FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Tablet PC

Model: MARS-3070XXXXXXXXXXX

Trade Name: ADVANTECH, Snap-on

Issued to

Advantech Co., Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District,
Taipei 114, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No. 11, Wu-Gong 6th Rd., Wugu Industrial Park,
Taipei Hsien 248, Taiwan (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com

Testing Laboratory
1309

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1. TEST RESULT CERTIFICATION

Applicant:	Advantech Co., Ltd. No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.
Equipment Under Test:	Tablet PC
Trade Name:	ADVANTECH, Snap-on
Model:	MARS-3070XXXXXXXXXXX
Date of Test:	March 1 ~ May 28, 2010

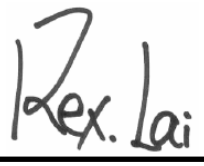
APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

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:



Rex Lai
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Gina Lo
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Tablet PC
Trade Name	ADVANTECH, Snap-on
Model Number	MARS-3070XXXXXXXXXXX
Module Number	BM-394
Module Trade Name	CC&C
Model Discrepancy	All the above models are identical except for the designation of model numbers. The suffix of X ("X" can be 0-9 or A-Z or blank or any alphanumeric character) on model number is just for marketing purpose only.
Power Supply	1. Powered by Power Adapter FSP / FSP065-RAB I/P: 100-240VAC, 50-60Hz, 1.5A O/P: 19V, 3.42A 2. Battery Brand / Model: SANYO / MARS-3070 Rating: 3 Cell / 2500mAH
Frequency Range	2402 ~ 2480 MHz
Transmit Power	12.98 dBm
Modulation Technique	GFSK for 1Mbps; π/4-DQPSK for 2Mbps; 8DPSK for 3Mbps
Transmit Data Rate	1, 2, 3Mbps
Number of Channels	79 Channels
Antenna Specification	Gain: 0.15 dBi
Antenna Designation	PIFA 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: **M82-MARS-3070** 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 and FCC CFR 47 Part 15.207, 15.209 and 15.247.

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

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

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

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

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

3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[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.

3.5 DESCRIPTION OF TEST MODES

The EUT (model: MARS-3070) had been tested under operating condition.

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

The EUT comes with one battery and one power adapter for sale. After the preliminary test, the EUT with power adapter was found to emit the worst emissions and therefore had been tested under standby condition.

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

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

During the preliminary test, GFSK, π/4-QPSK & 8DPSK with DH1 were pre-tested and found that GFSK emits the highest output power. Then the tests were carried on with DH1 compare to DH3 & DH5 and found that GFSK with DH5 emit the highest output power, and therefore had been tested under operating condition.

Following channels were selected for the radiated emission testing only as listed below:

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

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

4. INSTRUMENT CALIBRATION

4.1 MEASURING 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.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

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

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/03/2011
Power Meter	Agilent	E4416A	GB41291611	06/28/2010
Power Sensor	Agilent	E9327A	US40441097	06/28/2010

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510252	10/26/2010
EMI Test Receiver	R&S	ESCI	100064	02/04/2011
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/13/2011
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/20/2010
Bilog Antenna	Sunol Sciences	JB3	A030105	09/11/2010
Horn Antenna	EMCO	3117	00055165	12/07/2010
Loop Antenna	EMCO	6502	8905/2356	05/27/2011
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
Site NSA	CCS	N/A	N/A	12/31/2010
Test S/W	EZ-EMC (CCS-3A1RE)			

Powerline Conducted Emissions Test Site # 3				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCS30	845552/030	05/17/2011
LISN	R&S	ENV216	100069	01/27/2011
LISN	FCC	FCC- LISN-50/250-16-270	06013	10/13/2010
Test S/W	CCS-3A1-CE-Luchu			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.7806
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0606
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9979
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5790
3M Semi Anechoic Chamber / 8G~18G	+/- 2.5928
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7212
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9520

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

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

Remark: *The powerline conducted emissions test items was tested at Compliance Certification Services Inc. (Linkou Lab.) The test equipments were listed in page 8 and the test data, please refer page 72-73.*

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

5.2 EQUIPMENT

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

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

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

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

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II 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	LCD Monitor	DELL	2408WFB	CN-0G293H-74261-87C-0LVS-A00	FCC DoC	D-SUB Cable: Shielded, 1.8mwith two cores	Unshielded, 1.8m
2	USB Keyboard	ACER	6512-UV	21200201-1294000050	FCC DoC	Unshielded, 1.8m	N/A
3	USB Mouse	HP	MO19UCA	020509272	FCC DoC	Unshielded, 1.8m	N/A
4	Multimedia Headset	Logitech	ClearChat	N/A	FCC DoC	Unshielded, 1.8m	N/A
5	Traveling Disk	PQI	U172	C072001303246	FCC DoC	Shielded, 1.8m	N/A
6	Traveling Disk	PQI	U172	C072001301616	FCC DoC	Shielded, 1.8m	N/A
7	Traveling Disk	PQI	U172	C072001301669	FCC DoC	Shielded, 1.8m	N/A
8	Traveling Disk	PQI	U172	C07200131674	FCC DoC	Shielded, 1.8m	N/A
9	SD Card	Transcend	213412 7676	N/A	N/A	N/A	N/A

Remark:

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.*

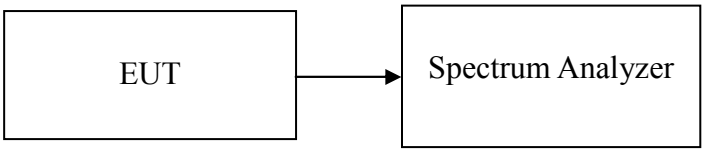
7. FCC PART 15.247 REQUIREMENTS

7.1 20 DB BANDWIDTH

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10kHz, VBW = 30kHz, Span = 1.5kHz, 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 Data

For GFSK / DH5

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	0.881
Mid	2441	0.882
High	2480	0.877

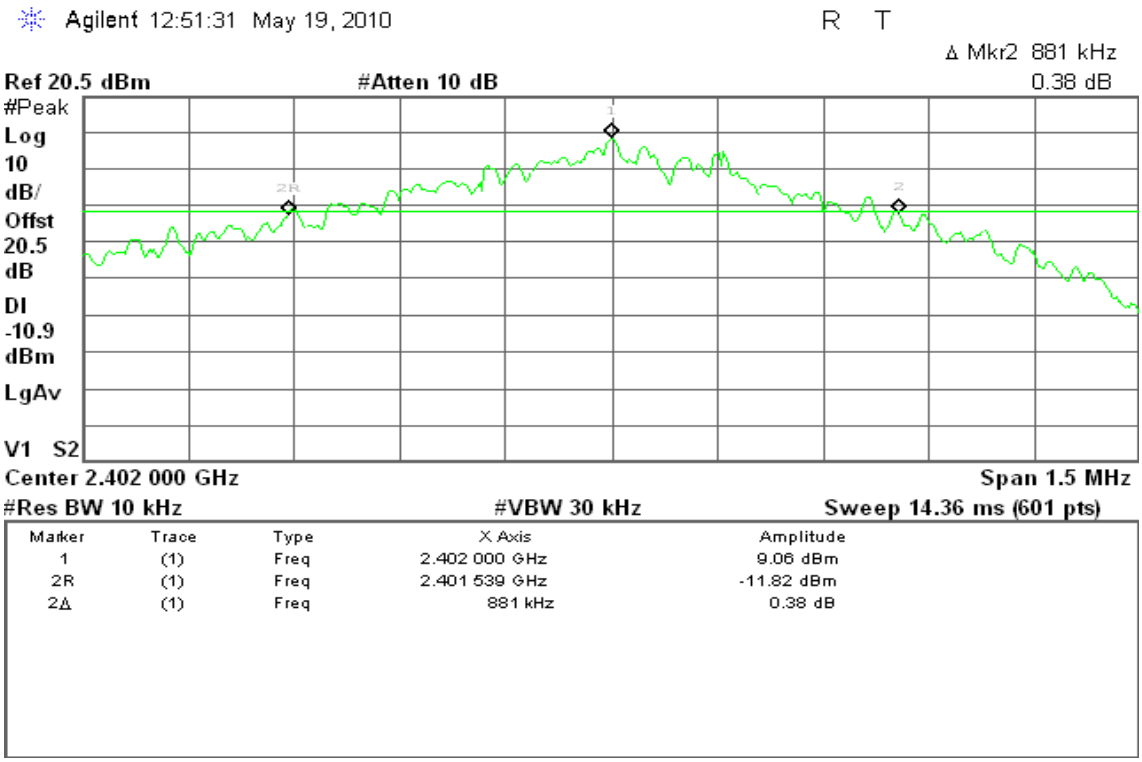
For 8DPSK / DH5

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	1.285
Mid	2441	1.280
High	2480	1.315

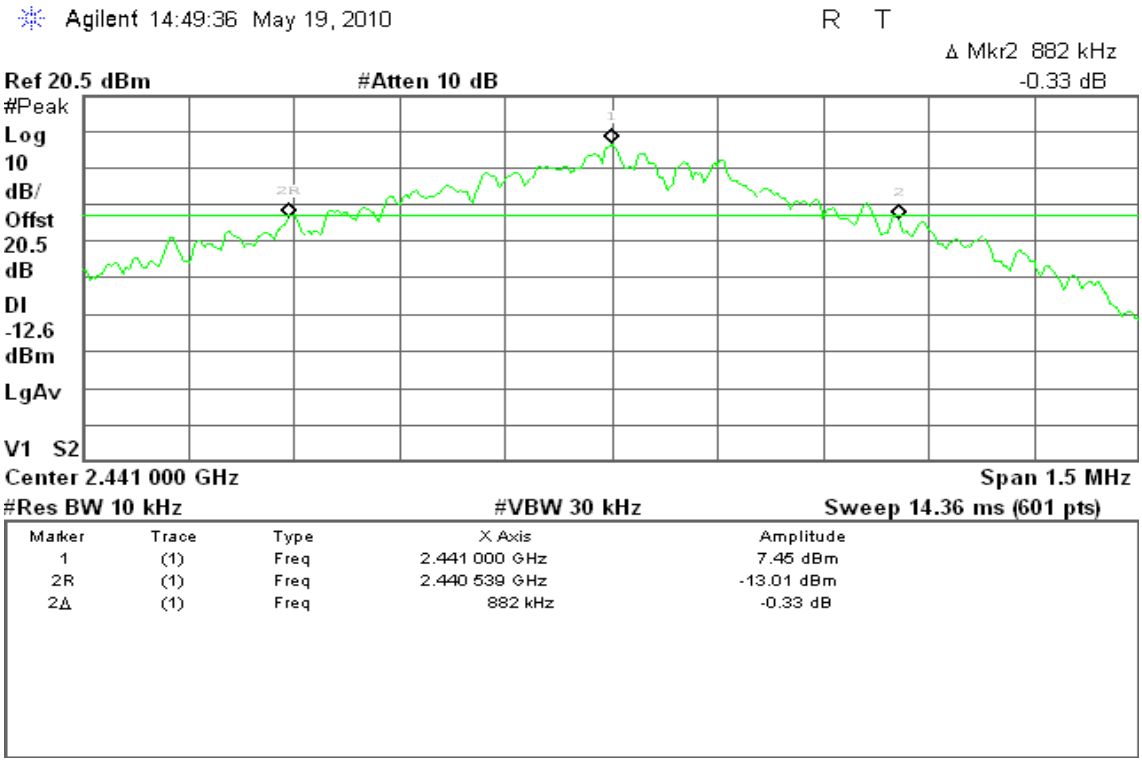
Test Plot

For GFSK / DH5

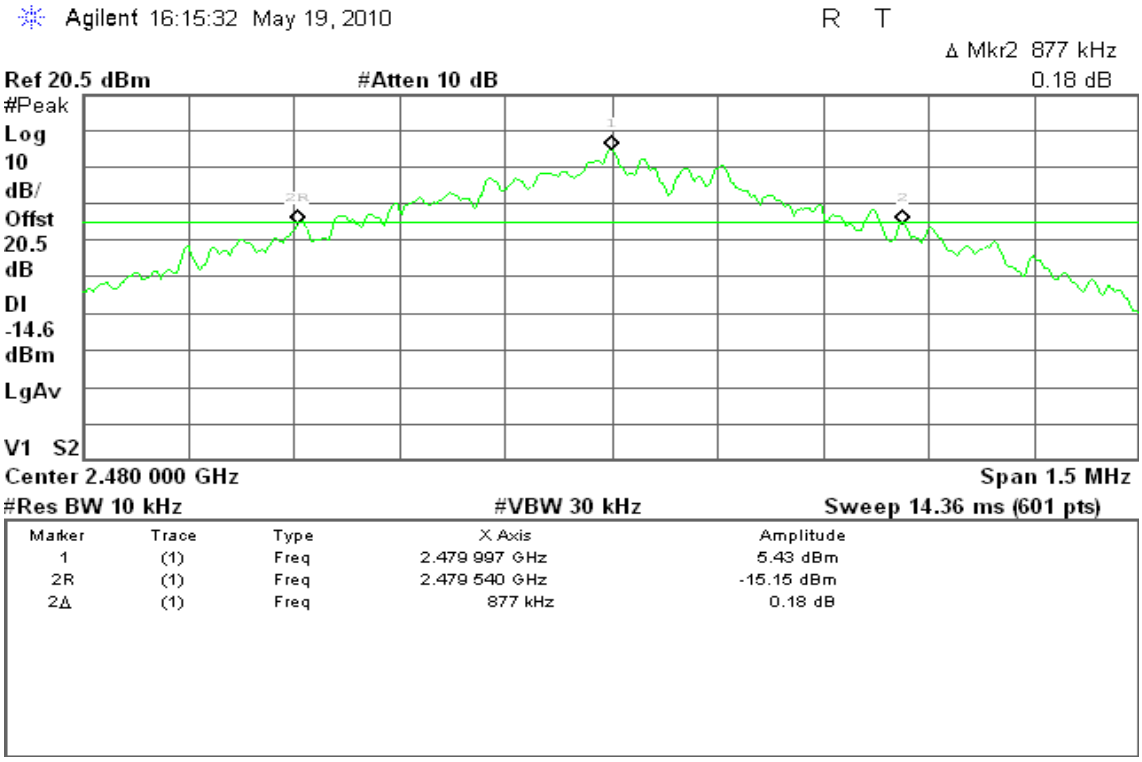
20dB Bandwidth (CH Low)



20dB Bandwidth (CH Mid)

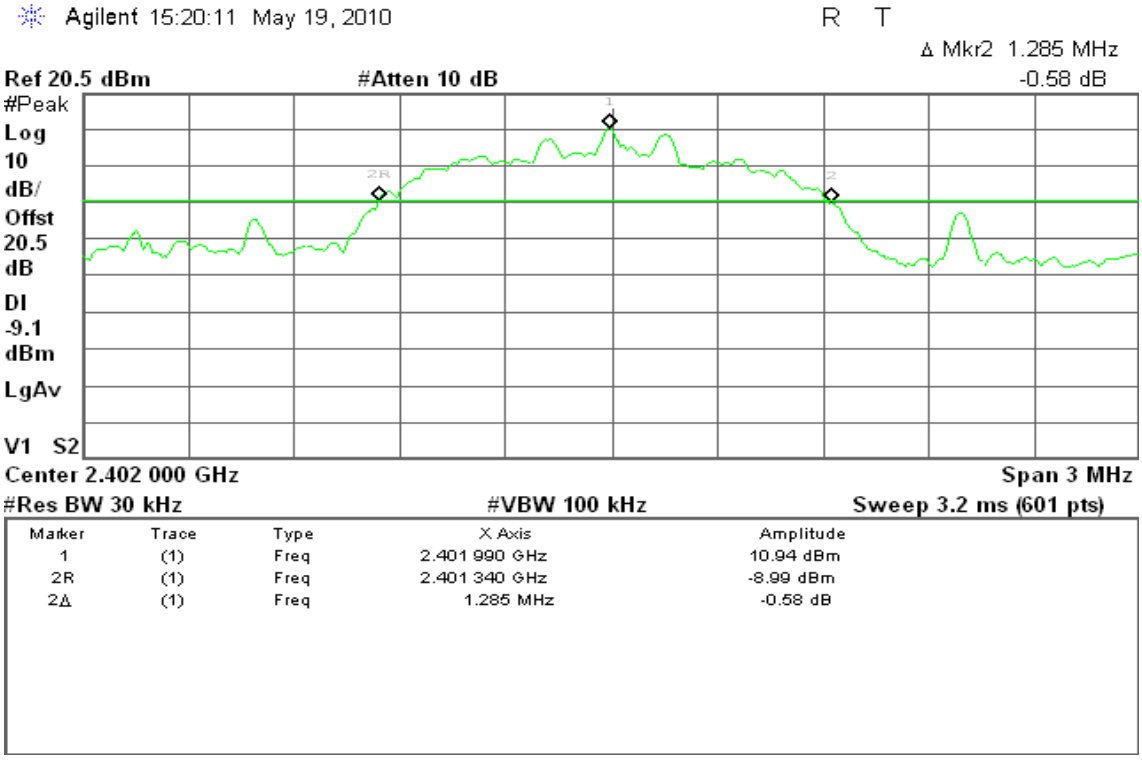


20dB Bandwidth (CH High)

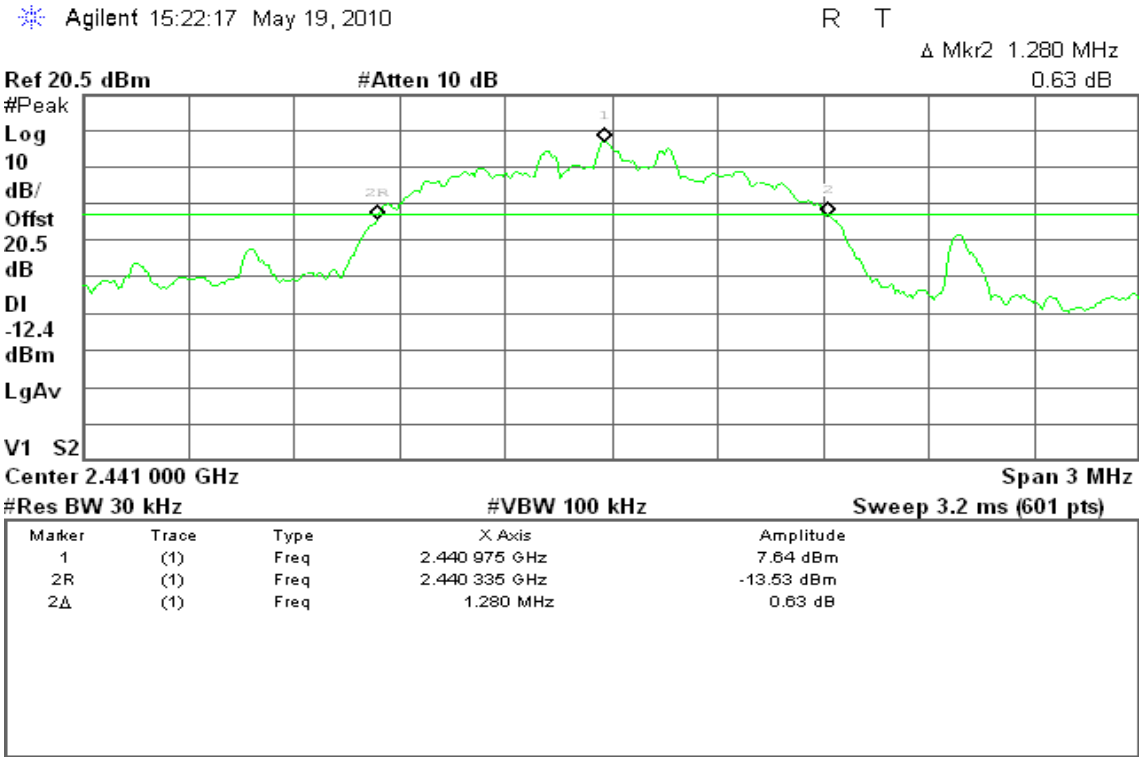


For 8DPSK / DH5

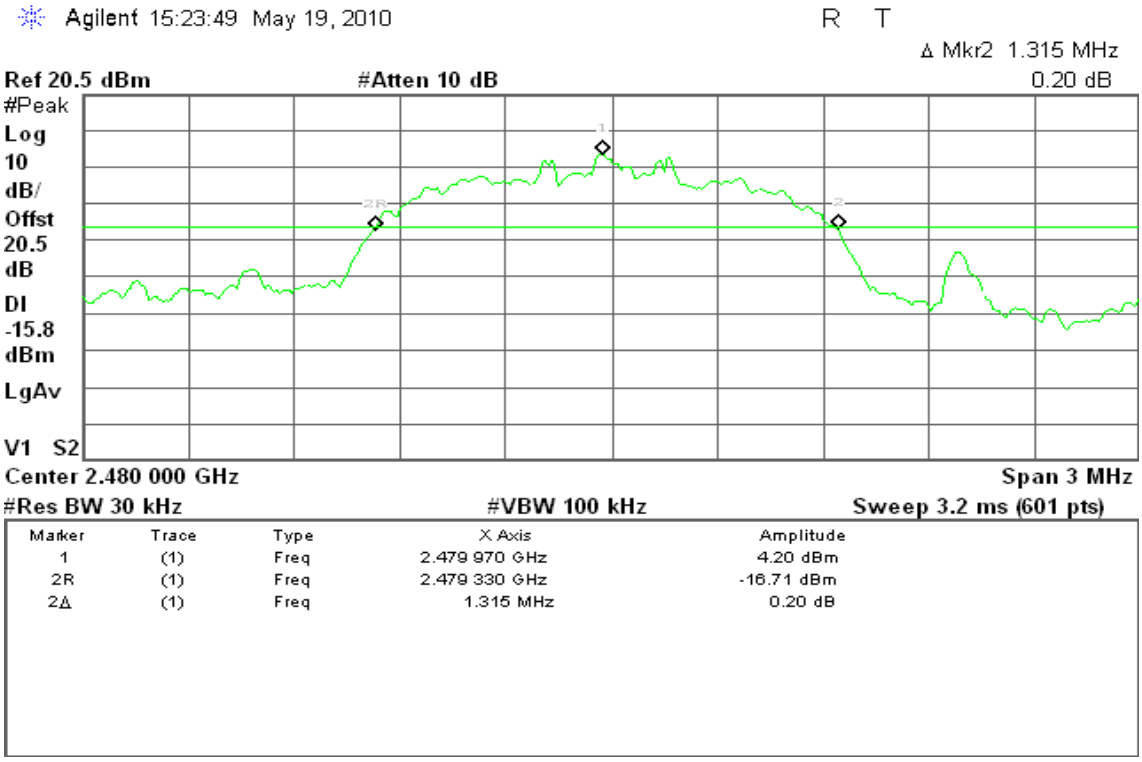
20dB Bandwidth (CH Low)



20dB Bandwidth (CH Mid)



20dB Bandwidth (CH High)



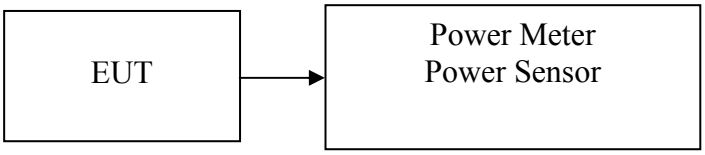
7.2 PEAK POWER

LIMIT

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

For GFSK / DH5

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	12.98	0.0199	0.125	PASS
Mid	2441	10.68	0.0117		PASS
High	2480	8.81	0.0076		PASS

For 8DPSK / DH5

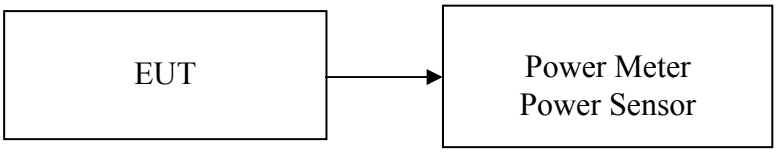
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	12.38	0.0173	0.125	PASS
Mid	2441	9.75	0.0094		PASS
High	2480	7.87	0.0061		PASS

7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted.

Test Data

For GFSK / DH5

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	11.94	0.0156
Mid	2441	9.55	0.0090
High	2480	7.63	0.0058

For 8DPSK / DH5

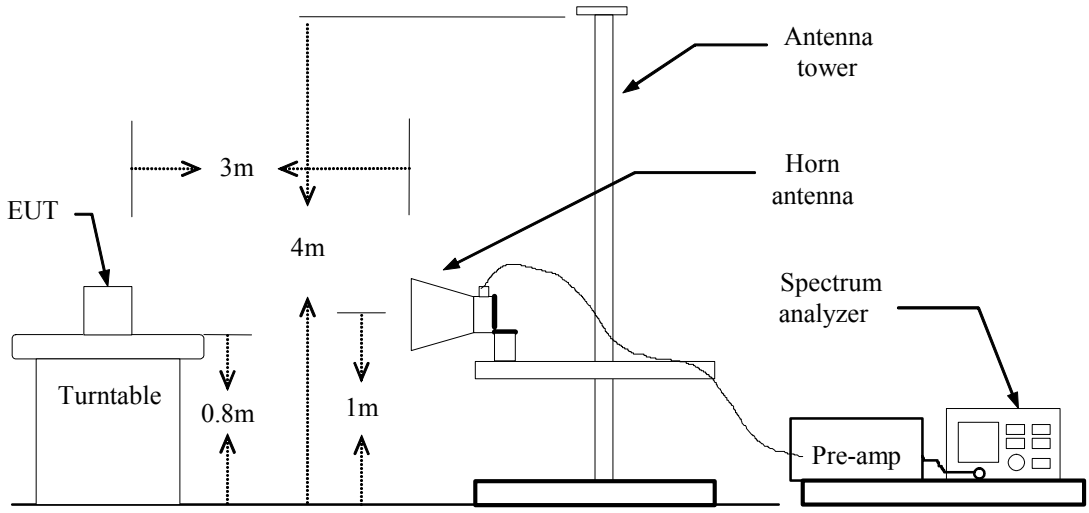
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	9.36	0.0086
Mid	2441	5.74	0.0037
High	2480	3.43	0.0022

7.4 BAND EDGES MEASUREMENT

LIMIT

According to §15.247(d), 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. 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 in 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.

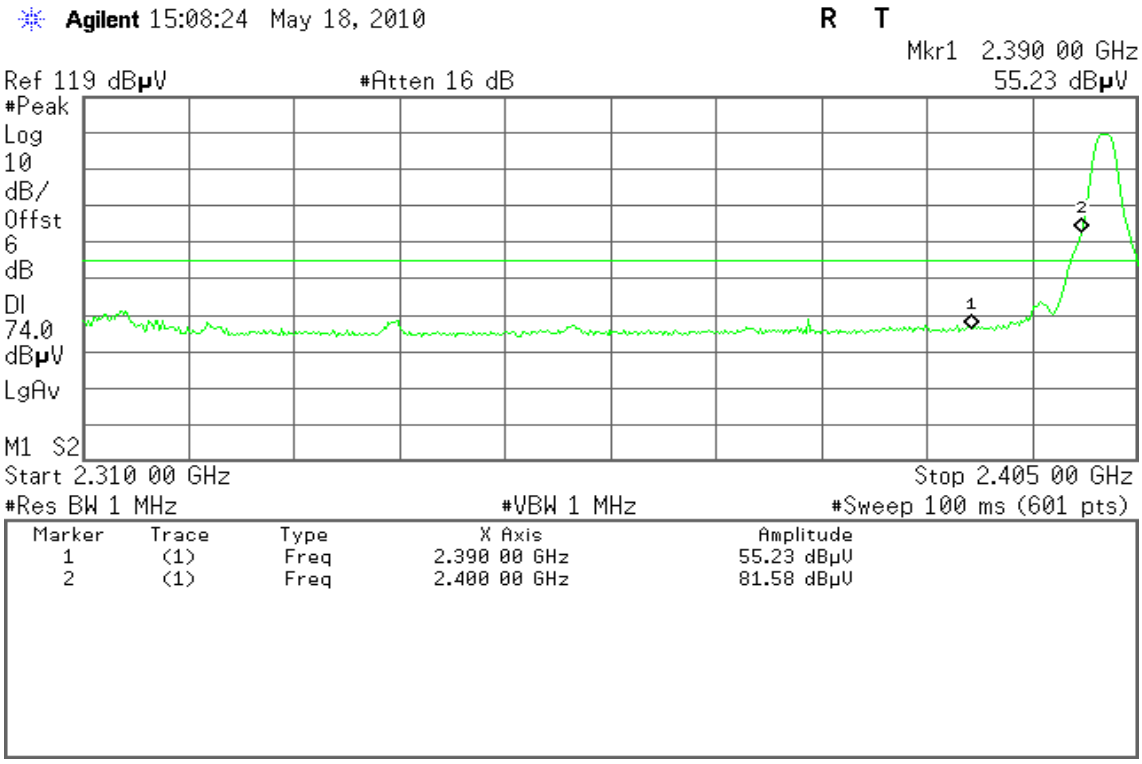
TEST RESULTS

Refer to attach spectrum analyzer data chart.

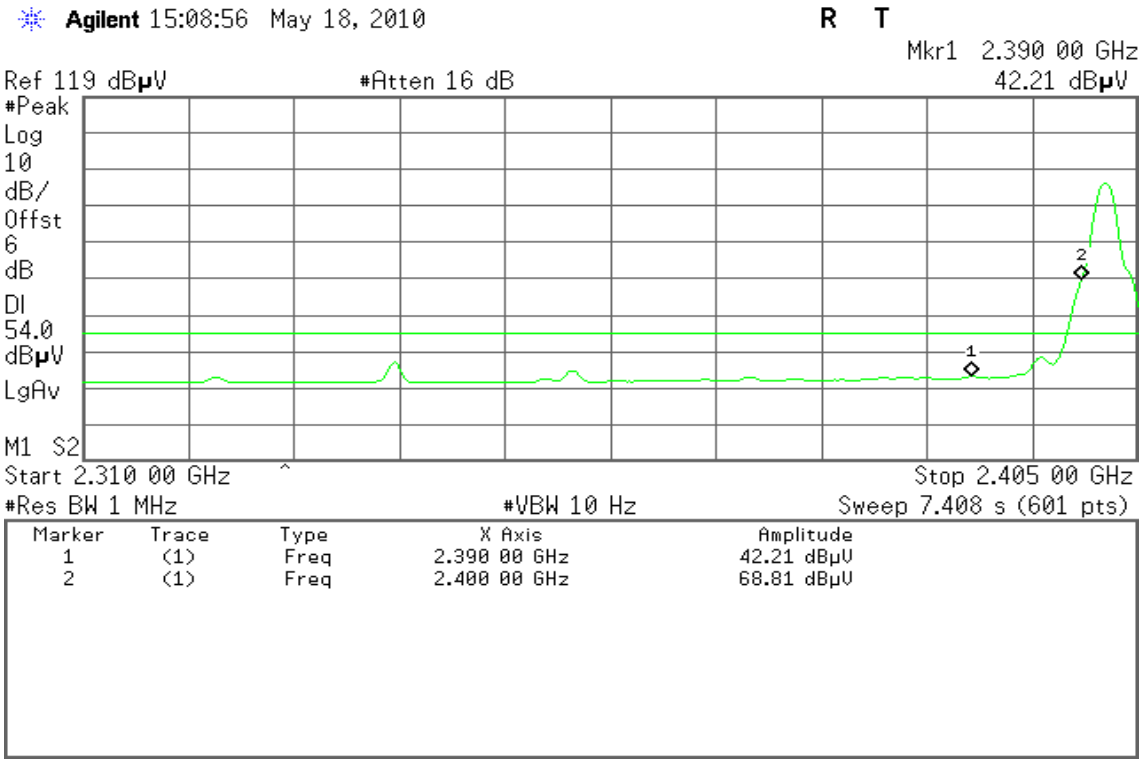
For GFSK / DH5

Band Edges (CH Low)

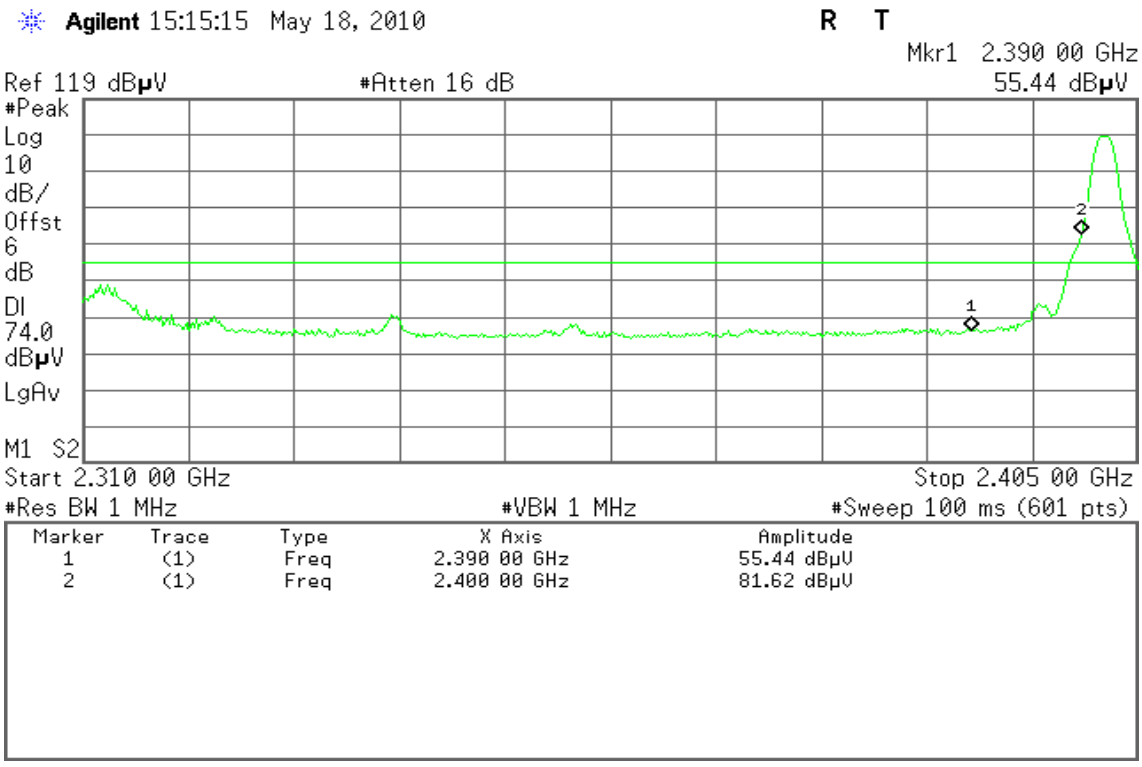
Detector mode: Peak **Polarity: Vertical**



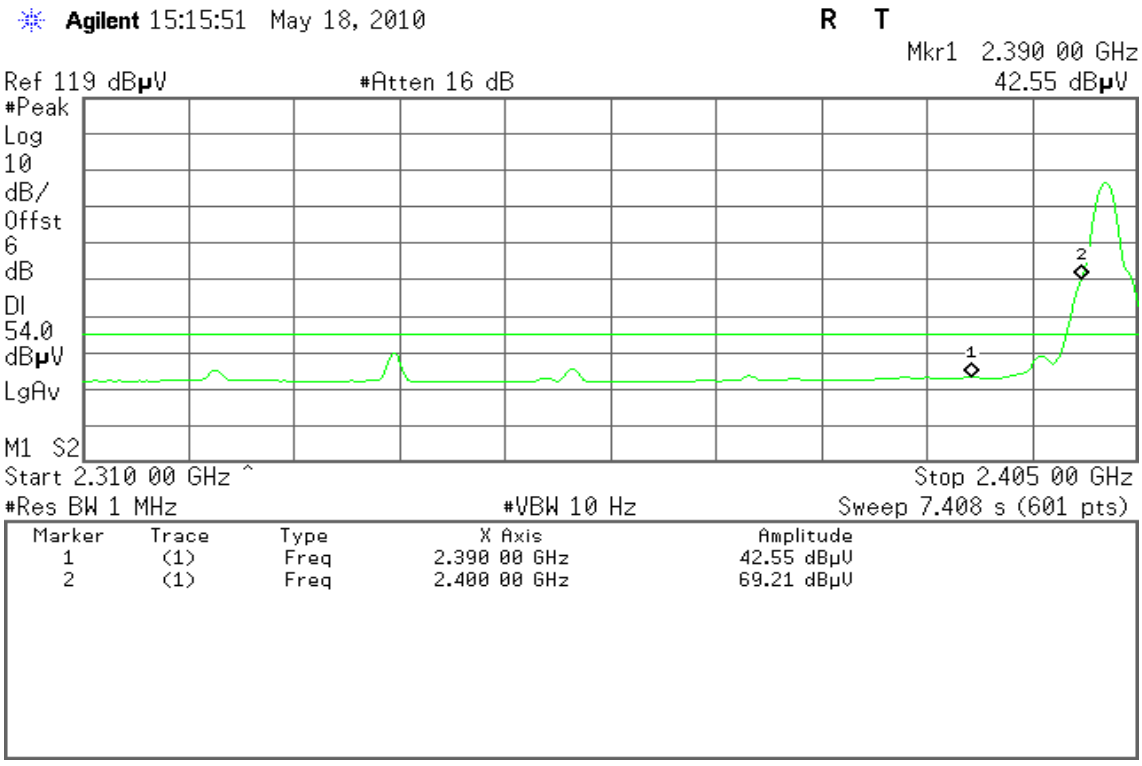
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

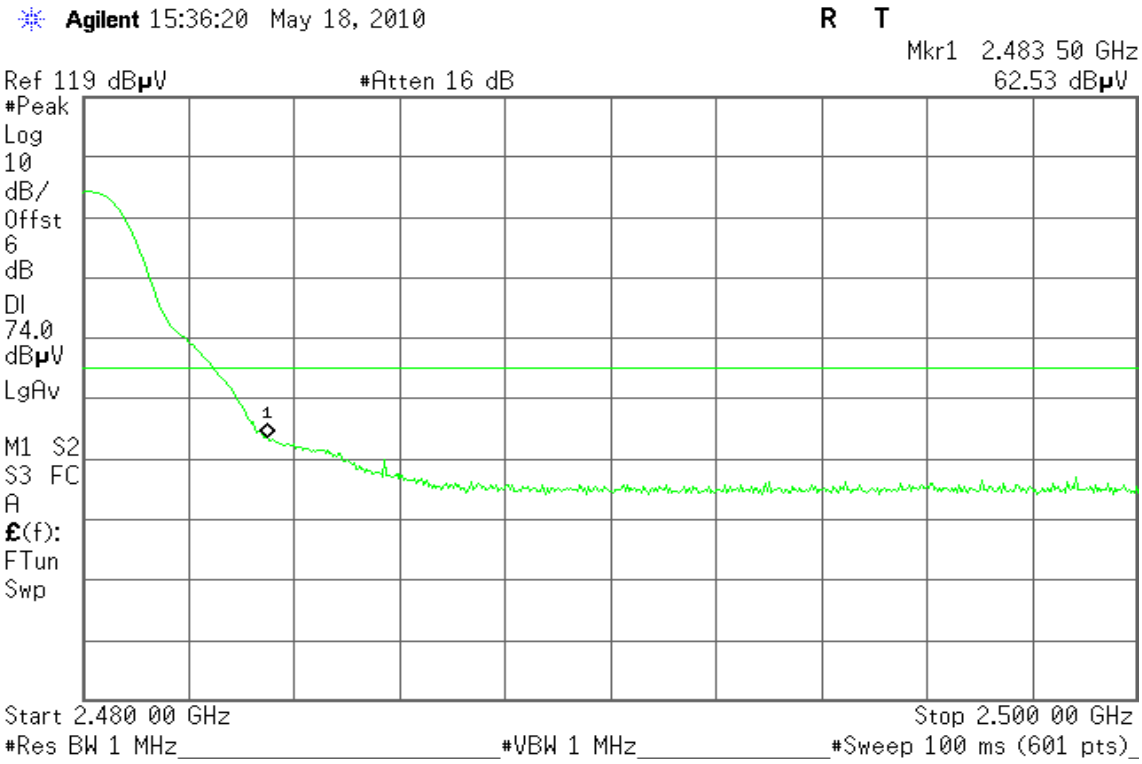


Detector mode: Average **Polarity: Horizontal**

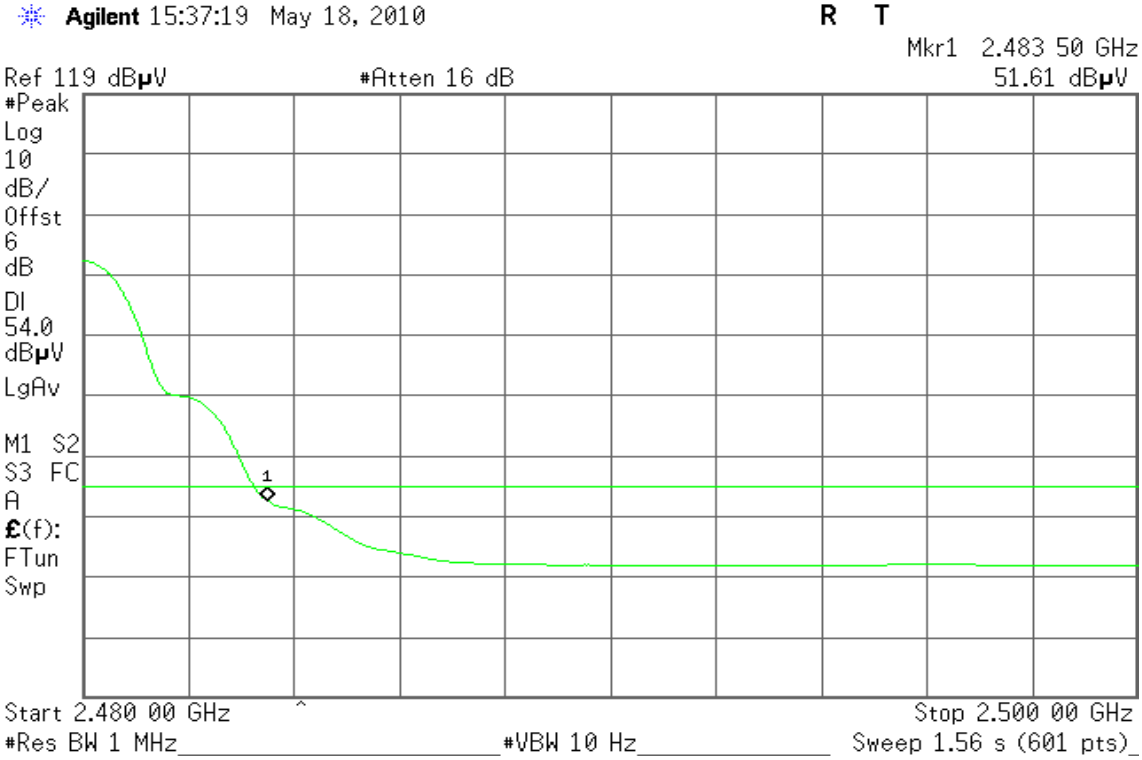


Band Edges (CH High)

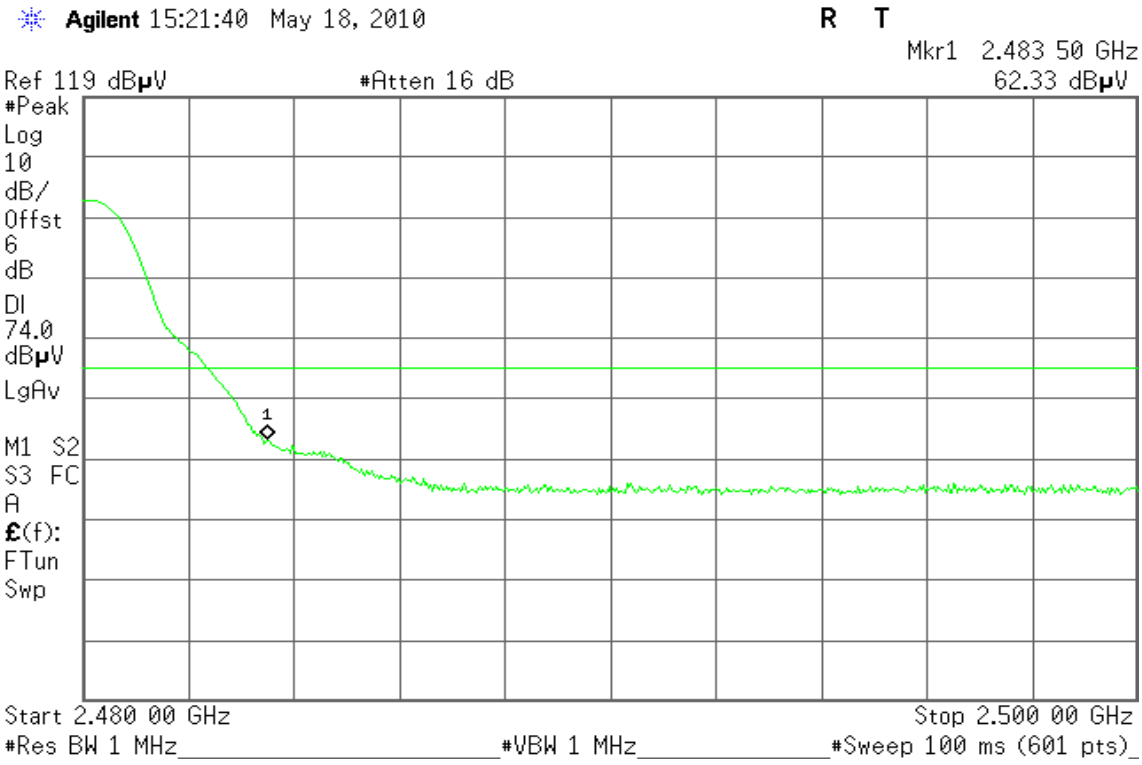
Detector mode: Peak Polarity: Vertical



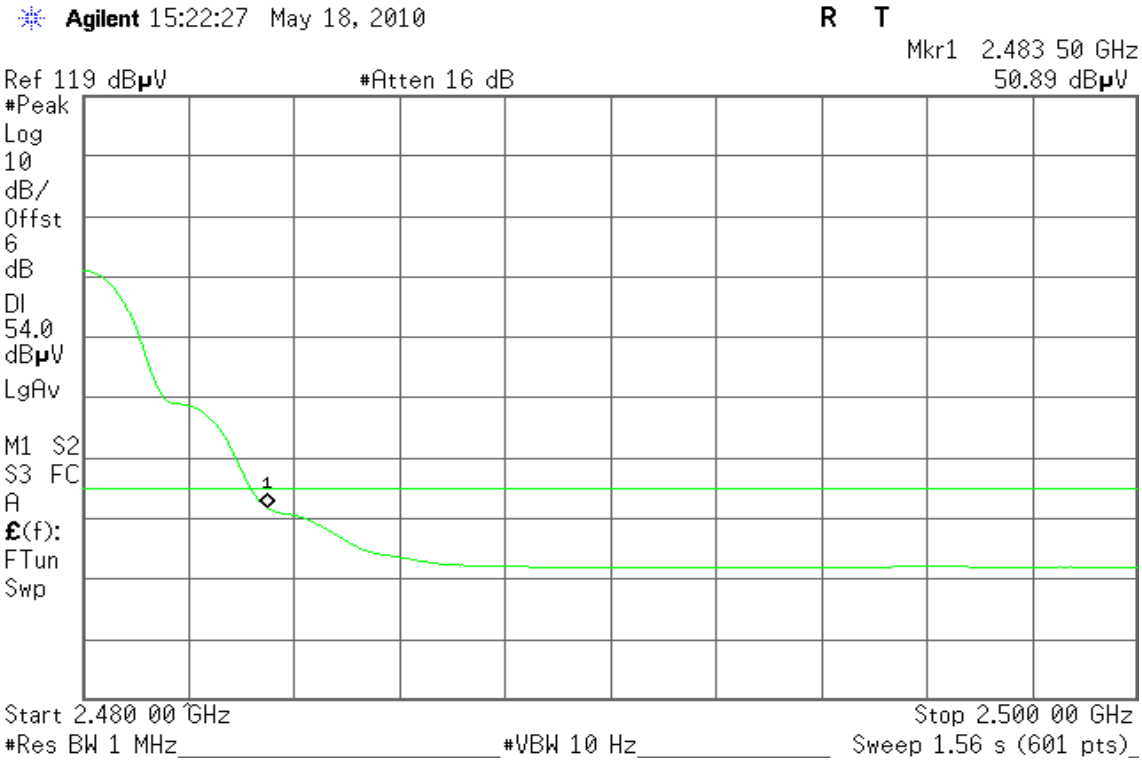
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



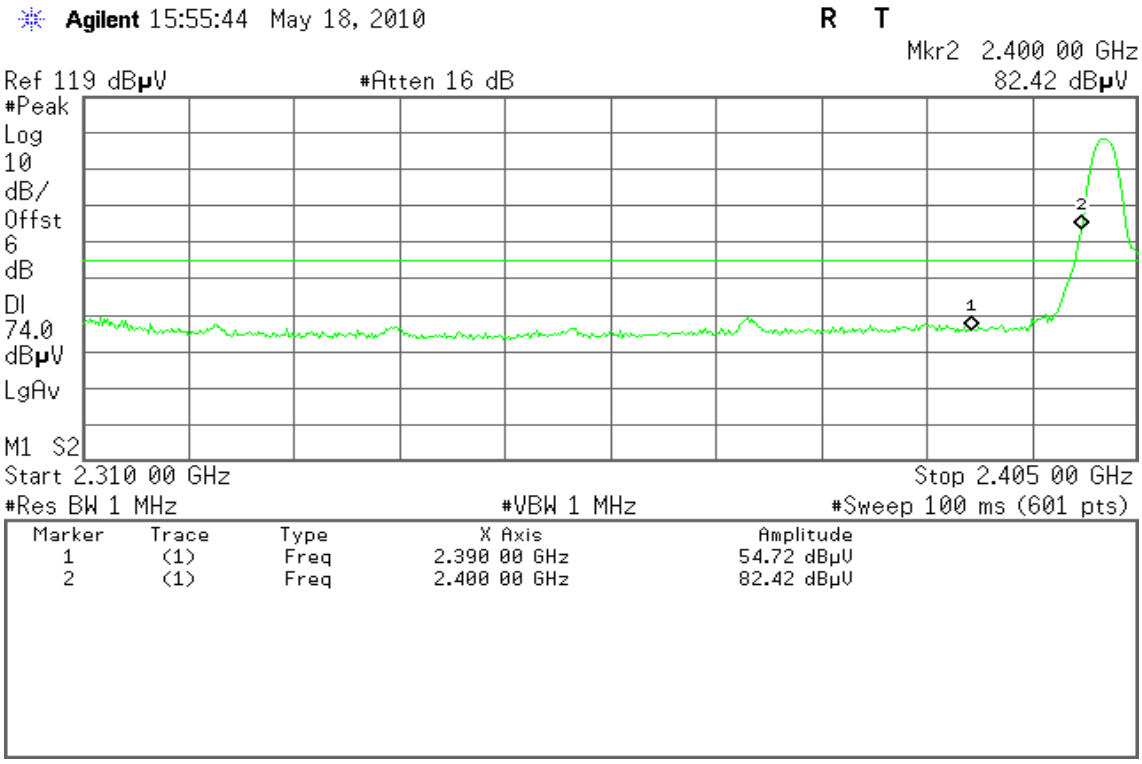
Detector mode: Average **Polarity: Horizontal**



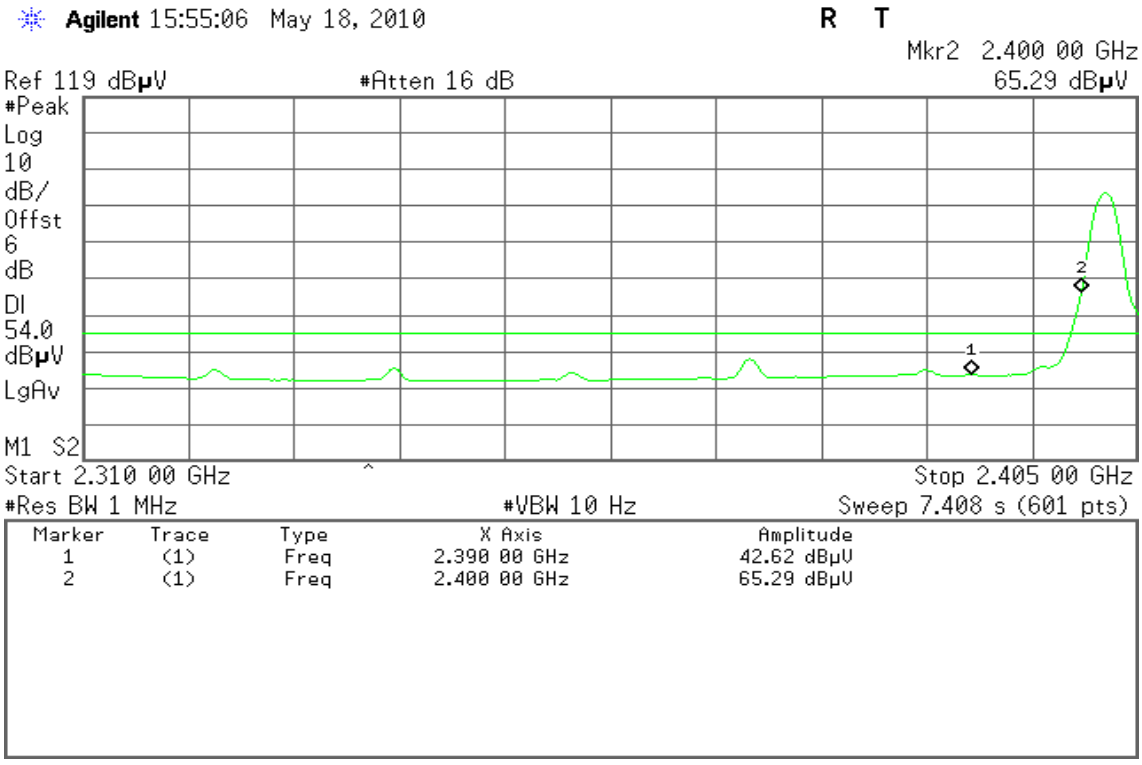
For 8DPSK / DH5

Band Edges (CH Low)

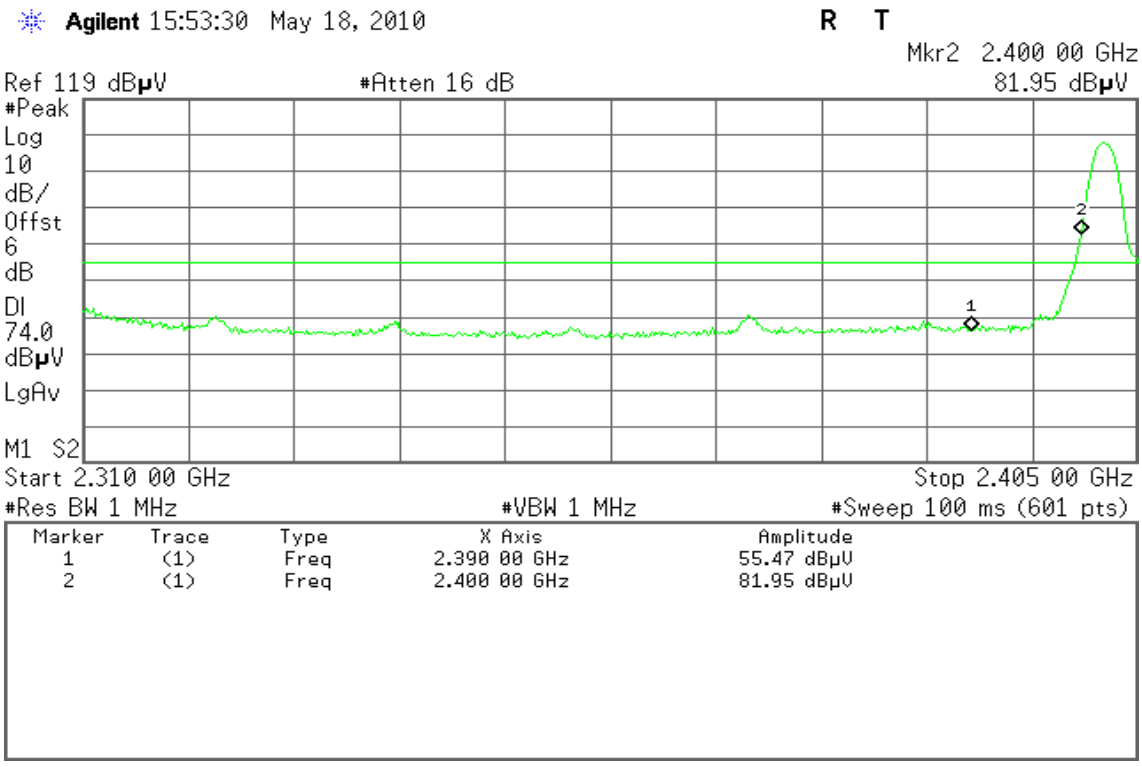
Detector mode: Peak **Polarity: Vertical**



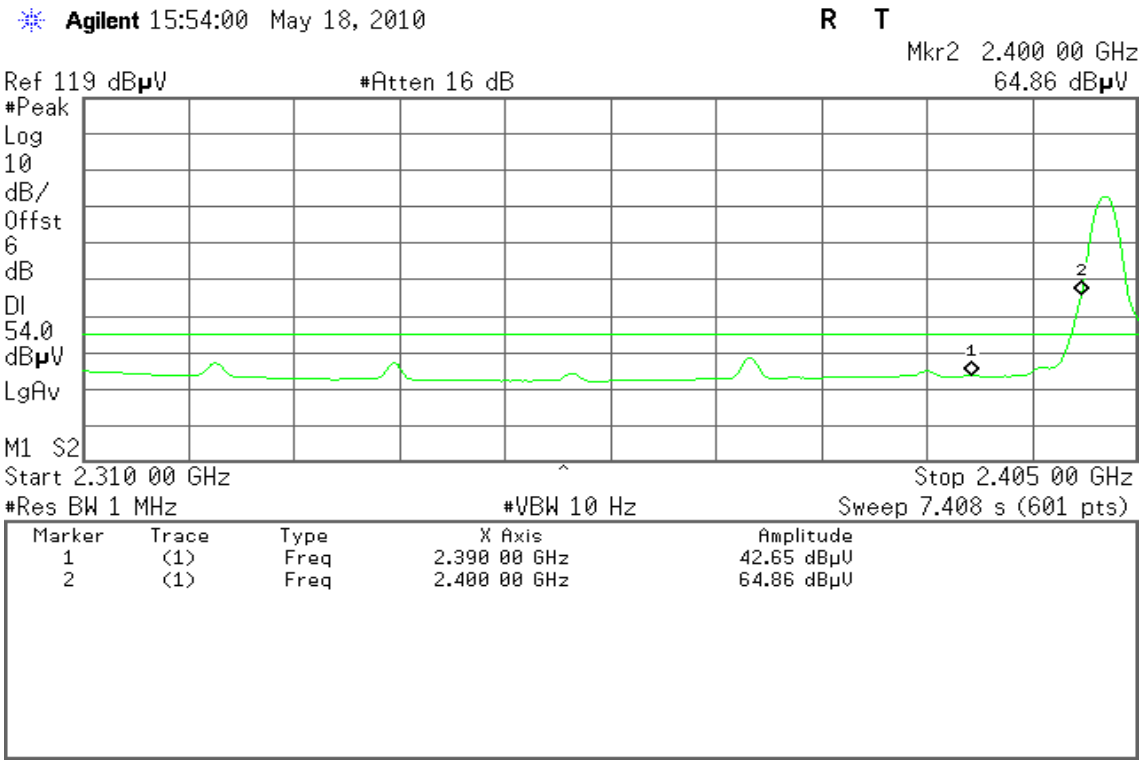
Detector mode: Average **Polarity: Vertical**



Detector mode: Peak **Polarity: Horizontal**

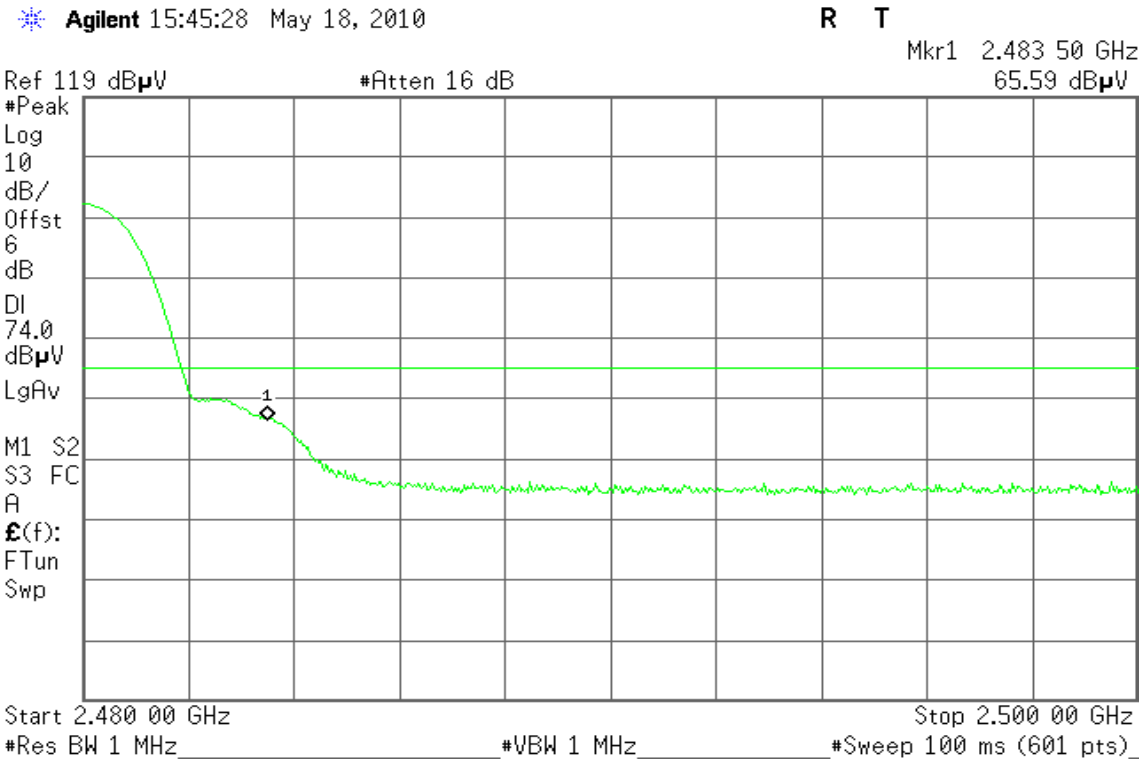


Detector mode: Average **Polarity: Horizontal**

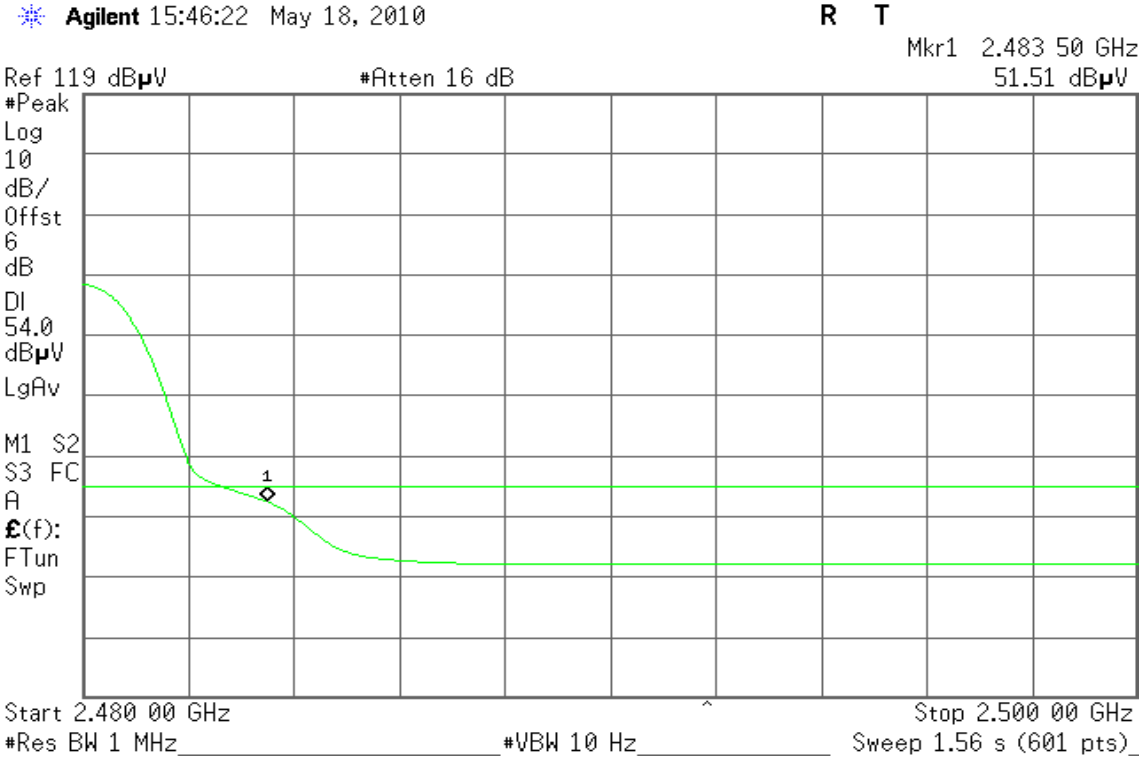


Band Edges (CH High)

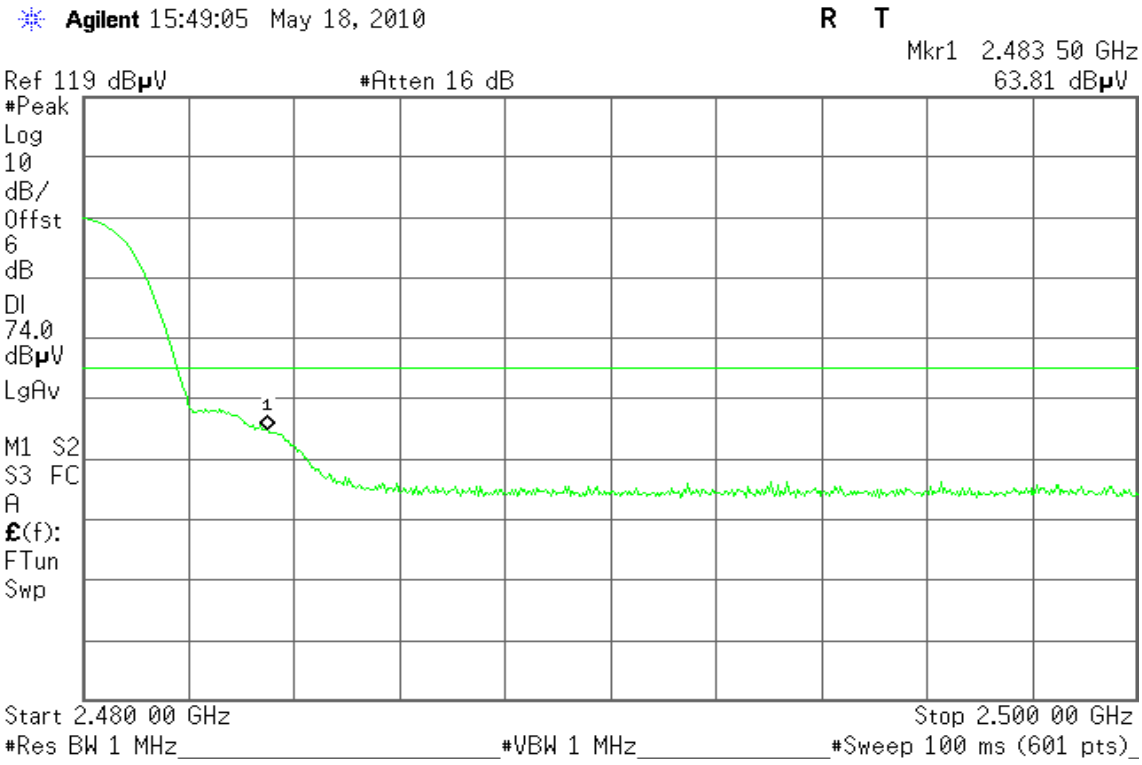
Detector mode: Peak Polarity: Vertical



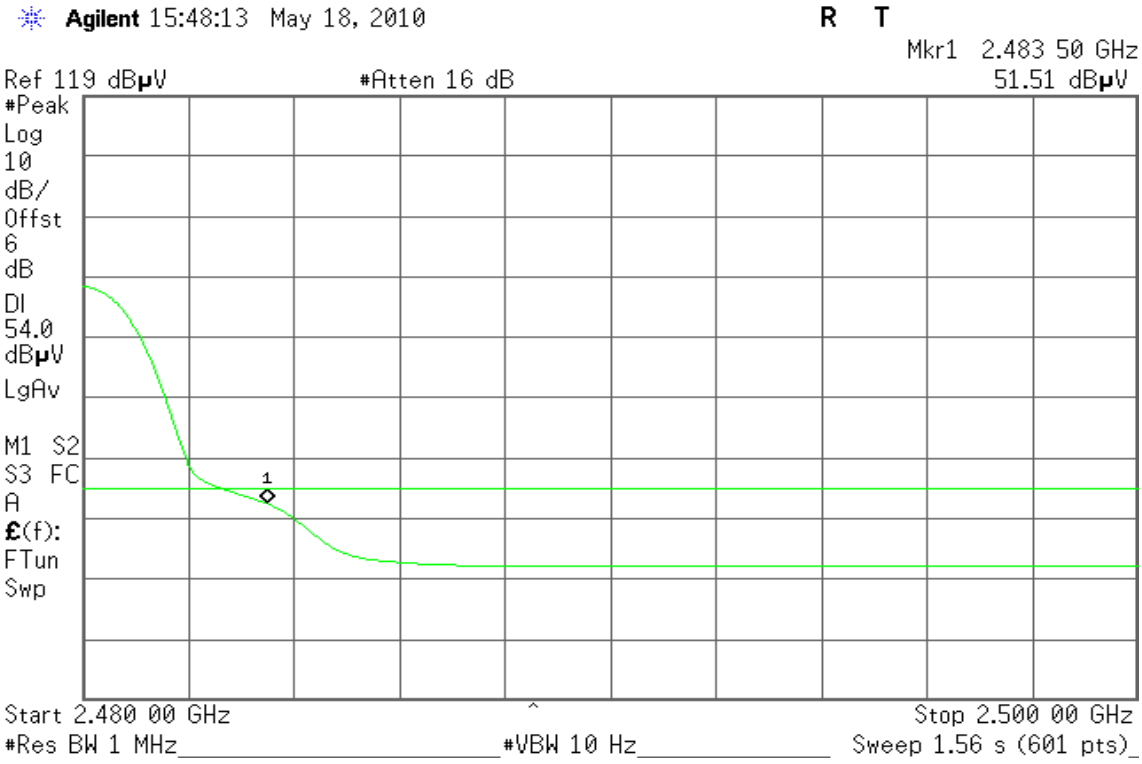
Detector mode: Average Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**

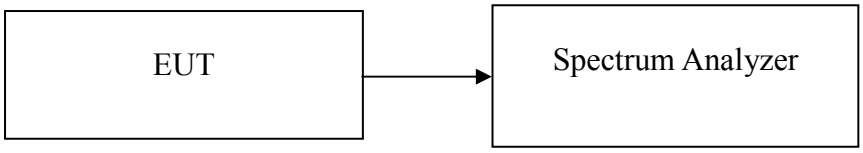


7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

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

No non-compliance noted

Test Data

For GFSK / DH5

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2402	1.15	8.00	PASS
Mid	2441	-0.98		PASS
High	2480	-2.82		PASS

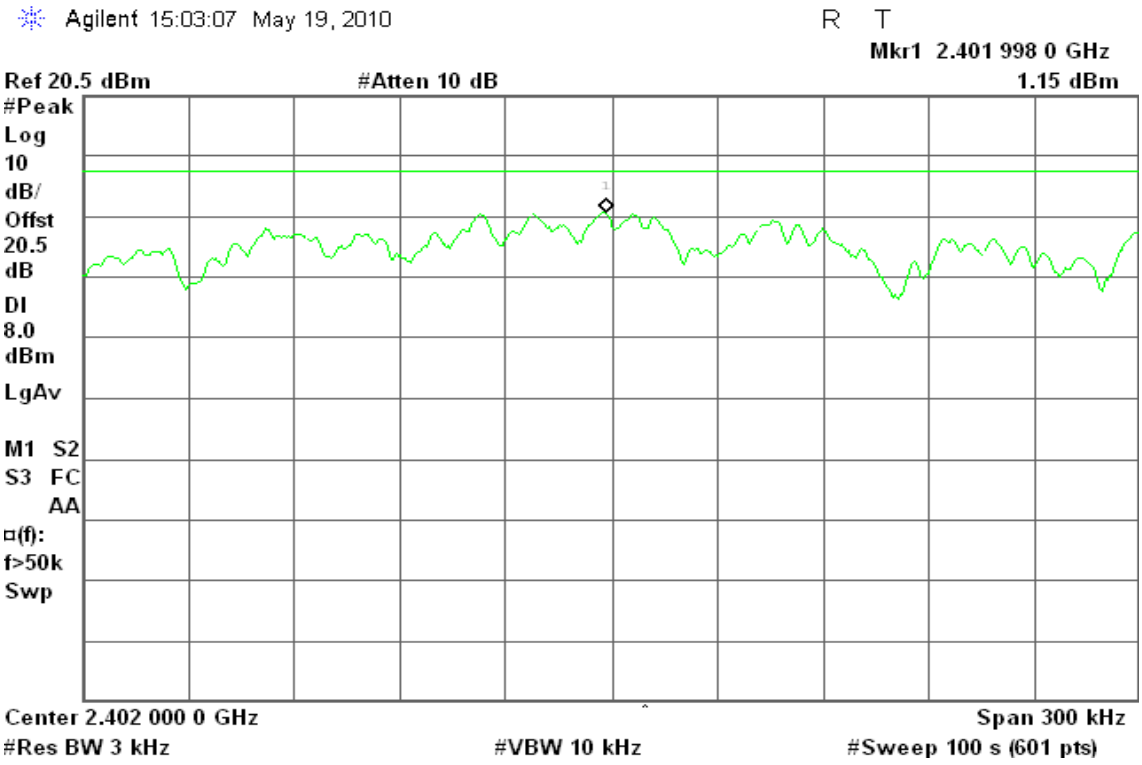
For 8DPSK / DH5

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2402	-0.16	8.00	PASS
Mid	2441	-1.95		PASS
High	2480	-3.84		PASS

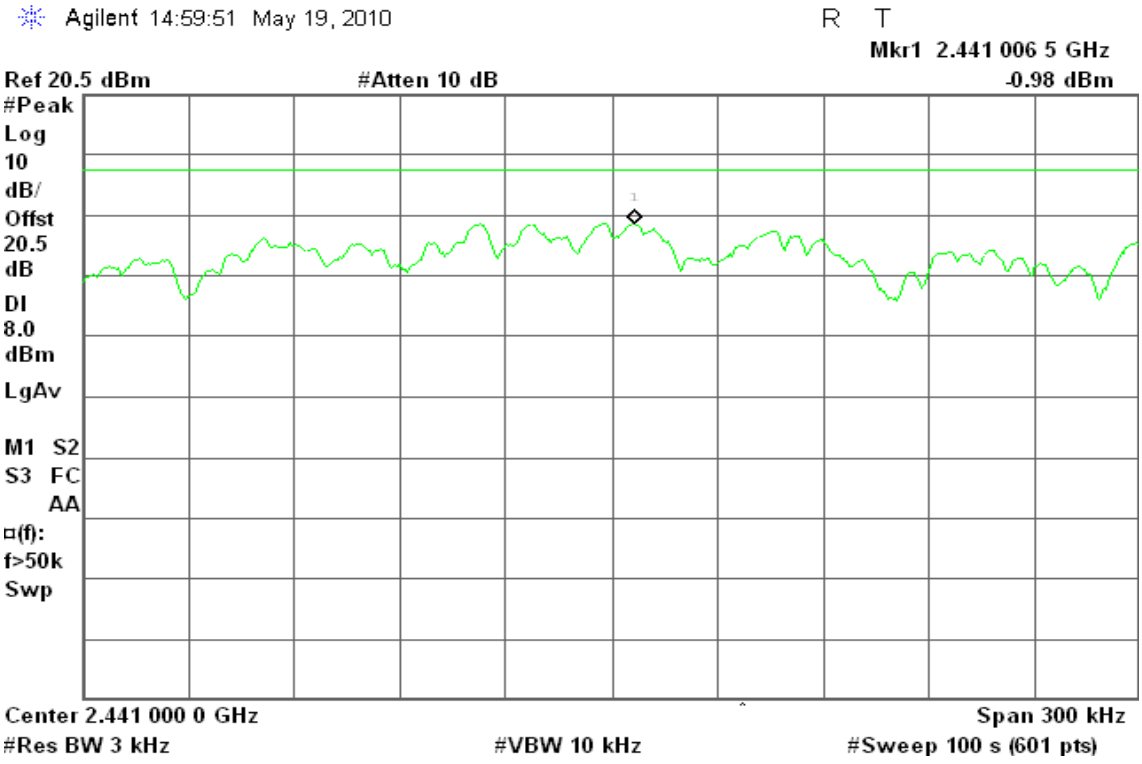
Test Plot

For GFSK / DH5

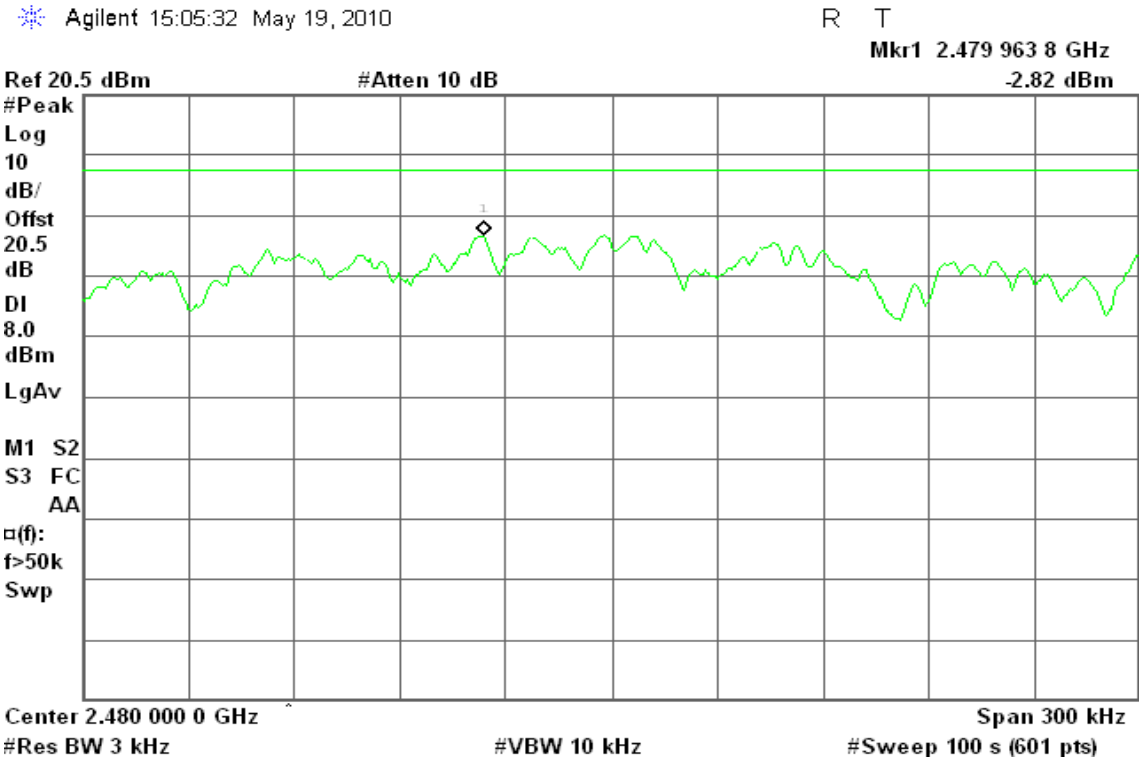
PPSD (CH Low)



PPSD (CH Mid)

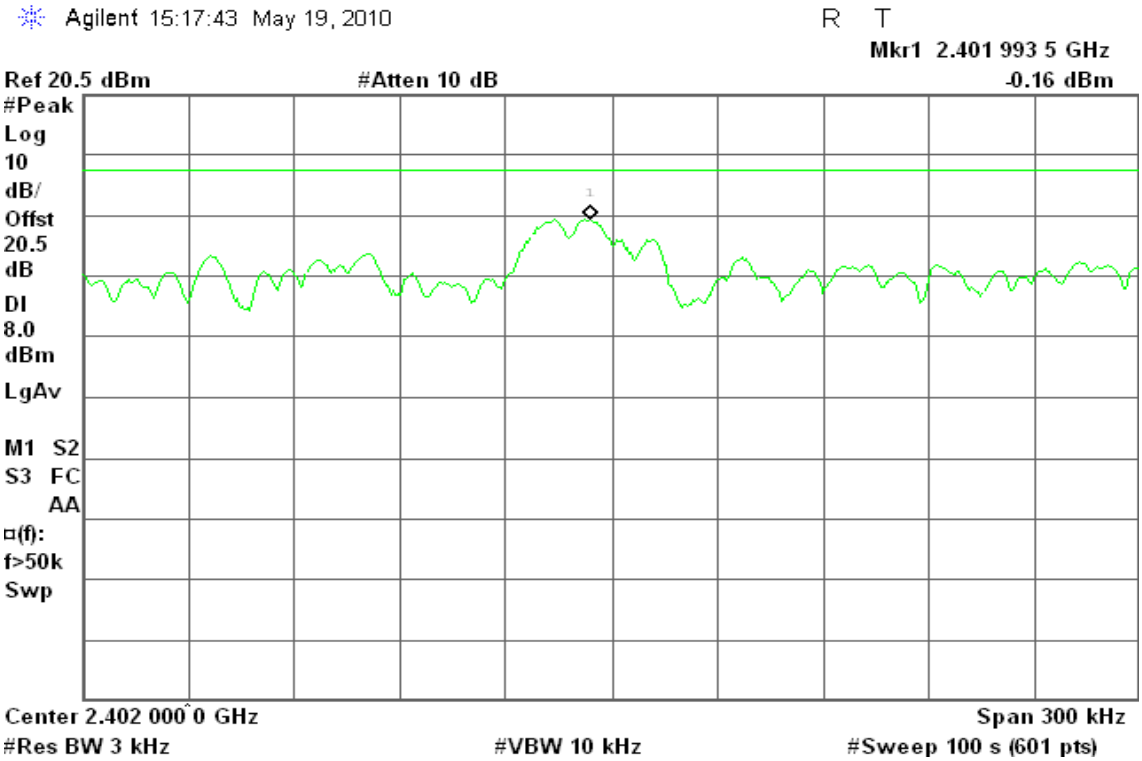


PPSD (CH High)

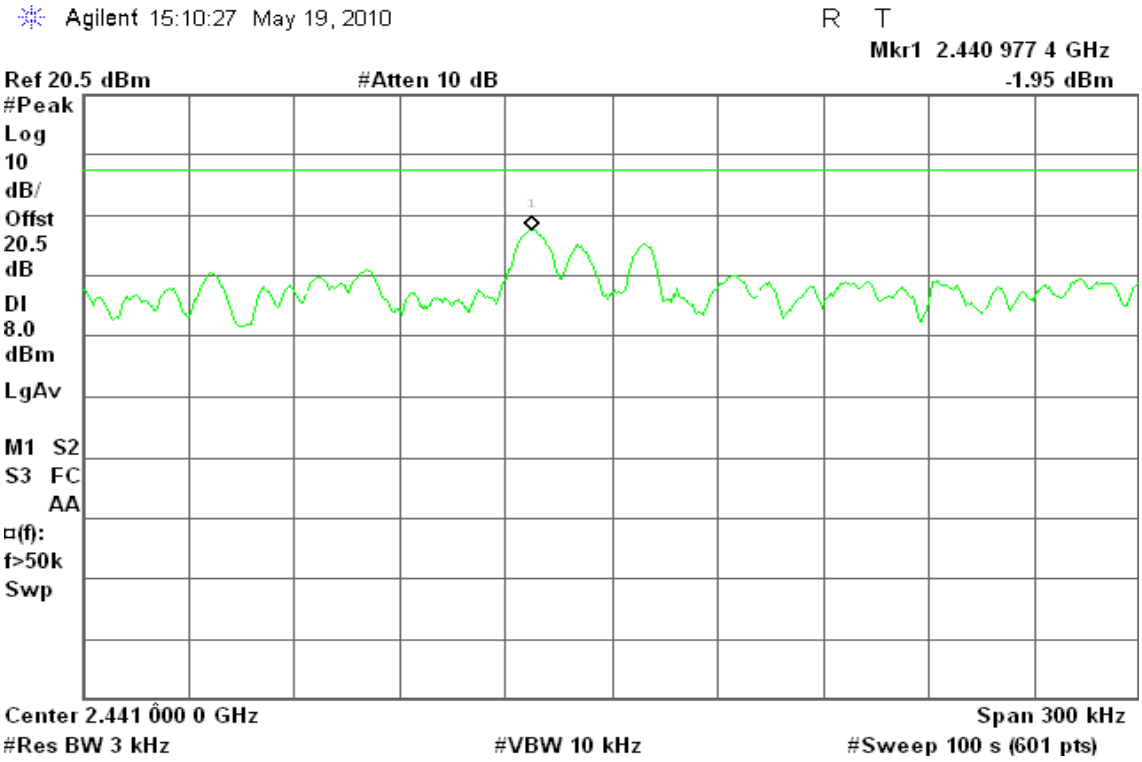

Agilent 15:05:32 May 19, 2010
R T
Mkr1 2.479 963 8 GHz
-2.82 dBm
Ref 20.5 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Offst
20.5
dB
Dl
8.0
dBm
LgAv
M1 S2
S3 FC
AA
¤(f):
f>50k
Swp
Center 2.480 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)

For 8DPSK / DH5

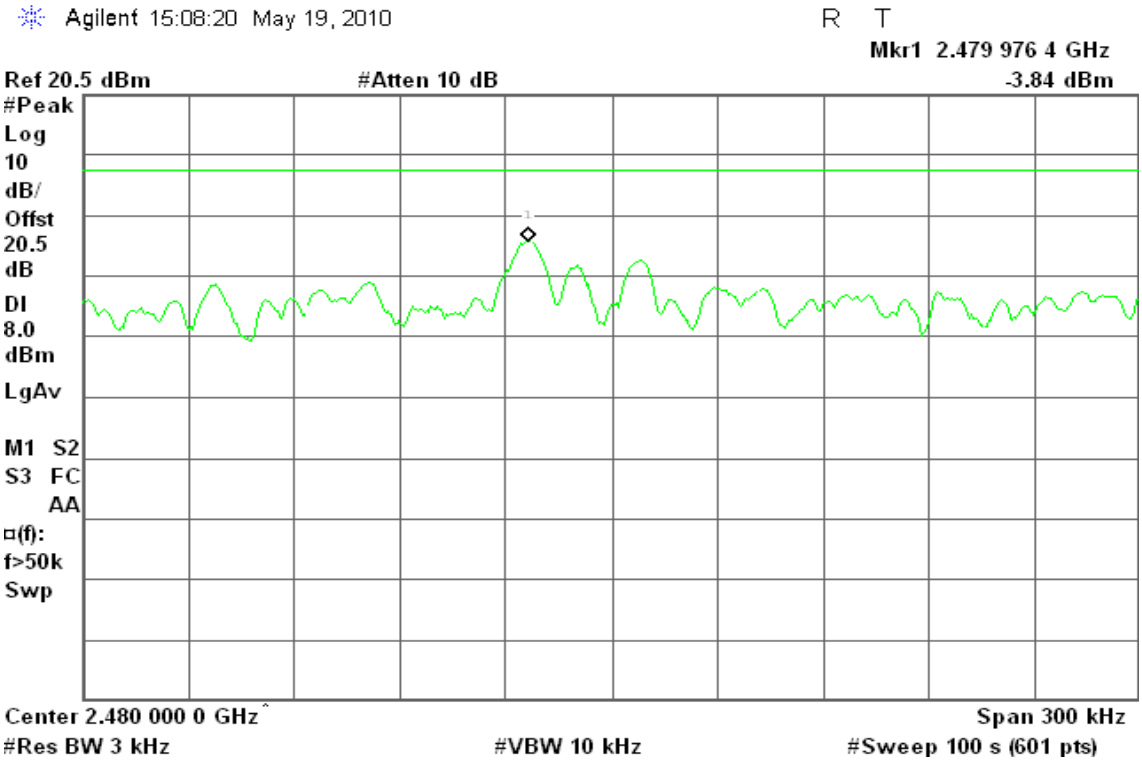
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)

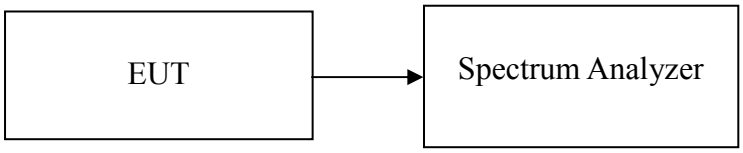

Agilent 15:08:20 May 19, 2010
R T
Mkr1 2.479 976 4 GHz
-3.84 dBm
Ref 20.5 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Offst
20.5
dB
Dl
8.0
dBm
LgAv
M1 S2
S3 FC
AA
¤(f):
f>50k
Swp
Center 2.480 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)

7.6 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

For GFSK / DH5

Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	588	>two-thirds of the 20 dB bandwidth	Pass

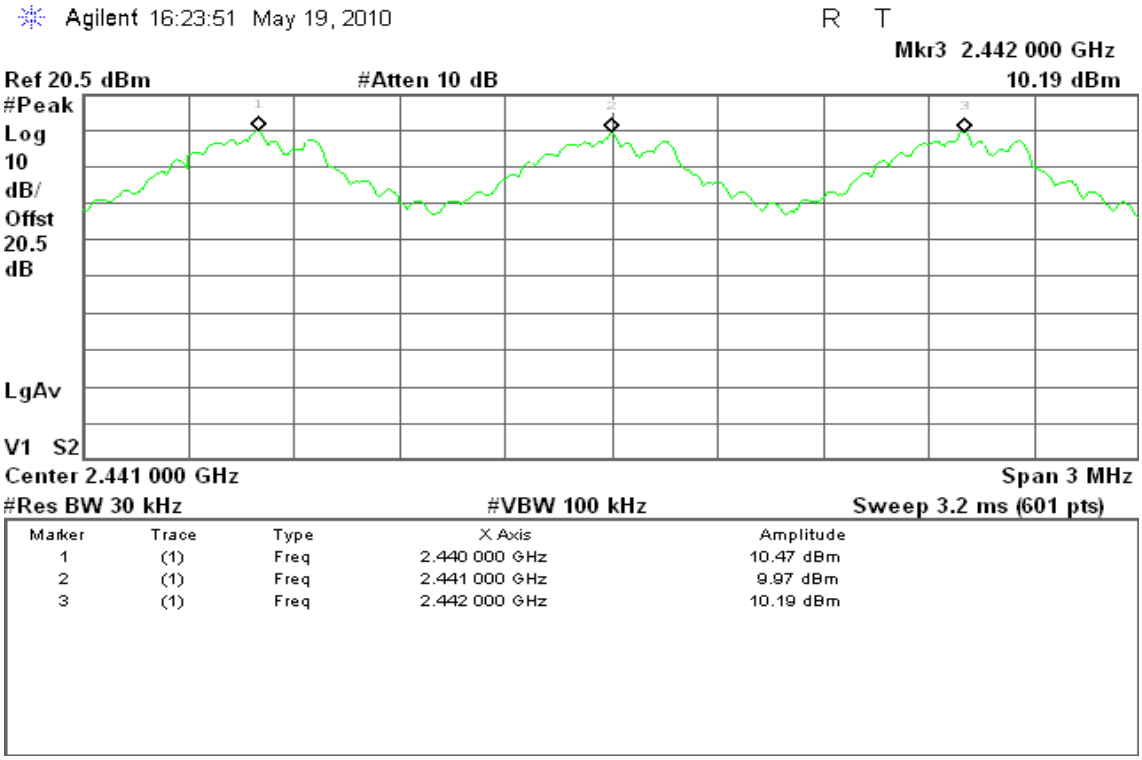
For 8DPSK / DH5

Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	876.7	>two-thirds of the 20 dB bandwidth	Pass

Test Plot

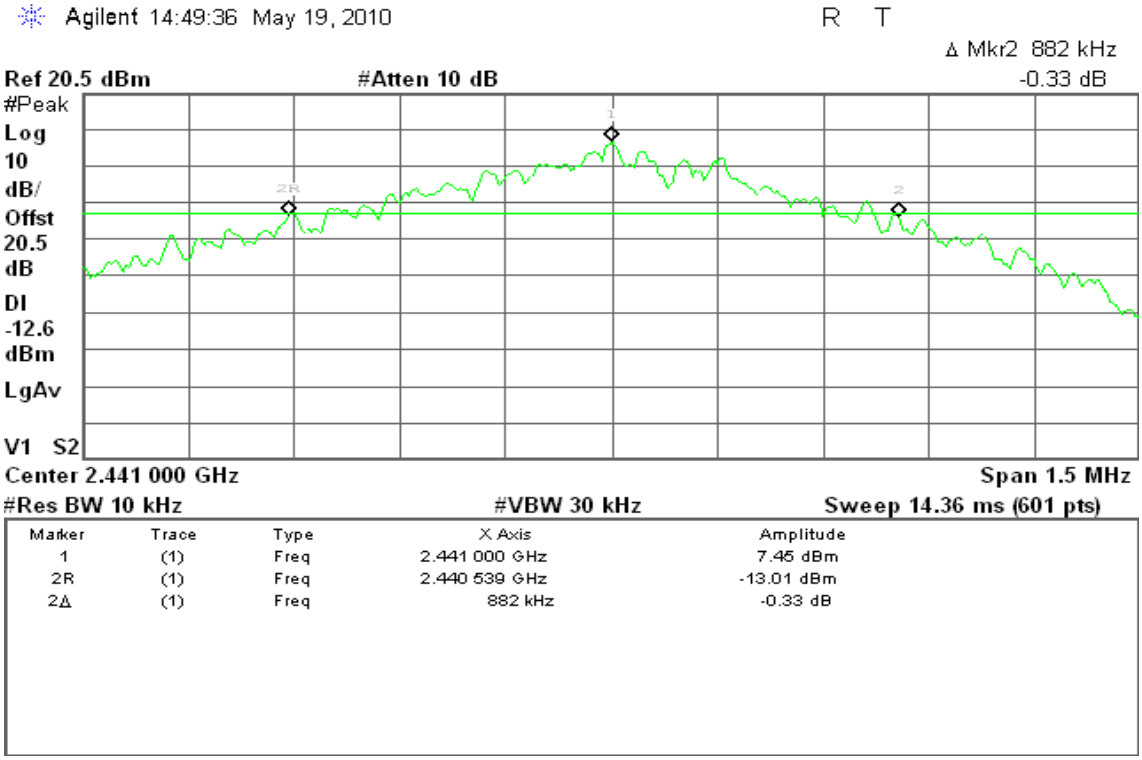
For GFSK / DH5

Measurement of Channel Separation



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.440 000 GHz	10.47 dBm
2	(1)	Freq	2.441 000 GHz	9.97 dBm
3	(1)	Freq	2.442 000 GHz	10.19 dBm

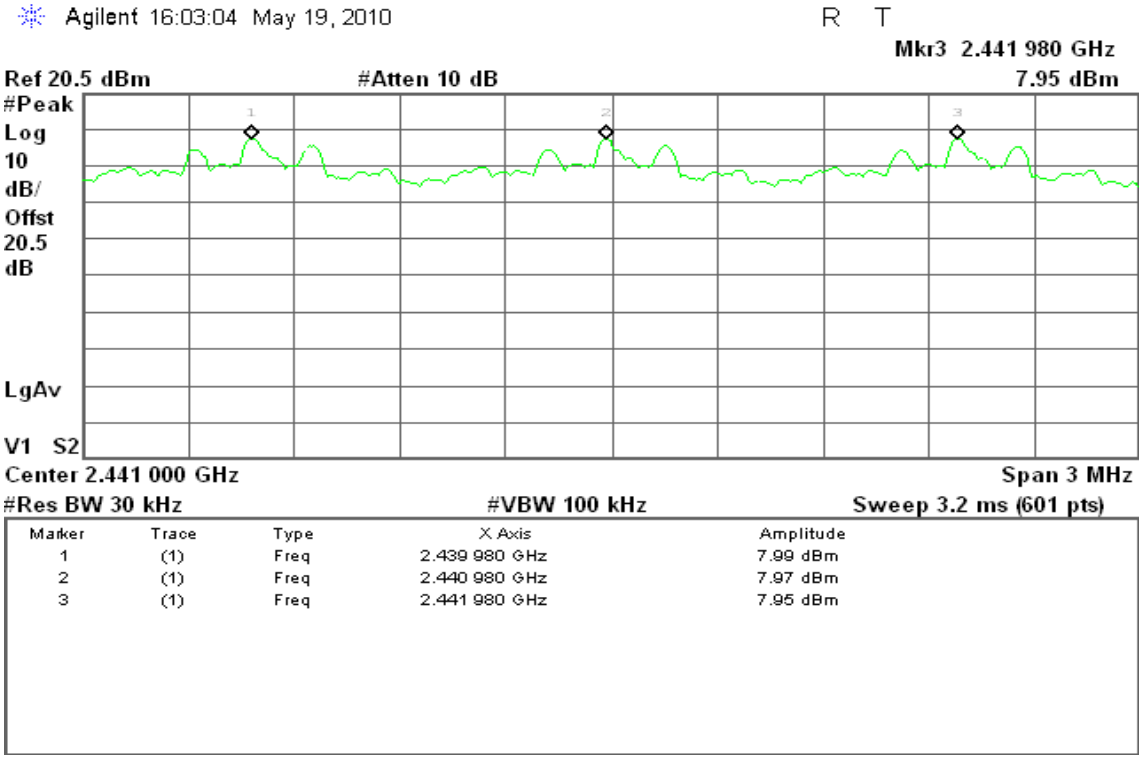
Measurement of 20dB Bandwidth



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.441 000 GHz	7.45 dBm
2R	(1)	Freq	2.440 539 GHz	-13.01 dBm
2Δ	(1)	Freq	882 kHz	-0.33 dB

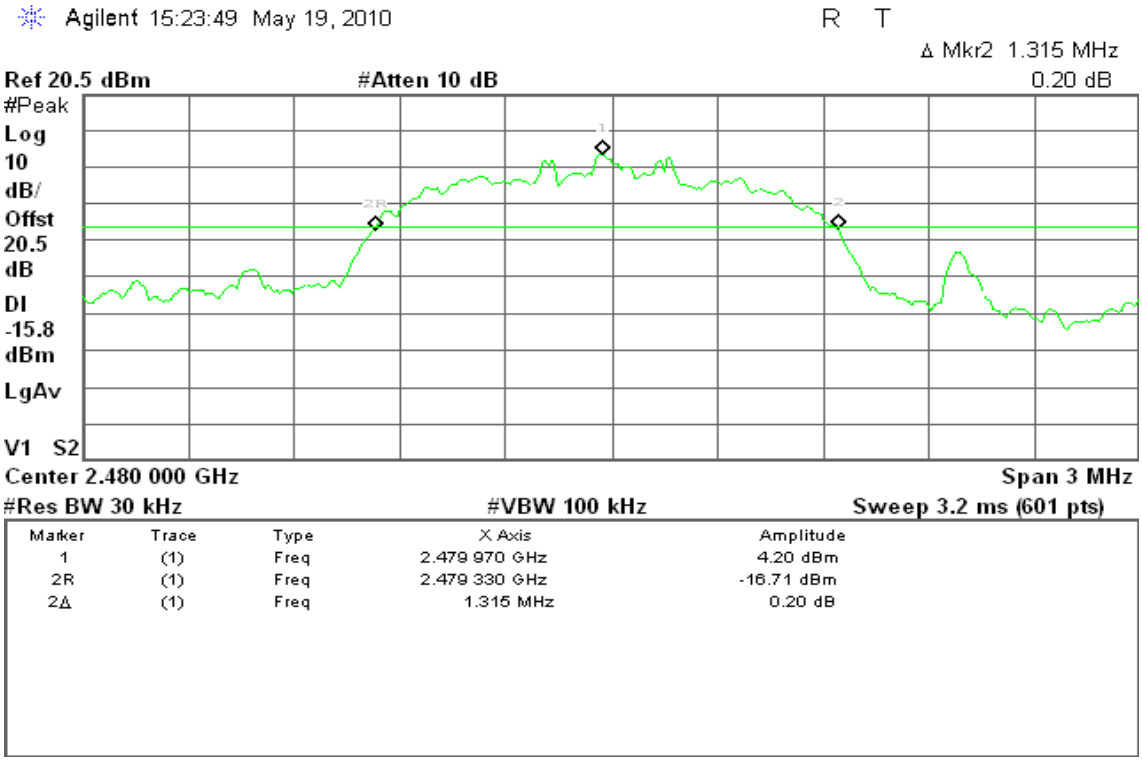
For 8DPSK / DH5

Measurement of Channel Separation



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.439 980 GHz	7.99 dBm
2	(1)	Freq	2.440 980 GHz	7.97 dBm
3	(1)	Freq	2.441 980 GHz	7.95 dBm

Measurement of 20dB Bandwidth



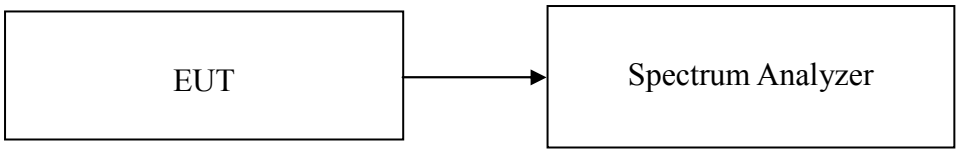
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.479 970 GHz	4.20 dBm
2R	(1)	Freq	2.479 330 GHz	-16.71 dBm
2Δ	(1)	Freq	1.315 MHz	0.20 dB

7.7 NUMBER OF HOPPING FREQUENCY

LIMIT

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

Test Configuration



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted

Test Data

For GFSK / 8DPSK

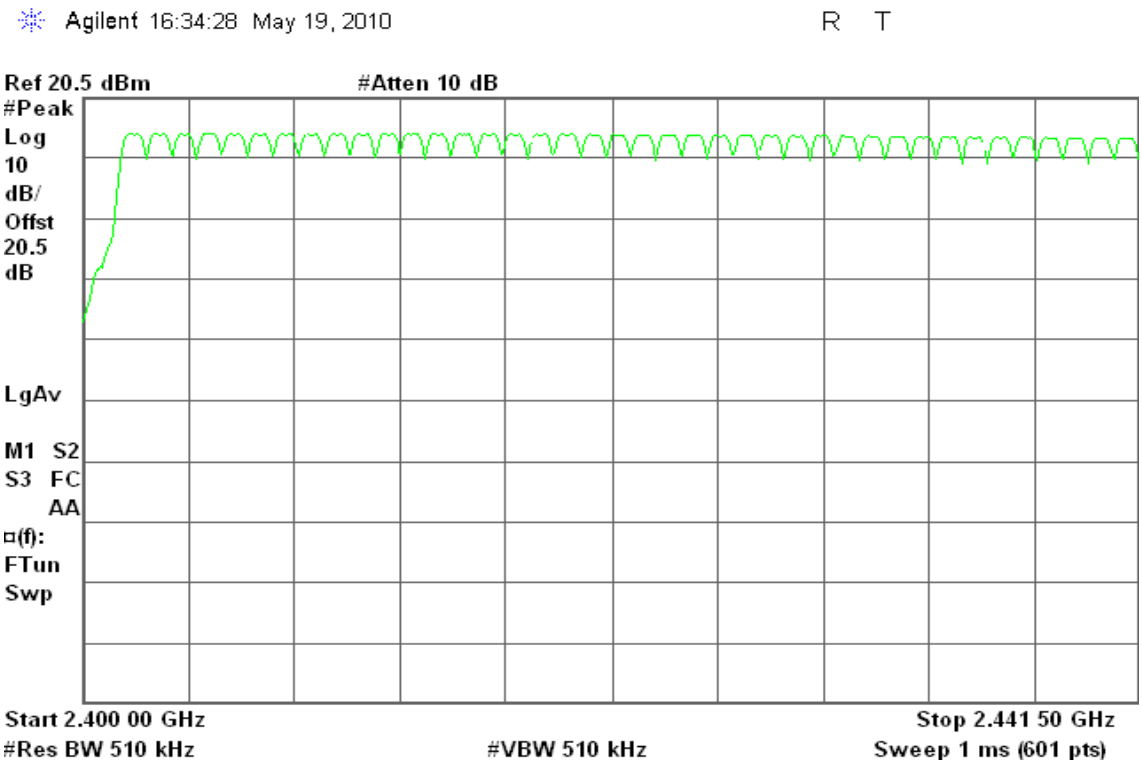
Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS

Test Plot

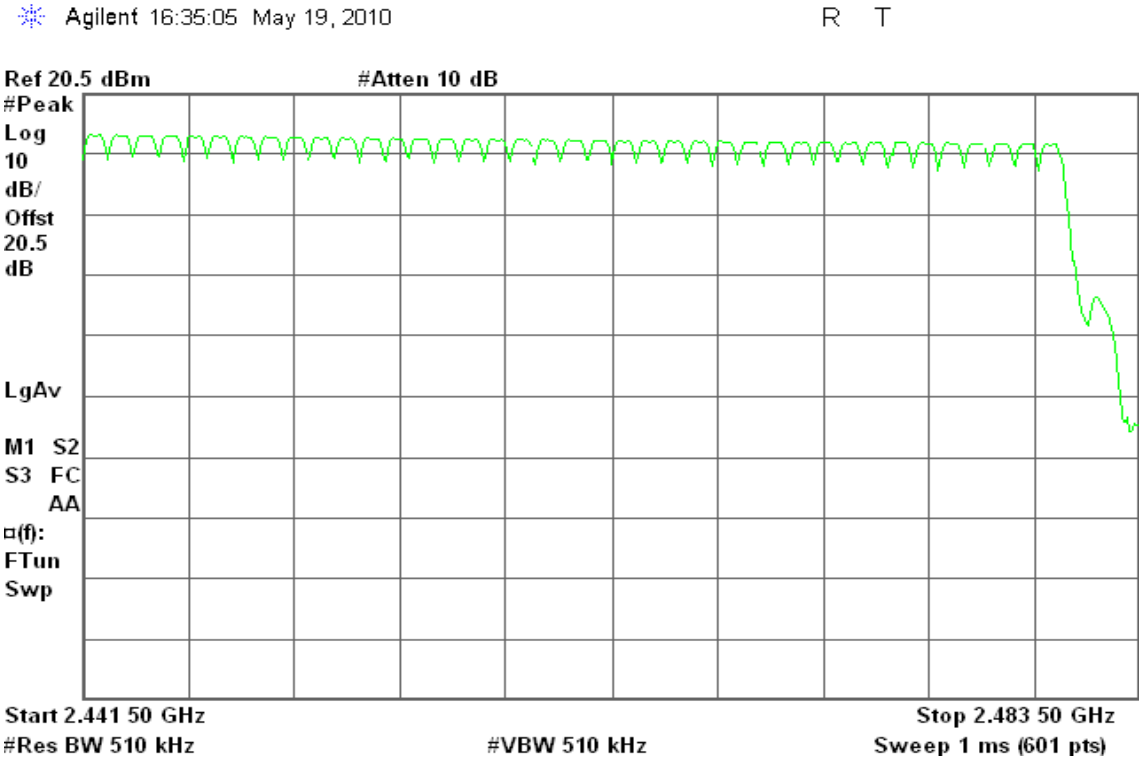
For GFSK

Channel Number

2.4 GHz – 2.4415 GHz



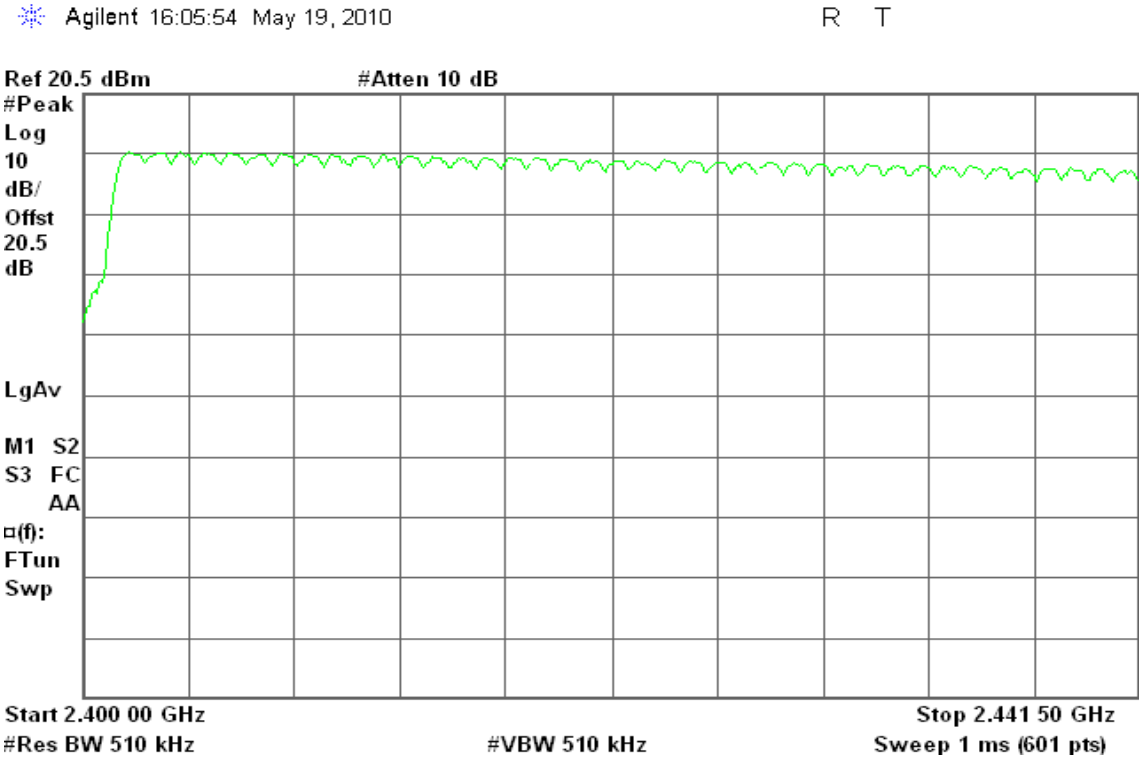
2.4415 GHz – 2.4835 GHz



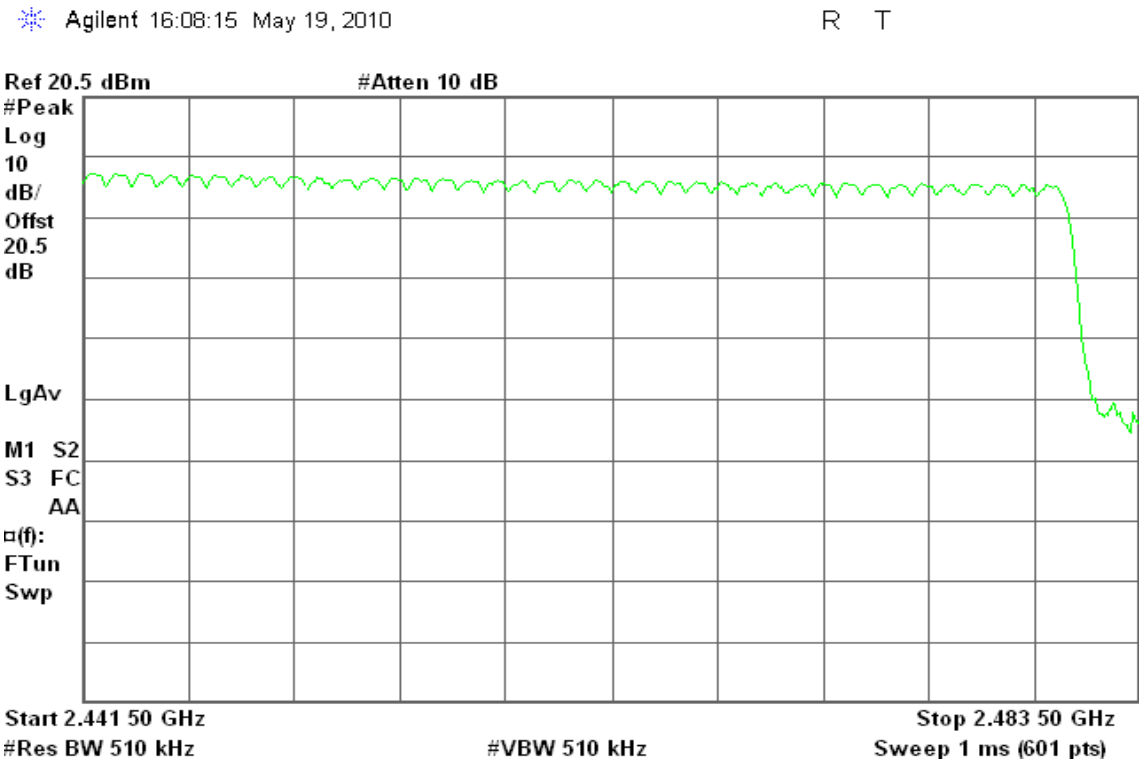
For 8DPSK

Channel Number

2.4 GHz – 2.4415 GHz



2.4415 GHz – 2.4835 GHz

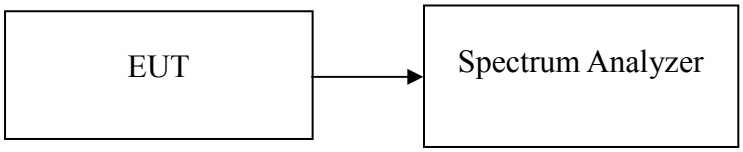


7.8 TIME OF OCCUPANCY (DWELL TIME)

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 Data

For GFSK

DH 1

CH Low: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)
CH Mid: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)
CH High: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4333	138.656	31.60	400.00	PASS
Mid	0.4333	138.656	31.60		PASS
High	0.4333	138.656	31.60		PASS

DH 3

CH Low: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)
CH Mid: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)
CH High: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.683	269.280	31.60	400.00	PASS
Mid	1.683	269.280	31.60		PASS
High	1.683	269.280	31.60		PASS

DH 5

CH Low: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)
CH Mid: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)
CH High: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)

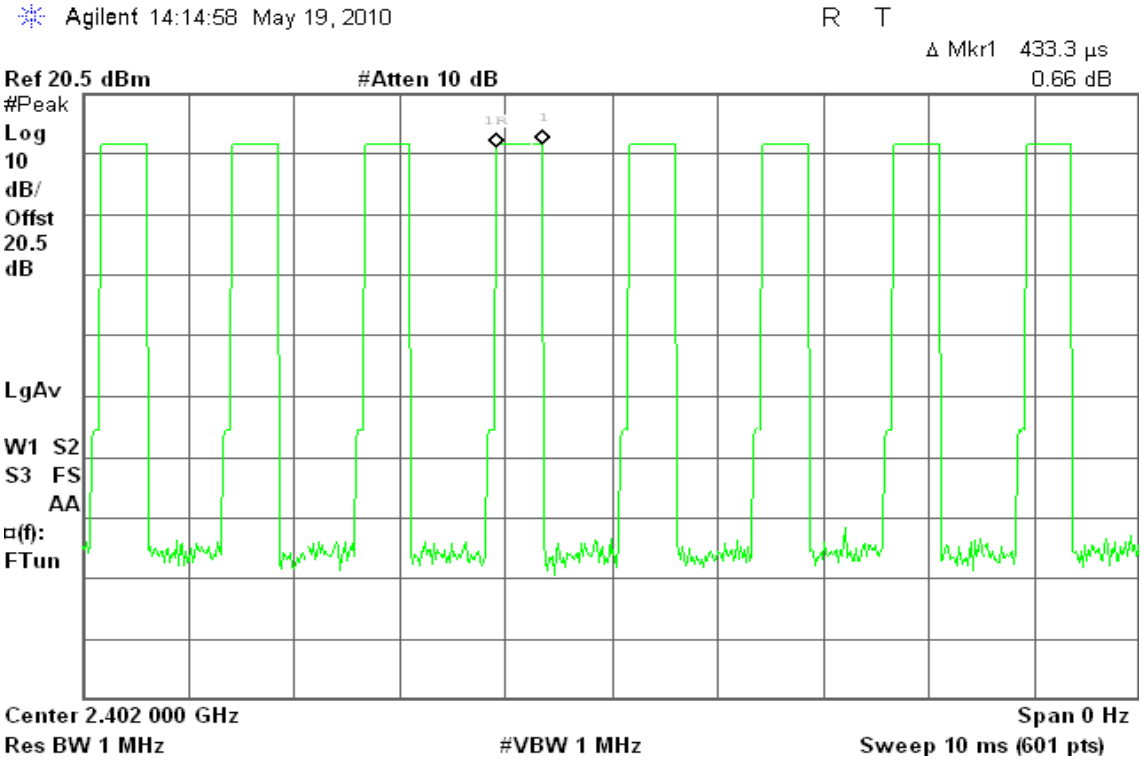
CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.933	312.853	31.60	400.00	PASS
Mid	2.933	312.853	31.60		PASS
High	2.933	312.853	31.60		PASS

Test Plot

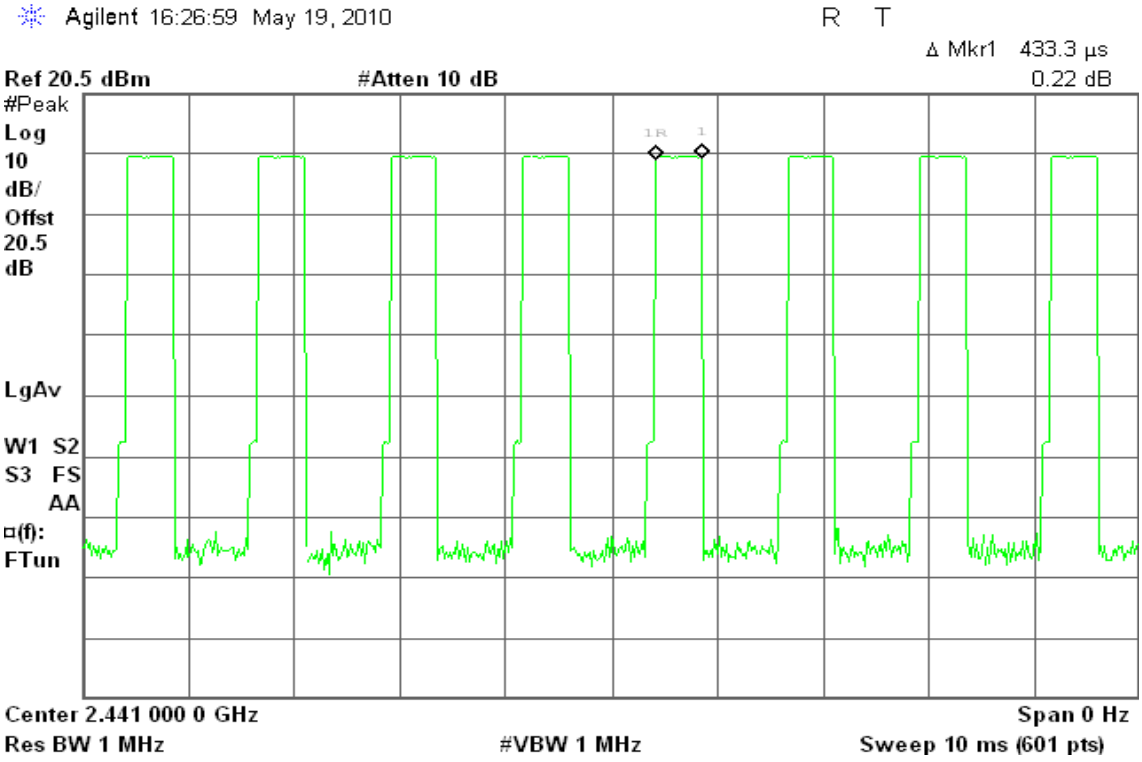
For GFSK

DH 1

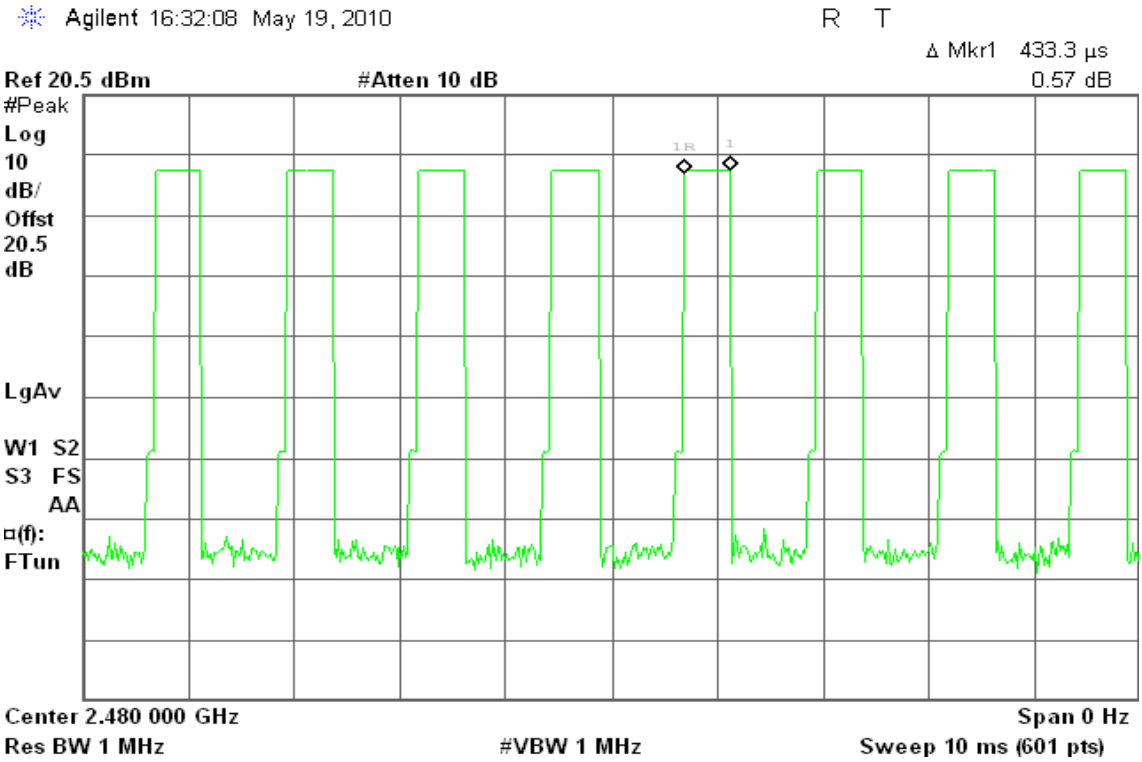
CH Low



CH Mid

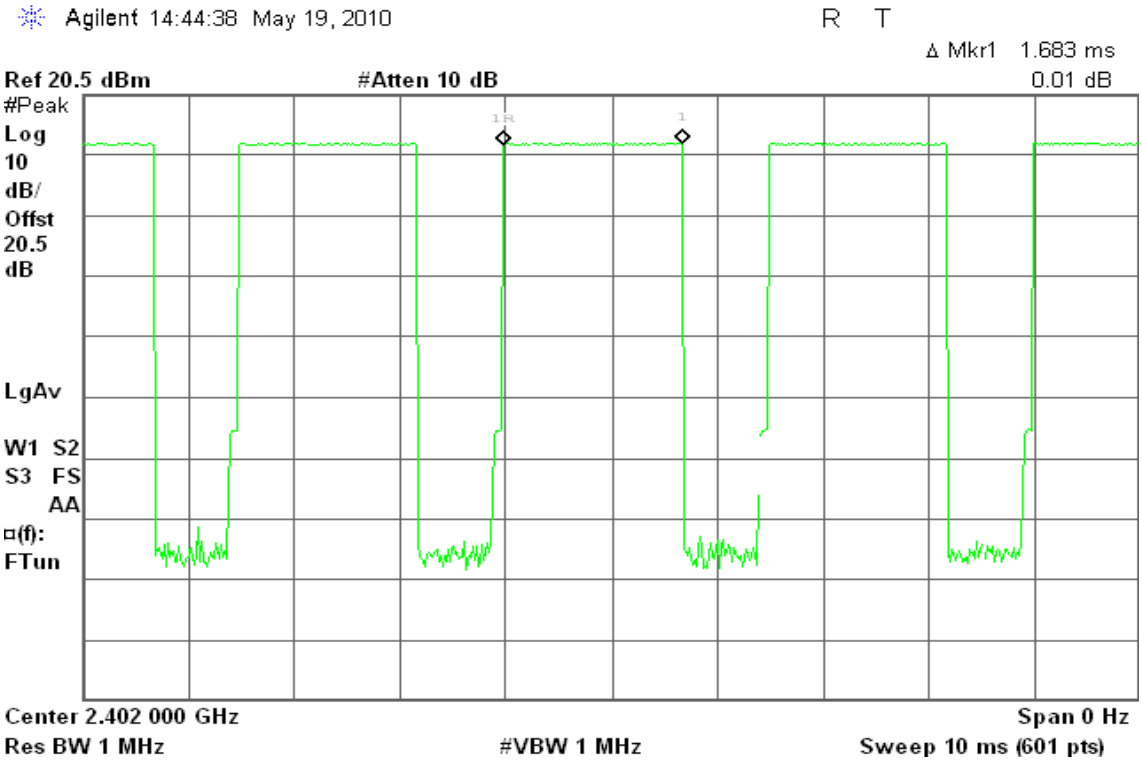


CH High

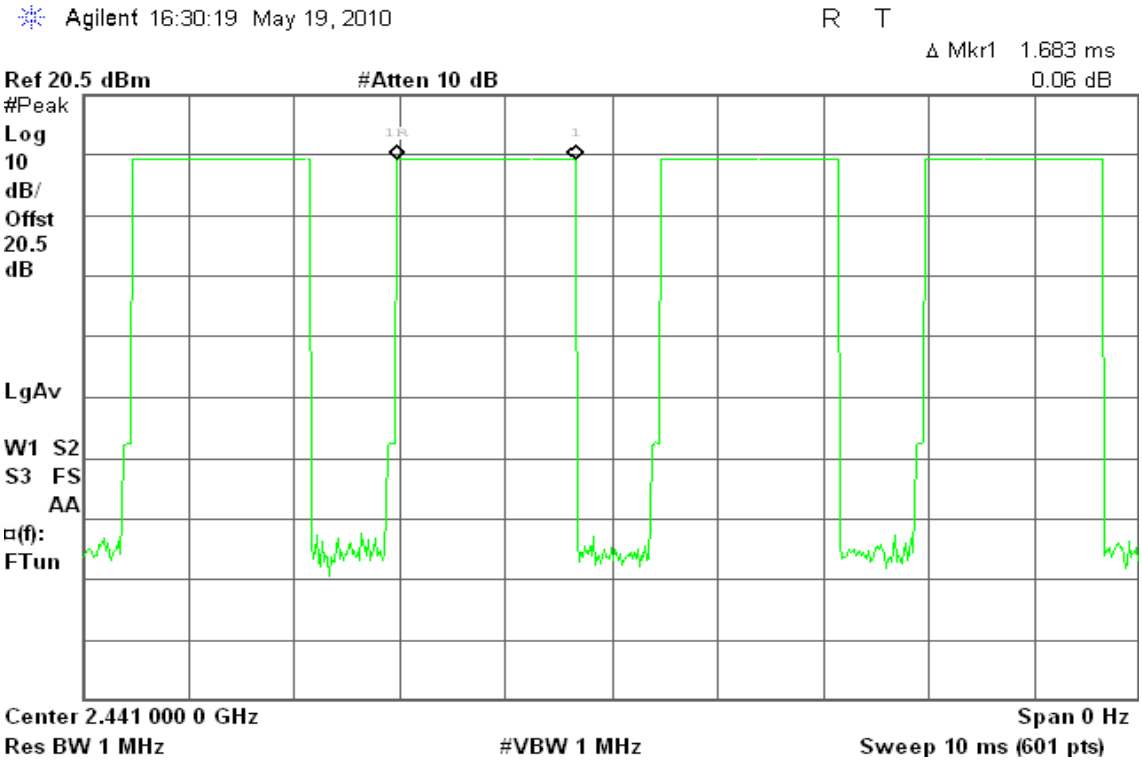


DH 3

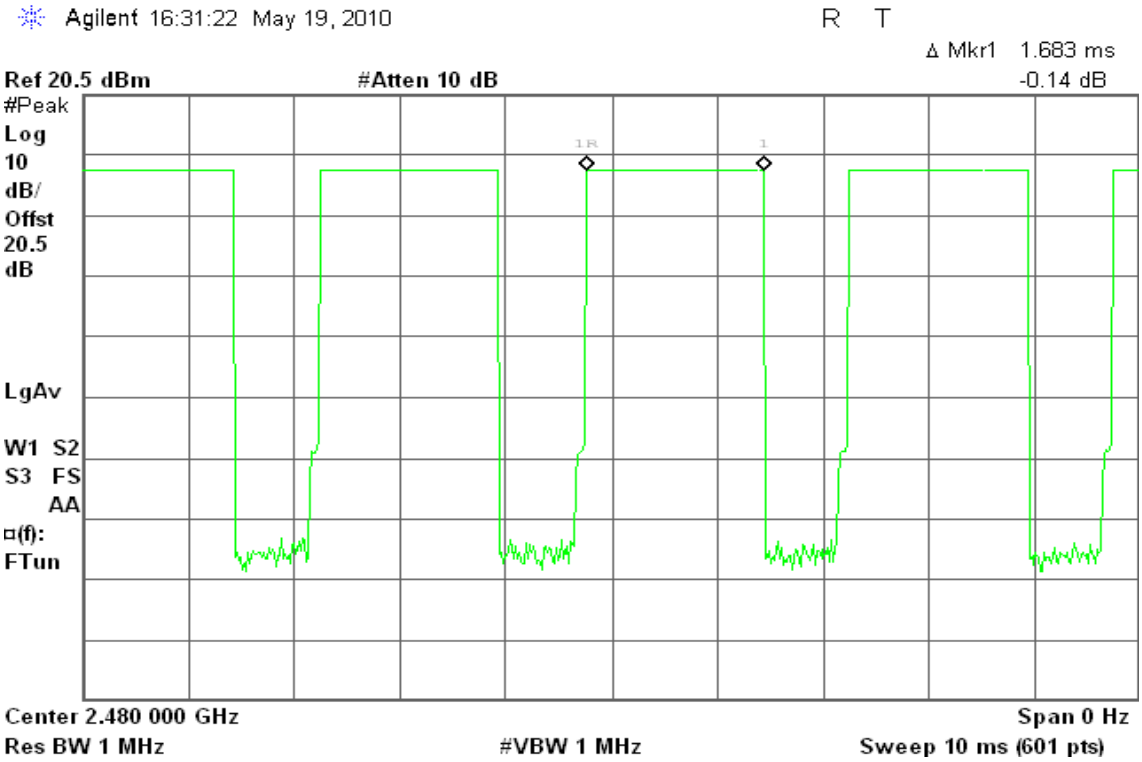
CH Low



CH Mid

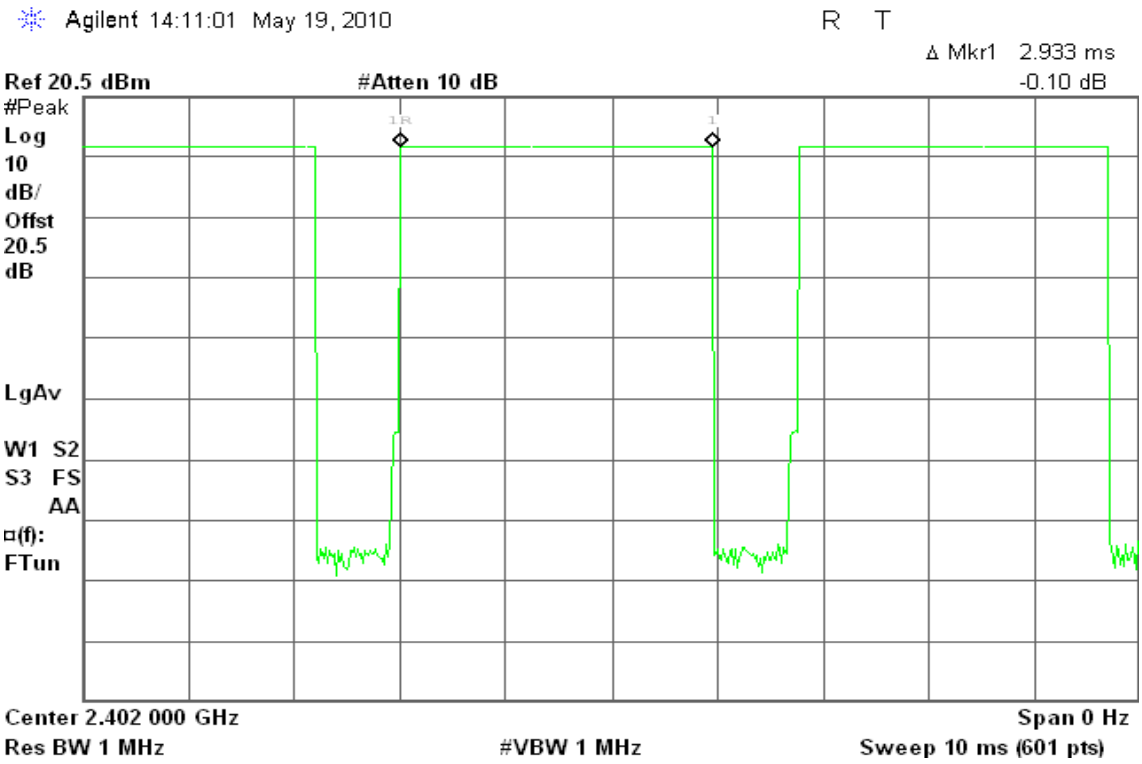


CH High

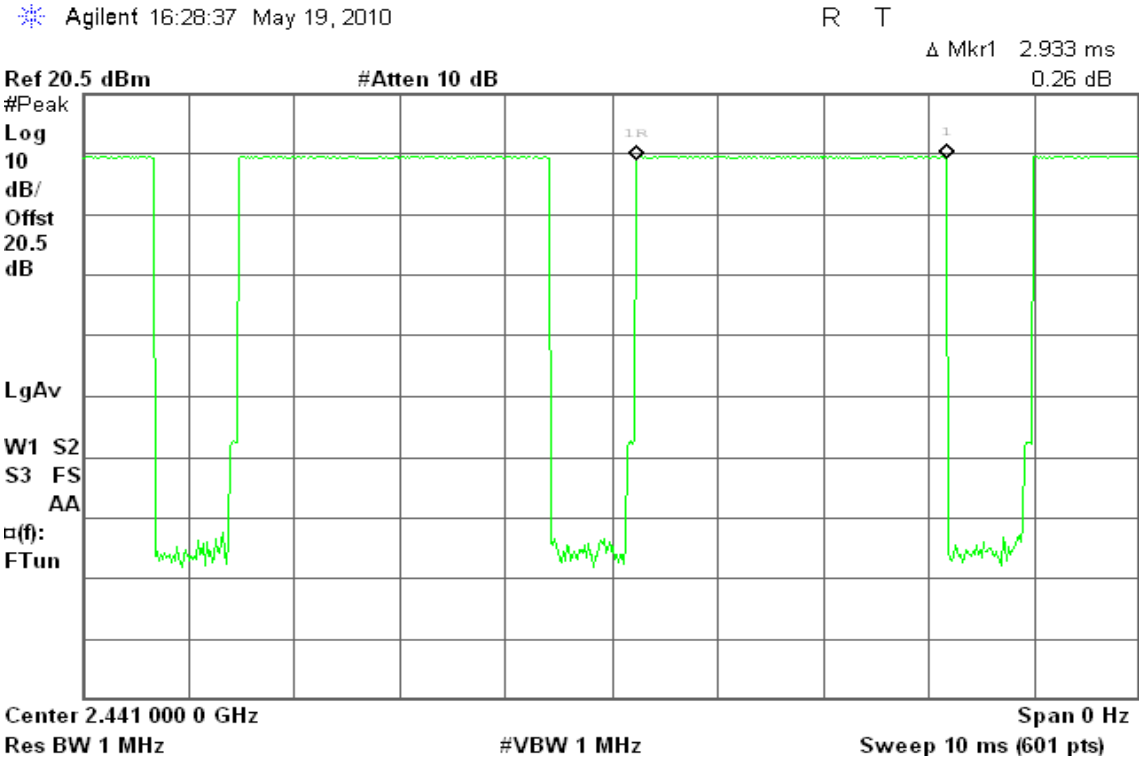


DH 5

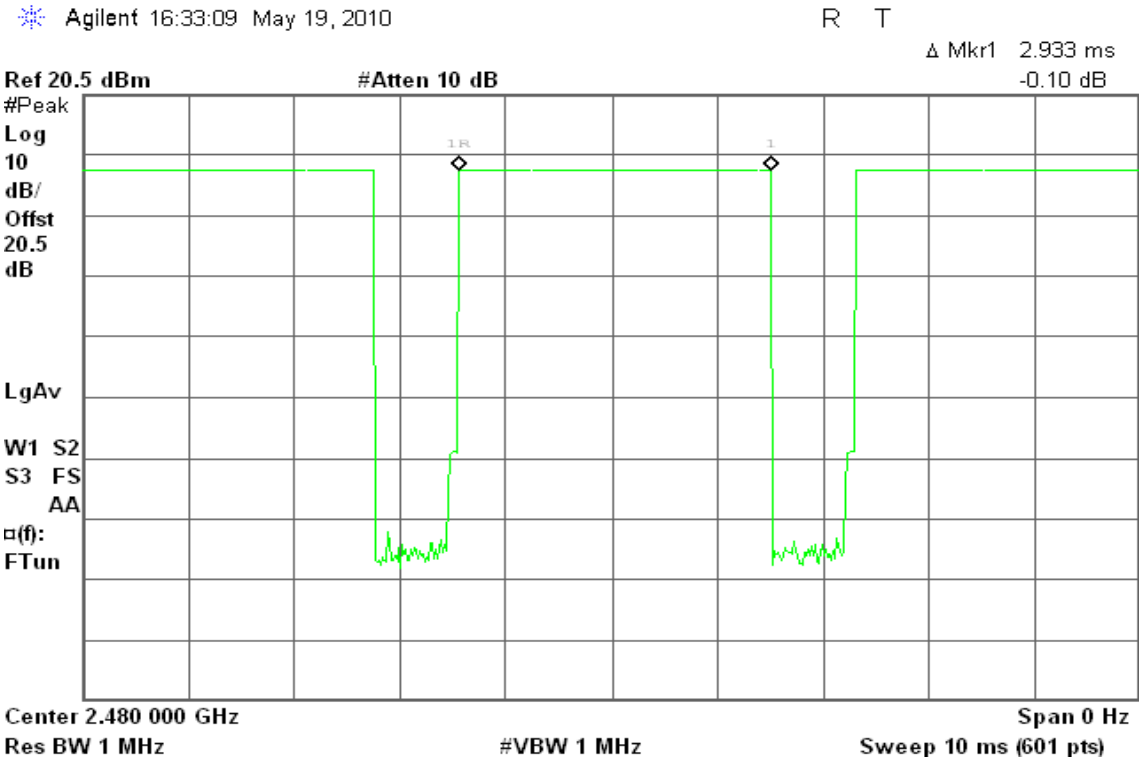
CH Low



CH Mid



CH High


Agilent 16:33:09 May 19, 2010
R T
Δ Mkr1 2.933 ms
-0.10 dB
Ref 20.5 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Offst
20.5
dB
LgAv
W1 S2
S3 FS
AA
¤(f):
FTun
Center 2.480 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 10 ms (601 pts)

Test Data

For 8DPSK

DH 1

CH Low: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)
CH Mid: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)
CH High: 0.4333 * (1600/2)/79 * 31.6 = 138.656 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4333	138.656	31.60	400.00	PASS
Mid	0.4333	138.656	31.60		PASS
High	0.4333	138.656	31.60		PASS

DH 3

CH Low: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)
CH Mid: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)
CH High: 1.683 * (1600/4)/79 * 31.6 = 269.280 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.683	269.280	31.60	400.00	PASS
Mid	1.683	269.280	31.60		PASS
High	1.683	269.280	31.60		PASS

DH 5

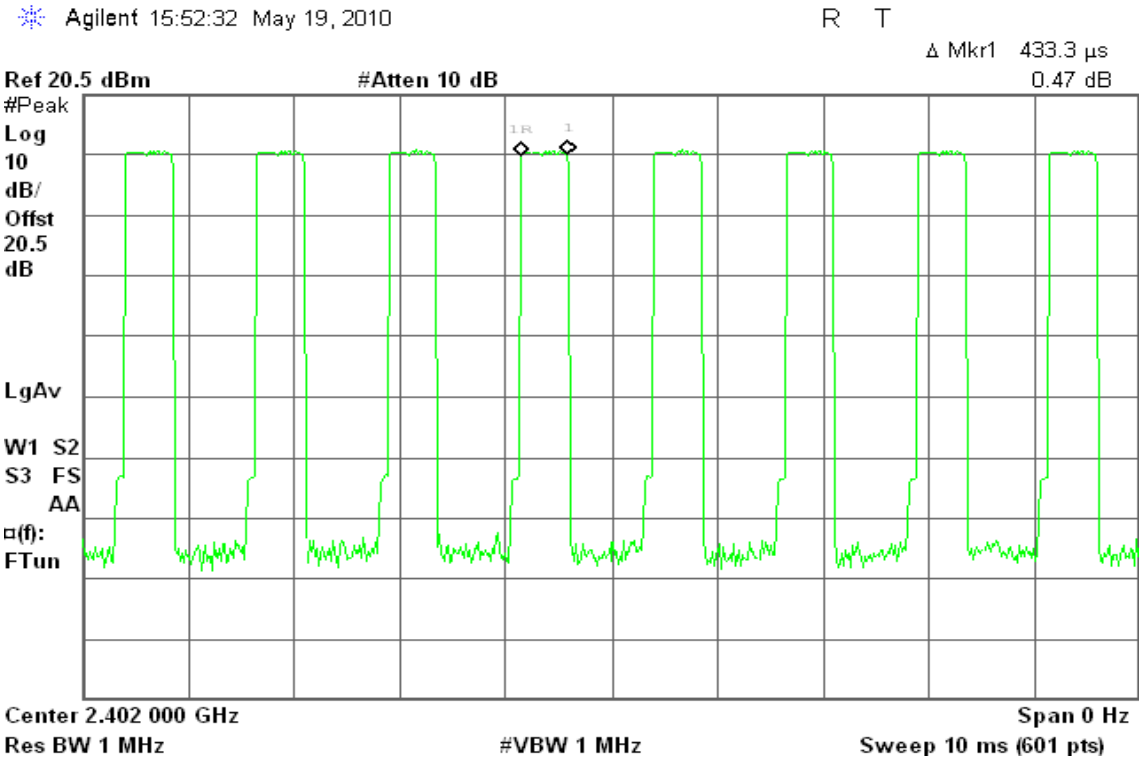
CH Low: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)
CH Mid: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)
CH High: 2.933 * (1600/6)/79 * 31.6 = 312.853 (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.933	312.853	31.60	400.00	PASS
Mid	2.933	312.853	31.60		PASS
High	2.933	312.853	31.60		PASS

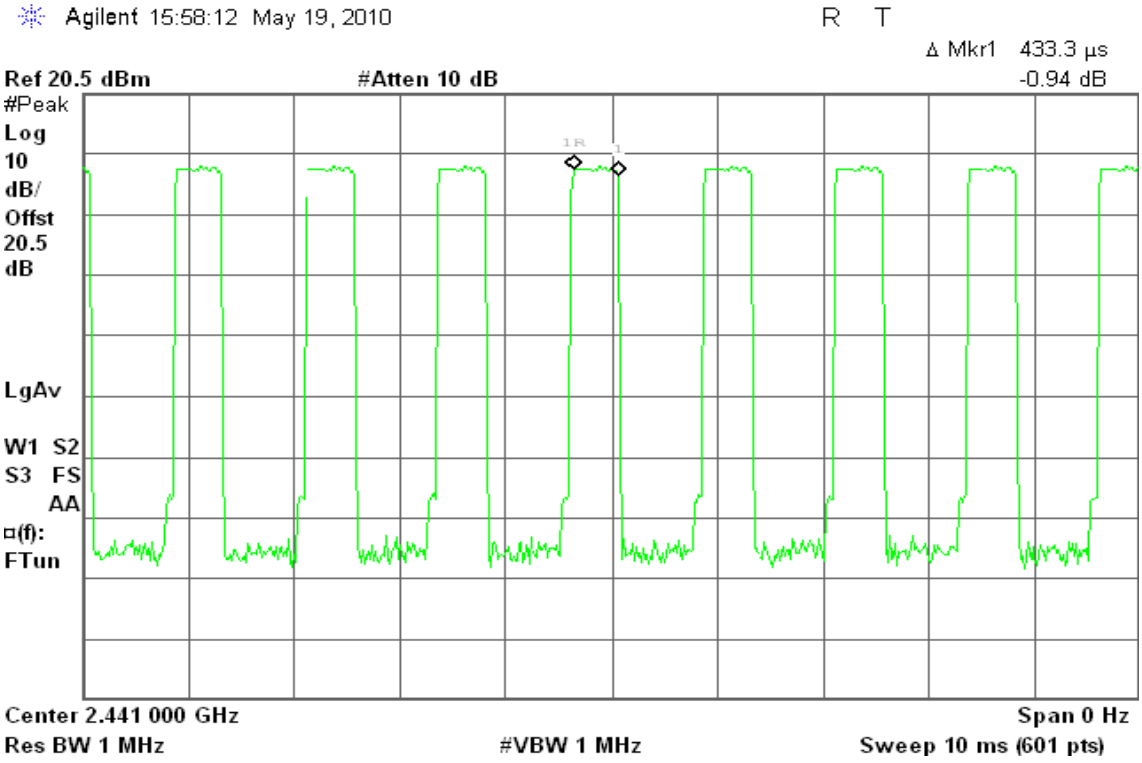
For 8DPSK

DH 1

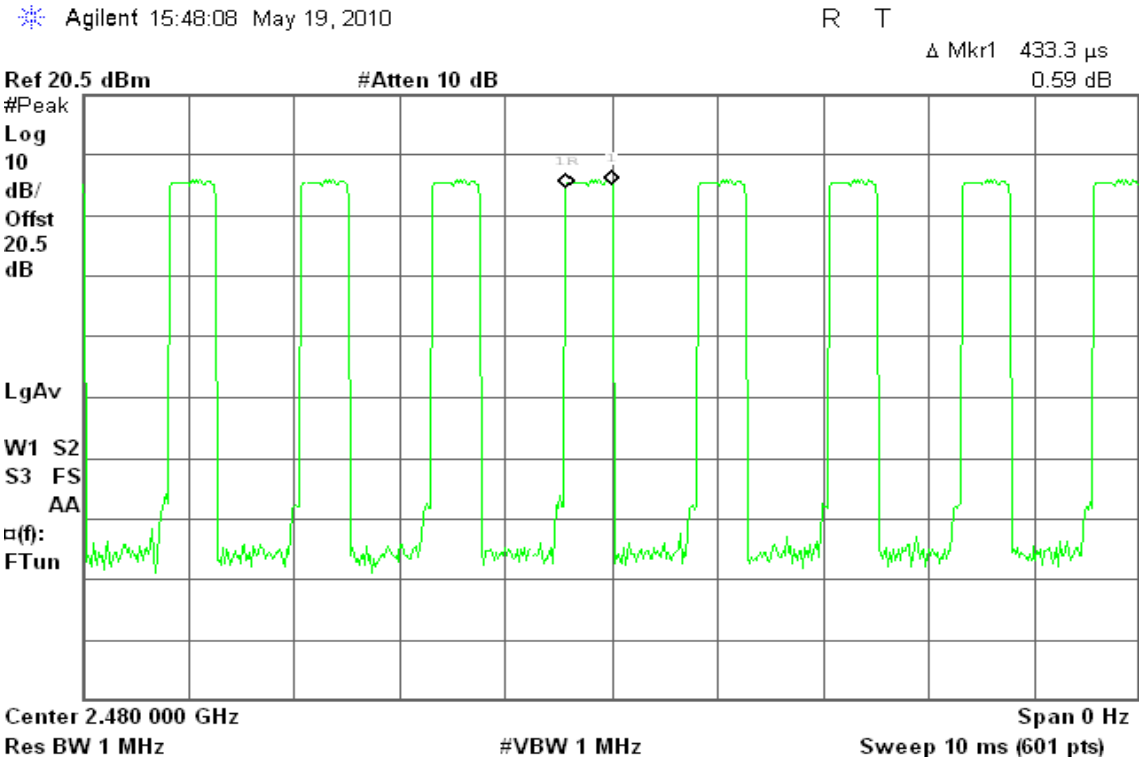
CH Low



CH Mid

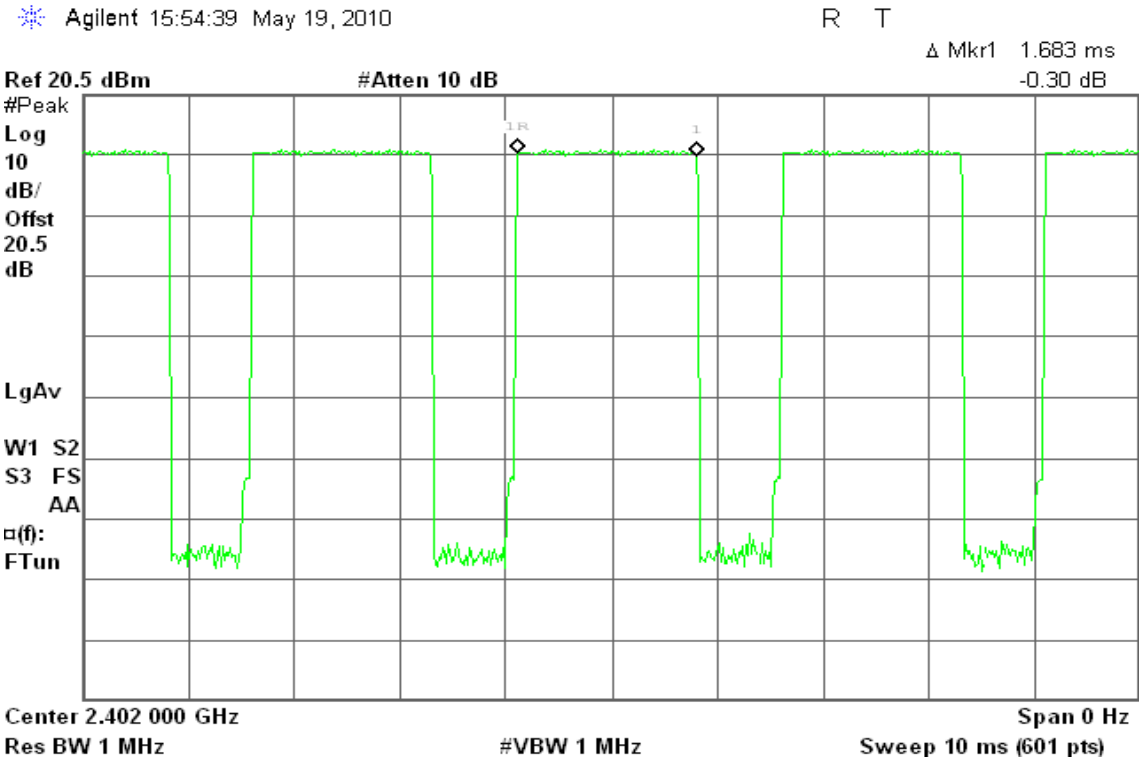


CH High

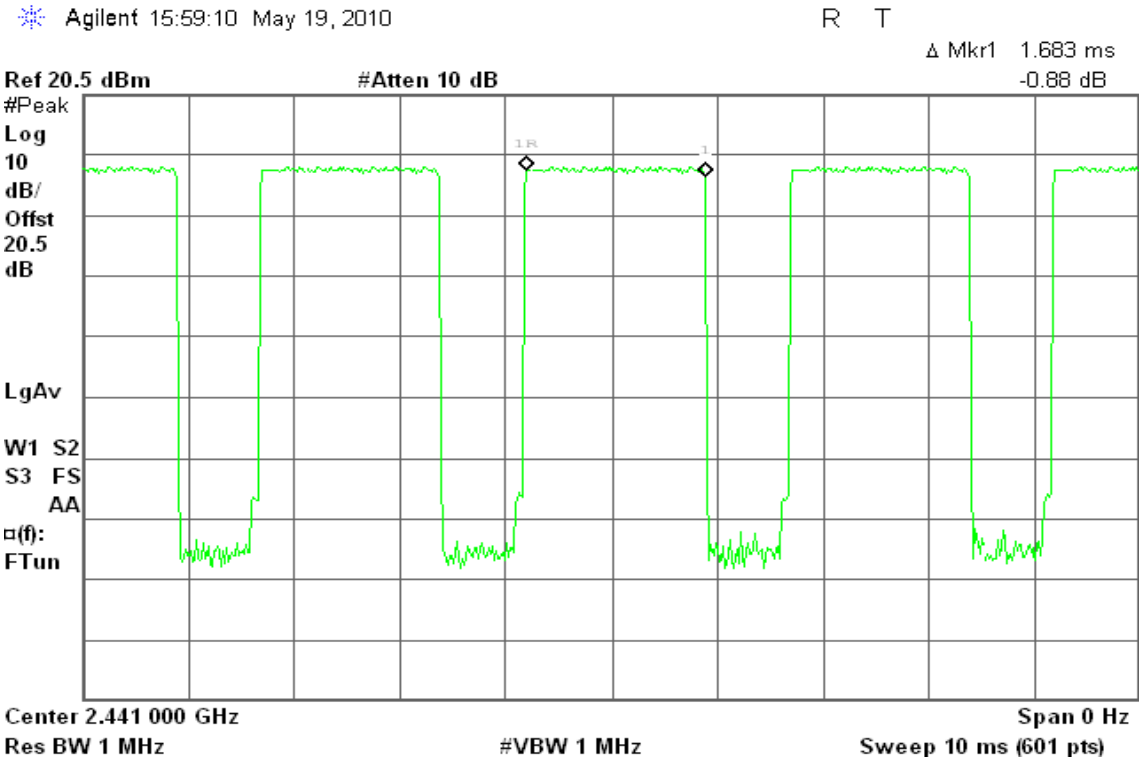


DH 3

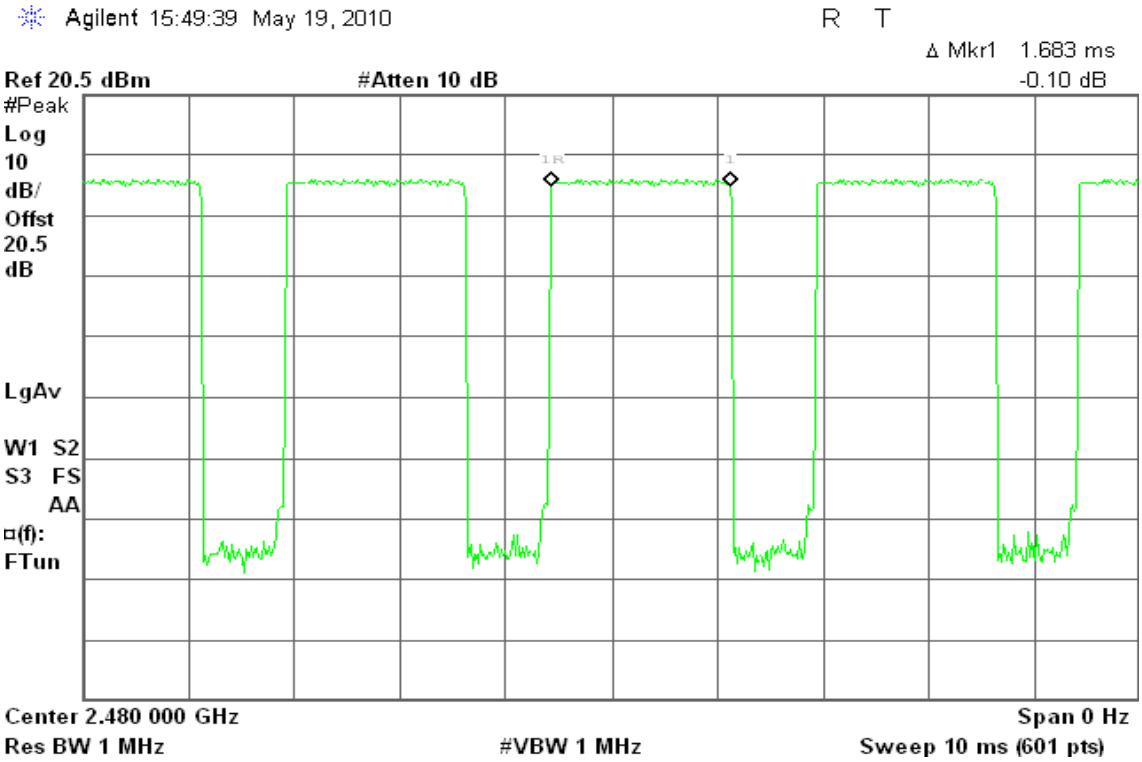
CH Low



CH Mid

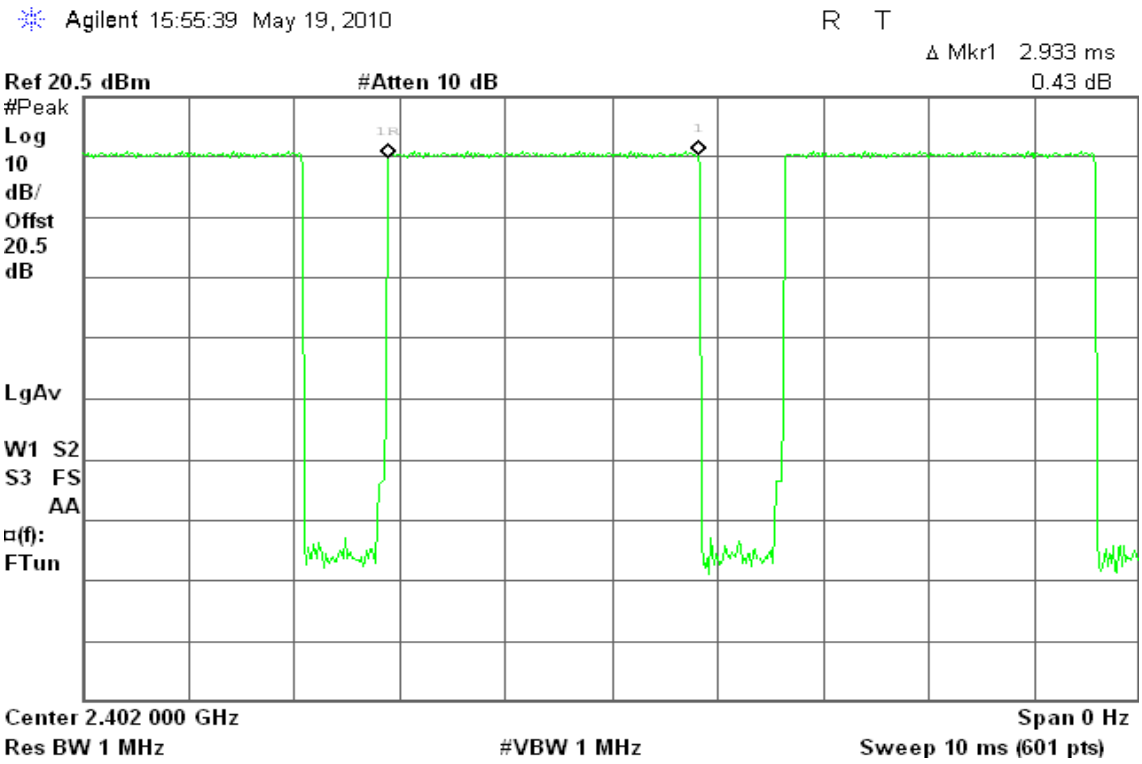


CH High

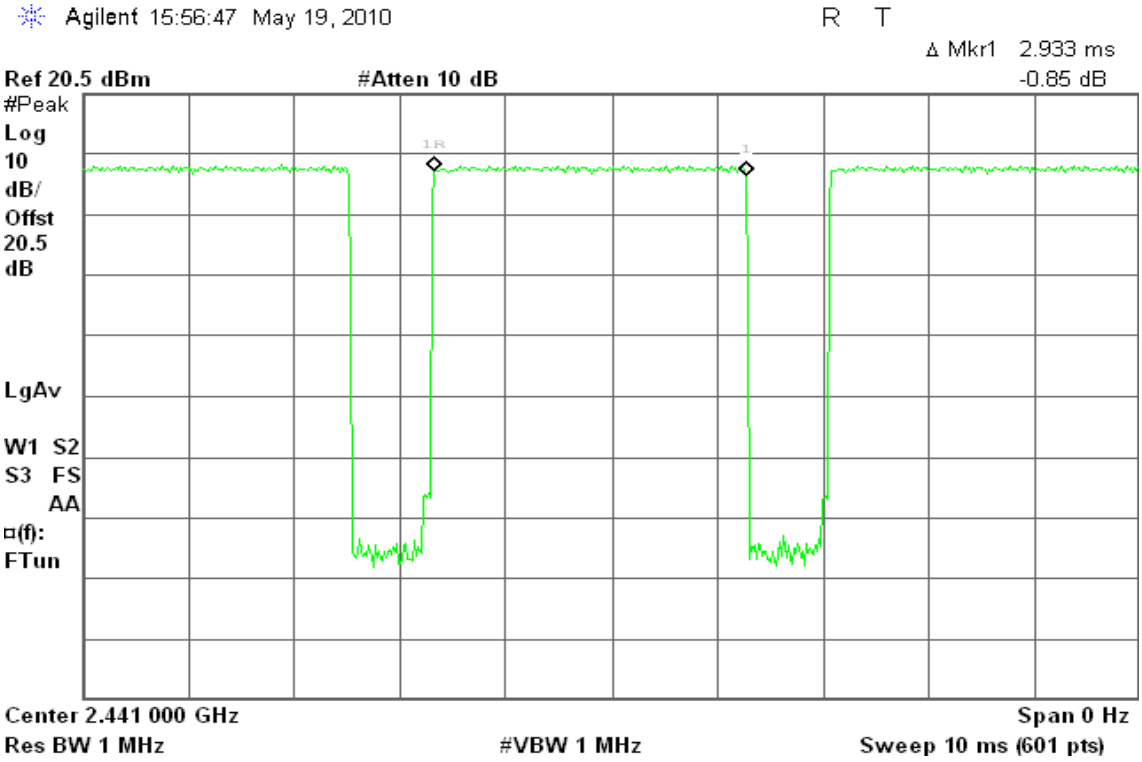


DH 5

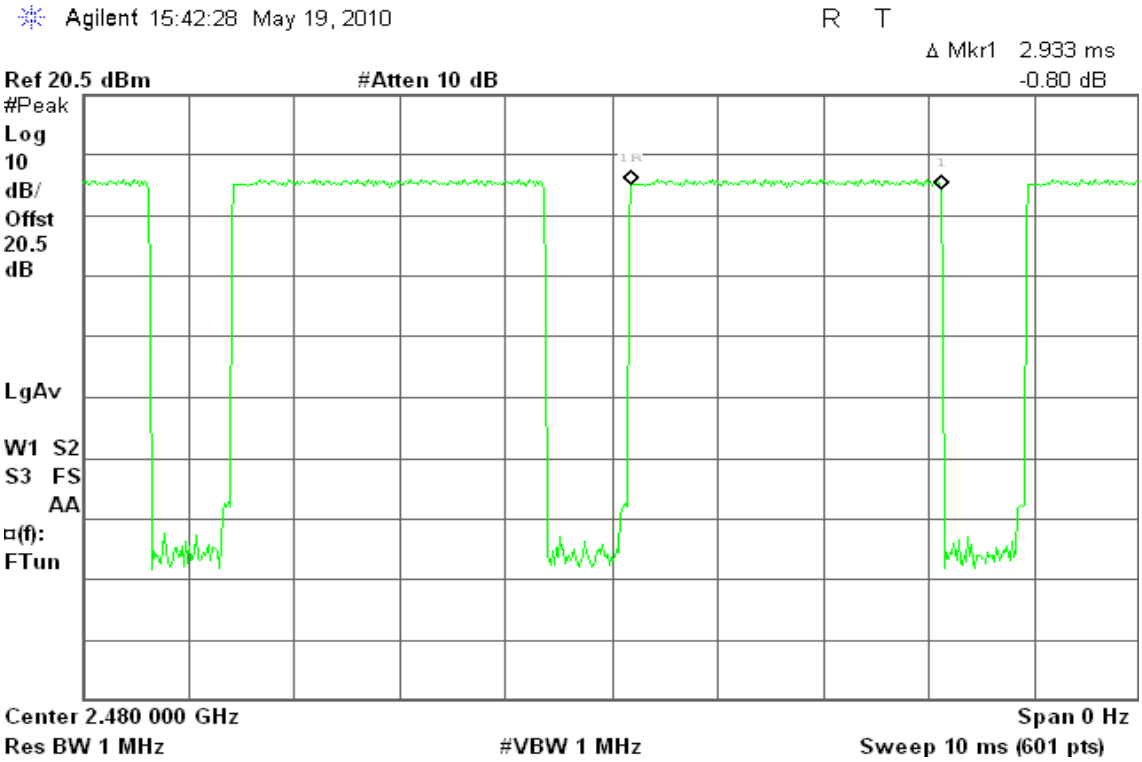
CH Low



CH Mid



CH High


Agilent 15:42:28 May 19, 2010
R T
Δ Mkr1 2.933 ms
-0.80 dB
Ref 20.5 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Offst
20.5
dB
LgAv
W1 S2
S3 FS
AA
¤(f):
FTun
Center 2.480 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 10 ms (601 pts)

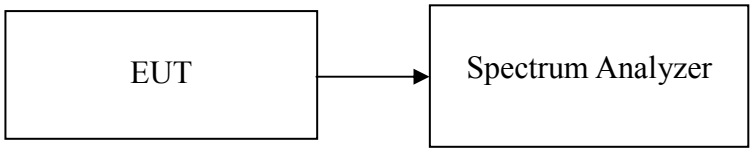
7.9 SPURIOUS EMISSIONS

7.9.1 Conducted Measurement

LIMIT

According to §15.247(d), 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. 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 in 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.

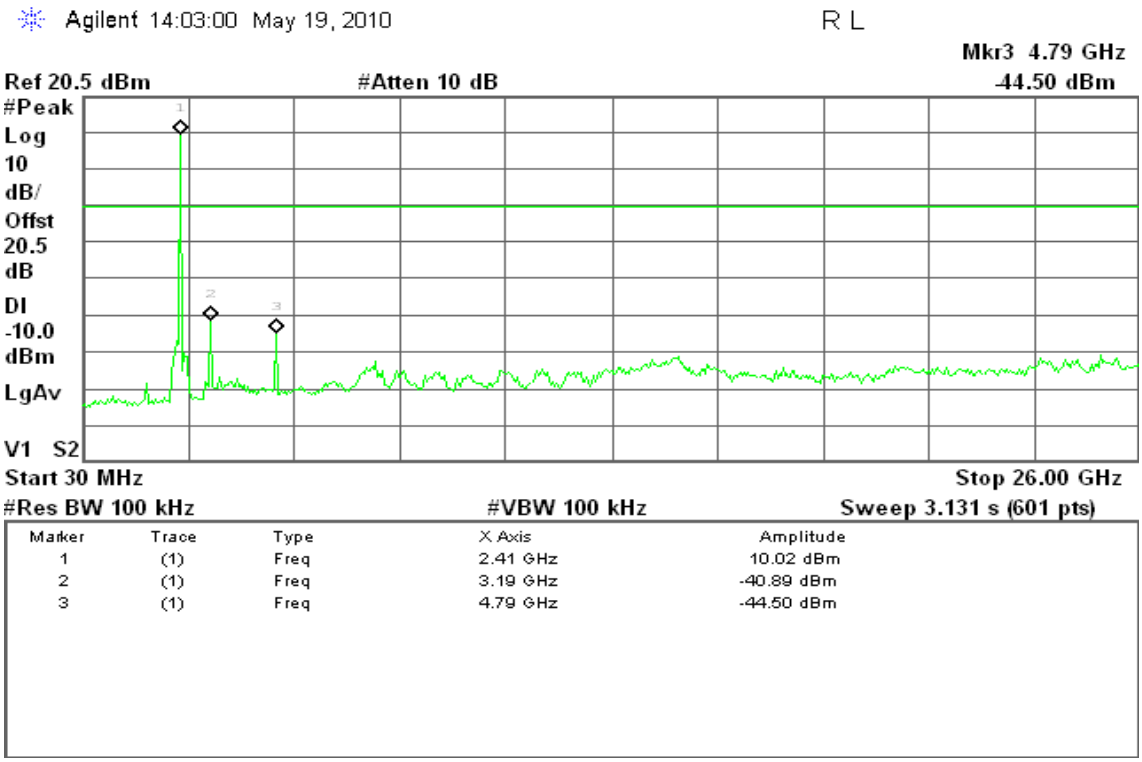
TEST RESULTS

No non-compliance noted

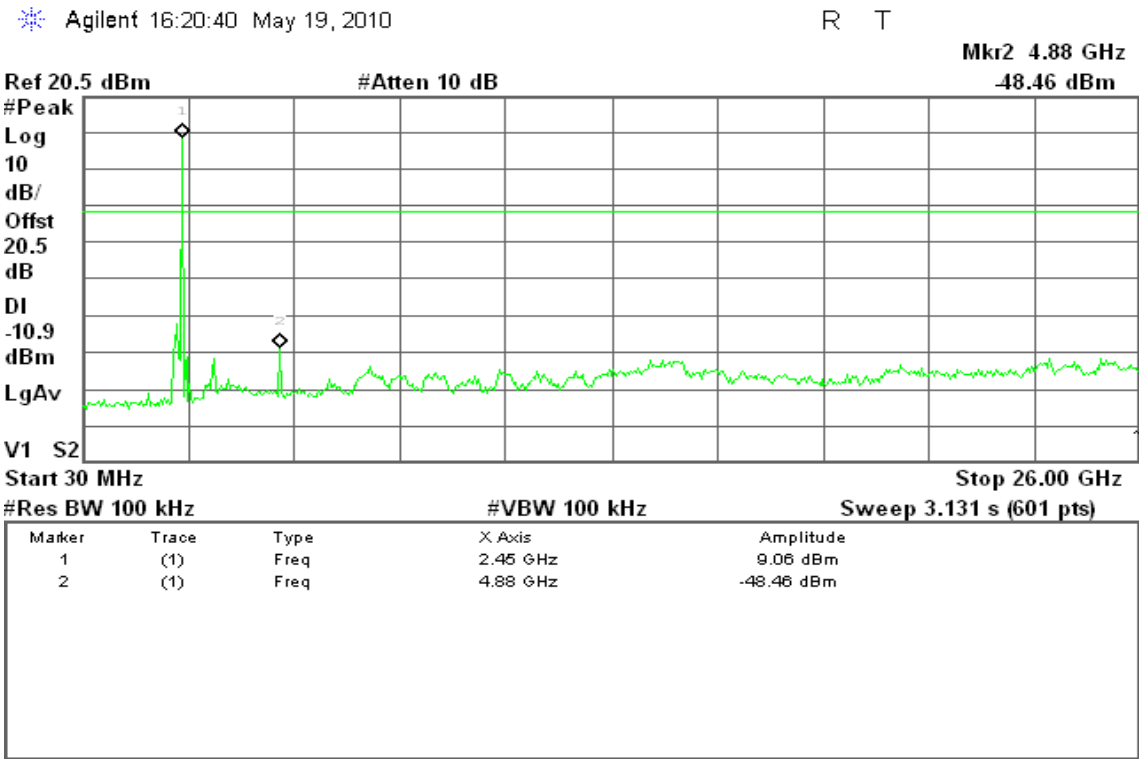
Test Plot

For GFSK / DH5

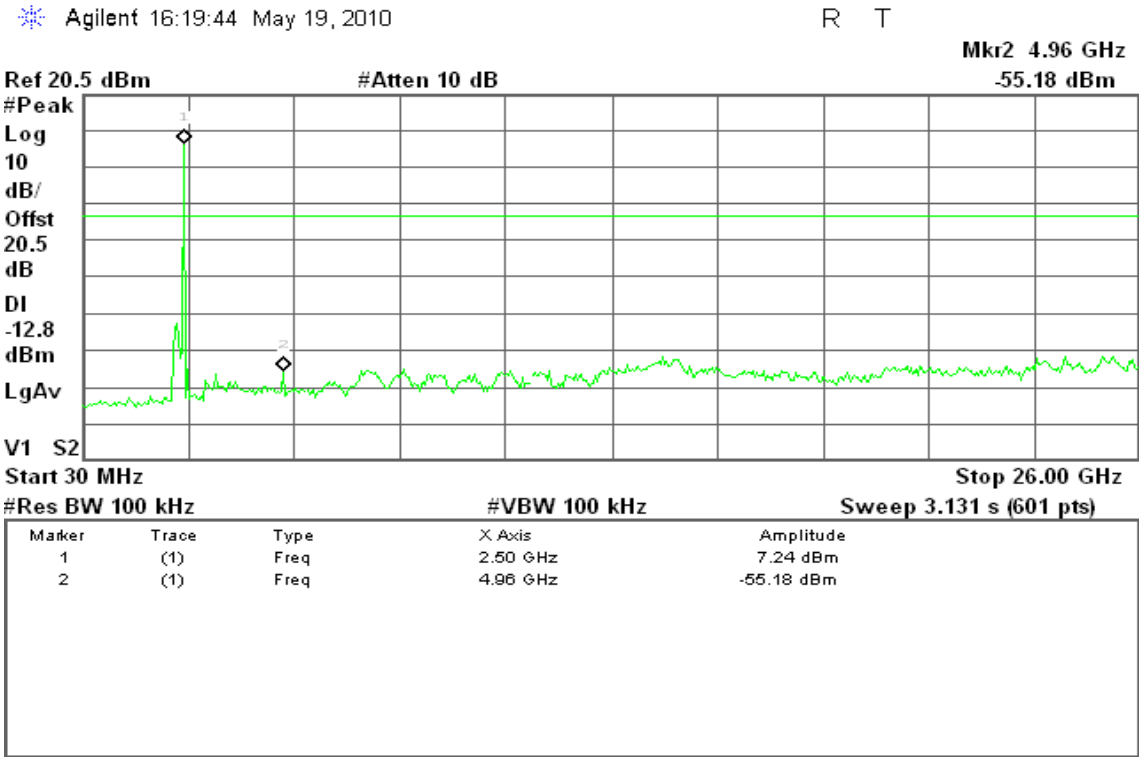
CH Low



CH Mid

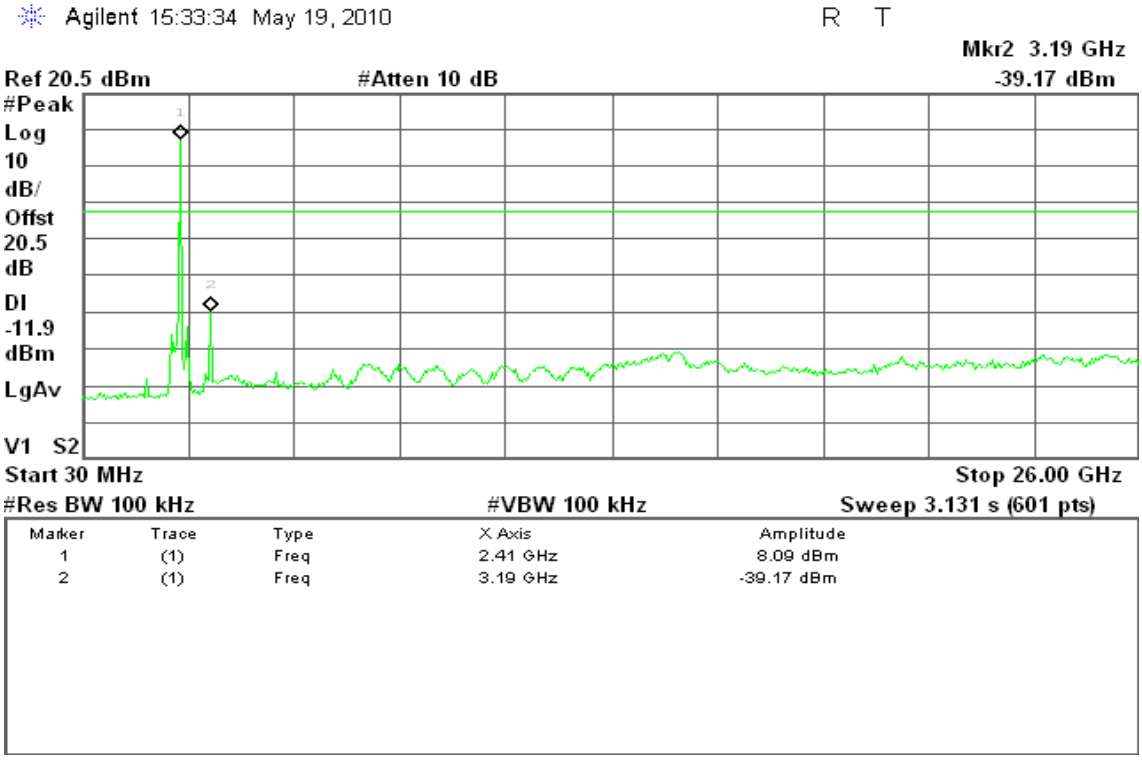


CH High

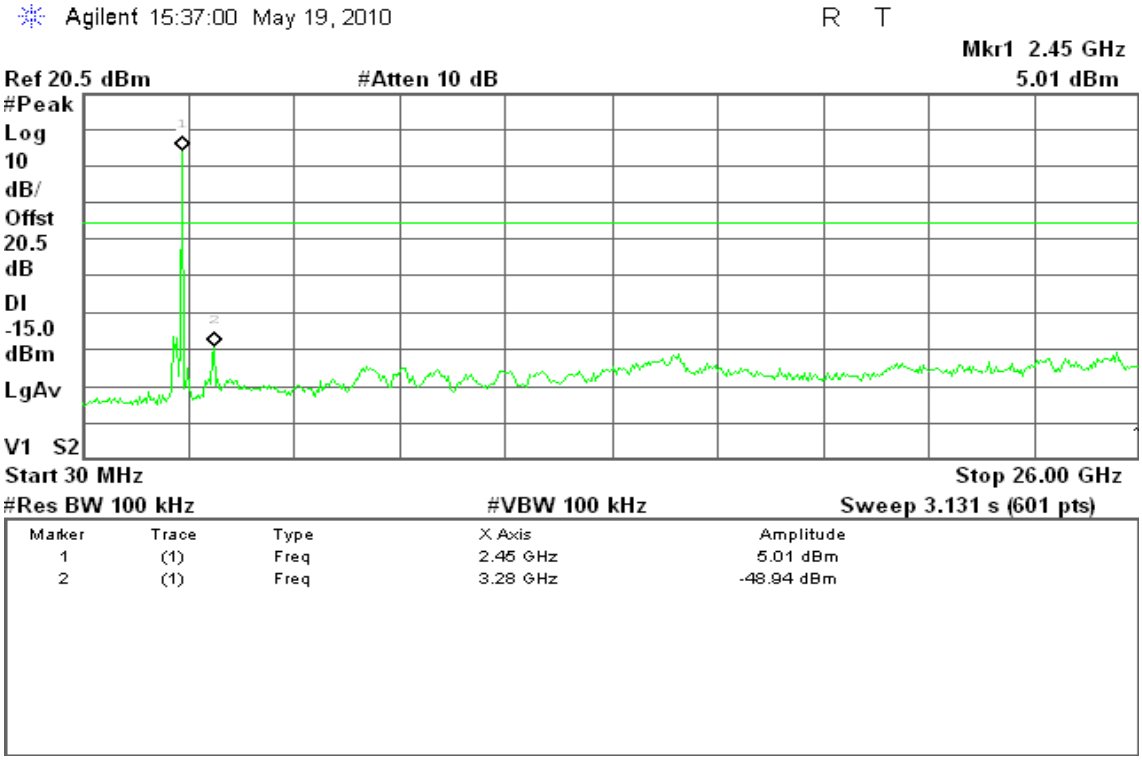

Agilent 16:19:44 May 19, 2010
R T
Mkr2 4.96 GHz
Ref 20.5 dBm
#Atten 10 dB
-55.18 dBm
#Peak
Log
10
dB/
Offst
20.5
dB
Dl
-12.8
dBm
LgAv
V1 S2
Start 30 MHz
Stop 26.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 3.131 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.50 GHz 7.24 dBm
2 (1) Freq 4.96 GHz -55.18 dBm

For 8DPSK / DH5

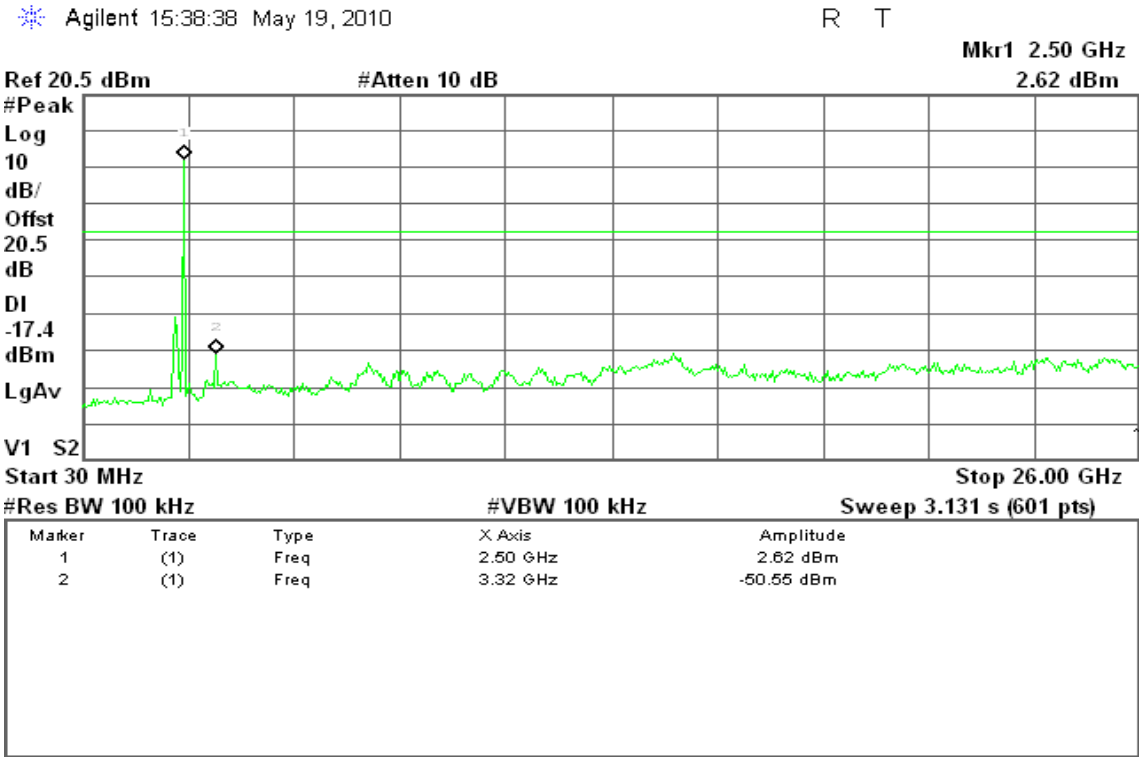
CH Low



CH Mid



CH High


Agilent 15:38:38 May 19, 2010
R T
Mkr1 2.50 GHz
Ref 20.5 dBm
#Atten 10 dB
2.62 dBm
#Peak
Log
10
dB/
Offst
20.5
dB
Dl
-17.4
dBm
LgAv
V1 S2
Start 30 MHz
Stop 26.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 3.131 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.50 GHz 2.62 dBm
2 (1) Freq 3.32 GHz -50.55 dBm

7.9.2 Radiated Emissions

LIMIT

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

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

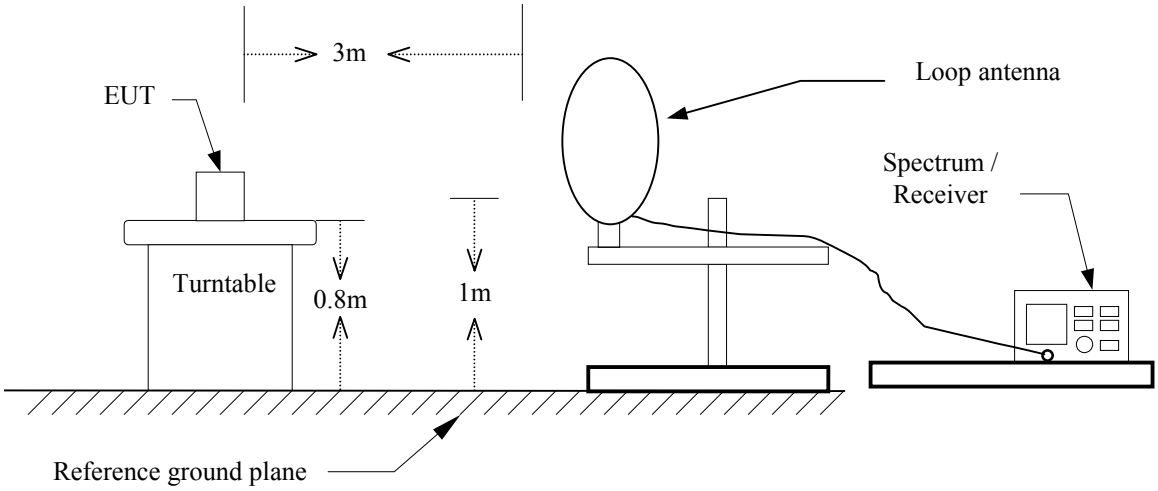
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

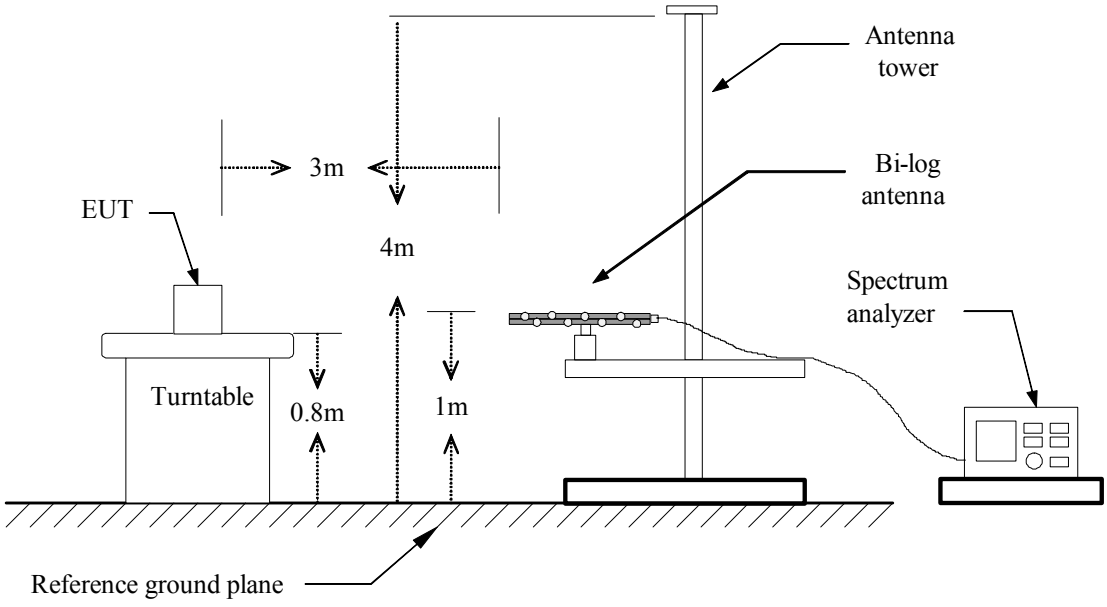
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

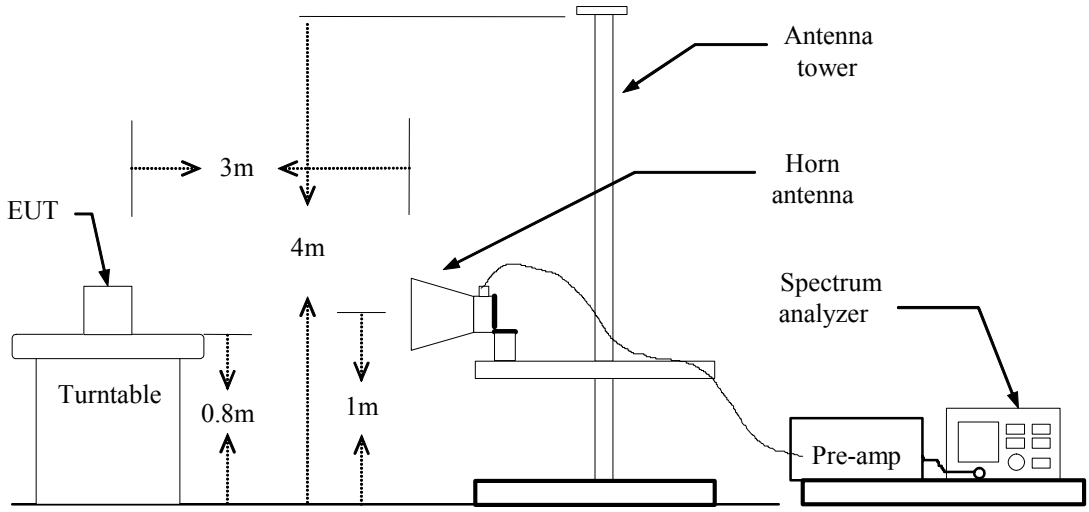
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz


Antenna
tower
3m
Horn
antenna
EUT
4m
Spectrum
analyzer
Turntable
0.8m
1m
Pre-amp

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.

Below 1 GHz

Operation Mode: Normal Link **Test Date:** May 28, 2010

Temperature: 25°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
78.50	V	51.63	-15.06	36.57	40.00	-3.43	Peak
149.63	V	48.62	-10.21	38.41	43.50	-5.09	QP
175.50	V	50.12	-11.39	38.73	43.50	-4.77	QP
201.37	V	48.64	-10.03	38.61	43.50	-4.89	QP
288.67	V	47.19	-9.36	37.83	46.00	-8.17	Peak
472.97	V	43.35	-5.53	37.82	46.00	-8.18	Peak
80.12	H	52.69	-15.14	37.55	40.00	-2.45	QP
170.65	H	52.52	-11.13	41.39	43.50	-2.11	QP
194.90	H	50.36	-10.36	40.00	43.50	-3.50	QP
201.37	H	49.04	-10.03	39.01	43.50	-4.49	QP
288.67	H	51.40	-9.36	42.04	46.00	-3.96	Peak
600.68	H	42.93	-4.04	38.89	46.00	-7.11	Peak

Remark:

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *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.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

Above 1 GHz

Operation Mode: TX / GFSK / DH5 / CH Low **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1603.33	V	59.69	---	-7.81	51.88	---	74.00	54.00	-2.12	Peak
1990.00	V	62.10	46.01	-4.24	57.86	41.77	74.00	54.00	-12.23	AVG
2306.67	V	69.21	50.21	-3.24	65.97	46.97	74.00	54.00	-7.03	AVG
2340.00	V	63.40	52.30	-3.14	60.26	49.16	74.00	54.00	-4.84	AVG
4800.00	V	62.09	31.99	1.18	63.27	33.17	74.00	54.00	-20.83	AVG
N/A										
1603.33	H	59.18	---	-7.81	51.37	---	74.00	54.00	-2.63	Peak
1796.67	H	61.23	45.21	-6.02	55.21	39.19	74.00	54.00	-14.81	AVG
2000.00	H	62.30	46.32	-4.15	58.15	42.17	74.00	54.00	-11.83	AVG
2306.67	H	70.34	57.02	-3.24	67.10	53.78	74.00	54.00	-0.22	AVG
4800.00	H	68.07	37.97	1.18	69.25	39.15	74.00	54.00	-14.85	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).*

Operation Mode: TX / GFSK / DH5 / CH Mid **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1626.67	V	62.30	52.96	-7.59	54.71	45.37	74.00	54.00	-8.63	AVG
1996.67	V	59.36	49.52	-4.18	55.18	45.34	74.00	54.00	-8.66	AVG
2313.33	V	72.59	52.08	-3.22	69.37	48.86	74.00	54.00	-5.14	AVG
2343.33	V	62.31	52.56	-3.13	59.18	49.43	74.00	54.00	-4.57	AVG
4883.33	V	65.74	35.64	1.16	66.90	36.80	74.00	54.00	-17.20	AVG
N/A										
1626.67	H	58.83	---	-7.59	51.24	---	74.00	54.00	-2.76	Peak
1796.67	H	57.88	---	-6.02	51.86	---	74.00	54.00	-2.14	Peak
1996.67	H	62.30	46.38	-4.18	58.12	42.20	74.00	54.00	-11.80	AVG
2313.34	H	75.30	55.58	-3.22	72.08	52.36	74.00	54.00	-1.64	AVG
4883.33	H	63.72	37.62	1.16	64.87	37.78	74.00	54.00	-16.22	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).*

Operation Mode: TX / GFSK / DH5 / CH High **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1653.33	V	59.30	---	-7.35	51.95	---	74.00	54.00	-2.05	Peak
1993.33	V	60.30	46.36	-4.21	56.09	42.15	74.00	54.00	-11.85	AVG
2320.00	V	69.03	56.85	-3.20	65.83	53.65	74.00	54.00	-0.35	AVG
4958.33	V	65.25	35.15	1.13	66.38	36.28	74.00	54.00	-17.72	AVG
N/A										
1653.33	H	59.21	---	-7.35	51.86	---	74.00	54.00	-2.14	Peak
1796.67	H	63.61	44.34	-6.02	57.59	38.32	74.00	54.00	-15.68	AVG
1996.67	H	61.57	46.03	-4.18	57.39	41.85	74.00	54.00	-12.15	AVG
2320.00	H	74.18	56.85	-3.20	70.98	53.65	74.00	54.00	-0.35	AVG
2353.33	H	62.77	53.53	-3.10	59.67	50.43	74.00	54.00	-3.57	AVG
4958.33	H	62.01	31.91	1.13	63.15	33.04	74.00	54.00	-20.96	AVG

Remark:

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

Operation Mode: TX / 8DPSK / DH5 / CH Low **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1603.33	V	59.74	---	-7.81	51.93	---	74.00	54.00	-2.07	Peak
2000.00	V	61.38	45.80	-4.15	57.23	41.65	74.00	54.00	-12.35	AVG
2306.67	V	68.10	53.07	-3.24	64.86	49.83	74.00	54.00	-4.17	AVG
2370.00	V	61.91	50.05	-3.05	58.86	47.00	74.00	54.00	-7.00	AVG
2610.00	V	60.18	43.74	-2.34	57.84	41.40	74.00	54.00	-12.60	AVG
4800.00	V	56.02	25.92	1.18	57.21	27.10	74.00	54.00	-26.90	AVG
1603.33	H	58.79	---	-7.81	50.99	---	74.00	54.00	-3.01	Peak
1800.00	H	62.05	50.92	-5.99	56.06	44.93	74.00	54.00	-9.07	AVG
1993.33	H	61.60	45.80	-4.21	57.39	41.59	74.00	54.00	-12.41	AVG
2303.33	H	71.62	54.95	-3.25	68.37	51.70	74.00	54.00	-2.30	AVG
2700.00	H	56.97	43.08	-2.08	54.89	41.00	74.00	54.00	-13.00	AVG
4800.00	H	56.43	26.33	1.18	57.61	27.51	74.00	54.00	-26.49	AVG

Remark:

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

Operation Mode: TX / 8DPSK / DH5 / CH Mid **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1626.67	V	59.26	---	-7.59	51.67	---	74.00	54.00	-2.33	Peak
1793.33	V	58.02	---	-6.06	51.96	---	74.00	54.00	-2.04	Peak
1846.67	V	57.50	---	-5.56	51.94	---	74.00	54.00	-2.06	Peak
1993.33	V	60.21	45.80	-4.21	56.00	41.59	74.00	54.00	-12.41	AVG
2313.33	V	70.30	50.23	-3.22	67.08	47.01	74.00	54.00	-6.99	AVG
4883.33	V	54.45	24.35	1.16	55.60	25.51	74.00	54.00	-28.49	AVG
1626.67	H	59.57	---	-7.59	51.98	---	74.00	54.00	-2.02	Peak
1800.00	H	62.23	51.10	-5.99	56.24	45.11	74.00	54.00	-8.89	AVG
1993.33	H	62.10	46.20	-4.21	57.89	41.99	74.00	54.00	-12.01	AVG
2313.33	H	73.90	54.21	-3.22	70.68	50.99	74.00	54.00	-3.01	AVG
4883.33	H	55.71	25.61	1.16	56.87	26.77	74.00	54.00	-27.23	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).*

Operation Mode: TX / 8DPSK / DH5 / CH High **Test Date:** May 18, 2010

Temperature: 23°C **Tested by:** Wolf Huang

Humidity: 50 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1653.33	V	59.30	---	-7.35	51.95	---	74.00	54.00	-2.05	Peak
1993.33	V	60.36	45.96	-4.21	56.15	41.75	74.00	54.00	-12.25	AVG
2310.00	V	73.20	53.69	-3.23	69.97	50.46	74.00	54.00	-3.54	AVG
4958.33	V	52.56	22.46	1.13	53.70	23.59	74.00	54.00	-30.41	AVG
N/A										
1653.33	H	59.05	---	-7.35	51.70	---	74.00	54.00	-2.30	Peak
1800.00	H	60.20	50.30	-5.99	54.21	44.31	74.00	54.00	-9.69	AVG
1993.33	H	62.30	46.36	-4.21	58.09	42.15	74.00	54.00	-11.85	AVG
2303.26	H	75.85	54.20	-3.25	72.60	50.95	74.00	54.00	-3.05	AVG
4958.33	H	50.65	20.55	1.13	51.79	21.68	74.00	54.00	-32.32	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).*

7.10 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

***** *Decreases with the logarithm of the frequency.*

Test Configuration

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

TEST PROCEDURE

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

TEST RESULTS

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

Test Data

Operation Mode:	Normal Link	**Tested by:**	Ming Wu
Temperature:	25°C	**Humidity:**	57% RH
Test Date:	March 1, 2010		

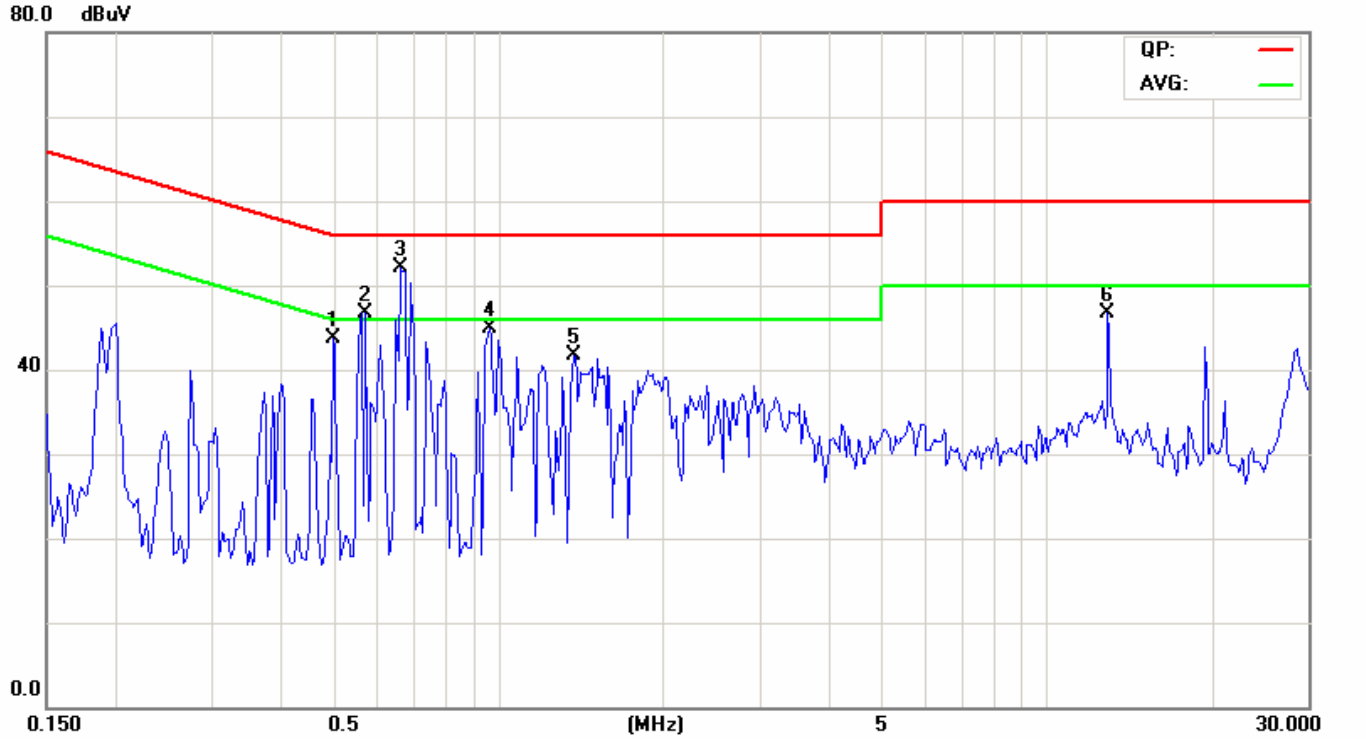
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.5016	33.02	20.72	9.58	42.60	30.30	56.00	46.00	-13.40	-15.70	L1
0.5719	35.02	18.82	9.58	44.60	28.40	56.00	46.00	-11.40	-17.60	L1
0.6617	40.62	23.02	9.58	50.20	32.60	56.00	46.00	-5.80	-13.40	L1
0.9664	33.11	13.71	9.59	42.70	23.30	56.00	46.00	-13.30	-22.70	L1
1.3805	28.27	11.57	9.63	37.90	21.20	56.00	46.00	-18.10	-24.80	L1
12.9703	37.87	31.17	10.23	48.10	41.40	60.00	50.00	-11.90	-8.60	L1
0.4977	33.21	21.21	9.59	42.80	30.80	56.04	46.04	-13.24	-15.24	L2
0.6109	31.91	16.01	9.59	41.50	25.60	56.00	46.00	-14.50	-20.40	L2
0.6539	40.31	22.41	9.59	49.90	32.00	56.00	46.00	-6.10	-14.00	L2
0.6891	40.81	24.61	9.59	50.40	34.20	56.00	46.00	-5.60	-11.80	L2
0.9664	34.10	14.90	9.60	43.70	24.50	56.00	46.00	-12.30	-21.50	L2
1.0953	32.59	15.29	9.61	42.20	24.90	56.00	46.00	-13.80	-21.10	L2

Remark:

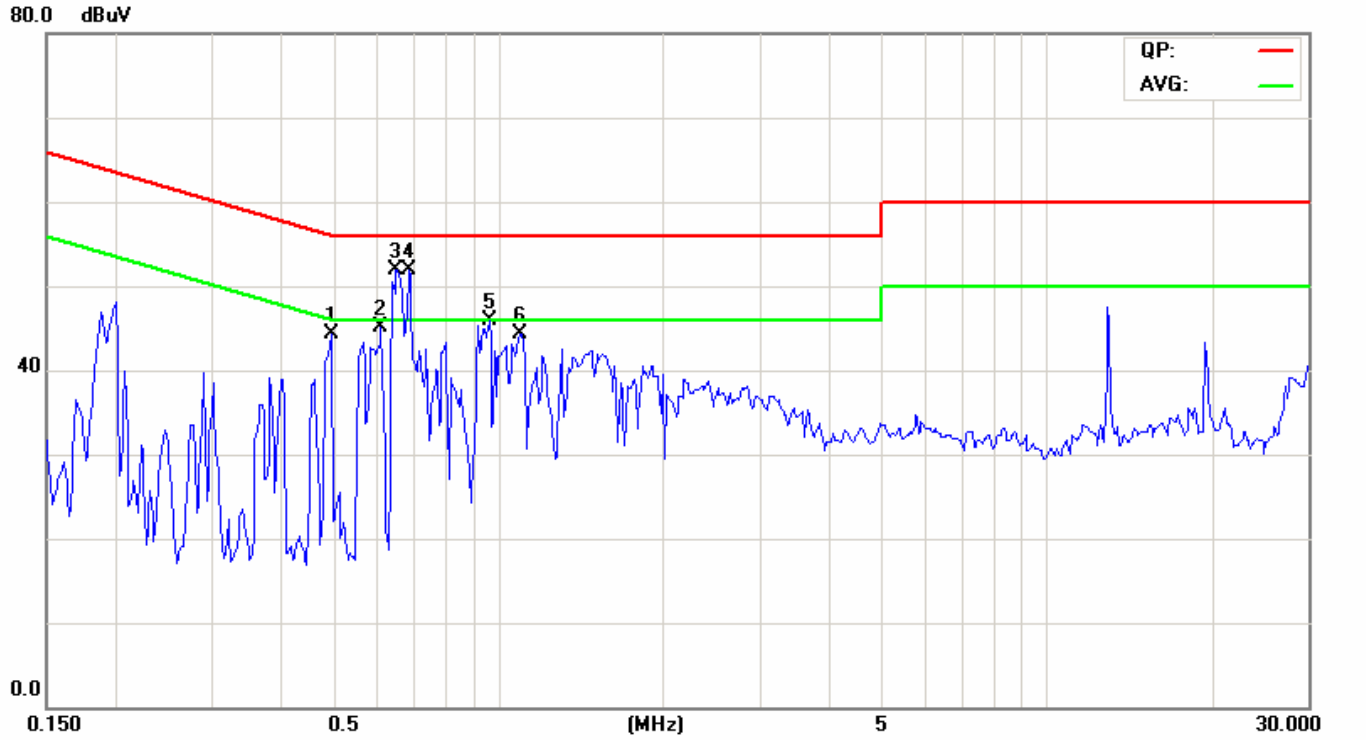
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz; the IF bandwidth of Test Receiver between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

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)



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

EUT	Tablet PC
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☒ Others: Bluetooth: 2.402GHz ~ 2.480GHz
Device category	☒ Portable (<20cm separation) ☐ Mobile (>20cm separation) ☐ Others _____
Exposure classification	☐ Occupational/Controlled exposure *(S = 5mW/cm^2)* ☒ General Population/Uncontrolled exposure *(S=1mW/cm^2)*
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	12.98 dBm (19.86mW)
Antenna gain (Max)	0.15 dBi (Numeric gain: 1.04)
Evaluation applied	☐ MPE Evaluation ☐ SAR Evaluation ☒ N/A*
Remark: *1. The maximum output power is 12.98 dBm (19.86mW) at 2402MHz (with 1.04 numeric antenna gain.)* *2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.*	

TEST RESULTS

No non-compliance noted.

(SAR evaluation is not required for the PORTABLE device while its maximum output power is lower than the general population low threshold: 60/$f_{(GHz)}$=60/2.441=24.58mW)