RADIO TEST REPORT

For

MODEL NO.: 1864
FCC ID: C3K1864
IC ID: 3048A-1864

Test Report No. R-TR571-FCCISED-NFC-4
Issue Date: September 23, 2019

FCC CFR47 Part 15 Subpart C
Innovation, Science and Economic Development
Canada RSS-210 Issue 9

Prepared by
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A2LA ACCREDITED
TESTING CERT #3472.01

1 Record of Revisions

Revision	Date	Section	Page(s)	Summary of Changes	Author/Revised By:
1.0	09/05/2019	All	All	Version 1.0	Daniel Salinas
2.0	09/17/2019	5.5	8	Support Equipment List included	Daniel Salinas
		6	9	20 dB Bandwidth Requirement included	
		8.3	13	EUT setup diagram included	
		9.5	23, 26	Worst-case orientation clarified	
		9.5	27	Measurement data updated to 200 MHz	
		9.4	29, 30	AC Line Conducted Emissions Updated	
3.0	09/20/2019	5, 9.3.5.2, 9.3.5.7, 9.4.2	7, 26, 27, 28	Included notes on charging and worst modes	Daniel Salinas
4.0	09/23/2019	9.3.5	23	Included note on measurement distance	Daniel Salinas

Table of Contents

Test Report Attestation

Microsoft Corporation
Model: 1864
FCC ID: C3K1864
IC ID: 3048A-1864

Applicable Standards

Specification	Test Result
FCC 47CFR Rule Parts 15.207, 15.209, 15.225	Pass
Innovation, Science and Economic Development Canada RSS-210 Issue 9, RSS-GEN Issue 5	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 test report replaces previous report # R-TR571-FCCISED-NFC-3 issued 09/20/2019.

Reviewed By: Vishwas Narayan

RF Test engineer

Written/ Issued By: Daniel Salinas

RF Compliance Test Lead

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
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	ºC
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:	Mike Boucher
Functional Description of the EUT:	Portable Computing, I/O Accessory Device with NFC Charging Capability
Model:	1864
FCC ID:	C3K1864
IC ID:	3048A-1864
Radio under test:	NFC (13.110-14.010 MHz)
Modulation(s):	ASK/CW
Antenna Information:	Integral coil
Equipment Design State:	Prototype/Production Equivalent (DV)
Equipment Condition:	Good
Test Sample Details:	**RF Conducted Test Sample** 005763792553, 000DVBB420700169 **RF Radiated Test Sample** 000DVBB420300028, 000DVBB420700169

5.1 Test Configurations

Test firmware provided by the customer was used to program the EUT to transmit continuously. With this firmware, the device can operate in single tone carrier and ASK modulation modes. Measurements with a companion device acting as a load in charging mode were also performed.
Radiated measurements were performed in X orientation as this is the device's intended orientation.

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 antenna/coil is 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 Support Equipment

Manufacturer	Model Number	Description	Serial Number(s)
Microsoft	1706	AC/DC Power Adapter	0CI30J0IHW396
Microsoft	1853	NFC Tag/Load Device	000498792456, 000495392456, 000557492356
Viewsonic	VP2780-4K	Monitor	U8K153600200
Samsung	T5	Gen 2 SSD	S3UKNV0K500312E

5.6 Dates of Testing

Testing was performed from August 9th to September 4th, 2019 and September 13th to September 17th, 2019.

6 Test Results Summary

Test Description	FCC CFR 47/ ISED Rule Part	Limit	Test Result
20 dB Bandwidth & Occupied Bandwidth	FCC 15.215 (c) RSS-Gen [6.7]	The Bandwidth must remain within the operating band	N/A
Frequency Stability	FCC 15.225 (e) RSS-210 [B.6]	within ±0.01%	Pass
Carrier Mask	FCC 15.225 (a)(b)(c) RSS-210 [B.6]	FCC CFR 47 15.225 Limits RSS-210 [B.6]	Pass
Radiated Spurious Emissions	15.205, 15.209 RSS-210 [B.6] RSS-Gen [8.9]	FCC CFR 47 15.209 limits RSS-Gen [8.9]	Pass

7 Test Equipment List

Equipment used for Radiated and Conducted Measurements				
Manufacturer	**Description**	**Model #**	**Asset #**	**Calibration Due**
Rohde & Schwarz	Signal Analyzer	FSV40	RF-580	4/9/2020
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-229	4/10/2020
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-248	4/11/2020
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-192	4/10/2020
ETS-Lindgren	Antenna - Passive Loop	6512	RF-202	1/31/2020
Sunol Sciences	Antenna - Broadband	JB6	EMC-017	1/3/2020
Sunol Sciences	Antenna - Broadband	JB1	EMC-1174	8/17/2019*
PCE	Climate Meter	PCE-THB 40	EMC-1207	9/28/2019
Madge Tech	THP Monitor	TCTemp2000	RF-168	10/9/2019
Fluke	Multimeter	87V	EMC-666	10/3/2019
Langer	Near Field Probe Set	RF-2	EMC-692	N/A
Agilent	DC Power Supply	E3632A	EMC-1152	N/A
Test Equity	Temperature Chamber	1007S	EMC-591	N/A
Rohde & Schwarz	Open Switch and Control Unit	OSP130	RF-249	N/A
Rohde & Schwarz	Open Switch and Control Unit	OSP150	RF-250	N/A
Teledyne	RF Cable	57500	EMC-1025	N/A
Huber and Suhner	Cable- SucoFlex 106A	0	RF-599	N/A
Micro-Coax	RF Cable	UTI Flex	RF-354	N/A
Huber-Suhner	Cable	SF126E/11SMA/11N/2M	EMC-1277	N/A

Equipment used for AC Line Conducted Emissions Measurement				
Manufacturer	**Description**	**Model #**	**Asset #**	**Calibration Due**
Rohde & Schwarz	EMI Test Receiver	ESR3	EMC-911	4/11/2020
Teseq	LISN	NNB 51	EMC-056	7/23/2020
Emco	LISN	3810/2	EMC-281	5/31/2020
Fluke	Multimeter	87V	EMC-052	5/3/2020
Madge Tech	THP Monitor	PRHTemp2000	EMC-681	10/31/2019
Micro-Coax	RF Cable	UFB311A-0-0787-500500	EMC-877	N/A
Chroma	AC Power Source	61609	EMC-598	N/A
ETS-Lindgren	TILE- Software License/USB	--	EMC-1105	N/A

Note: Items with Calibration Due date marked as N/A are characterized before use, where applicable.

Note*: All equipment used was within calibration during applicable measurements

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 in accordance with ANSI C63.4:2017. Measurements below 30 MHz were performed on a site demonstrating equivalence to an open field site per KDB 414788 D01.

8.1.1 Radiated Measurements in 9kHz- 30 MHz

The EUT is positioned on a turntable at a height of 80cm using a non-conducting table. A loop antenna is positioned at 3m from the EUT periphery at 1m height from the ground. The turntable is rotated 360 degrees to determine the highest emissions. This is repeated for three orientations of the measurement antenna- parallel, perpendicular and ground-parallel. All possible orientations of the EUT were investigated for emissions and the flat, or ‘X’, orientation was identified as the only applicable configuration.

8.1.2 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 flat, or ‘X’, orientation was identified as the only applicable configuration.

8.2 Antenna port conducted measurements

All antenna port conducted measurements were performed on a bench-top setup consisting of a spectrum analyzer, attenuators, and pre-characterized RF cables. Only relative measurements were taken with this setup.

8.3 Test Setup Diagrams

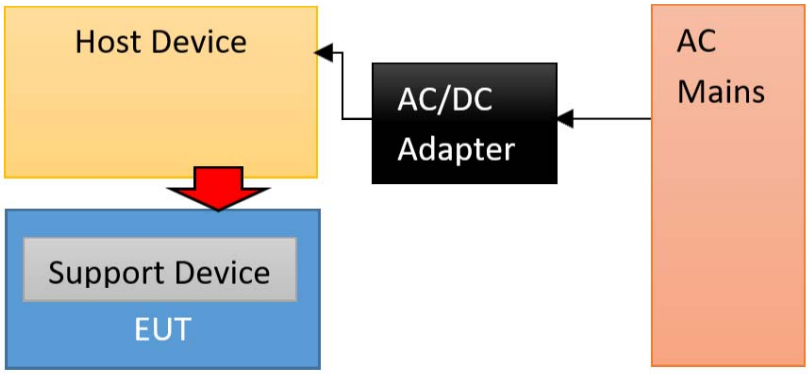

Figure 8-1 EUT Setup Block Diagram

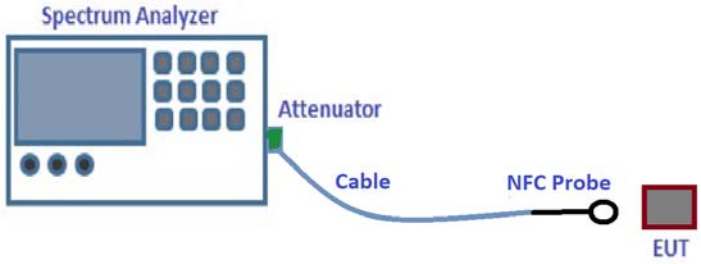

Figure 8-2 Test Setup for Antenna Port Coupled Measurements

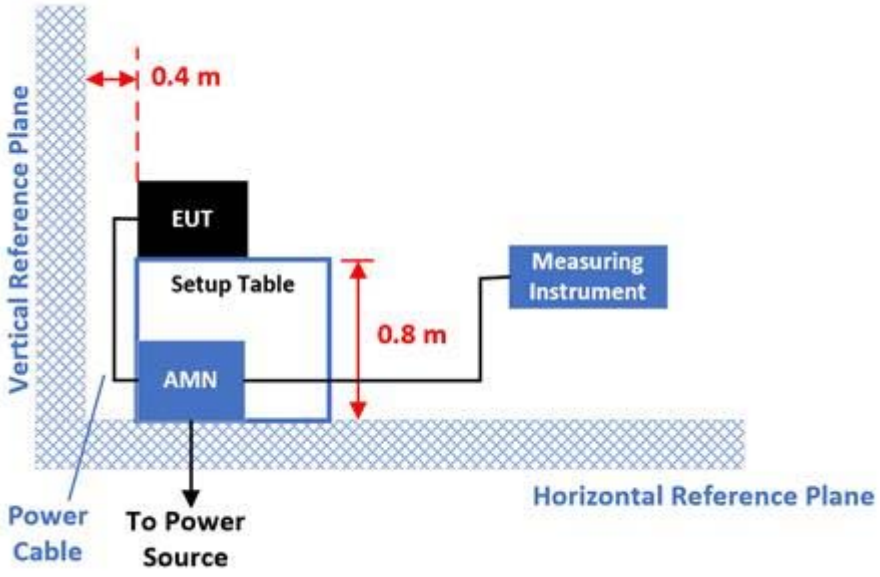

Figure 8-3 AC Line Conducted Emissions

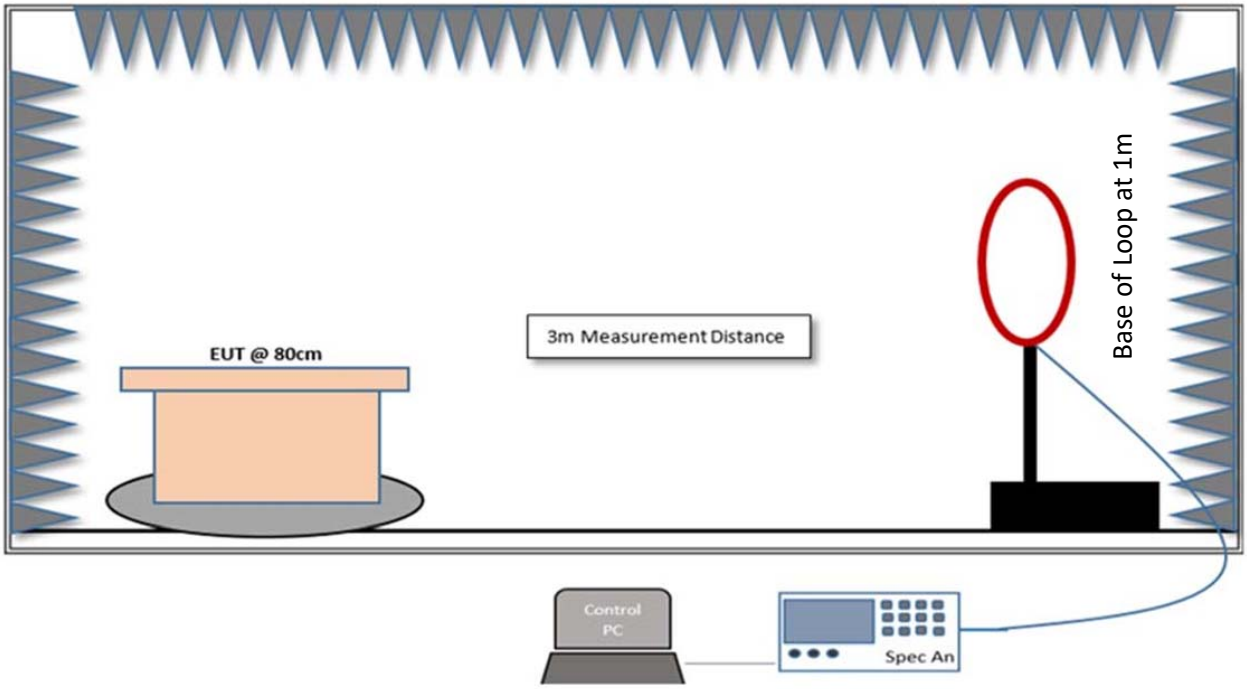

Figure 8-4 Test Setup for Radiated measurements in 9kHz - 30MHz Range

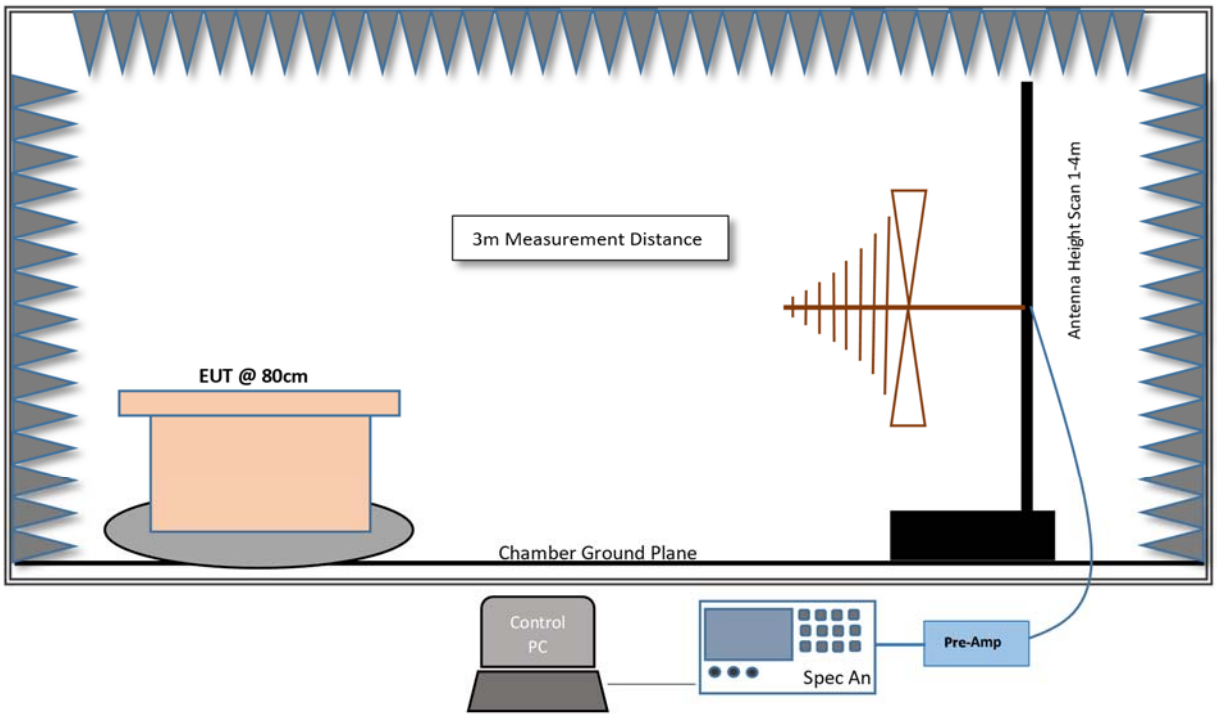

Figure 8-5 Test Setup for Radiated measurements in 30MHz- 1GHz Range

9 Test Results- Conducted

9.1 99% Occupied Bandwidth & 20 dB Occupied Bandwidth

9.1.1 Test Requirement:

FCC CFR 47 Rule Part 15.215 (c)

ISED RSS-Gen [6.6]

The 20 dB Occupied Bandwidth must remain within the operating frequency band.

The 99% Occupied Channel Bandwidth is the bandwidth that contains 99% of the power of the signal. This test is performed for reporting and measurement purposes only.

9.1.2 Test Method:

Measurements are performed according to ANSI C63.10: 2013 section 6.9.

99% Occupied Bandwidth Spectrum Analyzer settings:
Set analyzer center frequency to the nominal EUT channel frequency
Span is set to between 2 and 5 times the OBW bandwidth
RBW: 1% to 5% of the OBW or 20 dB BW= 30 kHz/10kHz
VBW ≥ 3 RBW= 100 kHz/100 kHz
Detector = Peak
Sweep time = Auto Couple
Trace mode = max hold
Use the 99% power bandwidth function of the instrument or set the markers 20 dB below the carrier and measure the difference in frequency.

9.1.3 Limits:

For reporting purpose only.

9.1.4 Test Results:

Frequency (MHz)	Test Mode	99% Bandwidth (kHz)	20 dB Bandwidth (kHz)	Result
13.56	ASK	790.16	464.80	Pass

9.1.5 Test Data:

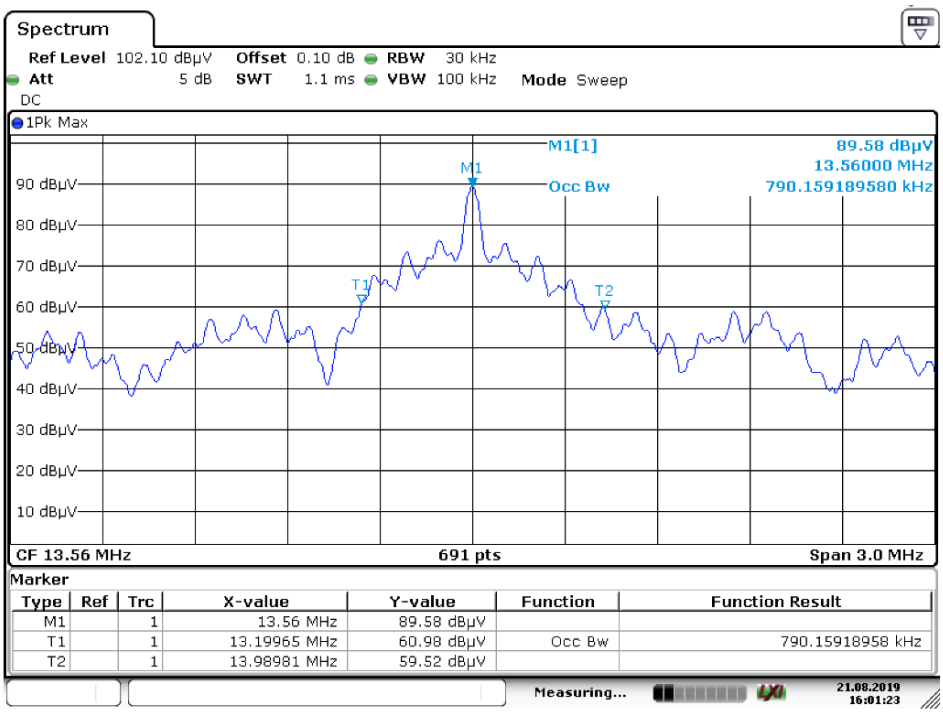

Figure 9-1 99% Occupied Bandwidth

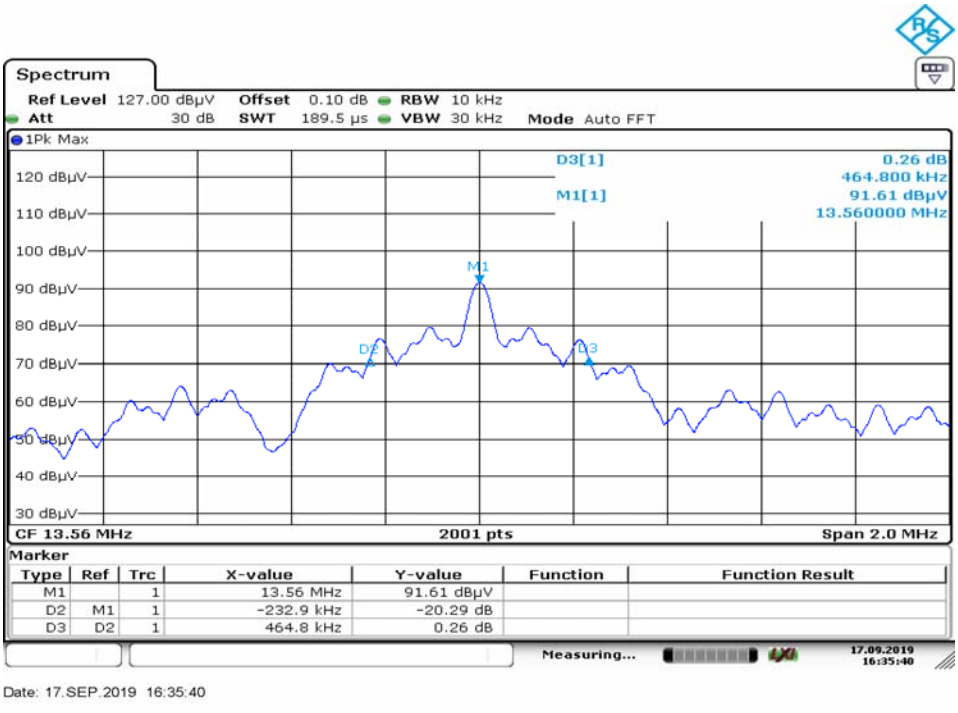

Figure 9-2. 20 dB Bandwidth

9.2 Frequency Stability

9.2.1 Test Requirement:

FCC CFR 47 Rule Part 15.225 (e)

ISED RSS-210 [B.6]

9.2.2 Test Method:

Measurements were performed according to the procedure defined in ANSI C63.10: 2013 Section 6.8.

Spectrum Analyzer settings:
RBW= 100 Hz
VBW = 300 Hz
Span = 10 kHz
Detector = Peak
Sweep Points = 32001
Sweep Time = Auto
Sweep Mode = Continuous
First capture the reference frequency at nominal voltage (from EUT spec) and nominal temperature (20°C).

- o After power on, use trace 1 on the spectrum analyzer. Select view to freeze the plot.
- o Use marker → peak search to establish the reference frequency. Marker 1 will now be the reference frequency.
- o Record the reference frequency M1(1)

Once the reference frequency has been established, use trace 2 to compare the frequency shift during the rest of the voltage and temperature values as defined in ANSI C63.10 section 6.8.

- o Select Trace → 2, Clear write
- o Select Marker → 2, Delta
- o Select Marker to Trace → 2
- o Select Trace → Max hold (ensure trace 2 is selected)
- o Select Marker → Peak Search
- o Record the frequency shift D2[2]

Repeat step 2 for the remaining voltage and temperature values as defined in ANSI C63.10 section 6.8.

- o Select Trace → 2, Clear write
- o Select Trace → Max hold (ensure trace 2 is selected)
- o Select Marker → Peak Search
- o Record the frequency shift D2[2]

Sample Plot:

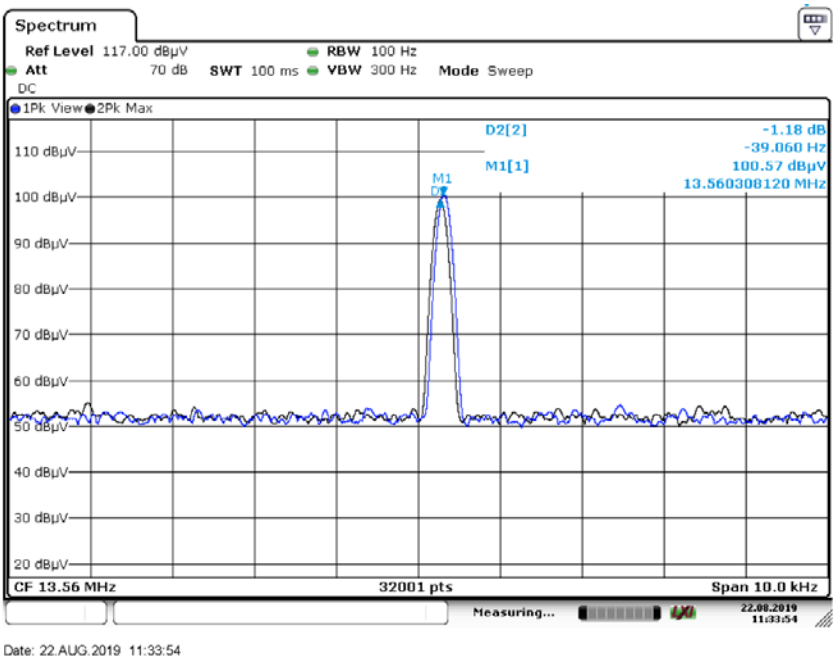

Figure 9-3. Frequency Stability (13.56 MHz)

9.2.3 Limits:

15.225 (e): The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

RSS-210 [B.6]: Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

9.2.4 Test Results:

1.) Results with varying temperature

Power Supply (Vac)= 7.55

Temperature (ºc)	Startup (MHz)	Frequency Shift (Hz)	Delta (ppm)	Frequency Shift (Hz) at 2 mins	2 mins (MHz)	Delta (ppm)
50.00	13.5602494	-58.80	4.334	0.00	**13.5603081**	0.00
40.00	13.5602690	-39.10	2.882	0.00	**13.5603081**	0.00
30.00	13.5602887	-19.40	1.430	0.00	**13.5603081**	0.00
20.00	**13.5603081**	**0.00**	0.000	0.00	**13.5603081**	0.00
10.00	13.5602790	-29.10	2.144	0.00	**13.5603081**	0.00
0.00	13.5602690	-39.10	2.882	0.00	**13.5603081**	0.00
-10.00	13.5602787	-29.40	2.167	0.00	**13.5603081**	0.00
-20.00	13.5603081	0.00	0.001	-9.69	**13.5602984**	0.71

Frequency Shift (Hz) at 5 mins	5 mins (MHz)	Delta (ppm)	Frequency Shift (Hz) at 10mins	10 mins (MHz)	Delta (ppm)	Limit (ppm)	Result
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	-0.27	**13.5603079**	0.02	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass

2.) Results with varying Supply voltage

Ambient temperature: 20 °C

Power Supply (VDC)	Startup (MHz)	Frequency Shift (Hz)	Delta (ppm)	Frequency Shift (Hz) at 2mins	2 mins (MHz)	Delta (ppm)
8.68	13.5603081	0.00	0.00	0.00	**13.5603081**	0.00
6.42	13.5603081	0.00	0.00	0.00	**13.5603081**	0.00

Frequency Shift (Hz) at 5mins	5 mins (MHz)	Delta (ppm)	Frequency Shift (Hz) at 10mins	10 mins (MHz)	Delta (ppm)	Limit (ppm)	Result
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass
0.00	**13.5603081**	0.00	0.00	**13.5603081**	0.00	±100	Pass

9.3 Radiated Spurious and Carrier Mask

9.3.1 Test Requirement:

FCC CFR 47 Rule Part 15.225 (a)(b)(c)(d) and 15.209

ISED RSS-210 [B.6] and RSS GEN [8.9]

9.3.2 Test Method:

Radiated spurious measurements were made from 9kHz to the 10th harmonic of the transmit fundamental frequency following ANSI C63.10:2013 procedures. The limit for radiated spurious emissions is per 15.209 and RSS-Gen [5.5]. Emissions observed in the restricted bands listed in 15.205 and RSS-Gen were tested for compliance per limits in 15.209 and RSS-Gen. Limits for Carrier Mask are as defined in 15.225.

Guidelines in ANSI C63.10:2013 were followed with respect to maximizing the emissions. Carrier Mask Measurements were performed at 1m measurement distance to improve SNR.

A pre-amp was required to provide the measuring system with sufficient sensitivity. The peak field strength of the emission is corrected by the antenna factor, cable loss, pre-amp etc.

Parallel, perpendicular, and ground parallel loop orientations were investigated. Due to the applicable EUT configuration only parallel and perpendicular loop orientations were tested. Worst-case maximized data for all loop orientations is shown in this test report.

Radiated Spurious Emissions

Spectrum Analyzer Settings:

9 kHz – 150 kHz

RBW= 1 kHz
VBW= 3 kHz
Trace Mode: Peak Detector (Max Hold)
Span= 1 - 150 kHz
Sweep time= Auto
Sweep points ≥ 2 x Span/RBW

150 kHz – 30 MHz

RBW= 10 kHz
VBW= 30 kHz
Trace Mode: Peak Detector (Max Hold)
Span= 150 kHz – 30 MHz
Sweep time= Auto
Sweep points ≥ 2 x Span/RBW

30 MHz - 1 GHz:

RBW = 120 kHz
VBW ≥ 3 X RBW
Trace Mode: Peak Detector (Max Hold). Final measurements performed using QP Detector.
Span= 30 MHz - 1 GHz
Sweep time= Auto
Sweep points ≥ 2 x Span/RBW

Final Peak Measurements
RBW = 10 kHz
VBW ≥ 30 kHz
Detector = Peak
IF filter = 6dB
Sweep time = auto
Trace mode = max hold. Allow sweeps to continue until the trace stabilizes

Final Quasi-Peak Measurements
RBW = 200 Hz; 9 kHz
IF filter = 6dB
Detector = Quasi-Peak
Measurement Time = 15s

Final Average Measurements (9 kHz – 90 kHz, 110 kHz – 490 kHz)
RBW = 1 kHz
VBW ≥ 3 kHz
Detector = Average
IF filter = 6dB
Measurement time = 0.1 to 1s
Trace mode = max hold. Allow sweeps to continue until the trace stabilizes

Sample Calculation:

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

9.3.3 Limits:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (meters)	Field Strength Limit (dBµV/m)
13.110 -13.410	106	30	40.51
13.410-13.533	334	30	50.47
13.553-13.567	15,848	30	84
13.567-13.710	334	30	50.47
13.710-14.010	106	30	40.51

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (meters)	Field Strength Limit (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 (Restricted Frequency Bands)	500	3	54 (Average) 74 (Peak)

9.3.4 Test Result:

Pass.

9.3.5 Test Data:

9.3.5.1 Carrier Mask Emission

The worst-case mode was observed to be with the EUT in flat 'X' orientation without the passive tag support device. The worst-case measurement antenna orientation was parallel loop orientation.

Carrier Mask						
Carrier Frequency (MHz)	**Configuration**	**Raw Peak Amplitude (dBµV/m)**	**Correction Factor (dB)**	**Corrected Peak Field Strength (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
13.56	ASK w/ Tag	-8.52	-5.00	-13.52	84	-97.52
13.56	ASK w/o Tag	-1.16	-5.00	-6.16	84	-90.16
13.56	CW w/ Tag	-9.19	-5.00	-14.19	84	-98.19
13.56	CW w/o Tag	0.1	-5.00	-4.90	84	-88.90

Note: Measurements were performed at 1m and extrapolated to 30m using a 40 dB/decade extrapolation formula.

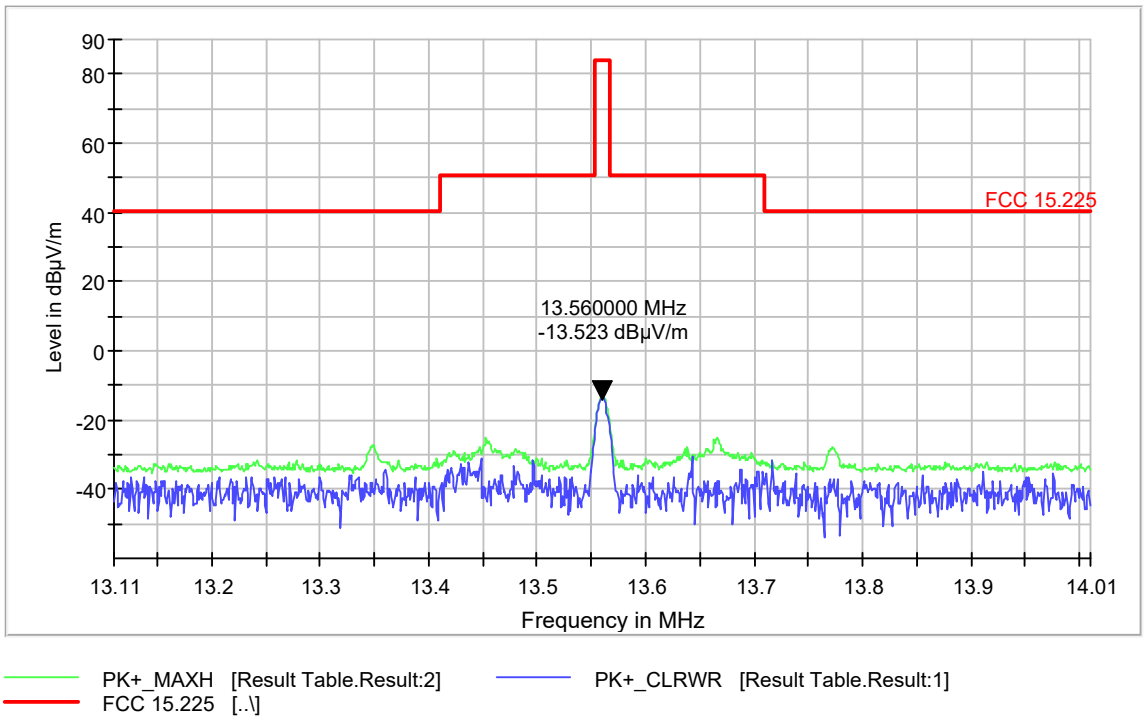

Figure 9-4 Carrier Mask ASK Modulation w/ Passive Tag Load (13.56 MHz)

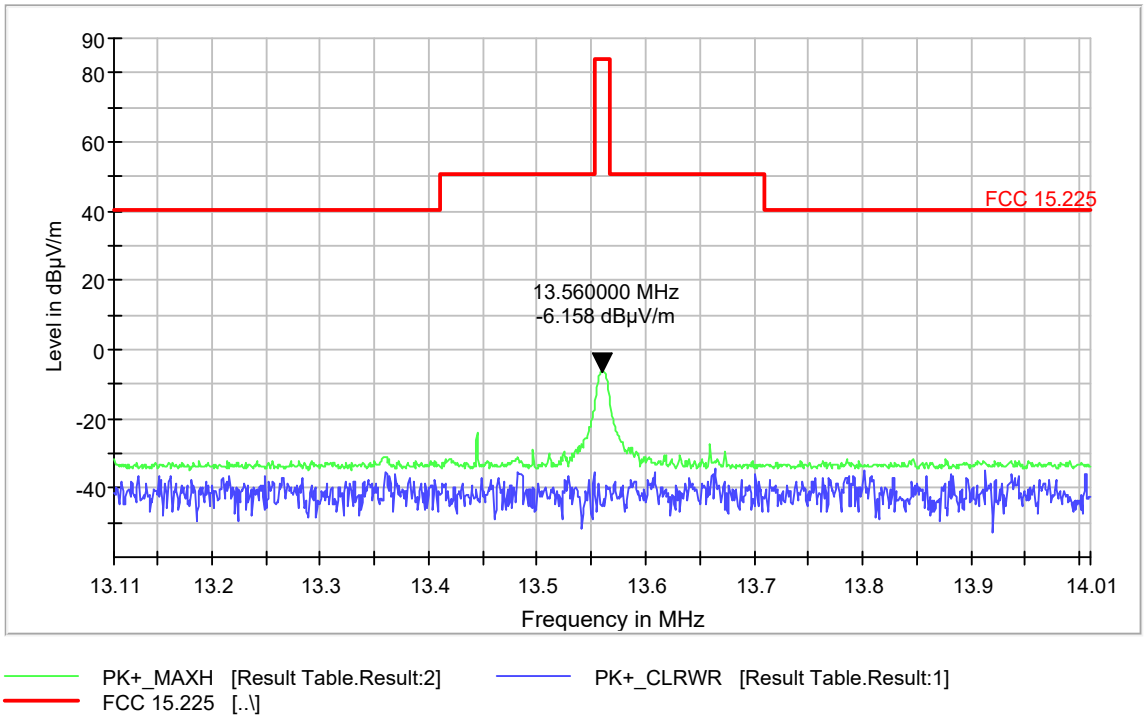

Figure 9-5 Carrier Mask ASK Modulation w/o Passive Tag Load (13.56 MHz)

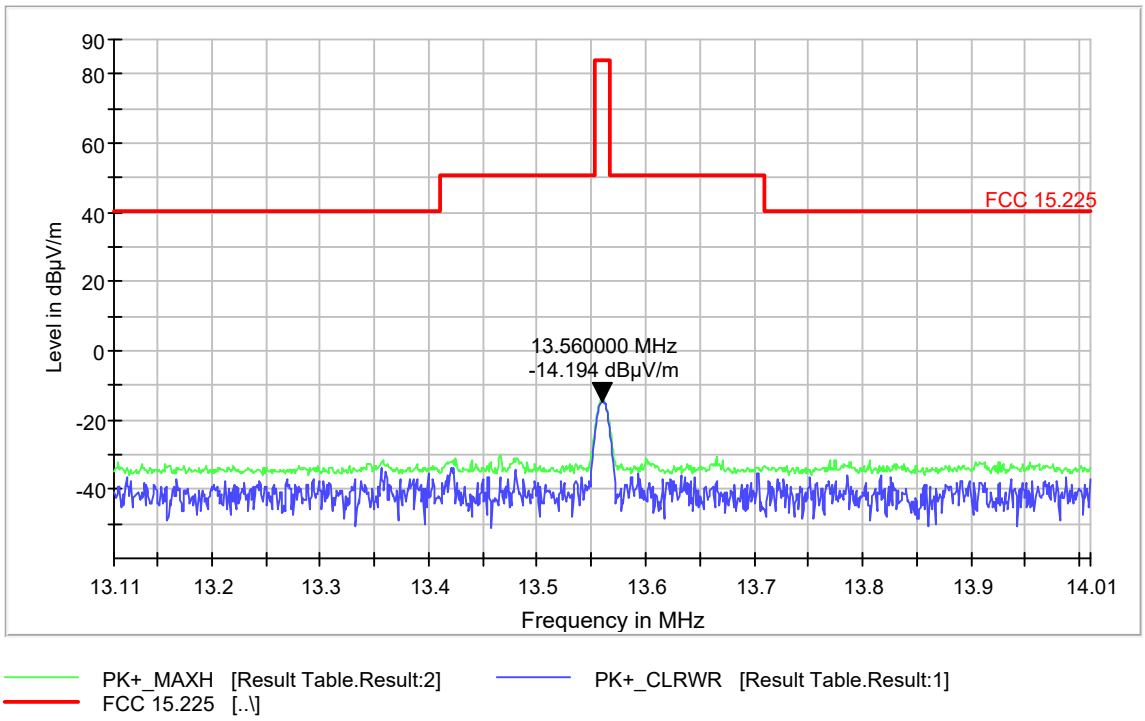

Figure 9-6 Carrier Mask CW Mode w/ Passive Tag Load (13.56 MHz)

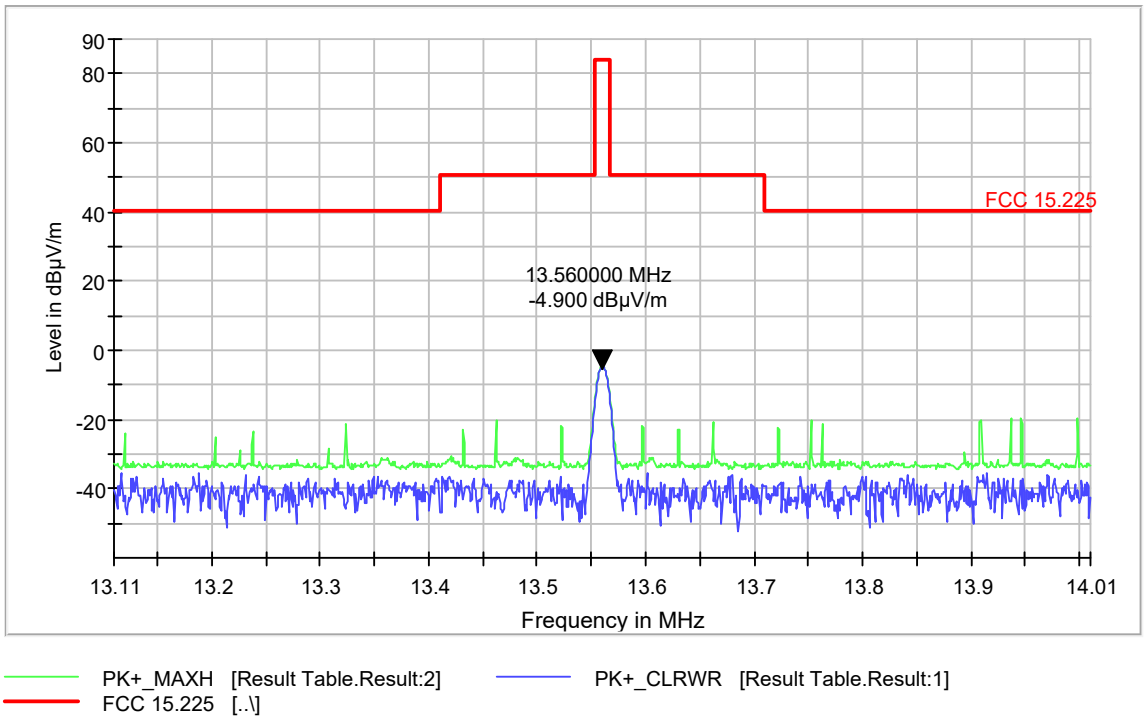

Figure 9-7 Carrier Mask CW Mode w/o Passive Tag Load (13.56 MHz)

9.3.5.2 Emissions in 9 kHz – 30 MHz

All modes, with and without passive tag load were tested and worst-case results are reported The worst-case mode was observed to be with the EUT in flat 'X' orientation without the passive tag support device in CW mode. The worst-case measurement antenna orientation was parallel loop orientation.

RSE 9 kHz – 30 MHz						
Carrier Frequency (MHz)	**Emission Frequency (MHz)**	**Raw Quasi-Peak Amplitude (dBµV/m)**	**Correction Factor (dB)**	**Corrected Quasi-Peak Field Strength (dBµV/m)**	**Quasi-Peak Limit (dBµV/m)**	**Quasi-Peak Margin (dB)**
13.56	16.23	-9.64	-5.10	-14.74	29.54	-44.28
13.56	23.13	-7.51	-5.20	-12.71	29.54	-42.25
13.56	26.60	-5.94	-5.40	-11.34	29.54	-40.88
13.56	28.68	-3.86	-6.10	-9.96	29.54	-39.50

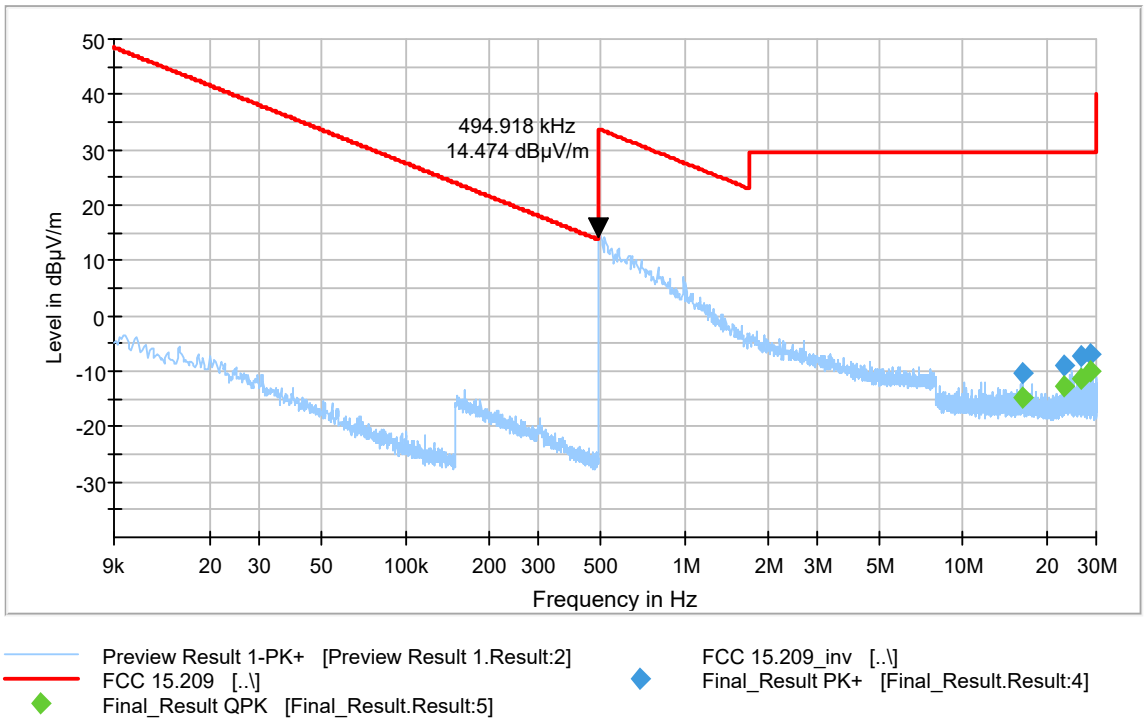

Figure 9-8 Radiated Spurious Emissions 9 kHz – 30 MHz – w/ Passive Tag Load

9.3.5.3 Emissions in 30 MHz- 1 GHz range

All modes were tested, and worst-case results are reported. EUT was setup in 'X' or flat orientation without the passive tag/charging device in CW mode.

RSE 30-1000 MHz						
Carrier Frequency (MHz)	**Emission Frequency (MHz)**	**Raw Quasi-Peak Amplitude (dBµV/m)**	**Correction Factor (dB)**	**Corrected Quasi-Peak Field Strength (dBµV/m)**	**Quasi-Peak Limit (dBµV/m)**	**Quasi-Peak Margin (dB)**
13.56	33.79	5.12	24.8	29.92	40	-10.08
13.56	40.66	4.71	19.8	24.51	40	-15.49
13.56	54.25	9.22	14.0	23.22	40	-16.78
13.56	67.82	4.34	14.7	19.04	40	-20.96
13.56	97.147	-0.40	16.4	16.00	43.52	-27.52
13.56	155.30	2.80	19.8	22.60	43.52	-20.92

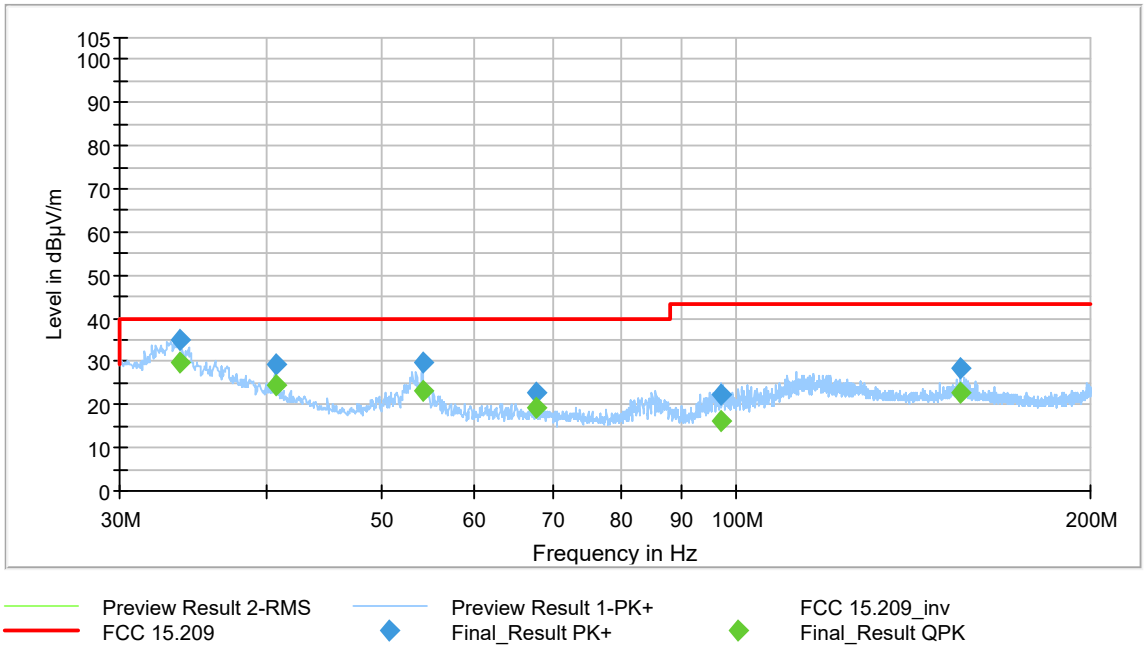

Figure 9-9 Radiated Spurious Emissions w/ Passive Tag Load (13.56 MHz)

9.4 AC Line Conducted Emissions

9.4.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

ISED RSS Gen [8.8]

9.4.2 Test Method

Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the Unsymmetric 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.

Worst case results were recorded when the EUT was transmitting continuously with a passive tag load in charging mode for this test.

EMI Receiver Settings:
150 kHz – 30 MHz:
RBW= 9 kHz
VBW ≥ 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

9.4.3 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

9.4.4 Test Result:

Pass

9.4.5 Test Data:

Frequency (MHz)	Line Tested (L or N)	AVG Amplitude (dBµV)	QP Amplitude (dBµV)	AVG Limit (dBµV)	QP Limit (dBµV)	AVG Margin (dB)	QP Margin (dB)
0.156	L	30.17	52.02	55.70	65.70	-25.52	-13.68
0.227	L	23.19	44.38	52.57	62.57	-29.38	-18.19
2.445	L	13.30	17.49	46.00	56.00	-32.70	-38.51
2.75	L	12.23	18.00	46.00	56.00	-33.77	-38.00
2.814	L	15.21	23.19	46.00	56.00	-30.79	-32.81
27.12	L	39.33	39.32	50.00	60.00	-10.67	-20.68
0.154	N	30.15	52.67	55.80	65.80	-25.65	-13.13
0.159	N	30.22	51.44	55.50	65.50	-25.28	-14.05
0.174	N	28.62	49.78	54.75	64.75	-26.13	-14.97
0.611	N	28.98	31.30	46.00	56.00	-17.02	-24.70
2.943	N	15.63	27.27	46.00	56.00	-30.37	-28.73
27.12	N	39.55	39.51	50.00	60.00	-10.46	-20.50

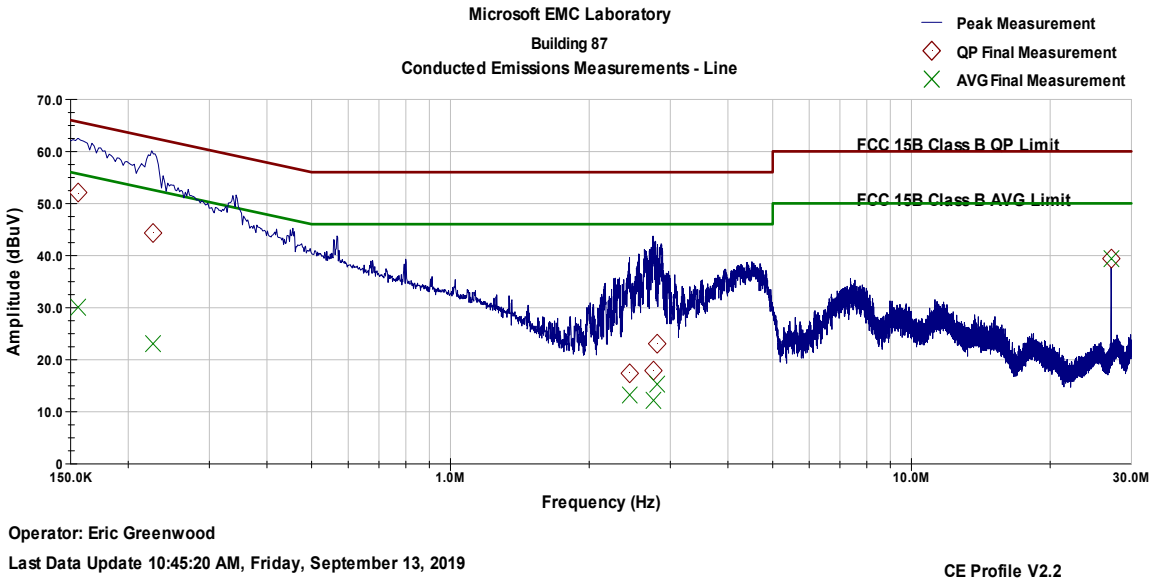

Figure 9-10 AC Line Conducted Emissions - Line (150 kHz - 30 MHz)

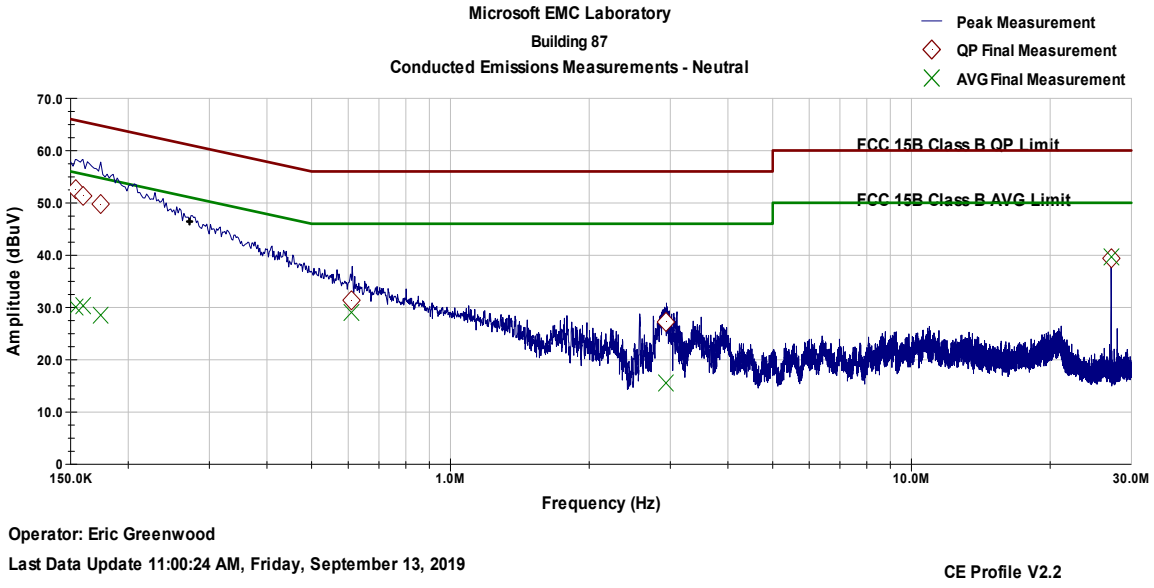

Figure 9-11 AC Line Conducted Emissions - Neutral (150 kHz - 30 MHz)

End of Report