



## **FCC 47 CFR PART 15 SUBPART C TEST REPORT**

**For**

**Keyboard**

**Model Name: KIRA, KIRAbook, KIRAbook Pro, KIRAbook Elite, KIRAbook V, KIRAbook Fit, KIRAbook Lift, KIRA Flip, KIRAbook Go, KIRAbook Switch, KIRAbook Ka, KIRAbook CrossFit, KIRAbook X-Fit, KIRAbook Klay, KIRAbook Kinetix, dynabook KIRA V93, dynabook KIRA V83, dynabook KIRA L93, dynabook KIRA L83, dynabook KIRA L73, dynabook KIRA L63, dynabook KIRA L53**

**Model Number: PSUM2, PSUM3, PSUM4**

**Trade Name: TOSHIBA**

*Issued to*

**Toshiba Corporation**

**Digital Products & Service Company 2-9, Suehiro-cho, Ome-shi , Tokyo ,Japan**

*Issued by*

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**Revision History**

Rev.	Issue Date		Revisions	Effect Page	Revised By
00	April 8, 2014		Initial Issue	All	Angel Hu



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# 1 TEST RESULT CERTIFICATION

**Applicant:** Toshiba Corporation  
Digital Products & Service Company 2-9, Suehiro-cho, Ome-shi ,  
Tokyo ,Japan

**Manufacturer:** Toshiba Information Equipment (Hangzhou) Co., Ltd.  
M12-19-1 Hangzhou Export Processing Zone, Hangzhou City,  
Zhejiang Province 310018, P.R. China

**Equipment Under Test:** Keyboard

**Trade Name:** TOSHIBA

**Model Name:** KIRA, KIRAbook, KIRAbook Pro, KIRAbook Elite, KIRAbook V,  
KIRAbook Fit, KIRAbook Lift, KIRA Flip, KIRAbook Go,  
KIRAbook Switch, KIRAbook Ka, KIRAbook CrossFit, KIRAbook  
X-Fit, KIRAbook Klay, KIRAbook Kinetix, dynabook KIRA V93,  
dynabook KIRA V83, dynabook KIRA L93, dynabook KIRA L83,  
dynabook KIRA L73, dynabook KIRA L63, dynabook KIRA L53

**Model Number:** PSUM2, PSUM3, PSUM4

**Date of Test:** March 25 ~ April 2, 2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

## We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

**Approved by:**

**Reviewed by:**

Stan Lin  
Section Manager

Angel Hu  
Section Manager



## 2 EUT DESCRIPTION

<b>Product</b>	Keyboard		
<b>Trade Name</b>	TOSHIBA		
<b>Model Name</b>	KIRA, KIRAbook, KIRAbook Pro, KIRAbook Elite, KIRAbook V, KIRAbook Fit, KIRAbook Lift, KIRA Flip, KIRAbook Go, KIRAbook Switch, KIRAbook Ka, KIRAbook CrossFit, KIRAbook X-Fit, KIRAbook Klay, KIRAbook Kinetix, dynabook KIRA V93, dynabook KIRA V83, dynabook KIRA L93, dynabook KIRA L83, dynabook KIRA L73, dynabook KIRA L63, dynabook KIRA L53		
<b>Model Number</b>	PSUM2, PSUM3, PSUM4		
<b>EUT Power Rating</b>	3.7VDC, 0.125A		
<b>Power Adapter</b>	TOSHIBA	<b>Model</b>	PA5201U-1ACA
<b>Adapter Power Rating</b>	I/P: 100-240VAC, 50-60Hz, 1.2A O/P: 19VDC, 2.37A		
<b>Battery Power Rating</b>	3.7VDC, 0.9Wh		
<b>RF Module Manufacturer</b>	Broadcom	<b>Model</b>	BCM20730
<b>Operating Frequency Range</b>	2402 ~ 2480 MHz		
<b>Transmit Power</b>	2.24dBm (0.0017W)		
<b>Modulation Technique</b>	GFSK		
<b>Transmit Data Rate</b>	GFSK for 1Mbps		
<b>Number of Channels</b>	79 Channels, Minimum 20 Channels(AFH)		
<b>Antenna Specification</b>	Inverte F Antenna / Gain: -0.8dBi		

**Remark:**

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: CJ6UPSUM3KBBT filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3 TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 (2009), DA00-705 and FCC CFR 47 15.207, 15.209 and 15.247.

#### **3.1. EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2. EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### **3.3. GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



### 3.4. FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



### **3.5. DESCRIPTION OF TEST MODES**

The EUT (model: KIRA) had been tested under operating condition and had been reported as worst case on this test report.

Test program used to control the EUT for staying in continuous transmitting mode was programmed.

Following channel(s) was (were) selected for the final test as listed below.

<b>Tested Channel</b>	<b>Modulation Type</b>	<b>Packet Type</b>	<b>Data Rate</b>
Low, Mid, High	GFSK	DH 5	1

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

Channel Low (2402MHz), Mid (2441MHz) and High (2480MHz) with 1Mbps data rate was chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.





## 4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.1. MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/01/2015
Spectrum Analyzer	Agilent	N9010A	MY52220817	03/20/2015
Spectrum Analyzer	R&S	FSL	100837	11/11/2014
Power meter	Anritsu	ML2495A	1033009	09/29/2014
Power Sensor	Anritsu	MA2411B	0917221	09/29/2014

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/01/2015
Pre-Amplifier	EMEC	EM01M26G	060570	07/25/2014
Pre-Amplifier	MITEQ	AMF-6F-26040 0-40-8P	985646	08/08/2014
Horn Antenna	EMCO	3115	9602-4659	06/16/2014
Horn Antenna	EMCO	3116	00026370	12/29/2014
Low Loss Cable	Huber+Suhner	104PEA	24815/4PEA	04/26/2014
Low Loss Cable	Huber+Suhner	104PEA	30956/4PEA	04/26/2014
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Bore-Sight Antenna Tower	CCS	CCS-BORESIG HT	001	N.C.R
Test S/W	EZ-EMC			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R = No Calibration Request.

**Compliance Certification Services Inc.**

Report No.: T140320L08-RP1

FCC ID: CJ6UPSUM3KBBT

Date of Issue: April 8, 2014

Powerline Conducted Emissions Test Site #4				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100782	06/14/2014
LISN	R&S	ENV216	100066	02/06/2015
LISN	R&S	ENV 4200	830326/016	05/30/2014
ISN	FCC	FCC-TLISN-T2-02	20587	08/01/2014
ISN	TESEQ	ISN-T8	30843	08/16/2014
Current Probe	FCC	F-35	506	07/19/2014
ISN	TESEQ	ISN ST08	27907	09/30/2014
Test S/W	EZ-EMC			

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R = No Calibration Request.



## 4.2. MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor)  $k = 1,96$  or  $k = 2$  (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 6 is based on such expansion factors.

**Table 6: Maximum measurement uncertainty**

Parameter	Uncertainty
Powerline Conducted Emission	$\pm 0.9203$
3M Semi Anechoic Chamber / 30MHz ~ 200MHz	$\pm 3.5921$
3M Semi Anechoic Chamber / 200MHz ~ 1GHz	$\pm 3.5657$
3M Semi Anechoic Chamber / 1 ~ 8GHz	$\pm 2.5873$
3M Semi Anechoic Chamber / 8 ~ 18GHz	$\pm 2.6646$
3M Semi Anechoic Chamber / 18 ~ 26GHz	$\pm 2.9617$
3M Semi Anechoic Chamber / 26 ~ 40GHz	$\pm 3.4250$

**Remark:** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



## **5 FACILITIES AND ACCREDITATIONS**

### **5.1. FACILITIES**

All measurement facilities used to collect the measurement data are located at

- ☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.  
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- ☐ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan  
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- ☒ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, Taiwan, R.O.C.  
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **5.2. EQUIPMENT**

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.






Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



### 5.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	 TESTING CERT #0824.01
USA	FCC MRA	3 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 TW1026
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	<b>VCCI</b> R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	  0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS-Gen Issue 3	 IC 2324C-5

**Note:** No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.



## 6 SETUP OF EQUIPMENT UNDER TEST

### 6.1. SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2. SUPPORT EQUIPMENT

For Radiated Emission (Below 1GHz) and Power Line Conducted Emission measurement							
No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	N/A	KIRA	N/A	N/A	TOSHIBA	N/A	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2	LCD Monitor	LT2452PWC	VNA7PCK	FCC DoC	LENOVO	Mini HDMI Cable: Shielded, 1.8m	Unshielded, 1.8m
3	Multimedia Headset	EPM-662	N/A	N/A	i-gota	Unshielded, 1.2m	N/A
4	USB Mouse	MO19UCA	020440943	FCC DoC	HP	Unshielded, 1.8m	N/A
5	USB External HDD	F12-UF	A0100214-43b0011	FCC DoC	TeraSys	Unshielded, 1.2m	N/A
6	Micro SD Card	MM8GRO 1GUACY	N/A	N/A	Transceond	N/A	N/A

For Conducted & Radiated Emission measurement (Above 1GHz):							
No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Test Jig	N/A	N/A	N/A	N/A	Unshielded, 0.12m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core
2	Notebook PC	TP00013A	LR-9XH2K	FCC DOC	LENOVO	Shielded, 1.2m	AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core

**Remark:** Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



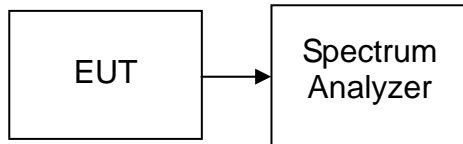
## **7 FCC PART 15.247 REQUIREMENTS**

### **7.1. 20DB BANDWIDTH**

#### **LIMIT**

None; for reporting purposes only.

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10kHz, VBW = RBW\*3, Span = 3MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### **TEST RESULTS**

*No non-compliance noted*



## Test Plot

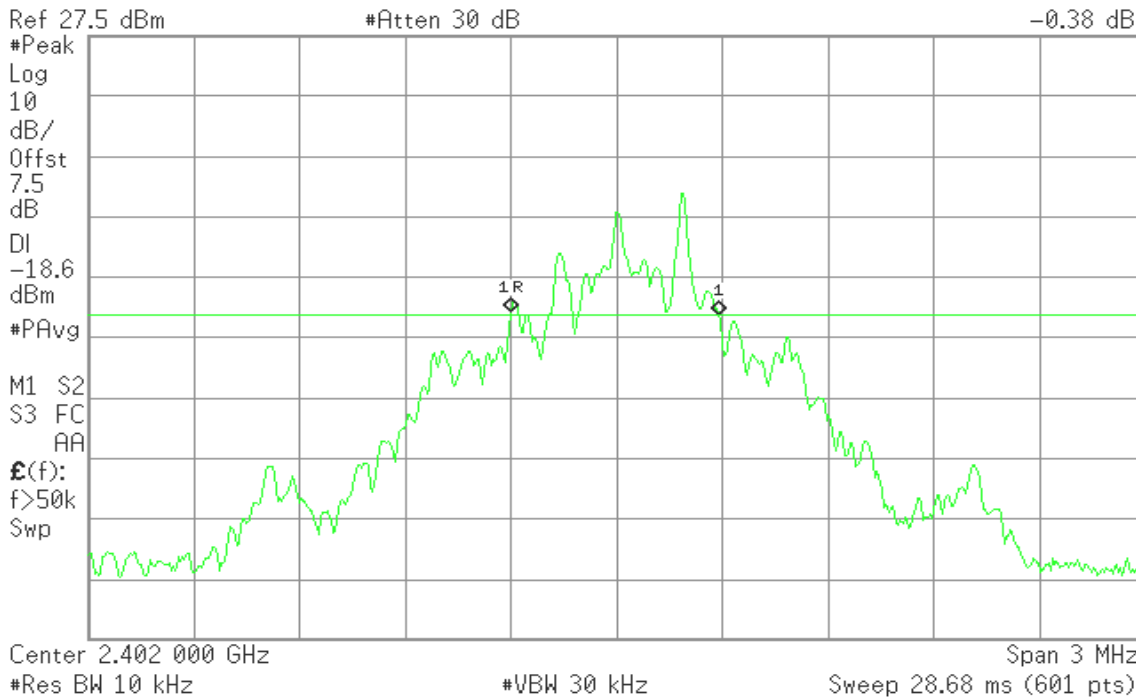
### GFSK

### CH Low

Agilent

R L

▲ Mkr1 590 kHz  
-0.38 dB

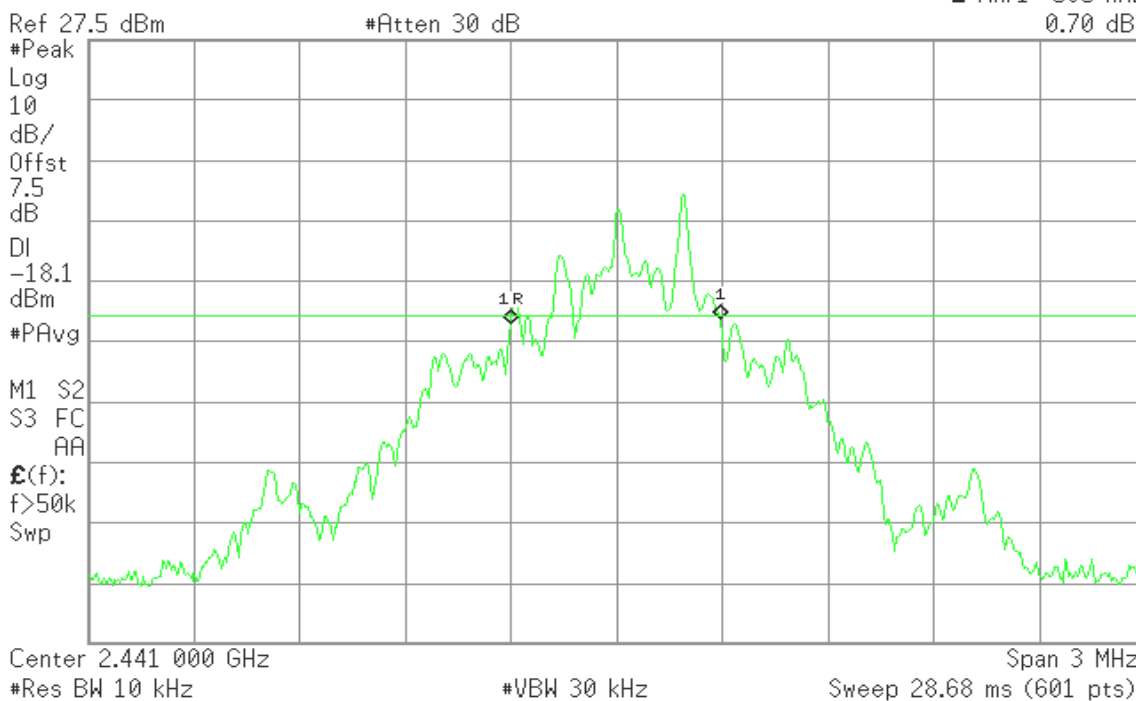


### CH Mid

Agilent

R L

▲ Mkr1 595 kHz  
0.70 dB







## CH High

Agilent

R L

▲ Mkr1 595 kHz  
0.68 dB

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

DI

-18.3

dBm

#PAvg

M1 S2

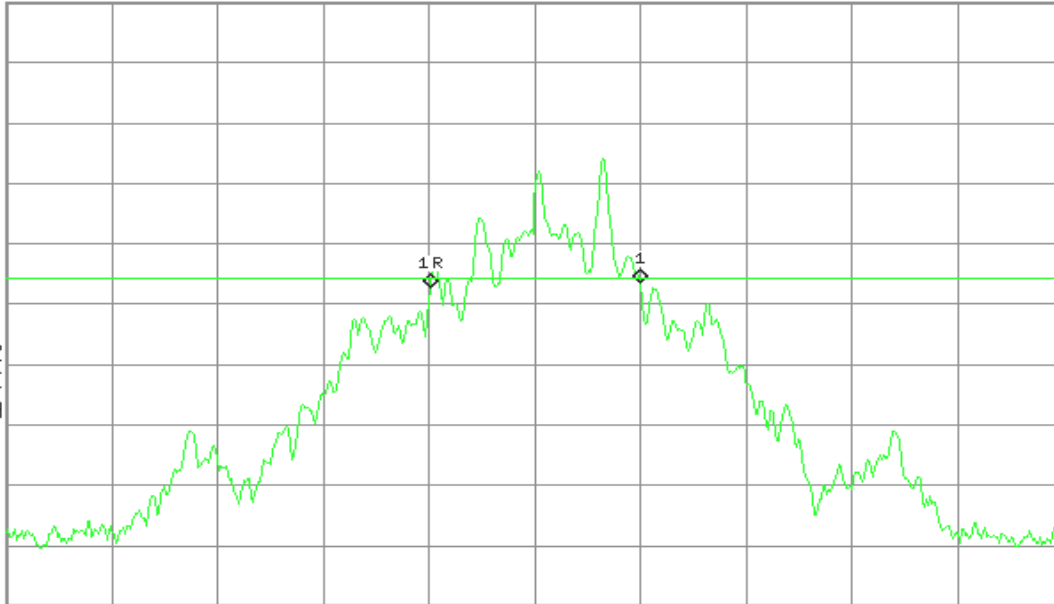
S3 FC

AA

£(f):

f>50k

Swp



Center 2.480 000 GHz

#Res BW 10 kHz

#VBW 30 kHz

Span 3 MHz  
Sweep 28.68 ms (601 pts)



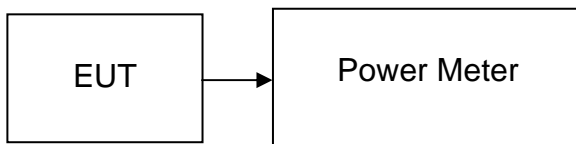
## **7.2. PEAK POWER**

### **LIMIT**

According to §15.247, the maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
2. According to §15.247(b) (4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

### **TEST RESULTS**

*No non-compliance noted*

**TEST DATA****GFSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2402	1.83	0.0015	1	PASS
Mid	2441	2.24	0.0017		PASS
High	2480	1.92	0.0016		PASS

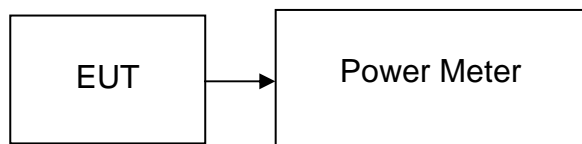


### **7.3. AVERAGE POWER**

#### **LIMIT**

None; for reporting purposes only.

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

#### **TEST RESULTS**

*No non-compliance noted*

#### **TEST DATA**

##### **GFSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	0.21	0.0010
Mid	2441	0.68	0.0012
High	2480	0.51	0.0011



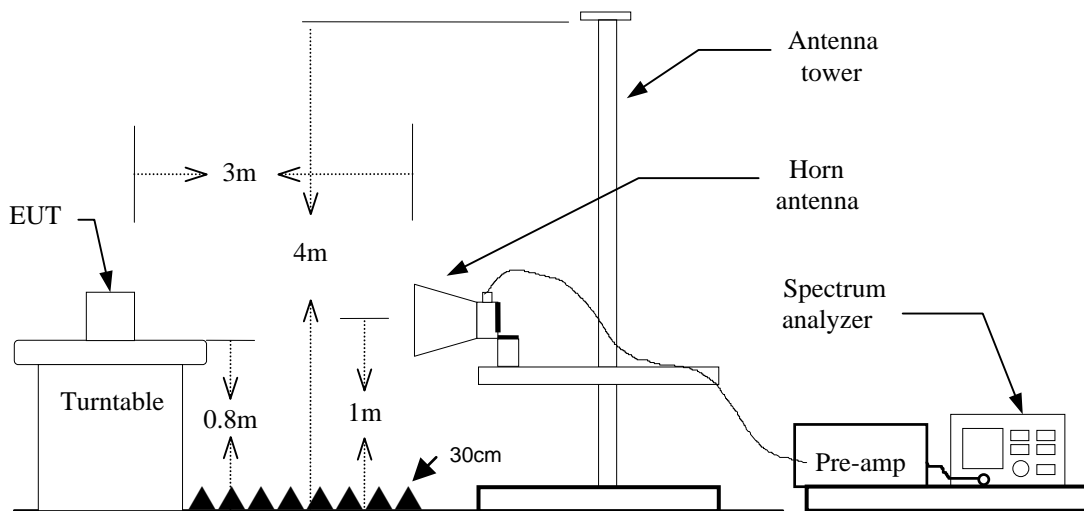
## 7.4. BAND EDGES MEASUREMENT

### LIMIT

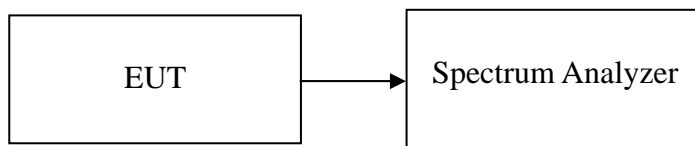
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the signal. This paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### TEST CONFIGURATION

#### For Radiated



#### For Conducted





## **TEST PROCEDURE**

### **For Radiated**

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=1MHz/VBW=3MHz / Sweep=100ms
  - (b) AVERAGE: RBW=1MHz / VBW=300Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### **For Conducted**

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

## **TEST RESULTS**

*No non-compliance noted*

## **TEST DATA**

Refer to attach spectrum analyzer data chart.



GFSK

CH Low

Detector mode: Peak

Polarity: Vertical

Agilent

R T

Mkr1 2.390 00 GHz  
43.80 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

#PAvg

M1 S2

Start 2.310 00 GHz

Stop 2.410 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	43.80 dB $\mu$ V/m

Detector mode: Average

Polarity: Vertical

Agilent

R T

Mkr1 2.390 00 GHz  
32.78 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

#PAvg

M1 S2

Start 2.310 00 GHz

Stop 2.410 00 GHz

#Res BW 1 MHz

#VBW 300 Hz

Sweep 259.9 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	32.78 dB $\mu$ V/m



Detector mode: Peak

Polarity: Horizontal

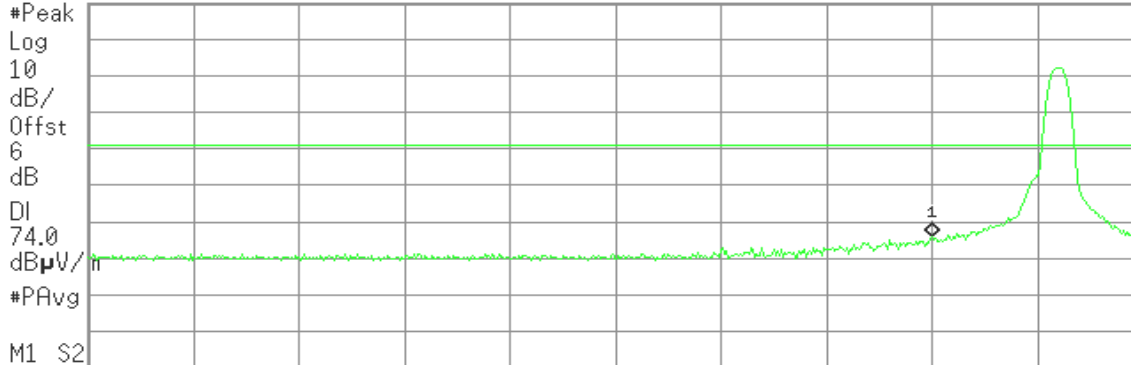
Agilent

R T

Mkr1 2.390 00 GHz  
48.91 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB



Start 2.310 00 GHz

Stop 2.410 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	48.91 dB $\mu$ V/m

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.390 00 GHz  
32.49 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB



Start 2.310 00 GHz

Stop 2.410 00 GHz

#Res BW 1 MHz

#VBW 300 Hz

Sweep 259.9 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	32.49 dB $\mu$ V/m





GFSK

CH High

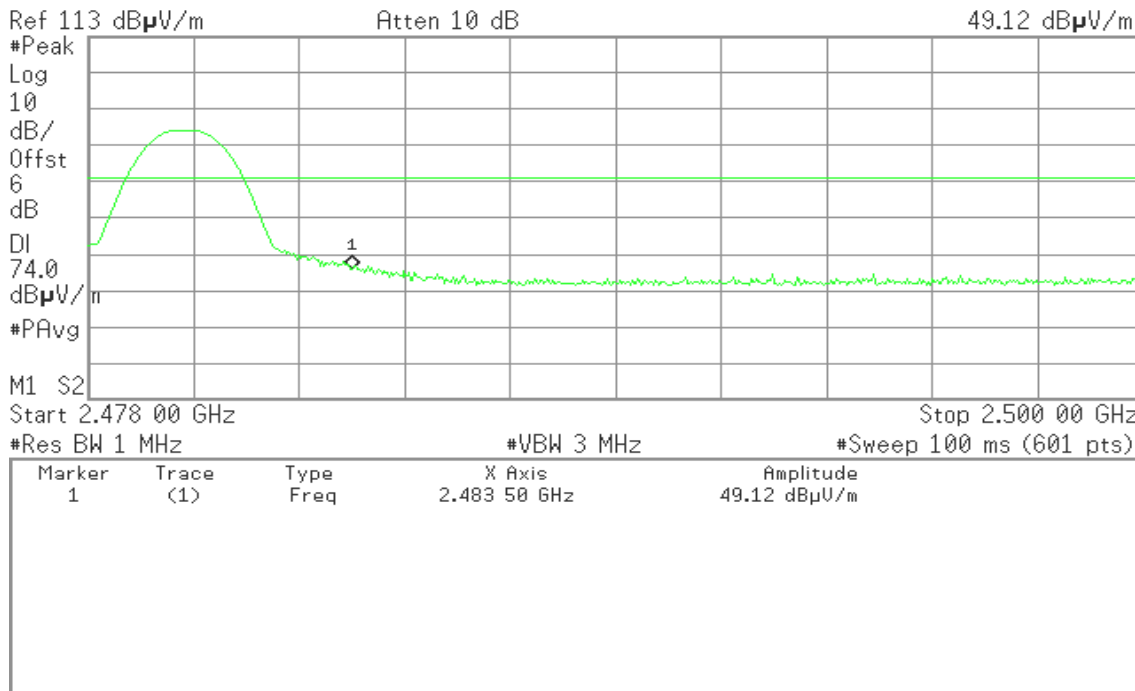
Detector mode: Peak

Polarity: Vertical

Agilent

R T

Mkr1 2.483 50 GHz  
49.12 dB $\mu$ V/m



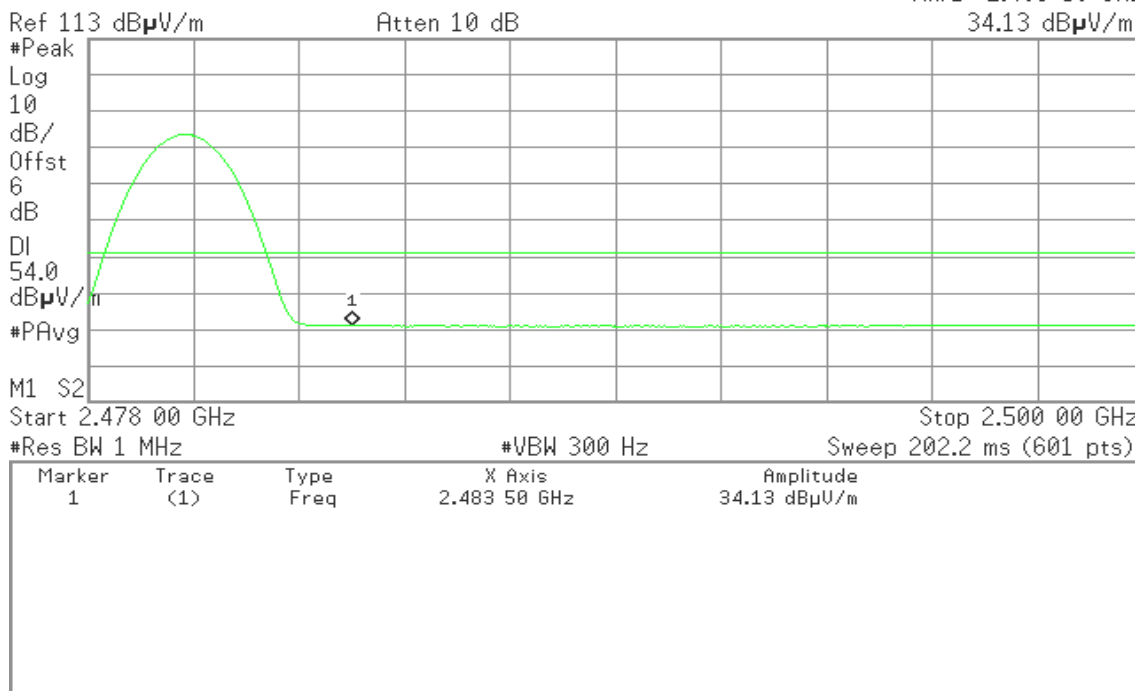
Detector mode: Average

Polarity: Vertical

Agilent

R T

Mkr1 2.483 50 GHz  
34.13 dB $\mu$ V/m





Detector mode: Peak

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz

58.96 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

74.0

dB $\mu$ V/m

#PAvg

M1 S2

Start 2.478 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 3 MHz

#Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.483 50 GHz	58.96 dB $\mu$ V/m

Detector mode: Average

Polarity: Horizontal

Agilent

R T

Mkr1 2.483 50 GHz

36.27 dB $\mu$ V/m

Ref 113 dB $\mu$ V/m

Atten 10 dB

#Peak

Log

10

dB/

Offst

6

dB

DI

54.0

dB $\mu$ V/m

#PAvg

M1 S2

Start 2.478 00 GHz

Stop 2.500 00 GHz

#Res BW 1 MHz

#VBW 300 Hz

Sweep 202.2 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.483 50 GHz	36.27 dB $\mu$ V/m



## Conducted band-edge

### GFSK

#### CH Low

Agilent

R L

Mkr2 2.402 200 GHz

1.58 dBm

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

DI

-18.4

dBm

#PAvg

M1 S2

Start 2.390 000 GHz

Stop 2.405 000 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 1.84 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.400 000 GHz	-43.61 dBm
2	(1)	Freq	2.402 200 GHz	1.58 dBm

#### CH High

Agilent

R T

Mkr1 2.480 20 GHz

1.74 dBm

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

DI

-18.3

dBm

#PAvg

M1 S2

Start 2.478 00 GHz

Stop 2.500 00 GHz

#Res BW 100 kHz

#VBW 100 kHz

Sweep 2.68 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 20 GHz	1.74 dBm
2	(1)	Freq	2.483 50 GHz	-53.11 dBm



## Hopping On

Agilent

R T

Mkr2 2.442 17 GHz

1.89 dBm

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

DI

-18.1

dBm

#PAvg

M1 S2

Start 2.387 00 GHz

Stop 2.487 00 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	-46.64 dBm
2	(1)	Freq	2.442 17 GHz	1.89 dBm
3	(1)	Freq	2.483 50 GHz	-45.96 dBm

## Hopping Off

Agilent

R T

Mkr2 2.480 17 GHz

1.80 dBm

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

DI

-18.2

dBm

#PAvg

M1 S2

Start 2.387 00 GHz

Stop 2.487 00 GHz

#Res BW 510 kHz

#VBW 510 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	-46.46 dBm
2	(1)	Freq	2.480 17 GHz	1.80 dBm
3	(1)	Freq	2.483 50 GHz	-46.13 dBm

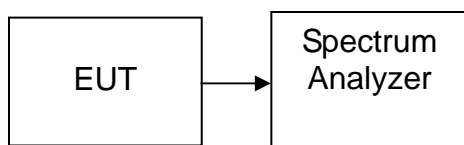


## **7.5. FREQUENCY SEPARATION**

### **LIMIT**

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW = 30kHz, VBW = 100kHz, Span = 3MHz, Sweep = auto.
5. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency.

### **TEST RESULTS**

*No non-compliance noted*

### **TEST DATA**

#### **GFSK**

Channel Separation (MHz)	20 dB bandwidth	Channel Separation Limit	Result
1.00	595	> 20dB Bandwidth or two-thirds of the 20 dB bandwidth	Pass



## Test Plot

### Measurement of Channel Separation

#### GFSK

Agilent

R L

Mkr1 2.440 005 GHz

1.84 dBm

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

#PAvg

M1 S2

Center 2.441 000 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.440 005 GHz	1.84 dBm
2	(1)	Freq	2.441 005 GHz	2.06 dBm
3	(1)	Freq	2.442 005 GHz	1.89 dBm

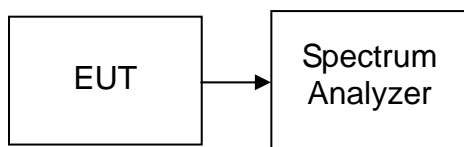


## **7.6. NUMBER OF HOPPING FREQUENCY**

### **LIMIT**

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2441.5MHz, Sweep = auto and Start=2441.5MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=510kHz.
5. Max hold, view and count how many channel in the band.

### **TEST RESULTS**

*No non-compliance noted*

### **TEST DATA**

Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS

AFH Mode: 20 Channels declared.

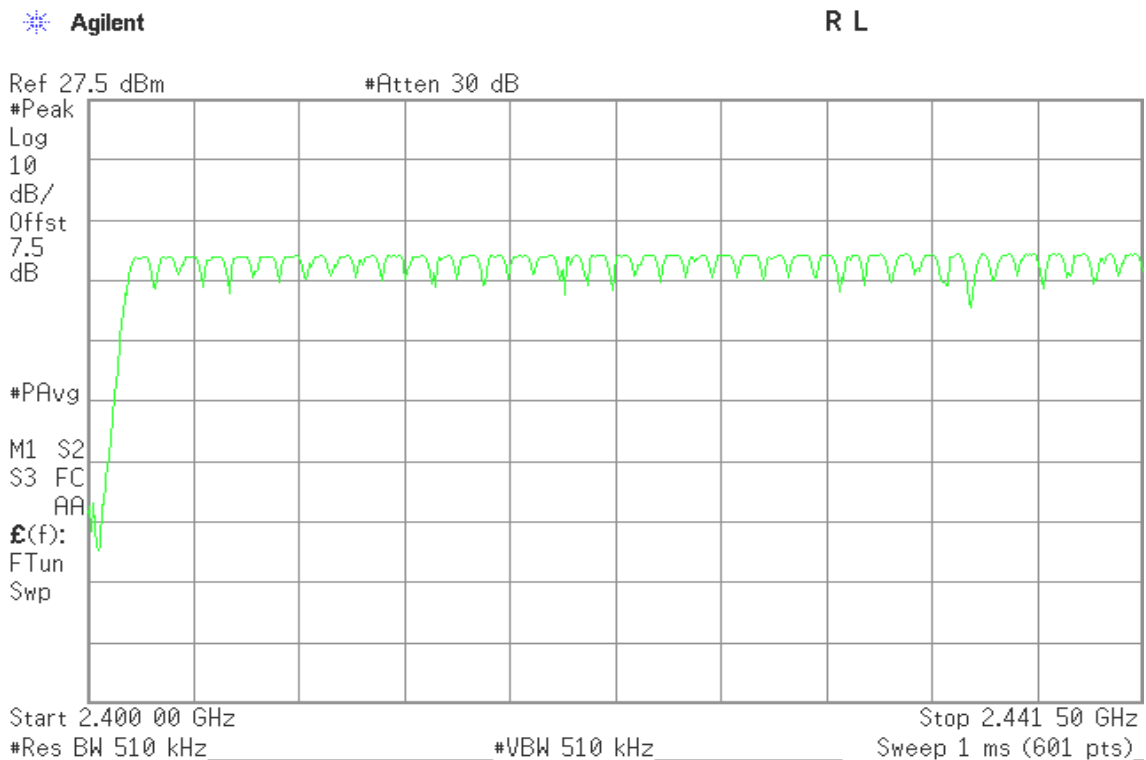


**Test Plot**

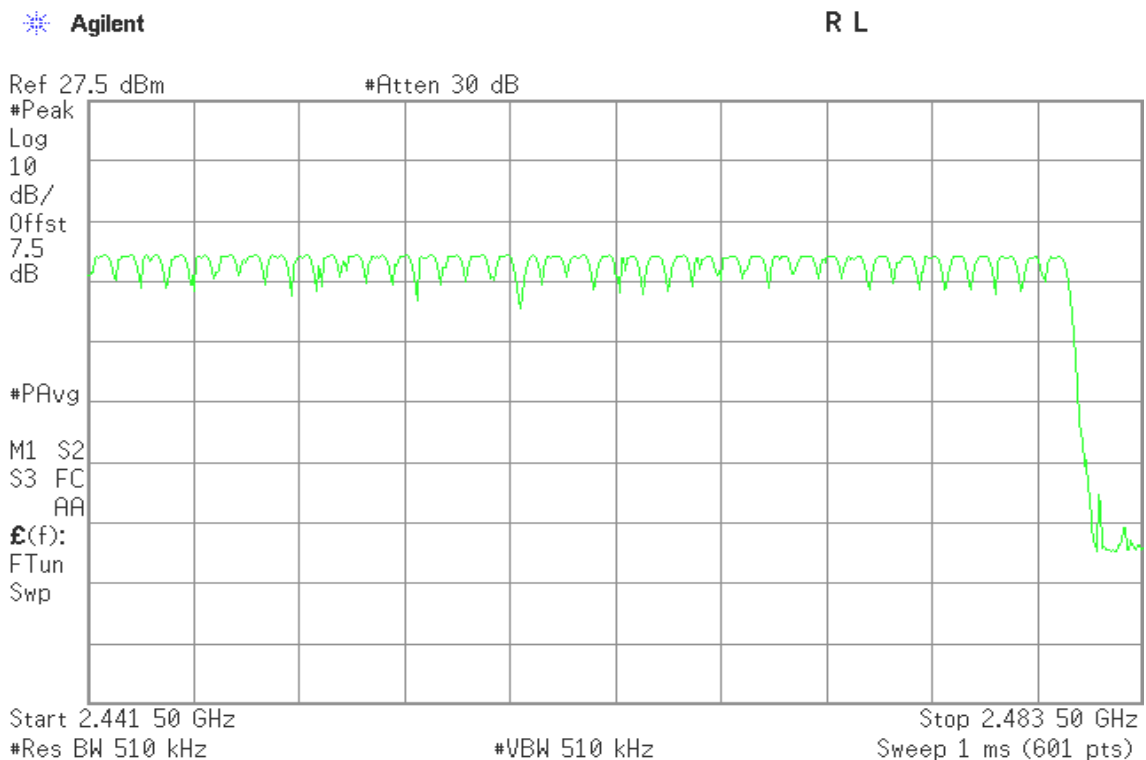
**GFSK**

**Channel Number**

**2.4 GHz – 2.4415 GHz**



**2.4415 GHz – 2.4835 GHz**





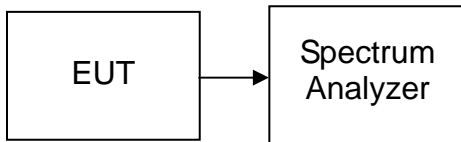


## **7.7. TIME OF OCCUPANCY (DWELL TIME)**

### **LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = 10ms.
5. Repeat above procedures until all frequency measured were complete.

### **TEST RESULTS**

*No non-compliance noted*

**TEST DATA****GFSK****DH 1**CH Low:  $0.4333 * (1600/2)/79 * 31.60 = 138.66$  (ms)CH Mid:  $0.4333 * (1600/2)/79 * 31.60 = 138.66$  (ms)CH High:  $0.4333 * (1600/2)/79 * 31.60 = 138.66$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4333	138.66	31.60	400	PASS
Mid	0.4333	138.66	31.60		PASS
High	0.4333	138.66	31.60		PASS

**DH 3**CH Low:  $1.683 * (1600/4)/79 * 31.60 = 269.28$  (ms)CH Mid:  $1.683 * (1600/4)/79 * 31.60 = 269.28$  (ms)CH High:  $1.683 * (1600/4)/79 * 31.60 = 269.28$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.683	269.28	31.60	400	PASS
Mid	1.683	269.28	31.60		PASS
High	1.683	269.28	31.60		PASS

**DH 5**CH Low:  $2.917 * (1600/6)/79 * 31.60 = 311.15$  (ms)CH Mid:  $2.917 * (1600/6)/79 * 31.60 = 311.15$  (ms)CH High:  $2.917 * (1600/6)/79 * 31.60 = 311.15$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.917	311.15	31.60	400	PASS
Mid	2.917	311.15	31.60		PASS
High	2.917	311.15	31.60		PASS

**For AFH****DH 1**CH Low:  $0.4333 * (800/2)/20 * 8.00 = 69.33$  (ms)CH Mid:  $0.4333 * (800/2)/20 * 8.00 = 69.33$  (ms)CH High:  $0.4333 * (800/2)/20 * 8.00 = 69.33$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4333	69.33	8.00	400	PASS
Mid	0.4333	69.33	8.00		PASS
High	0.4333	69.33	8.00		PASS

**DH 3**CH Low:  $1.683 * (800/4)/20 * 8 = 134.64$  (ms)CH Mid:  $1.683 * (800/4)/20 * 8 = 134.64$  (ms)CH High:  $1.683 * (800/4)/20 * 8 = 134.64$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.683	134.64	8.00	400	PASS
Mid	1.683	134.64	8.00		PASS
High	1.683	134.64	8.00		PASS

**DH 5**CH Low:  $2.917 * (800/6)/20 * 8 = 155.57$  (ms)CH Mid:  $2.917 * (800/6)/20 * 8 = 155.57$  (ms)CH High:  $2.917 * (800/6)/20 * 8 = 155.57$  (ms)

CH	Pulse Time(ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.917	155.57	8.00	400	PASS
Mid	2.917	155.57	8.00		PASS
High	2.917	155.57	8.00		PASS

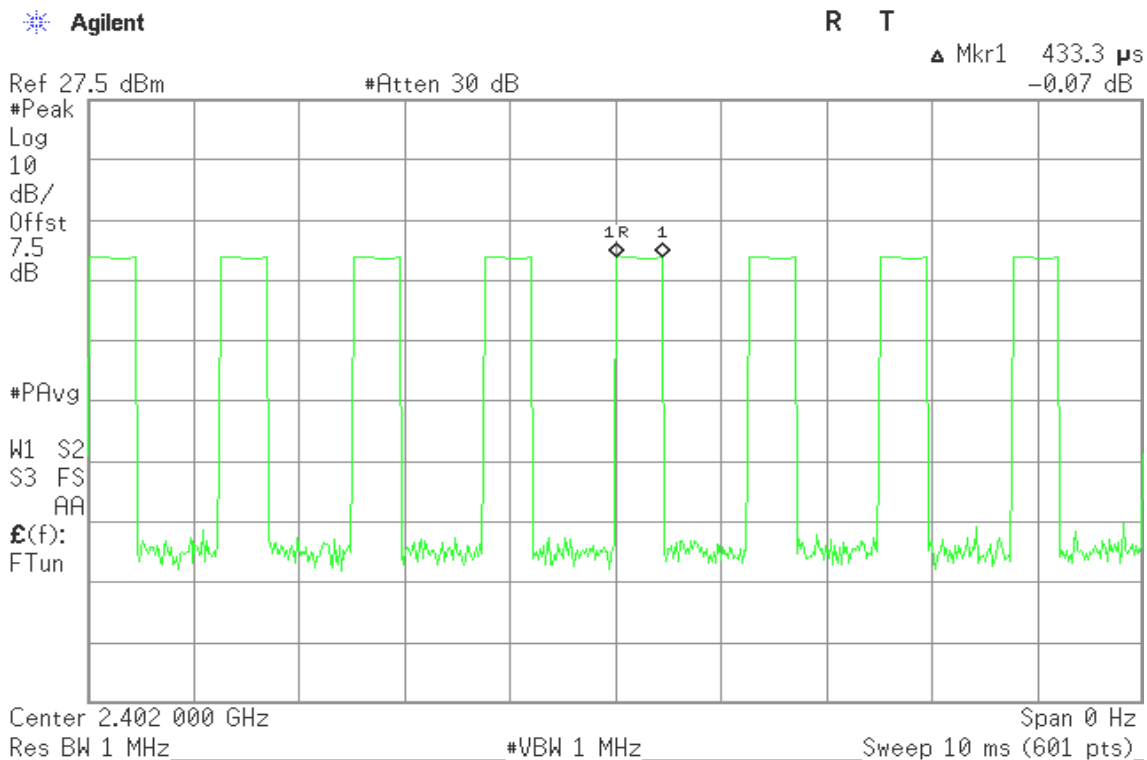


**Test Plot**

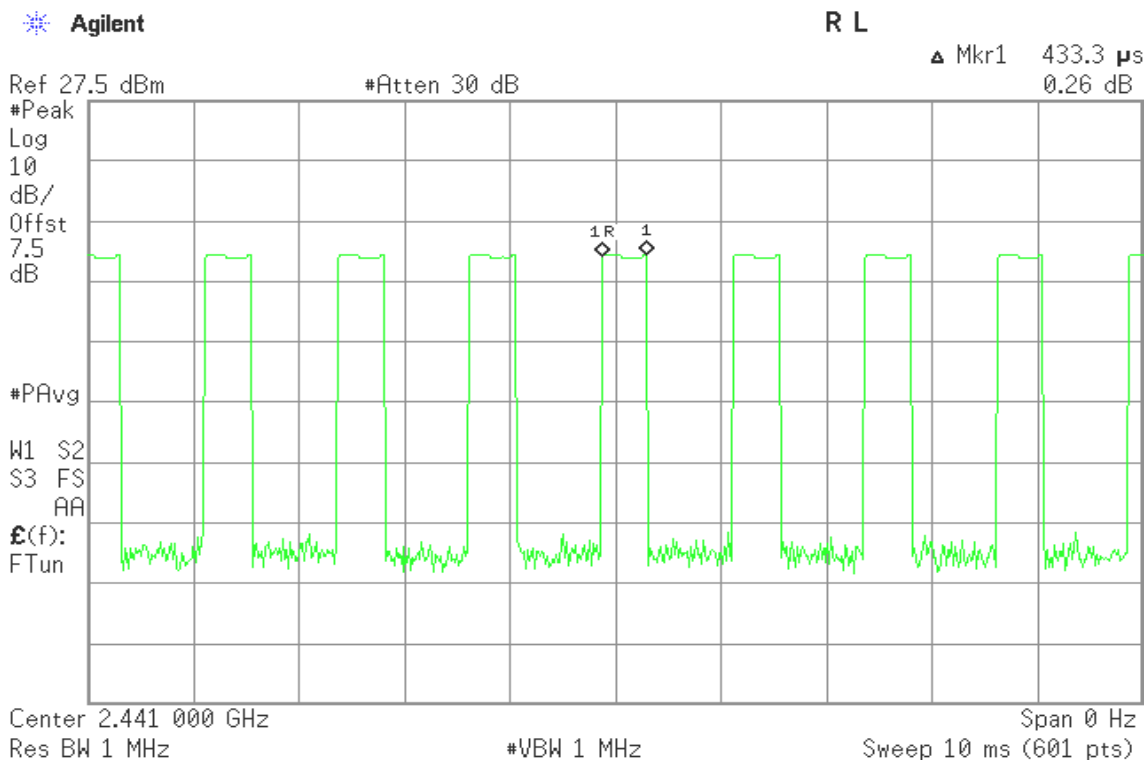
**GFSK**

**DH 1**

**CH Low**

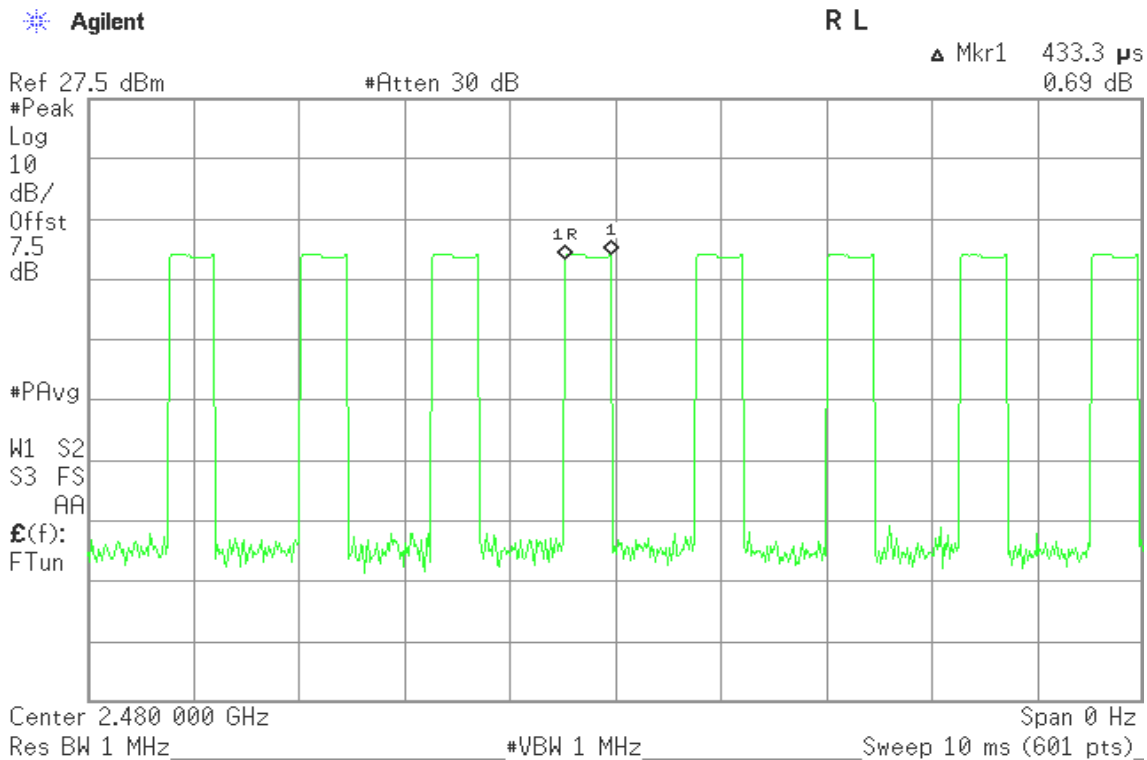


**CH Mid**



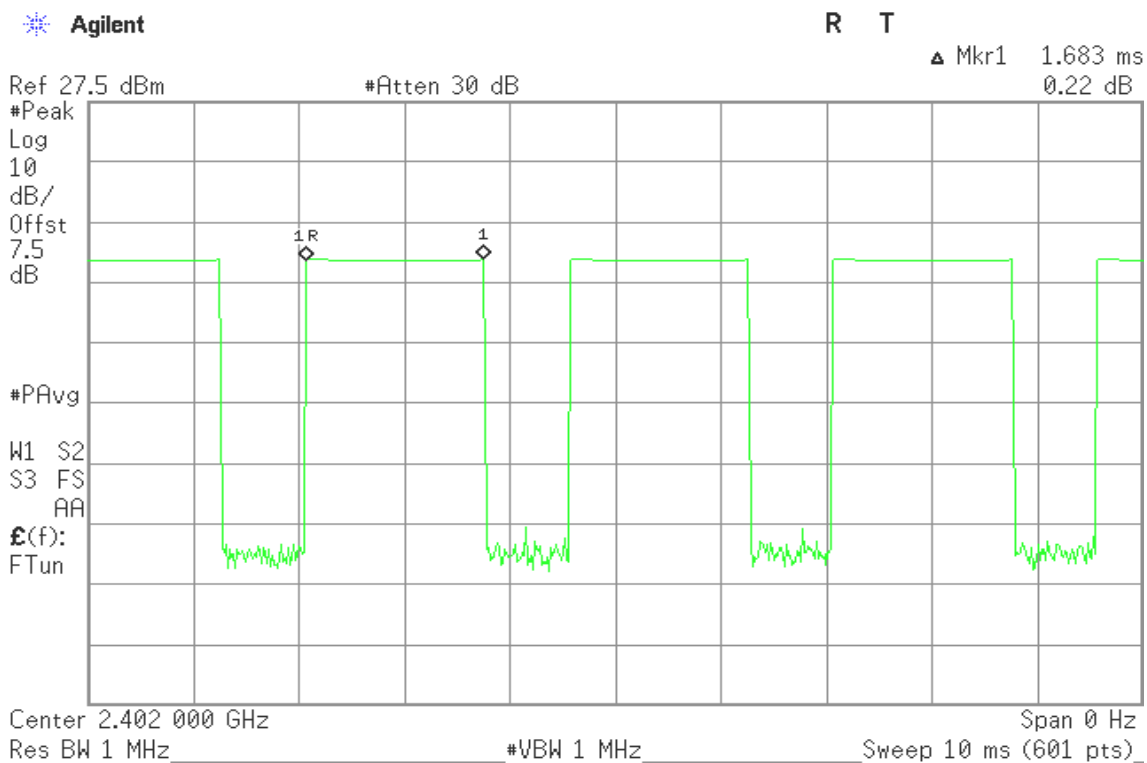


## CH High



## DH 3

### CH Low





## CH Mid

Agilent

R L

▲ Mkr1 1.683 ms  
0.10 dB

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

#PAvg

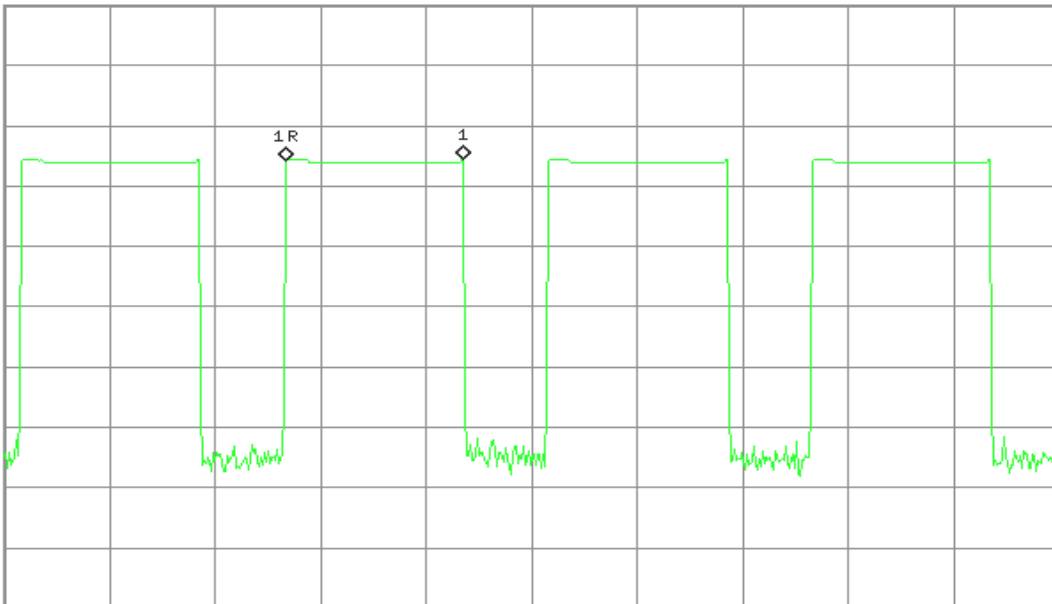
W1 S2

S3 FS

AA

£(f):

FTun



Center 2.441 000 GHz

Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)

## CH High

Agilent

R T

▲ Mkr1 1.683 ms  
0.23 dB

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

#PAvg

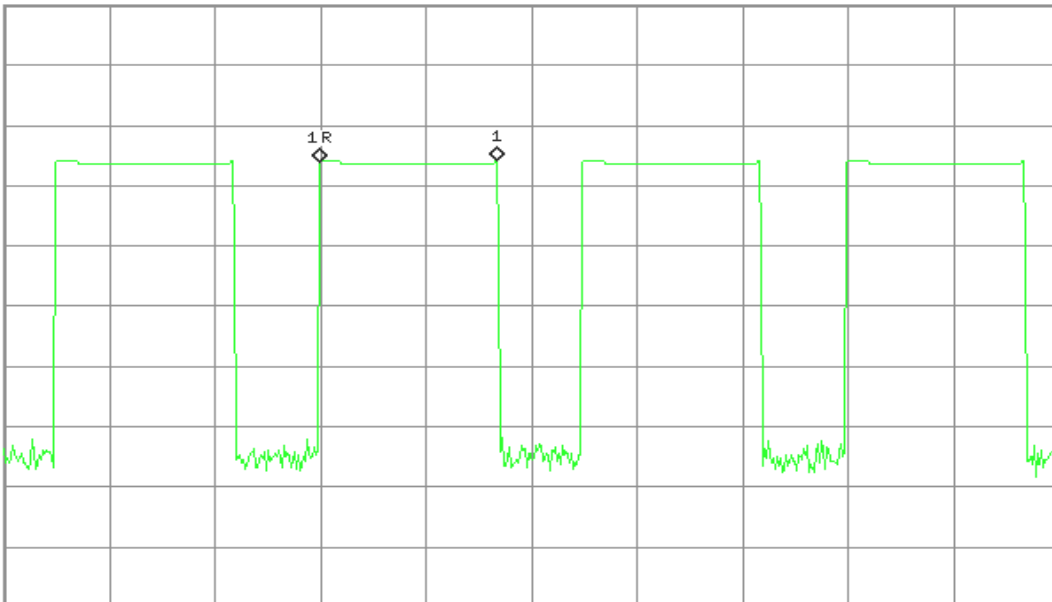
W1 S2

S3 FS

AA

£(f):

FTun



Center 2.480 000 GHz

Res BW 1 MHz

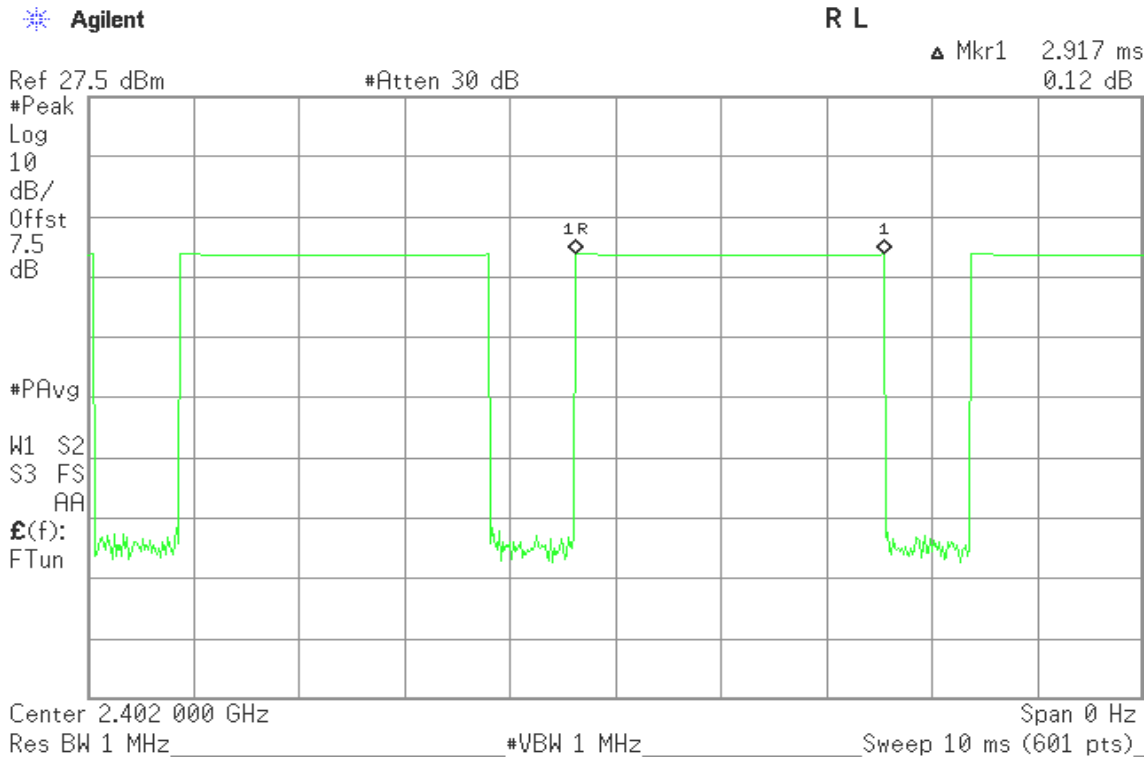
#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)

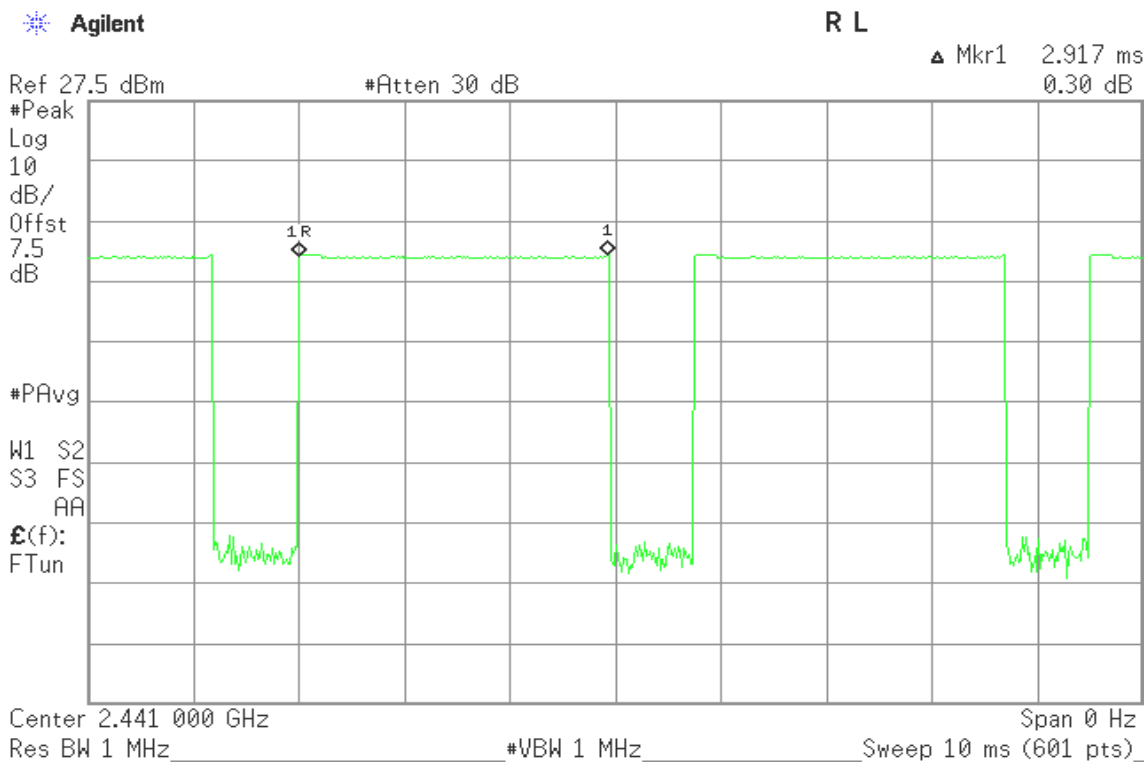


## DH 5

### CH Low



### CH Mid





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Report No.: T140320L08-RP1

FCC ID: CJ6UPSUM3KBBT

Date of Issue: April 8, 2014

## CH High

Agilent

R L

Mkr1 2.917 ms  
-0.05 dB

Ref 27.5 dBm

#Atten 30 dB

#Peak

Log

10

dB/

Offst

7.5

dB

#PAvg

W1 S2

S3 FS

AA

E(f):

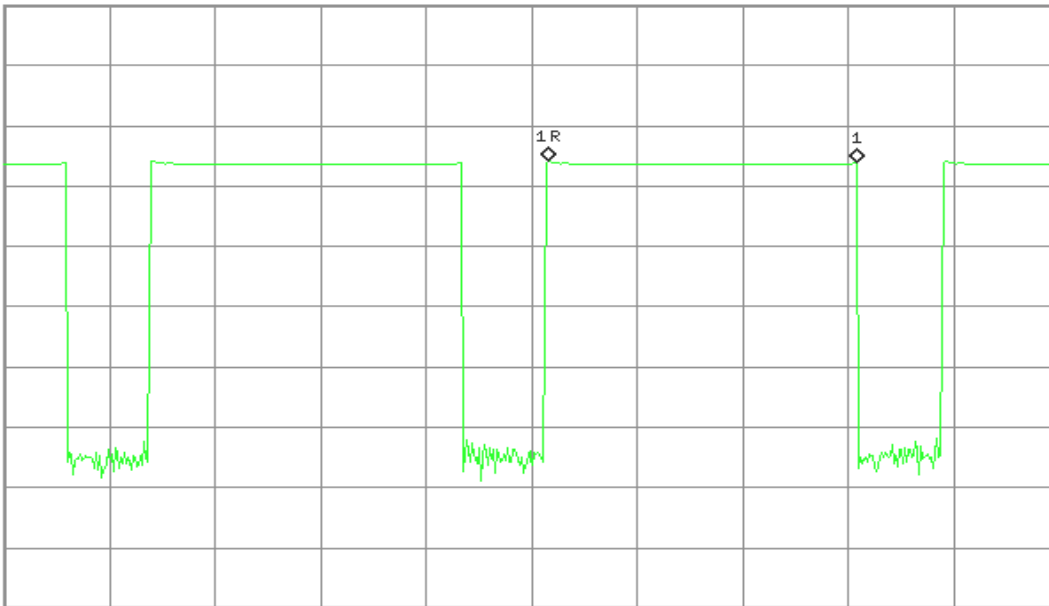
FTun

Center 2.480 000 GHz

Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)







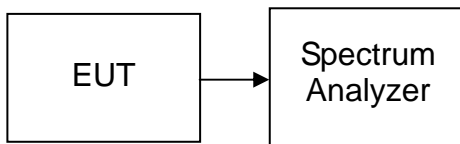
## **7.8. SPURIOUS EMISSIONS**

### **7.8.1 Conducted Measurement**

#### **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 or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

#### **TEST RESULTS**

*No non-compliance noted*

#### **TEST DATA**

Refer to attach spectrum analyzer data chart.



## Test Plot

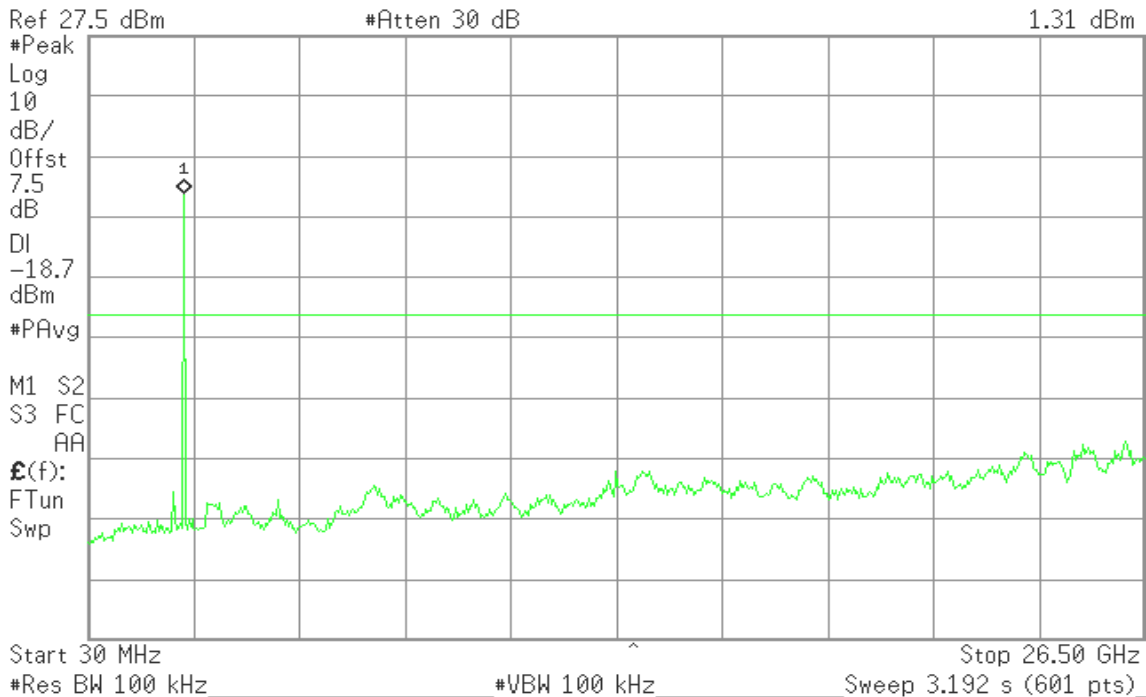
### GFSK

### CH Low

Agilent

R L

Mkr1 2.41 GHz  
1.31 dBm

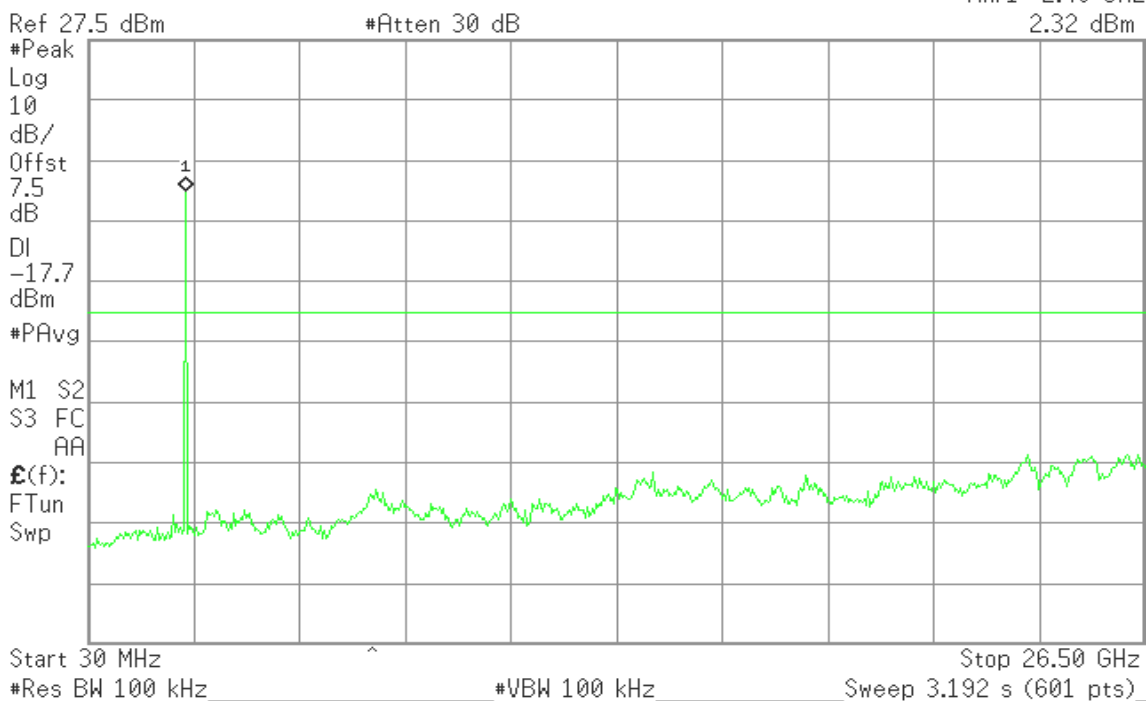


### CH Mid

Agilent

R L

Mkr1 2.46 GHz  
2.32 dBm



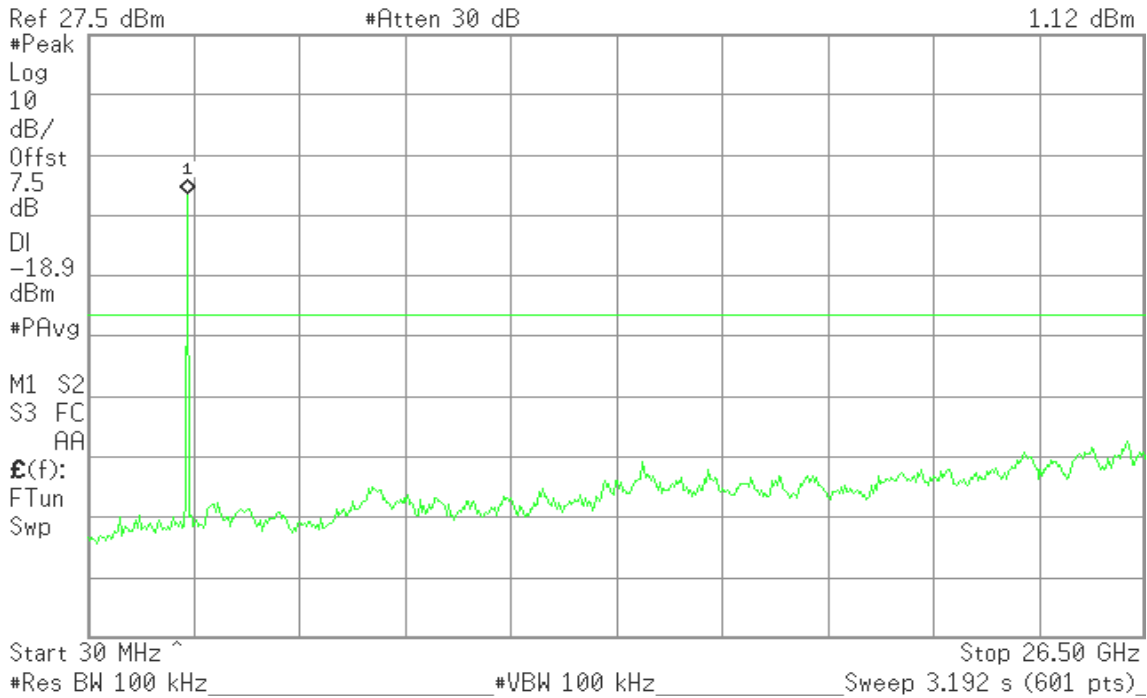


## CH High

Agilent

R L

Mkr1 2.50 GHz  
1.12 dBm





## 7.8.2 RADIATED EMISSIONS

### LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

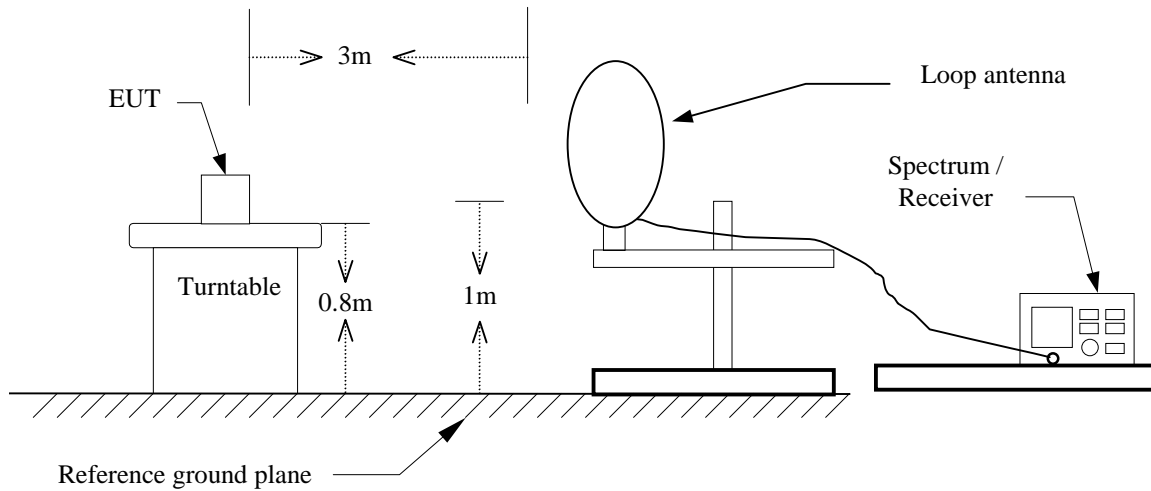
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

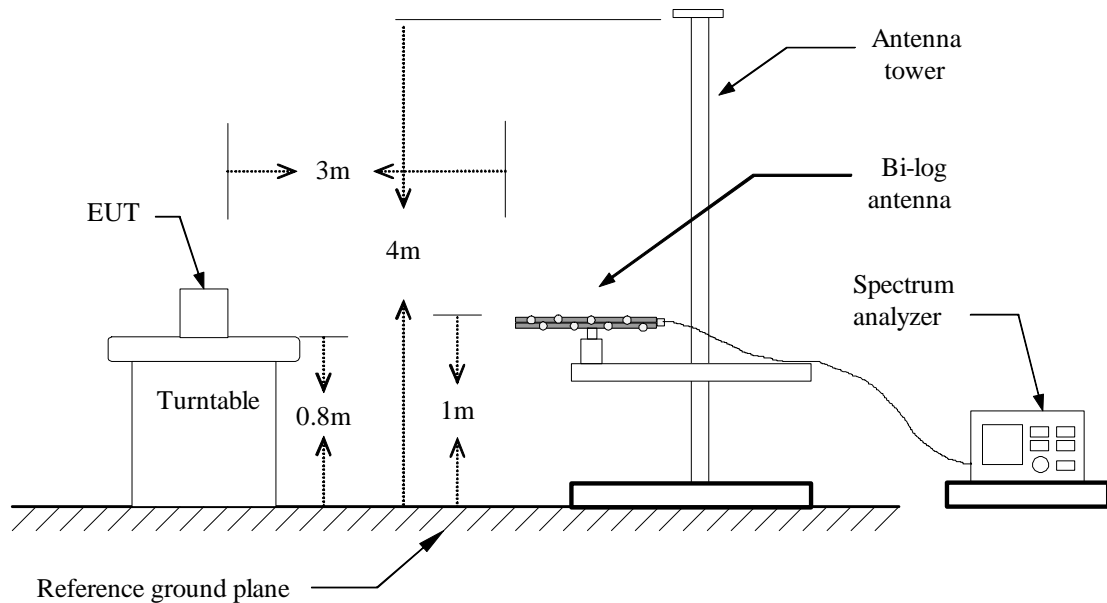


## **TEST CONFIGURATION**

**9kHz ~ 30MHz**

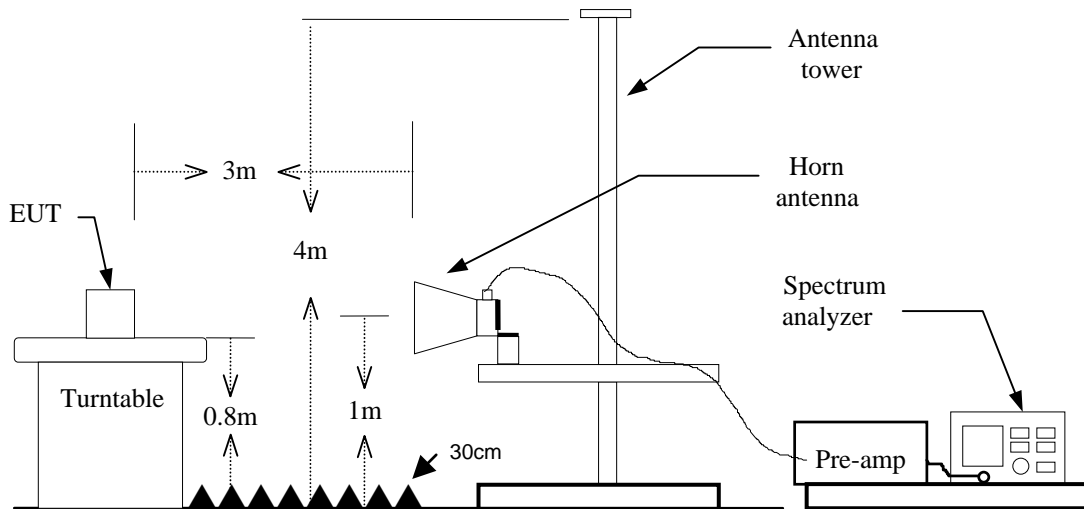


**30MHz ~ 1GHz**





**Above 1 GHz**



**TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

**Below 30MHz**

RBW=10kHz / VBW=30kHz / Sweep=AUTO

**30 ~ 1000MHz:**

RBW=100kHz / VBW=300KHz / Sweep=AUTO

**Above 1GHz:**

- a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
- b) AVERAGE: RBW=1MHz / VBW=300Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

In case the emission is lower than 30MHz. loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case

**TEST RESULTS*****Below 1 GHz (9kHz ~ 30MHz)***

*No emission found between lowest internal used/generated frequency to 30MHz*

***Below 1 GHz (30 ~ 1000MHz)***

*No non-compliance noted*

**TEST DATA****Below 1 GHz**

**Operation Mode:** Transmitting      **Test Date:** 2014/4/2  
**Temperature:** 26°C      **Tested by:** Louis Shen  
**Humidity:** 56 % RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol. (H/V)	Remark
93.0499	59.23	-17.74	41.49	43.50	-2.01	V	QP
445.1600	54.59	-9.93	44.66	46.00	-1.34	V	QP
461.6499	55.31	-9.76	45.55	46.00	-0.45	V	QP
593.5700	48.21	-8.05	40.16	46.00	-5.84	V	QP
741.9800	49.37	-6.30	43.07	46.00	-2.93	V	QP
890.3899	48.62	-4.05	44.57	46.00	-1.43	V	QP
922.3999	44.39	-3.72	40.67	46.00	-5.33	V	QP
95.8850	48.10	-17.23	30.87	43.50	-12.63	H	QP
445.1600	53.30	-9.93	43.37	46.00	-2.63	H	QP
593.5700	48.70	-8.05	40.65	46.00	-5.35	H	QP
741.9800	48.00	-6.30	41.70	46.00	-4.30	H	QP
766.2300	47.10	-5.98	41.12	46.00	-4.88	H	QP
890.3900	44.92	-4.05	40.87	46.00	-5.13	H	QP
922.4000	43.10	-3.72	39.38	46.00	-6.62	H	QP

**Remark:**

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 30 MHz to the 1GHz.
3. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Above 1 GHz****GFSK****Operation Mode:** Transmitting**Test Date:** 2014/4/2**Temperature:** 26°C**Tested by:** Louis Shen**Humidity:** 56% RH**Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1220.000	54.25	-8.47	45.78	74.00	-28.22	V	peak
1976.000	52.17	-1.68	50.49	74.00	-23.51	V	peak
2826.000	48.86	-1.73	47.13	74.00	-26.87	V	peak
3610.000	41.27	2.88	44.15	74.00	-29.85	V	peak
4805.000	41.67	2.23	43.90	74.00	-30.10	V	peak
7625.000	39.20	11.62	50.82	74.00	-23.18	V	peak
1458.000	51.79	-8.12	43.67	74.00	-30.33	H	peak
2198.000	50.64	-3.56	47.08	74.00	-26.92	H	peak
2888.000	49.12	-1.82	47.30	74.00	-26.70	H	peak
3625.000	41.67	4.06	45.73	74.00	-28.27	H	peak
4805.000	46.45	5.54	51.99	74.00	-22.01	H	peak
7350.000	38.84	11.57	50.41	74.00	-23.59	H	peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6.  $\text{Margin (dB)} = \text{Remark result (dBuV/m)} - \text{Average limit (dBuV/m)}$ .



**Compliance Certification Services Inc.**

Report No.: T140320L08-RP1

FCC ID: CJ6UPSUM3KBBT

Date of Issue: April 8, 2014

**Operation Mode:** TX / CH Mid**Test Date:** 2014/4/2**Temperature:** 26°C**Tested by:** Louis Shen**Humidity:** 56% RH**Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1596.000	52.08	-4.81	47.27	74.00	-26.73	V	peak
2002.000	49.30	-1.35	47.95	74.00	-26.05	V	peak
2874.000	48.91	-1.03	47.88	74.00	-26.12	V	peak
3645.000	41.10	2.72	43.82	74.00	-30.18	V	peak
4880.000	41.42	3.92	45.34	74.00	-28.66	V	peak
7585.000	38.66	11.85	50.51	74.00	-23.49	V	peak
1422.000	51.16	-7.36	43.80	74.00	-30.20	H	peak
2100.000	49.94	-3.78	46.16	74.00	-27.84	H	peak
2882.000	49.18	-1.86	47.32	74.00	-26.68	H	peak
3810.000	40.82	3.47	44.29	74.00	-29.71	H	peak
4880.000	41.18	3.92	45.10	74.00	-28.90	H	peak
7640.000	38.73	11.45	50.18	74.00	-23.82	H	peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / CH High**Test Date:** 2014/4/2**Temperature:** 26°C**Tested by:** Louis Shen**Humidity:** 56% RH**Polarity:** Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1596.000	51.61	-4.81	46.80	74.00	-27.20	V	peak
2132.000	51.41	-2.85	48.56	74.00	-25.44	V	peak
2932.000	48.52	-0.86	47.66	74.00	-26.34	V	peak
3735.000	40.70	2.90	43.60	74.00	-30.40	V	peak
6485.000	40.47	6.93	47.40	74.00	-26.60	V	peak
7550.000	38.33	11.72	50.05	74.00	-23.95	V	peak
1410.000	51.18	-7.11	44.07	74.00	-29.93	H	peak
2140.000	49.74	-3.69	46.05	74.00	-27.95	H	peak
2934.000	48.36	-1.37	46.99	74.00	-27.01	H	peak
4300.000	39.26	7.66	46.92	74.00	-27.08	H	peak
5510.000	38.55	8.89	47.44	74.00	-26.56	H	peak
7410.000	38.43	11.27	49.70	74.00	-24.30	H	peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



## 7.9. POWERLINE CONDUCTED EMISSIONS

### **LIMIT**

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### **TEST CONFIGURATION**

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### **TEST PROCEDURE**

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### **TEST RESULTS**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

**TEST DATA****Operation Mode:** Normal Link**Test Date:** 2014/4/2**Temperature:** 25°C**Tested by:** Louis Shen**Humidity:** 57% RH**Test**

Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.1571	44.89	23.79	9.87	54.76	33.66	65.62	55.62	-10.86	-21.96	L1
0.2222	40.15	27.76	9.87	50.02	37.63	62.74	52.74	-12.72	-15.11	L1
0.2777	35.84	21.03	9.88	45.72	30.91	60.88	50.88	-15.16	-19.97	L1
0.3194	31.33	10.54	9.89	41.22	20.43	59.72	49.72	-18.50	-29.29	L1
0.3959	28.08	14.01	9.87	37.95	23.88	57.94	47.94	-19.99	-24.06	L1
7.5967	27.04	20.82	10.16	37.20	30.98	60.00	50.00	-22.80	-19.02	L1
0.1609	45.59	27.30	9.79	55.38	37.09	65.42	55.42	-10.04	-18.33	L2
0.2193	37.81	25.46	9.80	47.61	35.26	62.85	52.85	-15.24	-17.59	L2
0.2692	33.03	15.05	9.81	42.84	24.86	61.14	51.14	-18.30	-26.28	L2
3.3248	18.96	11.03	10.05	29.01	21.08	56.00	46.00	-26.99	-24.92	L2
5.1534	24.62	14.75	10.12	34.74	24.87	60.00	50.00	-25.26	-25.13	L2
7.7404	30.38	24.33	10.20	40.58	34.53	60.00	50.00	-19.42	-15.47	L2

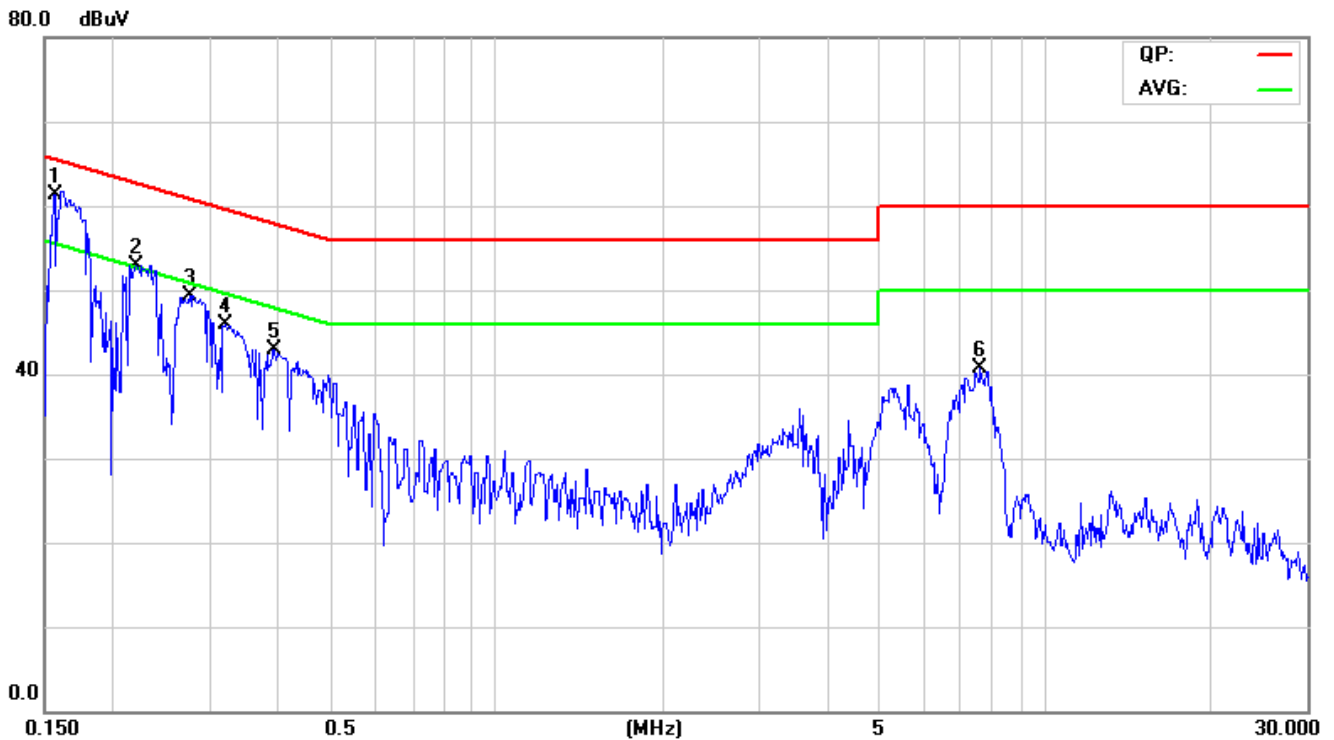
**Remark:**

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. "---" denotes the emission level was or more than 2dB below the Average limit
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



**Test Plots**

**Conducted emissions (Line 1)**



**Conducted emissions (Line 2)**

