



**BUREAU  
VERITAS**

## FCC/ICES Test Report

**Report No.:** EMC\_SL22020101-DME-210\_FCC15B

**Test Model:** Oyster3 4G

**Received Date:** February 24, 2022

**Test Date:** February 24 and 25, 2022

**Issued Date:** March 4, 2022

**Applicant:** Digital Matter

**Address:** Suite 6, 100 Railway Road, Subiaco, 6008, Western Australia

**Manufacturer:** Digital Matter Embedded

**Address:** Unit 7, Pinetree Business Park, 63 Brahman Crescent, Westfield, Edenvale, 1610, South Africa

**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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## Table of Contents

<b>Release Control Record</b> .....	<b>3</b>
<b>1 Certificate of Conformity</b> .....	<b>4</b>
<b>2 Summary of Test Results</b> .....	<b>5</b>
2.1 Measurement Uncertainty .....	5
2.2 Modification Record .....	5
<b>3 General Information</b> .....	<b>6</b>
3.1 Description of EUT .....	6
3.2 Operating Modes of EUT and Determination of Worst Case Operating Mode .....	6
3.3 Test Program Used and Operational Description.....	6
3.4 Primary Clock Frequencies of Internal Source .....	6
<b>4 Configuration and Connections with EUT</b> .....	<b>7</b>
4.1 Connection Diagram of EUT and Peripheral Devices .....	7
4.2 Configuration of Peripheral Devices and Cable Connections .....	7
<b>5 Radiated Emissions up to 1 GHz</b> .....	<b>8</b>
5.1 Limits .....	8
5.2 Test Instruments .....	8
5.3 Test Arrangement .....	9
5.4 Test Results.....	10
<b>6 Radiated Emissions above 1 GHz</b> .....	<b>11</b>
6.1 Limits .....	11
6.2 Test Instruments .....	11
6.3 Test Arrangement .....	12
6.4 Test Results.....	13
<b>7 Pictures of Test Arrangements</b> .....	<b>14</b>
7.1 EUT Photos .....	14
7.2 Radiated Emissions up to 1 GHz .....	15
7.3 Radiated Emissions above 1 GHz .....	16
<b>Appendix – Information of the Testing Laboratories</b> .....	<b>17</b>



### Release Control Record

<b>Issue No.</b>	<b>Description</b>	<b>Date Issued</b>
EMC_SL22020101-DME-210-01_FCC15B	Original release	March 4, 2022

**1 Certificate of Conformity**

**Product:** Oyster3 4G

**Test Model:** Oyster3 4G

**Applicant:** Digital Matter

**Test Date:** February 24 and 25, 2022

**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 :**           *Pooja Pandya*           , **Date:**           March 4, 2022            
Pooja Pandya, RF Test Engineer

**Approved by :**           *Suresh Kondapalli*           , **Date:**           March 4, 2022            
Suresh Kondapalli, Technical Director

## 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	Not Applicable
15.109	6.2.1	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -7.4 dB at 741.751 MHz	Pass
	6.2.2	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -22.3 dB at 17890.08 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) (±)
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	Oyster3 4G
Brand	Digital Matter
Test Model	Oyster3 4G
Regulatory Type	FCC & ISED
Model details	This device contains 4G module Nordic NRF9160-SICA-R7
Sample Status	Final Production
Operating Software	Custom Firmware
Power Supply Rating	3 x AA 1.5V Battery or 3 x 3.6V LTC
sData Cable Supplied	DMLink

#### 3.2 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT was tested with internal lithium-ion battery and external DC power supply of 4.5V.

EUT has been pre-tested under following test modes, and test mode 1 was the worst case for final test.

Mode	Test Condition
1	Normal mode

Test modes are presented in the report as below.

Mode	Test Condition
	Conducted emission test
	EUT is DC powered. Test not applicable.
	Radiated emission test
	Normal mode

#### 3.3 Test Program Used and Operational Description

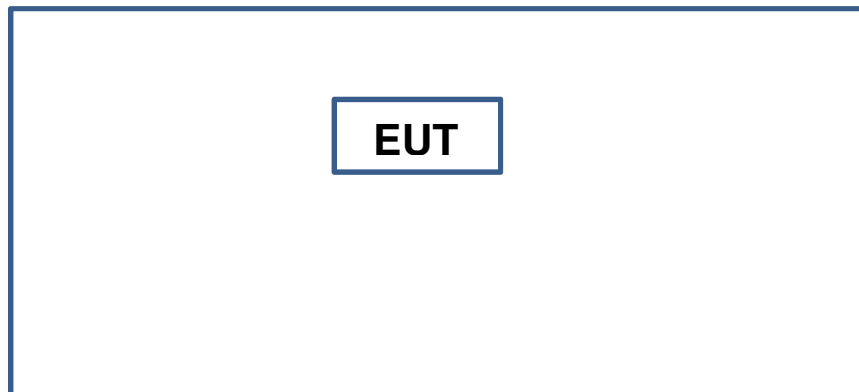
Test program was provided by Digital Matters. This device is used in vehicle as a tracking device. This device was used in normal operational mode during the testing.

#### 3.4 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 64 MHz, provided by Digital Matter, 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
A.	AA Batteries	Duracell	MN1500 1.5V LR6	-	-	-

## 5 Radiated Emissions up to 1 GHz

### 5.1 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 $\mu$ 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 $\mu$ 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 $\mu$ V/m) = 20 log Emission level (uV/m).  
 3. QP detector shall be applied if not specified.

### 5.2 Test Instruments

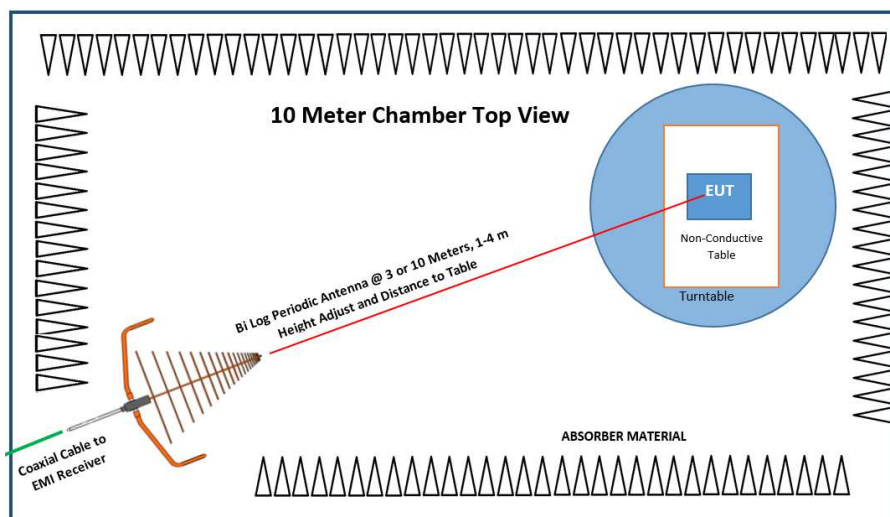
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Rohde and Schwarz	ESW44	1328.4100K- 101662-MH	09/22/2021	09/22/2022
Biconilog Antenna , Sunol	JB6	A111717	9/4/2021	09/04/2022
Horn Antenna ETS-Lindgren	3117	218554	04/21/2021	04/21/2022
Pre-Amplifier RF-Lambda	RAMP00M50GA	18040300055	05/07/2021	05/07/2022



### 5.3 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.

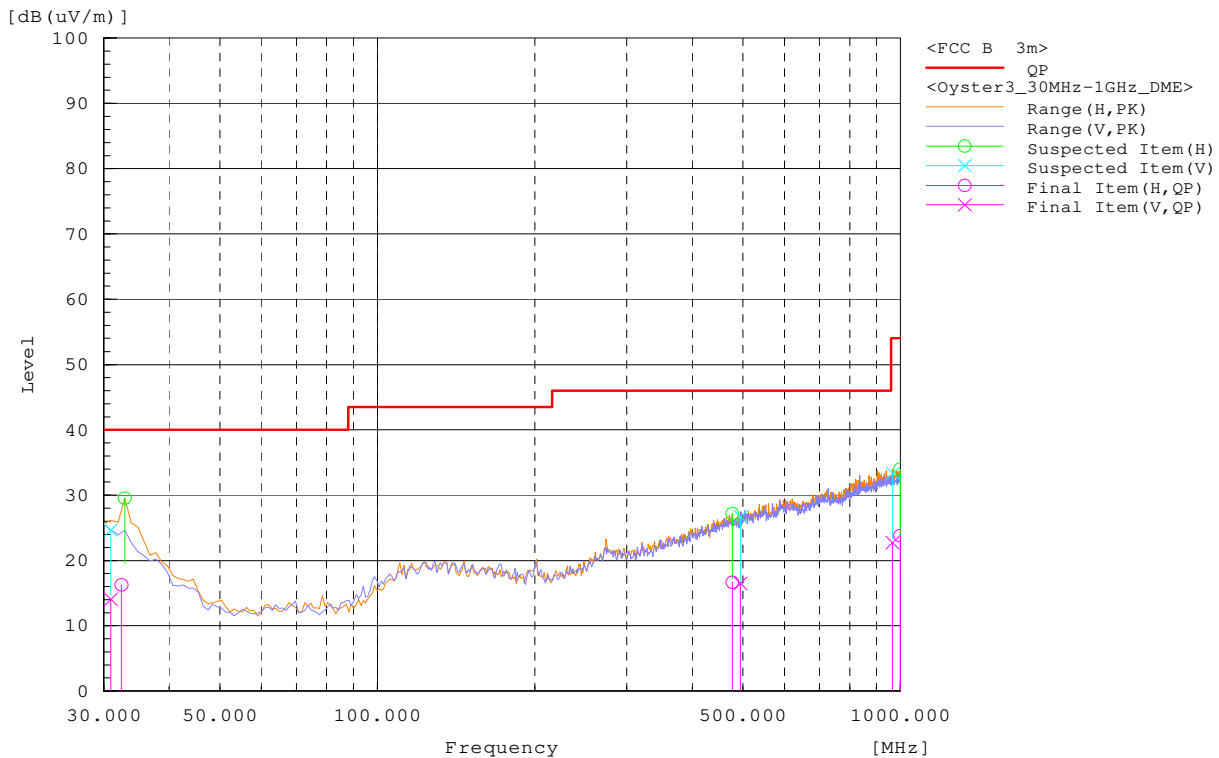


## 5.4 Test Results

Frequency Range	30MHz to 1000MHz		
Input Power	120 Vac, 60 Hz	Environmental Conditions	22 °C, 55% RH
Tested by	Pooja Pandya	Test Date	02/24/2022
Test Mode	Normal Mode		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m

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	30.957	V	-10.6	24.7	14.1	40	-25.9	261.6	264.2	Pass
2	32.417	H	-8.9	25.2	16.3	40	-23.7	135.5	294.8	Pass
3	477.137	H	-8.2	24.9	16.7	46	-29.3	181.8	147.1	Pass
4	494.19	V	-8.5	25	16.5	46	-29.5	342.2	333.7	Pass
5	965.583	V	-8.3	31.1	22.8	54	-31.2	201.4	258	Pass
6	999.202	H	-8.5	32.3	23.8	54	-30.2	250.8	297.9	Pass



\*Negative margin indicates below the limit.

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)

## 6 Radiated Emissions above 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 $\mu$ 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 $\mu$ 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

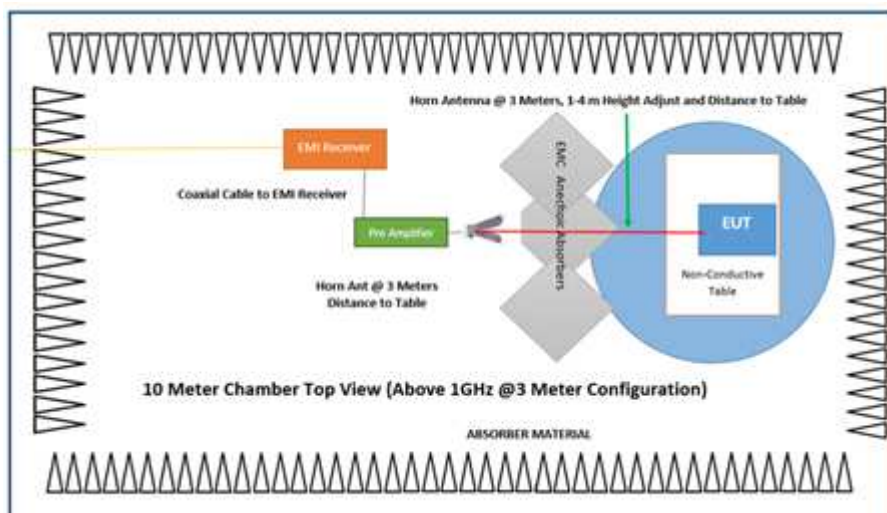
### 6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Rohde and Schwarz	ESW44	1328.4100K- 101662-MH	09/22/2021	09/22/2022
Horn Antenna ETS-Lindgren	3117	218554	04/21/2021	04/21/2022
Pre-Amplifier RF-Lambda	RAMP00M50GA	18040300055	05/07/2021	05/07/2022

### 6.3 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.

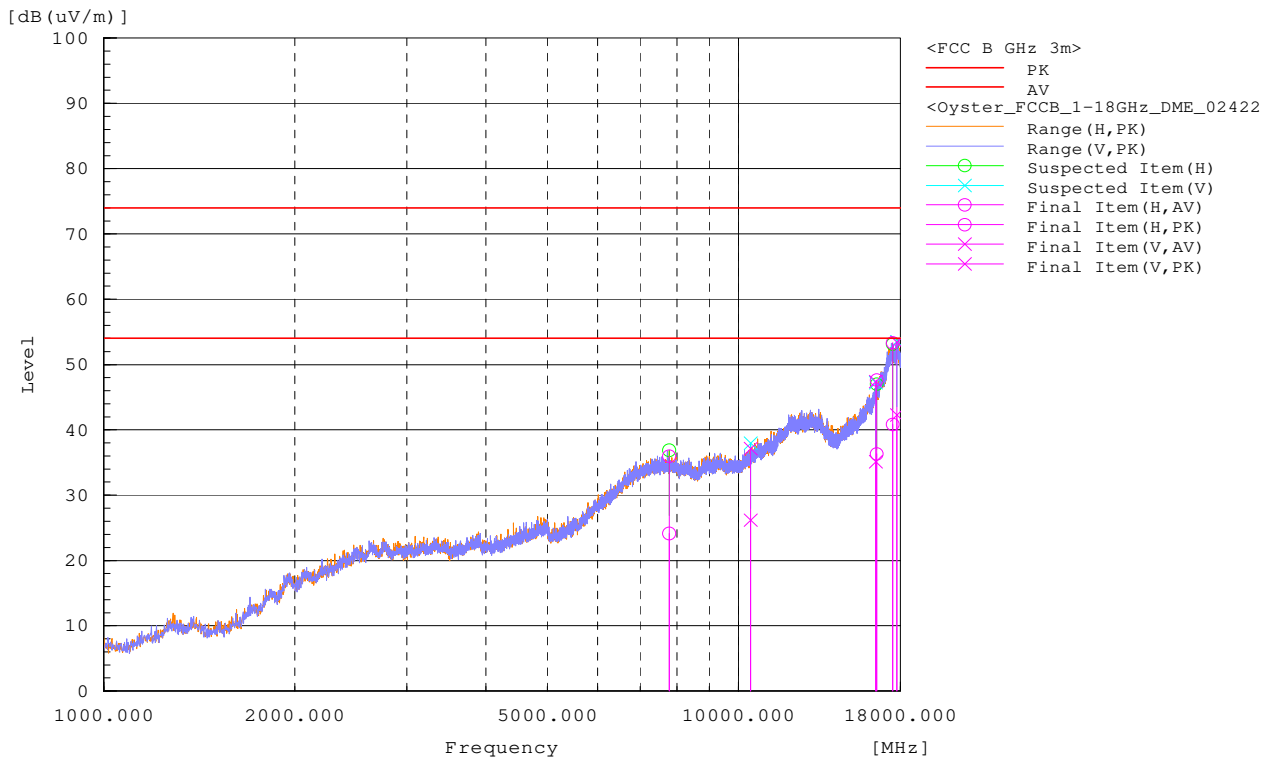


## 6.4 Test Results

Frequency Range	1GHz to 18GHz		
Input Power	120 Vac, 60 Hz	Environmental Conditions	22 °C, 55% RH
Tested by	Pooja Pandya	Test Date	02/25/2022
Test Mode	Normal Mode		

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)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	7776.944	H	23.4	35.3	0.7	24.1	36.0	54	74	-29.9	-38.0	285.9	248.3	Pass
2	10456.93	V	20.9	31.8	5.3	26.2	37.1	54	74	-27.8	-36.9	318.4	237.1	Pass
3	16465.9	V	21.4	33.6	13.8	35.2	47.4	54	74	-18.8	-26.6	319.1	143.4	Pass
4	16504.56	H	22.5	33.8	13.8	36.3	47.6	54	74	-17.7	-26.4	267.3	356.9	Pass
5	17495.64	H	24.4	36.9	16.4	40.8	53.3	54	74	-13.2	-20.7	318.1	257.1	Pass
6	17765.12	V	26.1	37.2	16.2	42.3	53.4	54	74	-11.7	-20.6	100.0	353.3	Pass



\*Negative margin indicates below the limit.

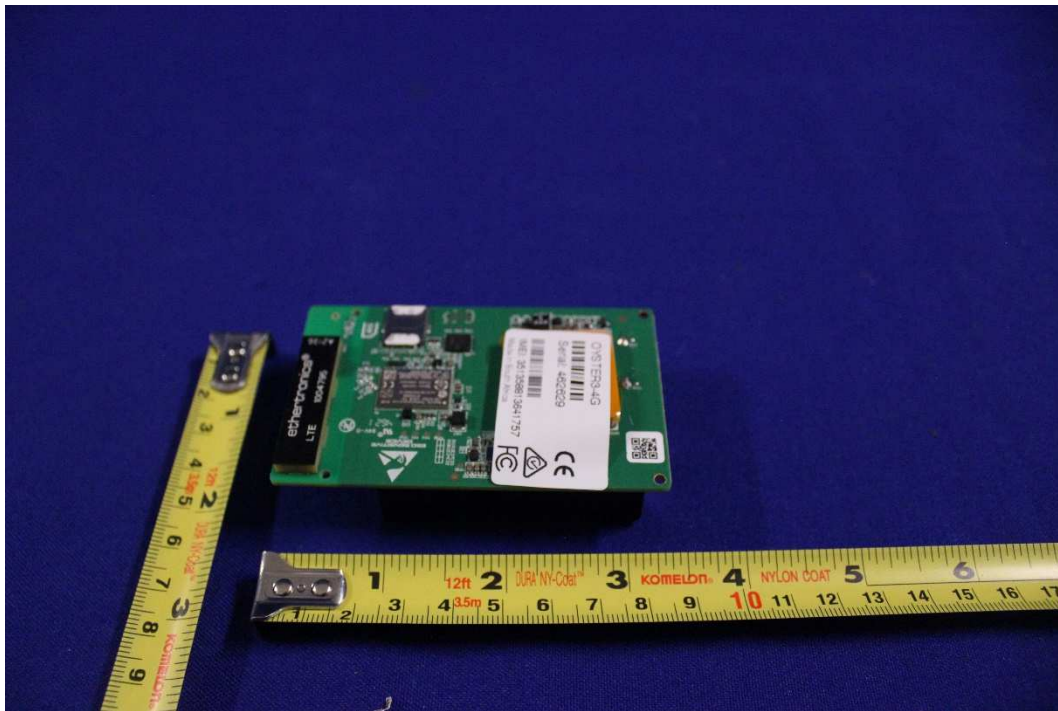
Remarks:

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

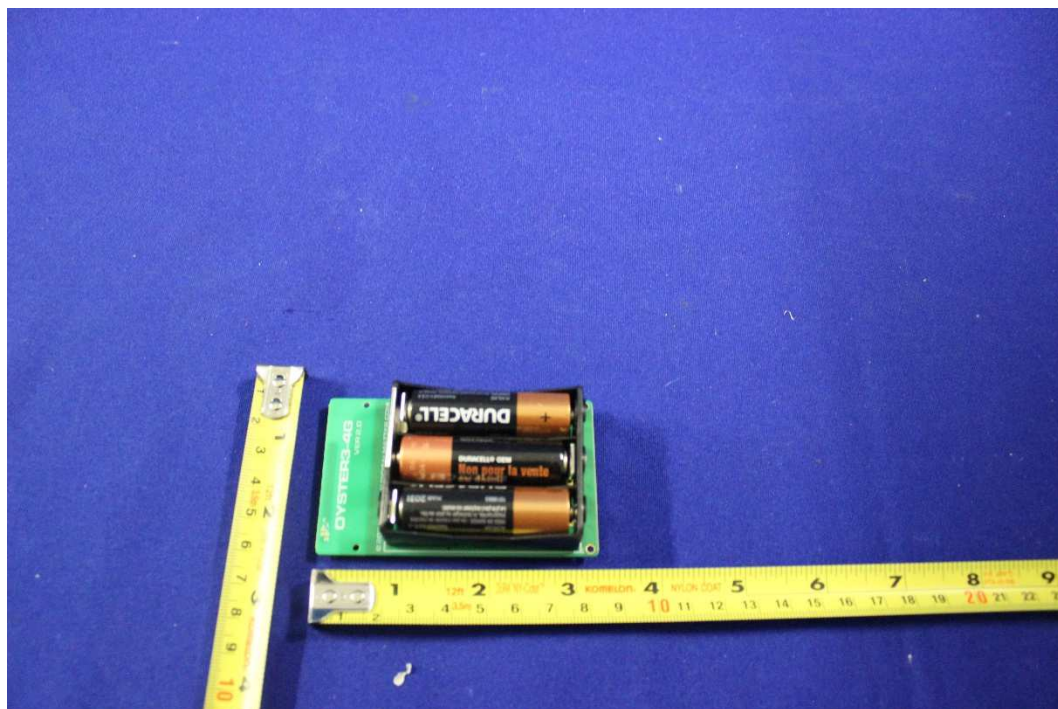
## 7 Pictures of Test Arrangements

### 7.1 EUT Photos

EUT - Front



EUT - Rear

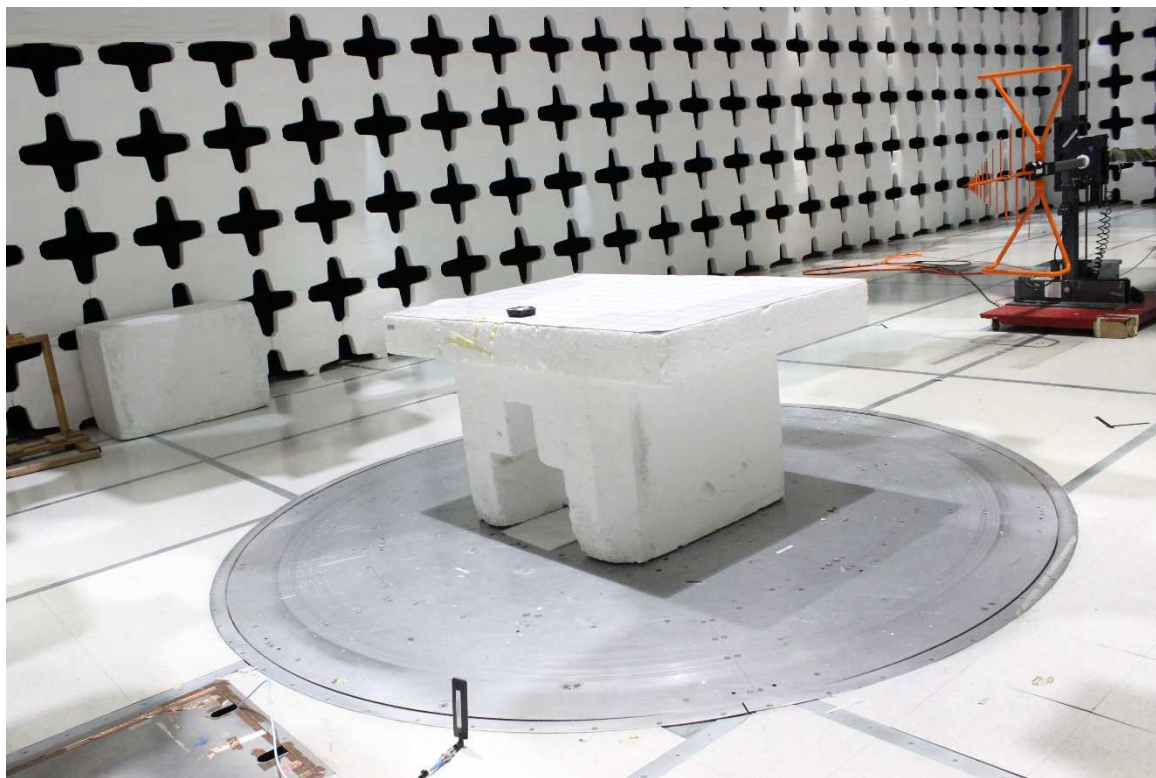


## 7.2 Radiated Emissions up to 1 GHz

Setup – Front



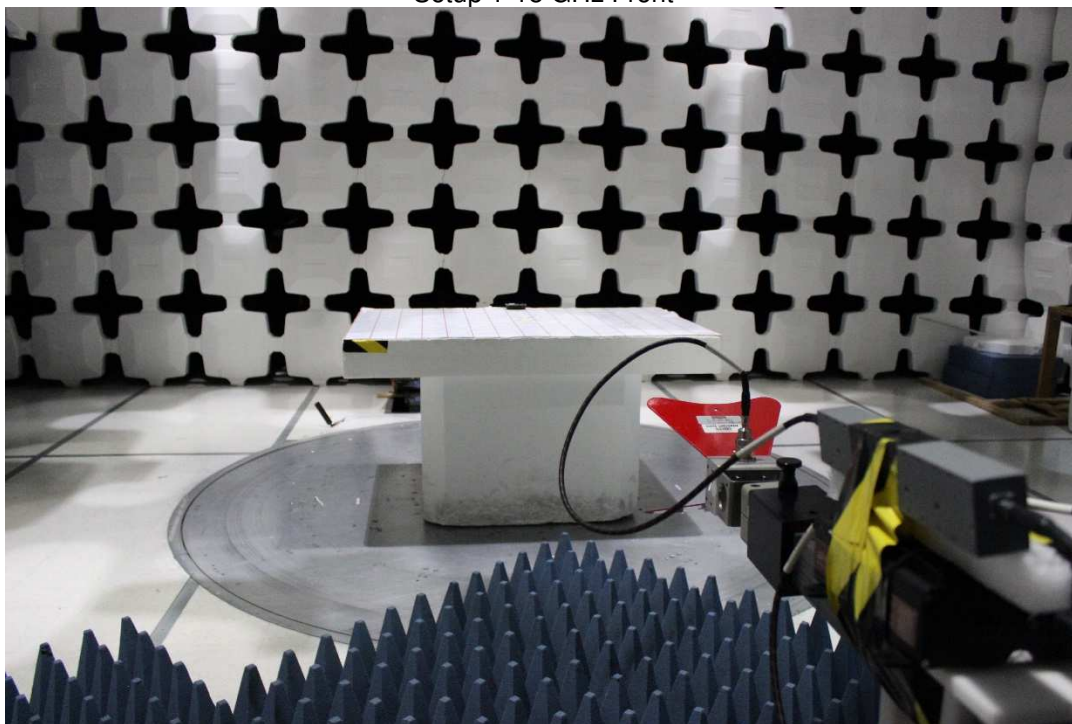
Setup – Rear



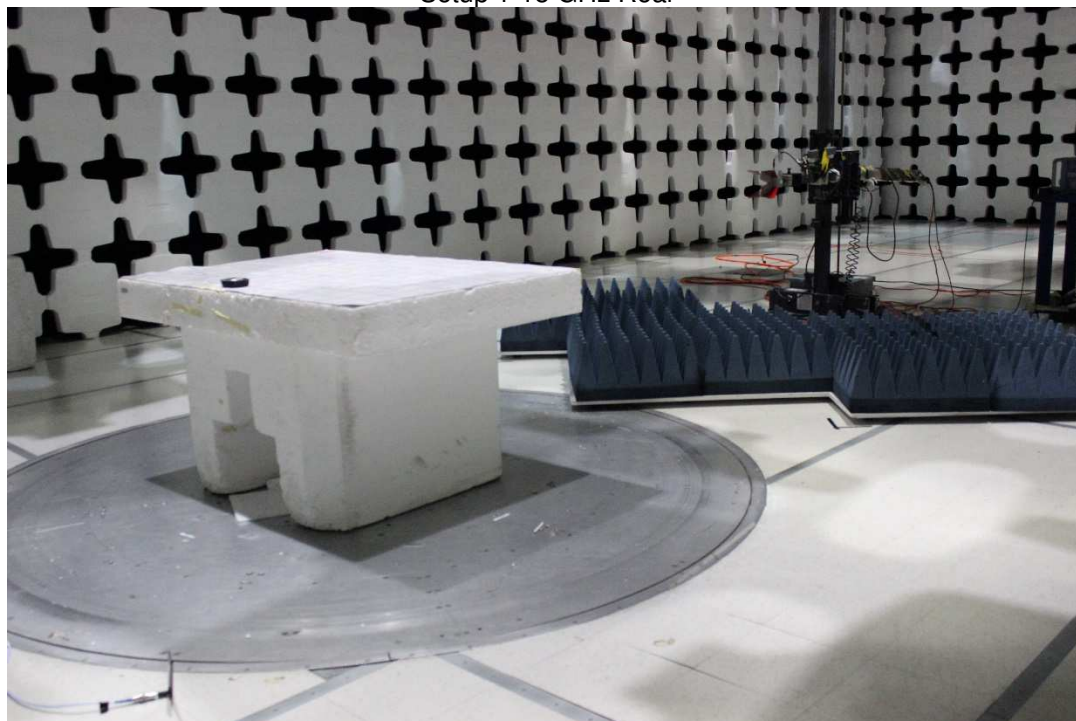
### 7.3 Radiated Emissions above 1 GHz

#### Above 1GHz

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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**Web Site:** [www.cpsusa-bureauveritas.com](http://www.cpsusa-bureauveritas.com)

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

--- End of Test Report ---