



BUREAU
VERITAS

FCC/ICES Test Report

Report No.: EMC_SL20070901-BW-004_WBNA_FCC

Test Model: Note-WBNA

Received Date: 9/22/2020

Test Date: 9/29/2020

Issued Date: 10/1/2020

Applicant: Blues Wireless

Address: 50 Harbor Street, Manchester, MA 01944, United States

Manufacturer: Blues Wireless

Address: 50 Harbor Street, Manchester, MA 01944, United States

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



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Release Control Record

Issue No.	Description	Date Issued
EMC_SL20070901-BW-004_WBNA_FCC	Original Report	10/1/2020

1 Certificate of Conformity

Product: Notecard

Brand: Blues Wireless

Test Model: Note-WBNA

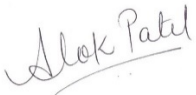
Sample Status: Test Sample


Applicant: Blues Wireless

Test Date: 9/29/2020

Standards: 47 CFR FCC Part 15, Subpart B, Class B
ICES-003:2016 Issue 6, Class B
ANSI C63.4:2014

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: 10/1/2020
Alok Patel, Electrical Test Engineer

Approved by :  , Date: 10/1/2020
George Hsu, Lead EMC Test Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart B / ICES-003:2016 Issue 6, Class B

ANSI C63.4:2014

FCC Clause	ICES-003 Clause	Test Item	Result/Remarks	Verdict
15.107	6.1	AC Power Line Conducted Emissions	The EUT does not have an AC port.	N/A
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is 4.4 dB at 30.769 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is 15.7 dB at 17846.01 MHz	Pass

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report
2. Please note for conducted emissions passing values are expressed as negative values while for radiated emissions passing values are expressed as positive values.

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) (\pm)
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 Wireless
Test Model	Note-WBNA
Identification No. of EUT	N/A
Sample Status	Test Sample
Operating Software	N/A
Power Supply Rating	5 Vdc

3.2 Features of EUT

The tests reported herein were performed according to the method specified by Blues Wireless, for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

Mode	Test Condition
1	Normal Operation

3.4 Test Program Used and Operational Description

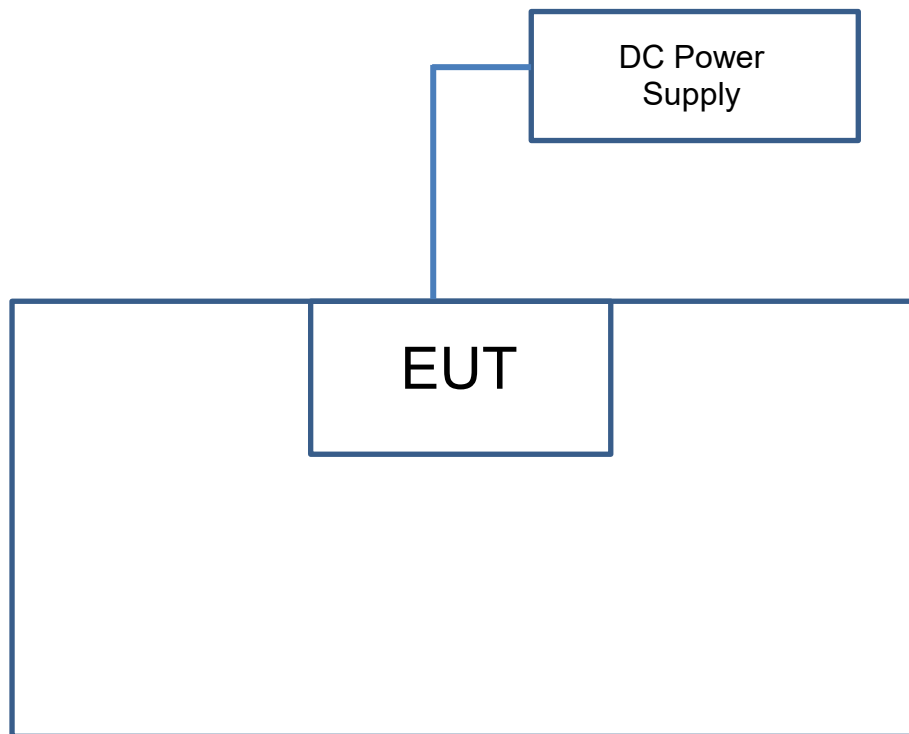
During the testing process the EUT was connected to CMW 500 basestation via its supported LTE Bands.

3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 120 MHz, provided by Blues Wireless, for detailed internal source, please refer to the manufacturer's specifications.

4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
N/A						

Cable Connections to/from EUT.

ID	Description	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
N/A						

5 Conducted Emissions at Mains Ports

The test for the conducted disturbance at mains ports is determined not necessary for the EUT do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

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 10 meters (dB μ V/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33		
216-230	46.4	35.5		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters (dB μ V/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.6	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960			57.5	47.5
960-1000	60	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.

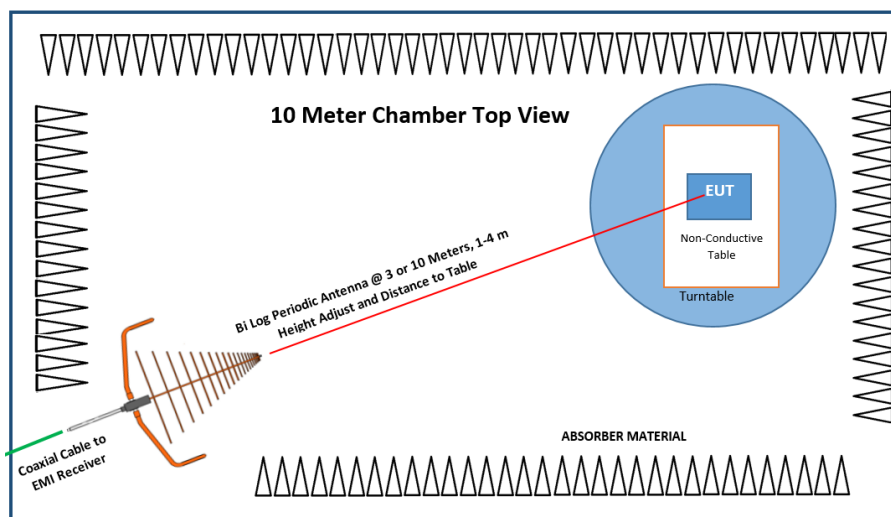
6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Keysight	N9038A	MY55330108	7/4/2020	7/4/2021
Biconilog Antenna Sunol	JB6	A111717	9/4/2020	9/4/2021
Pre-Amplifier RF Bay, Inc.	LPA-6-30	11170601	4/27/2020	4/27/2021

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 120 kHz for quasi-peak detection (QP) at frequency up to 1GHz.



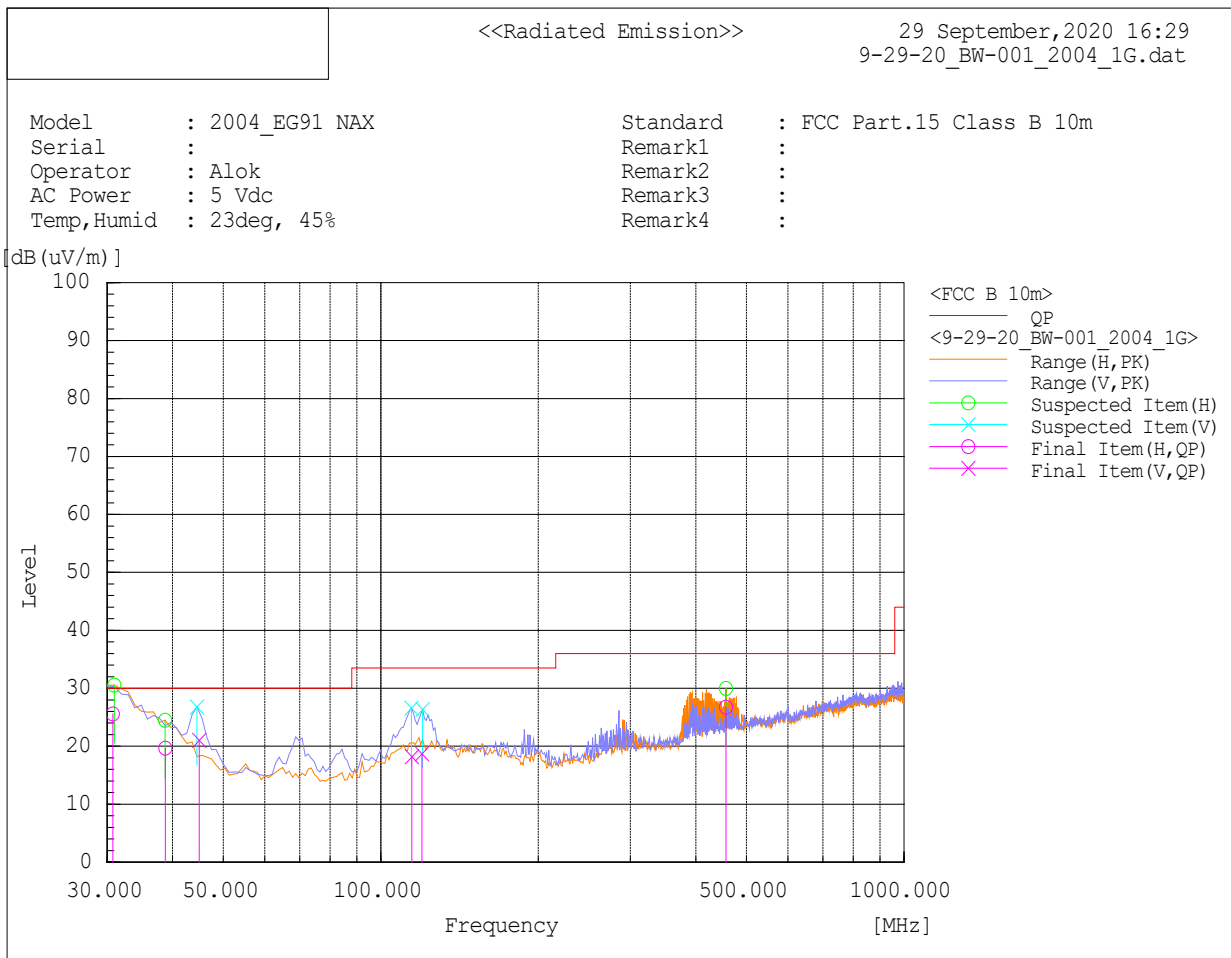
6.4 Test Results

Frequency Range	30-1000 MHz		
Input Power	5 Vdc	Environmental Conditions	23 °C, 45% RH
Tested by	Alok Patel	Test Date	9/29/2020
Test Mode	Normal Operation		

Antenna Polarity & Test Distance: Vertical and Horizontal at 10m										
No.	Frequency (MHz)	Polarization (H/V)	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)	Pass/Fail
1	30.769	H	37.9	-12.3	25.6	30	4.4	176	200	Pass
2	38.765	H	37.8	-18.1	19.7	30	10.3	357	290	Pass
3	44.977	V	44.4	-23.4	21	30	9	100	304	Pass
4	114.698	V	40.2	-22	18.2	33.5	15.3	100	109	Pass
5	119.846	V	40.7	-22	18.7	33.5	14.8	120	136	Pass
6	456.924	H	43.6	-16.8	26.8	36	9.2	230	300	Pass

Remarks:

1. Level (dBuV) = 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)



7 Radiated Emissions above 1 GHz

7.1 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)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000			Avg: 60 Peak: 80	Avg: 54 Peak: 74

- 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.

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower

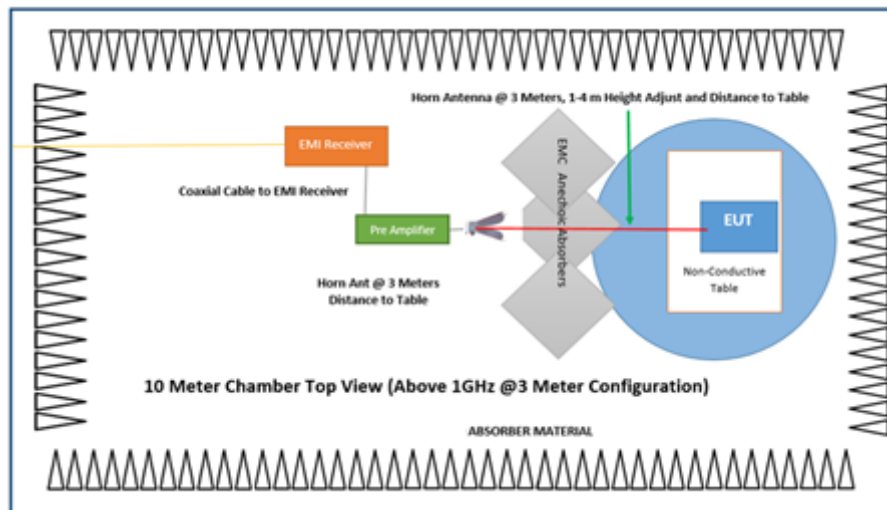
7.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Keysight	N9038A	MY55330108	7/4/2020	7/4/2021
Horn Antenna ETS-Lindgren	3117	218553	11/20/2019	11/20/2020
Pre-Amplifier RF-Lambda	RAMP00M50GA	17032300048	7/4/2020	7/4/2021

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.



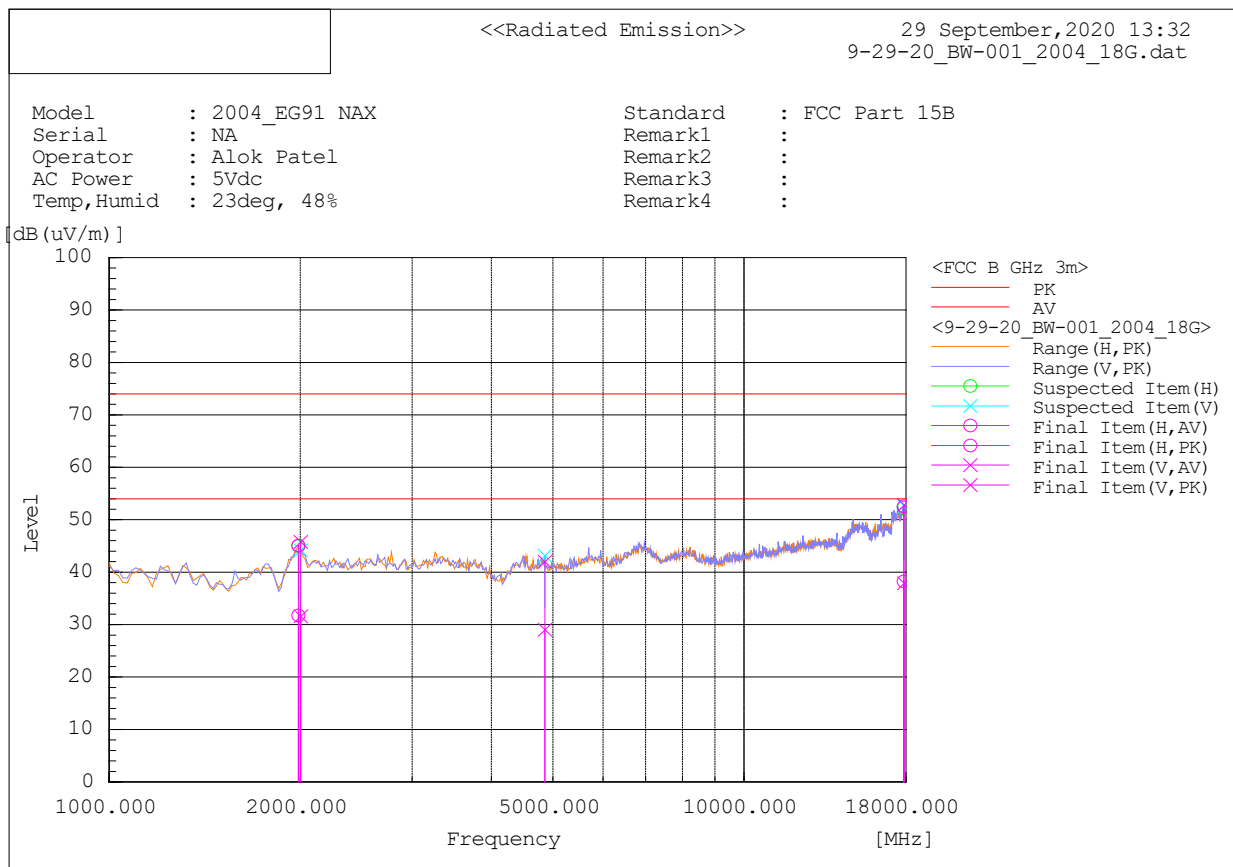
7.4 Test Results

Frequency Range	1000 MHz-18000 MHz		
Input Power	5 Vdc	Environmental Conditions	23 °C, 48% RH
Tested by	Alok Patel	Test Date	9/29/2020
Test Mode	Normal Operation		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1985.903	H	41.4	54.7	-9.6	31.8	45.1	54	74	22.2	28.9	298	25.1	Pass
2	2002.522	V	41.2	55.4	-9.6	31.6	45.8	54	74	22.4	28.2	312	308.4	Pass
3	4858.874	V	34.6	47.6	-5.6	29	42	54	74	25	32	272	230.1	Pass
4	17846.01	H	20.6	34.9	17.7	38.3	52.6	54	74	15.7	21.4	387	124.8	Pass
5	17879.87	V	20.3	35.2	17.6	37.9	52.8	54	74	16.1	21.2	251	355.8	Pass

Remarks:

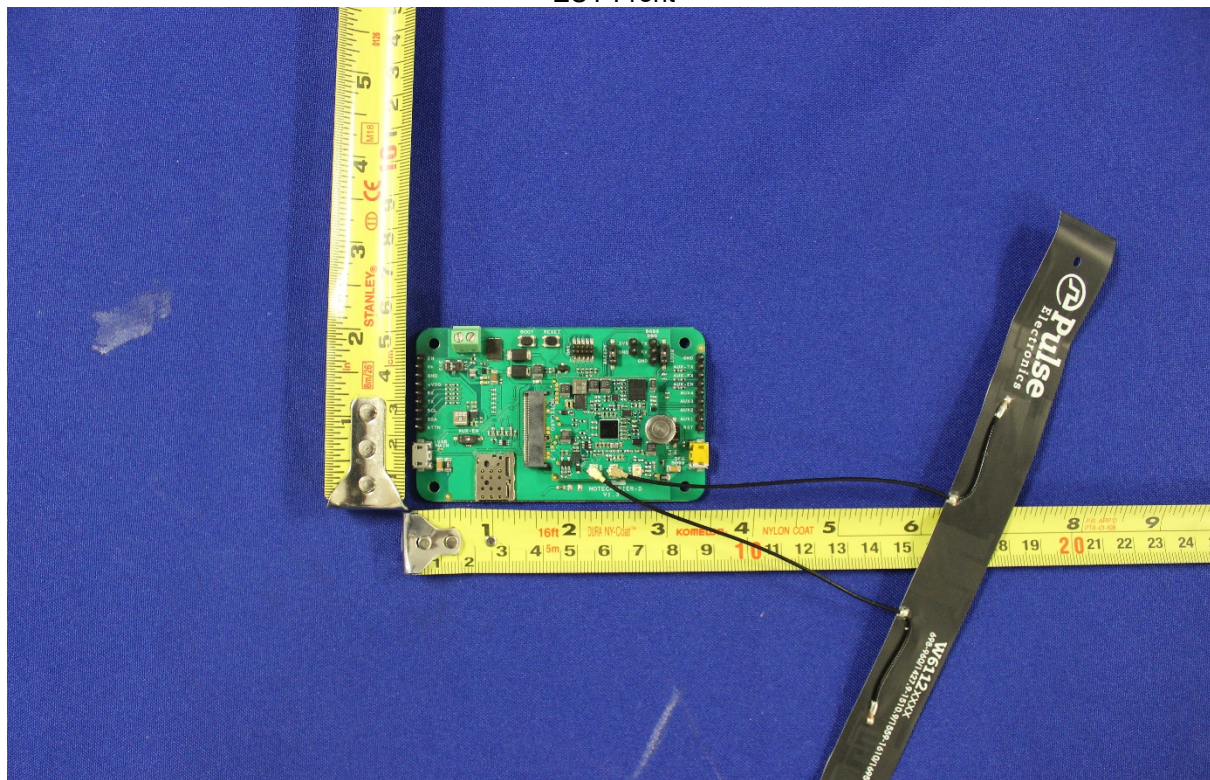
1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) -Preamplifier Gain (dB)
3. Margin = Limit value(dBuV/m) - Level (dBuV/m)



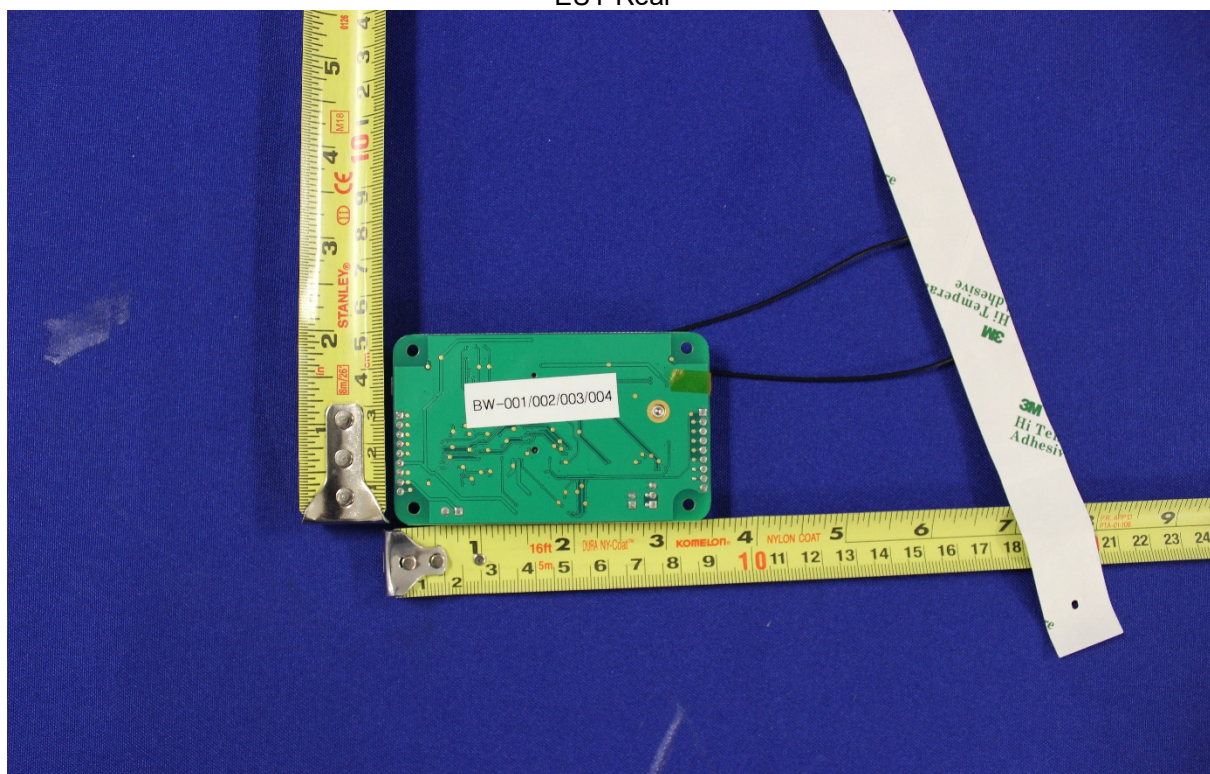
8 Pictures of Test Arrangements

8.1 EUT Photos

EUT Front

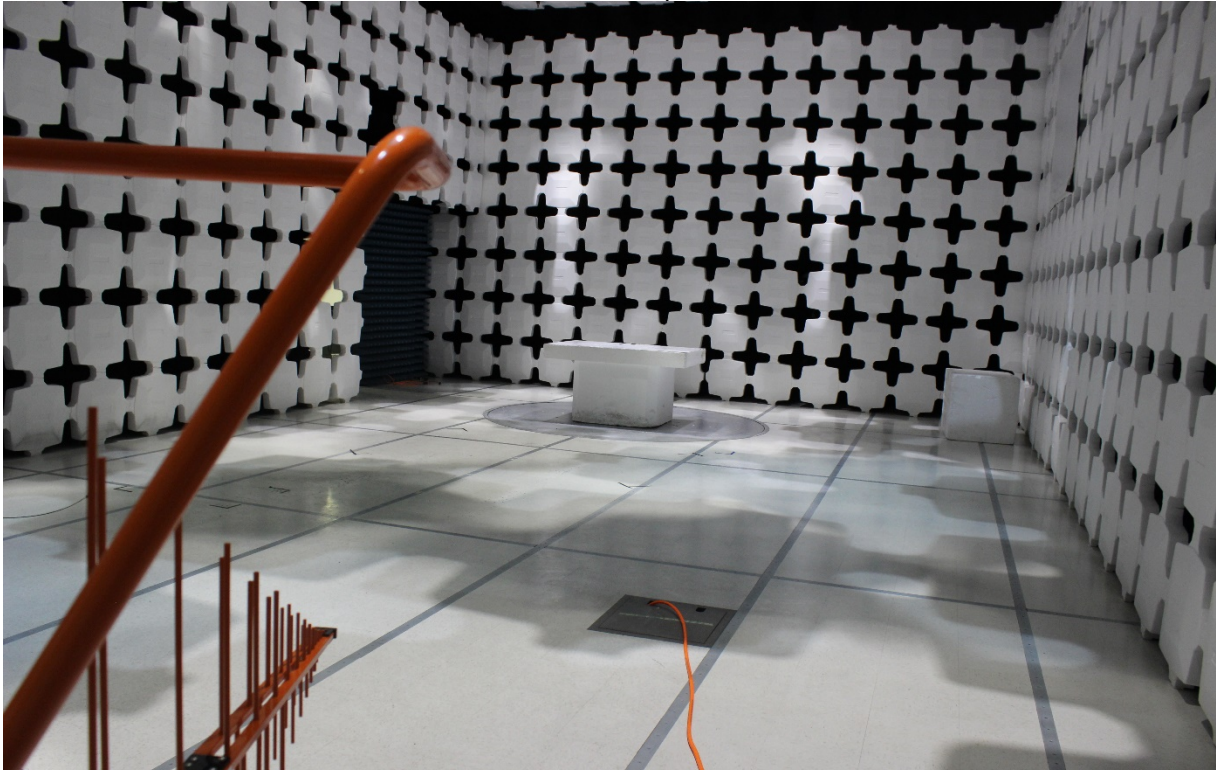


EUT Rear

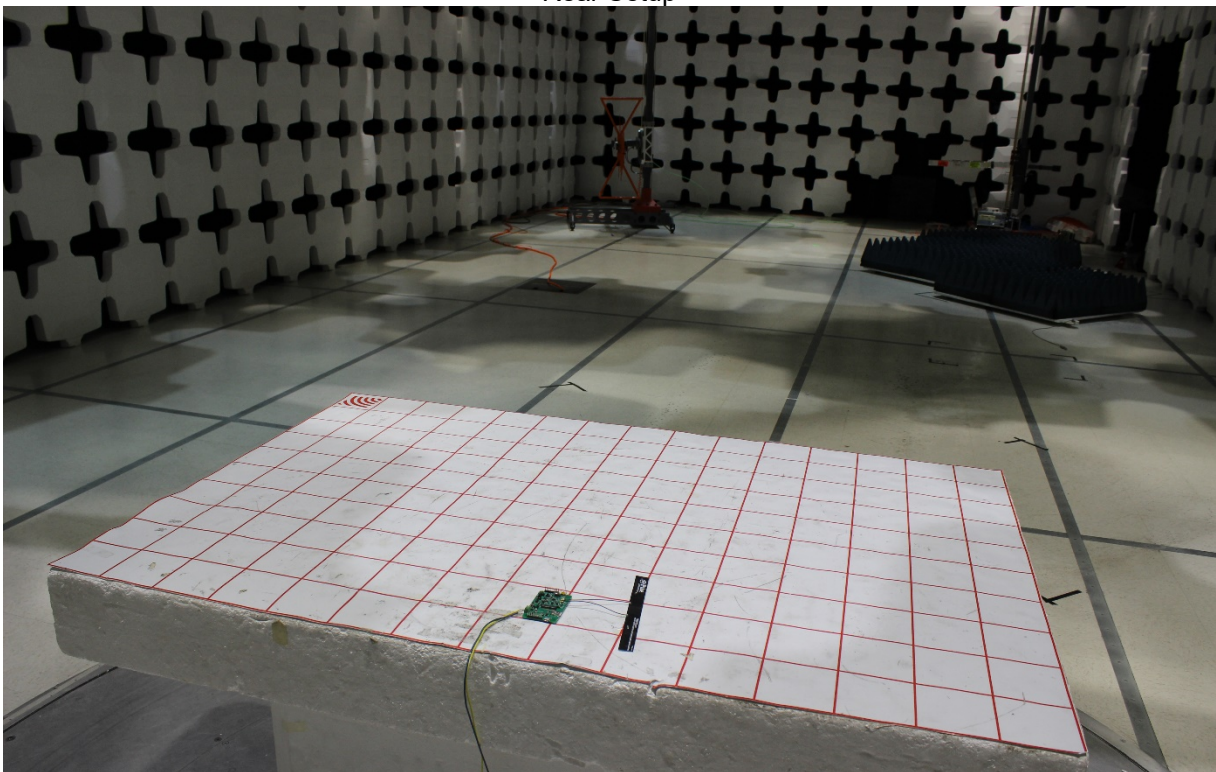


8.2 Radiated Emissions up to 1 GHz

Front Setup

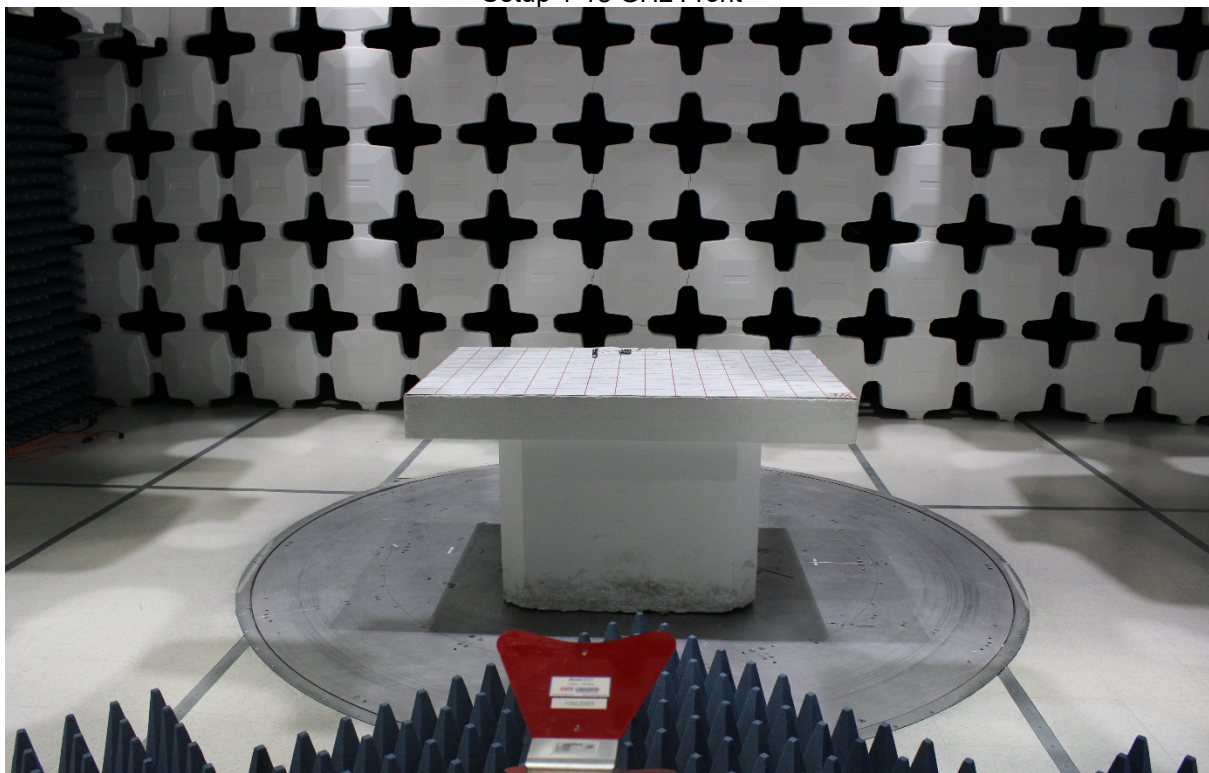


Rear Setup

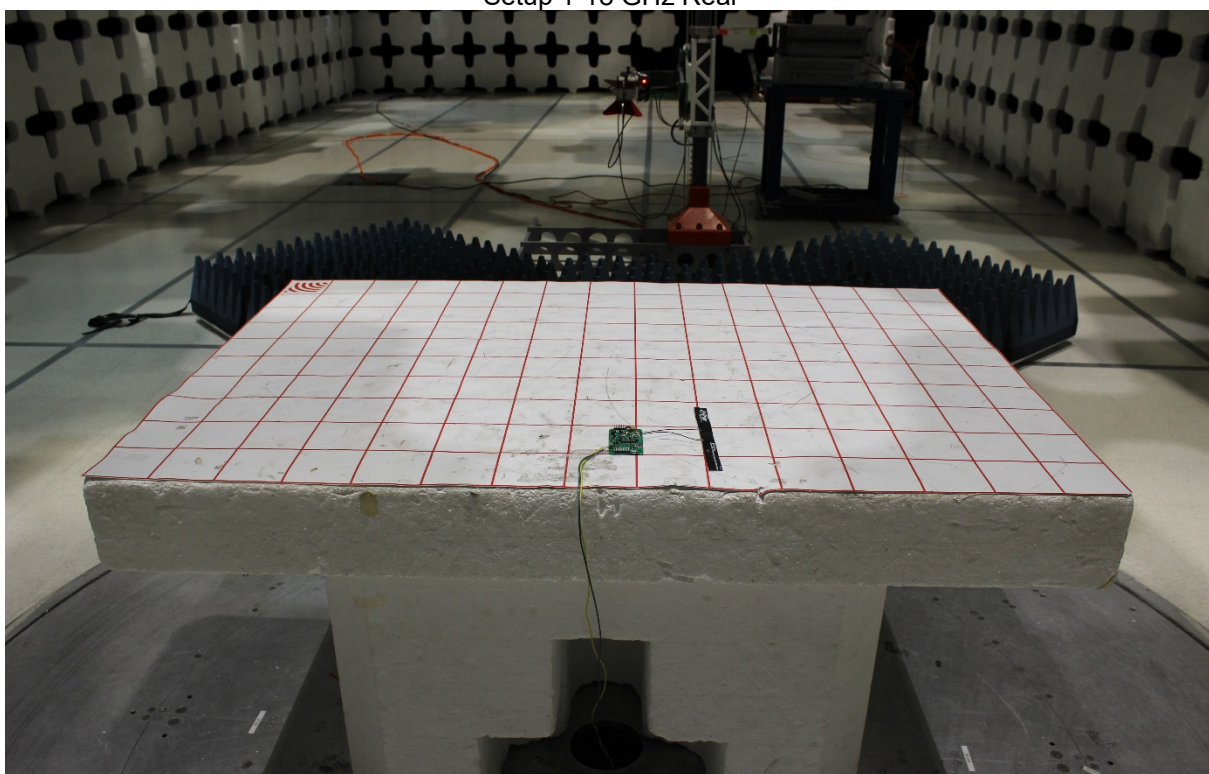


8.3 Radiated Emissions above 1 GHz

Setup 1-18 GHz Front



Setup 1-18 GHz Rear



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.

If you have any comments, please feel free to contact us at the following:

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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 ---