



RADIO TEST REPORT

For

MODEL NO. 1754
FCC ID: C3K1754
IC ID: 3048A-1754

Test Report No. R-TR217-FCCIC-BTLE-2
Issue Date: 01/14/2016

FCC CFR47 Part 15 Subpart C
Industry Canada RSS-247 Issue 1

Prepared by
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1 Record of Revisions

Revision	Date	Section	Page(s)	Summary of Changes	Author/Revised By:
1.0	12/28/2015	All	All	Version 1.0	Andy Shen
2.0	01/14/2016	8.3 9.1.5 9.7.5	14 17 39, 41-42.	Added test setup for <30MHz. Updated Fig 9-2. Added test data for <30MHz and updated >1GHz data.	Andy Shen

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Test Report Attestation

Microsoft Corporation

Model: 1754

FCC ID: C3K1754

IC ID: 3048A-1754

Applicable Standards

Specification	Test Result
FCC CFR47 Rule Parts 15.207, 15.209, 15.247	Pass
Industry Canada RSS-247 Issue 1	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.

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 document replaces the previously issued Test Report #R-TR217-FCCIC-BTLE-1 issued by Microsoft EMC Labs on 12/28/2015.



Written By: Andy Shen
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

IC Site Registration Numbers: 3048A-3, 3048A-4

3.3 Test Equipment

The site and related equipment are constructed in conformance with the requirements of ANSI C63.4 2014, CISPR 16-1-1 and other equivalent applicable standards. Test site requirements for measurements above 1 GHz are in accordance with ANSI C63.4 2014.

ANSI C63.10 2013 and the appropriate KDB test methods were followed here.

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 $k=2$.

Expanded uncertainty calculations are available upon request.

Test item	Value (dB)
Radiated disturbance (30 MHz to 1 GHz)	5.87
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:	Jennifer Liu
Functional Description of the EUT:	Wireless Input Device
Model:	1754
FCC ID:	C3K1754
IC ID:	3048A-1754
Radio Description:	BT LE (2402- 2480 MHz)
Modulation:	GFSK
Antenna Type and Gain:	Internal 3.68 dBi
EUT Classification:	DTS
Equipment Design State:	EV2-Production Equivalent Prototype FW0.99.14
Equipment Condition:	Good
Test Sample Details:	SN: 0001274547523 – Conducted SN: 0000725547523 – Radiated

5.1 Test Configurations

The EUT was preprogrammed to transmit continuously with a constant duty cycle on low, middle, and high channels. LEDs on the unit indicated the proper mode of operation.

White LED blink once: Low Channel 2402 MHz

White LED blink twice: Mid Channel 2440 MHz

White LED blink three times: High channel 2480 MHz

Yellow LED: Transmitter turn off

5.2 Environmental Conditions

Ambient air temperature of the test site was within the range of 10 °C to 40 °C (50 °F to 104 °F) 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.

5.5 Dates of Testing

Testing was performed on December 14th2015- January 14th2016.

6 Test Results Summary

Test Description	FCC CFR 47/ IC Rule Part	Limit	Test Result
6dB Bandwidth	15.247 (a)(2) RSS-247 [5.2]	> 500kHz	Pass
Output Power	15.247 (b)(3) RSS-247 [5.4]	< 1 Watt	Pass
Power Spectral Density	15.247 (e) RSS-247 [5.2]	< 8dBm/3kHz	Pass
Conducted Band Edge/Spurious Emissions	15.247 (d) RSS-247 [5.5]	At least 20dBc	Pass
Radiated Spurious Emissions/ Restricted Band Emissions	15.205, 15.209 RSS-247 [5.5], RSS-Gen [8.9]	FCC CFR 47 15.209 limits RSS-Gen [8.9]	Pass
AC Power line Conducted Emissions	15.207 RSS-Gen [8.8]	FCC CFR 47 15.207 limits RSS-Gen [8.8]	Pass

7 Test Equipment List

Manufacturer	Description	Model #	Asset #	Calibration/ Verification Due
Agilent	Spectrum Analyzer	N9030A	EMC-605	6/15/2016
Agilent	Spectrum Analyzer –	N9344C	EMC-411	2/5/2017
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-192	4/14/2016
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-012	4/13/2016
Rohde & Schwarz	Open Switch and Control Unit	OSP130	RF-249	12/10/2016
Rohde & Schwarz	Open Switch and Control Unit	OSP150	RF-250	12/10/2016
Rohde & Schwarz	Open Switch and Control Unit	OSP130	Rf-018	12/28/2016
Rohde & Schwarz	Custom Filter Bank	SFUNIT RX	RF-323	12/9/2016
ETS-Lindgren	Antenna	3117	RF-139	4/9/2016
ETS-Lindgren	Antenna – Standard Gain	3160-09	RF-037	5/1/2016
ETS-Lindgren	Passive Loop	6512	EMC-440	5/21/2016
Sunol Sciences	Antenna – Broadband Hybrid	JB6	RF-039	5/6/2016
Huber & Suhner	RF Cable	SucoFlex 100	RF-350	12/10/2016
Huber & Suhner	RF Cable	SucoFelx 100	RF-352	12/10/2016
Matura	RF Cable	MXHQ87WA3000	RF-393	11/4/2016
Micro-Coax	RF Cable	UTI Flex	RF-354	12/10/2016
Micro-Coax	RF Cable	UTI Flex	RF-359	12/18/2016
Micro-Coax	RF Cable	UFB311A-0-2756-5005G0	EMC-866	12/18/2016
Huber & Suhner	RF Cable	SucoFlex 106A	RF-351	12/10/2016
Pasternack	Attenuator	PE7087-6	RF-345	12/14/2016

AC Line Conducted Emission Equipment list

Manufacturer	Description	Model #	Asset #	Calibration/ Verification Due
Rohde & Schwarz	EMI Test Receiver	ESR 3	EMC-669	11/15/2016
Teseq	LISN	NNB 51	EMC-057	5/28/2016
Micro-Coax	RF Cable	UFA210A-1- 1800-50U50U	EMC-367	8/6/2016
Madge Tech	THP Monitor	PRHTemp2000	EMC-837	6/23/2016

8 Test Site Description

8.1 Radiated Emissions Test Site

Radiated measurements were performed in a 3m semi-anechoic chamber, which fully met NSA requirements for the frequency range of 30MHz to 1000MHz. An absorber configuration meeting the SVWR requirement as specified in ANSI C63.4:2014 was used for measurements from 1 to 18 GHz.

An antenna mast and turntable were used for changing antenna height and EUT azimuth respectively. For measurements below 1 GHz, the antenna height was 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 was installed on the turntable to support the EUT.

Measurements above 1 GHz were performed with a device positioner, which supported the EUT 150 cm above the ground plane. The measurement antenna remained fixed at 150 cm while the device positioner and turntable rotated the EUT about two orthogonal axes to investigate emissions.

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

Radiated emissions above 1GHz were performed with linearly polarized antennas. RF absorbers covered the ground plane such that the site criterion specified in ANSI C63.4:2014 was met. For radiated measurements below 1GHz, linearly polarized broadband antennas were used. The RF absorbers were removed to reveal the ground plane.

8.2 Antenna port conducted measurements

All antenna port conducted measurements were 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 account for these correction factors.

8.3 Test Setup Diagrams

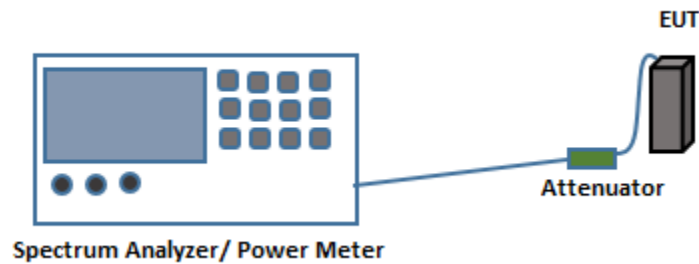


Fig.1. Test Setup for Antenna port conducted measurements

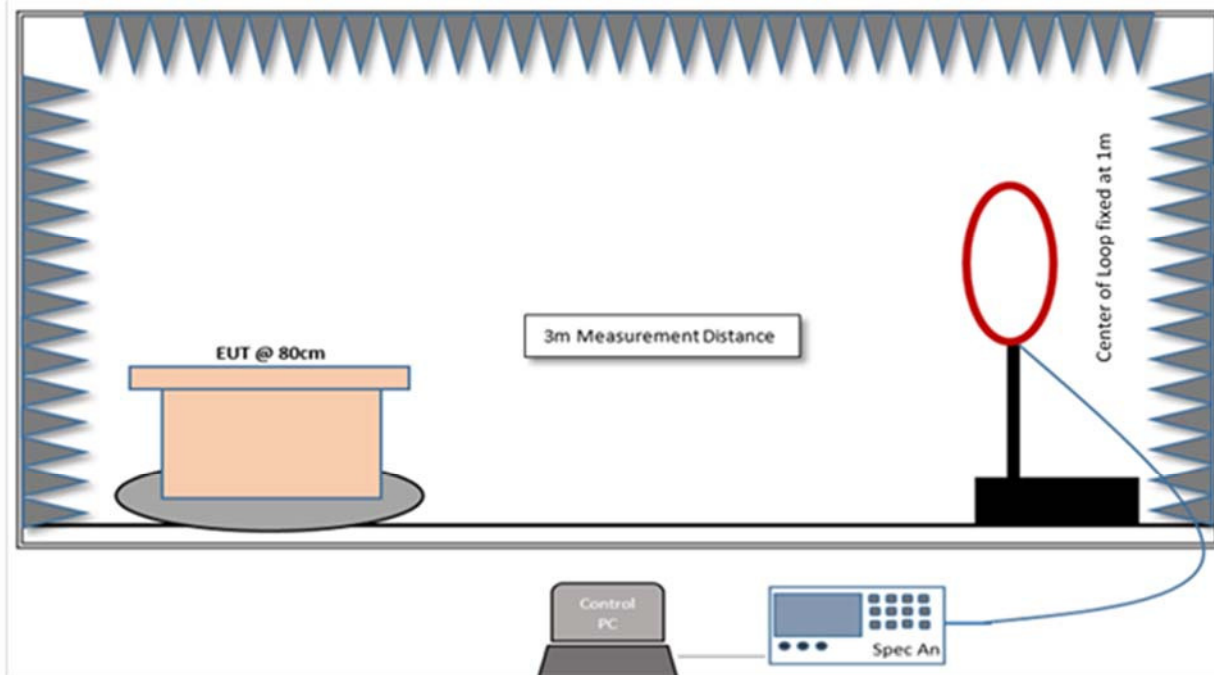


Fig.2. Test Setup for Radiated measurements in 9kHz - 30MHz

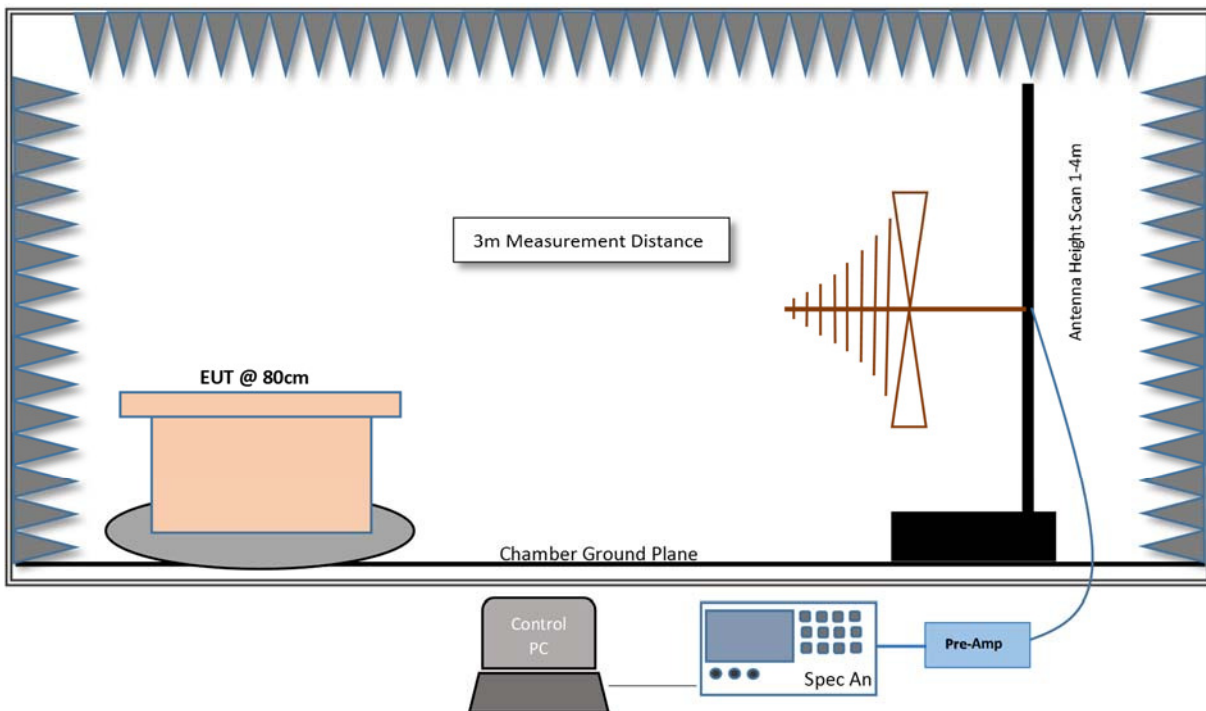


Fig.3. Test Setup for Radiated measurements in 30MHz- 1GHz Range

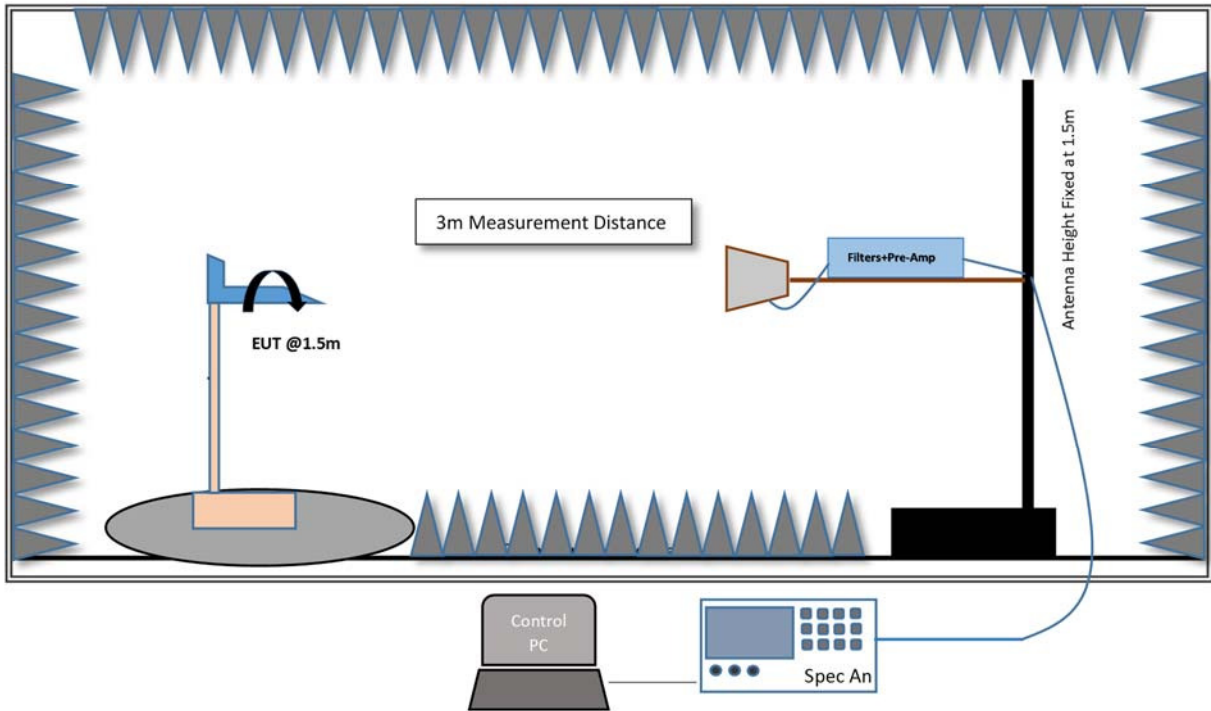


Fig.4. Test Setup for Radiated measurements in 1GHz- 18GHz Range

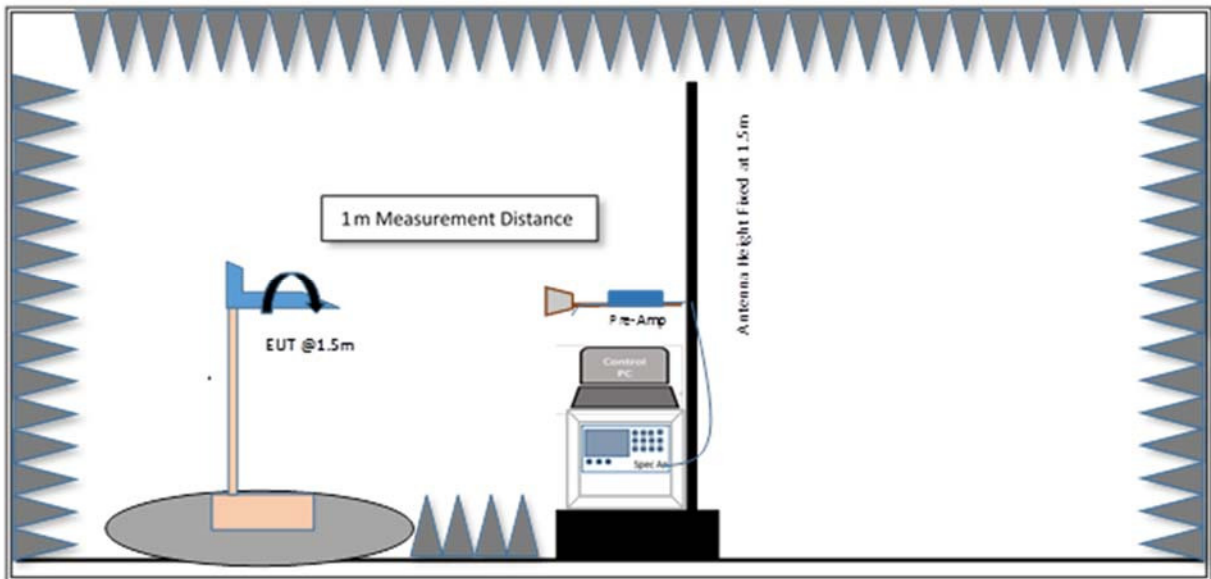


Fig.5. Test Setup for Radiated measurements >18GHz

9 Test Results- Conducted

9.1 Duty Cycle

9.1.1 Test Requirement:

Reporting and measurement purposes only.

9.1.2 Test Method:

Measurements were performed according to the procedure defined in ANSI C63.10 (2013) American National Standard of Procedure for Compliance Testing of Unlicensed Wireless Devices.

Spectrum Analyzer Settings:

RBW \geq Occupied Bandwidth if possible; otherwise, set RBW to the largest available value

VBW \geq RBW \geq Signal Period

Detector = Peak

Span = 0 Hz

Sweep points > 100

9.1.3 Limits:

Reporting and measurement purposes only.

9.1.4 Test Results:

Frequency (MHz)	On Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
2402	0.225	0.624	36.06%	4.43
2440	0.228	0.624	36.54%	4.37
2480	0.228	0.624	36.54%	4.37

9.1.5 Test Data:

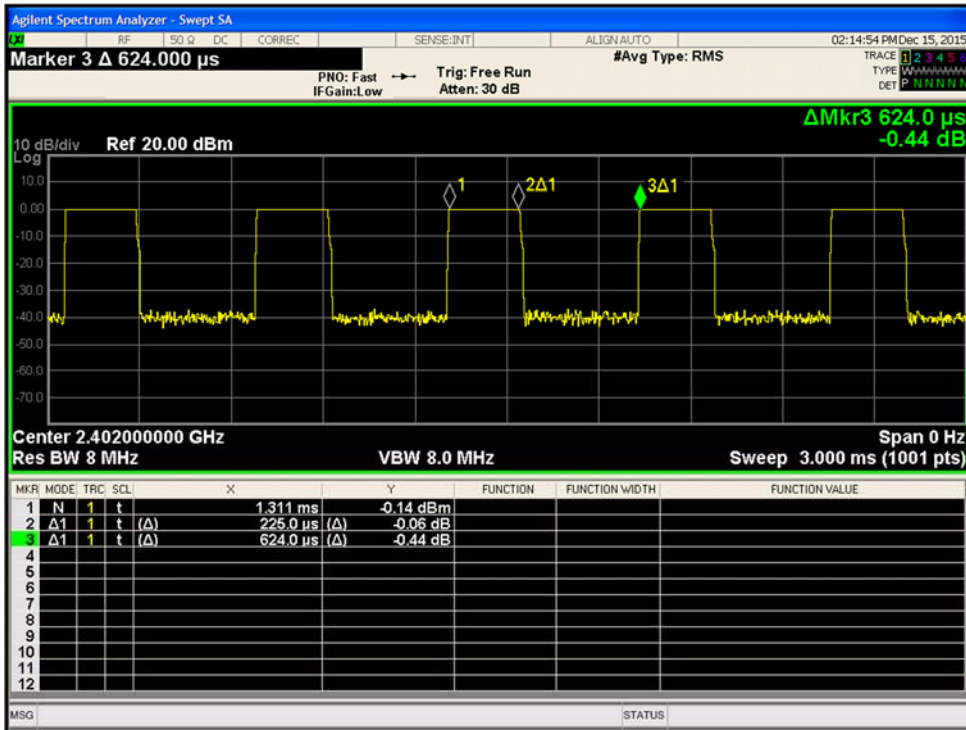


Figure 9-1. Duty Cycle 2402MHz (CH.0)

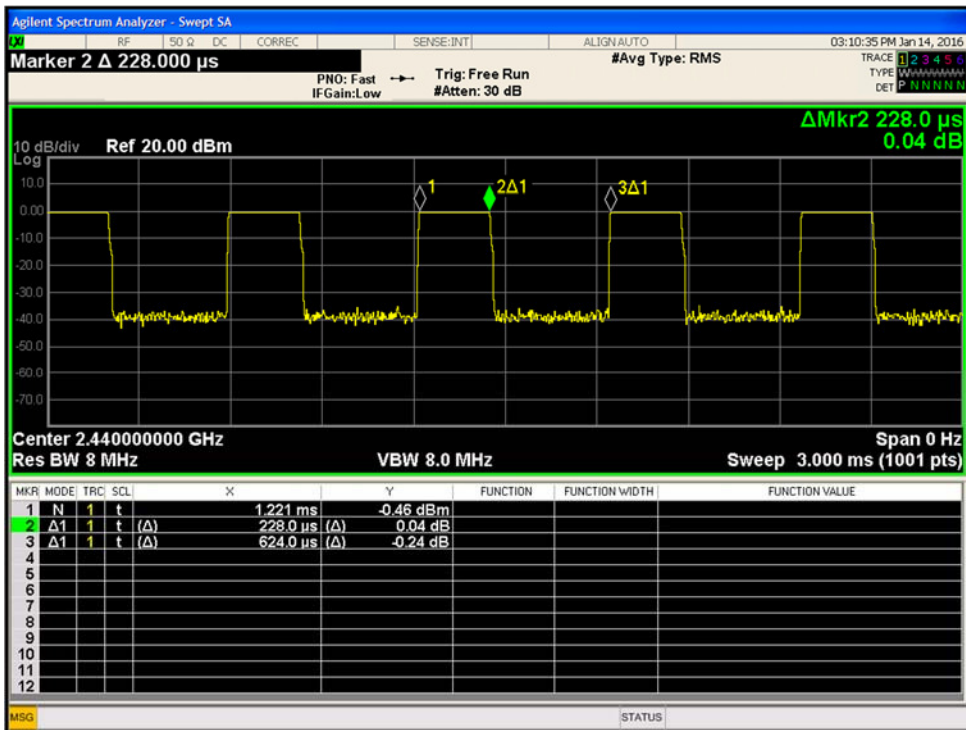


Figure 9-2. Duty Cycle 2440MHz (CH.19)

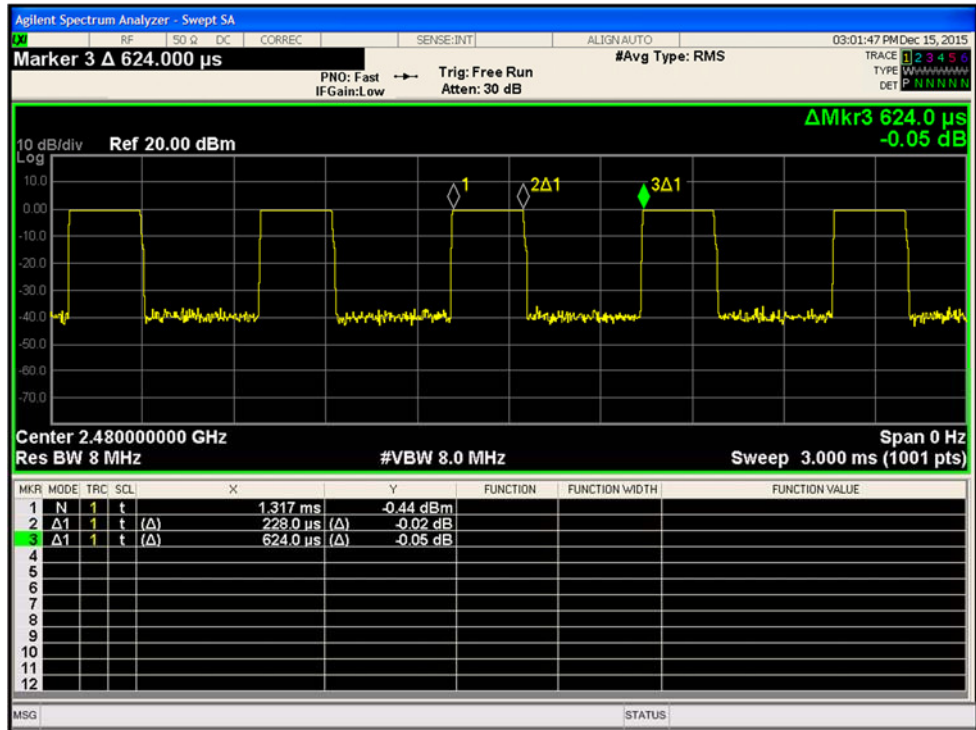


Figure 9-3. Duty Cycle 2480MHz (CH.39)

9.2 6-dB Bandwidth

9.2.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (a)(2)

Industry Canada RSS-247 [5.2]

9.2.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074- Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

Spectrum Analyzer settings:

RBW= 100 kHz

VBW= 300 kHz

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

The in-built functionality of the Spectrum Analyzer is used to measure the 6-dB bandwidth.

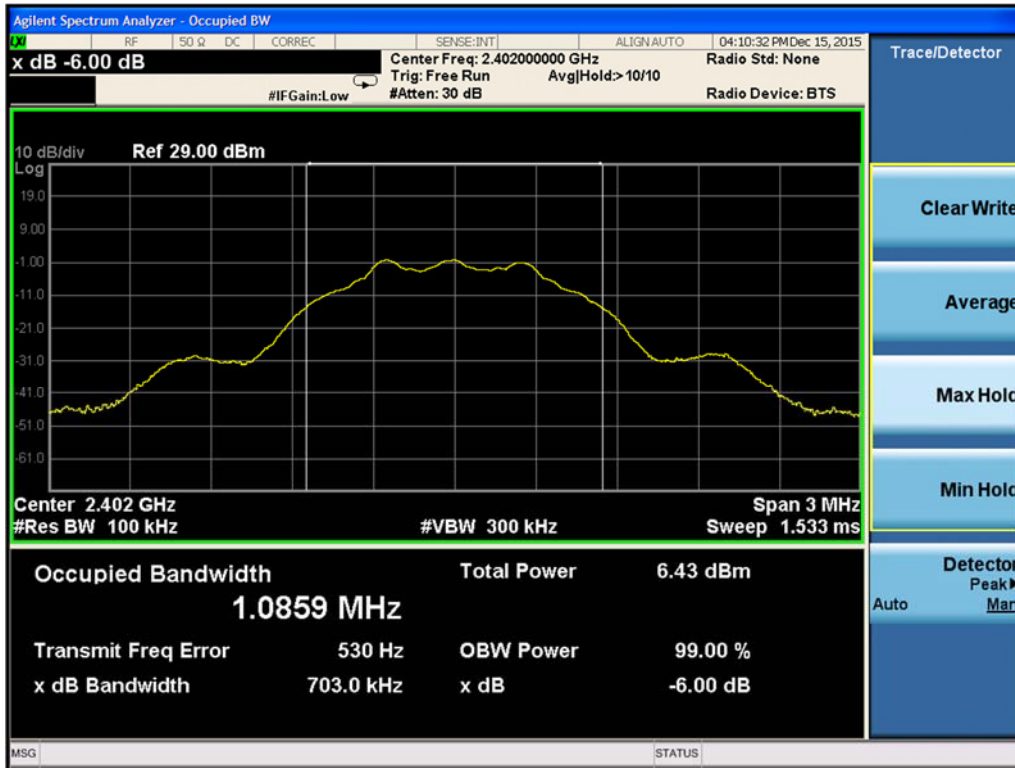
9.2.3 Limits:

The 6-dB bandwidth shall be at least 500 kHz

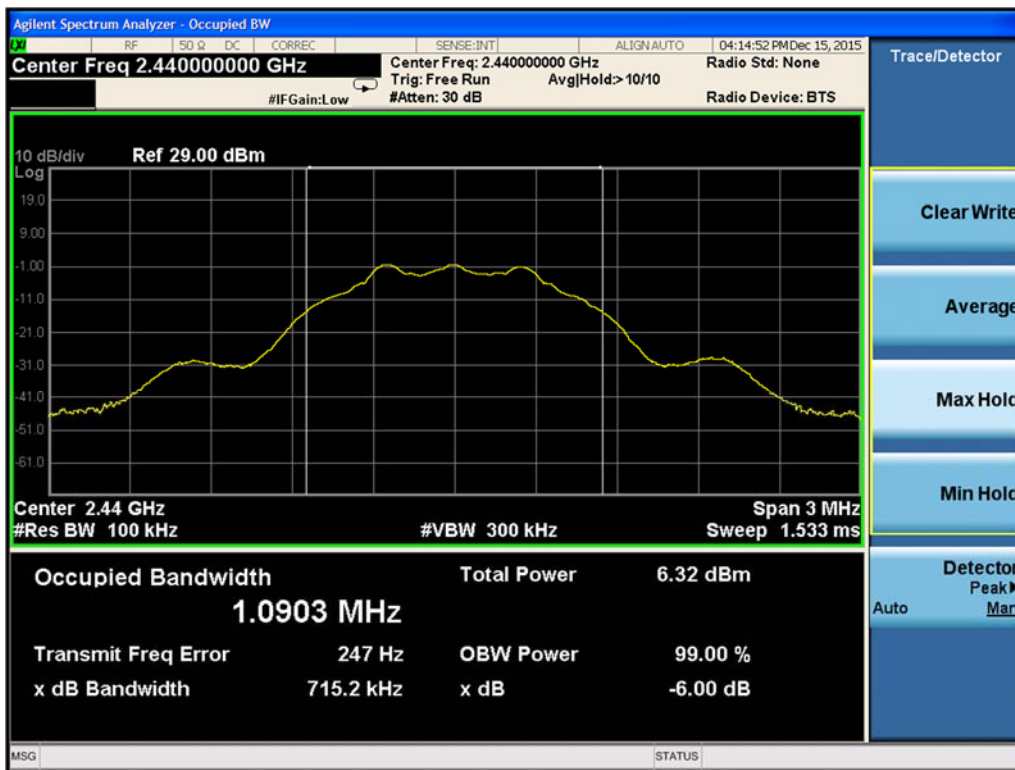
9.2.4 Test Results:

Frequency (MHz)	Test Mode	Channel No.	6dB Bandwidth (kHz)	Limit (kHz)	Result
2402	BT LE	0	703.0	>500	PASS
2440	BT LE	19	715.2	>500	PASS
2480	BT LE	39	714.0	>500	PASS

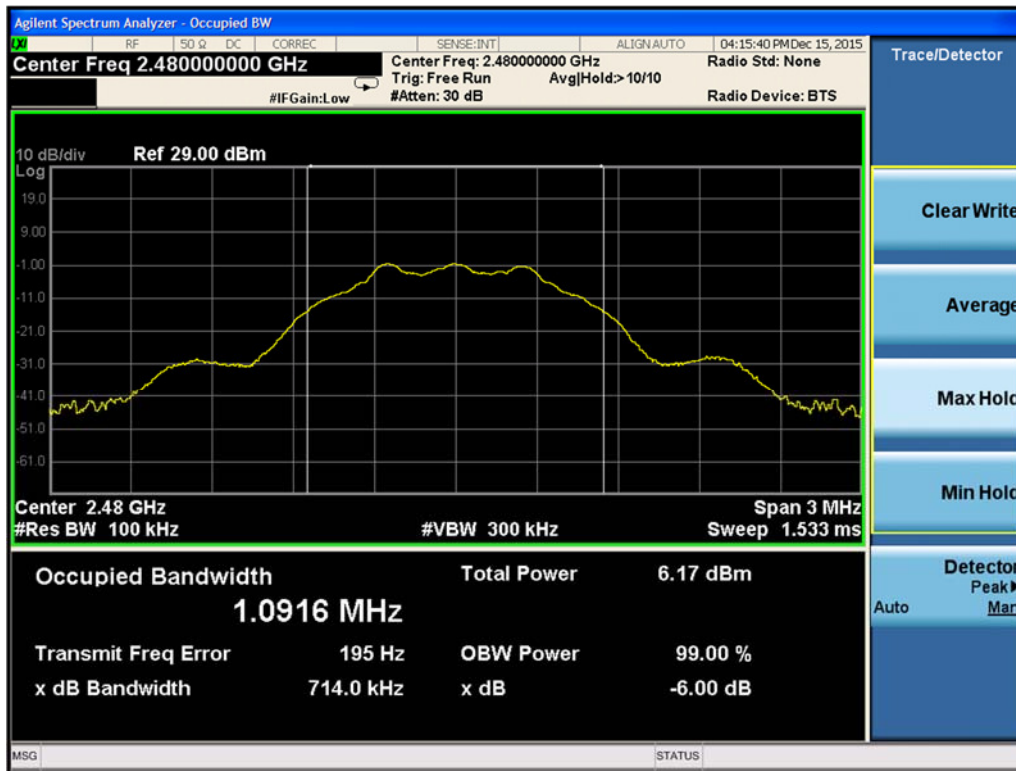
9.2.5 Test Data:



Plot 9-4. 6dB Bandwidth (Ch. 0)



Plot 9-5. 6dB Bandwidth (Ch. 19)



Plot 9-6. 6dB Bandwidth (Ch. 39)

9.3 Output Power

9.3.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (b)(3)

Industry Canada RSS-247 [5.4]

9.3.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

Spectrum Analyzer settings:

Peak Power:

RBW= 1 MHz

VBW= 3 MHz

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

Span= 3 MHz

9.3.3 Limits:

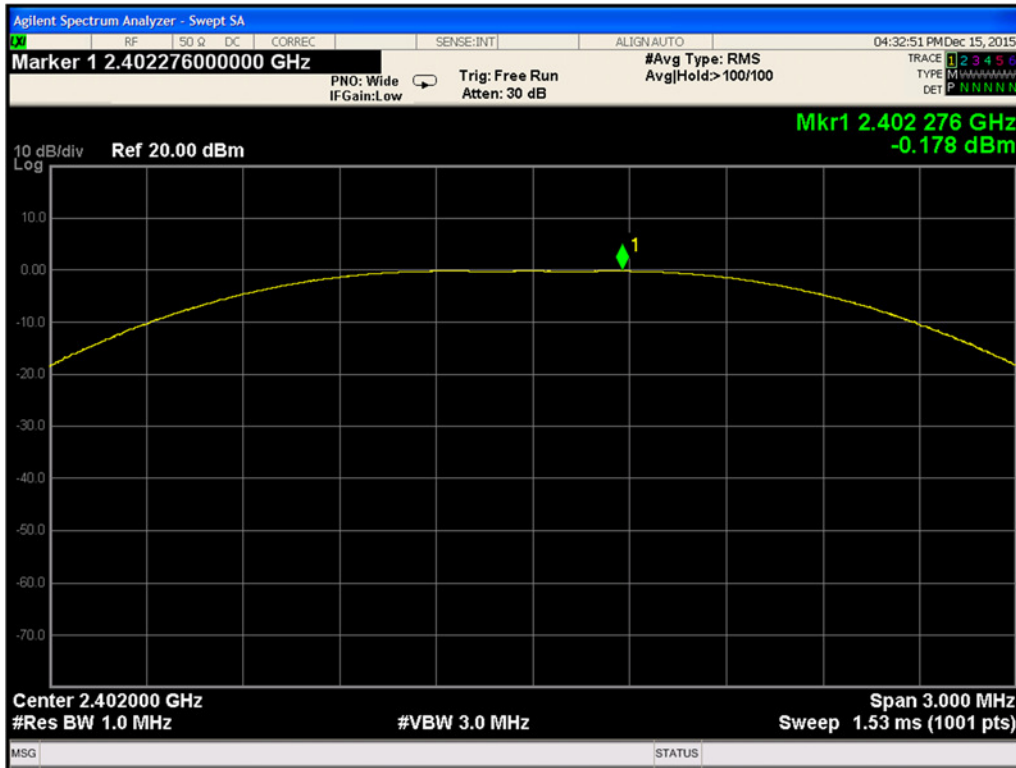
15.247: The maximum permissible peak output power is 30 dBm (1 W)

RSS-247: The maximum peak conducted output power shall not exceed 30dBm (1 W) and the maximum radiated output power shall not exceed 36dBm (4 W) EIRP.

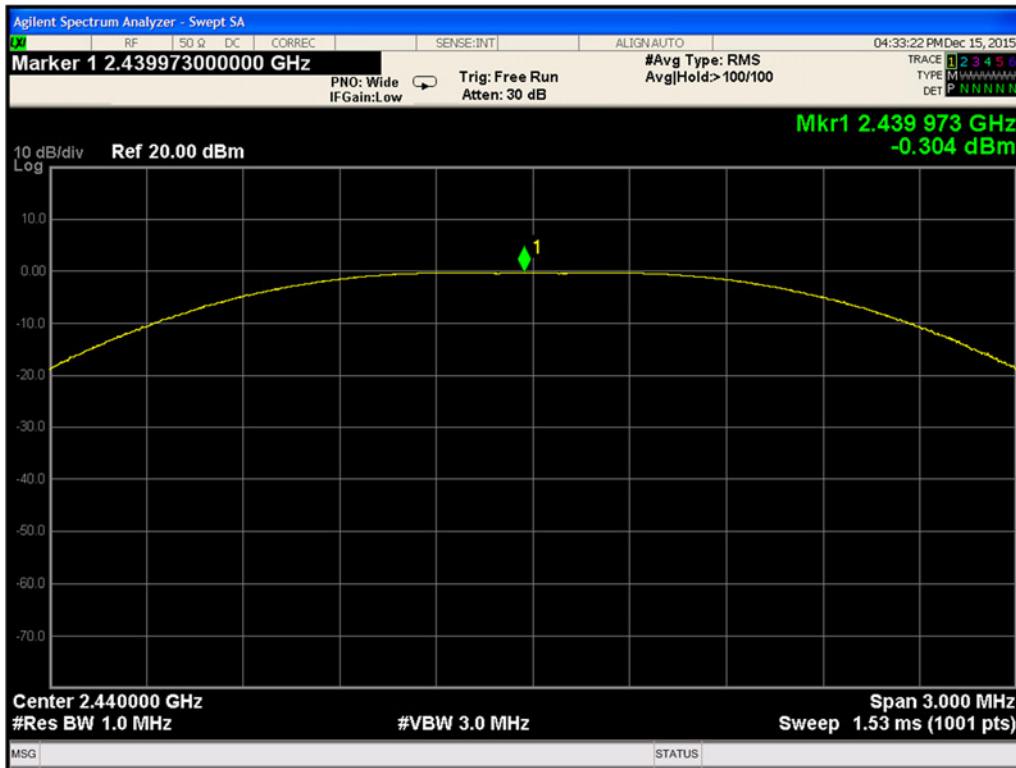
9.3.4 Test Results:

Frequency (MHz)	Test Mode	Channel No.	Peak Power-Conducted (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Peak EIRP (W)	Result
2402	BT LE	0	-0.178	3.68	3.50	0.0022	PASS
2440	BT LE	19	-0.304	3.68	3.38	0.0022	PASS
2480	BT LE	39	-0.519	3.68	3.16	0.0021	PASS

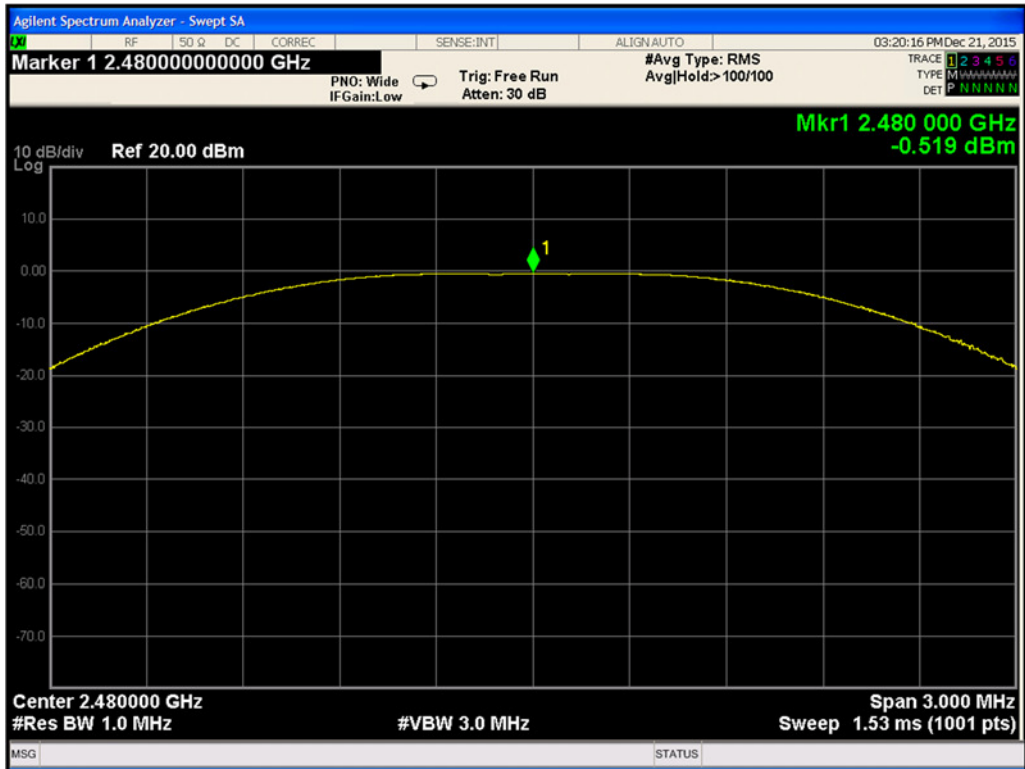
9.3.5 Test Data:



Plot 9-7. Peak Power (Ch. 0)



Plot 9-8. Peak Power (Ch. 19)



Plot 9-9. Peak Power (Ch. 39)

9.4 Peak Power Density

9.4.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (e)

Industry Canada RSS-247 [5.2]

9.4.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

Spectrum Analyzer settings:

RBW= 100 kHz

VBW= 300 kHz

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

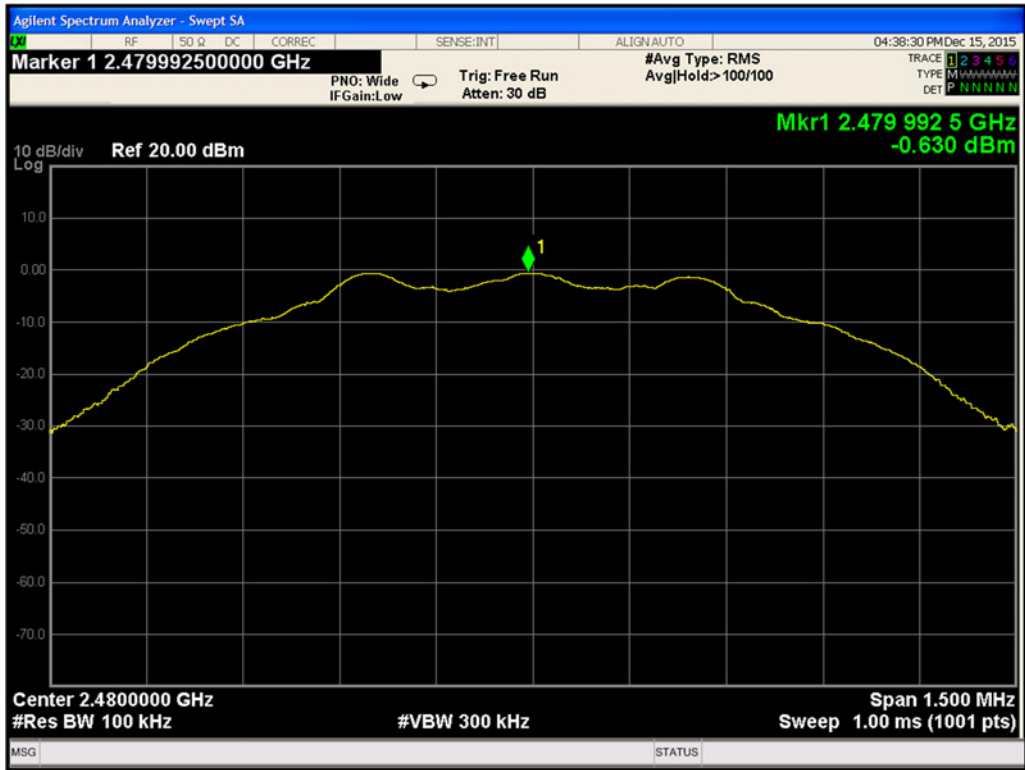
9.4.3 Limits:

The maximum permissible power density is 8 dBm/3kHz.

9.4.4 Test Results:

Frequency (MHz)	Test Mode	Channel No.	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
2402	BT LE	0	-0.323	8	PASS
2440	BT LE	19	-0.435	8	PASS
2480	BT LE	39	-0.630	8	PASS

The test data shows that the EUT passes the requirement using 100kHz RBW setting and hence should meet the requirement for 3kHz BW.



Plot 9-12. Power Spectral Density (Ch. 39)

9.5 Conducted Spurious Emissions

9.5.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

Industry Canada RSS-247 [5.5]

9.5.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

Spectrum Analyzer settings:

Identification of Reference Level:

RBW= 100 kHz

VBW \geq 3 x RBW

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

Span= 3 MHz

Peak Marker function to determine the max PSD level.

Conducted Spurious Emissions:

RBW= 1MHz

VBW \geq 3 x RBW

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

Span= 30 MHz- 12 GHz; 12 GHz – 25 GHz

Sweep Points= 30000

9.5.3 Limits:

All spurious emissions at least 20 dBc.

9.5.4 Test Result:

Pass.

9.5.5 Test Data:

Channel	Carrier Frequency (MHz)	Emission Frequency (MHz)	Emissions Amplitude (dBm/MHz)	Limit (dBm)	Result
0	2402	4805	-34.29	-20.32	Pass
0	2402	22894.4	-26.15	-20.32	Pass
39	2440	4880.4	-36.81	-20.43	Pass
39	2440	22686.4	-26.16	-20.43	Pass
78	2480	4960.6	-34.17	-20.63	Pass
78	2480	22760.5	-26.18	-20.63	Pass

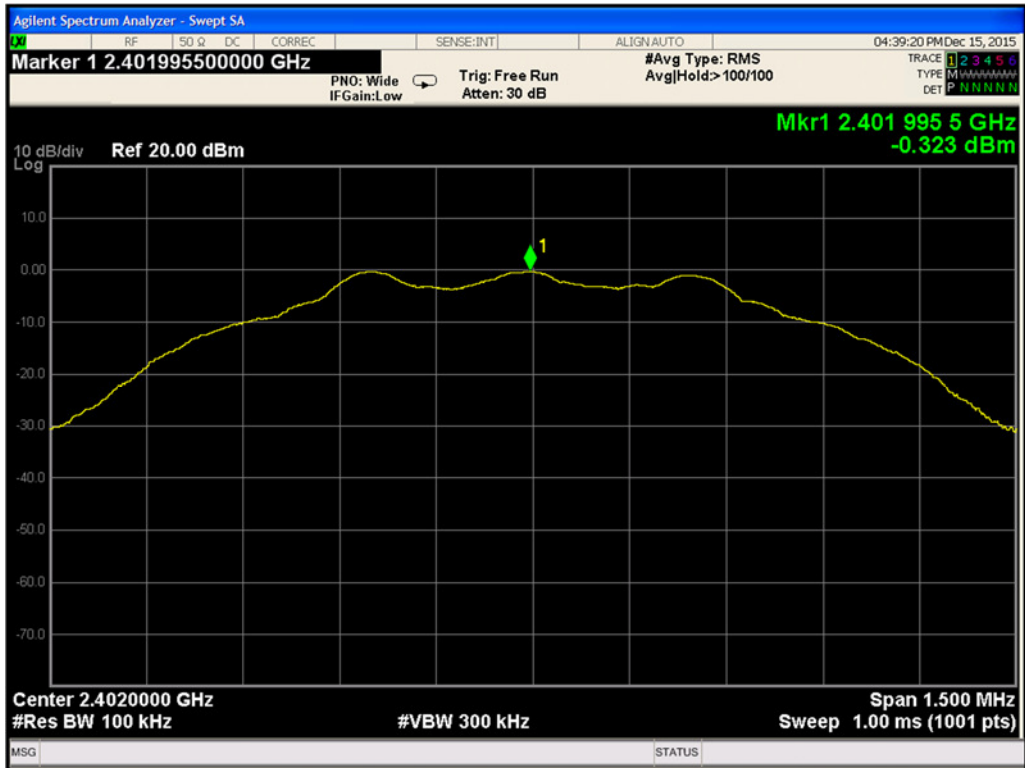
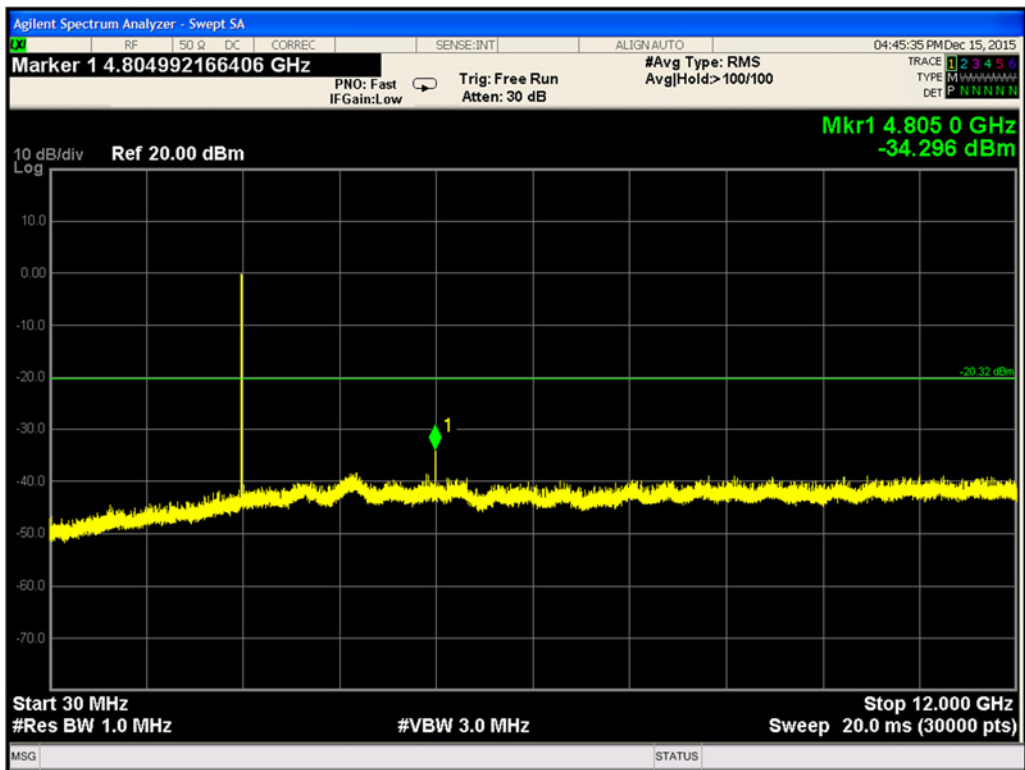


Figure 9-13. Reference Level Measurement (Ch.0)



Plot 9-14. Conducted Spurious Emissions 30-12000 MHz (Ch. 0)

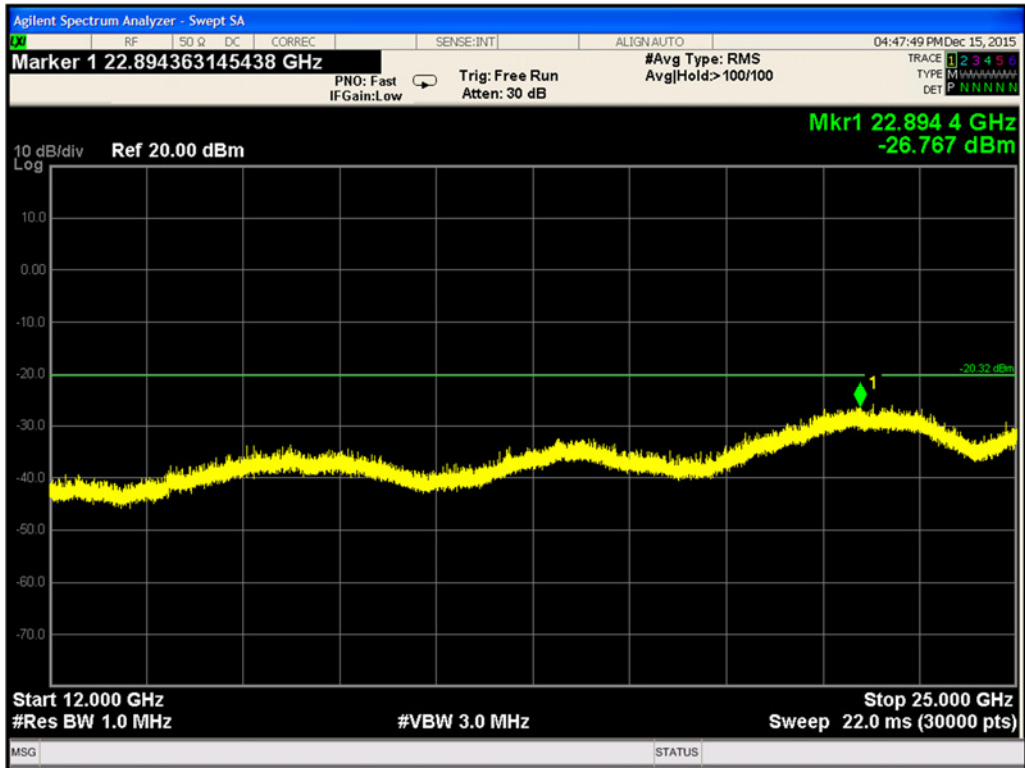


Figure 9-15. Conducted Spurious Emissions 12-25 GHz (ch.0)

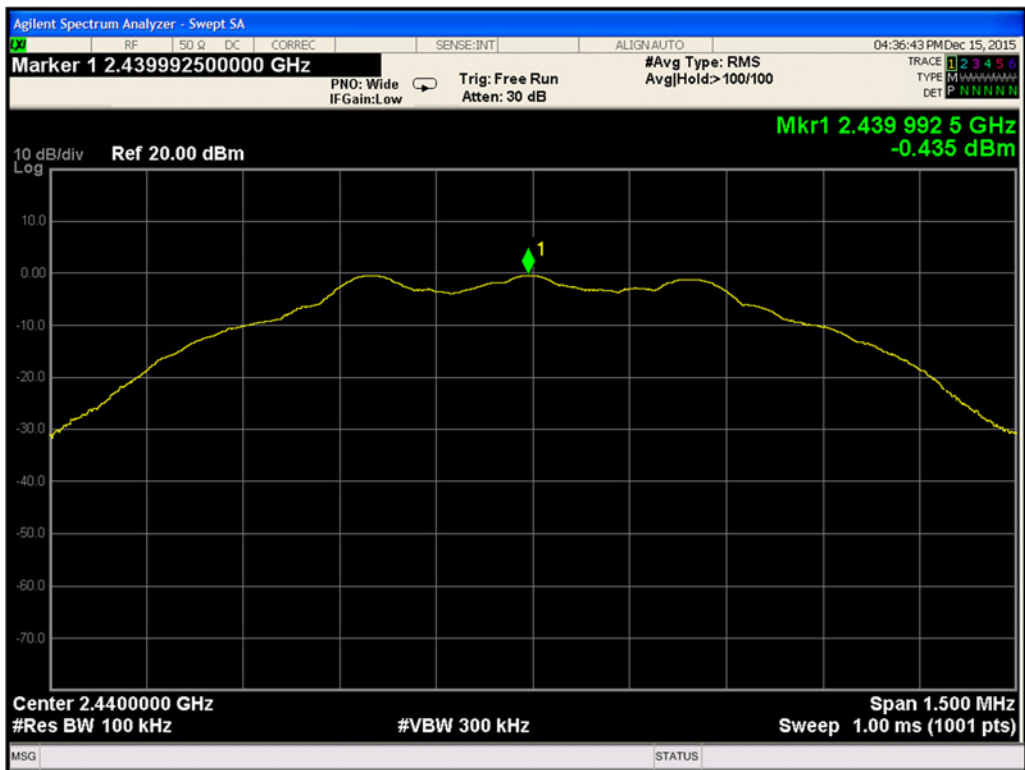


Figure 9-16. Reference Level Measurement (ch.19)

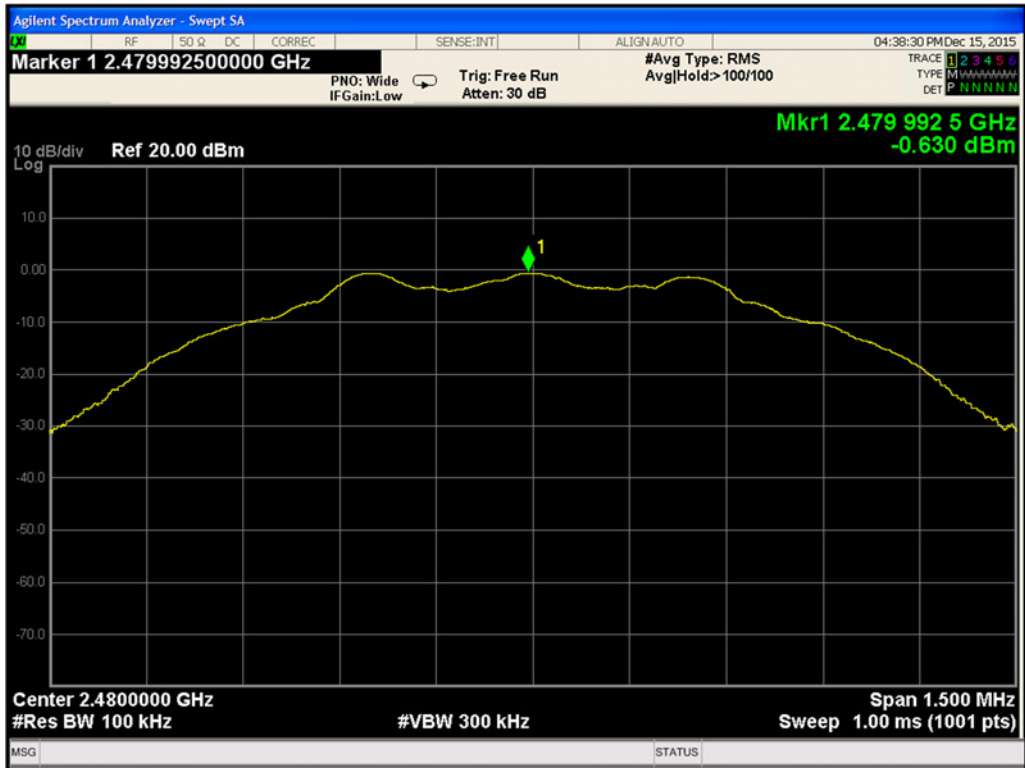


Figure 9-19. Reference Level Measurement (ch.39)

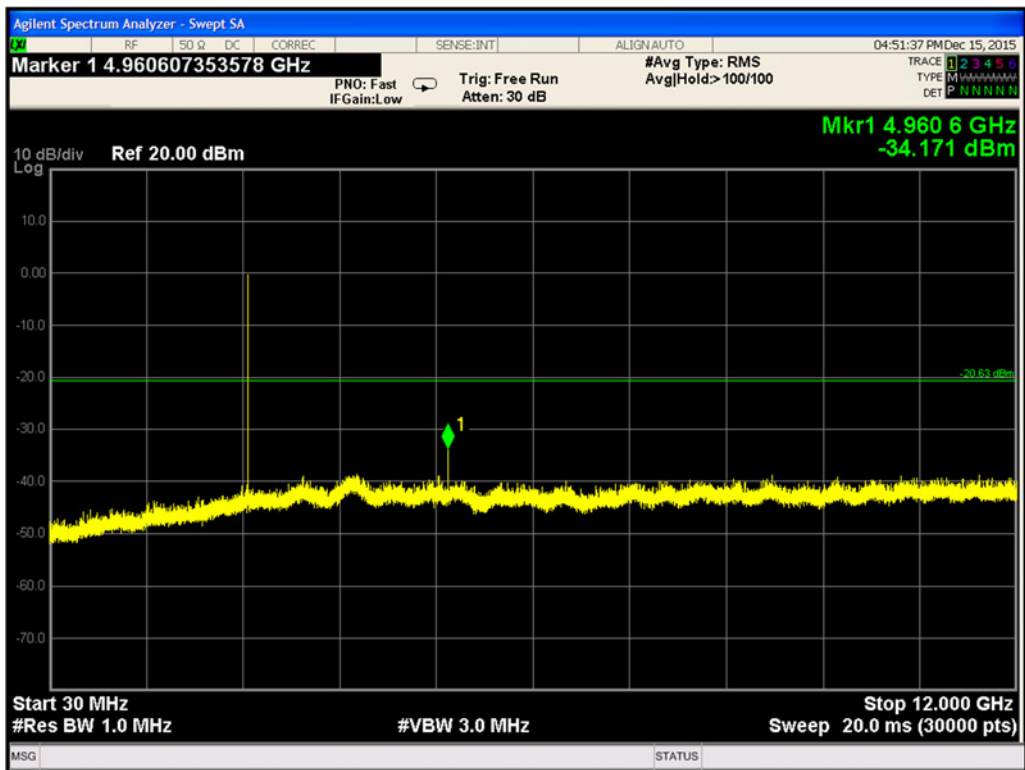


Figure 9-20. Conducted Spurious Emissions 30-12000 MHz (ch.39)

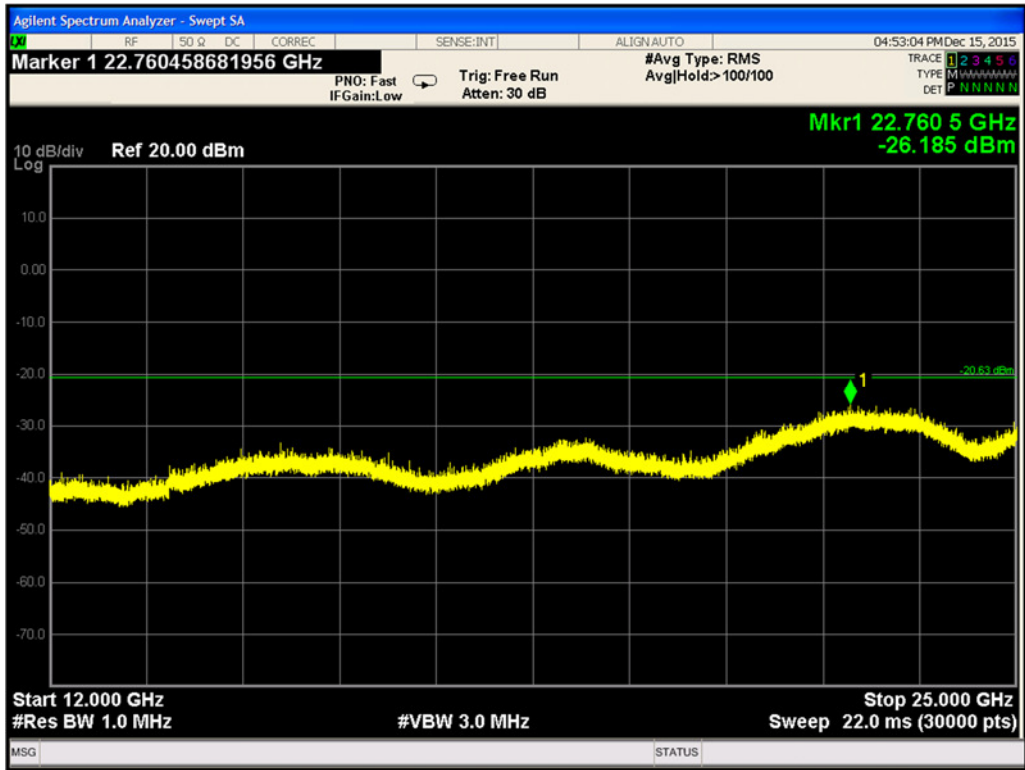


Figure 9-21. Conducted Spurious Emissions 12-25GHz (ch.39)

9.6 Conducted Band Edge Emissions

9.6.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

Industry Canada RSS-247 [5.5]

9.6.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

Spectrum Analyzer settings:

Band Edge Emissions:

RBW= 100 kHz

VBW \geq 3 x RBW

Detector= Peak

Sweep time= Auto

Span = 10MHz

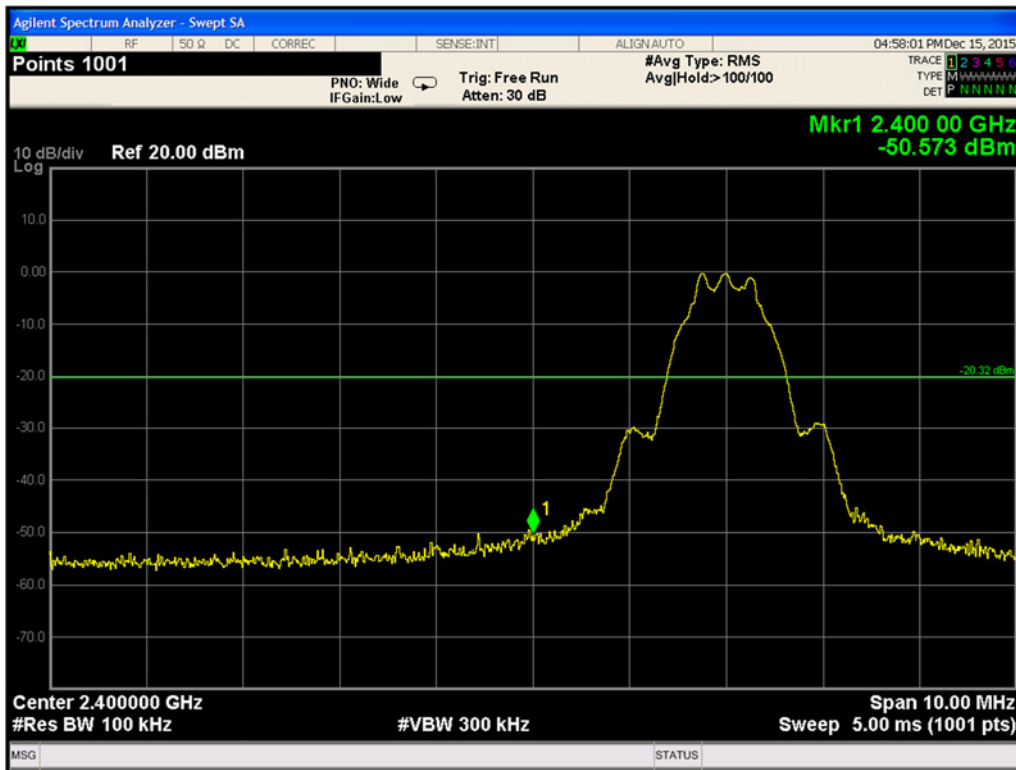
9.6.3 Limits:

All spurious emissions at least 20 dBc.

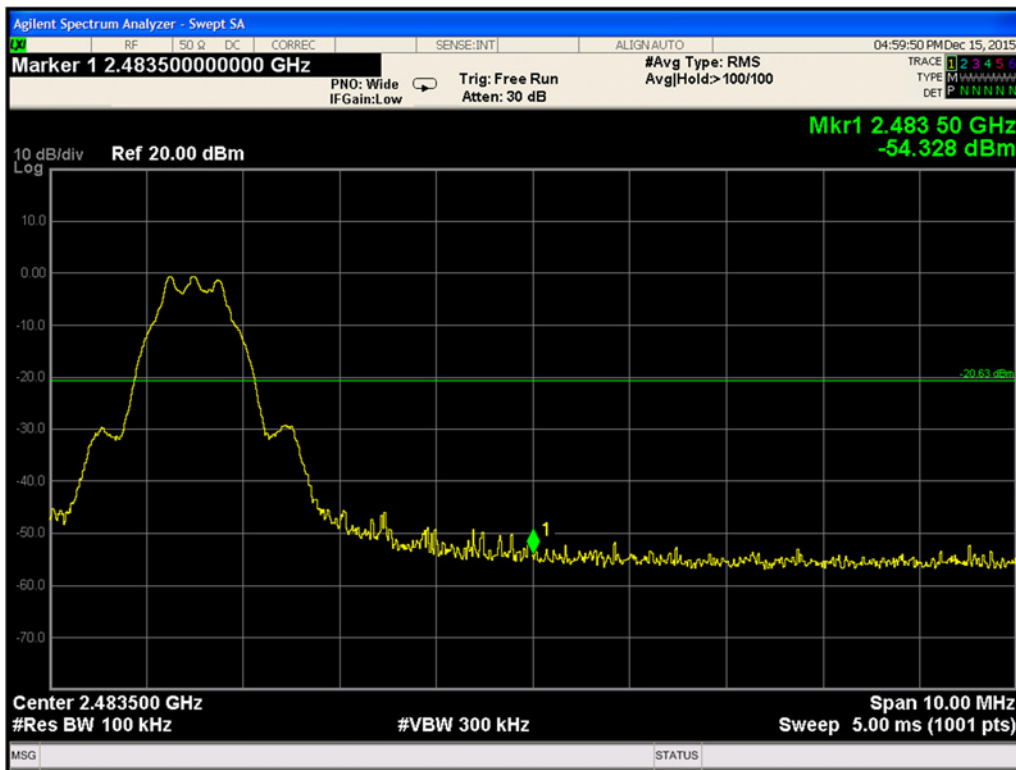
9.6.4 Test Result:

Pass.

9.6.5 Test Data:



Plot 9-22. Conducted-Low Band Edge (Ch. 0)



Plot 9-23. Conducted- High Band Edge (Ch. 39)

9.7 Radiated Spurious and Band Edge Emissions

9.7.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

Industry Canada RSS-247 [5.5] and RSS GEN [8.9]

9.7.2 Test Method:

Measurements were performed according to the procedure defined in KDB 558074 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 V03R04 and ANSI C63.10 2013.

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

The EUT was tested near the low, middle and high channels of operation. Guidelines in ANSI C63.10 2013 were followed with respect to maximizing the emission by rotating the EUT about its vertical and horizontal axis and adjusting the measurement antenna 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.

Sample Calculation:

Field Strength Level: Amplitude (Analyzer level) + AFCL (Antenna Factor and Cable losses) – Amplifier Gain = 50 dB μ V + 33 dB – 25 dB = 58dB μ V/m

Spectrum Analyzer Settings:

Radiated Spurious Emissions

30 MHz- 1 GHz:

RBW= 100 kHz

VBW \geq 3 X RBW

Trace Mode: Peak Detector (Max Hold). Final measurements performed using QP Detector.

Span= 30 MHz- 1 GHz

Sweep time= Auto

Above 1 GHz:

RBW= 1 MHz

VBW= 3 MHz

Trace Mode: Peak Detector (Max Hold) and RMS Average Detector (Max Hold)

Span= 1- 18 GHz and 18- 26.5 GHz.

Sweep time= Auto

Spectrum Analyzer Settings:

Restricted Band-Edge Emissions

RBW= 1 MHz

VBW= 3 MHz

Trace Mode: Peak Detector (Max Hold) and RMS Average Detector (Max Hold)

Span= 2310 – 2500 MHz

Sweep Points = 801

Sweep Time = Peak: Auto; Average: 100 s

9.7.3 Limits:

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Field Strength ($\text{dB}\mu\text{V}/\text{m}$)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	48.5- 13.8	300
0.490-1.705	24000/F (kHz)	33.8- 23.0	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
960-1000	500	54	3
Above 1000	500	54 (Average) 74 (Peak)	3

9.7.4 Test Result:

Pass.

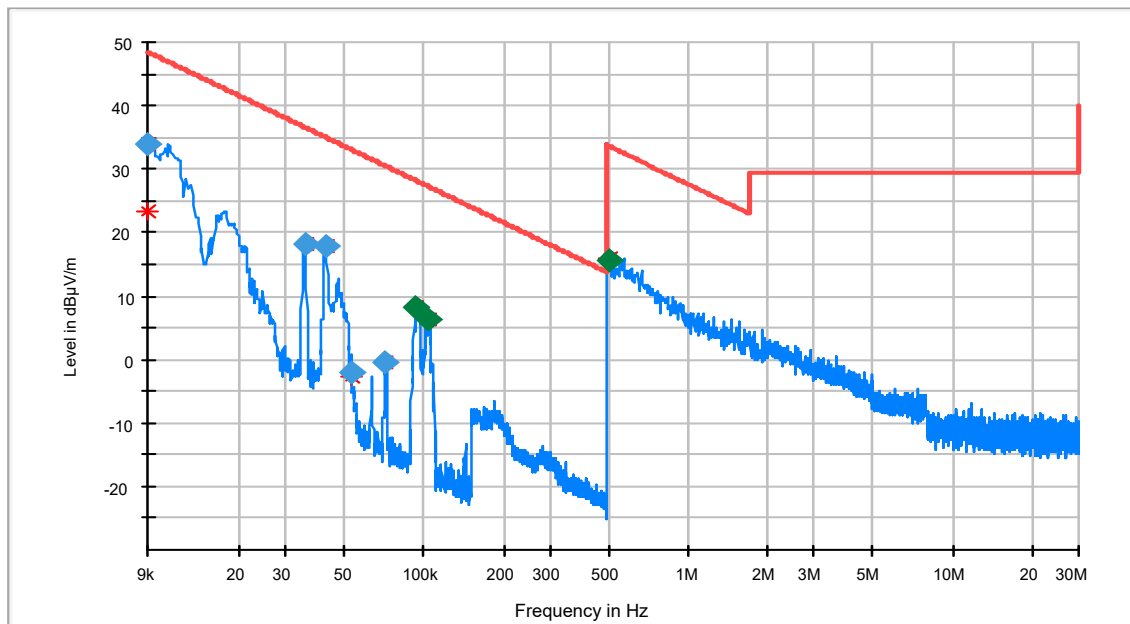
9.7.5 Test Data:

9.7.5.1 Emission in 9 kHz – 30 MHz range

Worst case emission in low channel of operation shown here. Peak data meets the average limit requirement and hence additional average measurements are not performed.

RSE 9 kHz – 30MHz Peak Data							
Carrier Frequency (MHz)	Frequency (MHz)	Raw Peak Amplitude (dB μ V)	Correction Factor (dB)	Corrected Peak Field Strength (dB μ V/m)	Average Limit (dB μ V/m)	Peak Limit (dB μ V/m)	Peak Margin (dB)
2402	0.0090	26.34	7.6	33.94	48.50	68.50	-34.56
2402	0.0355	22.30	-4.2	18.10	36.58	56.58	-38.48
2402	0.0422	23.71	-5.7	18.01	35.07	55.07	-37.06
2402	0.0535	5.70	-7.8	-2.10	33.02	53.02	-55.12
2402	0.0718	9.63	-10.0	-0.37	30.46	50.46	-50.83

RSE 9 kHz – 30MHz Quasi-Peak Data						
Carrier Frequency (MHz)	Frequency (MHz)	Raw Quasi-Peak Amplitude (dB μ V)	Correction Factor (dB)	Corrected Quasi-Peak Field Strength (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	QP Margin (dB)
2402	0.0927	20.84	-12.5	8.34	28.25	-19.91
2402	0.1034	19.95	-13.6	6.35	27.3	-20.95
2402	0.5060	2.7	13.0	15.7	33.52	-17.82



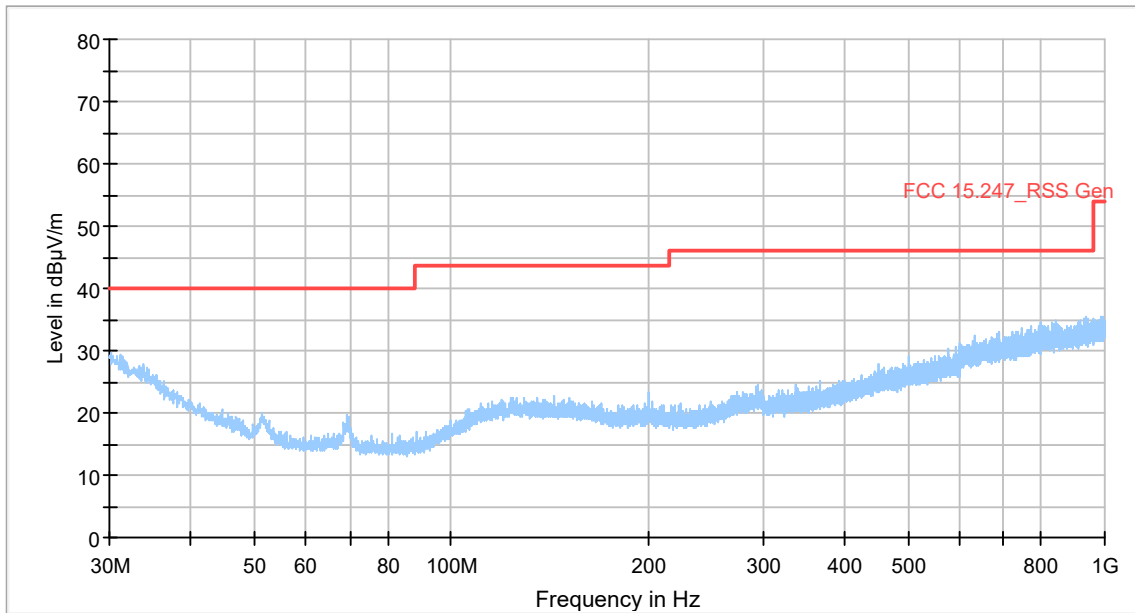
◆ Preview Result 1-PK+ Final_Result PK+
 ✱ Critical_Freqs PK+ Final_Result QPK
 — FCC 15.209

Plot 9-24. Radiated Spurious Emissions (Ch. 0) (9kHz – 30MHz)

9.7.5.3 Emissions in 30 MHz- 1 GHz range

Worst case emissions in mid channel of operation shown here.

RSE 30-1000 MHz					
Frequency (MHz)	Raw Quasi-Peak Amplitude (dB μ V/m)	Correction Factor (dB)	Corrected Peak Field Strength (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Quasi-Peak Margin (dB)
2440	No significant emissions to report above noise floor.				



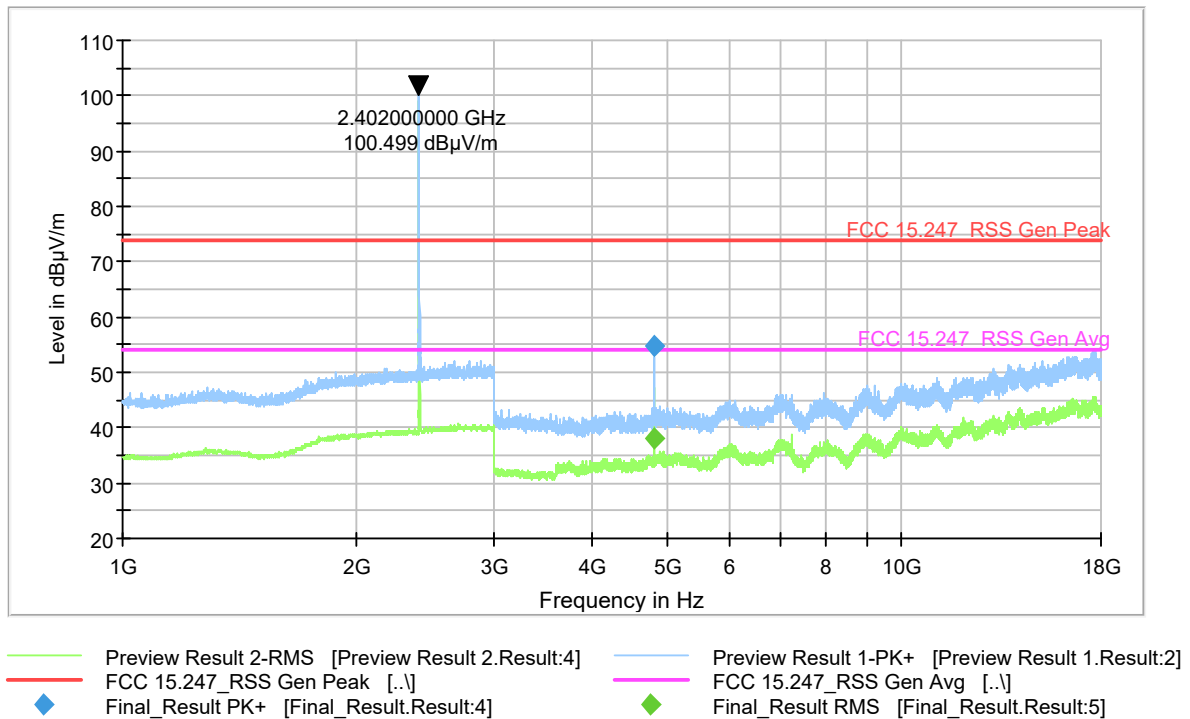
- Preview Result 1-PK+ [Preview Result 1.Result:2]
- * Critical_Freqs PK+ [Critical_Freqs.Result:4]
- ◆ Final_Result PK+ [Final_Result.Result:4]
- * Critical_Freqs AVG [Critical_Freqs.Result:5]
- FCC 15.247_RSS Gen [..]
- ◆ Final_Result QPK [Final_Result.Result:5]

Plot 9-25. Radiated Spurious Emissions (Ch. 19) (30MHz - 1GHz)

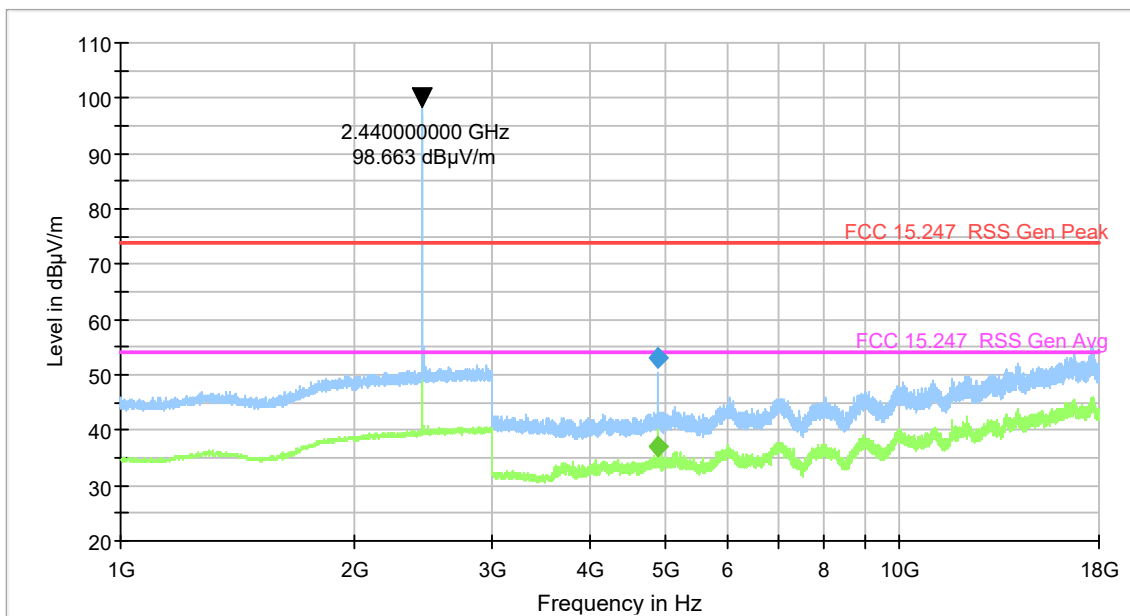
9.7.5.4 Emissions in 1-18 GHz range

RSE 1 - 18GHz Average Data							
Carrier Frequency (MHz)	Frequency (MHz)	Raw Avg. Amplitude (dB μ V)	Correction Factor (dB)	Duty Cycle Correction (dB)	Corrected Avg. Field Strength (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)
2402	4804.1	29.74	8.3	4.43	42.47	54	-11.53
2440	4880.1	29.06	8	4.47	41.53	54	-12.47
2480	4959.8	28.68	8	4.47	41.15	54	-12.85
2480	7439.3	23.86	10.5	4.47	38.83	54	-15.17

RSE 1 - 18GHz Peak Data							
Carrier Frequency (MHz)	Frequency (MHz)	Raw Peak Amplitude (dB μ V)	Correction Factor (dB)	Corrected Peak Field Strength (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	
2402	4804.1	46.63	8.3	54.93	74	-19.07	
2440	4880.1	44.9	8	52.9	74	-21.1	
2480	4959.8	42.91	8	50.91	74	-23.09	
2480	7439.3	35.19	10.5	45.69	74	-28.31	

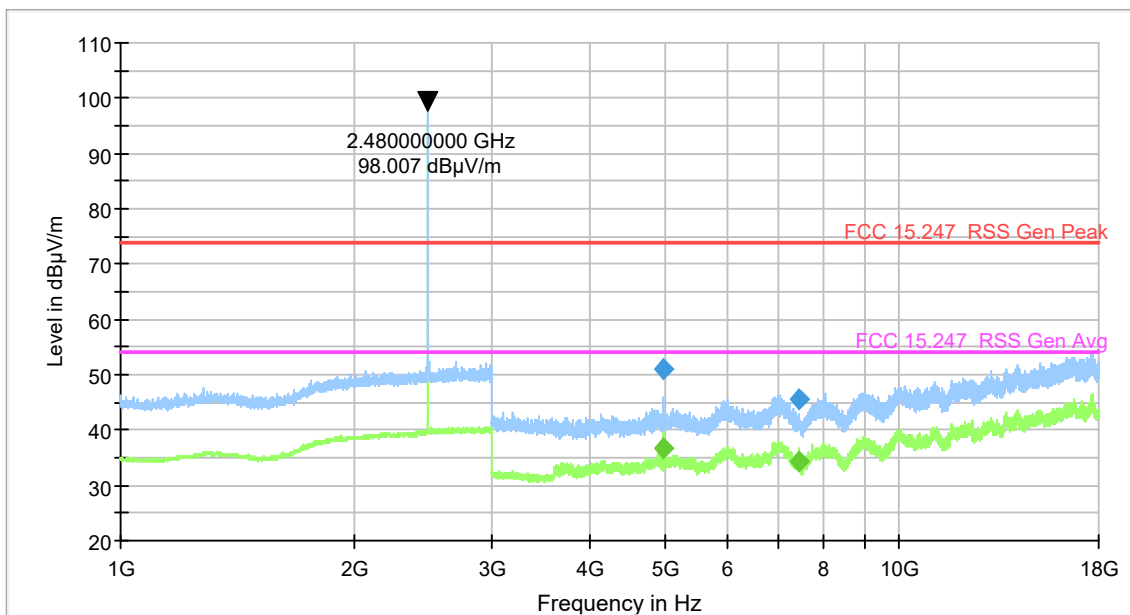


Plot 9-26. Radiated Spurious Emissions 1-18 GHz (Ch. 0)



— Preview Result 2-RMS [Preview Result 2.Result:4] — Preview Result 1-PK+ [Preview Result 1.Result:2]
— FCC 15.247_RSS Gen Peak [..] — FCC 15.247_RSS Gen Avg [..]
◆ Final_Result PK+ [Final_Result.Result:4] ◆ Final_Result RMS [Final_Result.Result:5]

Plot 9-27. Radiated Spurious Emissions 1-18 GHz (Ch. 19)

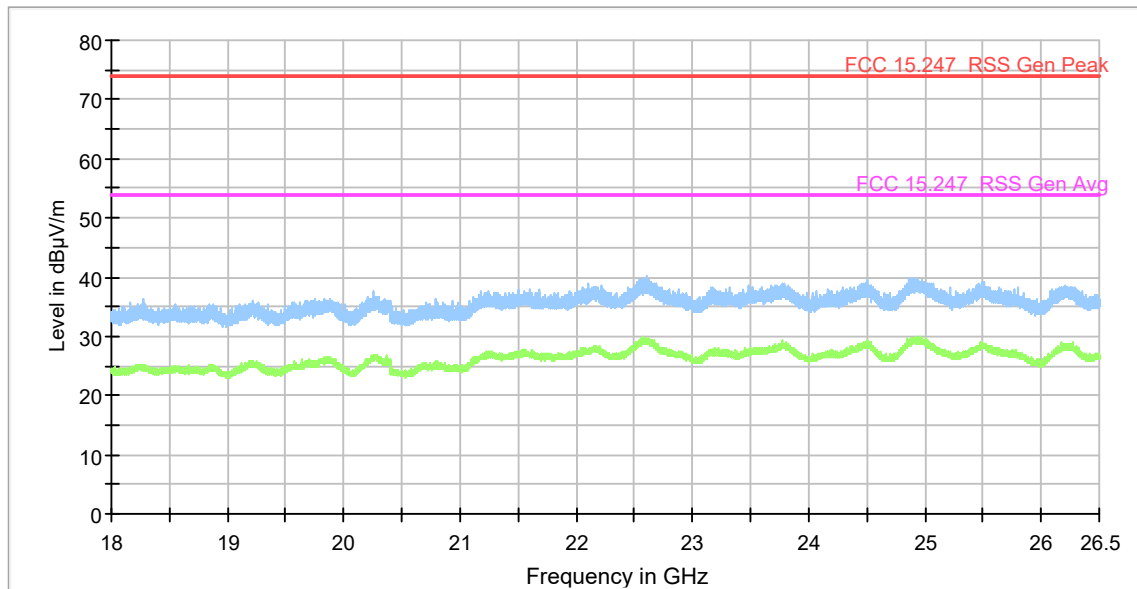










— Preview Result 2-RMS [Preview Result 2.Result:4] — Preview Result 1-PK+ [Preview Result 1.Result:2]
— FCC 15.247_RSS Gen Peak [..] — FCC 15.247_RSS Gen Avg [..]
◆ Final_Result PK+ [Final_Result.Result:4] ◆ Final_Result RMS [Final_Result.Result:5]

Plot 9-28. Radiated Spurious Emissions 1-18 GHz (Ch. 39)

9.7.5.5 Emissions in 18-26.5 GHz range

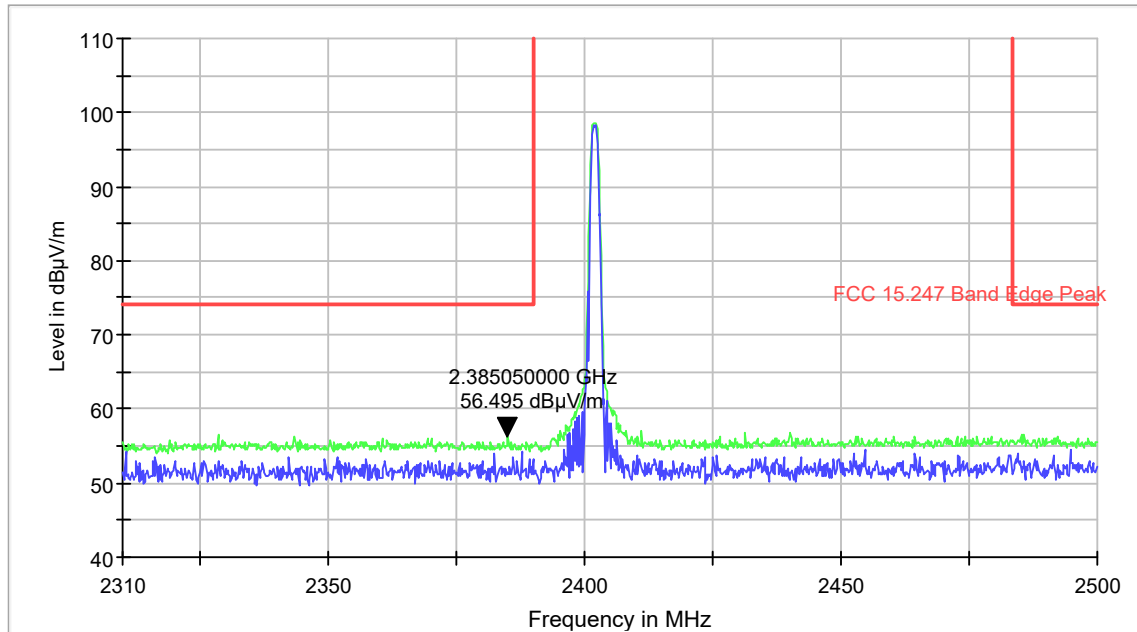
No significant emissions to report above noise floor.



- | | | | |
|---|--|---|--|
|  | Preview Result 2-RMS [Preview Result 2.Result:4] |  | Preview Result 1-PK+ [Preview Result 1.Result:2] |
|  | Critical_Freqs RMS [Critical_Freqs.Result:5] |  | Critical_Freqs PK+ [Critical_Freqs.Result:4] |
|  | FCC 15.247_RSS Gen Peak [..] |  | FCC 15.247_RSS Gen Avg [..] |
|  | Final_Result PK+ [Final_Result.Result:4] |  | Final_Result RMS [Final_Result.Result:5] |

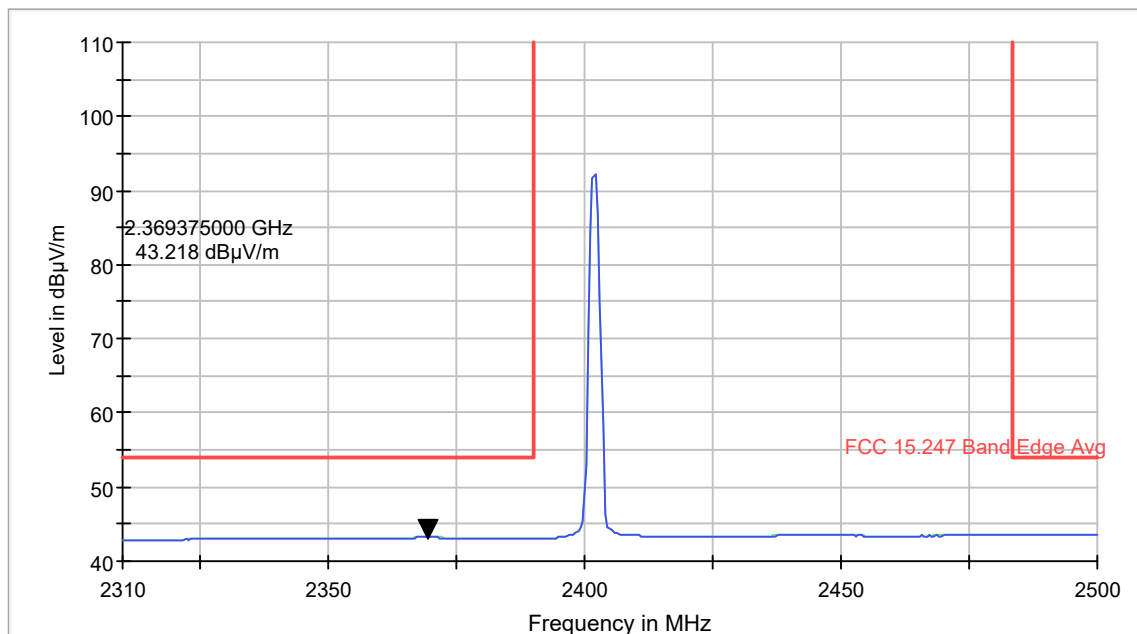
Plot 9-29. Radiated Spurious Emissions (Ch. 0) (18 – 26.5 GHz)

9.7.5.6 Radiated restricted Band-edge emissions



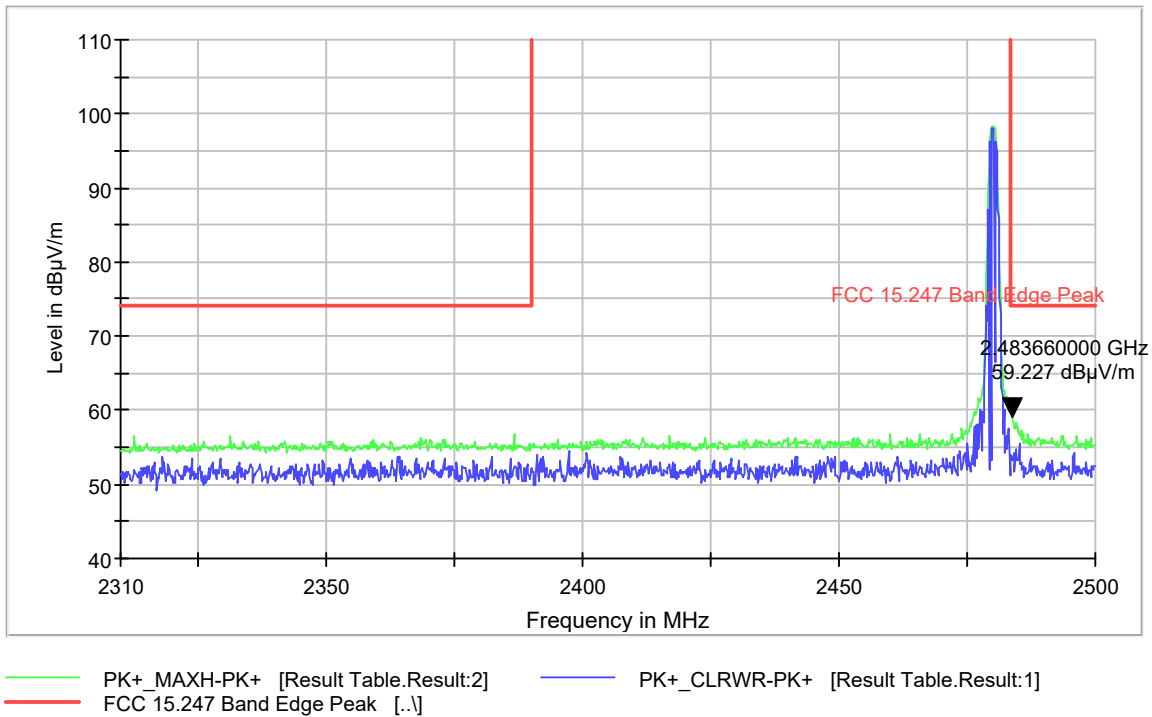
— PK+_MAXH-PK+ [Result Table.Result:2] — PK+_CLRWR-PK+ [Result Table.Result:1]
— FCC 15.247 Band Edge Peak [..]

Plot 9-30. Radiated Restricted Band Edge (Ch. 0) Peak

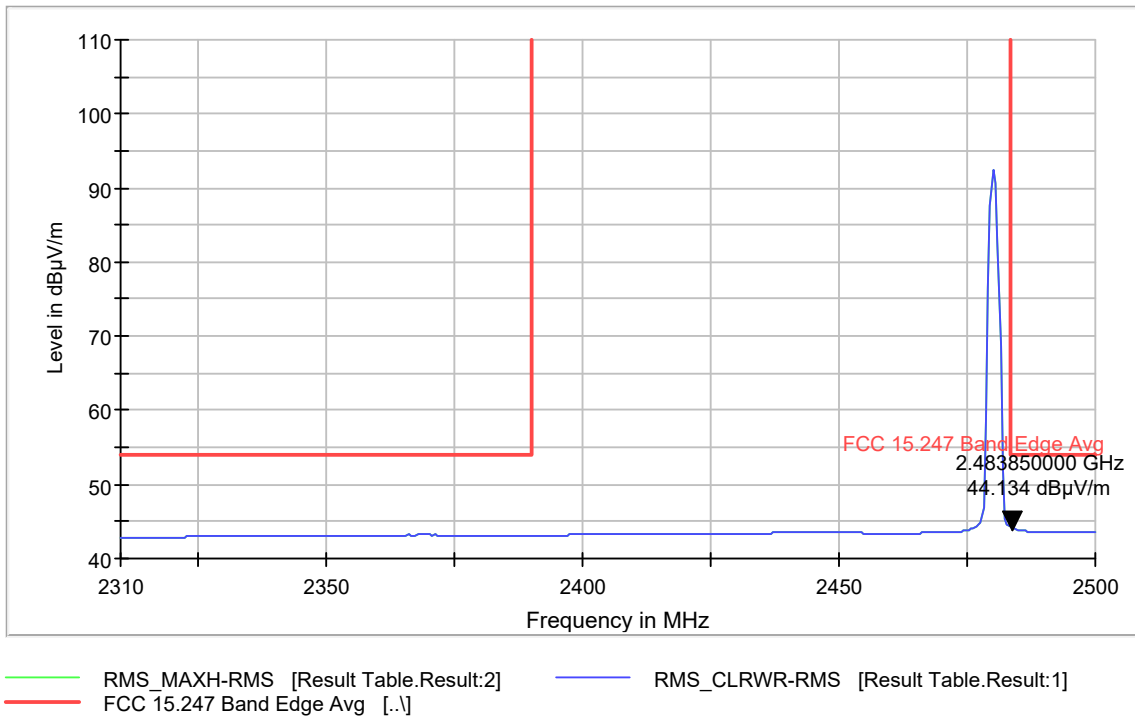


— RMS_MAXH-RMS [Result Table.Result:2] — RMS_CLRWR-RMS [Result Table.Result:1]
— FCC 15.247 Band Edge Avg [..]

Plot 9-31. Radiated Restricted Band Edge (Ch. 0) Average



Plot 9-32. Radiated Restricted Band Edge (Ch. 39) Peak



Plot 9-33. Radiated Restricted Band Edge (Ch. 39) Average

9.8 AC Line Conducted Emissions

9.8.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

Industry Canada RSS Gen [8.8]

9.8.2 Test Method

Conducted power line measurements are made 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) connected to a public power network. The measurements were made using a LISN (Line Impedance Stabilization Network).

The EUT has a USB port and is not supplied with a specific AC/DC adapter. An off-the-shelf adapter and USB cable were used for this test. The EUT is set to continuously transmit on Ch.19.

EMI Receiver Settings:

150 kHz – 30 MHz:

RBW= 9 kHz

VBW \geq 3 X RBW

Trace Mode: Peak Detector (Max Hold).

Final measurements were performed using Quasi-Peak and Average Detectors.

Span= 150 kHz – 30 MHz

Sweep time= Auto

9.8.3 Limit

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

9.8.4 Test Result:

Pass

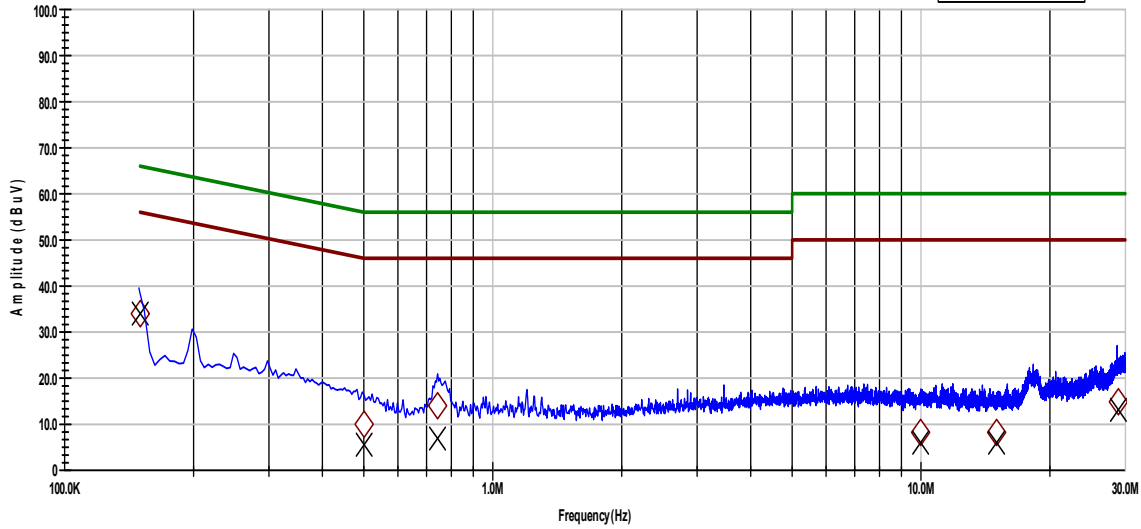
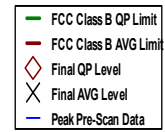
9.8.5 Test Configuration:

Description	Manufacturer	Model #	Identifier/ Asset #
USB AC/DC Adapter	Microsoft Corporation	1623	R-217-121415-03
USB Cable	N/A	N/A	R-217-121415-04
Spectrum Analyzer (Monitoring Peripheral)	Keysight Technologies	N9344C	EMC-411
Horn Antenna (Monitoring Peripheral)	Sunol Sciences	DRH-118	RF-035

9.8.6 Test Data:

Frequency (MHz)	Quasi-Peak Net Reading (dB μ V)	AVG Net Reading (dB μ V)	Quasi-Peak Limit (dB μ V)	Average Limit (dB μ V)	Line Tested (L or N)	Quasi-Peak Margin (dB)	Average Margin (dB)
0.2	22.32	22.3	64.57	54.57	L	-42.25	-32.27
0.5	7.86	4.7	56	46	L	-48.14	-41.3
0.74	9.39	4.24	56	46	L	-46.61	-41.76
10	8.87	6.28	60	50	L	-51.13	-43.72
15	8.4	6.21	60	50	L	-51.6	-43.79
28.97	19.19	14.31	60	50	L	-40.81	-35.69
0.15	33.77	33.76	66	56	N	-32.23	-22.24
0.5	9.83	5.55	56	46	N	-46.17	-40.45
0.74	13.91	6.74	56	46	N	-42.09	-39.26
10	7.99	5.98	60	50	N	-52.01	-44.02
15	8.36	5.99	60	50	N	-51.64	-44.01
28.97	14.93	12.98	60	50	N	-45.07	-37.02

Microsoft EMC Laboratory
 Redmond 17760
 Final Neutral Measurements



Operator: ER

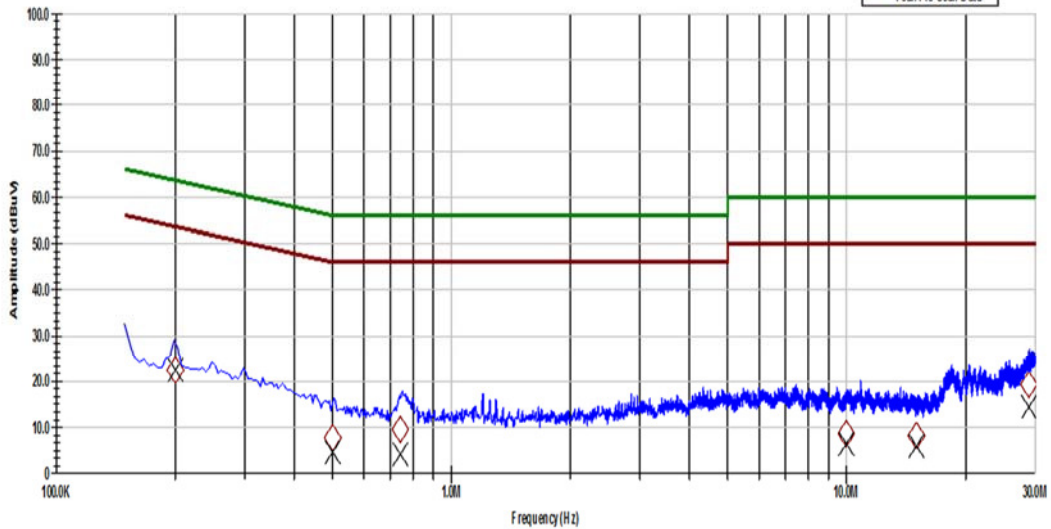
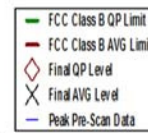
Precheck (Yes/No): Yes

Current Time -12:09:16 PM, Wednesday, December 16, 2015

TILE Profile: CE Rev 1.7

Plot 9-34. AC Line Conducted Emissions- Neutral (150 kHz- 30 MHz)

Microsoft EMC Laboratory
 Redmond 17760
 Final Line Measurements



Operator: ER

Precheck (Yes/No): Yes

Current Time -12:09:16 PM, Wednesday, December 16, 2015

TILE Profile: CE Rev 1.7

Plot 9-35. AC Line Conducted Emissions- Line (150 kHz- 30 MHz)

End of Report