RADIO TEST REPORT

For

MODEL NO.: 1995
FCC ID: C3K1995

Test Report No. R-TR1008-FCC -NFC-1
Issue Date: September 21st, 2021

FCC CFR47 Part 15 Subpart C

Prepared by

Microsoft EMC Laboratory
17760 NE 67th Ct,
Redmond WA, 98052, U.S.A.
425-421-8641
dasalina@microsoft.com

ACCREDITED
TESTING CERT #3472.01

1 Record of Revisions

Revision	Date	Section	Page(s)	Summary of Changes	Author/Revised By:
1.0	9/21/2021	All	All	Version 1.0	Vishwas

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Test Report Attestation

Microsoft Corporation
Model: 1995
FCC ID: C3K1995

Applicable Standards

Specification	Test Result
FCC 47CFR Rule Parts 15.207, 15.209, 15.225	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.

Reviewed By: Vishwas

Radio Test engineer

Written/Issued By: Daniel Salinas

Sr. RF Lab 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
ISED CAB ID: US0212

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. The test site for measurements below 30 MHz has been demonstrated to correlate with an open field site per KDB 414788.
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 (9 kHz 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:	Wireless Accessory
Model:	1995
FCC ID:	C3K1995
Radio under test:	NFC (13.110-14.010 MHz)
Modulation(s):	ASK/CW
Antenna Information:	Integral coil
Equipment Design State:	Prototype/Production Equivalent (EV1)
Equipment Condition:	Good
Load:	Microsoft Model # 1962
Host Device	Microsoft Model #1995

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 were also performed.

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 Dates of Testing

Testing was performed from Sept 8th to Sept 16th, 2021.

5.6 Test Samples Details

Internal Lab ID	Test Cases
R-1008-EV1-CERT-01	Radiated
R-1008-EV1-CERT-02	Conducted/Near Field Probe
R-1008-EV1-CERT-03	Conducted/Near Field Probe

5.7 Test Engineers

Name	Test Cases
Cameron Ashbaugh	Conducted/Near Field Probe
Akshay Landge	Radiated
Kushal Shastri	AC Line conducted emissions

6 Test Results Summary

Test Description	FCC CFR 47/RSS	Limit	Test Result
20 dB Bandwidth	FCC 15.215 (c)	Reporting & Measurement Purposes only	N/A
Occupied Bandwidth	RSS-Gen [6.7]	Reporting & Measurement Purposes only	N/A
Frequency Stability	FCC 15.225 (e) RSS-210 [B.6]	within ±0.01% or +/- 100 ppm	Pass
Carrier Mask	FCC 15.225 (a)(b)(c) RSS-210 [B.6]	FCC CFR 47 15.225 Limits RSS-210 [B.6] Limits	Pass
Radiated Spurious Emissions	15.205, 15.209 RSS-GEN [8.9] [8.10]	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	EMI Test Receiver	ESU40	RF-012	4/4/2022
Sunol Sciences	Antenna - Broadband	JB6	EMC-639	9/22/2021
ETS-Lindgren	Antenna - Passive Loop	6512	RF-202	2/26/2023
Pasternack	6dB attenuator	PE7004-6	EMC-950	9/22/2021
Rohde & Schwarz	Open Switch and Control Unit	OSP130	RF-193	11/12/2021
Rohde & Schwarz	Open Switch and Control Unit	OSP150	RF-194	11/12/2021
Teledyne	RF Cable	PR90-195-276	RF-1286	2/3/2022
Micro-Coax	RF Cable	UtiFlex	RF-869	03/25/2022
Micro-Coax	RF Cable	UFB311A-1-0787-50U50U (2 meter)	RF-1211	11/12/2021
Micro-Coax	RF Cable	UtiFlex	RF-1210	11/12/2021
Langer	Near Field Probe Set	NA	EMC-643	NA
PCE	Environmental (THP) meter	PCE-THB 40	EMC-1205	11/4/2021
Agilent	DC Power Supply	E3632A	EMC-1152	NA
Test Equity	Temperature Chamber	1007S	EMC-673	NA

Equipment used for AC Line Conducted Emissions Measurement				
Manufacturer	**Description**	**Model #**	**Asset #**	**Calibration Due**
Rohde & Schwarz	EMI Test Receiver	ESR3	EMC-1396	08/06/2022
Teseq	LISN	NNB 51	EMC-1198	08/03/2022
Fluke	Multimeter	87V	EMC-821	10/6/2021
PCE	Environmental (THP) meter	PCE-THB 40	EMC-1205	11/4/2021
Micro-Coax	RF Cable	UFA210A-1-1800-50U50U	EMC-367	12/11/2021
Chroma	AC Power Source	61602	EMC-055	11/4/2021
ETS-Lindgren	TILE- Software License/USB	--	EMC-985	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.

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.

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.

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

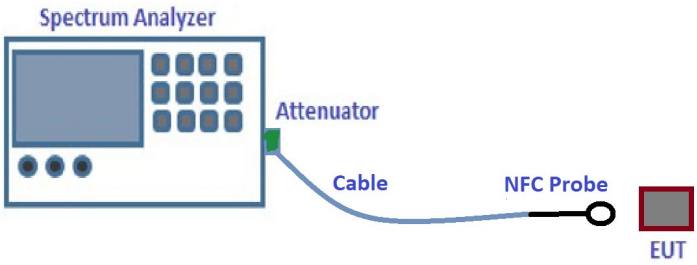

Figure 8-1 Test Setup for Antenna Port Coupled Measurements

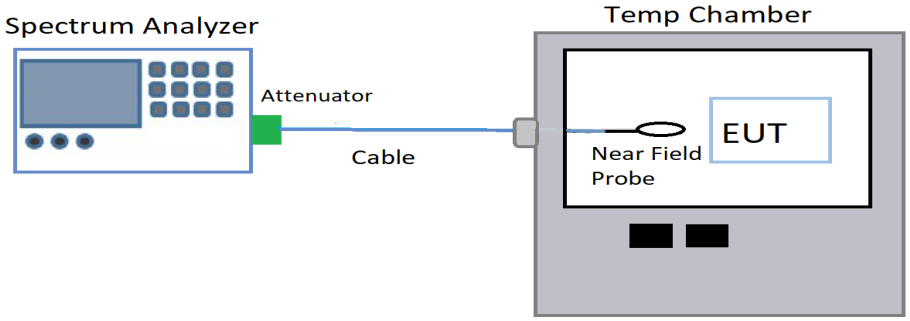

Figure 8-2 Test Setup for Antenna Port Coupled Frequency Stability Measurements

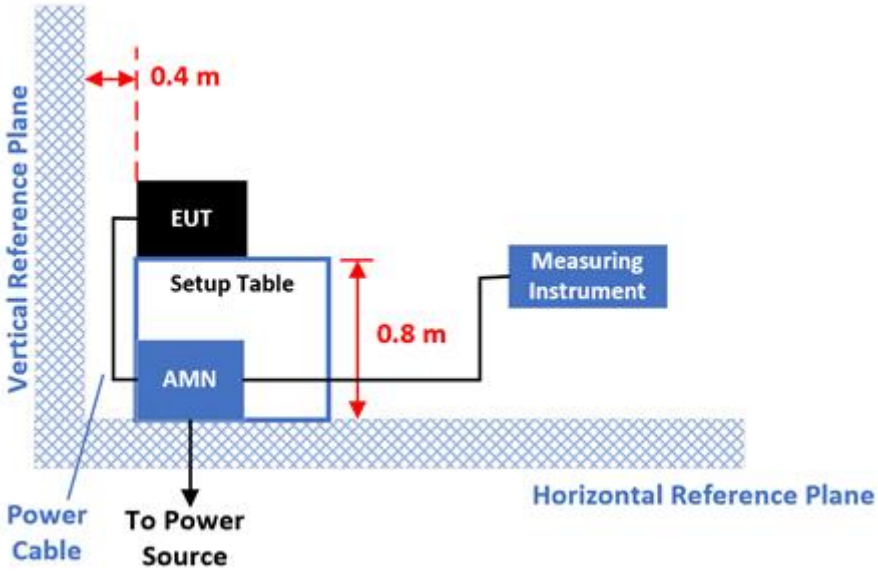

Figure 8-3 AC Line Conducted Emissions

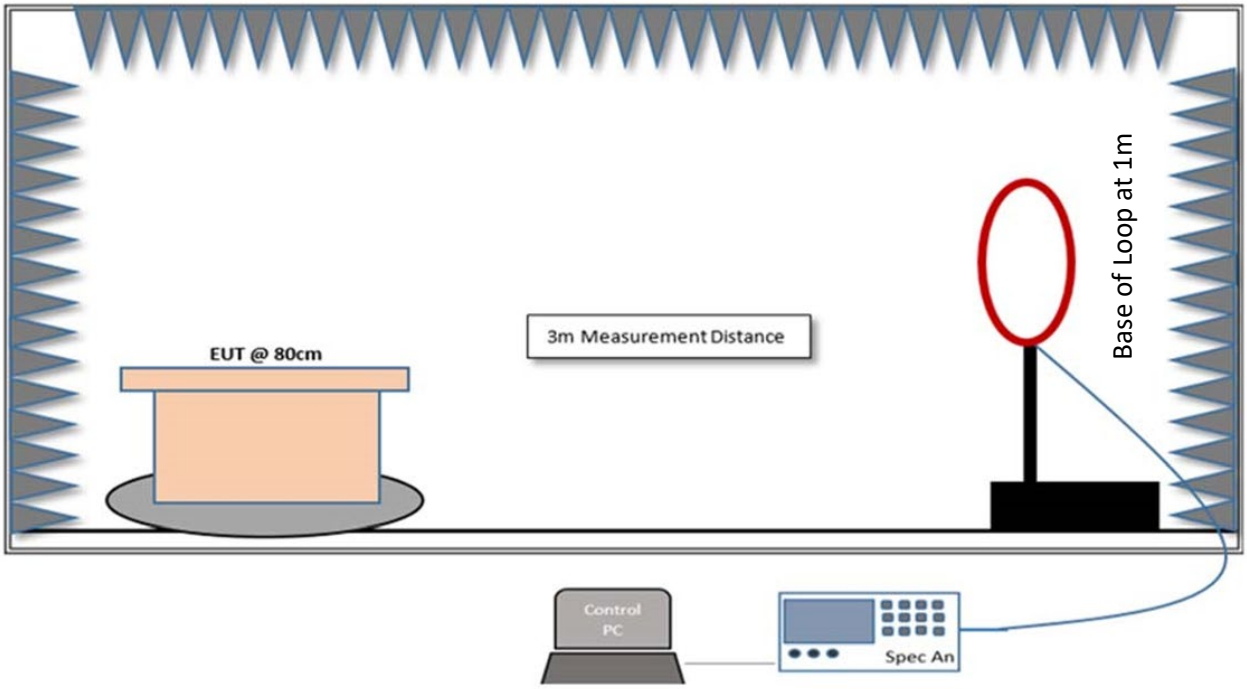

Figure 8-4 Test Setup for Radiated measurements in 9kHz - 30MHz Range

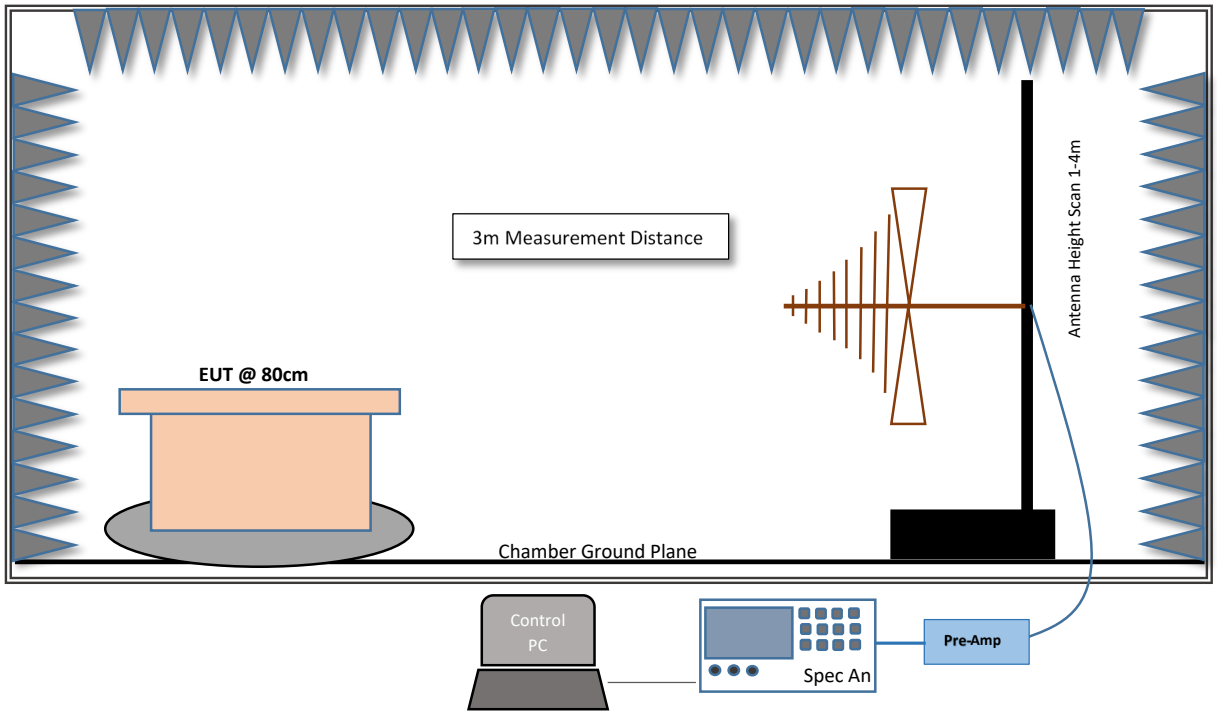

Figure 8-5 Test Setup for Radiated measurements in 30MHz- 1GHz Range

9 Test Results- Conducted

9.1 20 dB Occupied Bandwidth

9.1.1 Test Requirement:

The 20 dB Occupied Bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced 20 dB from maximum value of the spectral envelope. 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.

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= 30 kHz
VBW ≥ 3 RBW= 100 kHz
Detector = Peak
Sweep time = Auto Couple
Trace mode = max hold
Place two markers, one at the lowest frequency and the other at the highest frequency of the Spectral envelope 20 dB below the maximum value. The 20 dB bandwidth is the difference in frequency between these two markers.

9.1.3 Limits:

For reporting purpose only.

9.1.4 Test Results:

Frequency (MHz)	Test Mode	20 dB Occupied Bandwidth (kHz)
13.56	ASK	.96870

9.1.5 Test Data:

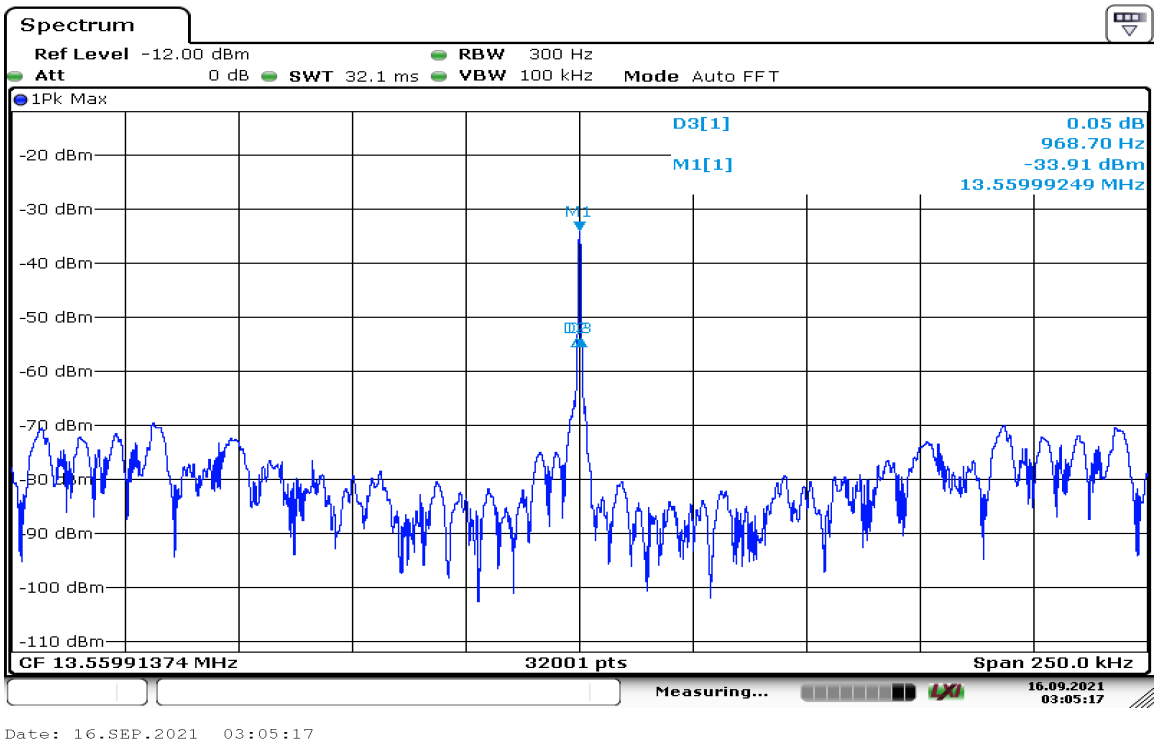

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Figure 9-1 20 dB Occupied Bandwidth

9.2 99% Occupied Bandwidth

9.2.1 Test Requirement:

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.

9.2.2 Test Method:

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

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= 30 kHz
VBW ≥ 3 RBW= 100 kHz
Detector = Peak
Sweep time = Auto Couple
Trace mode = max hold
Use the 99% power bandwidth function of the instrument.

9.2.3 Limits:

For reporting purpose only.

9.2.4 Test Results:

Frequency (MHz)	Test Mode	99% Bandwidth (kHz)
13.56	ASK	588.9815943

9.2.5 Test Data:

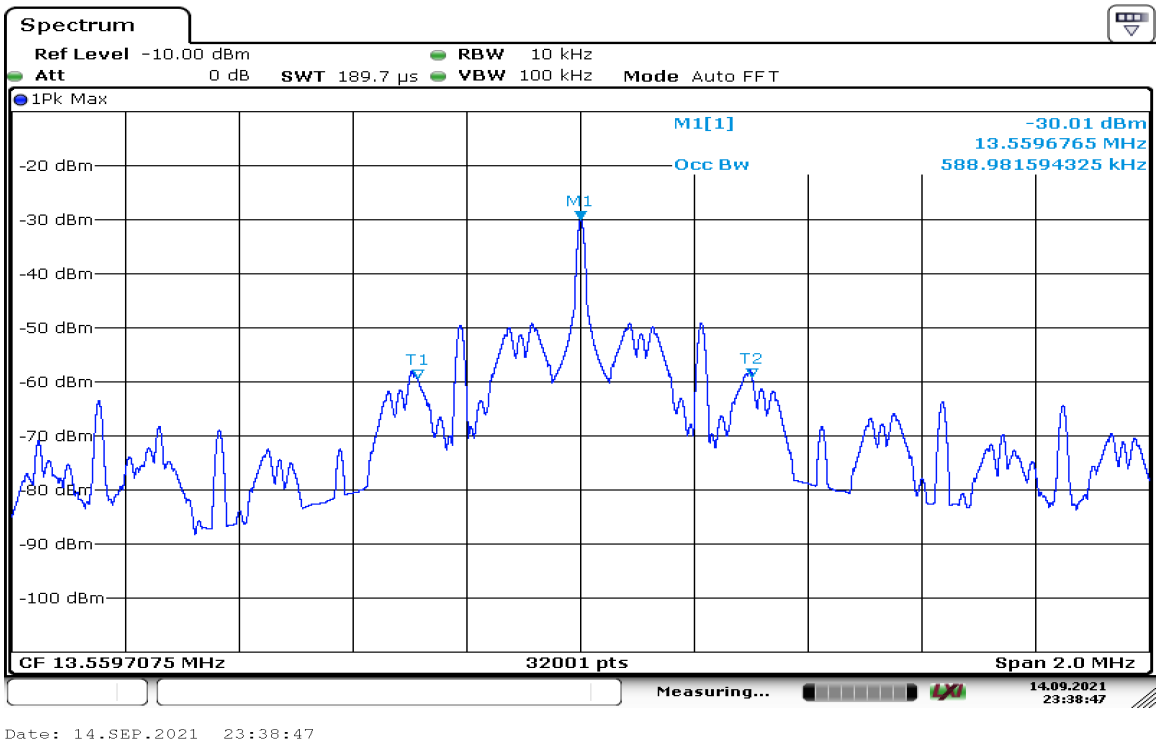

Figure 9-2 99% Bandwidth

9.3 Frequency Stability

9.3.1 Test Requirement:

FCC CFR 47 Rule Part 15.225 (e)

9.3.2 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]

9.3.3 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.

9.3.4 Test Results:

Pass.

1.) Results with varying temperature

Power Supply (Vdc)= 3.85 V

Temperature (ºc)	Startup (MHz)	Startup Frequency Shift (Hz)	Startup Delta (ppm)	Frequency Shift (Hz) at 2 mins	2 mins (MHz)	2 mins Delta (ppm)
50.00	13.5599682	-18.13	1.337	-18.13	13.5599682	1.33705149
40.00	13.5599776	-8.75	0.645	-18.13	13.5599682	1.33702200
30.00	13.5600001	13.75	-1.014	10.00	13.5599963	0.73746387
20.00	13.5599863	53.74	0.000	43.75	13.5600301	3.22640443
10.00	13.5600620	75.62	-5.577	56.87	13.5600432	4.19395702
0.00	13.5600738	87.49	-6.452	79.99	13.5600663	5.89897349
-10.00	13.5600732	86.87	-6.406	91.24	13.5600776	6.72862034
-20.00	13.5600601	73.74	-5.438	86.87	13.5600732	6.40634863

Frequency Shift (Hz) at 5 mins	5 mins (MHz)	5 mins Delta (ppm)	Frequency Shift (Hz) at 10mins	10 mins (MHz)	10 mins Delta (ppm)	Limit (ppm)	Result
15.00	13.5600013	-1.10619580	11.88	13.5599982	-0.8761	±100	Pass
-18.75	13.5599676	1.38274475	-18.75	13.5599676	1.3827448	±100	Pass
10.62	13.5599970	-0.78318663	-3.13	13.5599832	0.2308262	±100	Pass
40.00	13.5600263	-2.94985548	38.12	13.5600245	2.8112123	±100	Pass
48.12	13.5600345	-3.54867614	42.75	13.5600291	3.1526580	±100	Pass
75.62	13.5600620	-5.57670178	83.74	13.5600701	6.1755224	±100	Pass
85.62	13.5600720	-6.31416565	85.62	13.5600720	6.3141657	±100	Pass
84.73	13.5600711	-6.24853136	83.74	13.5600701	6.1755224	±100	Pass

2.) Results with varying Supply voltage

Ambient temperature: 20 °c

Power Supply (VDC)	Startup (Temp.)	Frequency Shift (Hz)	Delta (ppm)	Frequency Shift (Hz) at 2mins	2 mins (MHz)	Delta (ppm)
3.675	20.00	-1.20	-0.449	1.20	13.5599875	-0.08849566
4.235	20.00	-12.50	-0.269	12.50	13.5599738	0.92182984

Frequency Shift (Hz) at 5mins	5 mins (MHz)	Delta (ppm)	Frequency Shift (Hz) at 10mins	10 mins (MHz)	Delta (ppm)	Limit (ppm)	Res ult
-1.20	13.5599851	0.08849566	-11.20	13.5599752	0.82595953	±100	Pass
-12.50	13.5599738	0.92182984	-12.50	13.5599738	0.92182984	±100	Pass

9.4 Radiated Spurious and Carrier Mask

9.4.1 Test Requirement:

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

9.4.2 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. Emissions observed in the restricted bands listed in 15.205 and RSS-Gen were tested for compliance per limits in 15.209. 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 for this test, 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.

Parallel, perpendicular, and ground parallel loop orientations were investigated. 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/m – 25 dB = 58dBuV/m

9.4.3 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

9.4.4 Test Result:

Pass.

9.4.5 Test Data:

9.4.5.1 Carrier Mask Emission

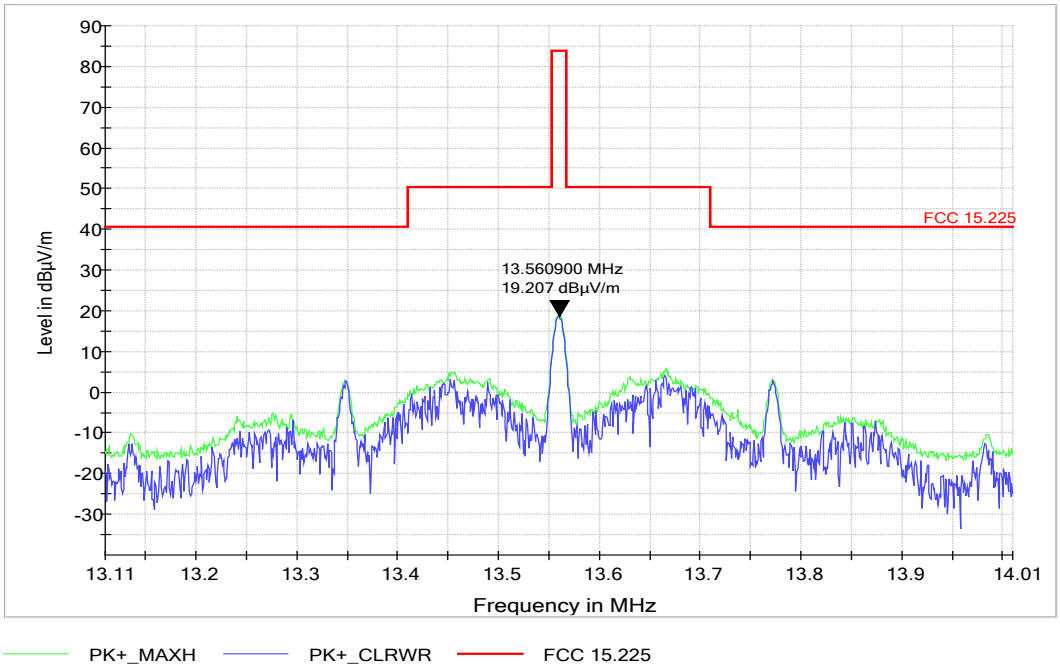

Figure 9-3 Carrier Mask with ASK Load (13.56 MHz)-Antenna Parallel Orientation

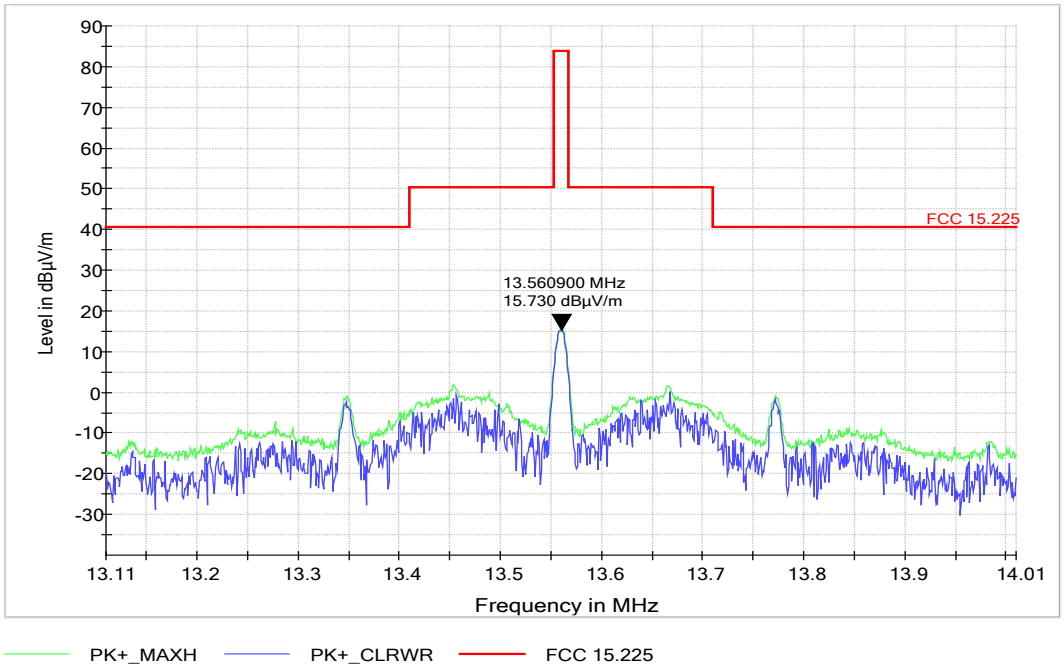

Figure 9-4 Carrier Mask with ASK Load (13.56 MHz)-Antenna Perpendicular Orientation

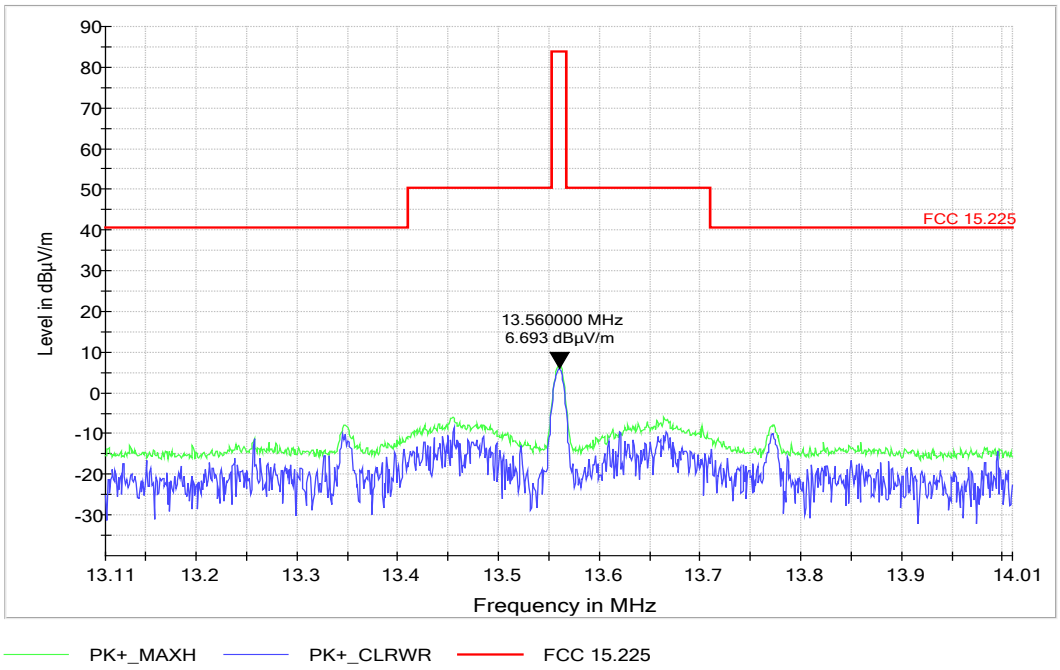

Figure 9-5 Carrier Mask with ASK Load (13.56 MHz)-Antenna Ground Parallel Orientation

9.4.5.2 Emissions in 9 kHz – 30 MHz

EUT in all modes and antenna in all orientation were tested and worst-case results are reported below:

i) Antenna in parallel orientation and EUT is with load:

RSE 9 kHz – 30 MHz-Parallel Orientation						
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	0.07	0.54	-11.80	-11.26	30.59	-41.85
13.56	0.50	-4.20	12.20	8.00	33.59	-25.59
13.56	1.72	-11.50	2.00	-9.50	29.50	-39.00
13.56	13.56*	23.90	-5.00	18.90	29.50	-10.60
13.56	20.26	-6.28	-5.40	-11.68	29.50	-41.18
13.56	26.50	-8.85	-5.40	-14.25	29.50	-43.75

*Fundamental emission

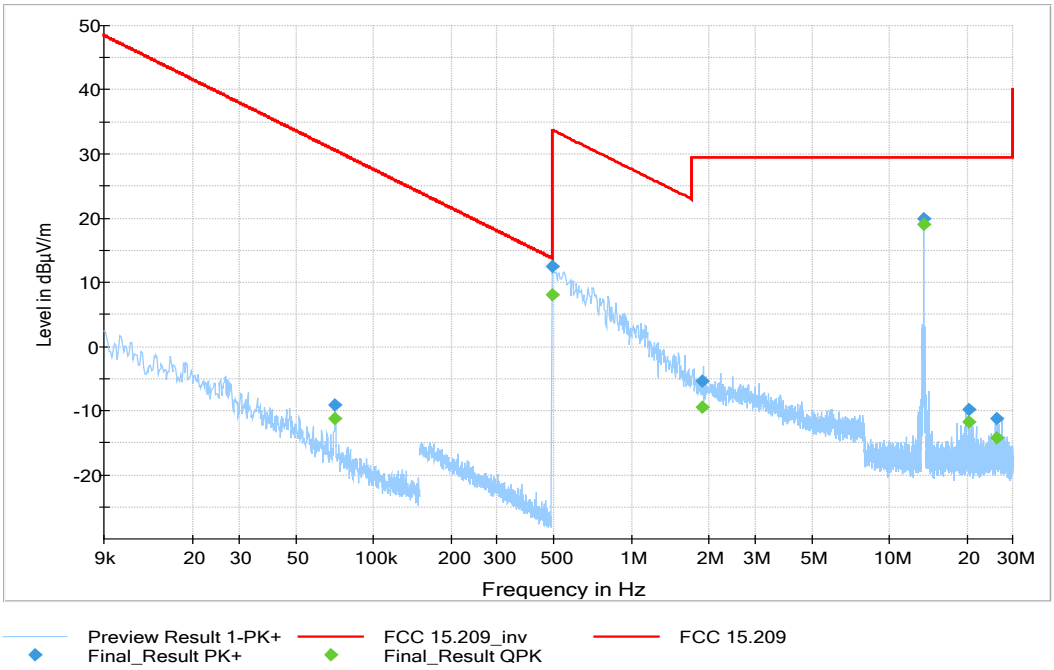

Figure 9-6 Radiated Spurious Emissions 9 kHz – 30 MHz – – ASK Modulation

ii) Antenna in perpendicular orientation and EUT is with load:

RSE 9 kHz – 30 MHz-Perpendicular						
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	0.07	0.71	-11.8	-11.09	30.59	-41.68
13.56	0.50	-4.19	12.1	7.91	33.59	-25.68
13.56	2.96	-11.13	-1.3	-12.43	29.50	-41.93
13.56	13.56*	19.77	-5.0	14.77	29.50	-14.73
13.56	18.24	-8.7	-5.1	-13.80	29.50	-43.30
13.56	27.11	-5.8	-5.6	-11.39	29.50	-40.89

*Fundamental emission

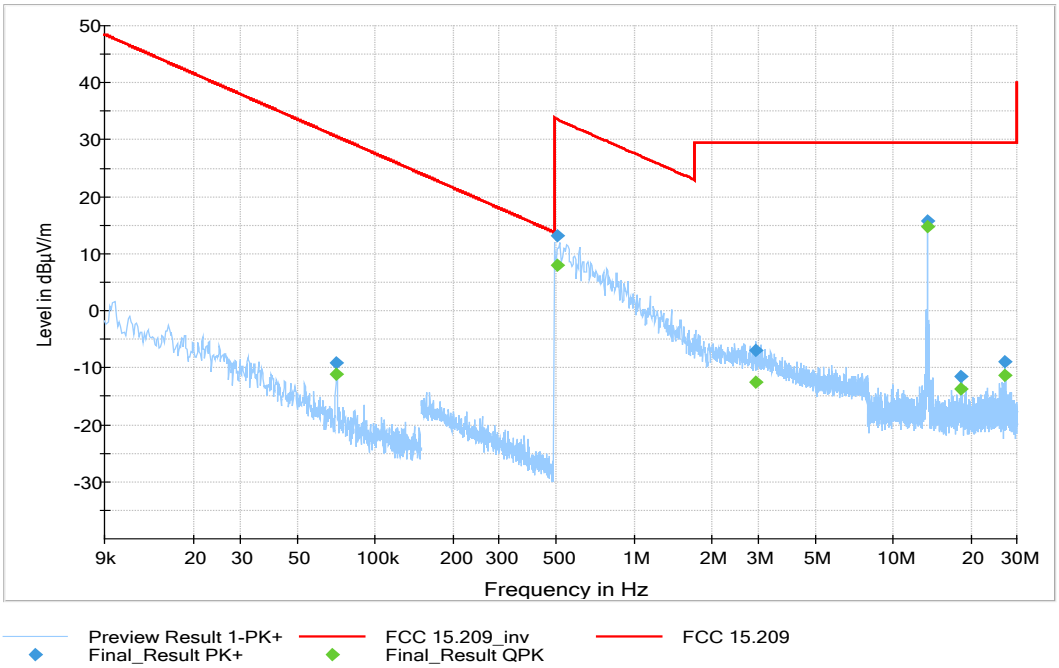

Figure 9-7 Radiated Spurious Emissions 9 kHz – 30 MHz- Perpendicular Orientation

iii) Antenna in ground parallel orientation and EUT is with load:

RSE 9 kHz – 30 MHz –Ground Parallel						
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	0.070	0.57	-11.8	-11.23	30.59	-41.82
13.56	0.49	-3.89	12.1	8.21	33.19	-24.98
13.56	1.20	-1.13	2.8	1.67	26.06	-24.39
13.56	13.56*	9.03	-5.0	4.03	29.50	-25.47
13.56	18.24	8.39	-5.1	-3.29	29.50	-32.79
13.56	26.61	19.72	-5.5	-14.22	29.50	-43.72

*Fundamental emission

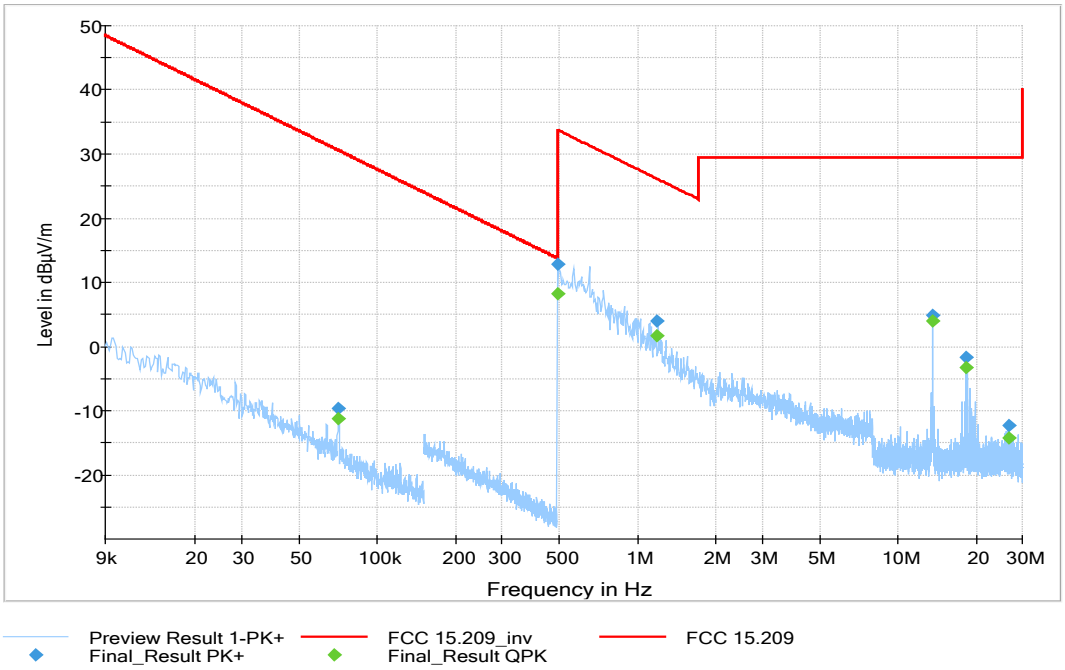

Figure 9-8 Radiated Spurious Emissions 9 kHz – 30 MHz-Ground Parallel Orientation

9.4.5.3 Emissions in 30 MHz- 1 GHz range

All modes were tested, and worst-case results are reported.

i) EUT in X orientation and with Load

RSE 30-1000 MHz -X orientation						
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	54.24	22.77	14.0	36.77	40.00	-3.23
13.56	67.78	9.86	14.6	24.46	40.00	-15.54
13.56	81.35	18.11	14.1	32.21	40.00	-7.79
13.56	108.47	6.73	19.1	25.83	43.52	-17.69
13.56	135.84	4.18	20.1	24.28	43.52	-19.24
13.56	162.72	6.43	19.5	25.93	43.52	-17.59
13.56	189.84	8.08	18.3	26.38	43.52	-17.14
13.56	216.96	6.96	17.9	24.86	46.02	-21.16
13.56	244.07	8.04	19.0	27.04	46.02	-18.98
13.56	271.20	6.71	20.8	27.51	46.02	-18.51
13.56	298.34	4.40	21.1	25.50	46.02	-20.52
13.56	942.64	-0.72	31.3	30.58	46.02	-15.44

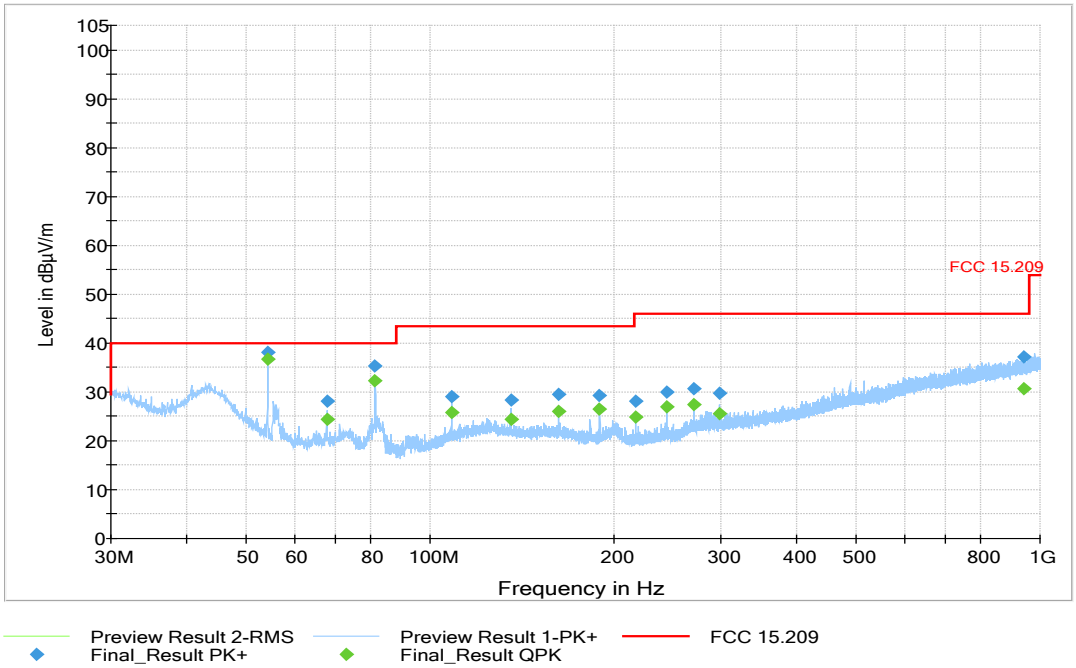

Figure 9-9 Radiated Spurious Emissions 30MHz – 1 GHz– X orientation

ii) EUT in Y orientation with Load:

RSE 30-1000 MHz -Y orientation						
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	40.67	8.48	20.4	28.88	40.00	-11.12
13.56	54.24	23.25	14.0	37.25	40.00	-2.75
13.56	67.78	9.80	14.6	24.40	40.00	-15.6
13.56	81.35	18.81	14.1	32.91	40.00	-7.06
13.56	108.47	7.17	19.1	26.27	43.52	-17.25
13.56	135.84	6.96	20.1	27.06	43.52	-16.46
13.56	162.72	10.20	19.5	29.70	43.52	-13.82
13.56	189.84	9.52	18.3	27.82	43.52	-15.70
13.56	216.96	6.47	17.9	24.37	46.02	-21.65
13.56	244.07	6.09	19.0	25.09	46.02	-20.93
13.56	271.20	3.27	20.8	24.07	46.02	-21.95
13.56	942.64	-0.95	31.3	30.25	46.02	-15.77

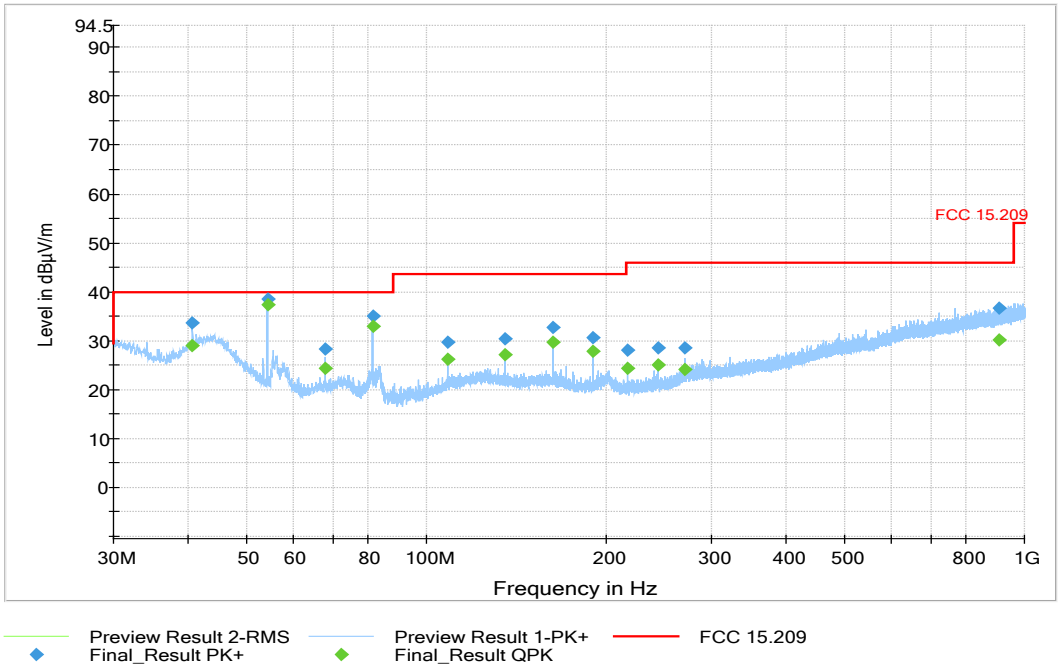

Figure 9-10 Radiated Spurious Emissions 30MHz – 1 GHz– Y orientation

iii) EUT in Z – orientation and with Load:

RSE 30-1000 MHz -Z orientation						
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	40.67	7.43	20.4	27.83	40.00	-12.17
13.56	54.24	23.12	14.0	37.12	40.00	-2.88
13.56	67.78	8.16	14.6	22.76	40.00	-17.24
13.56	81.35	18.27	14.1	32.37	40.00	-7.63
13.56	108.47	6.25	19.1	25.35	43.52	-18.17
13.56	135.84	2.15	20.1	22.25	43.52	-21.27
13.56	162.72	7.28	19.5	26.78	43.52	-16.74
13.56	189.84	9.80	18.3	28.10	43.52	-15.42
13.56	216.96	4.40	17.9	22.30	46.02	-23.72
13.56	244.07	6.11	19.0	25.11	46.02	-20.91
13.56	271.20	4.68	20.8	25.48	46.02	-20.54
13.56	515.28	2.77	26.00	28.77	46.02	-17.25
13.56	942.64	-0.81	31.3	30.69	46.02	-15.33

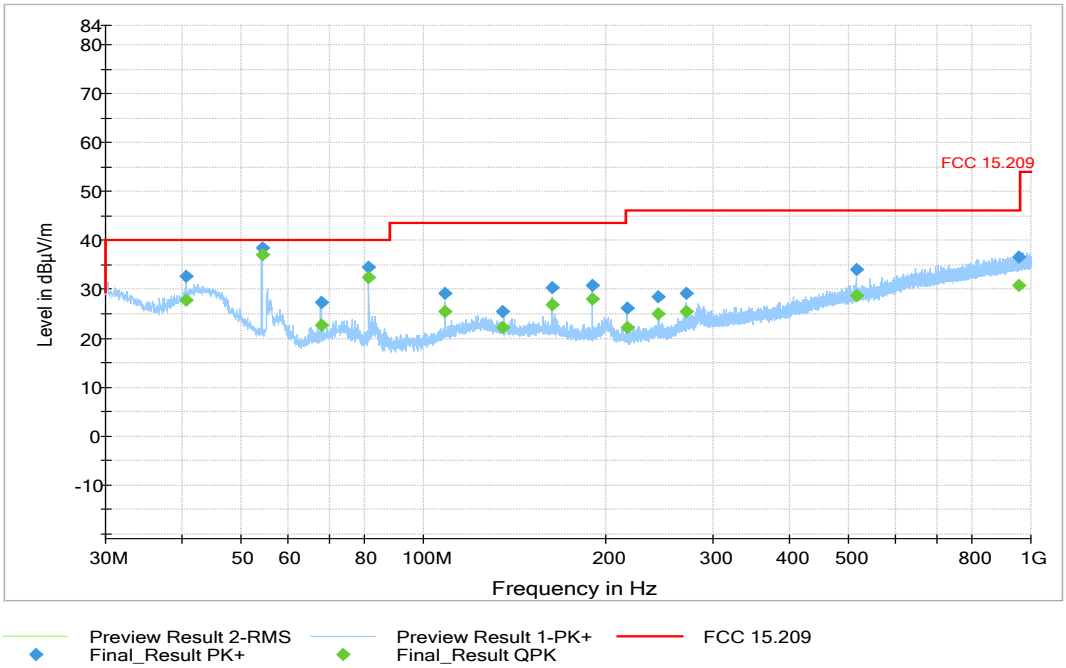

Figure 9-11 Radiated Spurious Emissions 30MHz – 1 GHz- Z orientation

9.5 AC Line Conducted Emissions

9.5.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

ISED RSS Gen [8.8]

9.5.2 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.

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

9.5.3 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

9.5.4 Test Result:

Pass

9.5.5 Test Data:

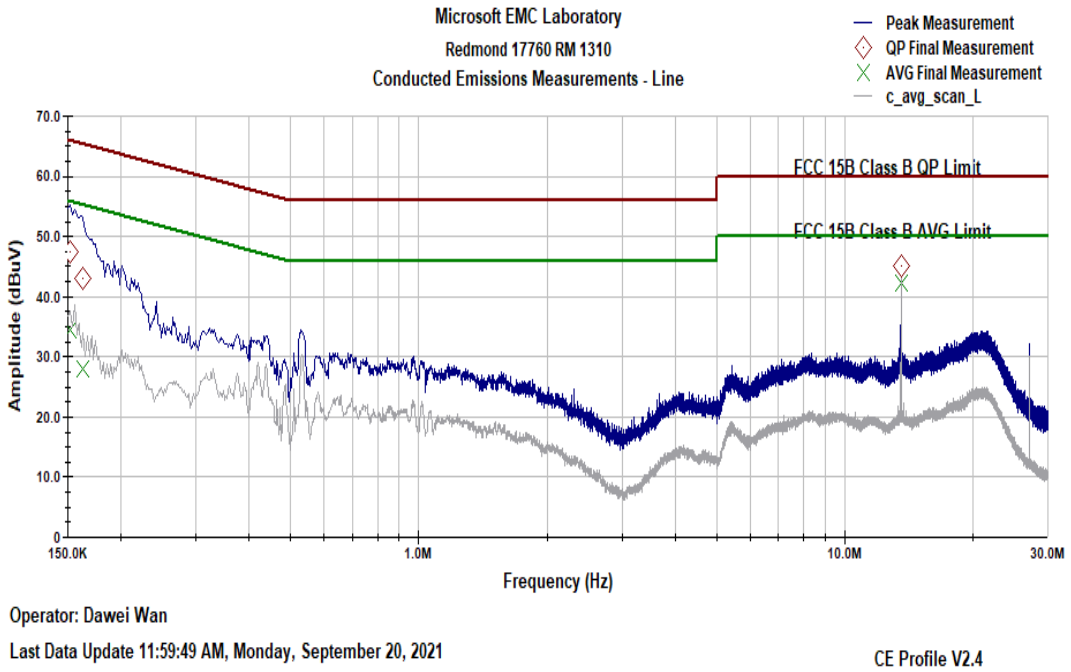

Figure 9-12 AC Line Conducted Emissions - Line (150 kHz - 30 MHz)

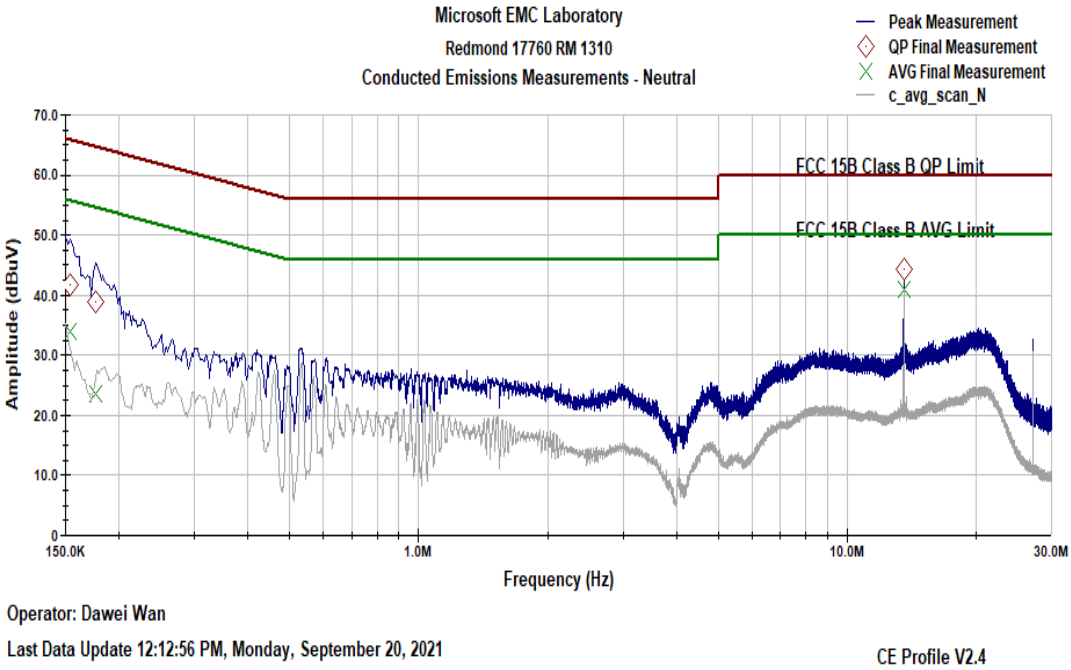

Figure 9-13 AC Line Conducted Emissions - Neutral (150 kHz - 30 MHz)

AC Conducted Line Emissions Data – ASK with Load							
Frequency (MHz)	**QP Amplitude (dBµV)**	**AVG Amplitude (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Average Limit (dBµV)**	**Line Tested (L or N)**	**Quasi-Peak Margin (dB)**	**Average Margin (dB)**
13.56	45.07	42.18	60.00	50.00	L	-14.93	-7.82
13.56	44.36	41.01	60.00	50.00	N	-15.64	-8.96
0.152	47.35	34.49	65.90	55.90	L	-18.55	-21.41
0.163	43.08	27.92	65.30	55.30	L	-22.22	-27.38
0.154	41.77	33.85	65.80	55.80	N	-24.02	-21.95
0.176	38.82	23.52	64.66	54.66	N	-25.84	-31.15

End of Report