Radio Intentional EMC Test Report: **EDCS-1403542**

For

CP-8851 Bluetooth Module

Against the following Specifications :

47 CFR 15.247, 15.205, 15.209

FCC ID: LDK88511056

and

RSS-210 Issue 8, RSS-Gen Issue 3

IC ID: 2461B-88511056

Cisco Systems

EMC Laboratory

170 West Tasman Drive

San Jose, CA 95134

Author: Danh Le

Approved By: Dilip Patel

Title: Regulatory Compliance Manager

This report replaces any previously entered test report under **EDCS-1403542**

This test report has been electronically authorized and archived using the CISCO Engineering Doc Control system.

Section 1: Overview

Test Summary

The samples were assessed against the tests detailed in section 3 under the requirements of the following standards:

Emissions:
CFR47 Part 15.247
RSS-210
RSS-Gen

Notes:

Measurements were made in accordance with FCC docket #:DA 00-0705, ANSI C64.10:2009 and ET docket 96-8 measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.

Section 2: Assessment Information

2.1 General

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal Government.

With regard to this assessment, the following points should be noted:

a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results, due to production tolerances and measurement uncertainties.

b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.

c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).

d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:
110V (+/-10%) 60Hz

f) Cisco Systems, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). The scope of accreditation, certificate number 1178-01 is referenced in appendix C, along with further details.

2.2 Start Date of Testing

March 04, 2014

2.3 Report Issue Date

Cisco Systems, Inc. uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Site Identifier
Building P, 10m Chamber	Company #: 4624-2
Building P, 5m Chamber	Company #: 4624-1
Building N, 5m Chamber	Company #: 6111
Building I, 5m Chamber	Company #: 6112

Test Engineers

Danh Le

2.5 Equipment Assessed (EUT)

CP-8851

2.6 EUT Description

The Cisco® IP Phone 8851 is a cost effective, business class collaboration endpoint that delivers high-fidelity, reliable, secure and scalable voice communications for mid-sized to large enterprise businesses. With the Cisco® IP Phone 8851, you can increase personal productivity through an engaging user experience that is both powerful and easy-to-use. The IP Phone 8851 combines an attractive new ergonomic design and software user experience with wideband audio for crystal clear voice communications, “always-on” reliability, encrypted voice communications to enhance security and access to a comprehensive suite of unified communications features from Cisco communication servers.

Supports 802.11i security standard

Single antenna for 2.4GHz Bluetooth

2.7 Scope of Assessment

Tests have been performed in accordance with the relevant Test and Assessment Plan (TAP), a copy of which is contained in Appendix F of this report, and the relevant Cisco Systems, Inc. radio test procedures (EDCS-420238). This test report may not cover all of the tests highlighted in the test plan.

2.8 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

Measurement Uncertainty Values

voltage and power measurements	**± 2 dB**
conducted EIRP measurements	**± 1.4 dB**
radiated measurements	**± 3.2 dB**
frequency measurements	**± 2.4 10-7**
temperature measurements	**± 0.54º.**
humidity measurements	**± 2.3%**
DC and low frequency measurements	**± 2.5%.**

2.9 Report Template Control No.

EDCS#703456

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Basic Standard	Technical Requirements / Details	Result
FCC 15.247 (b) (1) RSS-210 A8.4 (2)	**Peak Output Power**: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watt.	Pass
FCC 15.247 (a) (1) RSS-210 A8.1 (b)	**Carrier Separation**: For frequency hopping systems according to a hopping channel carrier frequencies that are separated by 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	Pass
FCC 15.247 (a) (1) RSS-210 A8.1 (a)	**20 dB Bandwidth**: The bandwidth of a frequency hopping channel is the – 20 dB emission bandwidth, measured with the hopping stopped, between upper and lower frequency from top carrier (dBc) down.	Reference
FCC 15.247 (a) (iii) RSS-210 A8.1 (d)	**No. of Hopping Frequencies / Time Occupancy**: Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.	Pass
FCC 15.247 (d) RSS-210 A8.5	**Conducted Spurious Emissions / Band-Edge**:**:** 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required	Pass

FCC 15.247 (d) RSS-210 A8.5 FCC 15.205 (a) RSS-Gen 7.2.2	**Restricted band**: Unwanted emissions falling within the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 7.2.2 must also comply with the radiated emission limits specified in FCC 15.209 (a) and RSS-Gen 7.2.5.	Pass

Radiated Emissions (General requirements)

Basic Standard	Technical Requirements / Details	Result
FCC 15.209 (a) RSS-Gen 7.2.5	**TX Spurious Emissions:** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the filed strength limits table in this section.	Pass
RSS-Gen 4.10	**RX Spurious Emissions:** Spurious emissions from the receivers shall not exceed the radiated limits of receiver spurious emissions shown in table 2 in section 6.1.	Pass
FCC 15.207 RSS-Gen 7.2.4	**AC conducted Emissions:** Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.	Pass

* MPE calculation is recorded in a separate report

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. During preliminary testing all three planes (X,Y & Z) were evaluated to determine "Worst Case". The data collected determine that the orientation used for this report was demined "Worst Case".

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	CP-8851	FCH17449DKM	68-5282-01 04

The following antennas were evaluated as part of this testing process. The antennas listed reflect the maximum gain allowed for each family type of antenna:

Fixed internal Dual Band Antenna, Gain = 3.11dBi (no external antenna can be used)

4.2 System Details

System #	Description	Samples
1	Bluetooth Radio Test Sample	S01

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Bluetooth Test Mode	System is connected to the MT8852B Bluetooth Tester and placed in either continuous TX Mode or Duty Cycle Mode with Hopping Function Turned ON or OFF per test requirements.

4.4 Test Mode, Modulation and Data Packet Type Description

Test Mode	Modulation	Data Packet
A	GFSK	DH5
B	π/4-DQPSK	2-H3
C	8-DPSK	3-DH1
Note1: Table above represents the worst case scenarios for all modulation and data packet type combinations.		

4.4.1 Test Mode and worst case

Item	Test Item	Test Mode	Test Frequency (MHz)
A.1	20 dB Bandwidth	A, B & C	2402, 244, 2480
A.2	Output Power	All available modulation and packet type	2402, 2441, 2480
	Worst Case	Mode C (Note: 1)	
A.3	Carrier Frequency Separation	Any with hopping enable	2441, 2442
A.4	Number of Hopping Frequencies	Any with hopping enable	2402 – 2483.5
A.5	Dwell Time / Average Time Occupancy	A, B & C / A, B & C w/ hopping enable	2441 / All Channels
A.6	Band-Edge	A, B & C	2402, 2480
A.7	Conducted Spurious Emissions	C	2402, 2441, 2480
A.8	Restricted Band	C	2402, 2441, 2480
A.9	RX Radiated Emissions	Receive / Idle	--------
A.10	TX Radiated Emissions	C	2402, 2441, 2480
A.11	Conducted Emissions	C / Receive	2441 (TX mode)
Note1: Worst case is determined as the combination of modulation and packet type with the highest output power.			

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

Appendix A: Formal Test Results

A.1 Occupied Bandwidth (20dB Bandwidth & 99% Bandwidth)

20dB bandwidth is the emission bandwidth across the lower frequency and the upper frequency at -20 dB levels relatively to the top carrier reference level with hopping function disabled.

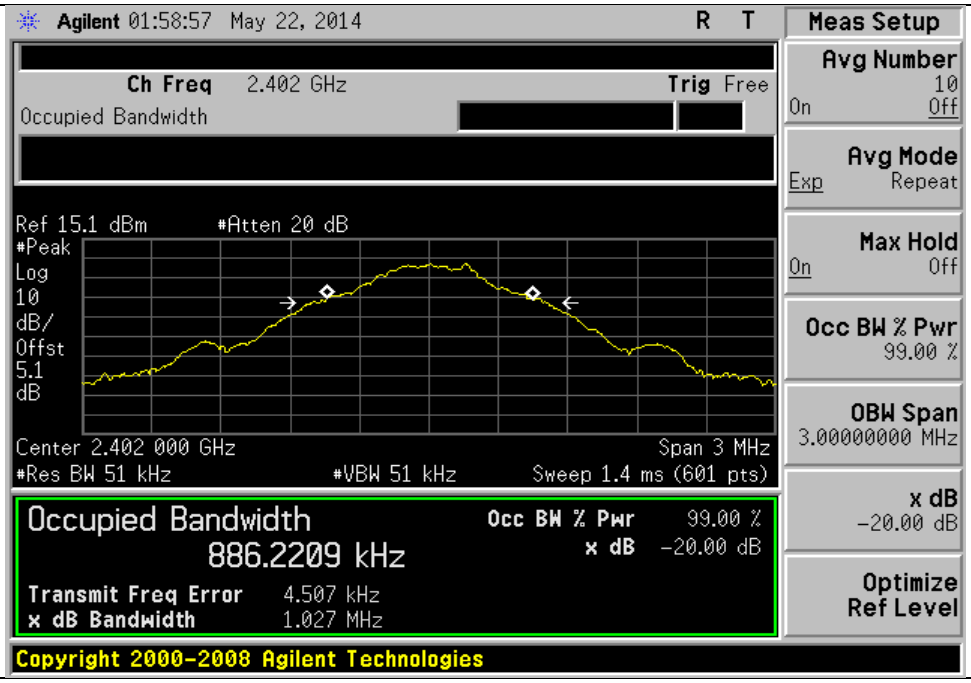
99% bandwidth is the recovered amplitude data points, beginning at the lowest frequency, are placed in running sum until 0.5% of the total is reached and that frequency recorded. The process repeated for the highest frequency data points. The span between the two recorded frequencies is the 99% occupied bandwidth.

Measurement Procedure
In accordance with KDB Publication DA 00-705

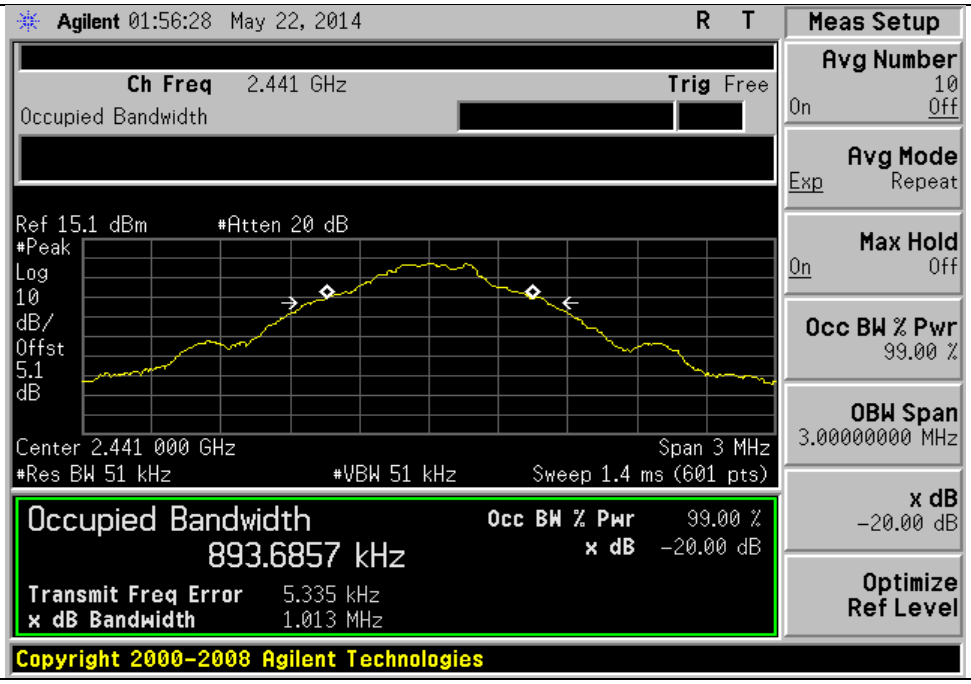
Test Data Table

Frequency (MHz)	20dB BW (MHz)	99% BW (MHz)	Modulation Type	Packet Type
2.402	1.027	0.886	GFSK	DH5
2.402	1.293	1.169	π/4-DQPSK	2-DH3
2.402	1.266	1.143	8-DPSK	3-DH1
2.441	1.013	0.894	GFSK	DH5
2.441	1.289	1.167	π/4-DQPSK	2-DH3
2.441	1.262	1.147	8-DPSK	3-DH1
2.480	1.045	0.896	GFSK	DH5
2.480	1.289	1.169	π/4-DQPSK	2-DH3
2.480	1.274	1.143	8-DPSK	3-DH1

Graphical Test Results

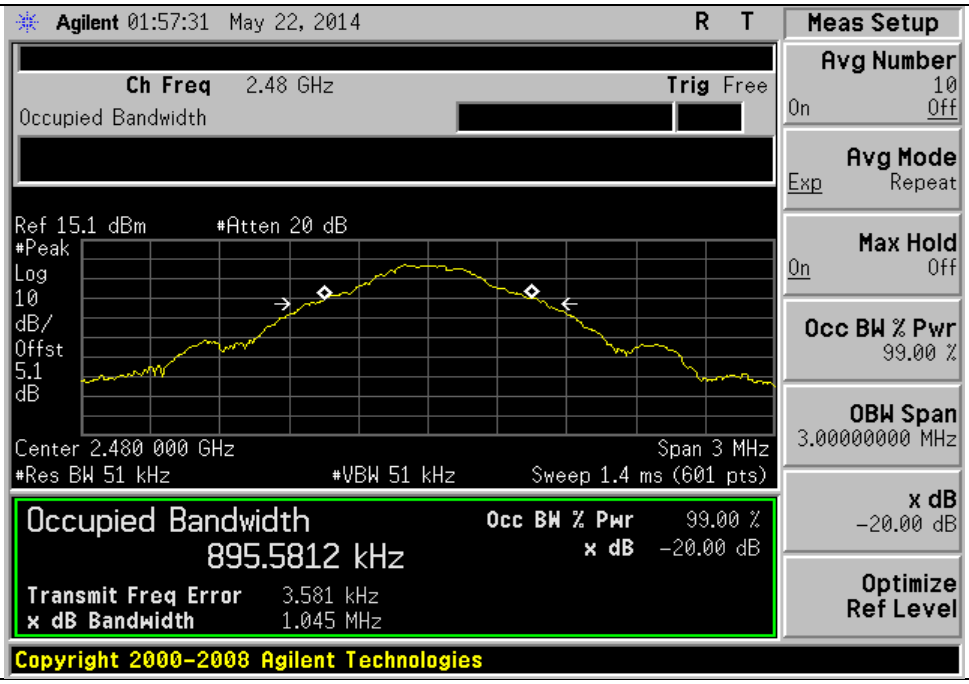


Title: **20dB Bandwidth Ch 0: 2402MHz with GFSK modulation (DH5 Packet)**

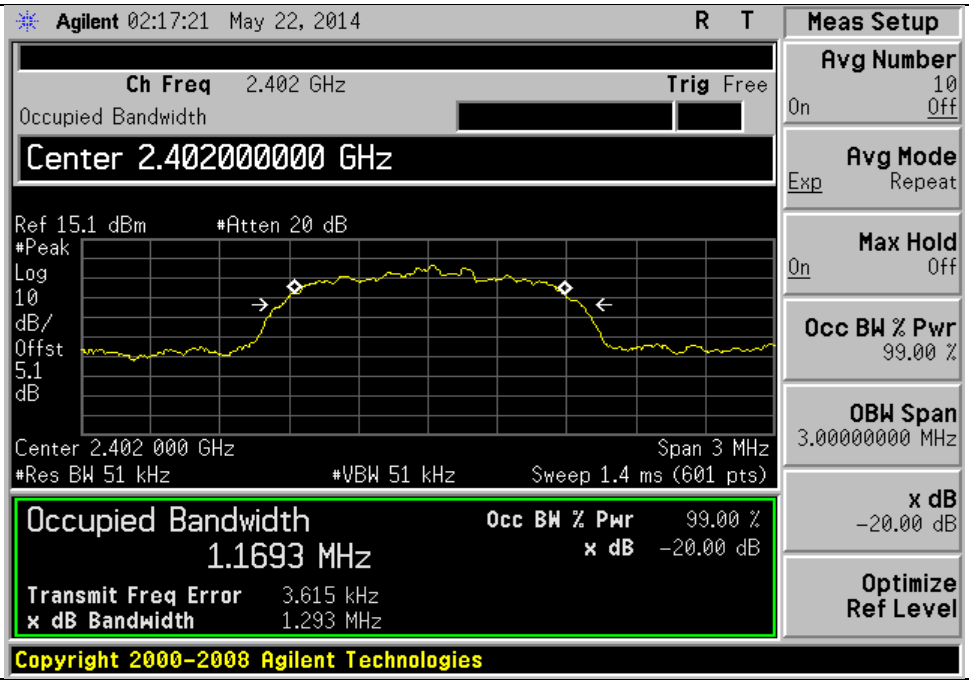


Title: **20dB Bandwidth Ch 39: 2441MHz with GFSK modulation (DH5 Packet)**

Graphical Test Results

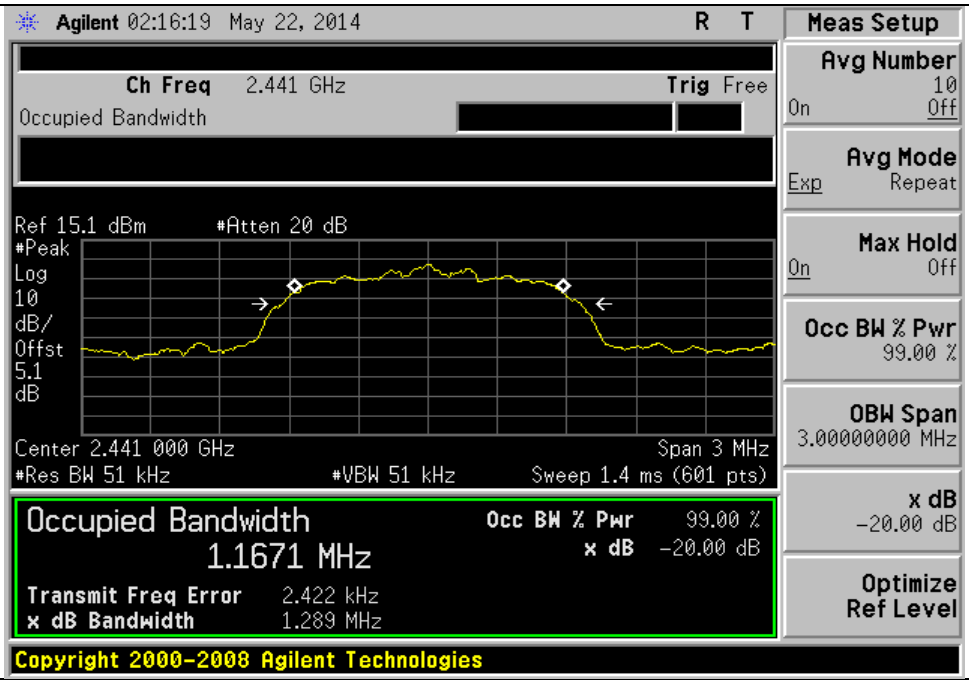


Title: **20dB Bandwidth Ch 78: 2480MHz with GFSK modulation (DH5 Packet)**

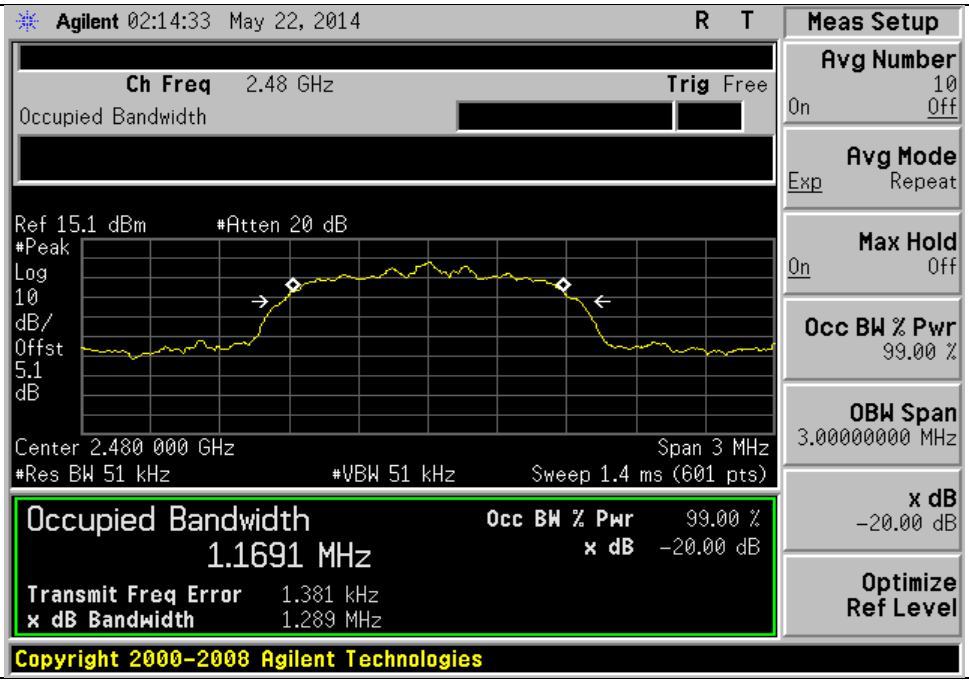


Title: **20dB Bandwidth Ch 0: 2402MHz with π/4DQPSK modulation (2-DH3 Packet)**

Graphical Test Results

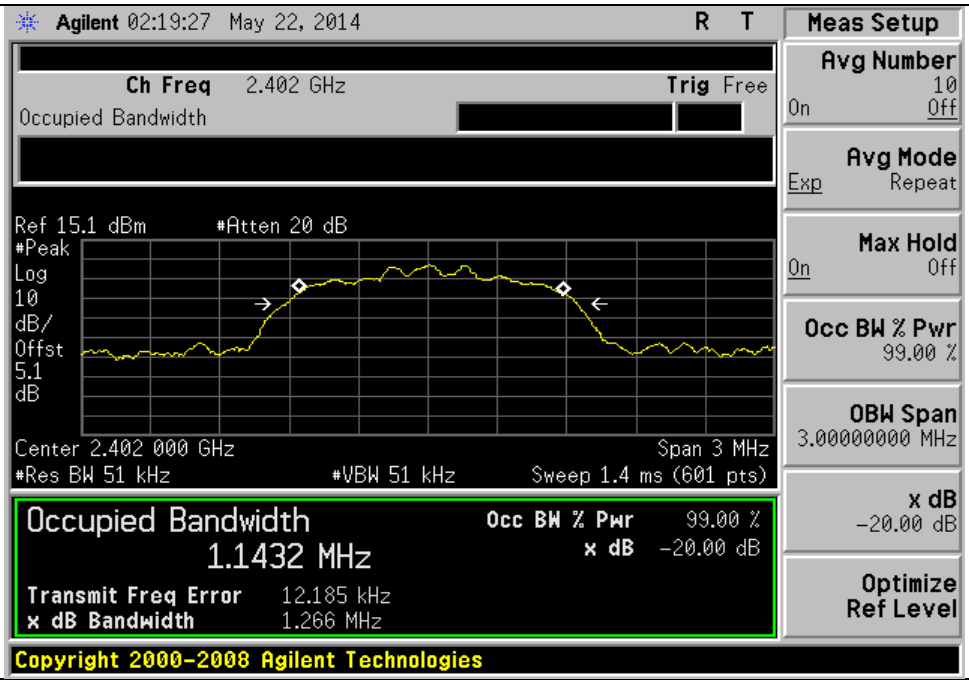


Title: **20dB Bandwidth Ch 39: 2441MHz with π/4DQPSK modulation (2-DH3 Packet)**

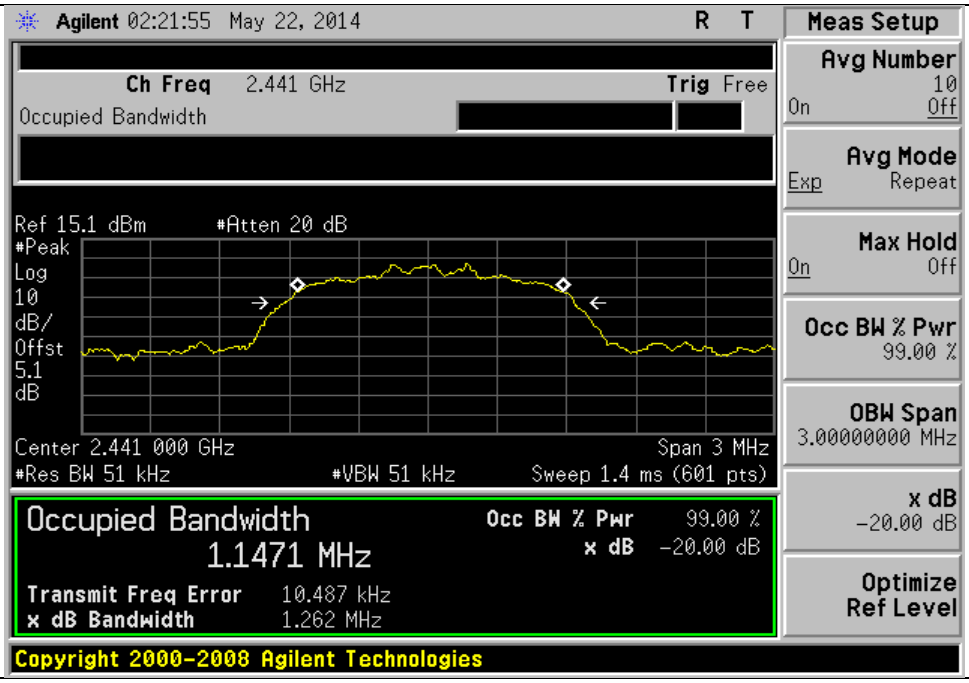


Title: **20dB Bandwidth Ch 78: 2480MHz with π/4DQPSK modulation (2-DH3 Packet)**

Graphical Test Results

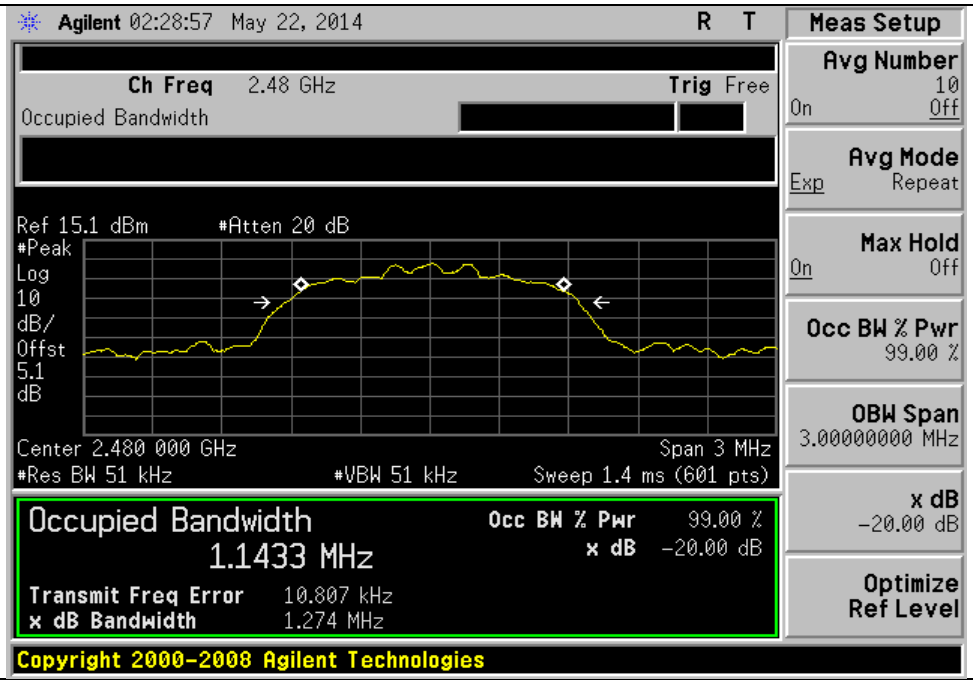


Title: **20dB Bandwidth Ch 0: 2402MHz with 8-DPSK modulation (3-DH1 Packet)**



Title: **20dB Bandwidth Ch 39: 2441MHz with 8-DPSK modulation (3-DH1 Packet)**

Graphical Test Results



Title: **20dB Bandwidth Ch 78: 2402MHz with 8-DPSK modulation (3-DH1 Packet)**

A.2 Peak Output Power

15.247 & RSS-210 A8.4:

The maximum conducted output power of the intentional radiator for systems using frequency hopping systems in the 2400-2483.5MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

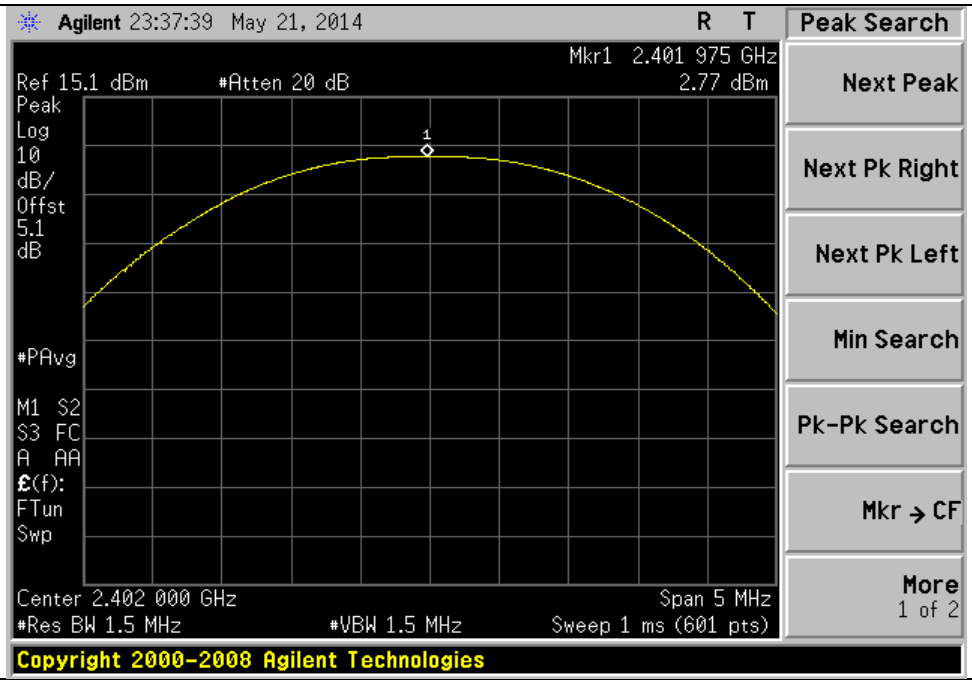
Measurement Procedure
In accordance with KDB Publication DA 00-705

Test Data Table

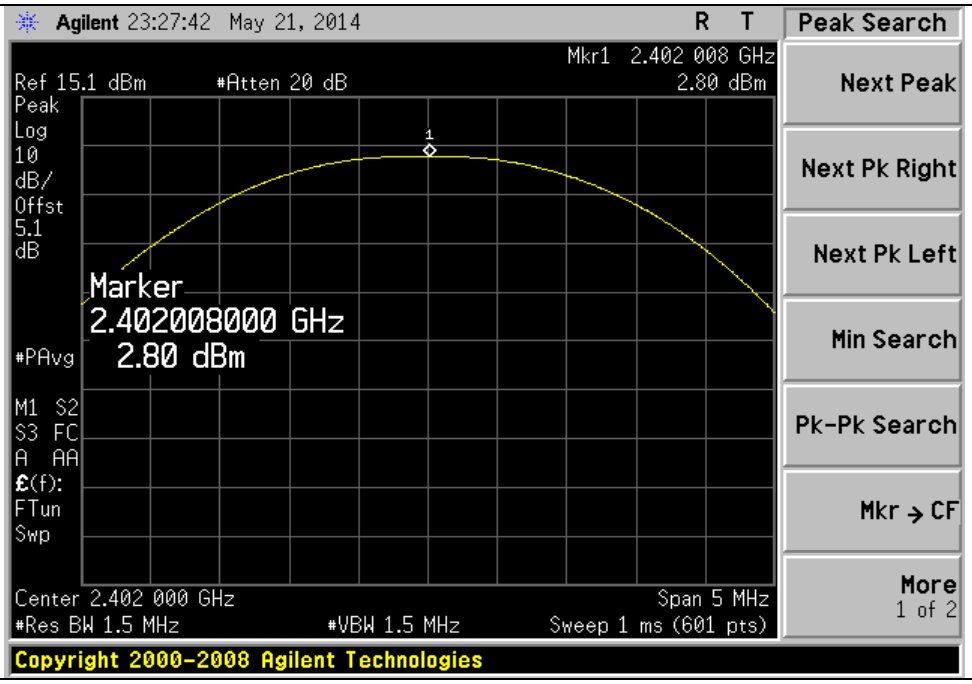
Frequencies (MHz)	Modulation	Data rate (Mbps)	Packet Type	Peak Output Power (dBm)	Limits (dBm)	Results
2402	GSFK	1 Mbps	DH1	2.77	30	Pass
2402	GSFK	1 Mbps	DH3	2.80	30	Pass
2402	GSFK	1 Mbps	DH5	3.91	30	Pass
2402	π/4-DQPSK	2 Mbps	2-DH1	3.34	30	Pass
2402	π/4-DQPSK	2 Mbps	2-DH3	3.51	30	Pass
2402	π/4-DQPSK	2 Mbps	2-DH5	3.46	30	Pass
2402	8-DPSK	3 Mbps	3-DH1	3.88	30	Pass
2402	8-DPSK	3 Mbps	3-DH3	3.78	30	Pass
2402	8-DPSK	3 Mbps	3-DH5	3.62	30	Pass
2441	GSFK	1 Mbps	DH1	3.20	30	Pass
2441	GSFK	1 Mbps	DH3	3.89	30	Pass
2441	GSFK	1 Mbps	DH5	4.31	30	Pass
2441	π/4-DQPSK	2 Mbps	2-DH1	3.89	30	Pass
2441	π/4-DQPSK	2 Mbps	2-DH3	3.88	30	Pass
2441	π/4-DQPSK	2 Mbps	2-DH5	3.83	30	Pass
2441	8-DPSK	3 Mbps	3-DH1	4.31	30	Pass
2441	8-DPSK	3 Mbps	3-DH3	4.22	30	Pass
2441	8-DPSK	3 Mbps	3-DH5	4.04	30	Pass
2480	GSFK	1 Mbps	DH1	3.41	30	Pass
2480	GSFK	1 Mbps	DH3	3.52	30	Pass
2480	GSFK	1 Mbps	DH5	3.55	30	Pass
2480	π/4-DQPSK	2 Mbps	2-DH1	4.12	30	Pass
2480	π/4-DQPSK	2 Mbps	2-DH3	4.21	30	Pass
2480	π/4-DQPSK	2 Mbps	2-DH5	4.18	30	Pass
2480	8-DPSK	3 Mbps	3-DH1	4.18	30	Pass
2480	8-DPSK	3 Mbps	3-DH3	3.85	30	Pass
2480	8-DPSK	3 Mbps	3-DH5	4.00	30	Pass

Note: Worst case is determined as the modulation with Highest Output Power.
Worst cases emissions to be determined as DH5, 2-DH3 & 3-DH1

Graphical Test Results

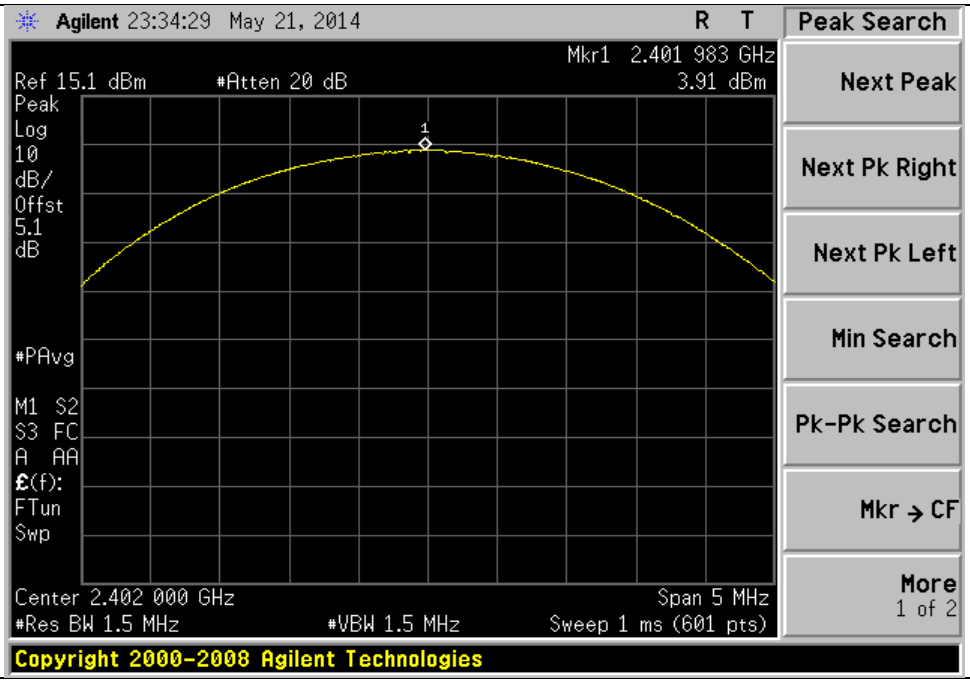


Title: Peak Output Power Ch 0: 2402MHz with GFSK modulation / DH1 Packet type

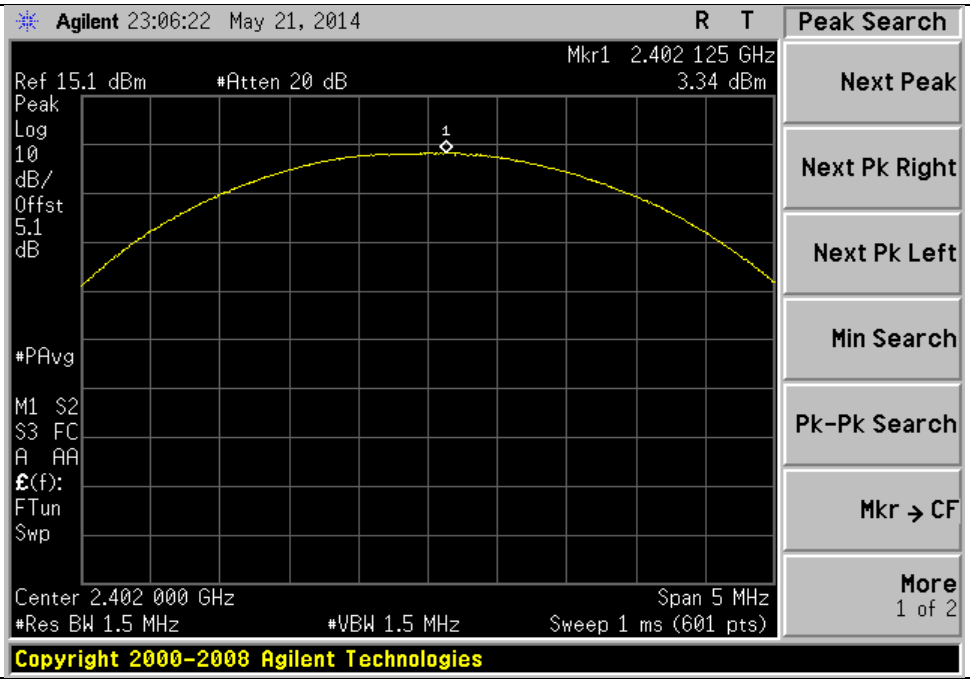


Title: Peak Output Power Ch 0: 2402MHz with GFSK modulation (DH3 packet type)

Graphical Test Results

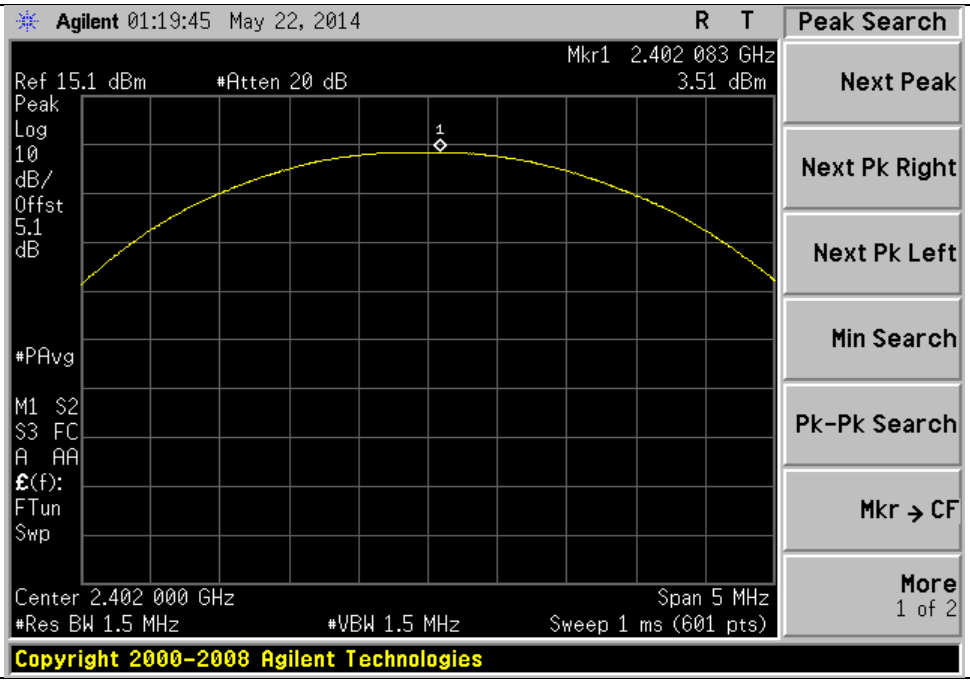


Title: Peak Output Power Ch 0: 2402MHz with GFSK modulation (DH5 packet type)

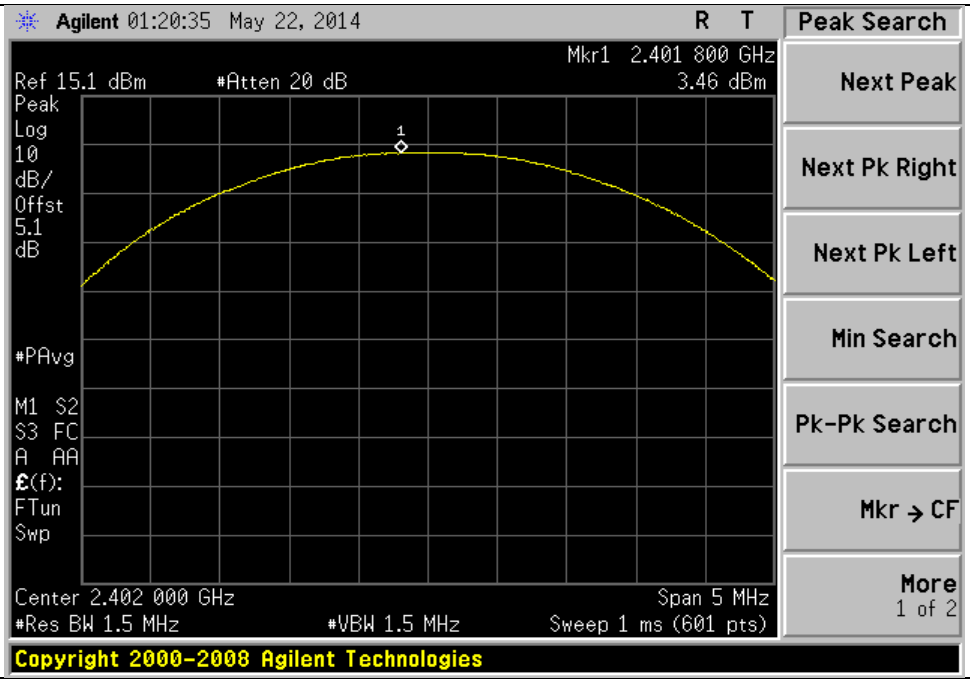


Title: Peak Output Power Ch 0: 2402MHz with π/4-DQPSK modulation (2-DH1 packet)

Graphical Test Results

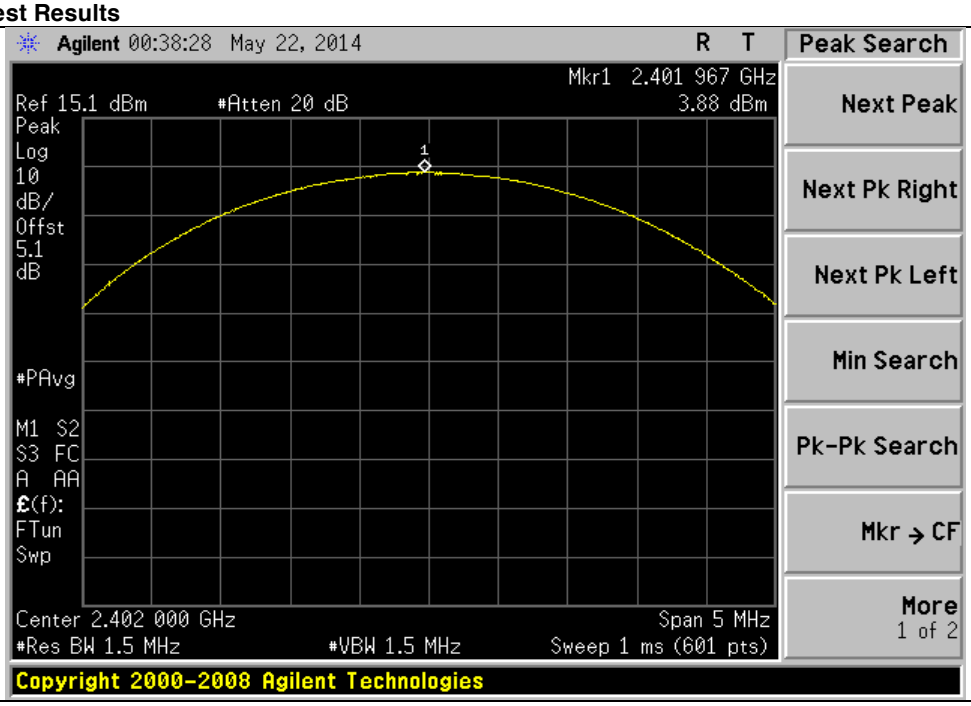


Title: **Peak Output Power Ch 0: 2402MHz with π/4-DQPSK modulation (2-DH3 packet)**

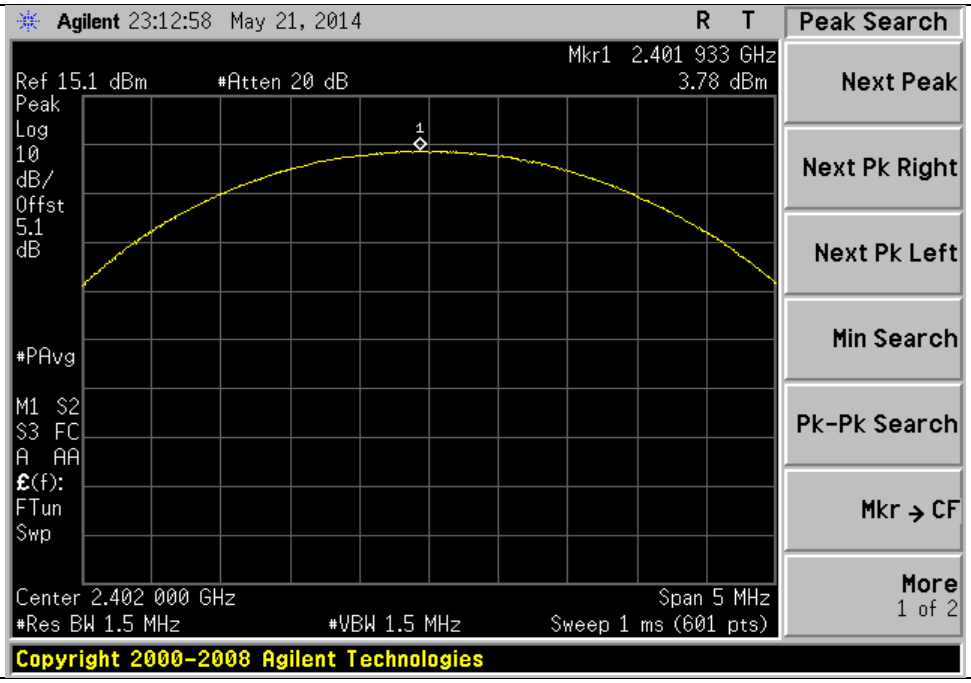


Title: **Peak Output Power Ch 0: 2402MHz with π/4-DQPSK modulation (2-DH5 packet)**

Graphical Test Results

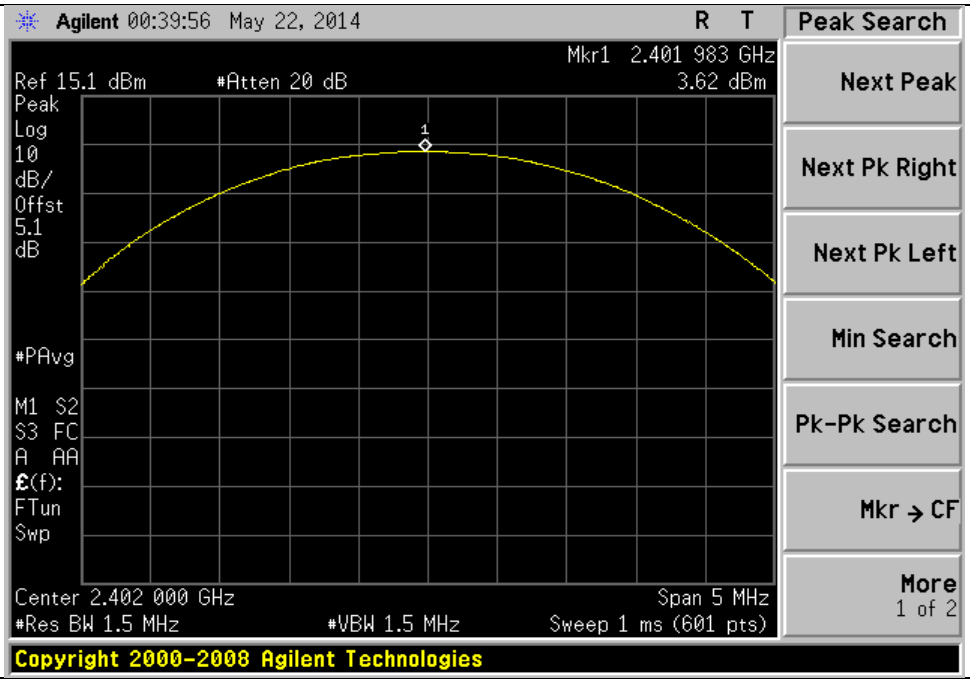


Title: Peak Output Power Ch 0: 2402MHz with 8-DPSK modulation (3-DH1 packet)

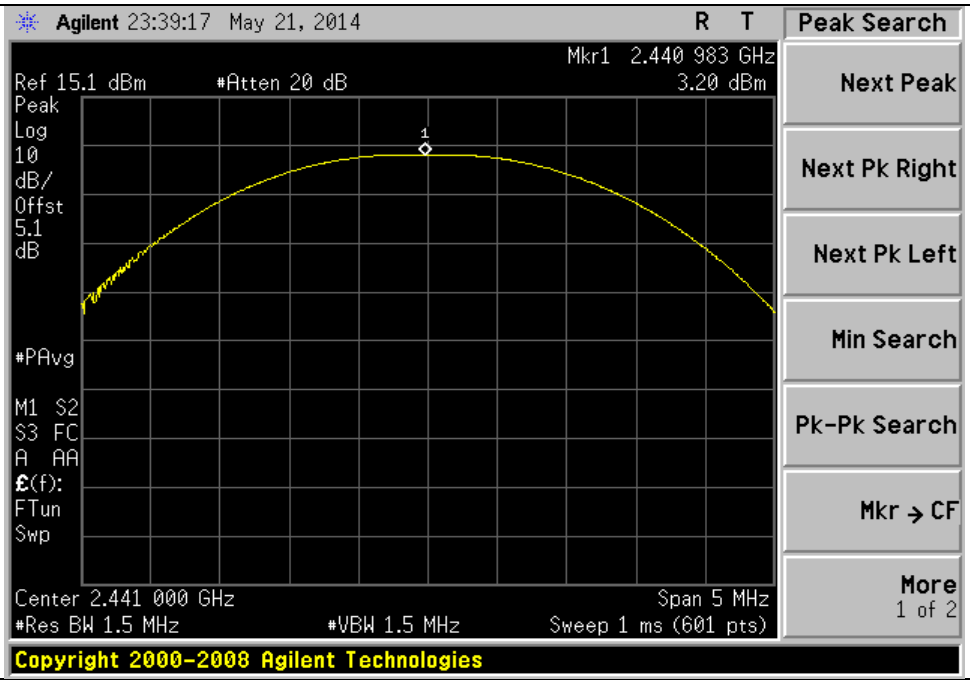


Title: Peak Output Power Ch 0: 2402MHz with 8-DPSK modulation (3-DH3 packet)

Graphical Test Results

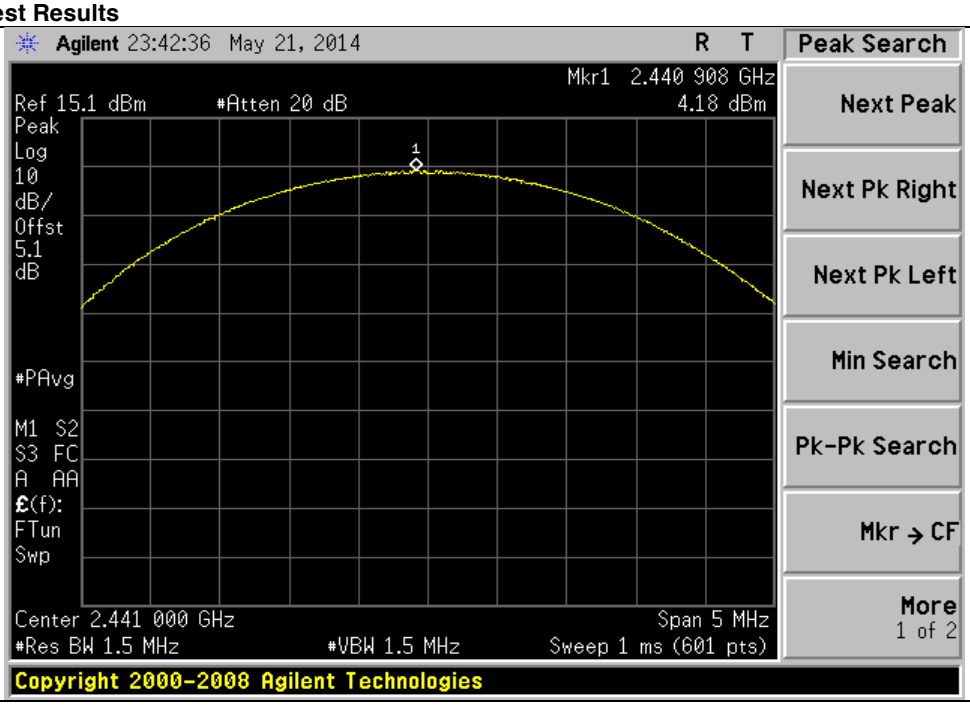


Title: Peak Output Power Ch 0: 2402MHz with 8-DPSK modulation (3-DH5 packet)

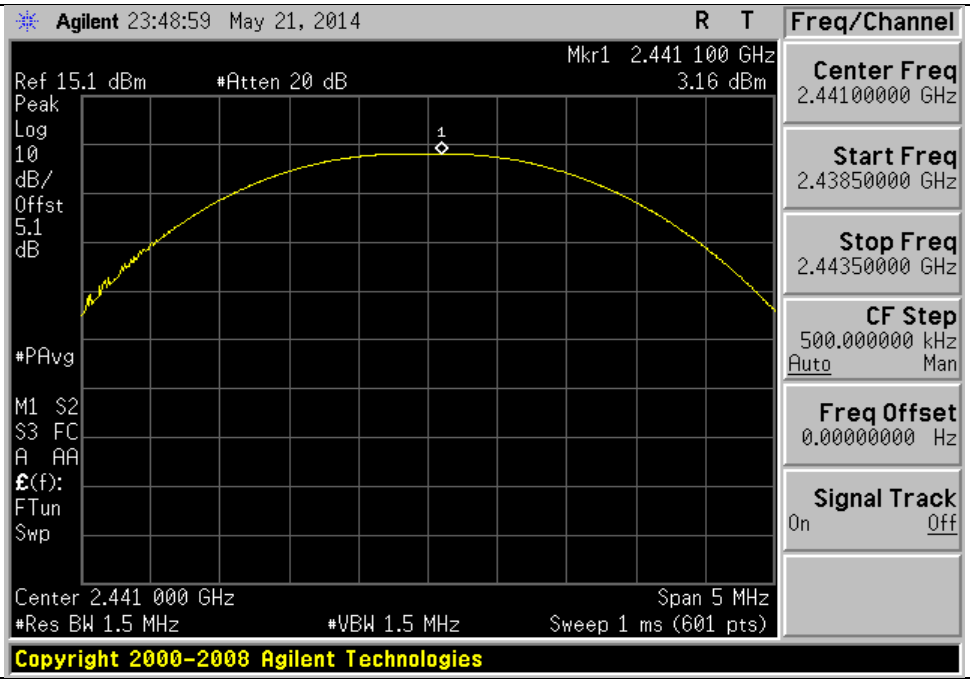


Title: Peak Output Power Ch 39: 2441MHz with GFSK modulation (DH1 packet)

Graphical Test Results

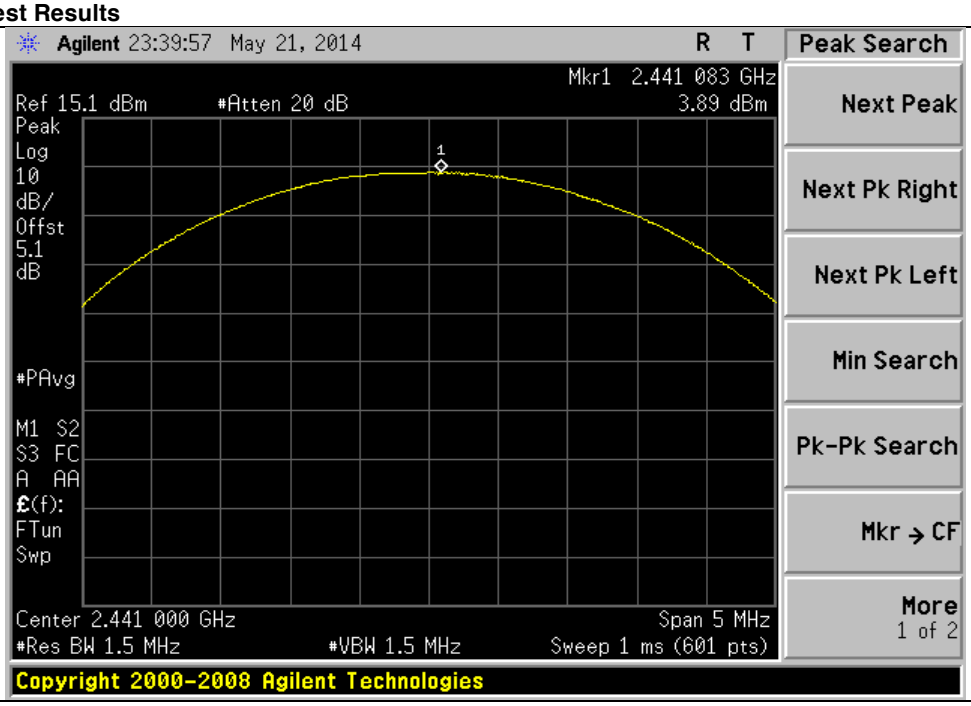


Title: Peak Output Power Ch 39: 2441MHz with GFSK modulation (DH3 packet type)

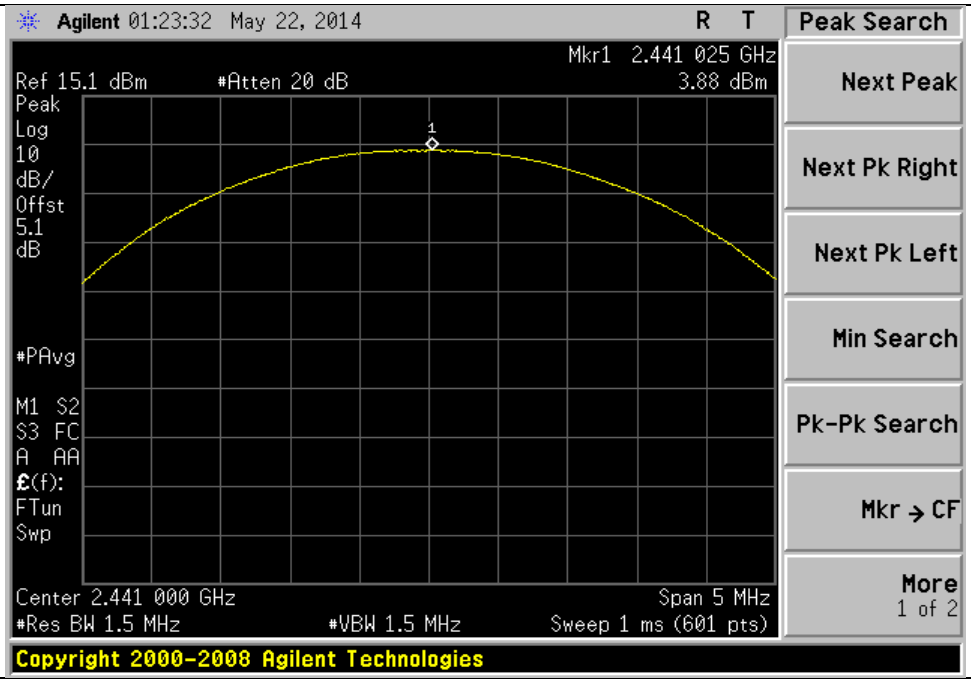


Title: Peak Output Power Ch 39: 2441MHz with GFSK modulation (DH5 packet)

Graphical Test Results

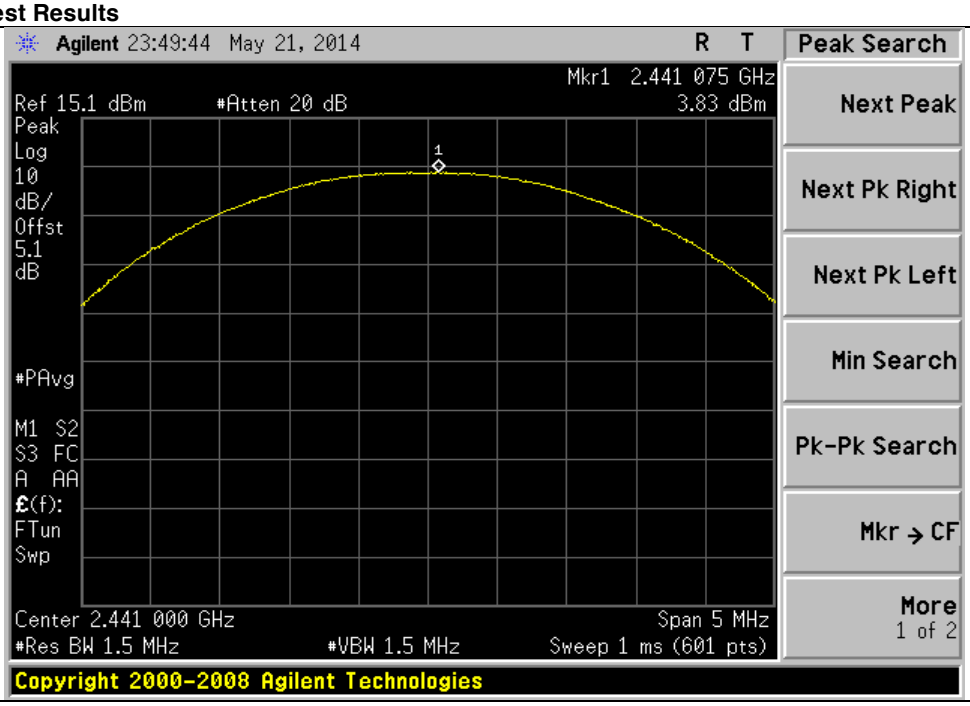


Title: Peak Output Power Ch 39: 2441MHz with π/4-DQPSK modulation (2-DH1 packet)

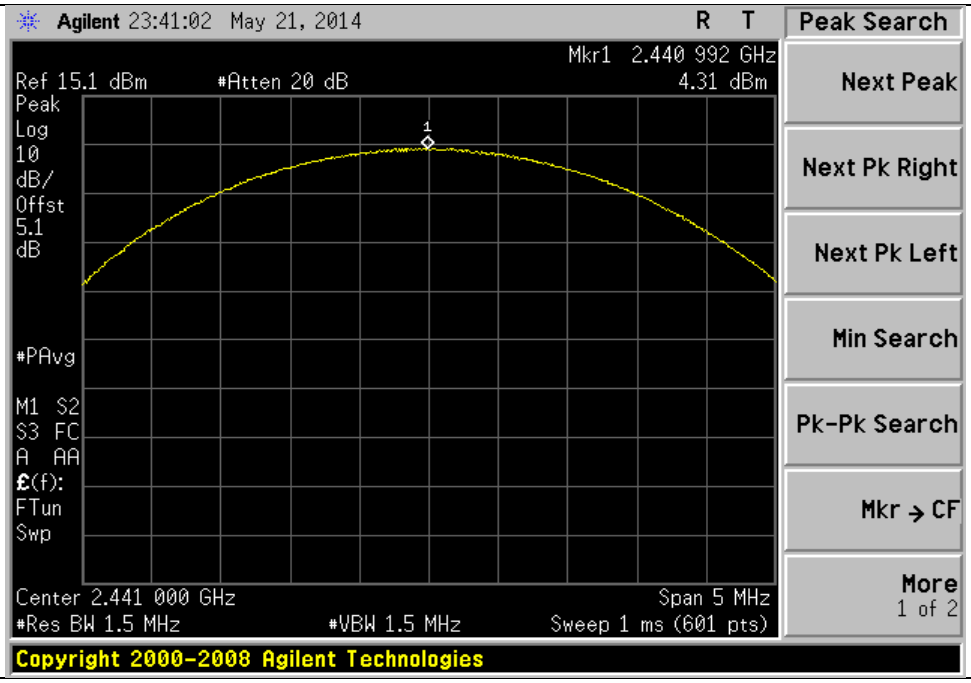


Title: Peak Output Power Ch 39: 2441MHz with π/4-DQPSK modulation (2-DH3 packet)

Graphical Test Results

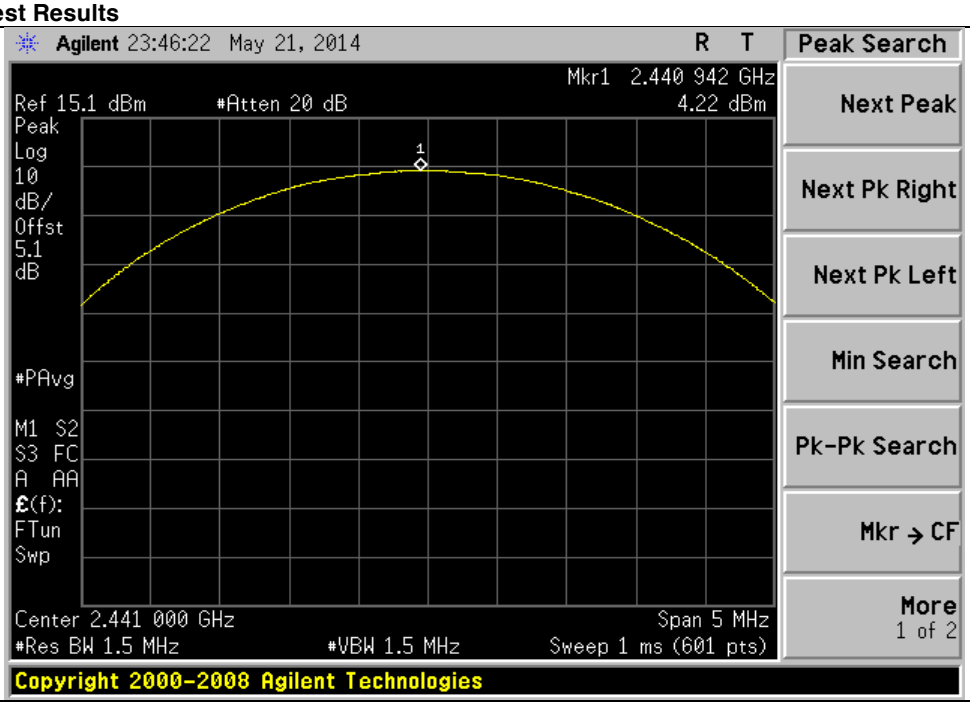


Title: **Peak Output Power Ch 39: 2441MHz with π/4-DQPSK modulation (2-DH5 packet)**

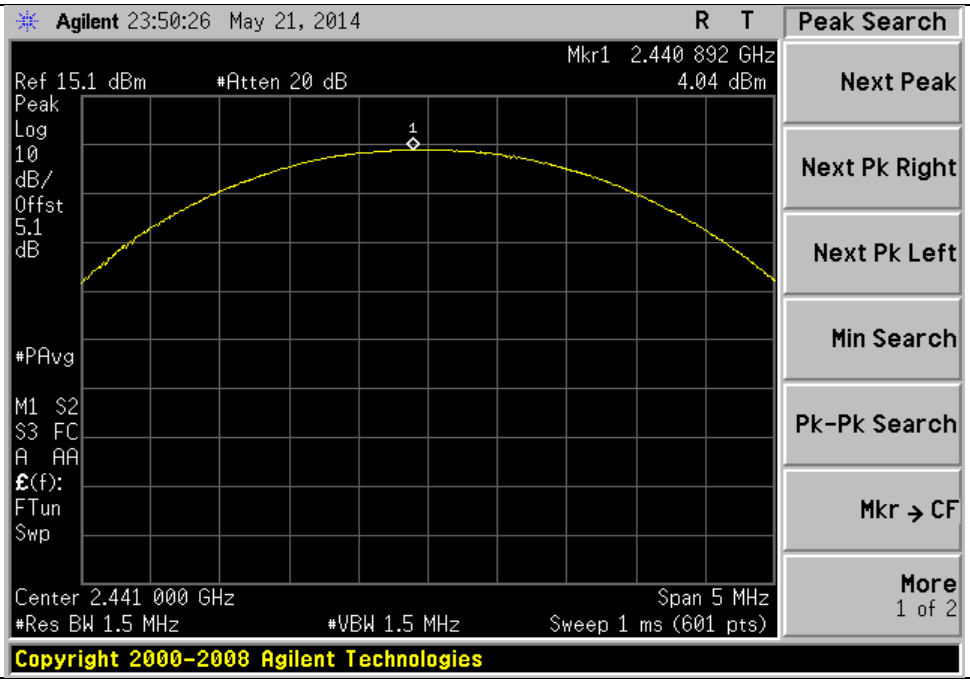


Title: **Peak Output Power Ch 39: 2441MHz with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results

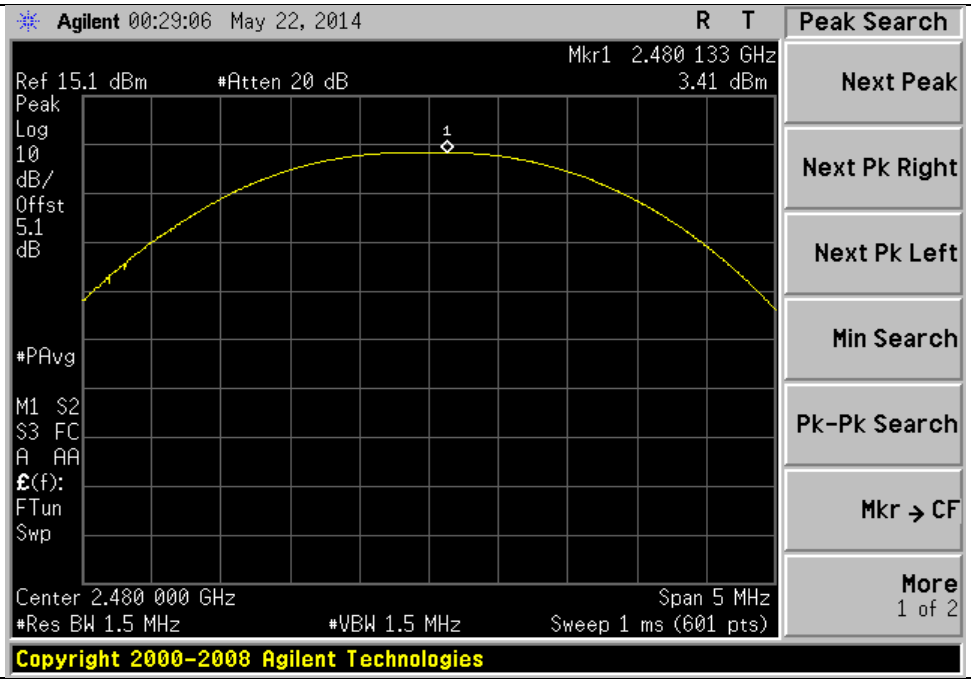


Title: **Peak Output Power Ch 39: 2441MHz with 8DPSK modulation (3-DH3 packet)**

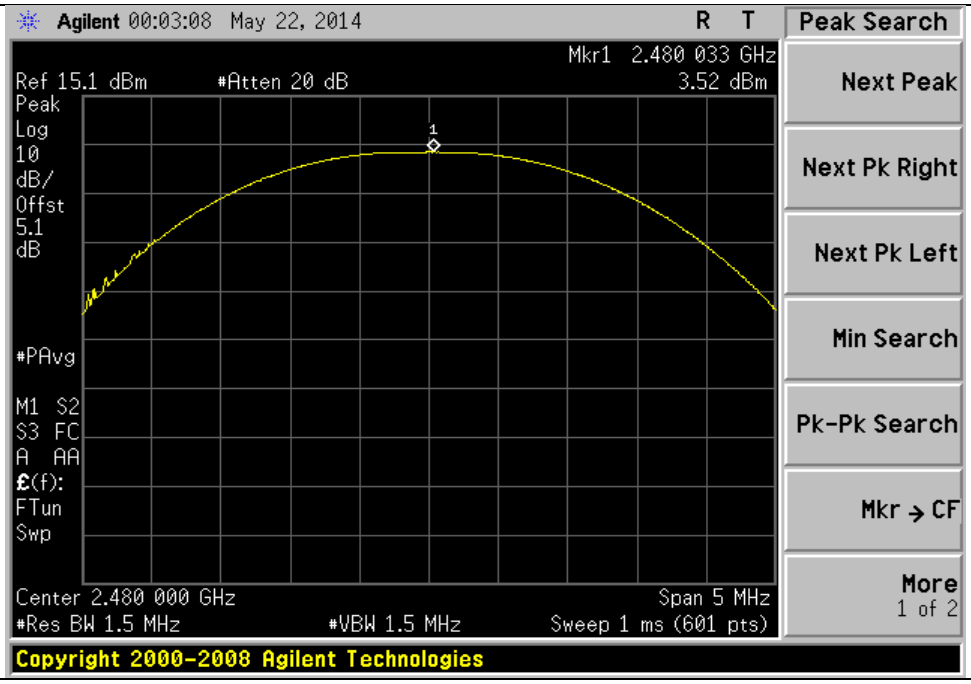


Title: **Peak Output Power Ch 39: 2441MHz with 8DPSK modulation (3-DH5 packet)**

Graphical Test Results

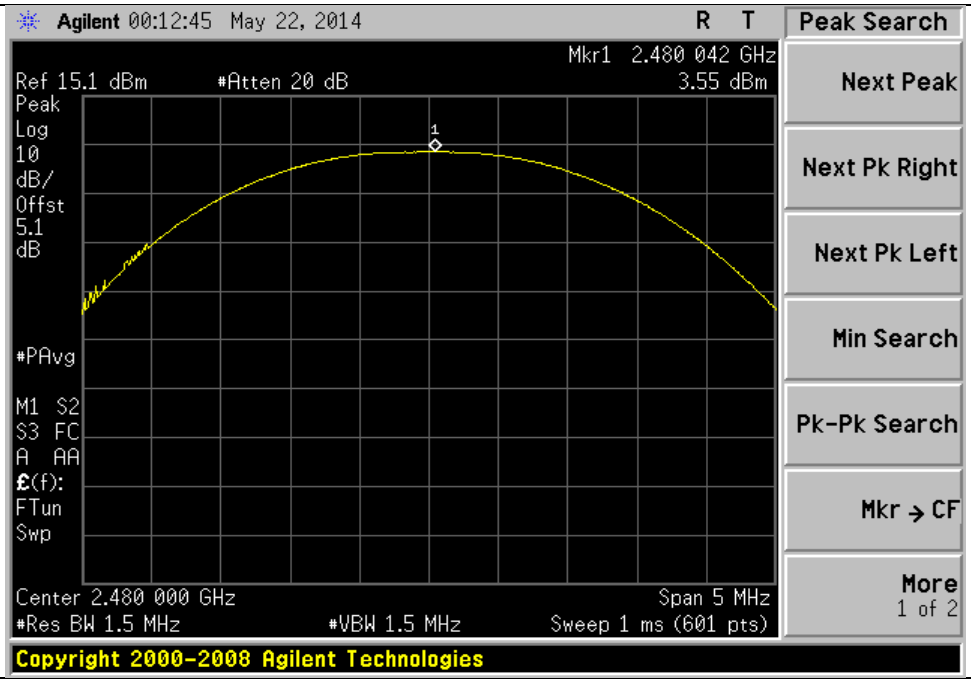


Title: **Peak Output Power Ch 78: 2480MHz with GFSK modulation (DH1 packet)**

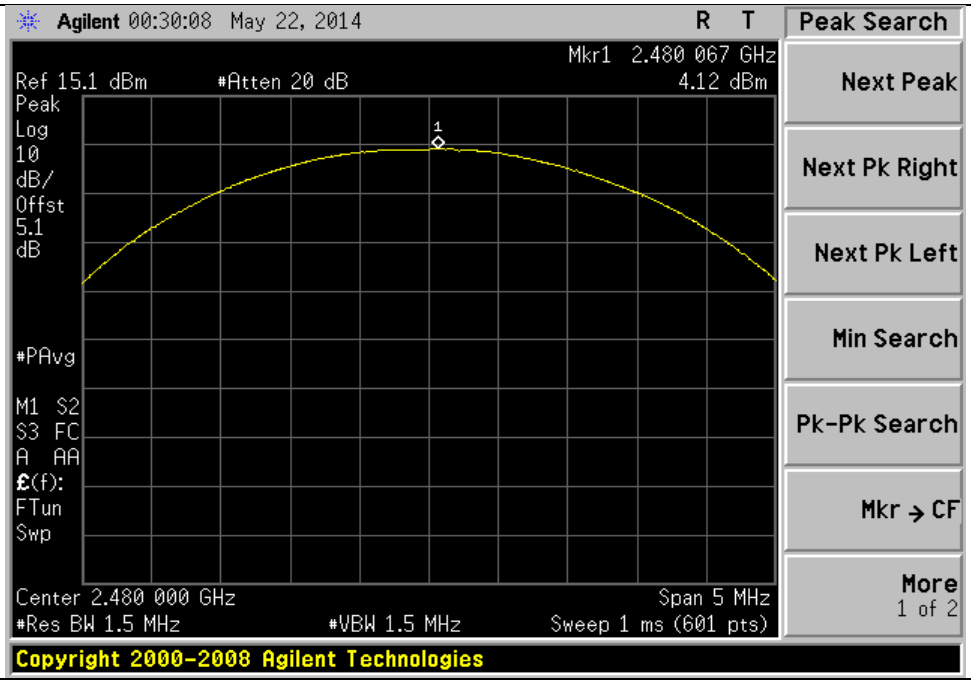


Title: **Peak Output Power Ch 78: 2480MHz with GFSK modulation (DH3 packet)**

Graphical Test Results

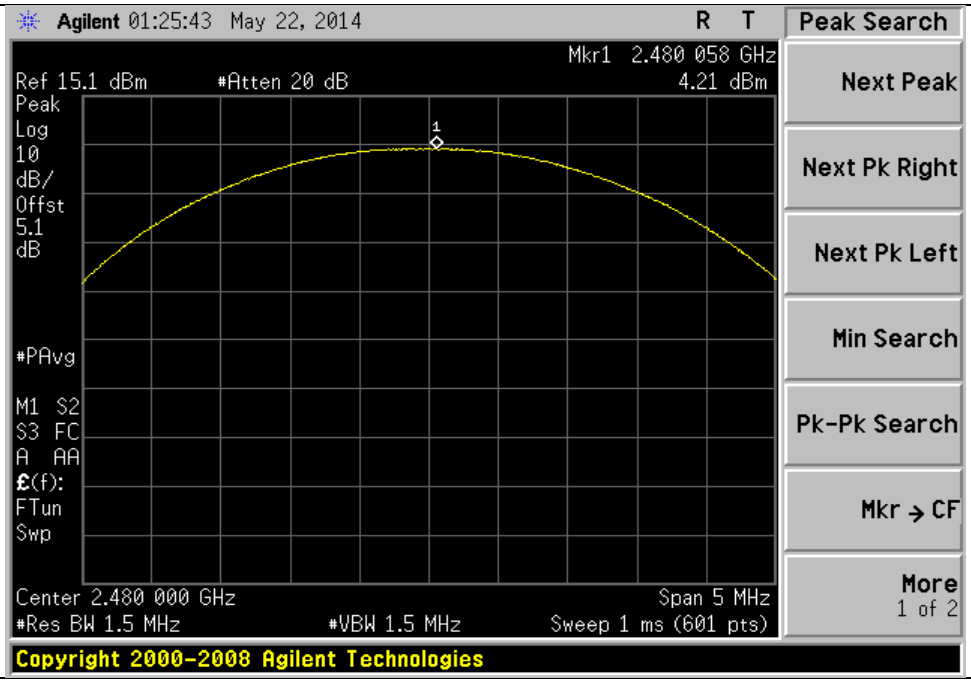


Title: **Peak Output Power Ch 78: 2480MHz with GFSK modulation (DH5 packet)**

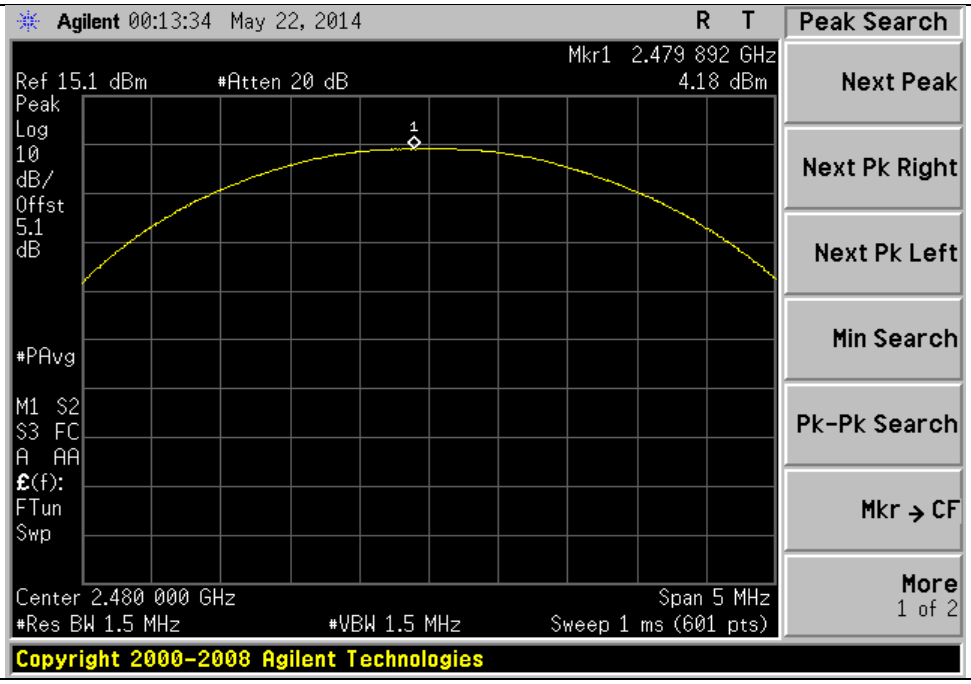


Title: **Peak Output Power Ch 78: 2480MHz with π/4-DQPSK modulation (2-DH1 packet)**

Graphical Test Results

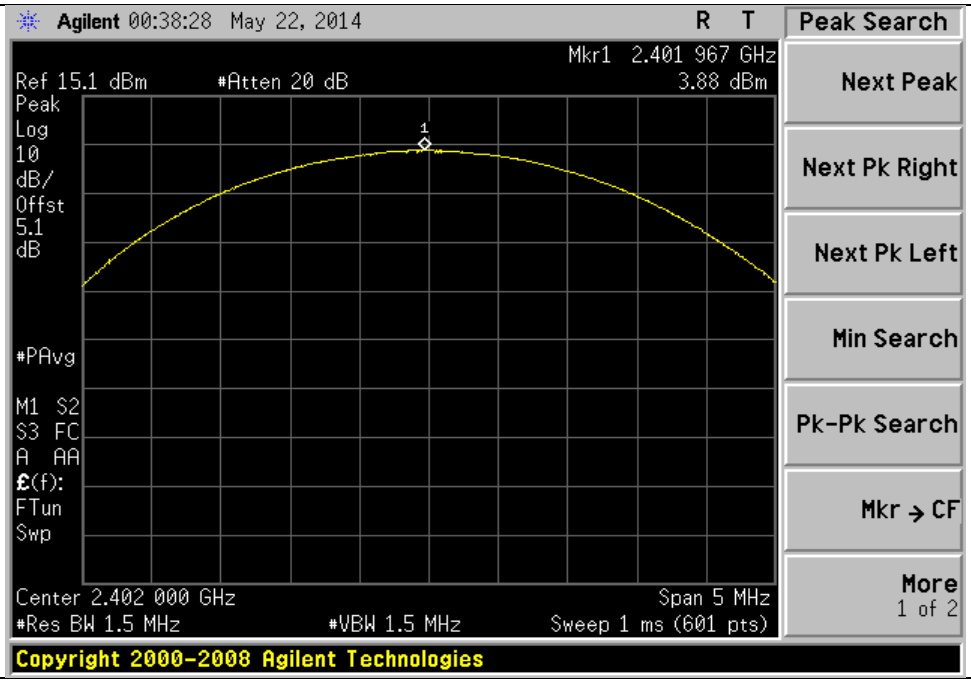


Title: **Peak Output Power Ch 78: 2480MHz with π/4-DQPSK modulation (2-DH3 packet)**

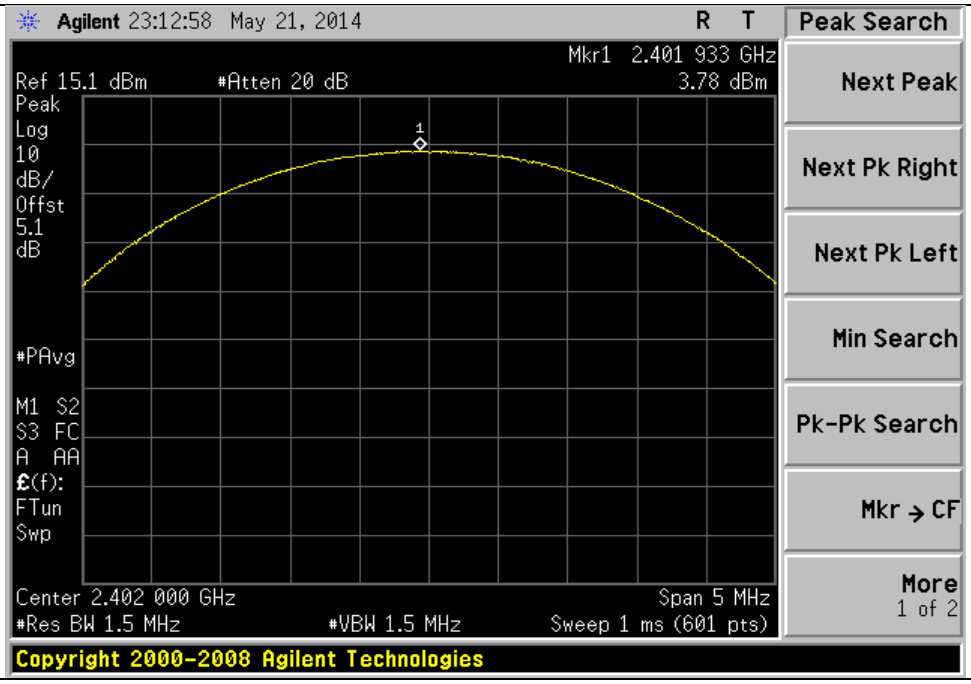


Title: **Peak Output Power Ch 78: 2480MHz with π/4-DQPSK modulation (2-DH5 packet)**

Graphical Test Results

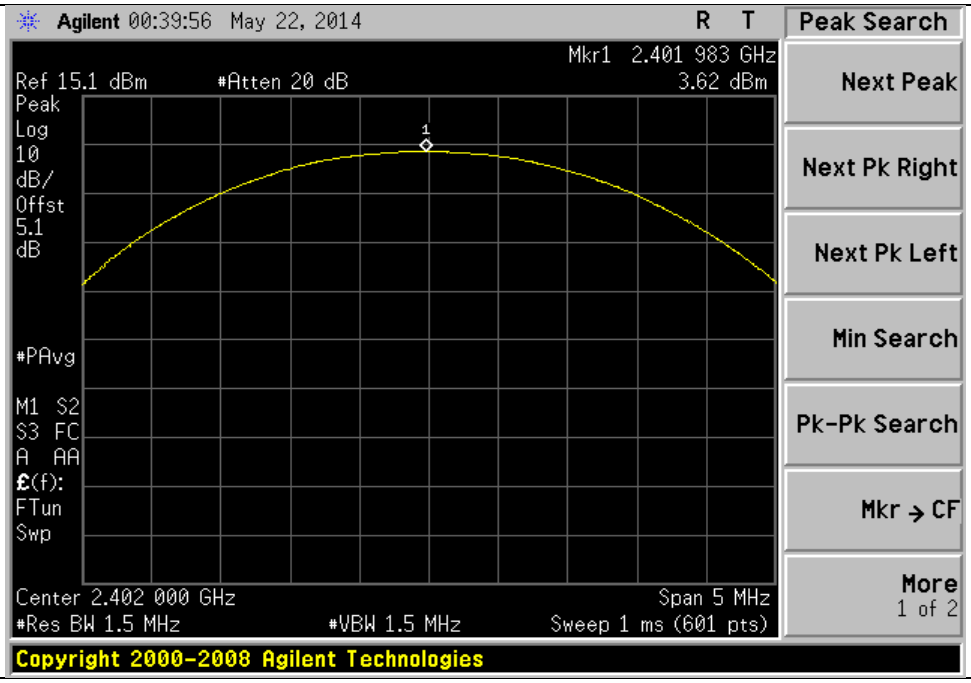


Title: **Peak Output Power Ch 78: 2480MHz with 8-DPSK modulation (3-DH1 packet)**



Title: **Peak Output Power Ch 78: 2480MHz with 8-DPSK modulation (3-DH3 packet)**

Graphical Test Results



Title: **Peak Output Power Ch 78: 2480MHz with 8-DPSK modulation (3-DH5 packet)**

Overall Result: PASS

A.3 Carrier Frequency Separation

15.247 & RSS-210 A8.1:

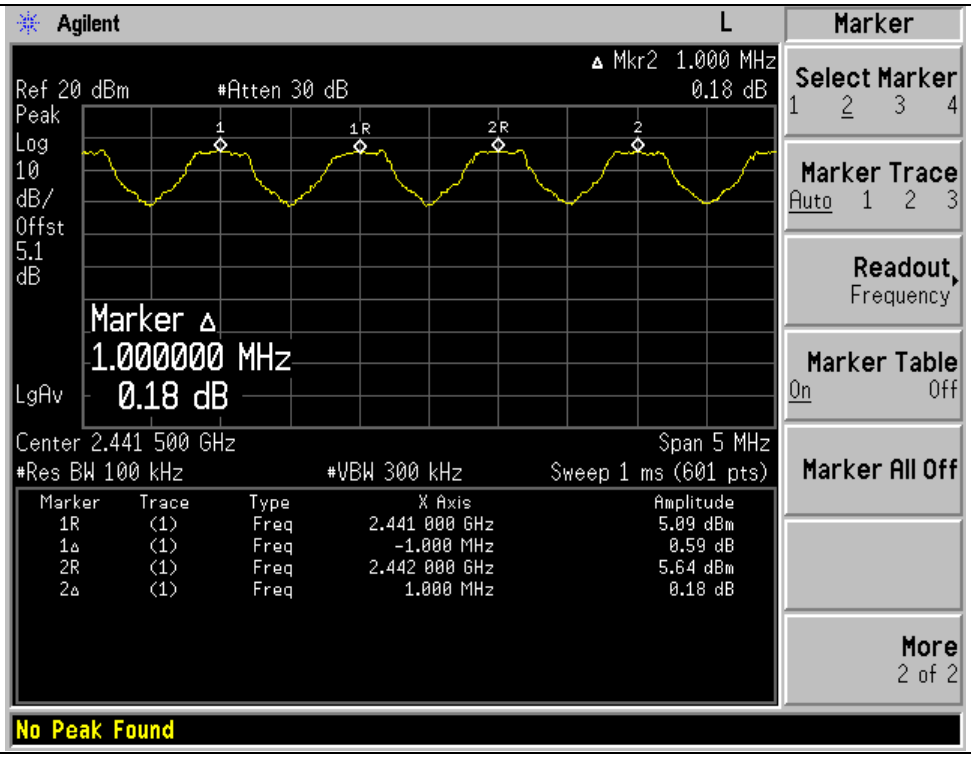
For frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 0.125W.

Measurement Procedure
In accordance with KDB Publication DA 00-705

Test Data Table

Frequency (MHz)	Carrier Frequency Separation (KHz)	Limits (KHz)	Results
2440 & 2441	1000.00	2/3 of 20dB BW	Pass
2442 & 2443	1000.00	2/3 of 20dB BW	Pass

Graphical Test Results



Title: **Carrier Frequency Separation between 2441 MHz & 2442 MHz**

A.4 Number of Hopping Frequencies

15.247 & RSS-210 A8.1:

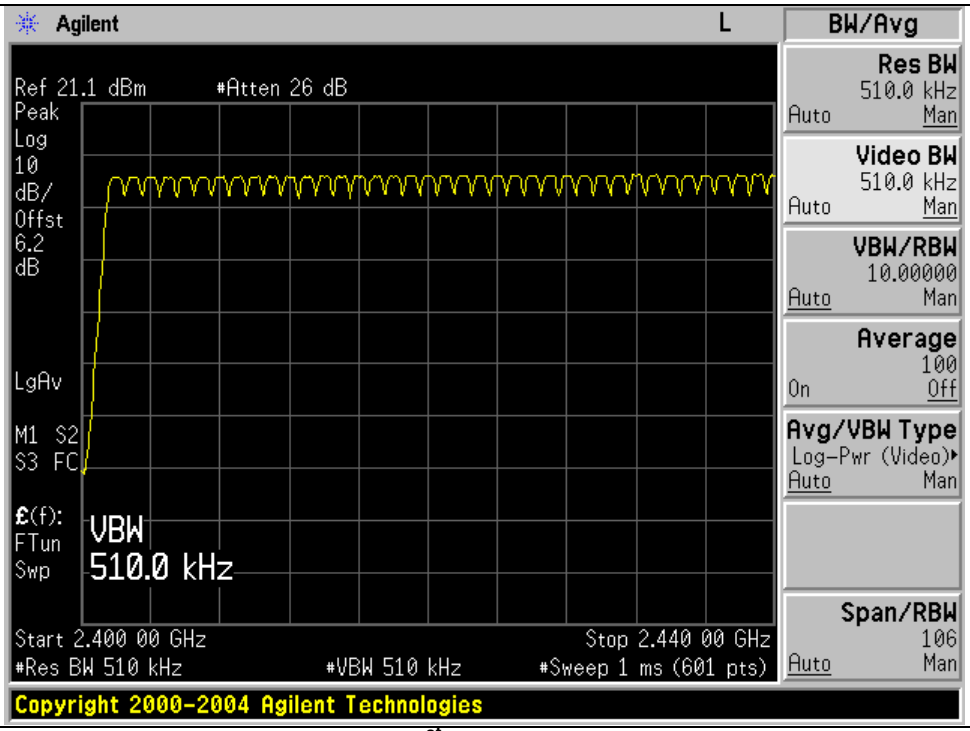
Frequency hopping systems operating in the band 2400-2483.5MHz shall use at least 15 hopping channels.

Measurement Procedure
In accordance with KDB Publication DA 00-705

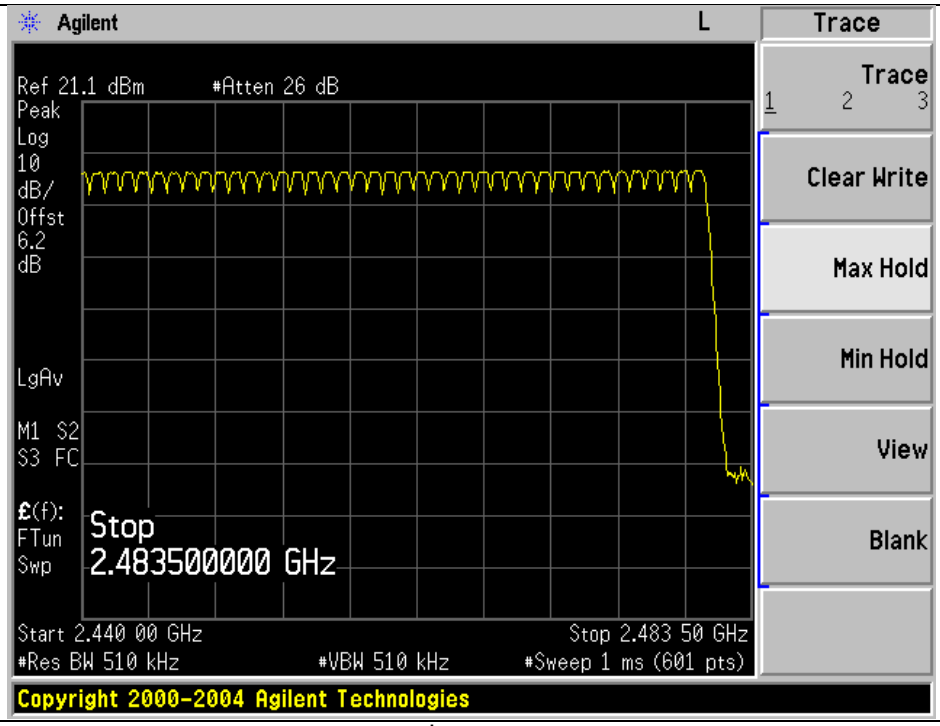
Test Data Table

Frequency (MHz)	Total No. of Channels	Limits	Results
2400 – 2483.5	79	≥ 15	Pass
Total number of hopping frequencies in the 2400-2483.5MHz Band = 79 Channels			

Graphical Test Results



Title: **Total No. of Hops Channels = 38.5 for 1st segment in the frequency range 2400-2440MHz**



Title: **Total No. of Hops Channels = 40.5 for 2nd segment in the frequency range 2400-2440MHz**

A.5 Dwell Time / Average Time of Occupancy

15.247 & RSS-210 A8.1:

Frequency hopping systems operating in the band 2400-2483.5MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Measurement Procedure

In accordance with KDB Publication DA 00-705

Calculation

The total sweep time is 0.4(79) = 31.6 seconds.
Due to the number of hops in the 31.6s sweep we determined to reduce the sweep time to 5 s, count the number of hops and multiply by 6.32. The total number of hops will be multiplied by the measured time of one pulse.

Example: Number of Hops in 5s = 50. Total Number of Hops in 31.6s = 5 (6.32) = 316
Single Pulse Width = 0.001s. Time of Occupancy = 316 (0.001) = 0.316s

Packet Type: DH1
DH1 Dwell Time = **0.400ms**
Total bins in 5 s = 52
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 52 (in 5s) x 6.32 = 328.6
Total time occupancy (in 31.6s) = 329 x 0.400ms = **131.6ms** or .132s

Packet Type: DH3
DH3 Dwell Time = **1.633 ms**
Total bins in 5 s = 18
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 18 (in 5s) x 6.32 = 113.8
Total time occupancy (in 31.6s) = 114 x 1.63ms = **185.8ms** or .186s

Packet Type: DH5
DH5 Dwell Time = **2.900 ms**
Total bins in 5 s = 13
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 13 (in 5s) x 6.32 = 82.2 bins
Total time occupancy (in 31.6s) = 82 x 2.90ms = **237.8ms** or .238s

Packet Type: 2-DH1
2-DH1 Dwell Time = **0.400ms**
Total bins in 5 s = 52
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 52 (in 5s) x 6.32 = 328.6
Total time occupancy (in 31.6s) = 329 x 0.400ms = **131.6ms** or .132s

Calculation (continue):

Packet Type: 2-DH3
2-DH3 Dwell Time = **1.633 ms**
Total bins in 5 s = 18
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 18 (in 5s) x 6.32 = 113.8
Total time occupancy (in 31.6s) = 114 x 1.63ms = **185.8ms** or .186s

Packet Type: 2-DH5
2-DH5 Dwell Time = **2.900 ms**
Total bins in 5 s = 14
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 13 (in 5s) x 6.32 = 88.5 bins
Total time occupancy (in 31.6s) = 88 x 2.90ms = **255.2ms** or .255s

Packet Type: 3-DH1
3-DH1 Dwell Time = **0.400ms**
Total bins in 5 s = 54
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 54 (in 5s) x 6.32 = 341.3
Total time occupancy (in 31.6s) = 341 x 0.400ms = **136.5ms** or .136s

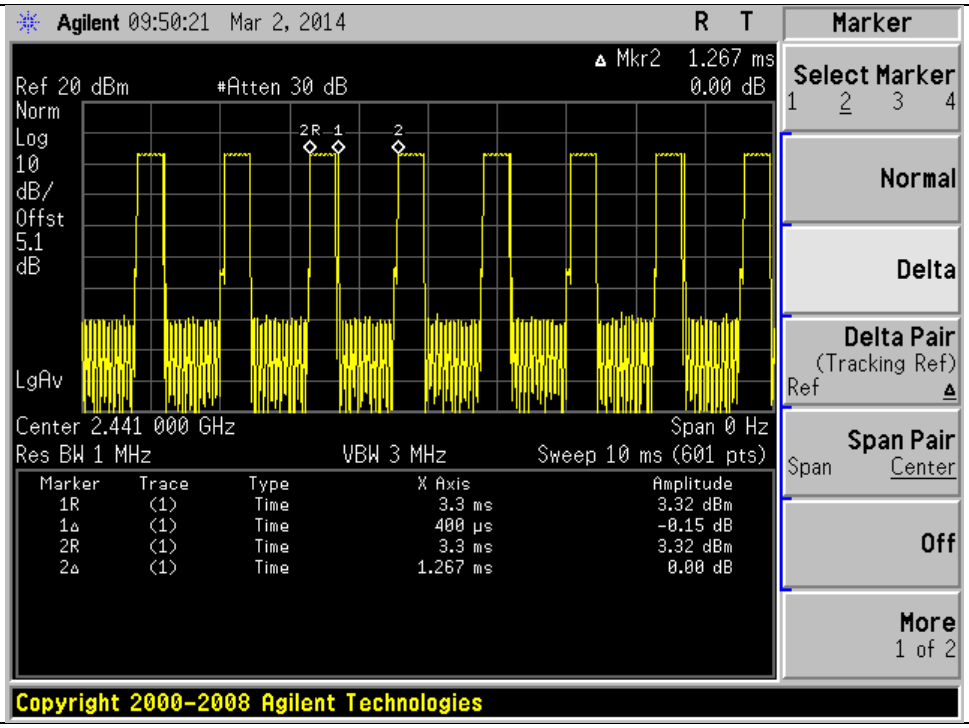
Packet Type: 3-DH3
3-DH3 Dwell Time = **1.633 ms**
Total bins in 5 s = 17
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 18 (in 5s) x 6.32 = 107.4
Total time occupancy (in 31.6s) = 107 x 1.63ms = **175ms** or .175s

Packet Type: 3-DH5
3-DH5 Dwell Time = **2.900 ms**
Total bins in 5 s = 12
Max. allowed time = 0.4 s x No. of available channels = 0.4s x 79 = 31.6s
Total bins in 31.6s = 13 (in 5s) x 6.32 = 75.8 bins
Total time occupancy (in 31.6s) = 76 x 2.90ms = **220.4ms** or .220s

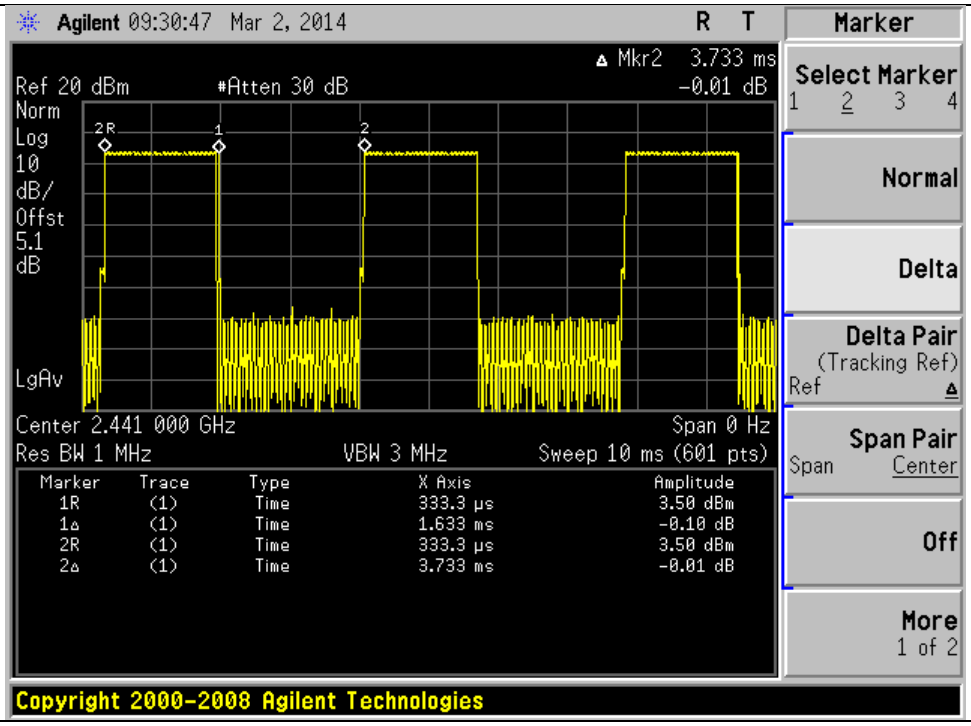
Test Data

Frequency (MHz)	Packet Type	Dwell Time (ms)	Time Occupancy (ms)	Limits (ms)	Results
2441	DH1	0.400	131.6	400	Pass
2441	DH3	1.633	185.8	400	Pass
2441	DH5	2.900	237.8	400	Pass
2441	2-DH1	0.400	131.6	400	Pass
2441	2-DH3	1.633	185.8	400	Pass
2441	2-DH5	2.900	255.2	400	Pass
2441	3-DH1	0.400	136.5	400	Pass
2441	3-DH3	1.633	175.0	400	Pass
2441	3-DH5	2.900	220.4	400	Pass

Graphical Test Results

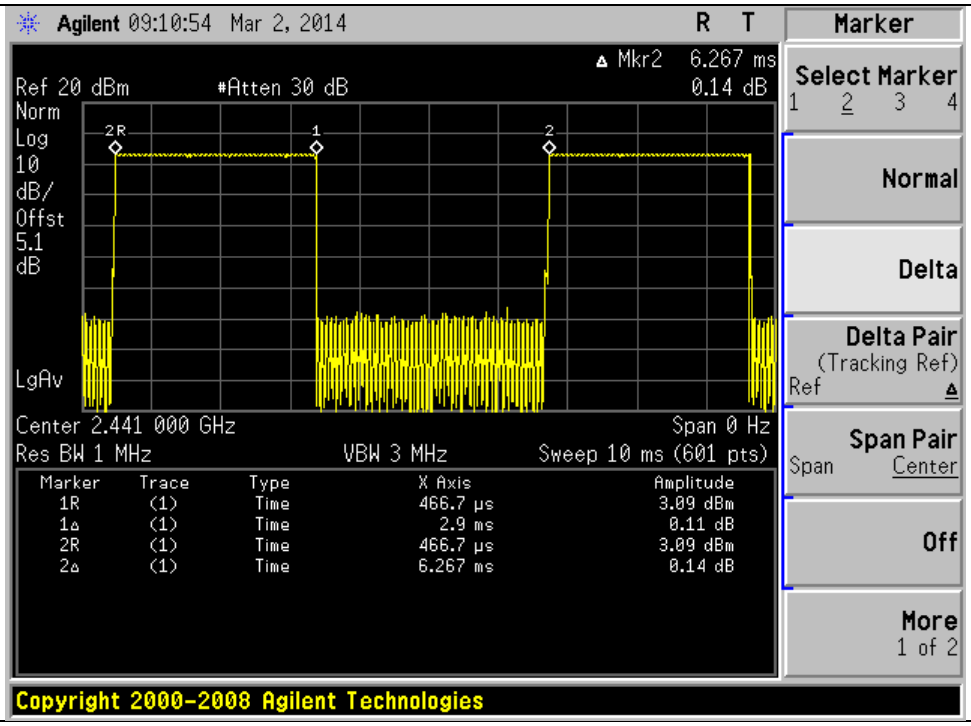


Title: **2441MHz Dwell Time with DH1 packet**

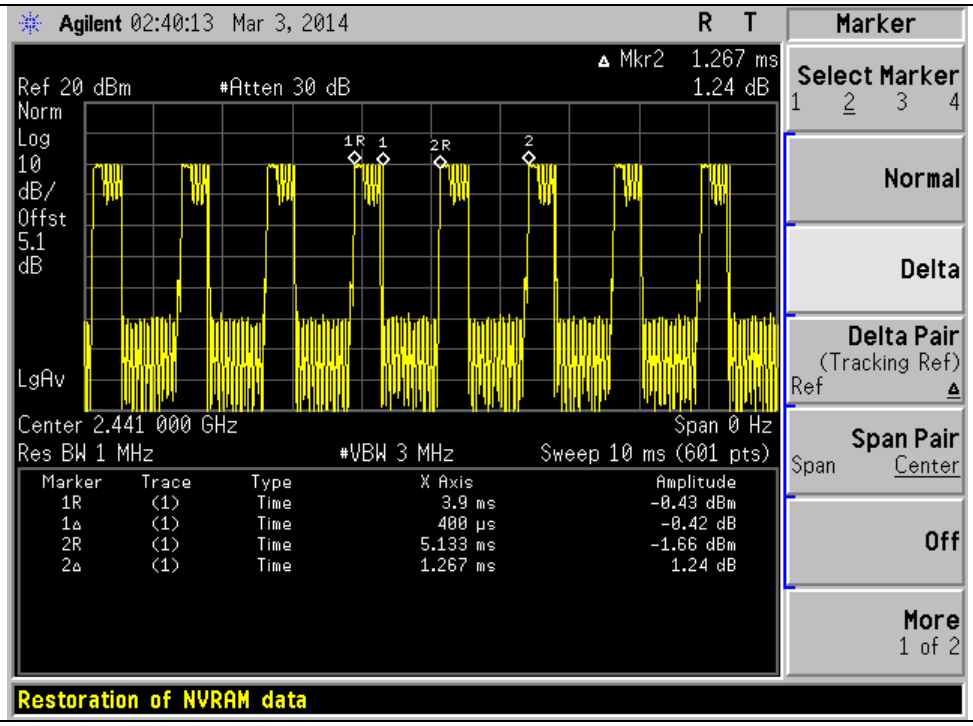


Title: **2441MHz Dwell Time with DH3 packet**

Graphical Test Results

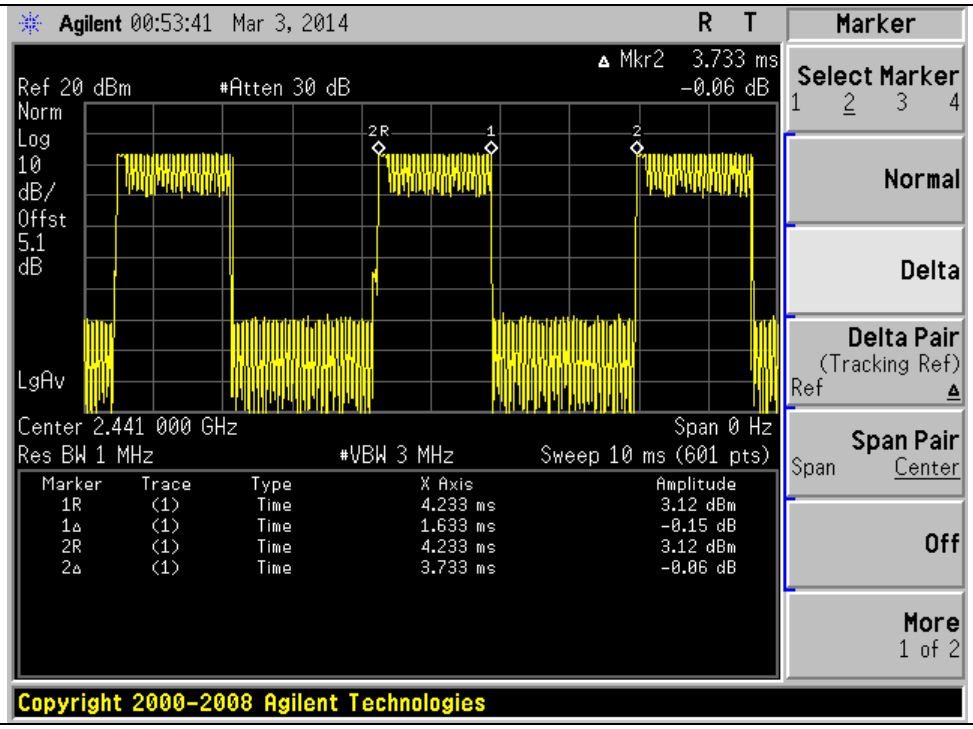


Title: **2441MHz Dwell Time with DH5 packet**

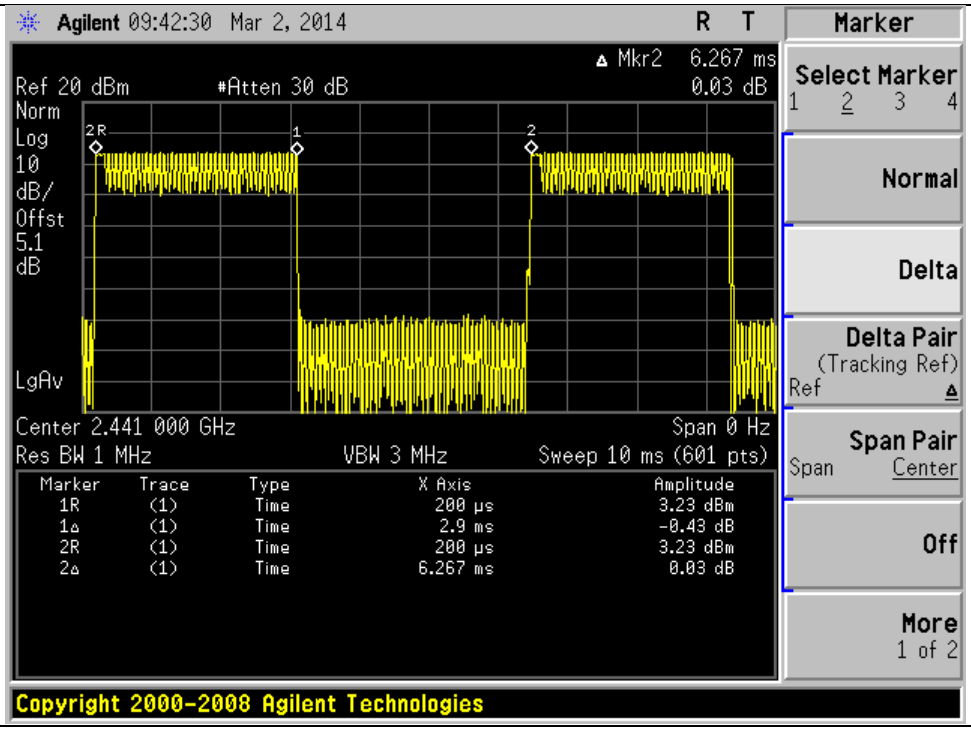


Title: **2441MHz Dwell Time with 2-DH1 packet**

Graphical Test Results

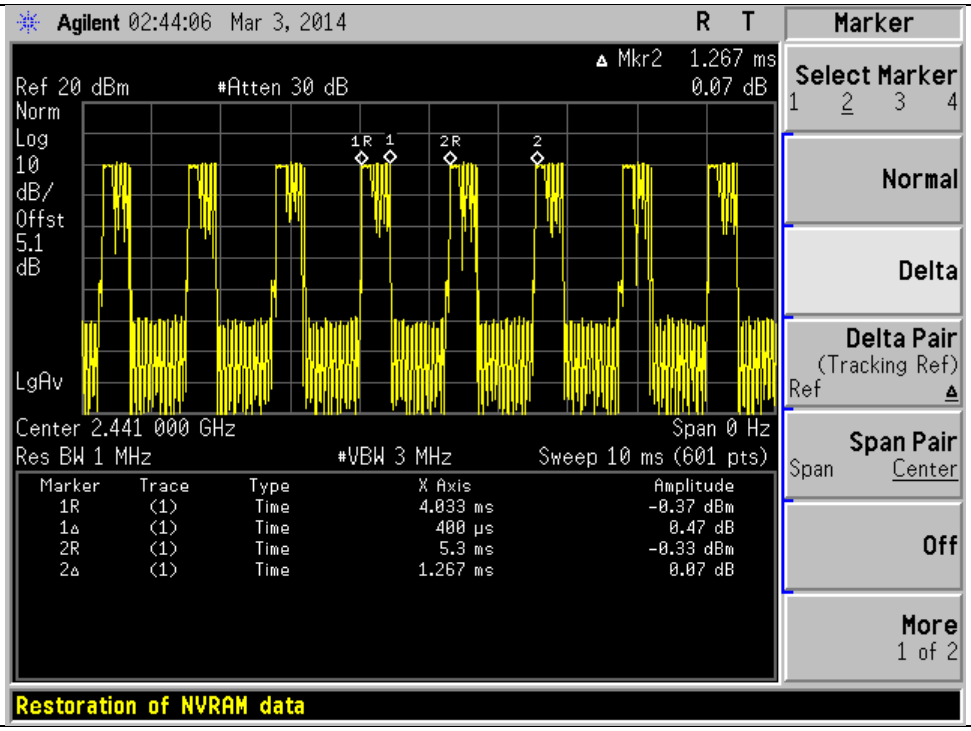


Title: **2441MHz Dwell Time with 2-DH3 packet**

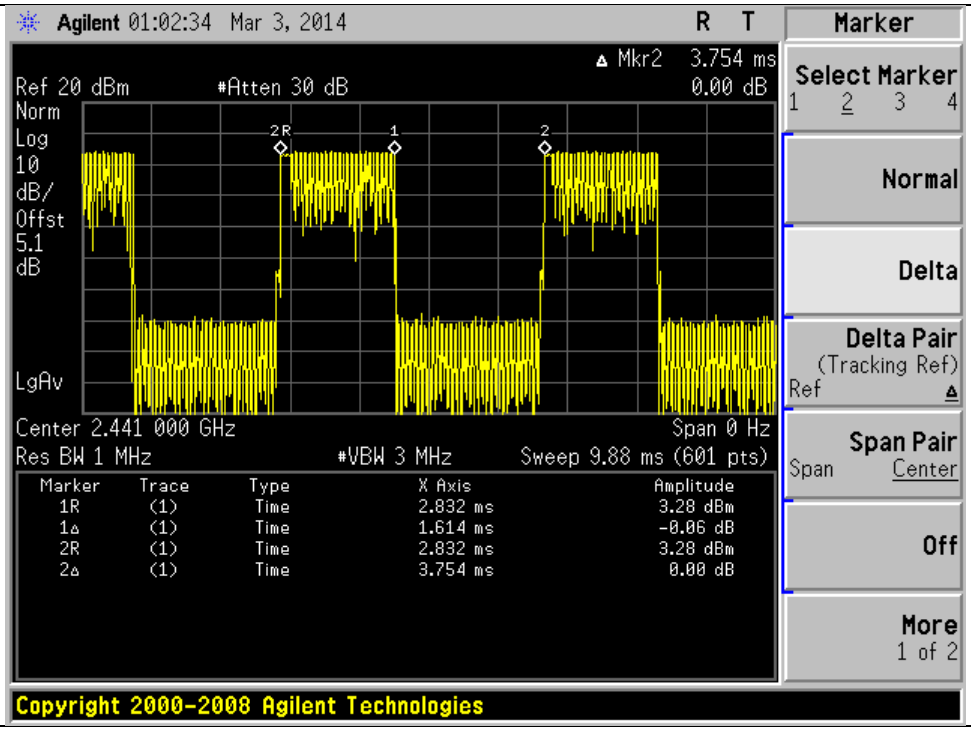


Title: **2441MHz Dwell Time with 2-DH5 packet**

Graphical Test Results

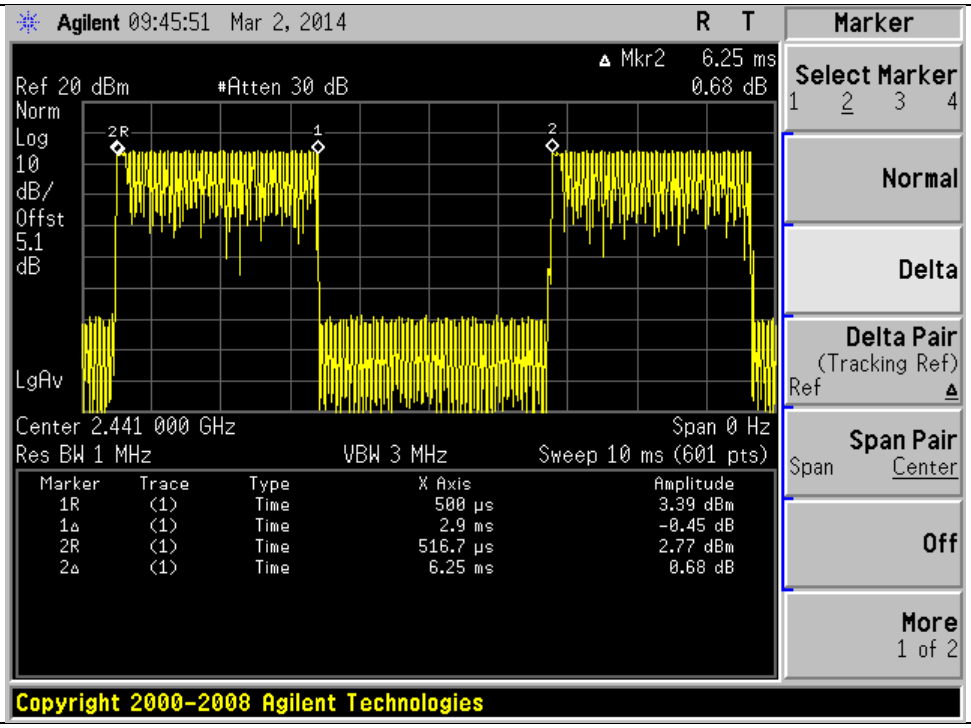


Title: **2441MHz Dwell Time with 3-DH1 packet**

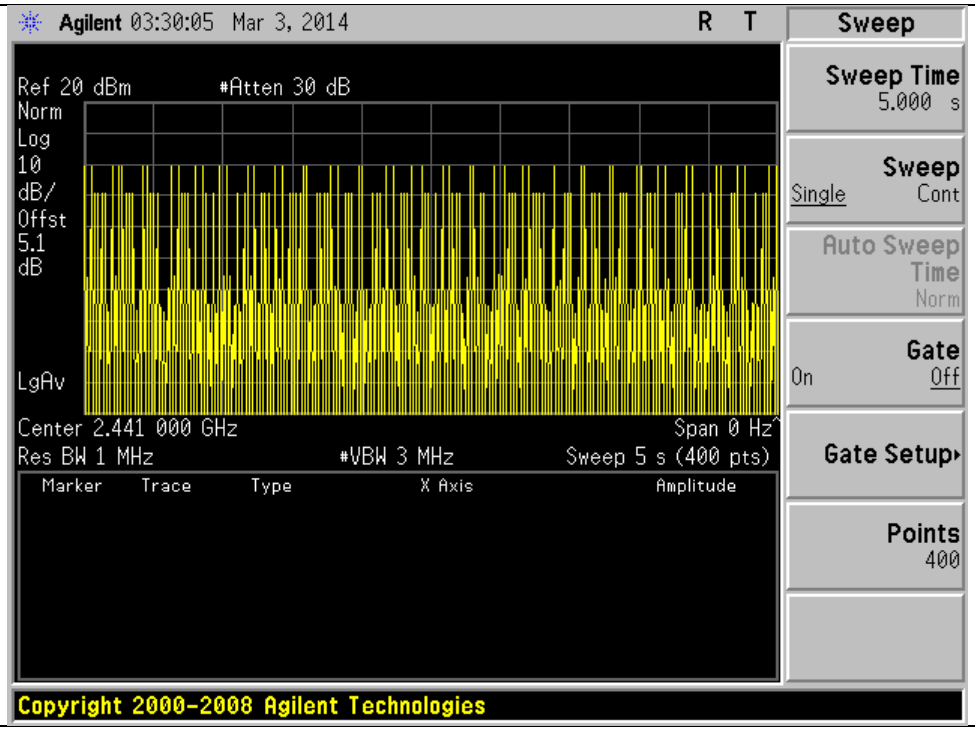


Title: **2441MHz Dwell Time with 3-DH3 packet**

Graphical Test Results

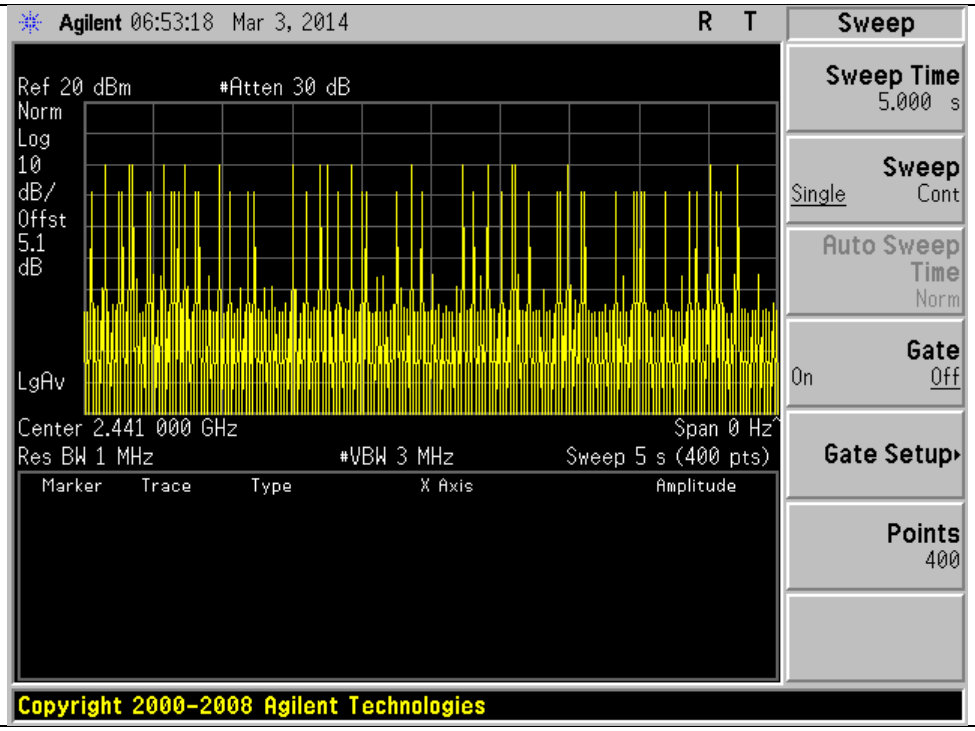


Title: **2441MHz Dwell Time with 3-DH5 packet**

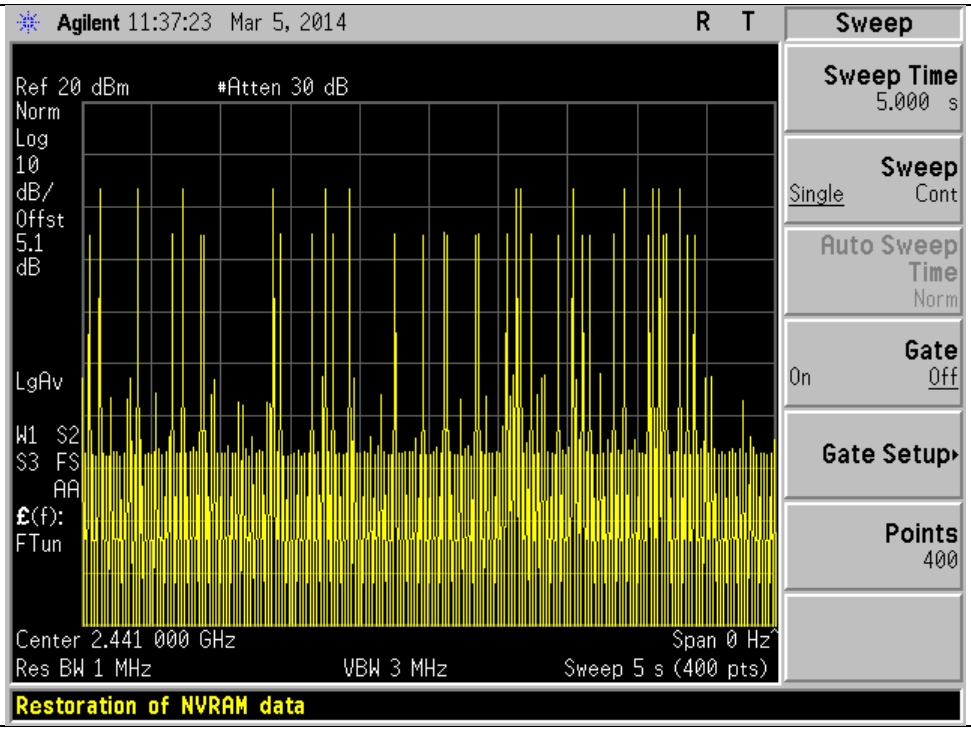


Title: **Time Occupancy in 5s with DH1 packet; Total bins in 5s = 52**

Graphical Test Results

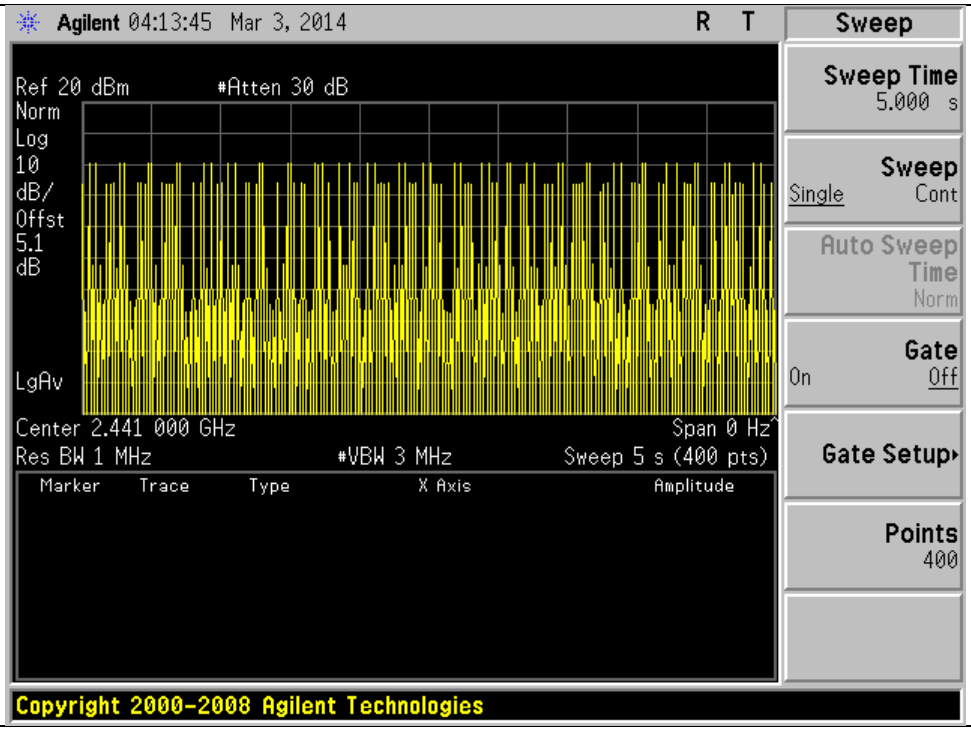


Title: **Time Occupancy in 5s with DH3 packet; Total bins in 5s = 18**

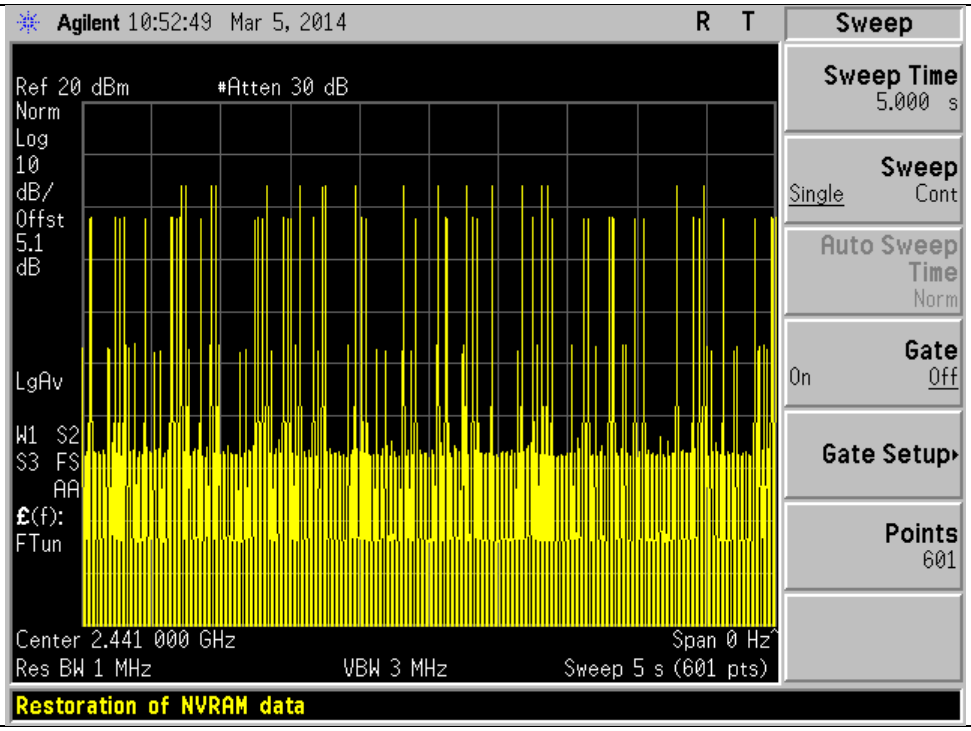


Title: **Time Occupancy in 5s with DH5 packet; Total bins in 5s = 13**

Graphical Test Results

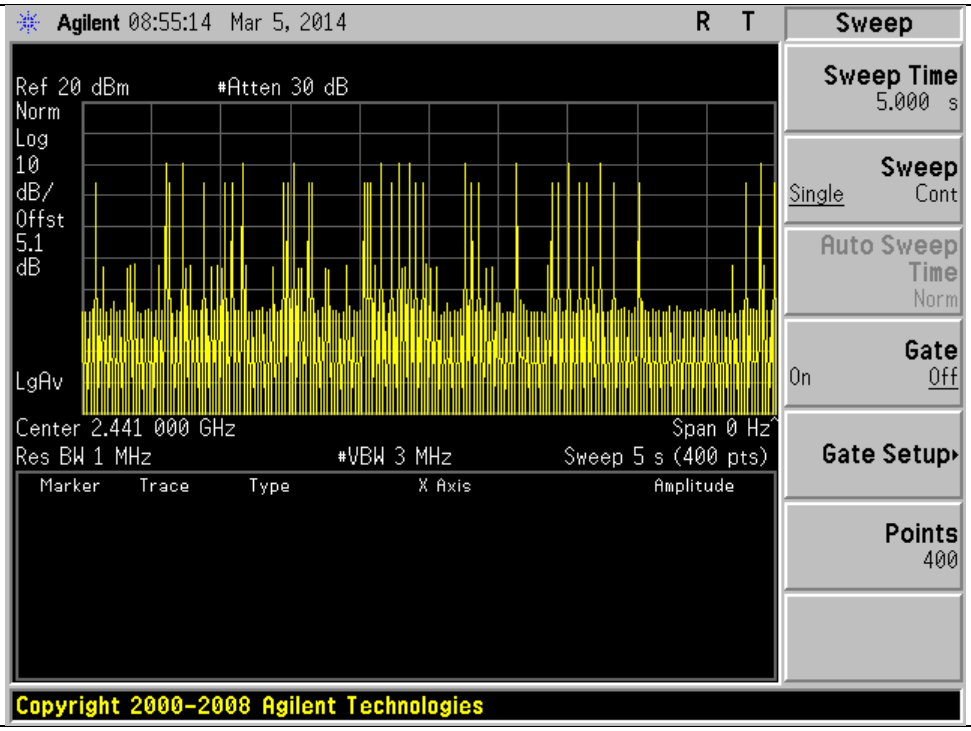


Title: **Time Occupancy in 5s with 2-DH1 packet; Total bins in 5s = 52**

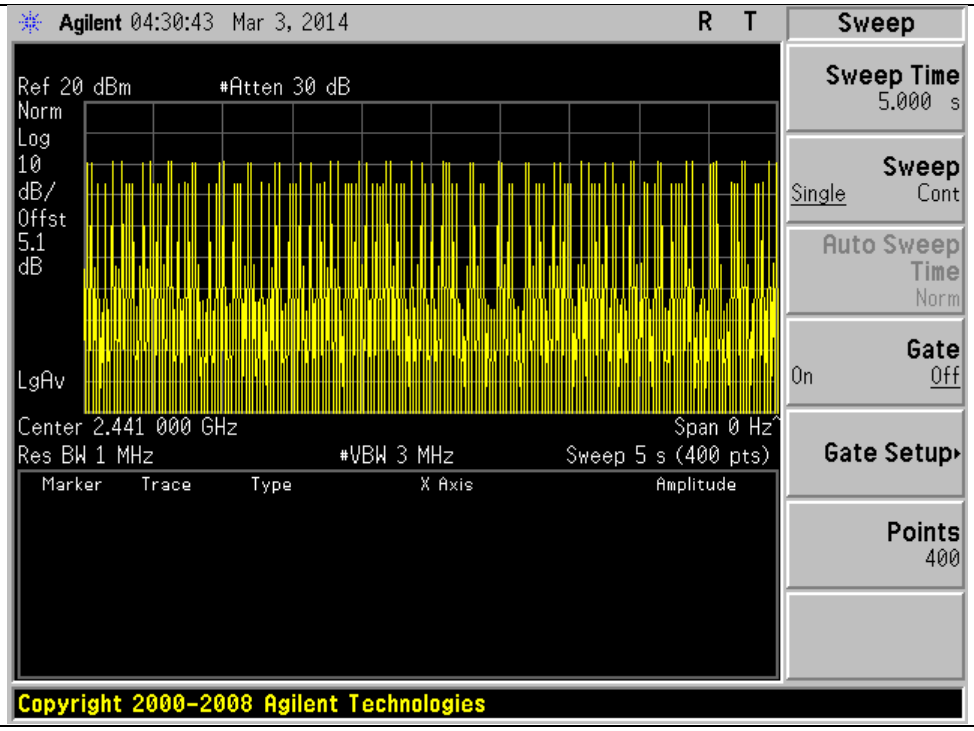


Title: **Time Occupancy in 5s with 2-DH3 packet; Total bins in 5s = 18**

Graphical Test Results

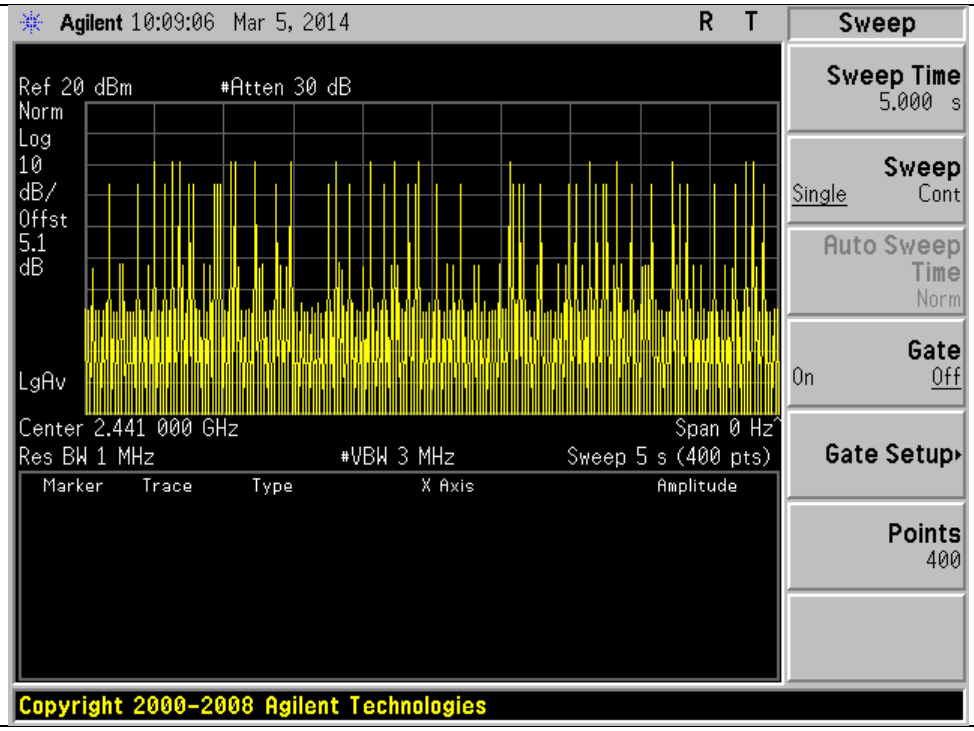


Title: **Time Occupancy in 5s with 2-DH5 packet; Total bins in 5s = 13**

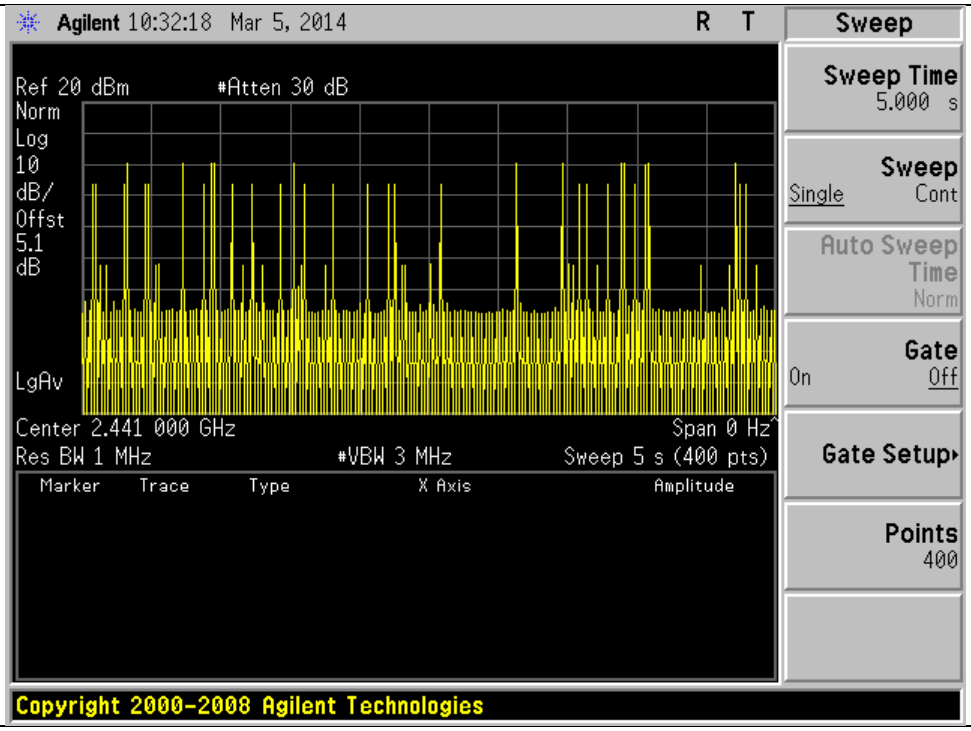


Title: **Time Occupancy in 5s with 3-DH1 packet; Total bins in 5s = 54**

Graphical Test Results



Title: **Time Occupancy in 5s with 3-DH3 packet; Total bins in 5s = 17**



Title: **Time Occupancy in 5s with 3-DH5 packet; Total bins in 5s = 12**

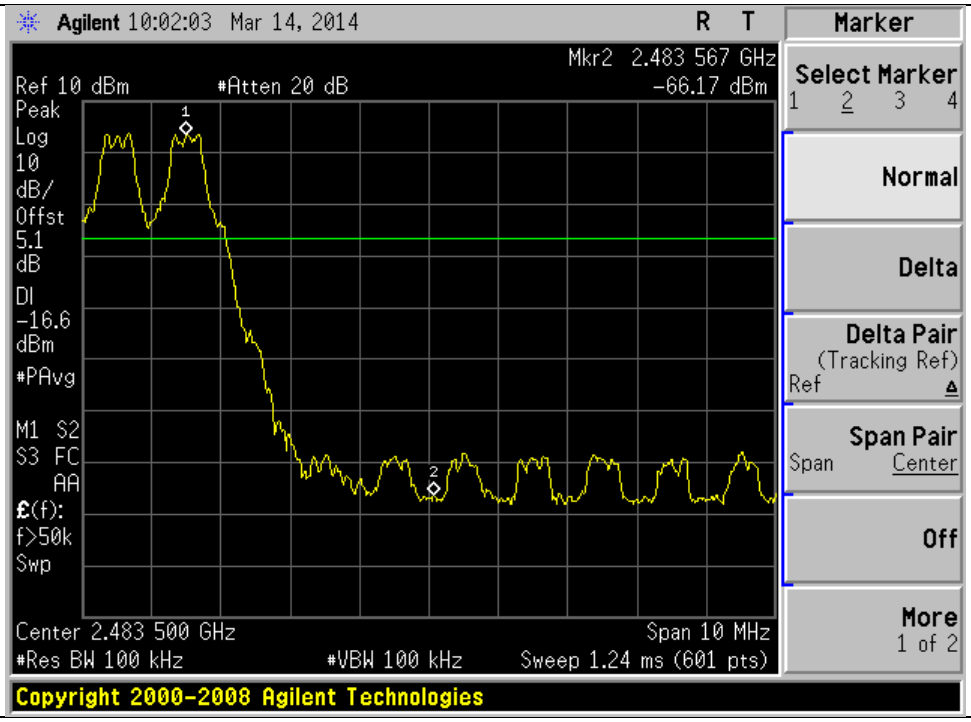
A.6 Conducted Band Edge

15.247 (d) & RSS-210 A8.5:

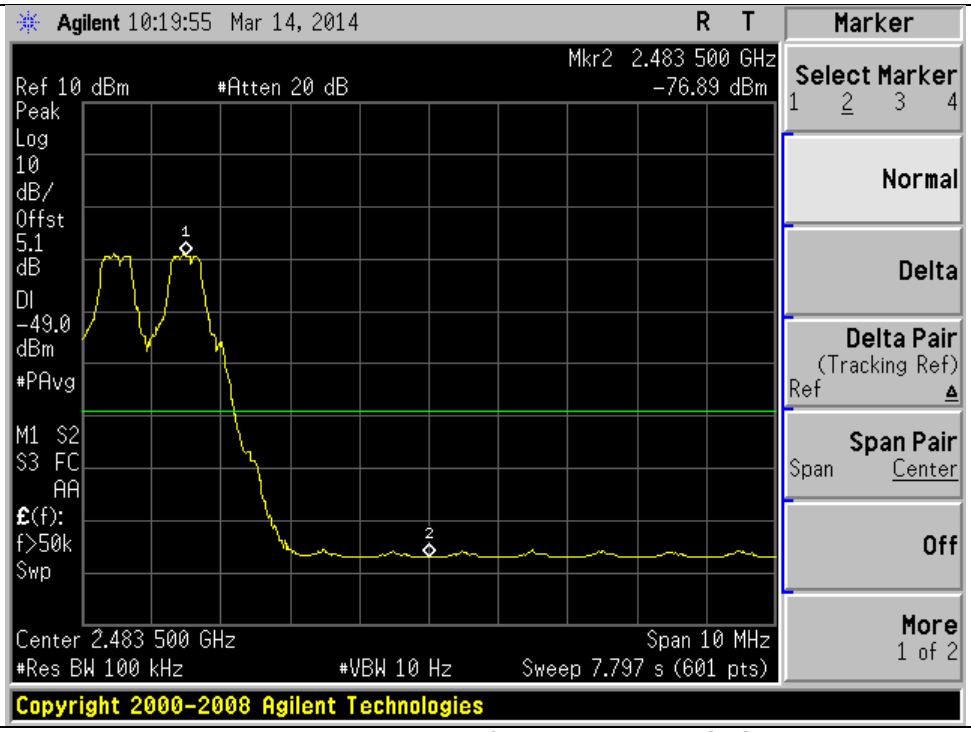
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in FCC §15.209(a) & RSS-Gen is not required.

Measurement procedure as per KDB Publication DA 00-705

Graphical Test Results

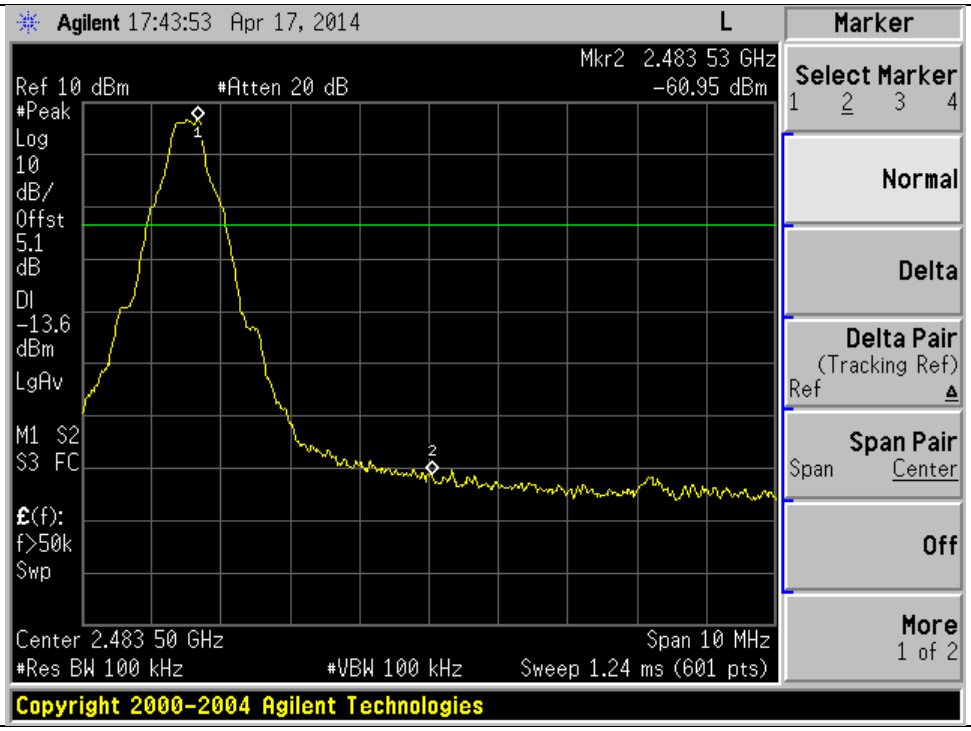


Title: **Upper Band Edge Peak -Hopping function on with 8-DPSK modulation (DH5)**

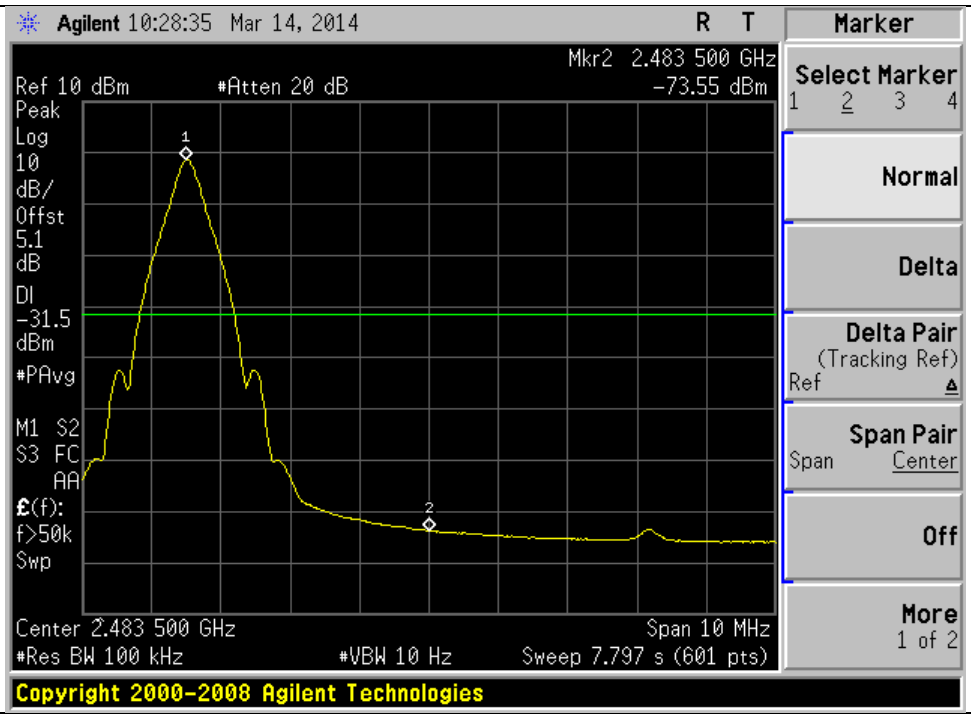


Title: **Upper Band Edge Average -Hopping function on with GFSK modulation (DH5)**

Graphical Test Results

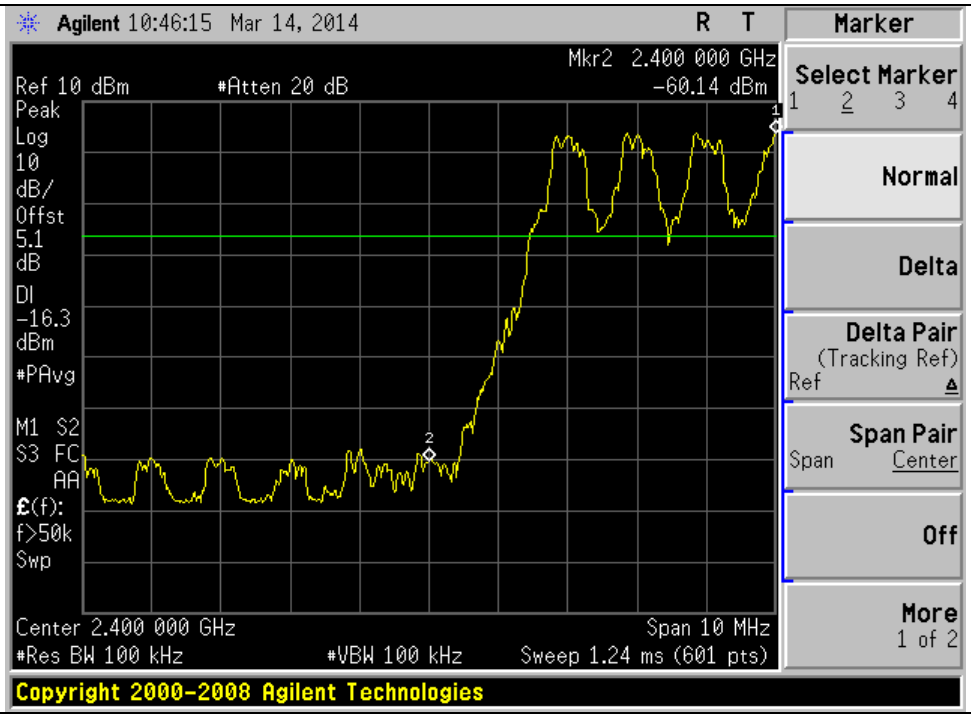


Title: **Upper Band Edge Peak -Hopping function off with GFSK modulation (DH5)**

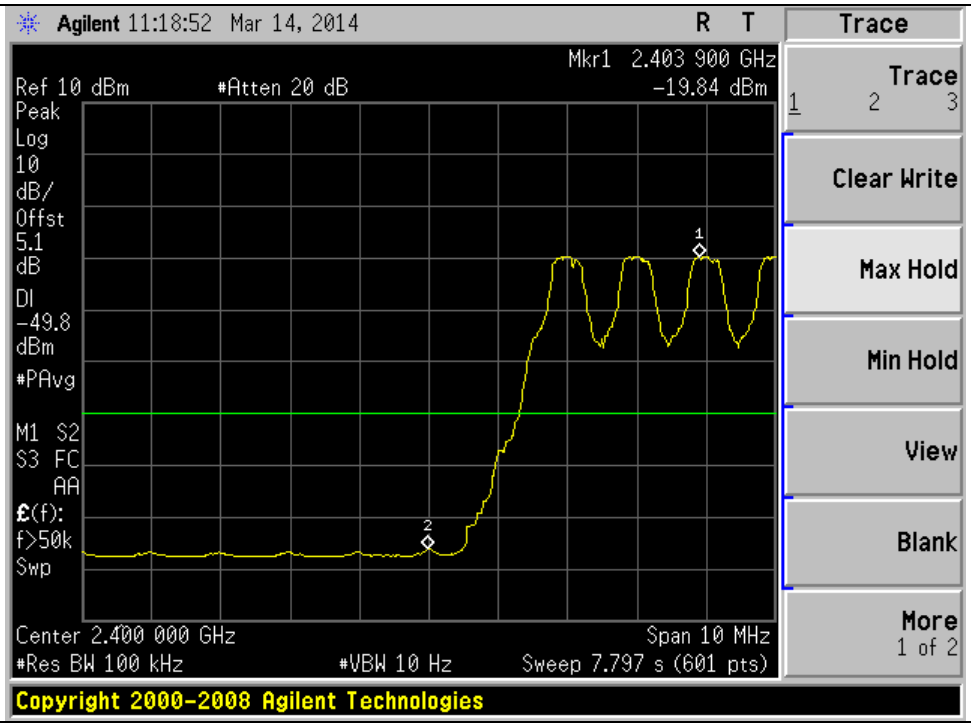


Title: **Upper Band Edge Average -Hopping function off with GFSK modulation (DH5)**

Graphical Test Results

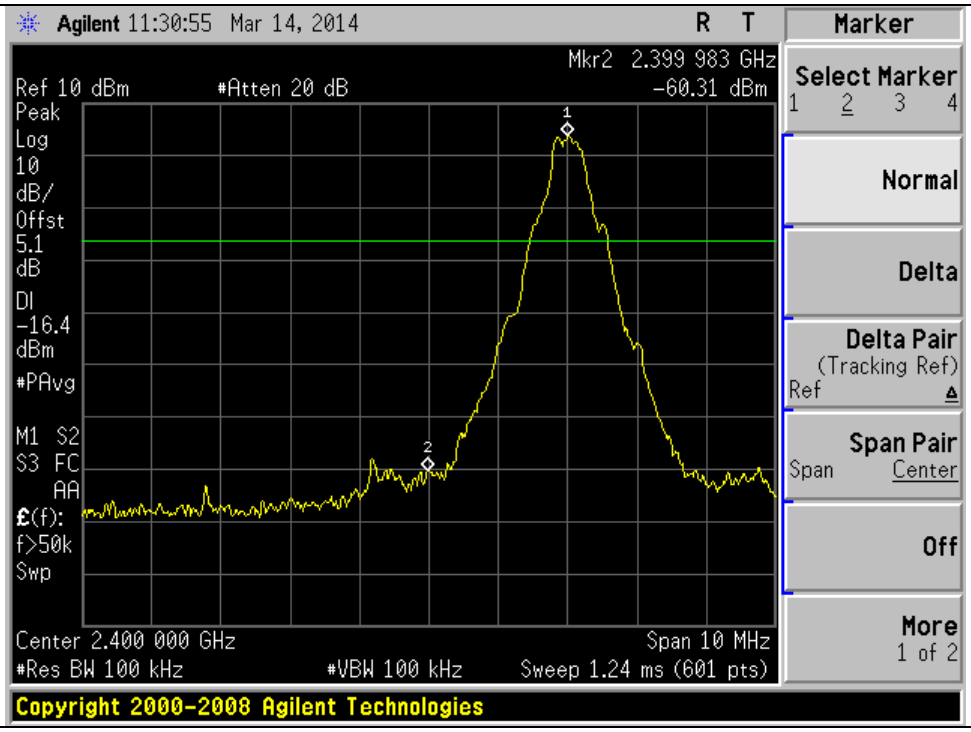


Title: **Lower Band Edge Peak -Hopping function on with GFSK modulation (DH5)**

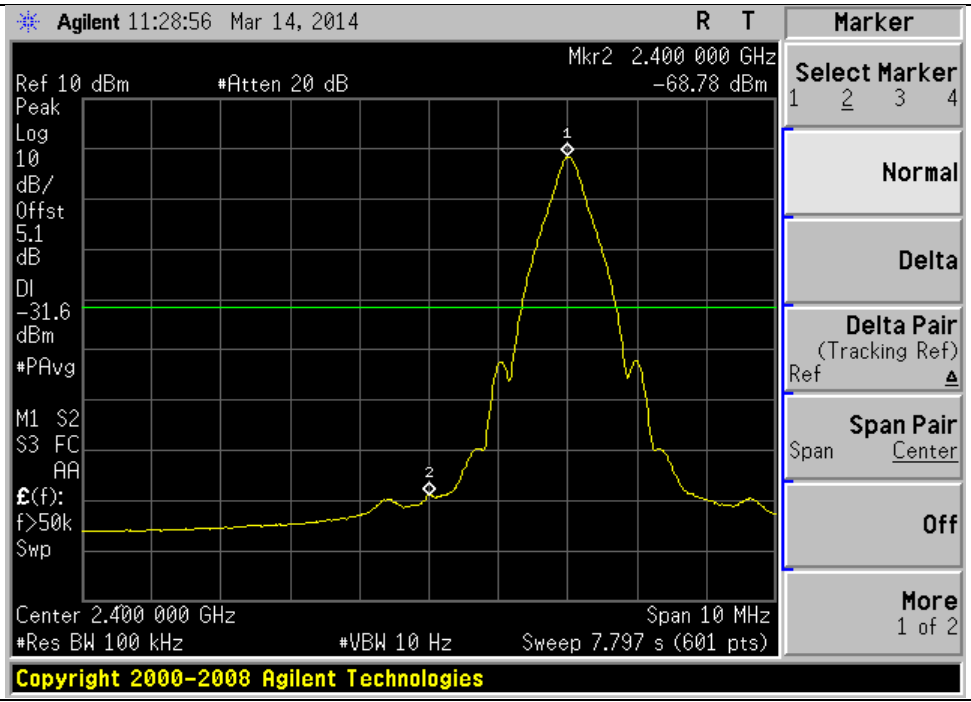


Title: **Lower Band Edge Average -Hopping function on with GFSK modulation (DH5)**

Graphical Test Results

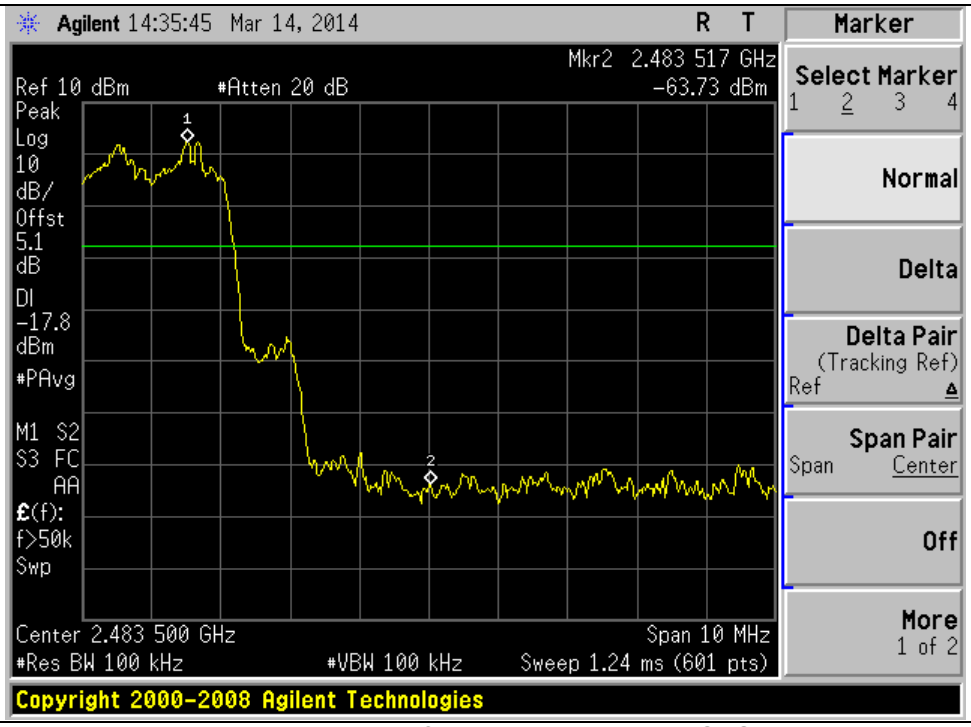


Title: **Lower Band Edge Peak -Hopping function off with GFSK modulation (DH5)**

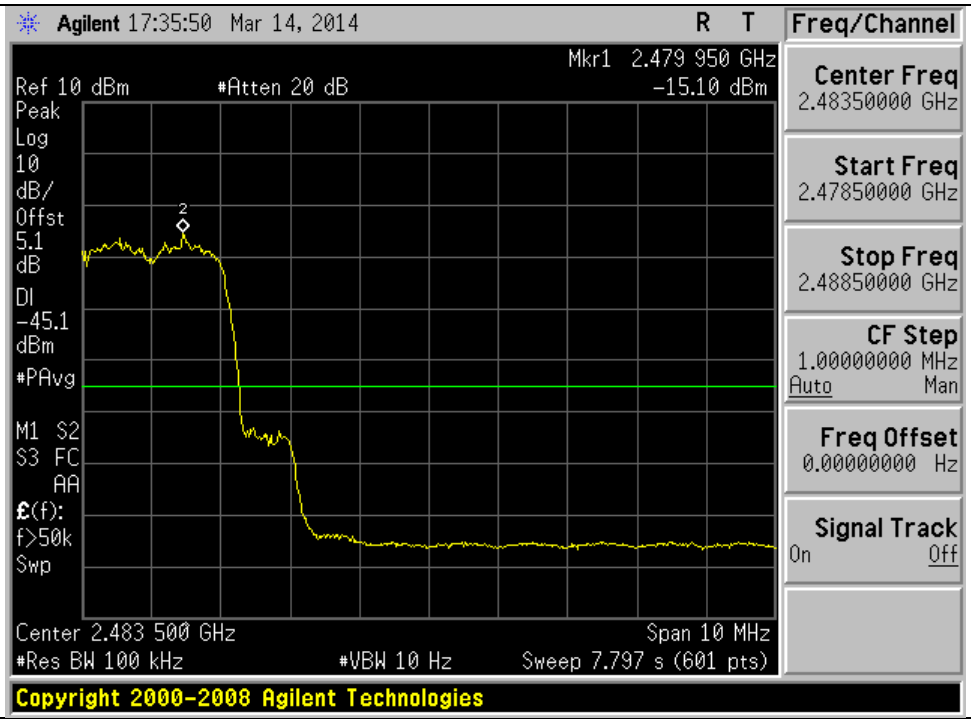


Title: **Lower Band Edge Average -Hopping function off with GFSK modulation (DH5)**

Graphical Test Results

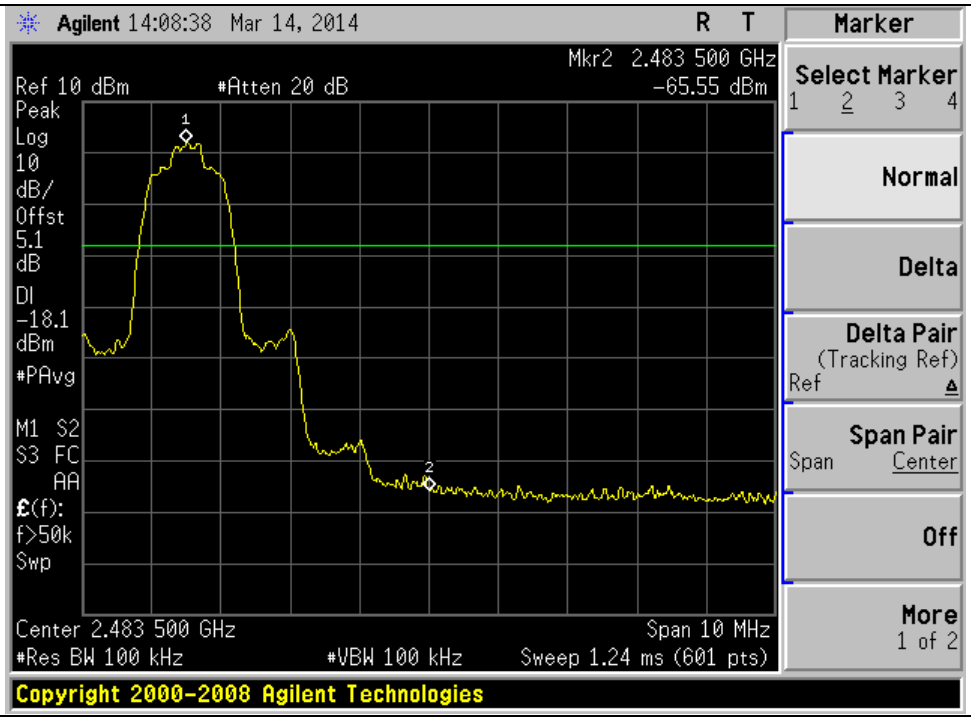


Title: **Upper Band Edge Peak -Hopping function on with π/4DQPSK modulation (2-DH3)**

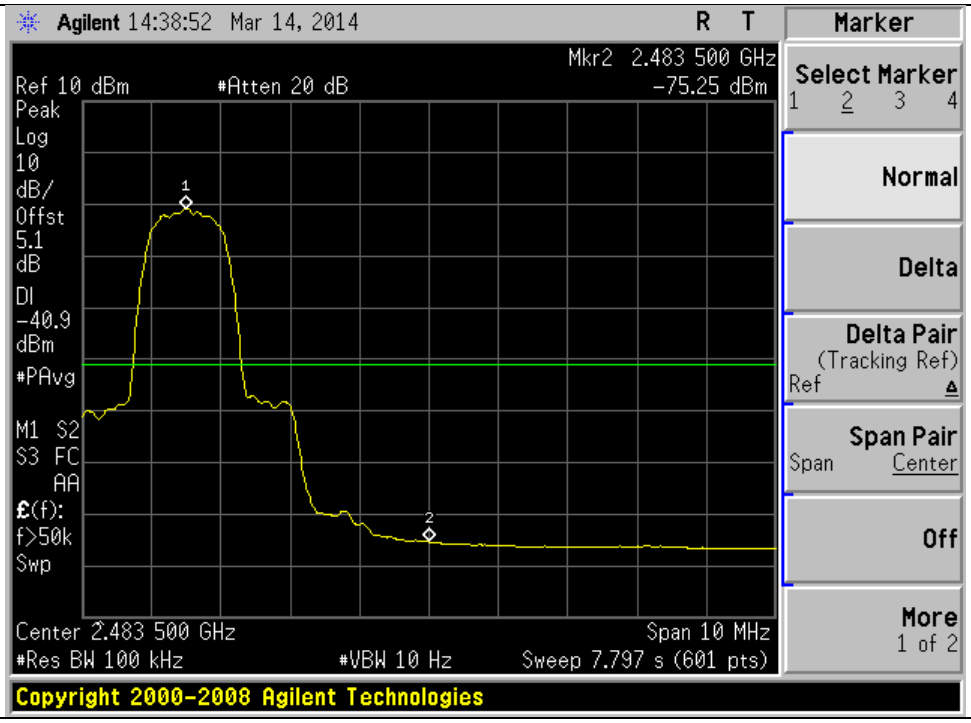


Title: **Upper Band Edge Average -Hopping function on with π/4DQPSK modulation (2-DH3)**

Graphical Test Results

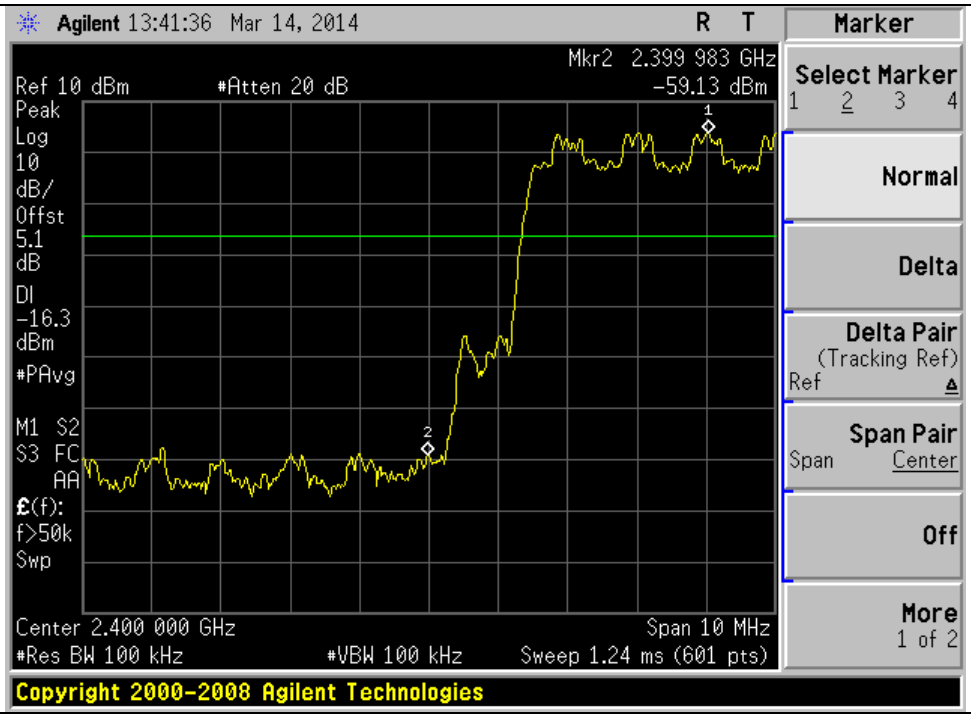


Title: **Upper Band Edge Peak -Hopping function off with π/4DQPSK modulation (2-DH3)**

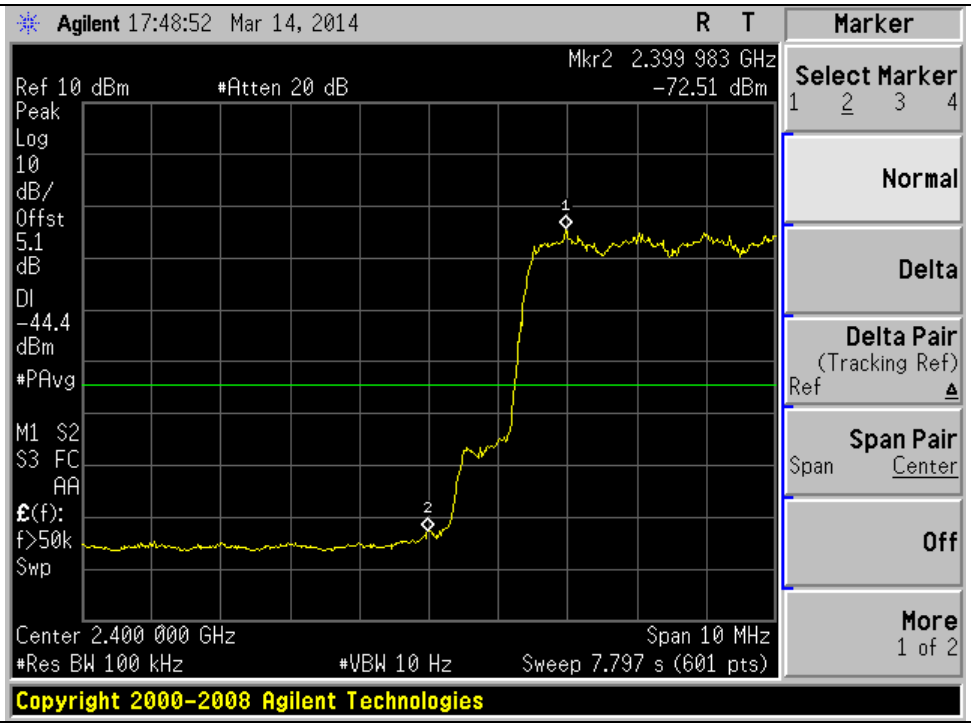


Title: **UpperBand Edge Average -Hopping function off with π/4DQPSK modulation (2-DH3)**

Graphical Test Results

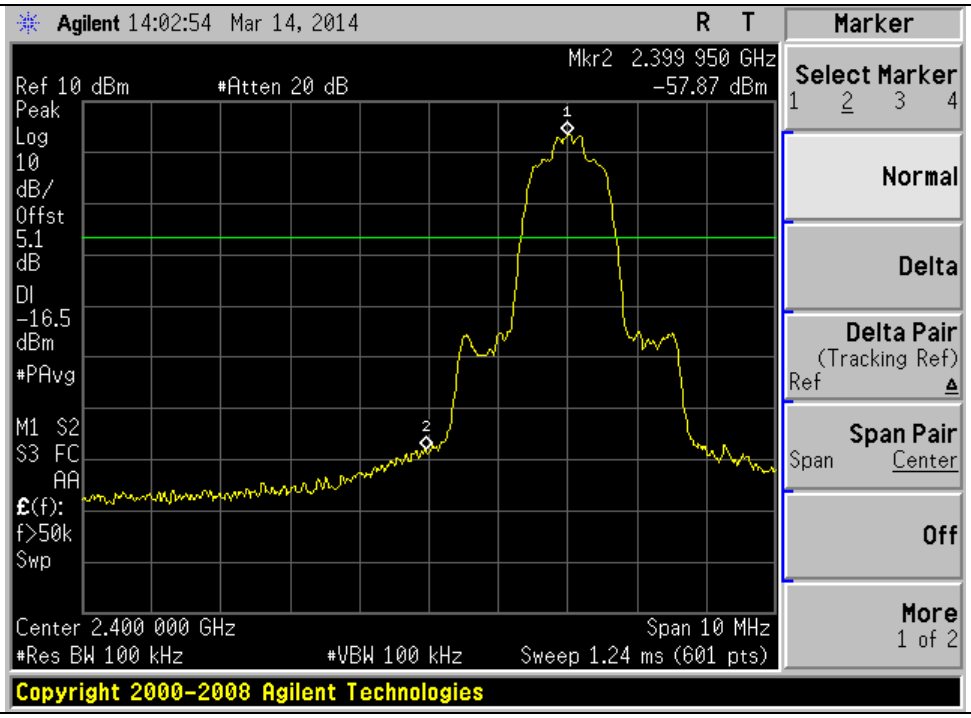


Title: **Lower Band Edge Peak –Hopping function on with π/4DQPSK modulation (2-DH3)**

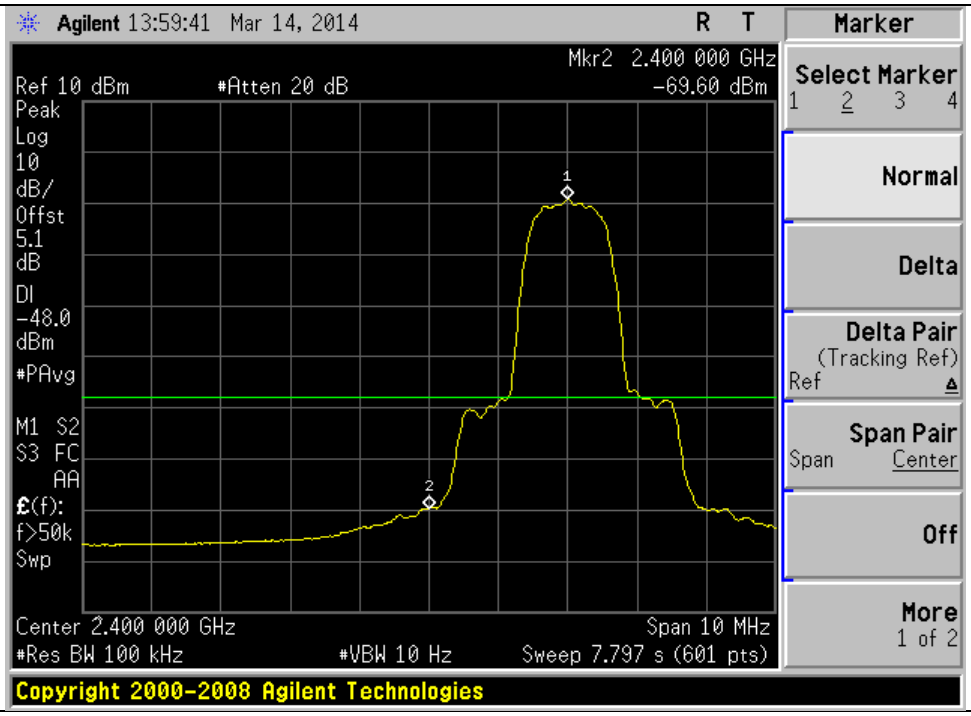


Title: **Lower Band Edge Average -Hopping function on π/4DQPSK modulation (2-DH3)**

Graphical Test Results

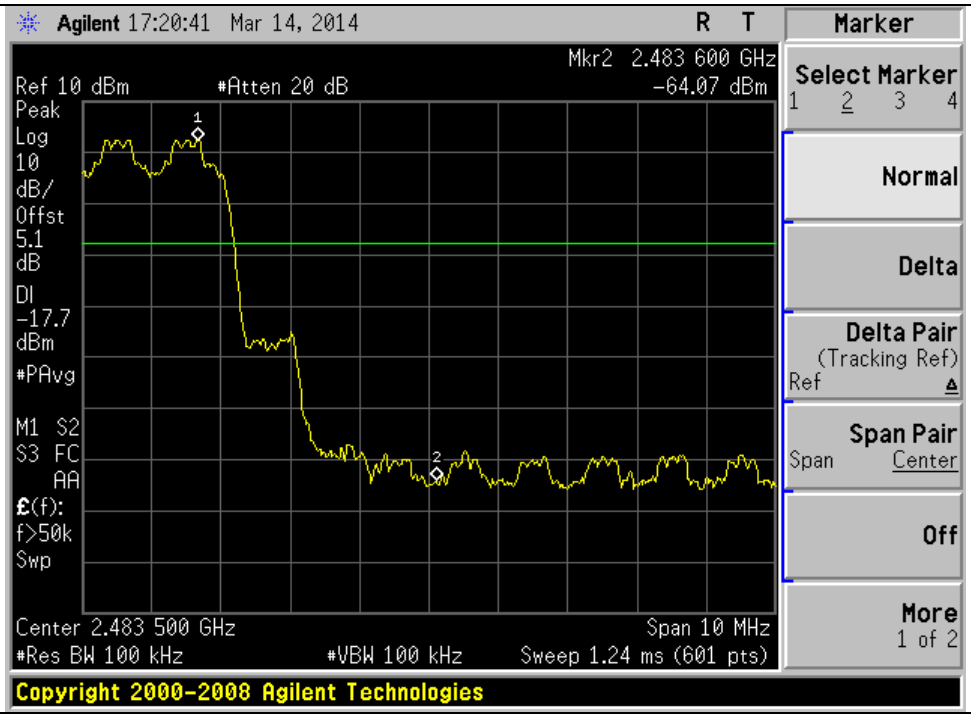


Title: **Lower Band Edge Peak -Hopping function off with π/4DQPSK modulation (2-DH3)**

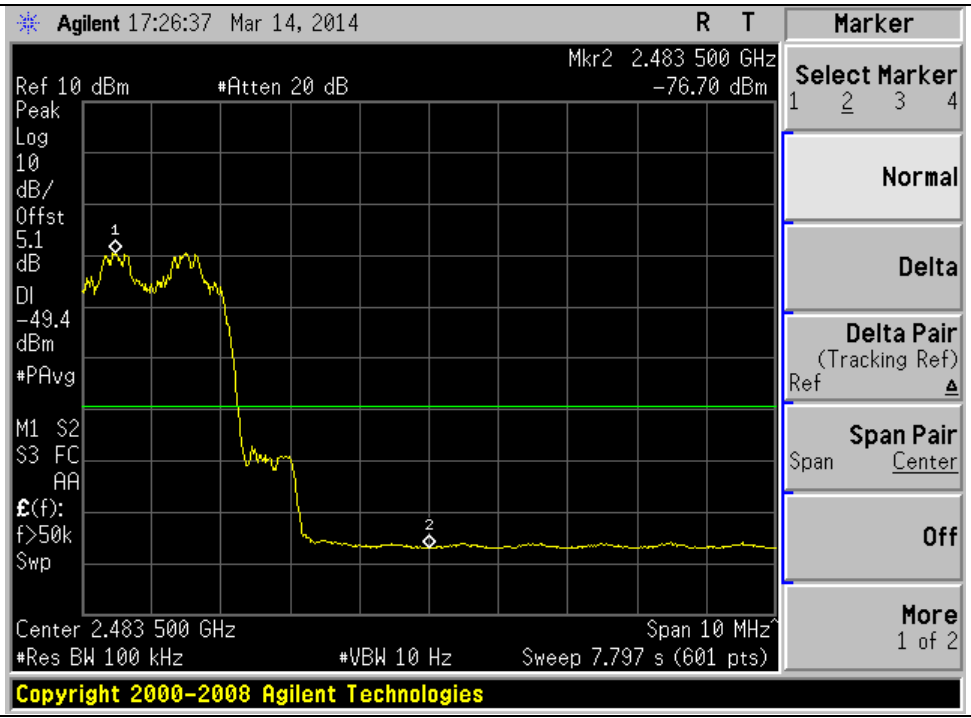


Title: **Lower Band Edge Average -Hopping function off with π/4DQPSK modulation (2-DH3)**

Graphical Test Results

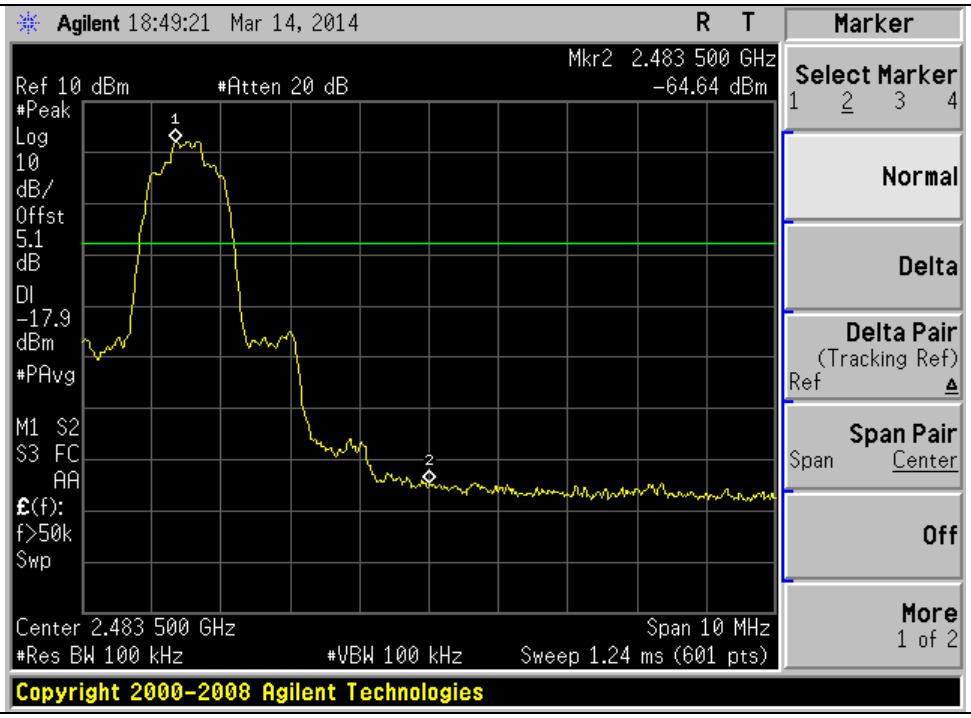


Title: **Upper Band Edge Peak –Hopping function on with 8DPSK modulation (3-DH1)**

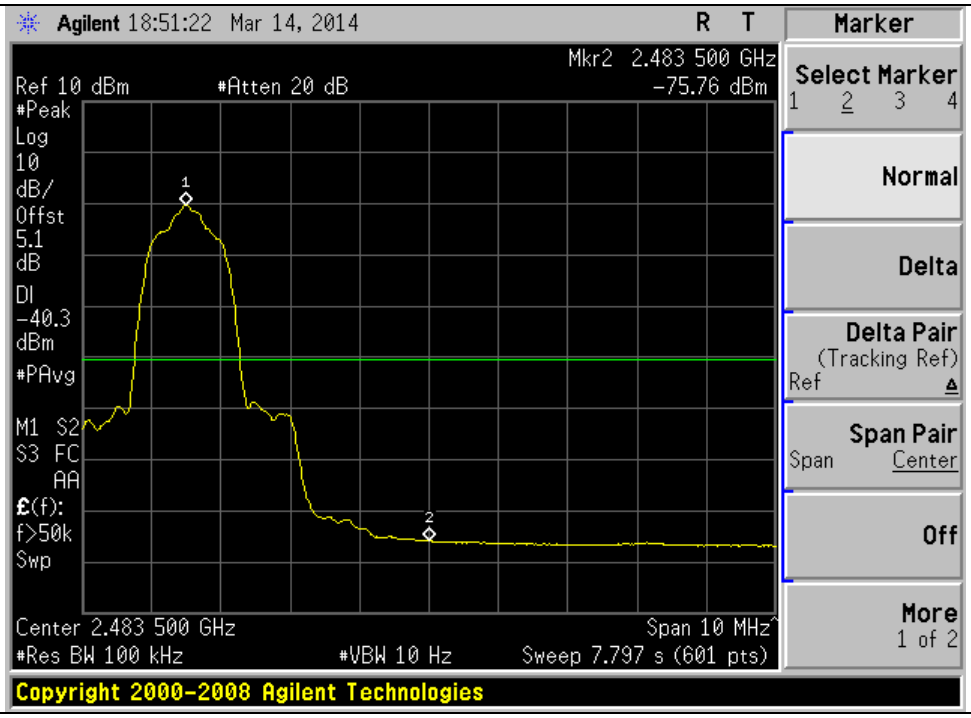


Title: **Upper Band Edge Average –Hopping function on with 8DPSK modulation (3-DH1)**

Graphical Test Results

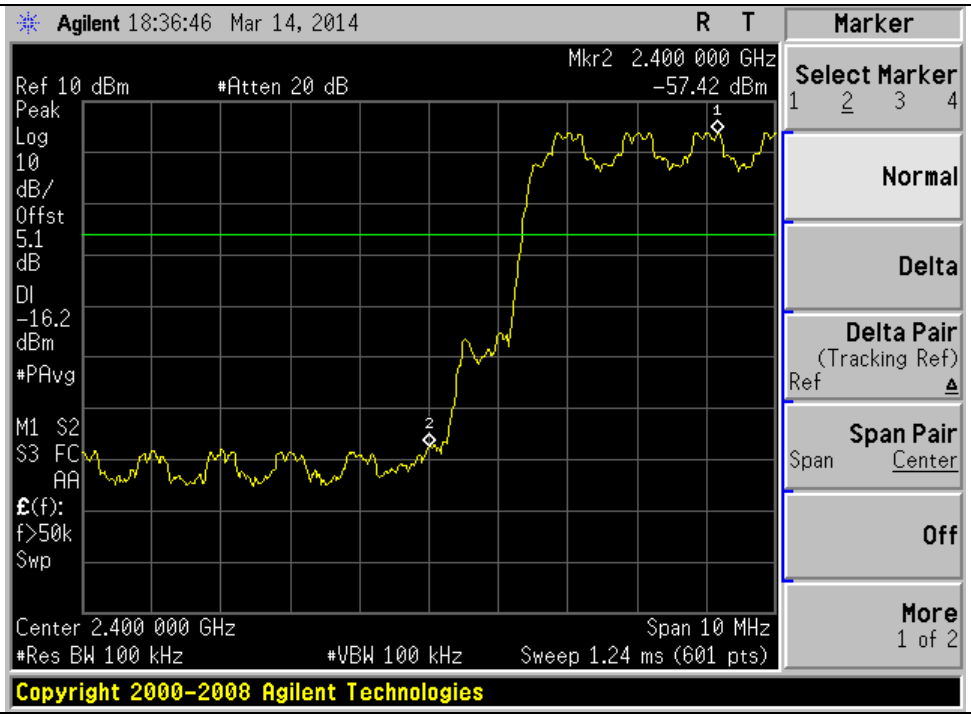


Title: **Upper Band Edge Peak -Hopping function off with 8DPSK modulation (3-DH1)**

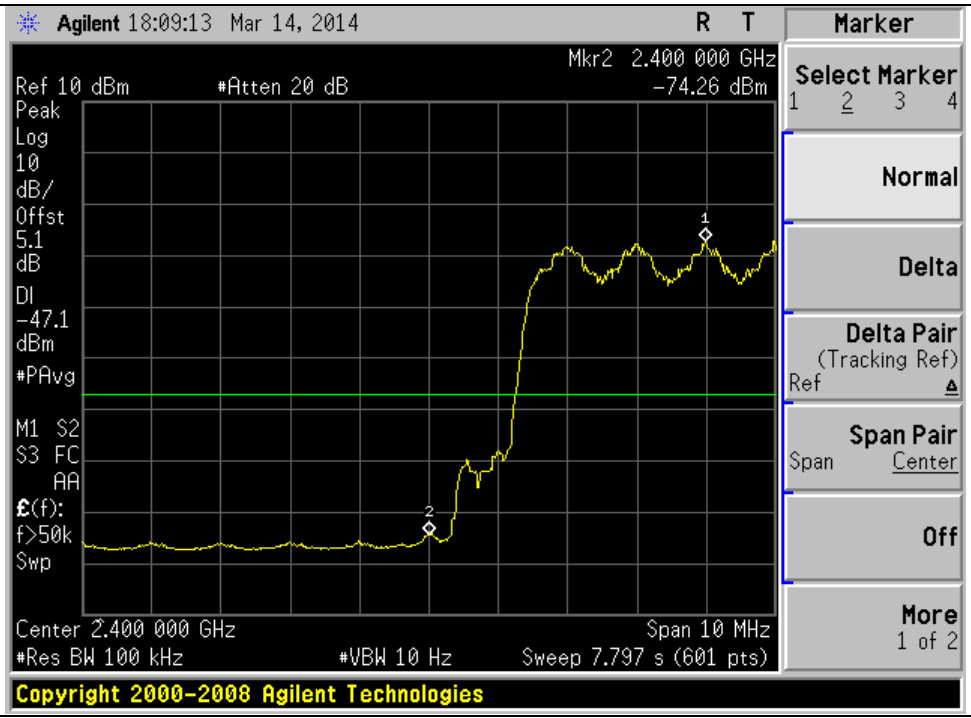


Title: **Upper Band Edge Average Hopping function off with 8DPSK modulation (3-DH1)**

Graphical Test Results

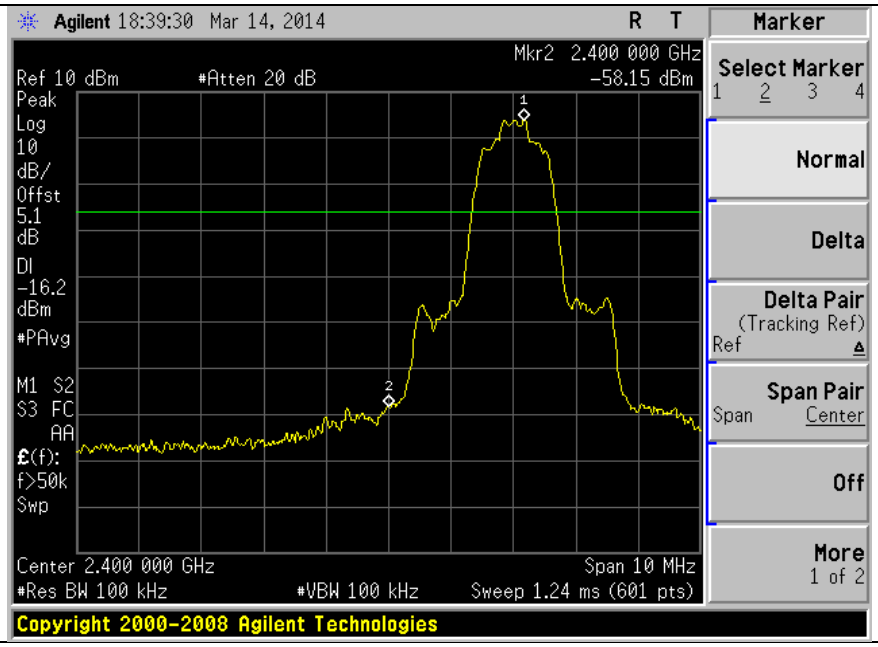


Title: **Lower Band Edge Peak -Hopping function on with 8DPSK modulation (3-DH1)**

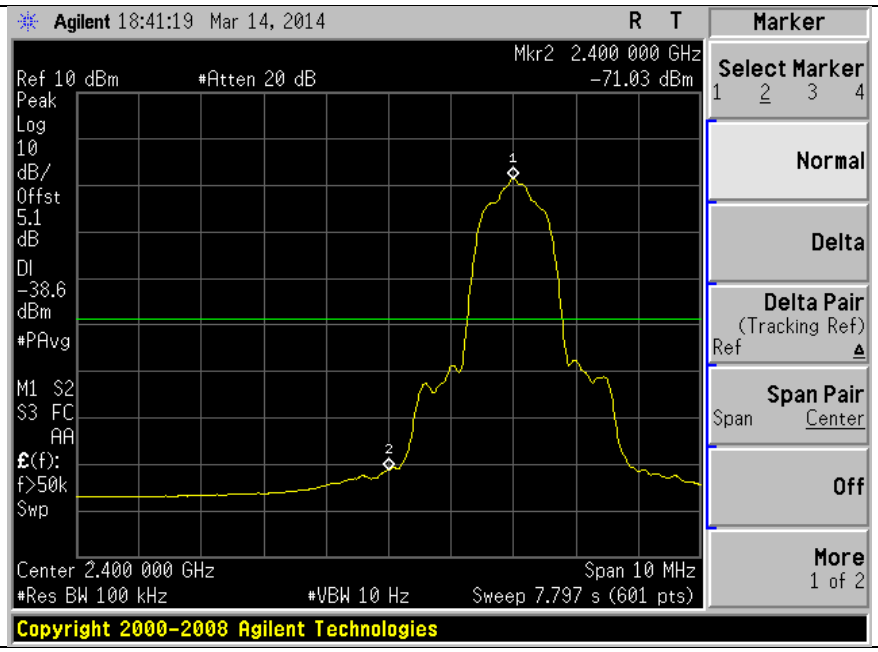


Title: **Lower Band Edge Average -Hopping function on with 8DPSK modulation (3-DH1)**

Graphical Test Results



Title: **Lower Band Edge Peak -Hopping function off with 8DPSK modulation (3-DH1)**



Title: **Lower Band Edge Average -Hopping function off with 8DPSK modulation (3-DH1)**

A.7 Conducted Spurious Emissions

15.247 (d) & RSS-210 A8.5:

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in FCC §15.209(a) & RSS-Gen is not required.

Measurement Procedure
In accordance with KDB Publication DA 00-705

Test Results Table

Test Mode: C
Test Channel: 0 (2402 MHz)

Frequency (GHz)	Raw (dBm)	C.F (dB)	Calculated Lvl (dBm)	Detector	Limit -20dBc (dBm)	Margin (dBm)	Results (Pass/Fail)
3.205	-35.62	4.7	-30.92	Pk	-13.9	-17.02	Pass
7.210	-47.28	7.1	-40.18	Pk	-13.9	-26.28	Pass
9.610	-43.26	7.0	-36.26	Pk	-13.9	-22.36	Pass

Test Mode: C
Test Channel: 39 (2441 MHz)

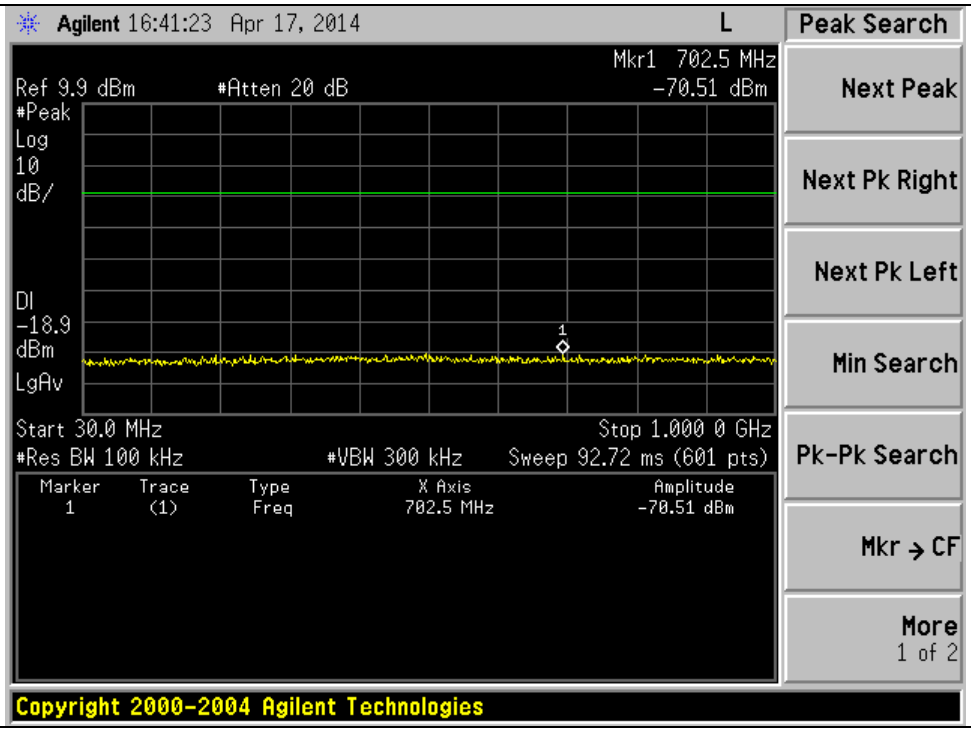
Frequency (GHz)	Raw (dBm)	C.F (dB)	Calculated Lvl (dBm)	Detector	Limit -20dBc (dBm)	Margin (dBm)	Results (Pass/Fail)
3.250	-43.73	4.7	-39.03	Pk	-18.9	-20.13	Pass
7.330	-52.89	8.6	-44.29	Pk	-18.9	-25.39	Pass
9.760	-47.20	6.0	-41.2	Pk	-18.9	-22.30	Pass

Test Mode: C
Test Channel: 78 (2480 MHz)

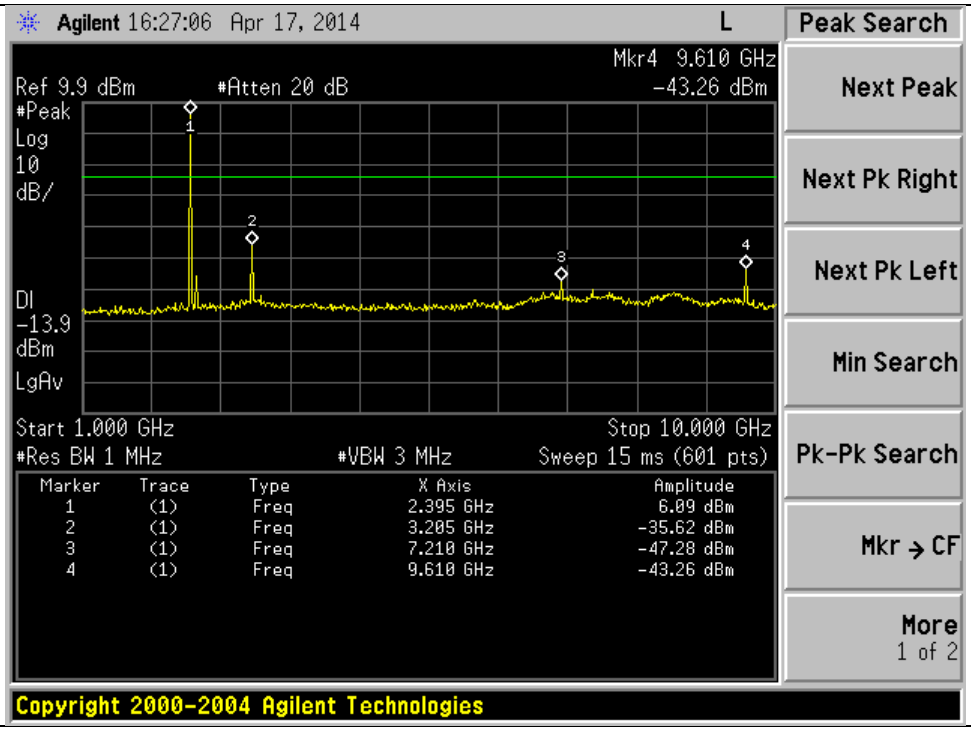
Frequency (GHz)	Raw (dBm)	C.F (dB)	Calculated Lvl (dBm)	Detector	Limit -20dBc (dBm)	Margin (dBm)	Results (Pass/Fail)
0.827	-69.29	3.9	-65.39	Pk	-18.3	-47.09	Pass
3.310	-44.67	4.1	-40.57	Pk	-18.3	-22.27	Pass
7.435	-51.17	7.3	-43.87	Pk	-18.3	-25.57	Pass
9.925	-48.62	6.5	-42.12	Pk	-18.3	-23.82	Pass

Note: Correction factors = splitter loss + cables loss

Graphical Test Results

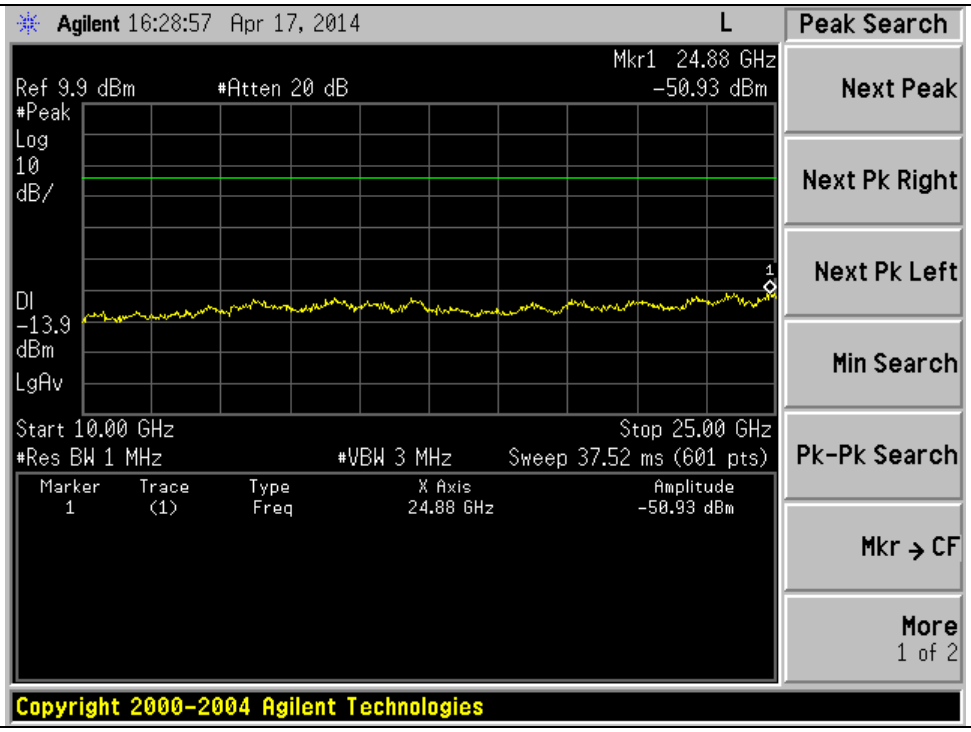


Title: **Ch0 = 2402 MHz Conducted EMI (30 MHz – 1.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

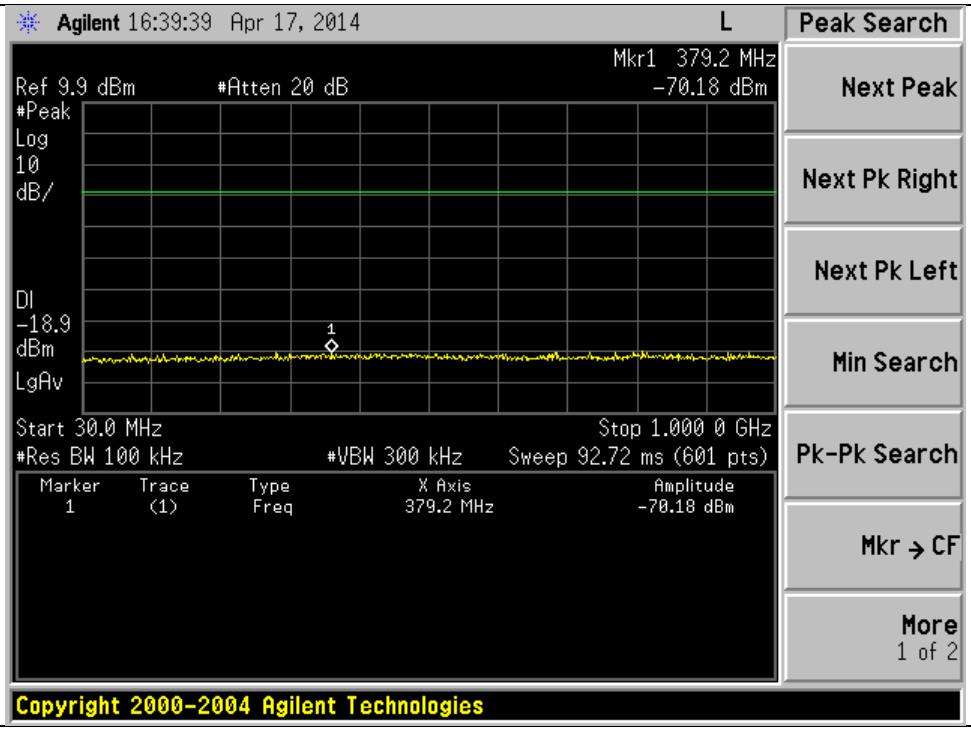


Title: **Ch0 = 2402 MHz Conducted EMI (1.0 GHz – 10.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results

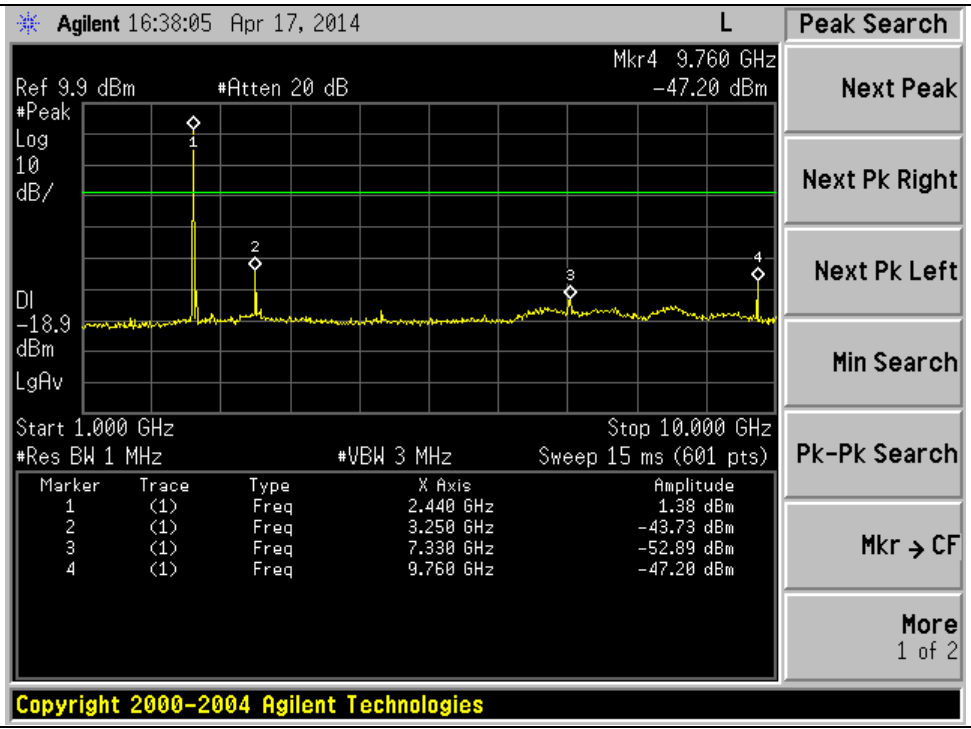


Title: **Ch0 = 2402 MHz Conducted EMI (10.0 GHz – 25.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

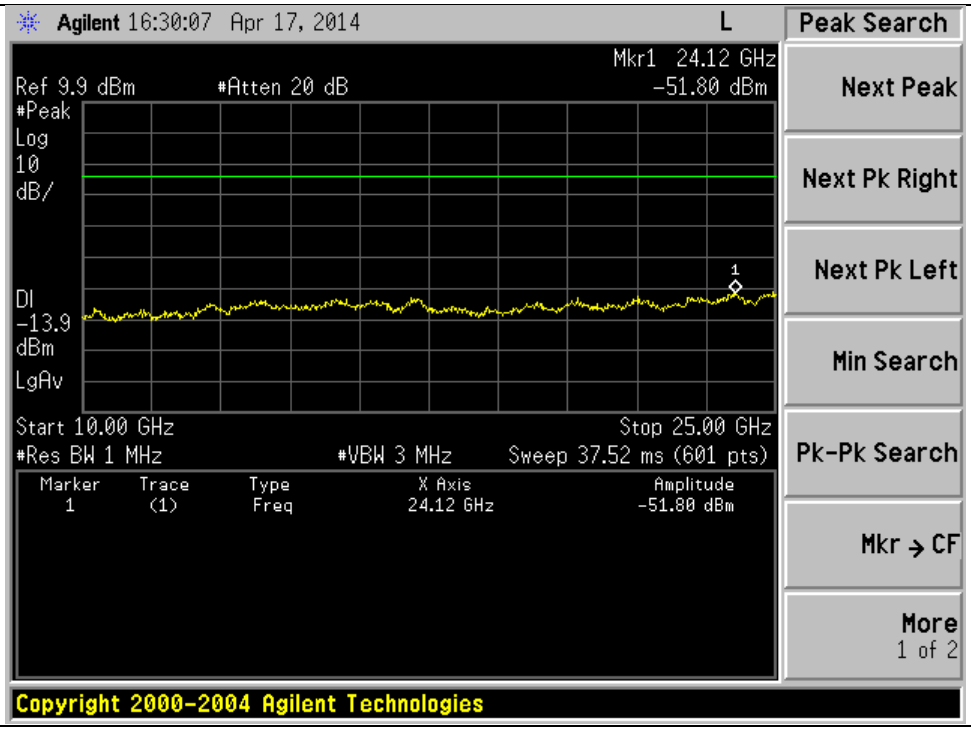


Title: **Ch39 = 2441 MHz Conducted EMI (30 MHz – 1.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results

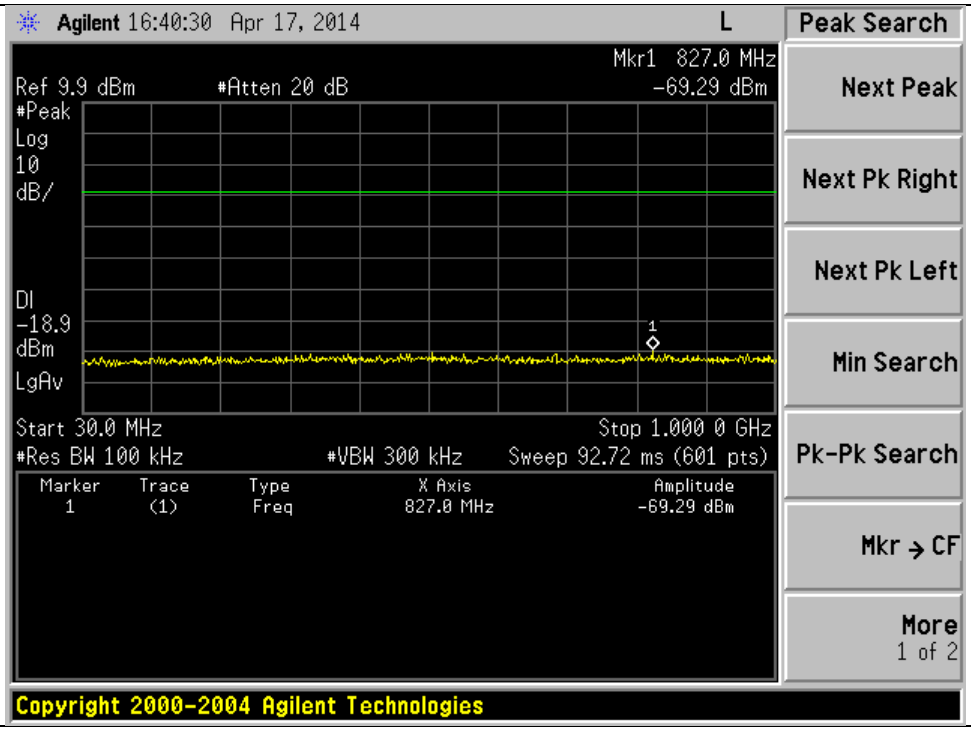


Title: **Ch39 = 2441 MHz Conducted EMI (1.0 GHz – 10.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

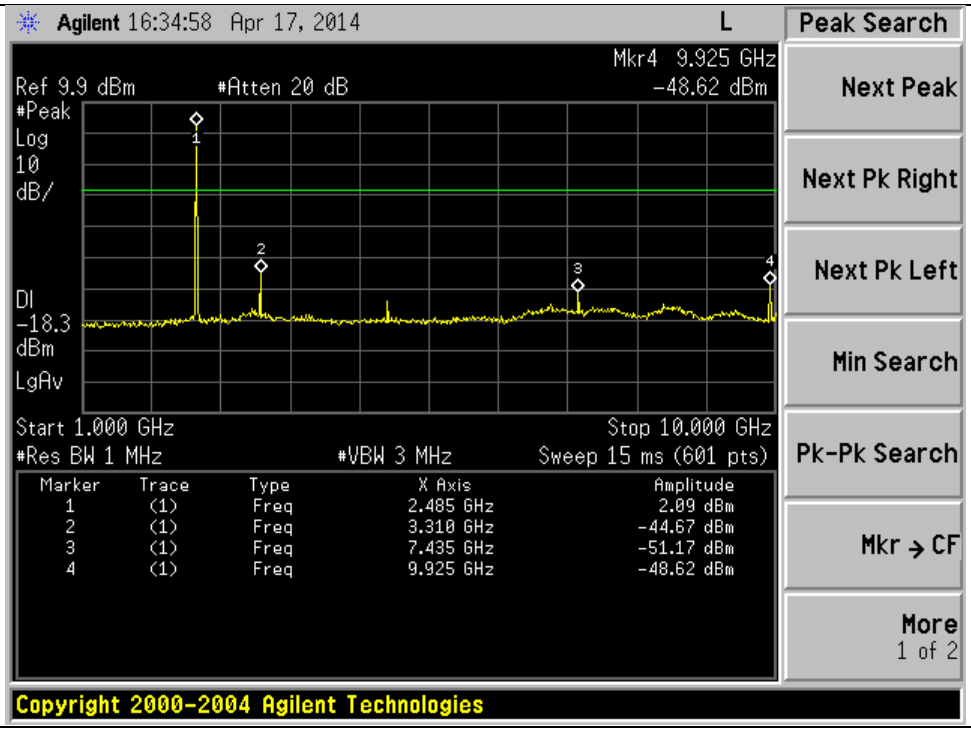


Title: **Ch39 = 2441 MHz Conducted EMI (10 GHz – 25 GHz) with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results

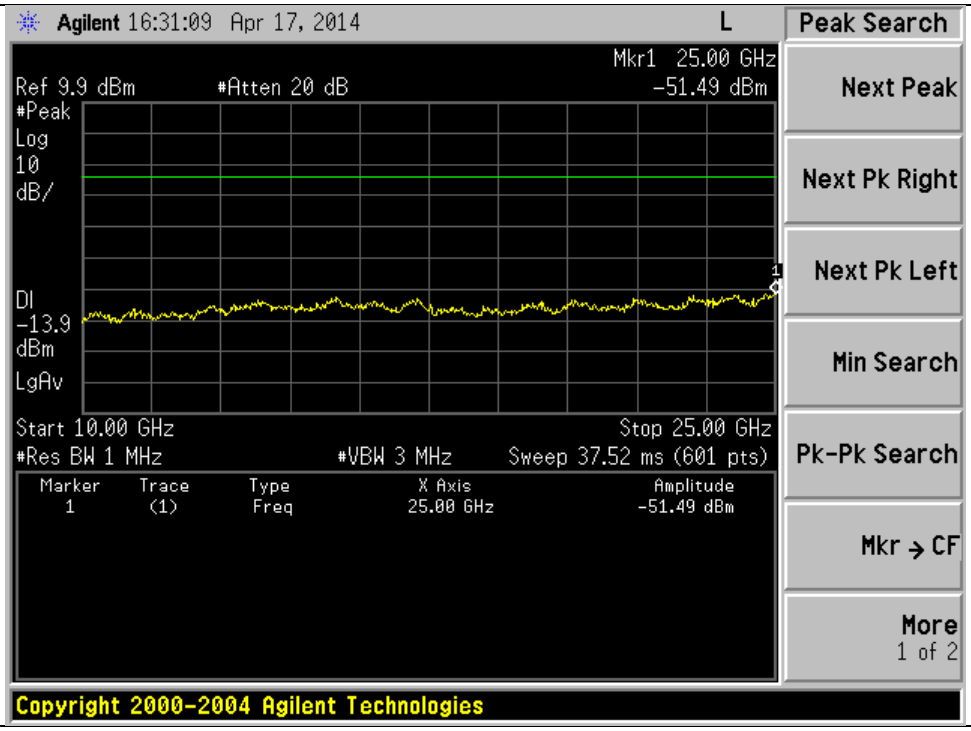


Title: **Ch78 = 2480 MHz Conducted EMI (30 MHz – 1.0 GHz) with 8-DPSK modulation (3-DH1 packet)**



Title: **Ch78 = 2480 MHz Conducted EMI (1 GHz – 10.0 GHz) with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results



Title: **Ch78 = 2480 MHz Conducted EMI (10 GHz – 25 GHz) with 8-DPSK modulation (3-DH1 packet)**

A.8 Restricted Band (Conducted)

FCC 15.205 (a) & RSS-Gen 7.2.2

Unwanted emissions which fall in the restricted bands, as defined in FCC 15.205 (a) and RSS-Gen 7.2.2 must also comply with the radiated emission limits specified in FCC Sec. 15.209 (a) and RSS-Gen 7.2.5.

Measurement Procedure

In accordance with KDB Publication DA 00-705

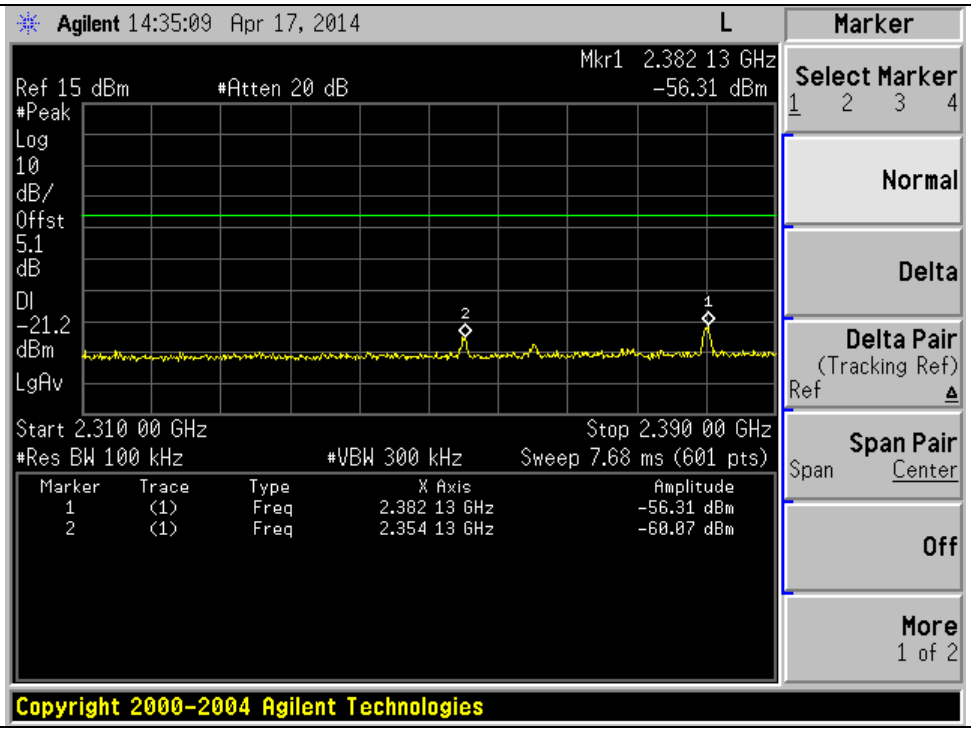
Test Results Table

Test Mode: C **Test Channel: 0 (2402 MHz)**							
Frequency (GHz)	**Raw (dBm)**	**C.F (dB)**	**Calculated Lvl (dBm)**	**Detector**	**Limit (dBm)**	**Margin (dBm)**	**Results (Pass/Fail)**
2.354	-60.07	-----	--------	Pk	-21.2	-38.87	Pass
2.354	-76.39	-----	--------	Av	-41.2	-35.19	Pass
2.382	-56.31	-----	--------	Pk	-21.2	-35.11	Pass
2.382	-74.92	-----	--------	Av	-41.2	-33.72	Pass

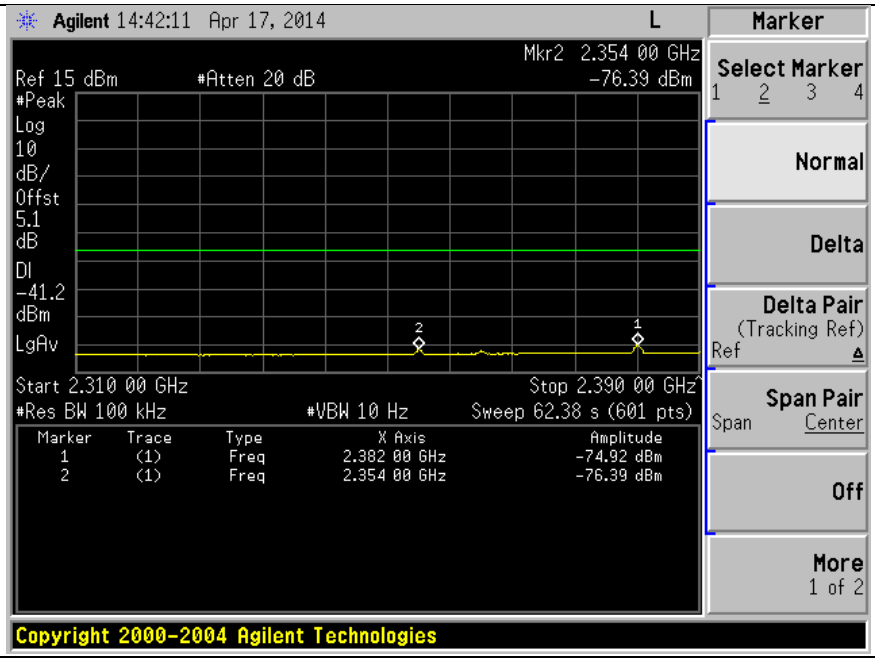
Test Mode: C **Test Channel: 78 (2480 MHz)**							
Frequency (GHz)	**Raw (dBm)**	**C.F (dB)**	**Calculated Lvl (dBm)**	**Detector**	**Limit (dBm)**	**Margin (dBm)**	**Results (Pass/Fail)**
2.500	-53.88	-----	--------	Pk	-21.2	-32.68	Pass
2.499	-74.44	-----	--------	Av	-41.2	-33.24	Pass

Note: Correction factor of 5.1 dB was compensated by entering the value in the offset function.

Graphical Test Results

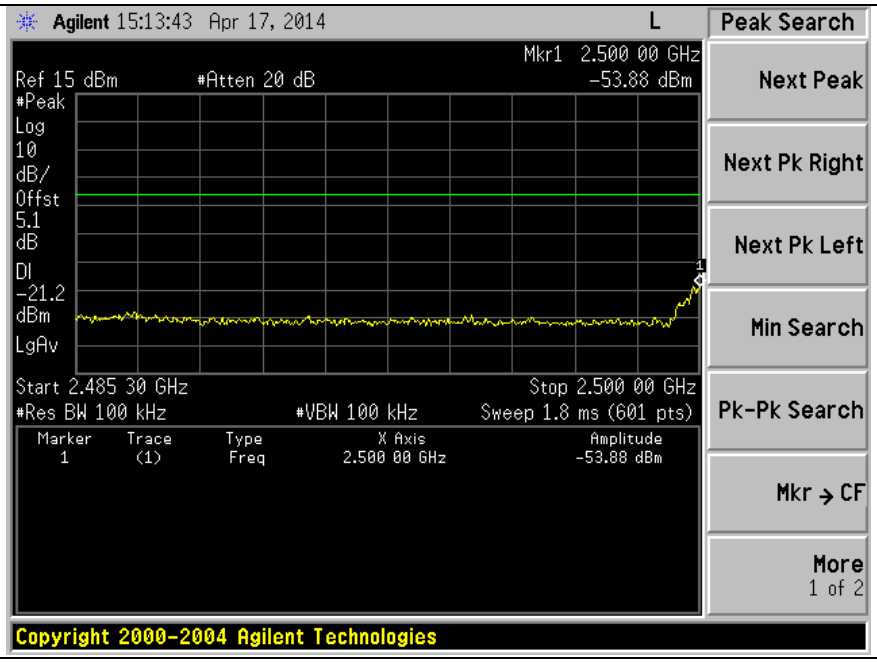


Title: **Ch0 = 2402 MHz- Pk -Conducted EMI (2.310 GHz – 2.390 GHz) with 8-DPSK modulation (3-DH1 packet)**

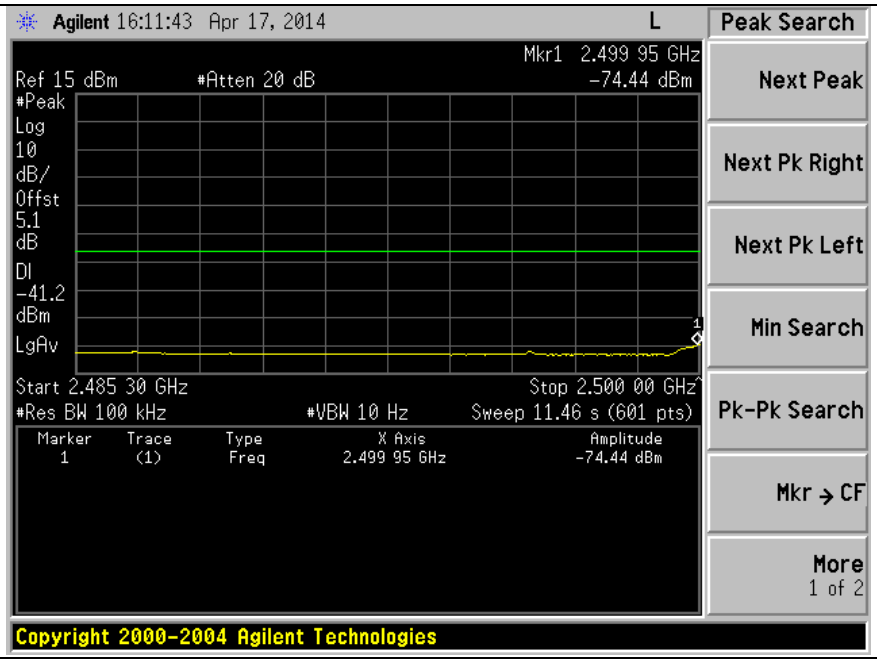


Title: **Ch0 = 2402 MHz- Av- Conducted EMI (2.310 GHz – 2.390 GHz) with 8-DPSK modulation (3-DH1 packet)**

Graphical Test Results



Title: **Ch78 = 2480 MHz- Pk -Conducted EMI (2.4853 GHz – 2.5 GHz) with 8-DPSK modulation (3-DH1 packet)**



Title: **Ch78 = 2480 MHz- Av -Conducted EMI (2.4853 GHz – 2.5 GHz) with 8-DPSK modulation (3-DH1 packet)**

A.9 **Receiver Radiated Spurious Emissions**

RSS-Gen section 4.10 & 6.1

The receiver shall be operated in the normal receive mode near the mid-point of the band in which the receiver is designed to operate.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator frequency, intermediate or carrier frequency), Or 30 MHz, whichever is higher, to at least 3 times the highest tuneable or local oscillator frequency whichever is higher, without exceeding 40 GHz.

For emissions below 1000 MHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.

Above 1000 MHz, measurements shall be performed using an average detector with a minimum resolution bandwidth of 1 MHz.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table 2 in section 6.1 of RSS-Gen.

Measurement Procedure
Accordance with ANSI C64.10:2009

No emissions seen above 18GHz

Test Result Tables for RX Radiated Spurious Emissions

Subtest Number: 163492 - 10	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Receiver Spurious Emissions
Frequency Range	30 MHz -1.0 GHz
Comments on the above Test Results	RX Channel

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
31.936	14	0.5	19	33.5	Qp	V	177	50	40.5	-7	Pass	RX
44.241	21.1	0.6	10.8	32.5	Qp	V	133	210	40.5	-8	Pass	RX
400.02	22.4	1.8	15.7	40	Qp	V	115	130	47.5	-7.5	Pass	RX
418.813	19.1	1.9	16.4	37.3	Qp	H	172	181	47.5	-10.2	Pass	RX
449.994	18	1.9	16.8	36.7	Qp	V	155	120	47.5	-10.8	Pass	RX
468.837	18	2	17.4	37.3	Qp	V	154	135	47.5	-10.2	Pass	RX
499.995	15.6	2	17.8	35.4	Qp	V	190	345	47.5	-12.1	Pass	RX
550.775	18	2.1	18.4	38.6	Qp	V	174	65	47.5	-8.9	Pass	RX

Subtest Number: 163492 - 7	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Receiver Radiated Emissions
Frequency Range	1 GHz - 10.0 GHz
Comments on the above Test Results	RX Channel

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
1299.964	56.9	3.4	-12.5	47.8	Pk	V	163	171	74	-26.2	Pass	RX
1299.964	32.3	3.4	-12.5	23.2	Av	V	163	171	54	-30.8	Pass	RX
1399.951	63	3.5	-13	53.5	Pk	V	148	310	74	-20.5	Pass	RX
1399.951	38.9	3.5	-13	29.4	Av	V	148	310	54	-24.6	Pass	RX
1423	32.9	3.5	-13.4	23	Av	V	163	52	54	-31	Pass	RX
1423	53.4	3.5	-13.4	43.5	Pk	V	163	52	74	-30.5	Pass	RX
1600.075	62.6	3.8	-13.8	52.6	Pk	H	133	172	74	-21.4	Pass	RX
1600.075	55.1	3.8	-13.8	45.1	Av	H	133	172	54	-8.9	Pass	RX
2000.125	52.2	4.2	-10.4	46	Pk	H	138	168	74	-28	Pass	RX

Subtest Number: 163492 - 7	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Receiver Radiated Emissions
Frequency Range	1 GHz - 10.0 GHz
Comments on the above Test Results	RX Channel

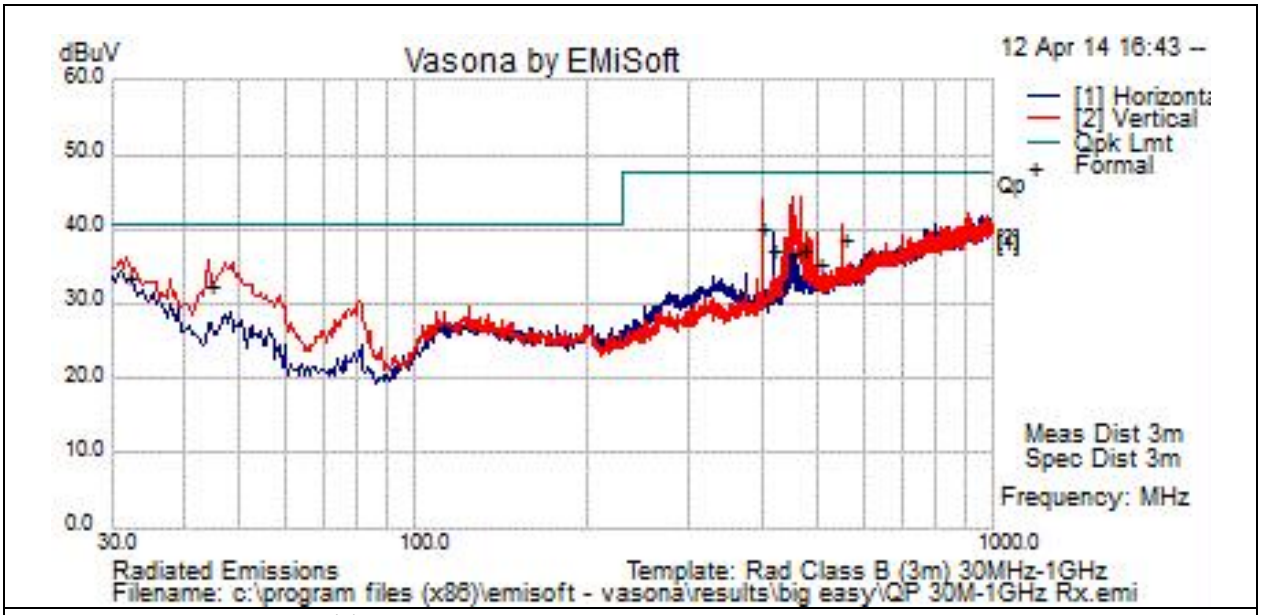
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
2000.125	39.4	4.2	-10.4	33.2	Av	H	138	168	54	-20.8	Pass	RX
2399.992	58.3	4.7	-9	54	Pk	H	171	219	74	-20	Pass	RX
2399.992	47	4.7	-9	42.6	Av	H	171	219	54	-11.4	Pass	RX
2800.063	47.4	5.1	-8.4	44.1	Pk	V	170	349	74	-29.9	Pass	RX
2800.063	31.9	5.1	-8.4	28.6	Av	V	0	349	54	-25.4	Pass	RX
3200.138	33.5	5.5	-7.3	31.7	Av	H	149	300	54	-22.3	Pass	RX
3200.138	47.8	5.5	-7.3	46	Pk	H	149	300	74	-28	Pass	RX
4000.082	46	6.2	-7.2	45	Pk	V	98	146	74	-29	Pass	RX
4000.082	39.5	6.2	-7.2	38.5	Av	V	98	146	54	-15.5	Pass	RX

Subtest Number: 163492 - 8	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Receiver Spurious Emissions 10GHz -18GHz.
Frequency Range	10.0 GHz - 18.0 GHz
Comments on the above Test Results	RX Channel / No emissions seen above 10GHz. Noise floor measurement recorded

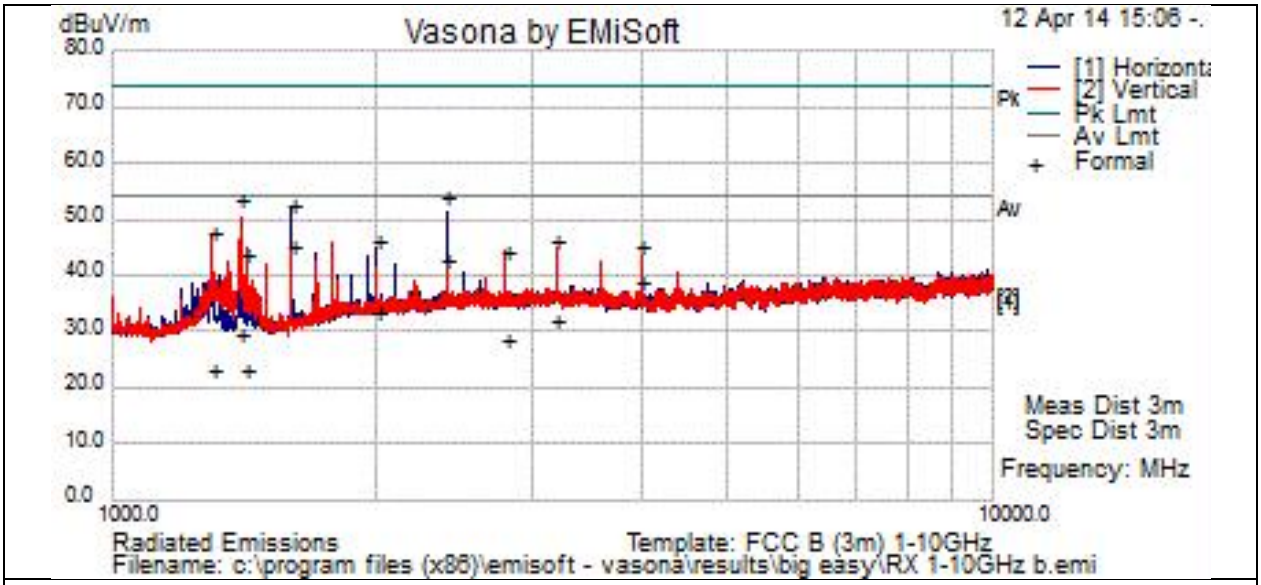
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
16768	43.8	14.4	-10.6	47.6	Peak	V	100	187	54	-6.4	Pass	RX

Graphical Test Results for RX Radiated Spurious Emissions

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements

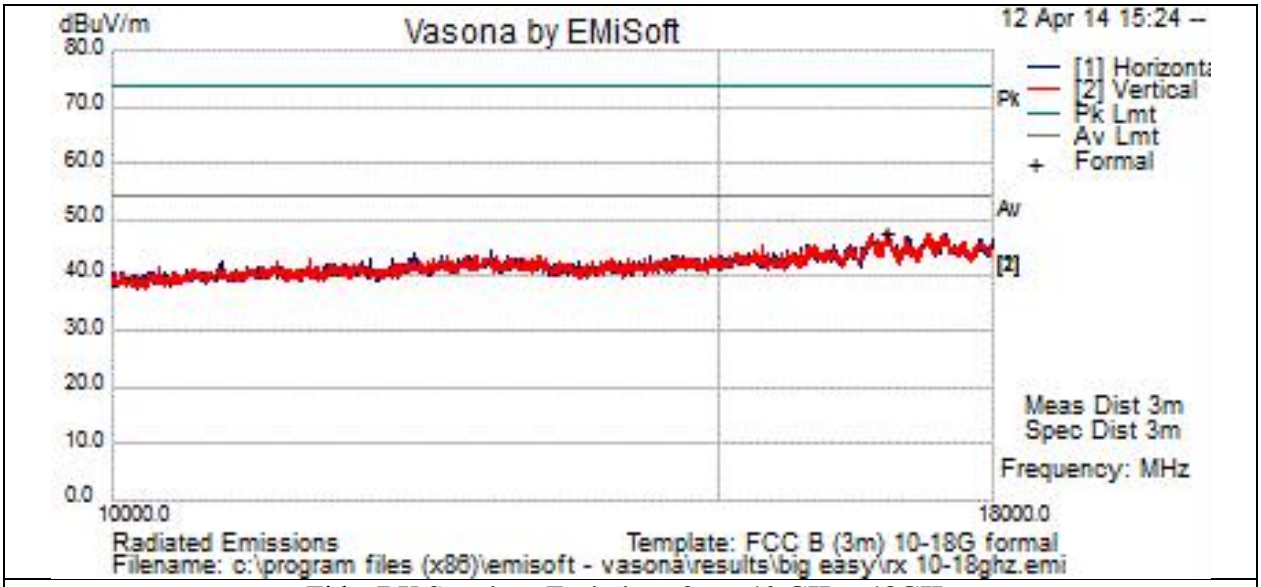


Title: **RX Spurious Emissions from 30MHz - 1GHz**



Title: **RX Spurious Emissions from 1GHz – 10 GHz**

Graphical Test Results (Continue)



Title: **RX Spurious Emissions from 10 GHz - 18GHz**

A.10 Transmitter Radiated Spurious Emissions

15.205 / RSS-210 2.7: 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 Procedure
Accordance with ANSI C64.10:2009

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	1GHz – 18 GHz
Reference Level:	60 dBuV below 1 GHz, 80 dBuV above 1 GHz
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	1MHz
Video Bandwidth:	1 MHz for peak, 10 Hz for average
Detector:	Peak

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots: 1) Average Plot (Vertical and Horizontal), Limit= 54dBuV/m @3m
2) Peak plot (Vertical and Horizontal), Limit = 74dBuV/m @3m

This report represents the worst case data for all supported operating modes and antennas. System was evaluated up to 40GHz but there were no measurable emissions above 15 GHz.

Note: A Notch Filter was used during formal testing from 1 – 15GHz to help prevent the front end of the analyzer from over loading. The Notch filters used are designed to suppress TX fundamental frequency but do not effect harmonics of the fundamental frequency from being measured

No emissions seen above 18GHz

Test Result Tables for TX Radiated Spurious Emissions:

Subtest Number: 163492 - 9	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	30.0 MHz - 1.0 GHz
Comments on the above Test Results	TX Channel 0 (2.402 MHz) – with 8-DPSK modulation – 3-DH1 packet

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
31.94	14.4	0.5	19	33.9	Qp	V	168	35	40.5	-6.6	Pass	TX / Ch 0
44.239	20.5	0.6	10.8	31.9	Qp	V	127	188	40.5	-8.6	Pass	TX / Ch 0
400.013	22.4	1.8	15.7	40	Qp	V	107	145	47.5	-7.5	Pass	TX / Ch 0
418.751	19.1	1.9	16.4	37.3	Qp	H	168	172	47.5	-10.2	Pass	Tx / Ch 0
468.863	17.4	2	17.4	36.7	Qp	V	170	149	47.5	-10.8	Pass	TX / Ch 0
550.876	17.3	2.1	18.4	37.9	Qp	V	184	70	47.5	-9.6	Pass	Tx / Ch 0

Subtest Number: 163492 -6/ 163492 -1	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1.0 GHz - 18.0 GHz
Comments on the above Test Results	TX Channel 0 (2.402 MHz) – with 8-DPSK modulation – 3-DH1 packet

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
3202.663	50	5.5	-2	53.5	Av	V	102	197	54	-0.5	Pass	outside Restri
3202.671	47.6	5.5	-2	51.1	Av	H	116	167	54	-2.9	Pass	outside Restri

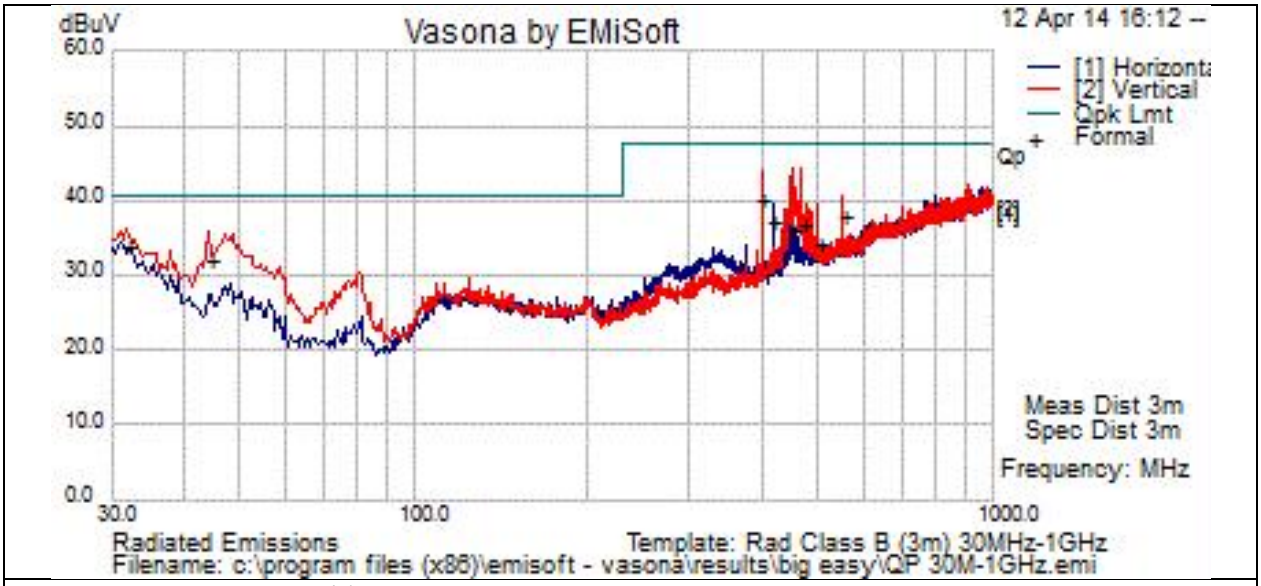
Subtest Number: 163492 -5/ 163492 -2	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1.0 GHz - 18.0 GHz
Comments on the above Test Results	TX Channel 39 (2.441 MHz) – with 8-DPSK modulation – 3-DH1 packet

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
3254.641	*46.7*	*5.6*	*-2*	*50.2*	*Av*	*H*	*123*	*365*	*54*	*-3.8*	*Pass*	TX / Ch 39
3254.641	*49.3*	*5.6*	*-2*	*52.9*	*Av*	*V*	*106*	*196*	*54*	*-1.1*	*Pass*	TX / Ch 39

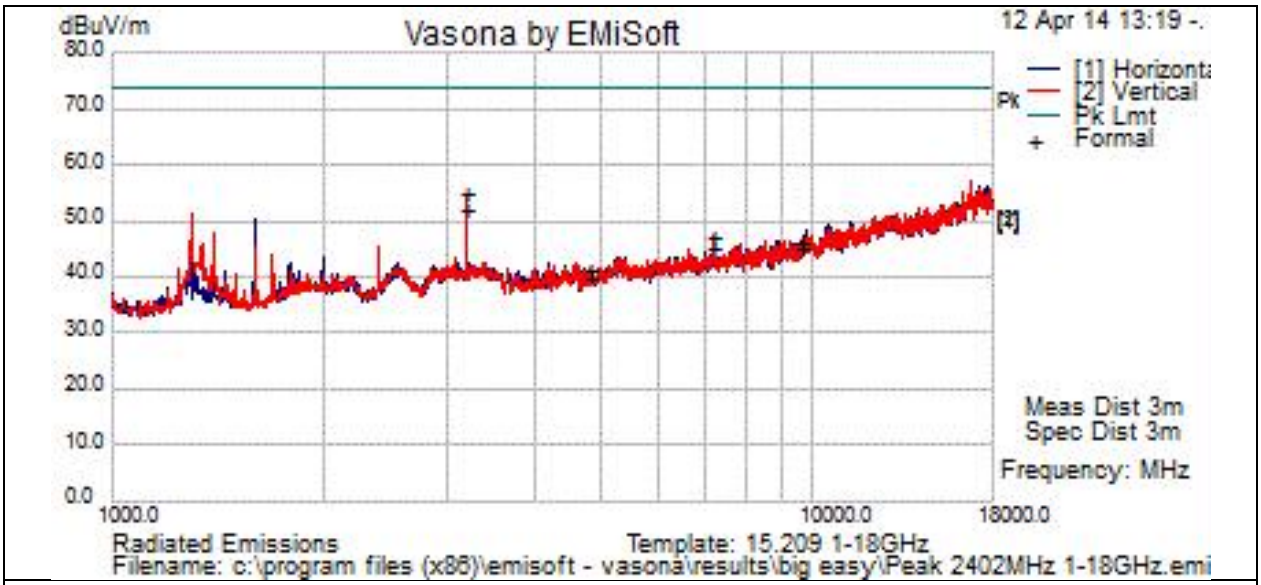
Subtest Number: 163492 -4/ 163492-3	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 5m Anechoic
Subtest Title	Transmitter Spurious Emissions
Frequency Range	1.0 GHz - 18.0 GHz
Comments on the above Test Results	TX Channel 78 (2480 MHz) – with 8-DPSK modulation – 3-DH1 packet

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Polarity	Height (cm)	Azt (Deg)	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
3306.628	43.9	5.6	-1.9	47.5	Av	H	100	48	54	-6.5	*Pass*	TX / Ch 78
3306.672	46.1	5.6	-1.9	49.8	Av	V	120	175	54	-4.2	*Pass*	TX / Ch 78
9919.977	30.9	10.5	3.6	45	Av	V	120	175	54	-9	*Pass*	Tx / Ch 78

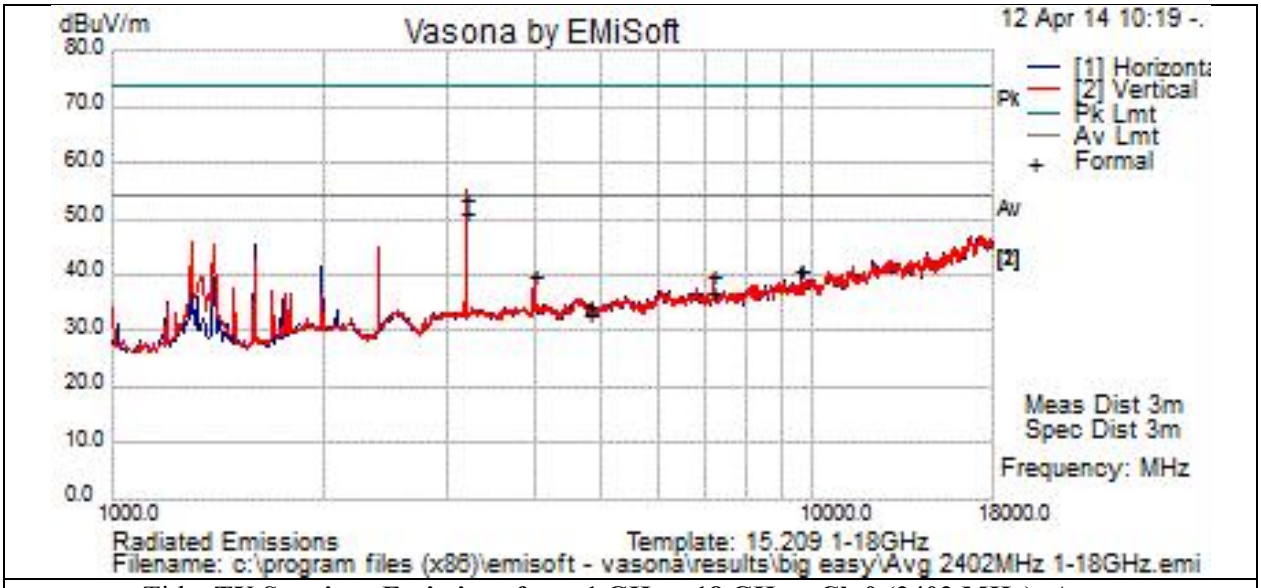
Graphical Test Results for TX Radiated Spurious Emissions



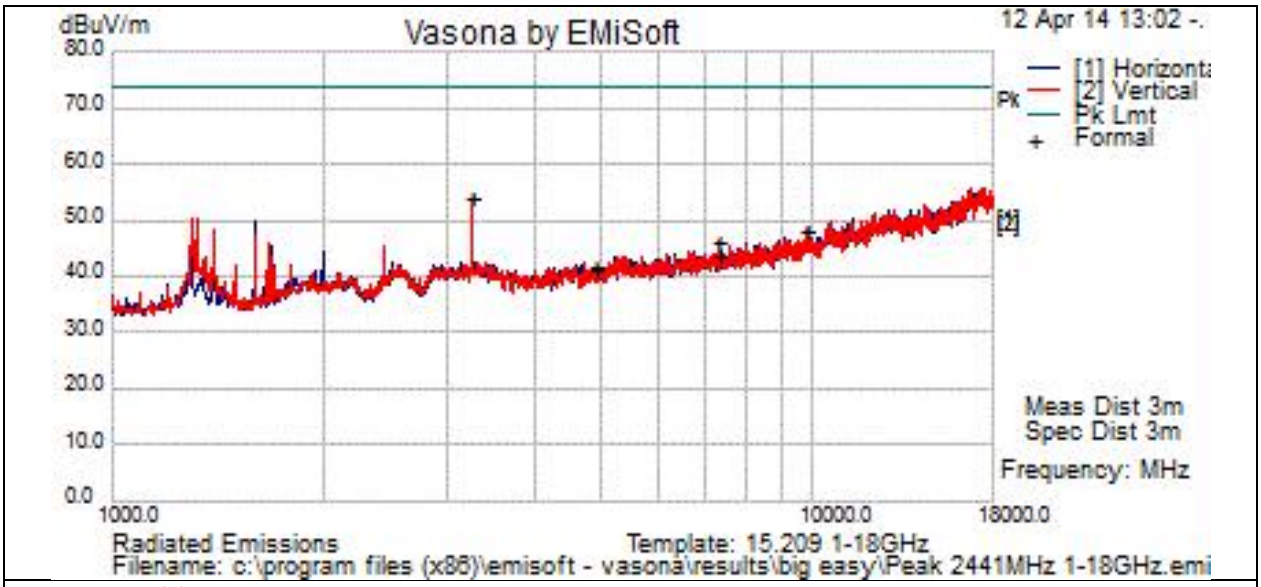
Title: **TX Spurious Emissions from 30 MHz - 1GHz**



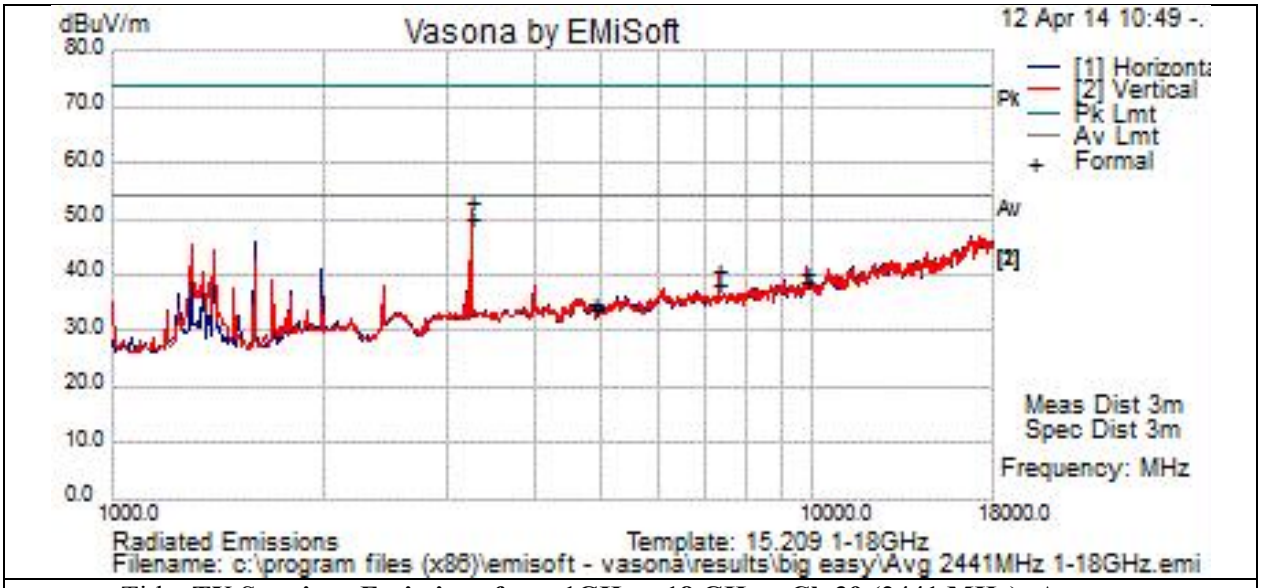
Title: **TX Spurious Emissions from 1GHz – 18 GHz – Ch 0 (2.402 MHz) - Peak**



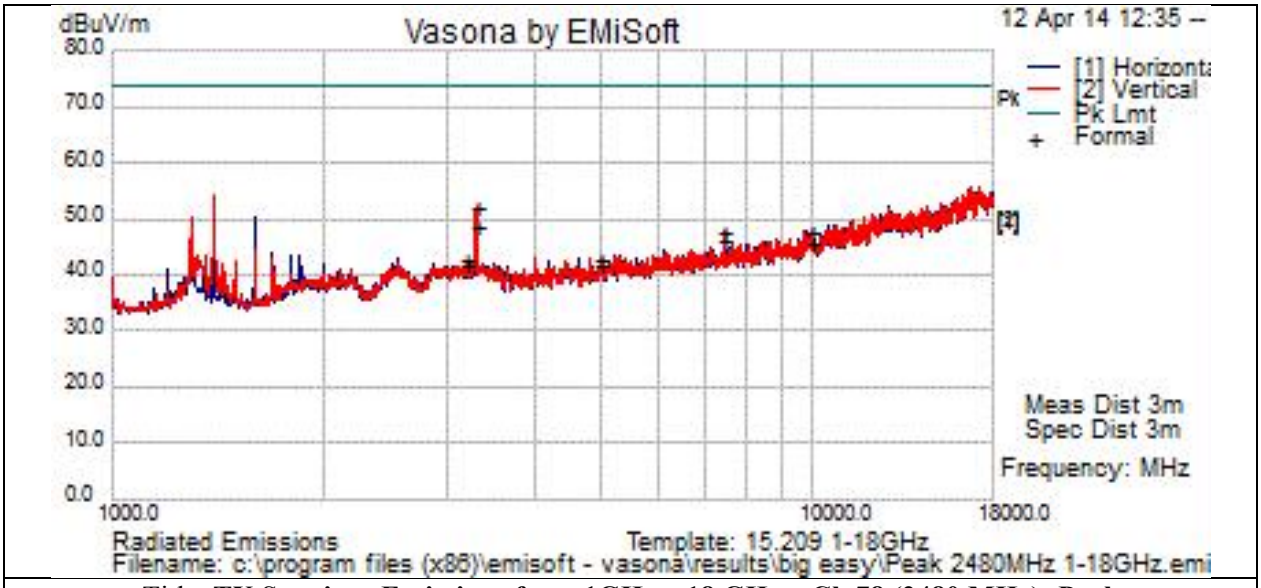
Title: **TX Spurious Emissions from 1 GHz – 18 GHz – Ch 0 (2402 MHz) -Average**



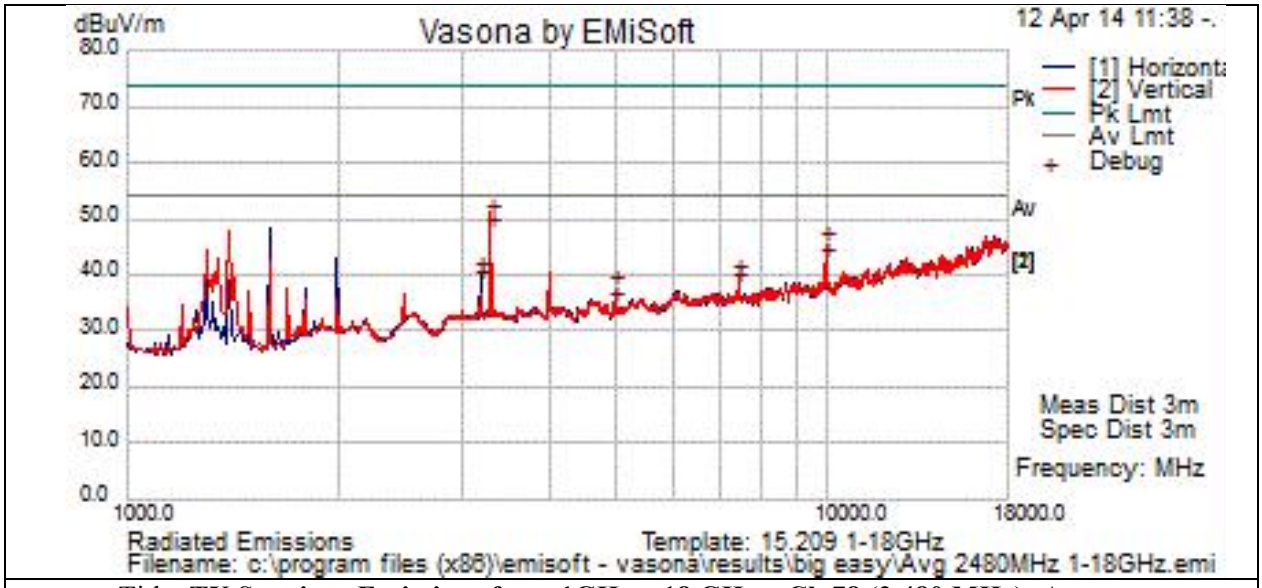
Title: **TX Spurious Emissions from 1GHz – 18 GHz – Ch 39 (2441 MHz) -Peak**



Title: **TX Spurious Emissions from 1GHz – 18 GHz – Ch 39 (2441 MHz) -Average**



Title: **TX Spurious Emissions from 1GHz – 18 GHz – Ch 78 (2480 MHz) -Peak**



Title: **TX Spurious Emissions from 1GHz – 18 GHz – Ch 78 (2.480 MHz) -Average**

A.11 **Conducted Emissions** for AC Power Adapter

FCC 15.207 (a) & RSS-Gen 7.2.4

Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table in these sections. The more stringent limit applies at the frequency range boundaries.

Measurement Procedure
Accordance with ANSI C64.10:2009

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

Span:	150 KHz – 30 MHz
Reference Level:	70 dBuV
Attenuation:	10 dB
Sweep Time:	Coupled
Resolution Bandwidth:	9 KHz
Video Bandwidth:	30 KHz
Detector:	Quasi-Peak / Average

Test Result Table

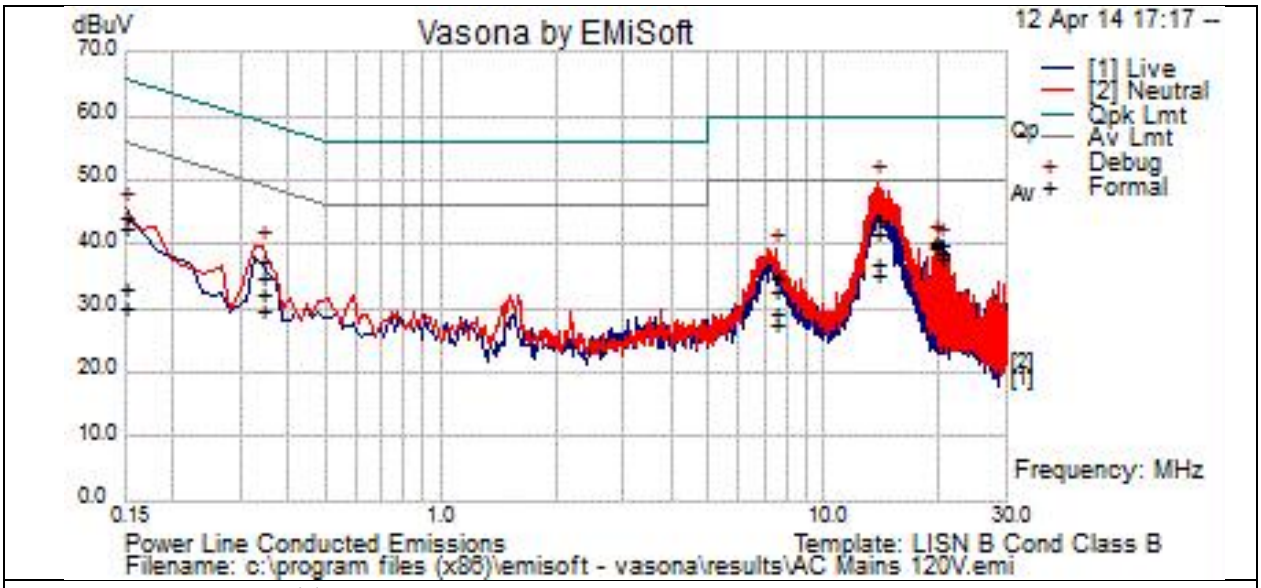
Subtest Number: 162052 - 2	**Subtest Date:** 12-Apr-2014
Engineer	Jose Aguirre
Lab Information	Building P, 10m Anechoic
Subtest Title	AC Main Conducted Emissions
Power Input	110, 60Hz (+/-20%)
Frequency Range	150 KHz - 30.0 MHz
Comments on the above Test Results	RX / Idle

Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Line	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
13.777	23.2	20.5	0.2	43.9	Qp	L	60	-16.1	Pass	
0.151	22.7	21.5	0.2	44.4	Qp	L	65.9	-21.6	Pass	
7.493	14.2	20.3	0.1	34.7	Qp	L	60	-25.3	Pass	
0.34	16.8	20.5	0	37.4	Qp	L	59.2	-21.8	Pass	
19.522	19.1	20.8	0.4	40.2	Qp	L	60	-19.8	Pass	
20.281	18.6	20.8	0.4	39.8	Qp	L	60	-20.2	Pass	
20.281	18.6	20.8	0.4	39.8	Qp	N	60	-20.2	Pass	
19.522	18.9	20.8	0.4	40.1	Qp	N	60	-19.9	Pass	
0.151	20.9	21.5	0.2	42.6	Qp	N	65.9	-23.4	Pass	
13.777	20.9	20.5	0.2	41.6	Qp	N	60	-18.4	Pass	
0.34	14.4	20.5	0	34.9	Qp	N	59.2	-24.3	Pass	
7.493	12.3	20.3	0.1	32.7	Qp	N	60	-27.3	Pass	
13.777	16.2	20.5	0.2	36.9	Av	L	50	-13.1	Pass	
0.151	11.5	21.5	0.2	33.2	Av	L	55.9	-22.8	Pass	
7.493	8.7	20.3	0.1	29.1	Av	L	50	-20.9	Pass	
0.34	11.6	20.5	0	32.2	Av	L	49.2	-17	Pass	
19.522	18.3	20.8	0.4	39.4	Av	L	50	-10.6	Pass	
20.281	17.5	20.8	0.4	38.6	Av	L	50	-11.4	Pass	
20.281	16.5	20.8	0.4	37.6	Av	N	50	-12.4	Pass	
19.522	18.2	20.8	0.4	39.4	Av	N	50	-10.6	Pass	
0.151	8.3	21.5	0.2	30	Av	N	55.9	-26	Pass	
13.777	14.4	20.5	0.2	35.1	Av	N	50	-14.9	Pass	
0.34	9.3	20.5	0	29.8	Av	N	49.2	-19.4	Pass	
7.493	6.9	20.3	0.1	27.3	Av	N	50	-22.7	Pass	

Subtest Number: 162052 - 3	**Subtest Date: 29-May-2014**
Engineer	**Jose Aguirre**
Lab Information	**Building P, 10m Anechoic**
Subtest Title	**AC Main Conducted Emissions**
Power Input	**110, 60Hz (+/-20%)**
Frequency Range	**150 KHz - 30.0 MHz**
Comments on the above Test Results	**TX on**

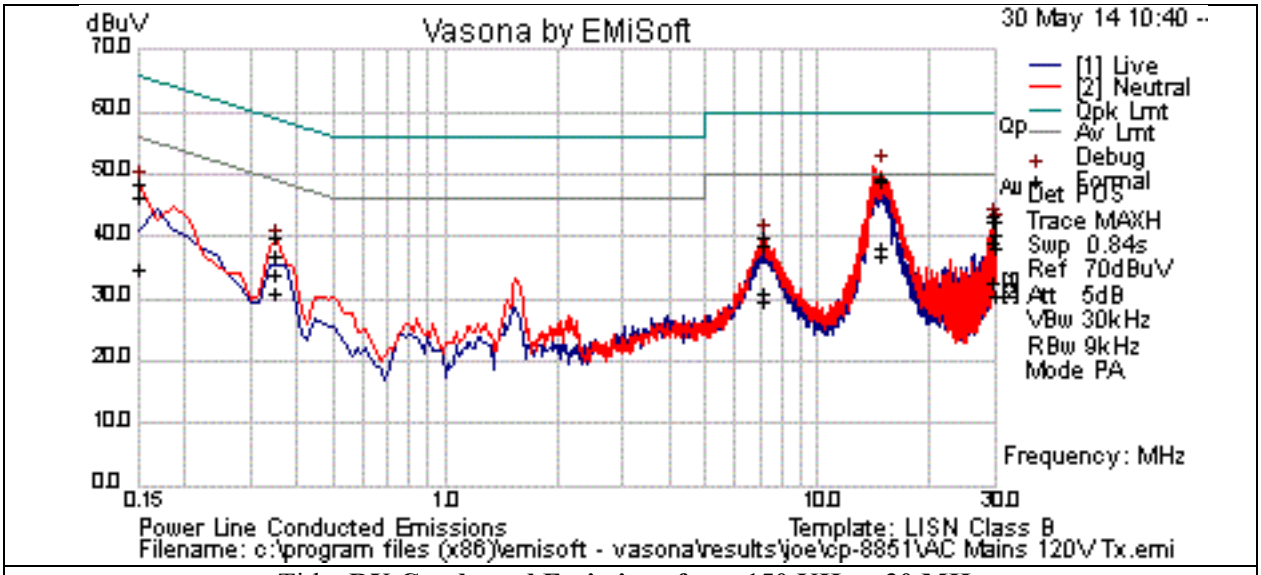
Frequency (MHz)	Raw (dBuV)	Cab Loss (dB)	AF (dB)	Level (dBuV)	Detector	Line	Limit (dBuV)	Margin (dB)	Results Pass /Fail	Comments
14.779	29.1	20.2	0.2	49.5	QP	L	60	-10.5	Pass	
29.897	21.5	20.6	0.3	42.4	QP	L	60	-17.6	Pass	
29.645	22.3	20.6	0.3	43.2	QP	L	60	-16.8	Pass	
7.109	18.5	20.1	0.1	38.6	QP	L	60	-21.4	Pass	
0.15	25	21.1	0.1	46.2	QP	L	66	-19.8	Pass	
0.345	16.6	20.3	0	36.9	QP	L	59.1	-22.2	Pass	
14.779	28.6	20.2	0.2	49	QP	N	60	-11	Pass	
29.645	21.4	20.6	0.3	42.3	QP	N	60	-17.7	Pass	
7.109	19.7	20.1	0.1	39.8	QP	N	60	-20.2	Pass	
0.345	19.6	20.3	0	39.9	QP	N	59.1	-19.2	Pass	
0.15	27.1	21.1	0.1	48.3	QP	N	66	-17.7	Pass	
29.897	19.3	20.6	0.3	40.2	QP	N	60	-19.8	Pass	
14.779	16.4	20.2	0.2	36.9	Av	L	50	-13.1	Pass	
29.897	17.2	20.6	0.3	38.2	Av	L	50	-11.8	Pass	
29.645	17.9	20.6	0.3	38.9	Av	L	50	-11.1	Pass	
7.109	9.4	20.1	0.1	29.5	Av	L	50	-20.5	Pass	
0.15	13.7	21.1	0.1	34.9	Av	L	56	-21.1	Pass	
0.345	10.8	20.3	0	31.1	Av	L	49.1	-18	Pass	
14.779	17.6	20.2	0.2	38.1	Av	N	50	-11.9	Pass	
29.645	11.5	20.6	0.3	32.5	Av	N	50	-17.5	Pass	
7.109	10.8	20.1	0.1	31	Av	N	50	-19	Pass	
0.345	13.5	20.3	0	33.9	Av	N	49.1	-15.2	Pass	
0.15	13.8	21.1	0.1	35	Av	N	56	-21	Pass	
29.897	9.5	20.6	0.3	30.5	Av	N	50	-19.5	Pass	

Graphical Test Results for RX Conducted Emissions



Title: **RX Conducted Emissions from 150 KHz – 30 MHz**

Graphical Test Results for TX Conducted Emissions



Title: **RX Conducted Emissions from 150 KHz – 30 MHz**

Appendix B: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	MegaHertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	μV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	μA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	μS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return

S	Supply	AC	Alternating Current

Appendix C: List of Test Equipment Used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Item
Test Equipment used for Radiated Emissions					
CIS004882	EMC Test Systems / 3115	Double Ridged Guide Horn Antenna	28-JUN-13	28-JUN-14	A9 , A10
CIS005691	Miteq / NSP1800-25-S1	Broadband Preamplifier (1-18GHz)	27-JAN-14	27-JAN-15	A9 , A10
CIS008448	Cisco / NSA 5m Chamber	NSA 5m Chamber	03-OCT-13	03-OCT-14	A9 , A10
CIS021117	Micro-Coax / UFB311A-0-2484-520520	RF Coaxial Cable, to 18GHz, 248.4 in	23-AUG-13	23-AUG-14	A9 , A10
CIS025658	Micro-Coax / UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 84 in	14-FEB-14	14-FEB-15	A9 , A10
CIS037581	ETS-Lindgren / 3117	Double Ridged Waveguide Horn Antenna	31-JUL-13	31-JUL-14	A9 , A10
CIS041935	Newport / iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	01-APR-14	01-APR-15	A9 , A10
CIS040641	Rohde & Schwarz / ESU26	EMI Test Receiver	24-JUN-13	24-JUN-14	A9 , A10
CIS047284	Huber + Suhner / Sucoflex 102E	40GHz Cable K Connector	30-MAY-13	30-MAY-14	A10
CIS047286	Huber + Suhner / Sucoflex 102E	40GHz Cable K Connector	30-MAY-13	30-MAY-14	A9
CIS049443	Micro-Tronics / BRM50702-02	Notch Filter, SB:2.4-2.5GHz, to 18GHz	20-MAR-14	20-MAR-15	A10
CIS049563	Huber + Suhner / Sucoflex 106A	N Type Cable 18GHz	23-AUG-13	23-AUG-14	A9 , A10
Test Equipment used for AC Mains Conducted Emissions					
CIS008375	Andrew / F4A-PNMNM	49 ft Heliax Cable	16-APR-13	16-APR-14	A.11
CIS008376	Andrew / F4A-PNMNM	30 ft Heliax Cable	24-JUN-13	24-JUN-14	A.11
CIS005707	Fischer Custom Communications / FCC-LISN-50-50	LISN	16-APR-13	16-APR-14	A.11
CIS019206	TTE / H785-150K-50-21378	High Pas Filter,Fo=150kHz	12-SEP-13	12-SEP-14	A.11
CIS008591	Fischer Custom Communications/ FCC-RFM2F-520R	LISN AC Adaptor – Std 120V outlet	16-APR-13	16-APR-14	A.11
CIS008582	Fischer Custom Communications/ FCC-RFM2F-520R	LISN AC Adaptor – Std 120V outlet	24-JUN-13	24-JUN-14	A.11
CIS030562	Micro-Coax / UFB311A-1-0950-504504	RF Coaxial Cable, to 18GHz, 95 in	26-JUN-13	26-JUN-14	A.11
CIS033649	Midwest Microwave / CSY-NMNM-14-010-FS	RF Coaxial Cable, RG-214, 10ft	16-APR-13	16-APR-14	A.11
CIS041929	Newport / iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	16-DEC-13	16-DEC-14	A.11
CIS045015	Huber + Suhner/ Sucoflex 106PA	Sucoflex N Type Black 7ft cable	30-OCT-13	30-OCT-14	A.11
CIS047300	Agilent Technologies / N9038A	MXE EMI Receiver 20Hz to 26.5 Ghz	17-DEC-13	17-DEC-14	A.11
RF Conducted at output antenna port					
CIS043023	Anritsu/ MT8852B-042	EDR Bluetooth Test Set	17-SEP-13	17-SEP-14	A1 thru A8
CIS040514	Agilent Technologies / E4440A	Precision Spectrum Analyzer	15-NOV-13	15-NOV-14	an

CIS045066	ZFSC-2-10G	Slitter	30-JAN-14	30-JAN-15	A1 thru A8
CIS036716	RF Coaxial Cable-SMA	Radio Test Cable, SMA-SMA	18-DEC-13	18-DEC-14	A1 thru A8
CIS036717	RF Coaxial Cable-SMA	Radio Test Cable, SMA-SMA	18-DEC-13	18-DEC-14	A1 thru A8
CIS037552	MXGS83RK3000	Special Radio Test Adaptor Cable	03-JUL-13	03-JUL-14	A1 thru A8

Appendix D: Test Procedures

Measurements were made in accordance with

- FCC docket #:DA 00-0705,
- ET docket 96-8, measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.
- ANSI C63.10 : 2009