



RADIO TEST REPORT

For

MODEL NO. 1707

FCC ID: C3K1707

IC ID: 3048A-1707

Test Report No. R-TR371-FCCIC-BTLE-4

Issue Date: 24 Oct 2016

FCC CFR47 Part 15 Subpart C
Innovation, Science and Economic Development
Canada RSS-247 Issue 1

Prepared by

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Test Report Attestation

Microsoft Corporation**Model:** 1707**FCC ID:** C3K1707**IC ID:** 3048A-1707**Applicable Standards**

Specification	Test Result
FCC 47CFR Rule Parts 15.207, 15.209, 15.247	Pass
Innovation, Science and Economic Development Canada RSS-247 Issue 1, RSS-GEN Issue 4	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 report replaces the previously issued report #R-TR371-FCCIC-BTLE-3 issued by Microsoft EMC Labs on 10/17/2016.



Written By: Daniel Salinas
Radio Test Lead



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 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.

4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the product, as specified in ETSI TR 100 028. This represents an expanded uncertainty expressed at 95% confidence level using a coverage factor k=2. These levels are for reference only and not included to determine product compliance.

Expanded uncertainty calculations are available upon request.

Test item	Uncertainty	Unit
Radiated disturbance (30 MHz to 1 GHz)	5.99	dB
Radiated disturbance (1 GHz to 18 GHz)	5.12	dB
Conducted Disturbance at Mains Port	3.31	dB
Uncertainty for Conducted Power test	1.277	dB
Uncertainty for Conducted Spurious emission test	2.742	dB
Uncertainty for Bandwidth test	4.98	kHz
Uncertainty for DC power test	0.05	%
Uncertainty for test site temperature	0.5	°C
Uncertainty for test site Humidity	3	%
Uncertainty for time	0.189	%

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:	PC with IEEE 802.11a/b/g/n/ac MIMO supporting 20/40/80 MHz bandwidths, Bluetooth and additional 802.11n Radio.
Model:	1707
FCC ID:	C3K1707
IC ID:	3048A-1707
Radio under test:	BTLE (2402- 2480 MHz)
Modulation(s):	GFSK
Antenna Information:	Internal Antenna. Manufacturer declared max Antenna Gain in 2.4GHz band of operation: 1.01 dBi
EUT Classification:	DTS
Equipment Design State:	Prototype/Production Equivalent
Equipment Condition:	Good
Test Sample Details:	RF Conducted Test Sample SN: 000074361258 RF Radiated Test Sample SN: 000266762258

5.1 Test Configurations

Test software “WiFi Tool” (V2.7.3) provided by the customer and “Lab Tool” (V2.0.0.77) from the module vendor was used to program the EUT to transmit continuously.

The device can operate in GFSK modulation. Channel numbers 0, 19 and 38 were 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 °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 June 9, 2016- Aug 02, 2016.

6 Test Results Summary

Test Description	FCC CFR 47/ ISED Rule Part	Limit	Test Result
Duty Cycle	Reporting & Measurements	Reporting & Measurements Purposes only	N/A
6dB Bandwidth	15.247 (a)(2) RSS-247 [5.2]	$\geq 500\text{kHz}$	Pass
Occupied Bandwidth	Reporting & Measurements	Reporting & Measurements Purposes only	N/A
Output Power	15.247 (b)(3) RSS-247 [5.4]	$\leq 1\text{ Watt}$	Pass
Equivalent Isotropic Radiated Power	15.247 (b)(3) RSS-247 [5.4]	$\leq 4\text{ Watt}$	Pass
Power Spectral Density	15.247 (e) RSS-247 [5.2]	$\leq 8\text{dBm}/3\text{kHz}$	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

Equipment used for Radiated and Conducted Measurements				
Manufacturer	Description	Model #	Asset #	Calibration Due
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-192	4/13/2017
Rohde & Schwarz	EMI Test Receiver	ESU40	EMC-607	05/26/2017
Rohde & Schwarz	Signal Analyzer	FSV40	RF-228	4/12/2017
Rohde & Schwarz	Power Meter	NRP-Z91	RF-211	4/113/2017
Sunol Sciences	Antenna - Broadband Hybrid	JB6	EMC-640	9/29/2016
ETS-Lindgren	Antenna	3117	RF-137	2/25/2017
ETS-Lindgren	Antenna – Standard Gain	3160-09	RF-037	3/15/2017
Rohde & Schwarz	Custom Filter Bank+PreAmp	SFUNIT RX	RF-323	12/10/2016
Rohde & Schwarz	Pre-Amp	TS-PR26	RF-199	12/15/2016
Rohde & Schwarz	Switch and Control Unit	OSP130	RF-249	12/10/2016
Rohde & Schwarz	Switch and Control Unit	OSP130	RF-018	12/18/2016
Rohde & Schwarz	Switch and Control Unit	OSP150	RF-250	12/10/2016
Rohde & Schwarz	Switch and Control Unit	OSP150	RF-019	12/18/2016
Murata	RF Cable	MXHQ87WA3000	RF-415	11/09/2016
MegaPhase	RF Cable	EMC3-N1N1-394	EMC-1034	06/21/2017
Huber & Suhner	RF Cable	SucoFlex 100	RF-350	12/10/2016
Huber & Suhner	RF Cable	SucoFelx 100	RF-352	12/10/2016
Huber & Suhner	RF Cable	SucoFlex 100	RF-350	12/10/2016
Huber & Suhner	RF Cable	SucoFelx 100	RF-352	12/10/2016

Manufacturer	Description	Model #	Asset #	Calibration Due
Huber & Suhner	RF Cable	Sucoflex 102A	RF-269	12/16/2016
Madge Tech	THP Monitor	PRH Temp 2000	EMC-681	11/19/2016
Micro-Coax	RF Cable	UFA210A-0-0787-300300	RF-292	11/10/2016
Micro-Coax	RF Cable	UTI Flex	RF-354	12/10/2016
Pasternack	Attenuator	PE7087-3	RF-337	01/26/2017
Pasternack	3dB Attenuator	PE7087-3	RF-338	01/29/2017
Pasternack	6dB Attenuator	PE7087-6	RF-432	01/27/2017

Equipment used for Line Conducted Emissions Measurement				
Manufacturer	Description	Model #	Asset #	Calibration Due
Rohde & Schwarz	EMI Test Receiver	ESR 3	EMC-669	4/14/2017
Teseq	AE LISN	NNB 51	EMC-187	9/25/2016*
Teseq	Test LISN	NNB 51	EMC-642	11/24/2016
Micro-Coax	RF Cable	UFA210A-1-1800-50U50U	EMC-367	8/6/2016*
Madge Tech	THP Monitor	PRHTemp2000	EMC-169	8/18/2016*
ETS	TILE SW	Ver 7.1.3.22	N/A	N/A
Fluke	Multimeter	189	EMC-231	8/31/2016*

*Note- all equipment in valid calibration status at the time of test- Jun 29, 2016.

8 Test Site Description

8.1 Radiated Emissions Test Site

Radiated measurements are performed in a 3m semi-anechoic chamber, which meets NSA requirements for the frequency range of 30MHz to 1000MHz. For measurements above 1 GHz, absorbers are laid out on the ground plane between the receiving antenna and the EUT to meet Site VSWR requirements in accordance with ANSI C63.4:2014.

8.1.1 Radiated Measurements in 30 MHz - 1000 MHz

The EUT is positioned on a turntable at a height of 80cm using a non-conducting table. A linearly polarized broadband antenna is positioned at 3m from the EUT periphery. The turntable is rotated 360 degrees and the antenna height varied from 1m to 4m to determine the highest emissions. This is repeated for both Horizontal and Vertical polarizations of the measurement antenna. All possible orientations of the EUT were investigated for emissions and the vertical standing mode was identified as the worst case configuration.

8.1.2 Radiated Measurements above 1GHz

The EUT is positioned on a Turntable at a height of 150cm. A linearly polarized antenna is positioned at 3m from the EUT periphery. Guidelines in ANSI C63.10:2013 were followed with respect to maximizing the emissions. The turntable is rotated 360 degrees and the antenna height varied from 1m to 4m (with antenna bore-sighting enabled) to determine the highest emissions. This is repeated for both Horizontal and Vertical polarizations of the measurement antenna. Measurements above 18GHz were performed at a distance of 3m.

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 were added internally in the analyzer settings, where applicable. The plots displayed takes into account these correction factors.

8.3 Test Setup Diagrams

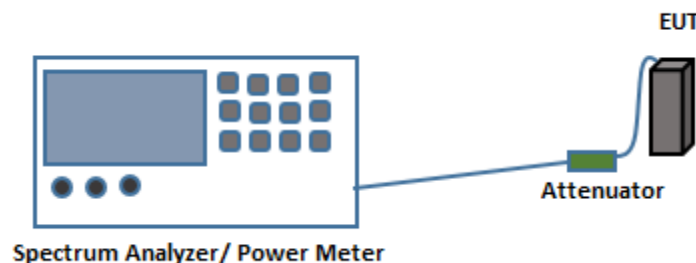


Fig.1. Test Setup for Antenna port conducted measurements

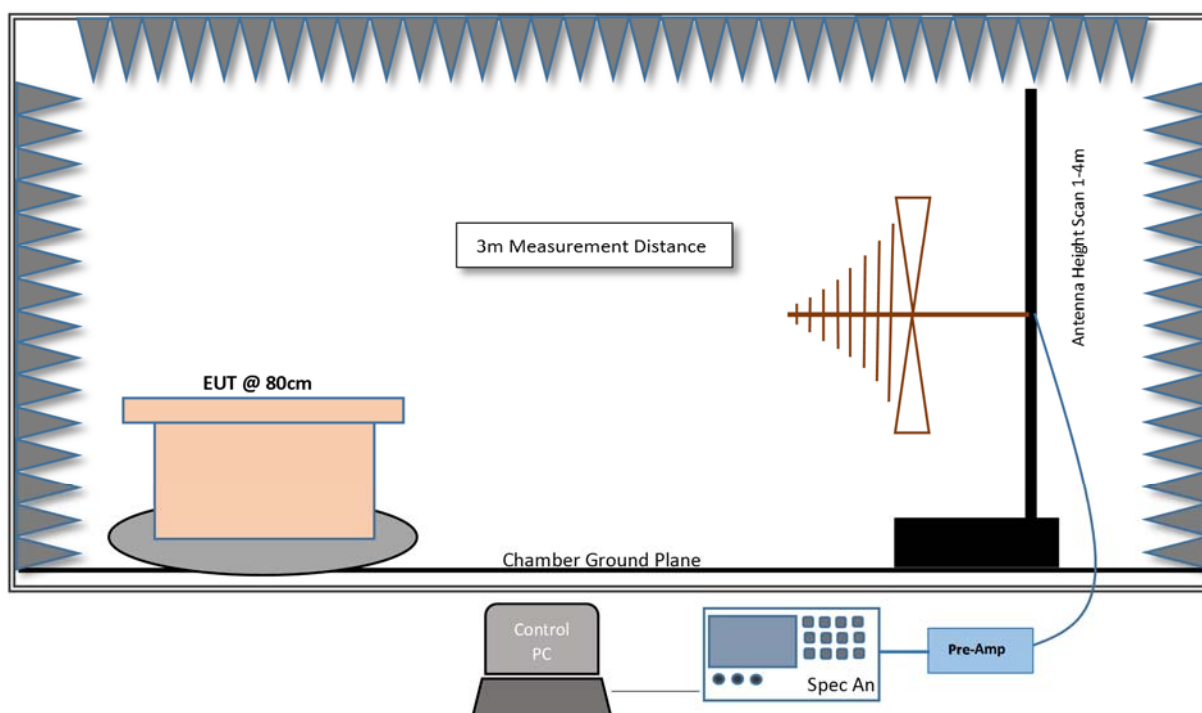


Fig.2. Test Setup for Radiated measurements in 30MHz- 1GHz Range

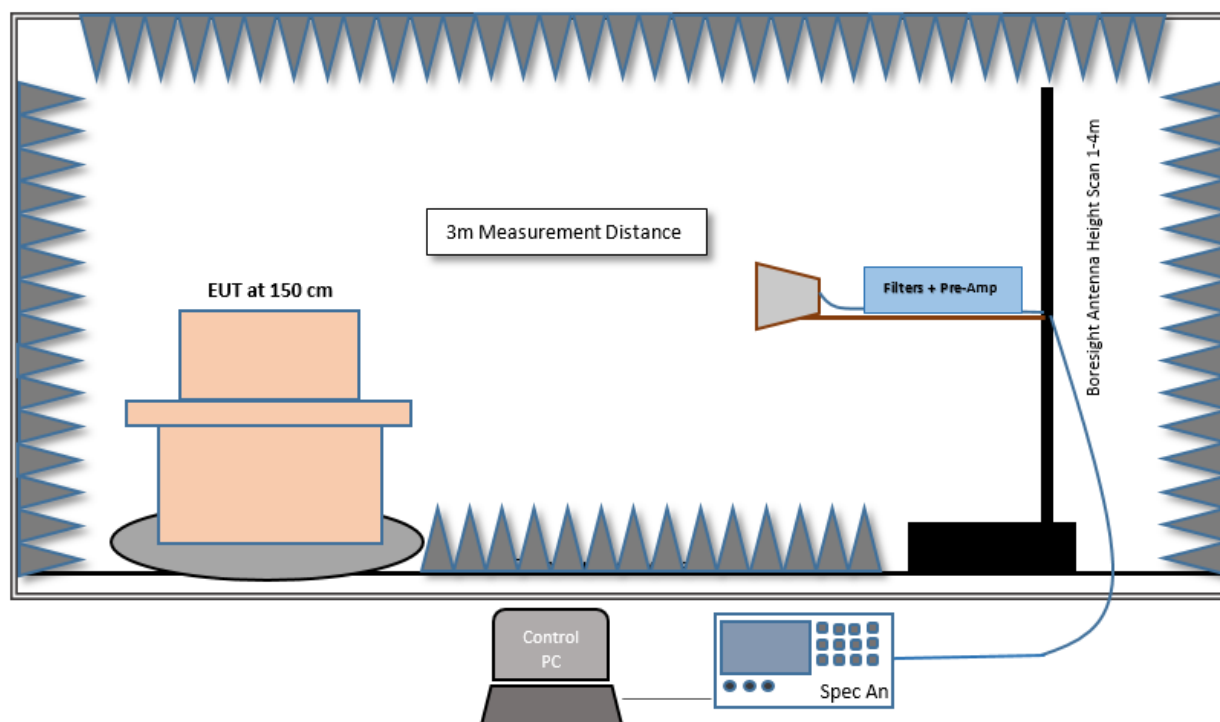


Fig.3. Test Setup for Radiated measurements in 1GHz- 18GHz Range

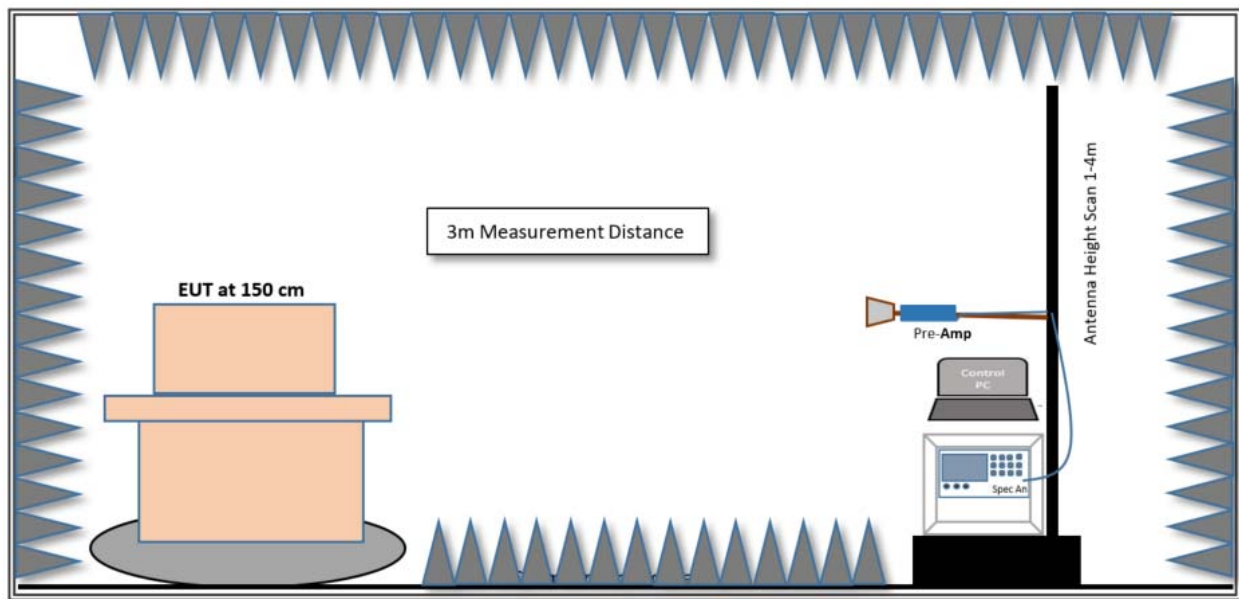


Fig.4. Test Setup for Radiated measurements >18GHz

9 Test Results- Conducted

9.1 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	389.00	626.00	61.86	2.09
2440	387.70	624.00	61.86	2.09
2480	381.00	624.00	62.14	2.07

9.1.5 Test Data:



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

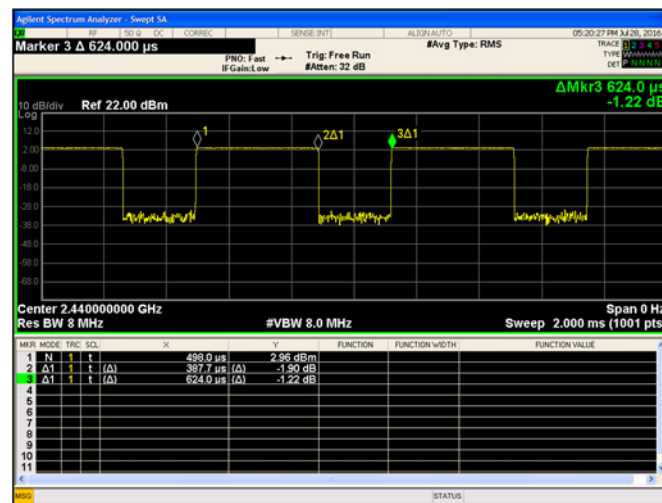


Figure 9-2. Duty Cycle 2440MHz (Ch.19)

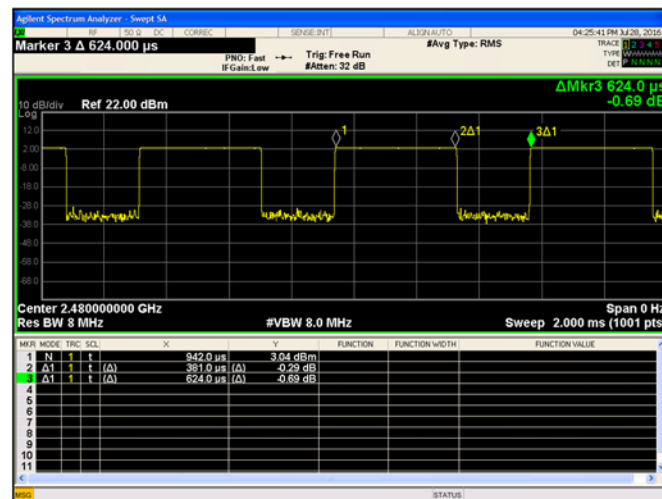


Figure 9-3. Duty Cycle 2480MHz (Ch.39)

9.2 6-dB Bandwidth

9.2.1 Test Requirement:

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

ISED 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 V03R05 and ANSI C63.10 2013.

Spectrum Analyzer settings:

RBW= 100 kHz

VBW $\geq$ 3 RBW.

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.

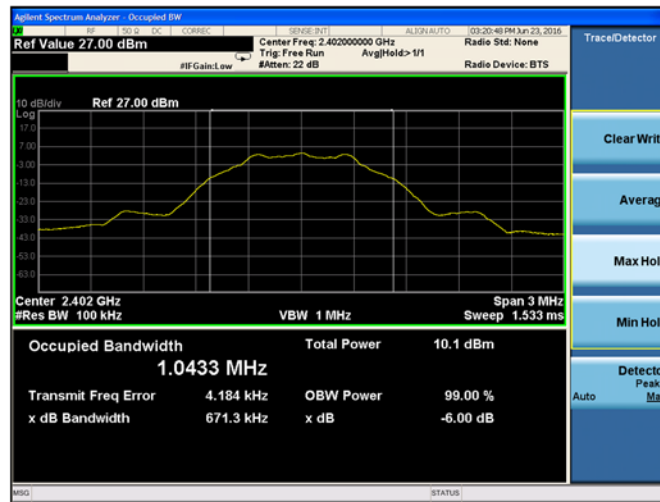
9.2.3 Limits:

The 6-dB bandwidth shall be at least 500 kHz

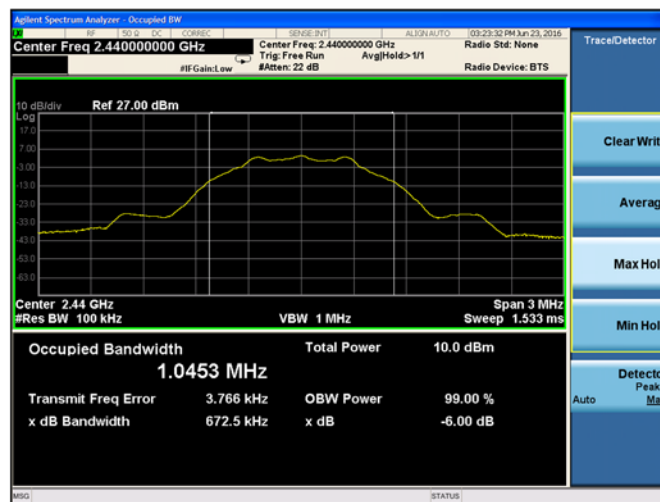
9.2.4 Test Results:

Frequency (MHz)	Test Mode	Channel No.	6dB Bandwidth (kHz)	Limit (kHz)	Result
2402	BT LE	0	671.3	>500	Pass
2440	BT LE	19	672.5	>500	Pass
2480	BT LE	39	669.8	>500	Pass

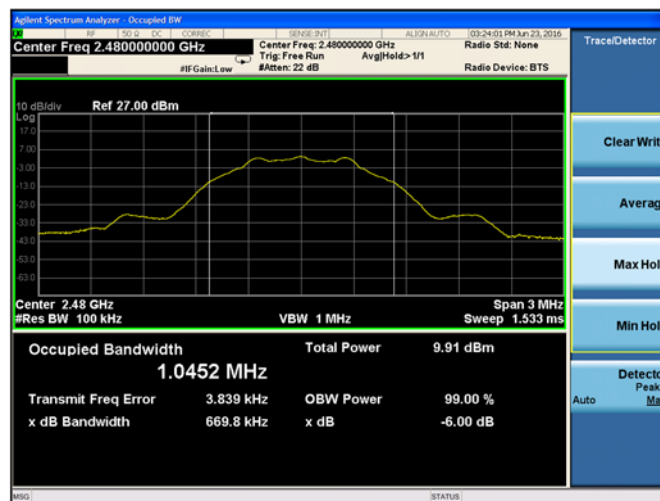
9.2.5 Test Data:



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



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



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

9.3 Occupied Bandwidth

9.3.1 Test Requirement:

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

9.3.2 Test Method:

Measurements are performed according to ANSI C63.10 (2013).

Spectrum Analyzer settings:

Set analyzer center frequency to the nominal EUT channel frequency

Span set to between 1.5 and 5.0 times the DTS bandwidth

RBW to: 1% to 5% of the OBW

VBW $\geq$ 3 RBW

Detector = Peak

Sweep time = auto couple

Trace mode = max hold

Use the 99% power bandwidth function of the instrument.

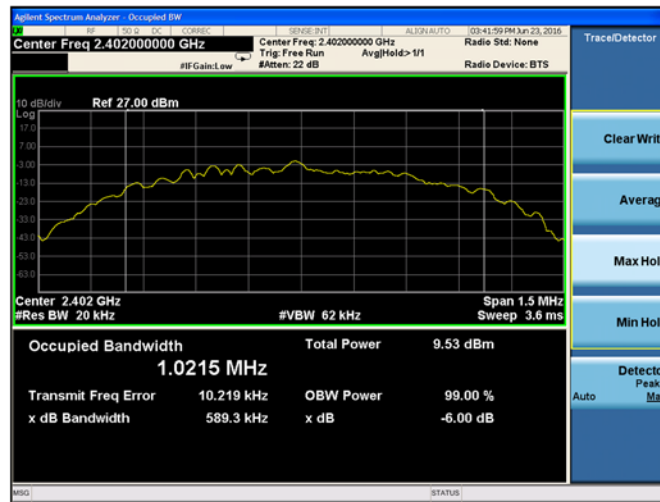
9.3.3 Limits:

For reporting purpose only.

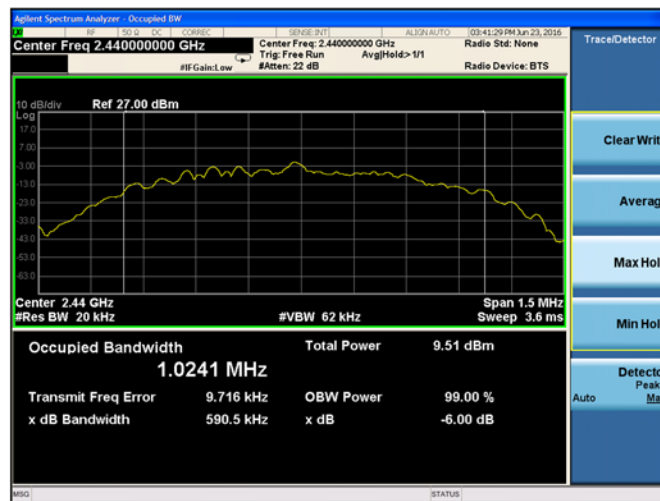
9.3.4 Test Results:

Frequency (MHz)	Test Mode	Channel No.	99% Bandwidth (MHz)
2402	BT LE	0	1.02
2440	BT LE	19	1.02
2480	BT LE	39	1.02

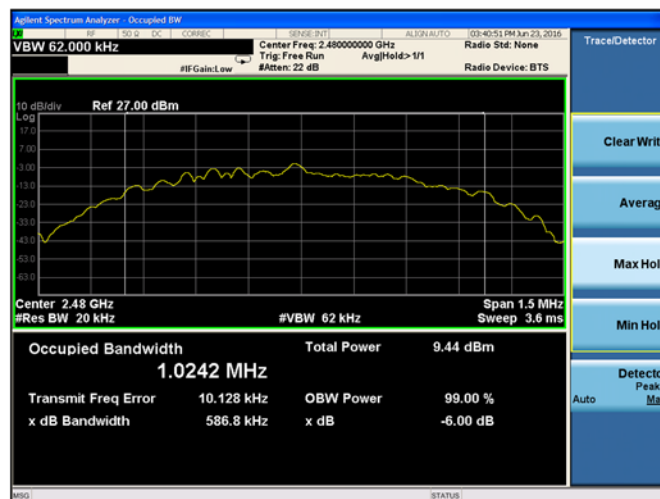
9.3.5 Test Data:



Plot 9-7. 99% Bandwidth (Ch. 0)



Plot 9-8. 99% Bandwidth (Ch. 19)



Plot 9-9. 99% Bandwidth (Ch. 39)

9.4 Output Power

9.4.1 Test Requirement:

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

ISED RSS-247 [5.4]

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 V03R05 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

9.4.3 Limits:

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

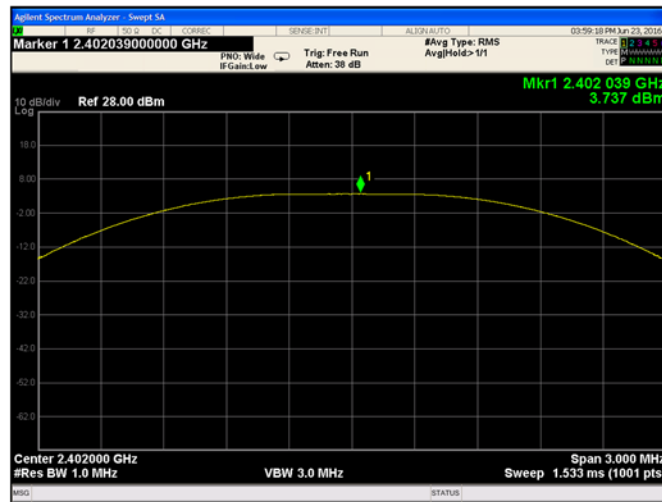
RSS-247: The maximum peak conducted output power shall not exceed 30dBm (1 W) and the maximum radiated output power shall not exceed 36dBm (4 W) EIRP.

9.4.4 Test Results:

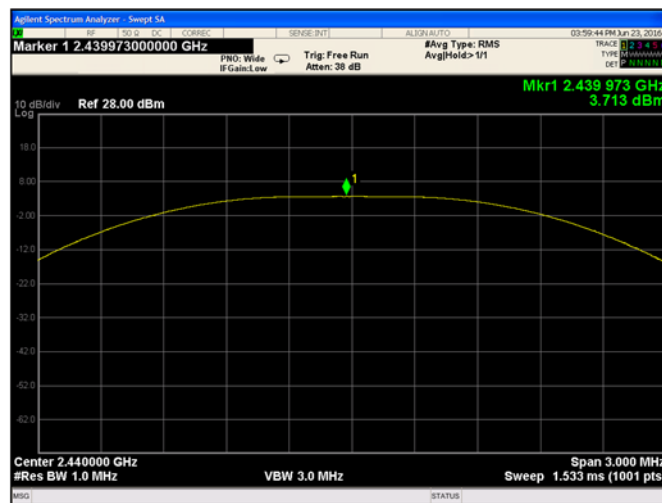
Frequency (MHz)	Mode	Channel No.	Cond. Peak Power (dBm)	Cond. Peak Power (W)	FCC Limit (dBm)	FCC Margin (dB)	Result
2402	BT LE	0	3.74	0.002	30	-26.26	Pass
2440	BT LE	19	3.71	0.002	30	-26.29	Pass
2480	BT LE	39	3.61	0.002	30	-26.39	Pass

Frequency (MHz)	Mode	Channel No.	Cond. Peak Power (dBm)	Max Antenna Gain (dBi)	E.I.R.P (dBm)	ISED Limit (dBm)	ISED Margin (dB)	Result
2402	BT LE	0	3.74	1.01	4.75	36	-31.25	Pass
2440	BT LE	19	3.71	1.01	4.72	36	-31.28	Pass
2480	BT LE	39	3.61	1.01	4.62	36	-31.38	Pass

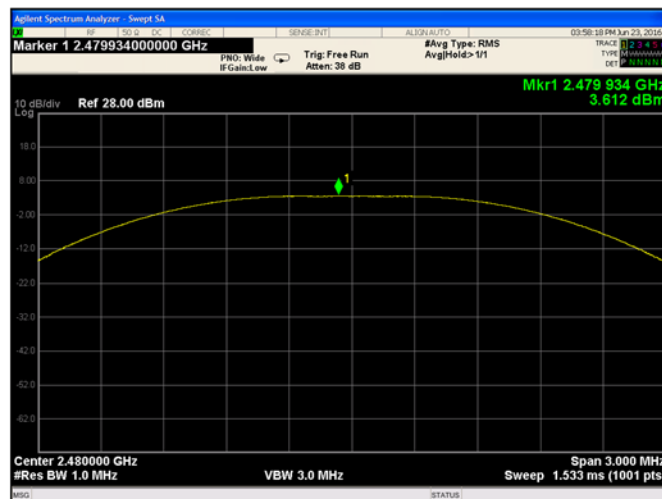
9.4.5 Test Data:



Plot 9-10. Peak Power (Ch. 0)



Plot 9-11. Peak Power (Ch. 19)



Plot 9-12. Peak Power (Ch. 39)

9.5 Peak Power Density

9.5.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (e)

ISED RSS-247 [5.2]

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 V03R05 and ANSI C63.10 2013.

Spectrum Analyzer settings:

RBW= 100 kHz

VBW= 300 kHz

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

9.5.3 Limits:

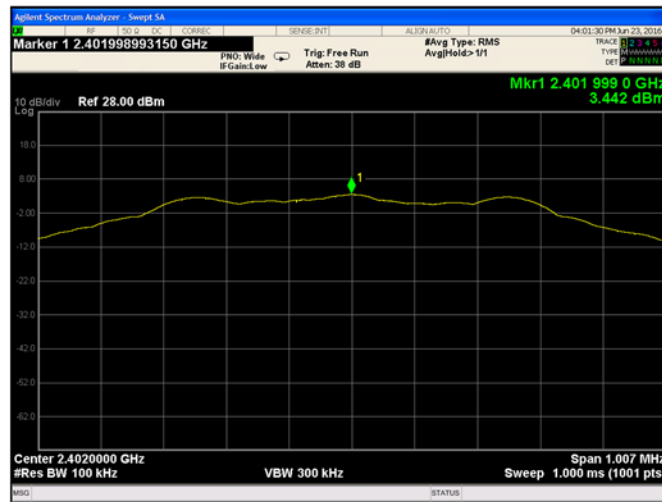
The maximum permissible power density is 8 dBm/3kHz.

9.5.4 Test Results:

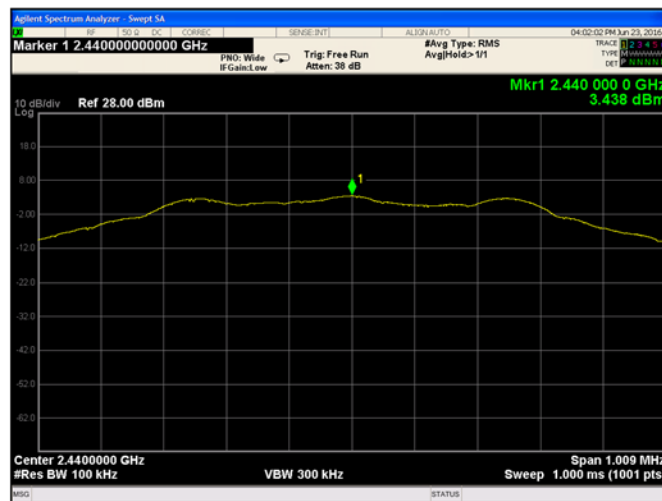
Frequency (MHz)	Test Mode	Channel No.	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
2402	BT LE	0	3.44	8	Pass
2440	BT LE	19	3.44	8	Pass
2480	BT LE	39	3.36	8	Pass

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

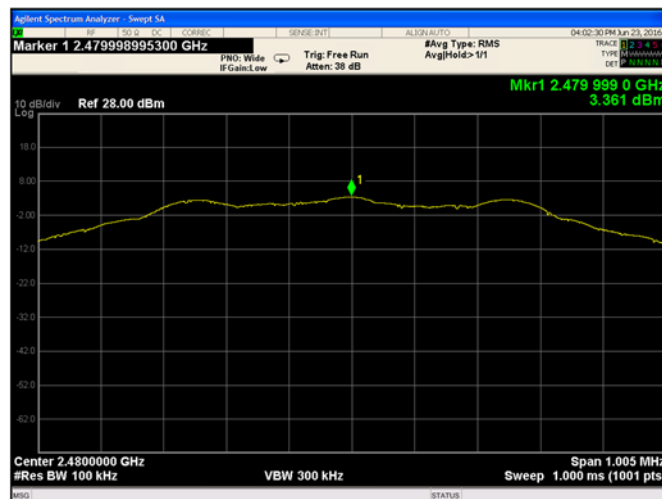
9.5.5 Test Data:



Plot 9-13. Power Spectral Density (Ch. 0)



Plot 9-14. Power Spectral Density (Ch. 19)



Plot 9-15. Power Spectral Density (Ch. 39)

9.6 Conducted Spurious Emissions

9.6.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

ISED 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 V03R05 and ANSI C63.10 2013.

Spectrum Analyzer settings:

Identification of Reference Level:

RBW= 100 kHz

VBW $\geq 3 \times$ RBW

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

Span >1.5 times DTS Bandwidth

Peak Marker function to determine the max PSD level.

Conducted Spurious Emissions:

RBW= 1 MHz

VBW $\geq 3 \times$ RBW = 3 MHz

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

Span= 30 MHz- 12 GHz; 12 GHz – 25 GHz

Sweep Points= 30000

9.6.3 Limits:

All spurious emissions at least 20 dBc.

9.6.4 Test Result:

Channel	Carrier Frequency (MHz)	Emission Frequency (GHz)	Emissions Amplitude (dBm/MHz)	Limit (dBm)	Margin (dB)	Result
0	2402	10.588	-35.725	-16.558	-19.17	Pass
0	2402	22.669	-37.241	-16.558	-20.68	Pass
19	2440	11.009	-36.493	-16.562	-19.93	Pass
19	2440	22.644	-36.830	-16.562	-20.27	Pass
39	2480	3.850	-36.364	-16.639	-19.73	Pass
39	2480	23.215	-37.441	-16.639	-20.80	Pass

9.6.5 Test Data:

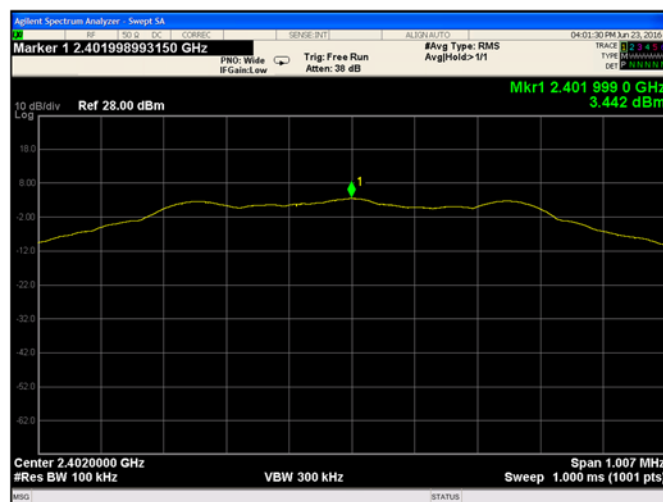
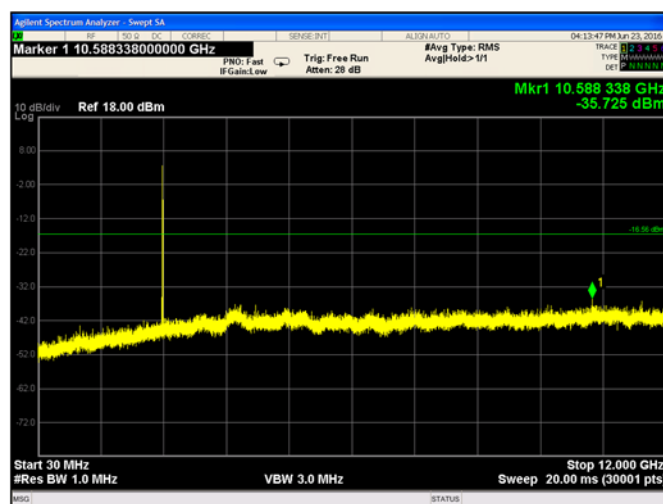


Figure 9-16. Reference Level Measurement (Ch.0)



Plot 9-17. Conducted Spurious Emissions 30-12000 MHz (Ch. 0)

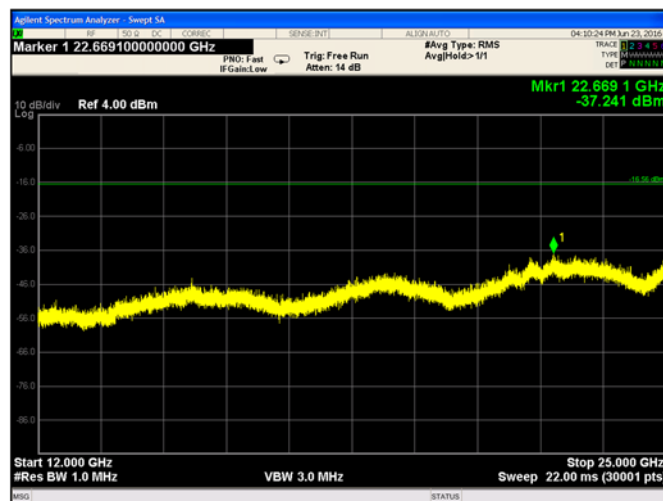


Figure 9-18. Conducted Spurious Emissions 12-25 GHz (Ch.0)

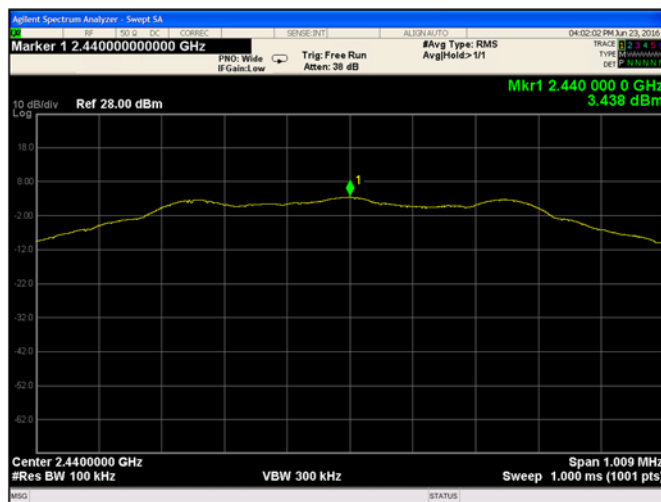
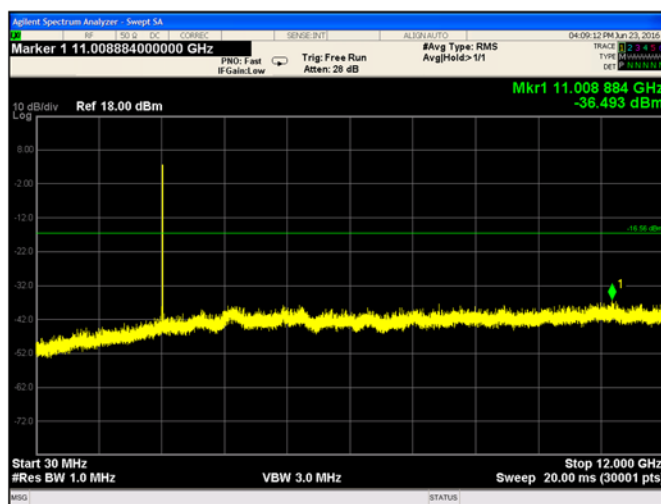
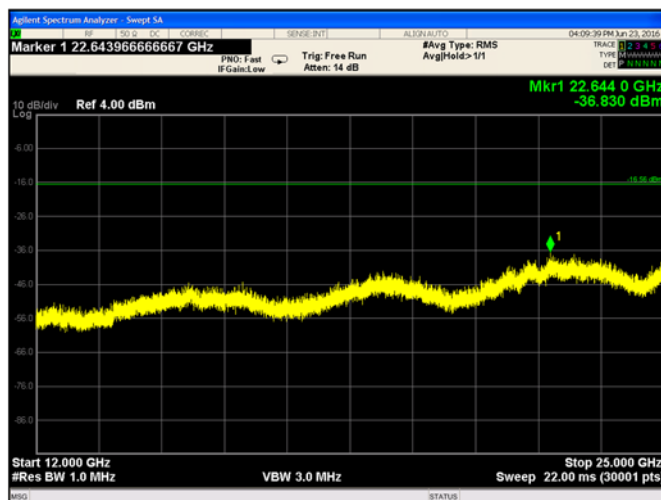


Figure 9-19. Reference Level Measurement (Ch.19)



Plot 9-20. Conducted Spurious Emissions 30-12000 MHz (Ch. 19)



Plot 9-21. Conducted Spurious Emissions 12-25 GHz (Ch. 19)

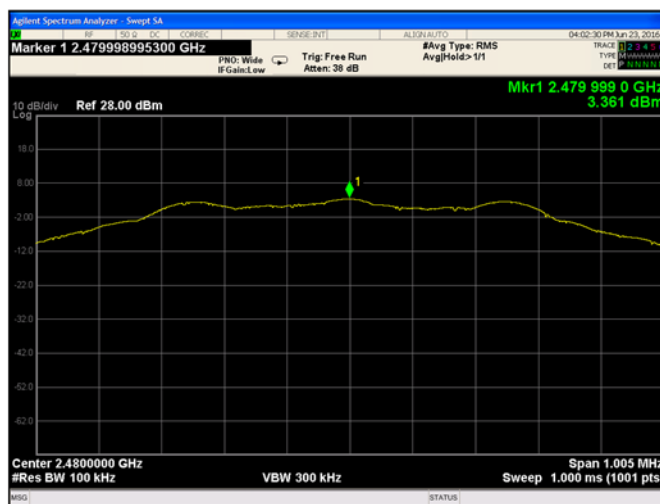


Figure 9-22. Reference Level Measurement (Ch.39)

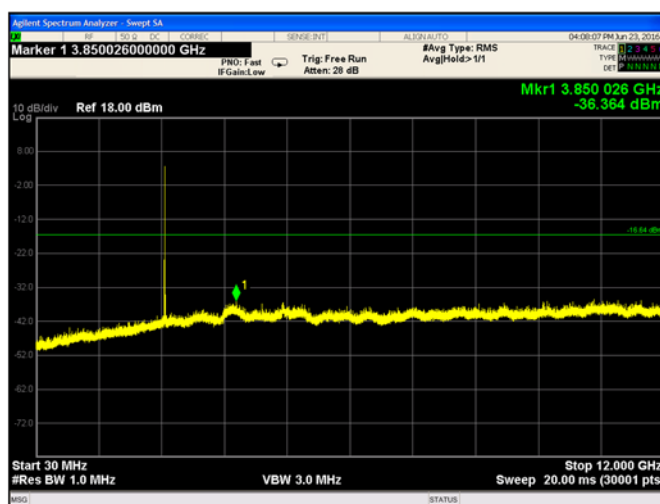


Figure 9-23. Conducted Spurious Emissions 30-12000 MHz (Ch.39)

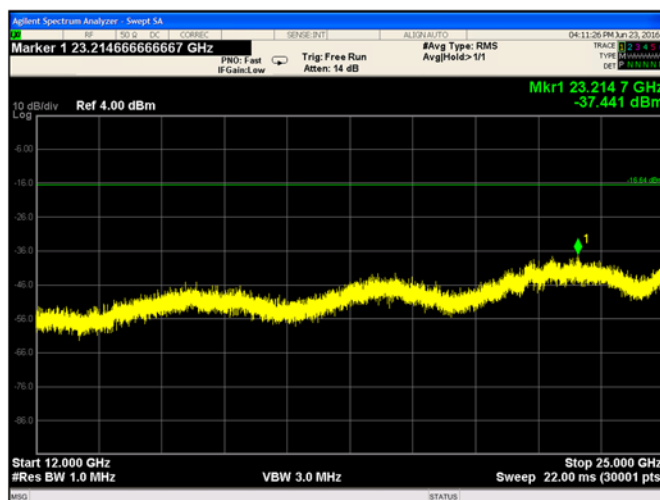


Figure 9-24. Conducted Spurious Emissions 12-25GHz (Ch.39)

9.7 Conducted Band Edge Emissions

9.7.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

ISED RSS-247 [5.5]

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 V03R05 and ANSI C63.10 2013.

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 = 100 kHz

VBW = 300 kHz

Sweep = Auto

Detector function = Peak

Trace = Max Hold

The trace was allowed to stabilize. The marker 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.

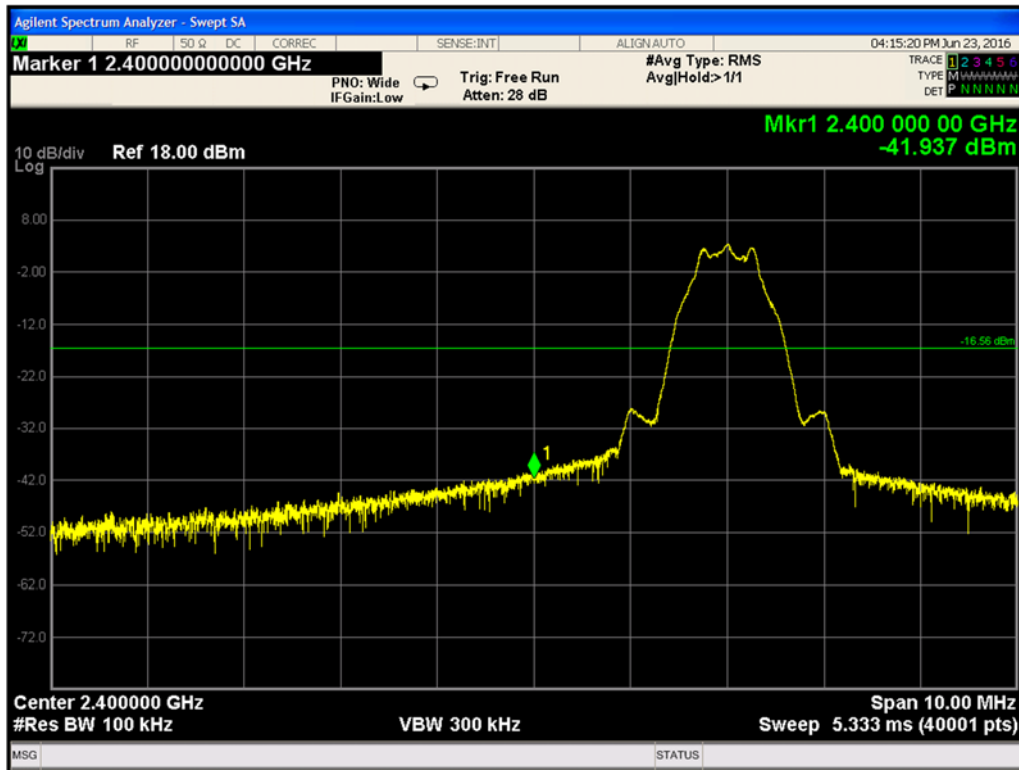
9.7.3 Limits:

All spurious emissions at least 20 dBc.

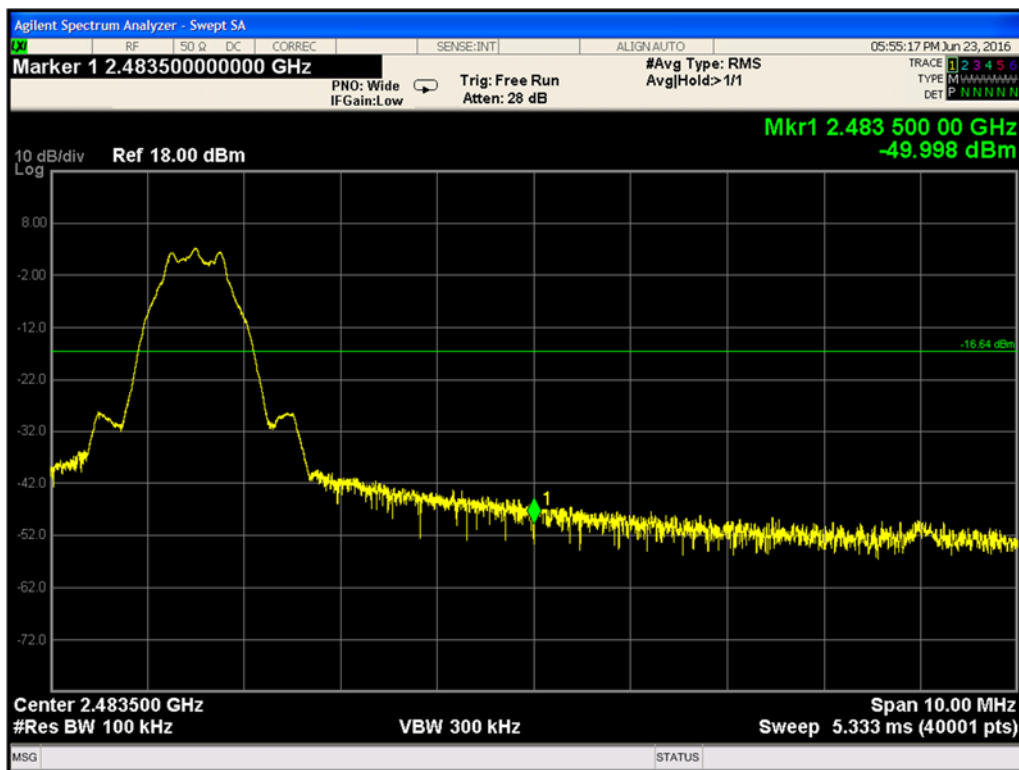
9.7.4 Test Result:

Pass.

9.7.5 Test Data:



Plot 9-25. Conducted-Low Band Edge (Ch. 0)



Plot 9-26. Conducted- High Band Edge (Ch. 39)

9.8 Radiated Spurious and Band Edge Emissions

9.8.1 Test Requirement:

FCC CFR 47 Rule Part 15.247 (d)

ISED RSS-247 [5.5] and RSS GEN [8.9]

9.8.2 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 V03R05 and ANSI C63.10 2013.

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 and RSS-247 [5.5]. 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 in each sub band. Guidelines in ANSI C63.10:2013 were followed with respect to maximizing the emissions. The EUT was placed on a turntable at a height of 80cm from the ground plane in standing position, which was estimated as the worst case orientation for all measurements.

Emissions below 1 GHz were maximized by rotating the EUT for 360 degs and with the antenna height scan performed from 1-4m. The same method was followed for emissions above 1GHz, but with the measurement antenna set in bore-sight mode. Both horizontal and vertical antenna polarizations were investigated. 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.

Radiated Spurious Emissions

Spectrum Analyzer Settings:

30 MHz- 1 GHz:

RBW= 120 kHz

VBW $\geq 3 \times$ 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

Restricted Band-Edge Emissions

Spectrum Analyzer Settings:

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

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:

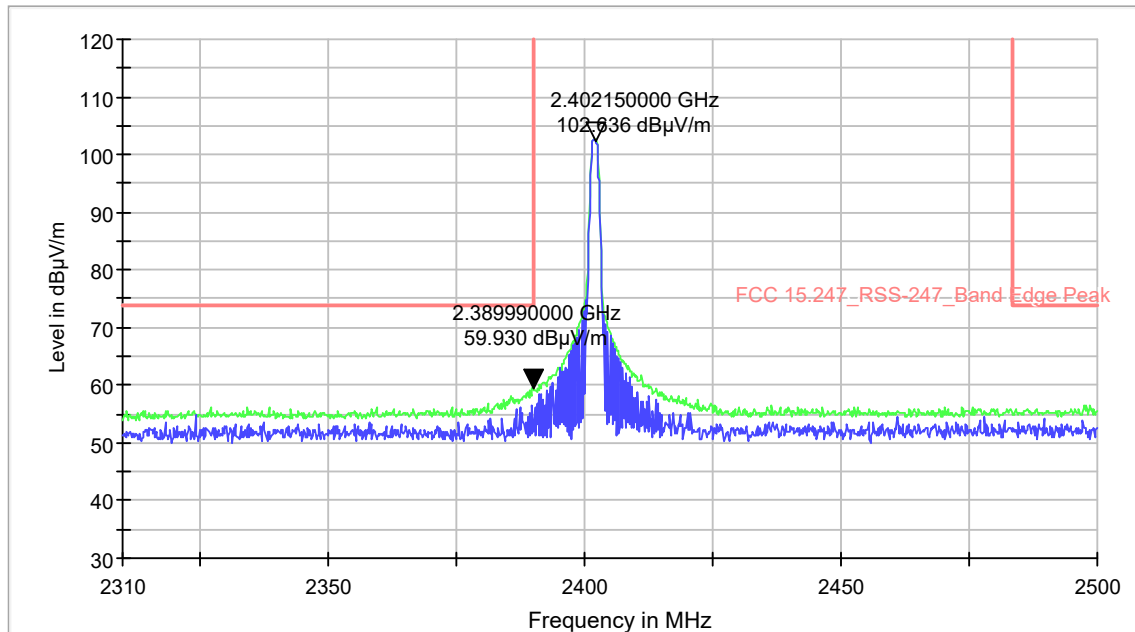
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (meters)	Corrected Field Strength for 3m measurement distance (dBμV/m)
0.009-0.490	2400/F (kHz)	300	48.5- 13.8
0.490-1.705	24000/F (kHz)	30	33.8- 23.0
1.705-30	30	30	29.5
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
960-1000	500	3	54
Above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

9.8.4 Test Result:

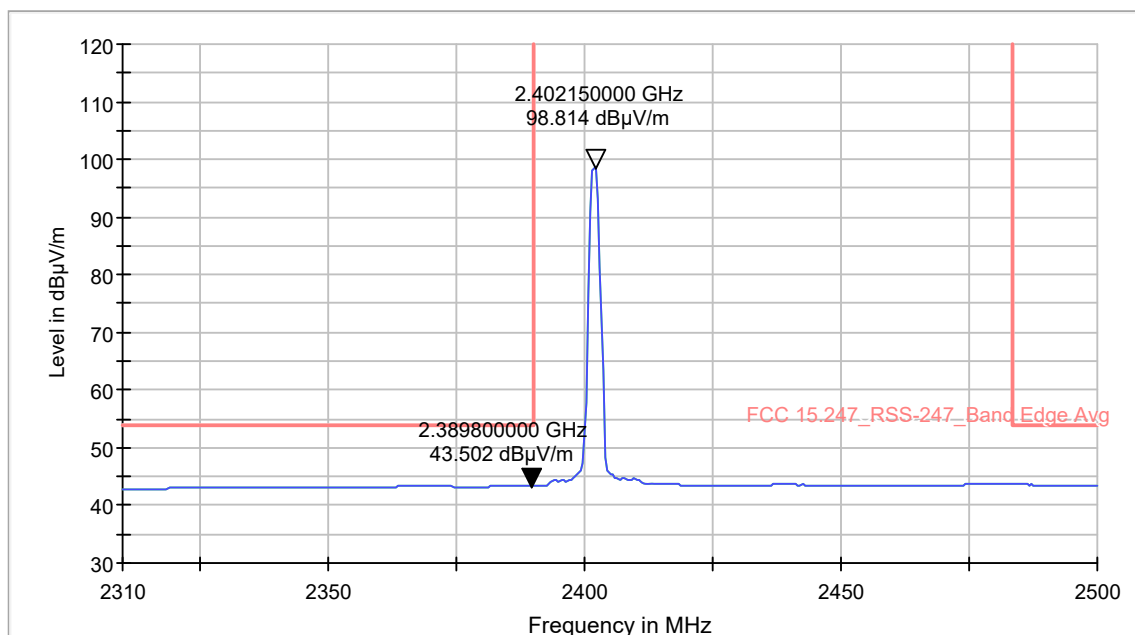
Pass.

9.8.5 Test Data:

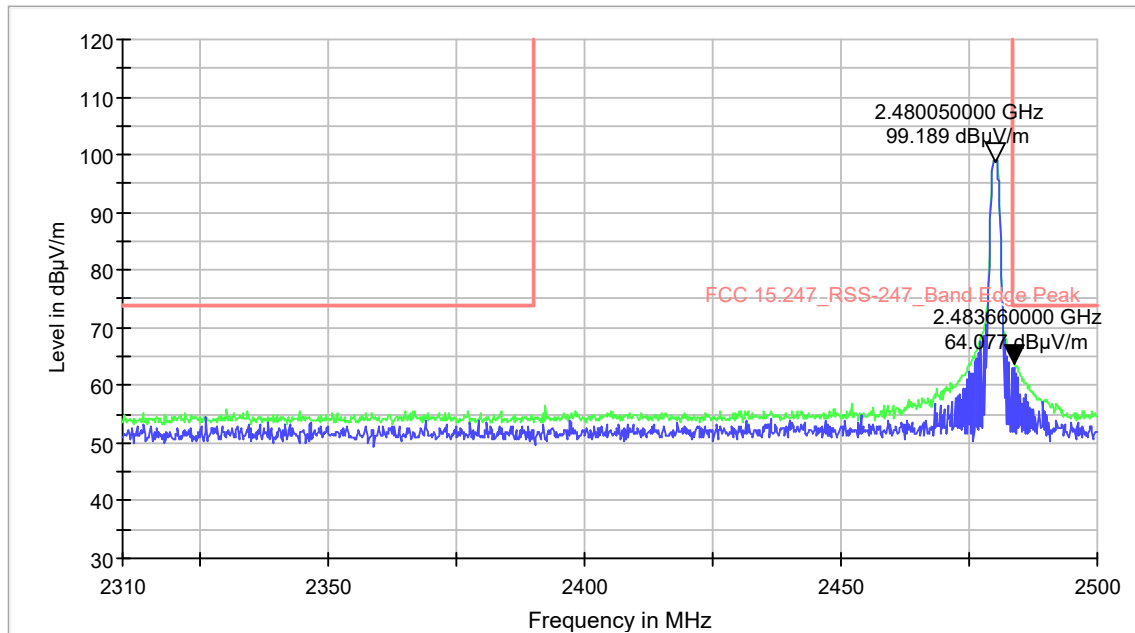
9.8.5.1 Radiated Restricted Band-edge emissions



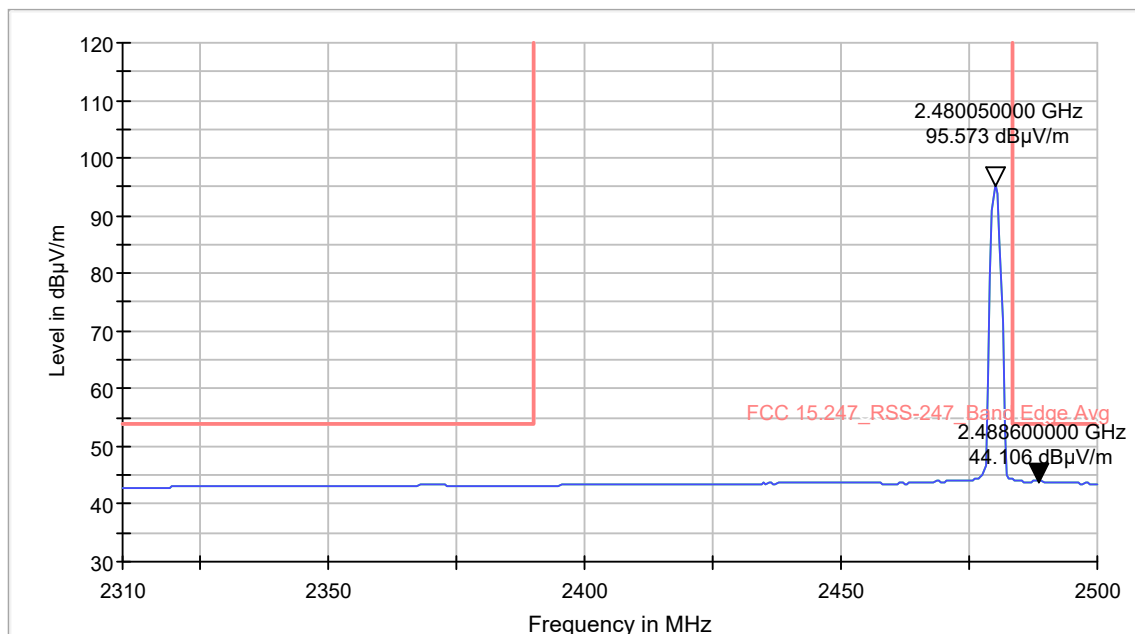
Plot 9-27. Radiated Restricted Band Edge (Ch. 0) Peak



Plot 9-28. Radiated Restricted Band Edge (Ch. 0) Average



Plot 9-29. Radiated Restricted Band Edge (Ch. 39) Peak

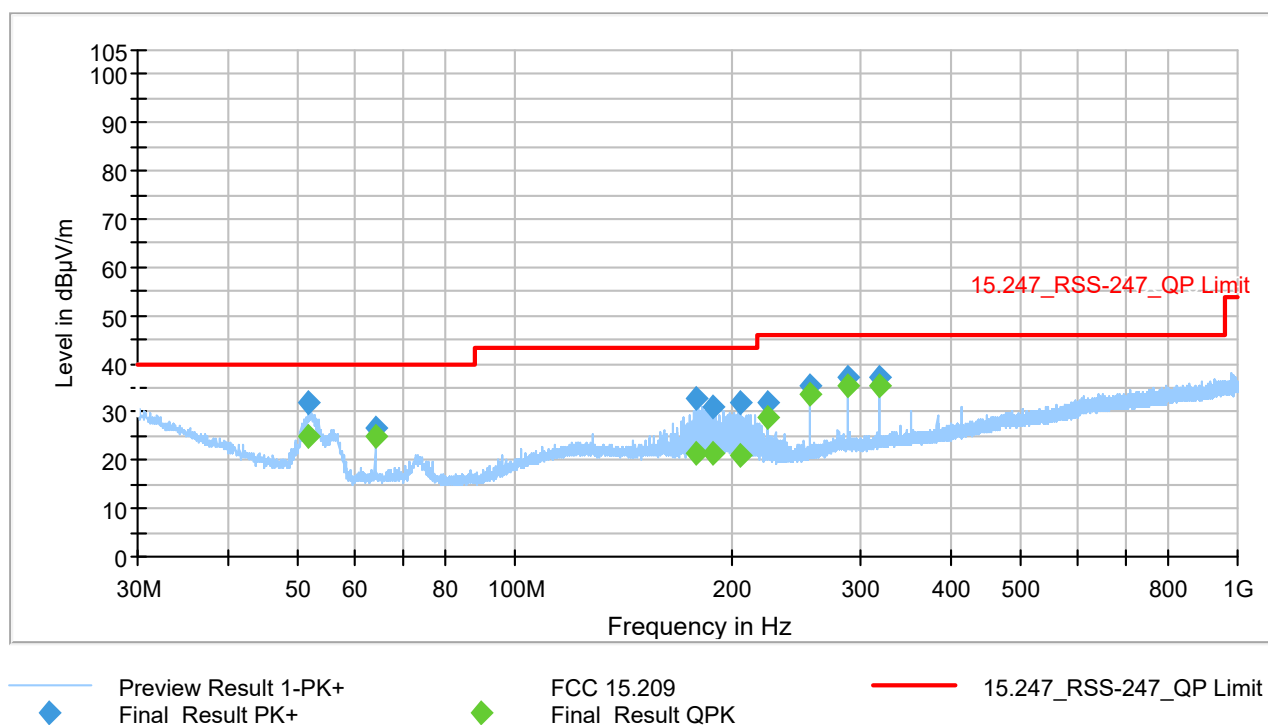


Plot 9-30. Radiated Restricted Band Edge (Ch. 39) Average

9.8.5.2 Emissions in 30 MHz- 1 GHz range

All channels were tested and worst case emissions in low channel of operation 2402 MHz shown here.

RSE 30-1000 MHz						
Carrier Frequency (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)
2402	51.73	10.09	14.80	24.89	40.00	-15.11
2402	64.00	10.66	14.20	24.86	40.00	-15.14
2402	178.24	3.21	18.40	21.61	43.52	-21.91
2402	187.62	3.10	18.40	21.50	43.52	-22.02
2402	204.60	1.94	19.00	20.94	43.52	-22.58
2402	223.99	10.69	18.10	28.79	46.02	-17.23
2402	256.00	14.44	19.30	33.74	46.02	-12.28
2402	288.01	14.46	20.90	35.36	46.02	-10.66
2402	319.98	14.20	21.40	35.60	46.02	-10.42

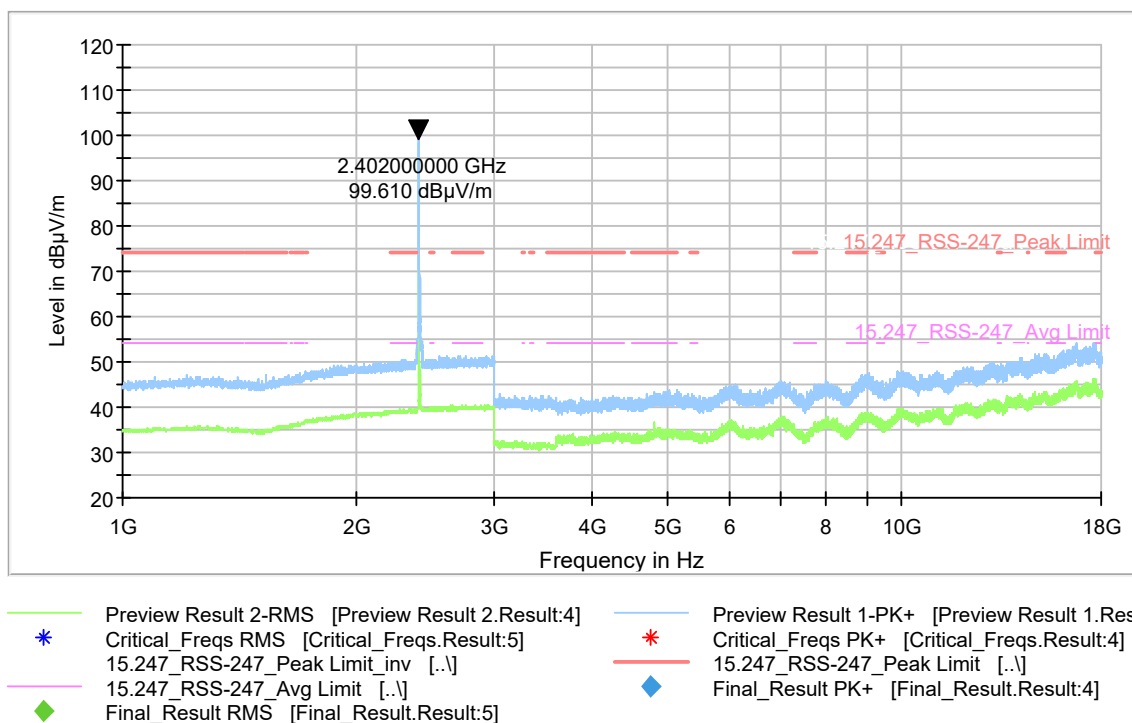


Plot 9-31. Radiated Spurious Emissions (Ch. 0) 2402 (30MHz - 1GHz)

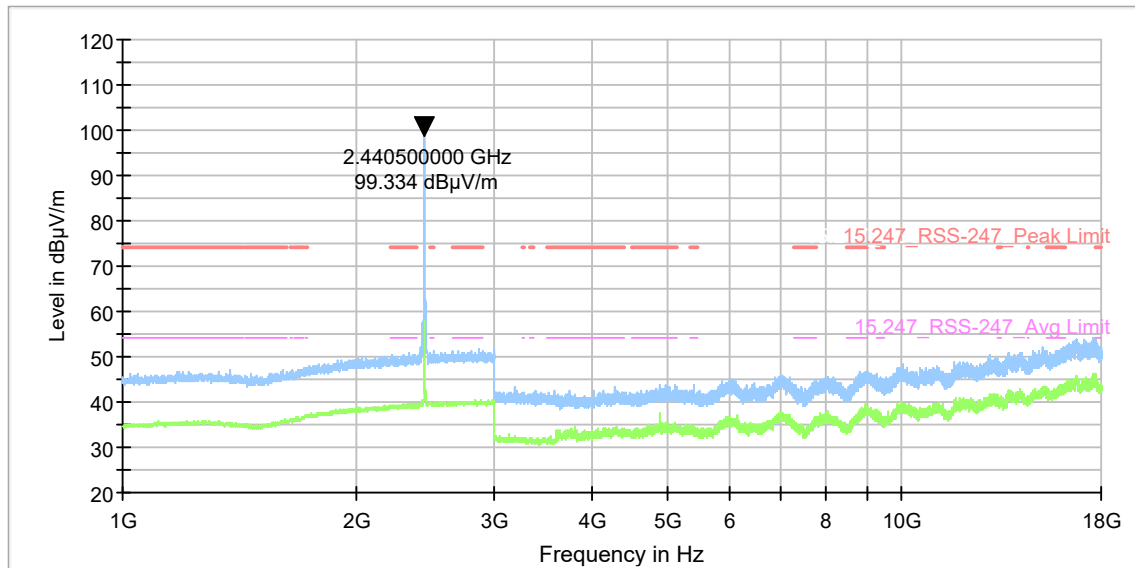
9.8.5.3 Emissions in 1-18 GHz range

RSE 1 - 18GHz Average Data							
Carrier Frequency (MHz)	Frequency (MHz)	Raw Avg. Amplitude (dBμV)	Correction Factor (dB)	DC Correction Factor	Corrected Avg. Field Strength (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
2402	No Spurs	--	--	--	--	--	--
2440	No Spurs	--	--	--	--	--	--
2480	3312.1	28.89	6.6	2.101	37.591	54	-16.409
2480	4959.7	32.26	8.0	2.101	42.361	54	-11.639
2480	5385.9	26.36	8.4	2.101	36.861	54	-17.139

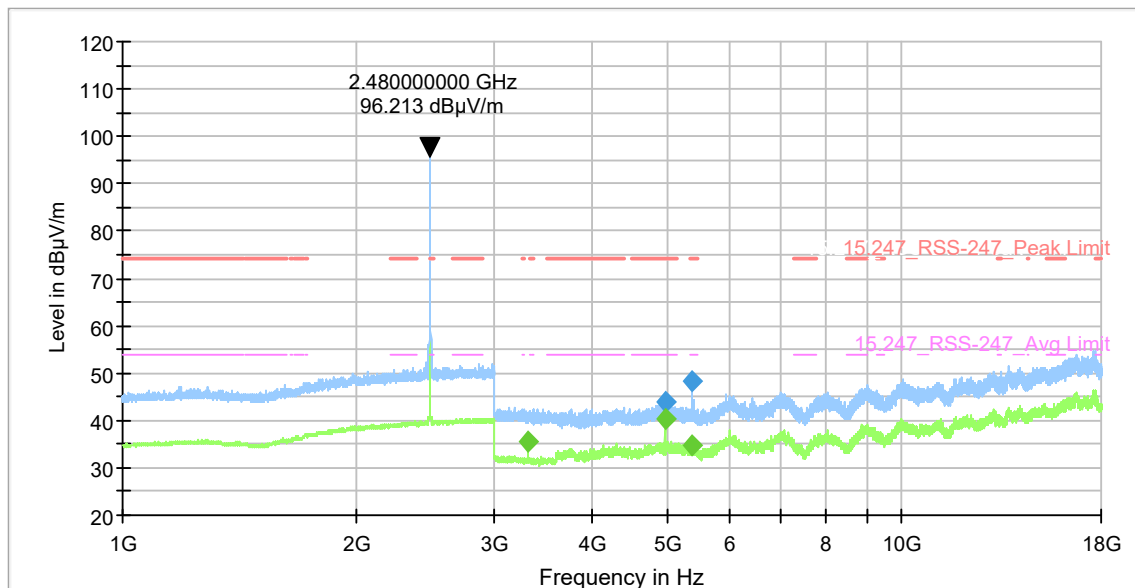
RSE 1 - 18GHz Peak Data						
Carrier Frequency (MHz)	Frequency (MHz)	Raw Peak Amplitude (dBμV)	Correction Factor (dB)	Corrected Peak Field Strength (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)
2402	No Spurs	--	--	--	--	--
2440	No Spurs	--	--	--	--	--
2480	4967.6	35.44	8.3	43.74	74	-30.26
2480	5384.7	40.00	8.4	48.4	74	-25.60



Plot 9-32. Radiated Spurious Emissions 1-18 GHz (Ch. 0)



Plot 9-33. Radiated Spurious Emissions 1-18 GHz (Ch. 19)

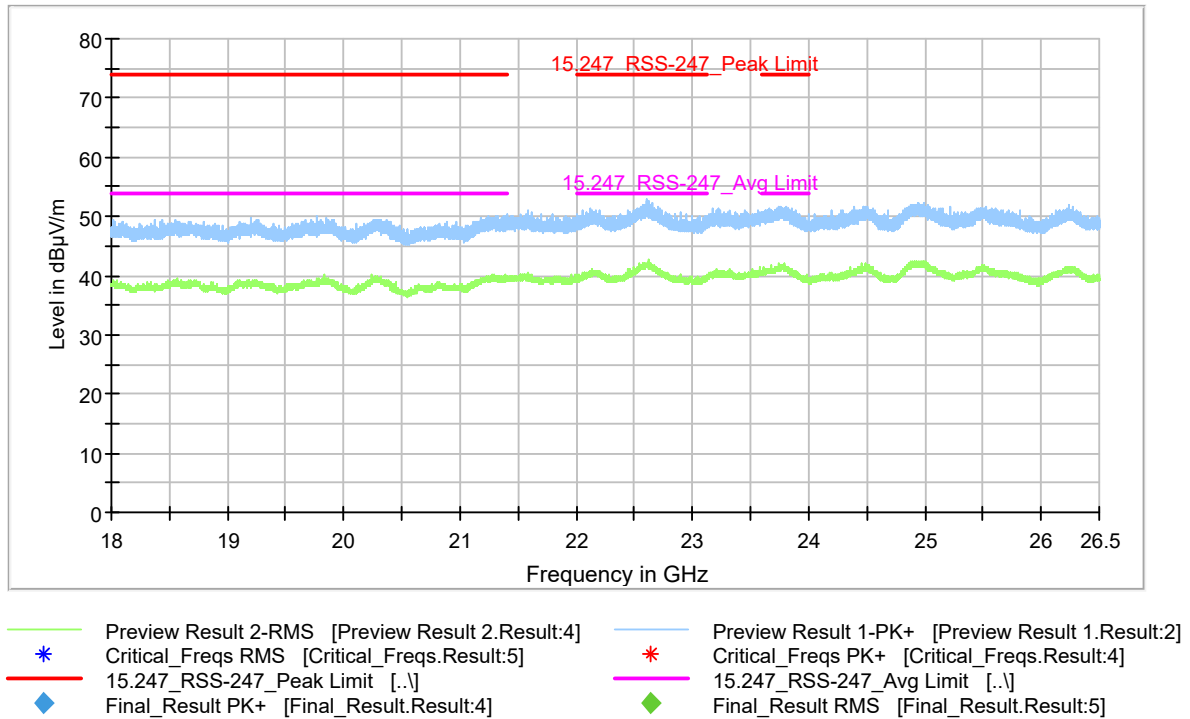


Plot 9-34. Radiated Spurious Emissions 1-18 GHz (Ch. 39)

9.8.5.4 Emissions in 18-26.5 GHz range

All channels were tested and worst case emissions in low channel of operation 2402 MHz shown here.

No significant emissions to report above noise floor.



Plot 9-35. Radiated Spurious Emissions (Ch. 0) (18 – 26.5 GHz)

9.9 AC Line Conducted Emissions

9.9.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

ISED RSS Gen [8.8]

9.9.2 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 is set to continuously transmit on Ch.0.

EMI Receiver Settings:

150 kHz – 30 MHz:

RBW= 9 kHz

VBW $\geq 3 \times$ 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

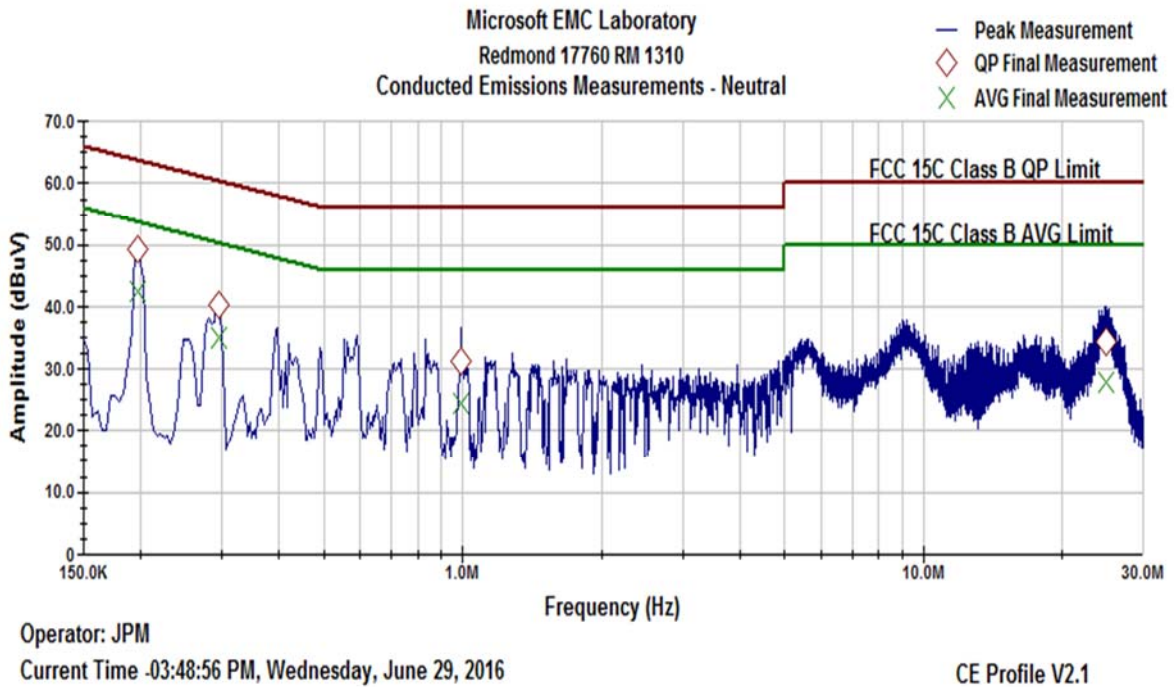
9.9.3 Limit

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

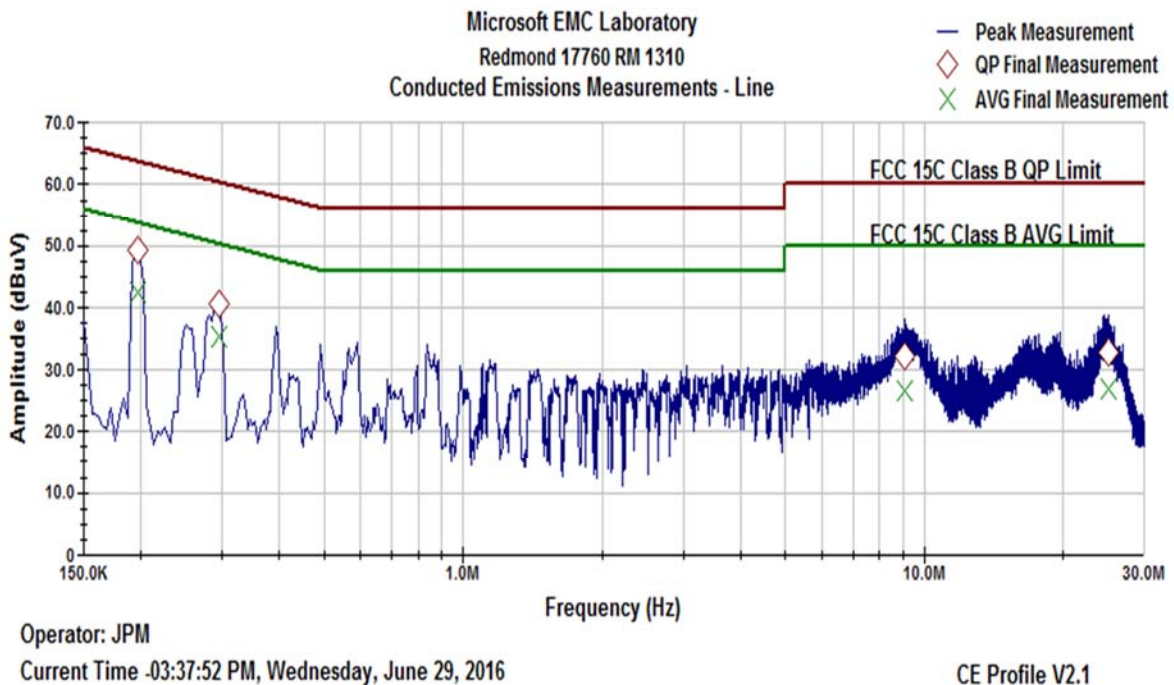
9.9.4 Test Result:

Pass

9.9.5 Test Data:



Plot 9-36. AC Line Conducted Emissions- Neutral (150 kHz- 30 MHz)



Plot 9-37. AC Line Conducted Emissions- Line (150 kHz- 30 MHz)

Frequency (MHz)	Quasi-Peak 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)
0.197	49.24	42.536	64.65	54.65	N	-15.41	-12.11
0.197	49.25	42.505	64.65	54.65	L	-15.40	-12.14
0.296	40.71	35.427	61.83	51.83	L	-21.12	-16.40
0.296	40.26	34.842	61.83	51.83	N	-21.57	-16.99
0.989	31.35	24.528	56.00	46.00	N	-24.65	-21.47
24.85	34.30	27.875	60.00	50.00	N	-25.70	-22.13
25.01	32.75	26.841	60.00	50.00	L	-27.25	-23.16
9.08	32.13	26.689	60.00	50.00	L	-27.87	-23.31

End of Report