

WiFi Module Integration Test Report per FCC/ISED

Report No.: CJJJ-TNY-P23060073-2

Test Model: WBNAW, NBNAW, NBGLW, WBGLW, WBEXW

Series Model: NOTE

Received Date: 07/03/2023

Test Date: 07/27/2023 – 07/28/2023

Issued Date: 08/24/2023

Applicant: Blues, Inc.

Address: 50 Harbor St
Manchester, MA 01944
USA

Manufacturer: Blues, Inc.

Address: 50 Harbor St
Manchester, MA 01944
USA

Issued By: Bureau Veritas Consumer Products Services, Inc.

Lab Address: 775 Montague Expressway, Milpitas, CA 95035, USA

Test Location(1): 775 Montague Expressway, Milpitas, CA 95035, USA

**FCC/ IC Test
Site Number:** 540430/4842D



US1109



Government
of Canada Gouvernement
du Canada

4842D



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Release Control Record

Issue No.	Description	Date Issued
CJJJ-TNY-P23060073-2	Original	08/24/2023

1 Certificate of Conformity

PRODUCT: Notecard

BRAND: Blues, Inc.

TEST MODEL: WBNAW, NBNAW, NBGLW, WBGLW, WBEXW

SAMPLE STATUS: Engineering sample

APPLICANT: Blues Inc.

TEST DATE: 07/27/2023 – 08/02/2023

Standards: 47 CFR FCC Part 15.207, 15.209 and 15.247: 2023
RSS 247 Iss. 3, RSS Gen Iss. 5
ANSI C63.10: 2013

The above equipment has been tested by Bureau Veritas Consumer Products Services, Inc. Milpitas Branch, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :



, Date:

08/24/2023

Brandon Quan / Test Engineer

Approved by :



, Date:

08/24/2023

Jeremy Luong / Reviewing Engineer

2 Summary of Test Results

47 CFR FCC Part 15.207, 15.209 & 15.247: 2023/ RSS247 Iss.3, RSS Gen. Issue 5

ANSI C63.10:2013

FCC Clause	RSS Gen Clause	Test Item	Result/Remarks	Verdict
15.207	8.8	AC Power Line Conducted Emissions 150 kHz – 30 MHz	Meet the requirement of limit.	Pass
15.209	8.9	Radiated Emissions 30 MHz – 1000 MHz	Meet the requirement of limit.	Pass
	8.9	Radiated Emissions Above 1 GHz	Meet the requirement of limit.	Pass

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. The Model WBNAW was used for evaluation; worst case.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.856 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.638 dB
Radiated Emissions above 1 GHz	Above 1GHz	4.580dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Notecard																																																																																																																
Brand	Blues, Inc.																																																																																																																
Test Model	WBNAW, NBNAW, NBGLW, WBGLW, WBEXW																																																																																																																
Status of EUT	Engineering sample																																																																																																																
Power Supply Rating	2.5VDC to 5.5VDC																																																																																																																
Temperature Operating Range	-35°C to 75°C																																																																																																																
Modulation Type	<table border="1"> <tr> <td>GSM</td> <td colspan="4">GMSK</td> </tr> <tr> <td>GPRS</td> <td colspan="4">GMSK</td> </tr> <tr> <td>EDGE</td> <td colspan="4">GMSK, 8PSK</td> </tr> <tr> <td>WCDMA</td> <td colspan="4">UL: QPSK DL: QPSK, 16QAM</td> </tr> <tr> <td>LTE</td> <td colspan="4">UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM</td> </tr> </table>					GSM	GMSK				GPRS	GMSK				EDGE	GMSK, 8PSK				WCDMA	UL: QPSK DL: QPSK, 16QAM				LTE	UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM																																																																																						
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Operating Frequency	<p>2g: GSM 850, PCS1900 3g: B2, B4, B5 4g: B2, B4, B5, B7, B12, B13, B66</p> <table border="1"> <tr> <td>Frequency range</td> <td>Uplink</td> <td>824</td> <td>849</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>GSM 850</td> <td>Downlink</td> <td>869</td> <td>894</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>1850</td> <td>1910</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>PCS 1900</td> <td>Downlink</td> <td>1930</td> <td>1990</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>1850</td> <td>1910</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 2 (1900 MHz)</td> <td>Downlink</td> <td>1930</td> <td>1990</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>1710</td> <td>1755</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 4 (1700 MHz)</td> <td>Downlink</td> <td>2110</td> <td>2155</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>824</td> <td>849</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 5 (850 MHz)</td> <td>Downlink</td> <td>869</td> <td>894</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>2500</td> <td>2570</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 7 (2600 MHz)</td> <td>Downlink</td> <td>2620</td> <td>2690</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>699</td> <td>716</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 12 (700 MHz)</td> <td>Downlink</td> <td>729</td> <td>746</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Uplink</td> <td>777</td> <td>787</td> <td>MHz</td> <td>Module transmit</td> </tr> <tr> <td>FDD Band 13 (750 MHz)</td> <td>Downlink</td> <td>746</td> <td>756</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>Frequency range</td> <td>Downlink</td> <td>2110</td> <td>2200</td> <td>MHz</td> <td>Module receive</td> </tr> <tr> <td>FDD Band 66 (2500 MHz)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>					Frequency range	Uplink	824	849	MHz	Module transmit	GSM 850	Downlink	869	894	MHz	Module receive	Frequency range	Uplink	1850	1910	MHz	Module transmit	PCS 1900	Downlink	1930	1990	MHz	Module receive	Frequency range	Uplink	1850	1910	MHz	Module transmit	FDD Band 2 (1900 MHz)	Downlink	1930	1990	MHz	Module receive	Frequency range	Uplink	1710	1755	MHz	Module transmit	FDD Band 4 (1700 MHz)	Downlink	2110	2155	MHz	Module receive	Frequency range	Uplink	824	849	MHz	Module transmit	FDD Band 5 (850 MHz)	Downlink	869	894	MHz	Module receive	Frequency range	Uplink	2500	2570	MHz	Module transmit	FDD Band 7 (2600 MHz)	Downlink	2620	2690	MHz	Module receive	Frequency range	Uplink	699	716	MHz	Module transmit	FDD Band 12 (700 MHz)	Downlink	729	746	MHz	Module receive	Frequency range	Uplink	777	787	MHz	Module transmit	FDD Band 13 (750 MHz)	Downlink	746	756	MHz	Module receive	Frequency range	Downlink	2110	2200	MHz	Module receive	FDD Band 66 (2500 MHz)					
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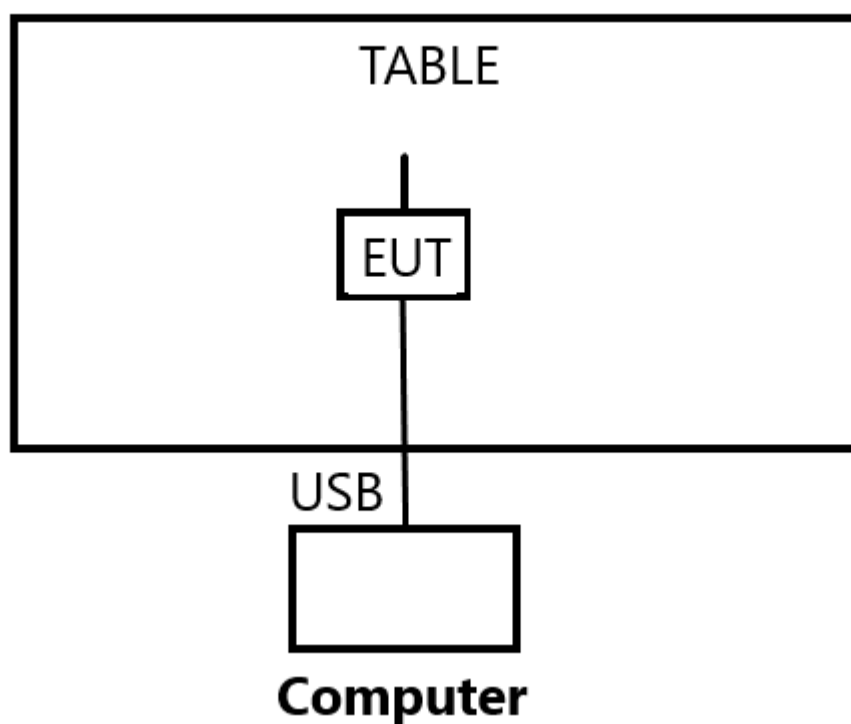
	Model		UGKZ7A10	
	Manufacturer		ALPS	
	WiFi	Frequency	2412 to 2472MHz for 802.11b/g/n	
		Channel Bandwidth	20 MHz	
		Modulation	802.11b – BPSK, QPSK, CCK, DSSS 802.11g – BPSK, QPSK, 16/64QAM, OFDM 802.11n – HT mode MCS0-7	
		Data rate max	802.11b – 11Mbps 802.11g – 54Mbps 802.11n – 72.2Mbps	
		Output Level	802.11b – +15dBm 802.11g – +13dBm 802.11n – +11dBm	
		Sensitivity	802.11b – -90dBm 802.11g – -74dBm 802.11n – -72dBm	
	BT	Frequency	2402 -2480MHz	
		Channel Spacing	Normal mode – 1MHz BLE mode –2MHz	
Antenna Type		External		

4 Configuration and Connections with EUT

4.1 Features of EUT

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

The WBNAW Model was transmitted continuously during the evaluation.



5 Conducted Emissions Measurement

5.1 Limits

Frequency (MHz)	CFR 47 Part 15.207	
	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

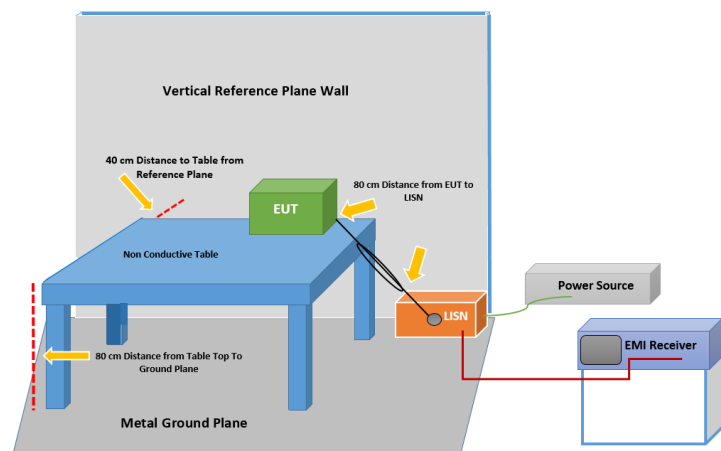
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Test Receiver Rohde & Schwarz	ESIB 40	100179	01/05/2023	01/05/2024
Transient Limiter Electro-Metrics	EM-7600-5	106	09/28/2022	09/28/2023
LISN ETS-Lindgren	3816/2NM	214372	01/05/2023	01/05/2024

Test software used: Toyo Corporation: Radiated Emission EP7/RE Ver 8.0.1 30

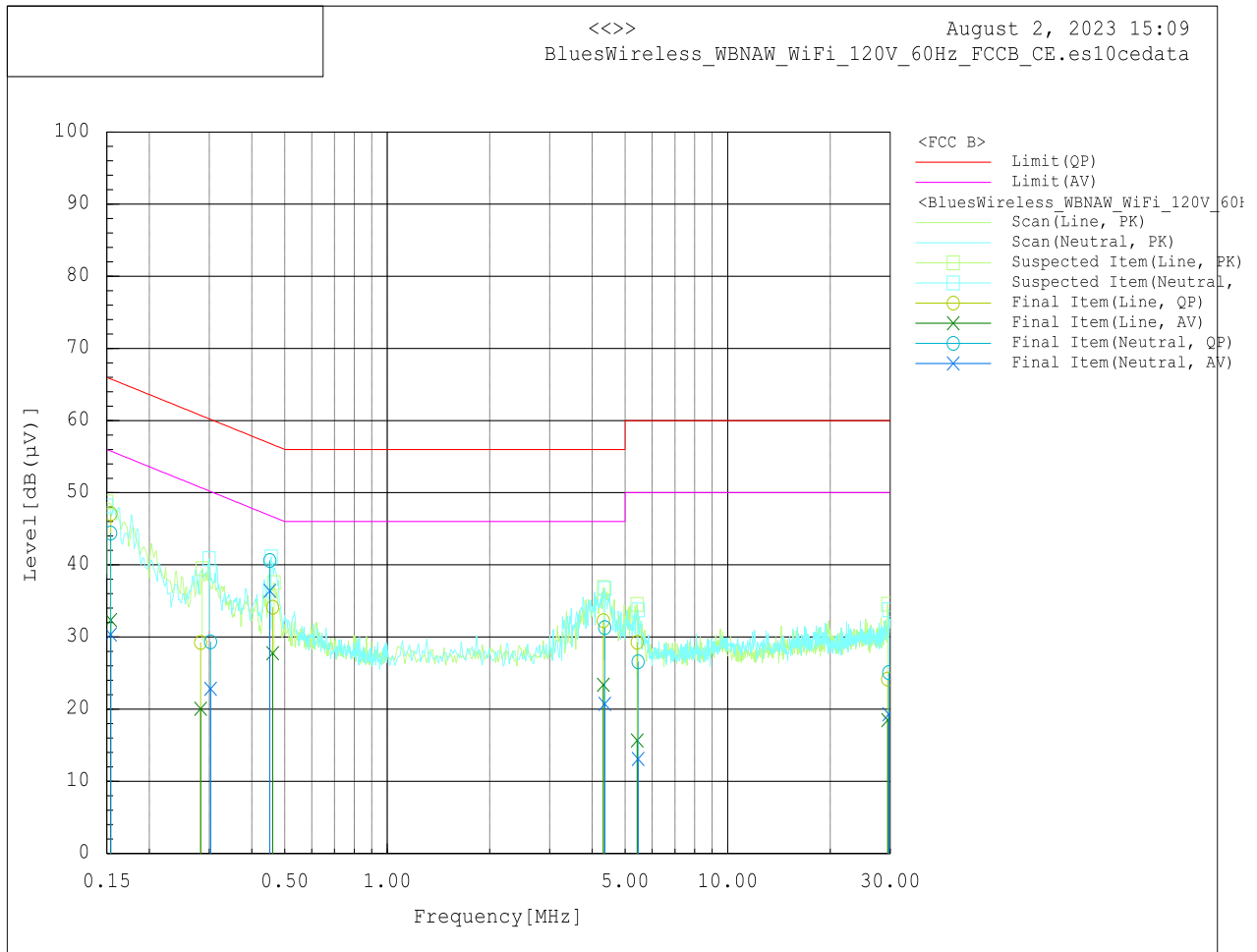
5.3 Test Arrangement

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



5.4 Test Results



Frequency	Raw	Corrd'	Level	Detector	Line	Limit	Margin
MHz	dBuV	dB	dBuV			dBuV	dB
0.154	37.50	9.60	47.10	QP	Line	65.80	-18.70
0.154	22.70	9.60	32.30	AV	Line	55.80	-23.50
0.283	19.70	9.50	29.20	QP	Line	60.70	-31.50
0.283	10.60	9.50	20.10	AV	Line	50.70	-30.60
0.461	24.70	9.40	34.10	QP	Line	56.70	-22.60
0.461	18.40	9.40	27.80	AV	Line	46.70	-18.90
4.314	22.90	9.40	32.30	QP	Line	56.00	-23.70
4.314	14.00	9.40	23.40	AV	Line	46.00	-22.60
5.424	19.90	9.40	29.30	QP	Line	60.00	-30.70
5.424	6.30	9.40	15.70	AV	Line	50.00	-34.30
29.515	14.30	9.90	24.20	QP	Line	60.00	-35.80
29.515	8.60	9.90	18.50	AV	Line	50.00	-31.50
0.154	34.80	9.60	44.40	QP	Neutral	65.80	-21.40
0.154	20.80	9.60	30.40	AV	Neutral	55.80	-25.40
0.303	19.80	9.50	29.30	QP	Neutral	60.20	-30.90
0.303	13.30	9.50	22.80	AV	Neutral	50.20	-27.40
0.452	31.20	9.40	40.60	QP	Neutral	56.80	-16.20
0.452	27.00	9.40	36.40	AV	Neutral	46.80	-10.40
4.355	21.90	9.40	31.30	QP	Neutral	56.00	-24.70
4.355	11.30	9.40	20.70	AV	Neutral	46.00	-25.30
5.458	17.20	9.40	26.60	QP	Neutral	60.00	-33.40
5.458	3.70	9.40	13.10	AV	Neutral	50.00	-36.90
29.721	15.20	9.90	25.10	QP	Neutral	60.00	-34.90
29.721	9.40	9.90	19.30	AV	Neutral	50.00	-30.70

Remarks:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Limit value(dBuV/m) - Level (dBuV/m)
4. Worst-case model was tested: WBNAW

6 Radiated Emissions up to 1 GHz

6.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 3 meters (dB μ V/m)	
Frequencies (MHz)	CFR47 Part 15.209 / RSS Gen Iss. 5, Sect. 8.9
30-88	40
88-216	43.5
216-230	46
230-960	
960-1000	54

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
 3. QP detector shall be applied if not specified.

6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Rohde and Schwarz	ESW44	1328.4100K- 101662-MH	09/20/2022	09/20/2023
Biconilog Antenna Sunol	JB6	A111717	09/22/2022	09/22/2023

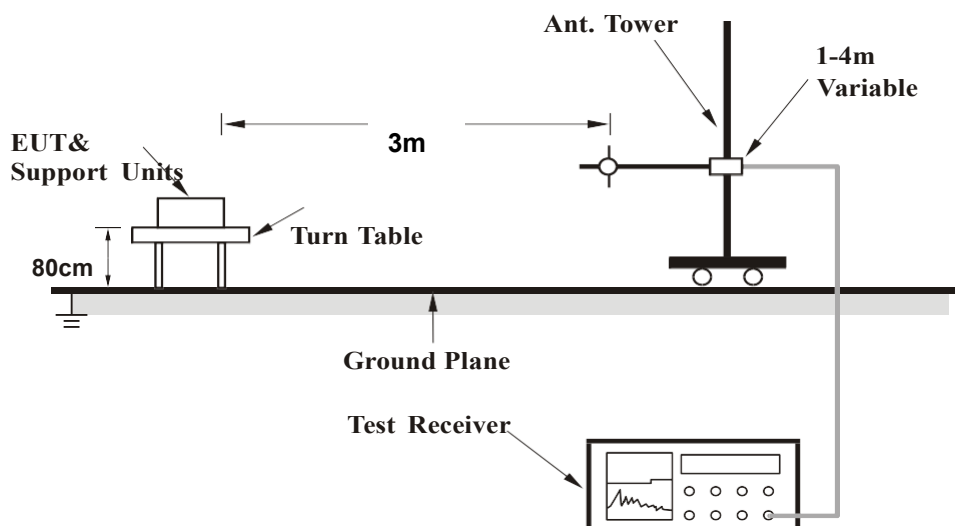
Test software used: Toyo Corporation: Radiated Emission EP7/RE Ver 8.0.1 30

6.3 Test Arrangement

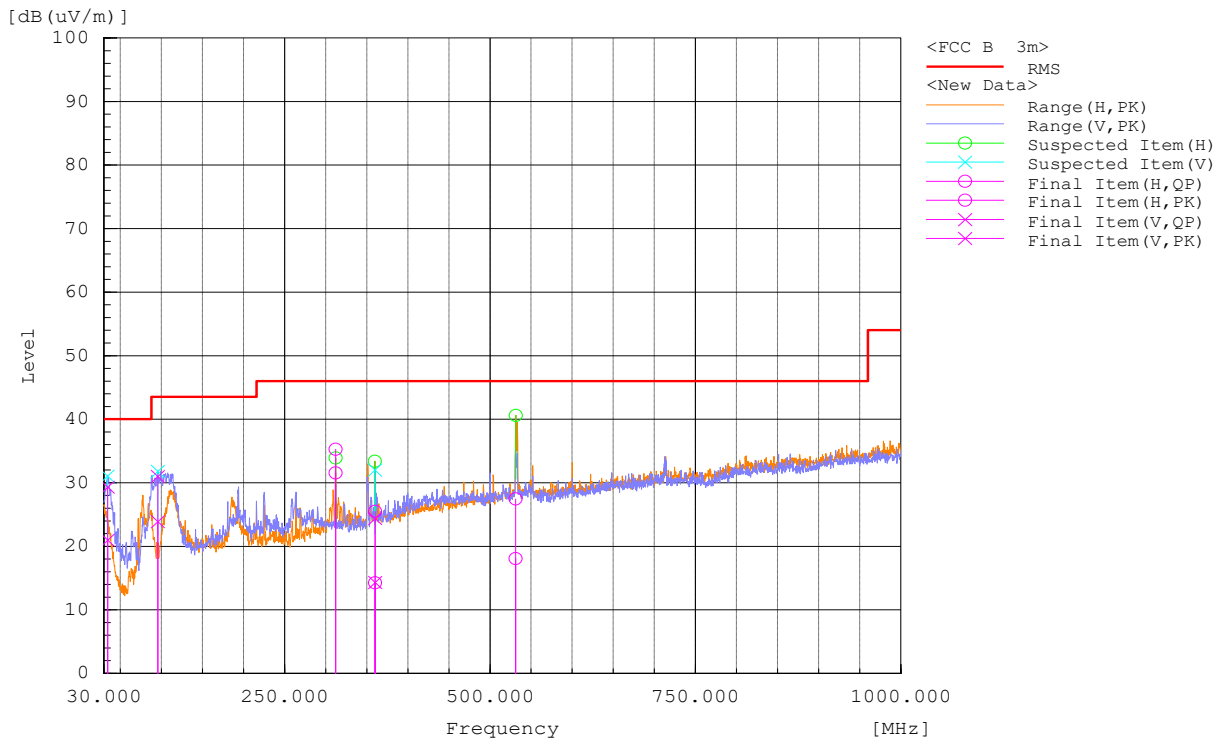
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.

For Radiated emission 30MHz to 1GHz



6.4 Test Results



Frequency [MHz]	Pol V/H	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
34.687	V	-1.7	22.7	21.0	40.0	-19.0	204.3	273.7
95.632	V	7.7	16.2	23.9	43.5	-19.6	102.4	330.2
311.999	H	9.3	22.2	31.5	46.0	-14.5	156.7	122.4
359.992	H	-9.2	23.5	14.3	46.0	-31.7	174.0	306.5
359.964	V	-9.1	23.4	14.3	46.0	-31.7	330.8	220.8
531.124	H	-9.5	27.6	18.1	46.0	-27.9	131.3	43.7

Remarks:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. Worst-case model was tested: WBNAW

7 Radiated Emissions above 1 GHz

7.1 Limits

Emissions radiated outside of the specified bands, shall be according to the radiated limits as following:

Radiated Emissions Limits at 3 meters (dB μ V/m)	
Frequencies (MHz)	CFR47 Part 15.209 / RSS Gen Iss. 5, Sect. 8.9
30-88	40
88-216	43.5
216-230	46
230-960	
960-1000	54
$f \geq 1000$	

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (uV/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

7.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Rohde and Schwarz	ESW44	1328.4100K-101662-MH	09/20/2022	09/20/2023
Horn Antenna ETS-Lindgren	3117	218553	04/24/2023	04/24/2025
The EMC Shop	PA18G-HA	001337	12/20/2022	12/20/2023

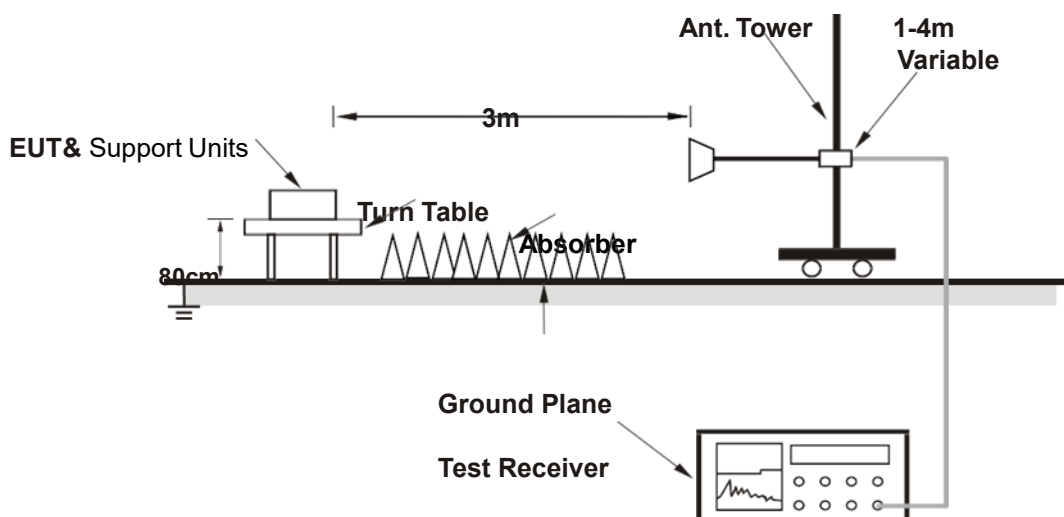
Test software used: Toyo Corporation: Radiated Emission EP7/RE Ver 8.0.1 30

7.3 Test Arrangement

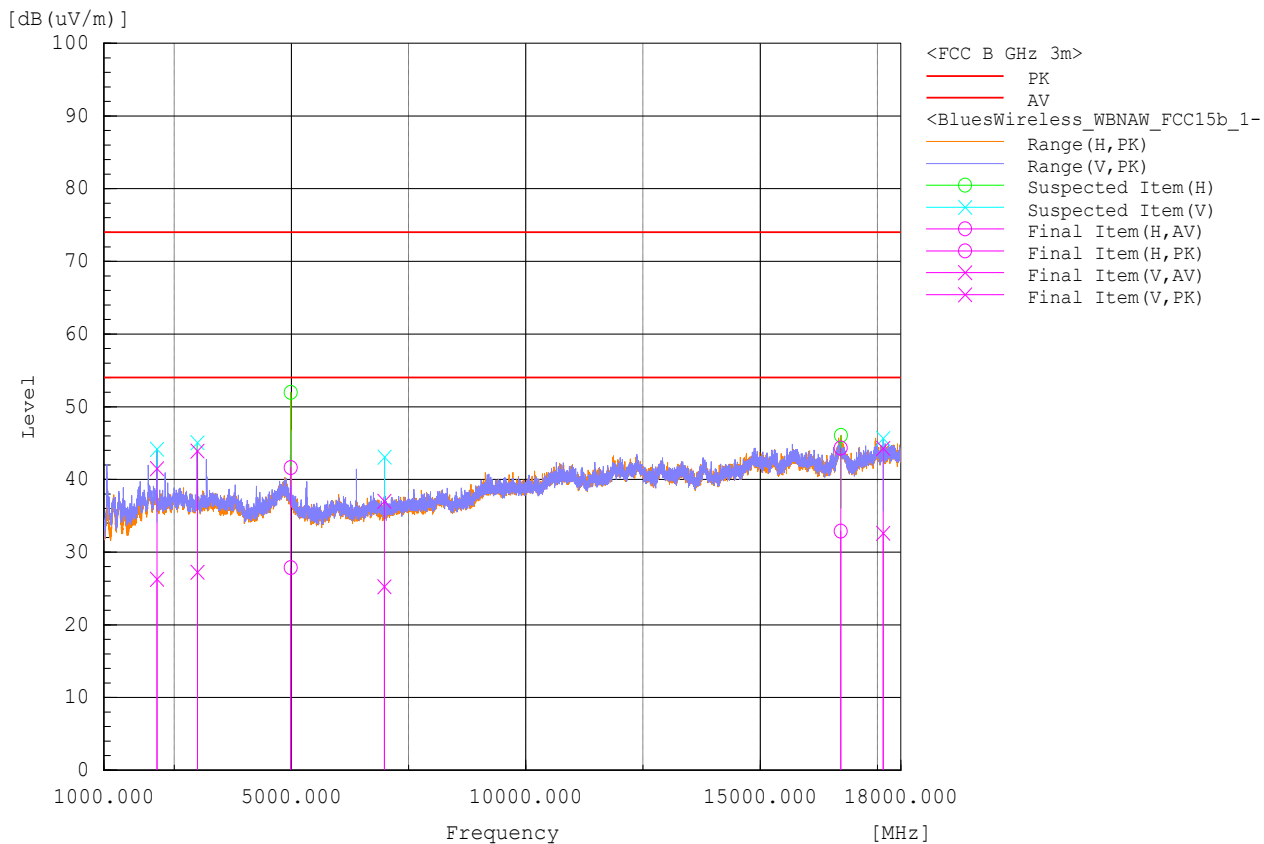
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.

For Radiated emission above 1GHz



7.4 Test Results



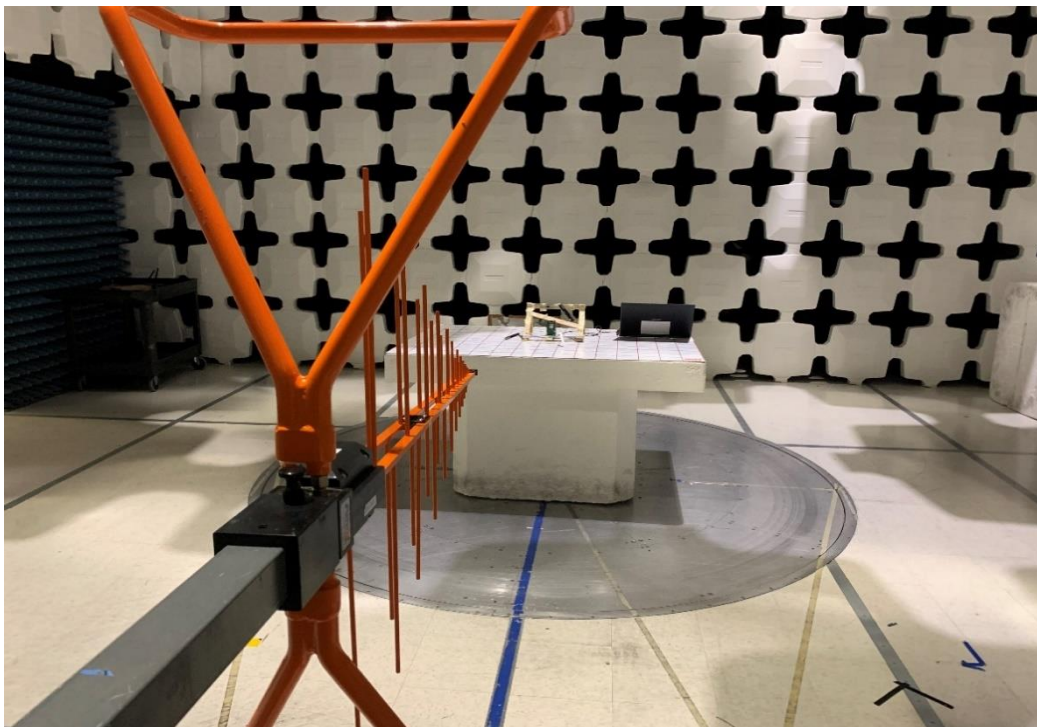
Frequency MHz	Pol	Reading dB(uV)		Factor dB(1/m)	Level dB(uV/m)		Limit dB(uV/m)		Margin dB		Height cm	Angle deg
		AV	PK		AV	PK	AV	PK	AV	PK		
2132.98	V	41.70	56.90	-15.40	26.30	41.50	54.00	74.00	-27.70	-32.50	173	34
2997.39	V	41.20	57.90	-14.00	27.20	43.90	54.00	74.00	-26.80	-30.10	207	33
4987.04	H	40.20	53.90	-12.30	27.90	41.60	54.00	74.00	-26.10	-32.40	197	0
6984.40	V	37.00	48.70	-11.70	25.30	37.00	54.00	74.00	-28.70	-37.00	250	1
16721.01	H	32.40	43.80	0.50	32.90	44.30	54.00	74.00	-21.10	-29.70	219	17
17621.31	V	30.20	41.90	2.40	32.60	44.30	54.00	74.00	-21.40	-29.70	136	304

Note: No significant emission was observed above 18 GHz.

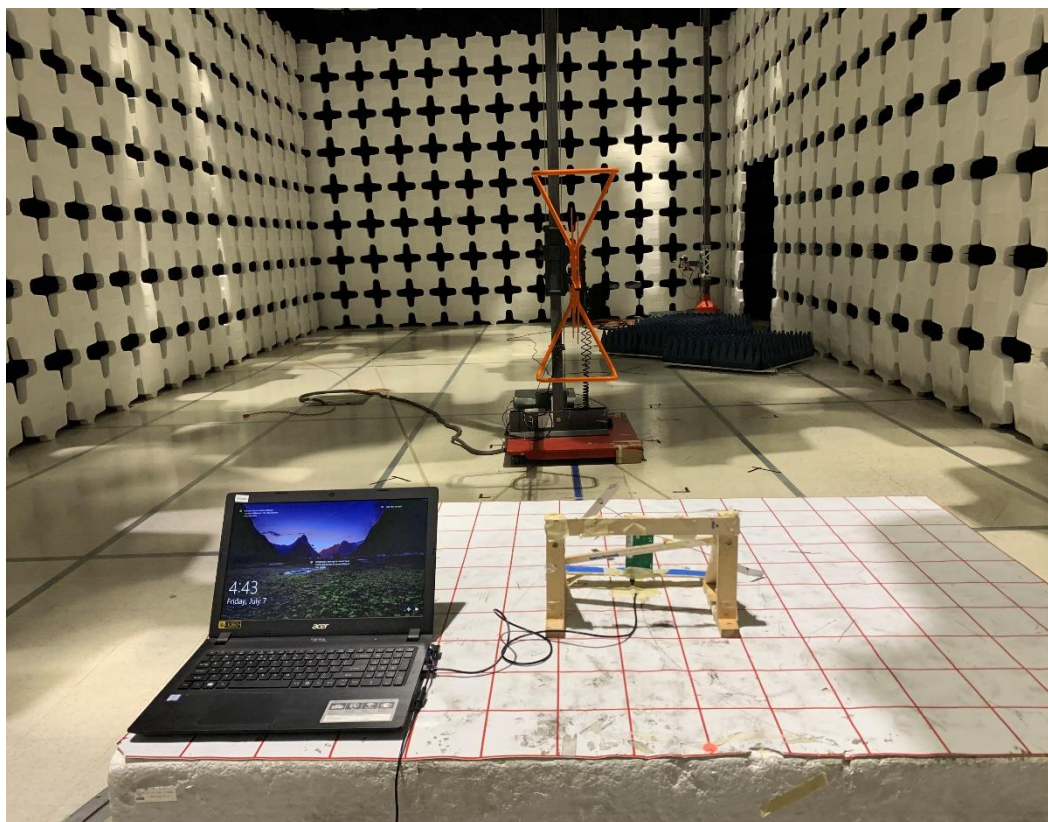
Remarks:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. Worst-case model was tested: WBNAW

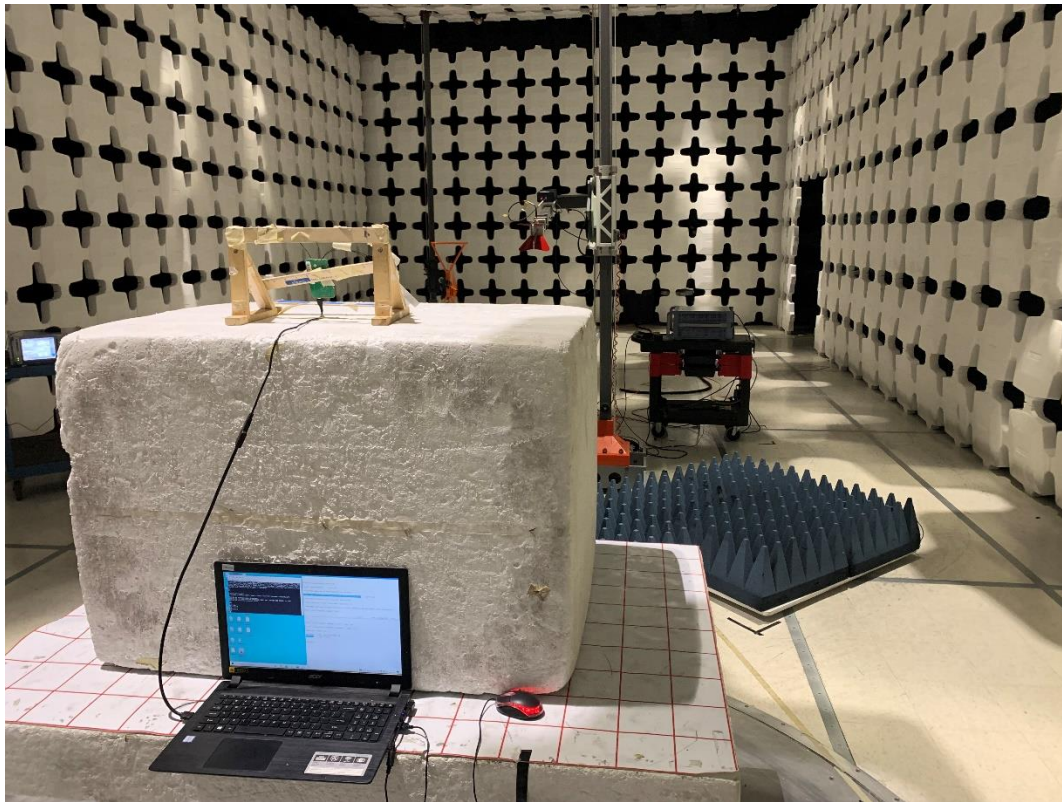
8 EUT TEST SETUP PHOTOS



Radiated Emission 30 – 1000MHz (Front View)



Radiated Emission 30 – 1000MHz (Rear View)



Radiated Emission 1 – 18GHz

Appendix – Information of the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

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The address and road map of all our labs can also be found on our web site.

--- End of Test Report ---