RADIO TEST REPORT

For

MODEL NO. 1657
FCC ID: C3K1657

Test Report No. R-TR78-FCC-BT-2
Issue Date: May 17, 2015

FCC CFR47 Part 15 Subpart C

Prepared by
Microsoft EMC Laboratory
17760 NE 67th Ct,
Redmond WA, 98052, U.S.A.
425-421-9799
sajose@microsoft.com

ACCREDITED
TESTING CERT #3472.01

1 Record of Revisions

Revision	Date	Section	Page(s)	Summary of Changes	Author/Revised By:
1.0	04/01/2015	All	All	First Version	Daniel Salinas
2.0	05/15/2015	9.1, 9.7	14, 37-41	Corrected table value. Corrected Conducted Spurious Emissions Plots	Daniel Salinas

Microsoft

Table of Contents

Test Report Attestation

Microsoft Corporation
Model: 1657
FCC ID: C3K1657

Applicable Standards

Specification	Test Result
FCC CFR47 Rule Parts 15.209, 15.247	Pass

Microsoft EMC Laboratory attests that the product model identified in this report has been tested to and meets the requirements identified in the above standards. The test results in this report solely pertains to the specific sample tested, under the conditions and operating modes as provided by the customer. All indications of Pass/Fail in this report are opinions expressed by the Microsoft EMC Laboratory based on interpretations and/or observations of test result on the tested sample only.

This report shall not be used to claim product certification, approval, or endorsement by A2LA or any agency of any Government. Reproduction, duplication or publication of extracts from this test report is prohibited and requires prior written approval of Microsoft EMC Laboratory.

This test report replaces report # R-TR78-FCCIC-BT-1 issued by Microsoft EMC Labs on 04/01/2015.

Written By: Daniel Salinas
Radio Test Engineer

Reviewed/ Issued By: Sajay Jose
EMC/RF Compliance Lab Manager

2 Deviations from Standards

None.

3 Facilities and Accreditations

3.1 Test Facility

All test facilities used to collect the test data are located at
Microsoft EMC Laboratory,
17760 NE 67th Ct,
Redmond WA, 98052, USA

3.2 Accreditations

The lab is established and follows procedures as outlined in IEC/ISO 17025 and A2LA accreditation requirements.
A2LA Accredited Testing Certificate Number: 3472.01
FCC Registration Number: US1141

3.3 Test Equipment

The site and related equipment are constructed in conformance with the requirements of ANSI C63.4:2009, CISPR 16-1-1 and other equivalent applicable standards.
The calibrations of the measuring instruments, including any accessories that may affect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the user manual for the measuring equipment.

4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the product, as specified in CISPR 16-4-2. This represents an expanded uncertainty expressed at 95% confidence level using a coverage factor k=2. These numbers are for reference only and not applied during test.
Expanded uncertainty calculations are available upon request.

Test item	Value (dB)
Radiated disturbance (30 MHz to 1 GHz)	6.10
Radiated disturbance (1 GHz to 18 GHz)	4.80
Conducted Disturbance at Mains Port	3.30

5 Product Description

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052-6399
Customer Contact:	Sahithi Kandula
Functional Description of the EUT:	Handheld computing device with 802.11 2x2 a/b/g/n/ac WLAN, Bluetooth, WCDMA and LTE Radios
Model:	1657
FCC ID:	C3K1657
Radio Description:	BT (2402- 2480 MHz)
Modulation(s):	GFSK, π/4DQPSK, 8DPSK
Antenna Type and Gain:	Internal 3.6 dBi
EUT Classification:	FHSS
Equipment Design State:	DV/Production
Equipment Condition:	Good
Test Sample Details:	SN: 000106745252- Conducted SN: 001364745052- Radiated

5.1 Test Configurations

Test software "WiFi Tool" (V2.6.0) created by the customer and "Lab Tool" (V2.0.0.57) by the module vendor was used to program the EUT to transmit continuously in hopping mode. The device can operate in GFSK, π/4DQPSK and 8DPSK modulations and all modes were tested and included in this report. Channel numbers 0, 39 and 78 are used as Low, Mid and High Channels respectively.

5.2 Environmental Conditions

Ambient air temperature of the test site was within the range of 10 ºC to 40 ºC (50 ºF to 104 ºF) unless the EUT specified testing over a different temperature range. Humidity levels were in the range of 10% to 90% relative humidity. Testing conditions were within tolerance and any deviations required from the EUT are reported.

5.3 Antenna Requirements

The antennas are permanently attached and there are no provisions for connection to an external antenna.

5.4 Equipment Modifications

No modifications were made during testing.

6 Test Results Summary

Test Description	FCC Rule Part	Limit	Test Result (Pass/Fail)
20dB Bandwidth	15.247 (a)(1)(iii)	For reporting purposes only.	Pass
Output Power	15.247 (b)(3)	< 1 Watt	Pass
Channel Spacing	15.247 (a)(1)	2/3 of 20dB BW or 25 kHz	Pass
Number of Hopping Frequencies	15.247 (a)(1)(iii)	> 15 channels	Pass
Dwell Time	15.247 (a)(1)(iii)	< 0.4 sec in 31.6 sec period	Pass
Conducted Band Edge/Spurious Emissions	15.247 (d)	< 20dBc	Pass
Radiated Spurious Emissions/ Restricted Band Emissions	15.205, 15.209	FCC CFR 47 15.209 limits	Pass
AC Powerline Conducted Emissions	15.207	FCC CFR 47 15.207 limits	Pass

7 Test Equipment List

The site and related equipment are in conformance with the requirements of ANSI C63.4:2009, CISPR 16-1-1, and other equivalent applicable standards.

Manufacturer	Description	Model #	Asset #	Calibration Due
Agilent Technologies	Spectrum Analyzer	N9030A	EMC-061	02/04/2016
Agilent Technologies	Spectrum Analyzer	N9030A	RF-011	02/29/2016
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-012	4/27/2015
Rhode & Schwarz	Spectrum Analyzer	FSV 40	RF-245	11/03/2015
Rohde & Schwarz	Switch Control Unit	OSP130	RF-018	5/16/2015
Rohde & Schwarz	Switch Control Unit	OSP150	RF-019	5/16/2015
Rohde & Schwarz	Signal Generator	SMB 100A	RF-013	9/04/2015
Micro-Tronix	Notch Filter	BRM50702-02	RF-055	N/A*
Sunol Sciences	Antenna	JB6	RF-039	5/05/2015
ETS-Lindgren	Antenna	3117	RF-139	7/10/2015
ETS-Lindgren	Antenna	3160-09	RF-037	N/A (Std Gain Horn)
Rohde & Schwarz	Pre-Amp	TS-PR18	RF-041	N/A*
Rohde & Schwarz	Pre-Amp	TS-PR26	RF-042	N/A*
Rosenburger	RF Cable	L72-449-915	EMC-326	N/A*
Madgetech	THP Monitor	PRHTemp2000	EMC-677	10/31/2015
Rohde & Schwarz	Software	EMC-32 V9.15	N/A	N/A

*Note: List of equipment that fall under the category of cables, pre-amplifiers or switching panels with Calibration due date of “n/a” have regular in house verification.

The calibrations of the measuring instruments, including any accessories that may affect such calibration, are checked frequently to ensure their accuracy.

8 Test Site Description

8.1 Radiated Emissions Test Site

Radiated measurements are performed in a 3m semi-anechoic chamber, which fully meets NSA requirements for the frequency range of 30MHz to 1000MHz and SVSWR for 1-18GHz.

An Antenna mast and Turntable are used for changing Antenna height and EUT azimuth respectively. For all measurements, the Antenna height is varied from 1 meter to 4 meters and the turn table rotated 360 degrees to determine the highest emissions. A non-conducting 1m x 1.5m x 80cm table is installed on the turntable to support the EUT.

The EUT and its support equipment were exercised and cabling manipulated to maximize each emission.

For radiated emissions above 1GHz, linearly polarized horn antennas are used. RF absorbers cover the ground plane such that the site validation criterion called out in CISPR 16-1-4 is met. For radiated measurements below 1GHz, Linearly polarized broadband antennas are used. The RF absorbers are removed to reveal the ground plane.

8.2 Antenna port conducted measurements

All antenna port conducted measurements are performed on a bench-top setup consisting of a Spectrum Analyzer, Power Meter (as necessary), Splitters/Combiners (as necessary), Attenuators and pre-characterized RF cables.

The correction factors between the EUT and the Spectrum Analyzer is added internally in the Analyzer settings. The plots displayed accounts for these correction factors.

8.3 Test Setup Diagrams

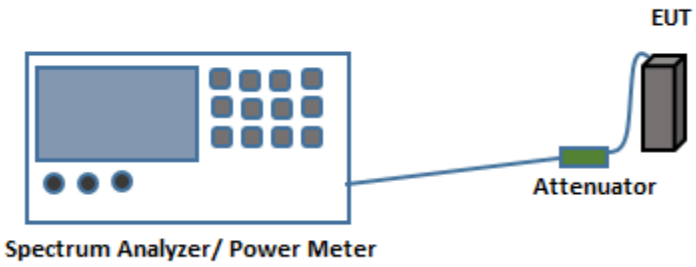


Fig.1. Test Setup for Antenna port conducted measurements

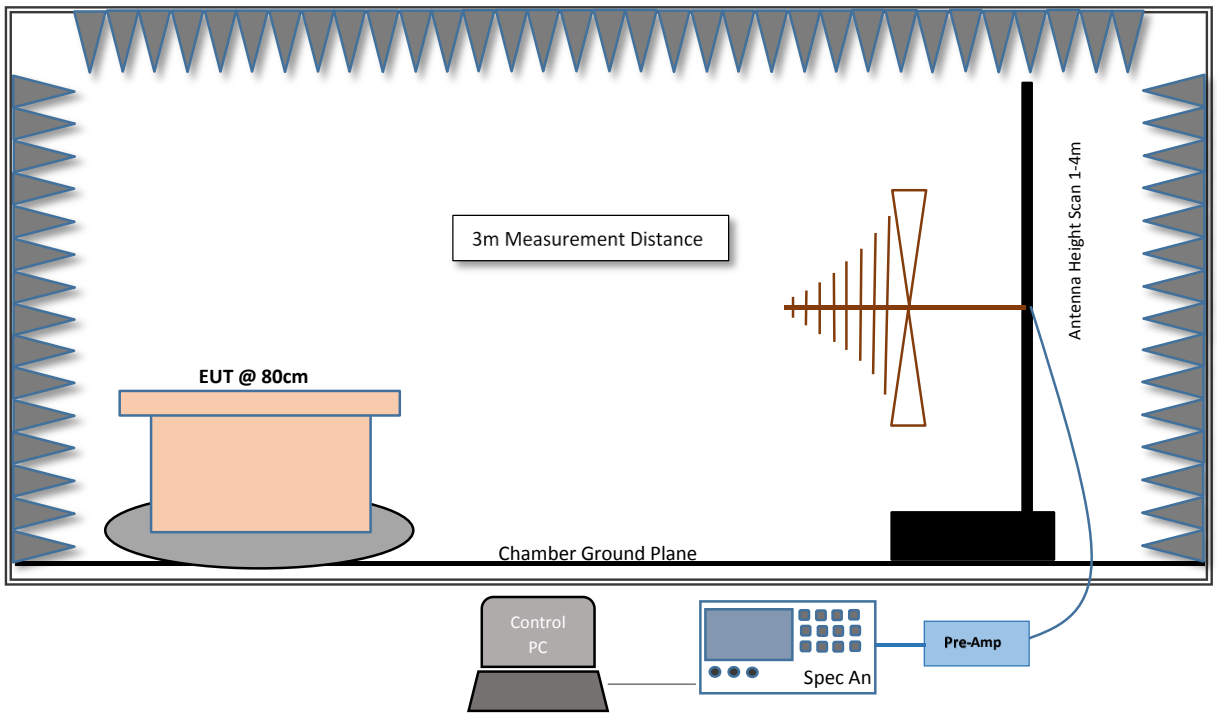


Fig.2. Test Setup for Radiated measurements in 30MHz- 1GHz Range

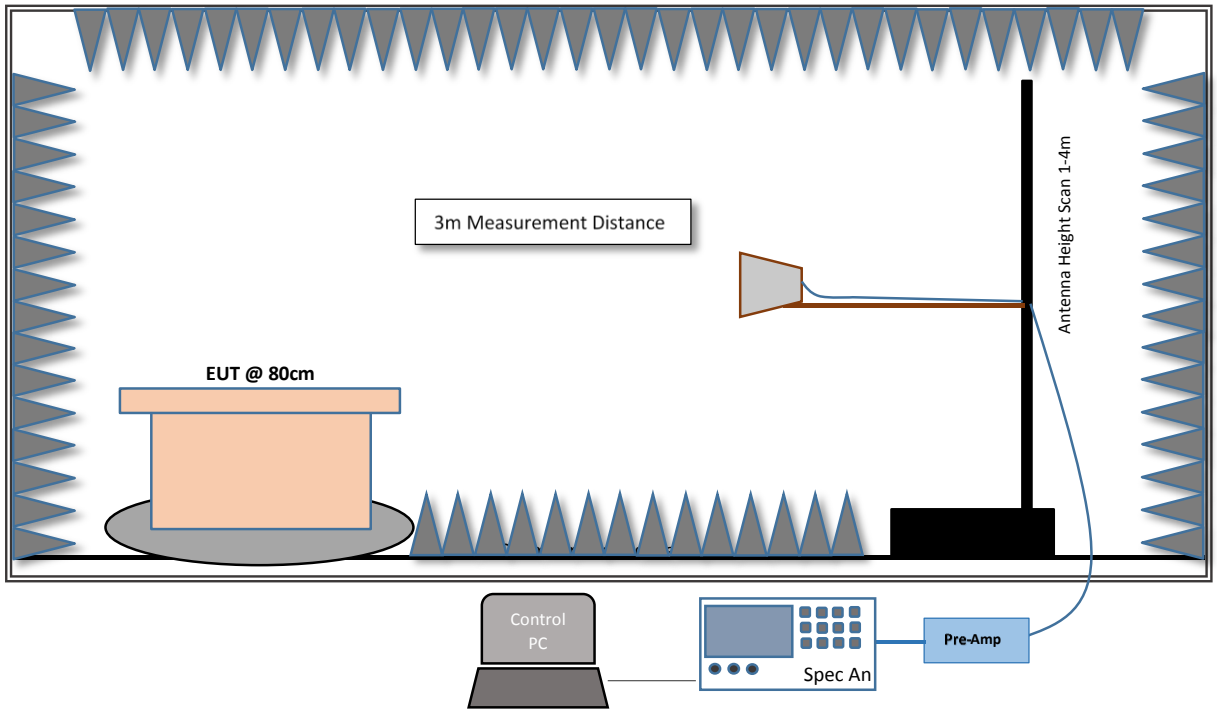


Fig.3. Test Setup for Radiated measurements in 1GHz- 18GHz Range

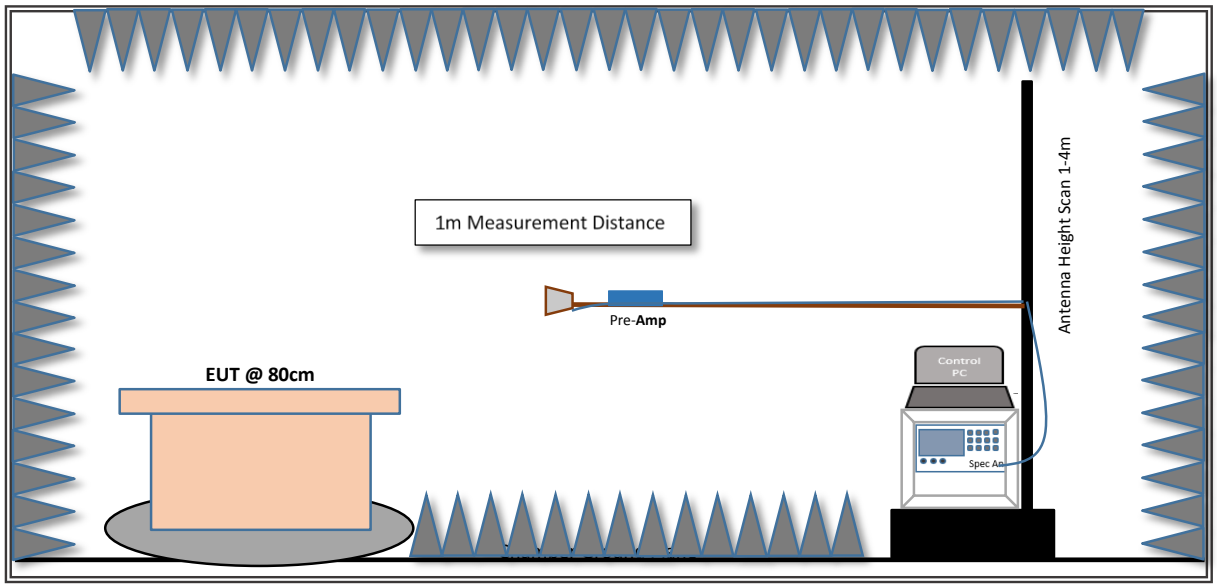


Fig.4. Test Setup for Radiated measurements >18GHz

9 Test Results- Conducted

9.1 20dB Bandwidth

9.1.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (a)(1)(iii)

9.1.2 Test Method:

Measurements are performed according to the procedure defined in DA 00-705 'Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems'

Spectrum analyzer settings:

The Occupied Bandwidth function on the spectrum analyzer was used to measure 20dB BW with the settings below:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

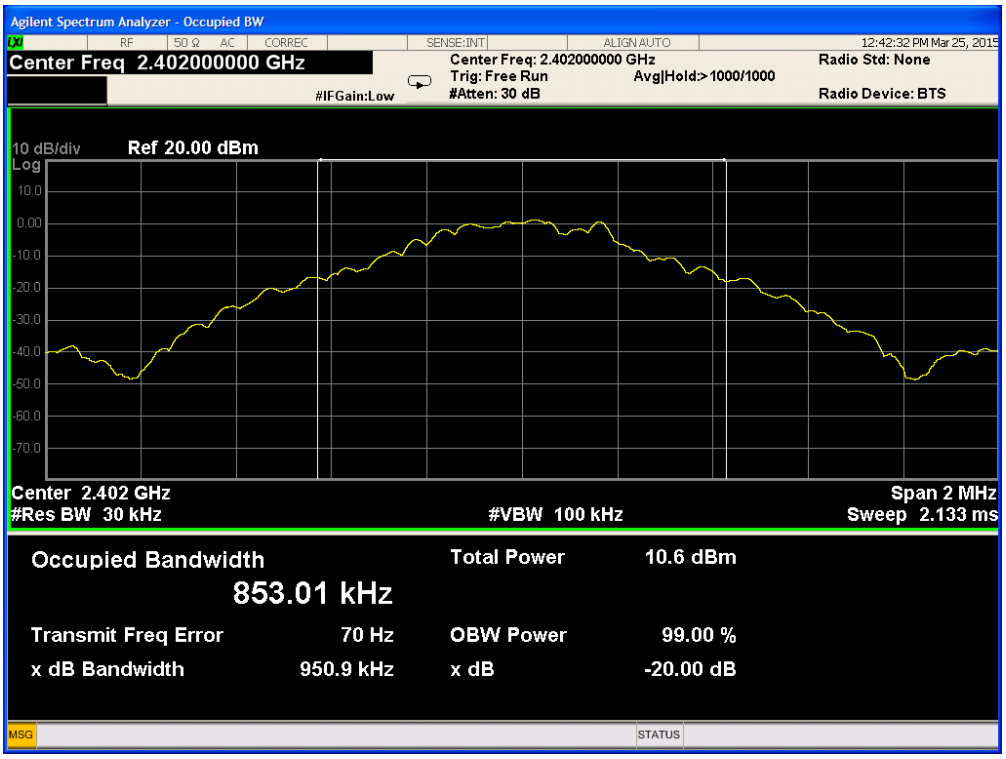
9.1.3 Limits:

The Limit is 1MHz unless there are more than 15 non-overlapping channels.

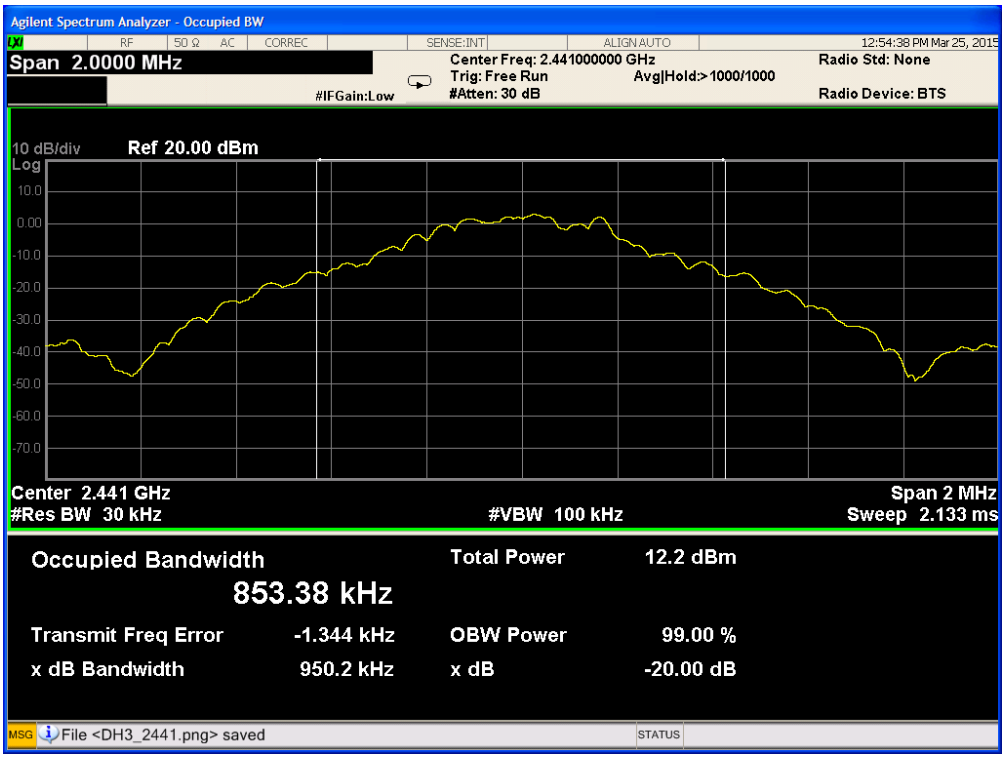
9.1.4 Test Results:

Frequency (MHz)	Mode	Data Rate (Mbps)	Channel No.	20 dB Bandwidth (kHz)
2402	1-DH5	1	0	950.9
2441	1-DH5	1	39	950.2
2480	1-DH5	1	78	951.3
2402	2-DH5	2	0	1284
2441	2-DH5	2	39	1284
2480	2-DH5	2	78	1283
2402	3-DH5	3	0	1298
2441	3-DH5	3	39	1297
2480	3-DH5	3	78	1296

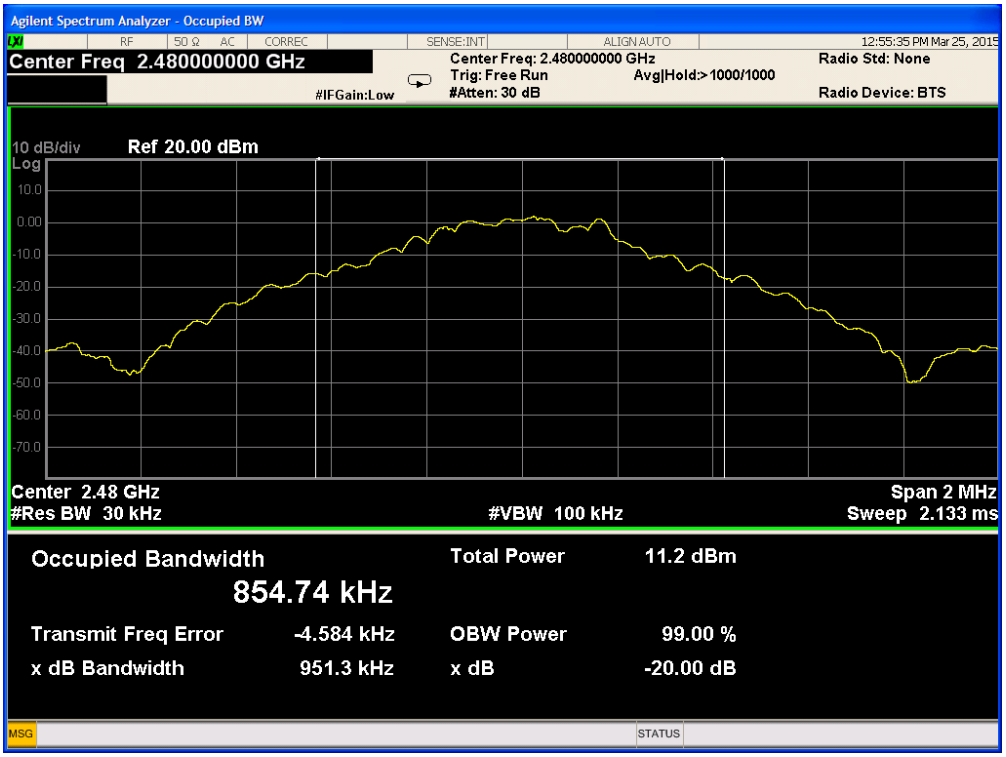
9.1.5 Test Data:



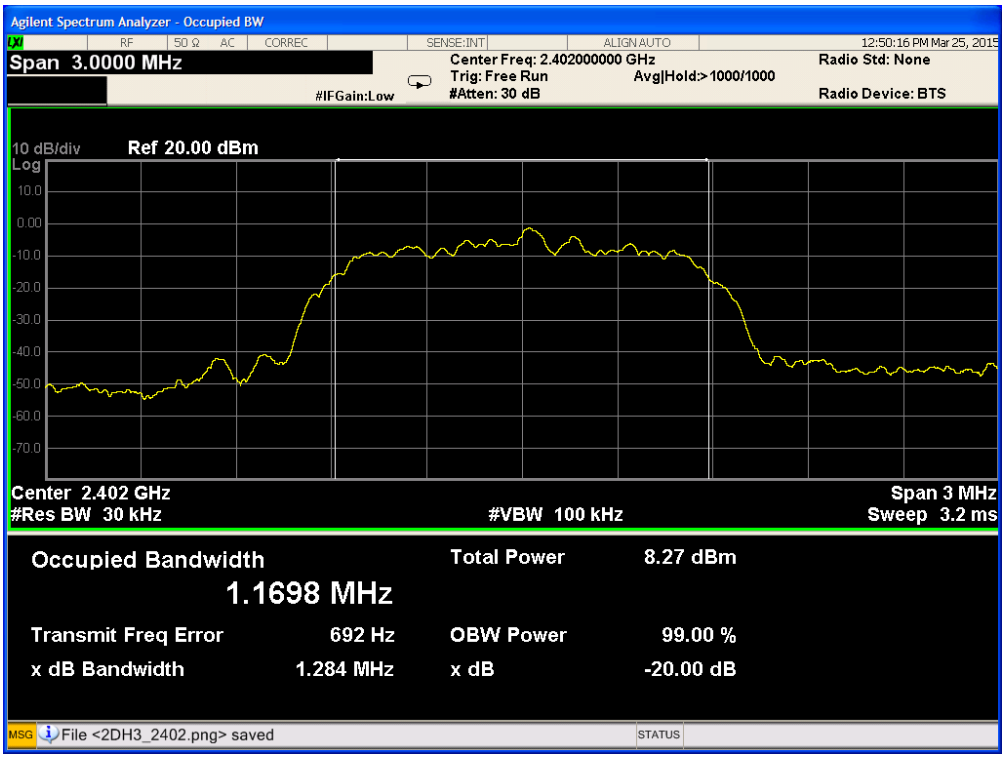
Plot 9-1. 20dB Bandwidth (Ch. 0, 1-DH5)



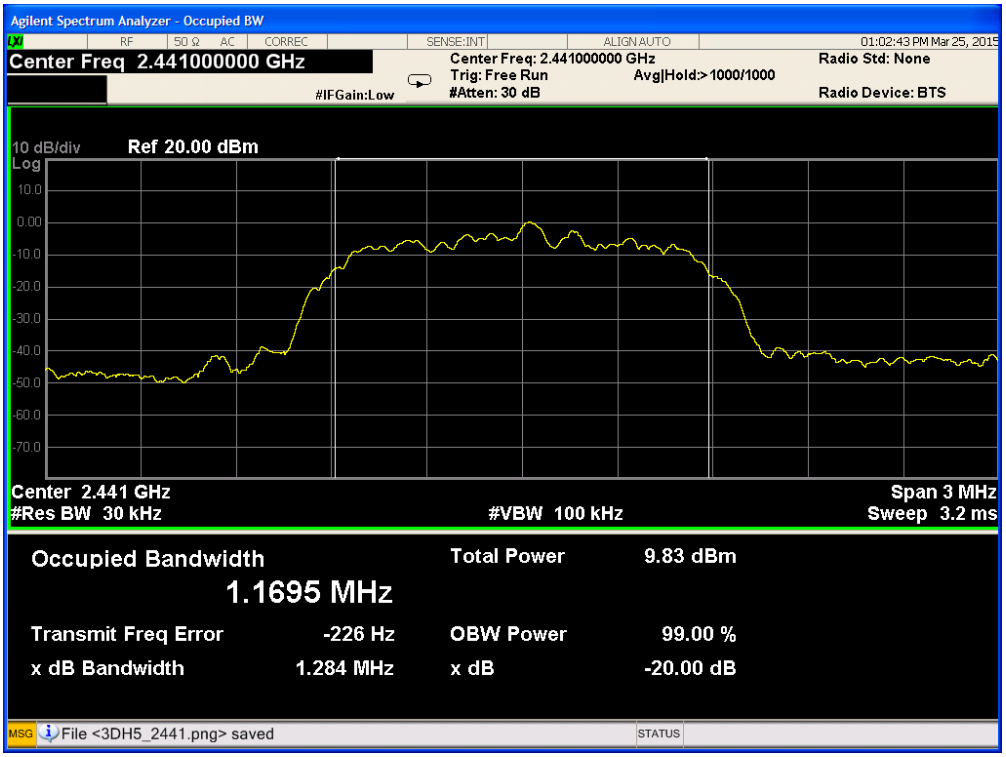
Plot 9-2. 20dB Bandwidth (Ch. 39, 1-DH5)



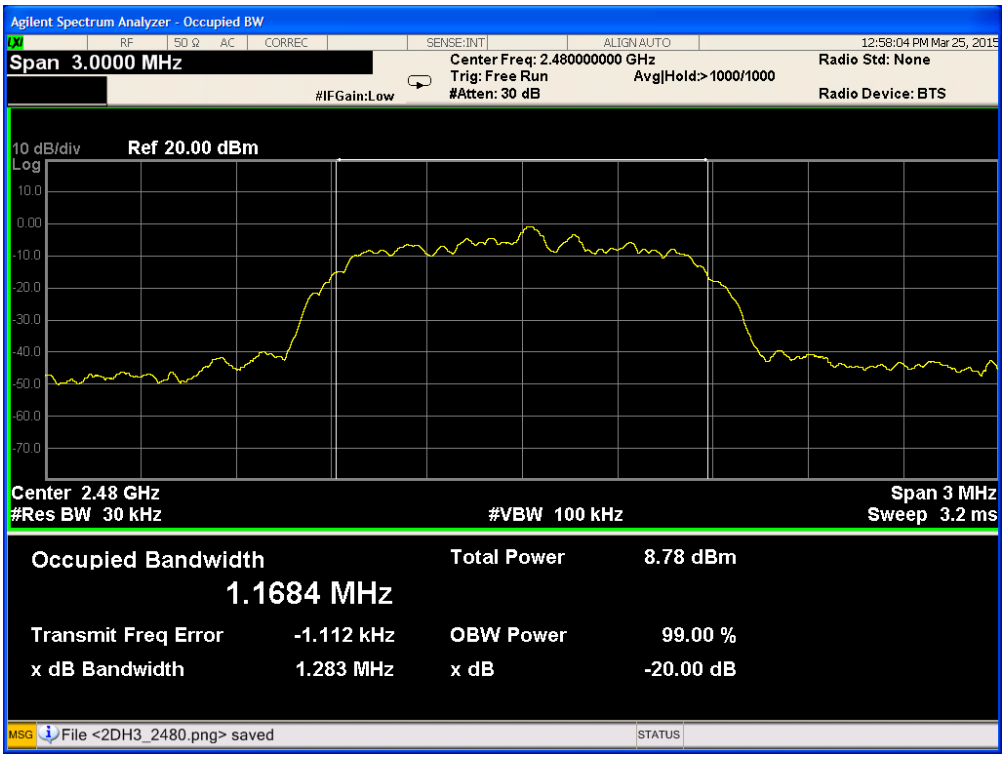
Plot 9-3. 20dB Bandwidth (Ch. 78, 1-DH5)



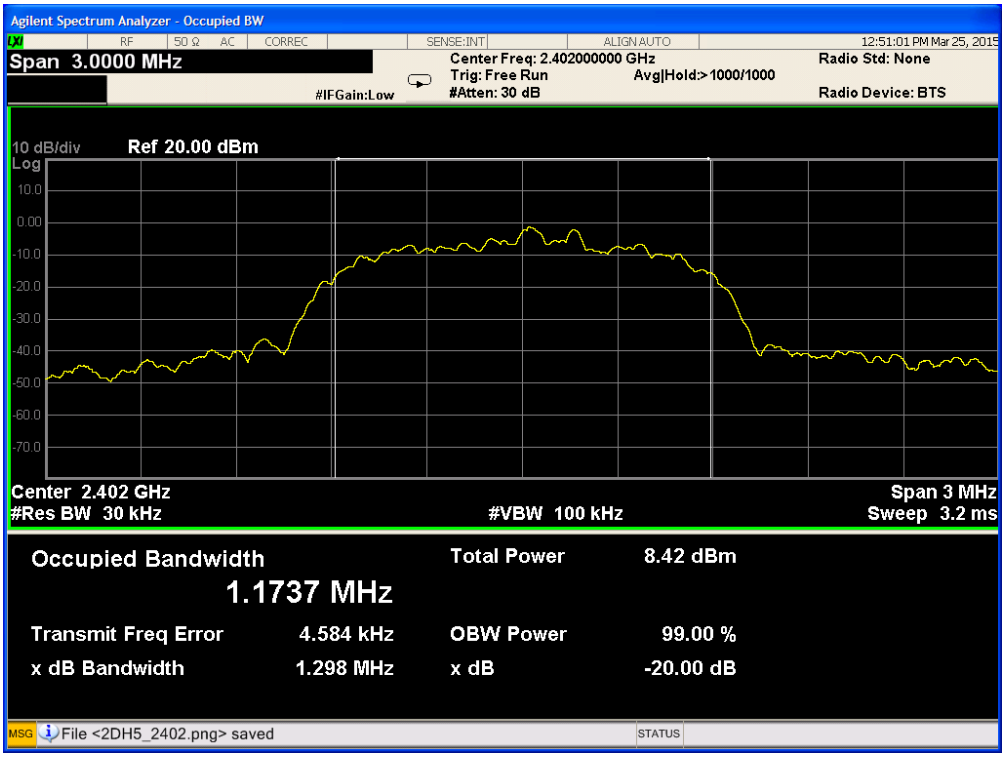
Plot 9-4. 20dB Bandwidth (Ch. 0, 2-DH5)



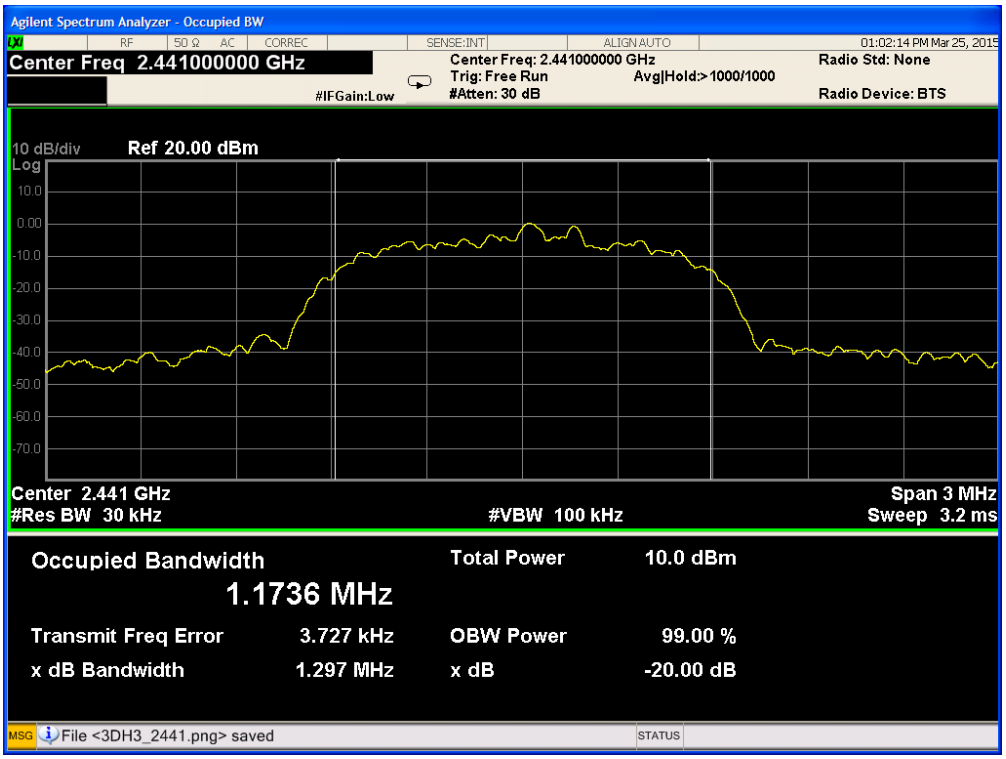
Plot 9-5. 20dB Bandwidth (Ch. 39, 2-DH5)



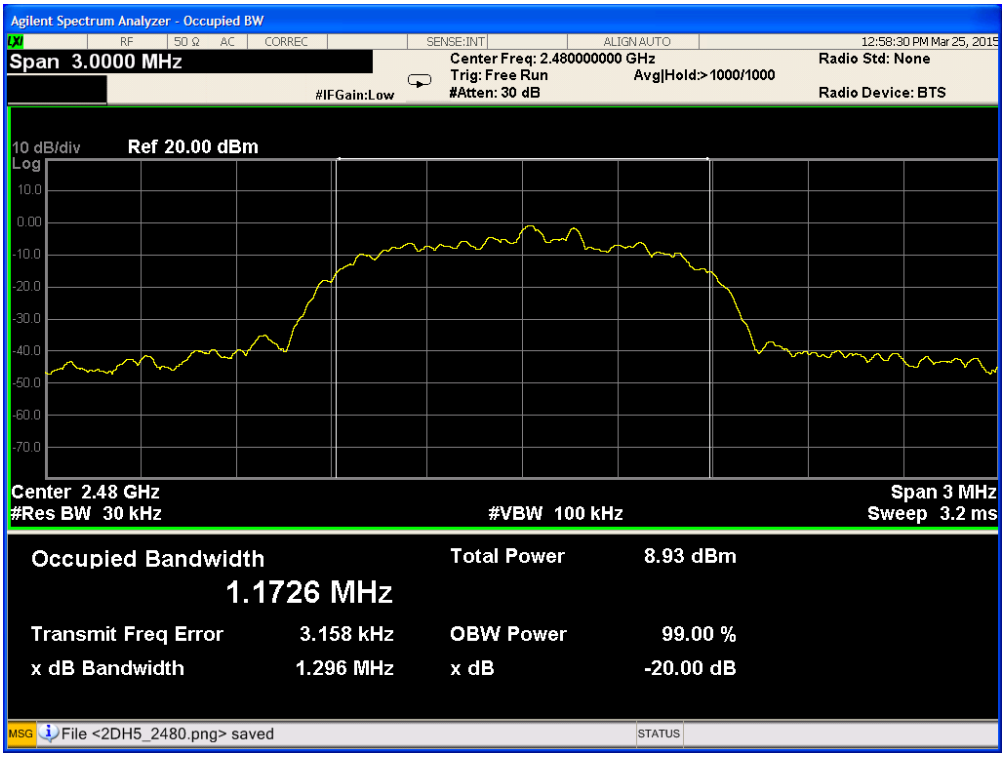
Plot 9-6. 20dB Bandwidth (Ch. 78, 2-DH5)



Plot 9-7. 20dB Bandwidth (Ch. 0, 3-DH5)



Plot 9-8. 20dB Bandwidth (Ch. 39, 3-DH5)



Plot 9-9. 20dB Bandwidth (Ch. 78, 3-DH5)

9.2 Output Power

9.2.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (b)(1)

9.2.2 Test Method:

Spectrum analyzer settings:

For Peak Powers:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured= 3MHz
VBW ≥ 3 x RBW= 50 MHz
Sweep = auto
Detector function = peak
Trace = max hold
The trace was allowed to stabilize. A Marker was set to the peak of the emission. The indicated level is the peak output power.

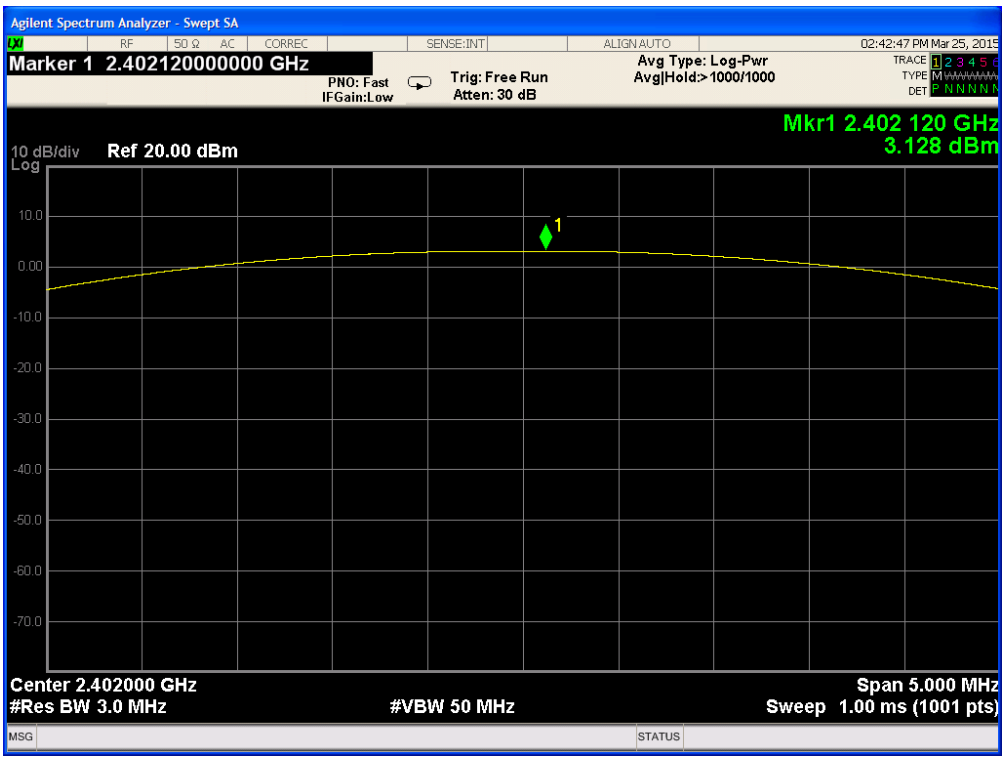
9.2.3 Limits:

1 Watt if ≥ 75 non-overlapping channels.

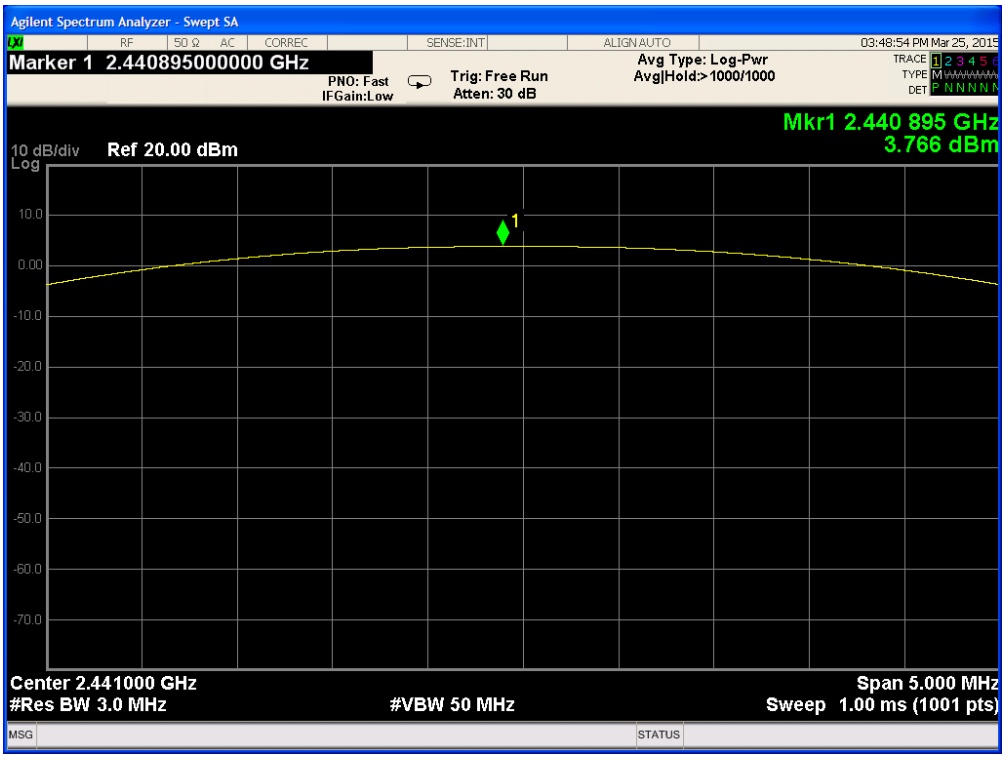
9.2.4 Test Results:

Frequency (MHz)	Mode	Data Rate (Mbps)	Channel No.	Peak Power (dBm)	Peak Power (W)
2402	1-DH5	1	0	3.128	0.002
2441	1-DH5	1	39	3.766	0.002
2480	1-DH5	1	78	2.788	0.002
2402	2-DH5	2	0	2.668	0.002
2441	2-DH5	2	39	3.166	0.002
2480	2-DH5	2	78	2.166	0.002
2402	3-DH5	3	0	2.930	0.002
2441	3-DH5	3	39	3.484	0.002
2480	3-DH5	3	78	2.497	0.002

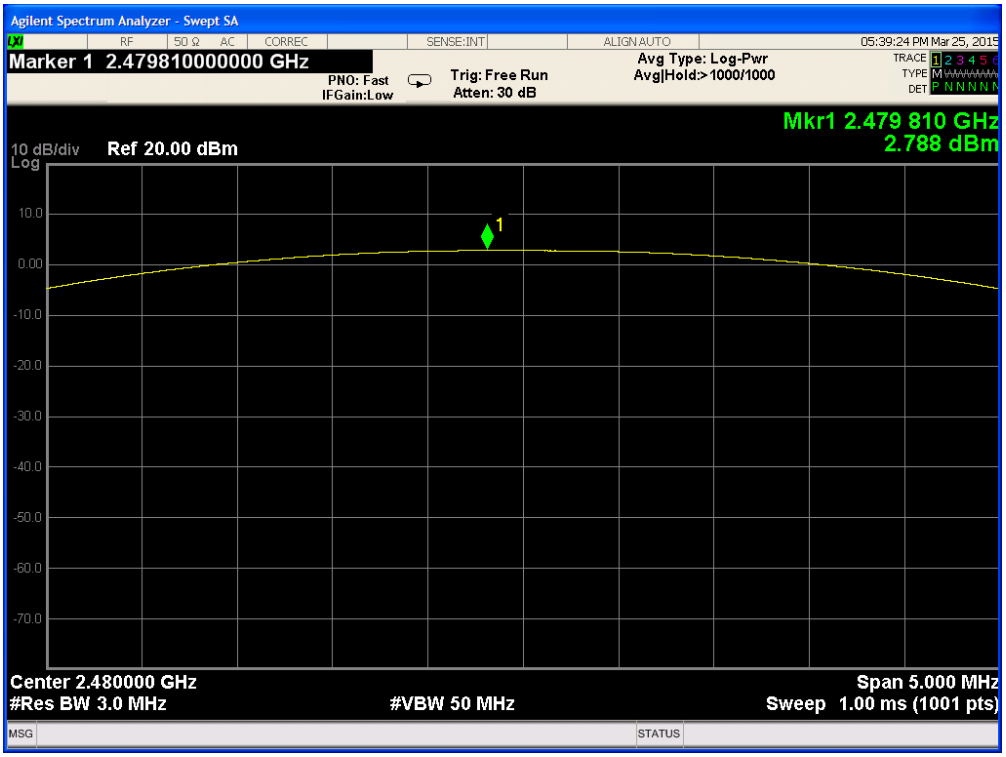
9.2.5 Test Data:



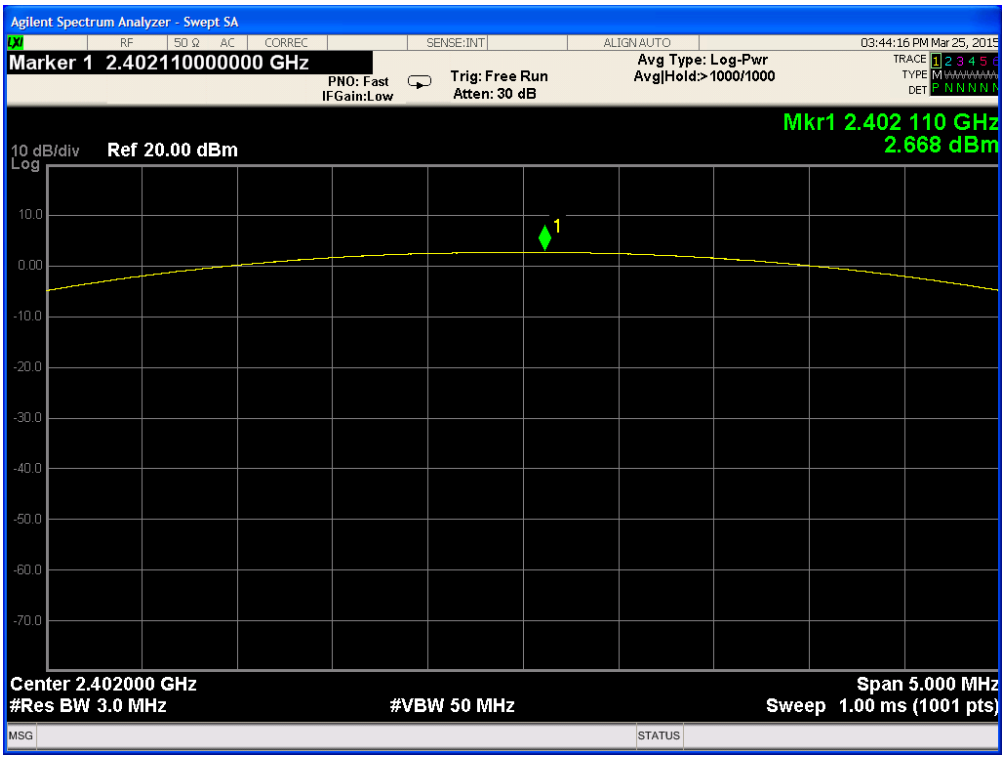
Plot 9-10. Peak Power (Ch. 0, 1-DH5)



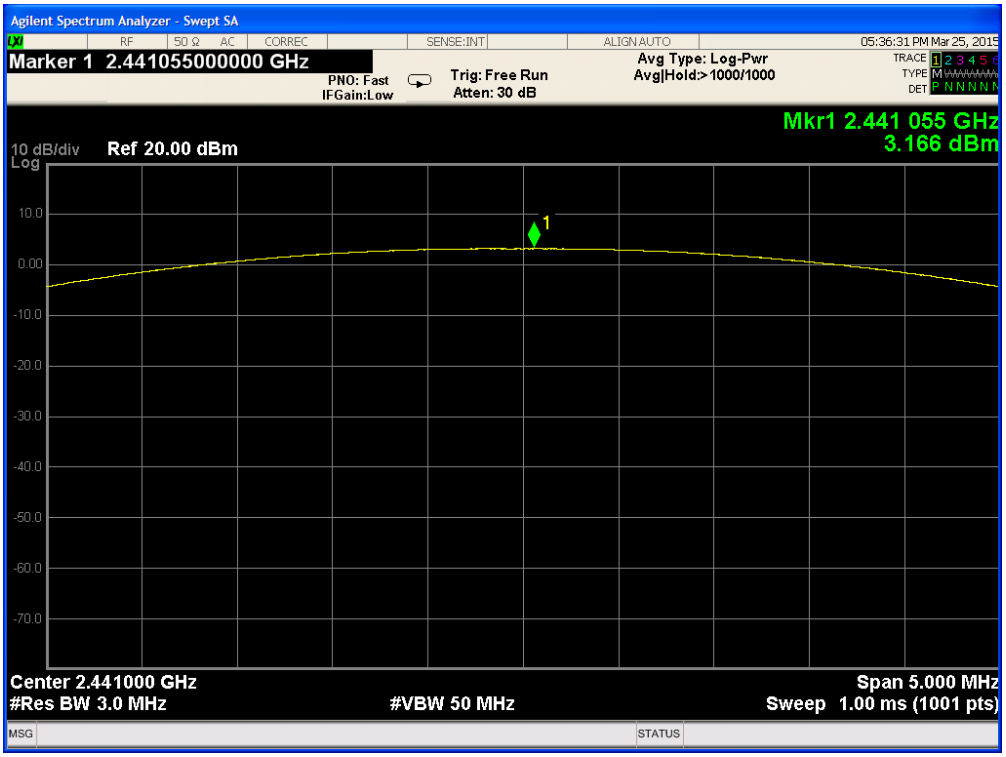
Plot 9-11. Peak Power (Ch. 39, 1-DH5)



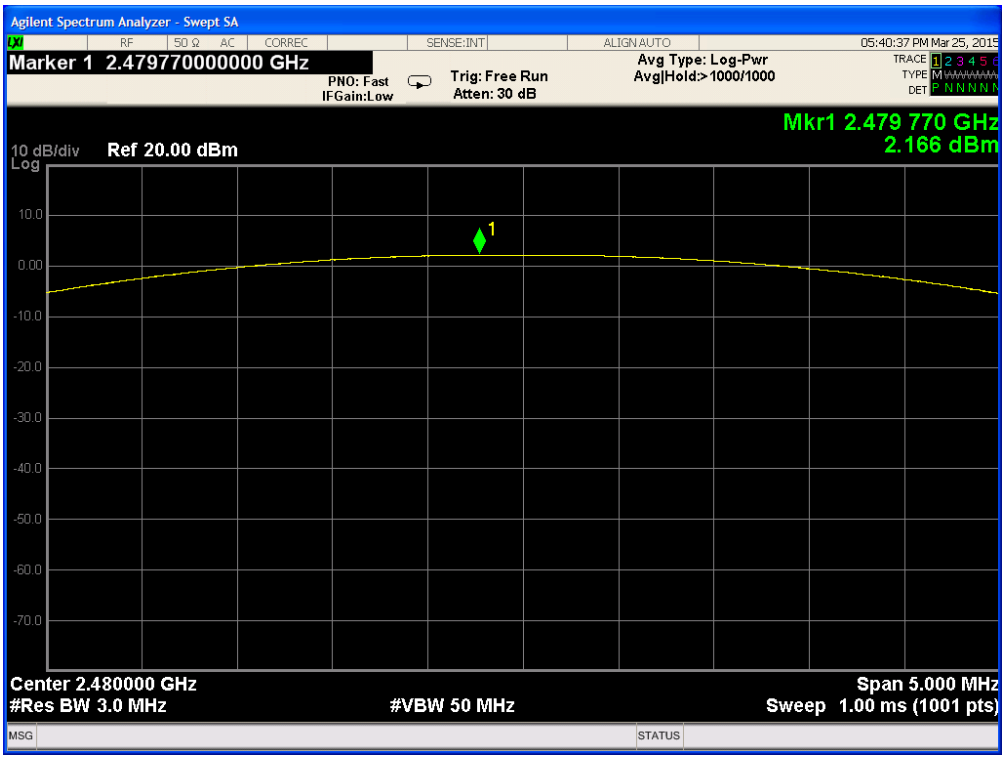
Plot 9-12. Peak Power (Ch. 78, 1-DH5)



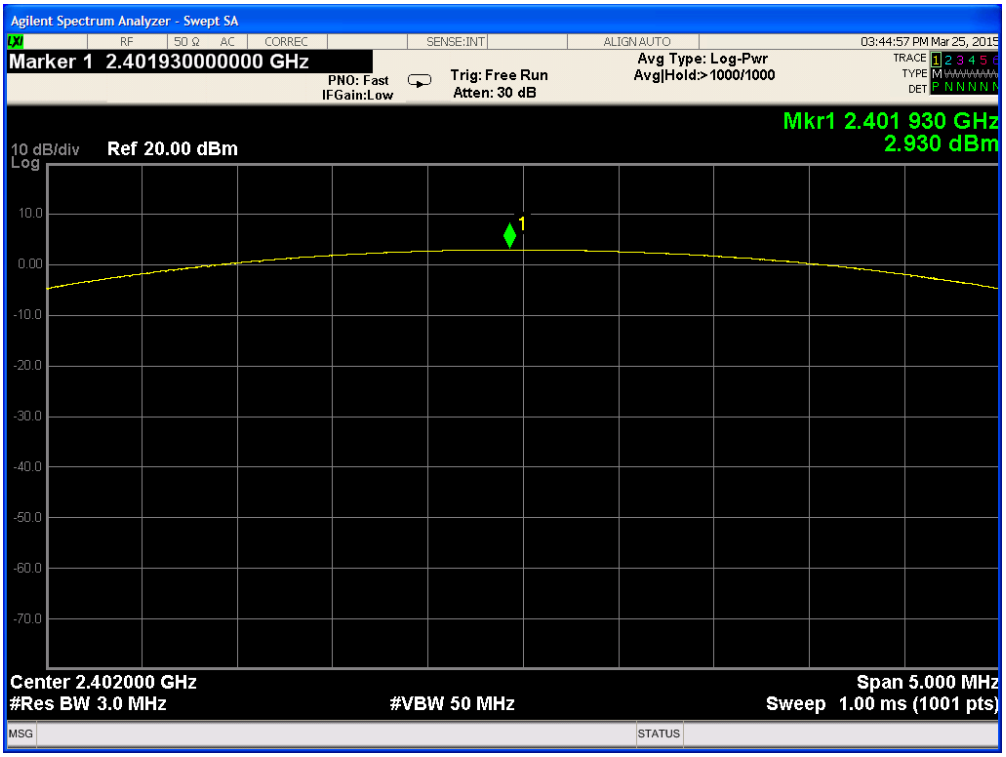
Plot 9-13. Peak Power (Ch. 0, 2-DH5)



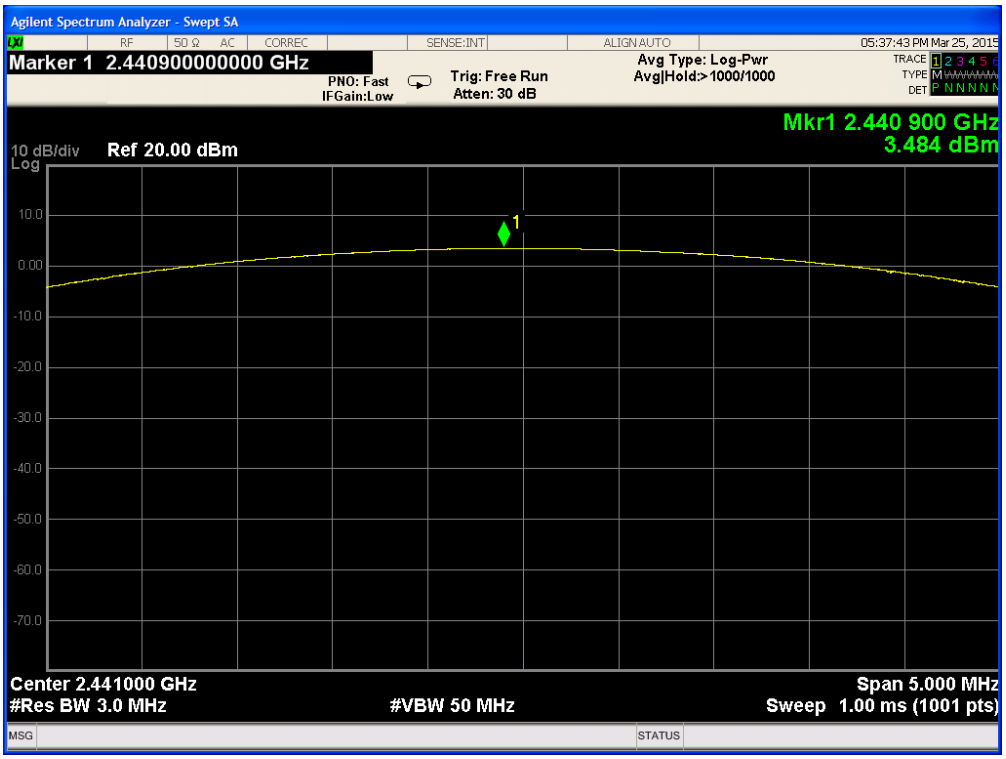
Plot 9-14. Peak Power (Ch. 39, 2-DH5)



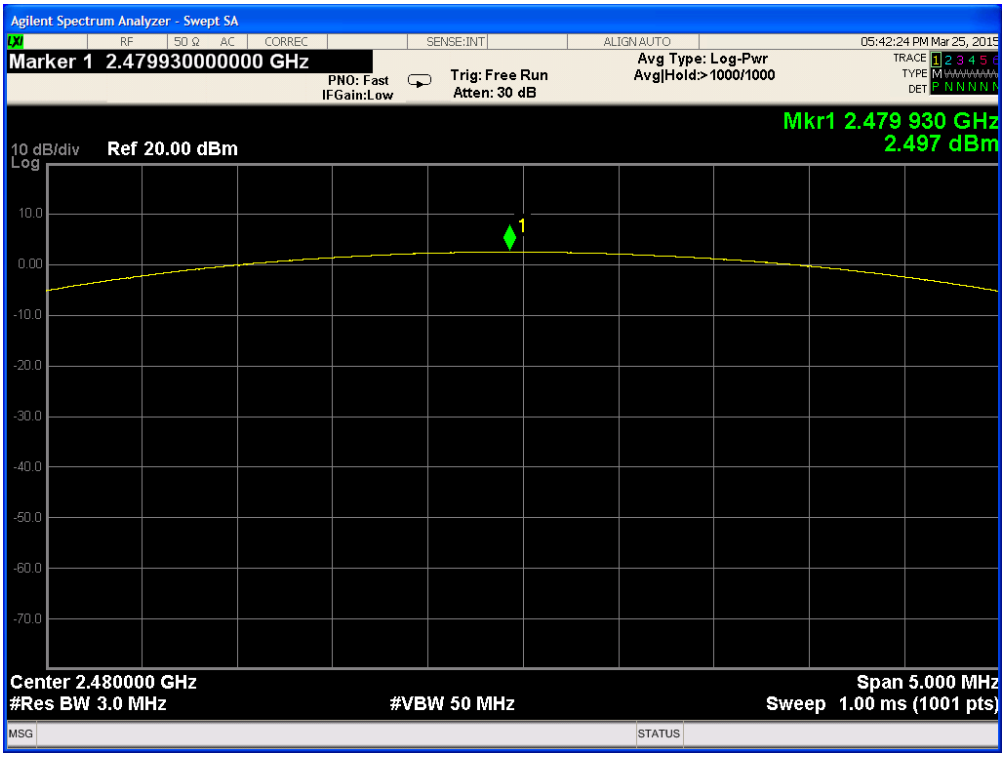
Plot 9-15. Peak Power (Ch. 78, 2-DH5)



Plot 9-16. Peak Power (Ch. 0, 3-DH5)



Plot 9-17. Peak Power (Ch. 39, 3-DH5)



Plot 9-18. Peak Power (Ch. 78, 3-DH5)

9.3 Channel Spacing

9.3.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (a)(1)

9.3.2 Test Method:

The EUT was in pseudorandom hopping mode with the separation of two peaks measured using the delta marker.

Spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) > 1% of the span
Video (or Average) Bandwidth (VBW) ≥ 3 x RBW
Sweep = auto
Detector function = peak
Trace = max hold
The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

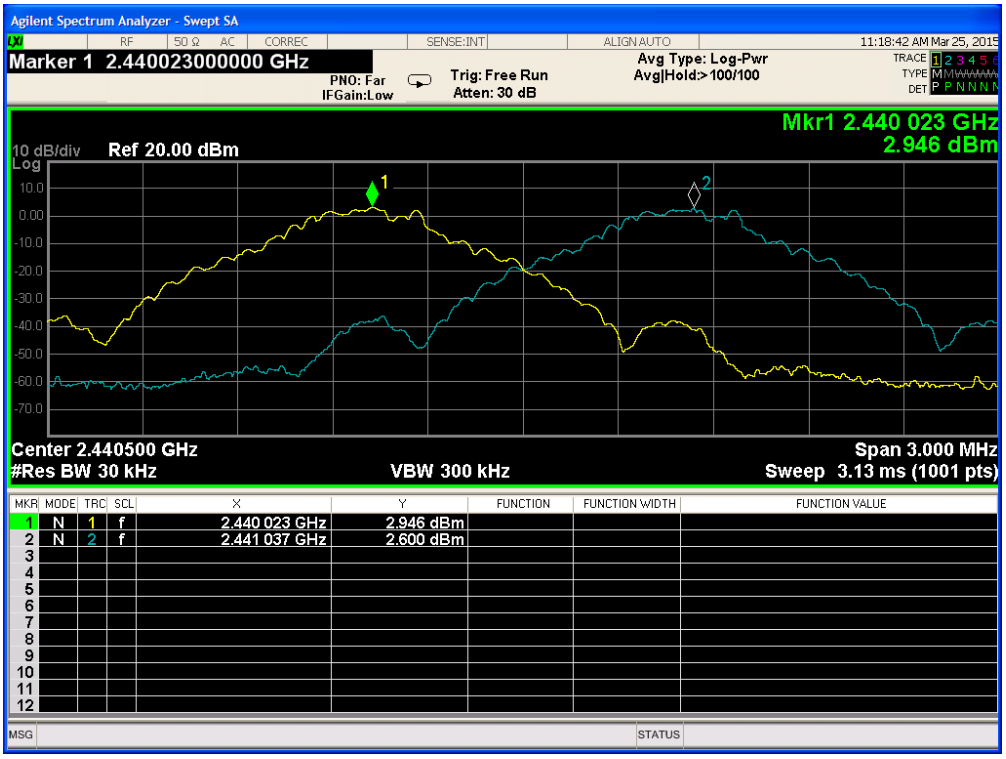
9.3.3 Limits:

The channel carrier frequencies must be separated by 25kHz or the 20dB BW of the hopping channel whichever is greater. If the output power is less than 125mW, then the channel separation can be 2/3 of the 20dB bandwidth or 25kHz whichever is greater.

9.3.4 Test Results:

Pass.
Minimum channel separation= 1.008 MHz

9.3.5 Test Data:



Plot 9-19 Channel Separation

9.4 Number of Hopping Frequencies

9.4.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (a)(1)(iii)

9.4.2 Test Method:

The EUT had its hopping function enabled.

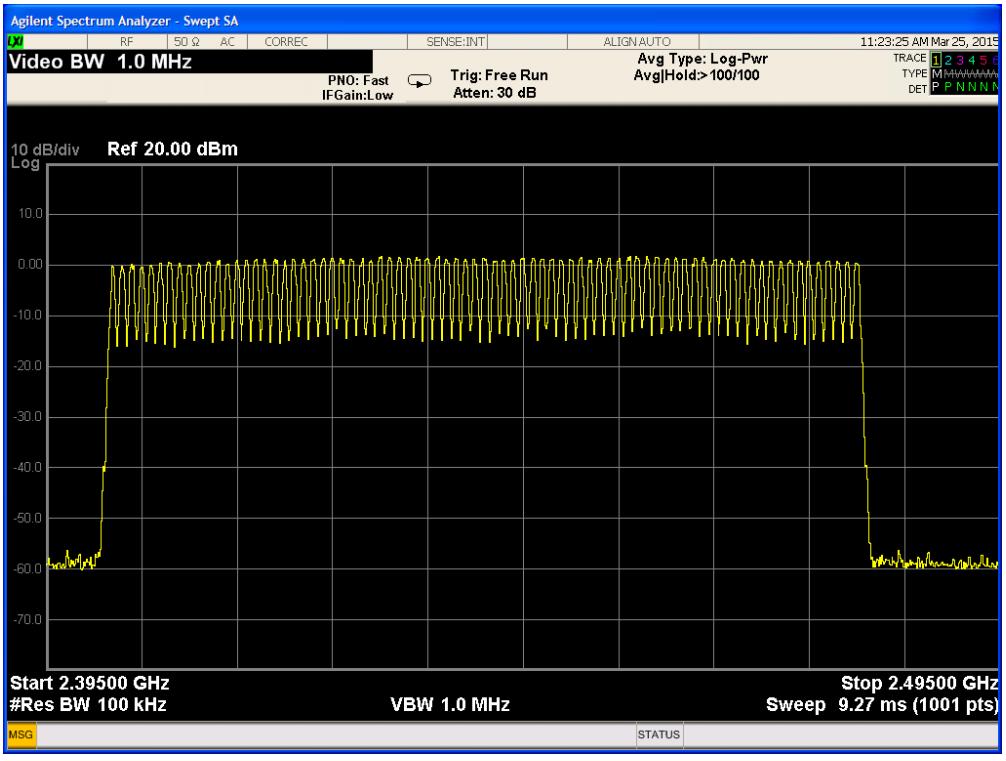
Spectrum analyzer settings:

Span = the frequency band of operation
RBW ≥ 1% of the span
VBW ≥ 3 x RBW
Sweep = auto
Detector function = peak
Trace = max hold
The trace was allowed to stabilize and the number of channels was counted.

9.4.3 Limits:

The minimum number of hopping channels required is 15 hopping channels.

9.4.4 Test Data:



Plot 9-20. Number of Hopping Channels

9.5 Dwell Time

9.5.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (a)(1)(iii)

9.5.2 Test Method:

The EUT had its hopping function enabled.

Spectrum analyzer settings:
Span = zero span, centered on a hopping channel
RBW = 1 MHz
VBW ≥ 3 x RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold

Dwell Time is measured with analyzer set to zero span at the middle channel and the trigger set to capture a burst. DH5 exhibited the longest burst time.
The dwell time limit is number of hopping channels * 400ms. For Bluetooth, 79 channels *400ms = 31.6 s.

9.5.3 Limits:

0.4s

9.5.4 Test Results:

Standard Bluetooth 1x/EDR has a channel hopping rate of 1600 hops/s.

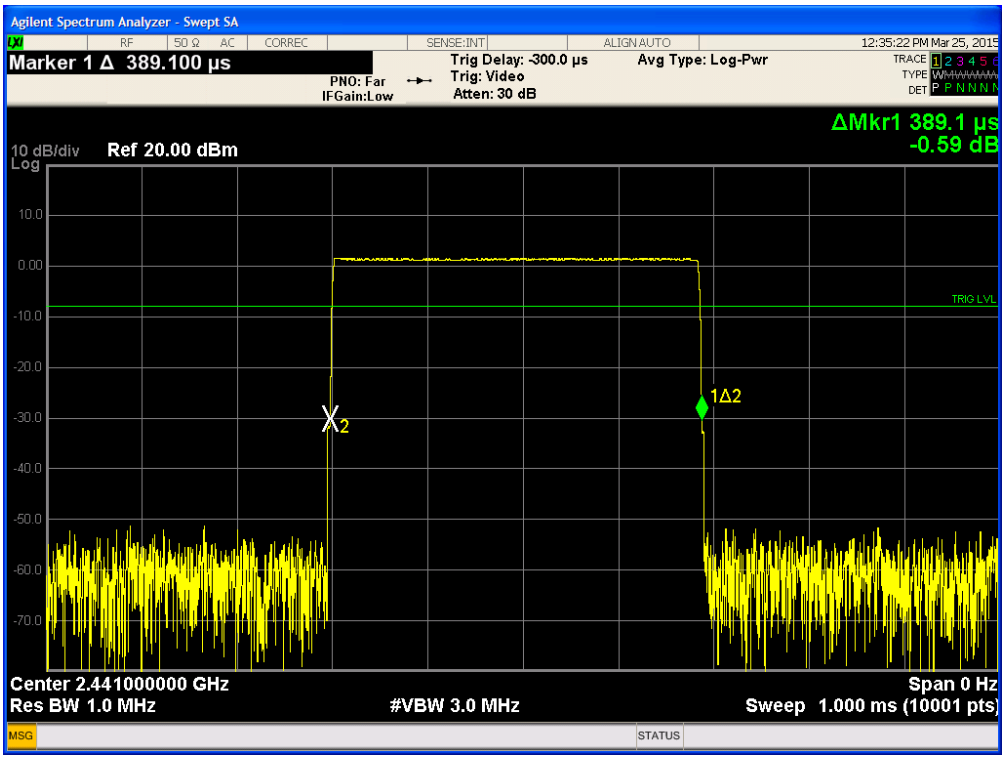
1x/EDR mode uses 5 transmit and 1 receive slots for a total of 6 slots.

Bluetooth is hopping at a rate of 1600/6 = 266.67 hops/s/slot. Then, 266.67 hops/s/79 channels = 3.38 hops/s for one channel.

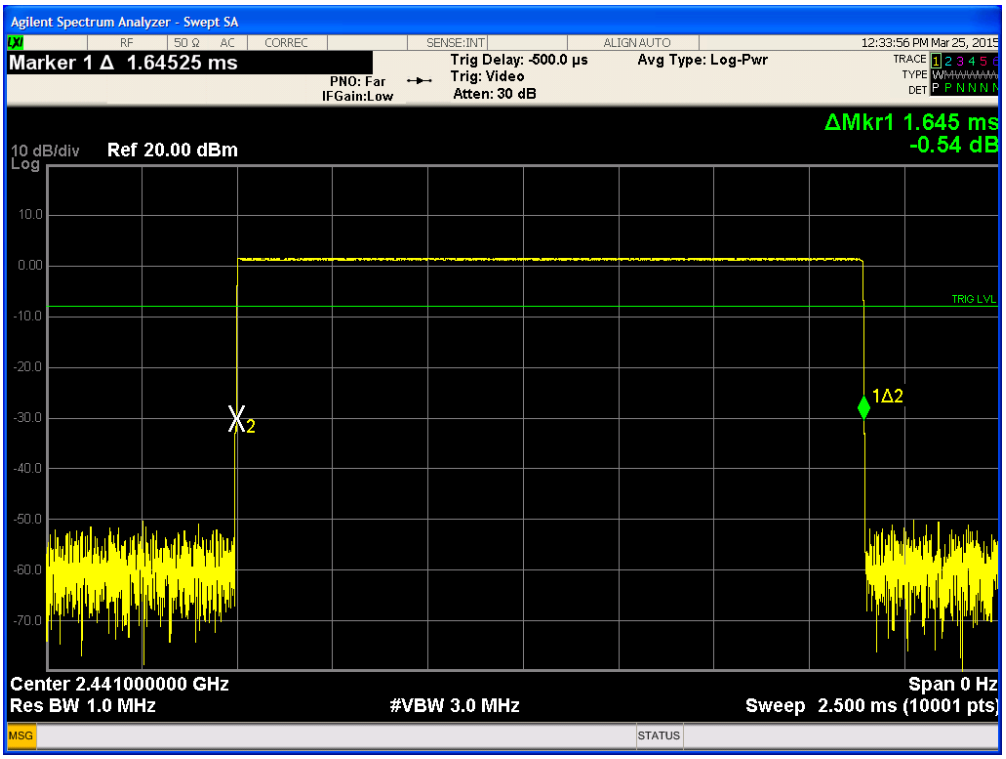
So the number of hops over a 31.6 s period is 3.38 hops/s * 31.6 s = 106.67 hops.

Worst case dwell time for one channel = 106.67 hops * Dwell Time = 106.67 hops * 2.896ms = 308.916ms.

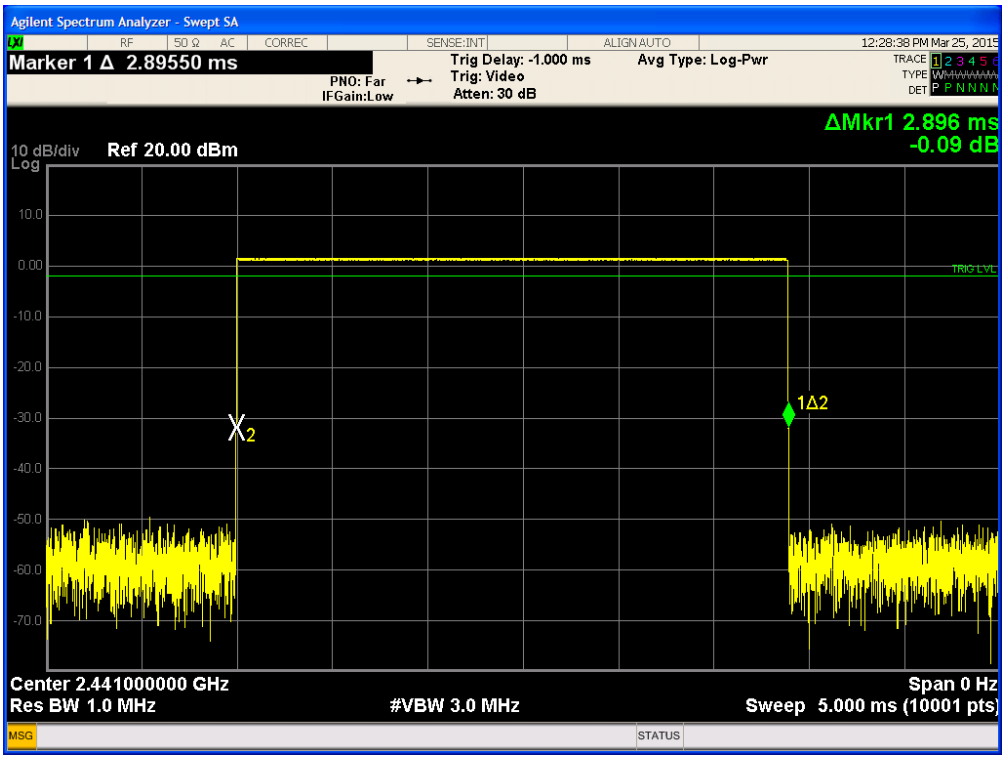
9.5.5 Test Data:



Plot 9-21. Dwell Time – DH1



Plot 9-22. Dwell Time – DH3



Plot 9-23 Dwell Time - DH5

9.6 Band Edge

9.6.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

9.6.2 Test Method:

Spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
RBW ≥ 1% of the span
VBW ≥ 3 x RBW
Sweep = auto
Detector function = peak
Trace = Max hold
The trace was allowed to stabilize. The market was set on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. The delta marker function was set and the marker-to-peak function moved to the peak of the in-band emission.

With the same instrument settings, the hopping function of the EUT was enabled and the trace was allowed to stabilize. The same procedure listed above was used to determine if any spurious emissions caused by the hopping function complied with the specified limit.

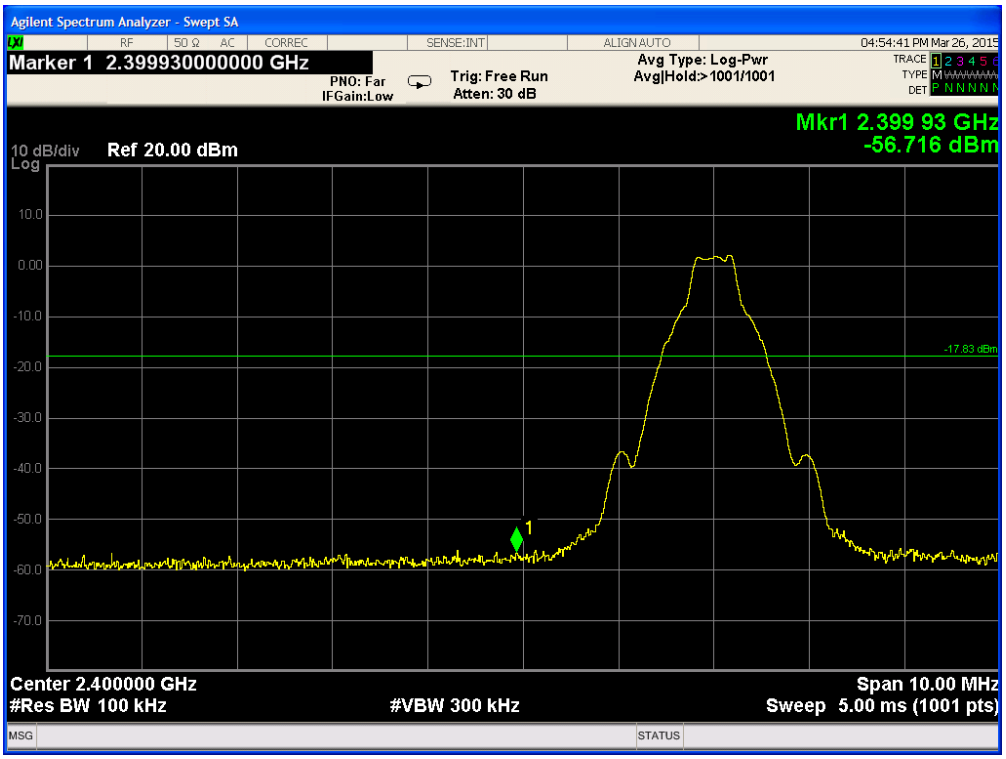
9.6.3 Limits:

The maximum level is 20dBc with measurements taken with the EUT in pseudorandom hopping mode and with hopping mode disabled.

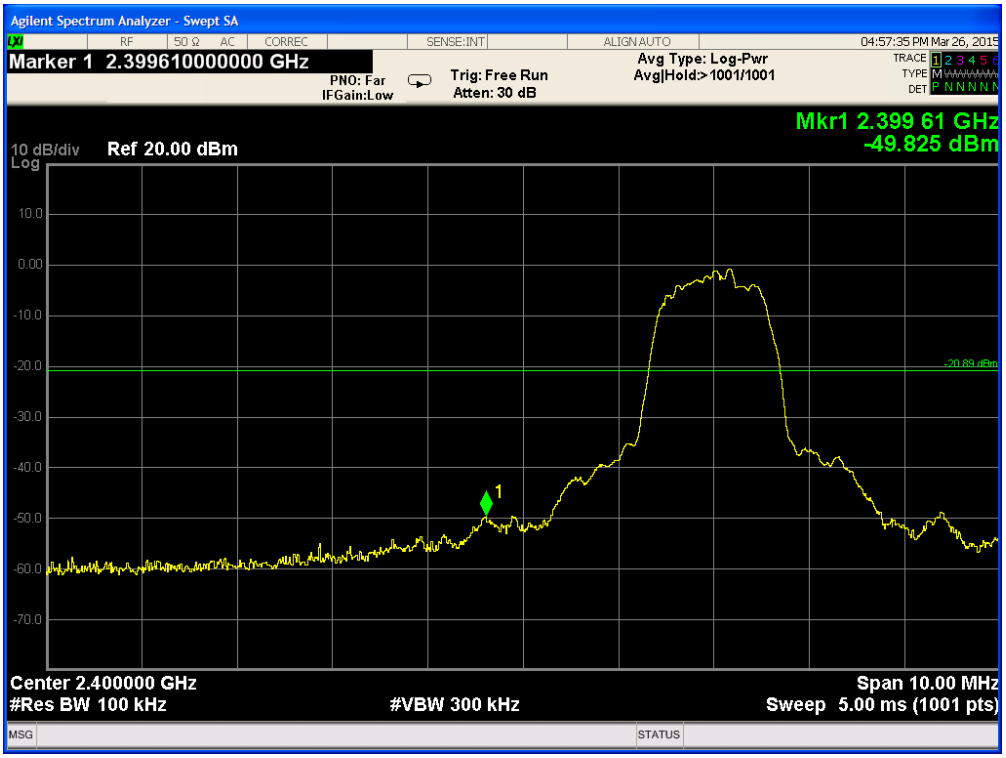
9.6.4 Test Results:

Pass.

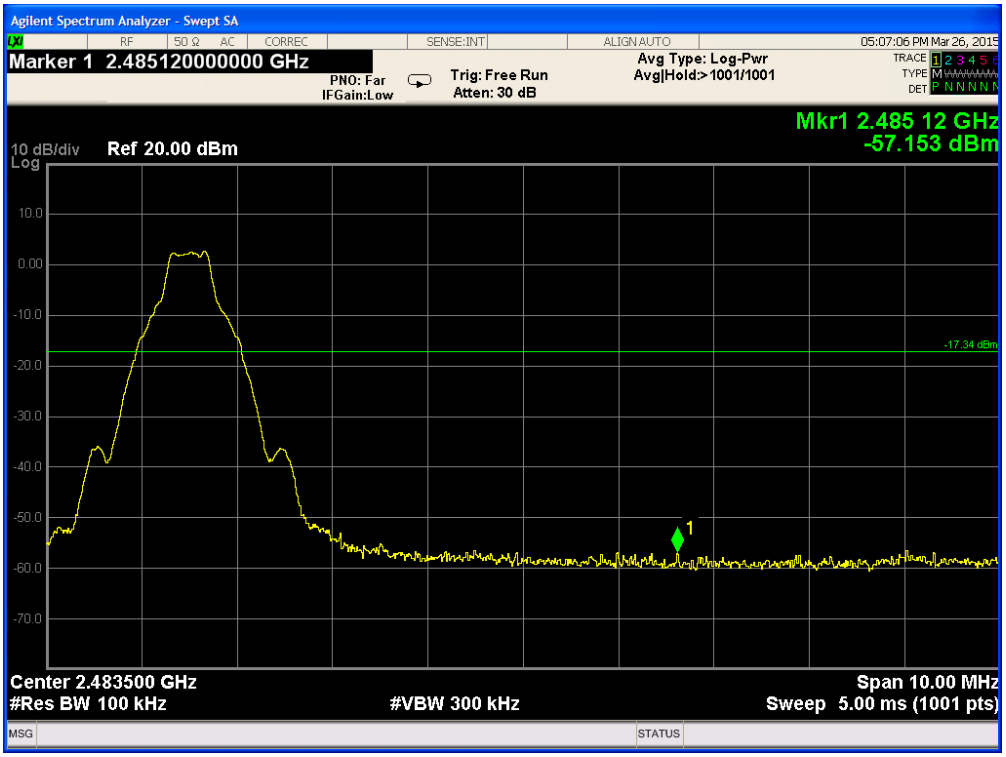
9.6.5 Test Data:



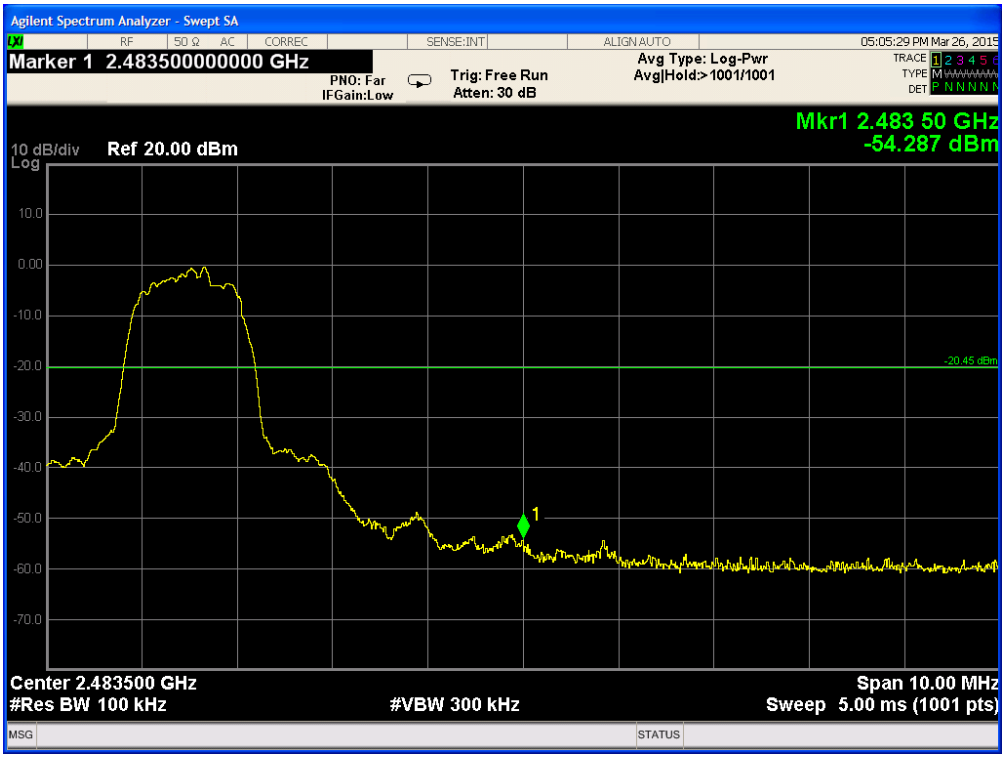
Plot 9-24. Low Bandedge: 1-DH5 Mode (Hopping disabled)



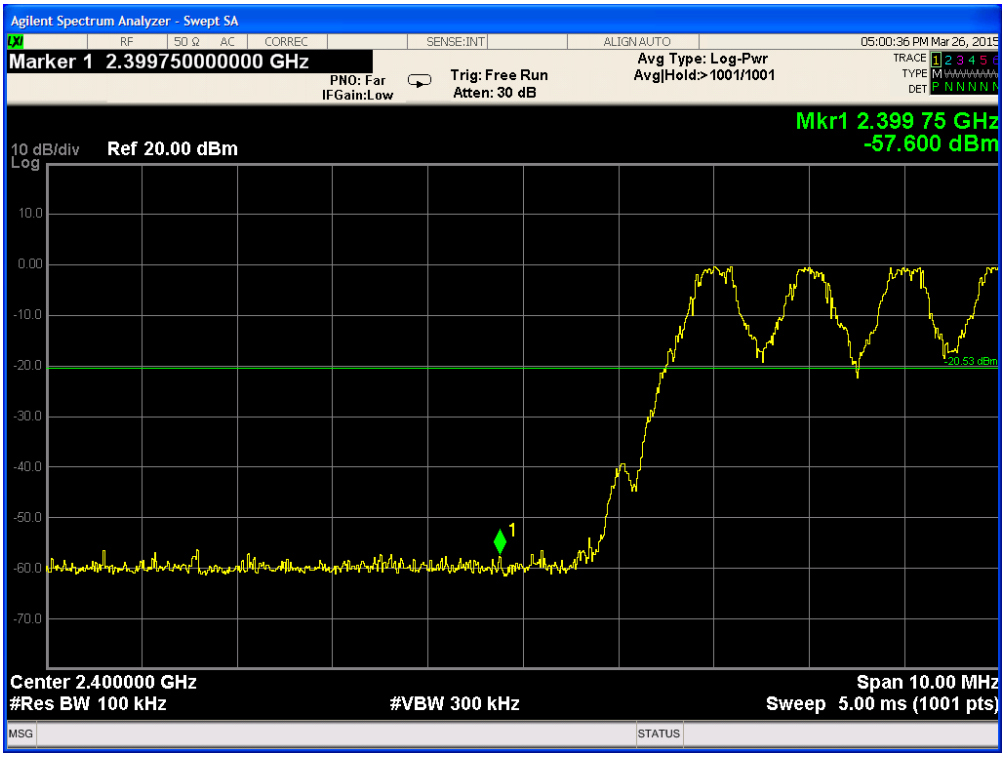
Plot 9-25. Low Bandedge: 3-DH5 Mode (Hopping disabled)



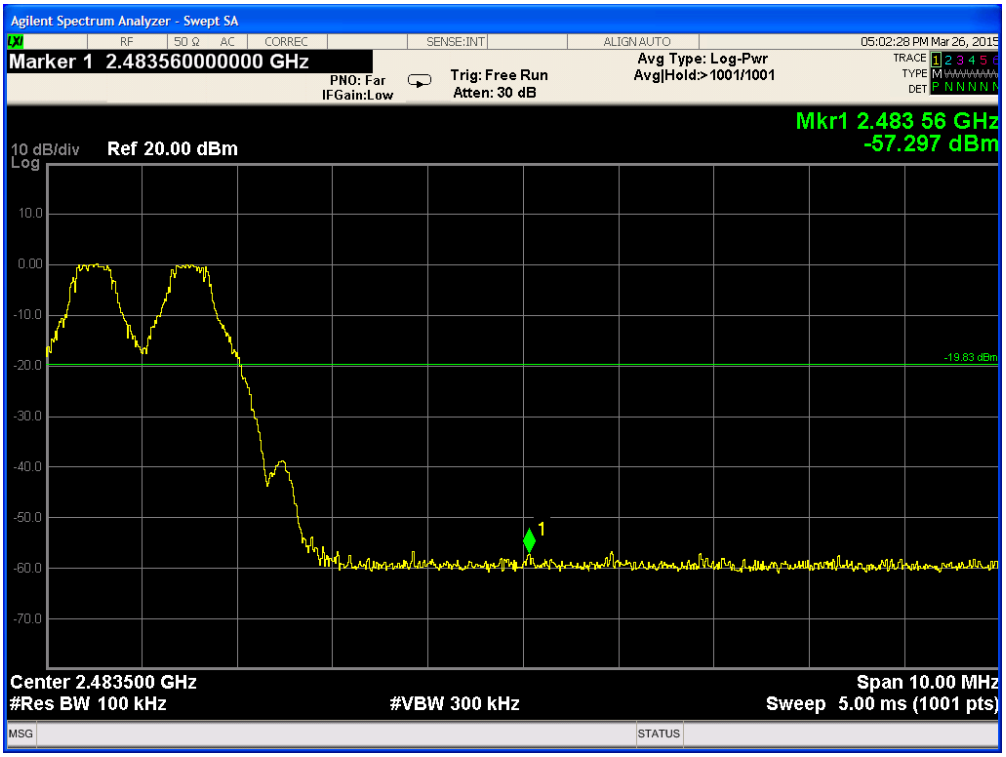
Plot 9-26. High Bandedge: 1-DH5 Mode (Hopping disabled)



Plot 9-17 High Bandedge: 3-DH5 Mode (Hopping disabled)



Plot 9-28. Low Bandedge (Hopping enabled)



Plot 9-29. High Bandedge (Hopping enabled)

9.7 Conducted Spurious Emissions

9.7.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

9.7.2 Test Method:

Spectrum analyzer settings:

Reference level measurements with 100kHz RBW settings are first performed in all modes of operation. The limit is defined at 20dB below the reference level reading.
Final spurious emissions measurements are performed as follows:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
RBW = 1 MHz
VBW ≥ 3 x RBW
Sweep = auto
Detector function = peak
Trace = max hold
The trace was allowed to stabilize. The marker was set on the peak of any spurious emission recorded. The level displayed had to comply with the limit specified.

9.7.3 Limits:

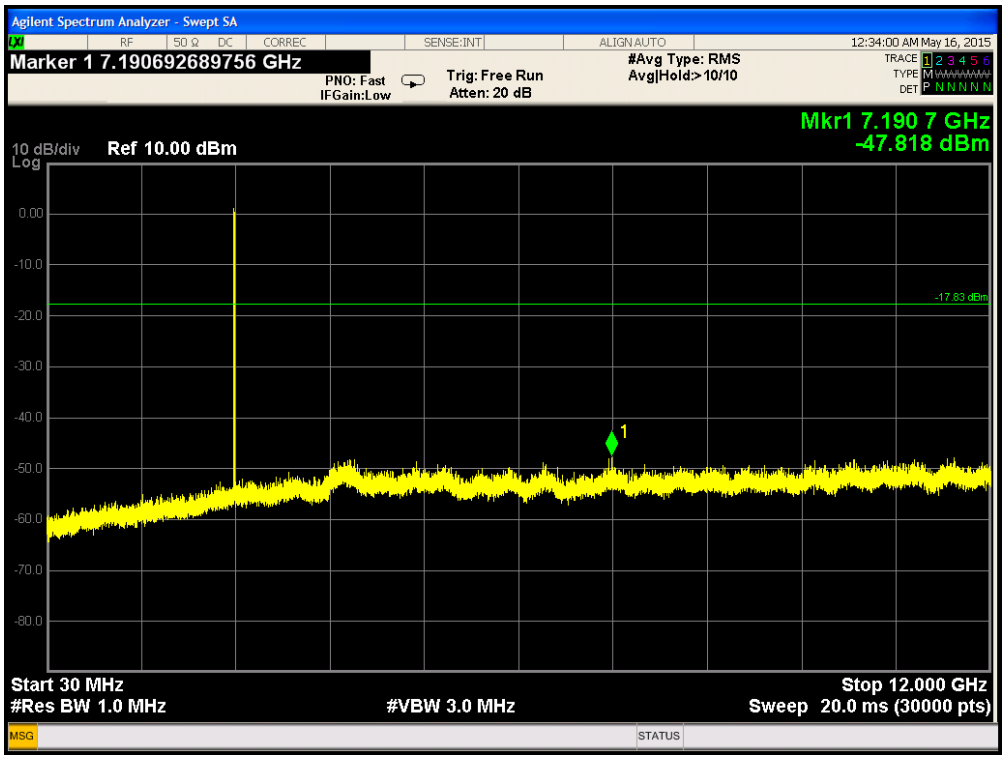
The maximum level is 20dBc.

9.7.4 Test Results:

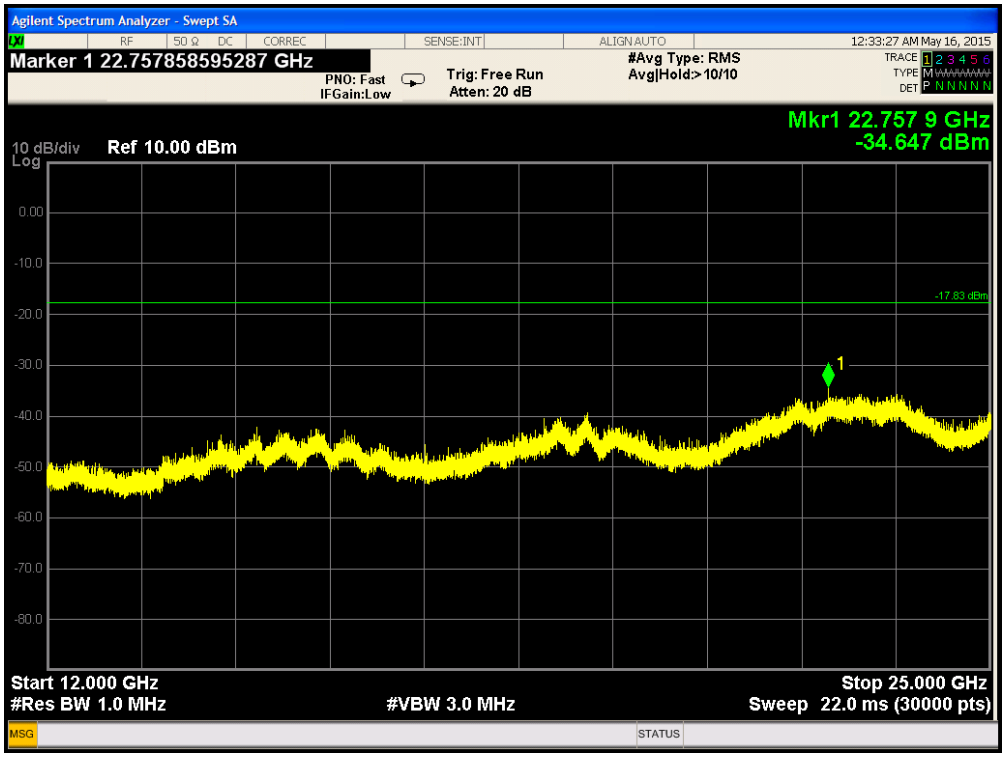
Pass

All spurious emissions below the limit at 1MHz RBW setting.

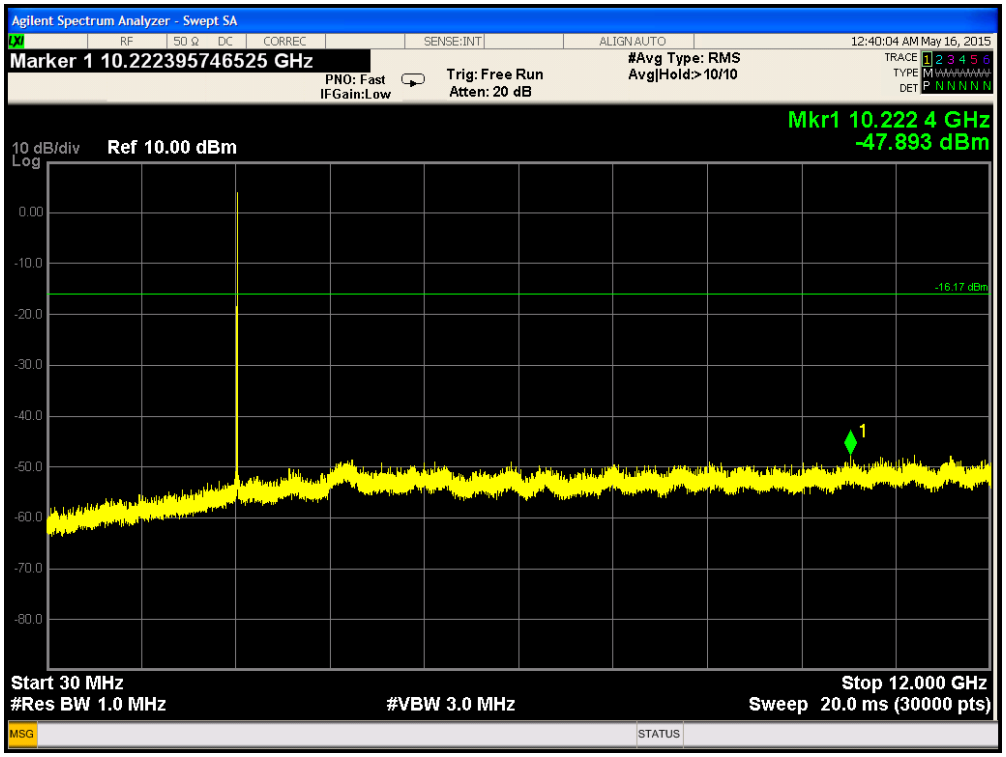
9.7.5 Test Data:



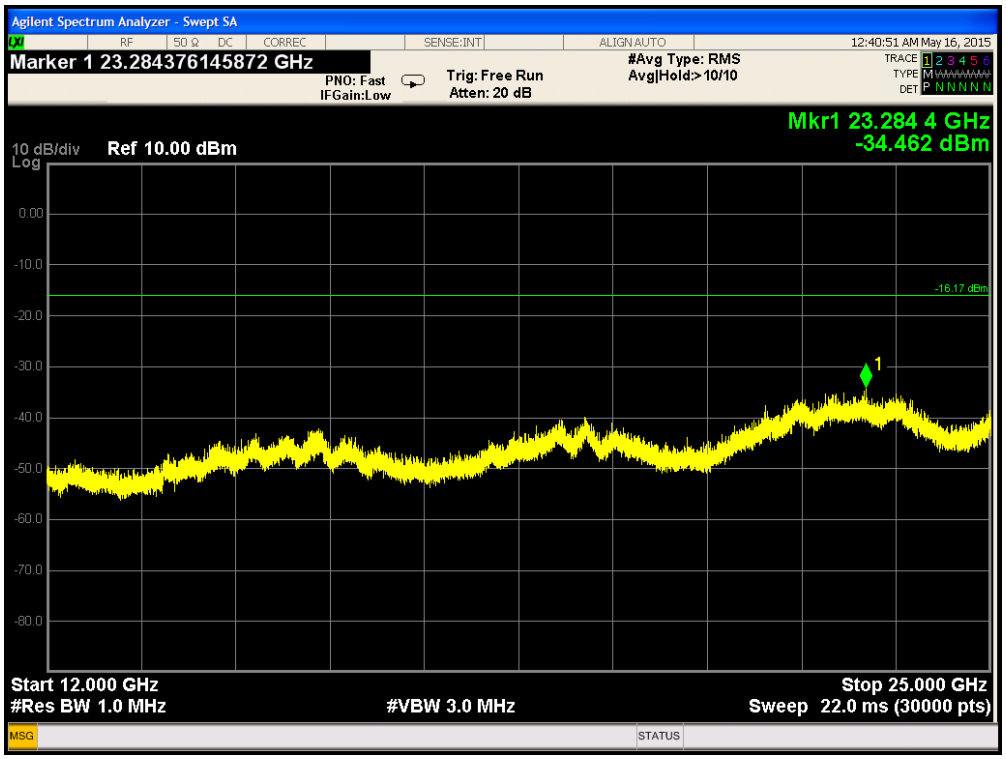
Plot 9-30. Conducted Spurious Emissions 30 MHz – 12 GHz: 1-DH5 Mode (Ch. 0)



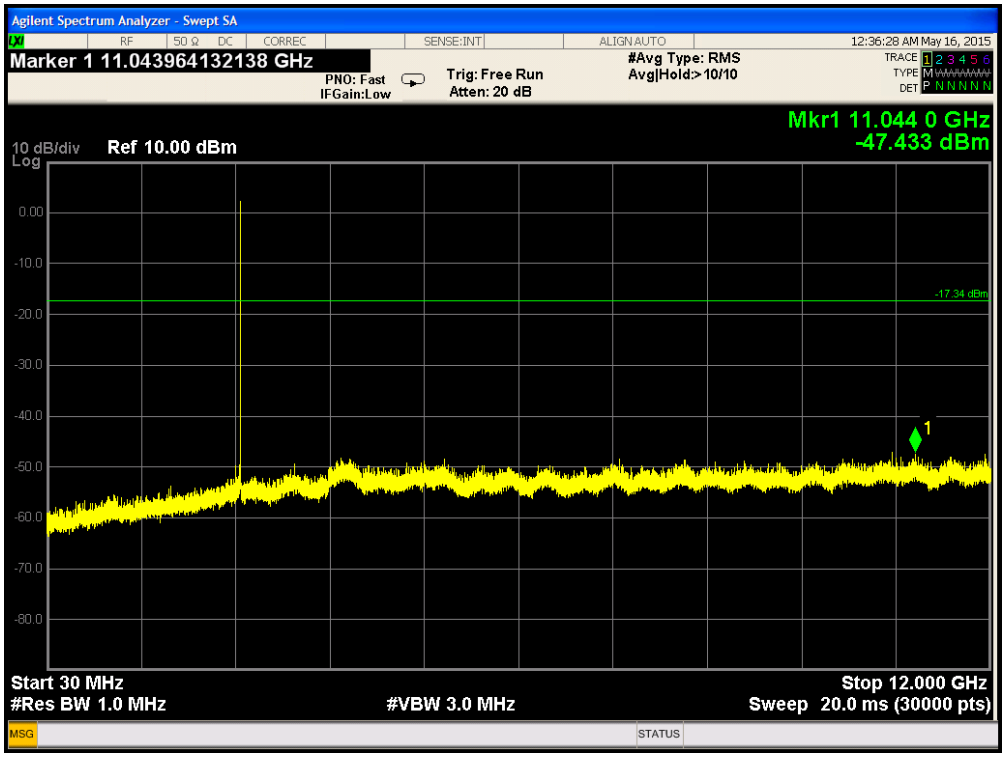
Plot 9-31. Conducted Spurious Emissions 12 – 25 GHz: 1-DH5 Mode (Ch. 0)



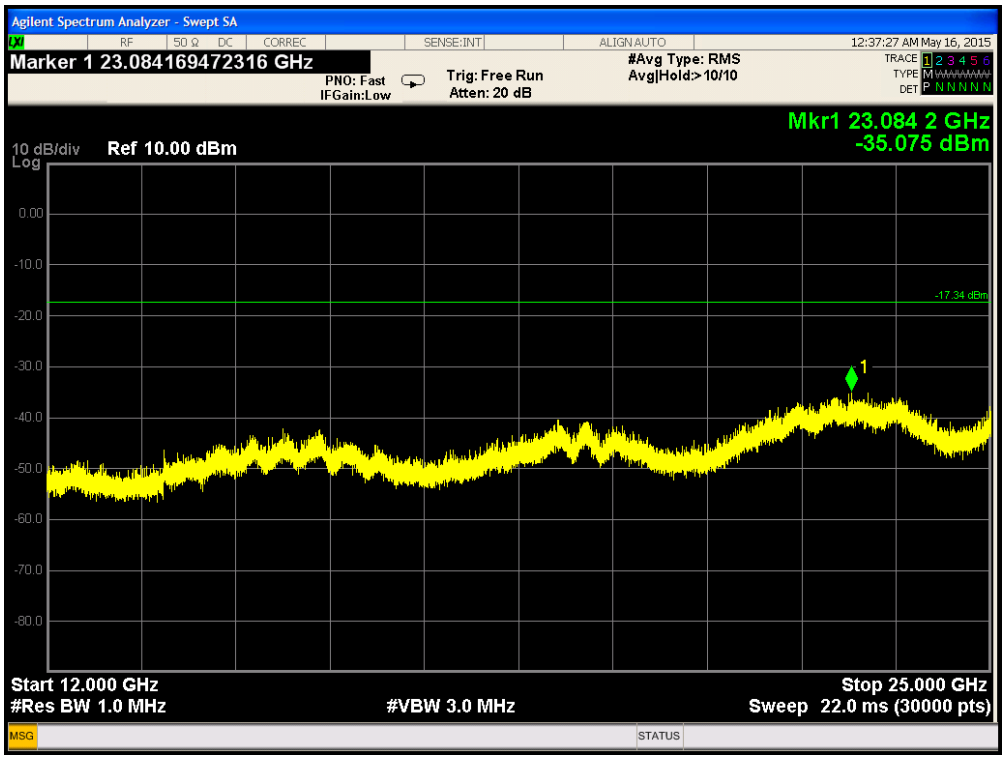
Plot 9-32. Conducted Spurious Emissions 30 MHz – 12 GHz: 1-DH5 Mode (Ch. 39)



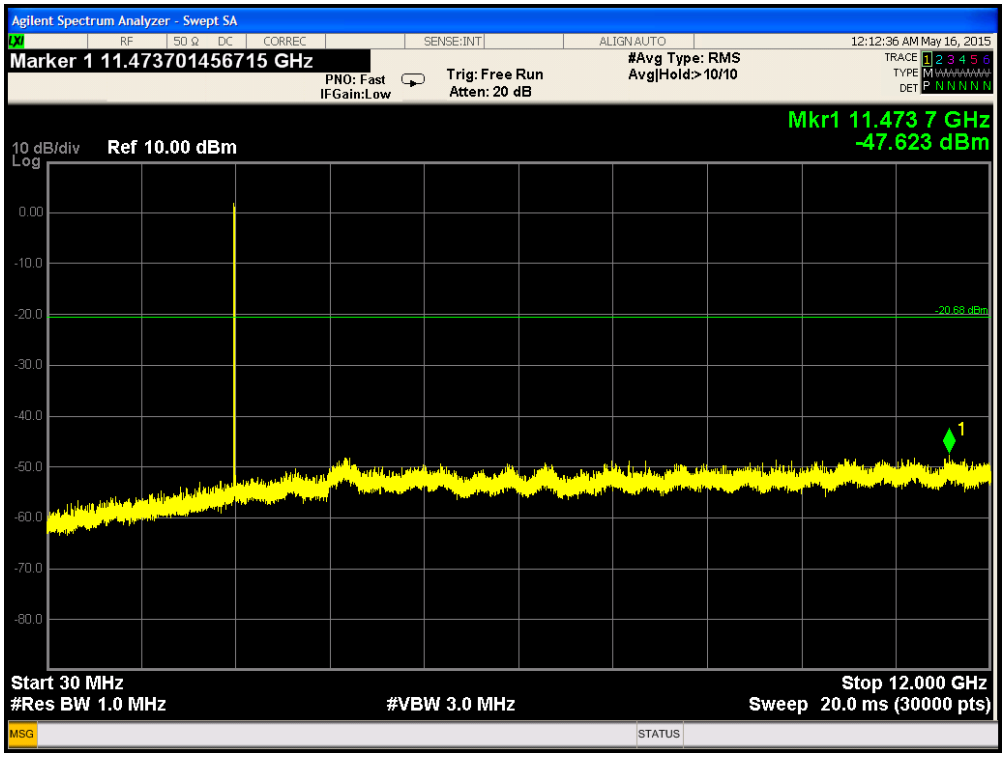
Plot 9-33. Conducted Spurious Emissions 12 - 25 GHz: 1-DH5 Mode (Ch. 39)



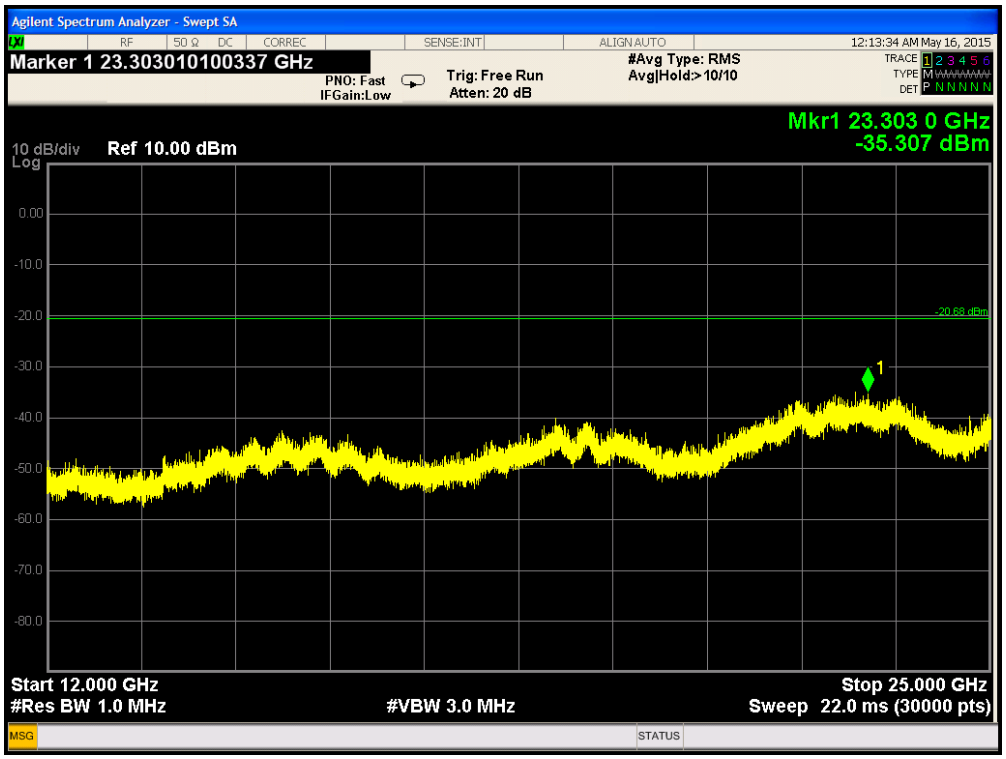
Plot 9-34. Conducted Spurious Emissions 30 MHz – 12 GHz: 1-DH5 Mode (Ch. 78)



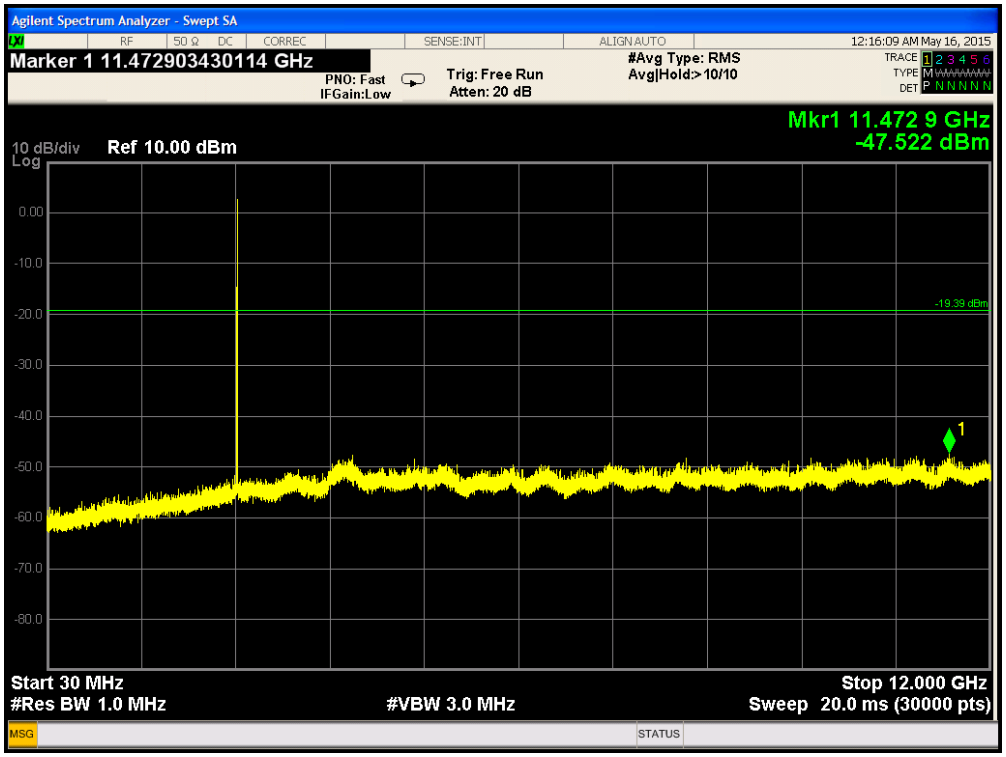
Plot 9-35. Conducted Spurious Emissions 12 – 25 GHz: 1-DH5 Mode (Ch. 78)



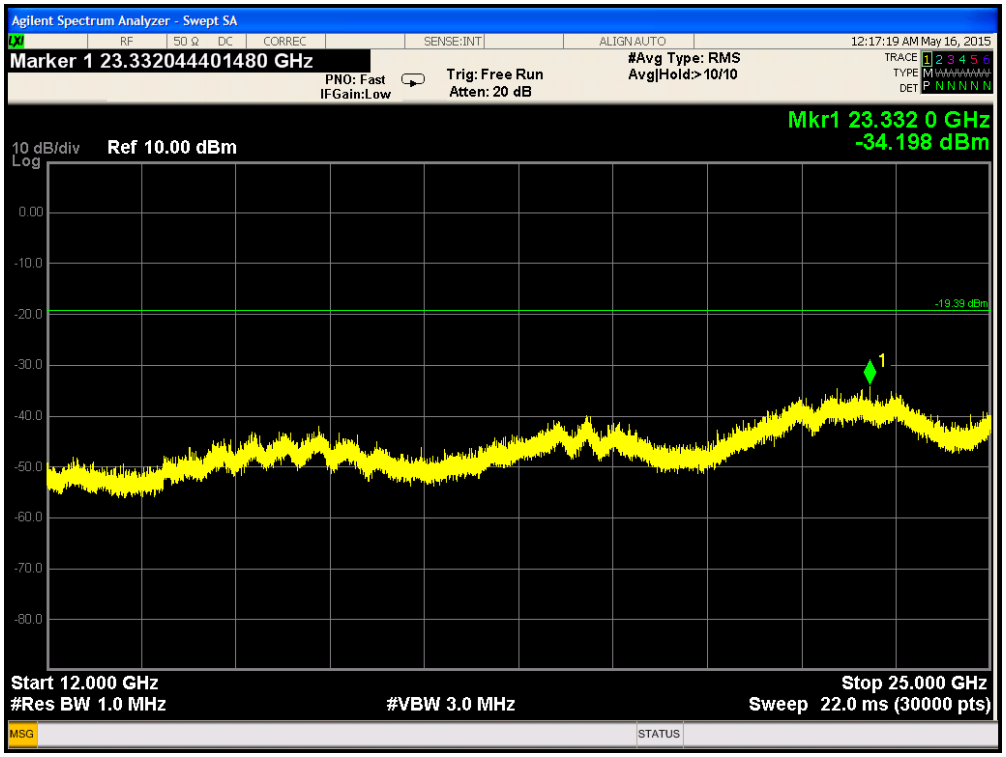
Plot 9-36. Conducted Spurious Emissions 30 MHz – 12 GHz: 2-DH5 Mode (Ch. 0)



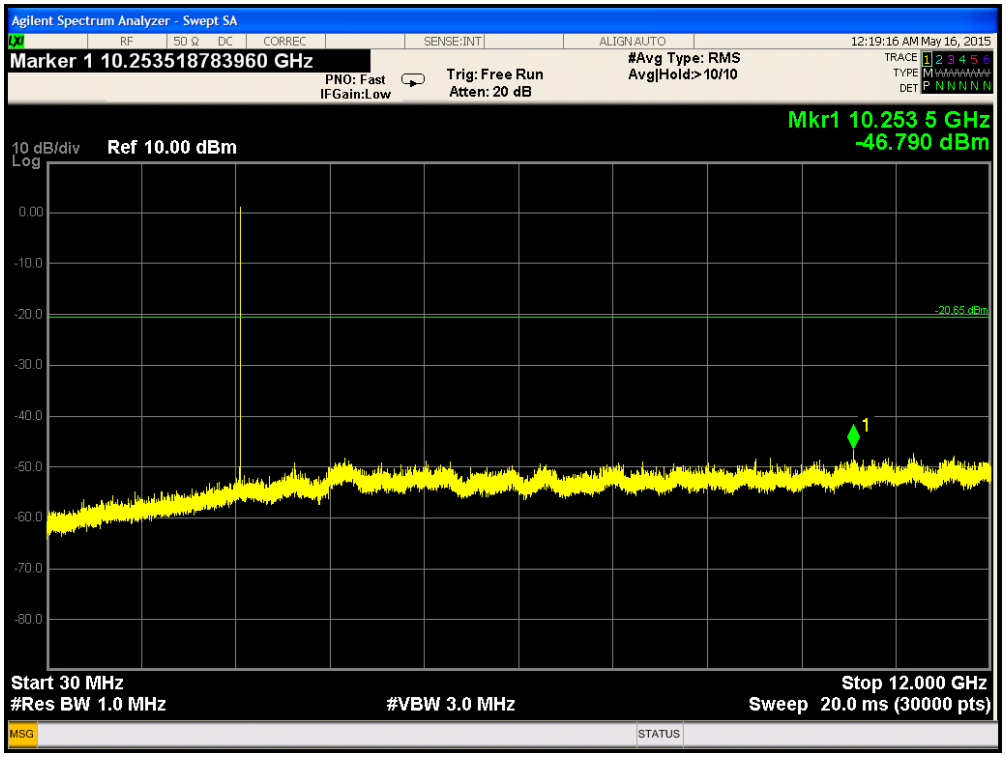
Plot 9-37. Conducted Spurious Emissions 12 - 25 GHz: 2-DH5 Mode (Ch. 0)



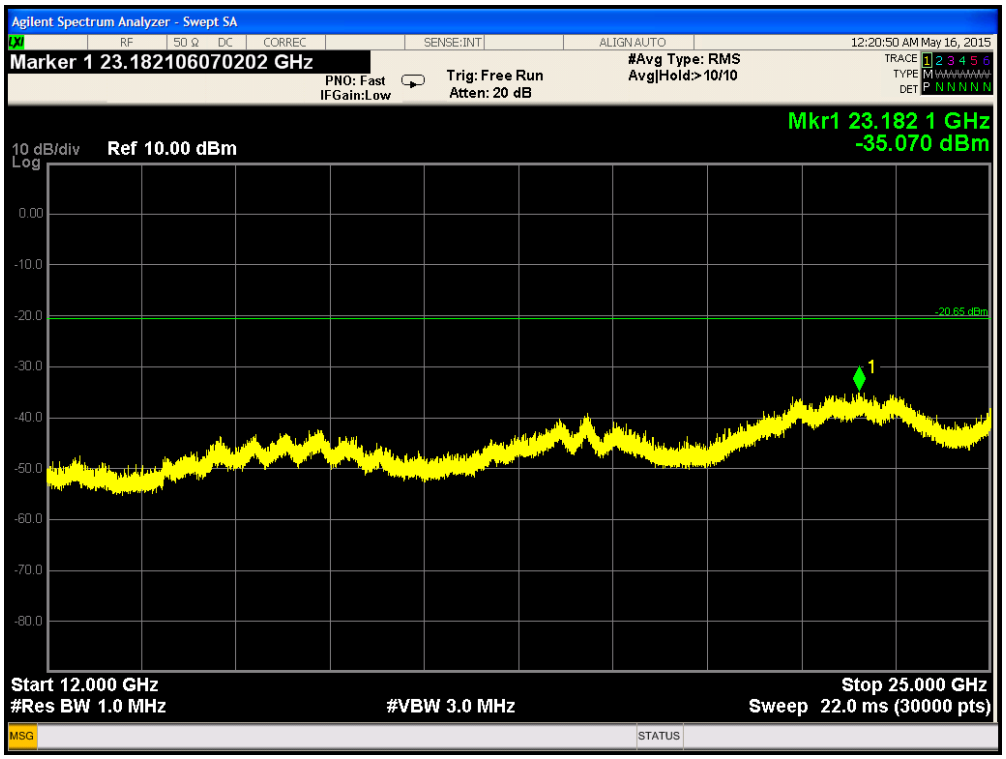
Plot 9-38. Conducted Spurious Emissions 30 MHz – 12 GHz: 2-DH5 Mode (Ch. 39)



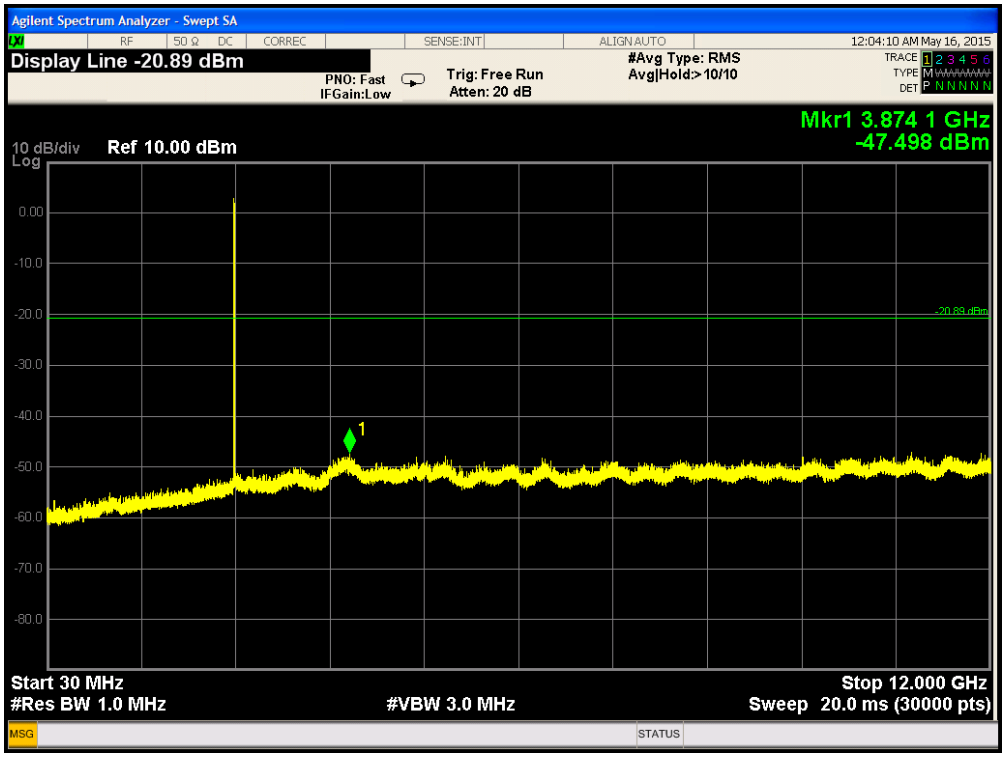
Plot 9-39. Conducted Spurious Emissions 12 - 25 GHz: 2-DH5 Mode (Ch. 39)



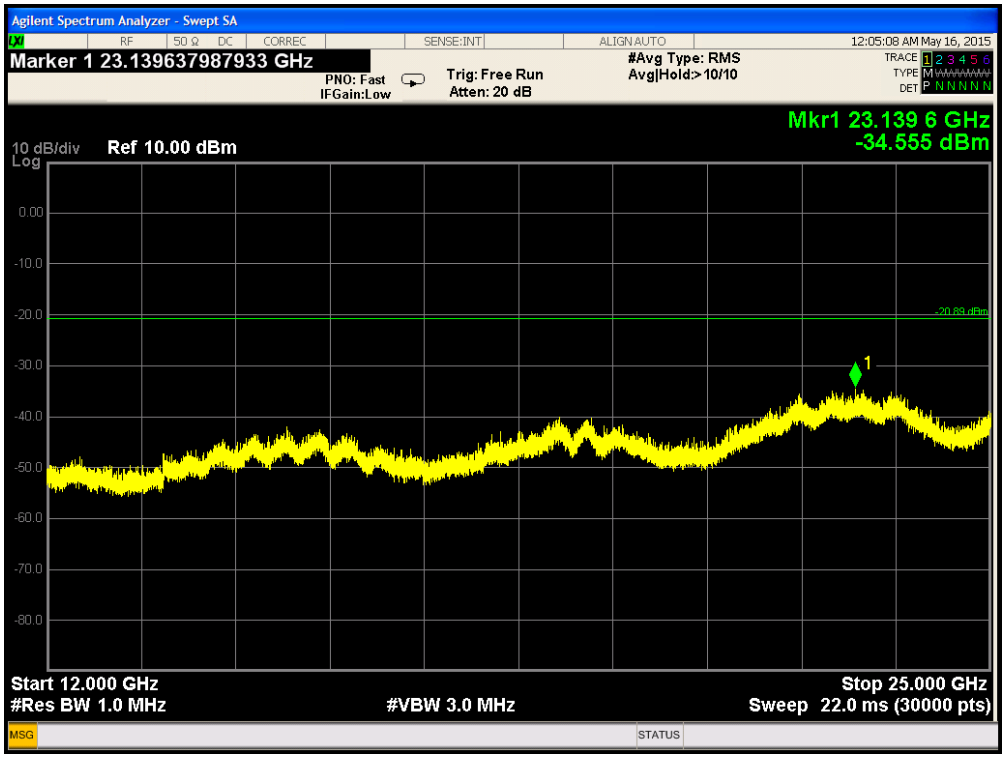
Plot 9-40. Conducted Spurious Emissions 30 MHz – 12 GHz : 2-DH5 Mode (Ch. 78)



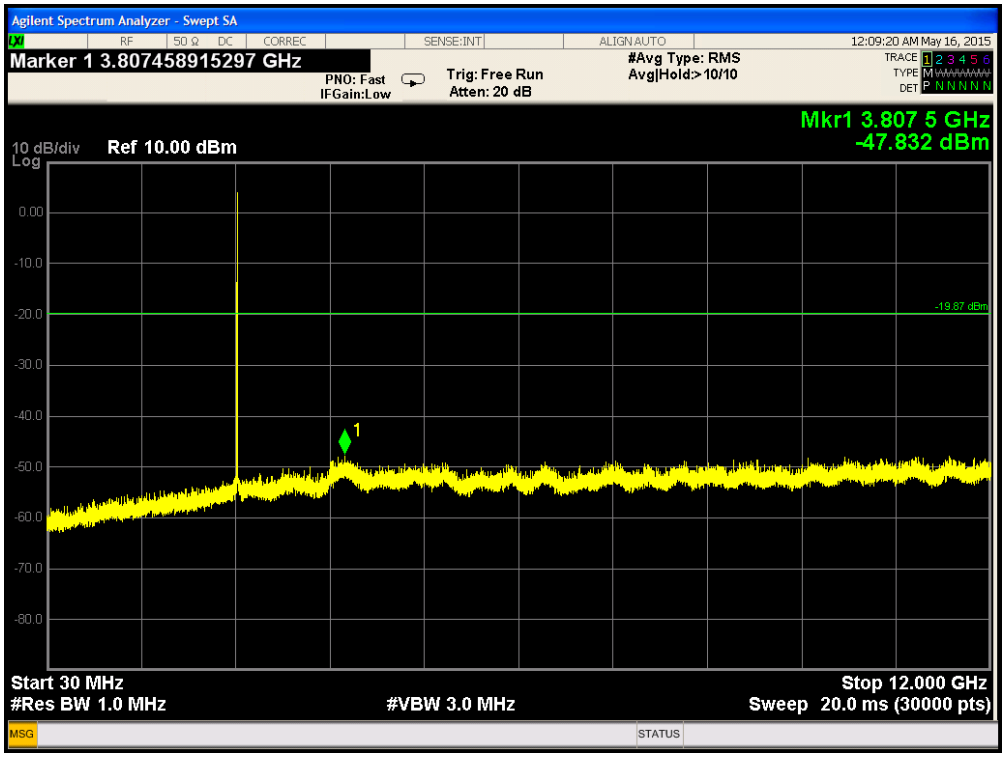
Plot 9-41. Conducted Spurious Emissions 12 - 25 GHz : 2-DH5 Mode (Ch. 78)



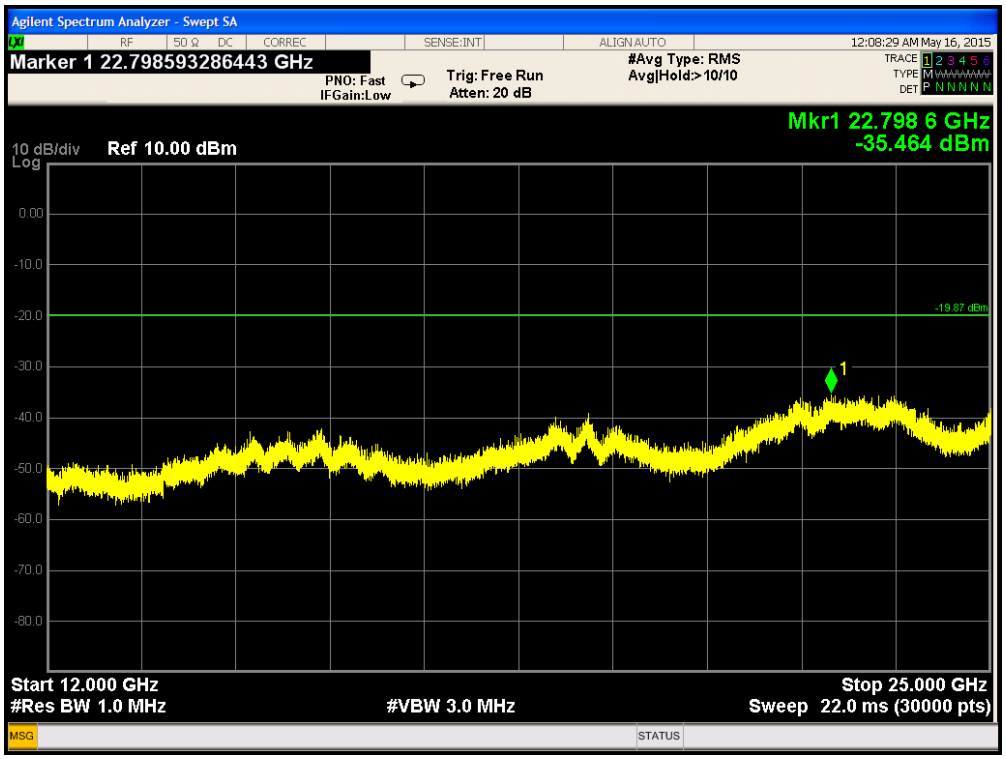
Plot 9-42. Conducted Spurious Emissions 30 MHz – 12 GHz: 3-DH5 Mode (Ch. 0)



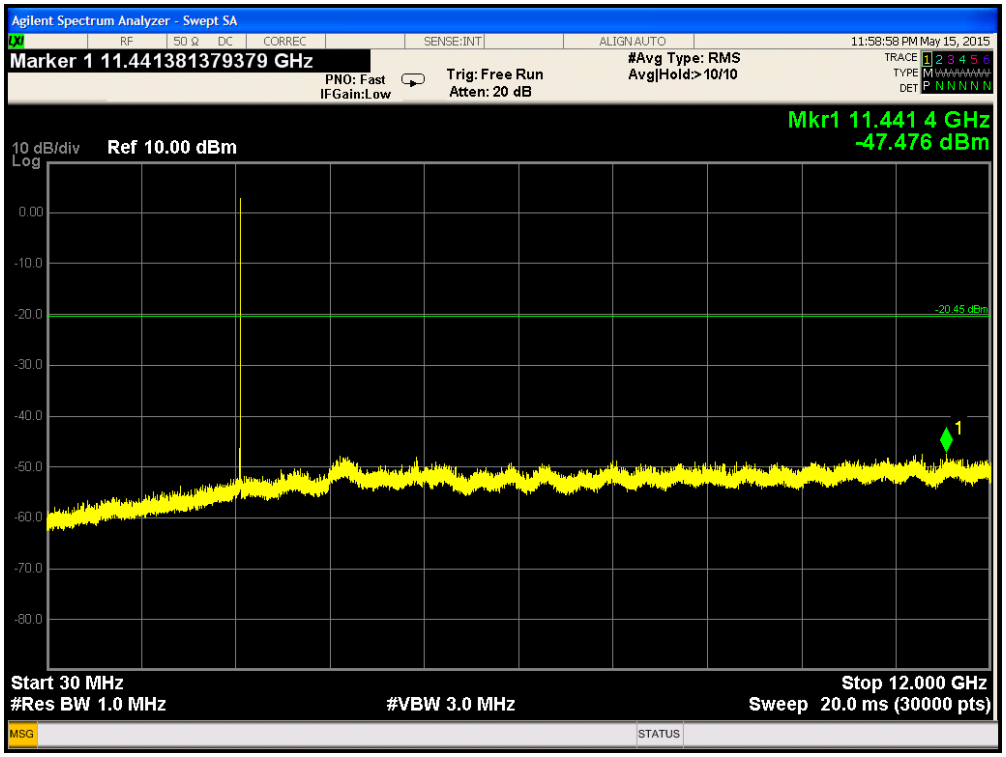
Plot 9-43. Conducted Spurious Emissions 12 - 25 GHz: 3-DH5 Mode (Ch. 0)



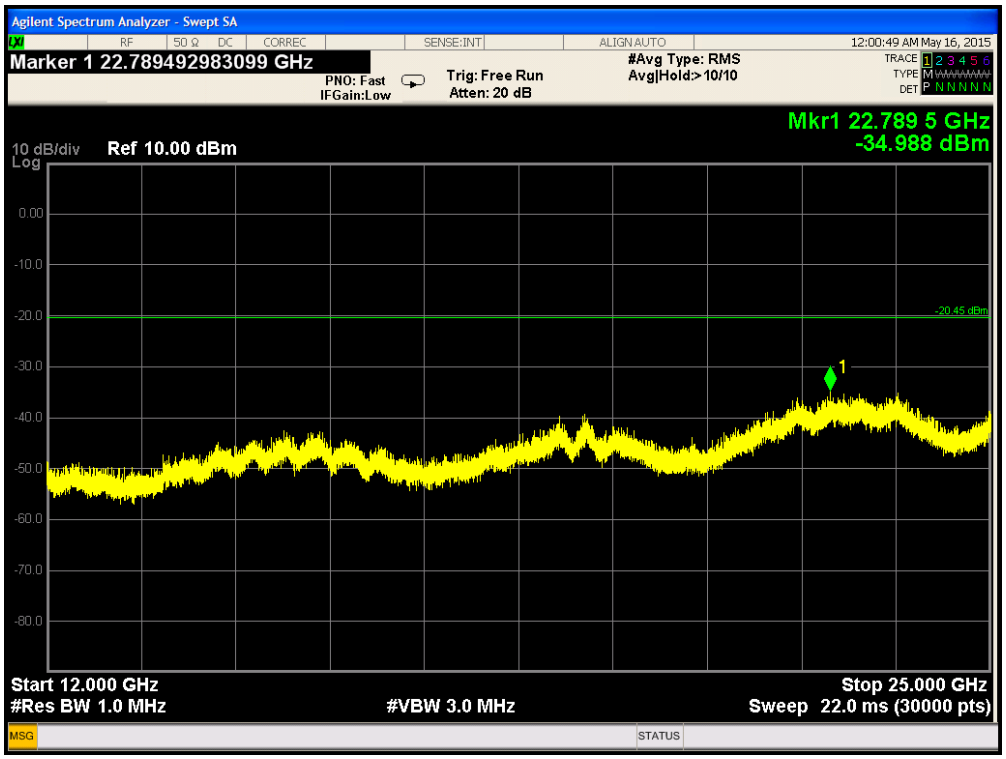
Plot 9-44. Conducted Spurious Emissions 30 MHz – 12 GHz: 3-DH5 Mode (Ch. 39)



Plot 9-45. Conducted Spurious Emissions 12 - 25 GHz: 3-DH5 Mode (Ch. 39)



Plot 9-46. Conducted Spurious Emissions 30 MHz – 12 GHz: 3-DH5 Mode (Ch. 78)



Plot 9-46. Conducted Spurious Emissions 12 - 25 GHz: 3-DH5 Mode (Ch. 78)

9.8 Radiated Out-of-Band Emissions/Restricted Band Edge Emissions

9.8.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

9.8.2 Test Method:

Radiated spurious measurements are made from 30MHz to the 10th harmonic of the fundamental frequency of the transmitter. The limit for radiated spurious emissions is per 15.209. Additionally, emissions found in the restricted bands as listed in 15.205 are tested for compliance per limits 15.209.

The EUT is tested near the low, middle and high channels of operation. Guidelines in ANSI C63.4 2009 were followed with respect to maximizing the emission by rotating the EUT in three orthogonal axes and adjusting the measurement antenna height and polarization. Worst case maximized data is shown in this test report.

A pre-amp and a high pass filter were required for this test, in order to provide the measuring system with sufficient sensitivity. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength.

Since the device operates at its highest power in 1-DH5 mode, all radiated spurious emissions measurements were performed only in this mode of operation.

Spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f > 1 GHz, 100 kHz for f < 1 GHz
VBW > 3 x RBW
Sweep = auto
Detector function = peak
Trace = max hold
Restricted Average band edge measurements were performed with VBW=10Hz setting.

Sample Calculation:

Field Strength Level: Amplitude (Analyzer level) + AFCL (Antenna Factor and Cable losses) – Amplifier Gain = 50 dBuV + 33 dB – 25 dB = 78dBuV/m

9.8.3 Limits:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (meters)	Corrected Field Strength for 3m measurement distance (dBµV/m)
0.009-0.490	2400/F (kHz)	300	48.5- 13.8
0.490-1.705	24000/F (kHz)	30	33.8- 23.0
1.705-30	30	30	29.5
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
960-1000	500	3	54
Above 1000	500	3	54 (Average) 74 (Peak)

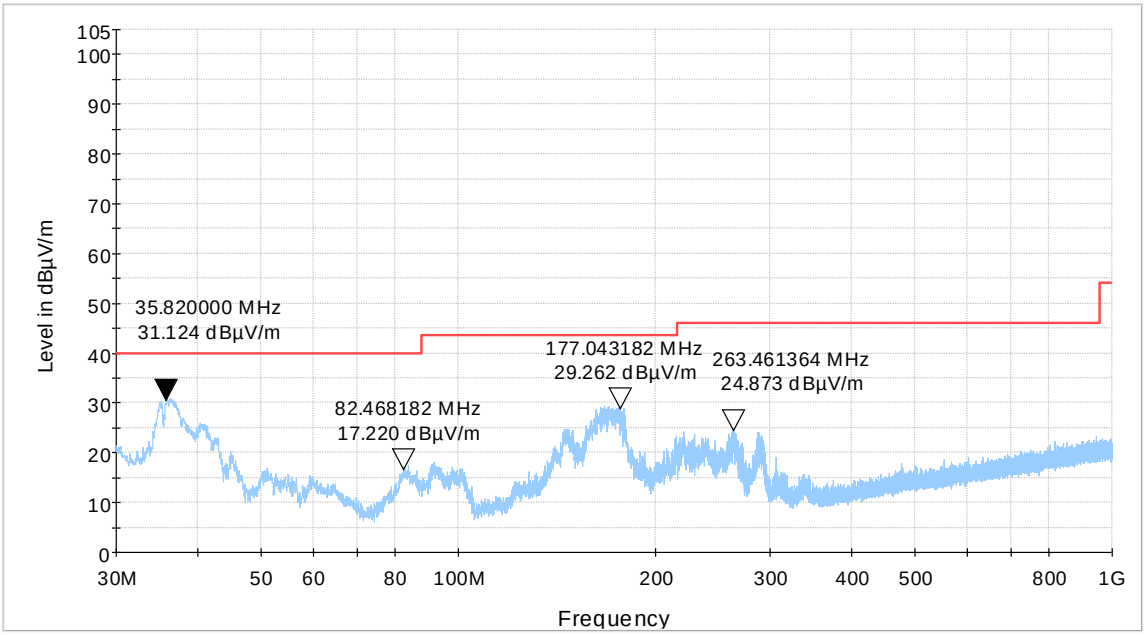
9.8.4 Test Result:

Pass.

9.8.5 Test Data:

9.8.5.1 Emissions in 30 MHz- 1 GHz range

Worst case emissions in mid channel of operation shown here.

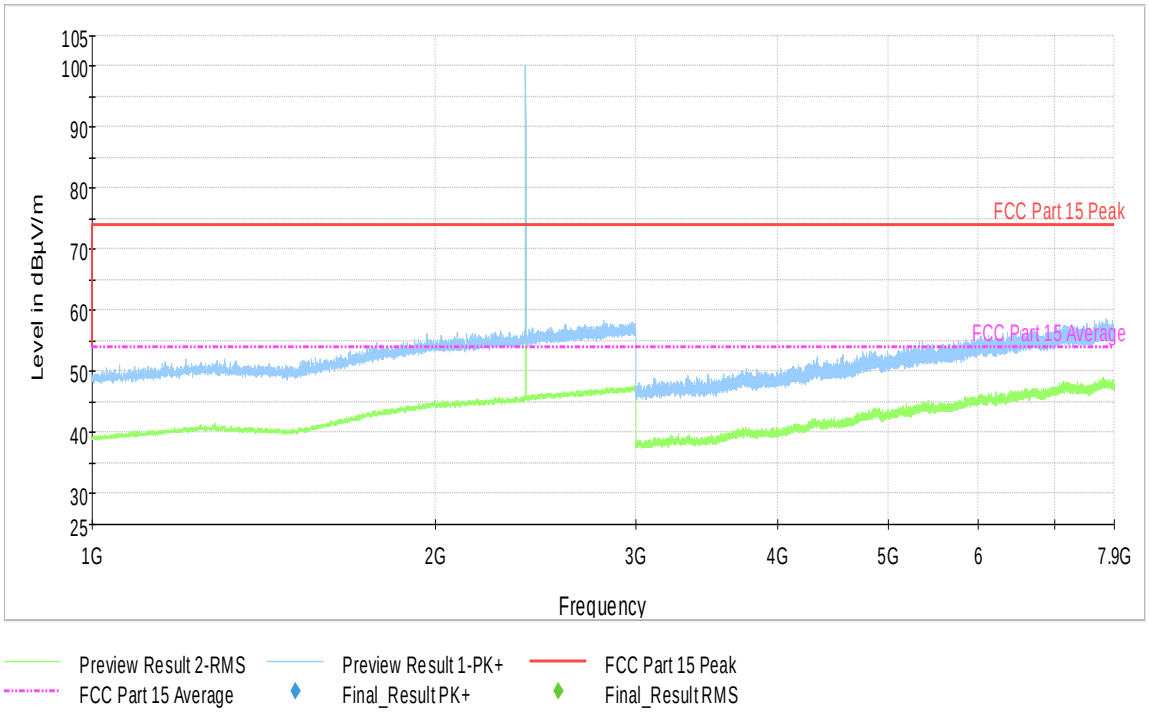


Plot 9-39. Radiated Spurious Emissions (Ch. 39) (30MHz - 1GHz)

Frequency (MHz)	Raw Peak Field Strength (dBµV/m)	Correction Factor (dB)	Corrected Peak Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
35.56	16.32	-13.1	29.42	40	-10.58
91.99	-2.75	-22.3	19.55	43.5	-23.95
168.05	10.08	-18.1	28.18	43.5	-15.32
227.09	6.14	-18.7	24.84	46.0	-21.16

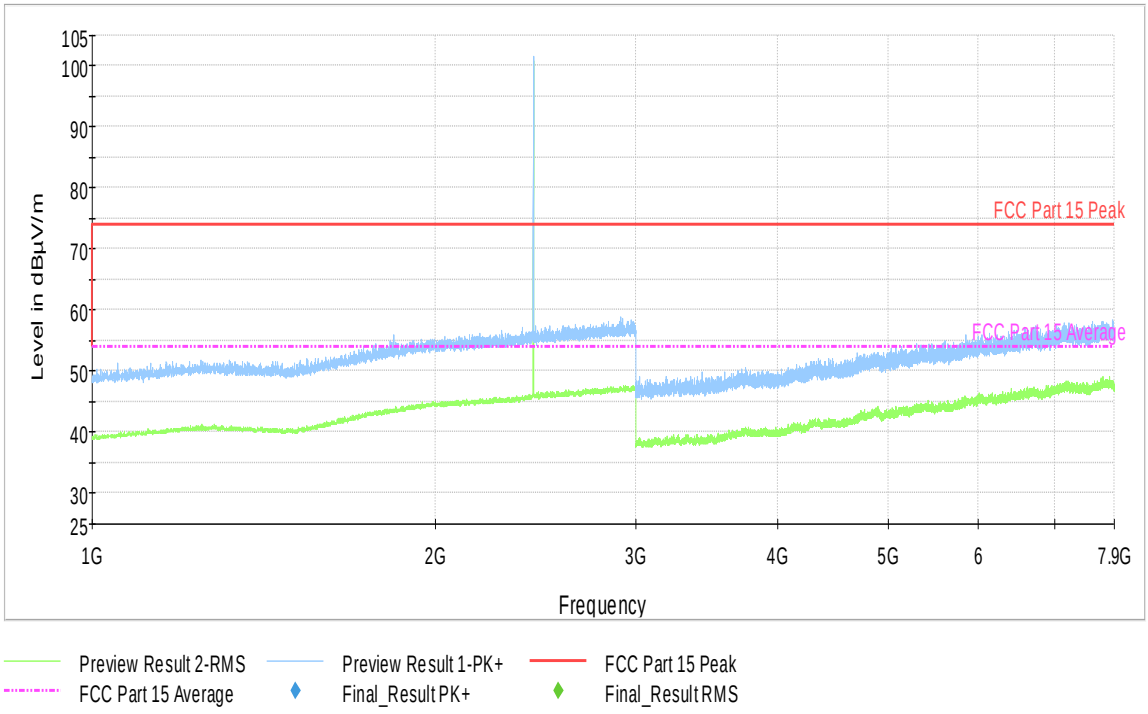
9.8.5.2 Emissions in 1-18 GHz range

No significant emissions to report above noise floor.

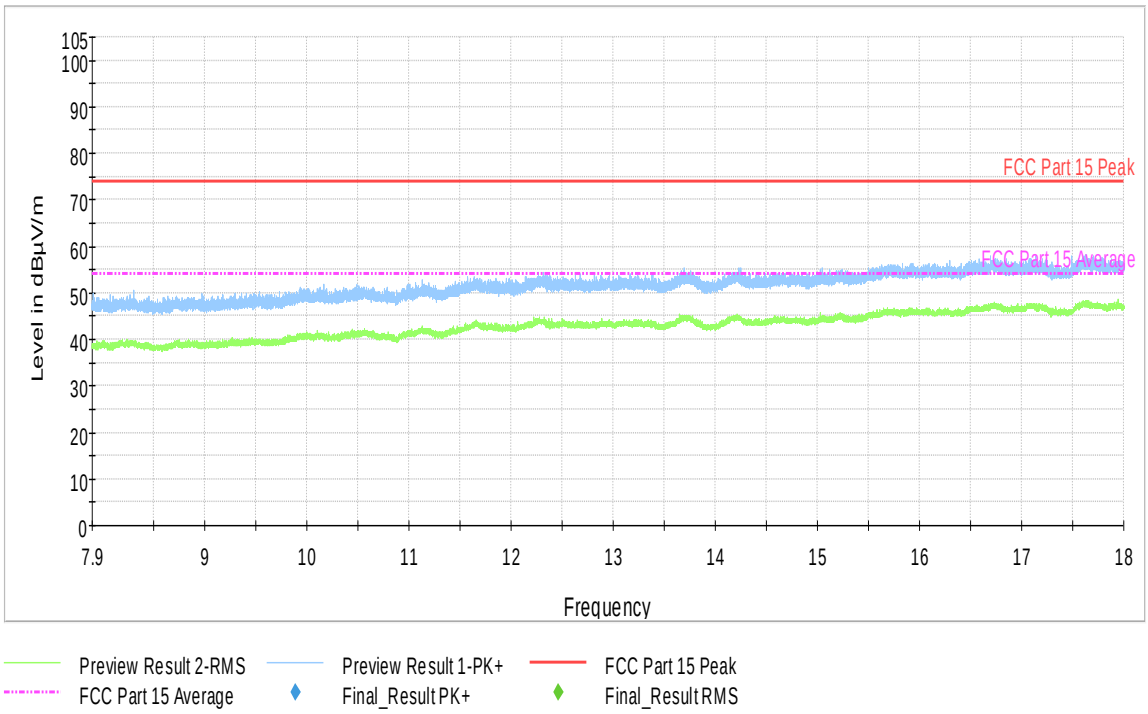


Plot 9-40. Radiated Spurious Emissions (Ch. 0) (1-7.9GHz)

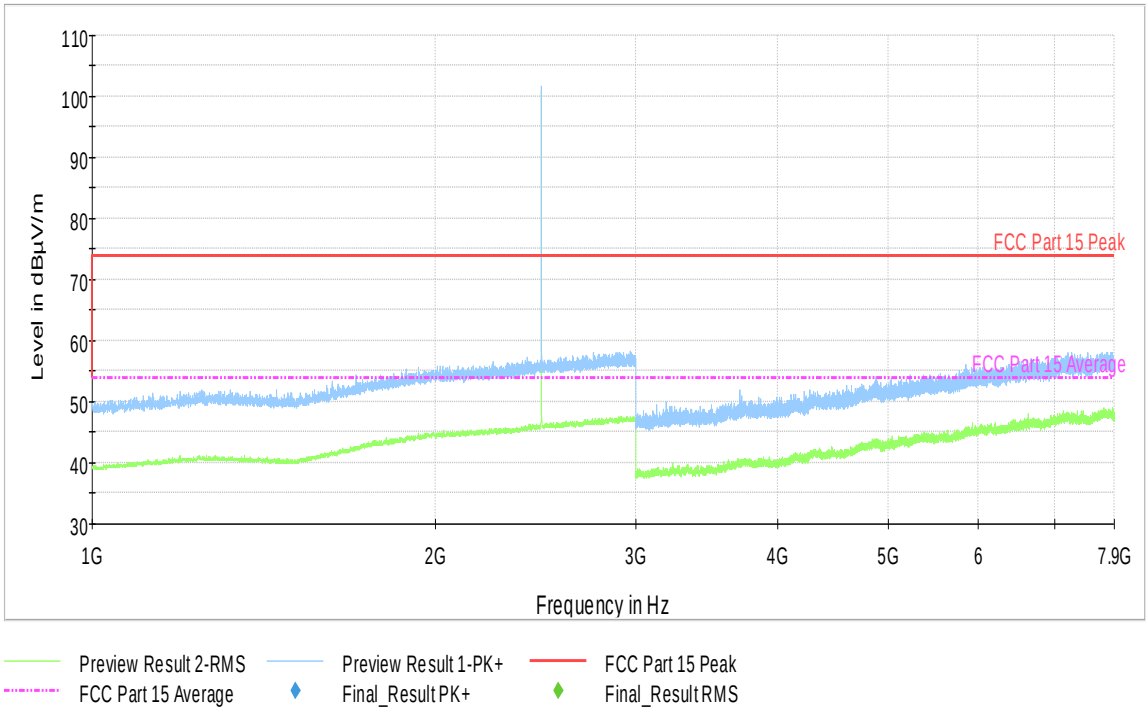
Plot 9-41. Radiated Spurious Emissions (Ch. 0) (7.9 – 18GHz)



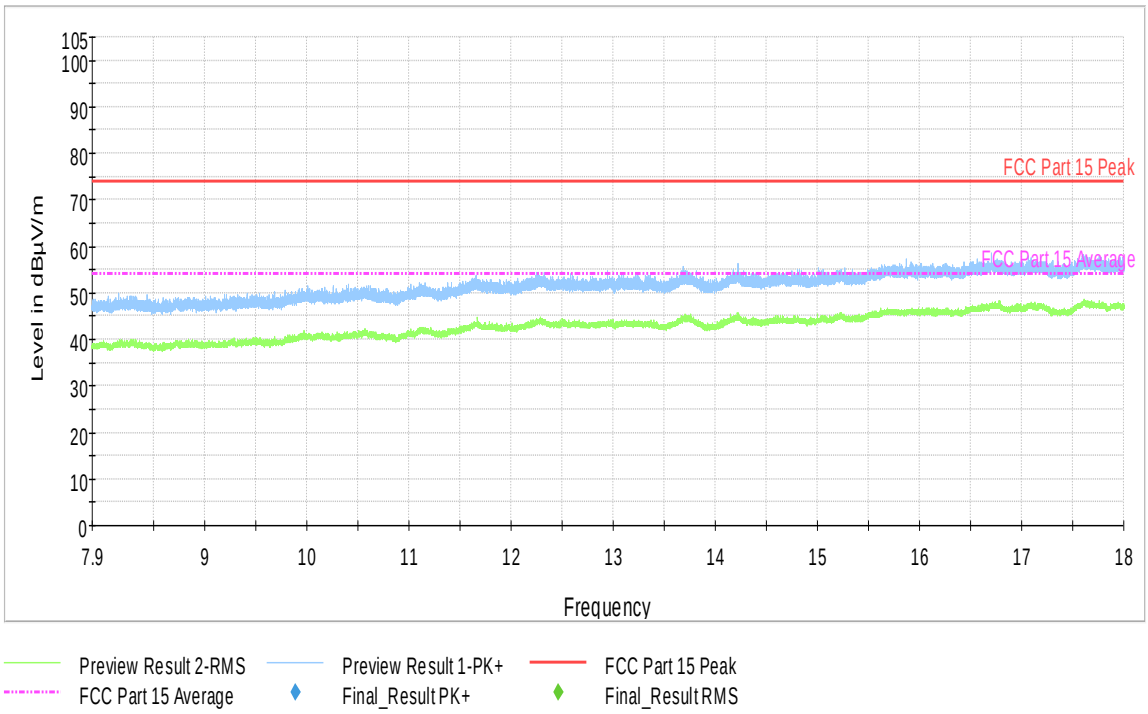
Plot 9-42. Radiated Spurious Emissions (Ch. 39) (1 – 7.9GHz)



Plot 9-43. Radiated Spurious Emissions (Ch. 39) (7.9 – 18GHz)



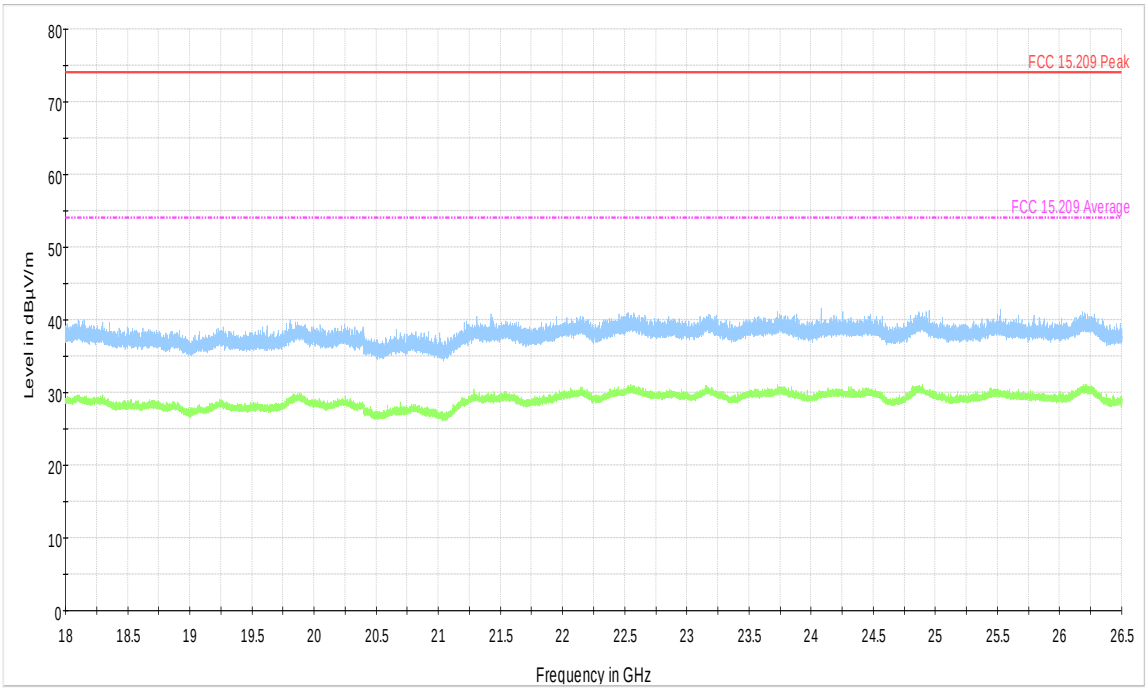
Plot 9-44. Radiated Spurious Emissions (Ch. 78) (1 – 7.9GHz)



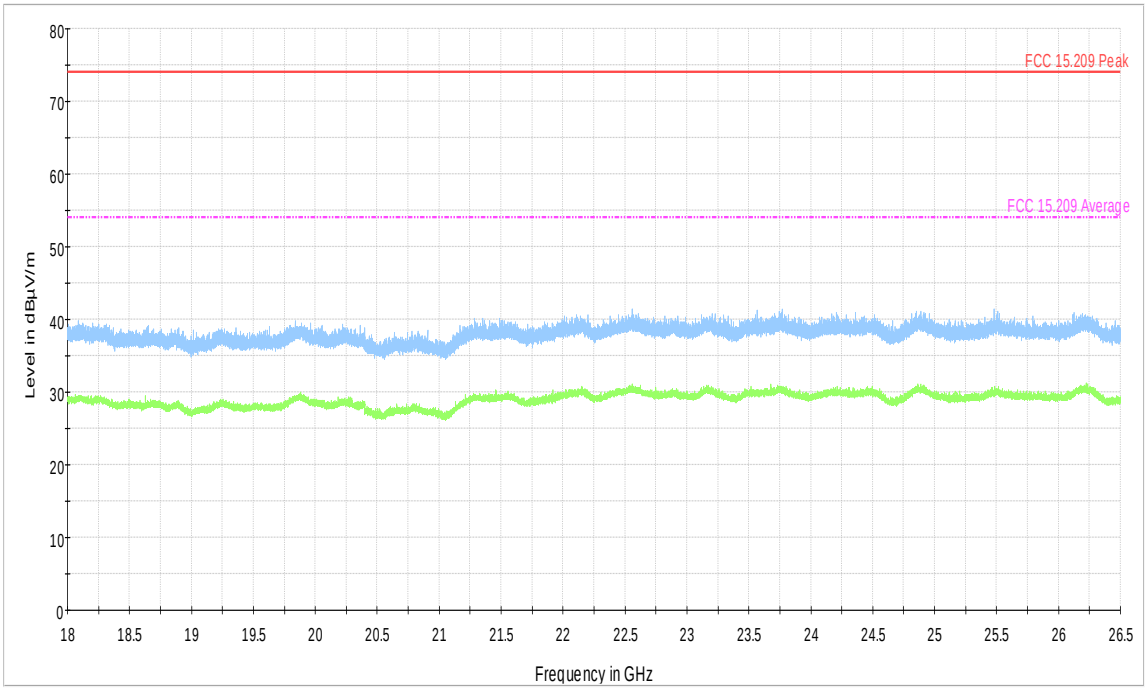
Plot 9-45. Radiated Spurious Emissions (Ch. 78) (7.9 – 18GHz)

9.8.5.3 Emissions in 18-26.5 GHz range

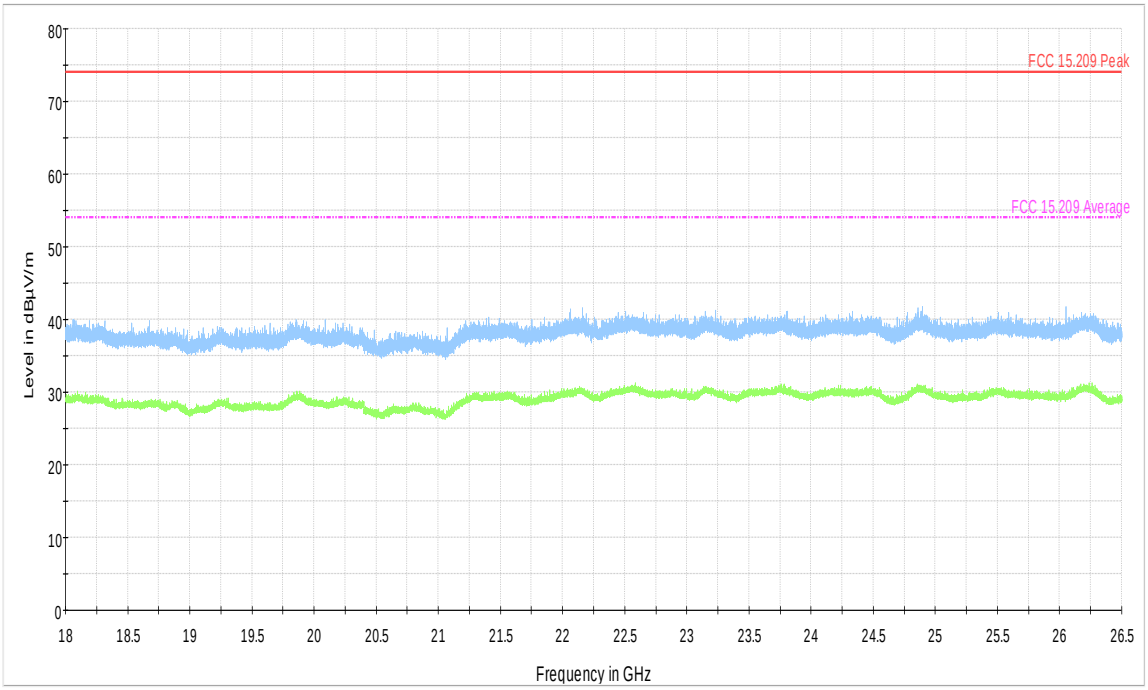
No significant emissions to report above noise floor.



Plot 9-46. Radiated Spurious Emissions (Ch. 0) (18 - 26GHz)

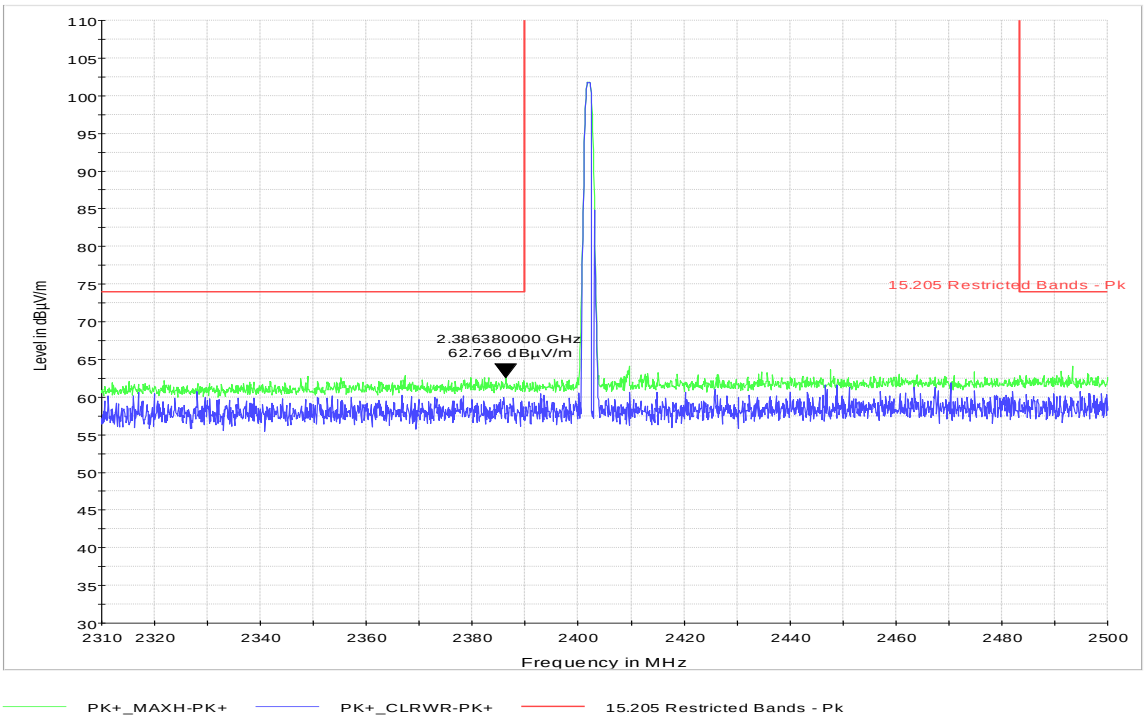


Plot 9-47. Radiated Spurious Emissions (Ch. 39) (18 - 26GHz)

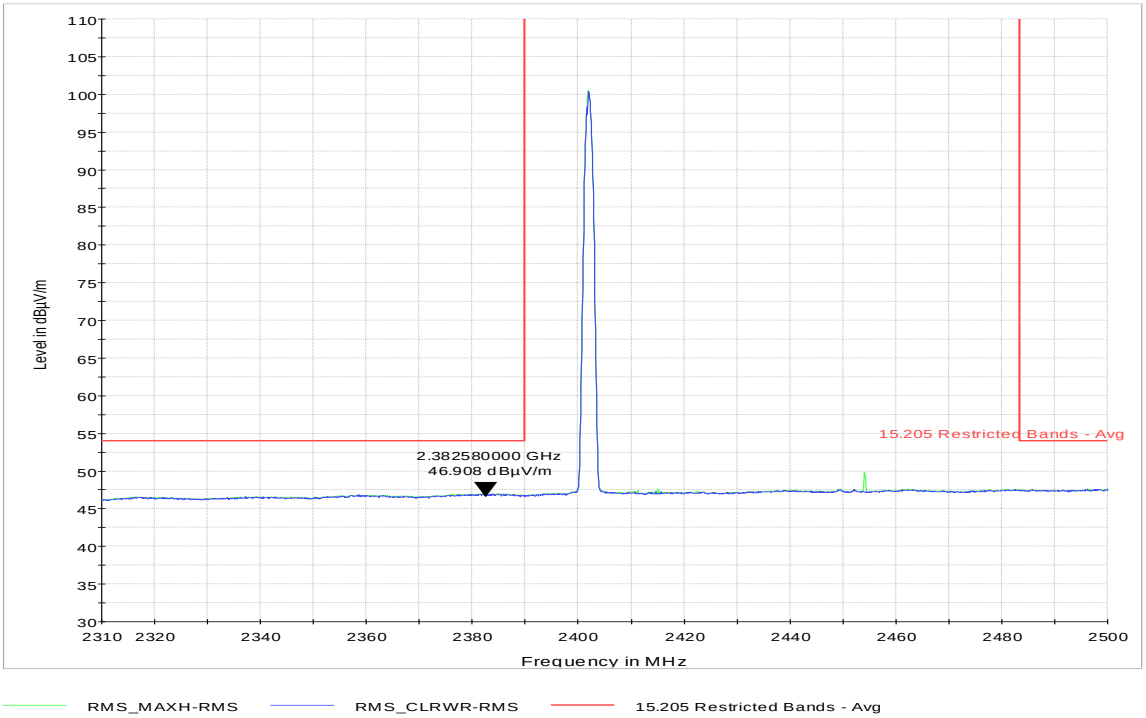


Plot 9-48. Radiated Spurious Emissions (Ch. 78) (18 - 26GHz)

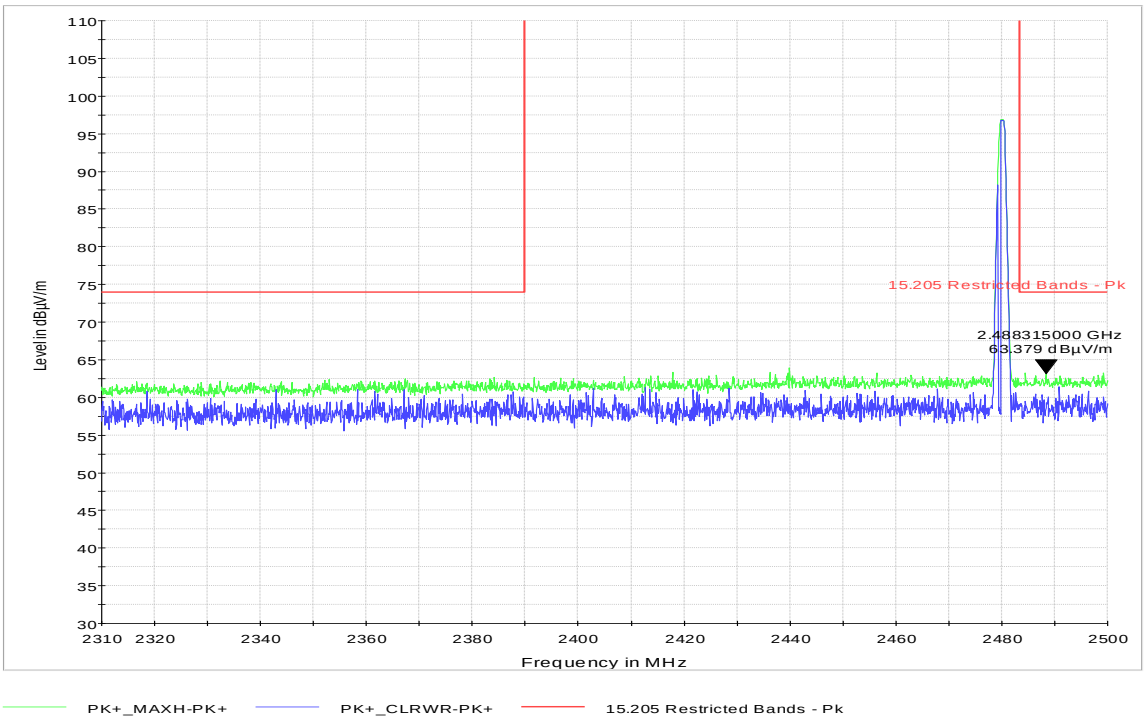
9.8.5.4 Radiated restricted Band-edge emissions



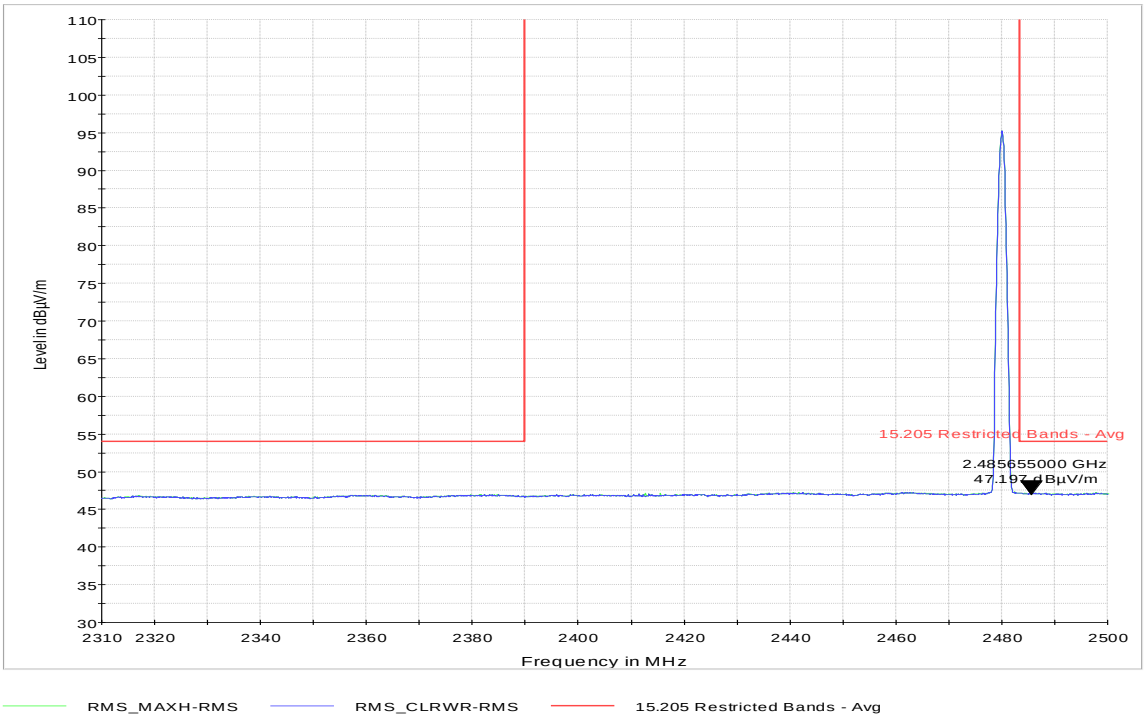
Plot 9 49. Restricted Band Edge 1-DH5 Mode– Ch. 0 (2310-2390MHz) – Peak



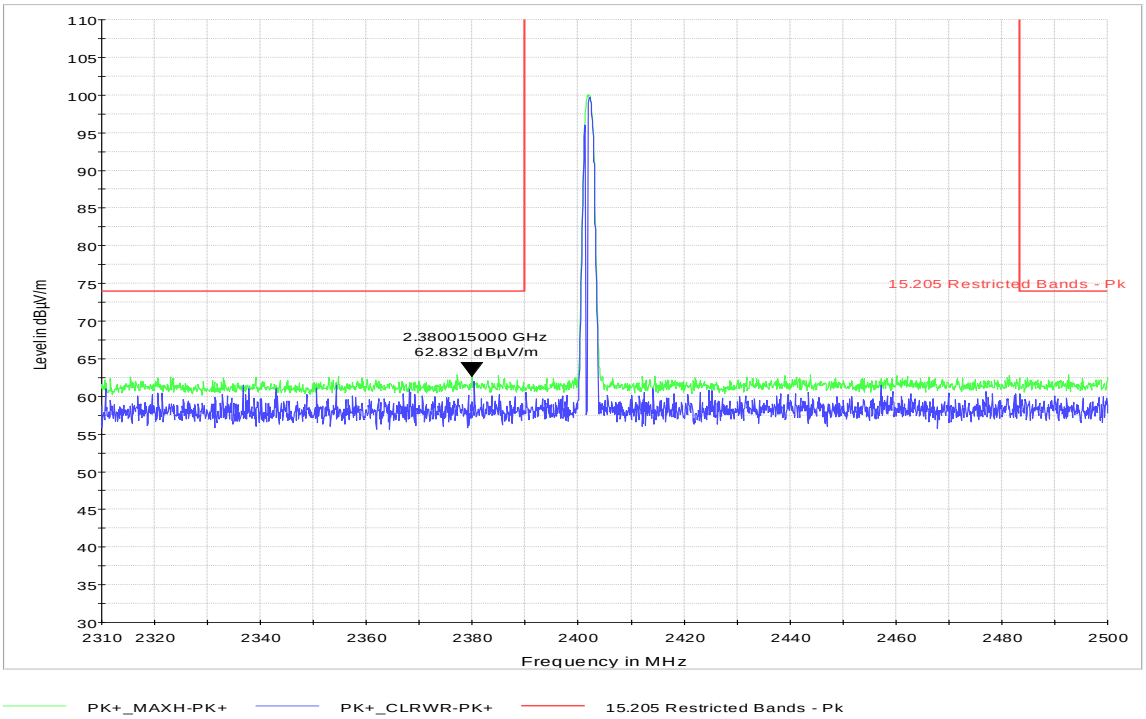
Plot 9-50. Restricted Band Edge 1-DH5 Mode– Ch. 0 (2310-2390MHz) – Average



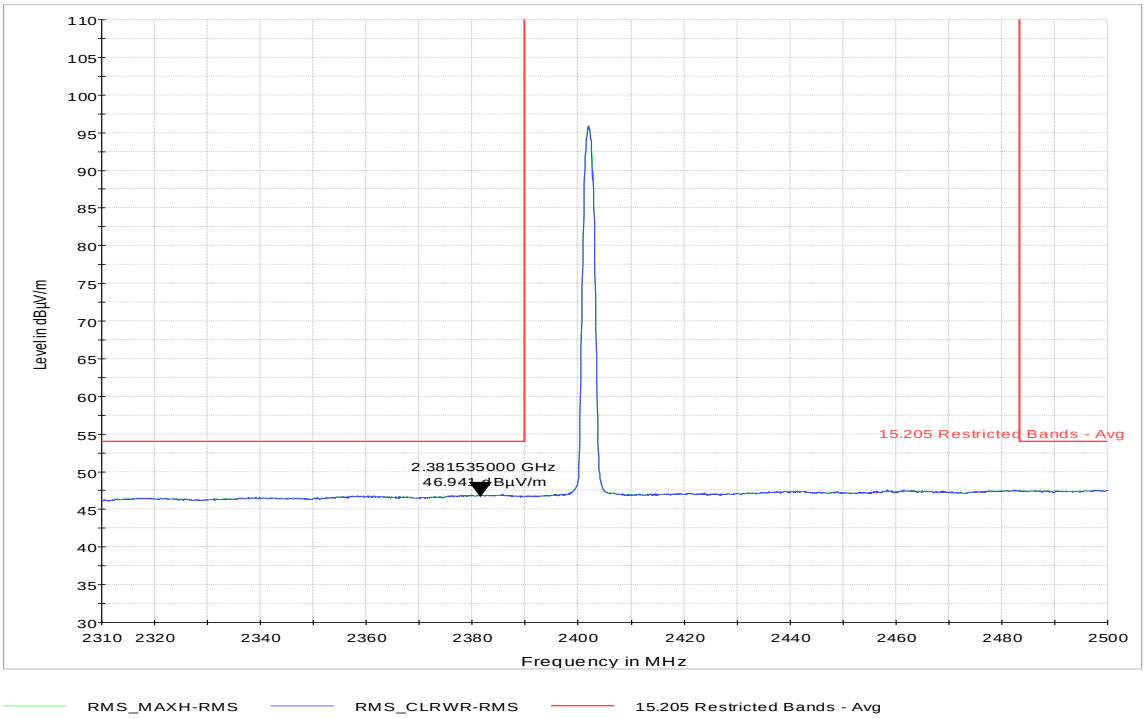
Plot 9-51. Restricted Band Edge 1-DH5 Mode– Ch. 78 (2483.5-2500MHz) – Peak



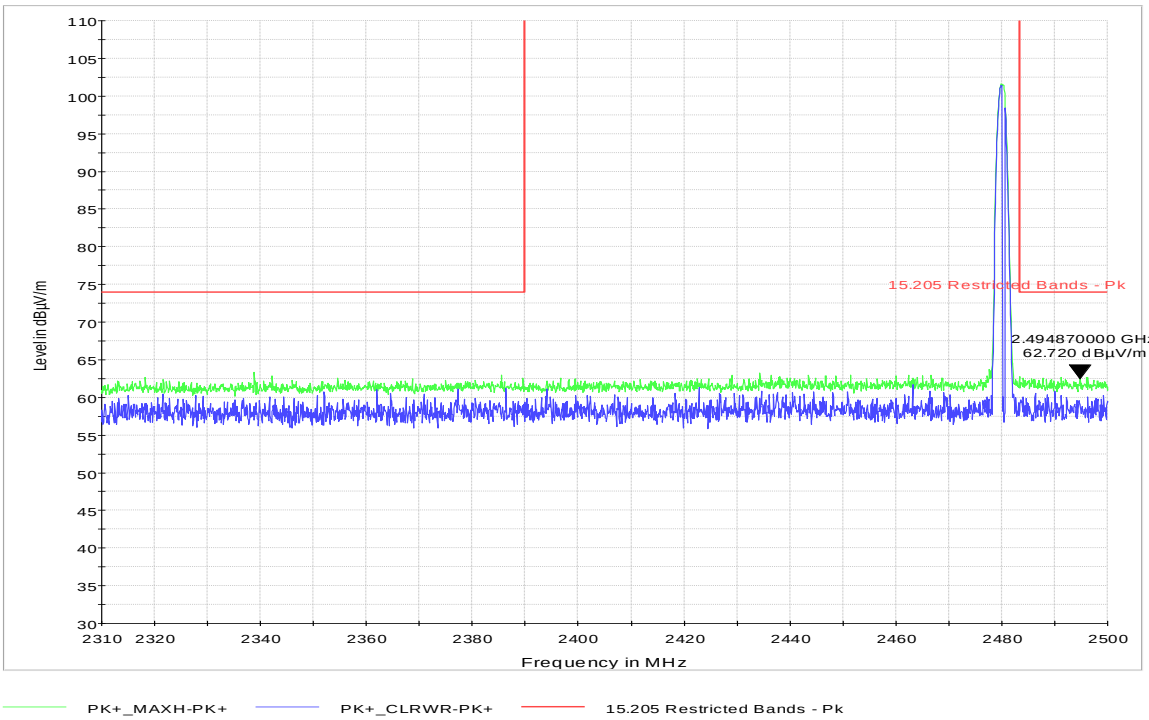
Plot 9-52. Restricted Band Edge 1-DH5 Mode– Ch. 78 (2483.5-2500MHz) – Average



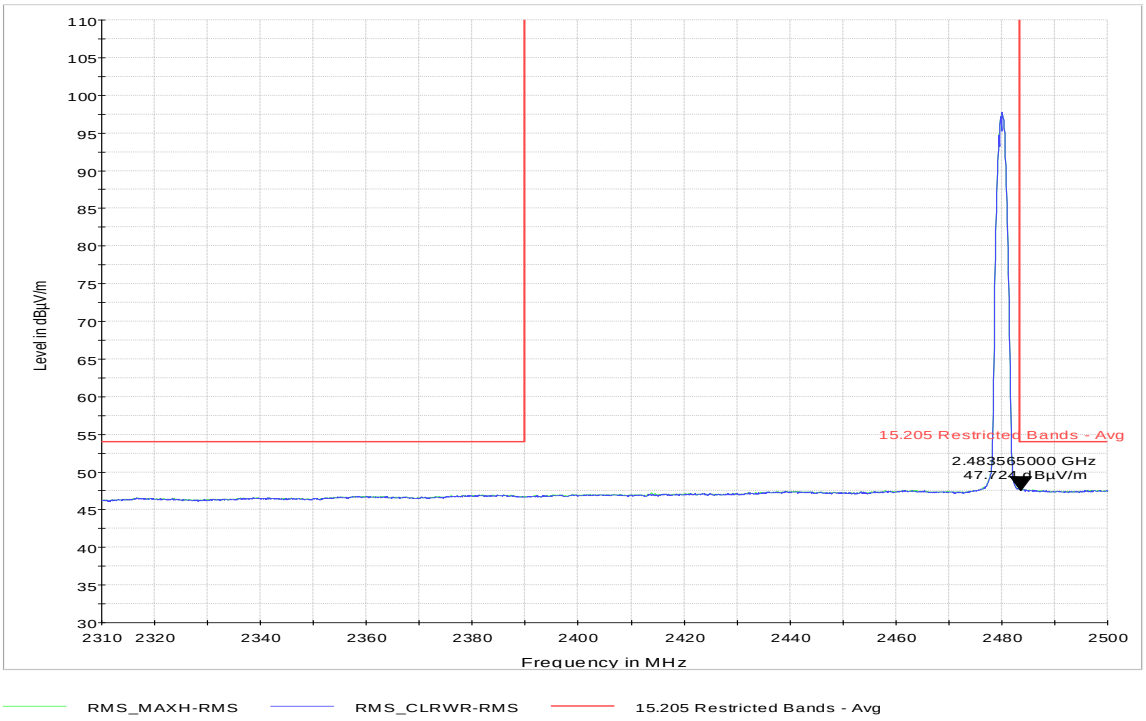
Plot 9 53. Restricted Band Edge 2-DH5 Mode– Ch. 0 (2310-2390MHz) – Peak



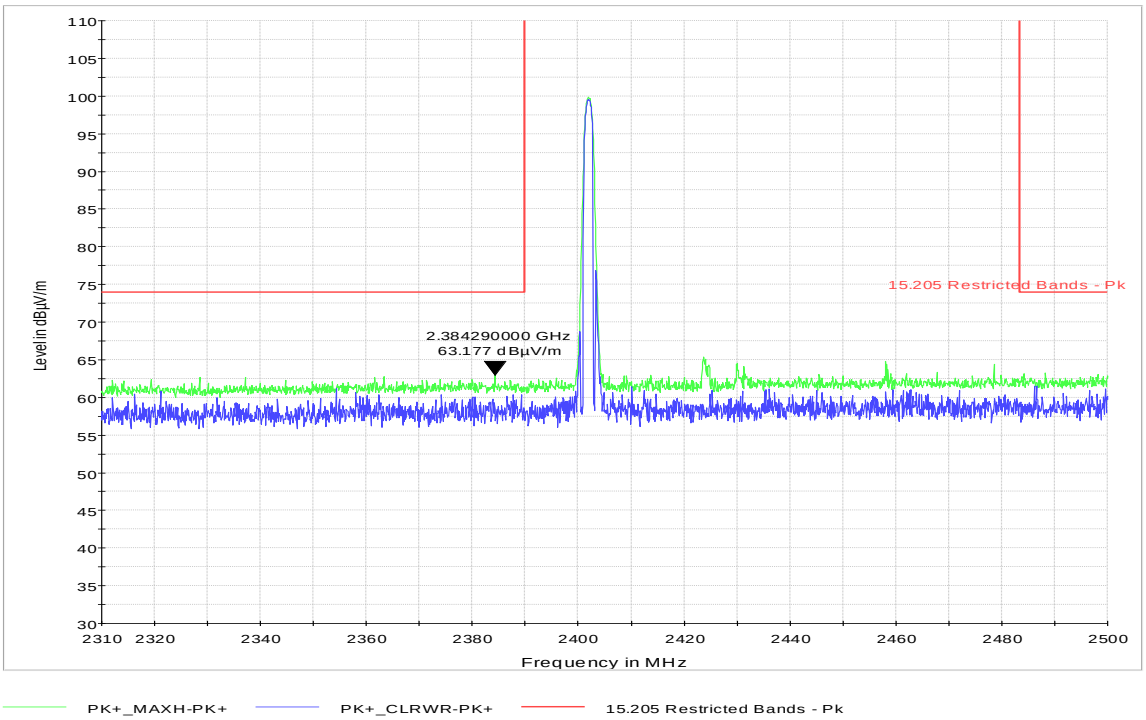
Plot 9-54. Restricted Band Edge 2-DH5 Mode– Ch. 0 (2310-2390MHz) - Average



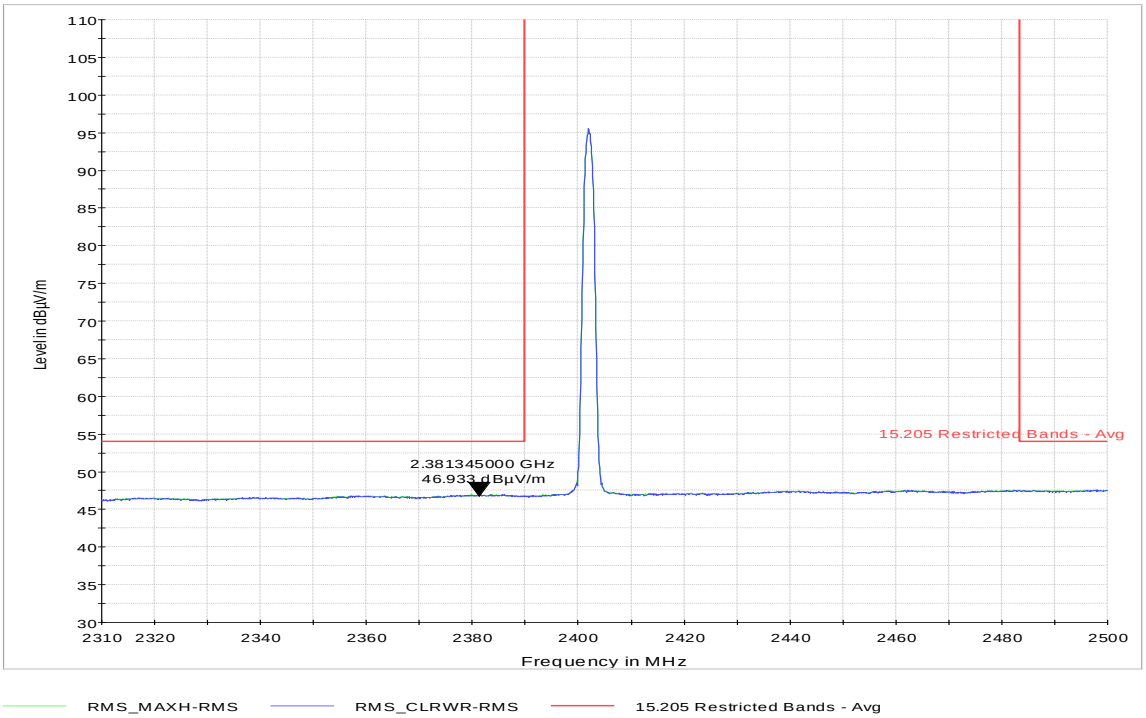
Plot 9 55. Restricted Band Edge 2-DH5 Mode– Ch. 78 (2483.5-2500MHz) – Peak



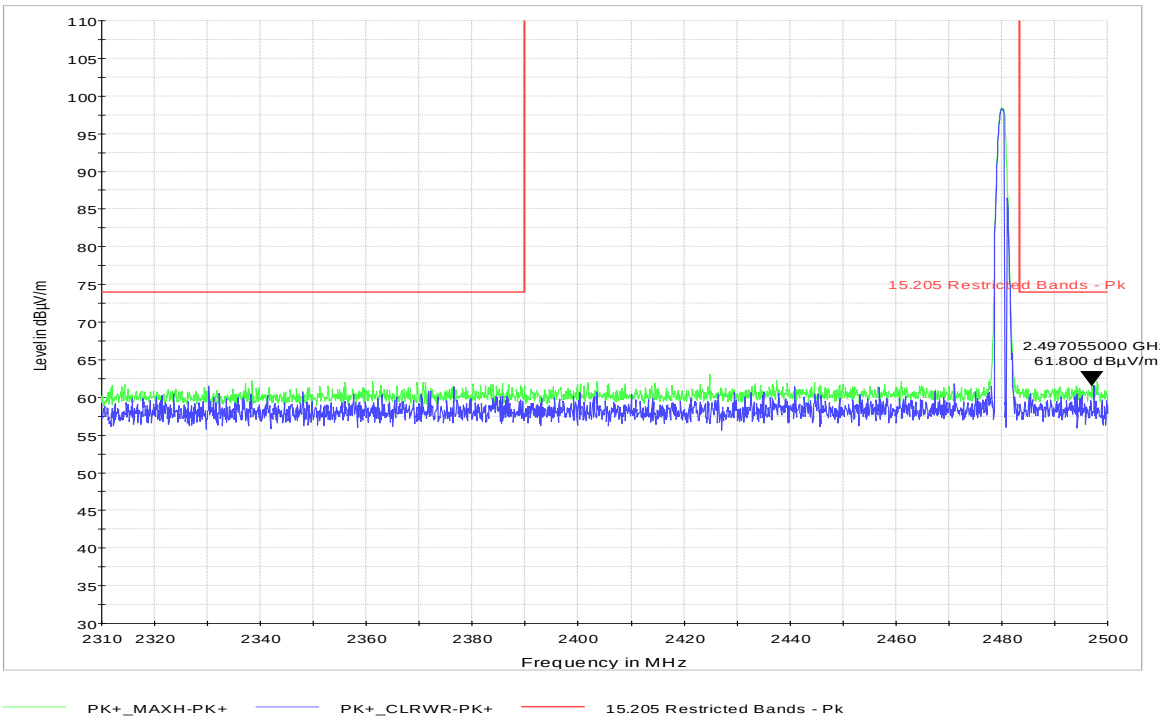
Plot 9-56. Restricted Band Edge 2-DH5 Mode– Ch. 78 (2483.5-2500MHz) – Average



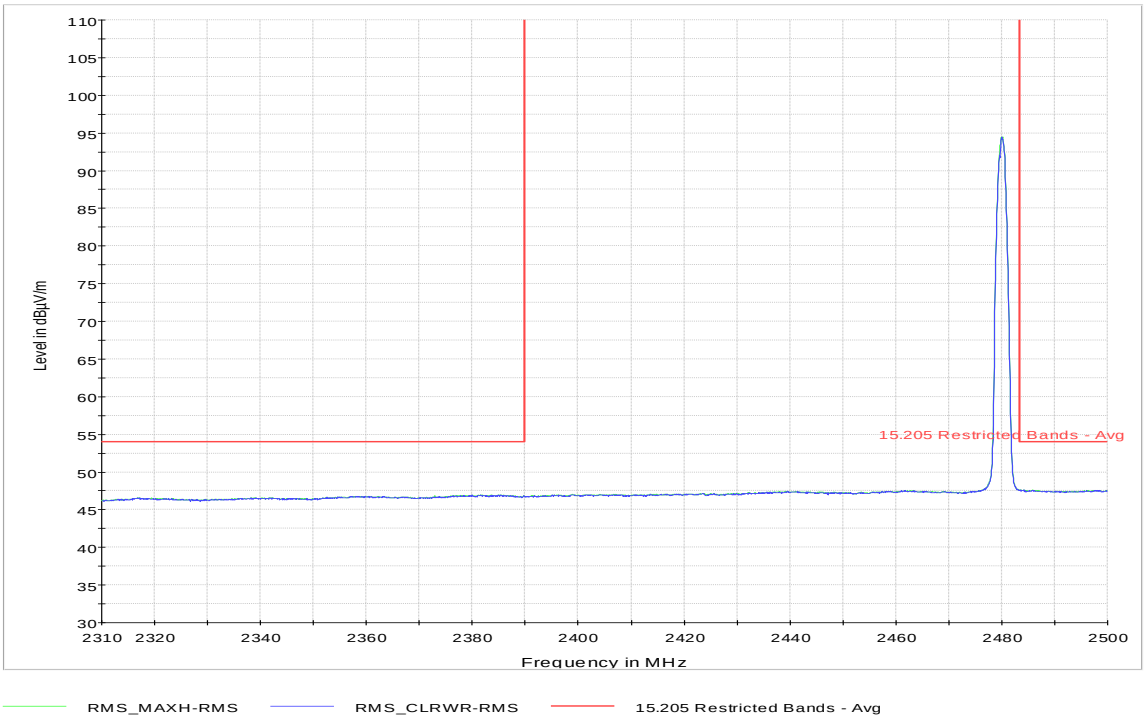
Plot 9 57. Restricted Band Edge 3-DH5 Mode– Ch. 0 (2310-2390MHz) – Peak



Plot 9-58. Restricted Band Edge 3-DH5 Mode– Ch. 0 (2310-2390MHz) - Average



Plot 9 59. Restricted Band Edge 3-DH5 Mode– Ch. 78 (2483.5-2500MHz) – Peak



Plot 9-60. Restricted Band Edge 3-DH5 Mode– Ch. 78 (2483.5-2500MHz) - Average

9.9 AC Line Conducted Emissions

9.9.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

9.9.2 Test Method

Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with the power cords that are used under normal operating conditions. These measurements are made using a LISN (Line Impedance Stabilization Network). AC powered peripherals are attached to a second LISN with the 50 ohm measuring port terminated by a 50 ohm resistive load.

EMI Receiver Settings:

150 kHz – 30 MHz:

RBW= 9 kHz
VBW ≥ 3 X RBW
Trace Mode: Peak Detector (Max Hold).
Final measurements performed using Quasi-Peak and Average Detectors.
Span= 150 kHz – 30 MHz
Sweep time= Auto

9.9.3 Limit

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

9.9.4 Equipment List:

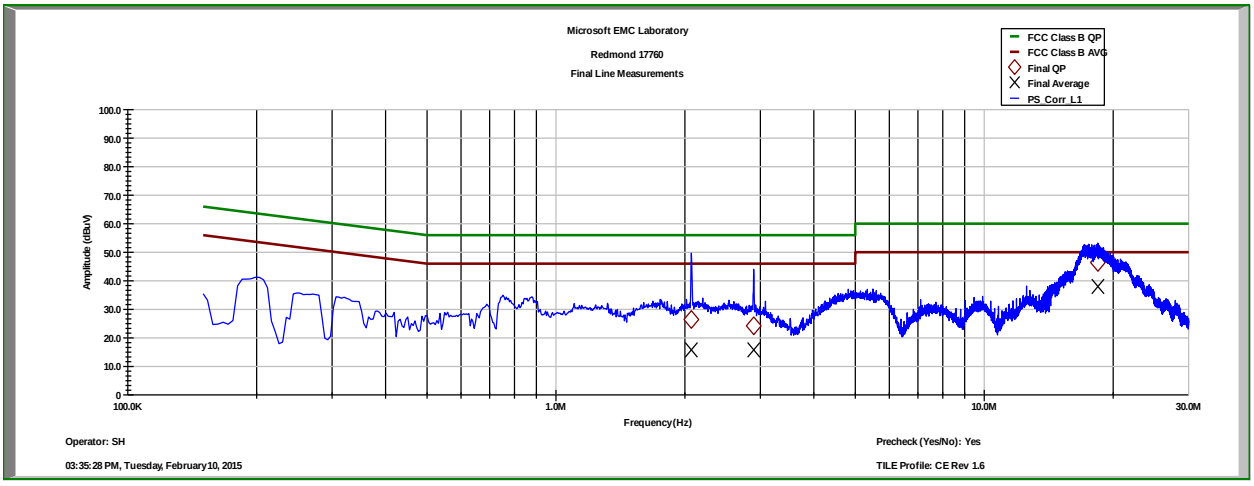
Description	Equipment ID	Last Cal Date	Cal Due Date
EMI Receiver	EMC-669	11/03/2014	11/03/2015
EUT LISN	EMC-187	10/11/2014	10/11/2015
AE LISN	EMC-057	05/08/2014	05/08/2015
Cable	EMC-367	N/A	N/A

9.9.5 Test Result:

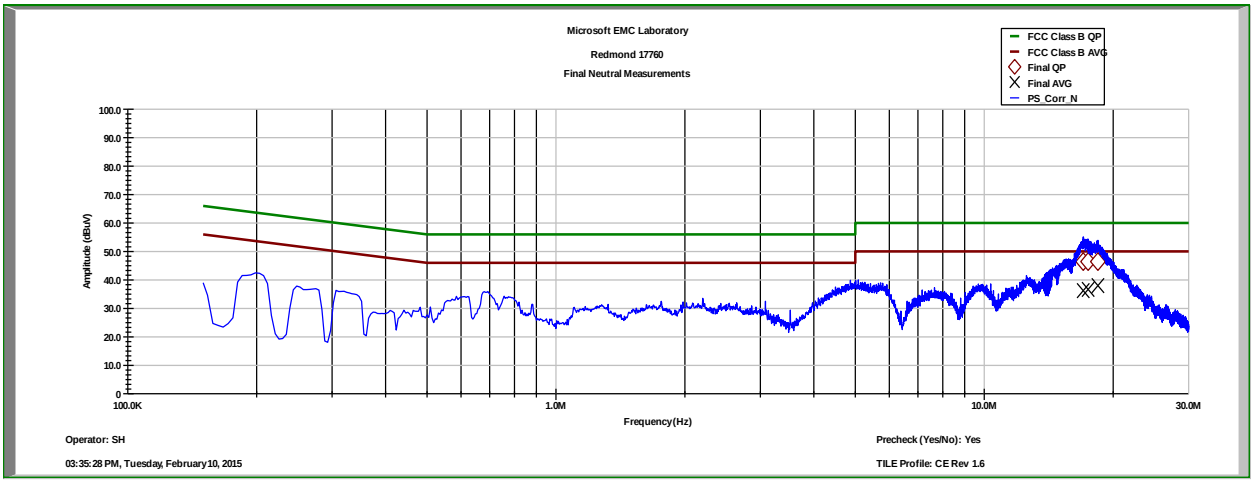
Pass

9.9.6 Test Data:

Frequency (MHz)	QP Net Reading (dBµV)	AVG Net Reading (dBµV)	Quasi-Peak Limit (dBµV)	Average Limit (dBµV)	Line Tested (L or N)	Quasi-Peak Margin (dB)	Average Margin (dB)
18.42	46.45	38.1	60	50	N	-13.55	-11.9
18.42	46.61	38.1	60	50	L	-13.39	-11.9
17.46	46.52	36.65	60	50	N	-13.48	-13.35
17.04	46.42	36.42	60	50	N	-13.58	-13.58
2.07	26.46	15.72	56	46	L	-29.54	-30.28
2.89	24.27	15.59	56	46	L	-31.73	-30.41



Plot 9-61. AC Line Conducted Emissions- Line (150 kHz- 30 MHz)



Plot 9-62. AC Line Conducted Emissions- Neutral (150 kHz- 30 MHz)

End of Report