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TESTING
NVLAP LAB CODE: 100275-0

Title 47 Code of Federal Regulations Test Report

Regulation:
FCC Part 2 and 30

Product Evaluated
AWEUC/D Airscale mmWave Radio 5G 24GHz with FA3WA Extension Module 5G 39 GHz

Client
Nokia Solutions and Networks, OY
Report Number:
TR-2022-0090-FCC30

Date
September 2, 2022

Revisions

Date	Revision	Section	Change
9/2/2022	0		Initial Release

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Table of Contents

1. ATTESTATION OF TEST RESULTS

Equipment Under Test (EUT)	FA3WA 24 GHz ASMR mmWave Radio Extension Module with 39 GHz ASMR Base
Serial Number(s)	**Radiated Emission:** AWEUC - AH211500018 FA3WA – YK212500175 **Radio Tests:** AWEUC - AH211500018 FA3WA – YK212500175
FCC ID	2AD8UASMR24FA3UB (AWEUC/D), 2AD8UAFA3WA01 (FW3WA)
Model Name	AWEUC/D Airscale mmWave Radio 5G 24GHz with FA3WA Extension Module 5G 39 GHz
Hardware Version	**Radiated Emission:** AWEUC - AH211500018 FA3WA – YK212500175 **Radio Tests:** AWEUC - AH211500018 FA3WA – YK212500175
GPCL Project Number	2022-0090
Manufacturer	NOKIA SOLUTIONS AND NETWORKS OY KARAKAARI 7, FI-02610 ESPOO FINLAND
Test Requirement	• 47 CFR FCC Part 2 and Part 30 (Part 2.1047, 2.1055)
Test Standard(s)	• 47 CFR FCC Parts 2 and Part 30 • KDB 971168 D01 Power Meas License Digital Systems v03r01 April 9, 2018 • KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013 • KDB 842590 D01 Upper Microwave Flexible Use Service v01r01–April 2020 • Procedures on TRP Compliance for Out of Band and Spurious Emissions C63.26 mmWave JTG - Version # 1 July 14th, 2018
Reference(s)	• ANSI C63.26 (2015) • ANSI C63.4 (2014) • TR 14-1001, MMW Measurements with Harmonic Mixers (April-4-2014)
Test Date	7/25/2022 – 8/19/2022
Test Performed By	Nokia Global Product Compliance Laboratory 600-700 Mountain Avenue P.O. Box 636 Murray Hill, NJ 07974-0636
FCC Registered Test Site Number	Designation Number: **US5302**, Test Firm Registration Number: **395774**
Product Engineer(s)	Jeff Webb
Lead Engineer	W. Steve Majkowski

Test Engineer (s)	Mike Soli
Test Results: The EUT, *as tested* met the above listed Test Requirements. The decision rule employed is binary (Pass/Fail) based on the measured values without accounting for Measurement Uncertainty or any Guard Band. The measured values obtained during testing were compared to a value given in the referenced regulation or normative standard. Report copies and other information not contained in this report are held by either the product engineer or in an identified file at the Global Product Compliance Laboratory in New Providence, NJ.	

2. SUMMARY OF THE TEST RESULTS

47 CFR FCC Sections	Description of Tests	Compliance Results
2.1046, 30.202 (a)	RF Power Output	Not Required
2.1047	Modulation Characteristics	Not Required
2.1049, 30.203	(a) Occupied Bandwidth (b) Edge-of-Band Emissions	Pass
2.1051, 30.203	Spurious Emissions at Antenna Terminals - Radiated	Pass
2.1053, 30.203	Field Strength of Spurious Radiation	Pass
2.1055	Measurement of Frequency Stability	Not Required

2.1 Measurement Uncertainty

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Tables below. These are the worst-case values.

Worst-Case Estimated Measurement Uncertainties

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, (*e.g.*, ANSI C63.4, CISPR 11, 14, 22, *etc.*, using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-8 Semi-Anechoic Chamber)	30 MHz – 200MHz H 30 MHz – 200 MHz V 200 MHz – 1000 MHz H 200 MHz – 1000 MHz V 1 GHz- 18 GHz	±5.4 dB ±5.4 dB ±4.7 dB ±4.7 dB ±3.3 dB

Antenna Port Test	Signal Bandwidth	Frequency Range	Expanded Uncertainty (k=2), Amplitude
Occupied Bandwidth, Edge of Band,	10 Hz 100 Hz 10 kHz to 1 MHz 1MHz to 100 MHz	9 kHz to 20 MHz 20 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 40 GHz:	±2.2 dB
Conducted Spurious Emissions	30 kHz to 100 MHz	10 MHz to 40 GHz:	±2.8 dB
RF Power, Channel Power	10 Hz to 100 MHz	10 MHz to 40 GHz	±1.4 dB

3. GENERAL INFORMATION

3.1 Product Descriptions

The equipment under test (EUT) has the following specifications.

Table 3.1.1 Product Specifications

24GHz ASMR AWEUC/D

Specification Items	Description
Radio Access Technology	5G-NR
Modulation Type(s)	QPSK, 16QAM, 64QAM, 256QAM
Operation Frequency Range	Tx/Rx = 24.25-25.25 GHz.
Channel Bandwidth	100, 200, 300, 400, 500, 600, 700 MHz
Number of Tx Ports per Unit	2
Number of Rx Ports Per Unit	2
MIMO	2x2 MIMO (2 duplex Tx/Rx Ports)
Max Conducted Power	52 dBm EIRP per polarization; 55 dBm EIRP Total for the two polarizations.
Deployment Environment	Outdoor
Power Source	-48VDC and 120VAC

39GHz Extension

Specification Items	Description
Radio Access Technology	5G-NR
Modulation Type(s)	QPSK, 16QAM, 64QAM, 256QAM
Operation Frequency Range	Tx/Rx = 37- 40 GHz.
Channel Bandwidth	100, 200, 300, 400, 500, 600, 700, 800 MHz
Number of Tx Ports per Unit	2
Number of Rx Ports Per Unit	2
MIMO	2x2 MIMO (2 duplex Tx/Rx Ports)
Max Conducted Power	52 dBm EIRP per polarization; 55 dBm EIRP Total for the two polarizations.
Deployment Environment	Outdoor
Power Source	-48VDC and 120VAC

3.2 EIRP/ PSD Compliance and Antenna Information.

Both AWEUC/D and FA3WA incorporate integrated antennas which are electronically steerable. Each antenna assembly has two cross-polarized modules where each antenna Tx/Rx module of AWEUC/D has an 8x12 matrix (96 elements) and each antenna Tx/Rx module of FA3WA has an 8x12 matrix (96 elements). The information about Antenna Gain vs frequency is detailed in the original filing package of AWEUC/D under 2AD8UASMR24FA3UB and FA3WA under 2AD8UAFA3WA01, respectively.

3.3 Antenna Far Field Determination Distance

The Far Field Determination Distance Test (1) was performed to determine the far field boundary location using calculations and low power measurements. For the antenna array we can calculate the Fraunhofer distance from

$$d_{ff} \geq 2D^2/\lambda$$

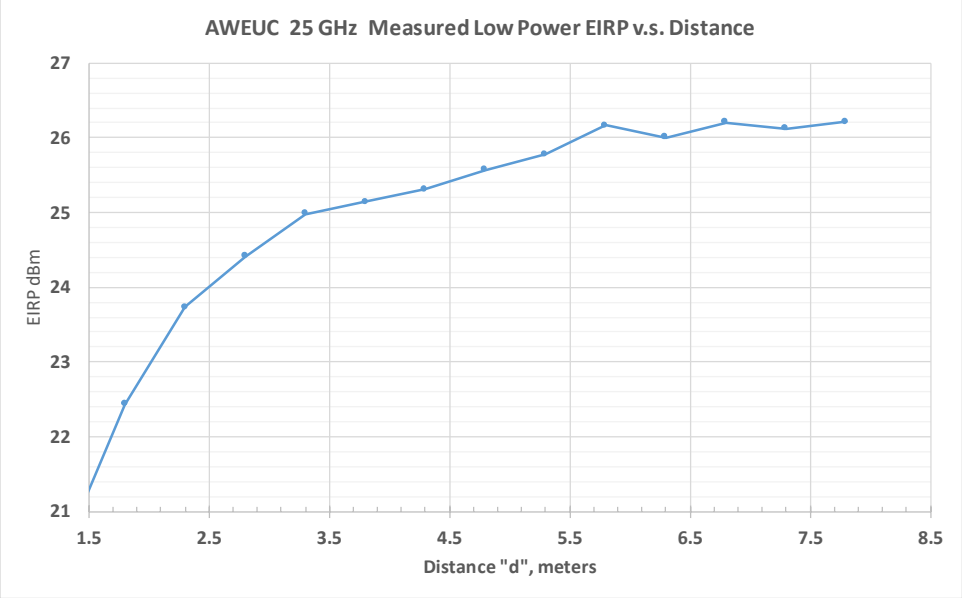
where d_{ff} = Far Field distance in meters,
D is the maximum size of the radiating array λ = wavelength of the operating signal in meters

The individual polarization antenna array height is 135 mm and is 77 mm wide with a 155mm diagional. The diagional for both arrays is 301 mm.
At 40 GHz the individual array dimensions results in a minimum Fraunhofer far field distance, $d_{ff,}$ of 6.4 meters.
At 40 GHz the overall array dimensions results in a minimum Fraunhofer far field distance, $d_{ff,}$ of 24 meters.

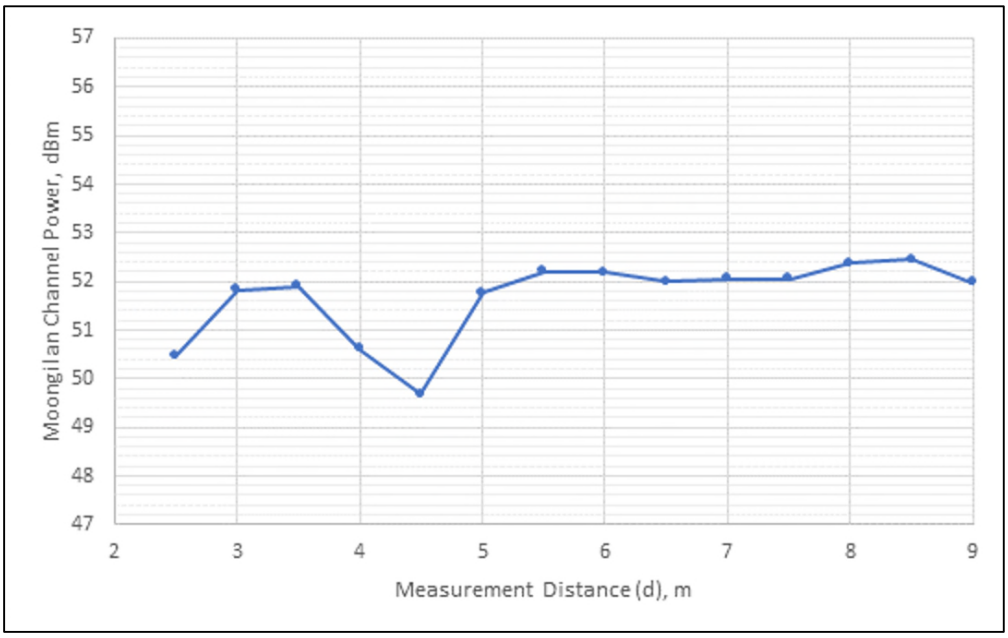
While the Fraunhofer far field distance is the minimum distance where the far field can occur, it does not predict the actual distance where the far field occurs. The Moongilan Test determines the actual distance where the far field occurs for the specific configuration under test.

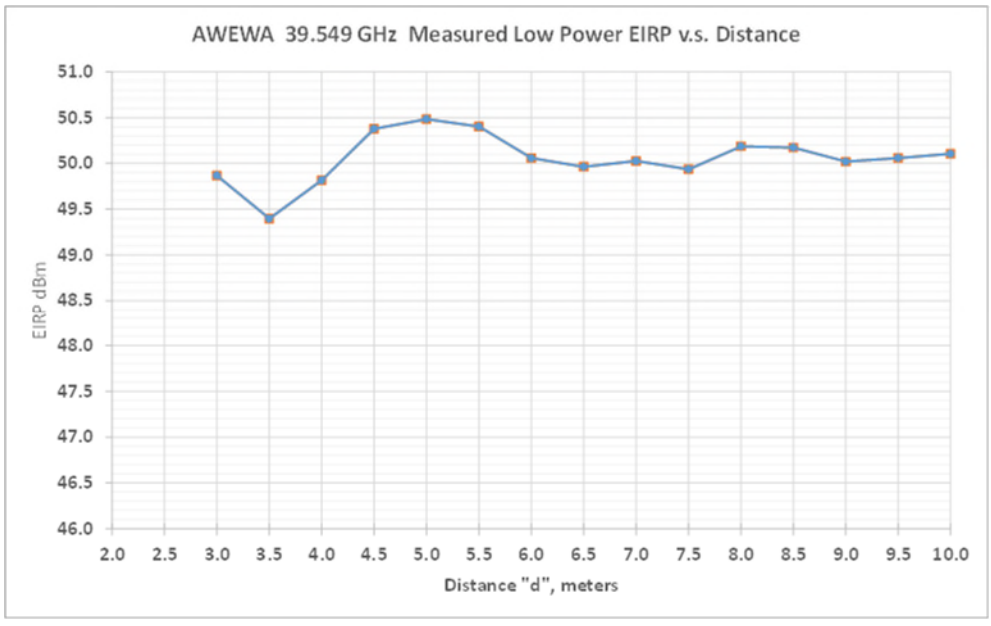
Measurements for the Far Field Determination Distance Test were performed at low power using a standard gain horn antenna In the horizontal polarization the determined boundary was 6.0 m.

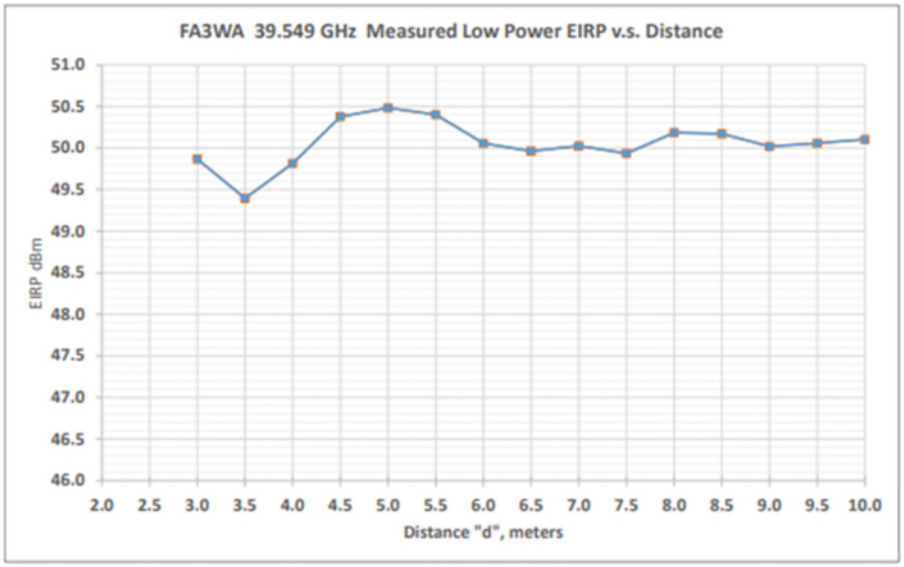
To eliminate any inconsistancy all Power, OBW and OOBE measurements were made at 6.5 m.



FA3UB 24 GHz Channel Power vs. Distance






FA3WA 39.549 GHz Measured Low Power EIRP v.s. Distance
EIRP dBm
51.0
50.5
50.0
49.5
49.0
48.5
48.0
47.5
47.0
46.5
46.0
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
Distance "d", meters

4. REQUIRED MEASUREMENTS AND RESULTS

Both AWEUC/D Main Unit and FA3WA extension Unit have been FCC certified individually. This test is to evaluate the configuration that AWEUC/D is paired with FA3WA for concurrent operation, where these two transmitters operate at maximum power within their approved bands. Therefore, only out-of-band emissions and spurious emissions need to be evaluated. Other tests, such as RF power output and occupied bandwidth, are for verification purpose.

Per 47CFR FCC Section 2.1033(c)(14), the following certification tests are required by Section 2.1046 through Section 2.1057. These tests are identified in Table 4.0a below.

Table 4.0a Required Certification Measurements

47 CFR FCC Sections	Description of Tests	Test Required for Class II Authorization
2.1046, 30.202 (a)	**RF Power Output** **(a) Power Limits, EIRP, PSD**	**No**
2.1047	**Modulation Characteristics**	**No**
2.1049, 30.203	**(a) Occupied Bandwidth** **(b) Out-of-Band Emissions**	**Yes[1]**
2.1051, 30.203	**Spurious Emissions at Antenna Terminals**	**Yes**
2.1053, 30.203, 30.204, 15.109(a) Class B	**Field Strength of Spurious Radiation**	**Yes**
2.1055	**Measurement of Frequency Stability**	**No**

[1]OBW is not required

The measurements were conducted in accordance with the procedures set out in Section 2.1041 and as appropriate per the test Standards listed in Table 4.0b below. The comprehensive list of tests performed included measurements at Left, Center and Right side of the Part 30 Band. These tests are presented to demonstrate compliance with FCC requirements.

The procedures defined in ANSI C63.26-2015 and KDB 971168 D01 were developed for conducted measurements. The mmWave Joint Technical Group with FCC oversight has been working diligently on revisions to add mmWave measurements for Upper Microwave Flexible Use Service (UMFUS). The new KDB, 842590, is closely aligned with those efforts.

All of the measurements performed herein were performed as radiated measurements. In order to perform these measurements, the equipment settings required to enable the FSW internal noise reduction capability were used. This typically required the use of average detector, and multiple sweep averages. The individual test sections identify any changes in measurement process.

Table 4.0b Test Standards Used for Radiated Measurements of Radio Performance

Test Standard(s)	• 47 CFR FCC Parts 2 and Part 30 • KDB 971168 D01 Power Meas License Digital Systems v03r01 April 9, 2018 • KDB 662911 D01 Multiple Transmitter Output v02r01 Oct 2013 • KDB 842590 D01 Upper Microwave Flexible Use Service v01r01–April 2020

	• Procedures on TRP Compliance for Out of Band and Spurious Emissions C63.26 mmWave JTG - Version # 1 July 14th 2018
Reference(s)	• 47 CFR FCC Part 2 and Part 30 • ANSI C63.26 (2015) • ANSI C63.4 (2014) • TR 14-1001, MMW Measurements with Harmonic Mixers (April-4-2014)

4.1 Section 2.1046 MEASUREMENT REQUIRED: RF POWER OUTPUT

The product incorporates internal antennas that are part of the signal source. There is no antenna terminal connection on the product. Therefore, this test as implemented is not a measurement of the total conducted power at the antenna terminal but rather the total radiated power in terms of the maximum EIRP radiated by the product.

The FCC recognized that these products would use integrated antennas and likewise structured the requirements under Part 30. Under Part 30 the average power of the sum of all antenna elements is limited to an equivalent isotopically radiated power (EIRP) density of +75dBm/100 MHz.

The Nokia AirScale 24 GHz Radio Unit (AWEUC-D) and 39 GHz Extension Unit (FA3WA) is a 5G-NR Remote radio head is configured for one to eight carrier operation. It is specified to provide a maximum power output of 52 dBm /158.5 W EIRP per transmit polarization for a sum total of 55 dBm /317W EIRP per unit. The product is designed for the 5G global market including operation per 47 CFR Part 30 rules for use in the USA authorized portions of 5G New Radio Band, n258 in 24.25-25.75 and n260 in 37 – 40 GHz.

4.1.1 RF Power Output Measurement

The product was allowed to warm up and stabilize per KDB 971168 D01 and ANSI C63.26.

Radiated Power measurements of the 5G New Radio transmit signal were conducted with an FSW Spectrum Analyzer per KDB 971168 D01 and KDB 842590 D01. Measurements were performed at a 6.5 m distance for 39 GHz and 6.0 m for 24 GHz using a constant offset. An additional FSW transducer correction factor is used to ascertain the actual measured EIRP power. The calculation of path loss, cable loss and measurement antenna gain are listed in Table 4.1.1. below. The unit was configured to transmit at its maximum power.

The Channel Power function of the FSW spectrum analyzer was used to measure the maximum average Horizontal and Vertical EIRP. The measurements were performed for one through eight carriers at the left, center and right side of the 37 -40 GHz Band. For all measurements a nominal 100 MHz bandwidth carrier with 5G-NR modulations was used. Channel power plots identify the individual carrier power, modulation and the total power.

Table 4.1.1 Corrections For Transmitter Power Measurements

Frequency	Free Space Path Loss, "PL"	Measurement Antenna Gain, "G1"	Measurement Cable Loss, "L1"	Total Offset Required PL -G1 + L1	FSW Measurement Offset	Required Final Correction
GHz	dB	dBi	dB	dB	dB	dB
35.00	79.58	23.96	12.84	68.46	68	0.460
35.50	79.70	23.52	13.03	69.21	68	1.214
36.00	79.83	24.27	13.20	68.75	68	0.754
36.50	79.95	23.28	13.35	70.01	68	2.015
37.00	80.06	24.42	13.39	69.04	68	1.040
37.50	80.18	23.27	13.39	70.29	68	2.293
38.00	80.30	24.29	13.45	69.45	68	1.455
38.50	80.41	23.18	13.54	70.76	68	2.762
39.00	80.52	23.65	13.73	70.60	68	2.604
39.50	80.63	23.03	13.76	71.36	68	3.358
40.00	80.74	23.00	13.79	71.53	68	3.530
40.50	80.85	23.35	13.84	71.34	68	3.343
41.00	80.96	23.22	13.98	71.72	68	3.717
41.50	81.06	23.28	14.14	71.93	68	3.927
42.00	81.17	23.39	14.23	72.01	68	4.014
42.50	81.27	23.81	14.36	71.81	68	3.815
43.00	81.37	23.55	15.30	73.11	68	5.114
43.50	81.47	23.60	16.14	74.01	68	6.008

Table 4.1.1b Corrections For Transmitter Power Measurements

Frequency	Free Space Path Loss, "PL"	Measurement Antenna Gain, "G1"	Measurement Cable Loss, "L1"	Total Offset Required PL -G1 + L1	FSW Measurement Offset	Required Final Correction
GHz	dB	dBi	dB	dB	dB	dB
22.00	74.85	23.46	11.02	62.41	62	0.407
22.50	75.05	23.49	11.17	62.73	62	0.730
23.00	75.24	23.69	11.43	62.98	62	0.981
23.50	75.43	23.80	11.51	63.13	62	1.134
24.00	75.61	23.80	11.41	63.23	62	1.227
24.23	75.69	23.92	11.50	63.27	62	1.270
24.23	75.69	23.92	11.50	63.27	62	1.270
24.50	75.79	24.06	11.60	63.33	62	1.328
25.00	75.96	24.14	11.72	63.55	62	1.549
25.30	76.07	24.10	11.76	63.73	62	1.731
25.30	76.07	24.10	11.76	63.73	62	1.731
25.50	76.14	24.07	11.79	63.86	62	1.859
26.00	76.30	24.28	11.95	63.97	62	1.972
26.50	76.47	24.38	12.16	64.25	62	2.252
27.00	76.63	24.39	12.26	64.50	62	2.504
27.50	76.79	24.39	12.29	64.69	62	2.694
28.00	76.95	24.57	12.40	64.78	62	2.778
28.50	77.10	24.63	12.57	65.05	62	3.045
29.00	77.25	24.53	12.61	65.33	62	3.332
29.50	77.40	24.60	12.82	65.62	62	3.616
30.00	77.55	24.71	12.90	65.73	62	3.733
30.50	77.69	24.63	13.04	66.10	62	4.099
31.00	77.83	24.71	13.13	66.25	62	4.248
31.50	77.97	24.74	13.17	66.40	62	4.399

32.00	78.11	24.75	13.31	66.67	62	4.674
32.50	78.24	24.85	13.37	66.76	62	4.761
33.00	78.38	24.83	13.50	67.05	62	5.047

4.1.1.1 RF Power Output Results

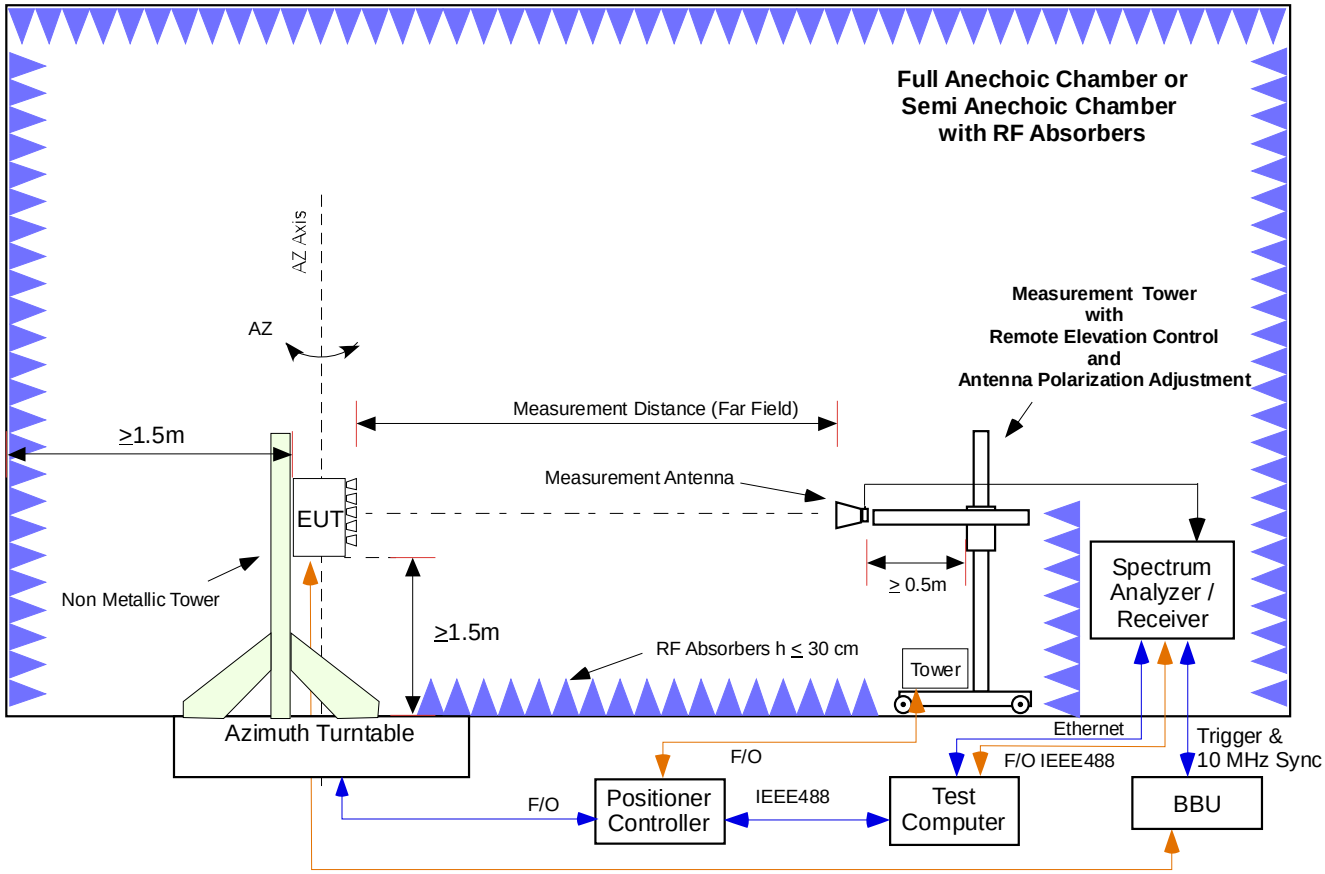
Power output measurements verified the expected performance of 52 dBm EIRP per polarization for a Total Power of 55 dBm. The maximum measured level was 52.73 dBm for a single polarization and 55.09 dBm total. This level is well within the maximum Part 30.202a limit of 75 dBm EIRP. Measurements were performed for each modulation.

The data presented here are for verification purpose. The measured performance was in full compliance with the Rules of the Commission. The data plots are detailed below.

Table 4.1.1.1 – Channel Power Measurements (adjacent)

Channel Center Frequencies, GHz	# of carriers	Modulation	Horizontal Polarization Total Channel Power, EIRP	Vertical Polarization Total Channel Power, EIRP	Sum Total Channel Power EIRP
			dBm	dBm	dBm
24.7992 24.89904 24.99888 25.09872	4	QPSK	50.31	52.67	54.66
37.05 37.14984 37.24968 37.34952	4	QPSK	52.73	51.31	55.09

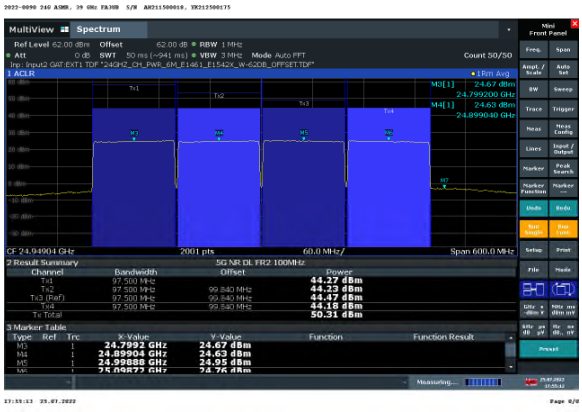
Figure 4.1.1 Test Set-Up for Measurement of Radio Transmitter Performance



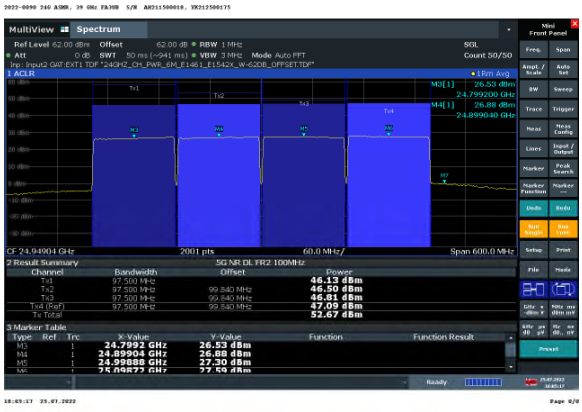
4.1.1.1.1 Channel Power Measurement Plots

Channel Power Measurements, 24GHz, 4 Carrier – QPSK

Horizontal

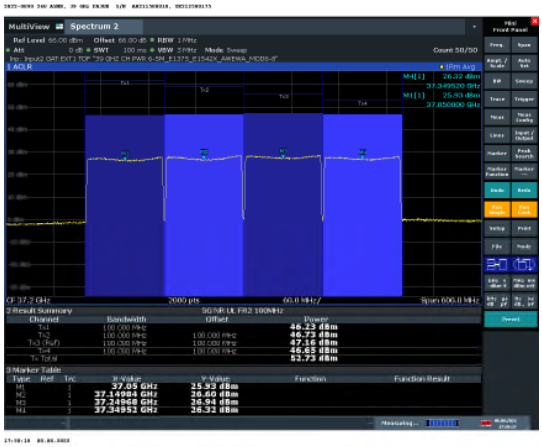


Vertical

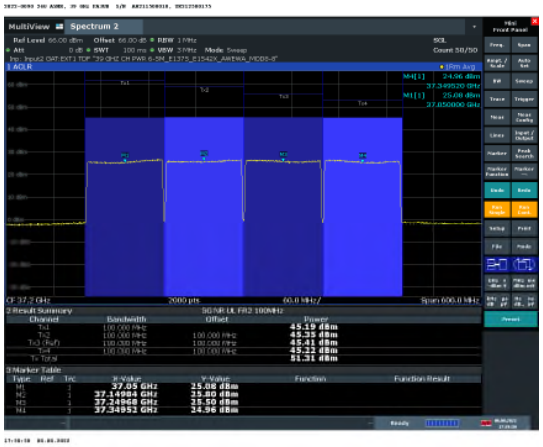


Channel Power Measurements, 39GHz, 4 Carrier – QPSK

Horizontal



Vertical



4.2 Section 2.1049 MEASUREMENT REQUIRED: OCCUPIED BANDWIDTH and EDGE of BAND EMISSIONS

This test measures the Occupied Bandwidth of the transmitting carrier and the Edge of-Block Emissions in the frequency spectrum immediately outside and adjacent to the transmitting carrier(s).

The occupied bandwidth (OBW) is usually defined either as the 99% power OBW or a relative OBW. The 99% OBW is the signal bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated or conducted are each equal to 0.5 percent of the total mean power radiated or conducted by a given emission. The relative OBW is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

Per KDB 971168 D01 v02, the relative OBW must be measured and reported when it is specified in the applicable rule part; otherwise, the 99% OBW shall be measured and reported. The OBW shall be measured when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment is operated.

4.2.1 Results Occupied Bandwidth (Signal Bandwidth)

The measurements of 99% occupied bandwidth were performed with a Rohde & Schwartz FSW85 GHz spectrum analyzer just for verification purpose.

Tabular Data – Occupied Bandwidth **1MHz** RBW

Carrier Frequencies (GHz)	Number of Carriers	Modulation	Horizontal Polarization Occupied Signal Bandwidth (MHz)	Vertical Polarization Occupied Signal Bandwidth (MHz)
24.7992 24.89904 24.99888 25.09872	4	QPSK	390.9455	390.7291
37.05 37.14984 37.24968 37.34952	4	QPSK	391.2025	391.0131

4.2.1.1 Results - Occupied Bandwidth Carrier Aggregation

The April 12, 2016 TCBC viewgraph package identified that Carrier Aggregation data should be supplied during filing. This requirement is not yet formalized in a KDB for LTE, 5G-NR or UMFUS but we used the same rules as used for Part 15. The multi-carrier bandwidth of the AWEUC/D is thus defined as follows. We have a two carrier configuration in the lower band and one to five carrier configurations in the USA upper n258 band. In both cases the individual carriers, with a bandwidth of 97.5 MHz maximum, are spaced on center 99.96 MHz apart and they do not overlap.

For AWEUC/D, the N258 24 GHz Band can be assigned a total of 7 carriers over the 24.25-24.45 and 24.75-25.25 GHz frequency range. The AWEUC/D can be operated anywhere within this 0.7 GHz wide band.

For FW3WA, the N260 39 GHz Band can be assigned a total of 30 side by side carriers over the 37-40 GHz frequency range. The FW3WA can be operated anywhere within this 3 GHz wide band.

The AWEUC/D product can support up to seven carriers. The FW3WA can support up to eight carriers. Additionally, we have evaluated carrier spacing configuration of 99.96 MHz and 99.84 MHz respectively. There was no difference identified for Power, radiated spurious or OOBE measurements with either spacing.

The maximum calculated assessment for two through eight carriers using 99.96 and 99.84 channel spacings are identified below.

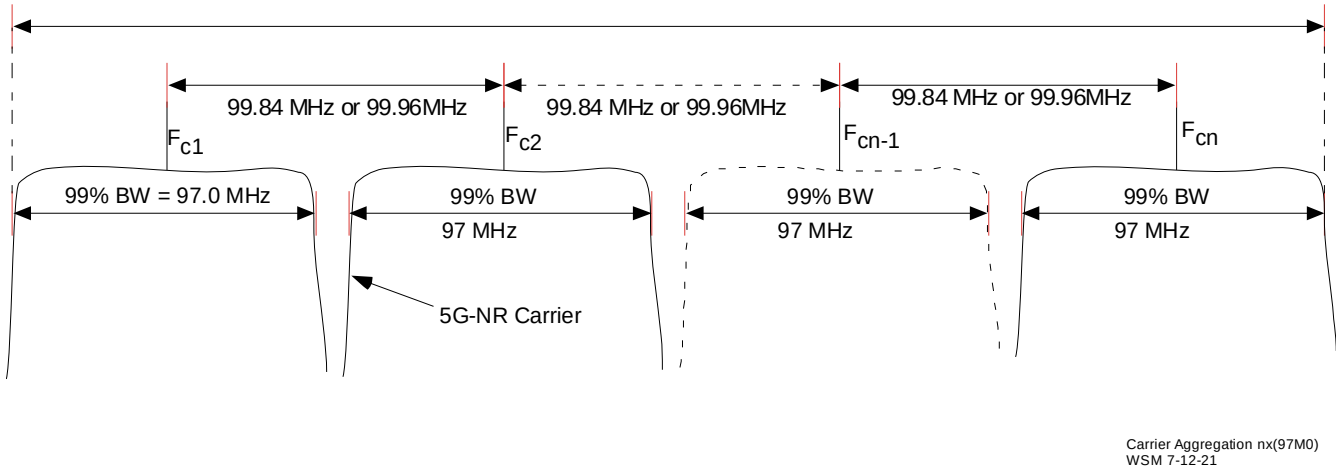
Two Carrier Aggregation Bandwidth = 1(99.96) + 97 MHz = 196.96 MHz = 197MG7W
Three Carrier Aggregation Bandwidth = 2(99.96) + 97 MHz = 296.92 MHz = 297MG7W
Four Carrier Aggregation Bandwidth = 3(99.96) + 97 MHz = 396.88 MHz = 397MG7W
Five Carrier Aggregation Bandwidth = 4(99.96) + 97 MHz = 496.84 MHz = 497MG7W
Six Carrier Aggregation Bandwidth = 5(99.96) + 97 MHz = 596.80 MHz = 597MG7W
Seven Carrier Aggregation Bandwidth = 6(99.96) + 97 MHz = 696.76 MHz = 697MG7W
Eight Carrier Aggregation Bandwidth = 7(99.96) + 97 MHz = 796.72 MHz = 797MG7W

The maximum calculated assessment for two through eight carriers using 99.84 channel spacing are identified below.

Two Carrier Aggregation Bandwidth = 1(99.84) + 97 MHz = 196.84 MHz = 197MG7W
Three Carrier Aggregation Bandwidth = 2(99.84) + 97 MHz = 296.68 MHz = 297MG7W
Four Carrier Aggregation Bandwidth = 3(99.84) + 97 MHz = 396.52 MHz = 397MG7W
Five Carrier Aggregation Bandwidth = 4(99.84) + 97 MHz = 496.36 MHz = 497MG7W
Six Carrier Aggregation Bandwidth = 5(99.84) + 97 MHz = 596.20 MHz = 597MG7W
Seven Carrier Aggregation Bandwidth = 6(99.84) + 97 MHz = 696.04 MHz = 697MG7W
Eight Carrier Aggregation Bandwidth = 7(99.84) + 97 MHz = 795.88 MHz $\leq$ 797MG7W

Since the values are identical for two through seven and nearly so for eight carriers the 99.96 set will be used.

Figure 4.2.1.1 Carrier Aggregation



For AWEUC/D, the multi-carrier bandwidth is defined as follows. We have a two carrier configuration in the lower band and one to sever carrier configurations in the USA upper n258 band. In both cases the individual carriers, with a bandwidth of 97.5 MHz maximum, are spaced on center 99.96 MHz apart and they do not overlap.

The overall signal bandwidth for 4 adjacent carriers is depicted in Figure 4.3.1.1. The calculated assessment was that the 4 carrier aggregated bandwidth is 397 MHz.

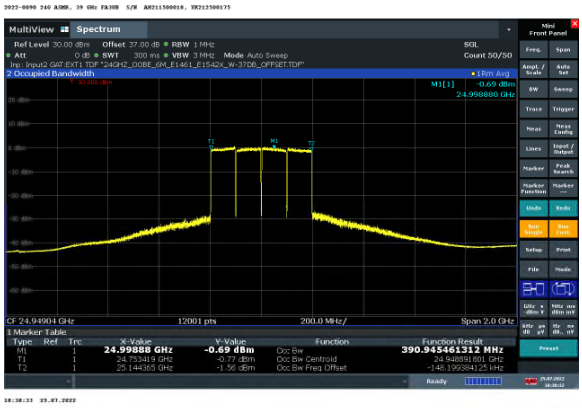
The bandwidth of 4 adjacent carriers measured for n258 is 390.9 MHz and for n260 is 391.2 MHz within the authorized band and are less than 397MHz calculated. This measurement is for verification purpose.

4.2.1.2 99% Signal Bandwidth Plots

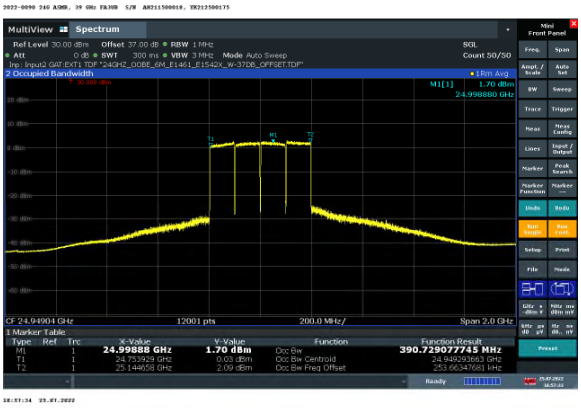
1MHz RBW

4 Carrier, QPSK, 24GHz

Horizontal



Vertical



4 Carrier, QPSK, 39GHz

Horizontal

Vertical

4.2.2 Occupied Bandwidth-Edge of Block Emissions

The classical Occupied Bandwidth measurement of Edge of Block Emissions or conveniently Out Of Band Emissions (OOBE) is an evaluation of the transmit carrier compliance with edge of block/edge of band requirements. This measurement documents the product's ability to maintain compliance with FCC Parts 2 and Part 30.203 limitations on emissions outside the block/ band of operation.

The AirScale 24 GHz Radio Unit (AWEUC-D) and 39 GHz Extension Unit (FA3WA) presently supports nominal 100 MHz bandwidth 5G-New Radio and LTE TDD technologies. The Out Of Band evaluation addresses operation with one through seven carriers for 24GHz and eight carriers for 39GHz

For each configuration channel power and modulation were verified prior to other measurements. The measurement process meets the requirements of ANSI C63.26 and ISO17025. The test setup was as shown in Figure 4.1.1.

The Out Of Band Emissions of each of the signals identified in Table 4.3.6 was measured using a Rohde & Schwarz FSW85 Spectrum analyzer, a remote PC based instrumentation controller and the same calibrated RF attenuation path used for channel power. The correction included the products antenna gain to correct the emissions to the relative "antenna connection" port. All spurious emissions > 10% Signal BW outside the band was evaluated for compliance without the product gain as is required.

Plots are provided using the triggered functionality of the test analyzer and demonstrate compliance with edge of band limits.

These sheets contain data for selected multiple mixed carrier configurations at Left Edge, Center and/or Right Edge of the 24GHz and 39 GHz Part 30 Upper Microwave Flexible Use Service spectrum.

4.2.3 Requirements 39 GHz Emissions Limits

The Limit in 47 CFR 30.203 for Emissions Limits is as follows:

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

(b)(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

In order to address the limit as imposed for the requirement in 47CFR 96.41 we evaluated emissions per the requirements in ANSI C63.26 and per KDB 940660 D01 Part 30 CBRS Equipment.

The average detector function was used for all MXA measurements and the Peak detector function were used for EMC receiver measurements.

4.2.4 Measurement Offset and MIMO

As this was a radiated EIRP measurement no MIMO adjustment was used.

4.2.5 Mask Parameters

The mask parameters are in units as stated in Part 30 and are listed in Table 4.3.5. Mask parameters are as stated in Table 4.2.5. The Guard band was adjusted for 10% of the maximum signal bandwidth (10 MHz) for 1x100MHz. Mask Edge Offsets = ½ the measurement Resolution Bandwidth were not used. The guard band for 4C is 40MHz. Therefore, the mask for 4C is more relaxed than that for 1C. If the emissions passed the mask for 1C, it certainly passed the mask for 4C.

Table 4.2.5 - Mask Parameters Out Of Band / Edge of Band Emissions

Frequency	Part 30 Limit
GHz	dBm
22.00	-13.0
24.24	-13.0
24.24	-5.0
24.25	-5.0
24.25	28.0
24.45	28.0
24.45	-5.0
24.46	-5.0
24.46	-13.0
24.74	-13.0
24.74	-5.0
24.75	-5.0
24.75	28.0
24.75	28.0
25.25	28.0
25.25	-5.0
25.26	-5.0
25.26	-13.0
33.00	-13.0

Frequency	Part 30 Limit
GHz	dBm
35.00	-13
36.00	-13
36.99	-13
36.99	-5
37.00	-5

37.00	57
40.00	57
40.00	-5
40.01	-5
40.01	-13
43.00	-13

4.2.6 Measurement Path Adjustments

The measured power at the spectrum analyzer input was adjusted for calculated free space loss, cable loss, measurement antenna gain and the product antenna gain over its applicable frequency range as documented in Exhibit 6 of the filing and in the table below. This is appropriate for Out Of Band Emissions / Edge of Band emissions only for the frequency range that the transmit antenna has documentable and consistent gain. Since different products have different gain responses vs frequency, the products documentable antenna gain only applies for the operational frequency range for which the product is designed.

Sample calculation: The sample calculation below is the formula and the correction for 35 GHz;

Adjustment **=** Free Space Path Loss - Measurement Antenna Gain + Cable Loss - Product Antenna Gain.

Total Required Adjustment (@35 GHz) **=** 50.32 dB = 79.58 dB -23.96dBi + 12.84dB – 18.14 dBi

This adjustment was only used for the OOBE/EoB frequency range. Table 4.2.6 below lists the offset correction factors used for the measurement distance of 6.5m. The measurements were made using a flat offset with a transducer correction identified below.

Table 4.2.6 Measurement Correction for Edge of Band / Out of Band Emissions

Frequency	Free Space Path Loss, PL	Measurement Antenna Gain, "G"	Measurement Cable Loss, "L"	PL-G1+L1	AEWF Antenna Gain, IEEE	Total Required Adjustment	FSW Offset	Transducer Correction Factor
GHz	dB	dBi	dB	dB	dBi	dB	dB	dB
22.00	74.85	23.46	11.02	62.41	24.77	37.64	37	0.637
22.50	75.05	23.49	11.17	62.73	24.90	37.83	37	0.833
23.00	75.24	23.69	11.43	62.98	25.02	37.96	37	0.957
23.50	75.43	23.80	11.51	63.13	25.15	37.98	37	0.982
24.00	75.61	23.80	11.41	63.23	25.28	37.95	37	0.947
24.50	75.79	24.06	11.60	63.33	25.41	37.92	37	0.921
25.00	75.96	24.14	11.72	63.55	25.53	38.01	37	1.014
25.50	76.14	24.07	11.79	63.86	25.72	38.14	37	1.141
26.00	76.30	24.28	11.95	63.97	25.90	38.07	37	1.071
26.50	76.47	24.38	12.16	64.25	26.16	38.09	37	1.087
27.00	76.63	24.39	12.26	64.50	26.43	38.08	37	1.077
27.50	76.79	24.39	12.29	64.69	26.72	37.97	37	0.972
28.00	76.95	24.57	12.40	64.78	27.02	37.76	37	0.760
28.50	77.10	24.63	12.57	65.05	27.41	37.64	37	0.637
29.00	77.25	24.53	12.61	65.33	27.80	37.53	37	0.532
29.50	77.40	24.60	12.82	65.62	27.41	38.21	37	1.208
30.00	77.55	24.71	12.90	65.73	27.02	38.72	37	1.717
30.50	77.69	24.63	13.04	66.10	25.06	41.04	37	4.041
31.00	77.83	24.71	13.13	66.25	23.10	43.15	37	6.149
31.50	77.97	24.74	13.17	66.40	23.87	42.53	37	5.526
32.00	78.11	24.75	13.31	66.67	24.65	42.02	37	5.025
32.50	78.24	24.85	13.37	66.76	24.75	42.02	37	5.015
33.00	78.38	24.83	13.50	67.05	24.84	42.21	37	5.205

Frequency	Free Space Path Loss, PL	Measurement Antenna Gain, "G"	Measurement Cable Loss, "L"	PL-G1+L1	AEWF Antenna Gain, IEEE	Total Required Adjustment	FSW Offset	Transducer Correction Factor
GHz	dB	dBi	dB	dB	dBi	dB	dB	dB
35.00	79.58	23.96	12.84	68.46	18.14	50.32	44	6.324
35.50	79.70	23.52	13.03	69.21	20.05	49.16	44	5.162
36.00	79.83	24.27	13.20	68.75	21.97	46.78	44	2.784
36.50	79.95	23.28	13.35	70.01	22.81	47.20	44	3.203
37.00	80.06	24.42	13.39	69.04	23.65	45.39	44	1.387
37.50	80.18	23.27	13.39	70.29	23.82	46.47	44	2.469
38.00	80.30	24.29	13.45	69.45	23.99	45.46	44	1.461
38.50	80.41	23.18	13.54	70.76	24.11	46.65	44	2.653
39.00	80.52	23.65	13.73	70.60	24.22	46.38	44	2.382
39.50	80.63	23.03	13.76	71.36	24.10	47.26	44	3.256
40.00	80.74	23.00	13.79	71.53	23.98	47.55	44	3.547
40.50	80.85	23.35	13.84	71.34	23.91	47.43	44	3.433
41.00	80.96	23.22	13.98	71.72	23.84	47.88	44	3.880
41.50	81.06	23.28	14.14	71.93	23.20	48.73	44	4.731
42.00	81.17	23.39	14.23	72.01	22.56	49.46	44	5.459
42.50	81.27	23.81	14.36	71.81	21.52	50.29	44	6.290
43.00	81.37	23.55	15.30	73.11	20.49	52.62	44	8.620
43.50	81.47	23.60	16.14	74.01	18.55	55.46	44	11.462

4.2.7 Edge of Band Measurements

The Occupied Bandwidth and Edge-of-Band emissions measurements were made as a radiated measurement at a distance of 6.5m for 39GHz and 6m for 24GHz. The measurements were performed with an FSW spectrum analyzer in compliance with the procedure and requirements of ANSI C63.26. The test set-up diagram in Figure 4.1.1 was used. Testing was performed for the four 100 MHz carrier configuration for both n258 band and n260 band. All of the Edge of Band measurements were performed at the specified 1 MHz resolution bandwidths. Adjustment factors were as described in Section 4.2.6 above.

4.2.7.1 EIRP Results - Edge of Band Measurements

KDB 842590 D01 Section 4.4.2.1 allows an "early exit", an alternative approach to TRP (or conducted power) measurement. In other words, it is acceptable to perform maximum EIRP measurements, over the required frequency range, and compare the measurements to the limit to verify compliance. If the measured EIRP levels are below the TRP limit the early exit condition is met and the device is compliant. If the device does not meet the emission limit at one or some frequencies, then TRP measurements need to be performed only at those frequencies.
EIRP measurements need to be performed using linearly polarized antenna. Both horizontal and vertical polarizations are measured separately and not summed. The highest amplitude signal measured from horizontal or vertical polarization is used for determining compliance to the unwanted emission limit.
The out-of-band emissions were measured for both n258 and n260 bands in vertical and horizontal polarizations.

For n258 24GHz band, the out-of-band emissions were evaluated in the frequency range of 24 GHz to 26 GHz. The worst emission was identified around 24.738 GHz with a level around -29.24dBm (16.24dB margin).

For n260 39GHz band, the worst emission from the OOBE measurement was identified at 41.24 GHz with a level at -21.72dBm (8.72dB margin). From the radiated measurement in the 40 GHz to 60 GHz presented in Section 4.5, the worst EIRP emission is at 43.8 GHz with an amplitude at -33.92 dBm/MHz. It is 20.9 dB below the TRP limit. From the field strength measurement in the 30 GHz to 36.75 GHz presented in Section 4.4, the worst emission is at 36.745 GHz with a margin of 10.2dB.

The maximum EIRP emissions from both vertical and horizontal polarizations are below the TRP limits with a minimum margin of 8.72 dB. Therefore, the early exit condition was met and the EUT is compliant.

4.2.7.2 Out Of Band Emissions Results

The Out Of Band Emissions plots for the tested configurations of four carriers operation are below. The 1C masks were used in the plots. For 24GHz, the EIRP emission with the minimum margin was -29.24dBm/MHz at 24.738GHz (26.95 dBm-56.19dB) and the margin under -13dBm/MHz limit was 16.24dB. For 39GHz, the EIRP emission with the minimum margin was -21.72dBm/MHz at 41.239GHz (27.46 dBm-49.18dB) and the margin under -13dBm/MHz limit was 8.72dB. The EIRP results met the early exit requirements.

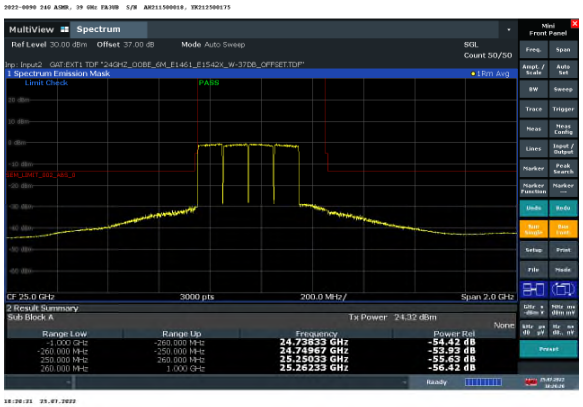
The measurement results of the occupied bandwidth and the out-of-band emissions as documented in the plots and Table 4.2.7.1 demonstrate the full compliance with the Rules of the Commission for the operating band.

Table 4.2.7.1 Results - Occupied Bandwidth-Edge of Block Emissions/ OOBE

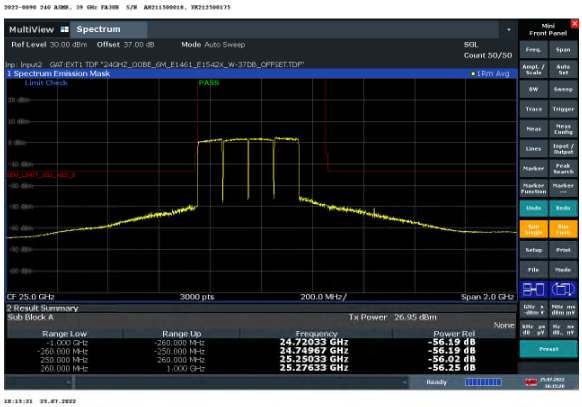
Center Frequencies of Edge Channels, GHz	Location	Number of Carriers	Modulation	Polarization	Occupied Bandwidth Edge of Block / OOBE Compliance
24.7992 24.89904 24.99888 25.09872	Left Side of Band	4	QPSK	Horizontal	Compliant
				Vertical	Compliant
37.05 37.14984 37.24968 37.34952	Left Side of Band	4	QPSK	Horizontal	Compliant
				Vertical	Compliant

4.2.7.2.1 Occupied Bandwidth Edge of Band Plots

4 Carrier – QPSK / 24GHz / Left
OOBE/EoB – Horizontal Polarization



OOBE/EoB – Vertical Polarization



4 Carrier – QPSK / 39 GHz / Left
OOBE/EoB – Horizontal Polarization

OOBE/EoB – Vertical Polarization

4.3 Section 2.1051 MEASUREMENT REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS

This test measures the emissions of spurious signals which may come from harmonic, parasitic, intermodulation and frequency conversion products and are outside the necessary bandwidth but excludes Edge-of-Band emissions.

4.3.1 Section 2.1051 Spurious Emissions at Antenna Terminals

Spurious Emissions were investigated per 47CFR Section 2.1057(a)(1) over the frequency range of 30 MHz to 200 GHz as specified in 2.1057(a)(2).

2.1057(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.

(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

4.3.2 Required Limit

The required emission limitation specified in 47CFR 30.203 (a) was applied to these tests. Based upon the criterion given in Section 30 of the Code and as developed in 4.3.3, the required emission limit for emissions outside a licensee's frequency block is:

47CFR 30.203 (a)

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be -13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be -5 dBm/MHz or lower.

4.3.3 Results

Since there is no antenna terminal, all measurements were performed as radiated measurements and standard radiated emissions. The emissions near the band edges are presented in 4.2.7 and are in compliance with the requirements.

The standard radiated emissions are documented in Section 4.4 "Section 2.1053 Measurement Required: Field Strength of Spurious Radiation".

The measurements were performed in compliance with ANSI C63.26, KDB 842590 D01, C63.26 mmWave JTG, and our ISO17025 process. The measurement meets the ANSI C63.26 requirements in paragraphs 5.2.4.4.1 and 5.7 which requires that the number of points in the sweep be > 2 × Span/RBW. The ESW-44 spectrum analyzer measurements examine the 30 MHz to 40 GHz range. The FSW based mmWave transmitter test system were used to provide measurement capability from 40 GHz to 220 GHz range.

4.4 Section 2.1053 MEASUREMENT REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

The field strength measurements of radiated spurious emissions were made in FCC registered ten meter semi-anechoic chambers AR-8, (FCC Registration Number: 395774) NVLAP Lab Code: 100275-0 and IC (Filing Number: 6933F-8) which are maintained by Nokia Bell Labs in Murray Hill, New Jersey.

The AirScale 24 GHz Radio Unit (AWEUC-D) and 39 GHz Extension Unit (FA3WA) (EUT) was configured in semi-anechoic chamber in a manner simulating a normal field installation. The recommendations of ANSI C63.4–2014, C63.26-2015, KDB 842590 D01 and C63.26 mmWave JTG were followed for EUT testing setup and cabling. The EUT was configured to operate in a 5G-NR test model per the constraints identified in section 4.1.

Both AWEUC/D main and FA3WA extension units were configured into the full power forward beam transmit configuration as defined in Table 4.4.1. The unit was configured with the maximum transmit bandwidth of four carriers for each polarization. The Vertical and Horizontal polarizations each transmitted 52 dBm EIRP, with the total transmit power of 55 dBm EIRP. The product in the below configurations was evaluated over the 30 MHz to 200 GHz frequency range as required.

Table 4.4.1 EUT Transmit Configuration

AWEWA/B Tx Frequencies GHz	Transmit Active Polarization	Signal Bandwidth, MHz	Modulation	Total Power, dBm EIRP	Radiated Emissions Pass / Fail
24.7992 24.89904 24.99888 25.09872	H & V	4x100	QPSK	55	Pass
37.05 37.14984 37.24968 37.34952	H & V	4x100	QPSK	55	Pass

4.4.1 Spurious Radiation and Radiated Emissions Requirements.

This product meets Part 15B, and Part 30.203 requirements. FCC Part 15 Class B require emissions to be below 54.5 dBuV/m at 3m. Part 30.203 requires emissions to be below the value generated by a conducted emission of -13 dBm. This is a standard value for wireless products typically defined as

-43+10LogP=-13 dBm.

The evaluation of emissions at the Edge of Band was detailed in Sections 4.2.7 and 4.2.8. Emissions removed from the transmit band were evaluated identically to other wireless products.

Measurements were performed in compliance with Section 2.1053, FCC publication 442401, the requirements detailed above and clause 5.5 of ANSI C63.26. For this case the evaluation of acceptable radiated field strength is as follows.

The calculated emission levels were found by:

Pmeas (dBm) + Cable Loss(dB) + Antenna Factor(dB) + 107 (dBμV/dBm) -Amplifier Gain (dB)
= Field Strength (dBμV/m)

Title 47CFR section 30.203 and 2.1053 contains the requirements for the levels of spurious radiation as a function of the EIRP of the modulated carrier with 100 MHz of bandwidth. The reference level for the modulated carrier is calculated as the field produced by an isotropic radiator excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 27-7, 6th edition, IT&T Corp.

$$\mathbf{E = (120\pi P)^{1/2} = [(30*P)^{1/2}] / R}$$

$$\mathbf{20 \log (E*10^{6}) - (43 + 10 \log P) = 82.23\ dB\ \mu V/meter}$$

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 3 m
P = Transmitted Power, Watts = 316.23 W

The field strength of radiated spurious emissions measured was determined by

E (dBμV/m) = V_{meas} (dBμV) + Cable Loss (dB) + Antenna Factor (dBi/m).

Field strength measurements of radiated spurious emissions were made in the semi-anechoic chamber, AR-8 as detailed above. The recommendations of ANSI C63.4 and ANSI C63.26 were followed for EUT testing setup, cabling, and measurement approach and procedures. All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in the Figure 4.4. The minimum margins to the Part 30.203 limit is as measured in accordance with 2.1053. The test data follows.

4.4.2 Radiated Spurious Emissions Measurements: 40 GHz - 100 GHz

The radiated spurious emissions spectrum was investigated per 47CFR Section 2.1057(a)(1) for spurious emissions over the frequency range of 40 GHz to 200 GHz. The procedure and methodology followed the recommendations of ANSI C63.4–2014, C63.26-2015 and C63.26 mmWave JTG.

A Rohde & Schwarz FSW 67 was employed with external three port Harmonic Down Converters (HDC). The waveguide RF input converters provided coverage for 40-60 GHz (U), 60-90 GHz (E), 90-140 GHz (F) and 140-220 GHz (G) bands. The HDC's were paired with 25 dB Standard Gain Horns. A 40 GHz waveguide high pass filter was utilized to limit the transmit carrier emissions from overloading the 40-60 GHz HDC.

Operation of the harmonic down converters utilizes a swept LO with a fixed IF frequency of 1.325 GHz. The IF cable loss for the 4m of cable was 1.03 dB and was corrected internally to the FSW along with the Conversion loss for the harmonic down converters. Additional external shielding of the HDC's was necessary to limit carrier energy from creating immunity issues with the measurements.

Cable loss compensation for the LO cable loss was necessary to enable scan heights from 1-3 meters. The experience of this test indicated that a 3m maximum test height with this product is adequate (0.5 m above the top of product). This allowed for a reduction of the test cables length and reduce IF images which occurred at multiples of the 1.325 GHz IF frequency.

Measurements were performed at the following distances:

mmWave Band	Frequency Range GHz	Measurement distance meters
U	40-60	4
E	60-90	4
F	90-140	3
G	140-220	3

Operation was verified prior to testing by bore-sighting a mmWave signal generator or mmWave source module with an antenna identical to the measurement antenna at the test distance. The location of the maximum beams had previously been ascertained for both vertical and horizontal polarizations. The beam is narrow and radiated power is down 23 dB at just ± 12 degrees off center. All of the emissions and harmonics were found to be centered on the beam as well.

Based upon previous experience a continuous max hold (average detector) sweep of the product in elevation and azimuth was employed for full coverage scanning of the product. For these measurements in each band the scan was started at the beam peak location of 21 degrees azimuth, and a nominal elevations 172 cm for Vertical and Horizontal. The peak was first located for the most prominent emissions in the span. The elevation was then swept down to 1m and back up back to 3m and returned to the beam peak. The product was then rotated continuously to 360 degrees back to 0 degrees and back to 21 degrees. This method locates any emission and provides the maximum emissions but required operation without the analyzer internal noise reduction function. Peaks were noted using the marker function which were later formally measured with the required 1 MHz resolution bandwidth. Measurements for 40-200 GHz were performed this way for the 1-8 carrier transmit configurations.

4.4.2.1 Bandwidth Limits and Corrections: Radiated Measurements 40 GHz - 100 GHz

All corrections were made to the signal level as detailed below.

4.4.2.2 Resolution Bandwidth and # of Points:

For measurements above 40 GHz we performed final measurement scans with the required 1 MHz resolution bandwidth and preliminary scans with either a 10 MHz or 3 MHz resolution bandwidth.

Final measurements were performed so that the resolution bandwidth and span limitations of ANSI C63.26 were followed so that the number of measurement points > 2(Span/RBW). Our FSW was upgraded from the original filing and now processes 100,000 data points across the screen which allows for 50 GHz spans with a 1 MHz RBW. Multiple spans were therefore used when necessary to evaluate the peak spurious emissions detected.

4.4.2.3 Part 30 Limit:

The -13 dBm emissions limit was not adjusted in any way.

4.4.2.4 Emissions Corrections

The measured signal was corrected by the FSW for the harmonic downconverter (HDC) conversion loss. In addition, a correction consisting of the radiated path loss, the gain of the measurement antenna and a 1 dB IF cable loss (at 1.3 GHz) was applied. There was no correction applied for the product antenna gain as these measurements are outside the transmit frequency range.

$$\text{Emissions Correction} = \text{Path Loss} - \text{Antenna Gain} + \text{IF Cable loss (1dB)}$$

$$\text{Where Free Space Path Loss} = ((4\pi d)/\lambda))^2$$

Table 4.4.2.4 details the correction for the three bands.

Table 4.4.2.4a Radiated Emissions Corrections for 40-60 GHz at 4m

Frequency	λ	Measurement Distance, d	Path Loss	Measurement Antenna Gain	IF Cable Loss	Emissions Correction Total
GHz	m	m	dB	dB	dB	dB
40.0	0.0075	4	76.52	21.80	1.03	55.75
42.5	0.0071	4	77.05	22.20	1.03	55.87
45.0	0.0067	4	77.55	22.50	1.03	56.07
47.5	0.0063	4	78.02	22.70	1.03	56.34
50.0	0.0060	4	78.46	23.00	1.03	56.49
52.5	0.0057	4	78.89	23.30	1.03	56.61
55.0	0.0055	4	79.29	23.40	1.03	56.91
57.5	0.0052	4	79.68	23.60	1.03	57.10
60.0	0.0050	4	80.05	23.70	1.03	57.37

Table 4.4.2.4b Radiated Emissions Corrections for 60-90 GHz at 4m

Frequency	λ	Measurement Distance, d	Path Loss	Measurement Antenna Gain	IF Cable Loss	Emissions Correction Total
GHz	m	m	dB	dB	dB	dB
60.0	0.0050	4	80.05	21.80	1.03	59.276
65.0	0.0046	4	80.74	22.30	1.03	59.471
70.0	0.0043	4	81.38	22.70	1.03	59.715
75.0	0.0040	4	81.98	23.00	1.03	60.014
80.0	0.0038	4	82.54	23.40	1.03	60.175
85.0	0.0035	4	83.07	23.60	1.03	60.501
90.0	0.0033	4	83.57	23.80	1.03	60.798

4.4.3 Field Strength of Spurious Radiation Results:

This product meets Part 15B limits and Part 30 Requirements. For the Title 47CFR section 30.203 and 2.1053 test, the field strength of any spurious radiation, measured at 3m, is required to be less than 82.23 dBµV/meter. Emissions equal to or less than 62.23 dBµV/meter are not reportable.

Presented results include the standard measurements from 30 MHz to 40 GHz followed by the four mmWave bands. The worst-case emissions are presented. The scans are performed with the required 1 MHz resolution bandwidth and sufficient number of points per ANSI C63.26 with markers at the frequencies of interest. The limit in the measurement is the conducted -13 dBm limit as specified in Part 30.203. Corrections to the emissions levels consisted of only the HDC conversion loss, the Free Space Path Loss and the gain of the measurement antenna as detailed in Table 4.4.2.4.

In the frequency range of 30 MHz to 18 GHz, the field strength of the EUT measured has a minimum margin of 28.2 dB to 82.23 dBµV/m field strength limit derived from -13dBm TRP limit with an isotropic radiator assumed. Therefore, the maximum EIRP emissions measured is below -13dBm/MHz TRP limit with a 28.2 dB margin.

In the frequency range of 18 MHz to 40 GHz, the field strength of the EUT measured has a minimum margin of 10.17 dB except at 27.899GHz which failed the 82.23 dBµV/m limit by -2.16dB. The 27.899GHz signal was from AWEUC/D or FW3UB 24GHz device. In the project 2022-0036 evaluation for AWEUC/D 24GHz with FA3UB 24GHz co-current operation (C2PC certification), the EUT failed 82.23 dBµV/m limit by 7.27dB at 27.899GHz during the field strength evaluation but passed the TRP measurement with 1.99dB margin. Therefore, TRP evaluation for AWEUC/D with FW3WA was waived. The minimum margin will be at least 1.99dB.

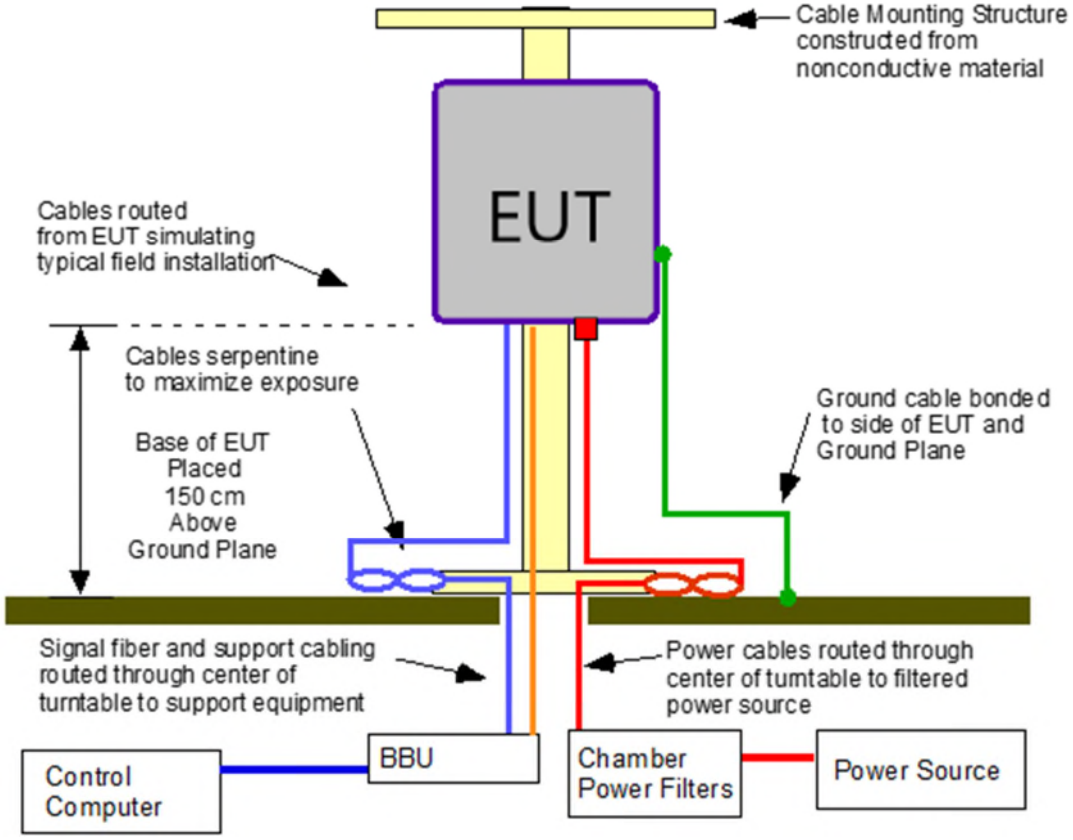
In the frequency range of 40 GHz to 200 GHz, the EIRP of the EUT measured has a minimum margin of 4.15 dB to the -13 dBm TRP limit.

The maximum EIRP in the frequency range of 30 MHz to 200 GHz measured is less than the TRP limit, then early exit condition is met and no further measurements are required. Therefore, the spurious emissions of the EUT are in compliance with FCC Part 30 requirements.

The emissions below 40 GHz were below the Part 15 Class B limit.

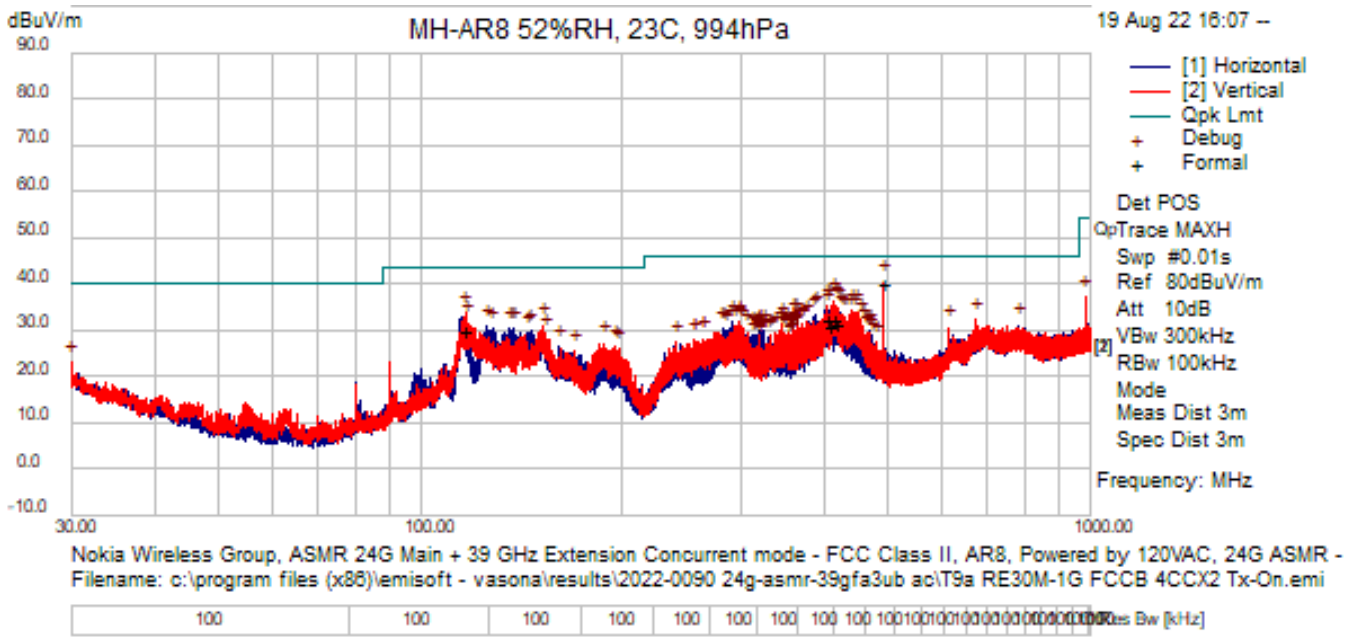
This demonstrates that the AirScale 24 GHz Radio Unit (AWEUC-D) and 39 GHz Extension Unit (FA3WA), the subject of this application, complies with FCC Part 15 Class B, and FCC Sections 2.1053, 30.203 and 2.1057 of the Rules.

Figure 4.4 Radiated Emissions Product Setup



4.4.4 Transmitter Measurements of Radiated Spurious Emissions

30MHz – 1GHz Tx-On



Test Information

Results Title	RE30M-1G Bilog 3M
File Name	T9a RE30M-1G FCCB 4CCX2 Tx-On.emi
Test Laboratory	MH-AR8 52%RH, 23C, 994hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless Group
EUT Details	ASMR 24G Main + 39 GHz Extension Concurrent mode - FCC Class II
Configuration	AR8, Powered by 120VAC, 24G ASMR - AH211500018 39G Extension - YK212500175. RE 30M-1GHz, Tx -On-24G-4CC/39G-4CC, FCC Part B limits. Bilog Antenna E766, ESU-E954, PA-E812, LPF'S Filter E1268. Cable set- AR8. 100k BW Pre / 1M BW Formals
Date	2022-08-19 16:07:34

Formal Data

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
491.523	48.10	2.49	-10.44	40.16	QuasiMax	V	101	311	46.00	-5.84	Pass	
404.304	41.99	2.35	-11.74	32.61	QuasiMax	V	106	66	46.00	-13.39	Pass	
116.286	40.01	1.64	-11.75	29.90	QuasiMax	V	105	255	43.50	-13.60	Pass	
414.528	41.57	2.37	-11.57	32.36	QuasiMax	V	106	79	46.00	-13.64	Pass	
416.232	40.75	2.37	-11.55	31.57	QuasiMax	V	111	71	46.00	-14.43	Pass	
408.960	40.22	2.36	-11.66	30.92	QuasiMax	V	204	255	46.00	-15.08	Pass	

Preview Data

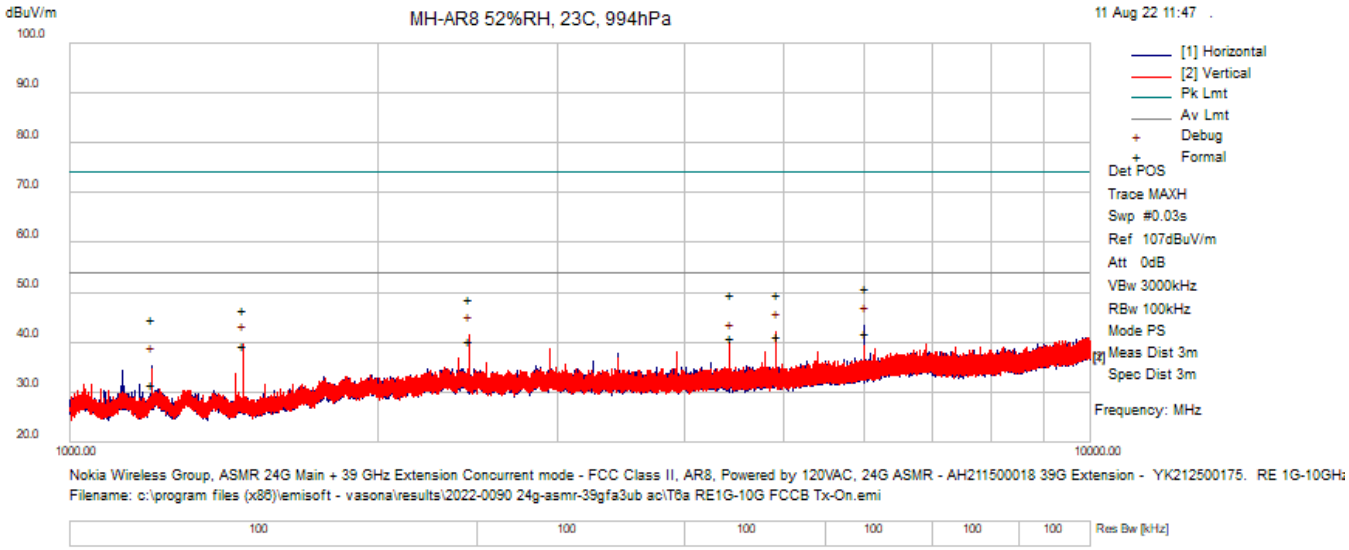
Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
491.520	48.16	2.49	-10.44	40.21	Debug	V	100	308	46.00	-5.79	Pass	
414.528	45.48	2.37	-11.57	36.28	Debug	V	100	90	46.00	-9.72	Pass	
116.616	43.50	1.64	-11.69	33.44	Debug	V	100	270	43.50	-10.06	Pass	
416.232	44.50	2.37	-11.55	35.32	Debug	V	100	90	46.00	-10.68	Pass	
404.304	44.42	2.35	-11.74	35.04	Debug	V	100	90	46.00	-10.96	Pass	
408.960	44.28	2.36	-11.66	34.98	Debug	V	200	90	46.00	-11.02	Pass	
421.152	43.85	2.38	-11.47	34.76	Debug	V	100	90	46.00	-11.24	Pass	
117.168	41.42	1.64	-11.61	31.46	Debug	V	100	270	43.50	-12.04	Pass	
441.216	42.94	2.41	-11.42	33.94	Debug	V	100	90	46.00	-12.06	Pass	
404.472	43.30	2.35	-11.73	33.92	Debug	V	100	45	46.00	-12.08	Pass	
448.656	42.78	2.42	-11.42	33.78	Debug	V	100	90	46.00	-12.22	Pass	
152.232	39.59	1.70	-10.29	30.99	Debug	V	200	225	43.50	-12.51	Pass	
388.320	43.13	2.31	-12.03	33.41	Debug	H	180	225	46.00	-12.59	Pass	
422.592	42.36	2.38	-11.45	33.29	Debug	H	100	90	46.00	-12.71	Pass	
125.592	39.52	1.65	-10.41	30.76	Debug	H	100	0	43.50	-12.74	Pass	
444.552	42.08	2.42	-11.42	33.08	Debug	V	200	0	46.00	-12.92	Pass	
436.416	42.07	2.41	-11.42	33.06	Debug	V	100	90	46.00	-12.94	Pass	
426.264	42.01	2.39	-11.41	32.98	Debug	V	100	90	46.00	-13.02	Pass	
385.416	42.63	2.30	-12.09	32.84	Debug	H	280	0	46.00	-13.16	Pass	
430.872	41.86	2.40	-11.42	32.84	Debug	V	200	0	46.00	-13.16	Pass	
128.016	39.01	1.66	-10.36	30.31	Debug	H	180	180	43.50	-13.19	Pass	
137.784	38.76	1.67	-10.16	30.27	Debug	H	100	225	43.50	-13.23	Pass	
135.552	38.66	1.67	-10.20	30.12	Debug	H	100	225	43.50	-13.38	Pass	
136.968	38.46	1.67	-10.17	29.96	Debug	H	100	225	43.50	-13.54	Pass	
675.840	32.28	2.85	-2.95	32.18	Debug	V	100	90	46.00	-13.82	Pass	
455.112	40.92	2.43	-11.30	32.06	Debug	V	200	90	46.00	-13.94	Pass	
145.848	37.88	1.69	-10.01	29.56	Debug	H	100	225	43.50	-13.94	Pass	
364.392	42.49	2.23	-12.66	32.05	Debug	V	100	180	46.00	-13.95	Pass	
360.624	42.59	2.21	-12.80	32.00	Debug	V	100	180	46.00	-14.00	Pass	
377.928	41.75	2.27	-12.24	31.79	Debug	V	100	90	46.00	-14.21	Pass	
144.192	37.49	1.68	-10.04	29.14	Debug	H	100	225	43.50	-14.36	Pass	
299.304	43.20	1.98	-13.57	31.61	Debug	V	100	308	46.00	-14.39	Pass	
291.576	43.34	1.97	-13.72	31.59	Debug	H	280	180	46.00	-14.41	Pass	
371.088	41.31	2.25	-12.43	31.14	Debug	V	100	90	46.00	-14.86	Pass	
153.528	37.39	1.70	-10.50	28.58	Debug	V	200	225	43.50	-14.92	Pass	
346.128	42.07	2.16	-13.18	31.05	Debug	V	100	45	46.00	-14.95	Pass	
299.568	42.45	1.98	-13.57	30.86	Debug	V	100	308	46.00	-15.14	Pass	
782.064	30.41	3.26	-2.82	30.85	Debug	H	100	308	46.00	-15.15	Pass	
300.456	42.39	1.98	-13.55	30.82	Debug	V	100	308	46.00	-15.18	Pass	
295.248	42.49	1.97	-13.65	30.81	Debug	V	100	308	46.00	-15.19	Pass	
457.224	39.53	2.44	-11.25	30.72	Debug	V	100	90	46.00	-15.28	Pass	
364.704	41.02	2.23	-12.65	30.60	Debug	V	100	180	46.00	-15.40	Pass	
614.376	33.54	2.75	-5.80	30.49	Debug	H	280	45	46.00	-15.51	Pass	
290.640	42.20	1.97	-13.74	30.43	Debug	H	280	180	46.00	-15.57	Pass	
372.600	40.49	2.26	-12.38	30.37	Debug	V	100	180	46.00	-15.63	Pass	
283.872	42.22	1.95	-13.88	30.29	Debug	H	280	180	46.00	-15.71	Pass	
359.952	40.85	2.21	-12.82	30.24	Debug	V	100	180	46.00	-15.76	Pass	
346.728	41.19	2.16	-13.18	30.17	Debug	V	100	45	46.00	-15.83	Pass	

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
344.568	40.99	2.16	-13.18	29.96	Debug	V	300	90	46.00	-16.04	Pass	
281.976	41.90	1.95	-13.91	29.94	Debug	H	280	180	46.00	-16.06	Pass	
361.752	40.42	2.22	-12.76	29.88	Debug	V	300	90	46.00	-16.12	Pass	
468.096	38.30	2.45	-10.99	29.76	Debug	H	100	90	46.00	-16.24	Pass	
321.624	40.86	2.07	-13.22	29.71	Debug	H	180	45	46.00	-16.29	Pass	
325.896	40.75	2.09	-13.17	29.67	Debug	H	180	0	46.00	-16.33	Pass	
320.040	40.84	2.06	-13.25	29.66	Debug	H	180	45	46.00	-16.34	Pass	
188.136	40.32	1.74	-15.04	27.02	Debug	V	200	90	43.50	-16.48	Pass	
353.304	40.32	2.19	-13.06	29.45	Debug	V	300	90	46.00	-16.55	Pass	
285.240	41.30	1.95	-13.85	29.40	Debug	H	280	180	46.00	-16.60	Pass	
306.888	40.81	2.01	-13.45	29.38	Debug	H	180	0	46.00	-16.62	Pass	
362.928	39.87	2.22	-12.72	29.37	Debug	V	300	135	46.00	-16.63	Pass	
347.448	40.38	2.17	-13.18	29.36	Debug	V	100	45	46.00	-16.64	Pass	
465.264	37.79	2.45	-11.06	29.19	Debug	V	100	45	46.00	-16.81	Pass	
358.608	39.80	2.21	-12.87	29.14	Debug	V	100	180	46.00	-16.86	Pass	
339.264	40.17	2.14	-13.18	29.13	Debug	V	100	180	46.00	-16.87	Pass	
360.984	39.61	2.22	-12.79	29.04	Debug	V	300	90	46.00	-16.96	Pass	
312.696	40.36	2.04	-13.36	29.04	Debug	H	180	45	46.00	-16.96	Pass	
461.304	37.74	2.44	-11.15	29.04	Debug	V	100	90	46.00	-16.96	Pass	
983.040	36.58	3.58	-3.13	37.02	Debug	V	200	0	54.00	-16.98	Pass	
363.408	39.45	2.22	-12.70	28.98	Debug	V	300	135	46.00	-17.02	Pass	
317.352	40.16	2.05	-13.29	28.92	Debug	H	180	45	46.00	-17.08	Pass	
316.128	40.12	2.05	-13.31	28.86	Debug	H	180	45	46.00	-17.14	Pass	
194.760	40.24	1.75	-15.66	26.33	Debug	V	200	90	43.50	-17.17	Pass	
350.064	39.83	2.18	-13.18	28.83	Debug	V	100	45	46.00	-17.17	Pass	
333.984	39.88	2.12	-13.18	28.82	Debug	V	100	180	46.00	-17.18	Pass	
357.768	39.47	2.20	-12.90	28.78	Debug	V	100	180	46.00	-17.22	Pass	
469.584	37.27	2.46	-10.96	28.77	Debug	V	100	90	46.00	-17.23	Pass	
355.224	39.57	2.20	-12.99	28.77	Debug	V	300	135	46.00	-17.23	Pass	
30.000	30.82	2.00	-10.06	22.77	Debug	V	100	0	40.00	-17.23	Pass	
161.160	36.18	1.71	-11.70	26.18	Debug	H	280	0	43.50	-17.32	Pass	
470.640	37.07	2.46	-10.93	28.59	Debug	H	100	90	46.00	-17.41	Pass	
320.376	39.74	2.07	-13.24	28.57	Debug	V	380	180	46.00	-17.43	Pass	
326.424	39.64	2.09	-13.17	28.56	Debug	H	180	45	46.00	-17.44	Pass	
325.416	39.43	2.09	-13.17	28.34	Debug	H	180	0	46.00	-17.66	Pass	
197.472	39.97	1.75	-15.91	25.81	Debug	V	200	90	43.50	-17.69	Pass	
329.832	39.20	2.10	-13.17	28.12	Debug	H	100	225	46.00	-17.88	Pass	
264.696	39.29	1.91	-13.21	27.99	Debug	V	300	45	46.00	-18.01	Pass	
318.144	39.20	2.06	-13.28	27.98	Debug	H	180	45	46.00	-18.02	Pass	
263.832	39.20	1.91	-13.14	27.97	Debug	V	200	45	46.00	-18.03	Pass	
317.064	39.13	2.05	-13.29	27.89	Debug	H	180	45	46.00	-18.11	Pass	
256.176	38.45	1.89	-12.49	27.85	Debug	V	200	180	46.00	-18.15	Pass	
356.472	38.58	2.20	-12.95	27.83	Debug	V	300	135	46.00	-18.17	Pass	
169.368	36.42	1.72	-12.93	25.21	Debug	V	100	270	43.50	-18.29	Pass	
472.320	36.09	2.46	-10.89	27.66	Debug	H	100	90	46.00	-18.34	Pass	
313.512	38.89	2.04	-13.35	27.59	Debug	H	180	45	46.00	-18.41	Pass	
257.112	38.16	1.90	-12.57	27.48	Debug	V	200	180	46.00	-18.52	Pass	
321.480	38.59	2.07	-13.22	27.43	Debug	H	180	45	46.00	-18.57	Pass	
353.880	38.18	2.19	-13.04	27.33	Debug	V	300	90	46.00	-18.67	Pass	

Frequency MHz	Raw dBuV	Cable Loss	AF dB/m	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
321.960	38.38	2.07	-13.22	27.23	Debug	H	180	45	46.00	-18.77	Pass	
479.352	35.42	2.47	-10.72	27.17	Debug	V	300	90	46.00	-18.83	Pass	
240.336	38.68	1.86	-13.41	27.13	Debug	V	200	45	46.00	-18.87	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

1GHz – 10GHz **Tx-On**



Test Information

Results Title	Radiated E 3m 1GHz-18GHz
File Name	T6a RE1G-10G FCCB Tx-On.emi
Test Laboratory	MH-AR8 52%RH, 23C, 994hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless Group
EUT Details	ASMR 24G Main + 39 GHz Extension Concurrent mode - FCC Class II
Configuration	AR8, Powered by 120VAC, 24G ASMR - AH211500018 39G Extension - YK212500175. RE 1G-10GHz, Tx -On, FCC Part B limits. DR Horn Antenna E1073, FSW67-E1260, PA-E447, LPF'S Filter E1475. Cable set- AR8. 100k BW Pre / 1M BW Formals
Date	2022-08-11 11:47:32

Formal Data

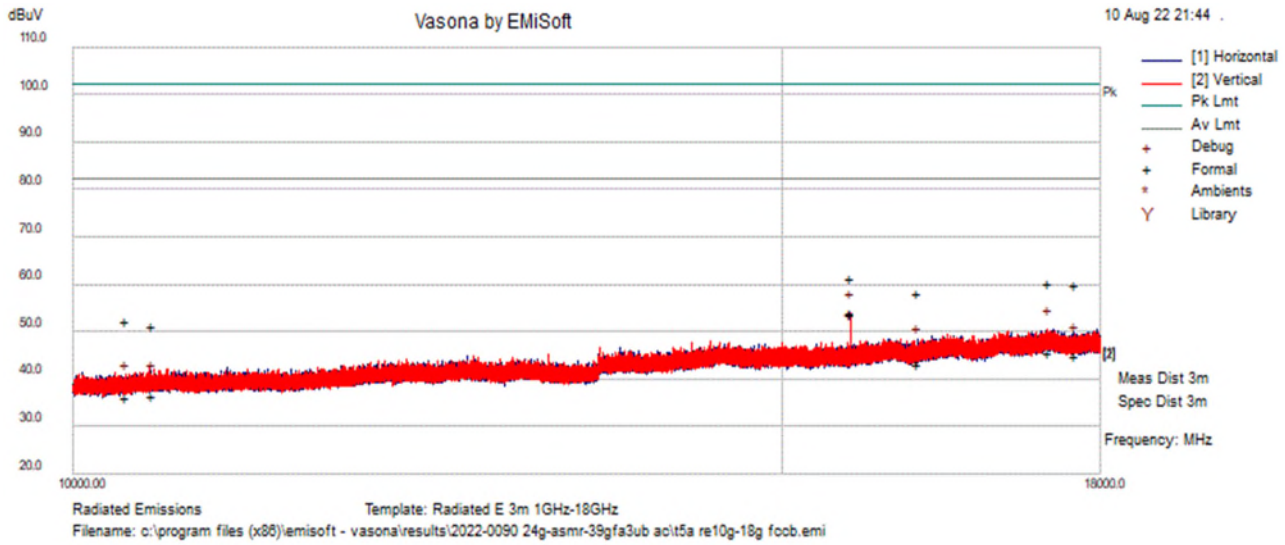
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
6000.019	37.56	7.37	-3.01	41.92	AvgMax	H	126	108	54.00	-12.08	Pass	
4915.205	39.15	6.24	-4.08	41.30	AvgMax	V	123	118	54.00	-12.70	Pass	
4423.688	39.28	5.95	-4.39	40.84	AvgMax	V	102	104	54.00	-13.16	Pass	
2457.593	41.96	4.55	-6.12	40.39	AvgMax	V	110	1	54.00	-13.61	Pass	
1474.568	47.41	3.50	-11.35	39.55	AvgMax	V	104	290	54.00	-14.45	Pass	
1199.993	40.46	3.32	-11.97	31.81	AvgMax	H	121	150	54.00	-22.19	Pass	
6000.019	46.45	7.37	-3.01	50.81	PeakMax	H	126	108	74.00	-23.19	Pass	
4915.205	47.59	6.24	-4.08	49.75	PeakMax	V	123	118	74.00	-24.25	Pass	
4423.688	48.11	5.95	-4.39	49.67	PeakMax	V	102	104	74.00	-24.33	Pass	
2457.593	50.32	4.55	-6.12	48.75	PeakMax	V	110	1	74.00	-25.25	Pass	
1474.568	54.38	3.50	-11.35	46.52	PeakMax	V	104	290	74.00	-27.48	Pass	
1199.993	53.37	3.32	-11.97	44.72	PeakMax	H	121	150	74.00	-29.28	Pass	

Preview Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
2457.593	42.89	4.55	-6.12	41.32	NoTune	V	100	331	54.00	-12.68	Pass	
1474.568	47.52	3.50	-11.35	39.66	NoTune	V	100	331	54.00	-14.34	Pass	
6000.019	38.80	7.37	-3.01	43.16	NoTune	H	100	331	54.00	-10.84	Pass	
4915.205	39.88	6.24	-4.08	42.04	NoTune	V	100	331	54.00	-11.96	Pass	
4423.688	38.23	5.95	-4.39	39.79	NoTune	V	100	331	54.00	-14.21	Pass	
1199.993	43.92	3.32	-11.97	35.27	NoTune	H	100	331	54.00	-18.73	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

10GHz – 18GHz TX-On



Test Information

Results Title	Radiated E 3m 1GHz-18GHz
File Name	T5b RE10g-18G Tx-On FCC P30.emi
Test Laboratory	MH-AR8 52%RH, 23C, 994hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless Group
EUT Details	ASMR 24G Main + 39 GHz Extension Concurrent mode - FCC Class II
Configuration	AR8, Powered by 120VAC, 24G ASMR - AH211500018 39G Extension - YK212500175. RE 10G-18GHz, Tx -On, FCC Part 30 limits. DR Horn Antenna E1073, FSW67-E1260, PA-E447, LPF'S Filter E1475. Cable set- AR8. 100k BW Pre / 1M BW Formals
Date	2022-08-11 17:34:09

Formal Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
15598.085	38.42	13.36	2.26	54.03	AvgMax	V	163	260	82.23	-28.20	Pass	
15598.085	38.22	13.36	2.26	53.84	Average	V	163	260	82.23	-28.39	Pass	
15598.085	38.21	13.36	2.26	53.83	Average	V	163	260	82.23	-28.40	Pass	
17454.800	26.34	14.42	4.91	45.67	AvgMax	V	332	16	82.23	-36.56	Pass	
17721.798	25.59	14.45	4.91	44.94	AvgMax	H	238	108	82.23	-37.29	Pass	
16202.377	25.48	14.85	2.83	43.16	AvgMax	H	183	140	82.23	-39.07	Pass	
15598.085	45.69	13.36	2.26	61.31	PeakMax	V	163	260	102.23	-40.92	Pass	
17454.800	41.08	14.42	4.91	60.41	PeakMax	V	332	16	102.23	-41.82	Pass	
17721.798	40.72	14.45	4.91	60.08	PeakMax	H	238	108	102.23	-42.15	Pass	
16202.377	40.74	14.85	2.83	58.43	PeakMax	H	183	140	102.23	-43.80	Pass	
10456.846	26.13	11.54	-1.10	36.57	AvgMax	H	128	221	82.23	-45.66	Pass	
10295.228	26.47	11.15	-1.39	36.24	AvgMax	V	344	37	82.23	-45.99	Pass	
10295.228	42.48	11.15	-1.39	52.25	PeakMax	V	344	37	102.23	-49.98	Pass	

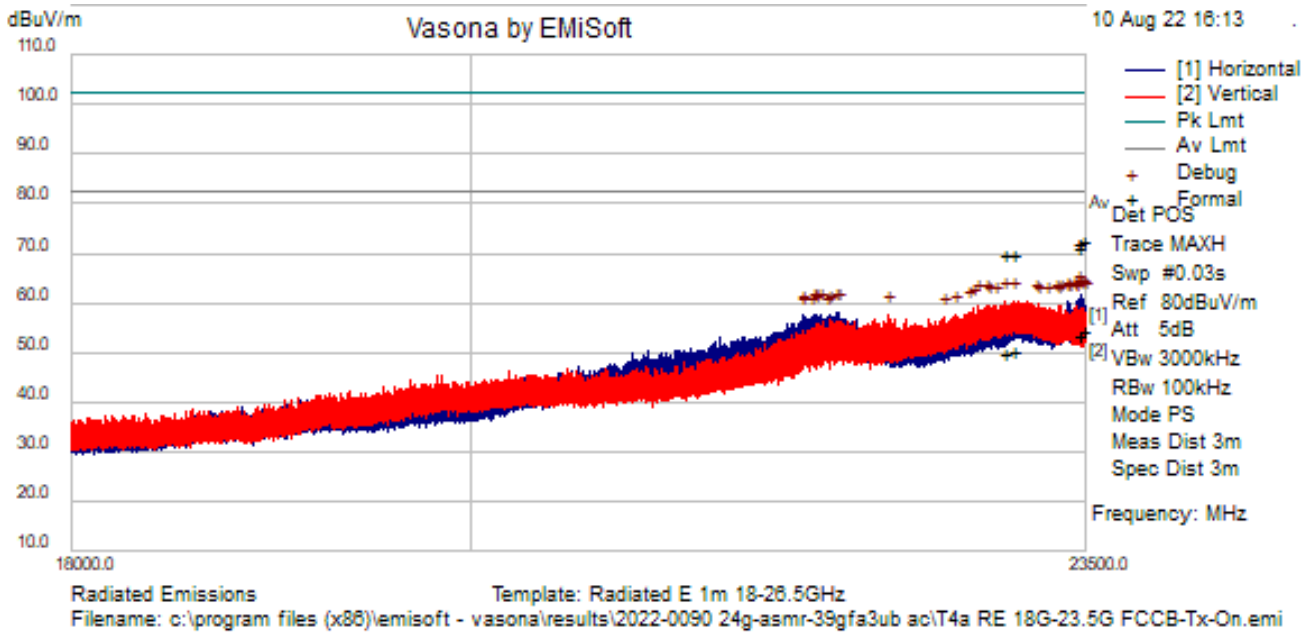
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
10456.846	41.01	11.54	-1.10	51.44	PeakMax	H	128	221	102.23	-50.79	Pass	

Preview Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
15598.067	38.48	13.36	2.26	54.09	Debug	V	175	270	82.23	-28.14	Pass	
17454.800	31.22	14.42	4.91	50.55	Debug	V	175	270	82.23	-31.68	Pass	
17721.798	27.60	14.45	4.91	46.96	Debug	H	100	331	82.23	-35.27	Pass	
16202.377	28.86	14.85	2.83	46.54	Debug	H	100	331	82.23	-35.69	Pass	
10295.228	29.21	11.15	-1.39	38.98	Debug	V	100	331	82.23	-43.25	Pass	
10456.846	28.30	11.54	-1.10	38.73	Debug	H	100	331	82.23	-43.50	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

18GHz – 23.5GHz TX-On



Test Information

Results Title	Radiated E 1m 18-26.5GHz
File Name	T4a RE 18G-23.5G FCCB-Tx-On.emi
Test Laboratory	MH-AR8 32%RH, 23C, 994hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless Group
EUT Details	ASMR 24G Main + 39 GHz Extension Concurrent mode - FCC Class II
Configuration	AR8, Powered by 120VAC, 24G ASMR - AH211500018 39G Extension - YK212500175. RE 18G-23.5GHz, Tx -On, FCC Part B limits. Horn Antenna E1452, FSW85-E1384, PA-E1525, LPF'S Filter E1499. Cable set- E1501 and E502. 100k BW Pre / 1M BW Formals
Date	2022-08-10 16:13:50

Formal Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
23490.986	30.19	29.17	-4.72	54.63	AvgMax	H	165	9	82.23	-27.60	Pass	
23465.503	29.91	28.62	-4.73	53.81	AvgMax	H	176	11	82.23	-28.42	Pass	
23459.819	29.89	28.50	-4.73	53.67	AvgMax	H	178	9	82.23	-28.56	Pass	
23466.817	29.65	28.65	-4.73	53.58	AvgMax	H	177	12	82.23	-28.65	Pass	
23490.986	48.41	29.17	-4.72	72.85	PeakMax	H	165	9	102.23	-29.38	Pass	
23465.503	48.42	28.62	-4.73	72.32	PeakMax	H	176	11	102.23	-29.91	Pass	
23459.819	48.53	28.50	-4.73	72.31	PeakMax	H	178	9	102.23	-29.92	Pass	
23466.817	47.36	28.65	-4.73	71.28	PeakMax	H	177	12	102.23	-30.95	Pass	
23061.283	36.08	19.94	-5.42	50.60	AvgMax	V	178	16	82.23	-31.63	Pass	
23013.739	36.73	18.91	-5.58	50.06	AvgMax	V	180	16	82.23	-32.17	Pass	

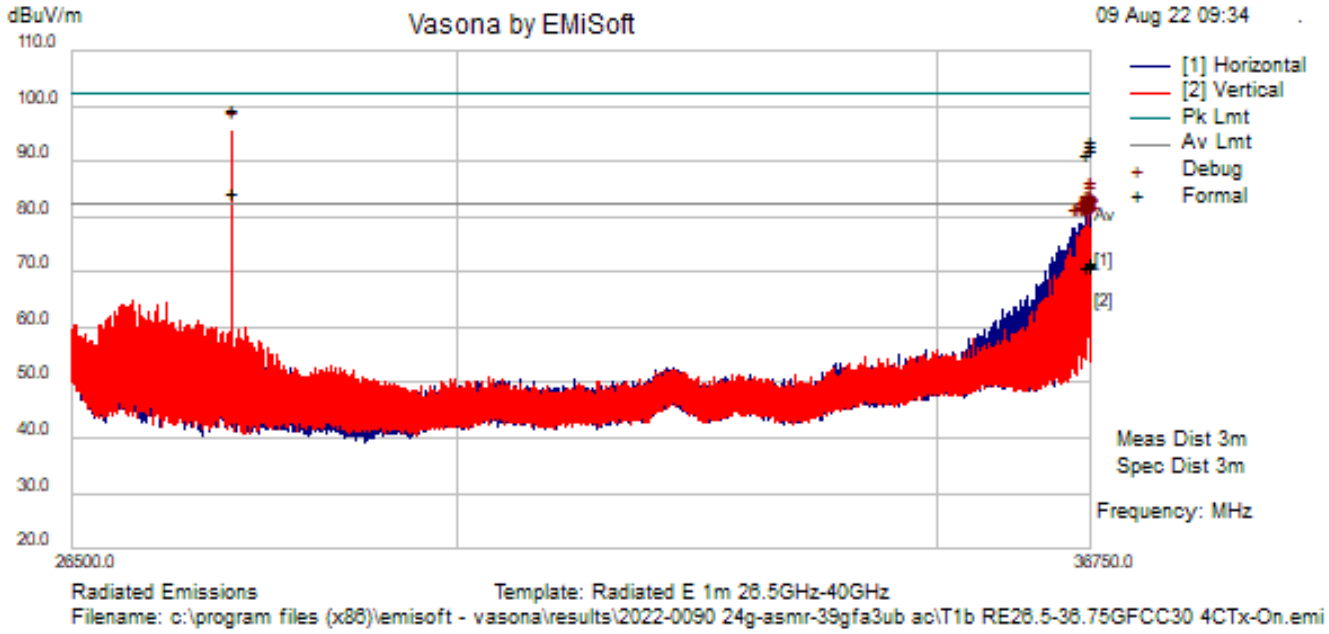
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
23013.739	56.68	18.91	-5.58	70.01	PeakMax	V	180	16	102.23	-32.22	Pass	
23061.283	55.34	19.94	-5.42	69.86	PeakMax	V	178	16	102.23	-32.37	Pass	

Preview Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
23466.817	37.58	28.65	-4.73	61.50	Debug	H	175	0	82.23	-20.73	Pass	
23490.986	36.15	29.17	-4.72	60.60	Debug	H	175	0	82.23	-21.63	Pass	
23465.503	36.62	28.62	-4.73	60.51	Debug	H	175	0	82.23	-21.72	Pass	
23459.819	36.60	28.50	-4.73	60.37	Debug	H	175	0	82.23	-21.86	Pass	
23013.739	46.91	18.91	-5.58	60.24	Debug	V	175	0	82.23	-21.99	Pass	
23061.283	45.62	19.94	-5.42	60.14	Debug	V	175	0	82.23	-22.09	Pass	
23439.897	36.75	28.08	-4.74	60.09	Debug	H	175	0	82.23	-22.14	Pass	
23470.575	36.08	28.73	-4.73	60.08	Debug	H	175	0	82.23	-22.15	Pass	
23391.406	37.78	27.04	-4.75	60.07	Debug	H	175	0	82.23	-22.16	Pass	
23500.000	35.34	29.36	-4.72	59.98	Debug	H	175	0	82.23	-22.25	Pass	
23205.933	41.72	23.06	-5.03	59.76	Debug	V	175	0	82.23	-22.47	Pass	
23410.747	36.91	27.46	-4.74	59.62	Debug	H	175	0	82.23	-22.61	Pass	
23393.361	37.28	27.09	-4.75	59.61	Debug	H	175	0	82.23	-22.62	Pass	
23450.744	35.97	28.31	-4.73	59.55	Debug	V	175	0	82.23	-22.68	Pass	
23442.800	36.08	28.14	-4.73	59.48	Debug	H	175	0	82.23	-22.75	Pass	
22852.008	48.02	17.29	-5.89	59.42	Debug	V	175	0	82.23	-22.81	Pass	
23355.044	37.94	26.27	-4.79	59.41	Debug	V	175	0	82.23	-22.82	Pass	
23329.500	38.51	25.72	-4.82	59.41	Debug	V	175	0	82.23	-22.82	Pass	
22897.414	47.50	17.70	-5.81	59.39	Debug	V	175	0	82.23	-22.84	Pass	
22957.761	46.82	18.23	-5.70	59.35	Debug	V	175	0	82.23	-22.88	Pass	
22911.622	47.26	17.82	-5.78	59.30	Debug	V	175	0	82.23	-22.93	Pass	
23344.778	37.92	26.05	-4.80	59.17	Debug	V	175	0	82.23	-23.06	Pass	
23211.617	40.98	23.19	-5.02	59.15	Debug	V	175	0	82.23	-23.08	Pass	
23276.914	39.31	24.59	-4.89	59.01	Debug	V	175	0	82.23	-23.22	Pass	
22822.736	47.72	17.03	-5.94	58.81	Debug	V	175	0	82.23	-23.42	Pass	
22794.350	47.30	16.77	-5.98	58.10	Debug	V	175	0	82.23	-24.13	Pass	
22013.381	51.54	13.51	-7.16	57.89	Debug	H	175	0	82.23	-24.34	Pass	
22028.597	51.47	13.53	-7.13	57.87	Debug	H	175	0	82.23	-24.36	Pass	
21924.953	51.57	13.45	-7.30	57.73	Debug	H	175	0	82.23	-24.50	Pass	
21886.086	51.54	13.43	-7.36	57.61	Debug	H	175	0	82.23	-24.62	Pass	
21897.056	51.49	13.44	-7.34	57.58	Debug	H	175	22	82.23	-24.65	Pass	
22311.358	50.22	13.89	-6.57	57.54	Debug	V	175	0	82.23	-24.69	Pass	
21975.492	51.23	13.48	-7.23	57.49	Debug	H	175	0	82.23	-24.74	Pass	
21817.122	51.56	13.39	-7.50	57.45	Debug	H	175	0	82.23	-24.78	Pass	
22716.036	47.36	16.07	-5.99	57.45	Debug	V	175	0	82.23	-24.78	Pass	
21903.961	51.04	13.44	-7.33	57.15	Debug	H	175	22	82.23	-25.08	Pass	
21828.214	51.19	13.40	-7.48	57.11	Debug	H	175	0	82.23	-25.12	Pass	
22648.080	47.64	15.46	-6.04	57.06	Debug	V	175	0	82.23	-25.17	Pass	
21966.722	50.81	13.48	-7.24	57.05	Debug	H	175	0	82.23	-25.18	Pass	
21874.200	50.98	13.42	-7.39	57.02	Debug	H	175	0	82.23	-25.21	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

26.5GHz – 36.75GHz TX-On



Test Information

Results Title	Radiated E 1m 26.5GHz-40GHz
File Name	T1b RE26.5-36.75GFCC30 4CTx-On.emi
Test Laboratory	MH-AR8 32%RH, 23C, 994hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless Group
EUT Details	ASMR 24G Main + 39 GHz Extension Concurrent mode - FCC Class II
Configuration	AR8, Powered by 120VAC, 24G ASMR - AH211500018 39G Extension - YK212500175. RE 26.5G-36.75GHz, Tx -On, FCC Part 30 limits. DR Horn Antenna E1375, FSW85-E1384, PA-E1525, HPF+ LPF'S Filters-E1361, E1362, E1472, E1473. Cable set - E1501 and E502. 100k BW Pre / 1M BW Formals
Date	2022-08-09 09:34:51

Formal Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
27899.239	65.24	19.23	-0.09	84.39	AvgMax	V	170	7	82.23	2.16	Fail	Passed TRP, 2022-0036
36745.274	49.25	24.81	-2.01	72.06	AvgMax	H	175	236	82.23	-10.17	Pass	
36742.654	49.21	24.81	-2.00	72.02	AvgMax	H	174	239	82.23	-10.21	Pass	
36743.224	48.85	24.81	-2.00	71.66	AvgMax	H	174	247	82.23	-10.57	Pass	
36688.500	68.45	24.73	-1.76	91.42	PeakMax	H	178	241	102.23	-10.81	Pass	
36746.071	48.46	24.81	-2.02	71.26	AvgMax	H	168	234	82.23	-10.97	Pass	
36688.500	47.96	24.73	-1.76	70.93	AvgMax	H	178	241	82.23	-11.30	Pass	

Preview Data

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
27899.239	76.18	19.23	-0.09	95.32	Debug	V	175	0	82.23	13.09	Fail	
36746.071	59.79	24.81	-2.02	82.59	Debug	H	175	242	82.23	0.36	Fail	
36742.654	59.67	24.81	-2.00	82.48	Debug	H	175	242	82.23	0.25	Fail	
36745.274	58.95	24.81	-2.01	81.75	Debug	H	175	242	82.23	-0.48	Pass	
36743.224	57.49	24.81	-2.00	80.29	Debug	H	175	242	82.23	-1.94	Pass	
36688.500	57.26	24.73	-1.76	80.23	Debug	H	175	242	82.23	-2.00	Pass	
36718.111	57.08	24.77	-1.89	79.96	Debug	H	175	242	82.23	-2.27	Pass	
36728.532	57.08	24.79	-1.94	79.93	Debug	V	175	242	82.23	-2.30	Pass	
36722.439	56.79	24.78	-1.91	79.66	Debug	H	175	242	82.23	-2.57	Pass	
36748.975	56.81	24.82	-2.03	79.60	Debug	H	150	242	82.23	-2.63	Pass	
36721.528	56.67	24.78	-1.91	79.54	Debug	H	150	242	82.23	-2.69	Pass	
36735.479	56.68	24.80	-1.97	79.51	Debug	V	175	242	82.23	-2.72	Pass	
36749.772	56.67	24.82	-2.03	79.46	Debug	H	150	242	82.23	-2.77	Pass	
36736.960	56.64	24.80	-1.98	79.46	Debug	V	175	242	82.23	-2.77	Pass	
36691.518	56.50	24.73	-1.78	79.46	Debug	H	200	242	82.23	-2.77	Pass	
36744.590	56.62	24.81	-2.01	79.42	Debug	H	175	242	82.23	-2.81	Pass	
36721.756	56.55	24.78	-1.91	79.42	Debug	H	150	242	82.23	-2.81	Pass	
36740.263	56.60	24.81	-1.99	79.41	Debug	H	150	242	82.23	-2.82	Pass	
36743.451	56.57	24.81	-2.00	79.37	Debug	H	175	242	82.23	-2.86	Pass	
36746.526	56.43	24.81	-2.02	79.23	Debug	H	175	242	82.23	-3.00	Pass	
36698.181	56.28	24.74	-1.81	79.22	Debug	H	175	242	82.23	-3.01	Pass	
36706.324	56.29	24.76	-1.84	79.20	Debug	H	200	242	82.23	-3.03	Pass	
36709.228	56.26	24.76	-1.86	79.16	Debug	H	175	242	82.23	-3.07	Pass	
36692.144	56.16	24.74	-1.78	79.12	Debug	H	175	242	82.23	-3.11	Pass	
36695.675	56.11	24.74	-1.80	79.05	Debug	H	175	242	82.23	-3.18	Pass	
36729.785	56.16	24.79	-1.95	79.00	Debug	H	150	242	82.23	-3.23	Pass	
36714.751	56.06	24.77	-1.88	78.95	Debug	H	150	242	82.23	-3.28	Pass	
36640.894	55.76	24.66	-1.54	78.88	Debug	H	175	242	82.23	-3.35	Pass	
36622.558	55.60	24.63	-1.45	78.78	Debug	H	175	242	82.23	-3.45	Pass	
36644.482	55.66	24.67	-1.55	78.78	Debug	H	175	242	82.23	-3.45	Pass	
36745.729	55.94	24.81	-2.01	78.74	Debug	H	175	242	82.23	-3.49	Pass	
36705.014	55.80	24.75	-1.84	78.72	Debug	H	175	242	82.23	-3.51	Pass	
36719.649	55.76	24.78	-1.90	78.63	Debug	H	175	242	82.23	-3.60	Pass	
36713.100	55.52	24.77	-1.87	78.42	Debug	H	150	242	82.23	-3.81	Pass	
36738.497	55.49	24.80	-1.98	78.31	Debug	H	150	242	82.23	-3.92	Pass	
36719.307	55.40	24.78	-1.90	78.28	Debug	H	150	242	82.23	-3.95	Pass	
36699.547	55.34	24.75	-1.81	78.27	Debug	H	175	242	82.23	-3.96	Pass	
36685.026	55.27	24.73	-1.74	78.25	Debug	H	175	242	82.23	-3.98	Pass	
36696.529	55.25	24.74	-1.80	78.19	Debug	V	175	242	82.23	-4.04	Pass	
36743.736	55.38	24.81	-2.01	78.18	Debug	H	175	242	82.23	-4.05	Pass	
36740.889	55.34	24.81	-1.99	78.15	Debug	H	150	242	82.23	-4.08	Pass	
36725.514	55.29	24.78	-1.93	78.15	Debug	H	150	242	82.23	-4.08	Pass	
36708.089	55.16	24.76	-1.85	78.06	Debug	H	175	242	82.23	-4.17	Pass	
36748.633	55.19	24.82	-2.03	77.98	Debug	H	175	242	82.23	-4.25	Pass	
36630.189	54.81	24.65	-1.48	77.97	Debug	H	175	242	82.23	-4.26	Pass	
36747.836	55.11	24.82	-2.02	77.90	Debug	H	175	242	82.23	-4.33	Pass	
36679.731	54.89	24.72	-1.72	77.89	Debug	H	175	242	82.23	-4.34	Pass	

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail	Comments
36702.224	54.92	24.75	-1.83	77.84	Debug	H	175	242	82.23	-4.39	Pass	
36662.818	54.78	24.69	-1.64	77.83	Debug	V	175	242	82.23	-4.40	Pass	
36580.078	54.51	24.57	-1.27	77.81	Debug	H	175	242	82.23	-4.42	Pass	
36696.871	54.84	24.74	-1.80	77.78	Debug	H	175	242	82.23	-4.45	Pass	
36648.867	54.68	24.67	-1.57	77.78	Debug	H	175	242	82.23	-4.45	Pass	
36742.939	54.96	24.81	-2.00	77.77	Debug	H	175	242	82.23	-4.46	Pass	
36546.879	54.37	24.52	-1.14	77.75	Debug	H	175	242	82.23	-4.48	Pass	
36742.369	54.92	24.81	-2.00	77.73	Debug	H	175	242	82.23	-4.50	Pass	
36626.943	54.55	24.64	-1.47	77.72	Debug	H	175	242	82.23	-4.51	Pass	
36572.390	54.34	24.56	-1.24	77.66	Debug	H	175	242	82.23	-4.57	Pass	
36698.522	54.65	24.74	-1.81	77.59	Debug	H	175	242	82.23	-4.64	Pass	
36678.819	54.57	24.72	-1.72	77.57	Debug	H	175	242	82.23	-4.66	Pass	
36667.886	54.49	24.70	-1.66	77.53	Debug	V	175	242	82.23	-4.70	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

Maximum Measured Radiated Emissions -U Band 40GHz-60GHz FCC B Part 30

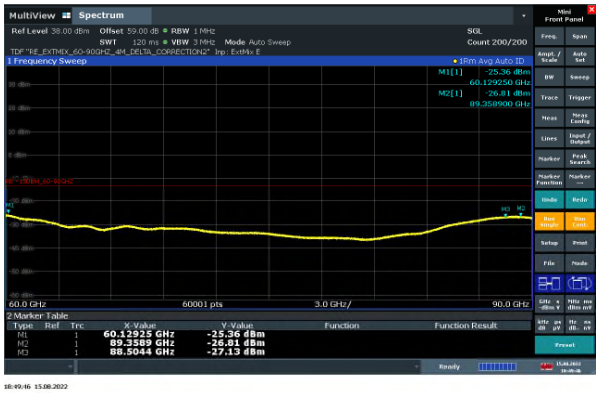
Horizontal Polarization – ASMR (20 deg)

Vertical Polarization - ASMR (100 deg)

Maximum Measured Radiated Emissions -U Band 60GHz-90GHz FCC B Part 30

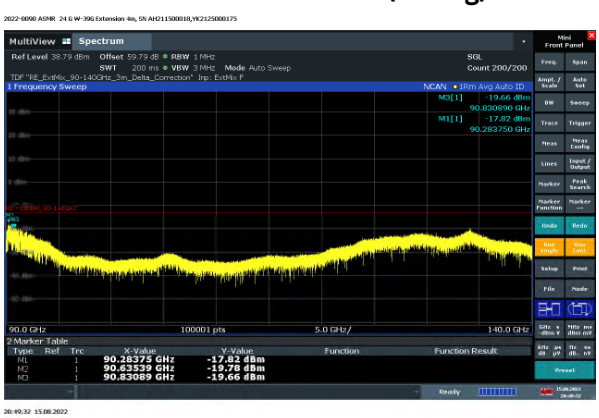
Horizontal Polarization - ASMR (200 deg)

Vertical Polarization - ASMR (150 deg)

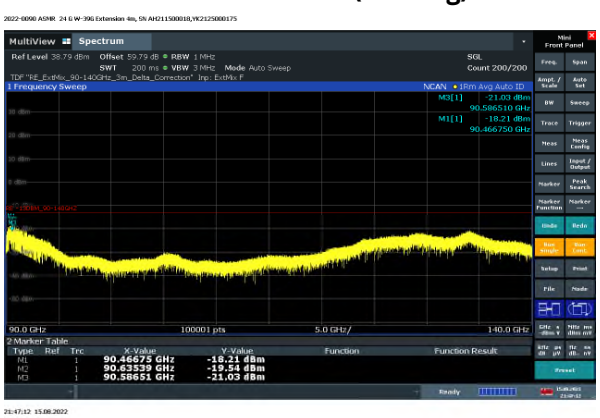


Maximum Measured Radiated Emissions -U Band 90GHz-140GHz FCC B Part 30

Horizontal Polarization - ASMR (50 deg)

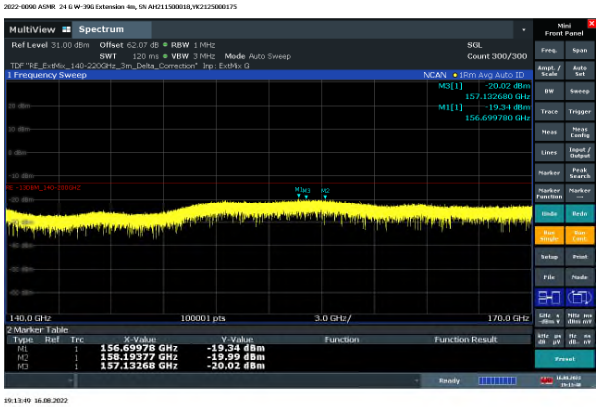


Vertical Polarization - ASMR (200 deg)

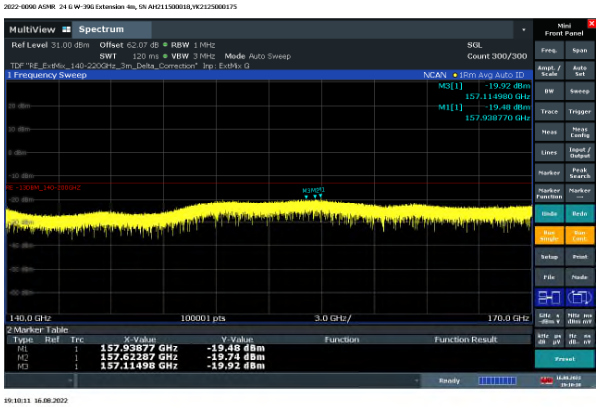


Maximum Measured Radiated Emissions -U Band 140GHz-170GHz FCC B Part 30

Horizontal Polarization - ASMR (10 deg)

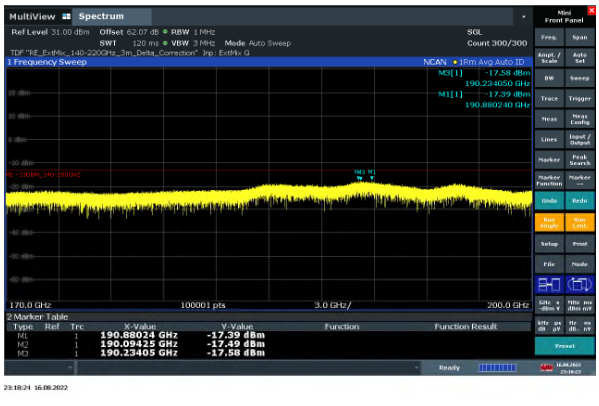


Vertical Polarization - ASMR (10 deg)

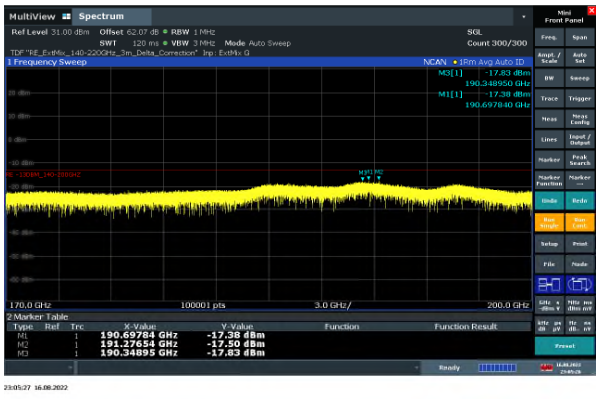


Maximum Measured Radiated Emissions -U Band 170GHz-200GHz FCC B Part 30

Horizontal Polarization - ASMR (2 deg)

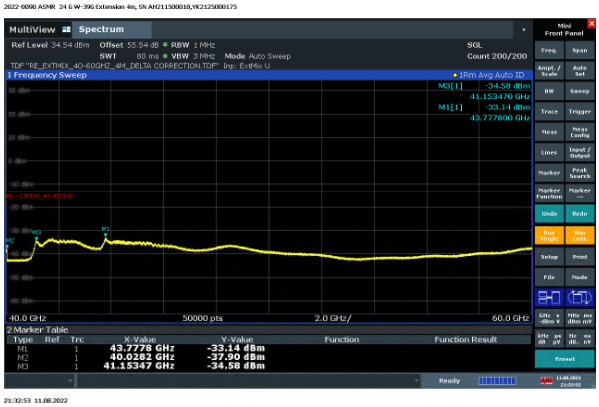


Vertical Polarization - ASMR (20 deg)



Maximum Measured Radiated Emissions -U Band 40GHz-60GHz FCC B Part 30

Horizontal Polarization – FA3WA (245 deg)

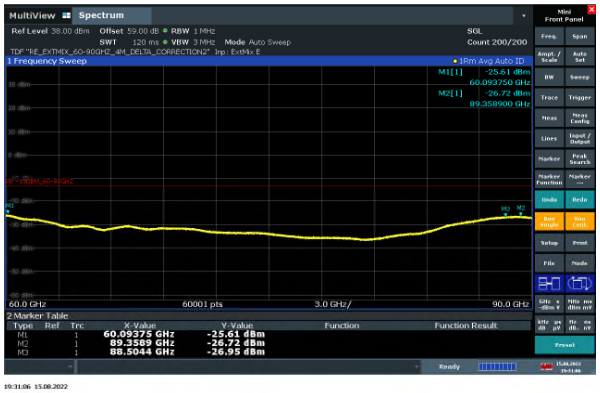


Vertical Polarization – FA3WA (234 deg)

Maximum Measured Radiated Emissions -U Band 60GHz-90GHz FCC B Part 30

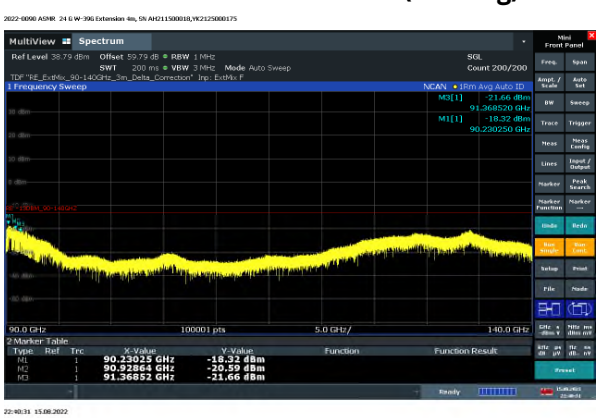
Horizontal Polarization - FA3WA (245 deg)

Vertical Polarization - FA3WA (250 deg)

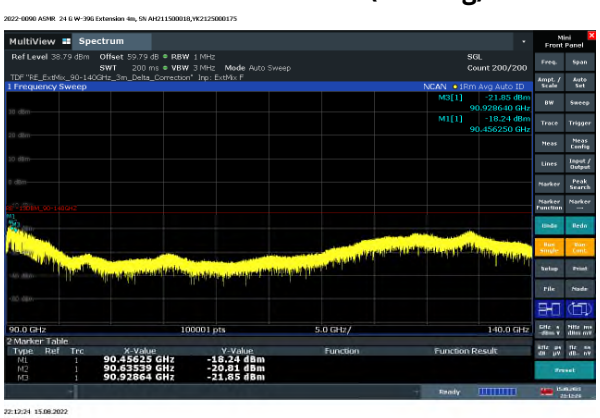


Maximum Measured Radiated Emissions -U Band 90GHz-140GHz FCC B Part 30

Horizontal Polarization - FA3WA (250 deg)

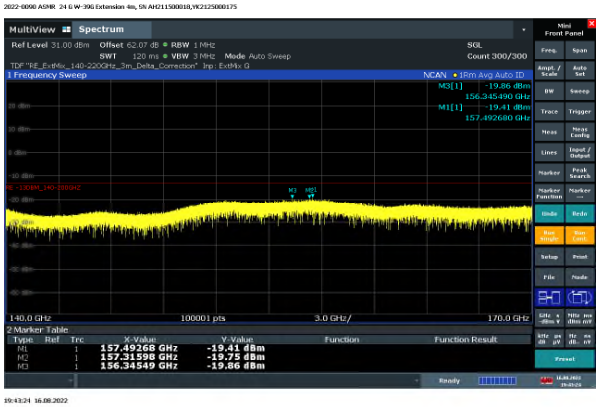


Vertical Polarization - FA3WA (230 deg)

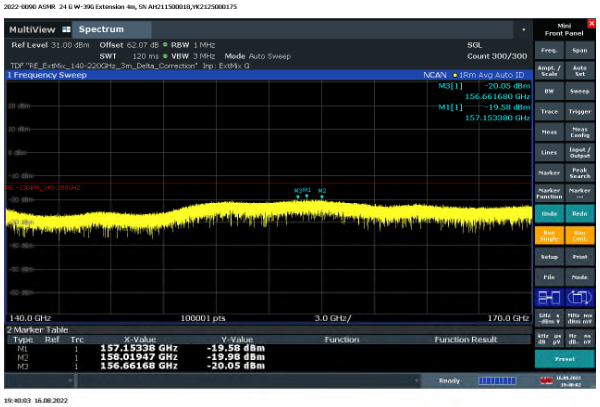


Maximum Measured Radiated Emissions -U Band 140GHz-170GHz FCC B Part 30

Horizontal Polarization - FA3WA (220 deg)

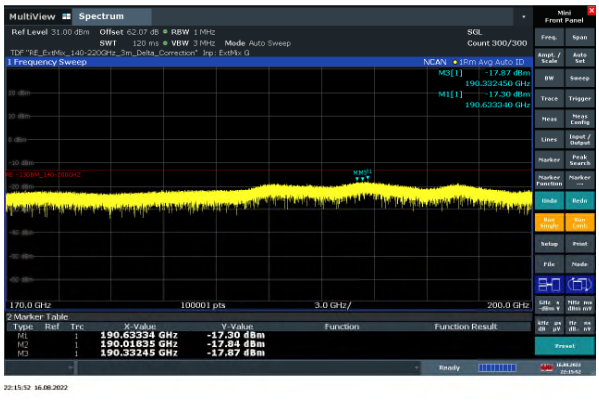


Vertical Polarization - FA3WA (220 deg)

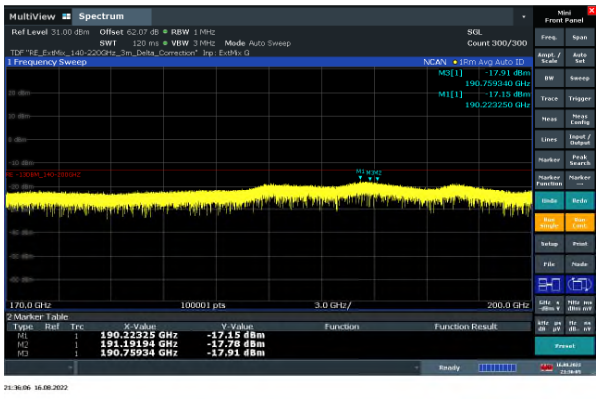


Maximum Measured Radiated Emissions -U Band 170GHz-200GHz FCC B Part 30

Horizontal Polarization - FA3WA (230 deg)



Vertical Polarization - FA3WA (250 deg)



4.5 Section 2.1055 MEASUREMENT OF FREQUENCY STABILITY

Frequency Stability was not performed.

4.6 List of Test Equipment

4.6.1 List of Radio Measurements Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1461	A-Info	Horn Antenna	22 - 33 GHz WR34 25dB	LB-34-25-C2-KF	J202026030	2022-01-25	2024-01-25
E1375	A-Info	Horn Antenna	26.5-40GHz WR28 25 dB	LB-28-25-C2-KF	J202023249	2020-07-27	2023-07-27
E1255	ETS Lindgren	Multi-Device Controller		2090	00078509	CNR	CNR
E1119	Extech	Data Logger	Pressure Humidity Temp data logger	SD700	Q668960	2021-01-11	2023-01-11
E1384	Rohde & Schwarz	Spectrum Analyzer	2 Hz to 85 GHz (with R&S®FSW-B90G option: 2 Hz to 90 GHz)	FSW85	101537	2020-08-25	2022-08-25
E772	Sunol Sciences Corp	Modular Controller		SC104V	0	CNR	CNR

CNR: Calibration Not Required
Test Dates: 7/25/2022 – 8/8/2022

4.6.2 List of Radiated Emissions Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1452	A-Info	Horn Antenna	18 to 26.5 GHz WR42 25 dB	LB-42-25-C2-KF	J202066361	2020-07-24	2023-07-24
E1375	A-Info	Horn Antenna	26.5-40GHz WR28 25 dB	LB-28-25-C2-KF	J202023249	2020-07-27	2023-07-27
E1525	A.H. Systems Inc.	Pre-Amplifier	18 GHz-40 GHz, 37 dB	PAM-1840VH	186	2020-11-30	2022-11-30
E1073	ETS Lindgren	Horn Antenna	Double-Ridged Waveguide Horn 1-18 GHz	3117	00135198	2022-01-04	2024-01-04
E1255	ETS Lindgren	Multi-Device Controller		2090	00078509	CNR	CNR
E1119	Extech	Data Logger	Pressure Humidity Temp data logger	SD700	Q668960	2021-01-11	2023-01-11

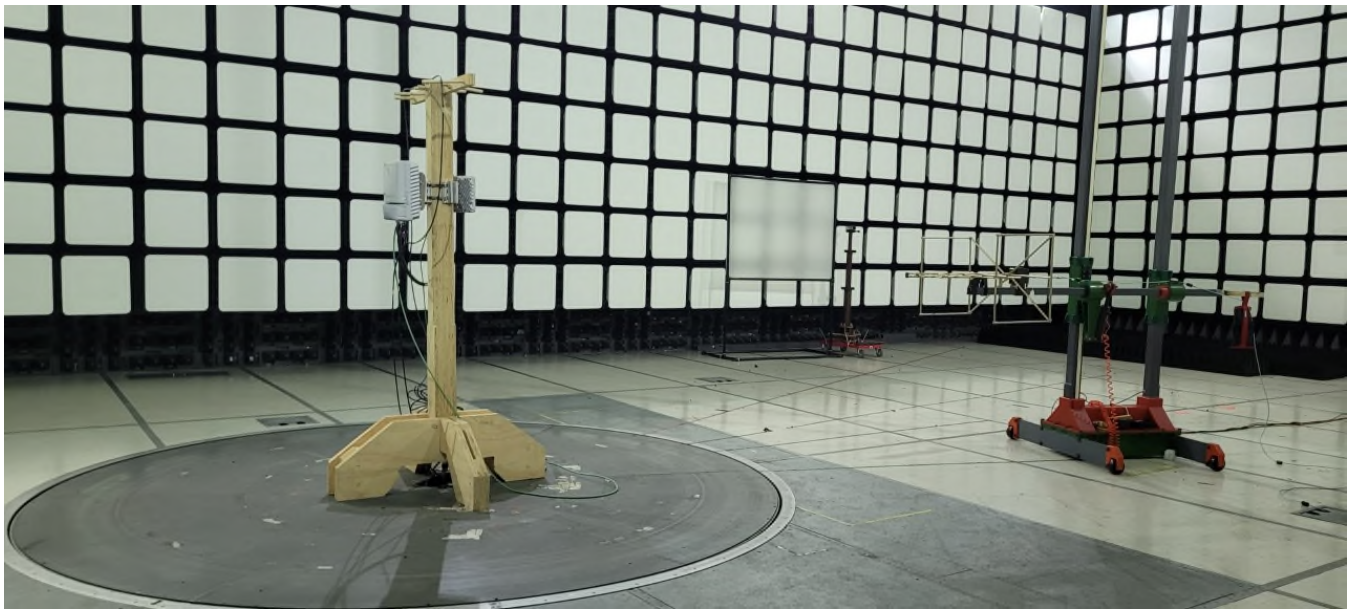
Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E447	Hewlett Packard	Pre-Amplifier	Preamplifier 1-26.5 GHz	8449B	3008A01384	2020-08-31	2022-08-31
E1361	Marki Microwave	Filter, Low Pass	DC - 36.6 GHz, 1W, 1.8 dB	FLP-3660	N/A	CNR-V	CNR-V
E1362	Marki Microwave	Filter, Low Pass	DC - 36.6 GHz, 1W, 1.8 dB	FLP-3660	N/A	CNR-V	CNR-V
E1472	Reactel, Inc.	Filter, High Pass	1 - 27 GHz, 2dB	11HS-X27G-K11	SN20-02	CNR-V	CNR-V
E1473	Reactel, Inc.	Filter, High Pass	DC - 27 GHz	11HS-X27G-K11	SN20-02	CNR-V	CNR-V
E1475	Reactel, Inc.	Filter, Low Pass	DC - 20 GHz	11LS-X20GS11	SN20-02	CNR-V	CNR-V
E1499	Reactel, Inc.	Filter, Low Pass	DC - 22 GHz, 1 dB	11LS-X22-6GK11	20-02	NA	NA
E1384	Rohde & Schwarz	Spectrum Analyzer	2 Hz to 85 GHz (with R&S®FSW-B90G option: 2 Hz to 90 GHz)	FSW85	101537	2020-08-25	2022-08-25
E772	Sunol Sciences Corp	Modular Controller		SC104V	0	CNR	CNR
E766	A.H. Systems Inc.	Bilogical Antenna	25 - 2000 MHz	SAS-521-2	457	2021-05-18	2023-05-18
E954	Rohde & Schwarz	Test Receiver	EMI 20Hz - 40GHz -155 dBm +30 dBm	ESU40	100246	2020-08-03	2022-09-03
E812	Sonoma Instrument Co.	Amplifier	9kHz-1GHz	310N	186744	2020-10-20	2022-10-20
E1268	Trilithic	Filter, Low Pass	DC - 1620 MHz	23042	200802040	CNR-V	CNR-V

CNR: Calibration Not Required
CNR-V: Calibration Not Required, Must Be Verified
Test Dates: 8/9/2022 – 8/19/2022

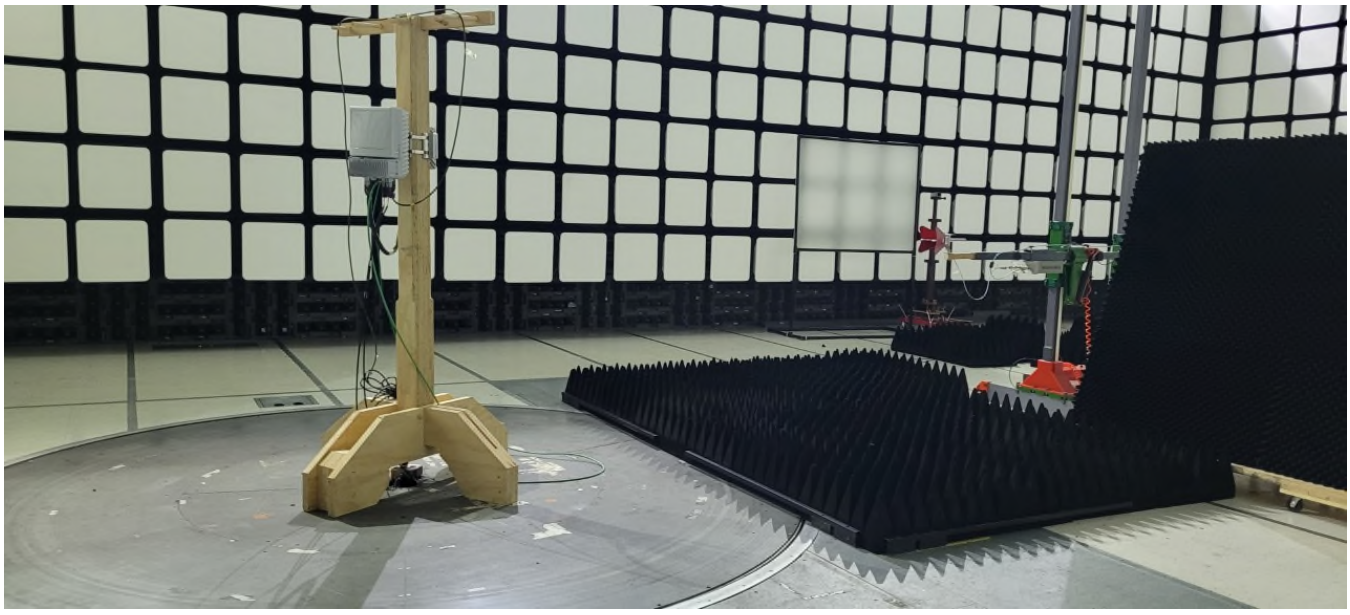
4.7 PHOTOGRAPHS OF THE TEST SETUPS

Radiated Emissions Test

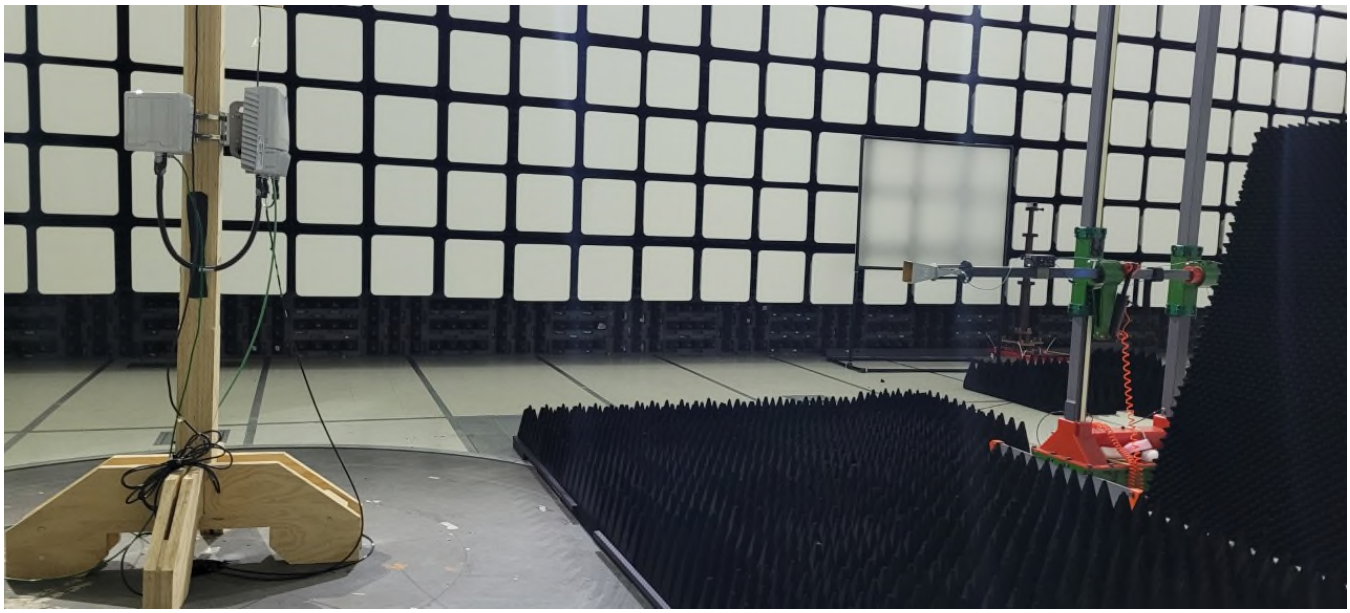
30 MHz-1 GHz



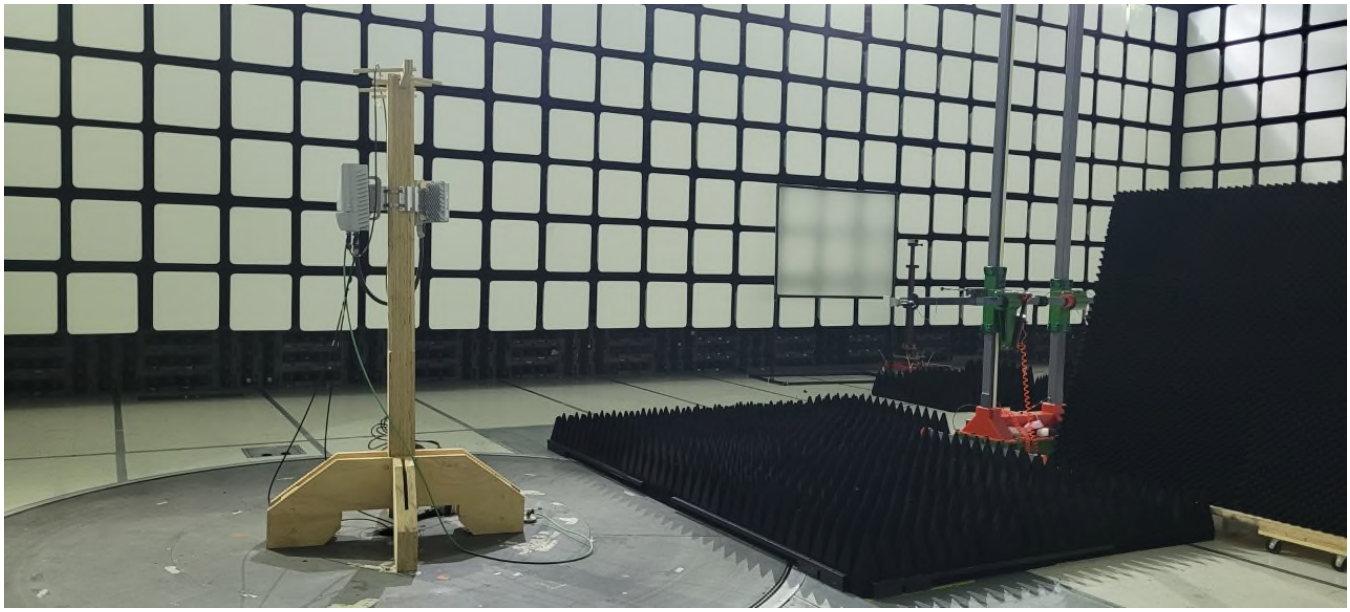
1 GHz – 18 GHz



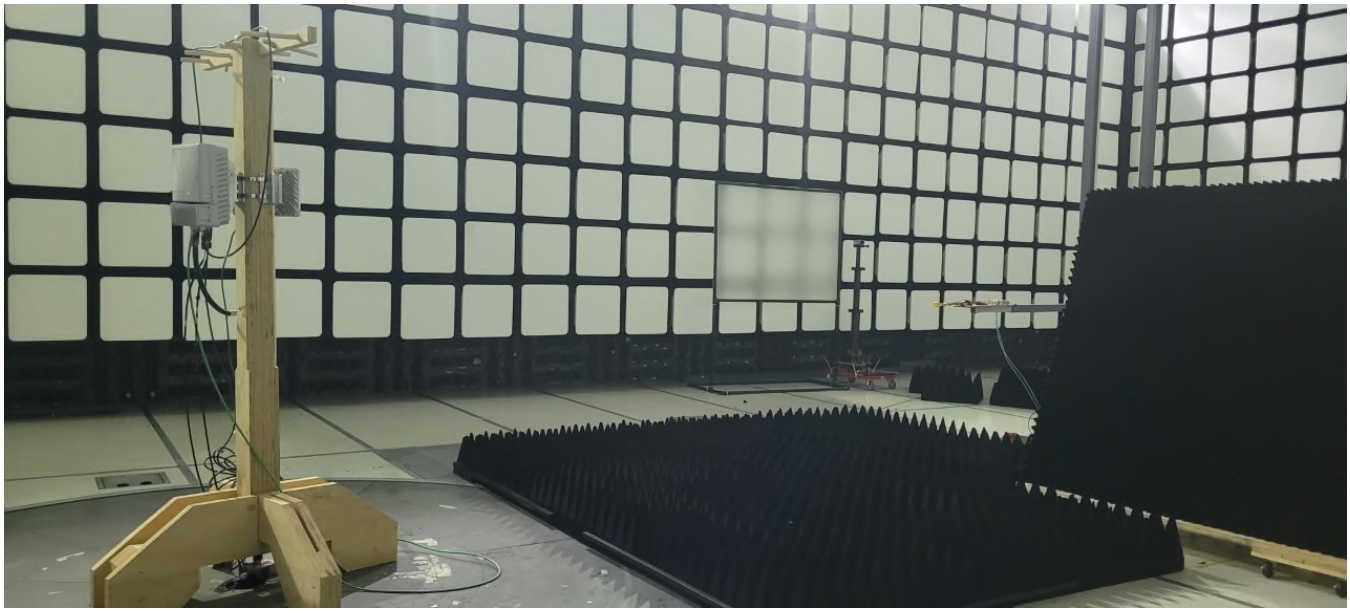
18GHz-26.5GHz



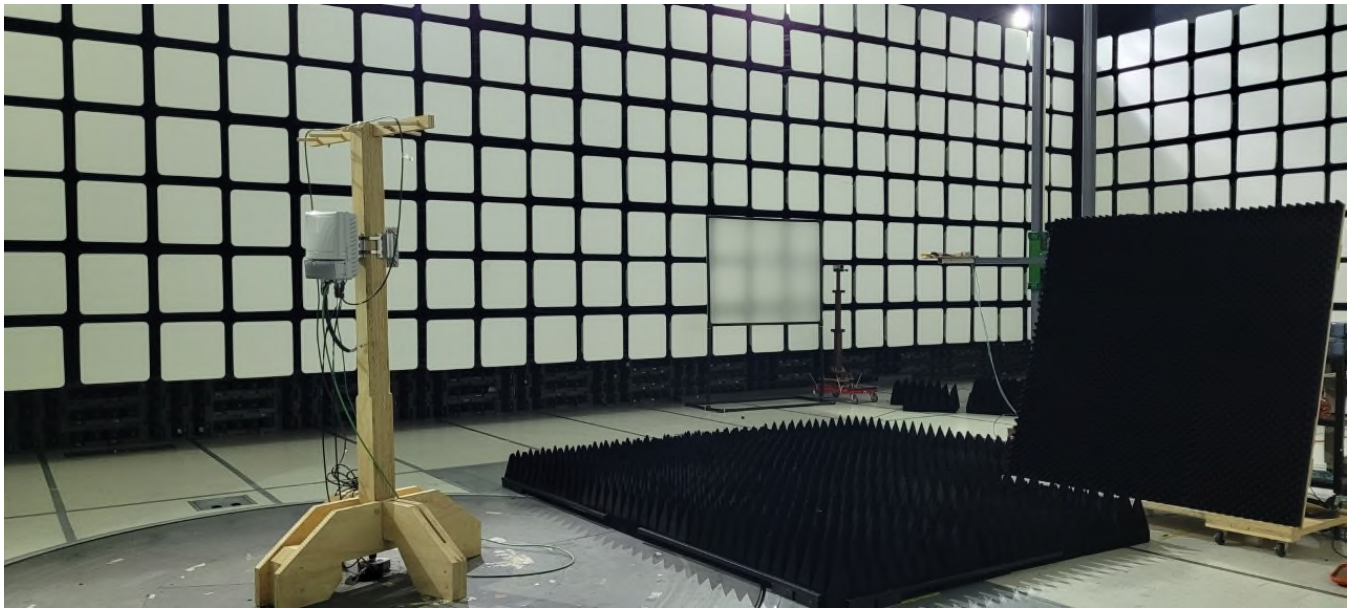
26.5GHz-40 GHz



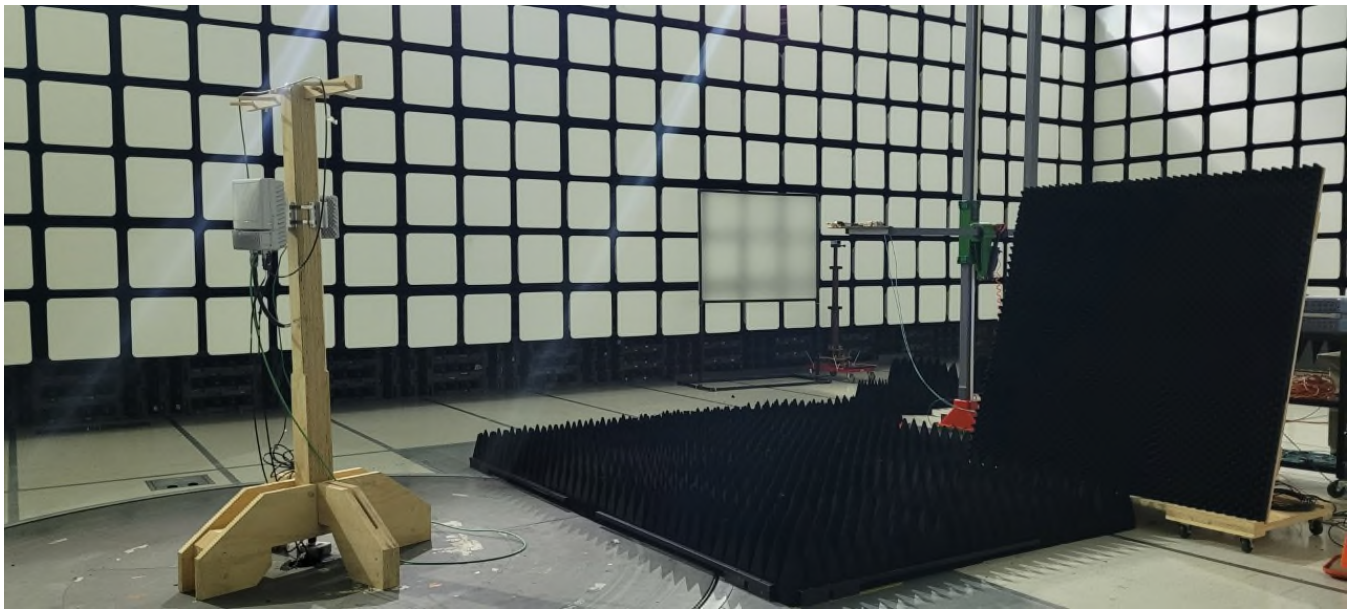
40GHz-60 GHz



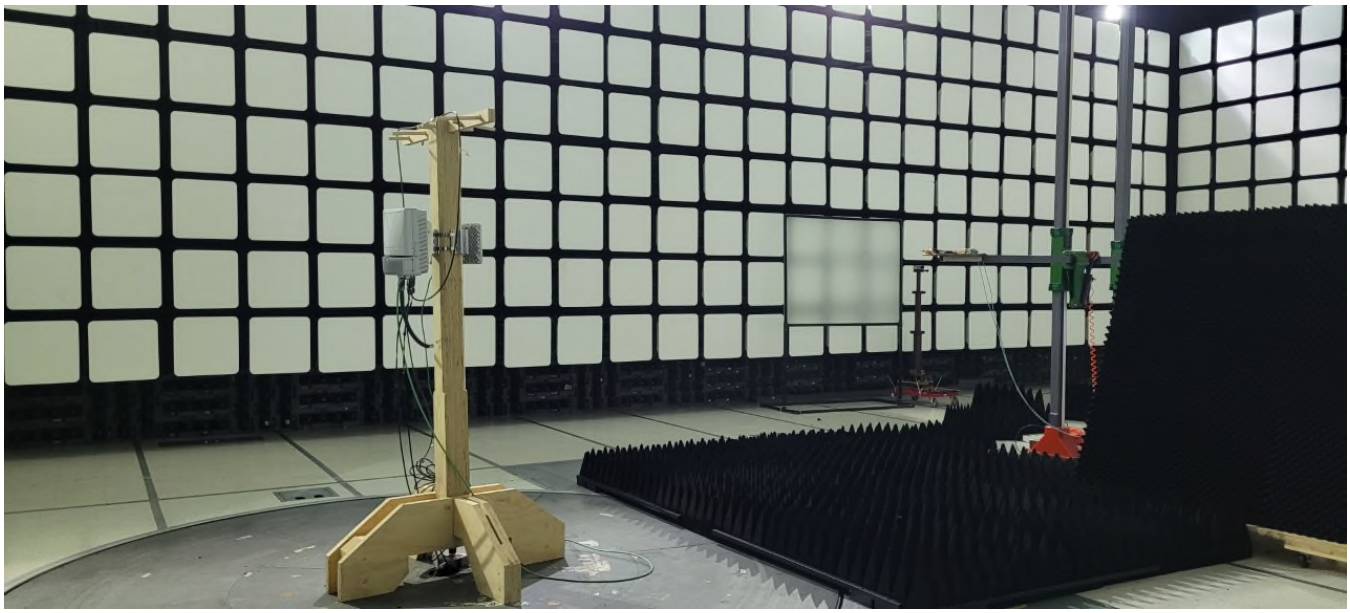
60GHz-90 GHz



90GHz-140 GHz

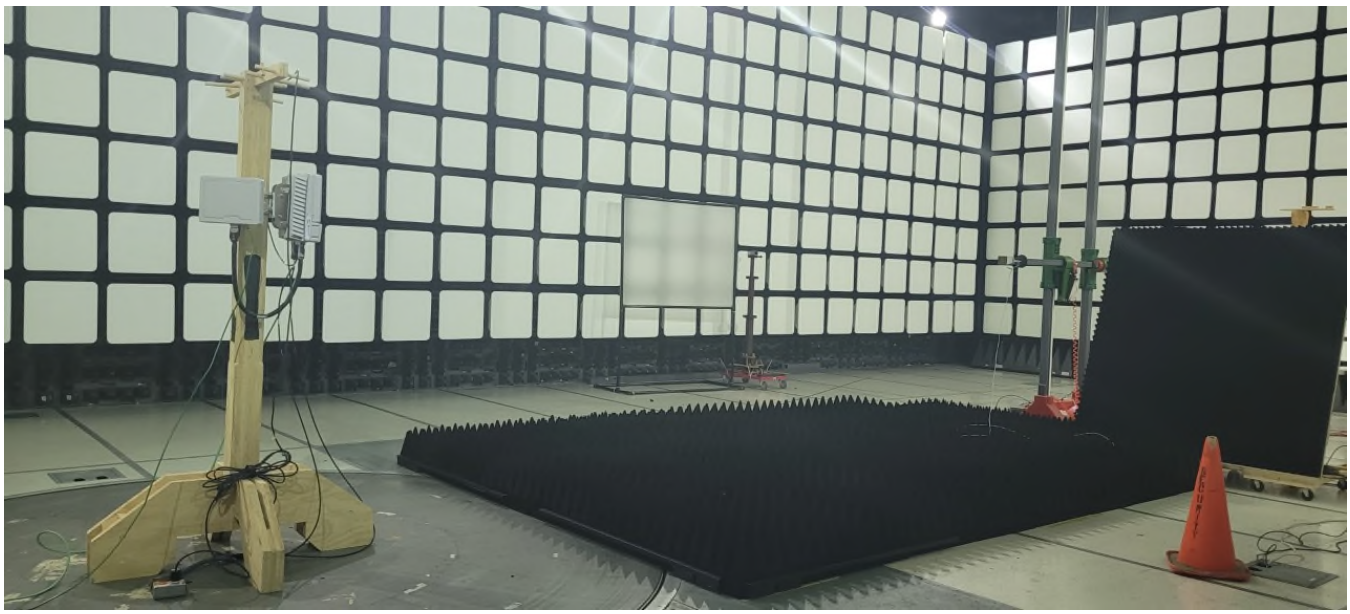


140GHz-200 GHz

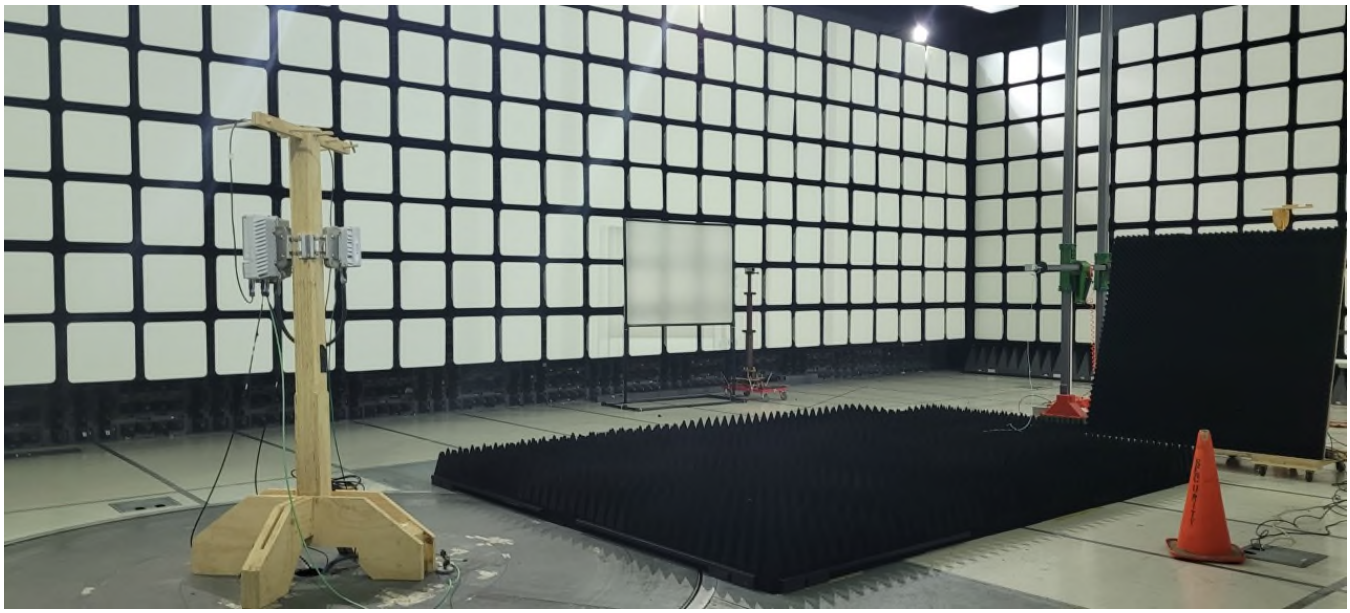


Radio Testing

24GHz ASMR



39GHz FA3WA



4.8 FACILITIES AND ACCREDITATION

Measurement facilities at Nokia, Global Product Compliance Laboratory (GPCL) a member of the Nokia family of companies, was used to collect the measurement data in the test report. The laboratory, which is part of Nokia Bell Labs, is located at 600-700 Mountain Avenue, Murray Hill, New Jersey 07974-0636 USA.

The field strength measurements of radiated spurious emissions were made in a FCC registered 10 meter semi-anechoic chamber AR-8, (FCC Registration Number: 395774) **NVLAP** Lab Code: 100275-0 and IC (Filing Number: 6933F-8) which is maintained by Nokia Bell Labs in Murray Hill, New Jersey. The sites were constructed and are continuously in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

Nokia Global Product Compliance Laboratory FCC OET Accredited Test Firm Scope List is accessible at:

https://apps.fcc.gov/oetcf/eas/reports/ViewTestFirmAccredScopes.cfm?calledFromFrame=N&RequestTimeout=500&regnum_specified=N&test_firm_id=7007

and is as listed in the Table below.

OET Accredited Test Firm Scope List

Test Firm: Nokia, Global Product Compliance Lab

Scope	FCC Rule Parts	Maximum Assessed Frequency, MHz	Status	Expiration Date	Recognition Date
Unintentional Radiators	FCC Part15, Subpart B	40000	Approved	9/30/2022	7/6/2017
Intentional Radiators	FCC Part 15 Subpart C	40000	Approved	9/30/2022	6/5/2018
U-NII without DFS Intentional Radiators	FCC Part 15, Subpart E	40000	Approved	9/30/2022	6/5/2018
U-NII with DFS Intentional Radiators	FCC Part 15, Subpart E	40000	Approved	9/30/2022	6/5/2018
Commercial Mobile Services	Part 22 (cellular), Part 24, Part 25 (below 3 GHz), Part 27	40000	Approved	9/30/2022	6/5/2018
General Mobile Radio Services	Part 22 (non-cellular), Part 90 (below 3 GHz), Part 95 (below 3 GHz), Part 97 (below 3 GHz), Part 101 (below 3 GHz)	40000	Approved	9/30/2022	6/5/2018
Citizens Broadband Radio Services	Part 30	40000	Approved	9/30/2022	7/6/2017
Microwave and Millimeter Bands Radio Services	Part 25, Part30, Part 74, Part 90 (90M DSRC, Y, Z), Part 95 (M & L), Part 101	200000	Approved	9/30/2022	7/6/2017

Nokia Global Product Compliance Laboratory is accredited with the US Department of Commerce National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 7 Code of Federal Regulations for offering test services for selected test methods in Electromagnetic Compatibility; Voluntary Control Council for Interference (VCCI), Japan; Australian Communications and Media Authority (ACMA). The laboratory is ISO 9001:2008 Certified.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ilac-MRA

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 100275-0

Nokia, Global Product Compliance Lab
Murray Hill, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2021-09-24 through 2022-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program