	30.00	1.00	Complies
2473	-2.44	0.0006	30.00	1.00	Complies

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

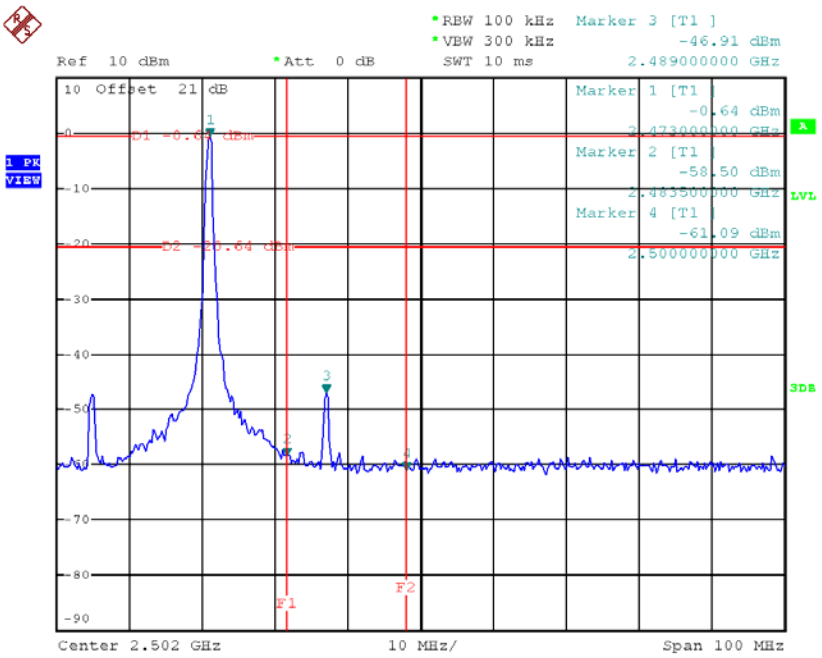
Test Mode :	CH01, CH31 , CH67

CH01 (Lower) - 1Mbps



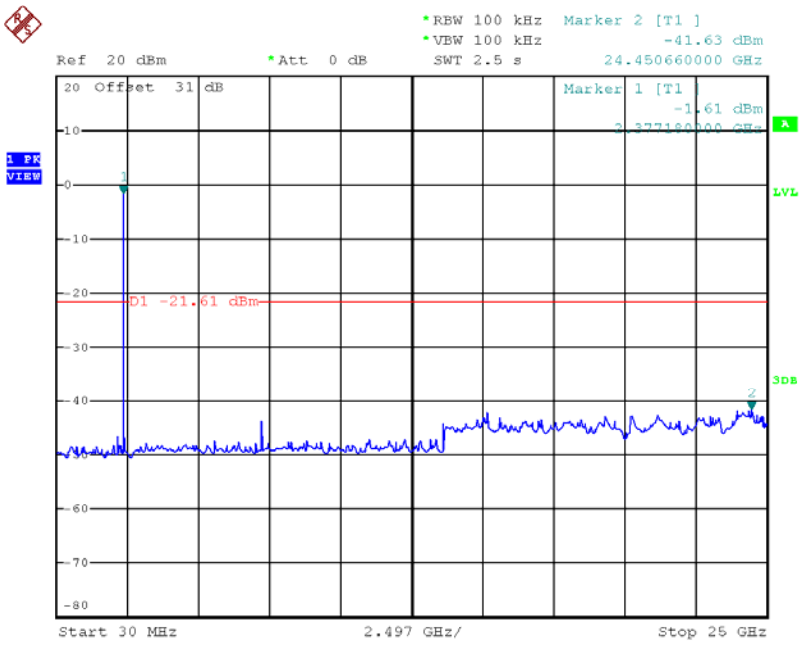
Date: 4.NOV.2015 14:51:45

CH67 (upper) - 1Mbps



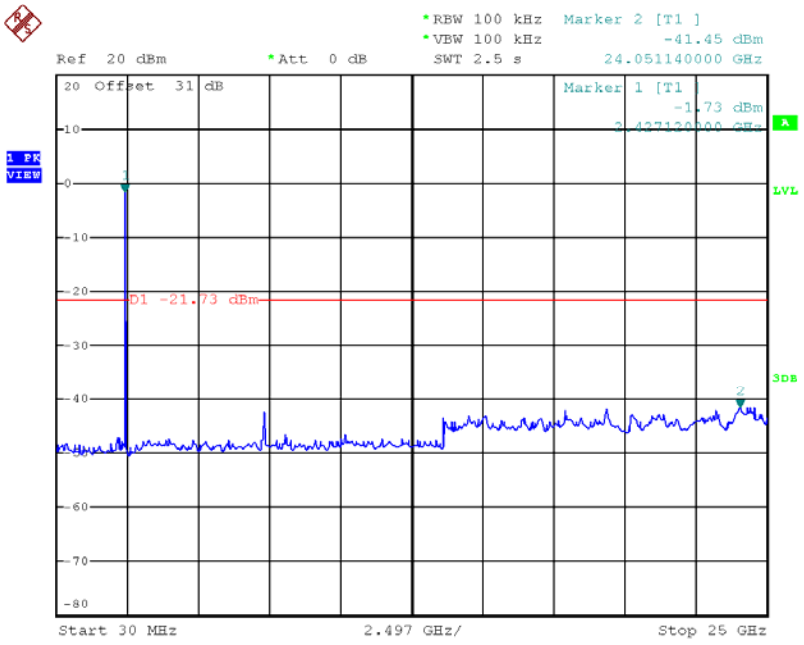
Date: 4.NOV.2015 15:07:35

CH01 (10 Harmonic of the frequency)



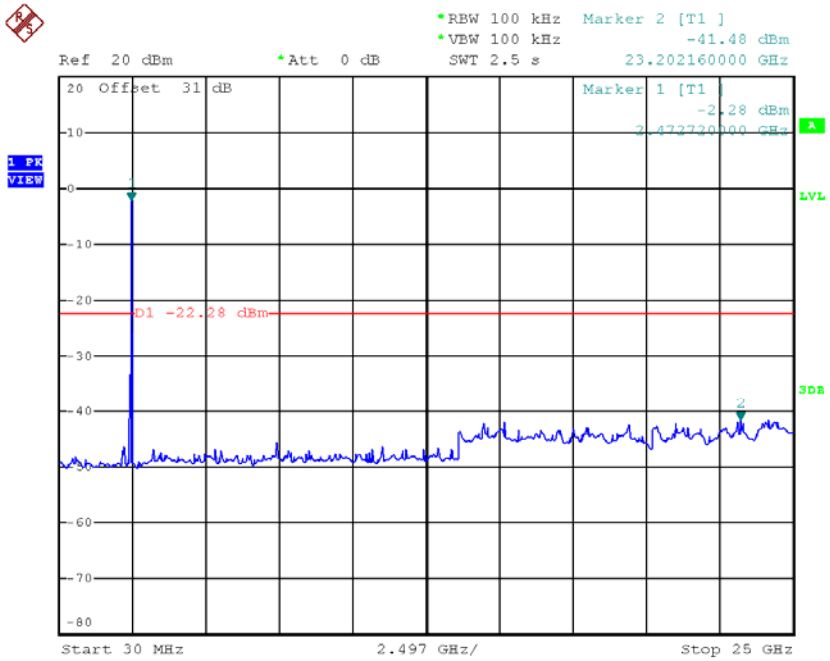
Date: 28.OCT.2015 18:14:40

CH31 (10 Harmonic of the frequency)



Date: 28.OCT.2015 18:57:24

CH67 (10 Harmonic of the frequency)

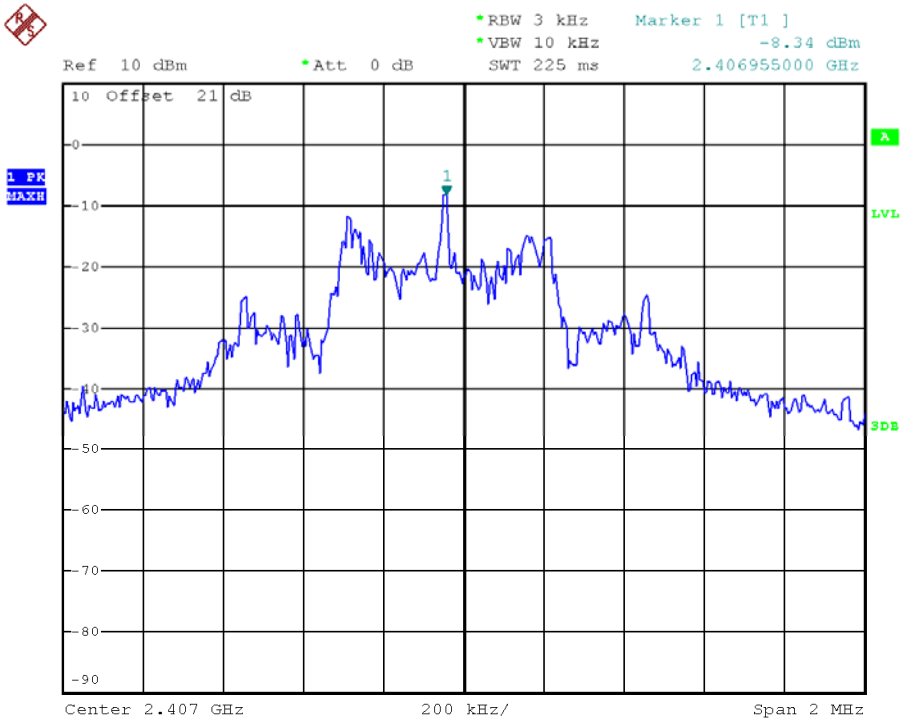


Date: 28.OCT.2015 19:05:20

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

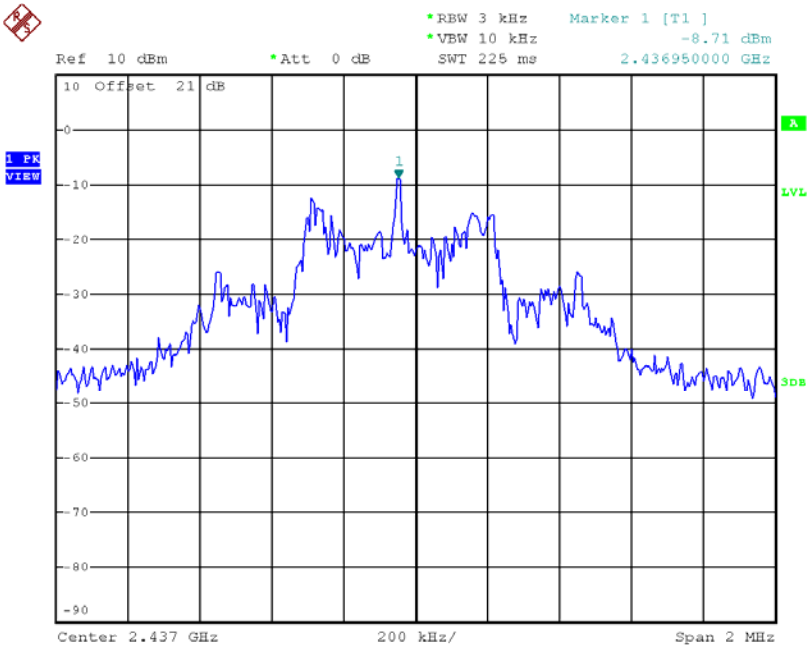
Frequency (MHz)	Power Density (dBm)	Max. Limit (dBm)	Result
2407	-8.34	8	Complies
2437	-8.71	8	Complies
2473	-9.05	8	Complies

TX CH01



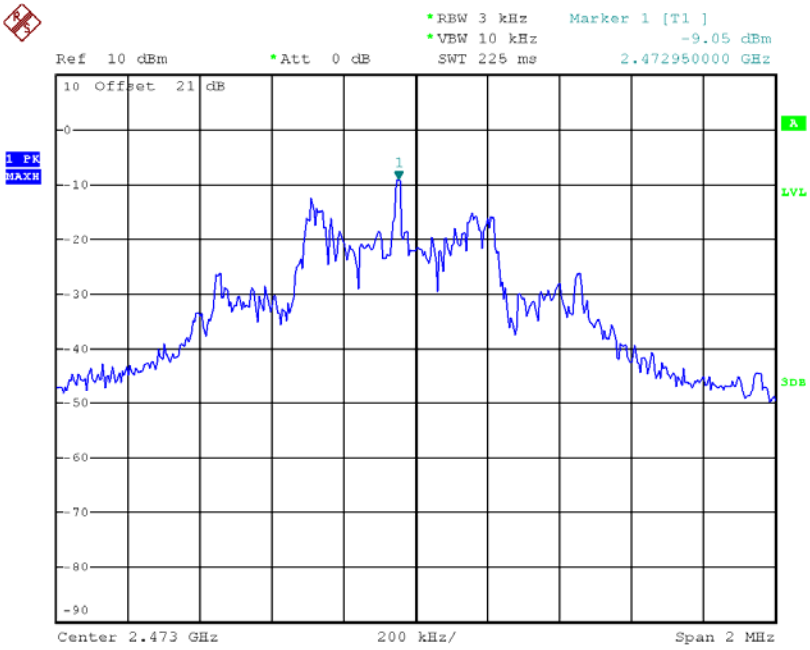
Date: 4.NOV.2015 15:13:36

TX CH31



Date: 4.NOV.2015 15:49:57

TX CH67



Date: 4.NOV.2015 15:12:14