



Neutron Engineering Inc.

FCC ID: 2AA9K-UDONGLE

# Radio Test Report

## FCC ID: 2AA9K-UDONGLE

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

**Issued Date** : Dec. 02, 2013

**Project No.** : 1311039

**Equipment** : USB Receiver

**Model Name** : D002

**Applicant** : Western Leaf Electronics Inc.

**Address** : 200, 638 11th Ave SW Calgary, AB,  
T2ROE CANADA

**Tested by:** Neutron Engineering Inc. EMC Laboratory

**Date of Receipt:** Nov. 05, 2013

**Date of Test:** Nov. 05, 2013 ~ Nov. 25, 2013

**Testing Engineer:** Josh Lin  
(Josh Lin)

**Technical Manager:** Jeff Yang  
(Jeff Yang)

**Authorized Signatory:** Andy Chiu  
(Andy Chiu)

**Neutron Engineering Inc.**  
B1, No. 37, Lane 365, YangGuang St.,  
NeiHu District 114, Taipei, Taiwan.

TEL: +886-2-2657-3299

FAX: +886-2-2657-3331





### **Declaration**

**Neutron** 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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**Neutron Engineering Inc.**

FCC ID: 2AA9K-UDONGLE

### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
NEI-FCCP-1-1311038	Original Issue.	Nov. 28, 2013
NEI-FCCP-1-1311039	A. Changed applicant name and address. B. Changed brand name, model name and FCC ID.	Dec. 02, 2013

Revised Version No.	Description	Issued Date
-	Initial Issue.	Dec. 02, 2013



## 1 CERTIFICATION

Equipment : USB Receiver

Brand Name : Frenzy by Western Leaf

Model Name : D002

Applicant : Western Leaf Electronics Inc.

Date of Test : Nov. 05, 2013 ~ Nov. 25, 2013

Standards : FCC Part 15, Subpart C: 2012

ANSI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-1311039) 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

Standard Clause	Test Item	Result
15.207	Conducted Emission	PASS
15.247 (c)	Antenna conducted Spurious Emission	PASS
15.247 (a)(2)	6dB Bandwidth	PASS
15.247 (b)	Maximum Peak Conducted Output Power	PASS
15.247 (c)	Radiated Spurious Emission	PASS
15.247 (d)(e)	Power Spectral Density	PASS
15.205	Restricted Bands	PASS
15.203	Antenna Requirement	PASS

NOTE:

(1) N/A: denotes test is not applicable in this Test Report



## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

### Conducted emission Test:

**CO2:** (VCCI RN: C-3477; FCC RN: 614388; FCC DN: TW1054)  
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

### 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 for reference only.**

The reported uncertainty of measurement  $y \pm U$ , where expended 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.

### A. Conducted emission test:

Test Site	Measurement Frequency Range	U, (dB)	NOTE
C02	150 kHz ~ 30 MHz	2.59	

### B. Radiated emission test:

Test Site	Measurement Frequency Range	Ant. H / V	U, (dB)	NOTE
OS02	30 MHz ~ 200 MHz	V	2.48	
	30 MHz ~ 200 MHz	H	2.16	
	200 MHz ~ 1, 000 MHz	V	2.50	
	200 MHz ~ 1, 000 MHz	H	2.66	

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	USB Receiver														
Brand Name	Frenzy by Western Leaf														
Model Name	D002														
OEM Brand/Model Name	N/A														
Model Difference	N/A														
Product Description	<p>The EUT is a USB Receiver.</p> <table border="1"><tr><td>Operation Frequency</td><td>2402 MHz - 2479 MHz</td></tr><tr><td>Modulation Type</td><td>GFSK</td></tr><tr><td>Bit Rate of Transmitter</td><td>1 Mbps</td></tr><tr><td>Number Of Channel</td><td>Please refer to the Note 2.</td></tr><tr><td>Antenna Designation</td><td>Please refer to the Note 3.</td></tr><tr><td>Antenna Gain(Peak)</td><td>Please refer to the Note 3.</td></tr><tr><td>Maximum Peak Conducted Output Power:</td><td>-3.47 dBm (0.0004 W)</td></tr></table> <p>More details of EUT technical specification, please refer to the User's Manual.</p>	Operation Frequency	2402 MHz - 2479 MHz	Modulation Type	GFSK	Bit Rate of Transmitter	1 Mbps	Number Of Channel	Please refer to the Note 2.	Antenna Designation	Please refer to the Note 3.	Antenna Gain(Peak)	Please refer to the Note 3.	Maximum Peak Conducted Output Power:	-3.47 dBm (0.0004 W)
Operation Frequency	2402 MHz - 2479 MHz														
Modulation Type	GFSK														
Bit Rate of Transmitter	1 Mbps														
Number Of Channel	Please refer to the Note 2.														
Antenna Designation	Please refer to the Note 3.														
Antenna Gain(Peak)	Please refer to the Note 3.														
Maximum Peak Conducted Output Power:	-3.47 dBm (0.0004 W)														
Power Source	Supplied from PC USB port.														
Power Rating	I/P: DC 5V														
Connecting I/O Port(s)	Please refer to the User's Manual														
Products Covered	N/A														
EUT Modification(s)	N/A														



## 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)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453		
25	2427	52	2454		
26	2428	53	2455		

## 3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Printed	N/A	0.00



### 3.2 DESCRIPTION OF TEST MODES

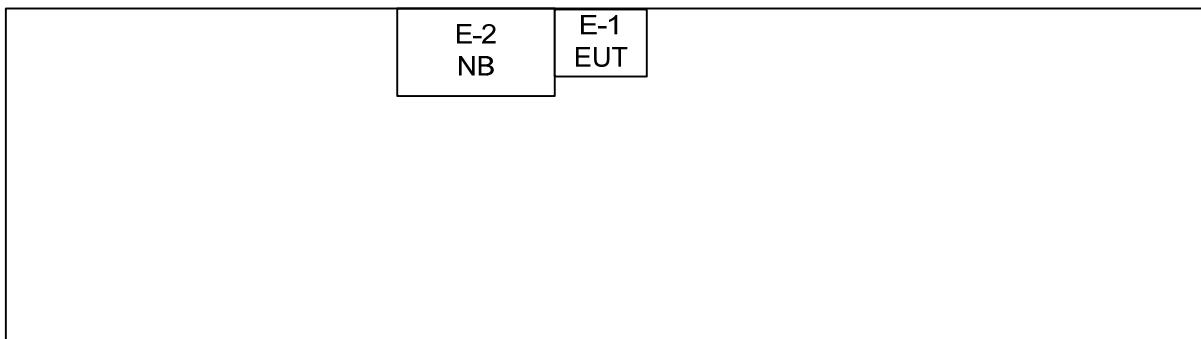
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Items	Mode	Data Rate	Channel	Note
Conducted Emission	GFSK	1 Mbps	37	
Antenna conducted Spurious Emission	GFSK	1 Mbps	00/37/77	
6 dB Bandwidth	GFSK	1 Mbps	00/37/77	
Maximum Peak Conducted Output Power	GFSK	1 Mbps	00/37/77	
Radiated Spurious Emission (30 MHz to 1 GHz)	GFSK	1 Mbps	37	
Radiated Spurious Emission (above 1 GHz)	GFSK	1 Mbps	00/37/77	
Restricted Bands	GFSK	1 Mbps	00/37/77	
Antenna Requirement	-----	-----	-----	

NOTE: The measurements are performed at the highest, middle, lowest available channels.



**3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED**





### 3.4 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
E-1	USB Receiver	Frenzy by Western Leaf	D002	2AA9K-UDONGLE	N/A	EUT
E-2	Notebook PC	DELL	D620	DOC	7T390 A03	

Item	Shielded Type	Ferrite Core	Length	Note
N/A	-	-	-	-

NOTE: The support equipment was authorized by Declaration of Conformity (DOC).



## 4 CONDUCTED EMISSION

### 4.1 LIMIT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

## NOTE:

1. The tighter limit applies at the band edges.
2. The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
3. 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

### 4.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	Schwarzbeck	NSLK 8127	8127685	Jun. 03, 2014
2	Test Cable	TIMES	CFD300-NL	C01	Jun. 16, 2014
3	EMI Test Receiver	R&S	ESCI	100082	Mar. 21, 2014
4	Measurement Software	EZ	EZ_EMCA (Version NB-02A)	N/A	N/A

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

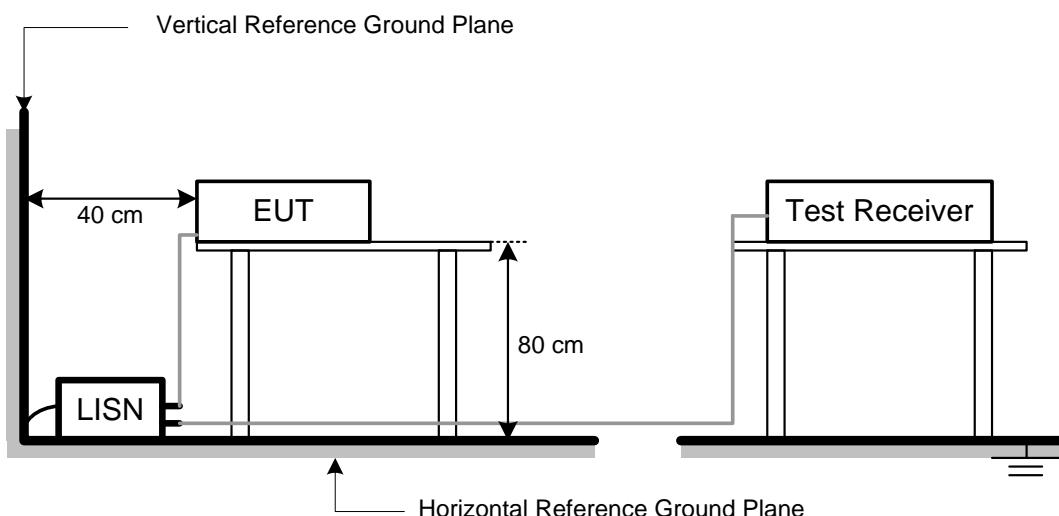
#### 4.3 TEST PROCEDURES

- 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.

**NOTE:**

- a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
- b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or 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 Peak or QP Mode was measured, but AVG Mode didn't perform.

#### 4.4 TEST SETUP LAYOUT



#### 4.5 DEVIATION FROM TEST STANDARD

No deviation

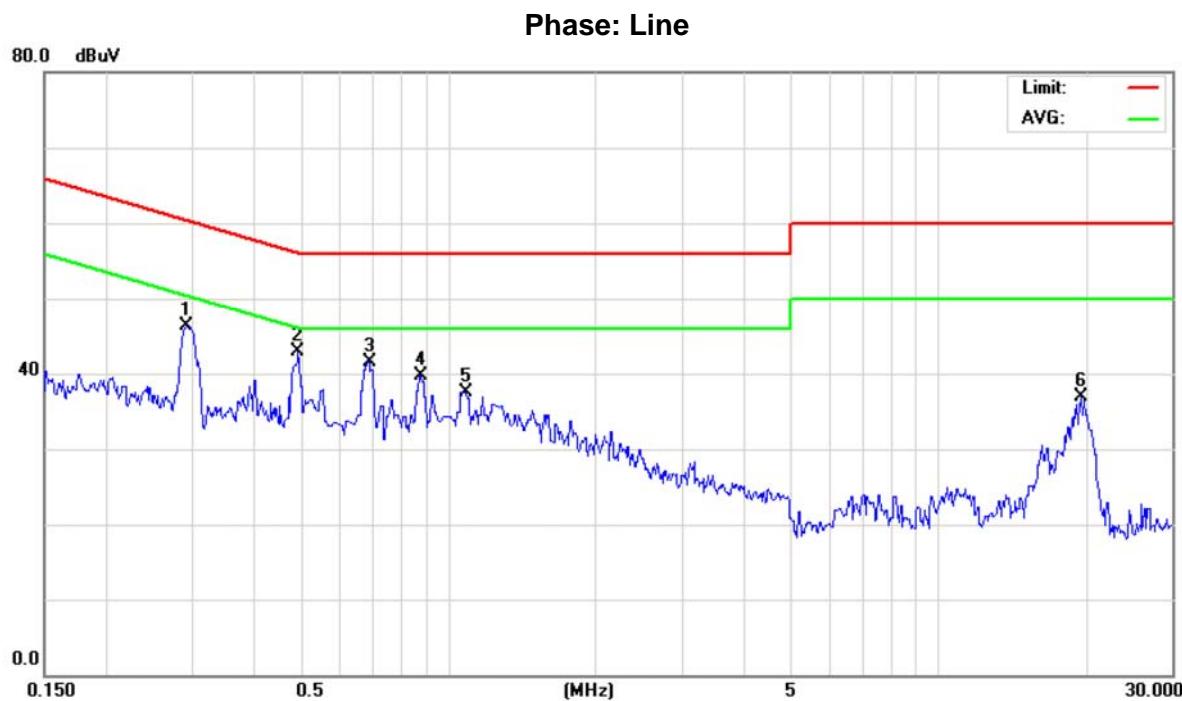


#### **4.6 EUT OPERATING CONDITIONS**

The EUT used during radiated and/or conducted emission measurement was designed to exercise in a manner similar to a typical use.

**4.7 TEST RESULTS**

EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2441 MHz		



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		0.2920	38.34	7.97	46.31	60.47	-14.16	peak	
2	*	0.4936	34.44	8.47	42.91	56.11	-13.20	peak	
3		0.6889	32.56	8.96	41.52	56.00	-14.48	peak	
4		0.8780	30.25	9.40	39.65	56.00	-16.35	peak	
5		1.0849	27.94	9.66	37.60	56.00	-18.40	peak	
6		19.4999	27.28	9.54	36.82	60.00	-23.18	peak	



EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2441 MHz		

**Phase: Neutral**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2976	38.71	7.89	46.60	60.31	-13.71	peak	
2	*	0.4852	35.07	8.41	43.48	56.25	-12.77	peak	
3		0.6889	32.85	8.96	41.81	56.00	-14.19	peak	
4		0.8690	30.87	9.38	40.25	56.00	-15.75	peak	
5		1.0849	27.99	9.66	37.65	56.00	-18.35	peak	
6		19.5499	25.76	9.56	35.32	60.00	-24.68	peak	



## 5 ANTENNA CONDUCTED SPURIOUS EMISSION

### 5.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Antenna conducted Spurious Emission	30-25000	20 dB less than the peak value of fundamental frequency

### 5.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

### 5.3 TEST PROCEDURES

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

### 5.4 TEST SETUP LAYOUT



### 5.5 DEVIATION FROM TEST STANDARD

No deviation

### 5.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.

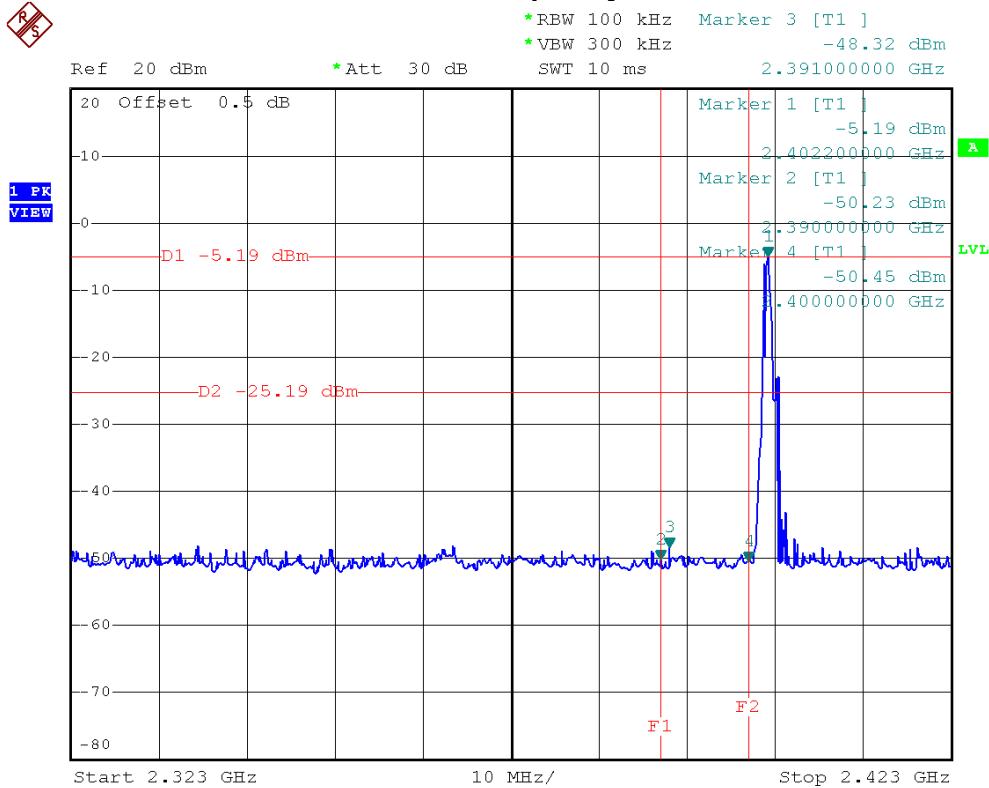
**5.7 TEST RESULTS**

EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz/2479 MHz		

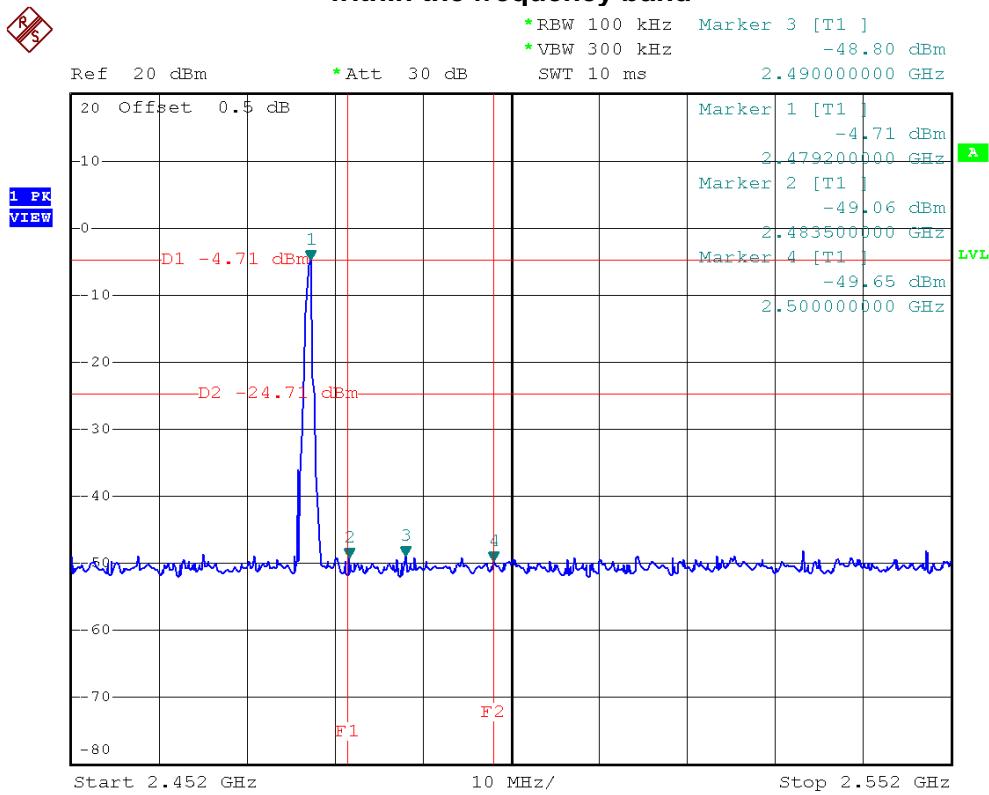
Channel of Worst Data			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2391.00	-48.32	2490.00	-48.80
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest lever of the desired power.			



**The max. radio frequency power in any 100kHz bandwidth outside the frequency band**

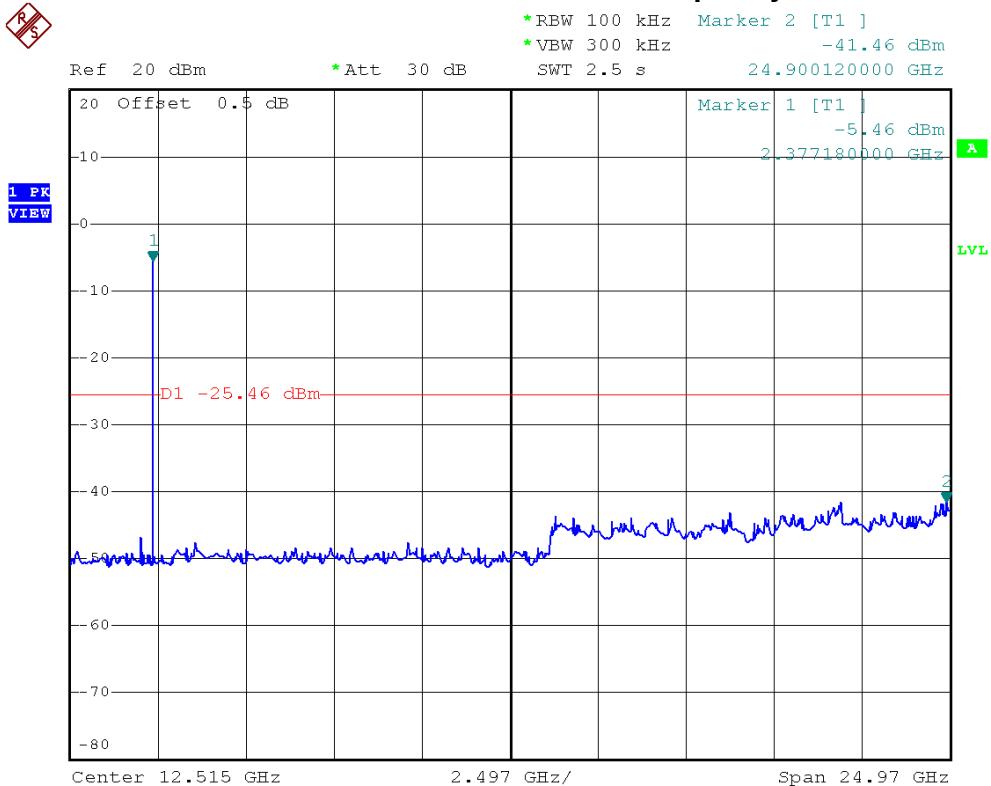


**The max. radio frequency power in any 100 kHz bandwidth within the frequency band**

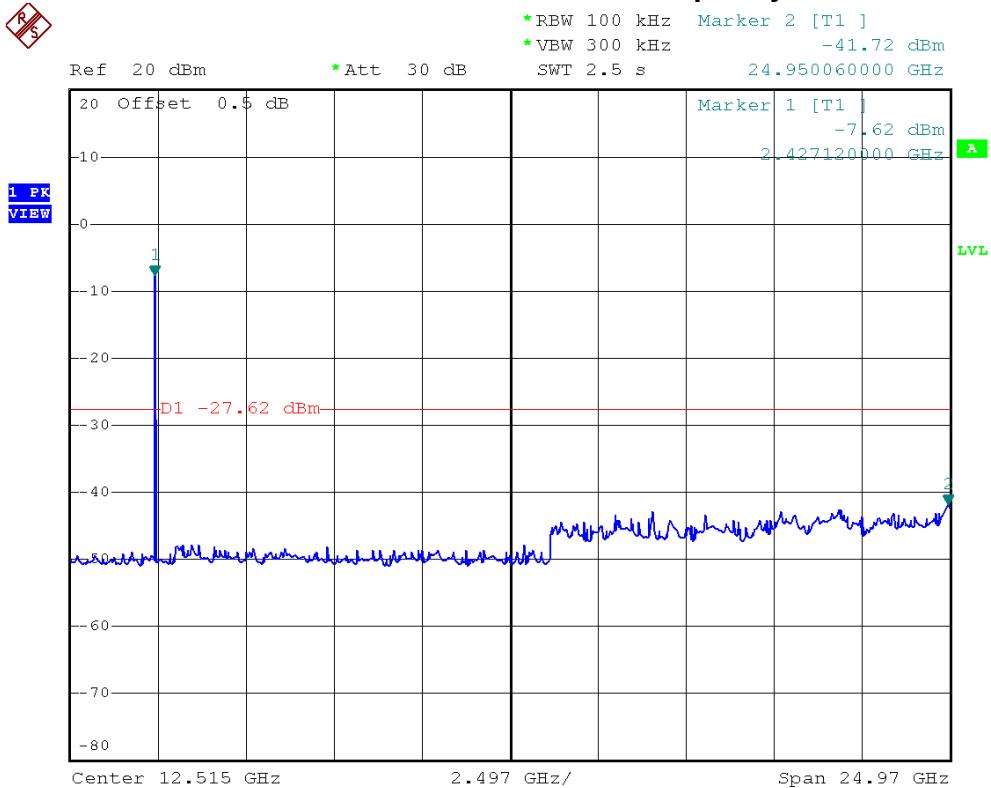




### 2402 MHz/10 Harmonic of the frequency

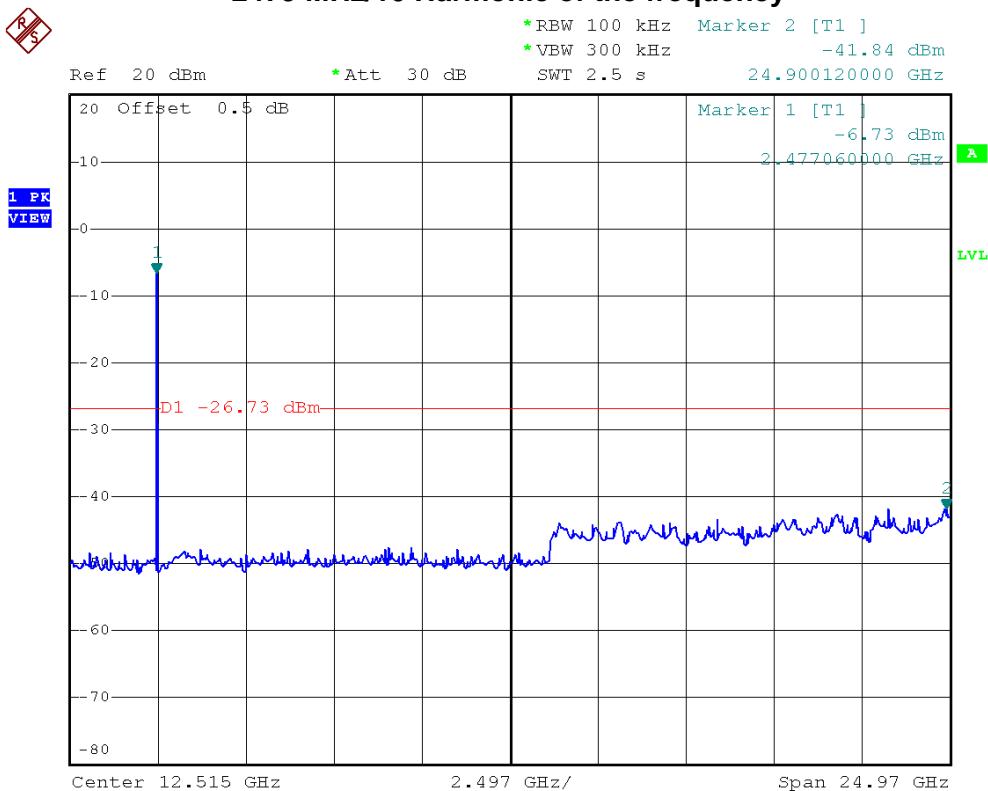


### 2439 MHz/10 Harmonic of the frequency





2479 MHz/10 Harmonic of the frequency





## 6 6 DB BANDWIDTH

### 6.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Bandwidth	2400-2483.5	>= 500KHz (6 dB bandwidth)

### 6.2 MEASUREMENT INSTRUMENTS LIST

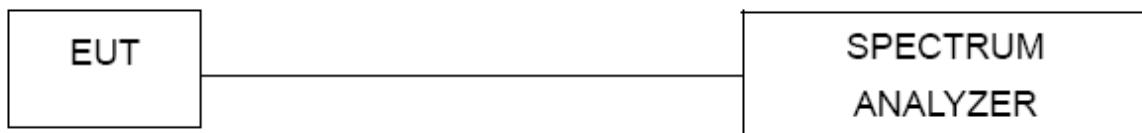
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

### 6.3 TEST PROCEDURES

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

### 6.4 TEST SETUP LAYOUT



### 6.5 DEVIATION FROM TEST STANDARD

No deviation

### 6.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.

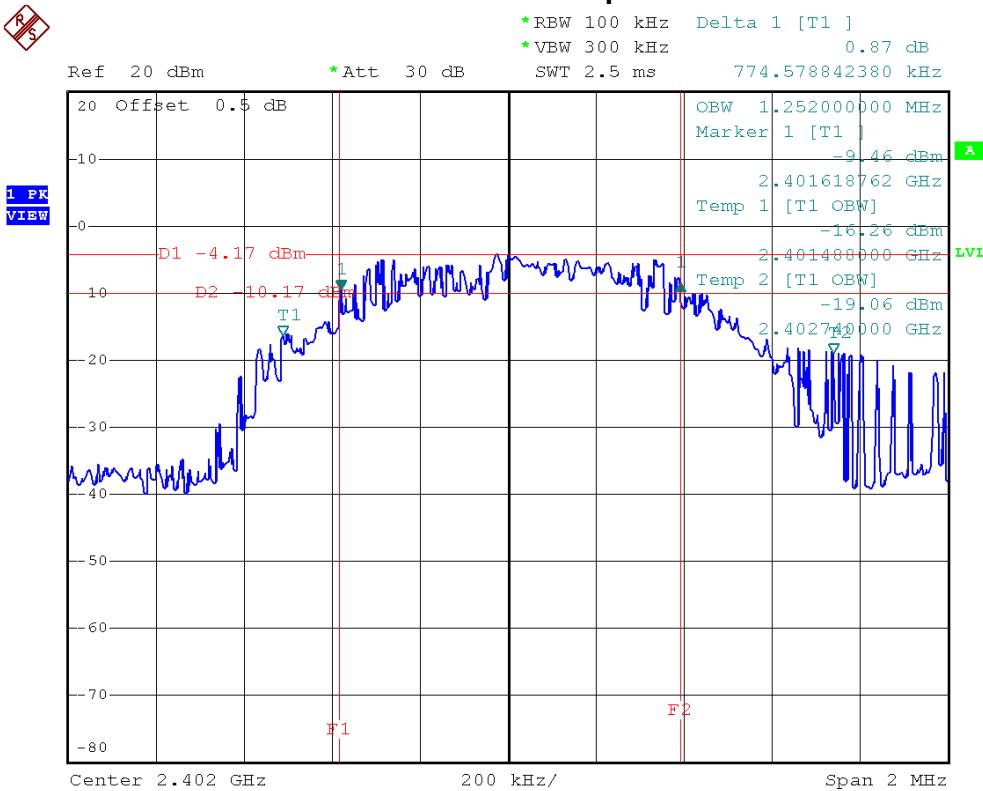


## 6.7 TEST RESULTS

EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz, 2439 MHz, 2479 MHz		

Frequency	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit	Result
2402 MHz	0.77	1.25	>=500 kHz	PASS
2439 MHz	0.91	1.21	>=500 kHz	PASS
2479 MHz	0.95	1.20	>=500 kHz	PASS

### 2402 MHz/6 dB and 99% Occupied Bandwidth

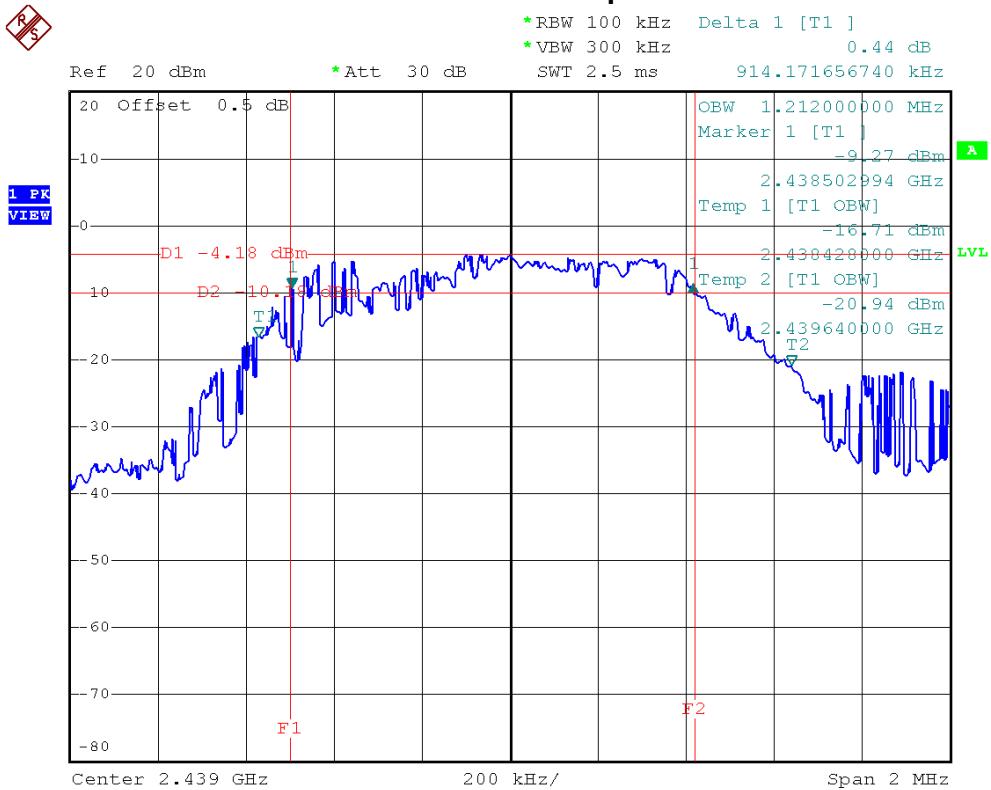




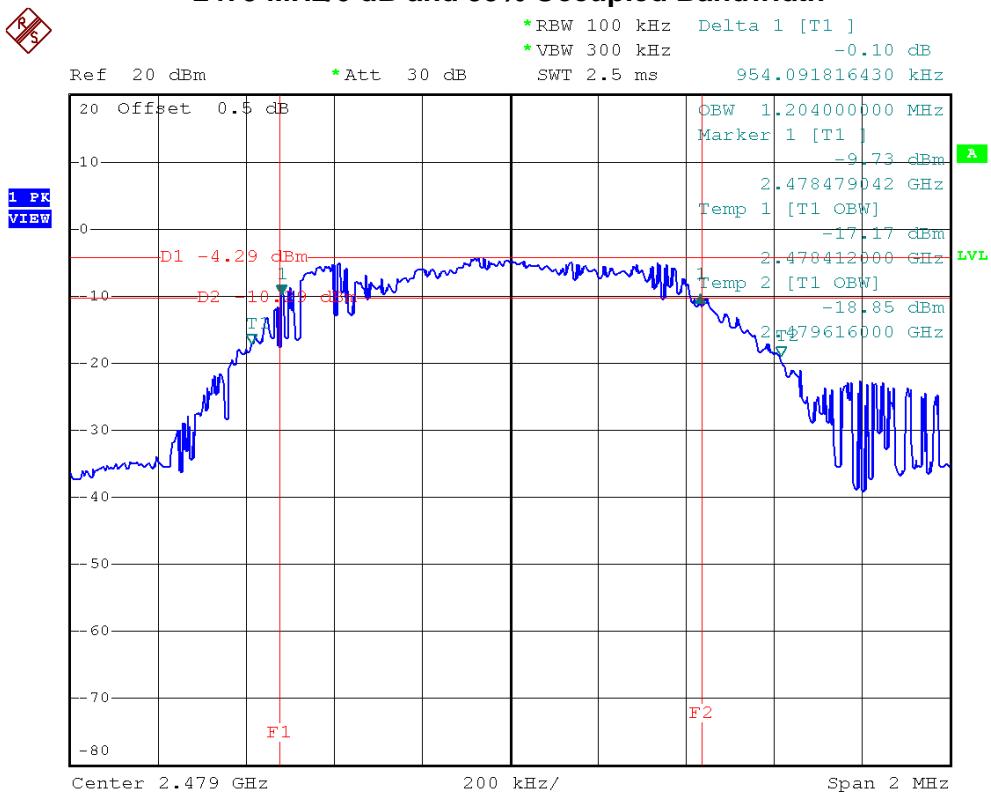
Neutron Engineering Inc.

FCC ID: 2AA9K-UDONGLE

### 2439 MHz/6 dB and 99% Occupied Bandwidth



### 2479 MHz/6 dB and 99% Occupied Bandwidth





## 7 MAXIMUM PEAK CONDUCTED OUTPUT POWER

### 7.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Maximum Peak Conducted Output Power	2400-2483.5	1 watt or 30 dBm

### 7.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

### 7.3 TEST PROCEDURES

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

### 7.4 TEST SETUP LAYOUT



### 7.5 DEVIATION FROM TEST STANDARD

No deviation

### 7.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 5.6 Unless otherwise a special operating condition is specified in the follows during the testing.

**7.7 TEST RESULTS**

EUT	USB Receiver	Model Name	D002			
Temperature	26°C	Relative Humidity	46%			
Test Voltage	AC 120V/60Hz (System)					
Test Mode	2402 MHz, 2439 MHz, 2479 MHz					

Frequency	Peak Output Power		Limit		Result
	(dBm)	(W)	(dBm)	(W)	
2402 MHz	-3.52	0.0004	30	1	PASS
2439 MHz	-3.48	0.0004	30	1	PASS
2479 MHz	-3.47	0.0004	30	1	PASS

**8 RADIATED SPURIOUS EMISSION (9 KHZ TO 1 GHZ)****8.1 LIMIT**

20 dB 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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (MHz)	Field Strength (micorvolts/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
Above 960	500	3

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

**NOTE:**

1. The limit for radiated test was performed according to FCC PART 15B.

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

**8.2 MEASUREMENT INSTRUMENTS LIST**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 15, 2014
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 16, 2014
4	Microflex Cable	Harbour industries	27478LL142	1m	May. 13, 2014
5	Microflex Cable	EMC	S104-SMA	8m	May. 13, 2014
6	Microflex Cable	Harbour industries	27478LL142	3m	May. 13, 2014
7	Test Cable	LMR	LMR-400	12m	May. 14, 2014
8	Test Cable	LMR	LMR-400	3m	May. 14, 2014
9	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 18, 2014
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 11, 2014
11	Preamplifier With Adaptor	EMC	EMC2654045	980030	Feb. 18, 2014
12	Horn Antenna	Schwarzbeck	BBHA 9170	187	Dec. 24, 2013

Remark: "N/A" denotes No Model Name, No Serial No. or No Calibration specified.

**8.3 MEASURING INSTRUMENTS SETTING**

EMI Test Receiver	Parameter Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



#### 8.4 TEST PROCEDURES

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1 GHz. For frequencies above 1 GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m Semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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.
- g. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

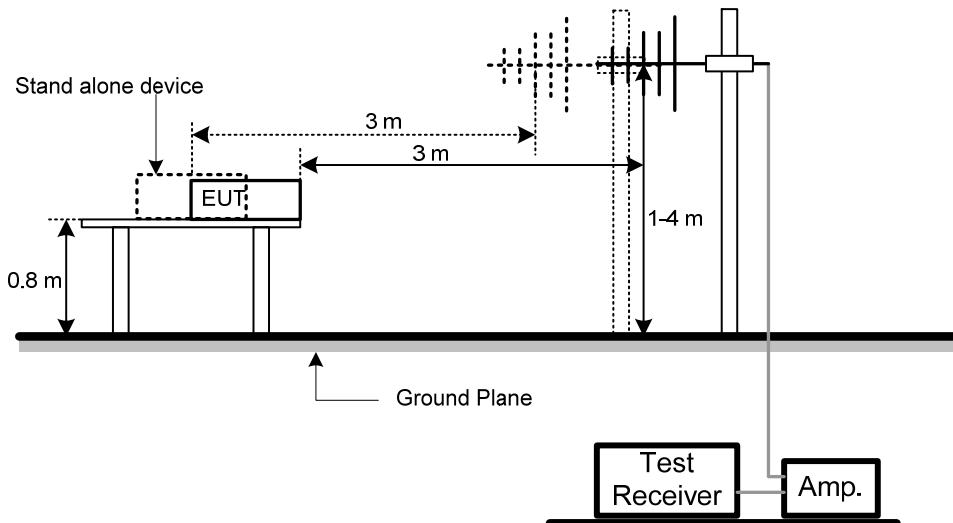
**NOTE:**

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz; SPA setting in RBW=100 kHz, VBW =100 kHz, Swp. Time = 0.3 sec./ MHz.
- b. 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.

#### 8.5 DEVIATION FROM TEST STANDARD

No deviation

#### 8.6 TEST SETUP LAYOUT



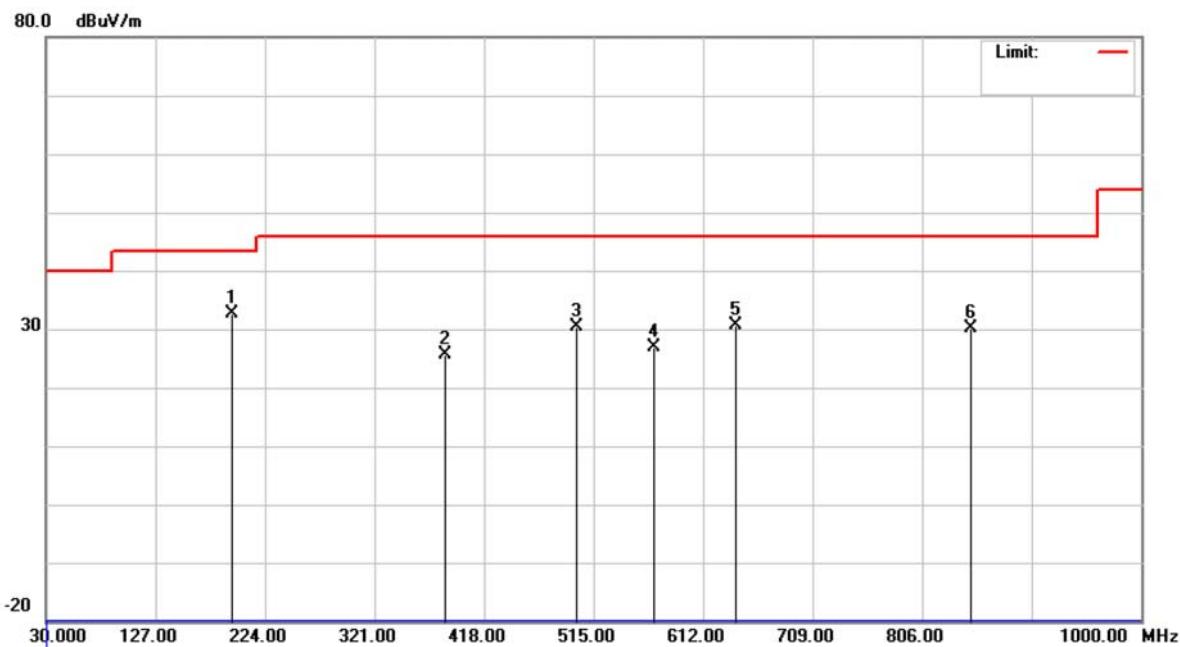


## **8.7 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 5.6 Unless otherwise a special operating condition is specified in the follows during the testing.

**8.8 TEST RESULTS**

EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

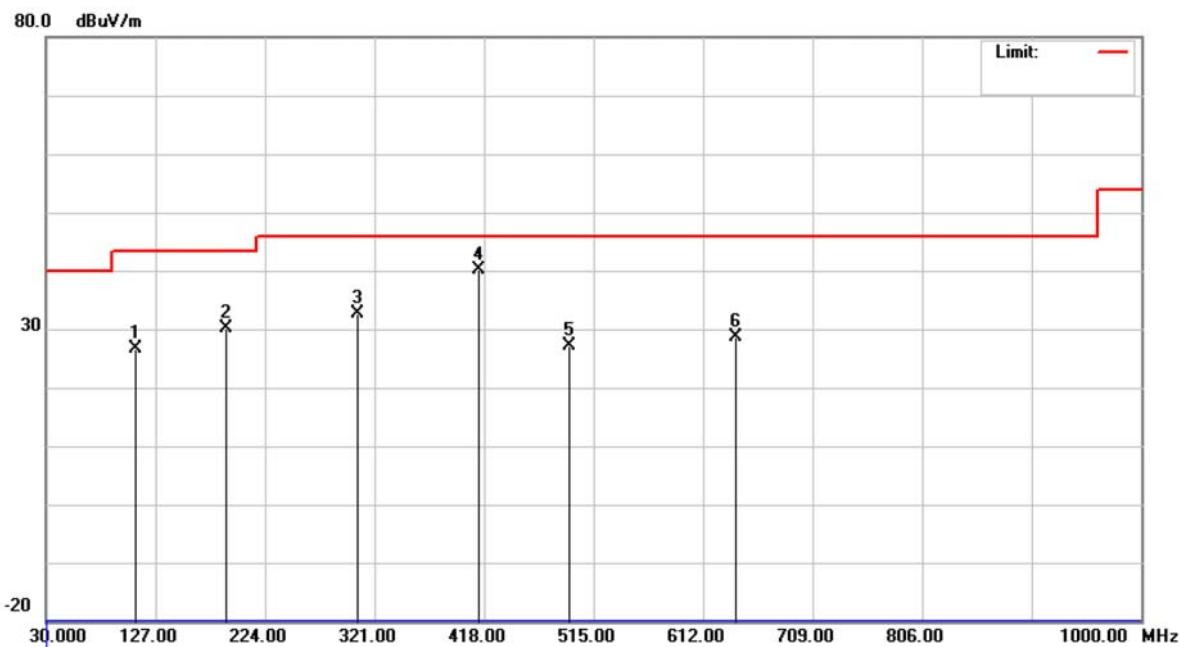
**Polarization: Vertical**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1 *	194.8999	49.47	-16.82	32.65	43.50	-10.85	peak
2	384.0499	37.50	-11.75	25.75	46.00	-20.25	peak
3	500.4500	39.88	-9.48	30.40	46.00	-15.60	peak
4	568.3499	34.66	-7.68	26.98	46.00	-19.02	peak
5	641.0999	37.45	-6.87	30.58	46.00	-15.42	peak
6	849.6500	34.23	-4.04	30.19	46.00	-15.81	peak



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

**Polarization: Horizontal**



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over		
						Detector	Comment	
1	110.0250	44.08	-17.37	26.71	43.50	-16.79	peak	
2	190.0500	46.84	-16.75	30.09	43.50	-13.41	peak	
3	306.4500	46.40	-13.68	32.72	46.00	-13.28	peak	
4 *	413.1499	50.96	-10.81	40.15	46.00	-5.85	peak	
5	493.1749	36.64	-9.53	27.11	46.00	-18.89	peak	
6	641.0999	35.52	-6.87	28.65	46.00	-17.35	peak	

**9 RADIATED SPURIOUS EMISSION (ABOVE 1 GHZ)****9.1 LIMIT**

20dBc 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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (MHz)	Field Strength (micorvolts/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
Above 960	500	3

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

**NOTE:**

(1) The limit for radiated test was performed according to FCC PART 15B.

(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

**9.2 MEASUREMENT INSTRUMENTS LIST**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 15, 2014
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 16, 2014
4	Microflex Cable	Harbour industries	27478LL142	1m	May. 13, 2014
5	Microflex Cable	EMC	S104-SMA	8m	May. 13, 2014
6	Microflex Cable	Harbour industries	27478LL142	3m	May. 13, 2014
7	Test Cable	LMR	LMR-400	12m	May. 14, 2014
8	Test Cable	LMR	LMR-400	3m	May. 14, 2014
9	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 18, 2014
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 11, 2014
11	Preamplifier With Adaptor	EMC	EMC2654045	980030	Feb. 18, 2014
12	Horn Antenna	Schwarzbeck	BBHA 9170	187	Dec. 24, 2013

Remark: "N/A" denotes No Model Name, No Serial No. or No Calibration specified.

**9.3 MEASURING INSTRUMENTS SETTING**

Spectrum Analyzer	Parameter Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

#### 9.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m Semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- c. 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.
- d. 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.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- f. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

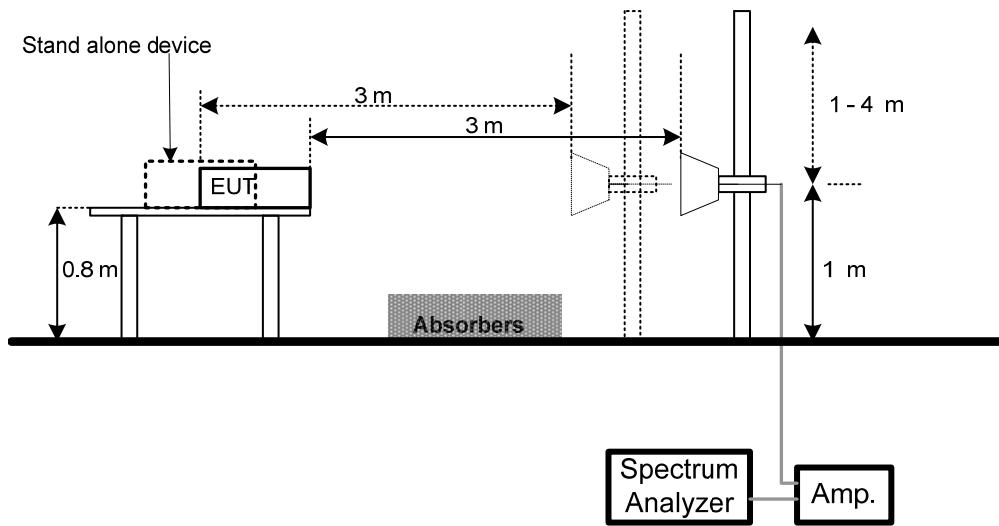
**NOTE:**

- a. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW= 1 MHz, VBW= 1 MHz, Swp. Time = Auto.  
Reading in which marked as AVG means measurements by using are Average Mode with instrument setting in RBW= 1 MHz, VBW= 10 Hz, Swp. Time = Auto.
- b. 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.

#### 9.5 DEVIATION FROM TEST STANDARD

No deviation

#### 9.6 TEST SETUP LAYOUT



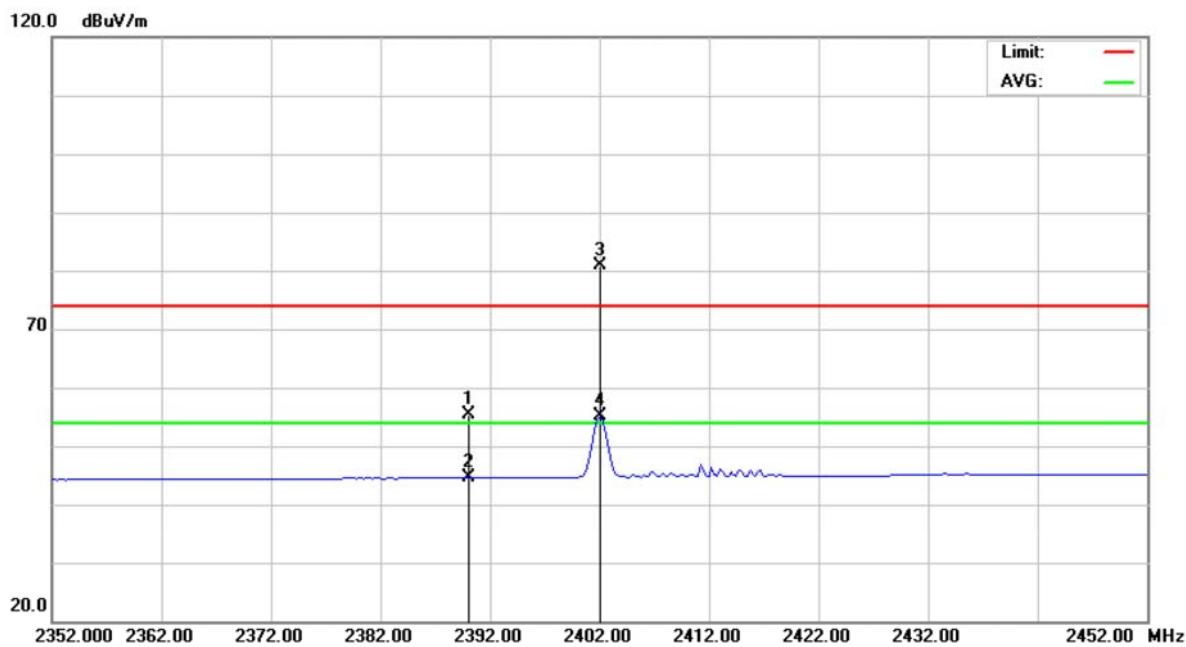


## **9.7 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 5.6 Unless otherwise a special operating condition is specified in the follows during the testing.

**9.8 TEST RESULTS**

EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		

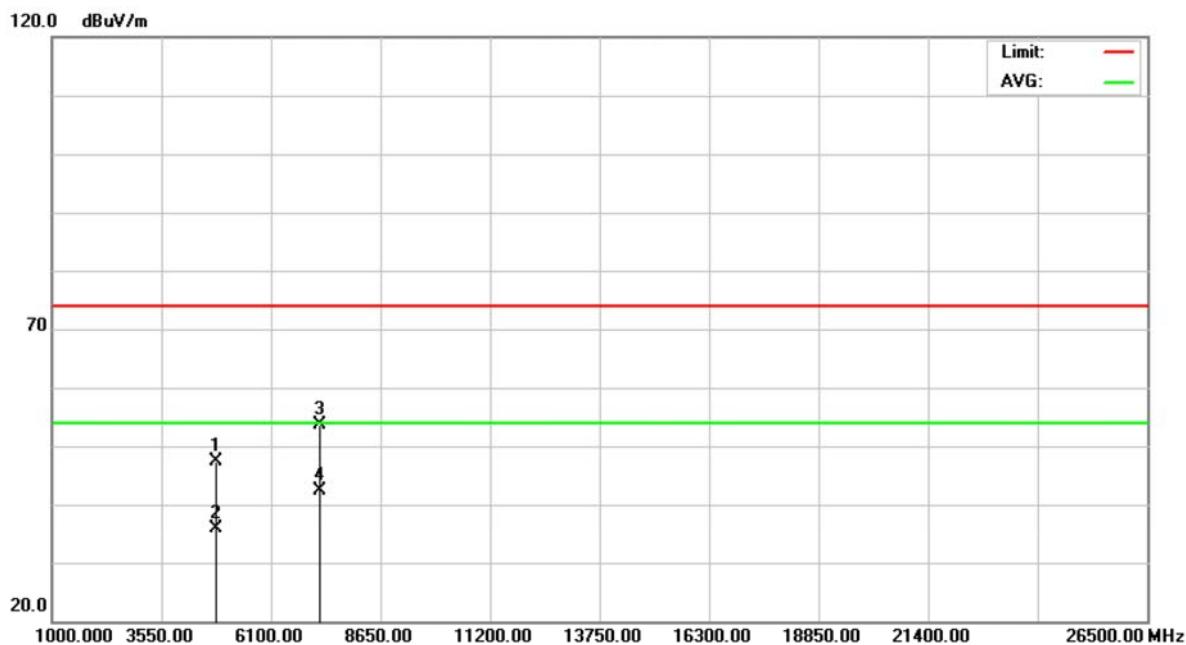
**Polarization: Vertical**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	2390.000	23.74	31.67	55.41	74.00	-18.59	peak
2	2390.000	12.93	31.67	44.60	54.00	-9.40	AVG
3 *	2402.000	49.10	31.72	80.82	74.00	6.82	peak
4 X	2402.000	23.33	31.72	55.05	54.00	1.05	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		

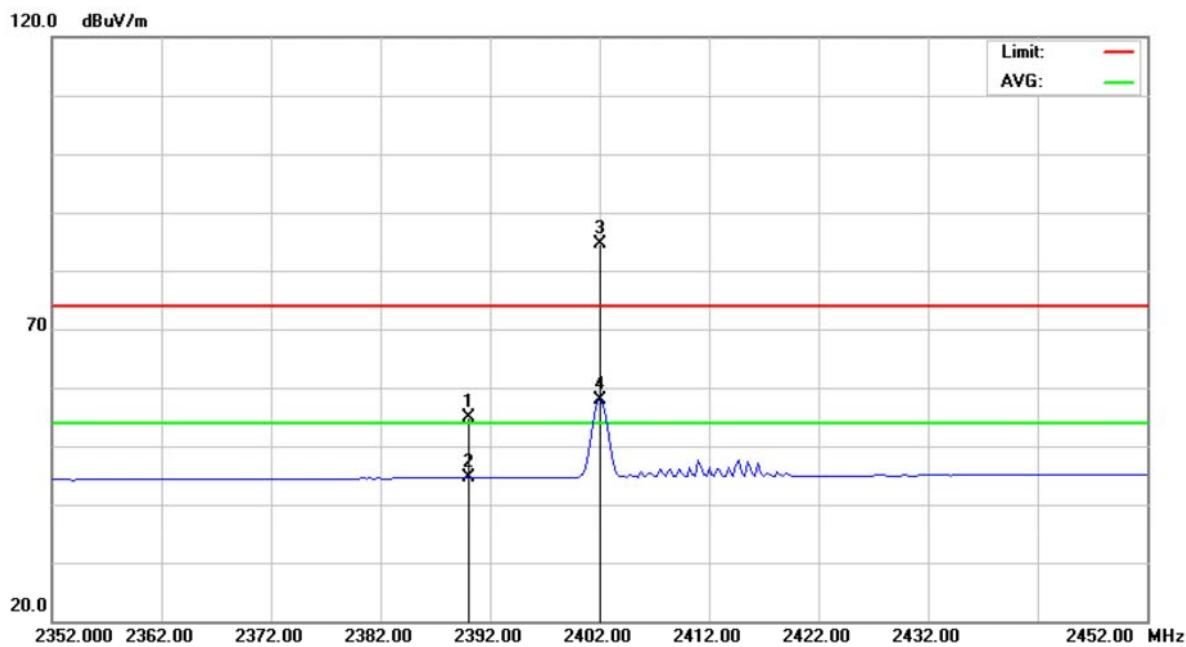
**Polarization: Vertical**



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4803.955	41.73	5.69	47.42	74.00	-26.58	peak
2	4803.955	30.21	5.69	35.90	54.00	-18.10	AVG
3	7206.145	41.41	12.18	53.59	74.00	-20.41	peak
4 *	7206.145	30.13	12.18	42.31	54.00	-11.69	AVG



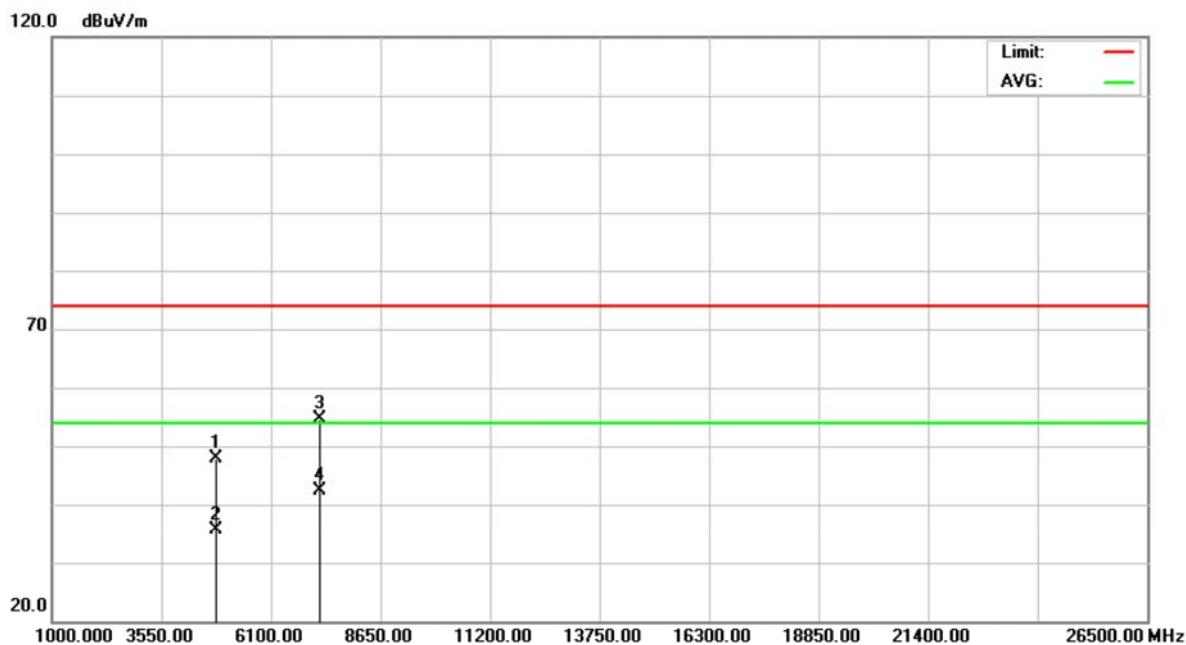
EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		

**Polarization: Horizontal**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over		Comment
						Detector		
1	2390.000	23.18	31.67	54.85	74.00	-19.15		peak
2	2390.000	12.88	31.67	44.55	54.00	-9.45		AVG
3 *	2402.000	52.99	31.72	84.71	74.00	10.71		peak
4 X	2402.000	26.23	31.72	57.95	54.00	3.95		AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		

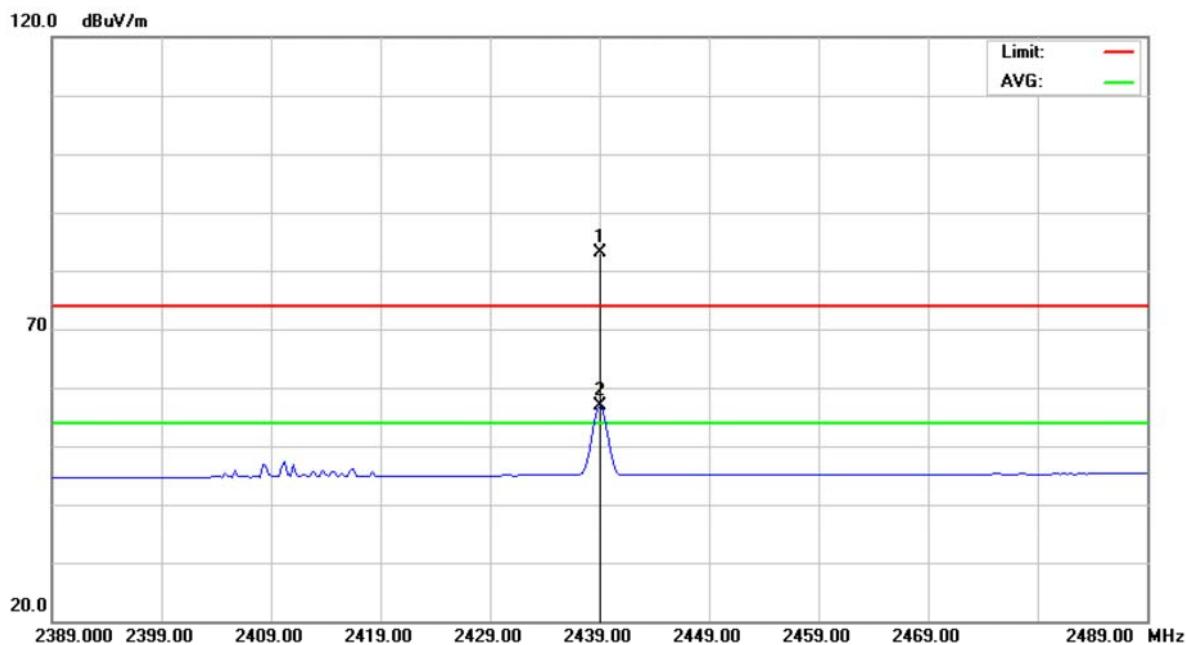
**Polarization: Horizontal**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4803.940	42.17	5.69	47.86	74.00	-26.14	peak
2	4803.940	30.01	5.69	35.70	54.00	-18.30	AVG
3	7205.995	42.56	12.18	54.74	74.00	-19.26	peak
4 *	7205.995	30.15	12.18	42.33	54.00	-11.67	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

**Polarization: Vertical**

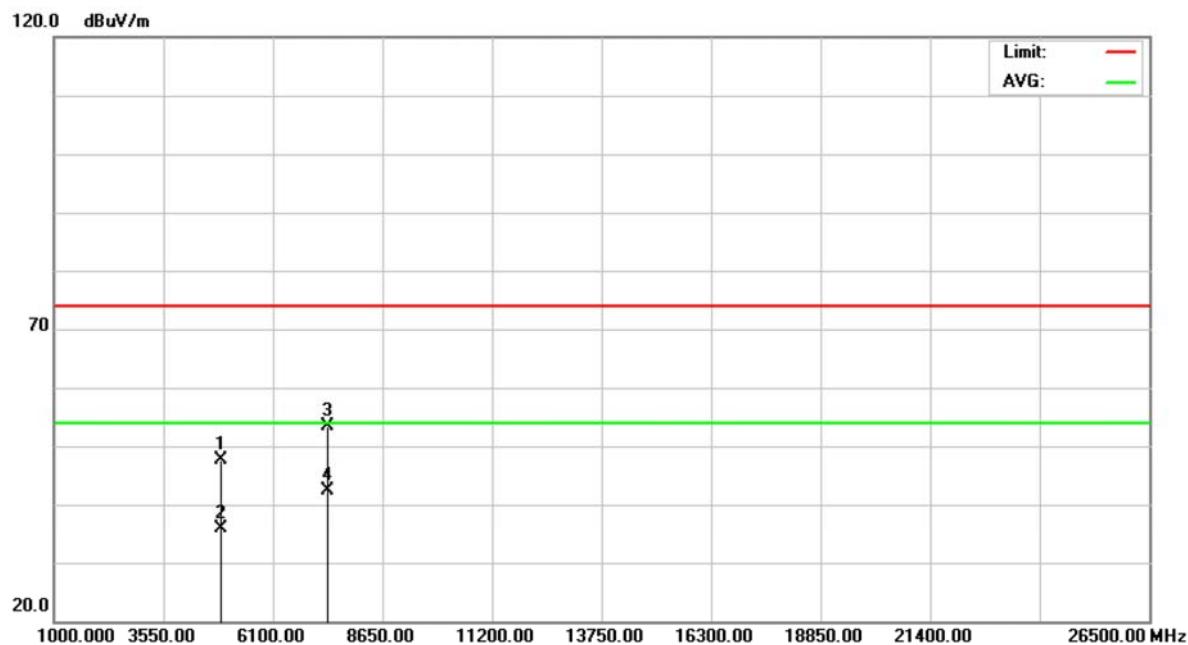


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1 *	2439.000	51.19	31.89	83.08	74.00	9.08	peak
2 X	2439.000	24.90	31.89	56.79	54.00	2.79	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

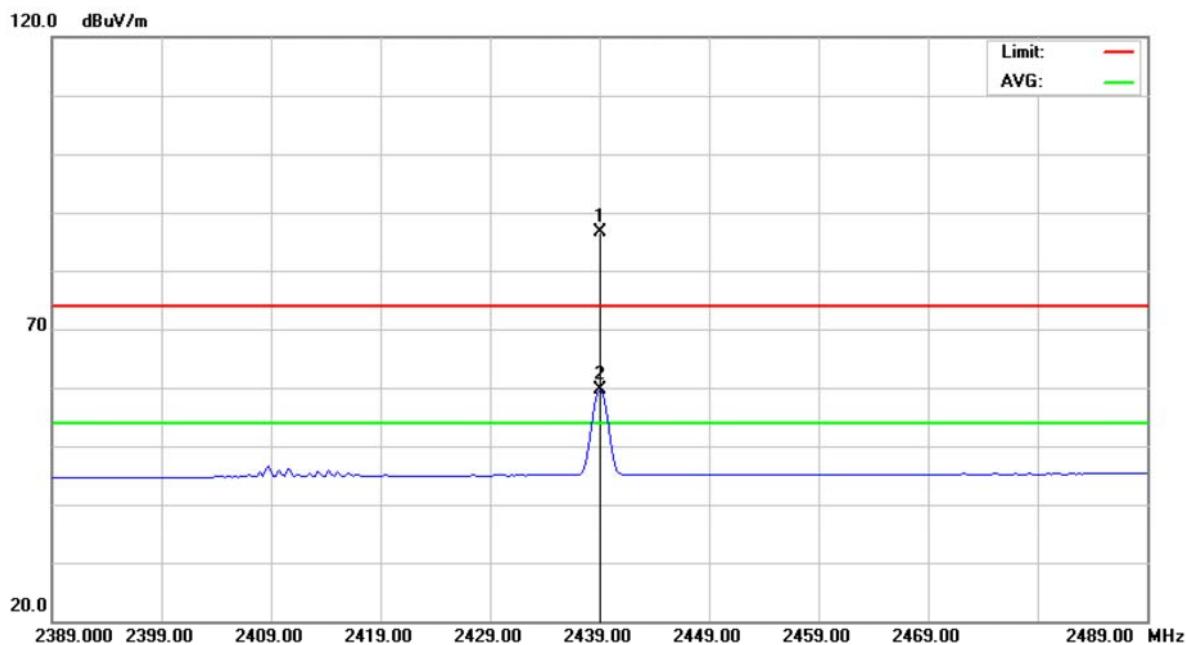
**Polarization: Vertical**



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4878.015	41.73	5.78	47.51	74.00	-26.49	peak
2	4878.015	30.12	5.78	35.90	54.00	-18.10	AVG
3	7316.790	40.91	12.59	53.50	74.00	-20.50	peak
4 *	7316.790	29.80	12.59	42.39	54.00	-11.61	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

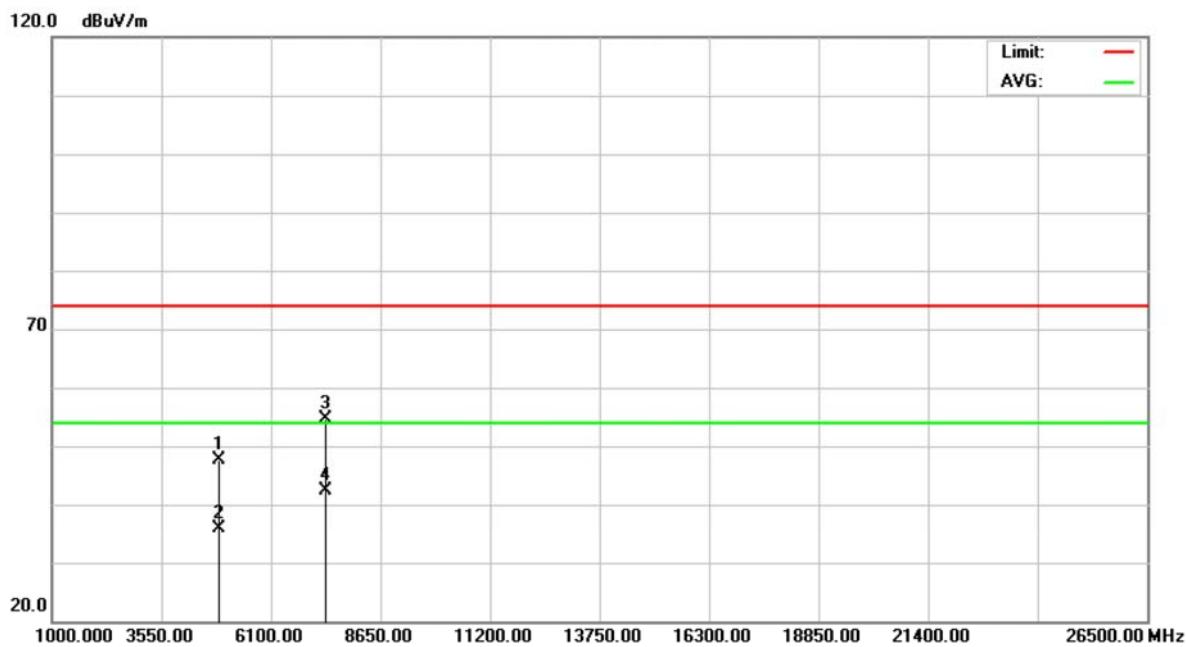
**Polarization: Horizontal**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1 *	2439.000	54.69	31.89	86.58	74.00	12.58	peak
2 X	2439.000	27.70	31.89	59.59	54.00	5.59	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2439 MHz		

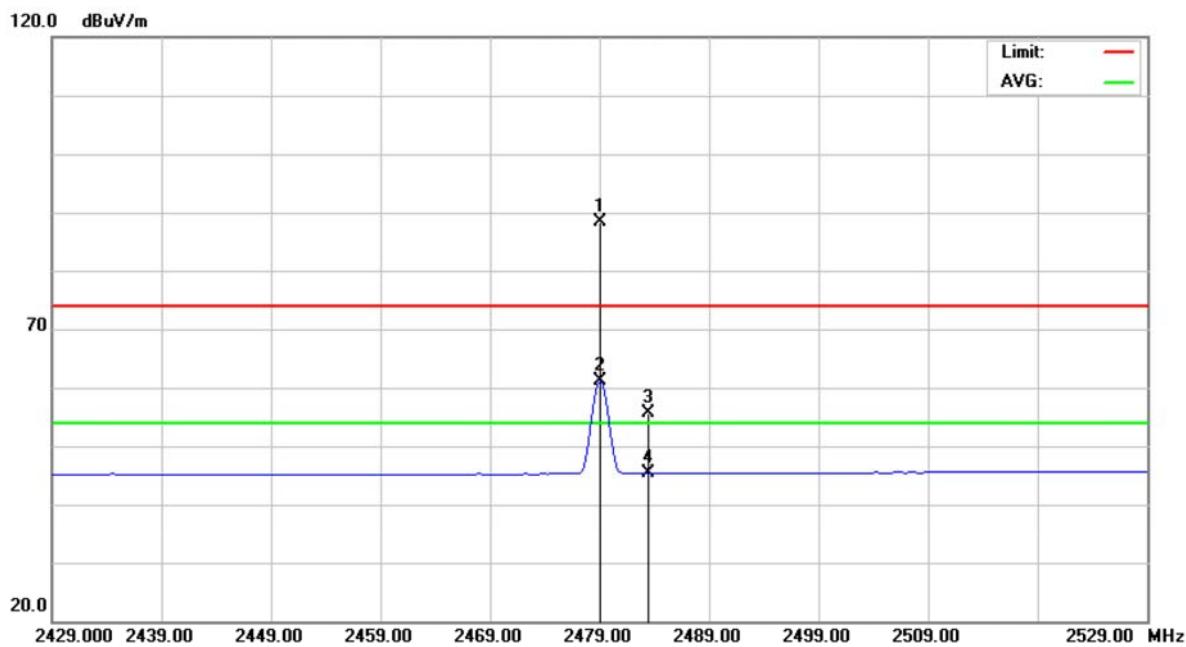
**Polarization: Horizontal**



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4878.100	41.95	5.78	47.73	74.00	-26.27	peak
2	4878.100	30.05	5.78	35.83	54.00	-18.17	AVG
3	7316.950	41.95	12.59	54.54	74.00	-19.46	peak
4 *	7316.950	29.80	12.59	42.39	54.00	-11.61	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		

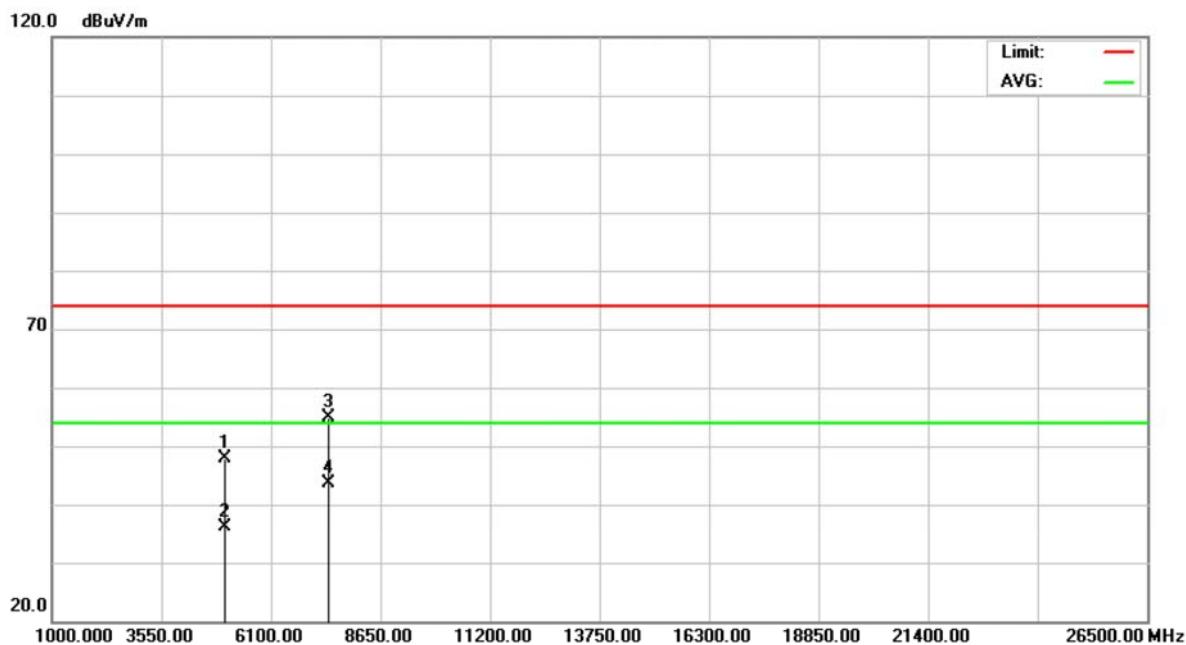
**Polarization: Vertical**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1 *	2479.000	56.37	32.07	88.44	74.00	14.44	peak
2 X	2479.000	29.16	32.07	61.23	54.00	7.23	AVG
3	2483.500	23.55	32.09	55.64	74.00	-18.36	peak
4	2483.500	13.20	32.09	45.29	54.00	-8.71	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		

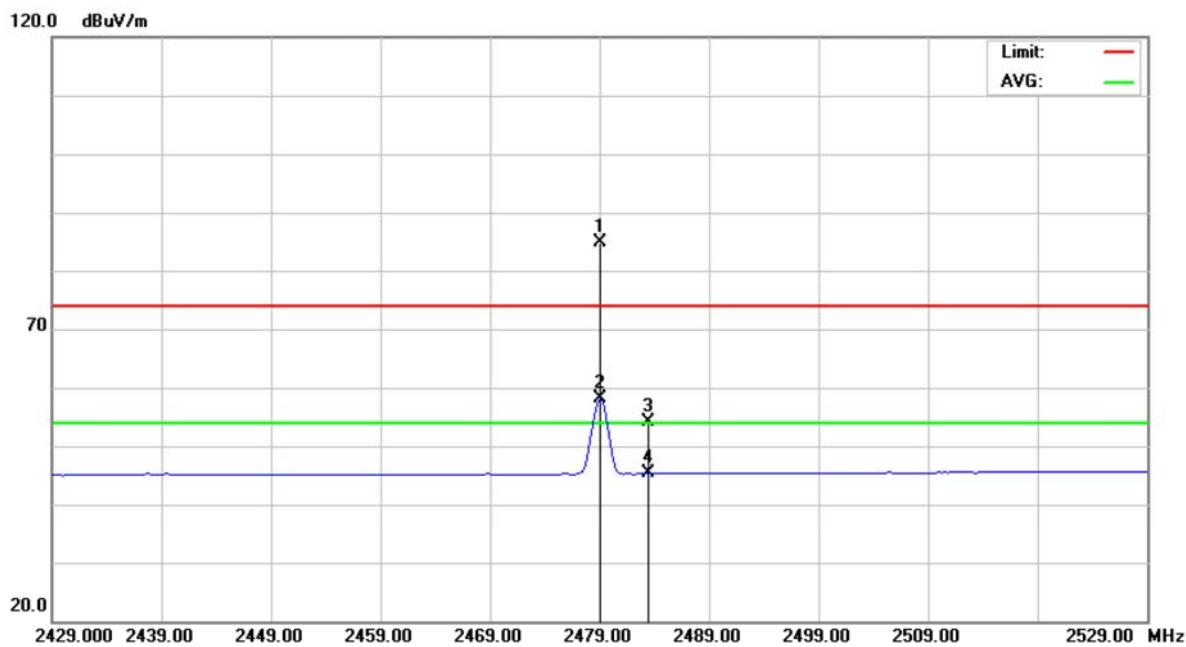
**Polarization: Vertical**



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4958.255	41.91	5.89	47.80	74.00	-26.20	peak
2	4958.255	30.23	5.89	36.12	54.00	-17.88	AVG
3	7437.000	41.88	13.04	54.92	74.00	-19.08	peak
4 *	7437.000	30.49	13.04	43.53	54.00	-10.47	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		

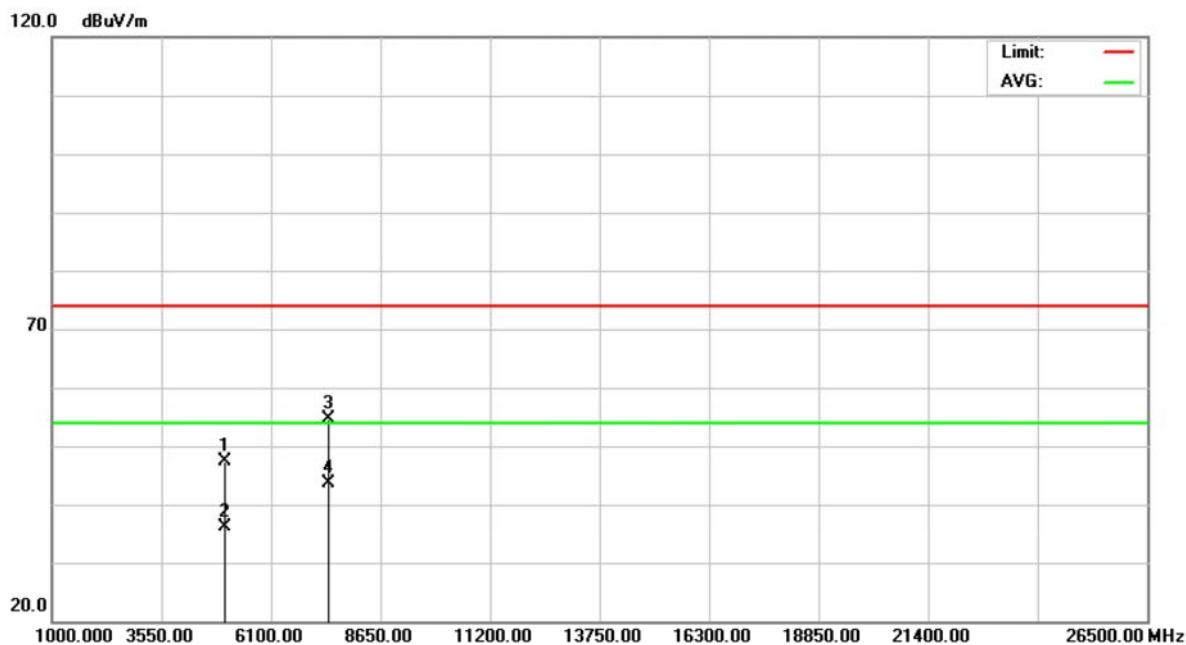
**Polarization: Horizontal**

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1 *	2479.000	52.87	32.07	84.94	74.00	10.94	peak
2 X	2479.000	26.10	32.07	58.17	54.00	4.17	AVG
3	2483.500	22.12	32.09	54.21	74.00	-19.79	peak
4	2483.500	13.21	32.09	45.30	54.00	-8.70	AVG



EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		

**Polarization: Horizontal**



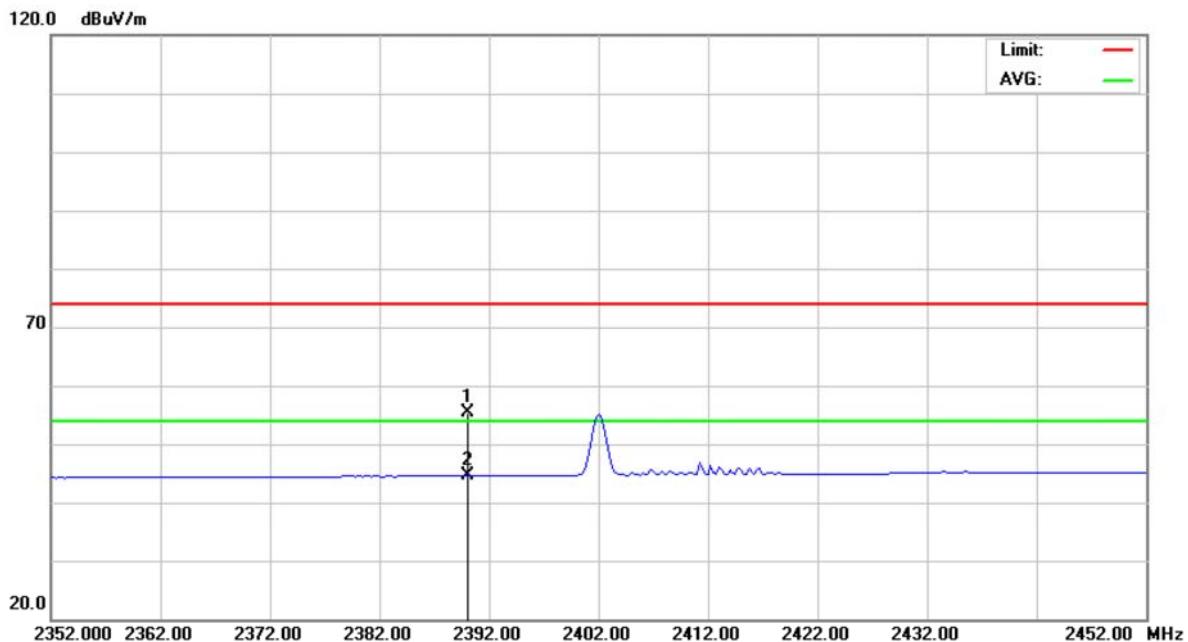
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4957.960	41.53	5.89	47.42	74.00	-26.58	peak
2	4957.960	30.17	5.89	36.06	54.00	-17.94	AVG
3	7436.870	41.62	13.04	54.66	74.00	-19.34	peak
4 *	7436.870	30.52	13.04	43.56	54.00	-10.44	AVG



## 9.9 TEST RESULTS (RESTRICTED BANDS)

EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

## Polarization: Vertical

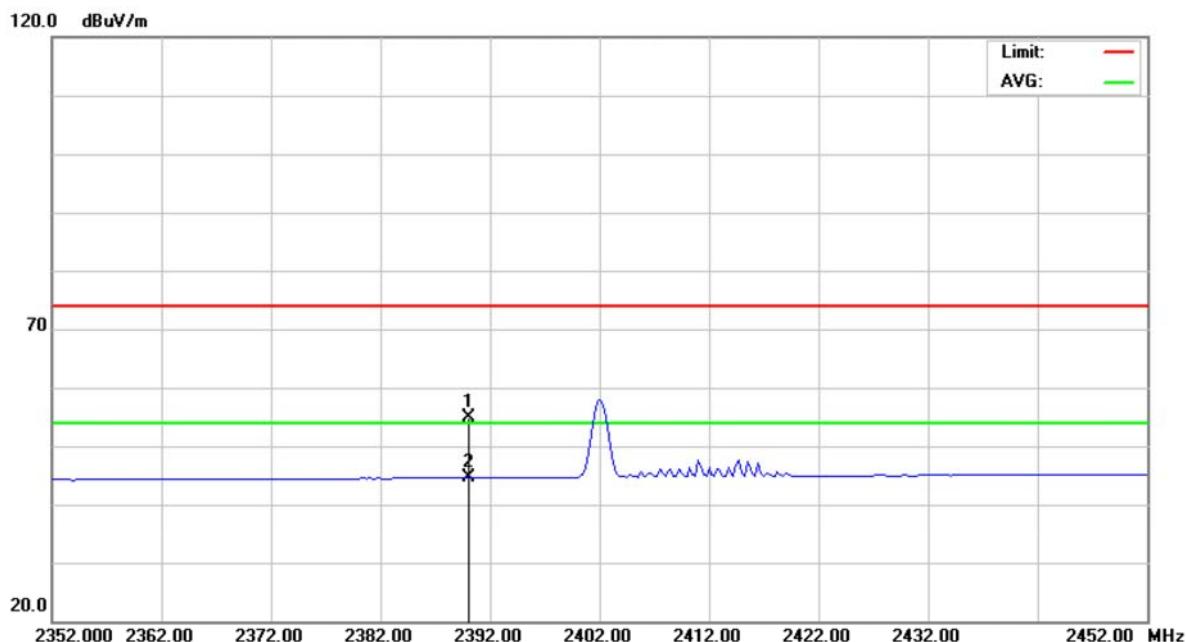


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over			
			Level	Factor	ment					
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.74	31.67	55.41	74.00	-18.59		peak	
2	*	2390.000	12.93	31.67	44.60	54.00	-9.40		AVG	



EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

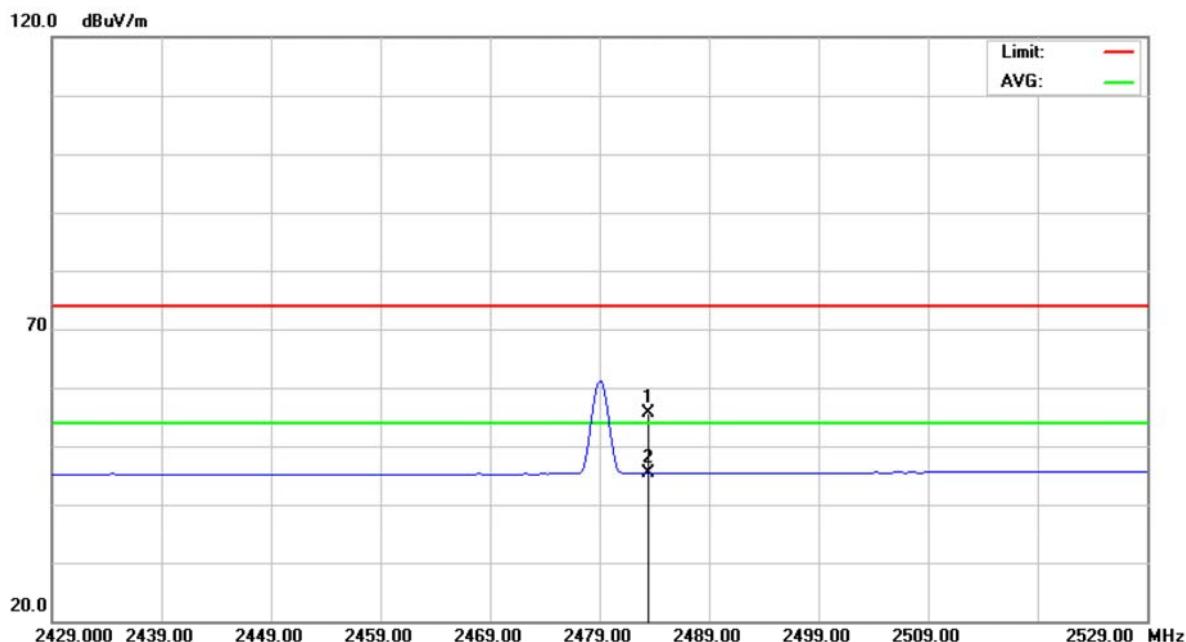
**Polarization: Horizontal**



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2390.000	23.18	31.67	54.85	74.00	-19.15	peak	
2	*	2390.000	12.88	31.67	44.55	54.00	-9.45	Avg	



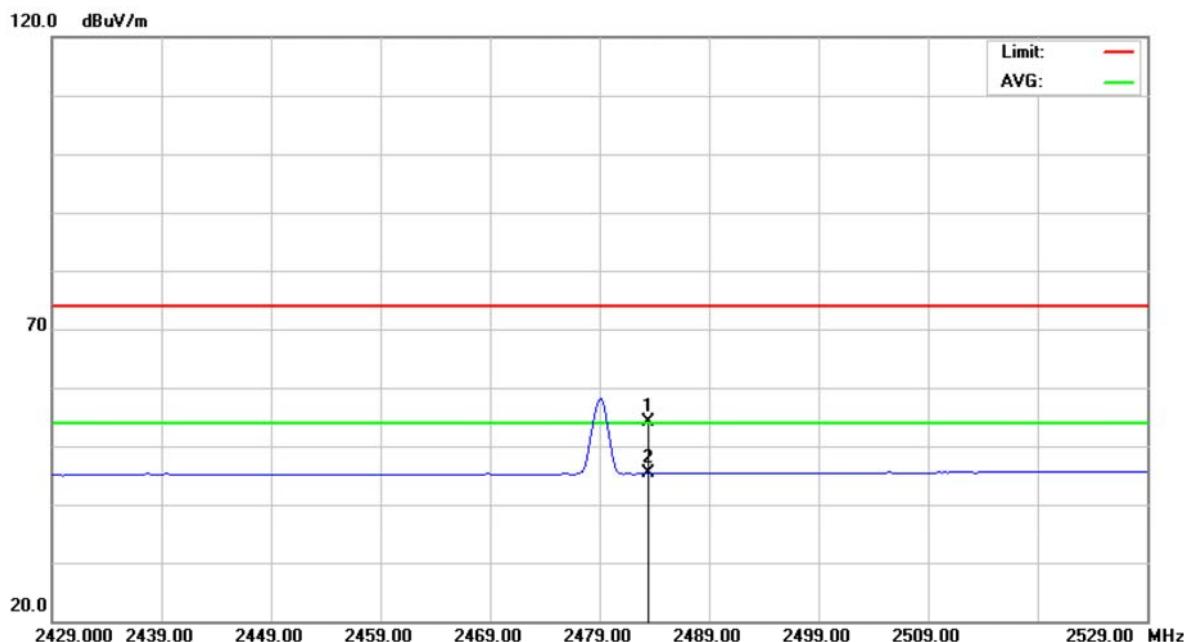
EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

**Polarization: Vertical**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2483.500	23.55	32.09	55.64	74.00	-18.36	peak	
2	*	2483.500	13.20	32.09	45.29	54.00	-8.71	Avg	



EUT	USB Receiver	Model Name	D002
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2479 MHz		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

**Polarization: Horizontal**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2483.500	22.12	32.09	54.21	74.00	-19.79	peak	
2	*	2483.500	13.21	32.09	45.30	54.00	-8.70	Avg	



## 10 POWER SPECTRAL DENSITY

### 10.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Power Spectral Density	2400-2483.5	8 dBm (in any 3 kHz)

### 10.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

NOTE: **N/A:** denotes No Model Name, No Serial No. or No Calibration specified.

### 10.3 TEST PROCEDURES

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW=3 kHz, VBW=30 kHz, Sweep time = 500s.

### 10.4 TEST SETUP LAYOUT



### 10.5 DEVIATION FROM TEST STANDARD

No deviation

### 10.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 5.6 Unless otherwise a special operating condition is specified in the follows during the testing.

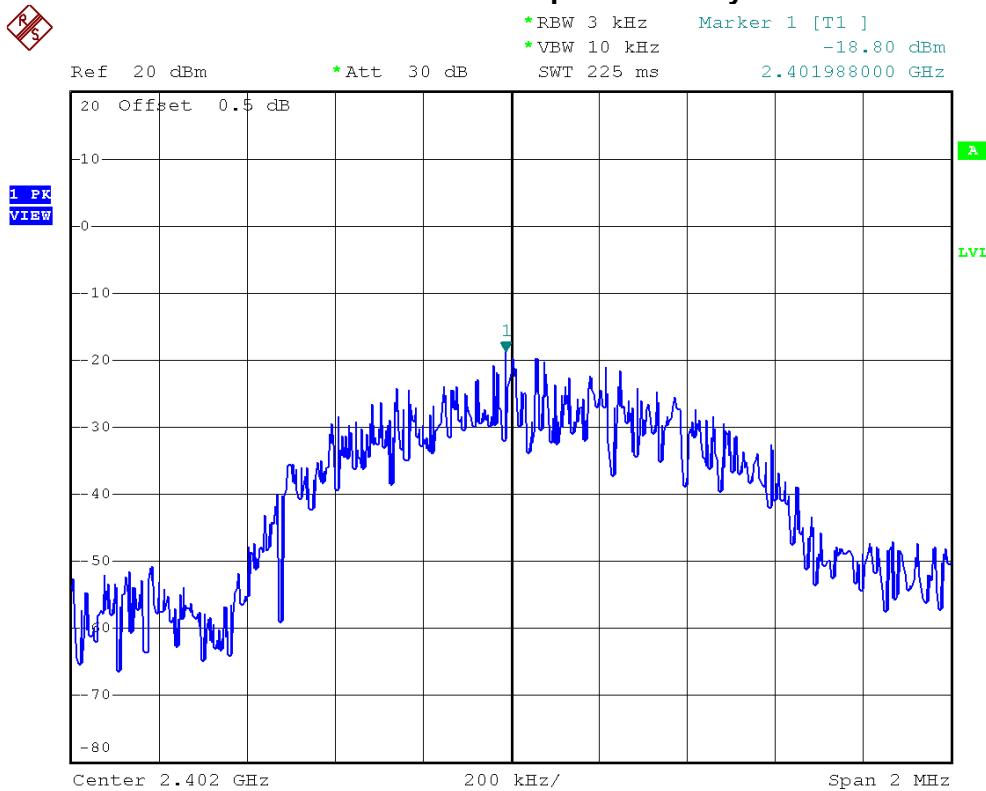


## 10.7 TEST RESULTS

EUT	USB Receiver	Model Name	D002
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz (System)		
Test Mode	2402 MHz, 2439 MHz, 2479 MHz		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2402 MHz	-18.80	8	PASS
2439 MHz	-18.21	8	PASS
2479 MHz	-17.51	8	PASS

### 2402 MHz/Power Sepctral Density

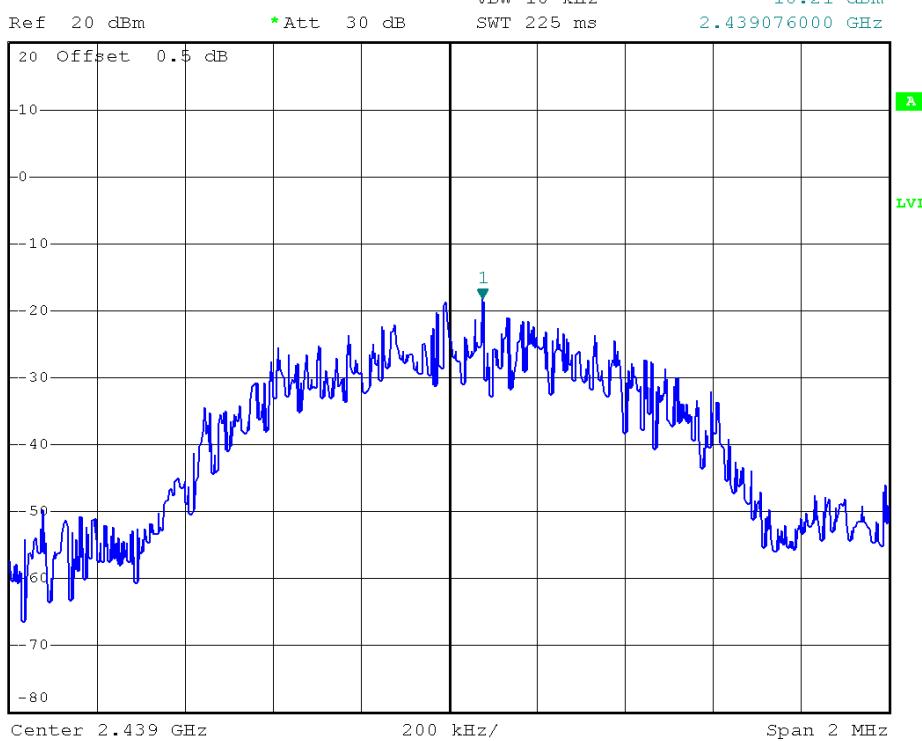




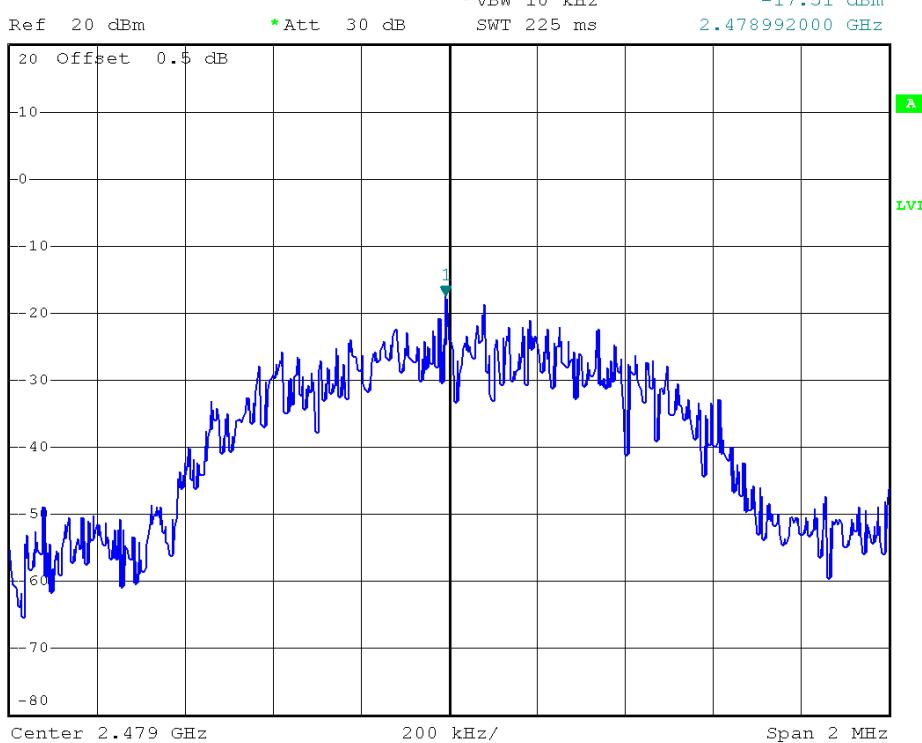
Neutron Engineering Inc.

FCC ID: 2AA9K-UDONGLE

### 2439 MHz/Power Sepctral Density



### 2479 MHz/Power Sepctral Density





## 11 EUT TEST PHOTO

### Conducted emission test photos





**Radiated spurious emission test photos**

