FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Hands-Free Visor Car Kit for iPhone & BT Phones

Model: K33440

Brand Name: Kensington

Prepared for

ACCO Brands, Inc.
333 Twin Dolphin 6th Floor, Redwood Shores, California, United States

Prepared by

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.
(aka COMPLIANCE ENGINEERING SERVICE (CHINA))
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1. TEST RESULT CERTIFICATION

Applicant:	ACCO Brands, Inc. 333 Twin Dolphin 6th Floor, Redwood Shores, California, United States
Equipment Under Test:	Hands-Free Visor Car Kit for iPhone & BT Phones
Brand Name:	Kensington
Model:	K33440
Date of Test:	September 19- November 06,2008

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 conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and 15.247.

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

Approved by:

Clinton Kao
Manager
Compliance Certification Service Inc.

Reviewed by:

Vincent Yao
Assistant manager
Compliance Certification Service Inc.

2. EUT DESCRIPTION

Product	Hands-Free Visor Car Kit for iPhone & BT Phones
Brand Name	Kensington
Model Number	K33440
Model Discrepancy	N/A
Power Supply	DC3.6V supplied by the battery
Frequency Range	2402 ~ 2480 MHz
Transmit Power	2.53 dBm
Modulation Technique	FHSS(GFSK, π/4-DQPSK, 8DPSK)
Number of Channels	79 Channels
Antenna Specification	IFA Antenna Gain: 2.18 dBi (max)
Temperature Range	0 ~ +55°C

Note: *This submittal(s) (test report) is intended for FCC ID: GV3M01042-V 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: 2003. Radiated testing was performed at an antenna to EUT distance 3 meters.

3.1EUT 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.

3.2EUT 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.

3.3GENERAL 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003.

3.4FCC 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
[1]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	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] 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.

3.5DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) are chosen for full testing.

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.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

No. 5, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China

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 LABORATORY ACCREDITATIONS AND LISTING

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	**TAF**

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	**FCC**
Japan	**VCCI**
Canada	**INDUSTRY CANADA**
Taiwan	**BSMI**

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsemc.com.tw

6. SETUP OF EQUIPMENT UNDER TEST

6.1SETUP CONFIGURATION OF EUT

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

6.2SUPPORT EQUIPMENT

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Telephone	5200	2600CP1742	N/A	NOKIA	N/A	N/A
2	Notebook	2672	N/A	992F2VG	IBM	Unshielded 1.80m	Unshielded 1.80m

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *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

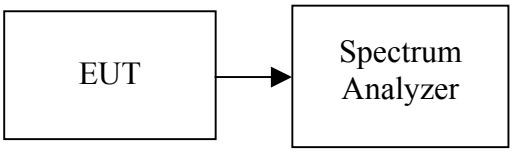
None; for reporting purpose only.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	**US44300399**	**02/24/2009**

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

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, then connect a low loss RF cable from antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=30kHz, VBW=30kHz, Span=3MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the test channels are investigated.

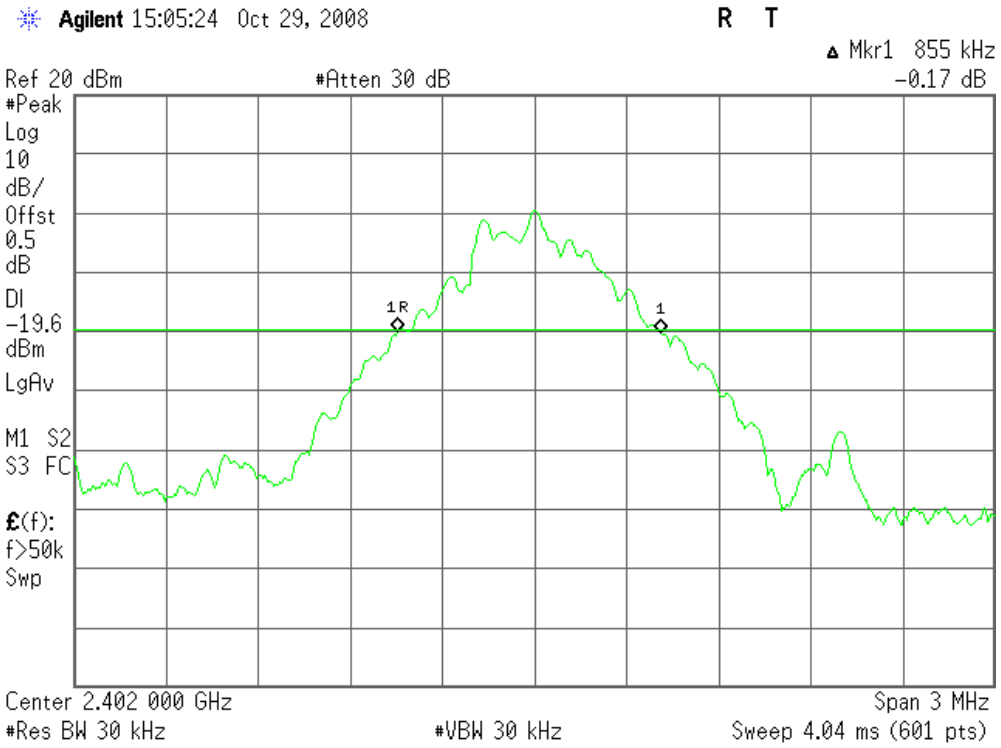
TEST RESULTS

No non-compliance noted

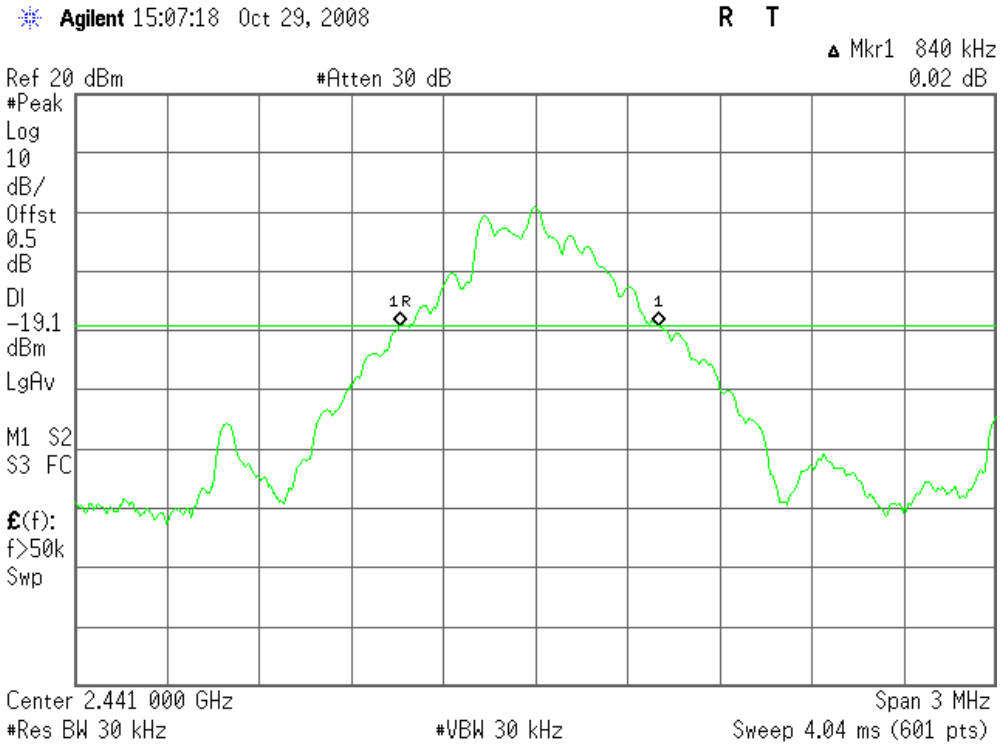
Test plot

GFSK

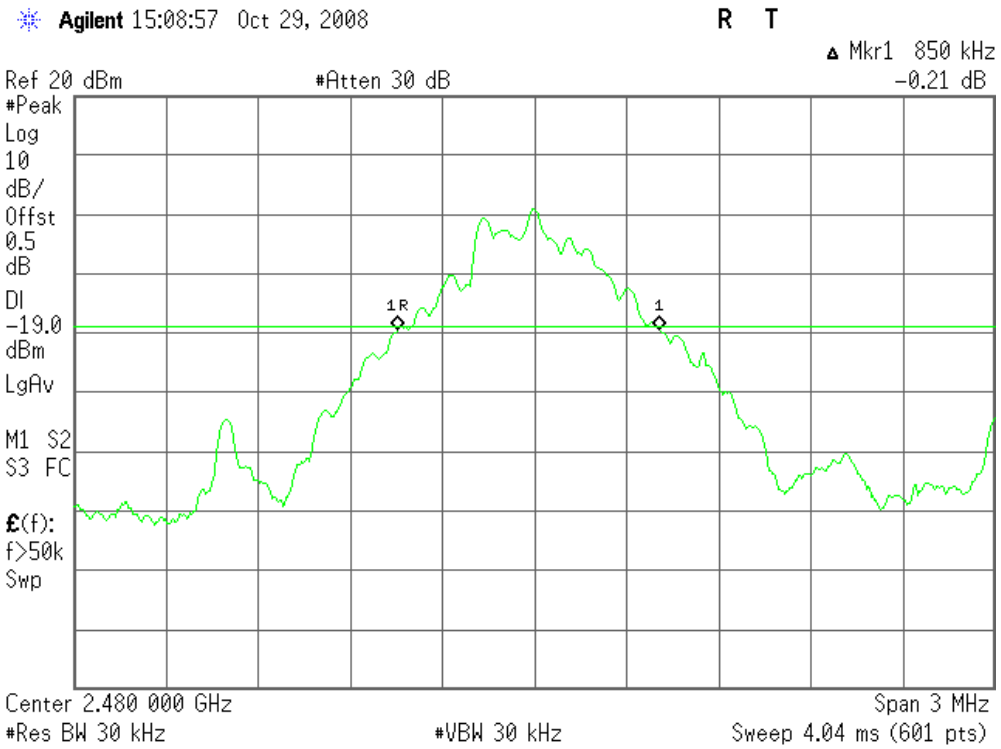
20dB Bandwidth (CH Low)



20dB Bandwidth (CH Mid)

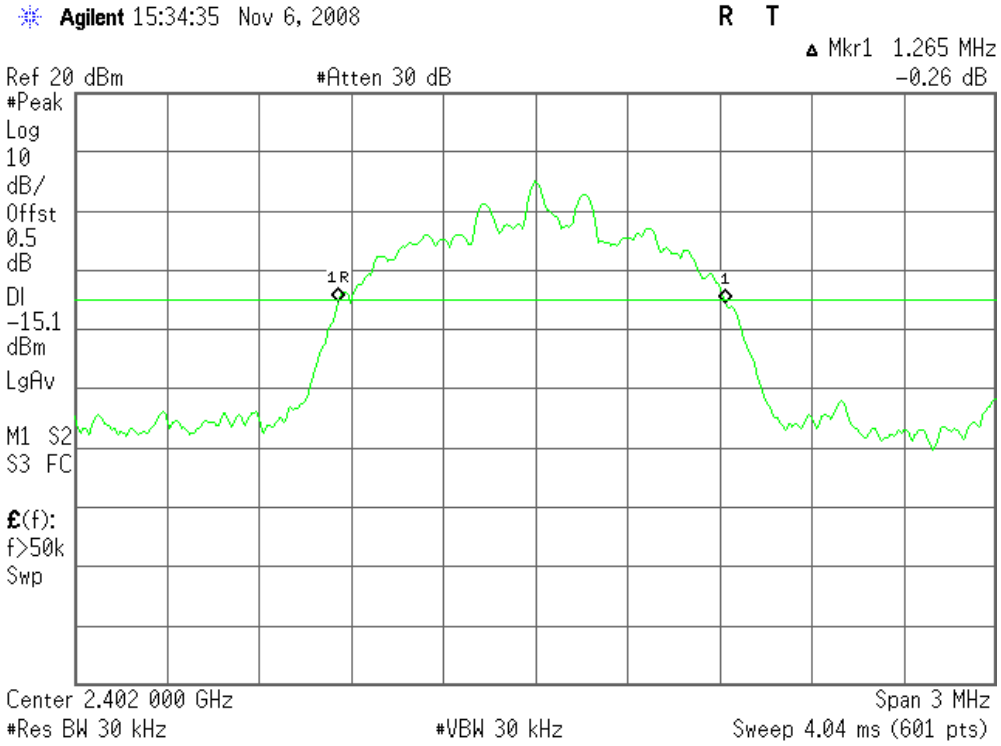


20dB Bandwidth (CH High)

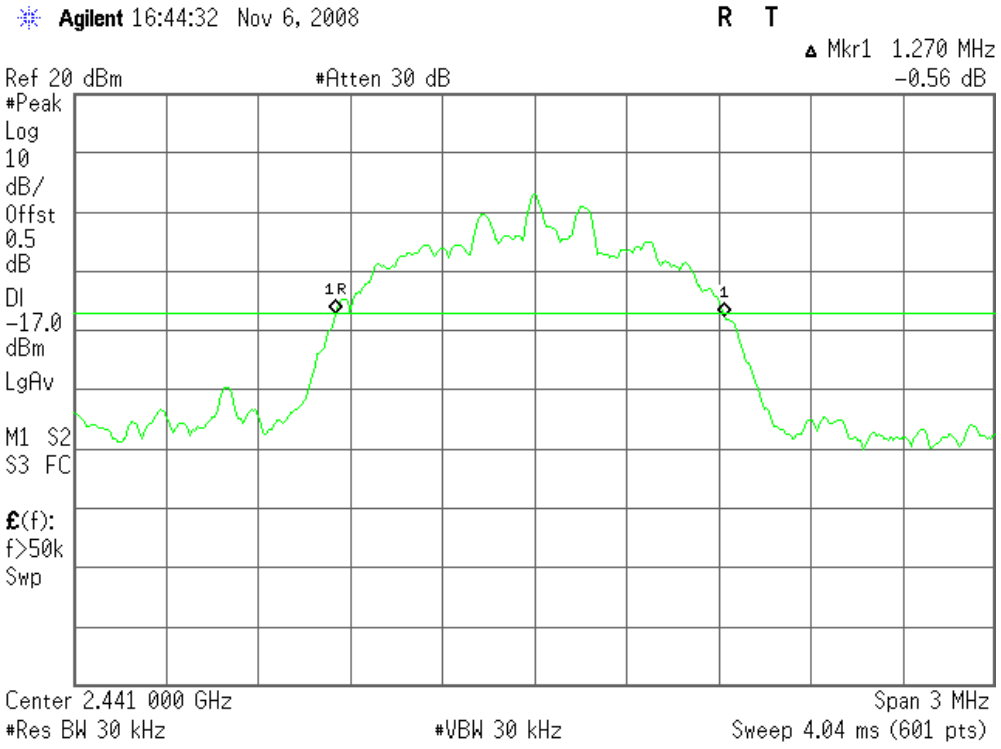


8DPSK

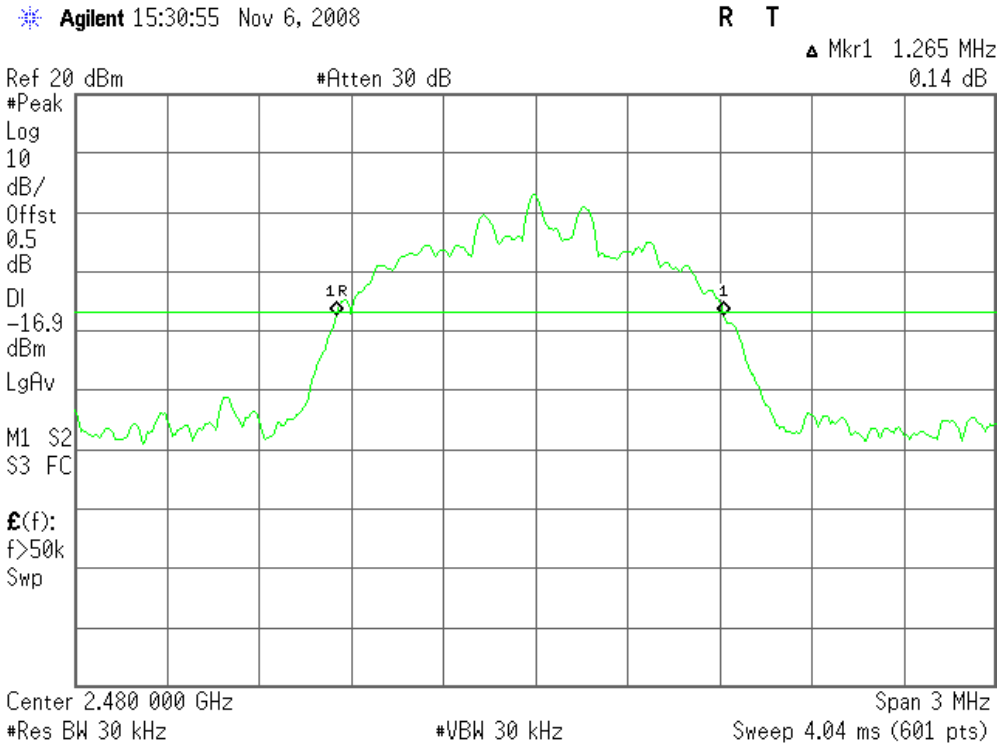
20dB Bandwidth (CH Low)



20dB Bandwidth (CH Mid)



20dB Bandwidth (CH High)



7.2PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

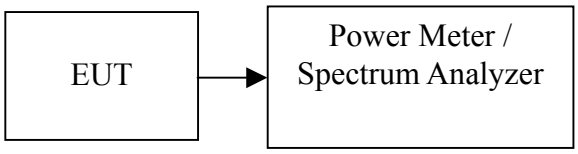
1. For systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
RF Power Meter & Sensor	Anritsu	ML2487A	6K00001491	02/23/2009
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009

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

Test Configuration



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted

Test Data

GFSK

Channel	Frequency (MHz)	Reading Power (dBm)	Factor (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	1.24	1.0	2.24	0.00167	1	PASS
Mid	2441	0.92	1.0	1.92	0.00156		PASS
High	2480	1.53	1.0	2.53	0.00179		PASS

8DPSK

Channel	Frequency (MHz)	Reading Power (dBm)	Factor (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	1.08	1.0	2.08	0.00161	1	PASS
Mid	2441	0.89	1.0	1.89	0.00155		PASS
High	2480	1.36	1.0	2.36	0.00172		PASS

7.3PEAK POWER SPECTRAL DENSITY

LIMIT

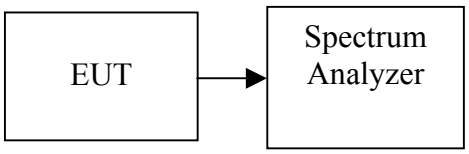
1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009

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

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 the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
4. Record the max. reading.
5. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

Not applicable. Since EUT is the Bluetooth device.

7.4BAND EDGES MEASUREMENT

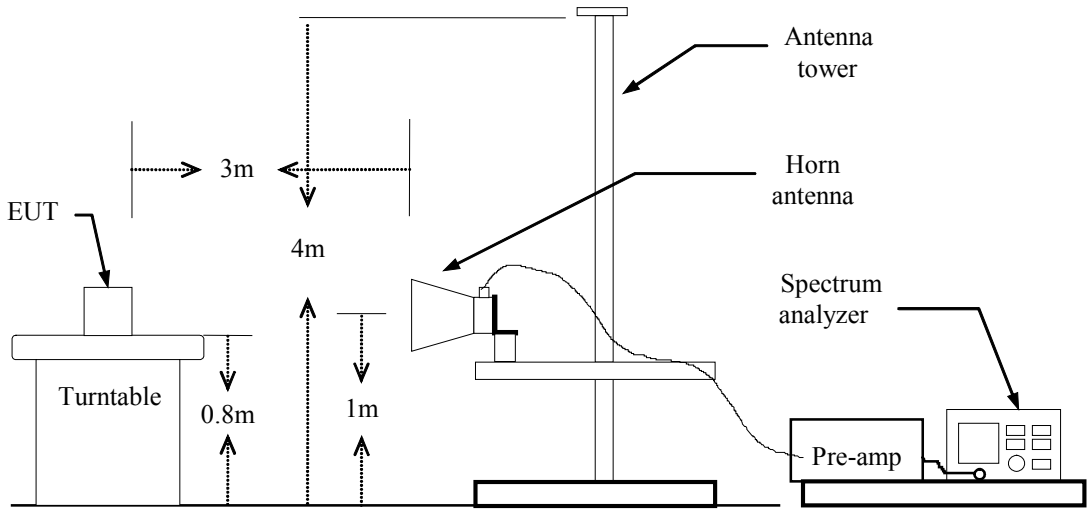
LIMIT

According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009
EMI Test Receiver	R&S	ESCI	1166.5950 03	01/13/2009
Low Noise Amplifier	MITEQ	AM-1604-3000	1123808	02/14/2009
Bilog Antenna	SCHWAZBECK	CBL6143	5082	06/09/2009
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	CT	N/A	N/A	N.C.R
Controller	CT	N/A	N/A	N.C.R
High Noise Amplifier	Agilent	89842	N/A	06/09/2009
Site NSA	C&C	N/A	N/A	06/09/2009
Horn Antenna	TRC	N/A	N/A	03/04/2009
Signal Generator	Anritsu	MG3694A	#050125	02/24/2009
Loop Antenna	ARA	PLA-1030/B	1029	02/24/2009

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

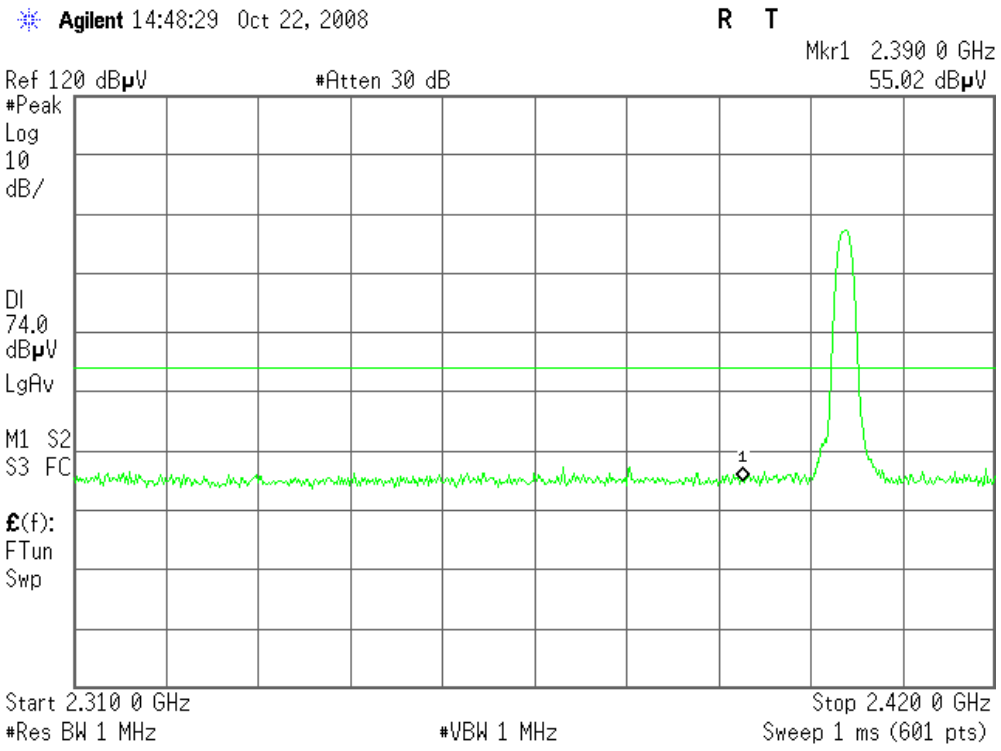
Refer to attach spectrum analyzer data chart.

Test Data

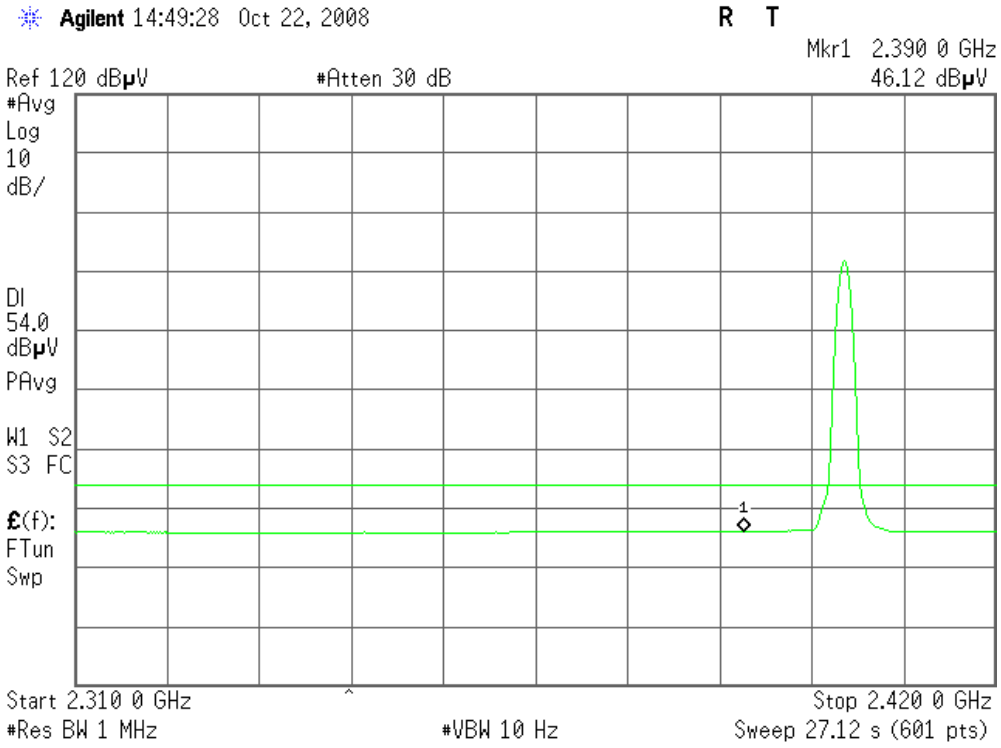
GFSK

Band Edges (CH-Low)

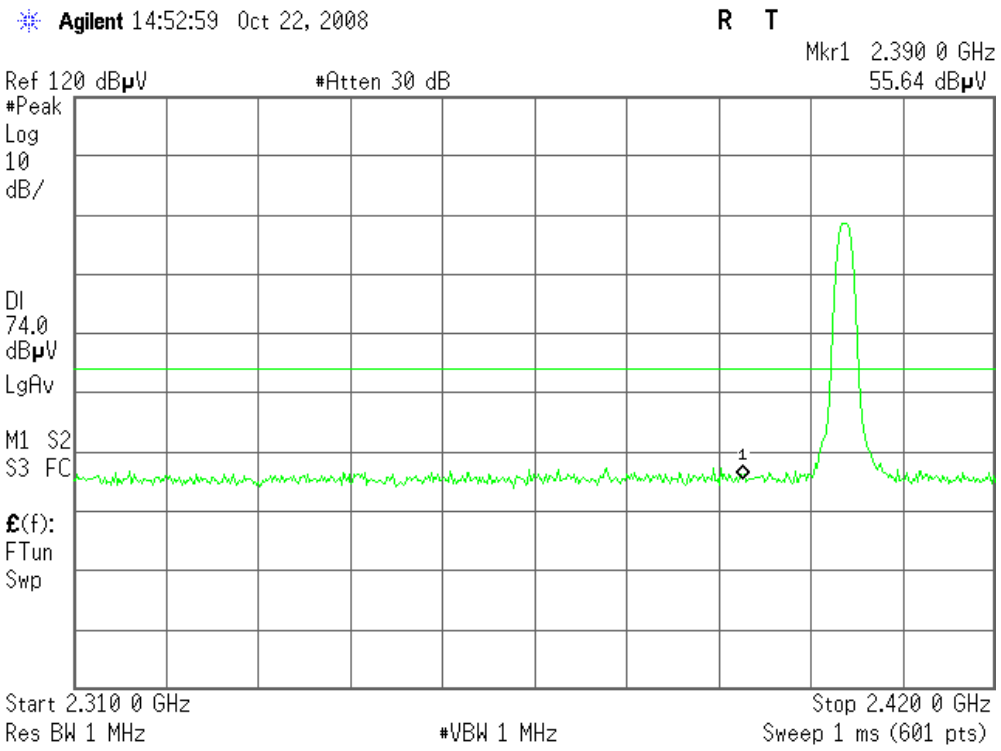
Detector mode: Peak **Polarity: Vertical**



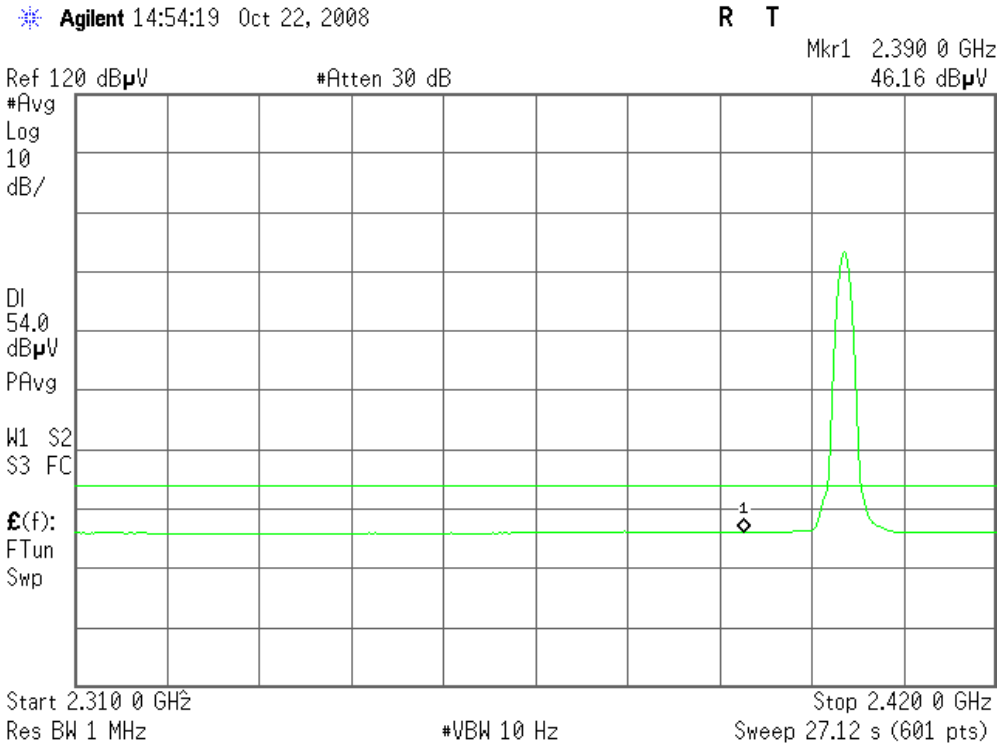
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

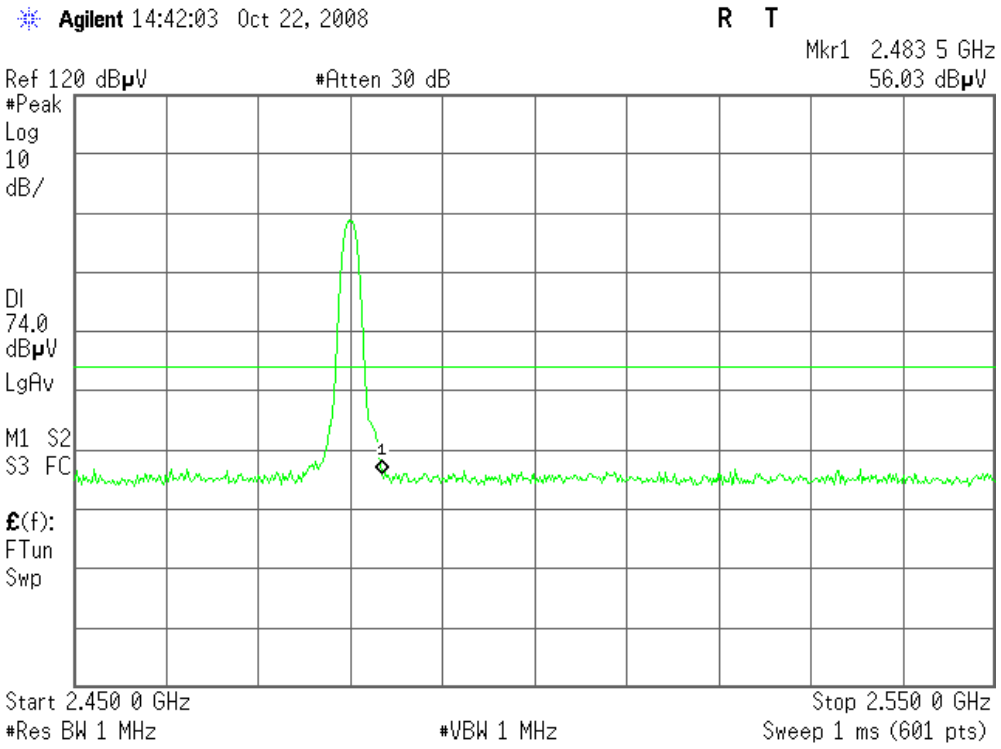


Detector mode: Average **Polarity: Horizontal**

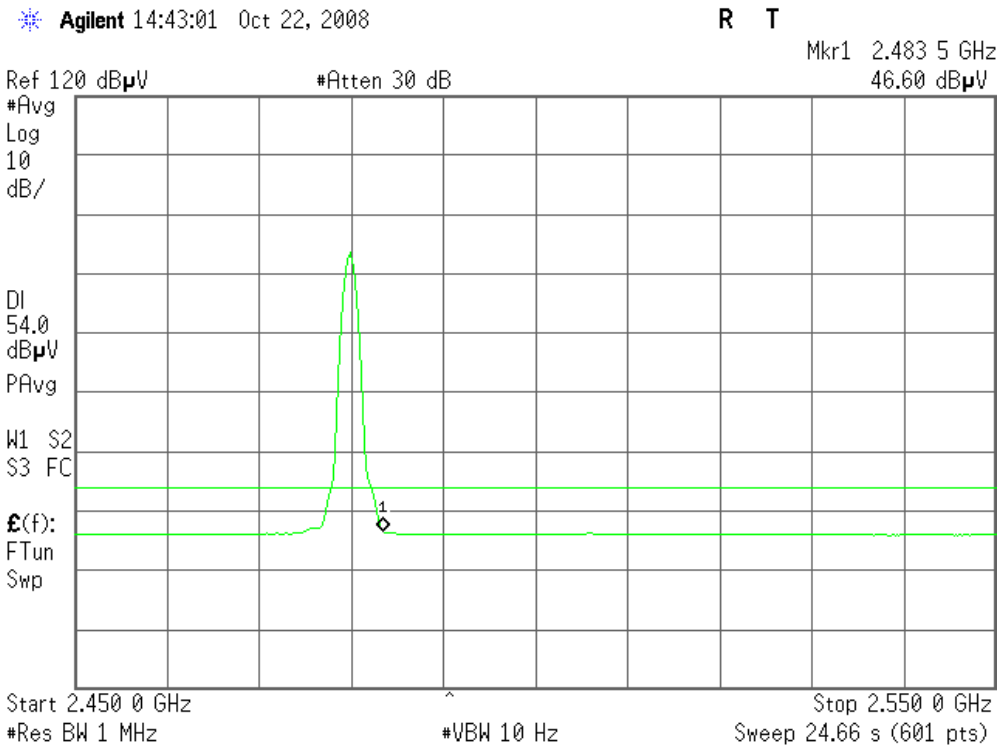


Band Edges (CH-High)

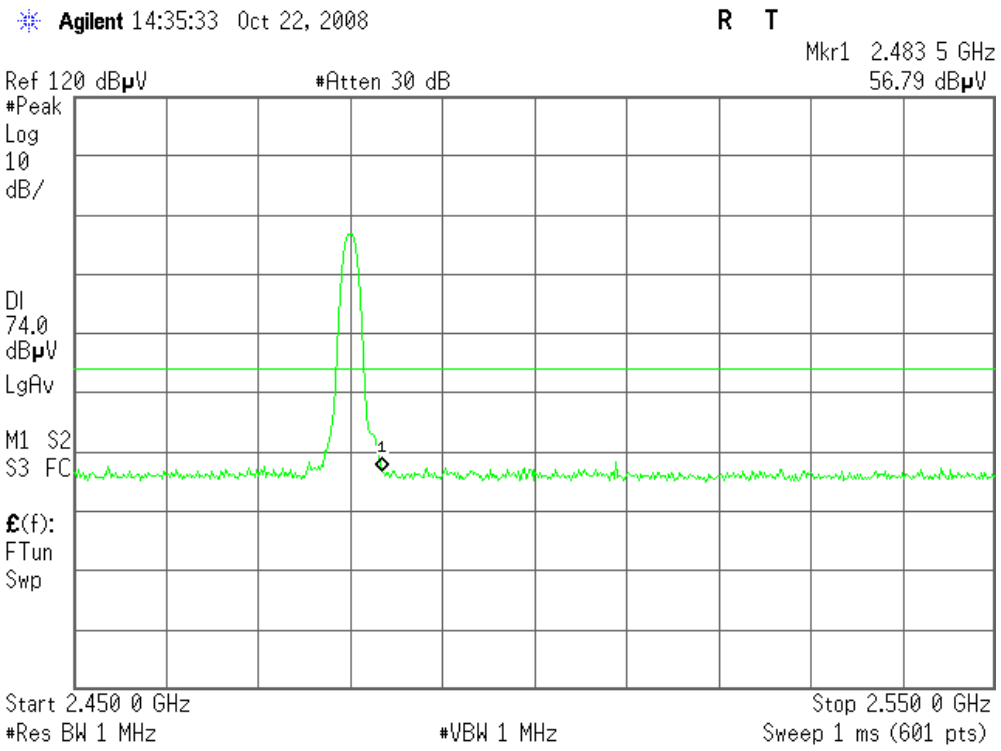
Detector mode: Peak Polarity: Vertical



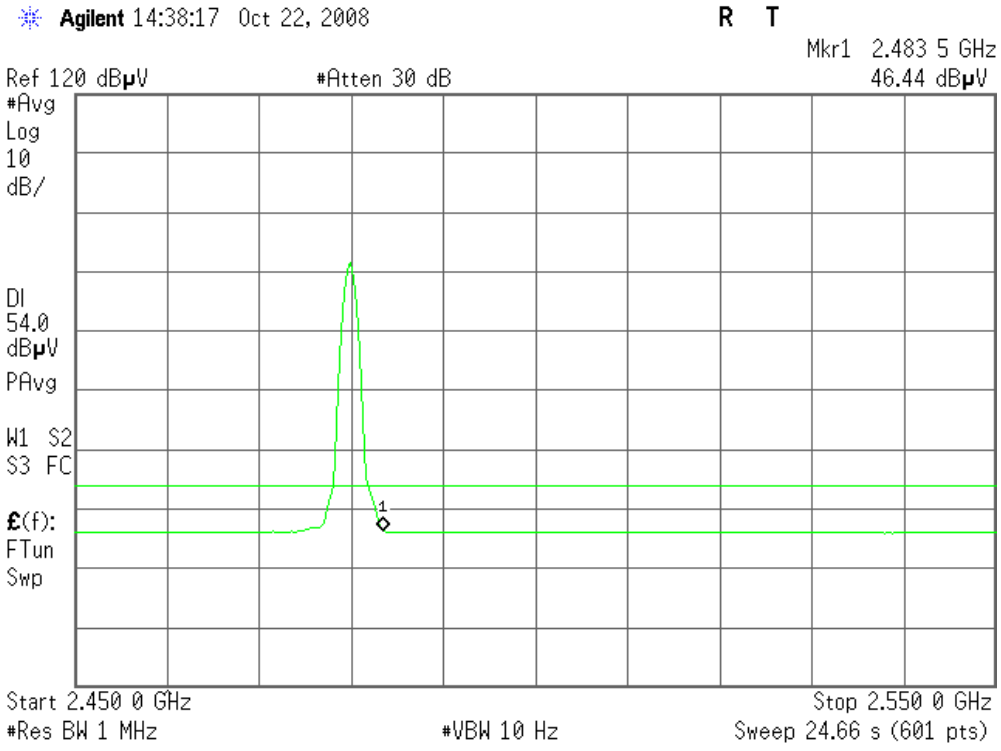
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



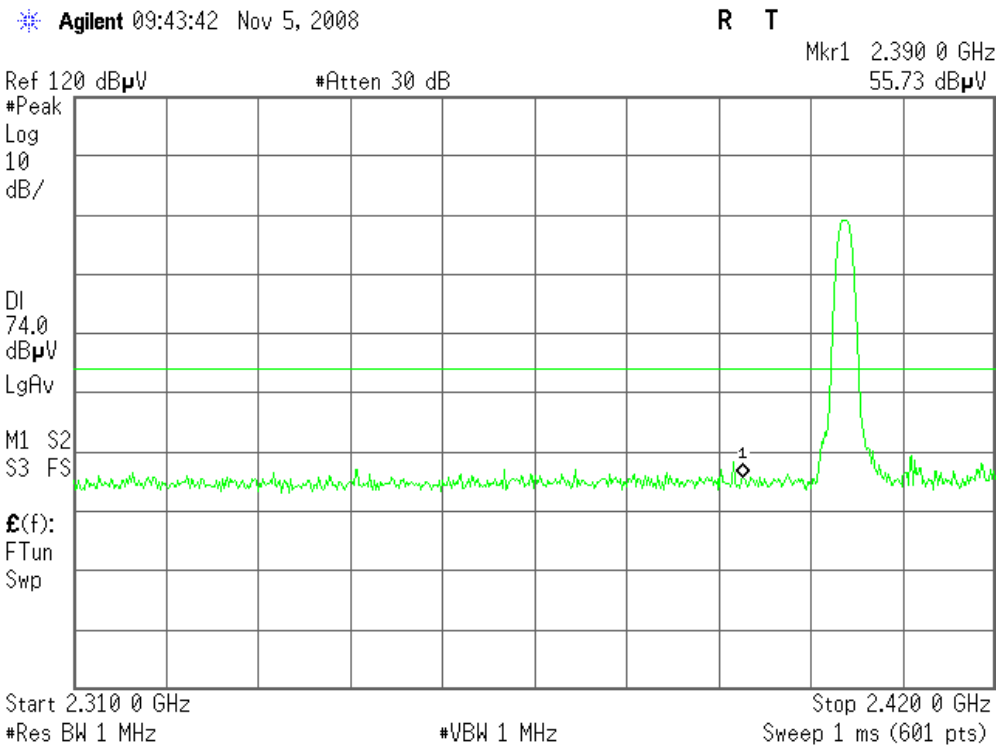
Detector mode: Average **Polarity: Horizontal**



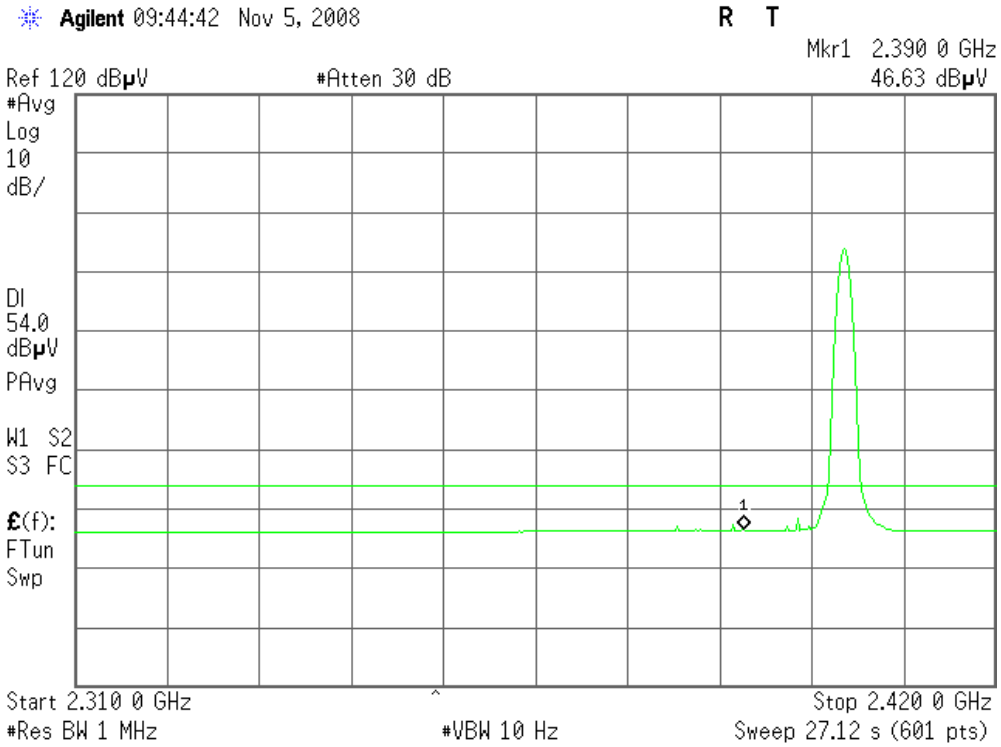
8DPSK

Band Edges (CH-Low)

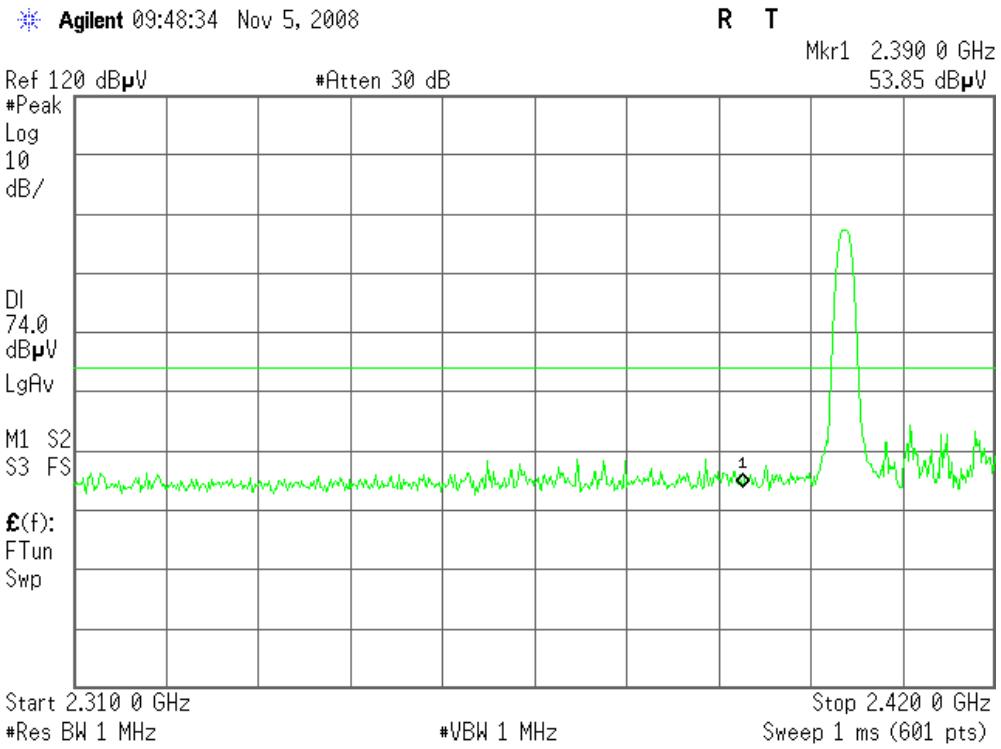
Detector mode: Peak **Polarity: Vertical**



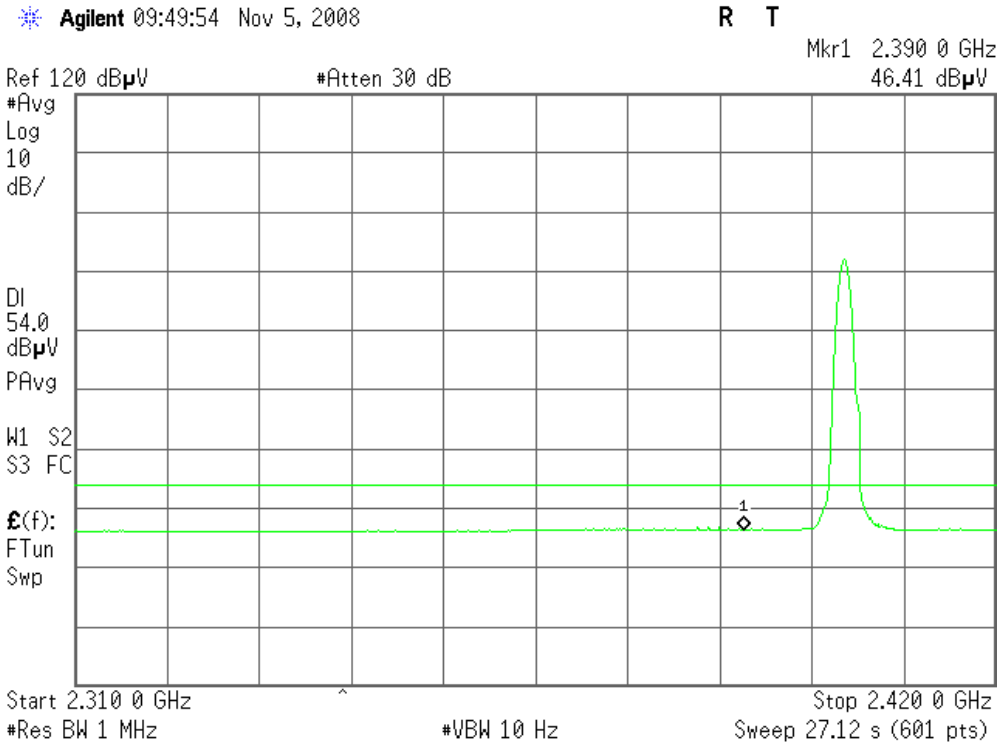
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

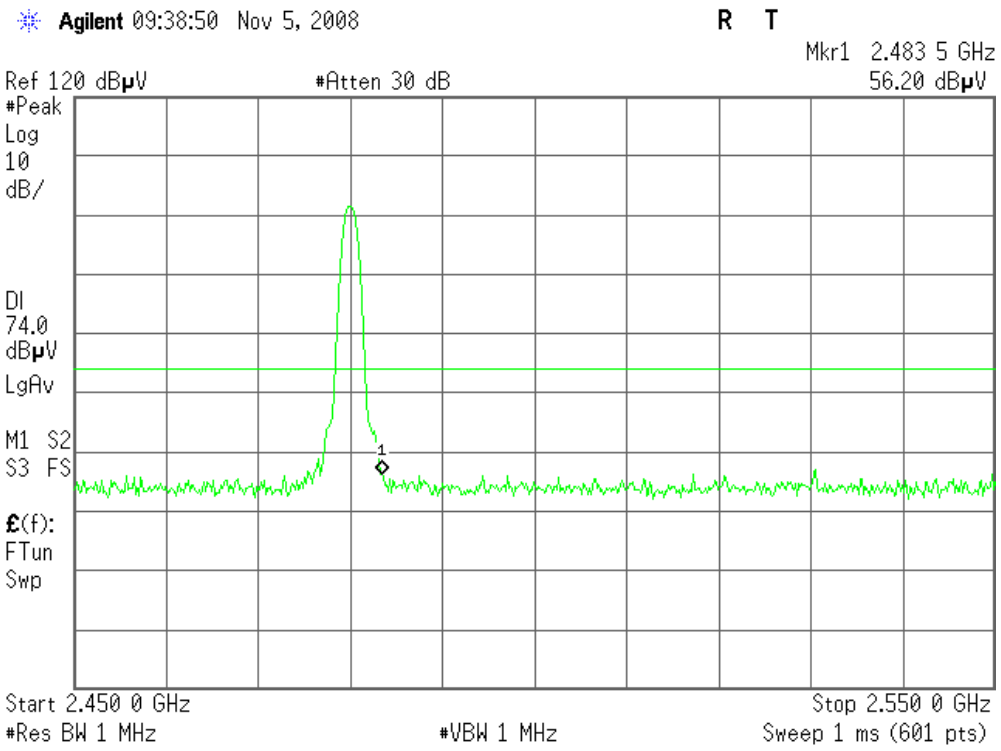


Detector mode: Average **Polarity: Horizontal**

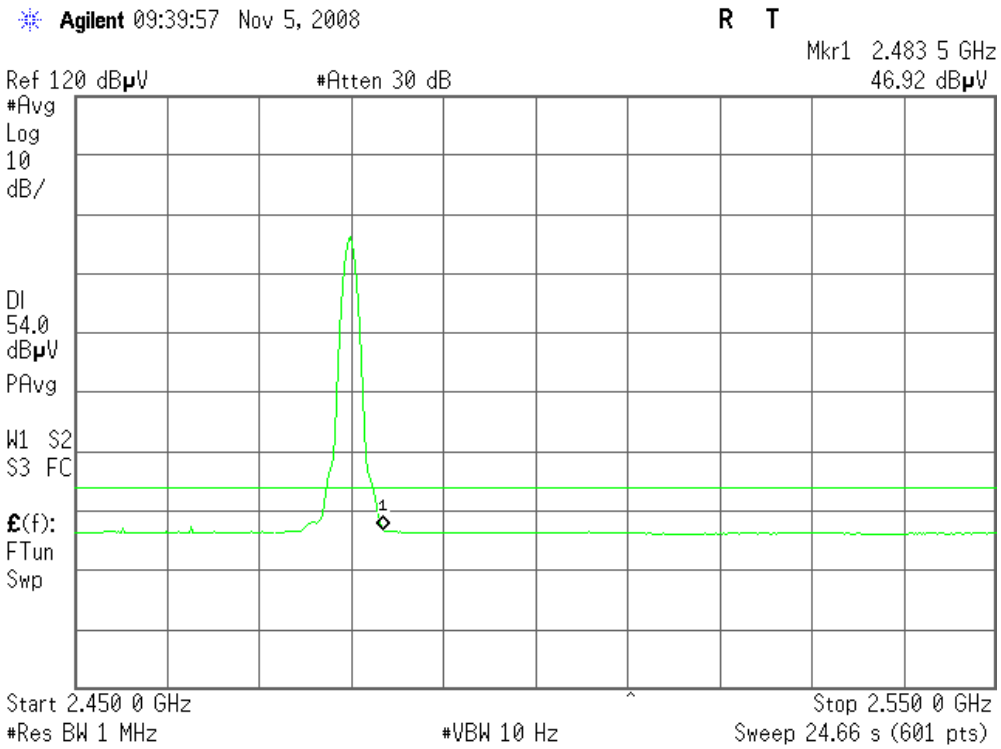


Band Edges (CH-High)

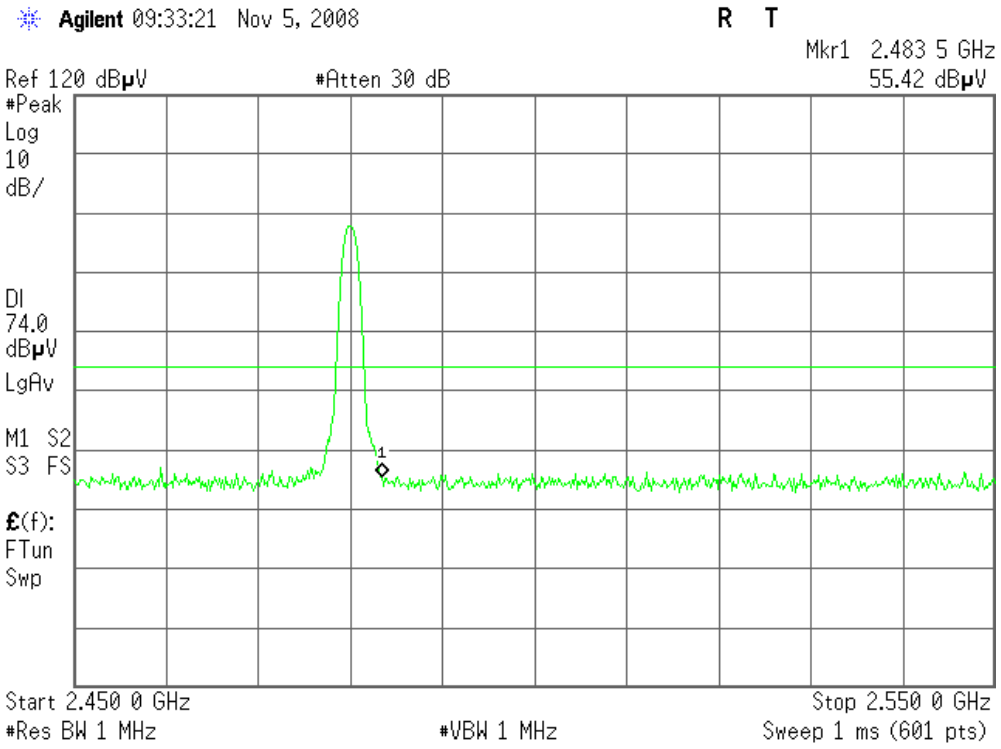
Detector mode: Peak Polarity: Vertical



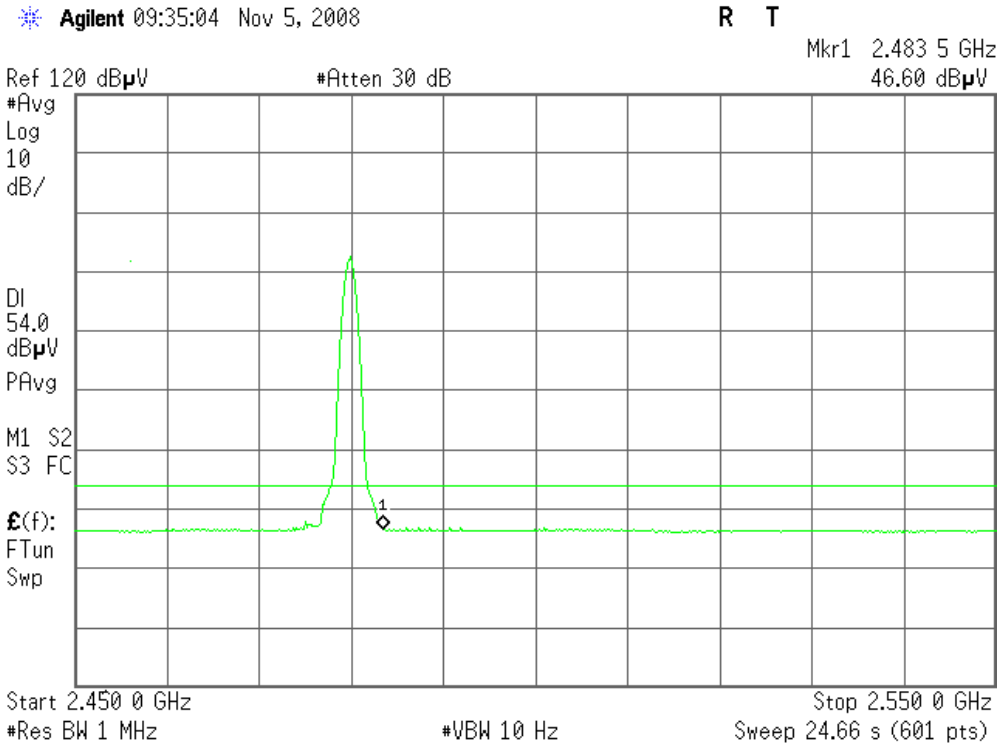
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



7.5FREQUENCY SEPARATION

LIMIT

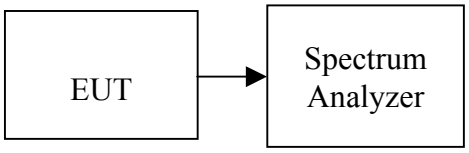
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/22/2009

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

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, VBW=30kHz, Adjust Span to 3 MHz, 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)	Limit (kHz)	Result
1.0	855kHz (20dB BW, Max)	Pass

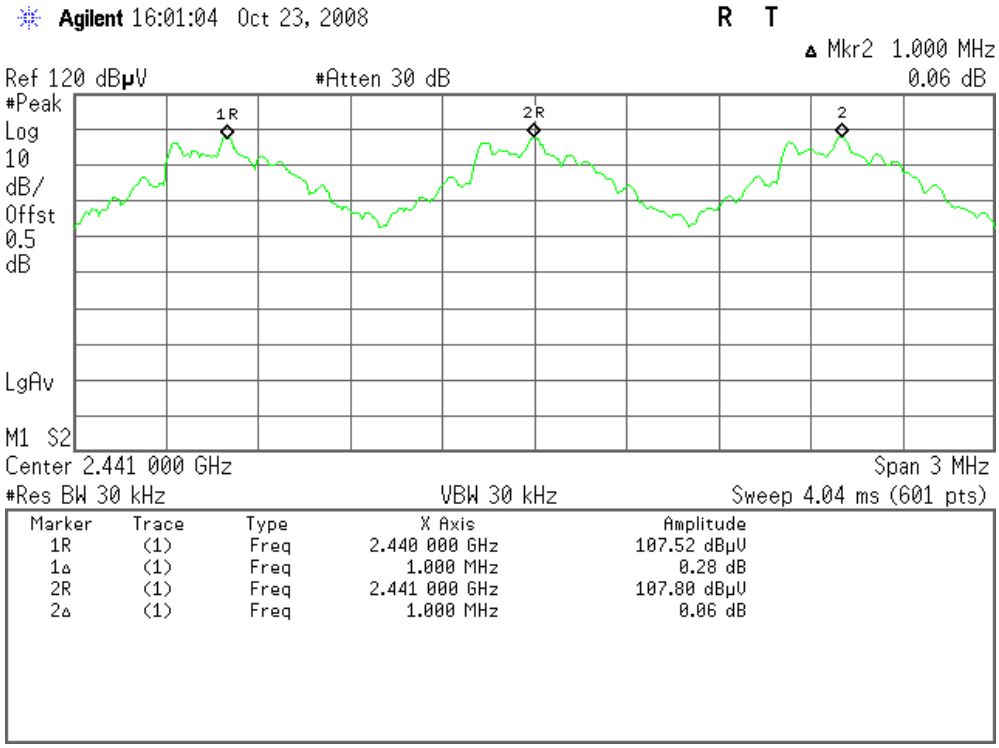
8DPSK

Channel Separation (MHz)	Limit (kHz)	Result
1.0	1270kHz (20dB BW, Max)	Pass

GFSK

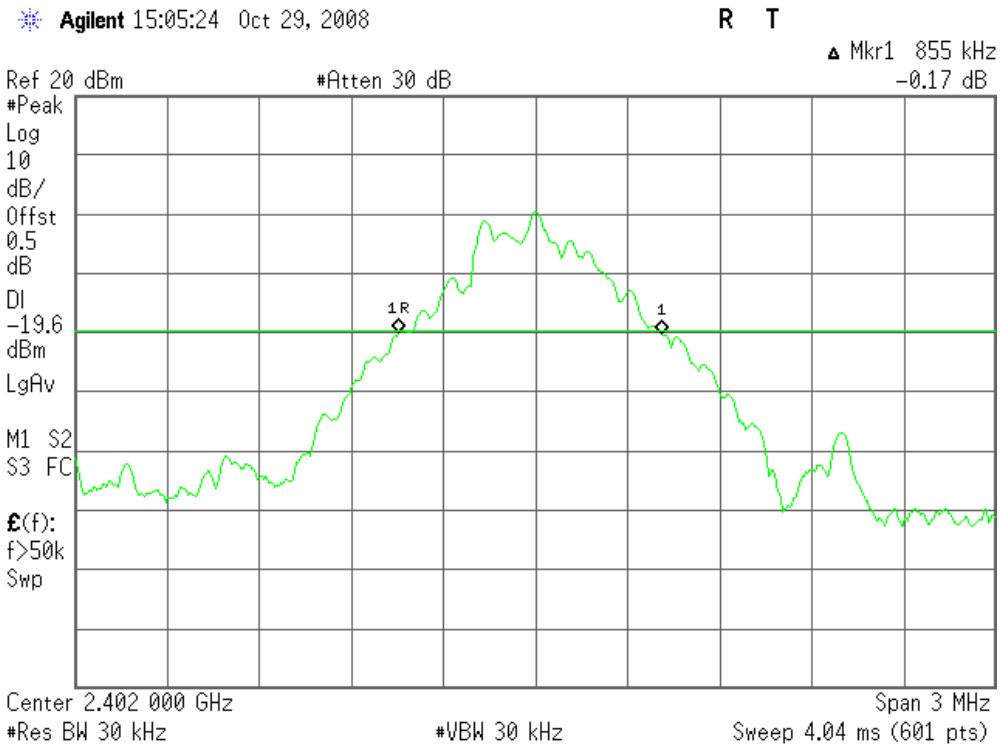
Test Plot

Measurement of Channel Separation



Marker	Trace	Type	X Axis	Amplitude
1R	(1)	Freq	2.440 000 GHz	107.52 dBµV
1Δ	(1)	Freq	1.000 MHz	0.28 dB
2R	(1)	Freq	2.441 000 GHz	107.80 dBµV
2Δ	(1)	Freq	1.000 MHz	0.06 dB

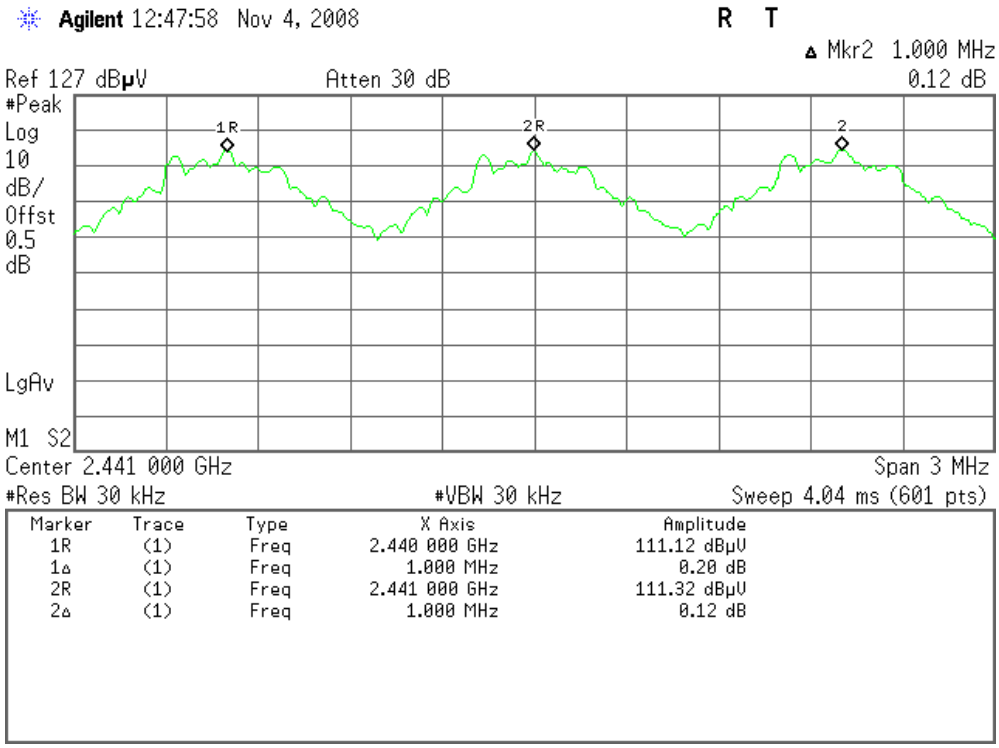
20 dB bandwidth(CH Low)



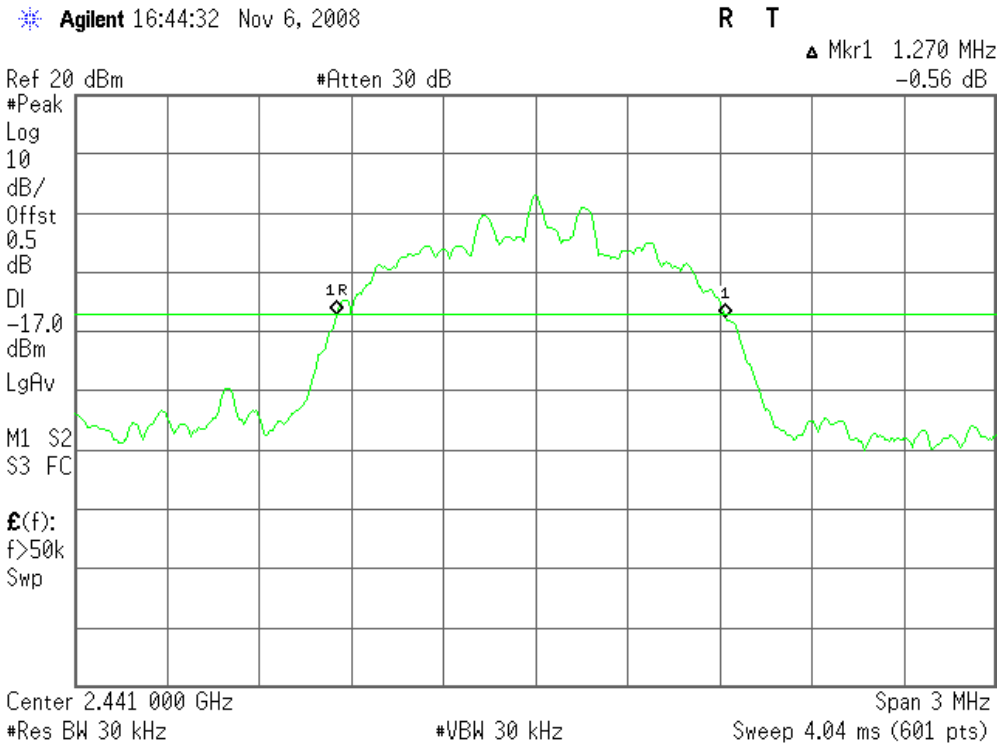
8DPSK

Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH Mid)



7.6NUMBER OF HOPPING FREQUENCY

LIMIT

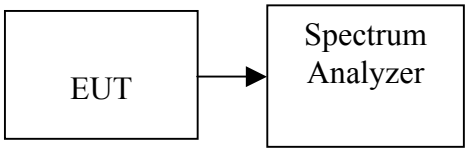
According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009

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

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 = 1ms and Start=2441.5MHz, Stop = 2483.5MHz, Sweep = 1ms.
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

GFSK / 8DPSK

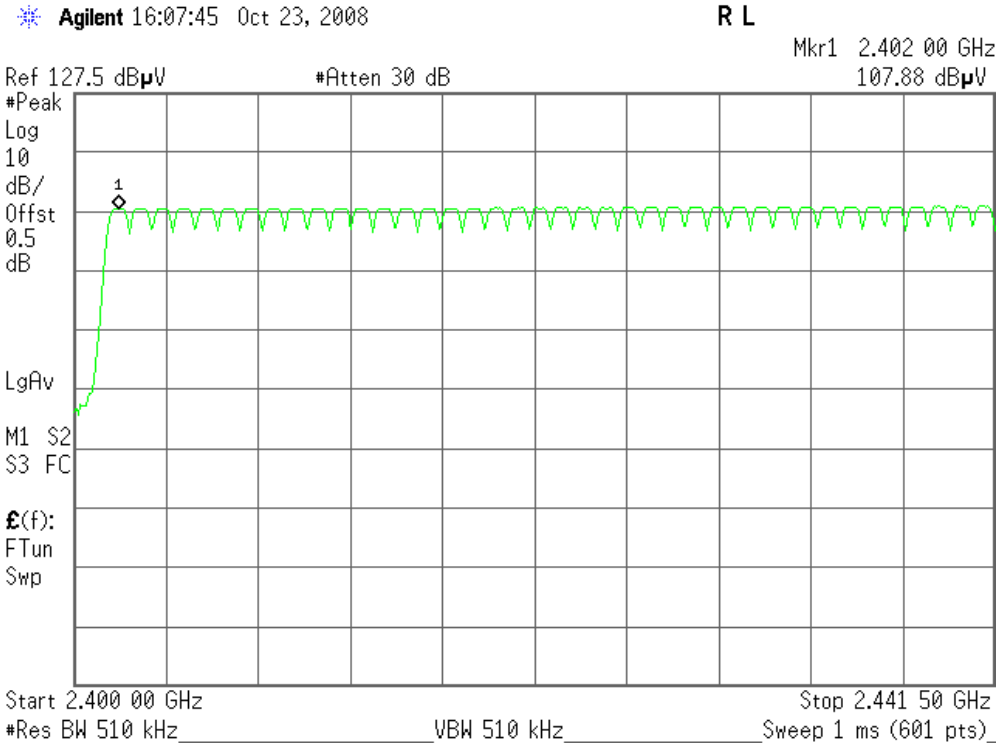
Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS

Test Plot

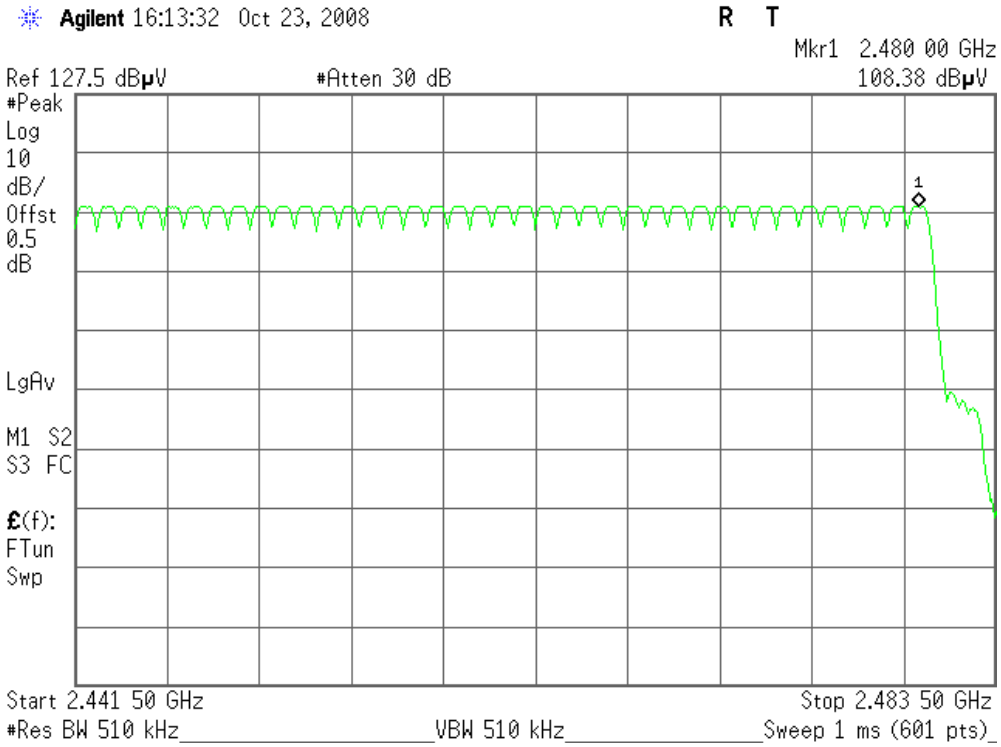
Channel Number

GFSK

2.4 GHz – 2.441 GHz

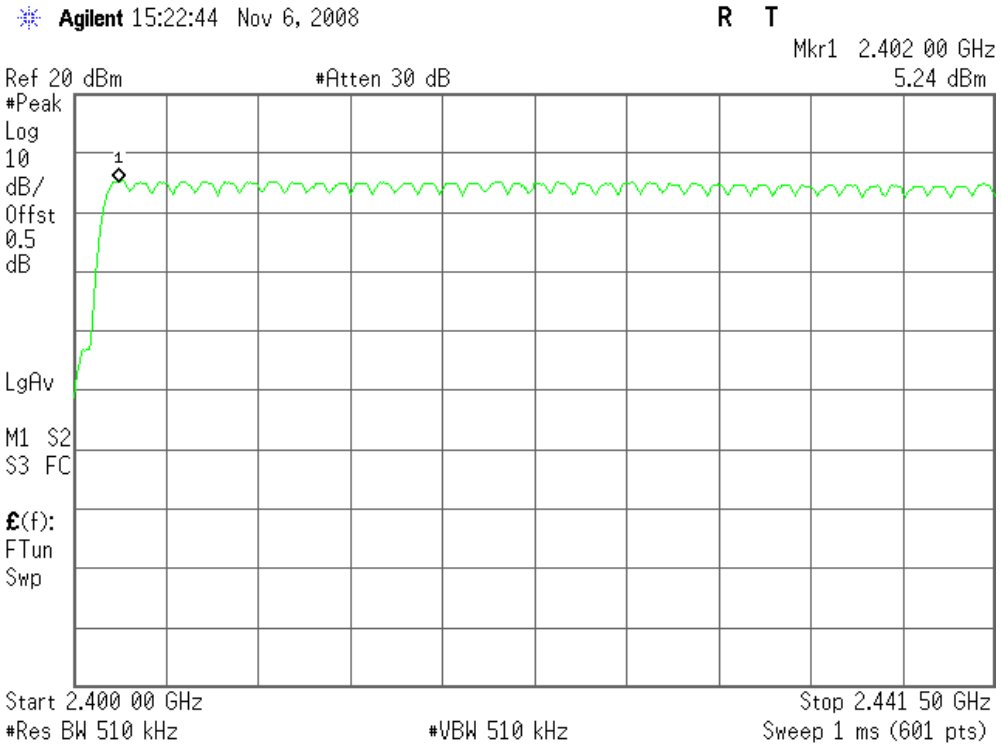


2.441 GHz – 2.4835 GHz

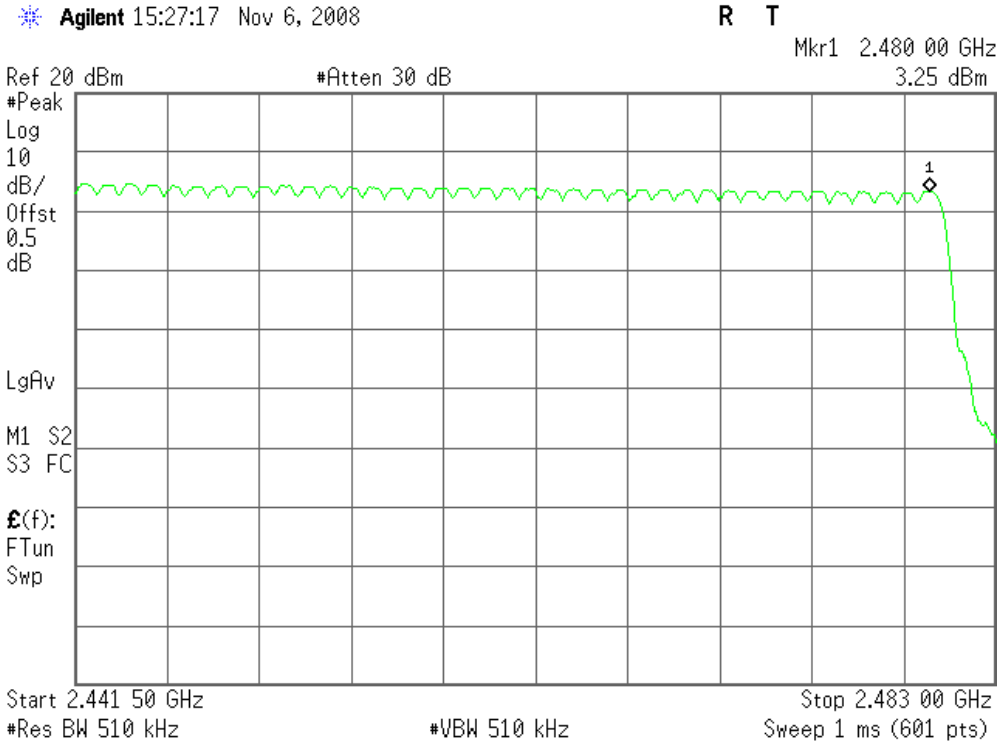


8DPSK

2.4 GHz – 2.441 GHz



2.441 GHz – 2.4835 GHz



7.7TIME OF OCCUPANCY (DWELL TIME)

LIMIT

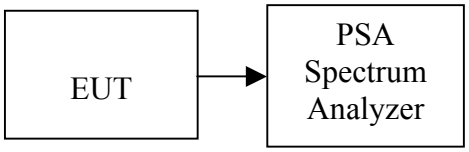
According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009

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

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: 0.40 * (1600/2)/79 * 31.6 = 128.0(ms)
CH Mid: 0.40 * (1600/2)/79 * 31.6 = 128.0 (ms)
CH High: 0.40 * (1600/2)/79 * 31.6 = 128.0 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.40	128.0	31.60	400.00	PASS
Mid	0.40	128.0	31.60		PASS
High	0.40	128.0	31.60		PASS

DH 3

CH Low: 1.63 * (1600/4)/79 * 31.6 = 260.8 (ms)
CH Mid: 1.65 * (1600/4)/79 * 31.6 = 264.0(ms)
CH High: 1.65 * (1600/4)/79 * 31.6 = 264.0 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.63	260.8	31.60	400.00	PASS
Mid	1.65	264.0	31.60		PASS
High	1.65	264.0	31.60		PASS

DH 5

CH Low: 2.90 * (1600/6)/79 * 31.6 =309.3 (ms)
CH Mid: 2.90 * (1600/6)/79 * 31.6 = 309.3 (ms)
CH High: 2.90 * (1600/6)/79 * 31.6 = 309.3 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.90	309.3	31.60	400.00	PASS
Mid	2.90	309.3	31.60		PASS
High	2.90	309.3	31.60		PASS

8DPSK

DH 1

CH Low: 0.40 * (1600/2)/79 * 31.6 = 128.0(ms)
CH Mid: 0.42 * (1600/2)/79 * 31.6 = 134.4 (ms)
CH High: 0.40 * (1600/2)/79 * 31.6 = 128.0 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.40	128.0	31.60	400.00	PASS
Mid	0.42	134.4	31.60		PASS
High	0.40	128.0	31.60		PASS

DH 3

CH Low: 1.67 * (1600/4)/79 * 31.6 = 267.2 (ms)
CH Mid: 1.63 * (1600/4)/79 * 31.6 = 260.8(ms)
CH High: 1.65 * (1600/4)/79 * 31.6 = 264.0 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.67	267.2	31.60	400.00	PASS
Mid	1.63	260.8	31.60		PASS
High	1.65	264.0	31.60		PASS

DH 5

CH Low: 2.92 * (1600/6)/79 * 31.6 = 311.5 (ms)
CH Mid: 2.90 * (1600/6)/79 * 31.6 = 309.3 (ms)
CH High: 2.92 * (1600/6)/79 * 31.6 = 311.5 (ms)

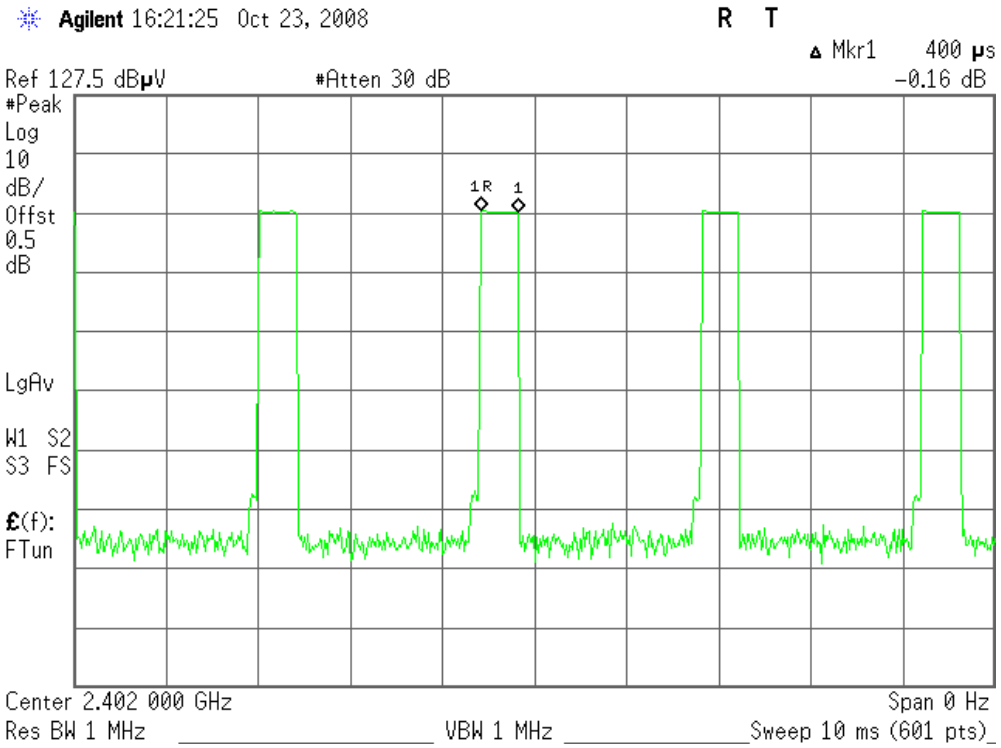
CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.92	311.5	31.60	400.00	PASS
Mid	2.90	309.3	31.60		PASS
High	2.92	311.5	31.60		PASS

Test Plot

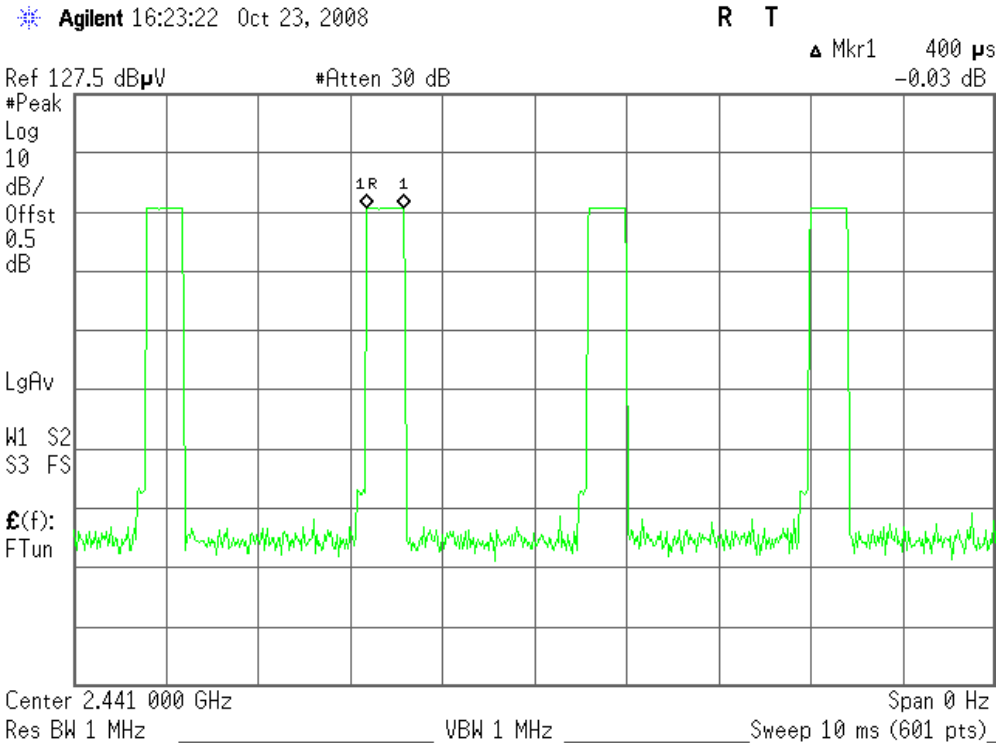
GFSK

DH 1

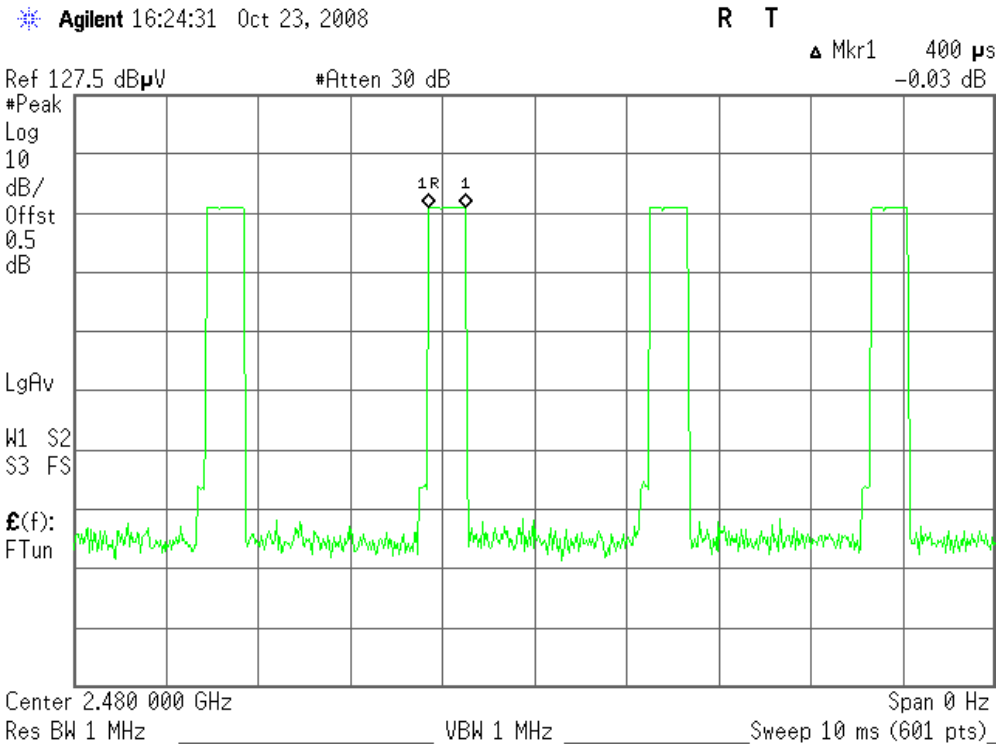
(CH Low)



(CH Mid)

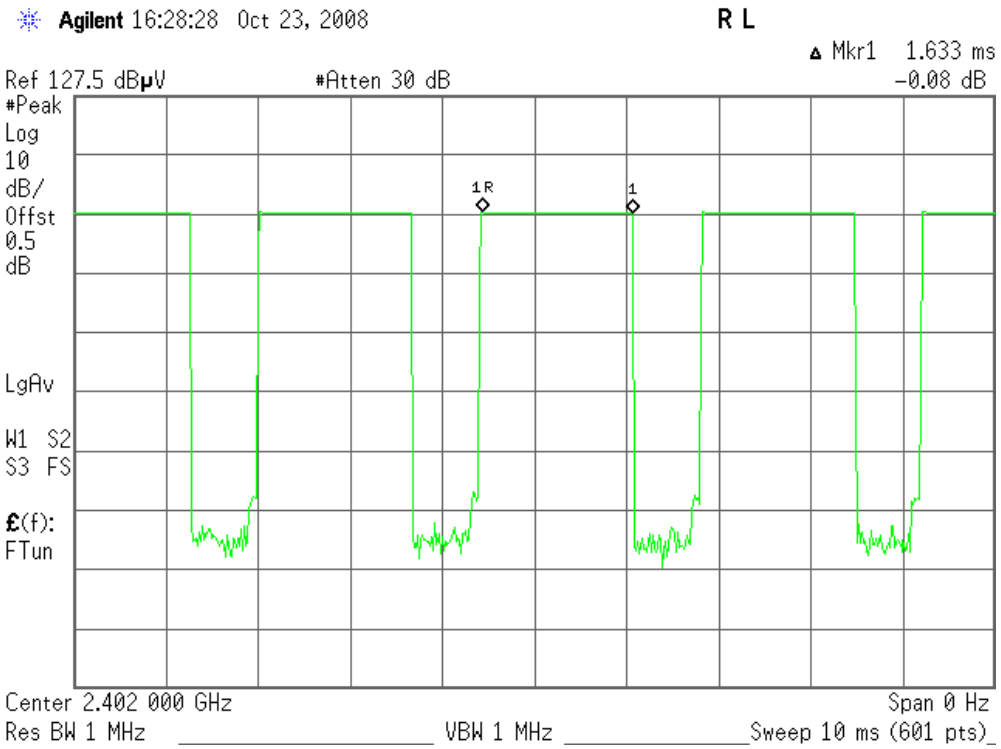


(CH High)

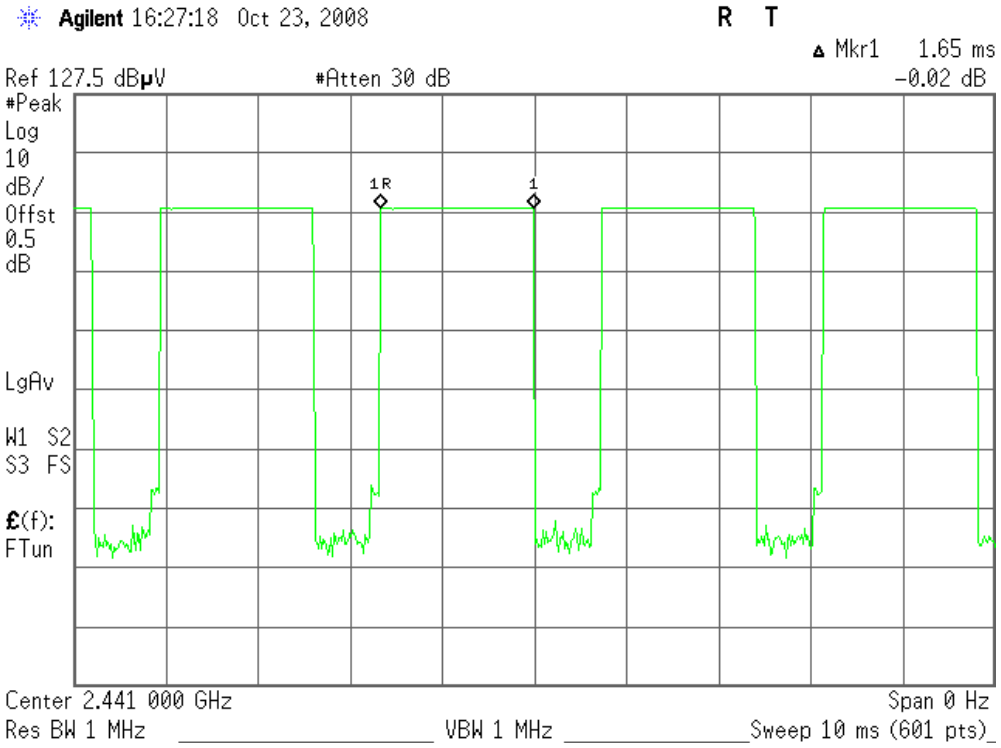


DH 3

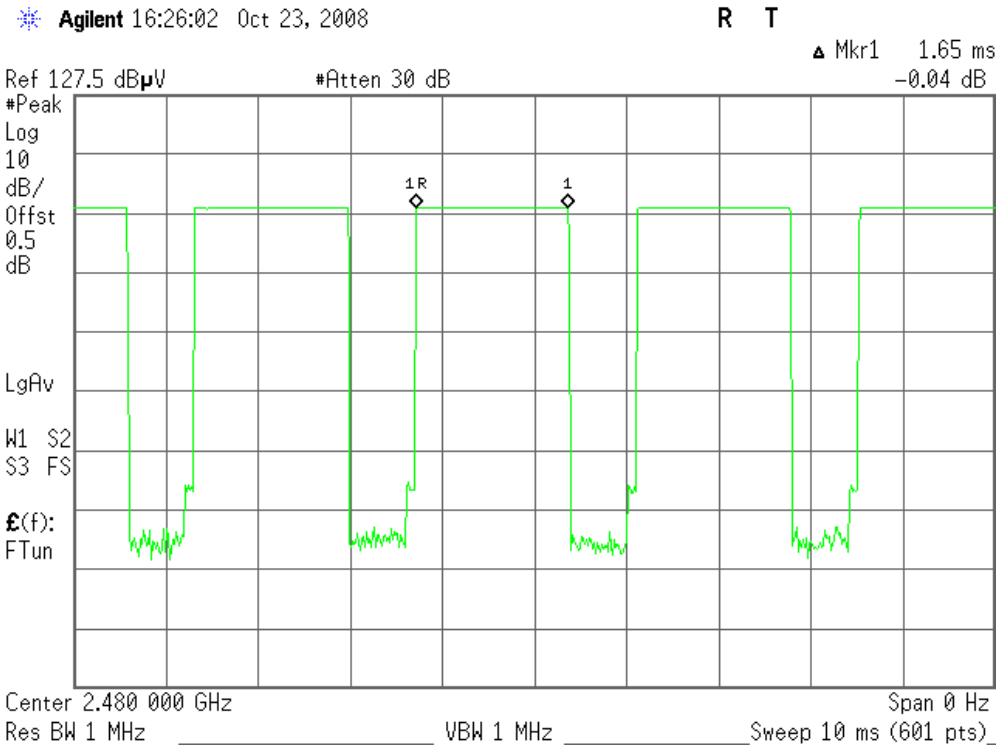
(CH Low)



(CH Mid)

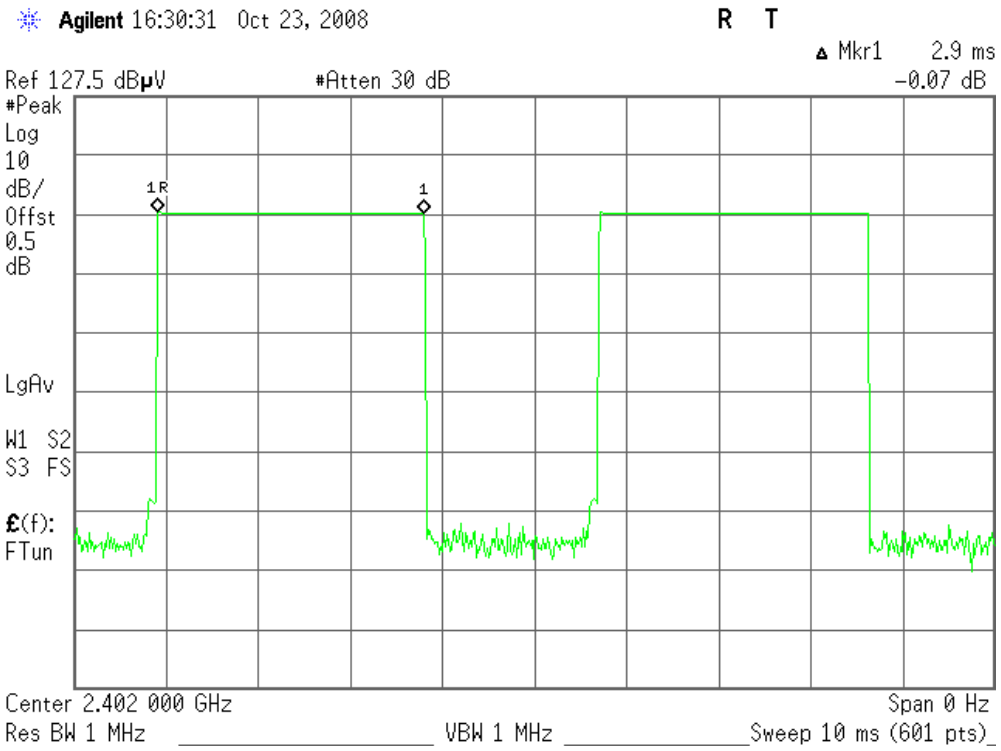


(CH High)

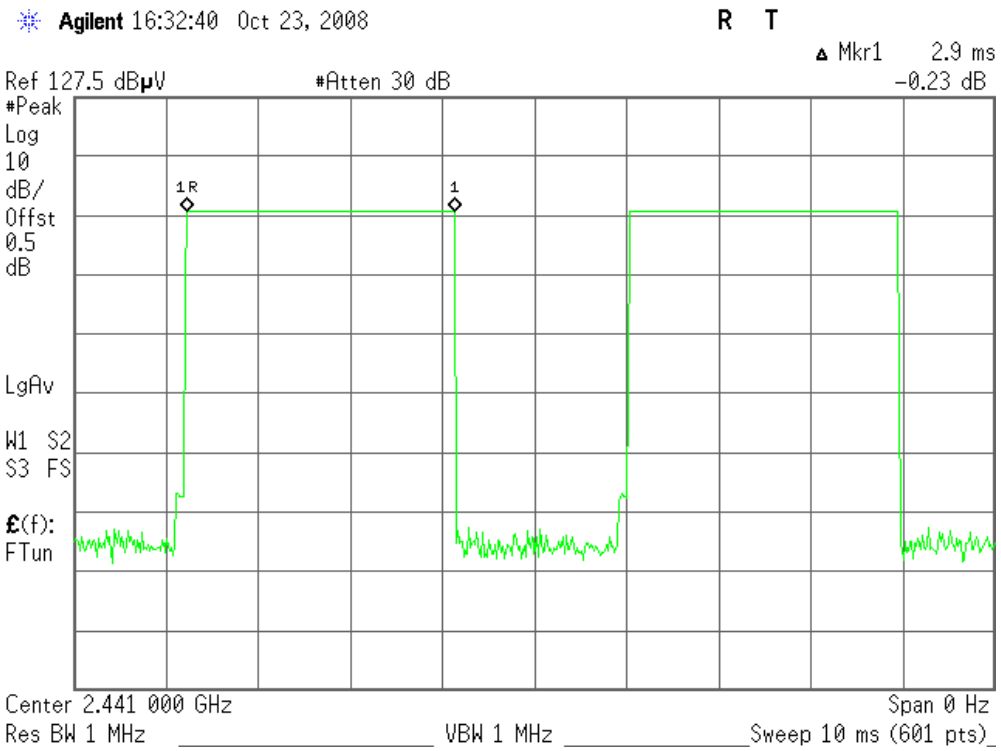


DH5

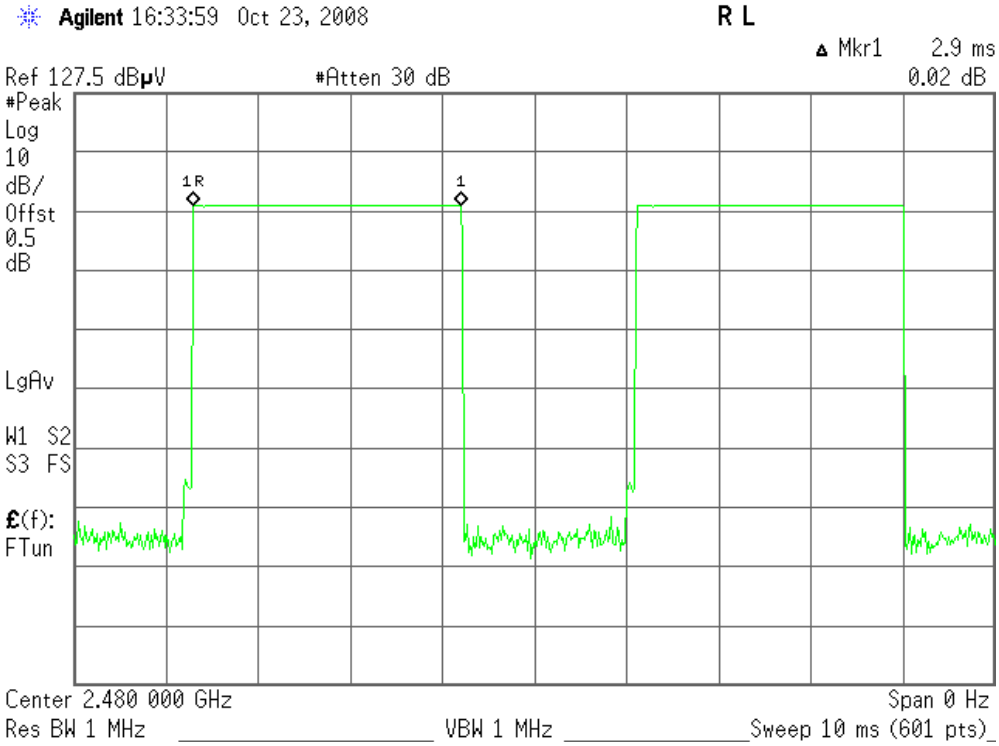
(CH Low)



(CH Mid)



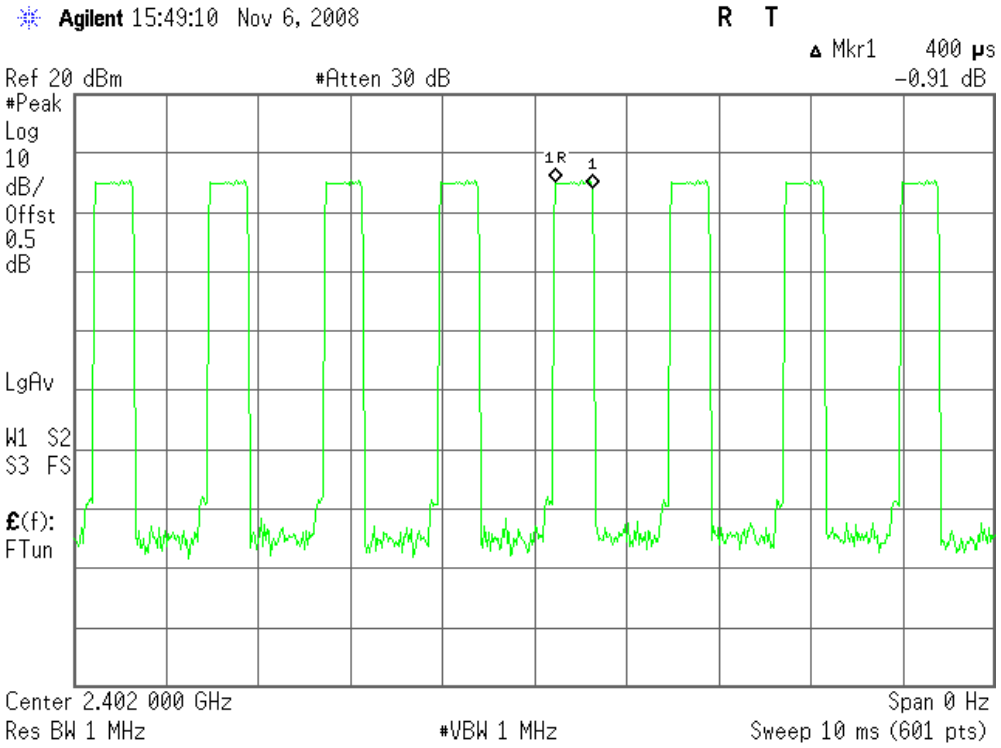
(CH High)


Agilent 16:33:59 Oct 23, 2008
R L
Mkr1 2.9 ms
Ref 127.5 dBµV
#Atten 30 dB
0.02 dB
#Peak
Log
10
dB/
Offst
0.5
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.480 000 GHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 10 ms (601 pts)

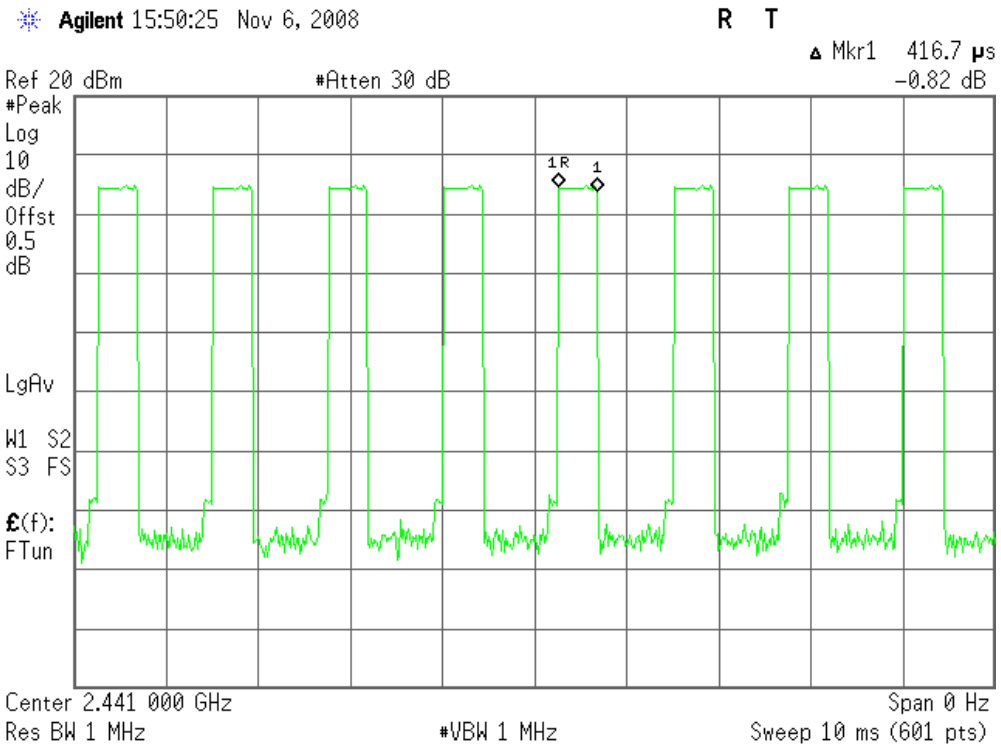
8DPSK

DH 1

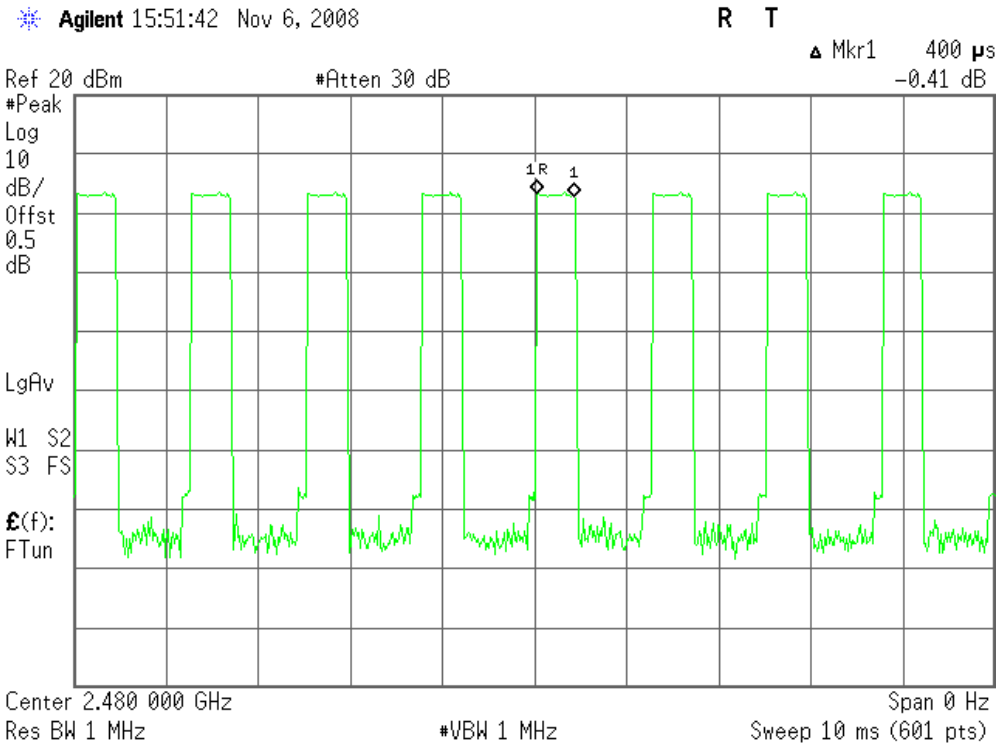
(CH Low)



(CH Mid)

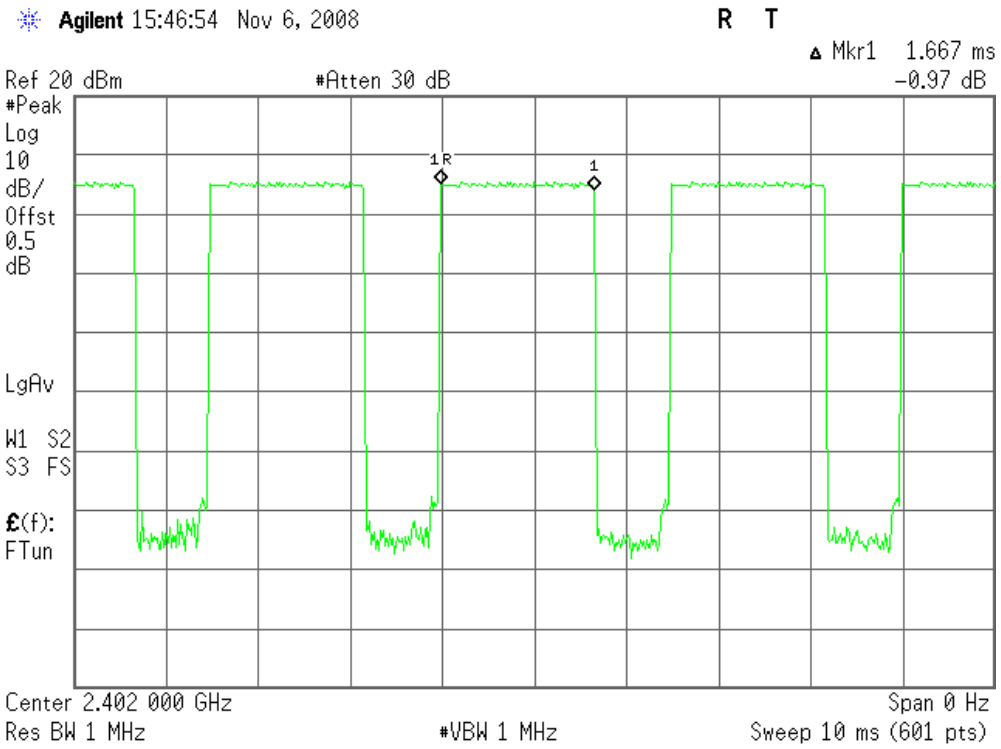


(CH High)

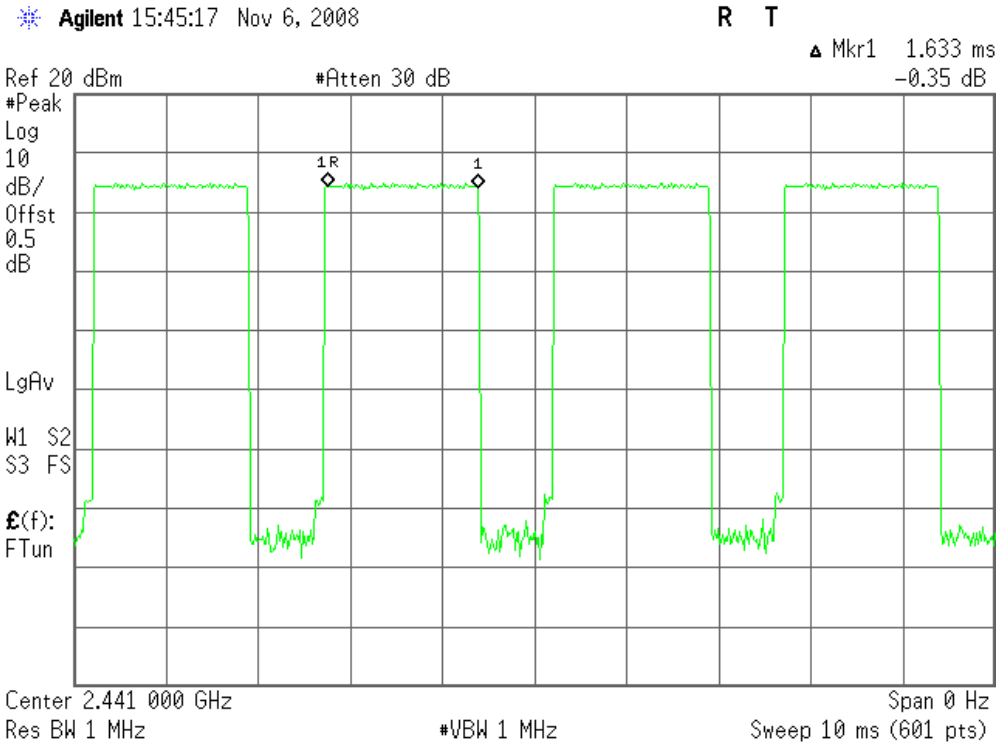


DH 3

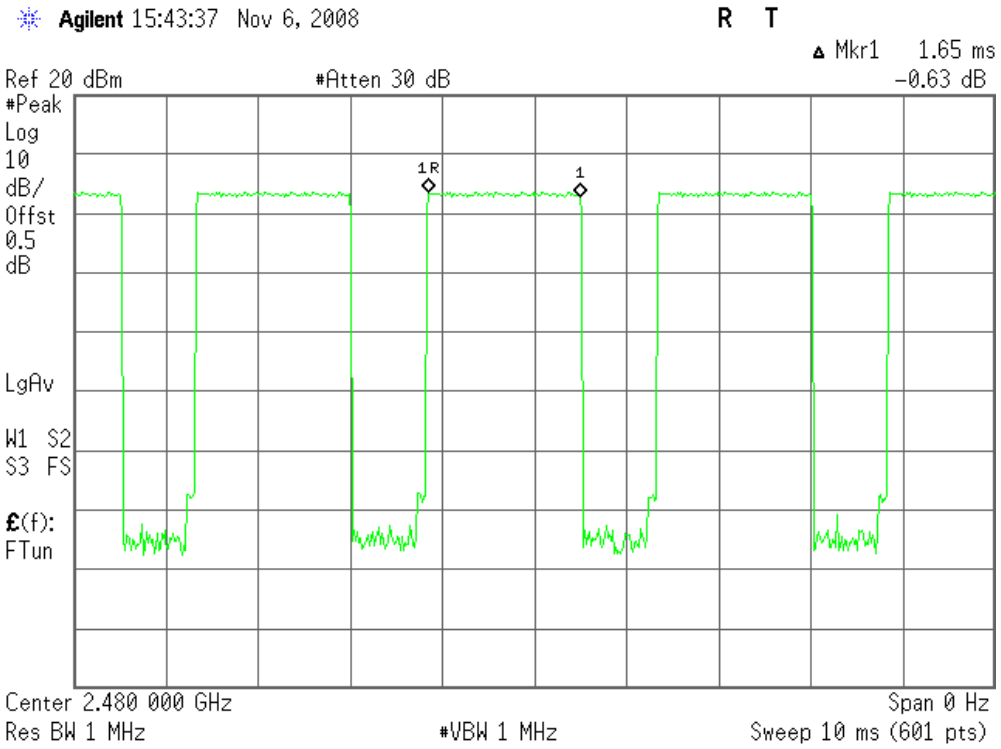
(CH Low)



(CH Mid)

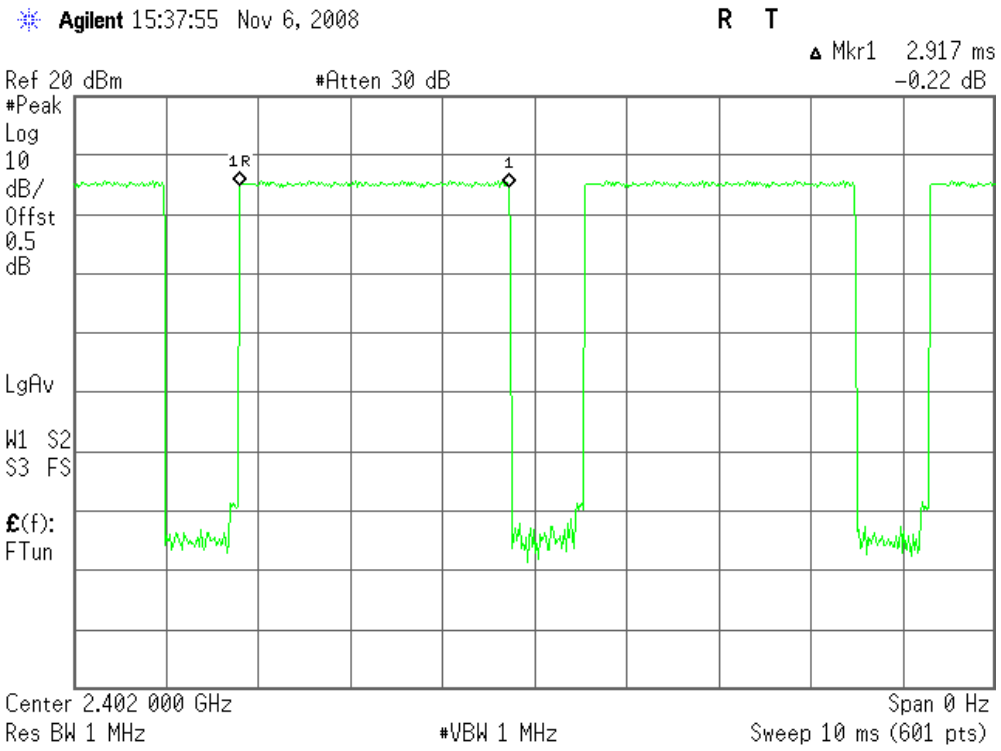


(CH High)

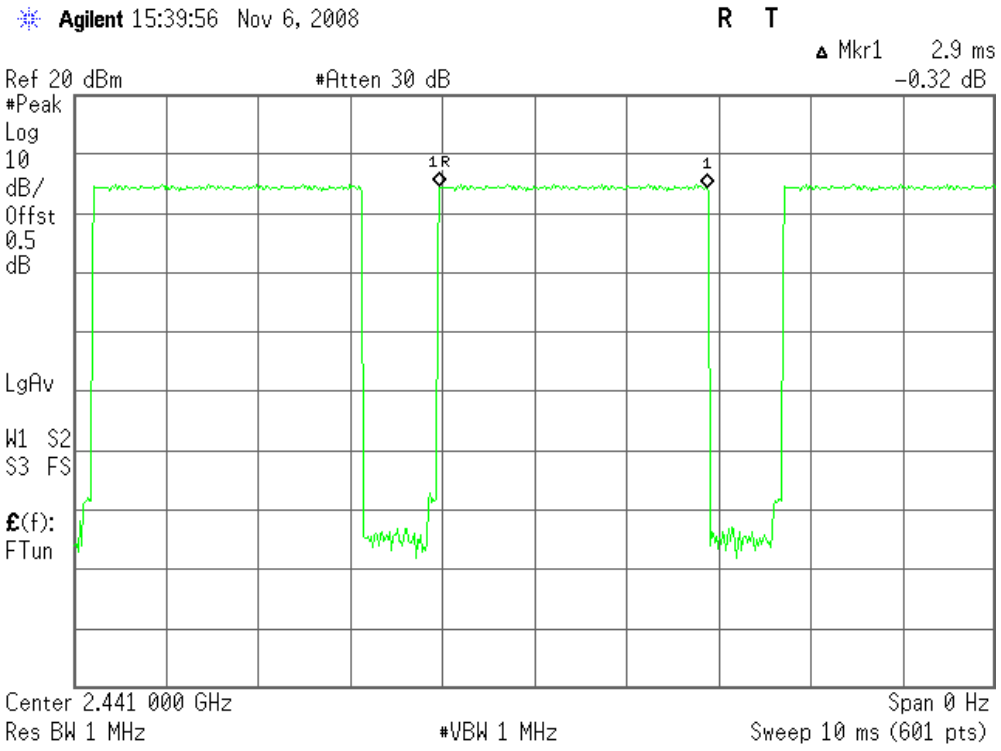


DH5

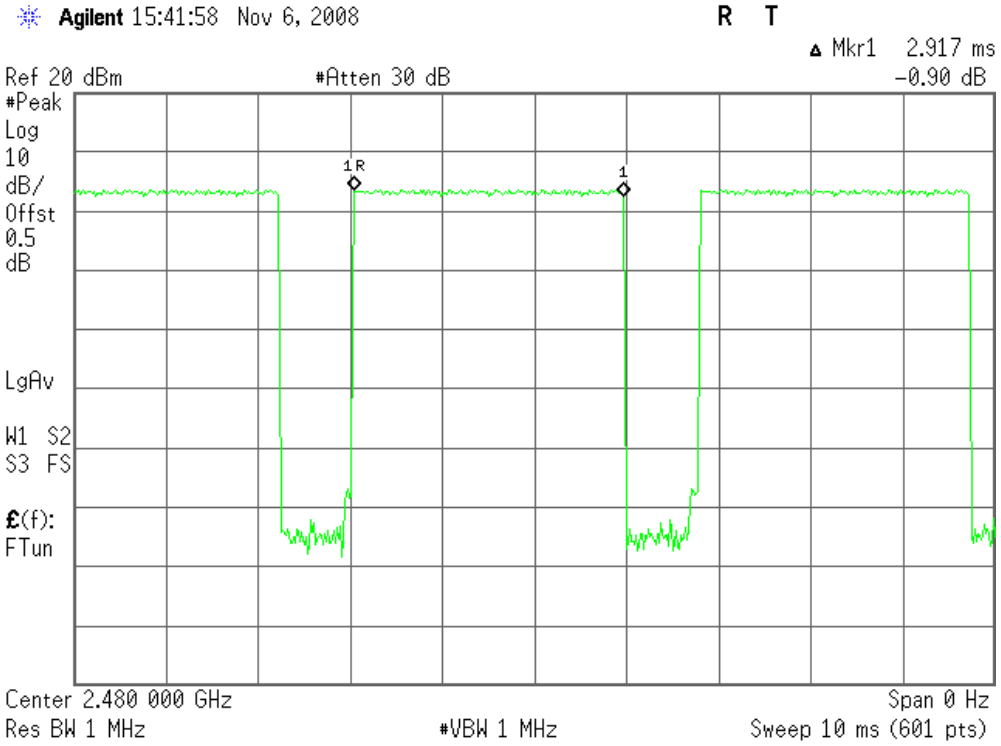
(CH Low)



(CH Mid)



(CH High)


Agilent 15:41:58 Nov 6, 2008
R T
Mkr1 2.917 ms
-0.90 dB
Ref 20 dBm
#Atten 30 dB
#Peak
Log
10
dB/
Offst
0.5
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.480 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 10 ms (601 pts)

7.8SPURIOUS EMISSIONS

7.7 Conducted Measurement

LIMIT

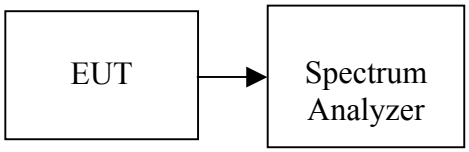
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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)).

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009

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

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 26GHzrange with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

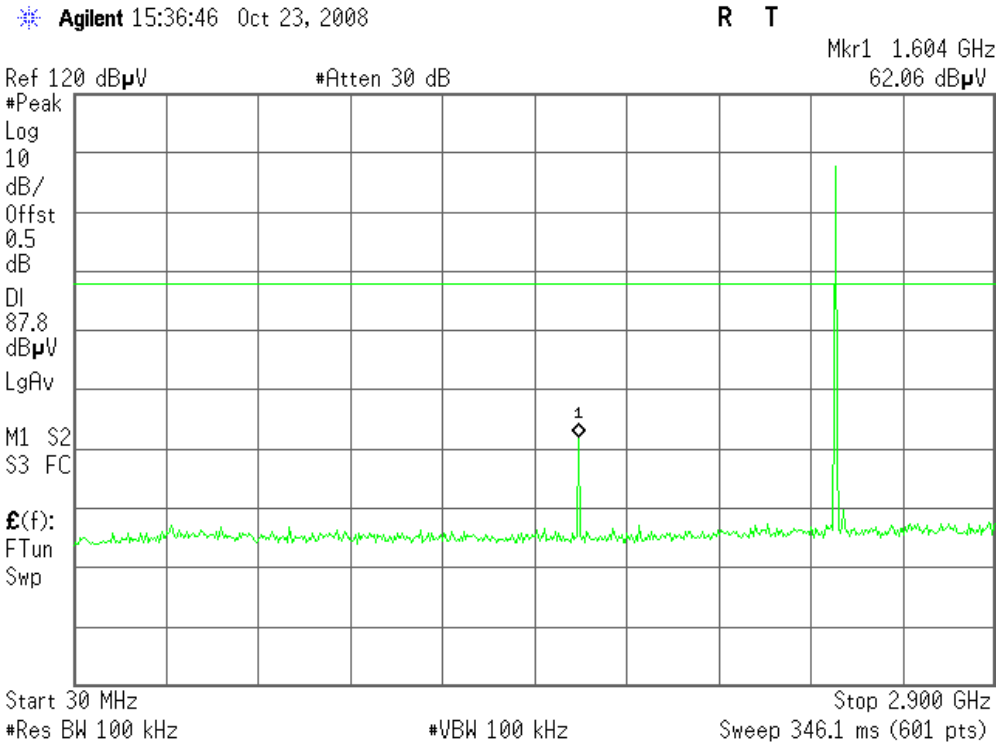
No non-compliance noted

Test Plot

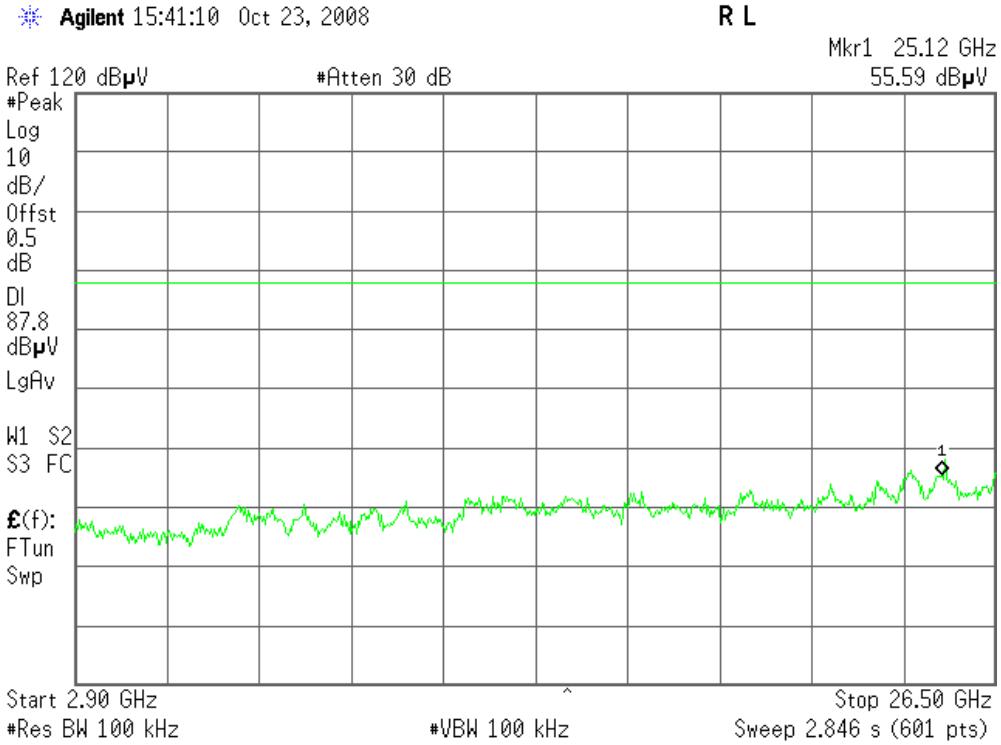
GFSK

CH Low

30MHz – 2.9GHz

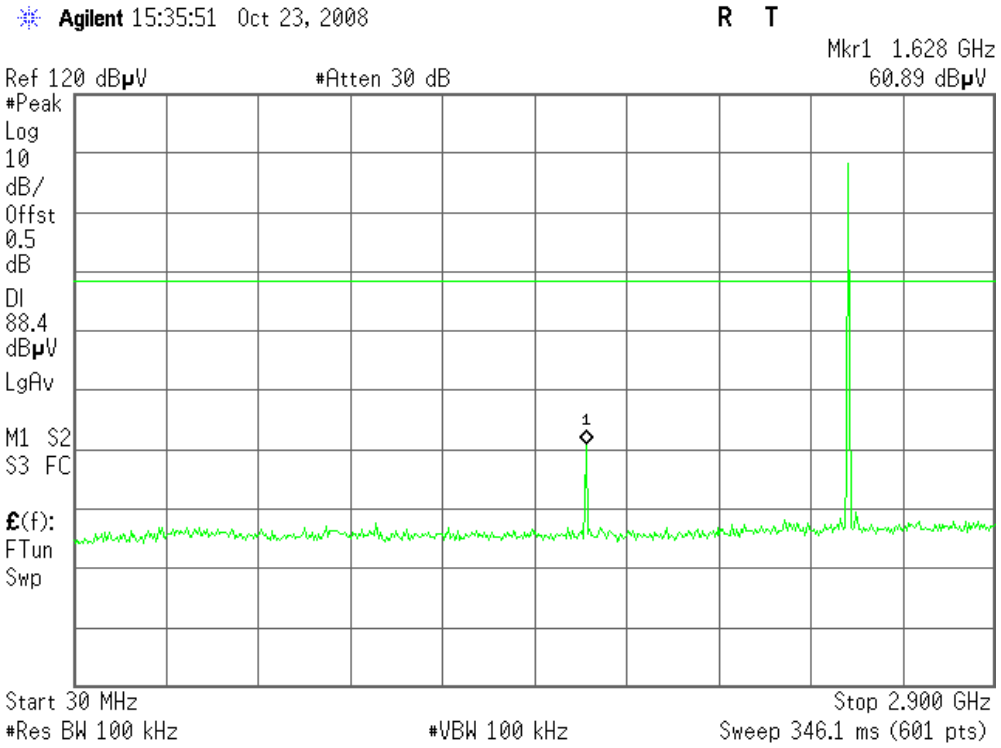


2.9GHz – 26.5GHz

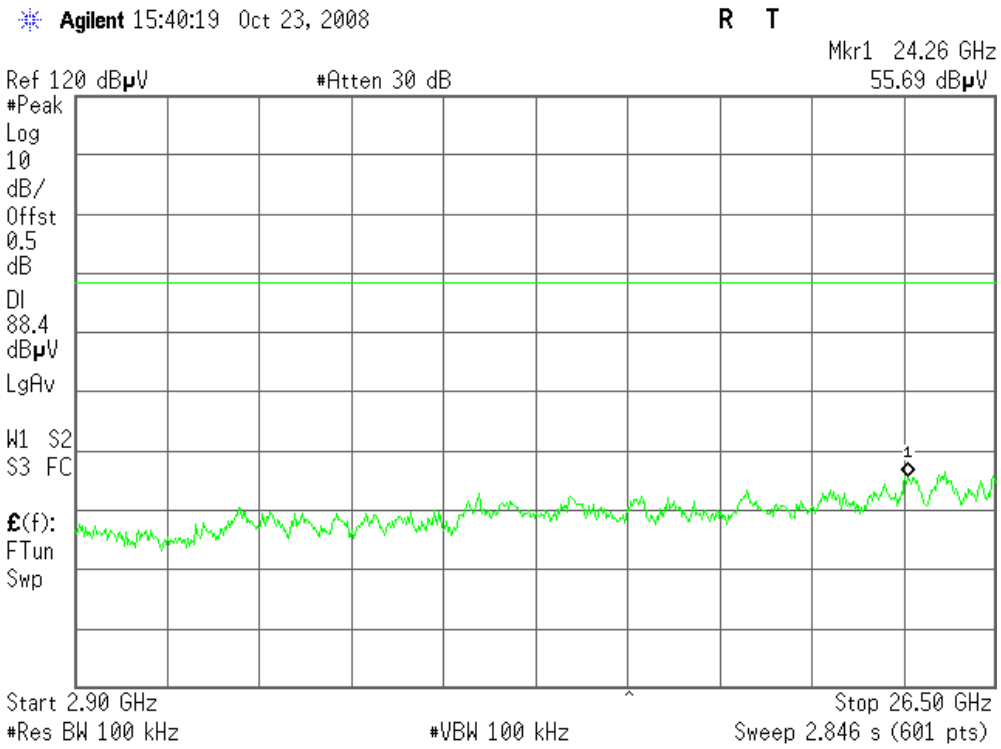


CH Mid

30MHz – 2.9GHz

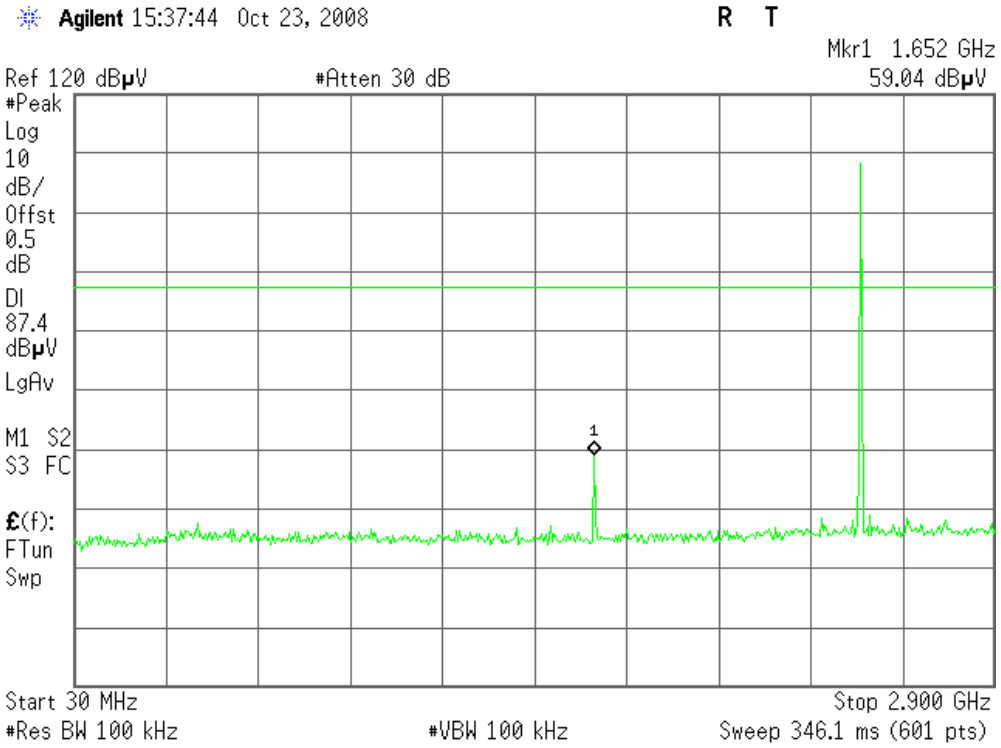


2.9GHz – 26.5GHz

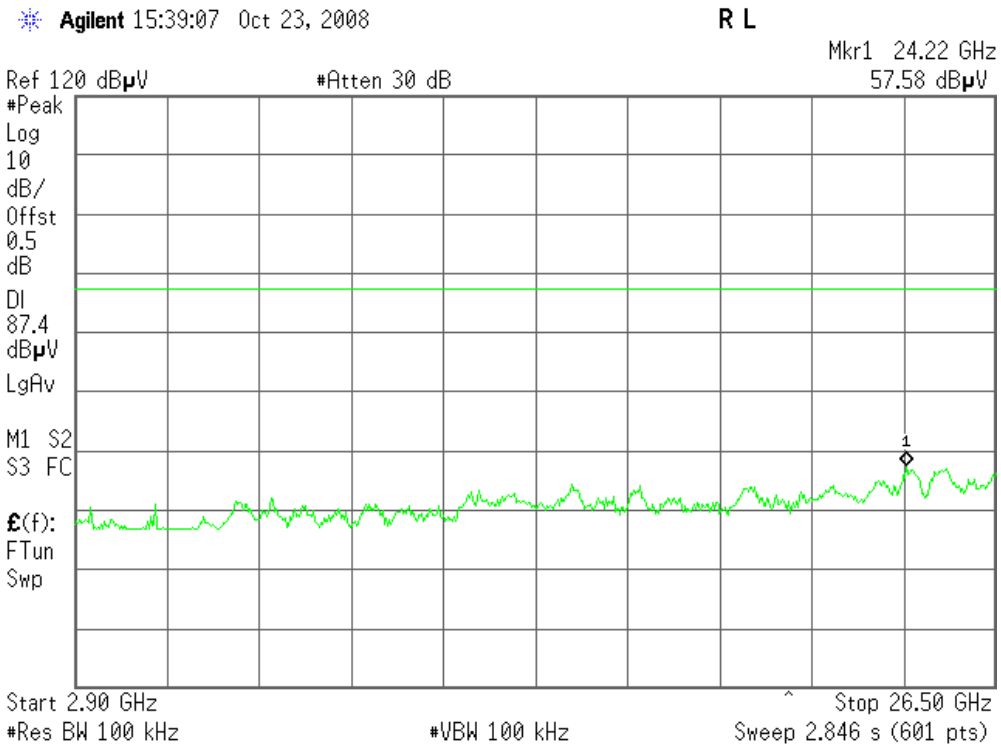


CH High

30MHz – 2.9GHz



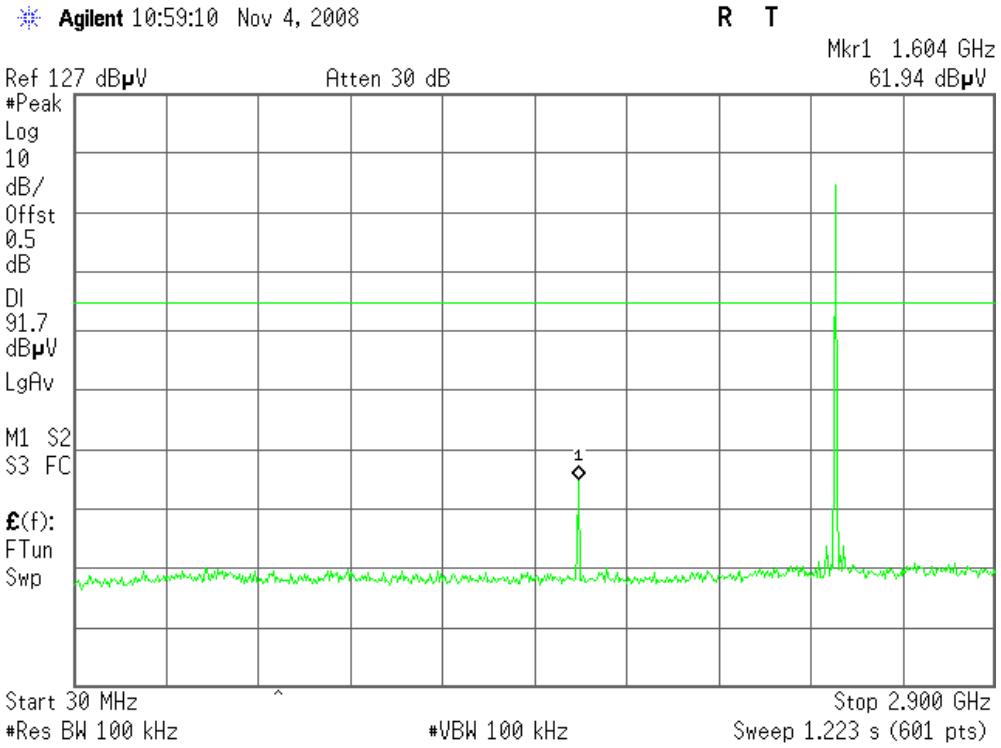
2.9GHz – 26.5GHz



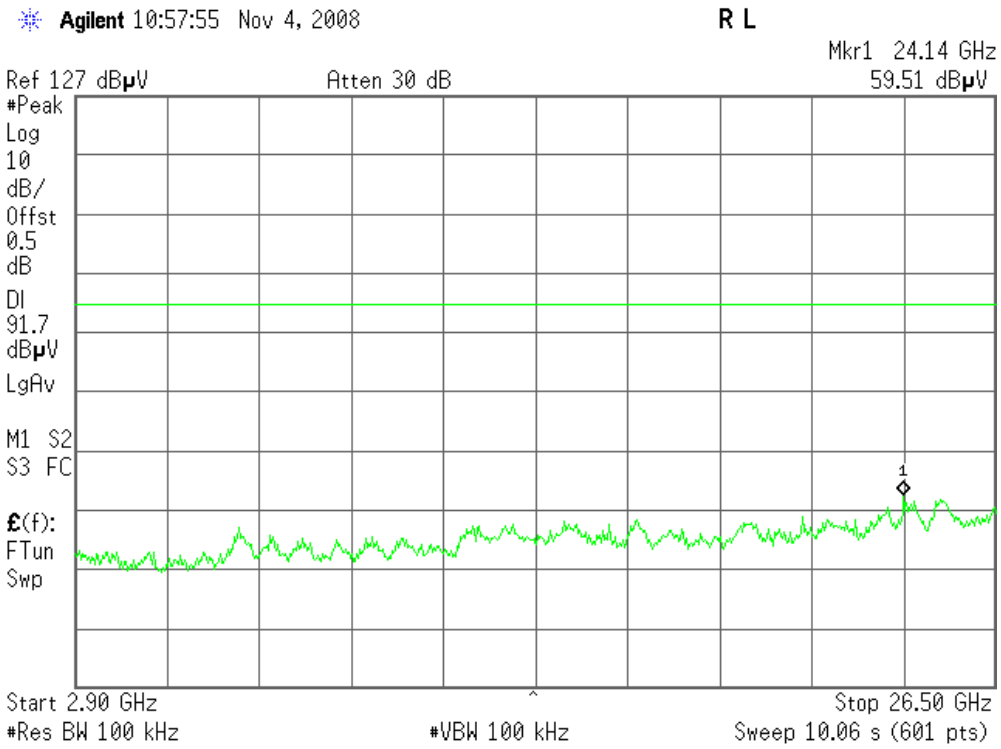
8DPSK

CH Low

30MHz – 2.9GHz

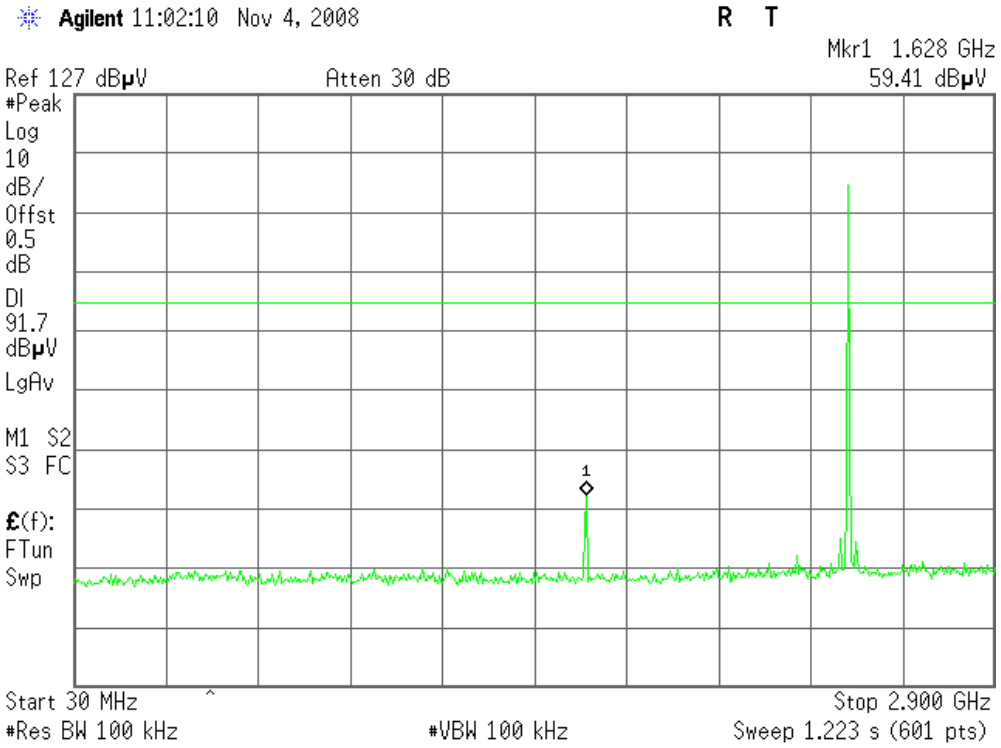


2.9GHz – 26.5GHz

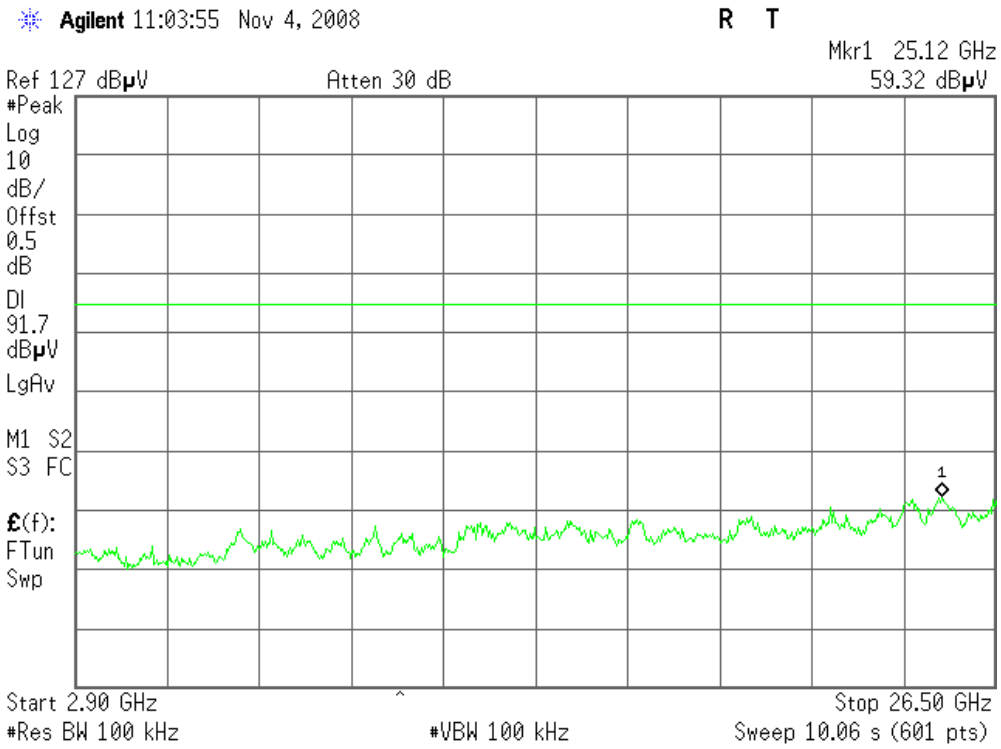


CH Mid

30MHz – 2.9GHz

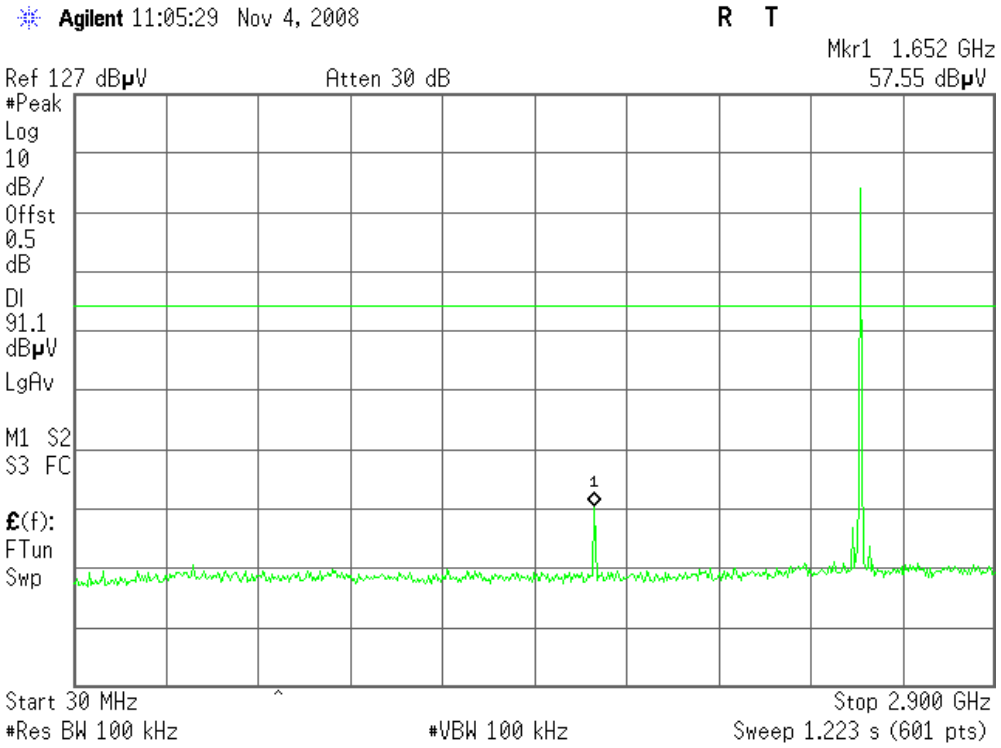


2.9GHz – 26.5GHz

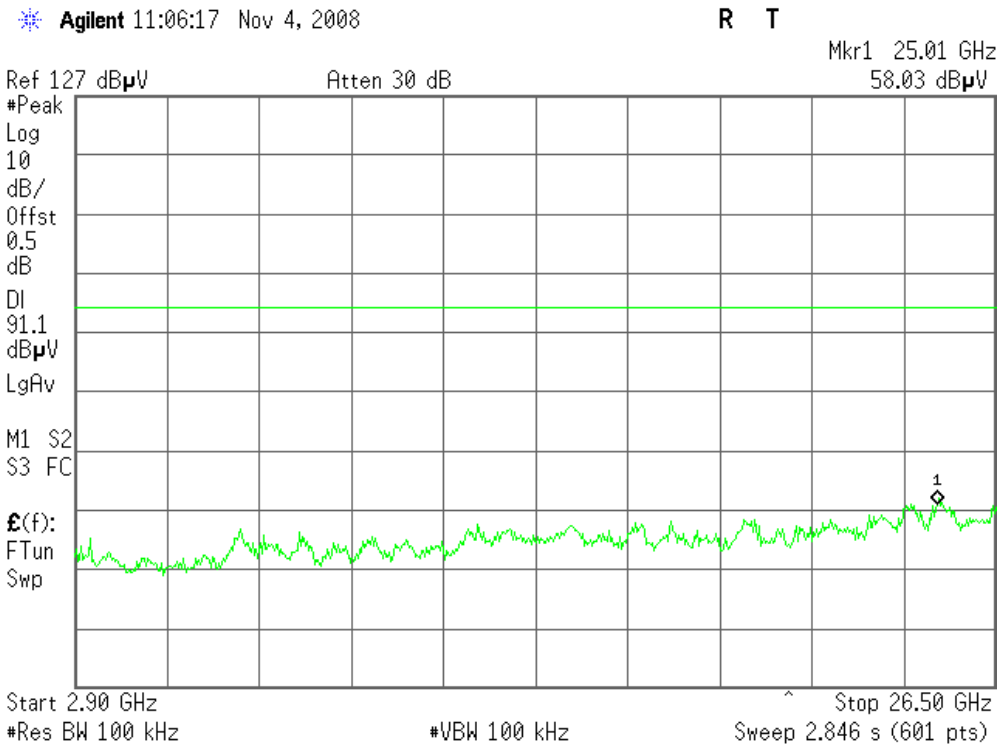


CH High

30MHz – 2.9GHz



2.9GHz – 26.5GHz



7.7.2 Radiated Emissions

LIMIT

1. 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 (mV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Note: *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 above emission table, 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

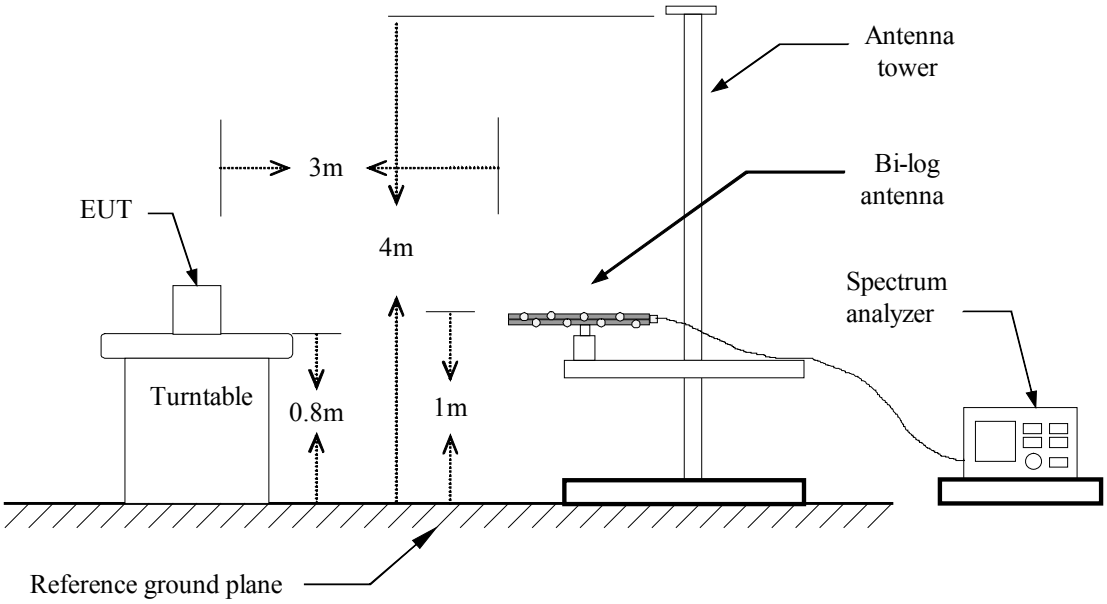
MEASUREMENT EQUIPMENT USED

966 RF CHAMBER 2				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US44300399	02/24/2009
EMI Test Receiver	R&S	ESCI	1166.5950 03	01/13/2009
Low Noise Amplifier	MITEQ	AM-1604-3000	1123808	02/14/2009
Bilog Antenna	SCHWAZBECK	CBL6143	5082	06/09/2009
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	CT	N/A	N/A	N.C.R
Controller	CT	N/A	N/A	N.C.R
High Noise Amplifier	Agilent	89842	N/A	06/09/2009
Site NSA	C&C	N/A	N/A	06/09/2009
Horn Antenna	TRC	N/A	N/A	03/04/2009
Signal Generator	Anritsu	MG3694A	#050125	02/24/2009
Loop Antenna	ARA	PLA-1030/B	1029	02/24/2009

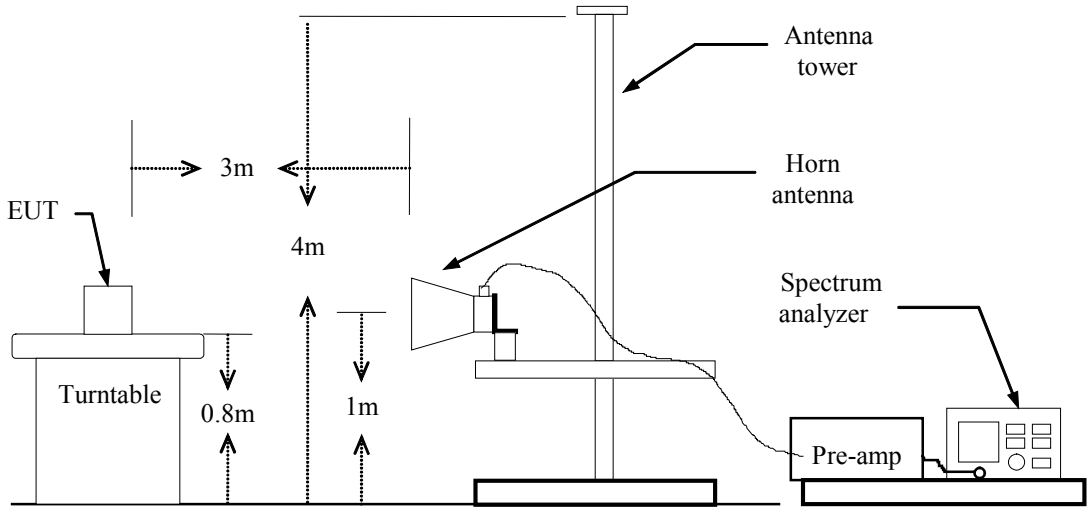
Remark: *Each piece of equipment is scheduled for calibration once a year.*

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

TEST RESULTS

Below 1 GHz

Operation Mode: Normal **Test Date:** October 27,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/Q.P)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Safe Margin (dBuV/m)
59.218	V	Q.P	44.86	-19.55	25.31	40.00	-14.69
79.238	V	Q.P	41.01	-19.93	21.08	40.00	-18.92
101.422	V	Q.P	42.66	-20.29	22.37	43.50	-21.13
124.148	V	Q.P	43.76	-19.51	24.25	43.50	-19.25
149.038	V	Q.P	42.76	-19.14	23.62	43.50	-19.88
183.126	V	Q.P	38.16	-18.32	19.84	43.50	-23.66
110.080	H	Q.P	41.04	-19.96	21.08	43.50	-22.42
112.785	H	Q.P	46.19	-19.85	26.34	43.50	-17.16
117.114	H	Q.P	49.81	-19.68	30.13	43.50	-13.37
157.154	H	Q.P	35.73	-19.02	16.71	43.50	-26.79
213.967	H	Q.P	38.61	-17.30	21.31	43.50	-22.19
224.789	H	Q.P	41.69	-17.12	24.57	46.00	-21.43

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

Notes:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *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.*
4. *The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

Above 1 GHz

GFSK

Operation Mode: TX(CH Low) **Test Date:** October 22,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1226.666	V	56.47	---	-10.92	45.55	---	74.00	54.00	-8.45	Peak
1343.333	V	55.79	---	-10.28	45.51	---	74.00	54.00	-8.49	Peak
4150.000	V	46.09	---	1.80	47.89	---	74.00	54.00	-6.11	Peak
4616.666	V	44.69	---	2.32	47.01	---	74.00	54.00	-6.99	Peak
N/A										
1090.000	H	55.33	---	-11.68	43.65	---	74.00	54.00	-10.35	Peak
1706.666	H	55.90	---	-7.78	48.12	---	74.00	54.00	-5.88	Peak
4175.000	H	47.26	---	1.82	49.08	---	74.00	54.00	-4.92	Peak
4425.000	H	45.68	---	2.05	47.73	---	74.00	54.00	-6.27	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

Operation Mode: TX(CH Mid) **Test Date:** October 22,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1160.00	V	56.72	---	-11.29	45.43	---	74.00	54.00	-8.57	Peak
1590.00	V	54.56	---	-8.71	45.85	---	74.00	54.00	-8.15	Peak
4291.67	V	44.94	---	1.93	46.87	---	74.00	54.00	-7.13	Peak
4816.67	V	44.33	---	2.66	46.99	---	74.00	54.00	-7.01	Peak
N/A										
1330.00	H	54.55	---	-10.36	44.19	---	74.00	54.00	-9.81	Peak
1536.67	H	54.53	---	-9.13	45.40	---	74.00	54.00	-8.60	Peak
4491.67	H	46.59	---	2.11	48.70	---	74.00	54.00	-5.30	Peak
4850.00	H	44.53	---	2.72	47.25	---	74.00	54.00	-6.75	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

Operation Mode: TX(CH High) **Test Date:** October 22,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1256.67	V	55.38	---	-10.76	44.62	---	74.00	54.00	-9.38	Peak
1480.00	V	55.63	---	-9.53	46.10	---	74.00	54.00	-7.90	Peak
5033.33	V	43.82	---	3.10	46.92	---	74.00	54.00	-7.08	Peak
5366.67	V	44.34	---	4.26	48.60	---	74.00	54.00	-5.40	Peak
N/A										
1100.00	H	56.41	---	-11.62	44.79	---	74.00	54.00	-9.21	Peak
1476.67	H	55.62	---	-9.55	46.07	---	74.00	54.00	-7.93	Peak
3416.67	H	48.09	---	-2.82	45.27	---	74.00	54.00	-8.73	Peak
3891.67	H	46.59	---	0.66	47.25	---	74.00	54.00	-6.75	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
   b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.

8DPSK

Operation Mode: TX(CH Low) **Test Date:** November 05,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1263.333	V	56.58	---	-10.72	45.86	---	74.00	54.00	-8.14	Peak
1443.333	V	55.47	---	-9.73	45.74	---	74.00	54.00	-8.26	Peak
3075.000	V	47.45	---	-1.92	45.53	---	74.00	54.00	-8.47	Peak
3525.000	V	46.89	---	-0.84	46.05	---	74.00	54.00	-7.95	Peak
N/A										
1183.333	H	56.01	---	-11.16	44.85	---	74.00	54.00	-9.15	Peak
1350.000	H	56.02	---	-10.24	45.78	---	74.00	54.00	-8.22	Peak
3291.666	H	47.99	---	-2.60	45.39	---	74.00	54.00	-8.61	Peak
3650.000	H	46.67	---	-1.58	45.09	---	74.00	54.00	-8.91	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

Operation Mode: TX(CH Mid) **Test Date:** November 05,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1063.33	V	56.42	---	-11.82	44.60	---	74.00	54.00	-9.40	Peak
1283.33	V	55.06	---	-10.61	44.45	---	74.00	54.00	-9.55	Peak
4175.00	V	46.05	---	1.82	47.87	---	74.00	54.00	-6.13	Peak
5541.67	V	45.69	---	4.79	50.48	---	74.00	54.00	-3.52	Peak
N/A										
1200.00	H	55.88	---	-11.07	44.81	---	74.00	54.00	-9.19	Peak
1320.00	H	56.01	---	-10.41	45.60	---	74.00	54.00	-8.40	Peak
4250.00	H	45.99	---	1.89	47.88	---	74.00	54.00	-6.12	Peak
5050.00	H	45.77	---	3.16	48.93	---	74.00	54.00	-5.07	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

Operation Mode: TX(CH High) **Test Date:** November 05,2008

Temperature: 27°C **Tested by:** Simple Guan

Humidity: 56 % 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)				
1286.67	V	56.05	---	-10.59	45.46	---	74.00	54.00	-8.54	Peak
1583.33	V	57.42	---	-8.76	48.66	---	74.00	54.00	-5.34	Peak
3425.00	V	47.68	---	-1.14	46.54	---	74.00	54.00	-7.46	Peak
3833.33	V	46.56	---	0.78	47.34	---	74.00	54.00	-6.66	Peak
N/A										
1336.67	H	56.93	---	-10.32	46.61	---	74.00	54.00	-7.39	Peak
1450.00	H	56.49	---	-9.70	46.79	---	74.00	54.00	-7.21	Peak
4708.33	H	44.92	---	2.48	47.40	---	74.00	54.00	-6.60	Peak
4875.00	H	44.71	---	2.77	47.48	---	74.00	54.00	-6.52	Peak
N/A										

Notes:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser 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.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.
   b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.

7.9POWERLINE 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 (dBμV)	
	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.

MEASUREMENT EQUIPMENT USED

Conducted Emission Test Site G				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESCI EMI TEST RECEIV.ESCI	ROHDE&SCHWARZ	1166.5950 03	100088	02/24/2009
LISN	EMCO	3825/2	1371	02/24/2009
LISN	EMCO	3825/2	8901-1459	02/24/2009

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

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

Not applicable, since the EUT powered by the battery.

8. ANNEX DECLARATION FOR BLUETOOTH DEVICE ACC TO PART 15.247

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth devicehas no influence on the output power and the channel spacing. There is only onetransmitter which is driven by identical input parameters concerning these two parameters.Only a different hopping sequence will be used. For this reason the check of these

RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

Hereby we declare that the maximum frequency of this device is: 2402 – 2480 MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organised in astructure called piconet. This piconet consist of max. 8 Bluetooth units. One unit isthe master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:40, 21, 44,
23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67, 56, 37, 60,
39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76,
31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13,
47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06, 01, 51, 03,
55, 05, 04

5 Equally average use of frequencies in data mode and behaviour for short transmissions:

The generation of the hopping sequence in connection mode depends essentiallyon two input values:

1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units onlyoffset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30).In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entireLAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations,additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequencewas not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the periodbetween the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth and behaviour for repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and itsTX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case.That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *30s

Example for a DH1 packet (with a maximum length of one time slot) Dwell time =625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multislot packet the hopping is reduced according to the length of the packet. Example for a DH5 packet (with a maximum length of five time slots) Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period).
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefor all Bluetooth devices **comply** with the FCC dwell time requirement in data mode. This was checked during the Bluetooth Qualification tests. The Dwell time in hybrid mode is measured and stated in the test report.

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07E) for three frequencies (2402, 2441, 2480 MHz).Additionally an example for the channel separation is given in the test report

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see chapter 5), but this time with differentinput vectors:

- For the inquiry hop sequence, a predefined fixed address is always used. Thisresults in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
- For the page hop sequence, the device address of the paged unit is used as input vector. This results in the use of a subset of 32 frequencies which is specificfor that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.

So it is ensured that also in hybrid mode the frequency use equally averaged.

Example of a hopping sequence in inquiry mode:48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode:08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronisation in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code, the other device is scanning for this inquiry access code. If twodevices have been connected previously and want to start a new transmission, asimilar procedure takes place. The only difference is, instead of the inquiry access code, an special access code, derived from the BD_ADDRESS of the paged devicewill be, will be sent by the master of this connection.Due to the fact that both units have been connected before (in the inquiry procedure)the paging unit has timing and frequency information about the page scan of thepaged unit. For this reason the time to establish the connection is reduced considerable.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there isa valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate/ Data rate will be 68/1.

12 Spurious emission in hybrid mode

The dwell time in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.

13 Peak power spectral density measurement

Since the transmitter is only active for some milliseconds on one channel you would get a result with many interruptions if using a sweep time of e.g. 1s as stated in the FCC rules. Therefore a fast sweep in maxhold function is used instead and the EUT is activated several times until the measurement curve has stabilized.