Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
E1579	KeySight Technologies	MXA Signal Analyzer	10 Hz - 50 GHz	N9021B	MY60080199	2021-11-30	2023-11-30
E896	Agilent Technologies	Network Analyzer	10 MHz - 40 GHz	N5230C	MY49000897	2021-03-03	2023-03-03
E1534	Traceable	Data Logger	Barometric Humidity Temp Data Logger	6529	200648430	2020-10-21	2022-10-21
E1212	RLC Electronics	Filter, High Pass	10 - 30 GHz, 2W, 5dB	F-19414	1444002	CNR-V	CNR-V
E1022	Weinschel	Attenuator	10dB DC-18GHz 25W	46-10-34-LIM	BN3118	CNR-V	CNR-V
E1023	Weinschel	Attenuator	20 dB DC-18 GHz 25W	46-20-34	BJ4772	CNR-V	CNR-V
E1344	Macom	Attenuator	3 dB, DC - 4 GHz, 2W	2082-6171-03	N/A	CNR-V	CNR-V
E1155	Weinschel	Attenuator	10dB 25W 0.05- 26GHz	74-10-12	1068	CNR-V	CNR-V
E1154	Weinschel	Attenuator	30dB 25W 0.05GHz-26GHz	74-30-12	1065	CNR-V	CNR-V
E1250	Weinschel	Attenuator	3dB Attenuator 100W	24-3-43	BB9072	CNR-V	CNR-V
E1251	Aeroflex	Attenuator	30dB 150W DC-18GHz Attenuator	66-30-33	BV1667	CNR-V	CNR-V

CNR-V: Calibration Not Required, Must Be Verified
Test Dates: 7/20/22 – 8/2/22

6. FCC Section 2.1053 - Field strength of spurious radiation

The field strength measurements of radiated spurious emissions were made in a FCC registered 3-meter semi-anechoic chamber AR-5, (FCC Registration Number: 395774) **NVLAP** Lab Code: 100275-0 and IC (Filing Number: 6933F-5) which is maintained by Nokia Bell Labs in Murray Hill, New Jersey.

6.1 Spurious Radiation and Radiated Emissions Requirements.

This product meets Parts 2,15 and 96 requirements. FCC Part 15 Class B require emissions to be below 54.5 dBuV/m at 3m.

47CFR 96.41 (e)(1) (i) and KDB 940660 D01 Section 3.2 (b)(6) specified that the limits for the emissions outside the fundamental are as follows.

- within 0 MHz to 10 MHz above and below the assigned channel $\leqslant$ −13 dBm/MHz,
- greater than 10 MHz above and below the assigned channel $\leqslant$ −25 dBm/MHz,
- any emission below 3530 MHz and above 3720 MHz $\leqslant$ −40 dBm/MHz.

Title 47CFR section 2.1053 contains the requirements for the levels of spurious radiation as a function of the EIRP of the unmodulated carrier. The reference level for the unmodulated 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.

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

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 3 m
P = Emission Power in Watts

Hence,

$$E\ (dB\mu V/m) = EIRP\ (dBm) - 20 \log d\ (m) + 104.77.$$

For EIRP = -13dBm/MHz, E = 82.2 dBμV/m,
For EIRP = -25dBm/MHz, E = 70.2 dBμV/m,
For EIRP = -40dBm/MHz, E = 55.2 dBμV/m.

The field strength of radiated spurious emissions measured was determined by

$$E\ (dB\mu V/m) = V_{meas}\ (dB\mu V) + \text{Cable Loss (dB)} + \text{Antenna Factor (dBi/m)}.$$

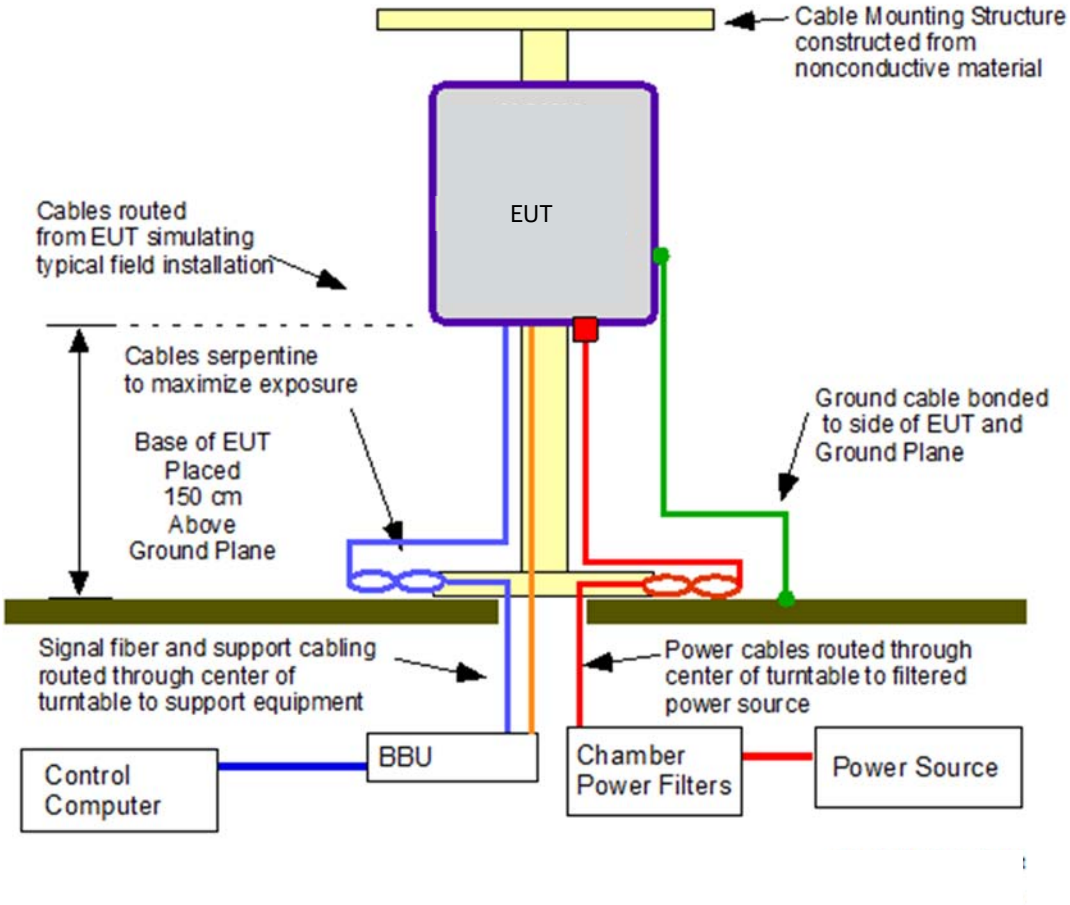
Field strength measurements of radiated spurious emissions were made in the 3m semi-anechoic chamber, AR-5 as detailed above. The recommendations of ANSI C63.4 and ANSI C63.26 were followed for EUT testing setup, cabling, and measurement approach and procedures. All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in section 6.2.

6.2 Field Strength of Spurious Radiation Results:

This product meets Part 96 Requirements. For the Title 47CFR section 90.1323 and 2.1053 test, the field strength of any spurious radiation, measured at 3m, is required to be less than 102.23dBμV/meter. Emissions equal to or less than 82.23 dBμV/meter are not reportable and may be verified using field strength measurements with broadband antennas.

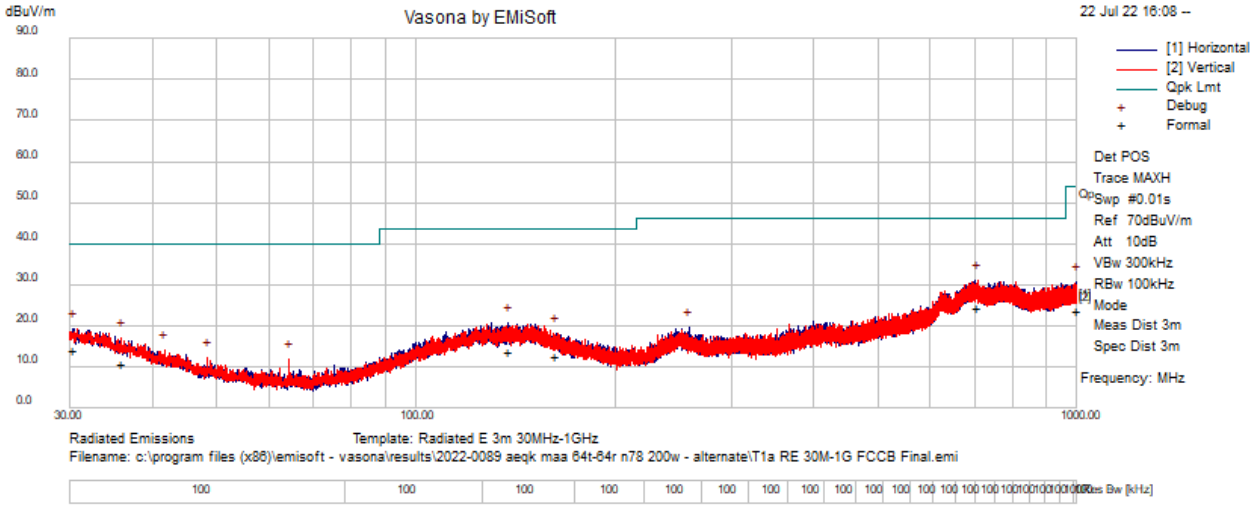
Over the out of band spectrum investigated from 10 MHz to beyond the tenth harmonic of the carrier (37GHz), no reportable spurious emissions were detected. Additionally, from 10 MHz to beyond the tenth harmonic of the carrier (37GHz), all non-transmit carrier emissions were below 54.5 dBμV/m. This demonstrates that the AirScale Micro RRH 3.5GHz 4T/4R 20W (AZQC), complies with FCC Part 15 Class B, and FCC Sections 2.1053, 90.1323 and 2.1057 of the Rules.

Radiated Emission Setup



6.3 Transmitter Measurements of Radiated Spurious Emissions Plots

RE 30MHz – 1GHz



Test Information

Results Title	Radiated E 3m 30MHz-1GHz
File Name	T1a RE 30M-1G FCCB Final.emi
Test Laboratory	MH-AR4, 56%RH, 24C, 996hPa
Test Engineer	GM/MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless
EUT Details	2022-0089 AEQK MAA 64T-64R N78 200W - Alternate, Carrier Tx 3840MHz, ETM3.1A, 100MHz BW, 35dBm total power
Configuration	FCC Pt.15-B/GR1089, RE 30MHz-1GHz FCC B 3 meter distance. 10dB Int Attn, RBW: Default, VBW: Default. ESU 954, PA E812, LPF-E1268, BiLog E766, RF cables, AR4 Cable set.
Date	2022-07-22 16:08:05

Formal Data

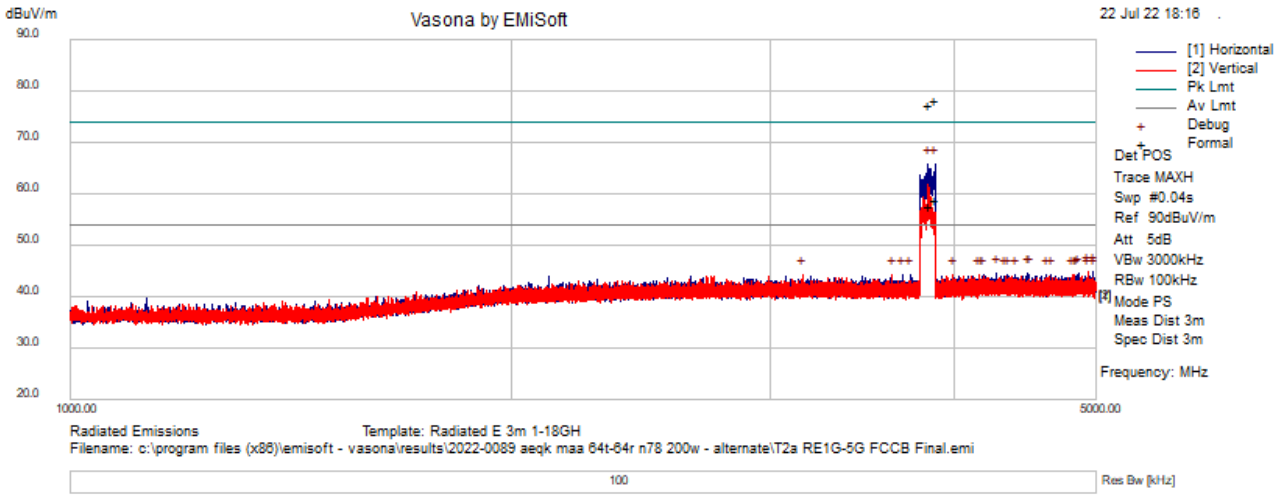
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/Fail	Comments
707.688	23.98	2.92	-2.30	24.60	QuasiMax	V	362	345	46.00	-21.40	Pass	
30.432	22.41	1.99	-10.32	14.07	QuasiMax	H	198	345	40.00	-25.93	Pass	
35.856	22.30	1.82	-13.32	10.80	QuasiMax	V	349	345	40.00	-29.20	Pass	
138.240	22.34	1.67	-10.15	13.86	QuasiMax	H	273	345	43.50	-29.64	Pass	
998.360	23.04	3.60	-2.99	23.65	QuasiMax	H	158	345	54.00	-30.35	Pass	
163.128	23.04	1.71	-12.00	12.74	QuasiMax	H	275	345	43.50	-30.76	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
707.688	30.39	2.92	-2.30	31.01	Debug	V	300	0	46.00	-14.99	Pass	
30.432	27.66	1.99	-10.32	19.32	Debug	H	375	180	40.00	-20.68	Pass	
138.240	28.98	1.67	-10.15	20.50	Debug	H	275	135	43.50	-23.00	Pass	
35.856	28.42	1.82	-13.32	16.92	Debug	V	200	225	40.00	-23.08	Pass	
998.360	29.98	3.60	-2.99	30.59	Debug	H	100	45	54.00	-23.41	Pass	
163.128	28.50	1.71	-12.00	18.21	Debug	H	375	0	43.50	-25.29	Pass	
41.712	28.43	1.67	-16.19	13.91	Debug	V	300	0	40.00	-26.09	Pass	
259.056	30.39	1.90	-12.74	19.55	Debug	H	275	270	46.00	-26.45	Pass	
48.432	29.40	1.55	-18.94	12.02	Debug	V	100	135	40.00	-27.98	Pass	
64.344	31.74	1.46	-21.43	11.77	Debug	V	100	225	40.00	-28.23	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.

RE 1GHz – 5GHz



Test Information

Results Title	Radiated E 3m 1-18GH
File Name	T2a RE1G-5G FCCB Final.emi
Test Laboratory	MH-AR4, 56%RH, 24C, 996hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless
EUT Details	2022-0089 AEQK MAA 64T-64R N78 200W - Alternate, Carrier Tx 3840MHz, ETM3.1A, 100MHz BW, 35dBm total power
Configuration	FCC Pt.15-B/GR1089, RE 1GHz-5GHz FCC B 3 meter distance. 5dB Int Attn, RBW: 100k, VBW: 3M. FSW67-E1260, PA E447, 10dB Pad-E177, Horn Antenna E1073, RF cables, AR4 Cable set.
Date	2022-07-22 18:16:33

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
3884.533333	69.81	13.40	-4.83	78.38	PeakMax	H	100	39	74.00	4.38	N/A	Tx Exempt
3845.466667	69.00	13.39	-4.89	77.49	PeakMax	H	167	302	74.00	3.49	N/A	Tx Exempt
3884.533333	50.48	13.40	-4.83	59.05	AvgMax	H	100	39	54.00	5.05	N/A	Tx Exempt
3845.466667	49.28	13.39	-4.89	57.77	AvgMax	H	167	302	54.00	3.77	N/A	Tx Exempt

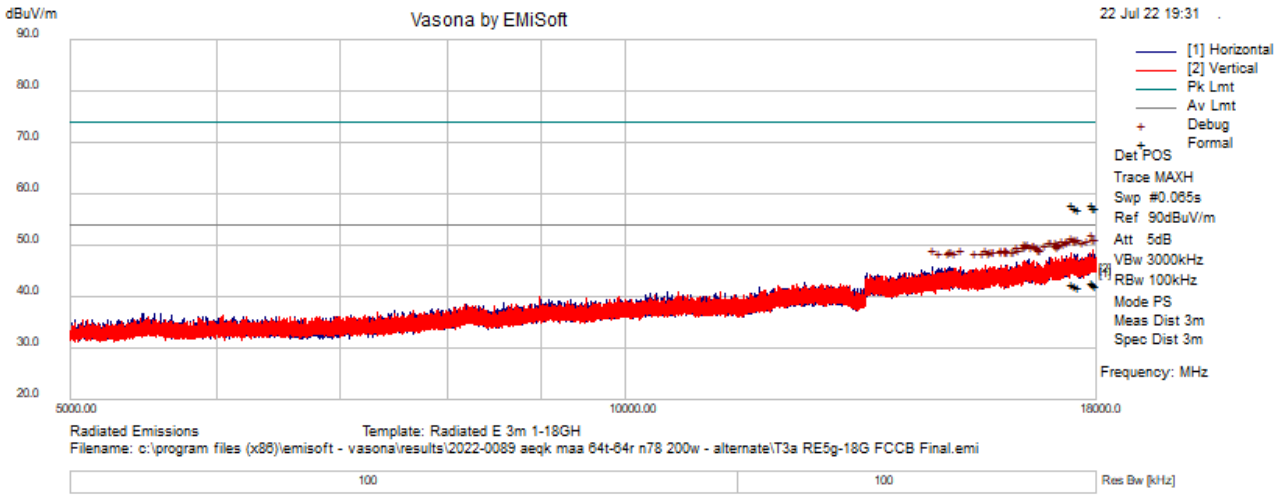
Preview Data

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
3884.533333	57.21	13.40	-4.83	65.78	Debug	H	100	30	54.00	11.78	Fail	
3845.466667	57.25	13.39	-4.89	65.74	Debug	H	100	300	54.00	11.74	Fail	
4980.800	34.97	13.93	-4.04	44.85	Debug	H	100	60	54.00	-9.15	Pass	
4938.400	34.98	13.90	-4.06	44.82	Debug	V	175	150	54.00	-9.18	Pass	
4865.200	34.89	13.86	-4.11	44.64	Debug	H	100	270	54.00	-9.36	Pass	
4498.133333	35.28	13.62	-4.34	44.56	Debug	H	100	60	54.00	-9.44	Pass	
4276.133333	35.41	13.54	-4.48	44.47	Debug	H	175	90	54.00	-9.53	Pass	
4504.666667	35.12	13.63	-4.34	44.41	Debug	H	100	90	54.00	-9.59	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
4854.800	34.64	13.85	-4.12	44.37	Debug	H	175	120	54.00	-9.63	Pass	
3154.933333	37.15	13.02	-5.81	44.36	Debug	V	175	90	54.00	-9.64	Pass	
4626.000	34.87	13.71	-4.26	44.31	Debug	H	250	60	54.00	-9.69	Pass	
3736.666667	36.03	13.34	-5.07	44.30	Debug	H	175	0	54.00	-9.70	Pass	
4838.800	34.58	13.84	-4.13	44.30	Debug	V	175	90	54.00	-9.70	Pass	
4658.933333	34.81	13.73	-4.24	44.30	Debug	H	100	240	54.00	-9.70	Pass	
4354.133333	35.15	13.57	-4.43	44.30	Debug	H	250	180	54.00	-9.70	Pass	
4818.000	34.60	13.83	-4.14	44.29	Debug	V	100	150	54.00	-9.71	Pass	
3996.666667	35.49	13.44	-4.66	44.28	Debug	V	250	150	54.00	-9.72	Pass	
4191.466667	35.29	13.51	-4.53	44.27	Debug	H	325	270	54.00	-9.73	Pass	
3635.066667	36.20	13.30	-5.24	44.27	Debug	V	325	150	54.00	-9.73	Pass	
4404.666667	35.05	13.59	-4.40	44.24	Debug	H	175	120	54.00	-9.76	Pass	
4161.600	35.28	13.50	-4.55	44.23	Debug	V	325	30	54.00	-9.77	Pass	
4940.000	34.37	13.90	-4.06	44.21	Debug	H	175	90	54.00	-9.79	Pass	
3691.333333	36.00	13.33	-5.14	44.18	Debug	H	250	30	54.00	-9.82	Pass	
4984.666667	34.28	13.93	-4.04	44.18	Debug	H	100	270	54.00	-9.82	Pass	
4181.466667	35.18	13.51	-4.54	44.16	Debug	H	250	270	54.00	-9.84	Pass	
4338.266667	35.02	13.57	-4.44	44.15	Debug	H	100	120	54.00	-9.85	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.

RE 5GHz – 18GHz



Test Information

Results Title	Radiated E 3m 1-18GH
File Name	T3a RE5g-18G FCCB Final.emi
Test Laboratory	MH-AR4, 56%RH, 24C, 996hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless
EUT Details	2022-0089 AEQK MAA 64T-64R N78 200W - Alternate, Carrier Tx 3840MHz, ETM3.1A, 100MHz BW, 35dBm total power
Configuration	FCC Pt.15-B/GR1089, RE 5GHz-18GHz FCC B 3 meter distance. 5dB Int Attn, RBW: 100k, VBW: 3M. FSW67-E1260, PA E447, HPF-E1479, Horn Antenna E1073, RF cables, AR4 Cable set.
Date	2022-07-22 19:31:03

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
17926.117	28.42	9.64	4.86	42.92	AvgMax	V	115	303	54.00	-11.08	Pass	
17473.717	28.27	9.35	4.93	42.55	AvgMax	V	130	355	54.00	-11.45	Pass	
17934.567	28.01	9.64	4.86	42.51	AvgMax	H	171	227	54.00	-11.49	Pass	
17977.900	27.90	9.67	4.85	42.43	AvgMax	H	221	55	54.00	-11.57	Pass	
17519.867	27.94	9.37	4.95	42.26	AvgMax	H	253	0	54.00	-11.74	Pass	
17594.833	27.57	9.42	4.93	41.92	AvgMax	H	205	0	54.00	-12.08	Pass	
17473.717	43.77	9.35	4.93	58.05	PeakMax	V	130	355	74.00	-15.95	Pass	
17926.117	43.48	9.64	4.86	57.98	PeakMax	V	115	303	74.00	-16.02	Pass	
17934.567	43.03	9.64	4.86	57.54	PeakMax	H	171	227	74.00	-16.46	Pass	
17519.867	43.08	9.37	4.95	57.40	PeakMax	H	253	0	74.00	-16.60	Pass	
17977.900	42.81	9.67	4.85	57.34	PeakMax	H	221	55	74.00	-16.66	Pass	
17594.833	42.89	9.42	4.93	57.24	PeakMax	H	205	0	74.00	-16.76	Pass	

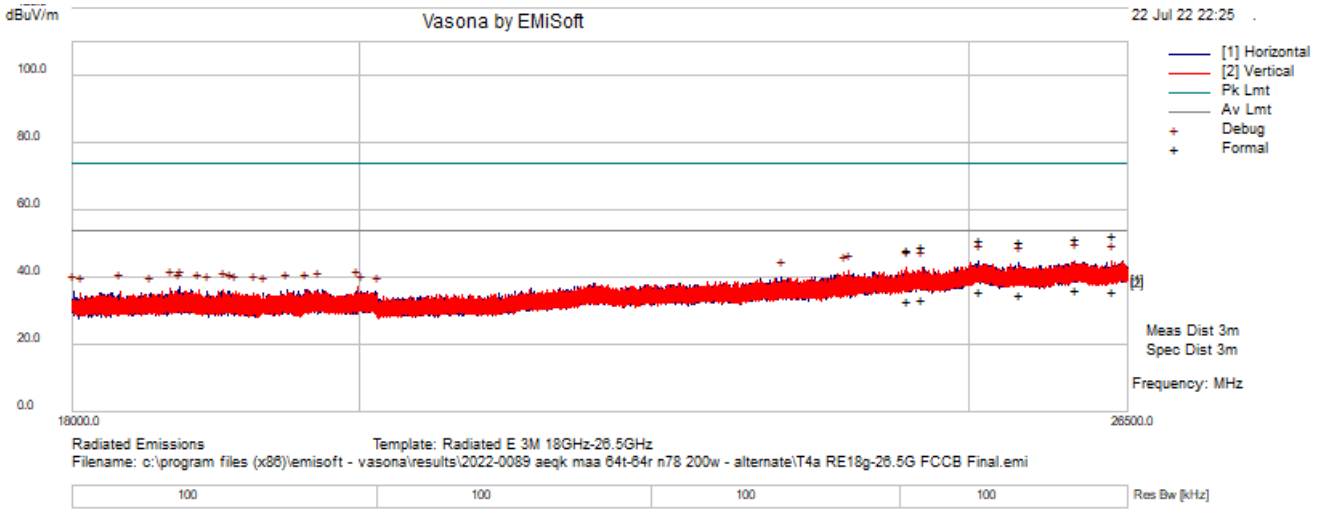
Preview Data

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
17926.117	34.68	9.64	4.86	49.18	Debug	V	250	150	54.00	-4.82	Pass	
17473.717	34.12	9.35	4.93	48.40	Debug	V	250	0	54.00	-5.60	Pass	
17977.900	33.81	9.67	4.85	48.34	Debug	H	325	330	54.00	-5.66	Pass	
17519.867	33.92	9.37	4.95	48.24	Debug	H	100	30	54.00	-5.76	Pass	
17594.833	33.87	9.42	4.93	48.22	Debug	H	325	240	54.00	-5.78	Pass	
17934.567	33.65	9.64	4.86	48.15	Debug	H	100	150	54.00	-5.85	Pass	
17354.767	33.87	9.33	4.82	48.02	Debug	H	175	150	54.00	-5.98	Pass	
17825.150	33.56	9.57	4.88	48.01	Debug	H	250	60	54.00	-5.99	Pass	
17577.933	33.66	9.41	4.94	48.00	Debug	H	325	270	54.00	-6.00	Pass	
17444.250	33.70	9.34	4.90	47.94	Debug	V	250	180	54.00	-6.06	Pass	
17533.300	33.52	9.38	4.95	47.84	Debug	H	100	90	54.00	-6.16	Pass	
17265.933	33.79	9.31	4.74	47.83	Debug	V	325	150	54.00	-6.17	Pass	
17121.200	33.85	9.28	4.60	47.73	Debug	V	100	240	54.00	-6.27	Pass	
17369.500	33.49	9.33	4.83	47.65	Debug	V	100	0	54.00	-6.35	Pass	
16999.433	33.85	9.26	4.48	47.59	Debug	H	100	0	54.00	-6.41	Pass	
17030.200	33.81	9.26	4.51	47.59	Debug	V	325	240	54.00	-6.41	Pass	
17694.500	33.12	9.48	4.91	47.52	Debug	V	325	30	54.00	-6.48	Pass	
16554.617	34.13	9.60	3.62	47.35	Debug	H	325	90	54.00	-6.65	Pass	
17286.950	33.27	9.31	4.76	47.34	Debug	V	325	90	54.00	-6.66	Pass	
17172.550	33.33	9.29	4.65	47.28	Debug	V	325	60	54.00	-6.72	Pass	
16472.500	34.07	9.66	3.45	47.18	Debug	V	250	180	54.00	-6.82	Pass	
16521.250	33.88	9.63	3.55	47.07	Debug	H	175	330	54.00	-6.93	Pass	
16656.233	33.63	9.53	3.82	46.97	Debug	V	175	30	54.00	-7.03	Pass	
17138.750	33.05	9.29	4.62	46.95	Debug	H	250	180	54.00	-7.05	Pass	
16659.700	33.60	9.52	3.82	46.94	Debug	H	100	330	54.00	-7.06	Pass	
17183.167	32.94	9.29	4.66	46.90	Debug	V	175	270	54.00	-7.10	Pass	
16907.783	33.25	9.33	4.31	46.88	Debug	V	100	90	54.00	-7.12	Pass	
16491.350	33.58	9.65	3.49	46.72	Debug	V	100	150	54.00	-7.28	Pass	
17160.200	32.76	9.29	4.64	46.68	Debug	H	325	300	54.00	-7.32	Pass	
16739.000	33.22	9.46	3.98	46.66	Debug	V	100	180	54.00	-7.34	Pass	
16318.450	33.82	9.70	3.10	46.62	Debug	H	250	60	54.00	-7.38	Pass	
16435.667	33.59	9.67	3.36	46.62	Debug	V	175	330	54.00	-7.38	Pass	
16613.333	33.26	9.56	3.73	46.56	Debug	H	175	90	54.00	-7.44	Pass	
16762.183	33.01	9.44	4.02	46.48	Debug	H	100	30	54.00	-7.52	Pass	
16341.633	33.37	9.69	3.15	46.22	Debug	V	325	240	54.00	-7.78	Pass	
16802.050	32.64	9.41	4.10	46.16	Debug	V	325	60	54.00	-7.84	Pass	
16768.467	32.64	9.44	4.04	46.11	Debug	V	100	300	54.00	-7.89	Pass	
16002.117	33.92	9.79	2.37	46.09	Debug	V	325	60	54.00	-7.91	Pass	
16107.633	33.70	9.76	2.62	46.08	Debug	V	325	0	54.00	-7.92	Pass	
16087.700	33.73	9.76	2.57	46.07	Debug	H	175	120	54.00	-7.93	Pass	
15691.200	34.40	9.38	2.29	46.07	Debug	V	100	330	54.00	-7.93	Pass	
15212.367	34.23	9.46	2.25	45.94	Debug	V	250	300	54.00	-8.06	Pass	
14687.167	34.29	9.32	2.32	45.93	Debug	H	100	60	54.00	-8.07	Pass	
15779.167	34.09	9.50	2.31	45.90	Debug	V	325	270	54.00	-8.10	Pass	
16261.033	33.21	9.72	2.97	45.89	Debug	V	325	30	54.00	-8.11	Pass	
15857.600	33.94	9.60	2.33	45.87	Debug	V	250	30	54.00	-8.13	Pass	
15005.667	33.90	9.70	2.27	45.87	Debug	H	175	30	54.00	-8.13	Pass	
16225.500	33.23	9.73	2.89	45.84	Debug	H	100	30	54.00	-8.16	Pass	
16122.367	33.38	9.75	2.65	45.79	Debug	V	100	210	54.00	-8.21	Pass	
16099.183	33.35	9.76	2.60	45.71	Debug	V	175	0	54.00	-8.29	Pass	
15839.400	33.78	9.58	2.33	45.68	Debug	V	175	0	54.00	-8.32	Pass	
16081.417	33.35	9.77	2.56	45.68	Debug	V	100	150	54.00	-8.32	Pass	
15038.383	33.73	9.66	2.26	45.66	Debug	H	175	30	54.00	-8.34	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
16015.333	33.43	9.79	2.40	45.62	Debug	V	325	150	54.00	-8.38	Pass	
15096.883	33.74	9.60	2.26	45.60	Debug	V	250	240	54.00	-8.40	Pass	
14980.317	33.61	9.69	2.27	45.57	Debug	H	100	180	54.00	-8.43	Pass	
15490.567	34.16	9.14	2.23	45.53	Debug	V	250	120	54.00	-8.47	Pass	
15760.750	33.68	9.48	2.30	45.46	Debug	V	100	120	54.00	-8.54	Pass	
14791.167	33.70	9.45	2.30	45.46	Debug	H	250	210	54.00	-8.54	Pass	
15633.567	33.84	9.31	2.27	45.42	Debug	V	100	300	54.00	-8.58	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.

RE 18 GHz – 26.5 GHz



Test Information

Results Title	Radiated E 3M 18GHz-26.5GHz
File Name	T4a RE18g-26.5G FCCB Final.emi
Test Laboratory	MH-AR4, 56%RH, 24C, 996hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless
EUT Details	2022-0089 AEQK MAA 64T-64R N78 200W - Alternate, Carrier Tx 3840MHz, ETM3.1A, 100MHz BW, 35dBm total power
Configuration	FCC Pt.15-B/GR1089, RE 18GHz-26.5GHz FCC B 3 meter distance. 5dB Int Attn, RBW: 100k, VBW: 3M. FSW67-E1260, PA E1525, Horn Antenna E1452, RF cables E1501 + E1502 Cable set.
Date	2022-07-22 22:25:05

Formal Data

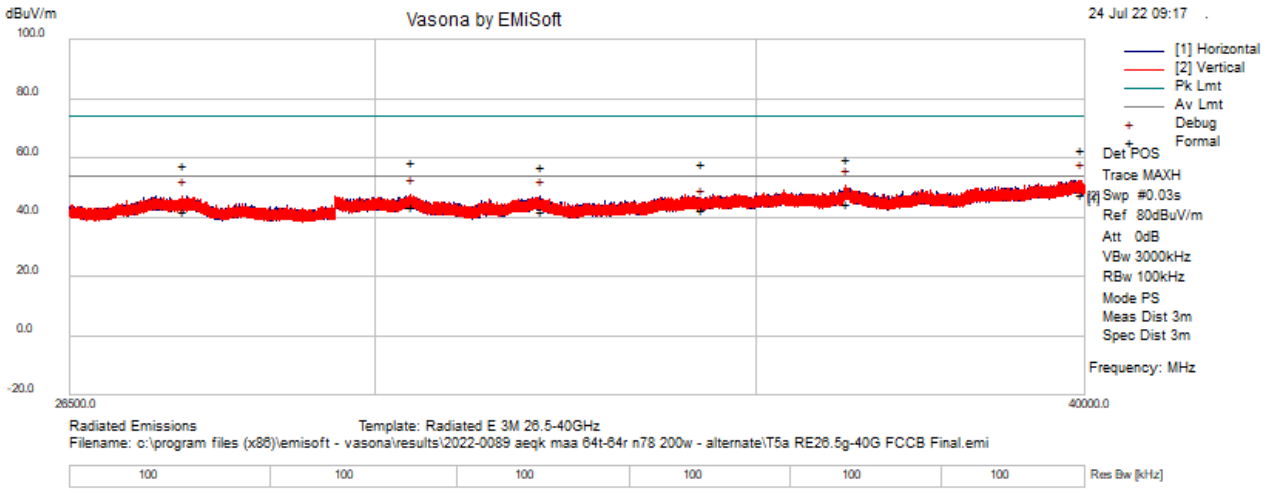
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass/Fail	Comments
25994.037	26.08	13.48	-3.07	36.49	AvgMax	V	224	147	54.00	-17.51	Pass	
26355.641	25.84	13.58	-3.23	36.19	AvgMax	V	311	275	54.00	-17.81	Pass	
25099.978	25.82	13.30	-3.23	35.90	AvgMax	H	101	289	54.00	-18.10	Pass	
25472.066	25.43	13.36	-3.53	35.26	AvgMax	H	132	352	54.00	-18.74	Pass	
24575.387	24.59	13.19	-3.92	33.86	AvgMax	V	132	0	54.00	-20.14	Pass	
24439.882	23.90	13.16	-3.75	33.32	AvgMax	V	108	107	54.00	-20.68	Pass	
26355.641	42.14	13.58	-3.23	52.50	PeakMax	V	311	275	74.00	-21.50	Pass	
25994.037	41.36	13.48	-3.07	51.77	PeakMax	V	224	147	74.00	-22.23	Pass	
25099.978	40.99	13.30	-3.23	51.06	PeakMax	H	101	289	74.00	-22.94	Pass	
25472.066	40.71	13.36	-3.53	50.54	PeakMax	H	132	352	74.00	-23.46	Pass	
24575.387	40.16	13.19	-3.92	49.43	PeakMax	V	132	0	74.00	-24.57	Pass	
24439.882	39.01	13.16	-3.75	48.43	PeakMax	V	108	107	74.00	-25.57	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
25994.037	34.65	13.48	-3.07	45.06	Debug	V	250	66	54.00	-8.94	Pass	
26355.641	34.60	13.58	-3.23	44.96	Debug	V	100	308	54.00	-9.04	Pass	
25099.978	34.62	13.30	-3.23	44.69	Debug	H	175	0	54.00	-9.31	Pass	
25472.066	34.63	13.36	-3.53	44.46	Debug	H	325	264	54.00	-9.54	Pass	
24439.882	33.48	13.16	-3.75	42.89	Debug	V	325	264	54.00	-11.11	Pass	
24575.387	33.53	13.19	-3.92	42.80	Debug	V	325	154	54.00	-11.20	Pass	
23924.712	33.42	13.03	-4.54	41.92	Debug	V	325	220	54.00	-12.08	Pass	
23887.666	33.06	13.02	-4.60	41.48	Debug	V	250	110	54.00	-12.52	Pass	
23340.337	32.05	12.84	-4.81	40.08	Debug	H	175	220	54.00	-13.92	Pass	
19980.642	34.60	11.78	-9.17	37.22	Debug	V	100	330	54.00	-16.78	Pass	
18724.979	34.62	11.40	-8.85	37.17	Debug	H	175	22	54.00	-16.83	Pass	
18651.738	34.41	11.38	-8.82	36.98	Debug	V	250	132	54.00	-17.02	Pass	
19694.263	33.91	11.69	-9.09	36.50	Debug	H	250	330	54.00	-17.50	Pass	
19022.338	33.95	11.46	-8.93	36.48	Debug	V	250	154	54.00	-17.52	Pass	
19600.975	33.86	11.65	-9.24	36.27	Debug	H	100	154	54.00	-17.73	Pass	
18707.625	33.63	11.40	-8.84	36.19	Debug	H	250	198	54.00	-17.81	Pass	
18848.017	33.62	11.42	-8.90	36.15	Debug	V	175	220	54.00	-17.85	Pass	
19469.367	33.73	11.61	-9.23	36.11	Debug	H	175	132	54.00	-17.89	Pass	
18312.021	33.13	11.32	-8.42	36.03	Debug	V	250	154	54.00	-17.97	Pass	
19064.058	33.55	11.47	-9.01	36.02	Debug	H	250	44	54.00	-17.98	Pass	
19104.646	33.46	11.49	-9.08	35.87	Debug	V	250	154	54.00	-18.13	Pass	
20009.471	33.23	11.79	-9.18	35.85	Debug	H	250	88	54.00	-18.15	Pass	
18908.579	33.32	11.43	-8.94	35.82	Debug	H	325	154	54.00	-18.18	Pass	
18002.479	32.61	11.26	-8.12	35.75	Debug	H	100	110	54.00	-18.25	Pass	
19232.429	33.20	11.53	-9.18	35.55	Debug	V	100	66	54.00	-18.45	Pass	
18047.671	32.39	11.27	-8.19	35.47	Debug	V	250	176	54.00	-18.53	Pass	
20127.479	32.61	11.83	-9.21	35.24	Debug	H	100	110	54.00	-18.76	Pass	
18517.154	32.49	11.36	-8.62	35.24	Debug	H	100	132	54.00	-18.76	Pass	
19300.217	32.92	11.55	-9.26	35.21	Debug	H	175	44	54.00	-18.79	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.

RE 26.5 GHz – 40 GHz



Test Information

Results Title	Radiated E 3M 26.5-40GHz
File Name	T5a RE26.5g-40G FCCB Final.emi
Test Laboratory	MH-AR4, 56%RH, 24C, 996hPa
Test Engineer	MJS
Test Software	Vasona by EMISoft, version 6.061
Equipment	Nokia Wireless
EUT Details	2022-0089 AEQK MAA 64T-64R N78 200W - Alternate, Carrier Tx 3840MHz, ETM3.1A, 100MHz BW, 35dBm total power
Configuration	FCC Pt.15-B/GR1089, RE 26.5GHz-40GHz FCC B 3 meter distance. 5dB Int Attn, RBW: 100k, VBW: 3M. FSW67-E1260, PA E1525, Horn Antenna E1375, RF cables E1501 + E1502 Cable set.
Date	2022-07-24 09:17:41

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
39949.225	30.56	17.17	0.14	47.88	AvgMax	V	207	114	54.00	-6.12	Pass	
36315.175	29.72	16.26	-1.27	44.70	AvgMax	V	118	185	54.00	-9.30	Pass	
30423.700	28.40	14.66	0.50	43.57	AvgMax	V	266	158	54.00	-10.43	Pass	
39949.225	45.67	17.17	0.14	62.99	PeakMax	V	207	114	74.00	-11.01	Pass	
34227.789	26.85	16.47	-0.75	42.57	AvgMax	V	130	292	54.00	-11.43	Pass	
32071.450	26.25	15.35	0.49	42.10	AvgMax	H	267	96	54.00	-11.90	Pass	
27733.825	27.96	13.95	0.12	42.03	AvgMax	V	207	10	54.00	-11.97	Pass	
36315.175	44.71	16.26	-1.27	59.69	PeakMax	V	118	185	74.00	-14.31	Pass	
30423.700	43.69	14.66	0.50	58.86	PeakMax	V	266	158	74.00	-15.14	Pass	
34227.789	42.61	16.47	-0.75	58.33	PeakMax	V	130	292	74.00	-15.67	Pass	
27733.825	43.38	13.95	0.12	57.46	PeakMax	V	207	10	74.00	-16.54	Pass	
32071.450	41.57	15.35	0.49	57.41	PeakMax	H	267	96	74.00	-16.59	Pass	

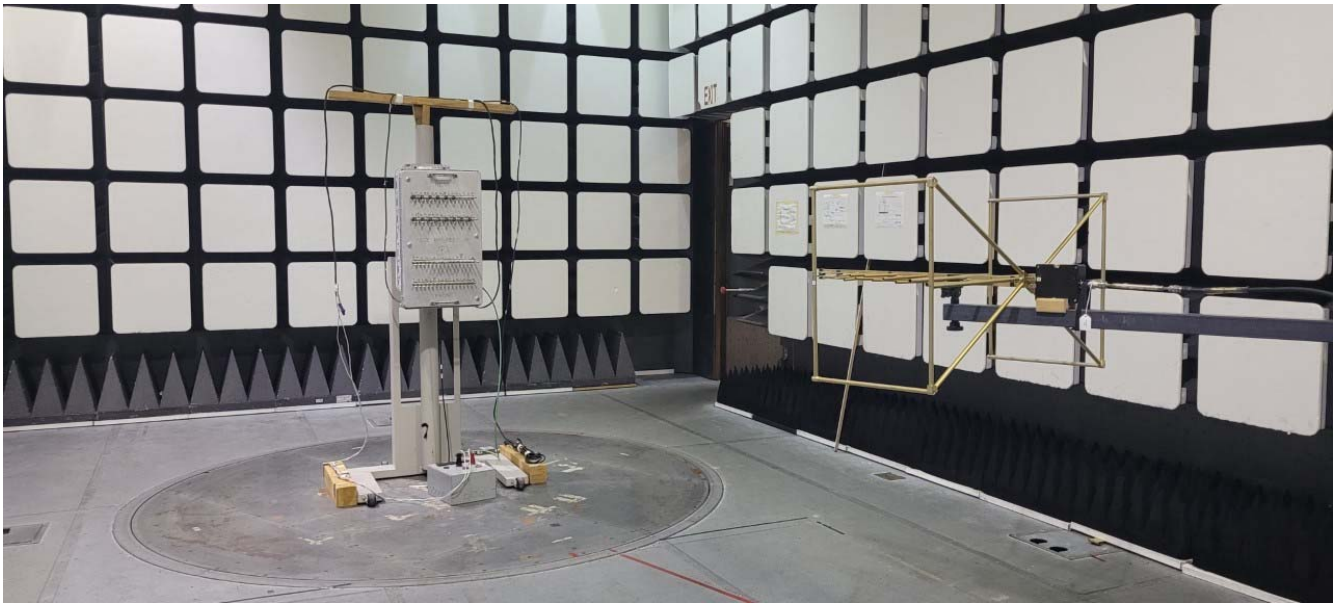
Preview Data

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
39949.225	35.23	17.17	0.14	52.54	Debug	V	100	132	54.00	-1.46	Pass	
36315.175	35.80	16.26	-1.27	50.79	Debug	V	175	22	54.00	-3.21	Pass	
30423.700	32.32	14.66	0.50	47.49	Debug	V	250	308	54.00	-6.51	Pass	
32071.450	31.30	15.35	0.49	47.15	Debug	H	175	352	54.00	-6.85	Pass	
27733.825	33.03	13.95	0.12	47.10	Debug	V	175	110	54.00	-6.90	Pass	
34227.789	28.26	16.47	-0.75	43.98	Debug	V	100	352	54.00	-10.02	Pass	

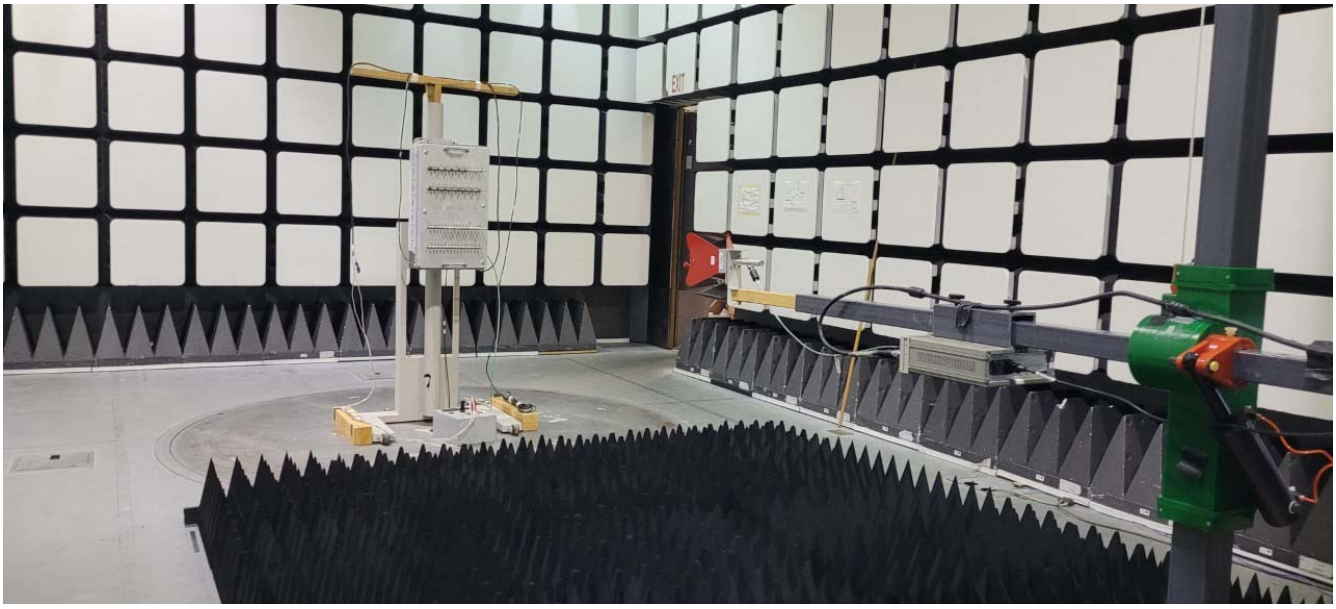
Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in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

Photographs

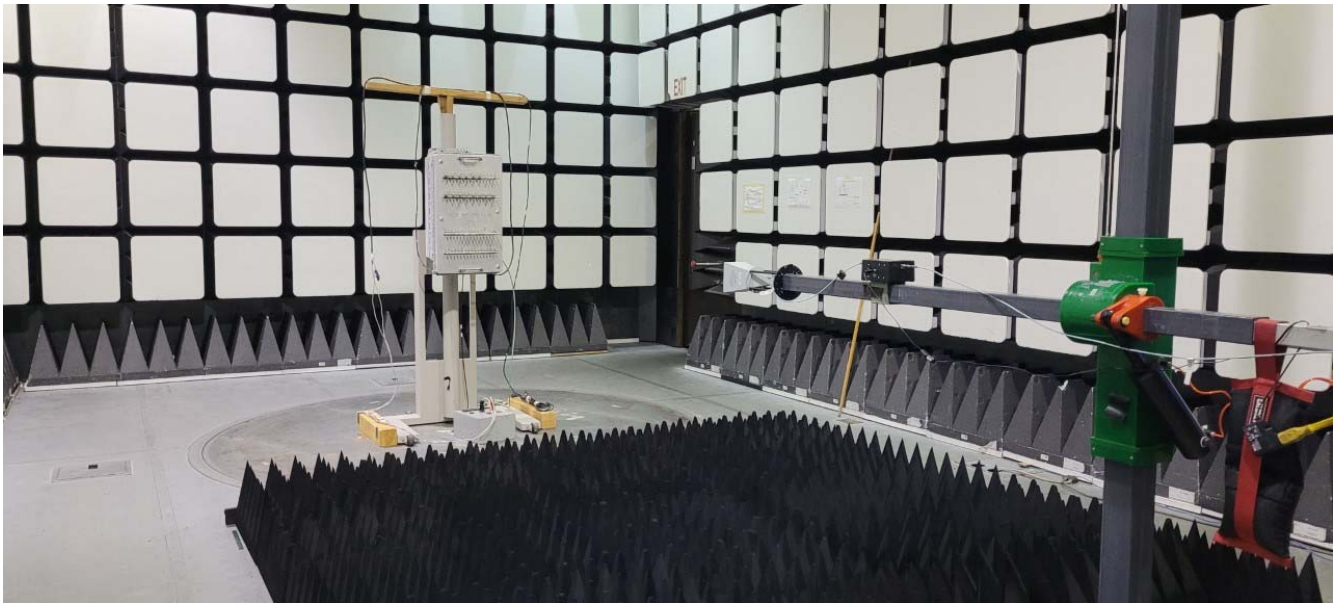
30MHz- 1GHz



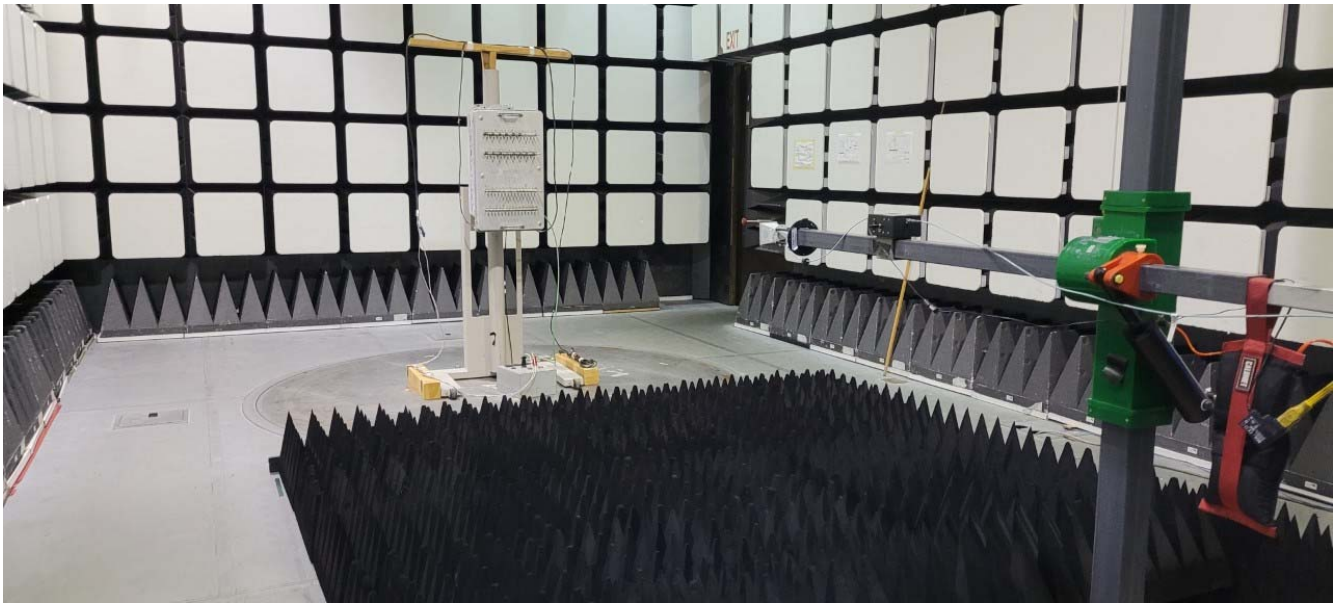
1GHz – 18GHz



18GHz – 26.5GHz



26.5GHz – 40GHz



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
E766	A.H. Systems Inc.	Bilogical Antenna	25 - 2000 MHz	SAS-521-2	457	2021-05-18	2023-05-18
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
E1150	Extech	Data Logger	Pressure Humidity Temp Data Logger	SD700	Q752767	2021-01-11	2023-01-11
E447	Hewlett Packard	Pre-Amplifier	Preamplifier 1-26.5 GHz	8449B	3008A01384	2020-08-31	2022-08-31
E483	Kikusui	Power Supply	DC 55 Volts 120 Amps	PAD 55-120L	DM000112	CNR	CNR
E1479	Reactel, Inc.	Filter, High Pass	DC - 4.3 GHz	11HS-X4.3 GS11	SN20-01	CNR-V	CNR-V
E1260	Rohde & Schwarz	Spectrum Analyzer		FSW67	104007	2020-08-21	2022-08-21
E954	Rohde & Schwarz	Test Receiver	EMI 20Hz - 40GHz -155 dBm +30 dBm	ESU40	100246	2020-08-03	2022-08-03
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	CNR
E177	Weinschel	Attenuator	10 dB , 18GHz 2 watt	2-10	BC0304	2020-09-11	2022-09-11

CNR: Calibration Not Required
CNR-V: Calibration Not Required, Must Be Verified
Test Dates: 7/22/22 – 7/24/22

7. FCC Section 2.1055 - Measurement of Frequency Stability

Frequency Stability testing was completed on AEQK Unit with Center Frequency 3840 MHz. Testing was performed from 07/14/2022 through 07/18/2022 on the radio, which was located in the T-11 Thermal chamber of the Global Product Compliance Laboratory (GPCL) test facility located in Building 4, Room 4-280, Murray Hill, NJ, by Joe Bordonaro from GPCL.

The temperatures to which the UUT were subjected ranged from a high temperature of +50ºC system ambient to a low temperature of -30ºC system ambient with measurements recorded at 10C increments

Frequency Stability performance was verified by measuring Frequency Tolerance using an MXA Signal Analyzer. Frequency Tolerance is a measurement of the difference between the actual transmit frequency and the assigned frequency (3840.0 MHz).

Baseline Measurement at +25°C

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	**Transmit Carrier Deviation (Hz)**
0	9.2257
0.5	1.2172
1.0	2.6935
1.5	-5.5039
2.0	1.0037
2.5	-4.1234
3.0	2.9959
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +50°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	**Transmit Carrier Deviation (Hz)**
0	-7.8934
0.5	4.0039
1.0	3.9697
1.5	-8.7471
2.0	1.6563
2.5	4.3716
3.0	10.428
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +40°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	7.6179
0.5	3.4195
1.0	-1.5325
1.5	1.7837
2.0	1.1501
2.5	-2.0291
3.0	10.428
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +30°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	9.0851
0.5	6.6415
1.0	-2.2859
1.5	3.0058
2.0	-4.1562
2.5	1.6679
3.0	-4.7208
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +20°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.5388
0.5	1.3336
1.0	-1.4063
1.5	-10.734
2.0	5.6279
2.5	-1.9328
3.0	7.0251
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +10°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	7.4846
0.5	19.761
1.0	-1.4836
1.5	-15.783
2.0	-2.9842
2.5	1.8843
3.0	-11.837
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at 0°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.6561
0.5	-3.3149
1.0	13.427
1.5	1.2317
2.0	3.4987
2.5	-2.5006
3.0	1.8098
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -10°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	11.301
0.5	1.9450
1.0	2.0919
1.5	-4.6068
2.0	4.4098
2.5	-2.6455
3.0	-3.1403
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -20°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	7.3910
0.5	2.1744
1.0	-1.7801
1.5	13.774
2.0	3.8876
2.5	1.4179
3.0	-1.3878
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at -30°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.9335
0.5	1.5950
1.0	5.9073
1.5	-3.1649
2.0	-1.9563
2.5	4.4262
3.0	-4.0734
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Upon return to +25°C.

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	-1.4506
0.5	-9.2326
1.0	5.9080
1.5	-1.0101
2.0	8.1452
2.5	3.0651
3.0	3.3147
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 103% of Nominal Voltage, -49.44VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.3273
0.5	3.5040
1.0	-6.9735
1.5	-1.5255
2.0	3.8619
2.5	-11.593
3.0	1.3817
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 106% of Nominal Voltage, -50.88VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	5.2627
0.5	-2.1825
1.0	1.9382
1.5	4.8962
2.0	-1.9082
2.5	3.9541
3.0	-3.5620
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 109% of Nominal Voltage, -52.32VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	-2.2879
0.5	-1.0553
1.0	-1.0461
1.5	3.8130
2.0	-3.8674
2.5	6.5563
3.0	2.3403
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 112% of Nominal Voltage, -53.76VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.0764
0.5	-1.2660
1.0	2.3162
1.5	1.9037
2.0	-2.7967
2.5	1.1006
3.0	1.9657
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 115% of Nominal Voltage, -55.20VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	2.4511
0.5	2.1311
1.0	-3.7184
1.5	13.015
2.0	2.1231
2.5	-1.5826
3.0	3.0154
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at 100% of Nominal Voltage, -48.0VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.3370
0.5	-1.7404
1.0	-4.9782
1.5	3.4728
2.0	-2.7209
2.5	-1.1107
3.0	-2.1715
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -3% of Nominal Voltage, -46.56VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	-3.6241
0.5	1.3526
1.0	-2.3198
1.5	1.3572
2.0	-1.1119
2.5	-2.0297
3.0	1.3553
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

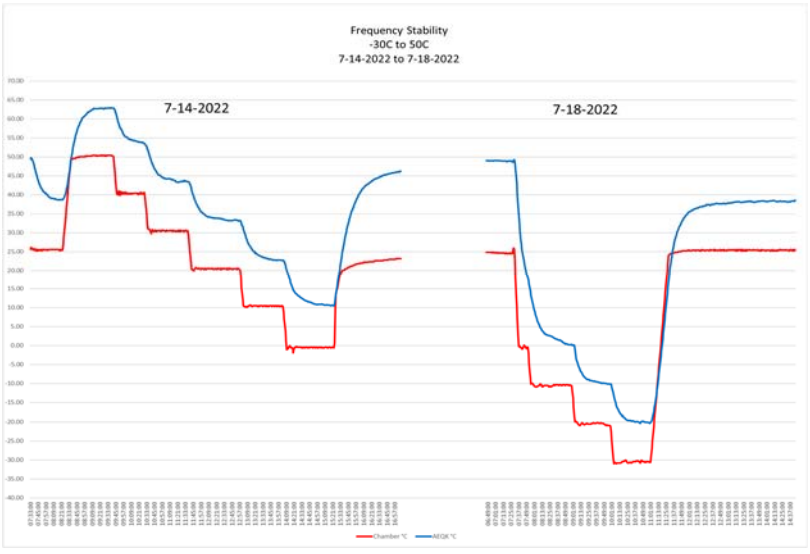
Transmit Frequency Deviation at +25°C at -6% of Nominal Voltage, -45.12VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	5.7485
0.5	2.9053
1.0	-4.6397
1.5	1.0287
2.0	1.6110
2.5	-1.2004
3.0	1.4779
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -9% of Nominal Voltage, -43.68VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.6550
0.5	-2.4771
1.0	-4.4006
1.5	2.2268
2.0	1.6860
2.5	3.9368
3.0	-5.9870
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -12% of Nominal Voltage, -42.24VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	1.3158
0.5	3.3219
1.0	-1.4856
1.5	5.9638
2.0	-2.5185
2.5	2.0857
3.0	4.8752
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Transmit Frequency Deviation at +25°C at -15% of Nominal Voltage, -40.80VDC	
Time (minutes)	Transmit Carrier Deviation (Hz)
0	12.300
0.5	1.5937
1.0	4.2008
1.5	-16.411
2.0	-2.2405
2.5	-1.0487
3.0	-1.1781
FCC SPECIFICATION	3840 MHz (±0.05ppm) ±0.05ppm = ±192.0Hz
FCC RESULT	PASS

Chamber Chart



Photographs

Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due
TH509-T11	Envirotronics	Controller		Envirotronics SPPCM	SP000638	2021-06-08	2023-06-08
TH-T11	Envirotronics	Thermal Chamber		N/A	0999-4722	2020-09-19	2022-09-19
TH069	Extech	Data Logger	Barometric Pressure/Humidity/ Temperature	SD700	Q690305	2021-07-20	2023-07-20
TH044	Fluke	Multimeter		83III	74910377	2022-02-24	2024-02-24
TH088	Yokogawa	Data Logger	10 Channel Paperless Recorder	GP10	S5U604860	2020-09-19	2022-09-19
MY59050106	Keysight	MXA	Signal Analyzer	N9020B	MY59050106	2020-12-27	2022-12-27

8. NVLAP Certificate of Accreditation

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