



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**Car Kit**

**Model: TZ700**

**Trade Name: Motorola**

*Issued to*

**Motorola Mobility Inc.  
Motorola Mobility, Inc. 8000 W. Sunrise Blvd., Plantation, Florida, U.S.A.**

*Issued by*

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# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

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## Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	Sep. 19, 2011	Initial Issue	ALL	Jill Shiau
01	Oct 4, 2011	Added test item Hopping ONTest	Page 48, 49	Jill Shiau



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# 1 TEST RESULT CERTIFICATION

**Applicant:** Motorola Mobility Inc.  
 Motorola Mobility, Inc. 8000 W. Sunrise Blvd.,  
 Plantation, Florida, U.S.A.

**Equipment Under Test:** Car Kit

**Trade Name:** Motorola

**Model:** TZ700

**Date of Test:** August 18, 2010 ~ October 4, 2011

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: 2003 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

---

Jill Shiao  
 Section Manager



## 2 EUT DESCRIPTION

Product	Car Kit		
Trade Name	Motorola		
Model Number	TZ700		
Model Name Discrepancy	N/A		
EUT Power Rating	5VDC		
Car Charger	Motorola	Model	N/A
Car Charger Power Rating	I/P: 10.8-33Vcc O/P: 4.75-5.25Vcc		
Bluetooth Module	CSR	Model	BC05-MM
Operating Frequency Range	2402 ~ 2480 MHz		
Transmit Power	2.95dBm (1.97mW)		
Modulation Technique	GFSK for 1Mbps; $\pi/4$ -DQPSK for 2Mbps; 8DPSK for 3Mbps		
Number of Channels	79 Channels		
Antenna Specification	1.96dBi		
Antenna Designation	PCB Antenna		

**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: **IHDP6LO2** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.
3. The EUT is part of a system that operates with, another device (FM transmitter), please T100817301-RP2 Report.



### **3 TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 (2003) 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 (2003) 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 (2003).



**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: TZ700) 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 channels were selected for the for radiated emission testing only as listed below:

<b>Tested Channel</b>	<b>Modulation Type</b>	<b>Packet Type</b>	<b>Date Rate</b>
Low, Mid, High	GFSK	DH 5	1
Low, Mid, High	8DPSK	DH 5	3

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, 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 stand-up position (Y 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

*Remark: Each piece of equipment is scheduled for calibration once a year.*

Conducted Emission Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	11/05/2010
Spectrum Analyzer	R&S	FSEB	825829/011	11/02/2010
USB Power Sensor	BOONTON	52012	2061194	06/22/2011
Power Meter	Agilnet	E4416A	GB41291611	04/03/2011

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	11/05/2010
Spectrum Analyzer	R&S	FSEB	825829/011	11/02/2010
Pre-Amplifier	HP	8447D	2944A06530	01/02/2011
Pre-Amplifier	HP	8449B	3008A01738	04/17/2011
EMI Test Receiver	SCHAFFNER	SCR 3501	436	01/26/2011
Loop Antenna	EMCO	6502	2356	06/11/2013
Bilog Antenna	SCHWAZBECK	VULB9160	3084	09/11/2010
Horn Antenna	EMCO	3115	00022250	05/09/2011
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
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/13/2012
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/19/2011
Horn Antenna	EMCO	3116	00026370	10/18/2011
Test S/W	LabVIEW 6.1 (Wugu Chamber EMI Teat V1_4.5.3)			



## 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
RF frequency	$\pm 1 \cdot 10^{-5}$
Total RF power conducted	$\pm 1,5$ dB
RF power density, conducted	$\pm 3$ dB
Spurious emissions, conducted	$\pm 3$ dB
All emissions, radiated	$\pm 6$ dB
Humidity	$\pm 5$ %
Temperature	$\pm 1^{\circ}\text{C}$
DC and low frequency voltages	$\pm 3\%$



## **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
  
- 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 (2003) 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	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	
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-321/1646
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	
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	

**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**

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	DC Power Source	GW	GPS-3303	0011606	FCC DoC	N/A	Unshielded, 1.8m

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



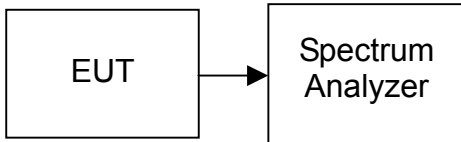
## **7 FCC PART 15.247 REQUIREMENTS**

### **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=30kHz, VBW = 100kHz, 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**

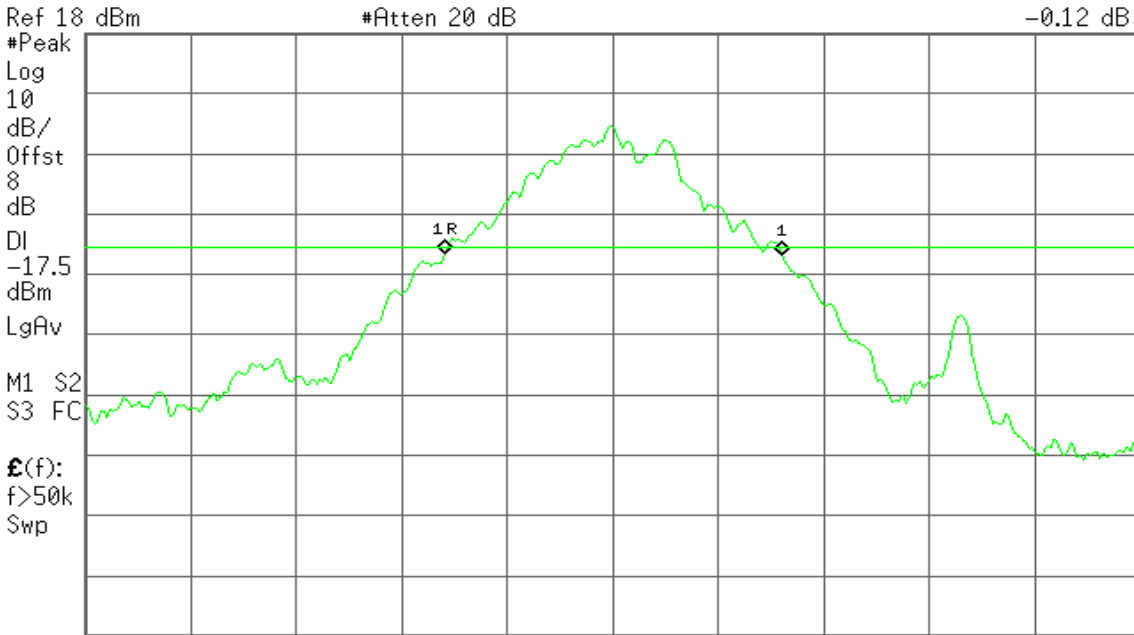
**GFSK Mode**

**20dB Bandwidth (CH Low)**

Agilent 13:28:32 Aug 19, 2010

R T

Mkr1 955 kHz  
-0.12 dB



Center 2.402 000 GHz

Span 3 MHz

#Res BW 30 kHz

#VBW 100 kHz

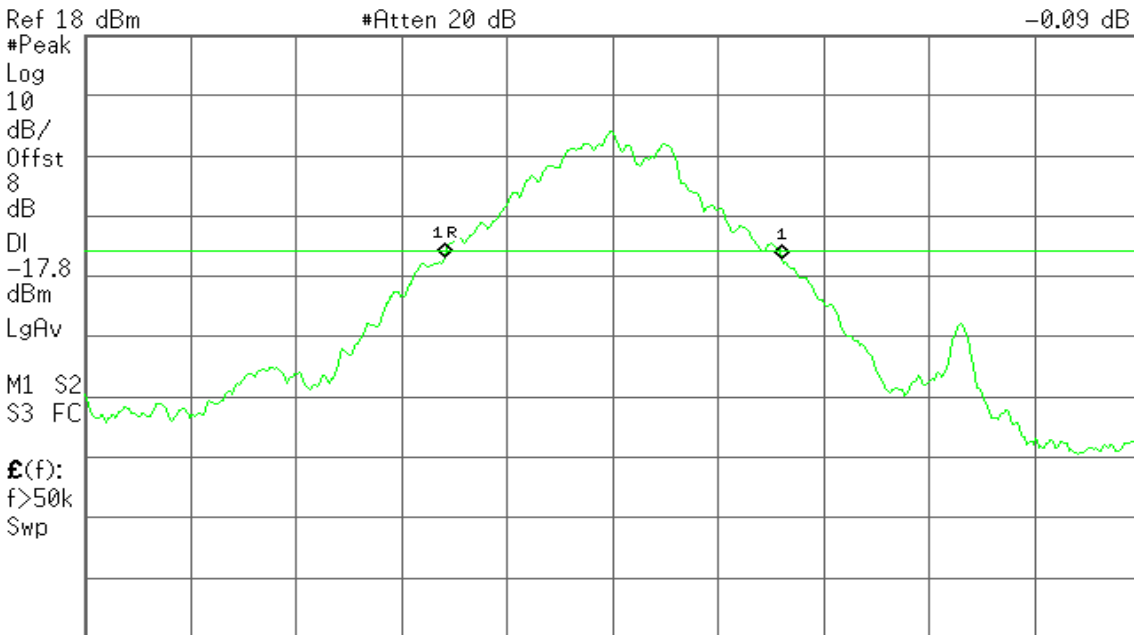
Sweep 3.2 ms (601 pts)

**20dB Bandwidth (CH Mid)**

Agilent 13:26:18 Aug 19, 2010

R L

Mkr1 955 kHz  
-0.09 dB



Start 2.439 500 GHz

Stop 2.442 500 GHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 3.2 ms (601 pts)

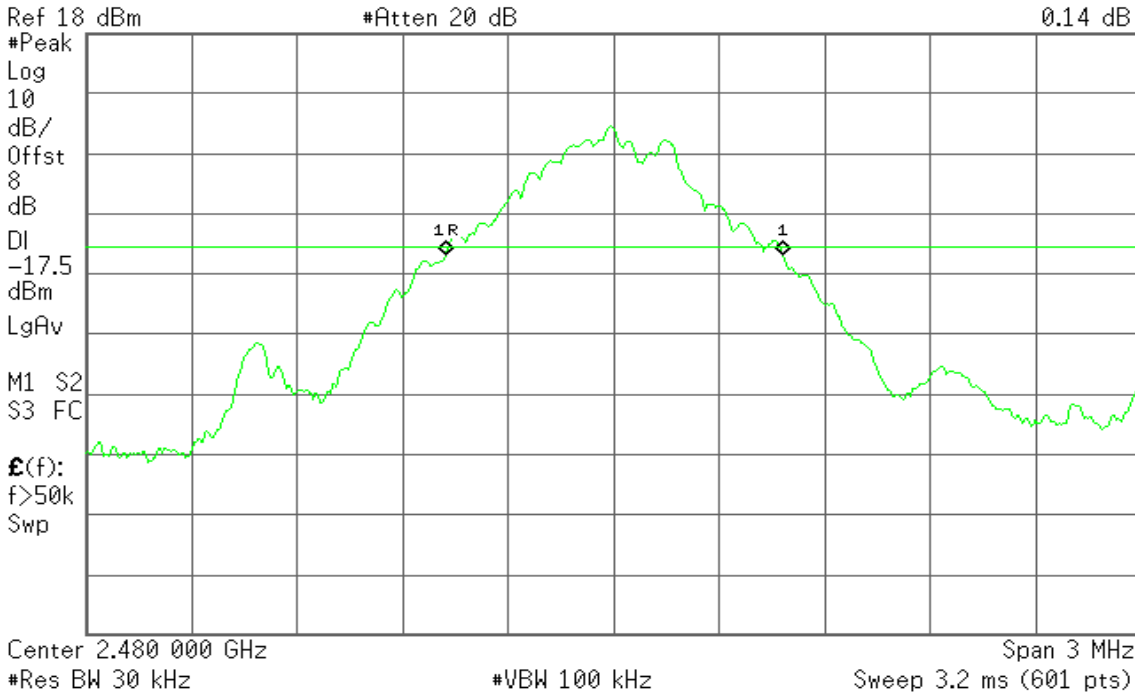


### 20dB Bandwidth (CH High)

Agilent 13:25:06 Aug 19, 2010

R T

Mkr1 955 kHz  
0.14 dB



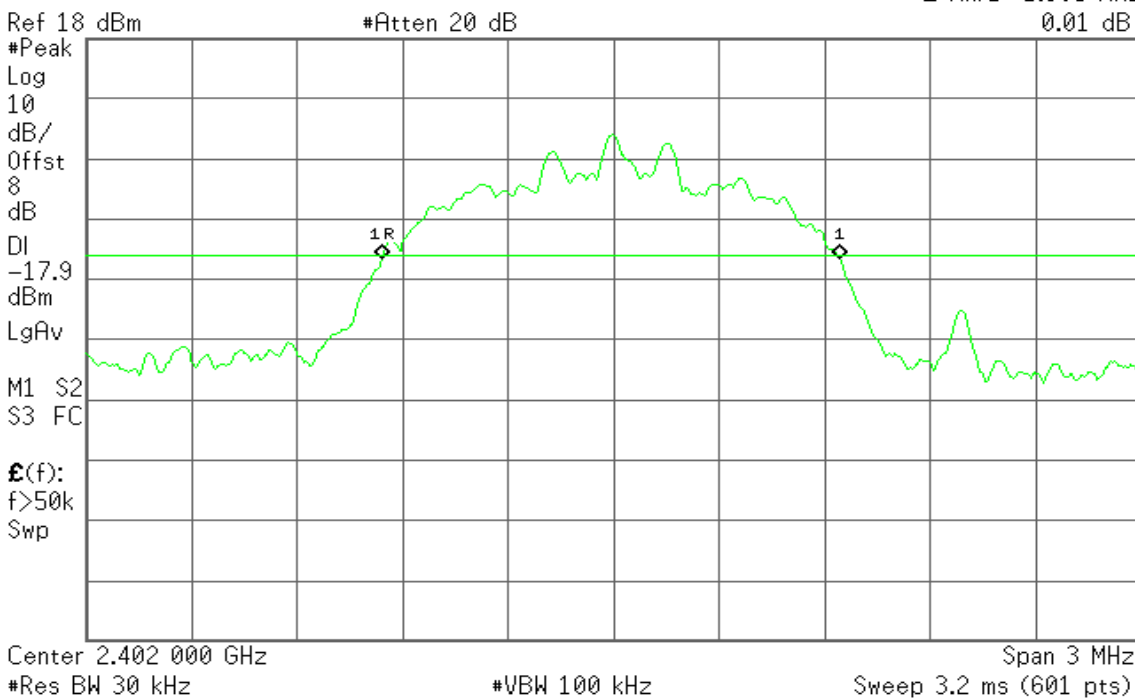
### 8DPSK Mode

### 20dB Bandwidth (CH Low)

Agilent 13:13:24 Aug 19, 2010

R L

Mkr1 1.305 MHz  
0.01 dB



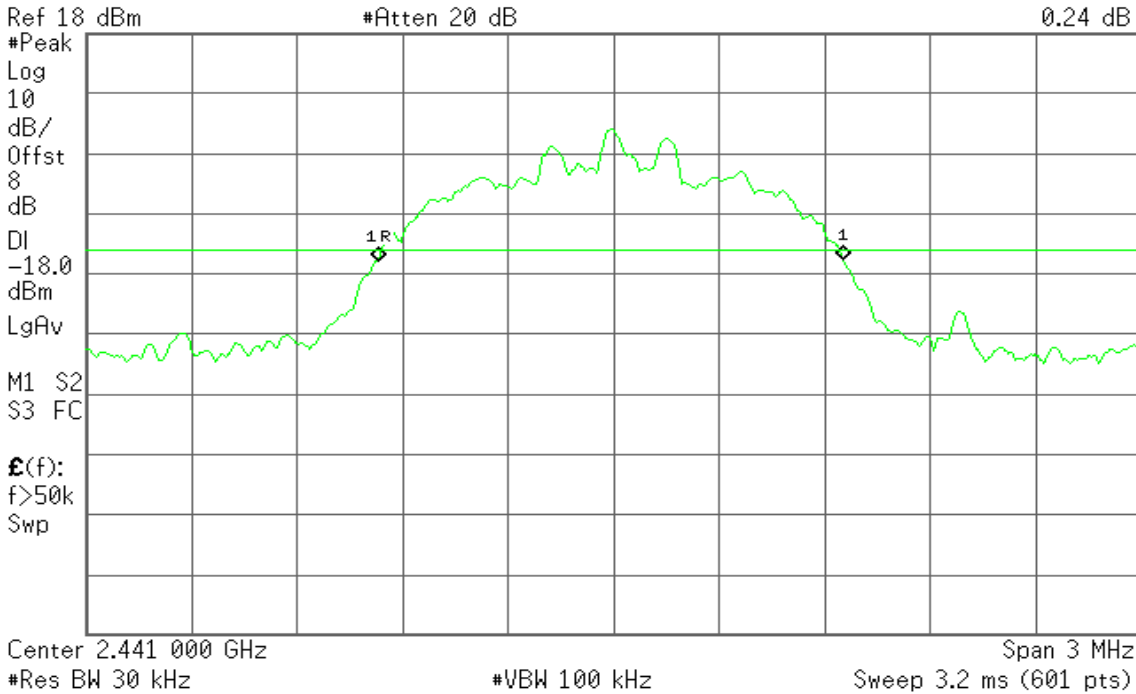


## 20dB Bandwidth (CH Mid)

Agilent 13:17:43 Aug 19, 2010

R T

Mkr1 1.325 MHz  
0.24 dB

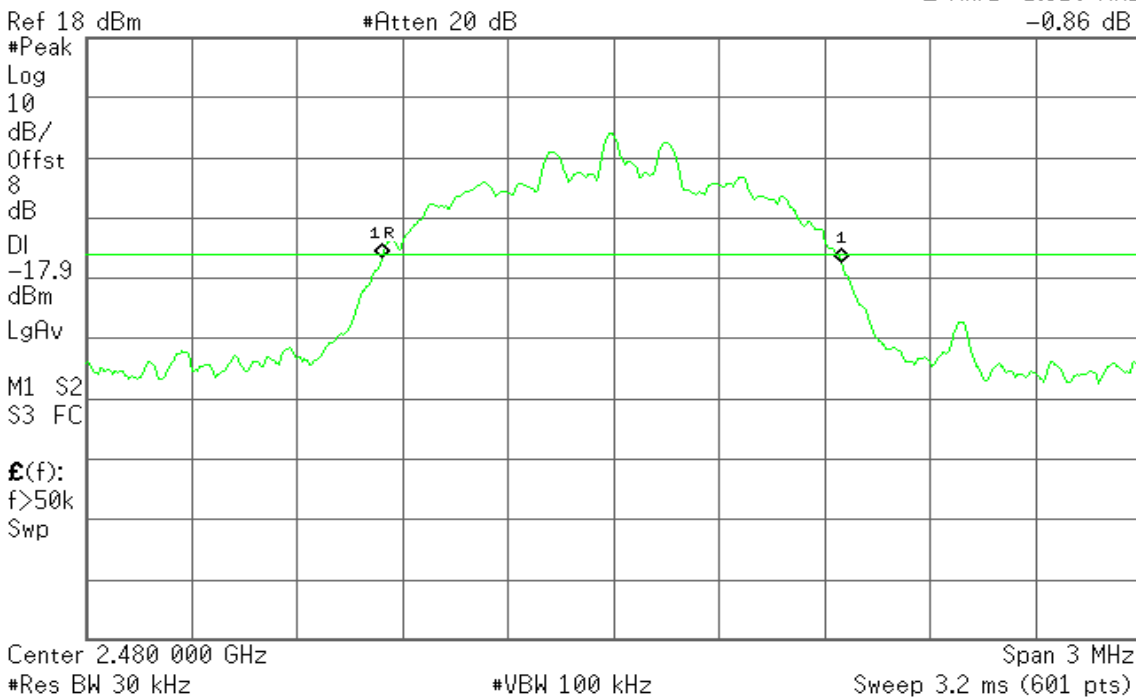


## 20dB Bandwidth (CH High)

Agilent 13:19:31 Aug 19, 2010

R L

Mkr1 1.310 MHz  
-0.86 dB





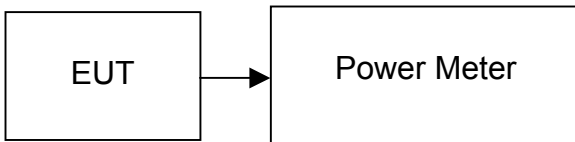
## **7.2. PEAK POWER**

### **LIMIT**

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

1. According to §15.247(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.
2. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
3. 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	2.91	0.00195	0.125	PASS
Mid	2441	2.66	0.00185		PASS
High	2480	2.95	0.00197		PASS

**8DPSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2402	2.72	0.00187	0.125	PASS
Mid	2441	2.89	0.00195		PASS
High	2480	2.86	0.00193		PASS

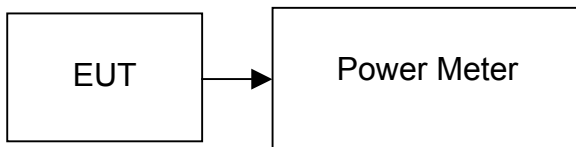


### 7.3. AVERAGE POWER

#### 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 average power detection.

#### TEST RESULTS

*No non-compliance noted*

#### TEST DATA

##### GFSK

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	1.36	0.00137
Mid	2441	1.07	0.00128
High	2480	1.40	0.00138

##### 8DPSK

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	-0.11	0.00097
Mid	2441	0.07	0.00102
High	2480	-0.10	0.00098

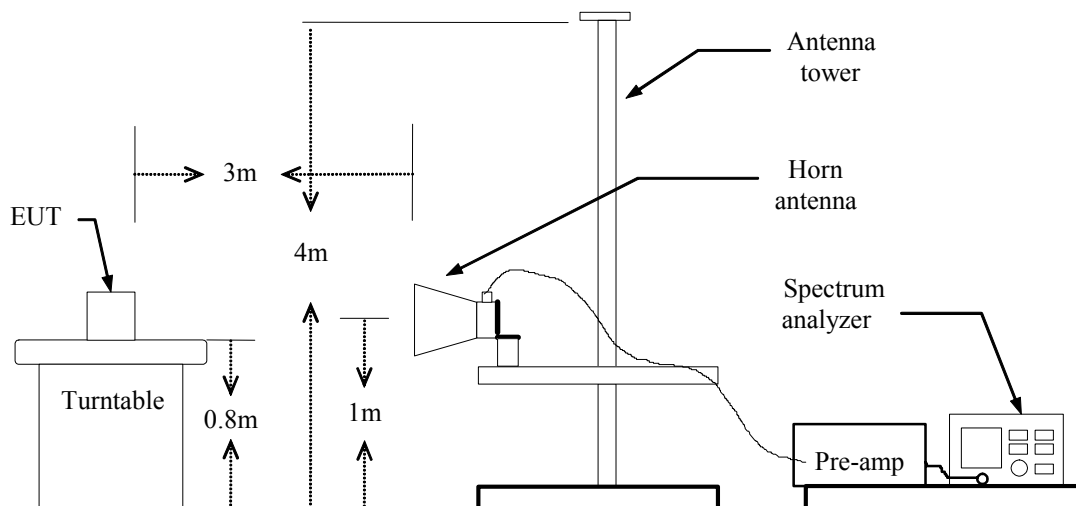


## 7.4. BAND EDGES MEASUREMENT

### 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 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



### TEST PROCEDURE

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=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### TEST RESULTS

*No non-compliance noted*

### TEST DATA

Refer to attach spectrum analyzer data chart.



## Band Edges (Bluetooth GFSK / CH Low)

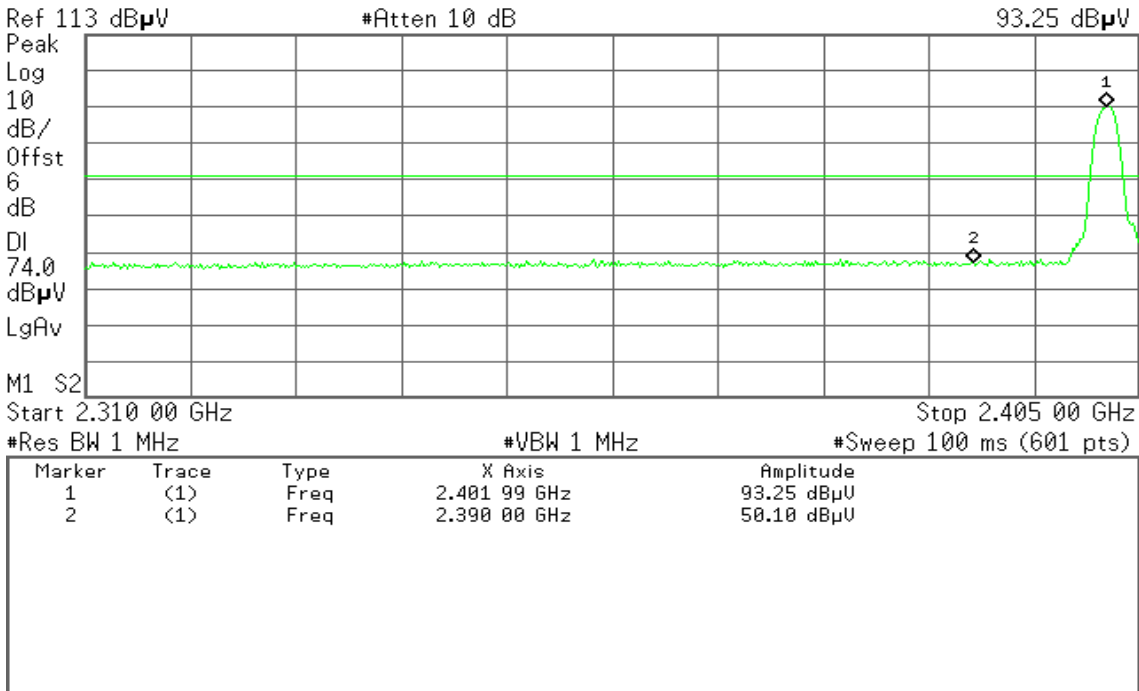
Detector mode: Peak

Polarity: Vertical

Agilent 14:49:57 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
93.25 dB $\mu$ V



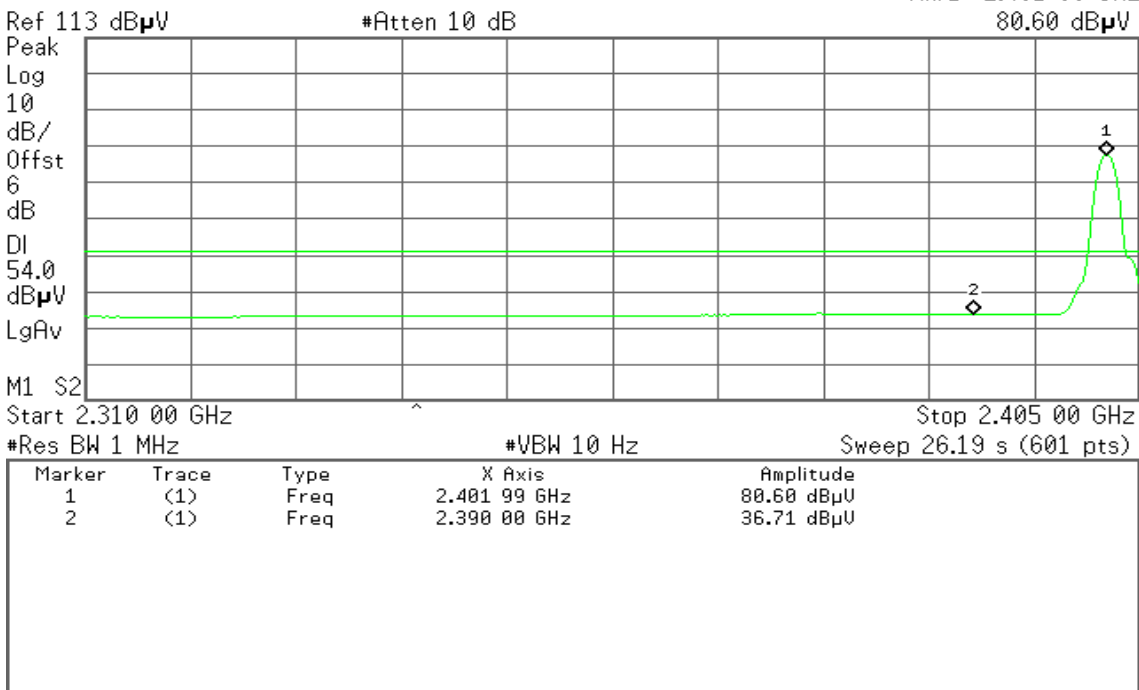
Detector mode: Average

Polarity: Vertical

Agilent 14:50:43 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
80.60 dB $\mu$ V





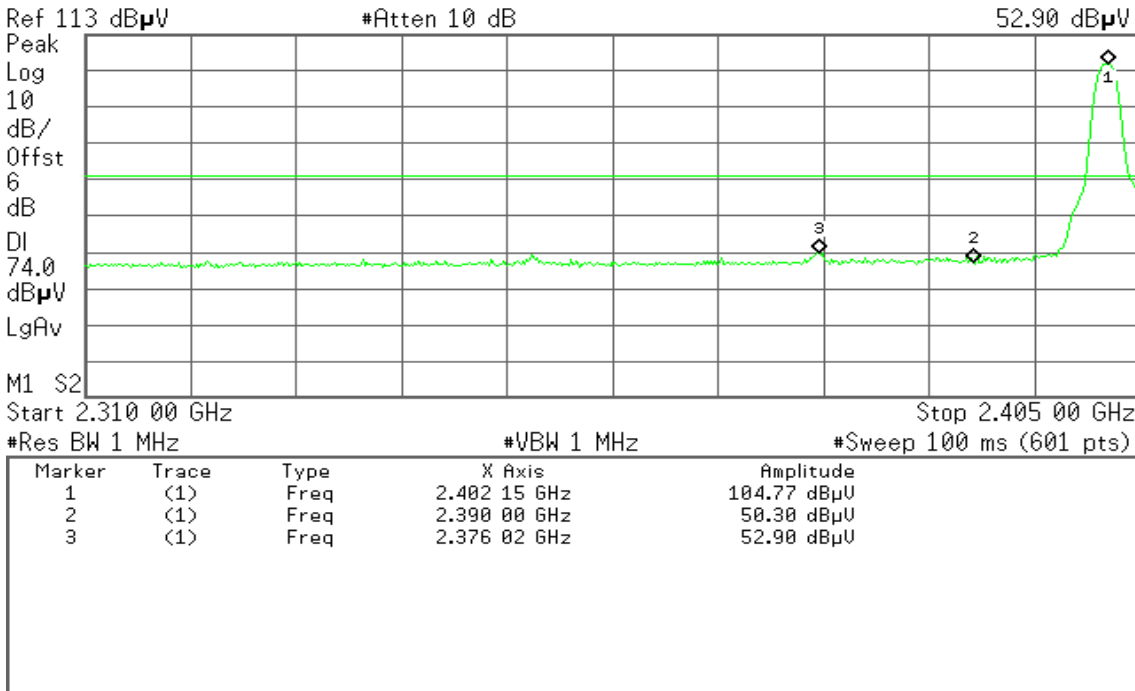
**Detector mode: Peak**

**Polarity: Horizontal**

\* Agilent 14:44:57 Aug 18, 2010

R T

Mkr3 2.376 02 GHz  
52.90 dBµV



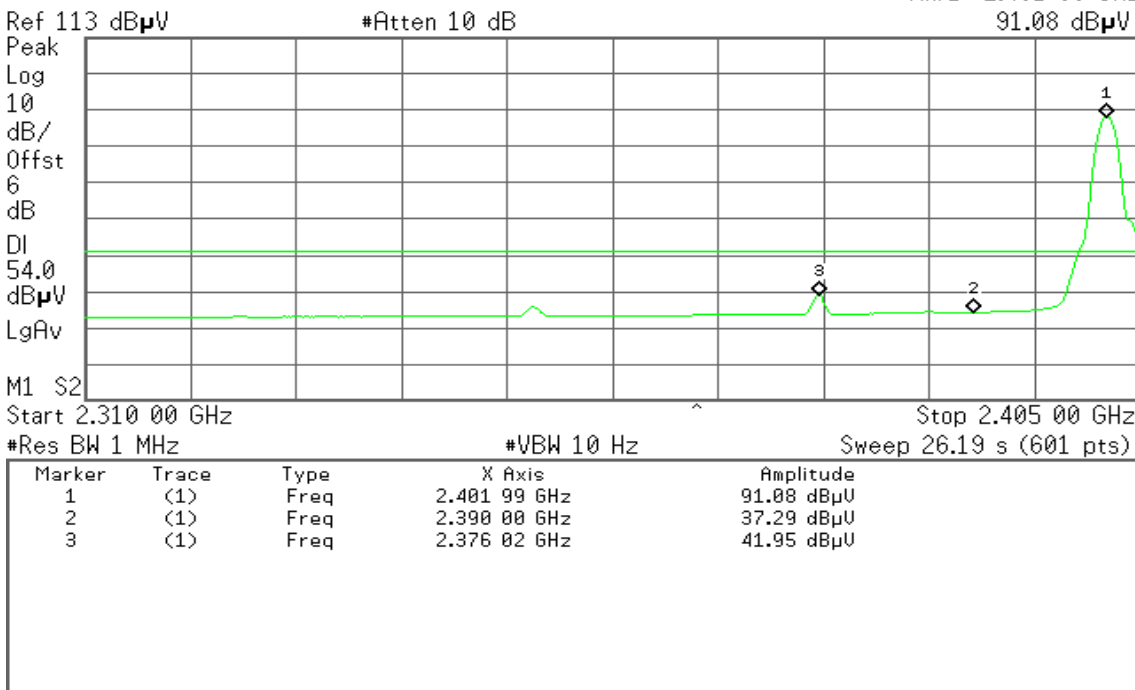
**Detector mode: Average**

**Polarity: Horizontal**

\* Agilent 14:45:54 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
91.08 dBµV





## Band Edges (Bluetooth GFSK / CH High)

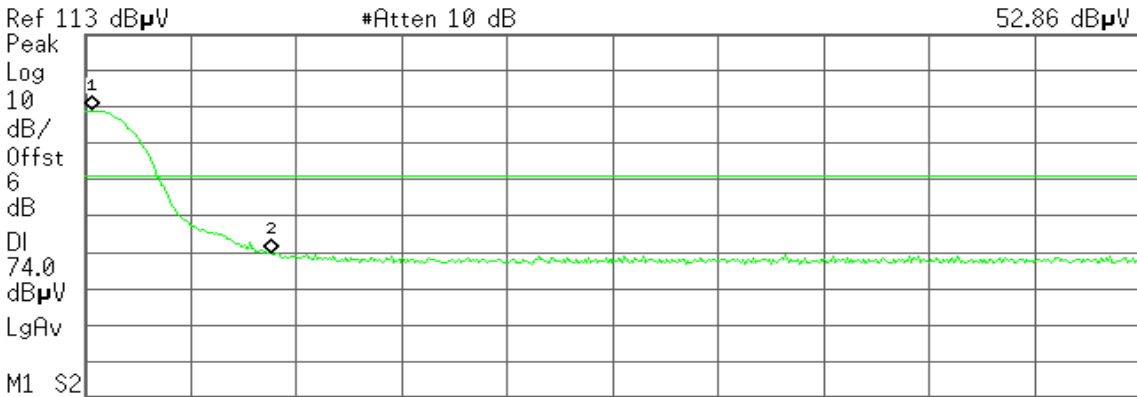
Detector mode: Peak

Polarity: Vertical

Agilent 14:26:46 Aug 18, 2010

R T

Mkr2 2.483 55 GHz  
52.86 dBμV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 13 GHz	92.00 dBμU
2	(1)	Freq	2.483 55 GHz	52.86 dBμU

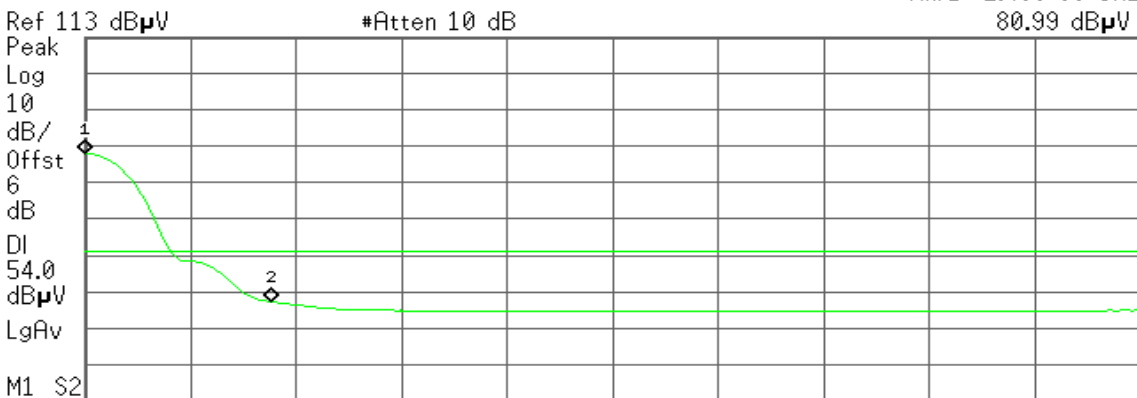
Detector mode: Average

Polarity: Vertical

Agilent 14:27:45 Aug 18, 2010

R T

Mkr1 2.480 00 GHz  
80.99 dBμV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 00 GHz	80.99 dBμU
2	(1)	Freq	2.483 55 GHz	48.31 dBμU



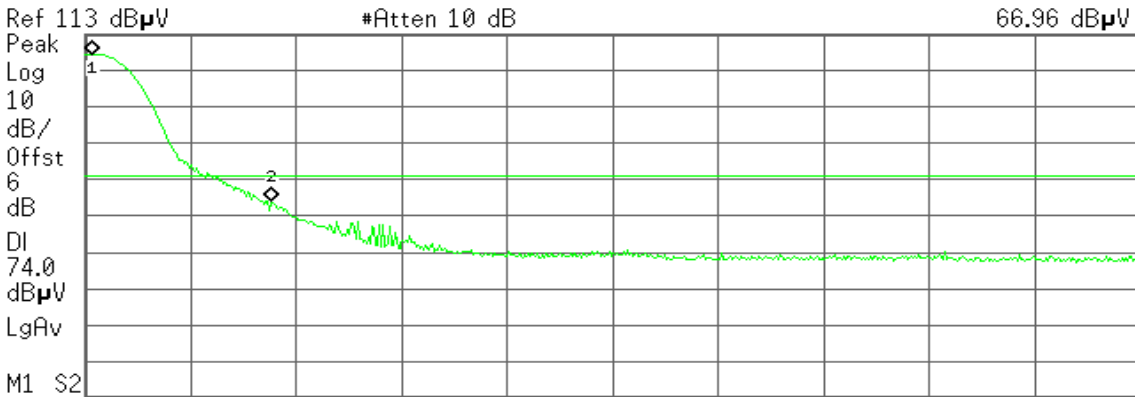
**Detector mode: Peak**

**Polarity: Horizontal**

Agilent 14:23:31 Aug 18, 2010

R T

Mkr2 2.483 55 GHz  
66.96 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 13 GHz	107.55 dBμU
2	(1)	Freq	2.483 55 GHz	66.96 dBμU

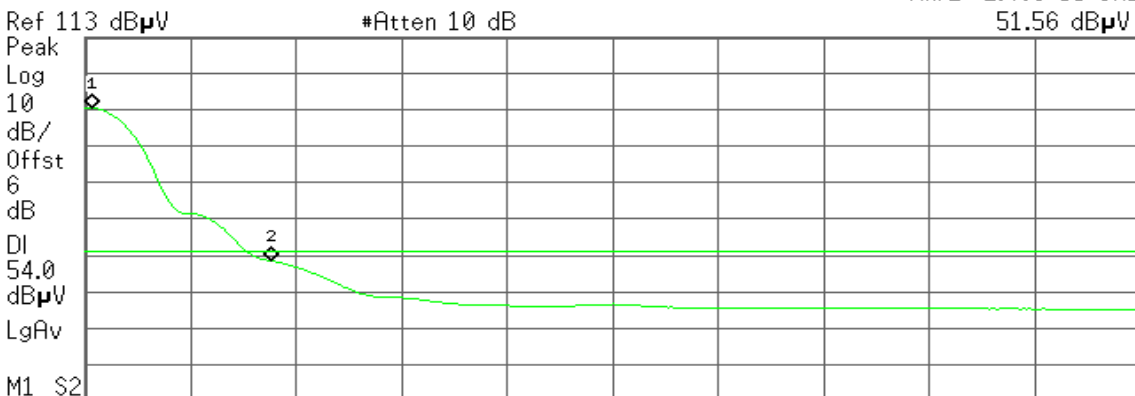
**Detector mode: Average**

**Polarity: Horizontal**

Agilent 14:24:19 Aug 18, 2010

R T

Mkr2 2.483 55 GHz  
51.56 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 5.514 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 13 GHz	93.62 dBμU
2	(1)	Freq	2.483 55 GHz	51.56 dBμU



## Band Edges (Bluetooth 8DPSK / CH Low)

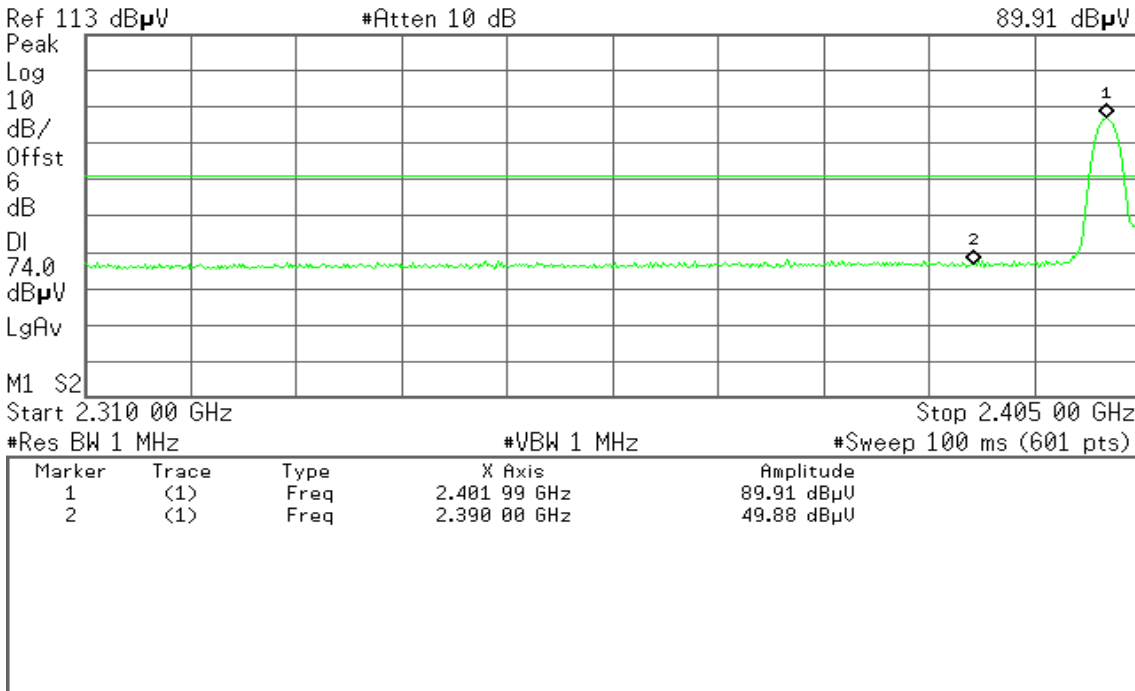
Detector mode: Peak

Polarity: Vertical

Agilent 14:55:20 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
89.91 dBμV



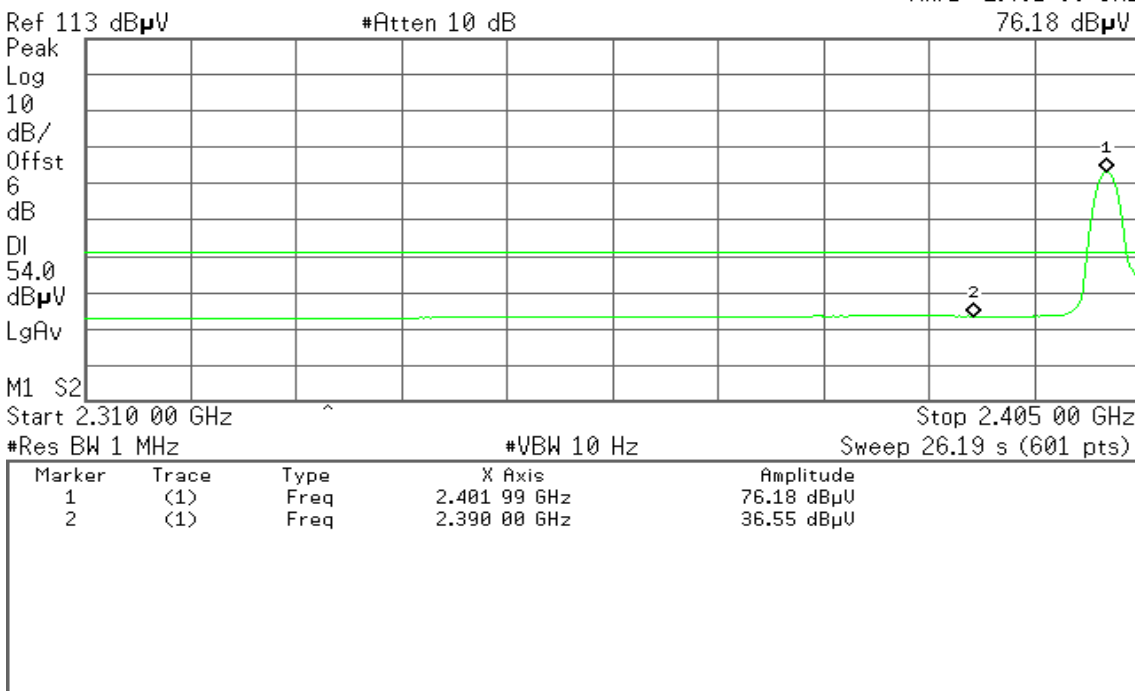
Detector mode: Average

Polarity: Vertical

Agilent 14:56:21 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
76.18 dBμV





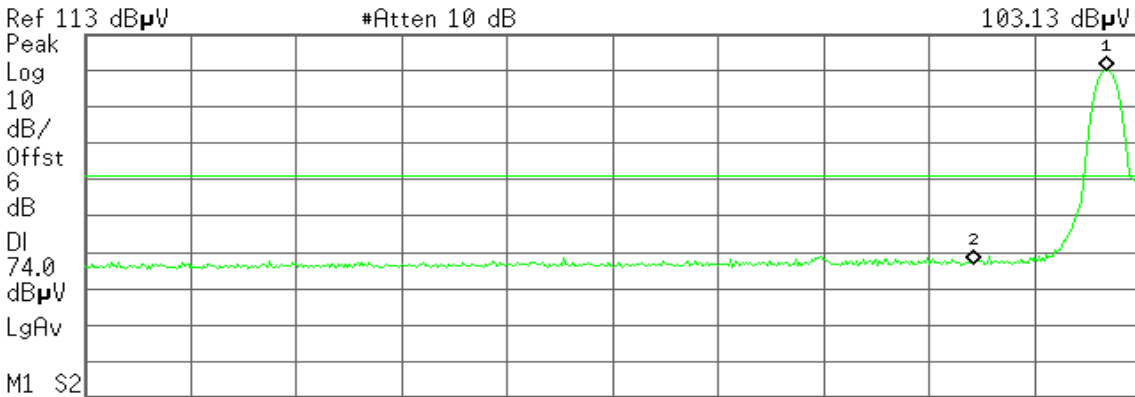
**Detector mode: Peak**

**Polarity: Horizontal**

\* Agilent 14:59:08 Aug 18, 2010

R T

Mkr1 2.401 99 GHz  
103.13 dB $\mu$ V



Start 2.310 00 GHz Stop 2.405 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.401 99 GHz	103.13 dB $\mu$ V
2	(1)	Freq	2.390 00 GHz	49.91 dB $\mu$ V

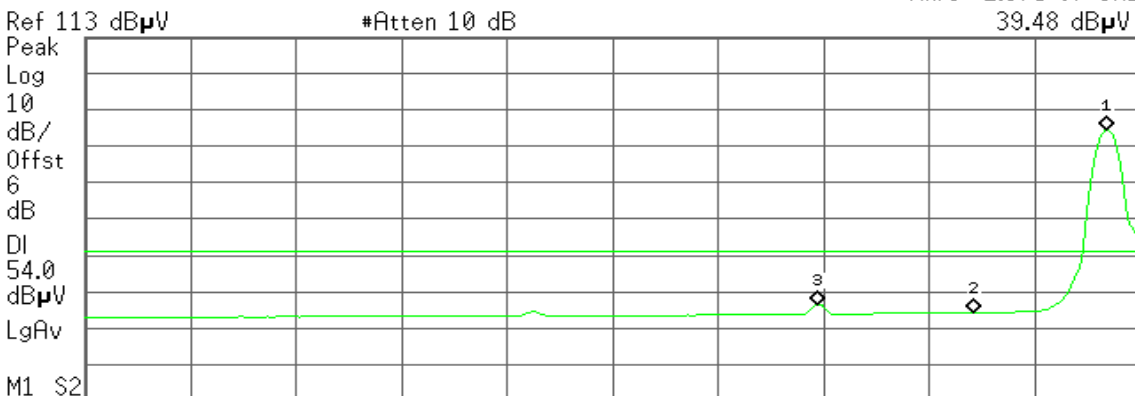
**Detector mode: Average**

**Polarity: Horizontal**

\* Agilent 15:00:02 Aug 18, 2010

R T

Mkr3 2.375 87 GHz  
39.48 dB $\mu$ V



Start 2.310 00 GHz Stop 2.405 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 26.19 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.401 99 GHz	87.43 dB $\mu$ V
2	(1)	Freq	2.390 00 GHz	37.16 dB $\mu$ V
3	(1)	Freq	2.375 87 GHz	39.48 dB $\mu$ V



## Band Edges (Bluetooth 8DPSK / CH High)

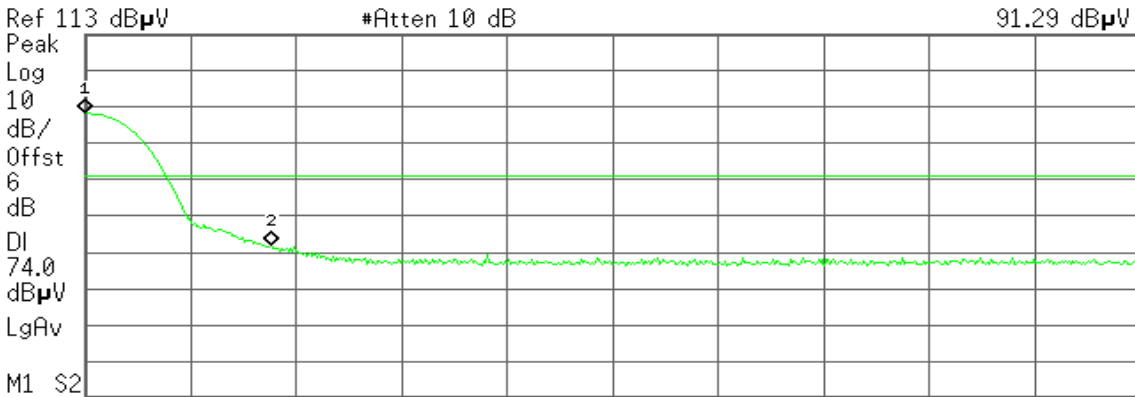
Detector mode: Peak

Polarity: Vertical

Agilent 14:30:45 Aug 18, 2010

R T

Mkr1 2.480 00 GHz  
91.29 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 00 GHz	91.29 dBμV
2	(1)	Freq	2.483 55 GHz	55.01 dBμV

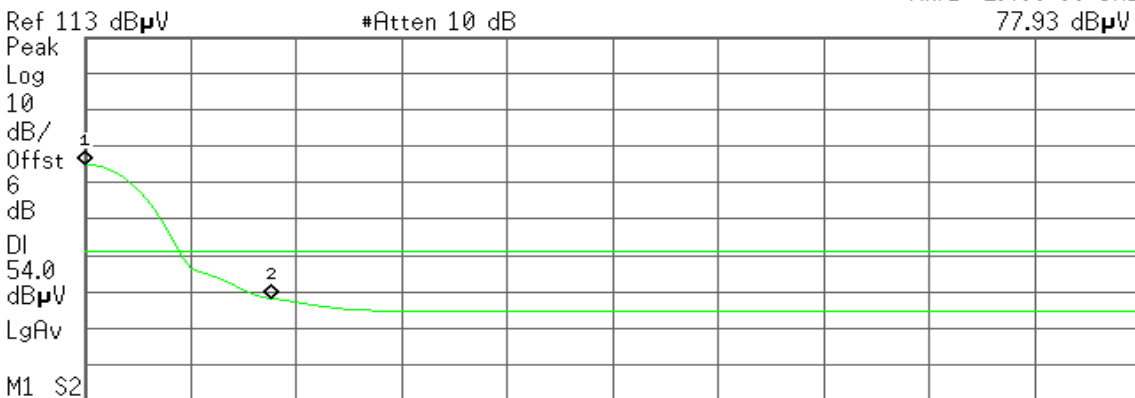
Detector mode: Average

Polarity: Vertical

Agilent 14:31:31 Aug 18, 2010

R T

Mkr1 2.480 00 GHz  
77.93 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 5.514 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 00 GHz	77.93 dBμV
2	(1)	Freq	2.483 55 GHz	41.15 dBμV



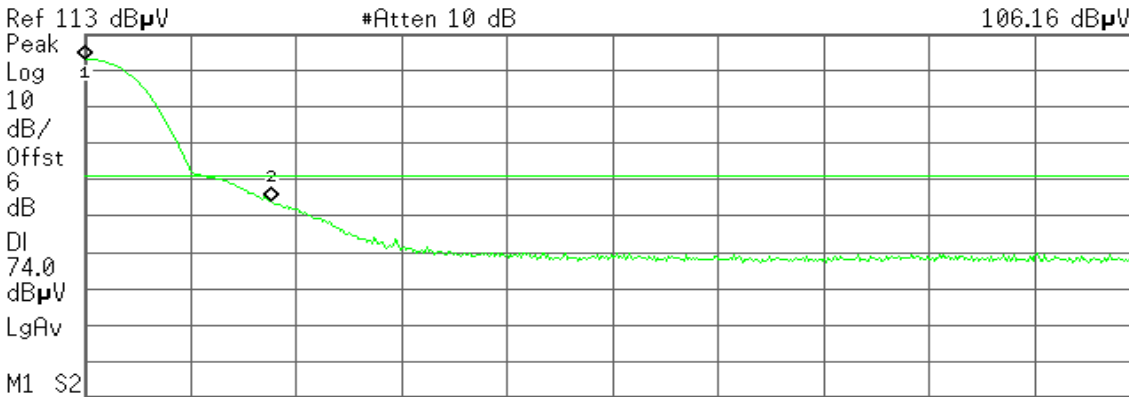
**Detector mode: Peak**

**Polarity: Horizontal**

Agilent 14:33:33 Aug 18, 2010

R T

Mkr1 2.480 00 GHz  
106.16 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 00 GHz	106.16 dBμV
2	(1)	Freq	2.483 55 GHz	66.96 dBμV

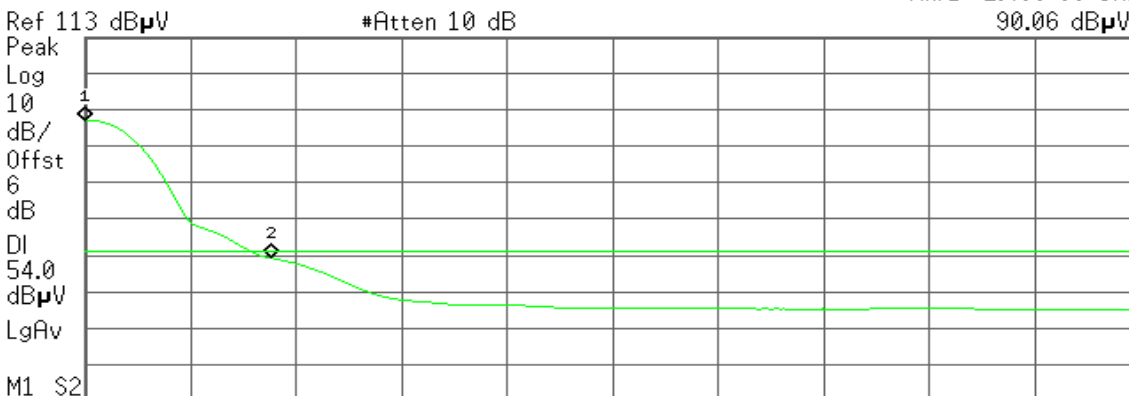
**Detector mode: Average**

**Polarity: Horizontal**

Agilent 14:34:06 Aug 18, 2010

R T

Mkr1 2.480 00 GHz  
90.06 dBμV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 5.514 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.480 00 GHz	90.06 dBμV
2	(1)	Freq	2.483 55 GHz	52.26 dBμV

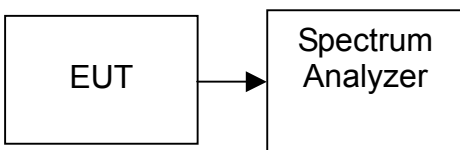


## **7.5. FREQUENCY SEPARATION**

### **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)	two-thirds of the 20 dB bandwidth	Channel Separation Limit	Result
1.00	636.7	> 20dB Bandwidth or two-thirds of the 20 dB bandwidth	Pass

#### **8DPSK**

Channel Separation (MHz)	two-thirds of the 20 dB bandwidth	Channel Separation Limit	Result
1.00	883	> 20dB Bandwidth or two-thirds of the 20 dB bandwidth	Pass



## Test Plot

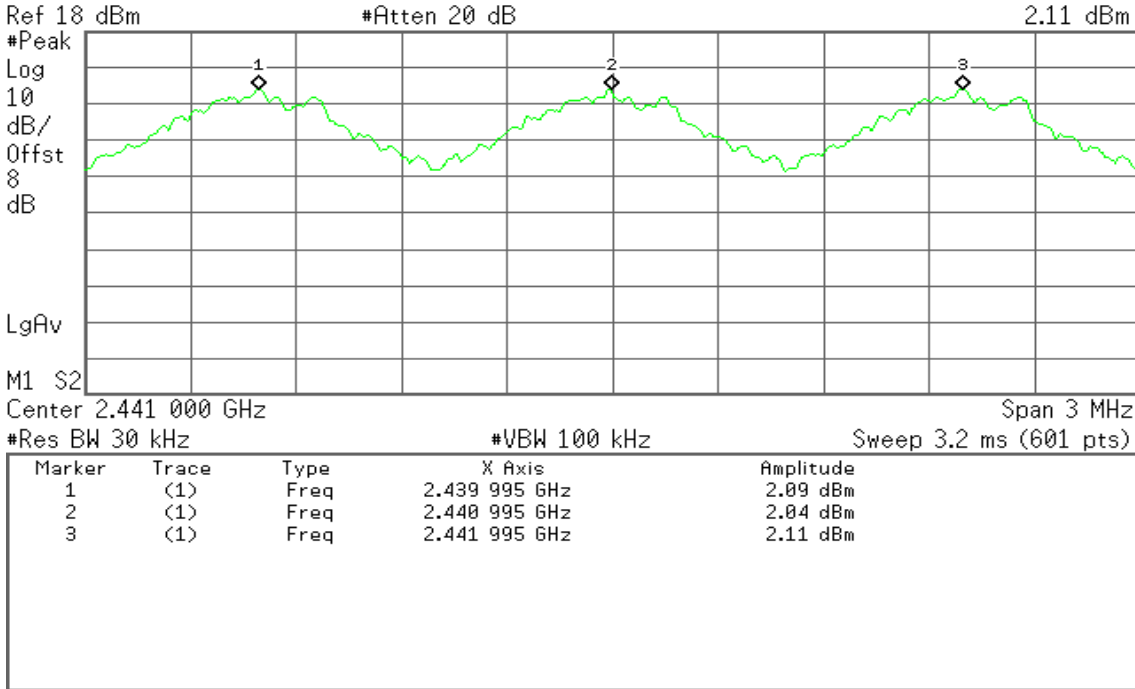
### Measurement of Channel Separation

#### GFSK

Agilent 13:44:36 Aug 19, 2010

R L

Mkr3 2.441 995 GHz  
2.11 dBm

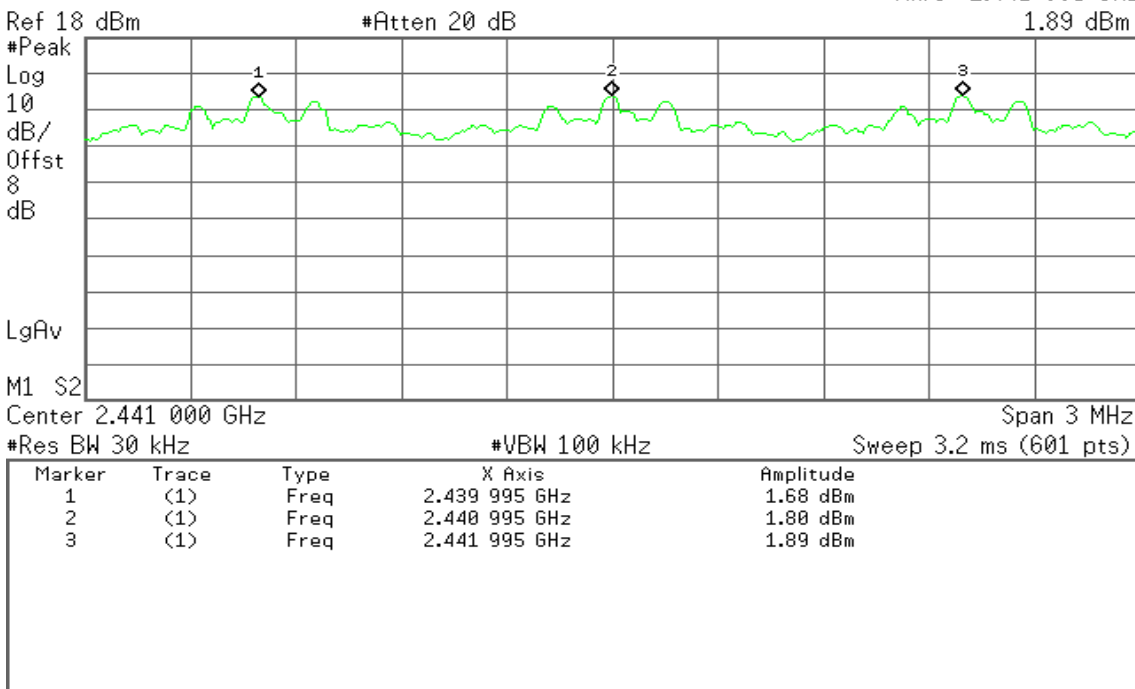


#### 8DPSK

Agilent 13:41:58 Aug 19, 2010

R L

Mkr3 2.441 995 GHz  
1.89 dBm



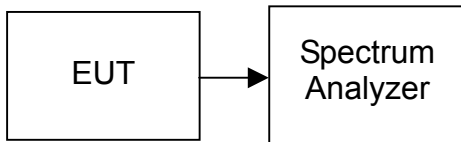


## **7.6. NUMBER OF HOPPING FREQUENCY**

### **LIMIT**

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 75 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**

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



**Test Plot**

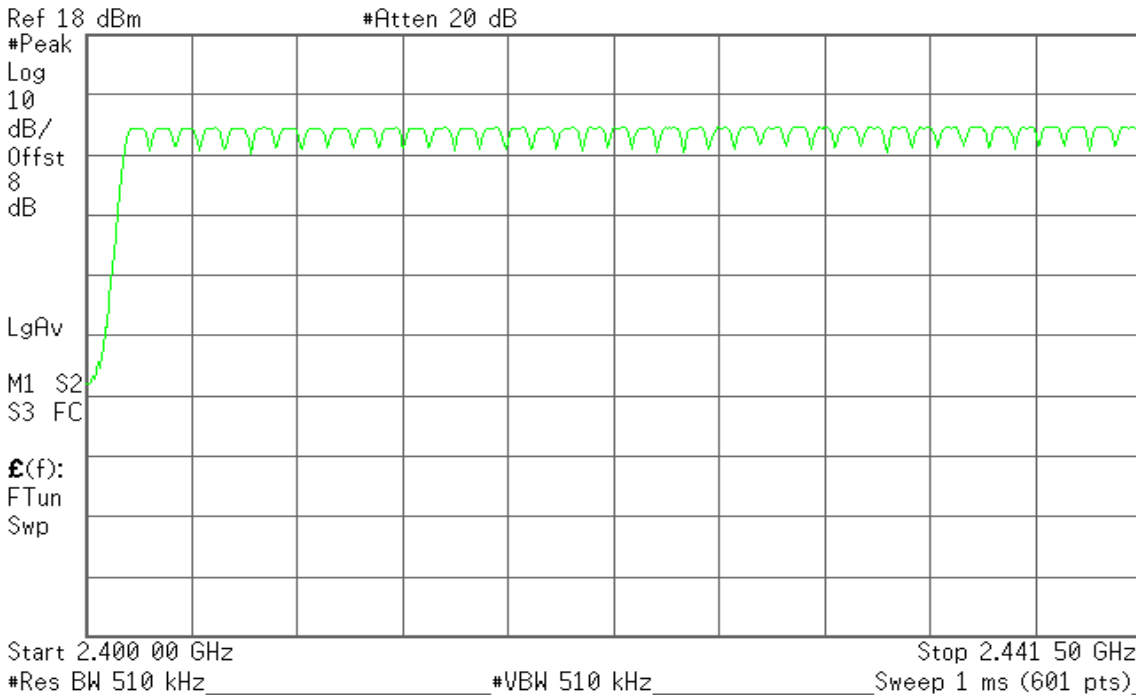
**GFSK**

**Channel Number**

**2.4 GHz – 2.4415 GHz**

\* Agilent 13:47:53 Aug 19, 2010

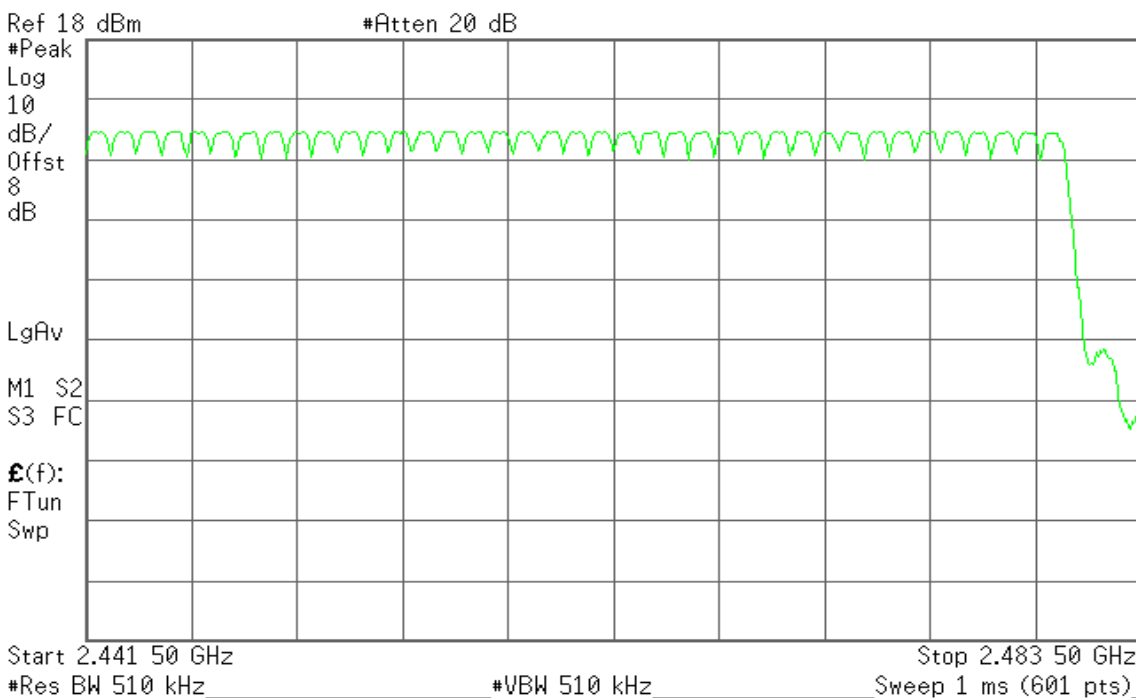
R L



**2.4415 GHz – 2.4835 GHz**

\* Agilent 13:48:24 Aug 19, 2010

R L





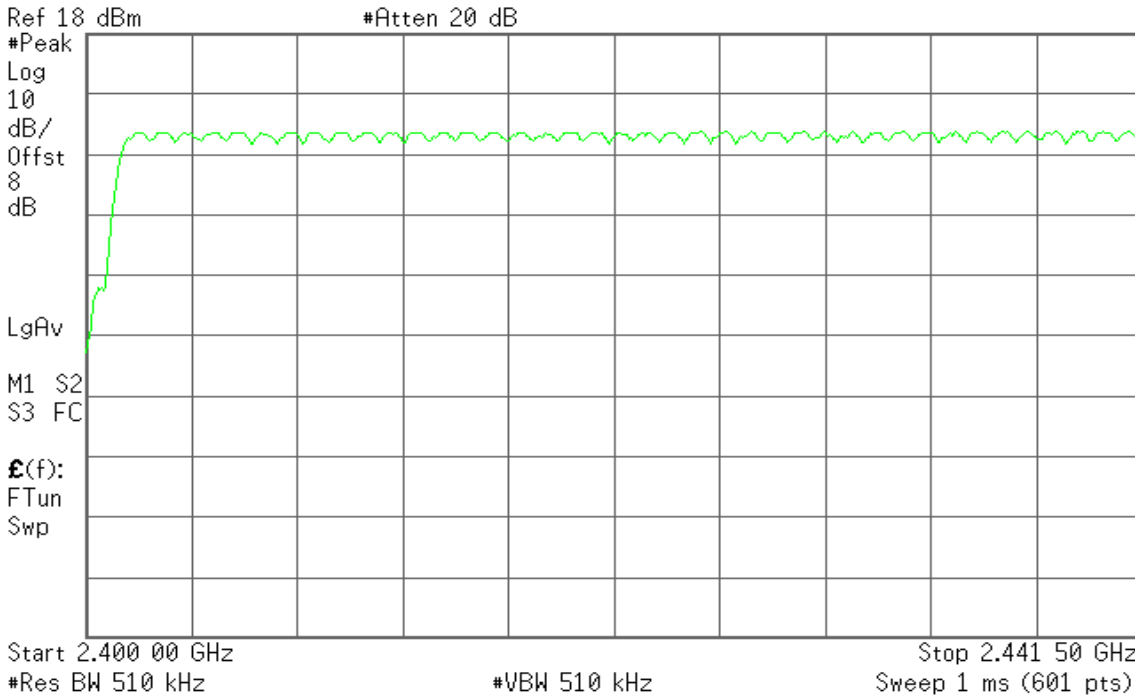
**8DPSK**

**Channel Number**

**2.4 GHz – 2.4415 GHz**

\* Agilent 13:56:26 Aug 19, 2010

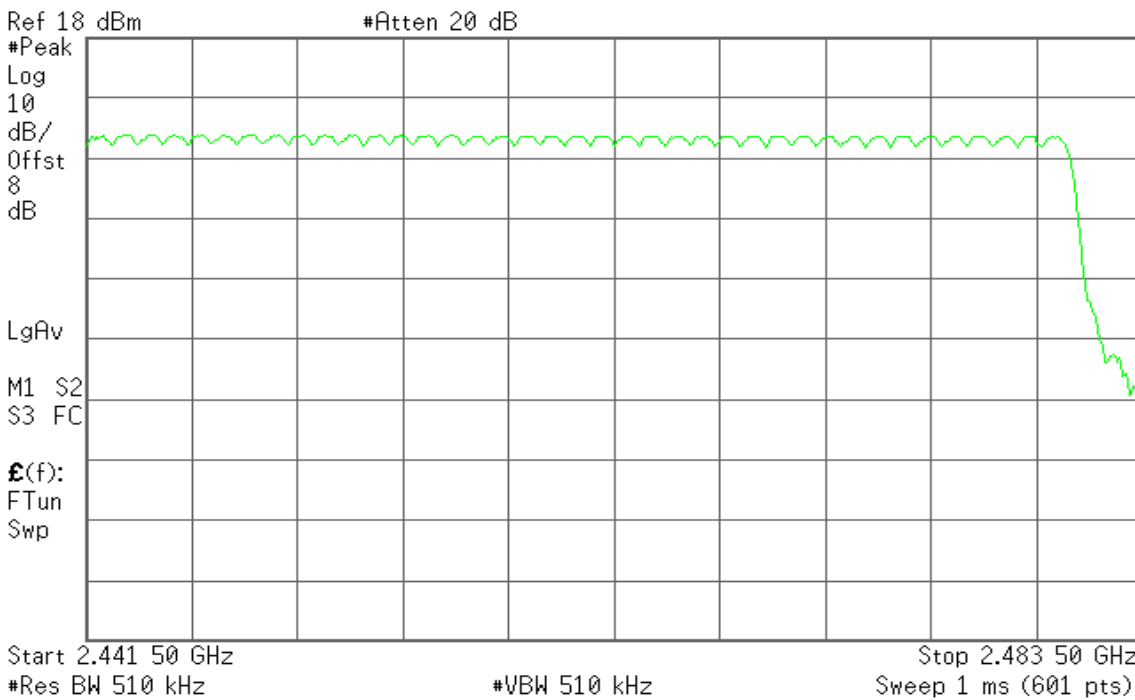
R L



**2.4415 GHz – 2.4835 GHz**

\* Agilent 13:54:01 Aug 19, 2010

R L



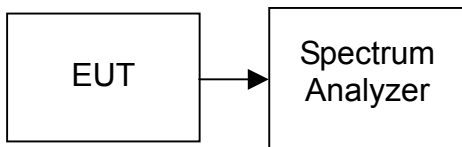


## **7.7. TIME OF OCCUPANCY (DWELL TIME)**

### **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 = auto.
5. Repeat above procedures until all frequency measured were complete.

### **TEST RESULTS**

*No non-compliance noted*



## TEST DATA

### GFSK

#### DH 1

CH Low:  $0.400 * (1600/2)/79 * 31.60 = 128.00$  (ms)CH Mid:  $0.400 * (1600/2)/79 * 31.60 = 128.00$  (ms)CH High:  $0.400 * (1600/2)/79 * 31.60 = 128.00$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.400	128.00	31.60	400.00	PASS
Mid	0.400	128.00	31.60		PASS
High	0.400	128.00	31.60		PASS

#### DH 3

CH Low:  $1.650 * (1600/4)/79 * 31.60 = 264.00$  (ms)CH Mid:  $1.650 * (1600/4)/79 * 31.60 = 264.00$  (ms)CH High:  $1.650 * (1600/4)/79 * 31.60 = 264.00$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.650	264.00	31.60	400.00	PASS
Mid	1.650	264.00	31.60		PASS
High	1.650	264.00	31.60		PASS

#### DH 5

CH Low:  $2.900 * (1600/6)/79 * 31.60 = 309.33$  (ms)CH Mid:  $2.900 * (1600/6)/79 * 31.60 = 309.33$  (ms)CH High:  $2.900 * (1600/6)/79 * 31.60 = 309.33$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.900	309.33	31.60	400.00	PASS
Mid	2.900	309.33	31.60		PASS
High	2.900	309.33	31.60		PASS



## 8DPSK

### DH 1

CH Low:  $0.400 * (1600/2)/79 * 31.60 = 128.00$  (ms)CH Mid:  $0.417 * (1600/2)/79 * 31.60 = 133.34$  (ms)CH High:  $0.417 * (1600/2)/79 * 31.60 = 133.34$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.400	128.00	31.60	400.00	PASS
Mid	0.417	133.34	31.60		PASS
High	0.417	133.34	31.60		PASS

### DH 3

CH Low:  $1.667 * (1600/4)/79 * 31.60 = 266.72$  (ms)CH Mid:  $1.667 * (1600/4)/79 * 31.60 = 266.72$  (ms)CH High:  $1.667 * (1600/4)/79 * 31.60 = 266.72$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.667	266.72	31.60	400.00	PASS
Mid	1.667	266.72	31.60		PASS
High	1.667	266.72	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	400.00	PASS
Mid	2.917	311.15	31.60		PASS
High	2.917	311.15	31.60		PASS



## Test Plot

### GFSK

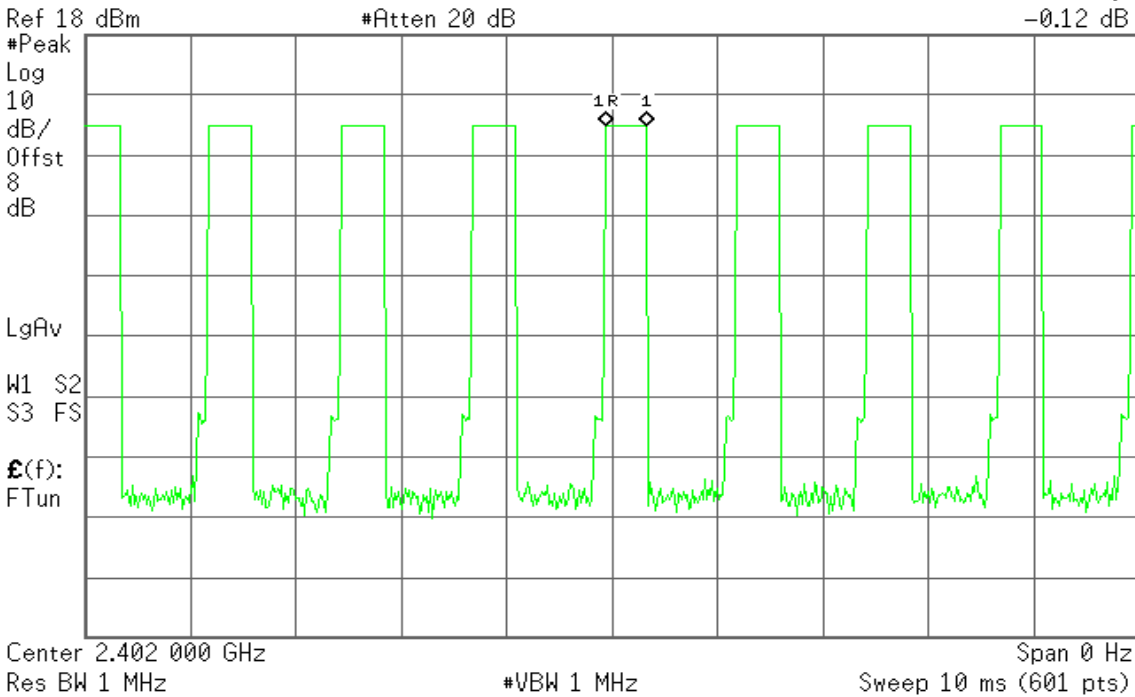
### DH 1

### (CH Low)

Agilent 14:00:40 Aug 19, 2010

R L

Mkr1 400  $\mu$ s  
-0.12 dB

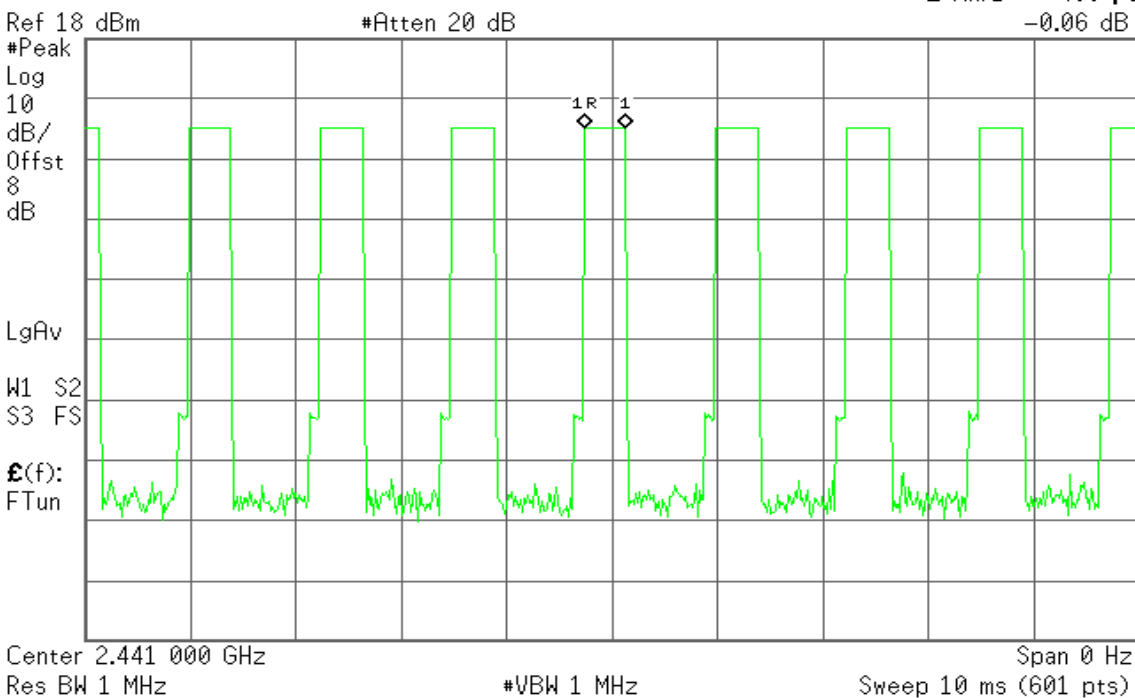


### (CH Mid)

Agilent 14:10:28 Aug 19, 2010

R L

Mkr1 400  $\mu$ s  
-0.06 dB





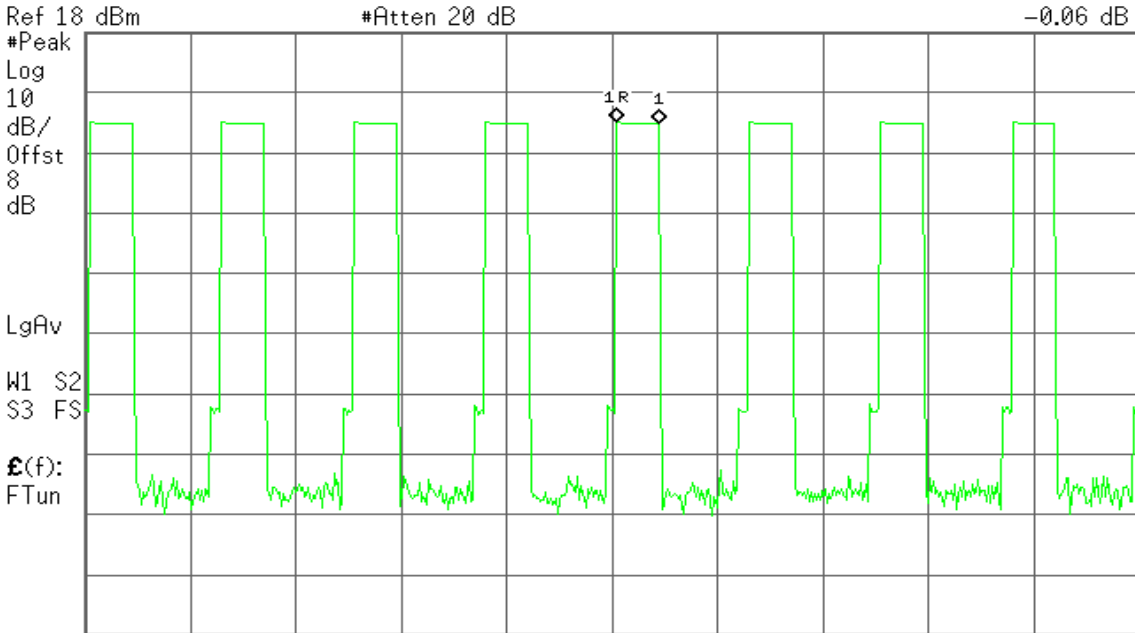
**(CH High)**

Agilent 14:18:08 Aug 19, 2010

R L

Mkr1 400  $\mu$ s

-0.06 dB



Center 2.480 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)

**DH 3**

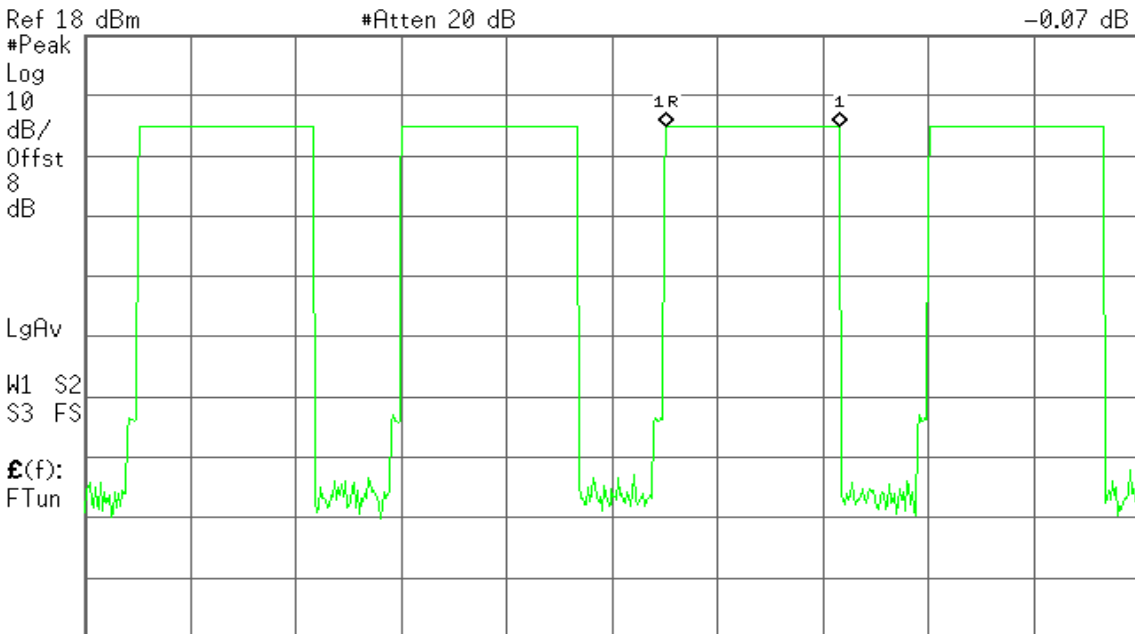
**(CH Low)**

Agilent 14:01:49 Aug 19, 2010

R L

Mkr1 1.65 ms

-0.07 dB



Center 2.402 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)

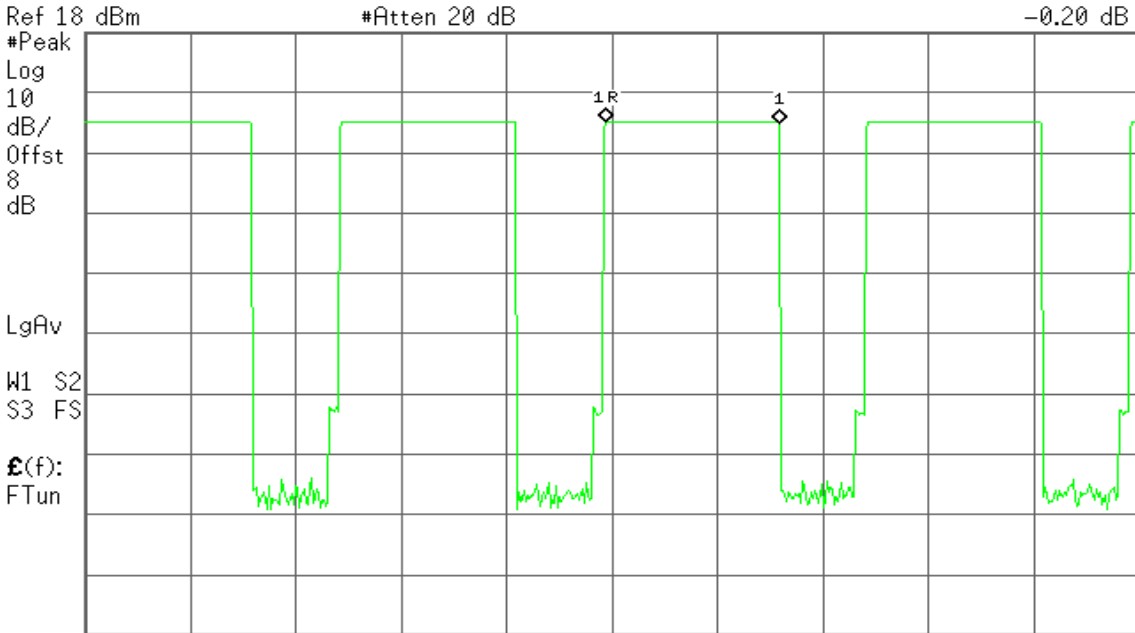


(CH Mid)

Agilent 14:11:25 Aug 19, 2010

R L

Mkr1 1.65 ms  
-0.20 dB



Center 2.441 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

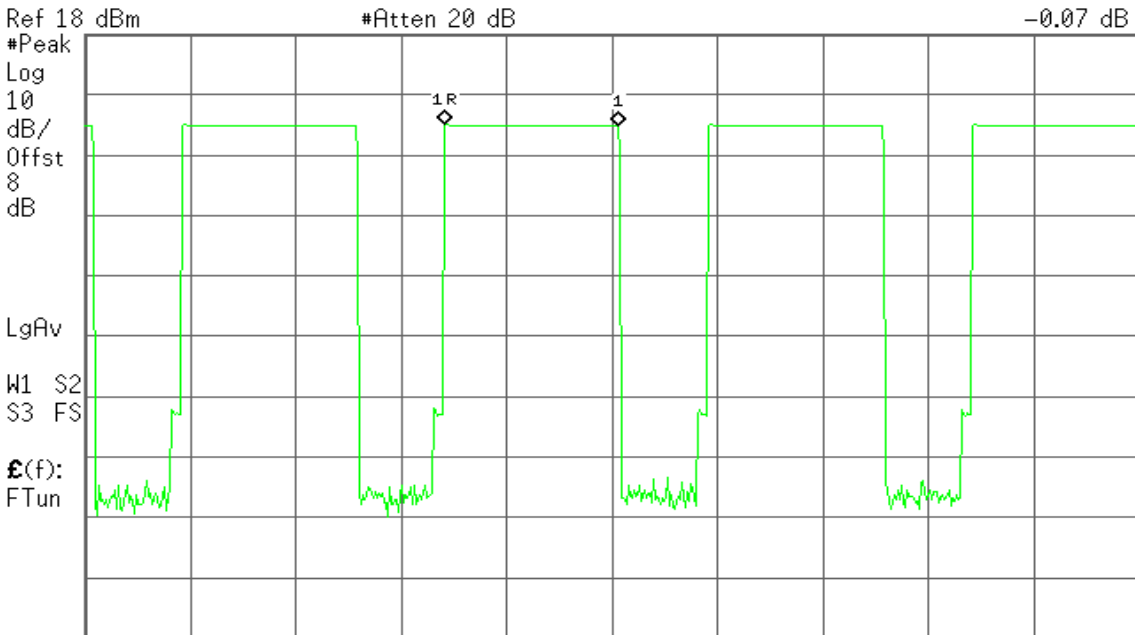
Span 0 Hz  
Sweep 10 ms (601 pts)

(CH High)

Agilent 14:16:32 Aug 19, 2010

R L

Mkr1 1.65 ms  
-0.07 dB



Center 2.480 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)



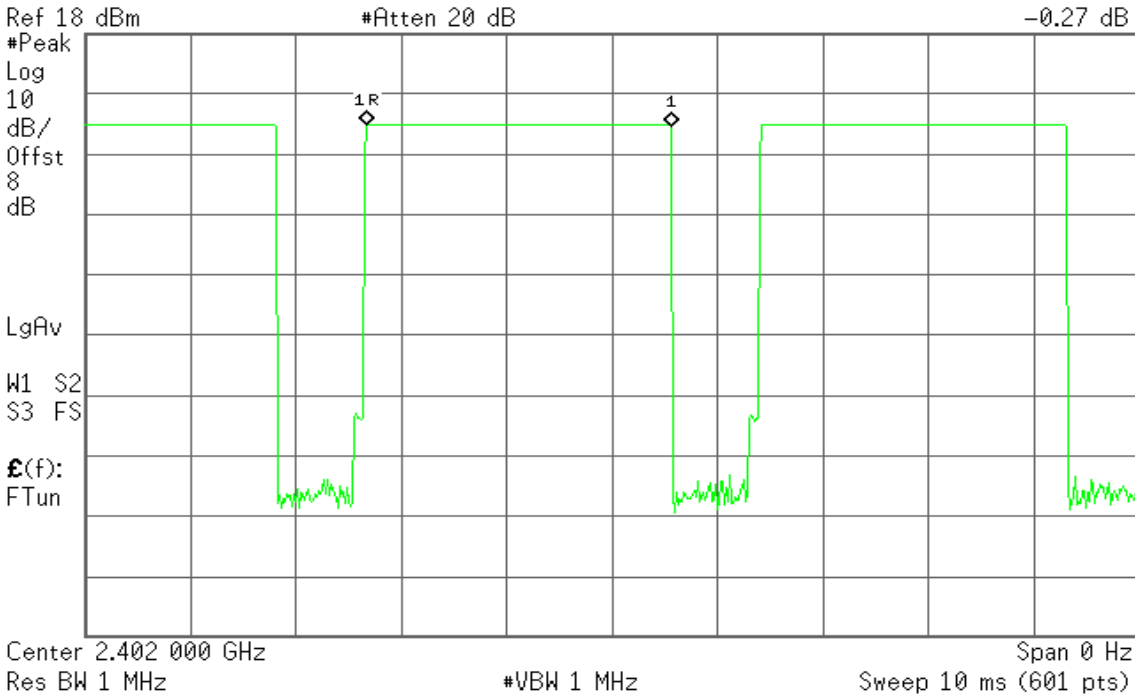
**DH 5**

**(CH Low)**

Agilent 14:02:42 Aug 19, 2010

R L

Mkr1 2.9 ms  
-0.27 dB

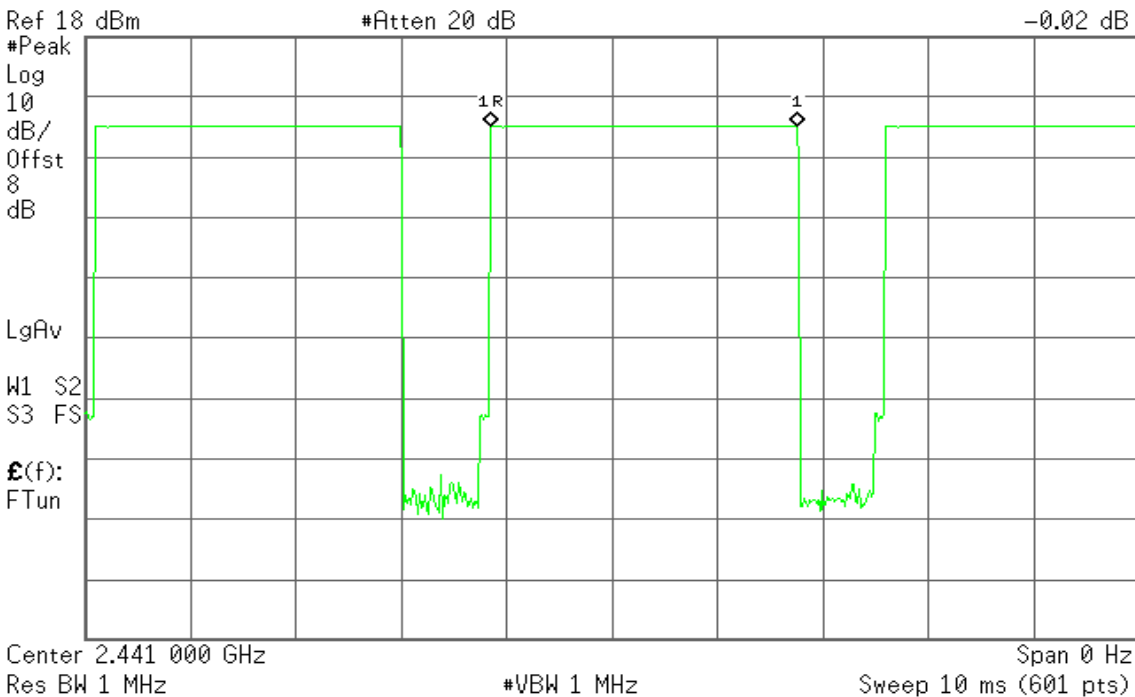


**(CH Mid)**

Agilent 14:12:52 Aug 19, 2010

R L

Mkr1 2.9 ms  
-0.02 dB



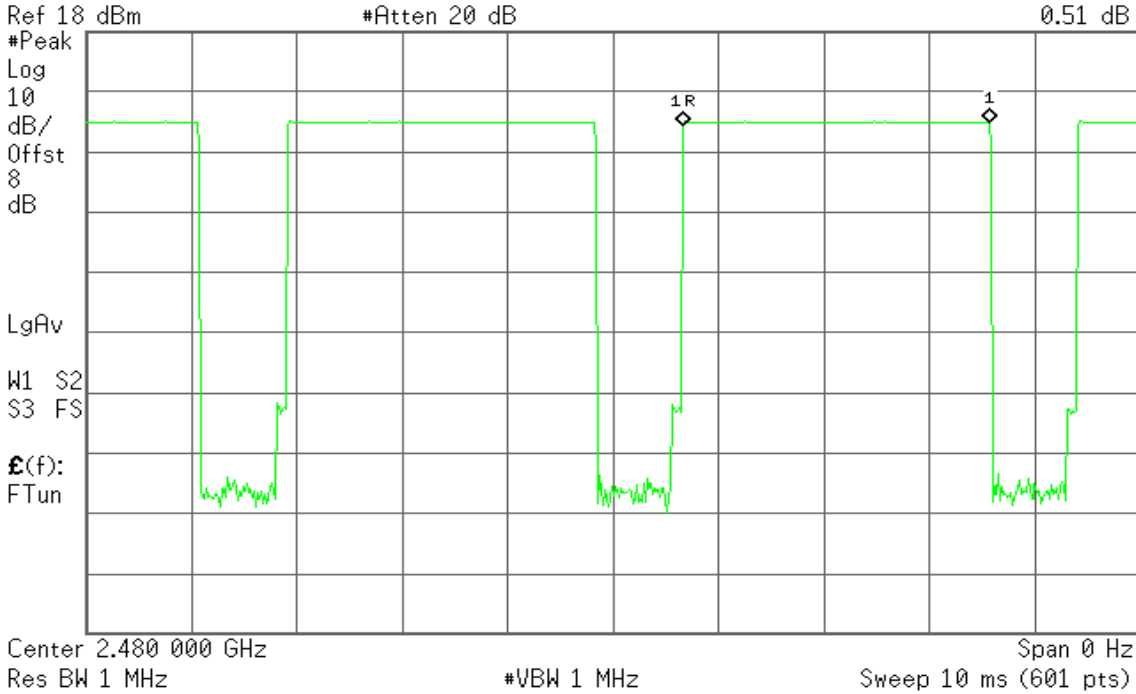


## (CH High)

Agilent 14:14:08 Aug 19, 2010

R L

Mkr1 2.9 ms  
0.51 dB



## 8DPSK

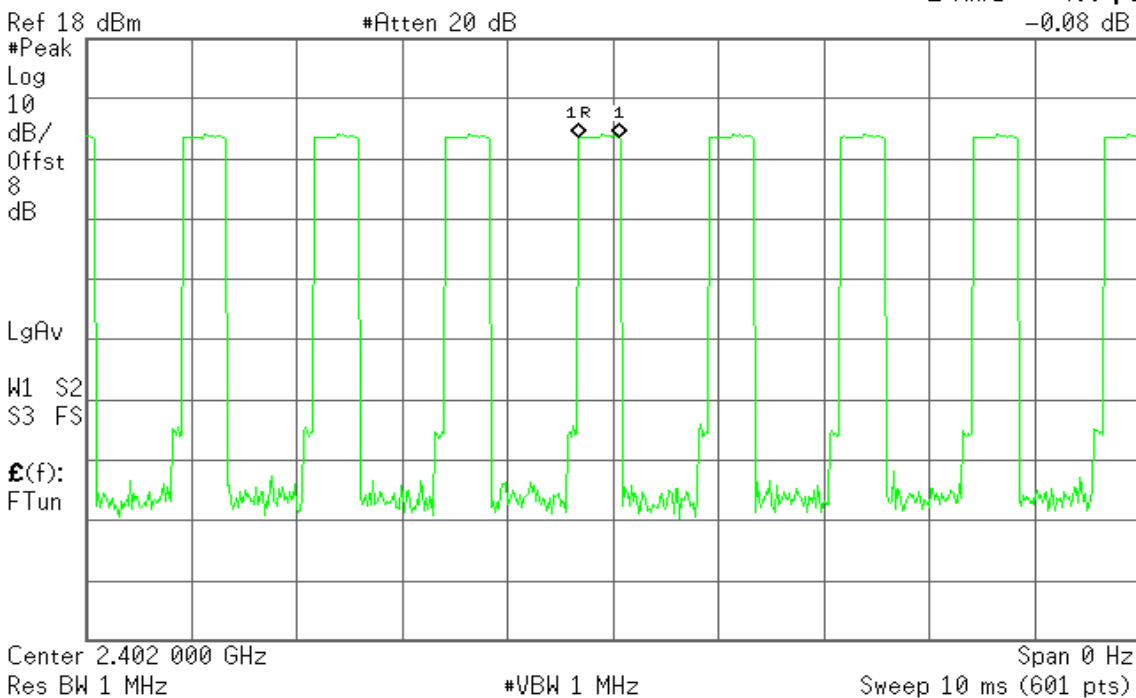
### DH 1

## (CH Low)

Agilent 14:04:40 Aug 19, 2010

R L

Mkr1 400 µs  
-0.08 dB



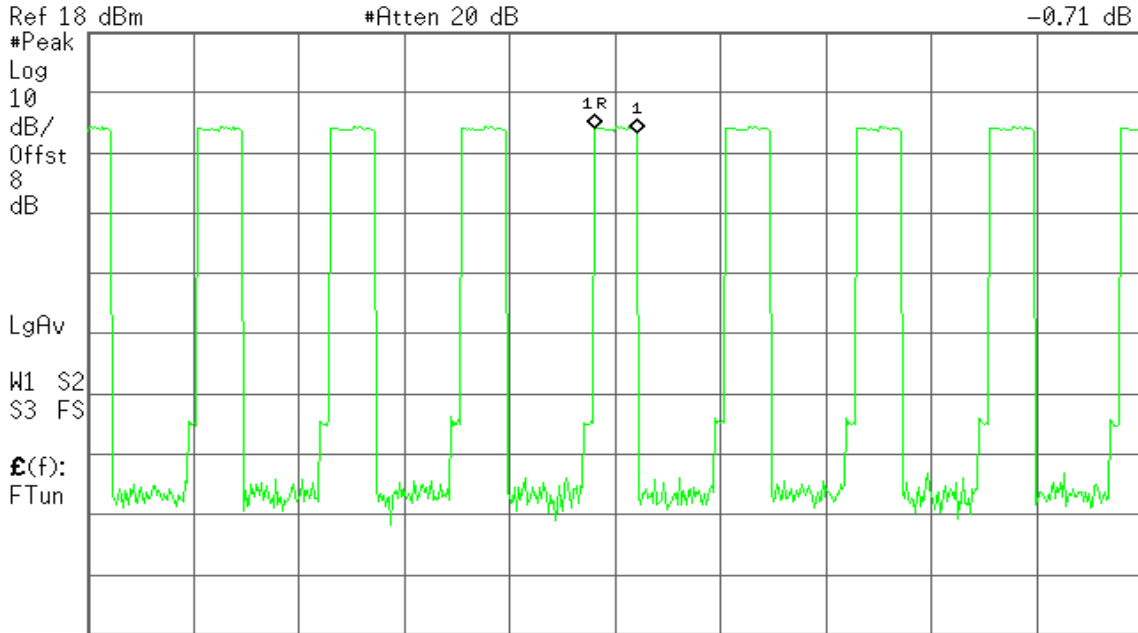


**(CH Mid)**

Agilent 14:09:37 Aug 19, 2010

R L

Mkr1 416.7  $\mu$ s  
-0.71 dB



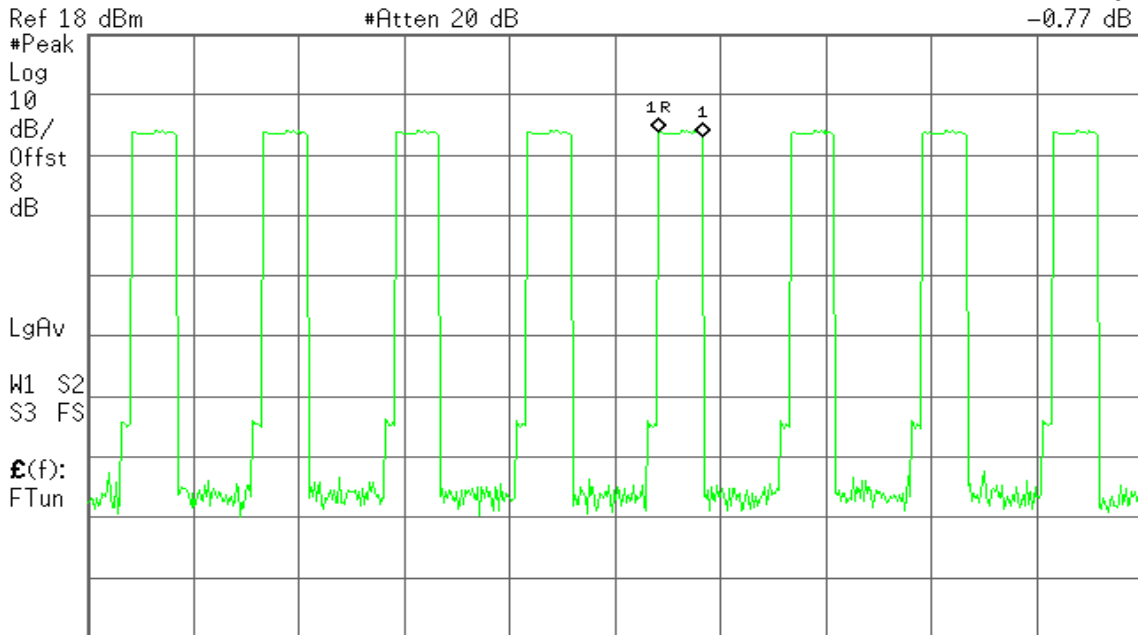
Center 2.441 000 GHz Span 0 Hz  
Res BW 1 MHz #VBW 1 MHz Sweep 10 ms (601 pts)

**(CH High)**

Agilent 14:19:05 Aug 19, 2010

R L

Mkr1 416.7  $\mu$ s  
-0.77 dB



Center 2.480 000 GHz Span 0 Hz  
Res BW 1 MHz #VBW 1 MHz Sweep 10 ms (601 pts)



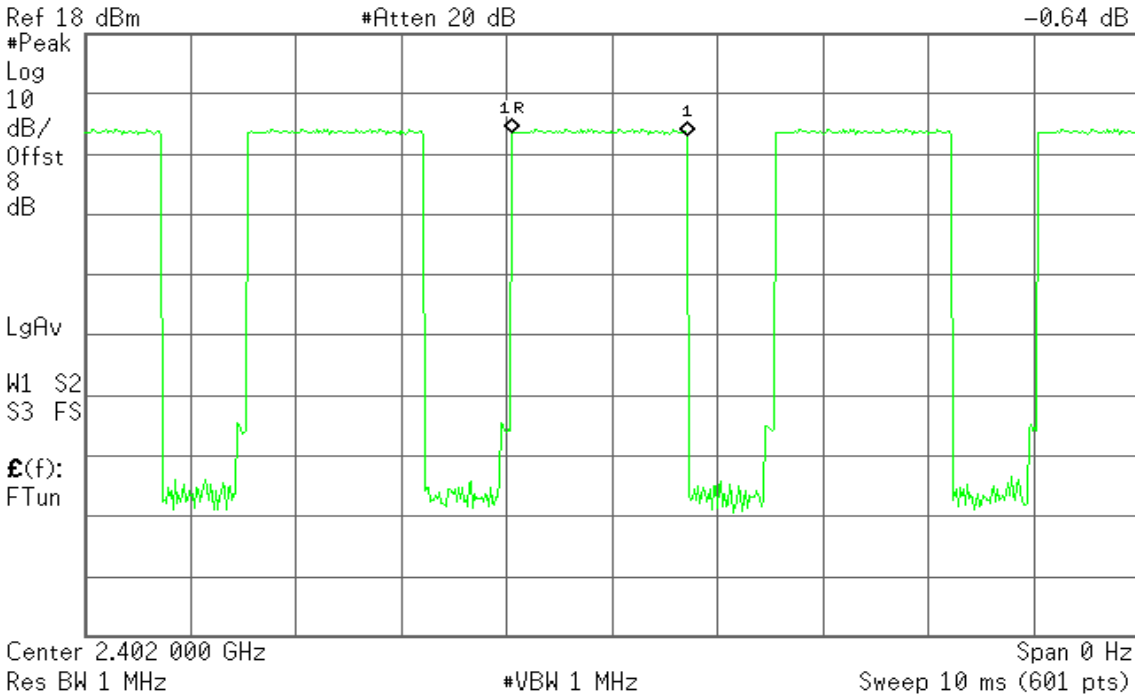
## DH 3

### (CH Low)

Agilent 14:06:01 Aug 19, 2010

R L

Mkr1 1.667 ms  
-0.64 dB

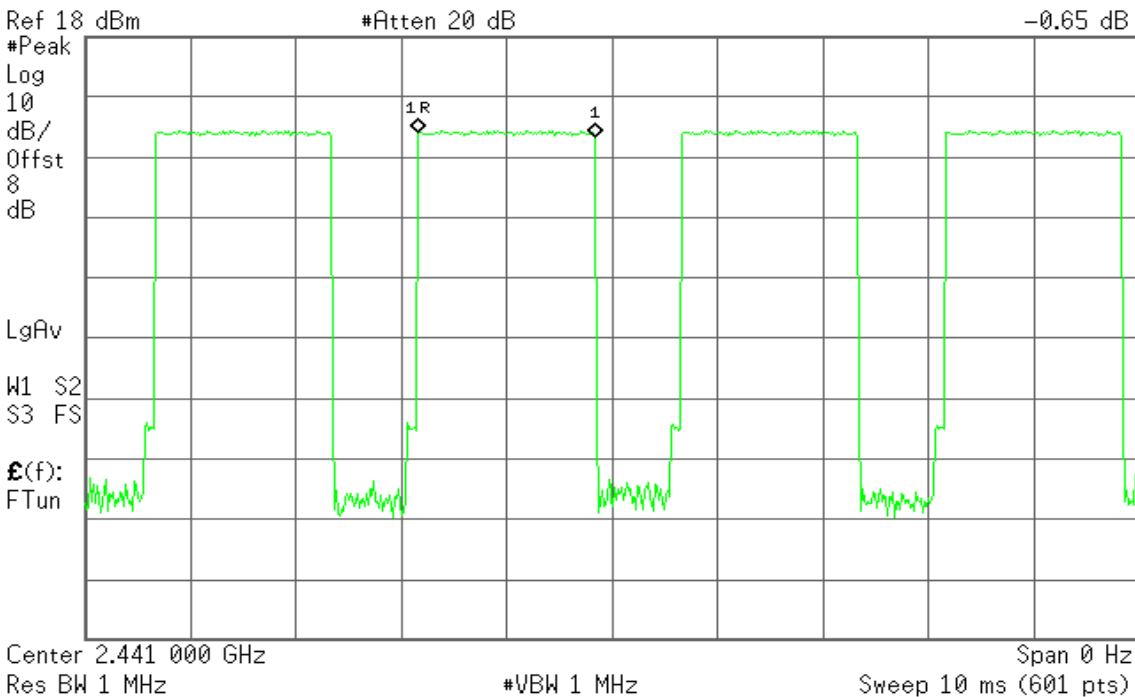


### (CH Mid)

Agilent 14:08:38 Aug 19, 2010

R L

Mkr1 1.667 ms  
-0.65 dB



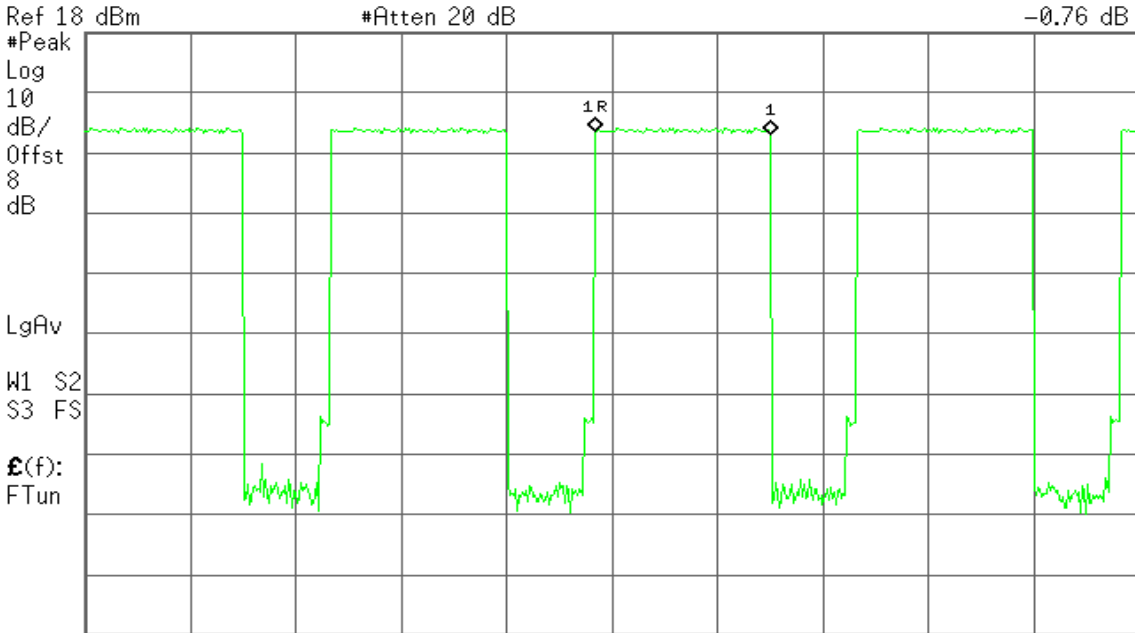


**(CH High)**

Agilent 14:19:54 Aug 19, 2010

R L

Mkr1 1.667 ms  
-0.76 dB



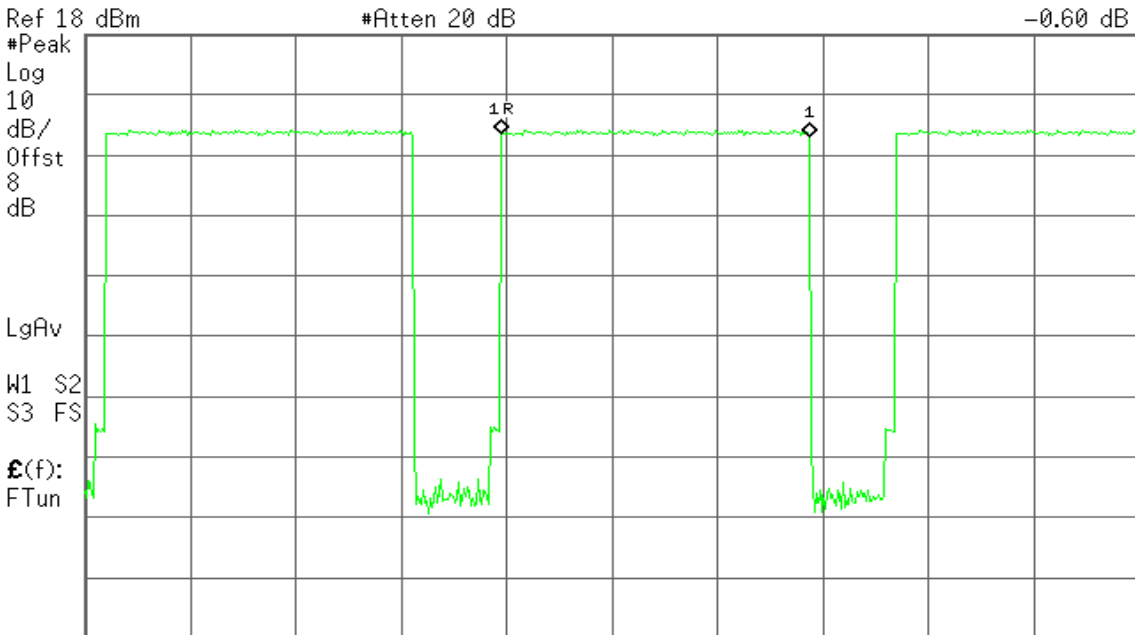
**DH 5**

**(CH Low)**

Agilent 14:06:51 Aug 19, 2010

R L

Mkr1 2.917 ms  
-0.60 dB



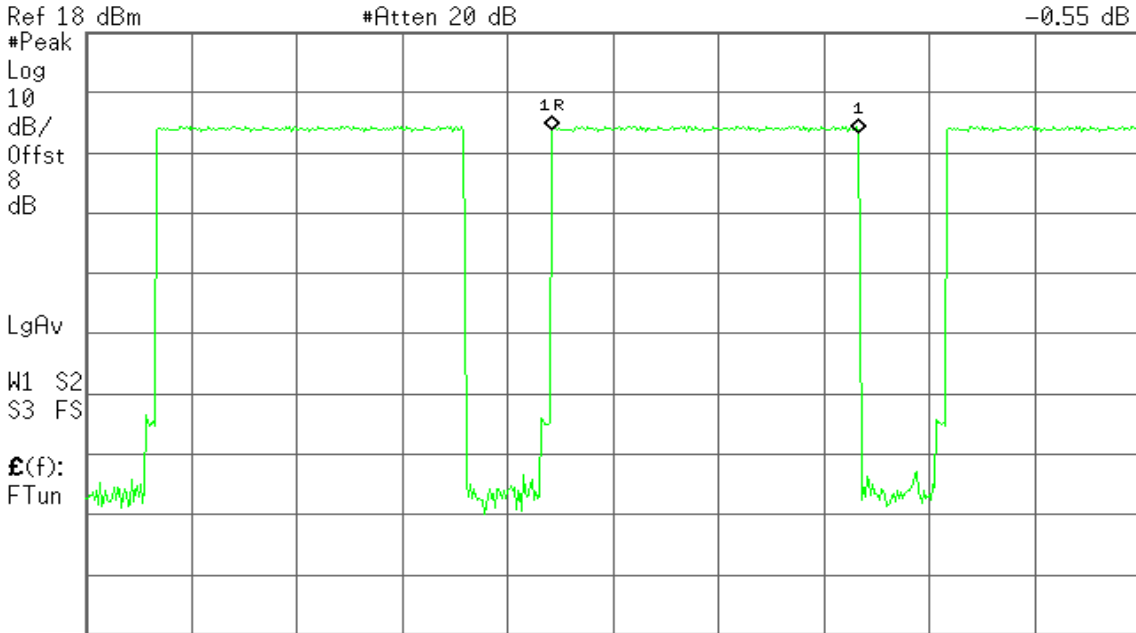


## (CH Mid)

Agilent 14:07:41 Aug 19, 2010

R L

Mkr1 2.917 ms  
-0.55 dB



Center 2.441 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

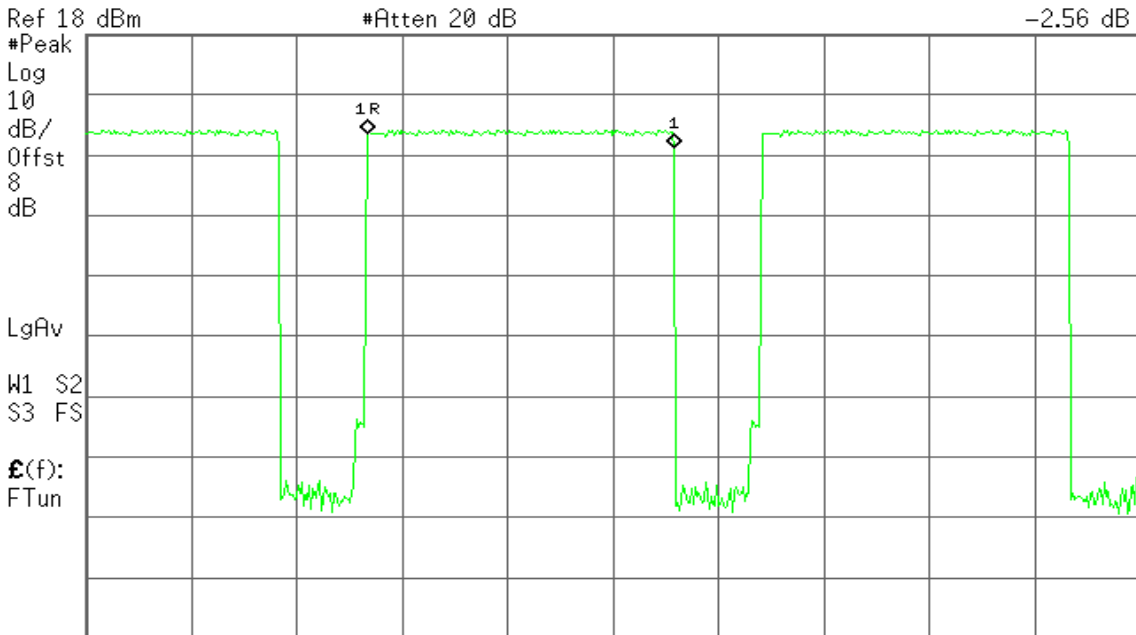
Span 0 Hz  
Sweep 10 ms (601 pts)

## (CH High)

Agilent 14:20:54 Aug 19, 2010

R L

Mkr1 2.917 ms  
-2.56 dB



Center 2.480 000 GHz  
Res BW 1 MHz

#VBW 1 MHz

Span 0 Hz  
Sweep 10 ms (601 pts)



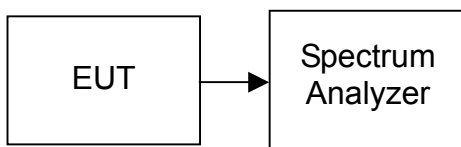
## **7.8. SPURIOUS EMISSIONS**

### **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.



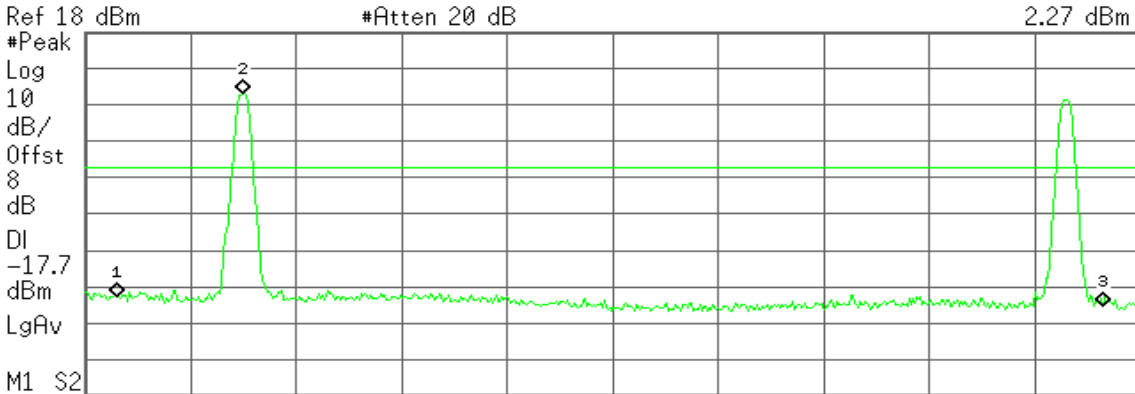
## Test Plot

### GFSK / Hopping Off

Agilent 17:39:58 Oct 4, 2011

R T

Mkr2 2.402 00 GHz  
2.27 dBm



Start 2.387 00 GHz Stop 2.487 00 GHz  
#Res BW 510 kHz VBW 510 kHz Sweep 1 ms (601 pts)

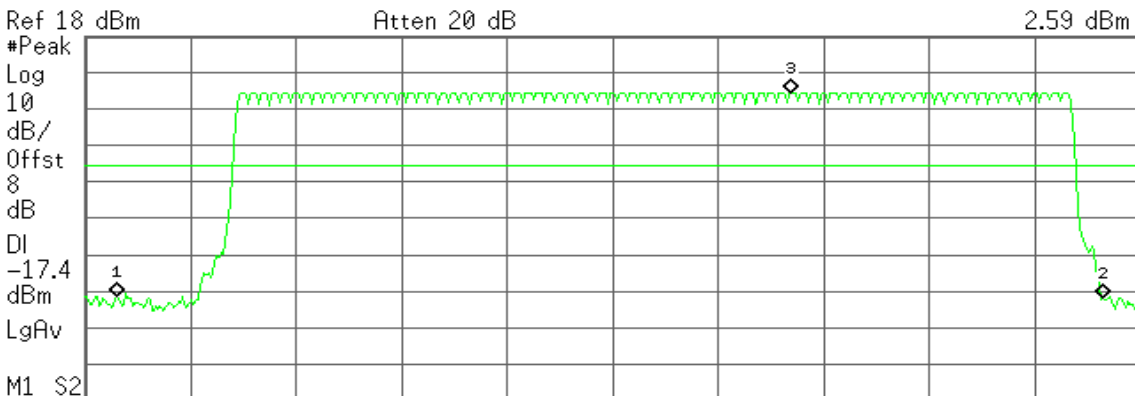
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	-55.38 dBm
2	(1)	Freq	2.402 00 GHz	2.27 dBm
3	(1)	Freq	2.483 50 GHz	-57.71 dBm

### GFSK / Hopping On

Agilent 09:49:51 Aug 20, 2010

R L

Mkr3 2.453 83 GHz  
2.59 dBm



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	-53.56 dBm
2	(1)	Freq	2.483 50 GHz	-53.96 dBm
3	(1)	Freq	2.453 83 GHz	2.59 dBm

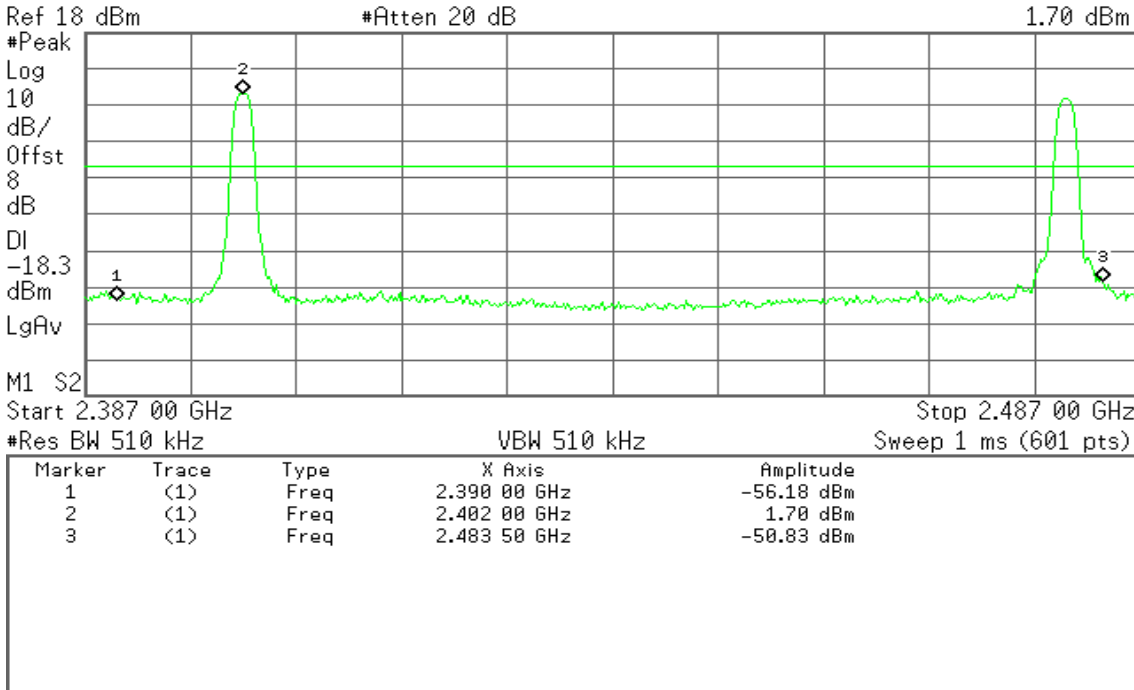


## 8DPSK / Hopping Off

Agilent 17:42:14 Oct 4, 2011

R T

Mkr2 2.402 00 GHz  
1.70 dBm

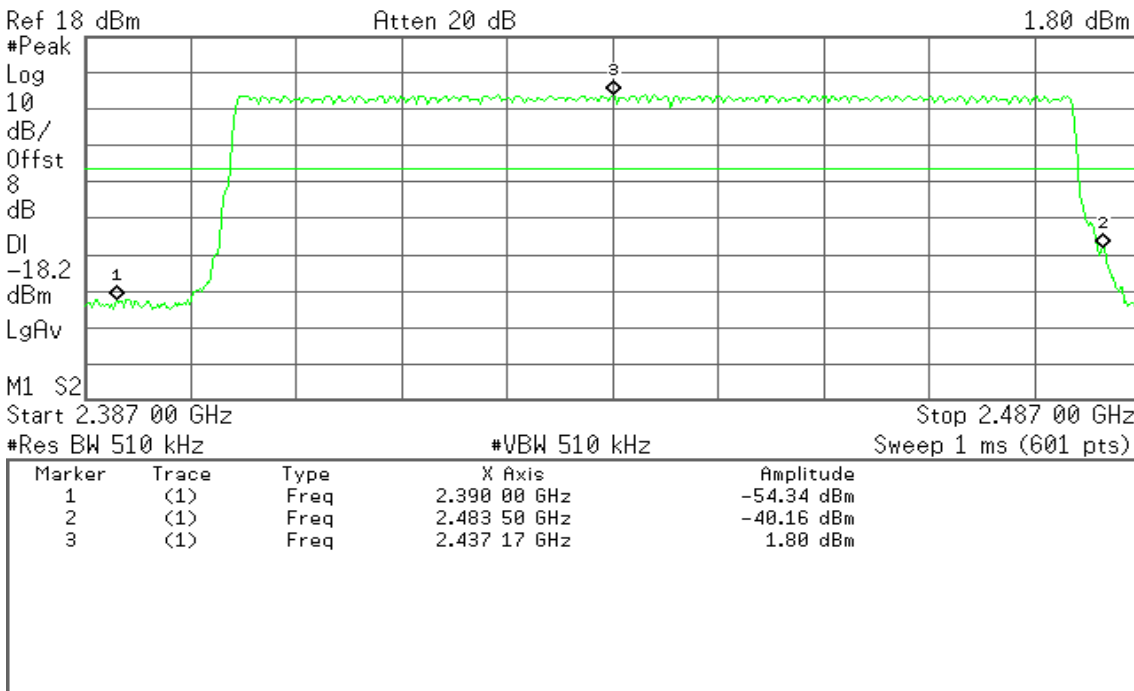


## 8DPSK / Hopping On

Agilent 09:46:51 Aug 20, 2010

R L

Mkr3 2.437 17 GHz  
1.80 dBm



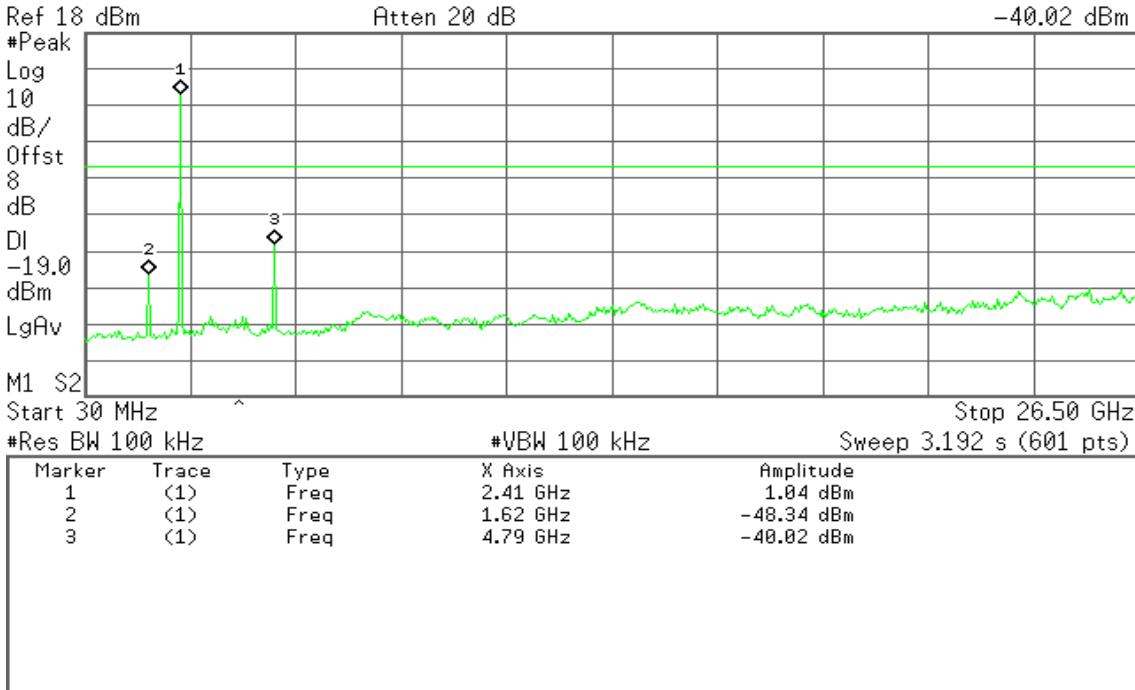


## GFSK / CH Low

Agilent 08:45:06 Aug 20, 2010

R L

Mkr3 4.79 GHz  
-40.02 dBm

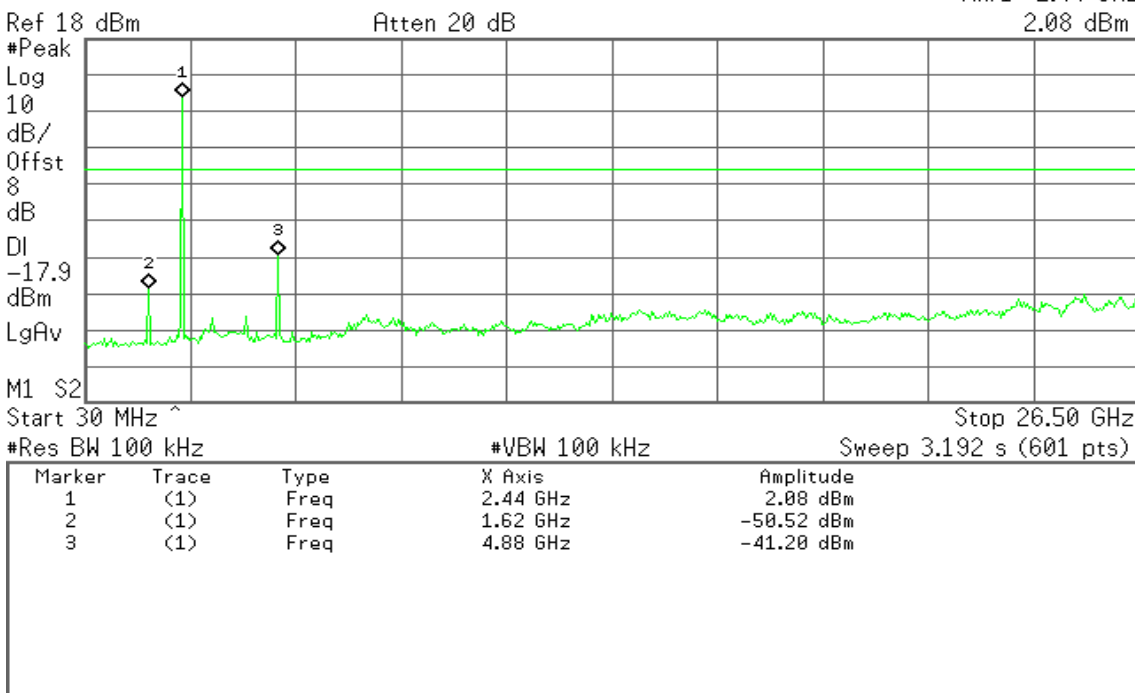


## GFSK / CH Mid

Agilent 08:46:20 Aug 20, 2010

R L

Mkr1 2.44 GHz  
2.08 dBm



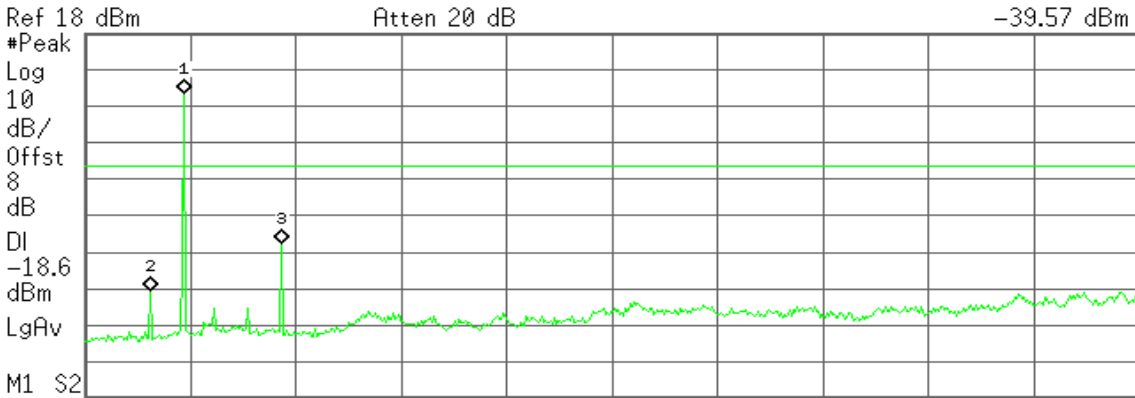


## GFSK / CH High

Agilent 08:47:32 Aug 20, 2010

R L

Mkr3 4.97 GHz  
-39.57 dBm



Start 30 MHz Stop 26.50 GHz  
#Res BW 100 kHz #VBW 100 kHz Sweep 3.192 s (601 pts)

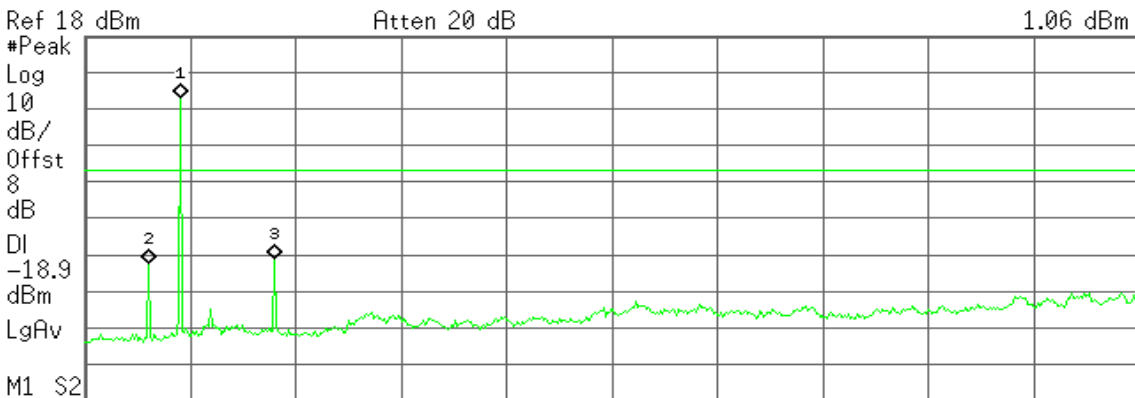
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.48 GHz	1.42 dBm
2	(1)	Freq	1.66 GHz	-52.41 dBm
3	(1)	Freq	4.97 GHz	-39.57 dBm

## 8DPSK / CH Low

Agilent 09:42:21 Aug 20, 2010

R L

Mkr1 2.41 GHz  
1.06 dBm



Start 30 MHz Stop 26.50 GHz  
#Res BW 100 kHz #VBW 100 kHz Sweep 3.192 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.41 GHz	1.06 dBm
2	(1)	Freq	1.62 GHz	-44.23 dBm
3	(1)	Freq	4.79 GHz	-43.19 dBm

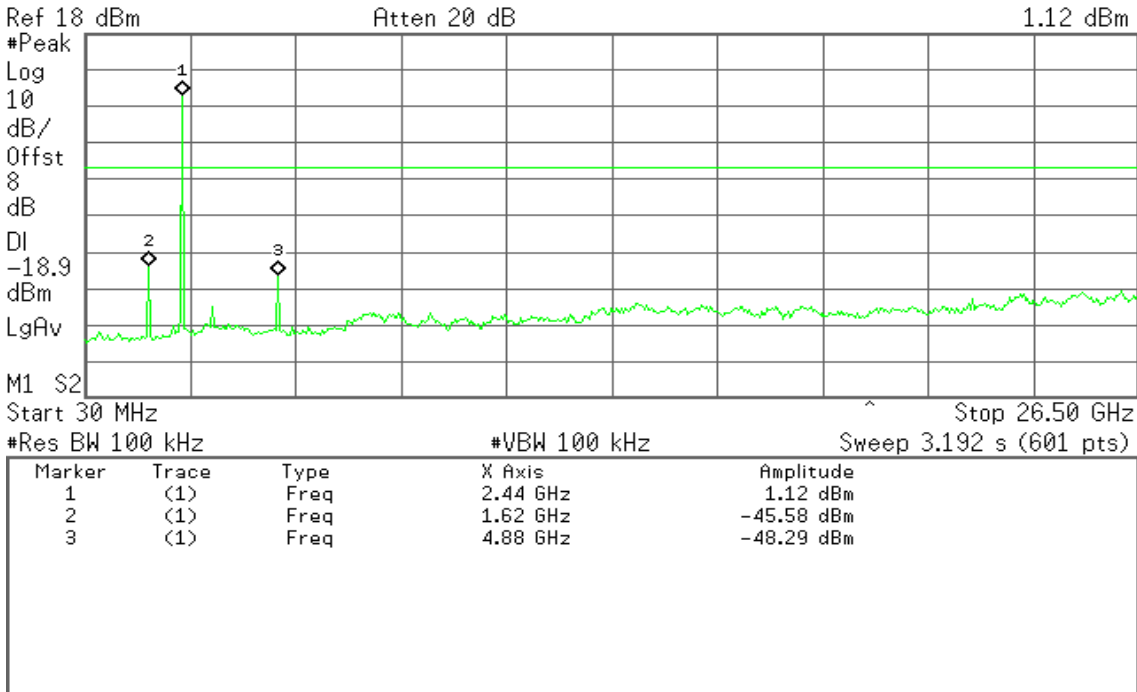


## 8DPSK / CH Mid

Agilent 09:37:09 Aug 20, 2010

R L

Mkr1 2.44 GHz  
1.12 dBm

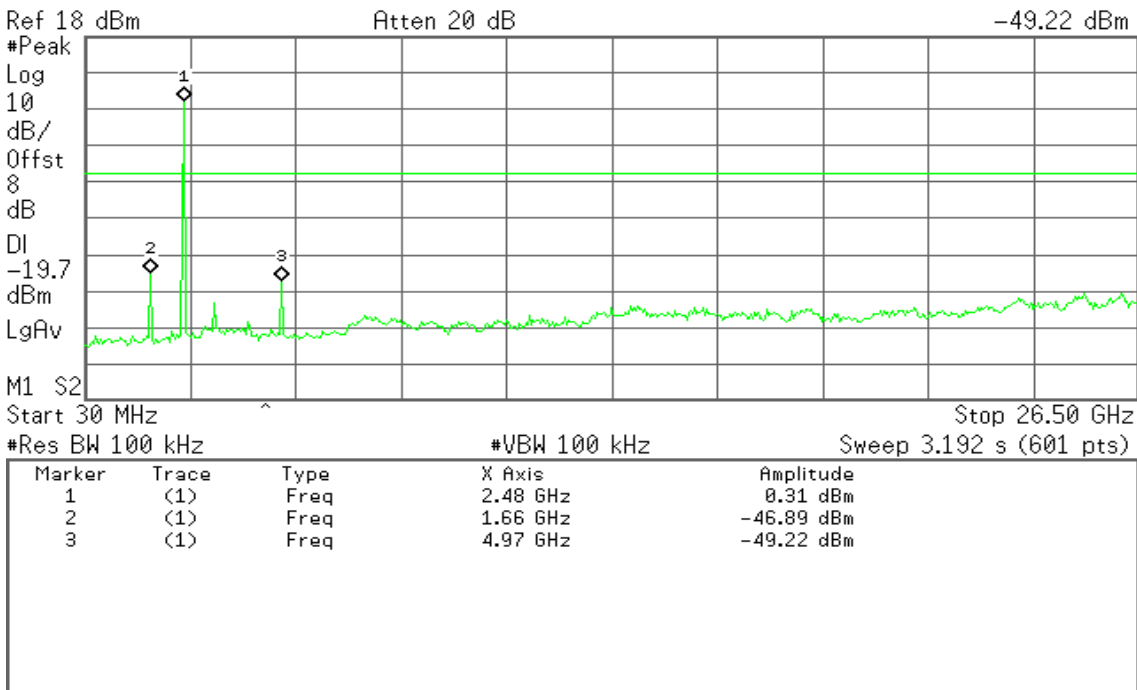


## 8DPSK / CH High

Agilent 09:32:42 Aug 20, 2010

R L

Mkr3 4.97 GHz  
-49.22 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 ( $\mu\text{V/m}$ )	Measurement Distance (m)
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.

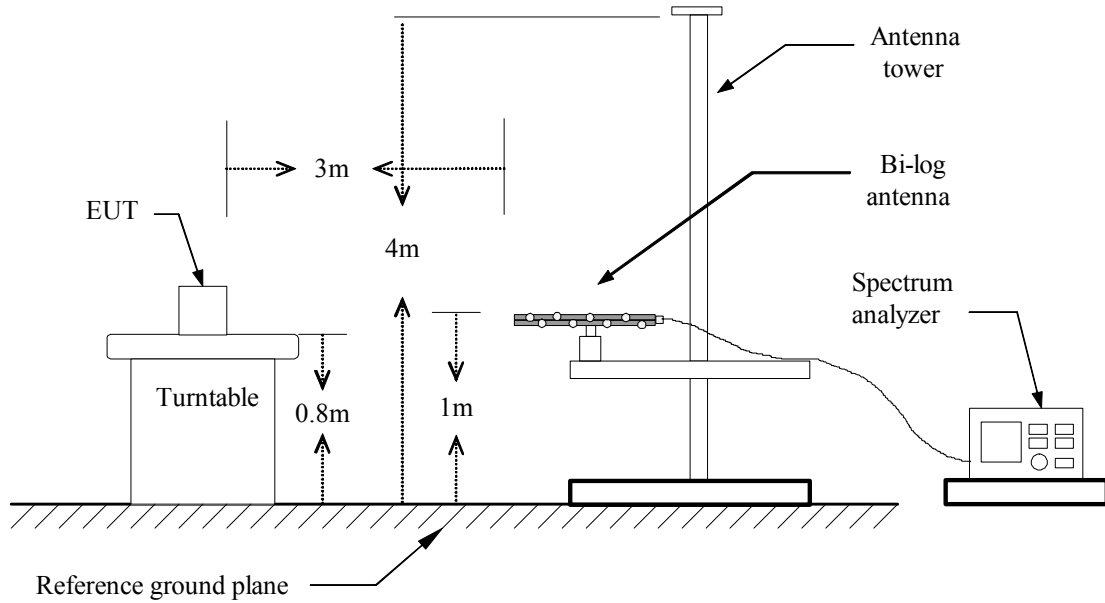
2. In the emission table above, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength ( $\text{dB}\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

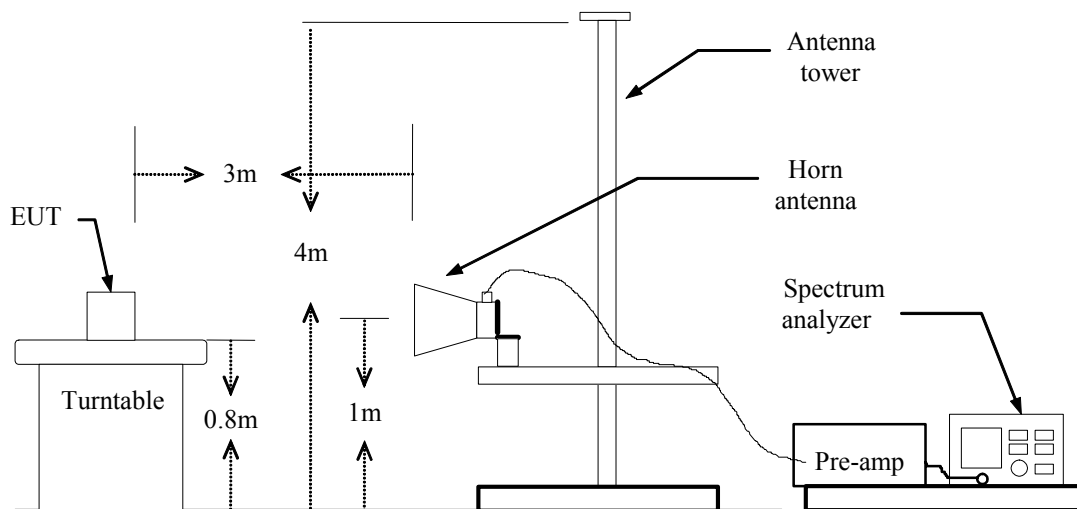


## TEST CONFIGURATION

### Below 1 GHz



### 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 1GHz:  
                    RBW=100kHz / VBW=300kHz / Sweep=AUTO  
Above 1GHz:  
                    (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
                    (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

## **TEST RESULTS**

*No non-compliance noted*



**TEST DATA**

**Below 1 GHz**

Operation Mode: TX

Test Date: Sep. 8, 2010

Temperature: 18°C

Tested by: Stan Lin

Humidity: 60 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit 3m (dBuV/m)	Safe Margin (dB)
32.7486	V	QP	48.79	-14.67	34.12	40.00	-5.88
51.8250	V	QP	44.33	-14.16	30.17	40.00	-9.83
90.6250	V	QP	46.56	-18.13	28.43	43.50	-15.07
236.1250	V	QP	47.03	-13.77	33.26	46.00	-12.74
267.6500	V	QP	55.64	-12.12	43.52	46.00	-2.48
277.3500	V	QP	55.00	-11.88	43.12	46.00	-2.88
289.4750	V	QP	51.55	-11.47	40.08	46.00	-5.92
352.5250	V	QP	47.62	-9.65	37.97	46.00	-8.03
236.1250	H	QP	55.06	-13.77	41.29	46.00	-4.71
267.6500	H	QP	53.60	-12.12	41.48	46.00	-4.52
277.3500	H	QP	51.74	-11.88	39.86	46.00	-6.14
289.4750	H	QP	50.16	-11.47	38.69	46.00	-7.31
374.3500	H	QP	46.70	-9.57	37.13	46.00	-8.87
405.8750	H	QP	48.44	-9.33	39.11	46.00	-6.89
490.7500	H	QP	38.83	-7.30	31.53	46.00	-14.47
619.2750	H	QP	35.95	-4.36	31.59	46.00	-14.41

**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.



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

## Above 1 GHz

### GFSK

**Operation Mode:** TX / CH Low

**Test Date:** Aug. 18, 2010

**Temperature:** 25°C

**Tested by:** Alonso Lu

**Humidity:** 50 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1603.33	V	54.21	---	-3.31	50.91	---	74.00	54.00	-3.09	Peak
2220.00	V	49.33	---	0.73	50.05	---	74.00	54.00	-3.95	Peak
4808.33	V	43.93	---	6.25	50.18	---	74.00	54.00	-3.82	Peak
N/A										
1603.33	H	56.97	---	-6.02	50.95	---	74.00	54.00	-3.05	Peak
2650.00	H	49.31	---	-0.14	49.17	---	74.00	54.00	-4.83	Peak
4800.00	H	43.52	37.90	7.73	51.25	45.63	74.00	54.00	-8.37	AVG
N/A										

### **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).



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

Operation Mode: TX / CH Mid

Test Date: Aug. 18, 2010

Temperature: 25°C

Tested by: Alonso Lu

Humidity: 50 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1626.67	V	53.68	---	-3.14	50.54	---	74.00	54.00	-3.46	Peak
2340.00	V	48.25	---	0.77	49.02	---	74.00	54.00	-4.98	Peak
4883.33	V	48.03	41.30	7.44	55.46	48.74	74.00	54.00	-5.26	AVG
N/A										
1626.67	H	57.15	55.39	-5.46	51.69	49.93	74.00	54.00	-4.07	AVG
4883.33	H	47.21	41.23	7.75	54.96	48.98	74.00	54.00	-5.02	AVG
N/A										

**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).



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

**Operation Mode:** TX / CH High

**Test Date:** Aug. 18, 2010

**Temperature:** 25°C

**Tested by:** Alonso Lu

**Humidity:** 50 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1653.33	V	54.31	51.09	-2.95	51.36	48.14	74.00	54.00	-5.86	AVG
2230.00	V	48.45	---	0.69	49.14	---	74.00	54.00	-4.86	Peak
4958.33	V	45.14	39.50	6.96	52.10	46.46	74.00	54.00	-7.54	Peak
N/A										
1653.33	H	57.02	54.57	-4.81	52.20	49.76	74.00	54.00	-4.24	AVG
2083.33	H	49.96	---	-1.96	48.00	---	74.00	54.00	-6.00	Peak
4958.33	H	46.20	41.10	8.75	54.95	49.85	74.00	54.00	-4.15	AVG
N/A										

**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).



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

## 8DPSK

Operation Mode: TX / CH Low

Test Date: Aug. 18, 2010

Temperature: 25°C

Tested by: Alonso Lu

Humidity: 50 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1603.33	V	54.25	---	-3.31	50.94	---	74.00	54.00	-3.06	Peak
2223.33	V	49.69	---	0.71	50.40	---	74.00	54.00	-3.60	Peak
4808.33	V	40.92	---	6.25	47.18	---	74.00	54.00	-6.82	Peak
N/A										
1603.33	H	57.43	55.38	-6.02	51.41	49.36	74.00	54.00	-4.64	AVG
2300.00	H	49.33	---	-1.32	48.01	---	74.00	54.00	-5.99	Peak
4833.33	H	38.10	---	7.74	45.84	---	74.00	54.00	-8.16	Peak
N/A										

### 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).



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

**Operation Mode:** TX / CH Mid

**Test Date:** Aug. 18, 2010

**Temperature:** 25°C

**Tested by:** Alonso Lu

**Humidity:** 50 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1626.67	V	55.50	51.46	-3.14	52.36	48.32	74.00	54.00	-5.68	AVG
4883.33	V	41.90	---	7.44	49.34	---	74.00	54.00	-4.66	Peak
3916.67	V	38.96	---	7.28	46.24	---	74.00	54.00	-7.76	Peak
N/A										
1626.67	H	57.36	55.02	-5.46	51.90	49.56	74.00	54.00	-4.44	Peak
2593.33	H	48.84	---	0.11	48.95	---	74.00	54.00	-5.05	Peak
4883.33	H	43.74	32.97	7.75	51.48	40.72	74.00	54.00	-13.28	Peak
N/A										

**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).



# Compliance Certification Services Inc.

Report No: T110914302-RP1

FCC ID: IHDP6LO2

Date of Issue: Sep. 19, 2011

**Operation Mode:** TX / CH High

**Test Date:** Aug. 18, 2010

**Temperature:** 25°C

**Tested by:** Alonso Lu

**Humidity:** 50 % RH

**Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1653.33	V	53.30	---	-2.95	50.35	---	74.00	54.00	-3.65	Peak
2736.67	V	48.24	---	1.37	49.62	---	74.00	54.00	-4.38	Peak
4958.33	V	41.36	---	6.96	48.32	---	74.00	54.00	-5.68	Peak
N/A										
1653.33	H	57.65	55.26	-4.81	52.84	50.45	74.00	54.00	-3.55	AVG
4958.33	H	40.35	---	8.75	49.11	---	74.00	54.00	-4.89	Peak
N/A										

**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**

***Not applicable, because EUT does not connect to AC Main Source.***



# APPENDIX I RADIO FREQUENCY EXPOSURE

## LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

## EUT SPECIFICATION

<b>EUT</b>	Car Kit
<b>Frequency band (Operating)</b>	<input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others <u>Bluetooth: 2.402GHz ~ 2.480GHz</u>
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others _____
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure ( $S = 5mW/cm^2$ ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S=1mW/cm^2$ )
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	2.95 dBm (1.97mW)
<b>Antenna gain (Max)</b>	1.96 dBi (Numeric gain: 1.57)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
<b>Remark:</b>	
1. <u>The maximum output power is 2.95 dBm (1.97mW) at 2480MHz (with 1.57 numeric antenna gain.)</u>	

## TEST RESULTS

No non-compliance noted.



## Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

## Maximum Permissible Exposure

EUT output power = 1.97mW

Numeric Antenna gain = 1.57

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

→ Power density = 0.0006 mW / cm<sup>2</sup>

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.)