CE EMC Test Report

Report No.: EMC_SL21121303-OMP-002_EN55032

Test Model: OPS243-A

Series Model: OPS24x

Received Date: 01/20/2022

Test Date: 01/27/2022 to 02/27/2022

Issued Date: 03/29/2022

Applicant: OmniPreSense Corporation

Address: 1650 Zanker Road, Suite 222
San Jose, CA 95112 USA

Manufacturer: OmniPreSense Corporation

Address: 1650 Zanker Road, Suite 222
San Jose, CA 95112 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

ACCREDITED
TESTING CERT # 2742-01

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Table of Contents

Release Control Record

Issue No.	Description	Date Issued
OMP-002_EMC_CE_EN55032 35 301 489	Original Report	March 29, 2022

1 Certificate of Conformity

Product:	OPS243-A
Brand:	OmniPreSense
Test Model:	OPS243-A
Series Model:	OPS24x
Applicant:	OmniPreSense Corporation
Test Date:	01/27/2022 to 02/27/2022
Standards:	EN 55032:2015, Class A EN 55035:2017 EN 301 489-1 V2.2.3 (2019-11) EN 301 489-3 V2.1.1 (2019-03) AS/NZ CISPR32 AS/NZ CISPR35 EN 61000-3-2:2014, Class {A/D} EN 61000-3-3:2013 EN 61000-4-2:2009 EN 61000-4-3:2006 +A1:2008 +A2:2010 EN 61000-4-4:2012 EN 61000-4-5:2014 EN 61000-4-6:2014 EN 61000-4-8:2009 EN 61000-4-11:2004 +A1:2017

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:** March 29, 2022

Abhijit Patibandla, RF/EMC Engineer

Approved by :  , **Date:** **March 29, 2022**

Suresh Kondapalli, Engineer Reviewer

2 Summary of Test Results

EN 55032:2015/EN 301 489 Series Emissions				
Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
EN 55032:2015	Radiated emission 30-1000 MHz	Enclosure of ancillary equipment measured on a stand alone basis	Minimum passing Class A margin is 9.6 dB at 104 MHz	Pass
	Radiated emission 1-6 GHz		Minimum passing Class A margin is 26.3 dB at 5899 MHz	Pass
EN 55032:2015	Conducted emission 150 kHz - 30 MHz	DC power input/output ports (fixed)	Test not applicable because DC cable is no longer than 3 m.	N/A
EN 55032:2015	Conducted emission 150 kHz - 30 MHz	AC mains input/output ports	NA	Pass
EN 61000-3-2:2014* EN 61000-3-2:2006 +A1:2009 +A2:2009	Harmonic current emissions	AC mains input port	NA	Pass
EN 61000-3-3:2013* EN 61000-3-3:2008	Voltage fluctuations and flicker	AC mains input port	NA	Pass
EN 55032:2015	Conducted disturbance 150 kHz - 30 MHz	Telecommunication ports	NA	N/A

EN55035/EN 301 489 Series Immunity				
Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
EN 61000-4-3:2006 +A1:2008 +A2:2010	RF Electromagnetic Field (RS)	Enclosure	Performance Criterion A	Pass
EN 61000-4-2:2009	Electrostatic Discharges (ESD)	Enclosure	Performance Criterion B	Pass
EN 61000-4-4:2012* EN 61000-4-4:2004 +A1:2010	Fast Transients Common Mode (EFT)	Signal, telecommunication and control ports, DC and AC power ports	Test not applicable because the port does not exist.	NA
EN 61000-4-5:2014* EN 61000-4-5:2006	Surges	AC mains power input ports, line to line and line to ground Telecommunication ports, line to ground	NA	NA
EN 61000-4-6:2014* EN 61000-4-6:2009	RF Common Mode 150 kHz to 80 MHz (CS)	Signal, telecommunication and control ports, DC and AC power ports	Test not applicable because the port does not Exist	NA
EN 61000-4-8:2010	Power Frequency Magnetic Field (PFMF)	Enclosure	Performance Criterion A	Pass

EN55035/EN 301 489 Series Immunity				
Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
EN 61000-4-11:2004 +A1:2017	Voltage Dips and Interruptions	AC mains power input ports	NA	NA

N/A: Not Applicable
* Both the specific and the latest version of the basic standard are referenced to fulfill the requirements.
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.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Expanded Uncertainty (k=2) (±)
Conducted disturbances,150kHz ~ 30MHz	3.856 dB
Radiated disturbance, 30MHz ~ 1GHz	4.638 dB
Radiated disturbance, 1GHz ~ 6GHz	4.580 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

3 General Information

3.1 General Description of EUT

Product	OPS243-A
Brand	OmniPreSense
Test Model	OPS243-A
Identification No. of EUT	NA
Series Model	OPS24x
Operating Software	Embedded Firmware; No OS
Power Supply rating	5.0Vdc
I/O Ports	Refer to user's manual
Accessory Device	NA
Data Cable Supplied	Micro USB cable

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

The EUT is designed to operate at 5V DC.

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 (EUT Powered through USB port)

Test modes are presented in the report as below.

Mode	Test Condition
Conducted emission test	
1	Normal Mode (EUT Powered through USB port)
The idle mode of conducted emission test at telecom port was pre-tested based on the worst case of link mode. Due to emissions of idle mode being very low compared to link mode, only the link mode data were presented in the test report.	
Radiated emission test	
1	Normal Mode (EUT Powered through USB port)

3.3 Test Program Used and Operational Description

OPS243 is a single board radar sensor which transmits a constant frequency of 24.125GHz and receives it back to determine the speed of any objects in the sensor field of view. The device digitizes the signal for processing and speed information.

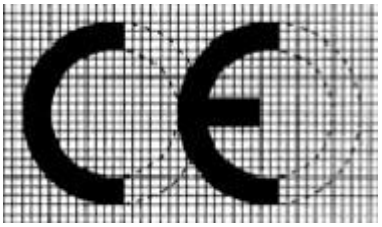
3.4 Primary Clock Frequencies of Internal Source

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

3.5 Miscellaneous

- **Affix CE marking**

The marking must be placed visibly and legibly on the product or, if not possible due to the nature of the product, be affixed to the packaging and the accompanying document. The CE marking shall consist of the initials 'CE' taking the following form:



A minimum height of 5 mm is required to ensure that it is legible. However on account of the nature of radio equipment, the height of the CE marking affixed to radio equipment may be lower than 5 mm, provided that it remains visible and legible. If the CE marking is reduced or enlarged, the proportions given in the graduated drawing above must be respected.

When the product is subject to other Directives covering other aspects and which also provide for the 'CE' marking, the accompanying documents must indicate that the product also conforms to those other Directives.

However, when one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking has to indicate conformity only with the Directives applied by the manufacturer. In this case, the particularities of the Directives applied, as published in the Official Journal of the European Union, must be given in the documents, notices or instructions required by the Directives and accompanying such products.

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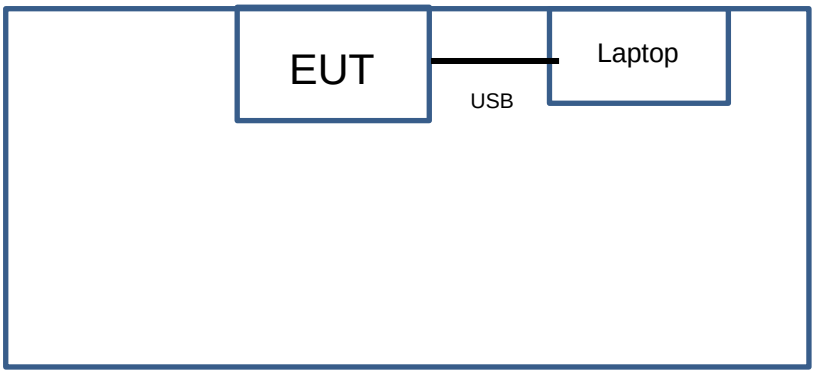
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

Emission tests, Harmonics, Flicker, Immunity tests::



4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests, Harmonics, Flicker, Immunity tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Dell	-	-	-	-

Note:

1. All power cords of the above support units are non-shielded

ID	Description	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB to Micro USB	1	1	No	-	-

5 Conducted Disturbance at Mains Ports

5.1 Limits

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	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
Transient Limiter Electro-Metrics	EM-7600-5	106	09/22/2021	09/22/2022
LISN ETS-Lindgren	3816/2NM	214372	01-11-2022	01-11-2023
Keysight MXE EMI	N9038A	MY55330108	09/22/2021	09/22/2022

5.3 Test Arrangement

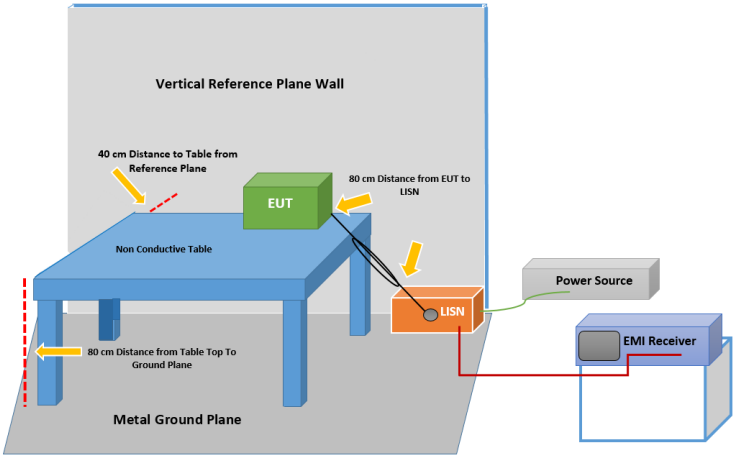
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The test results of conducted disturbance 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.



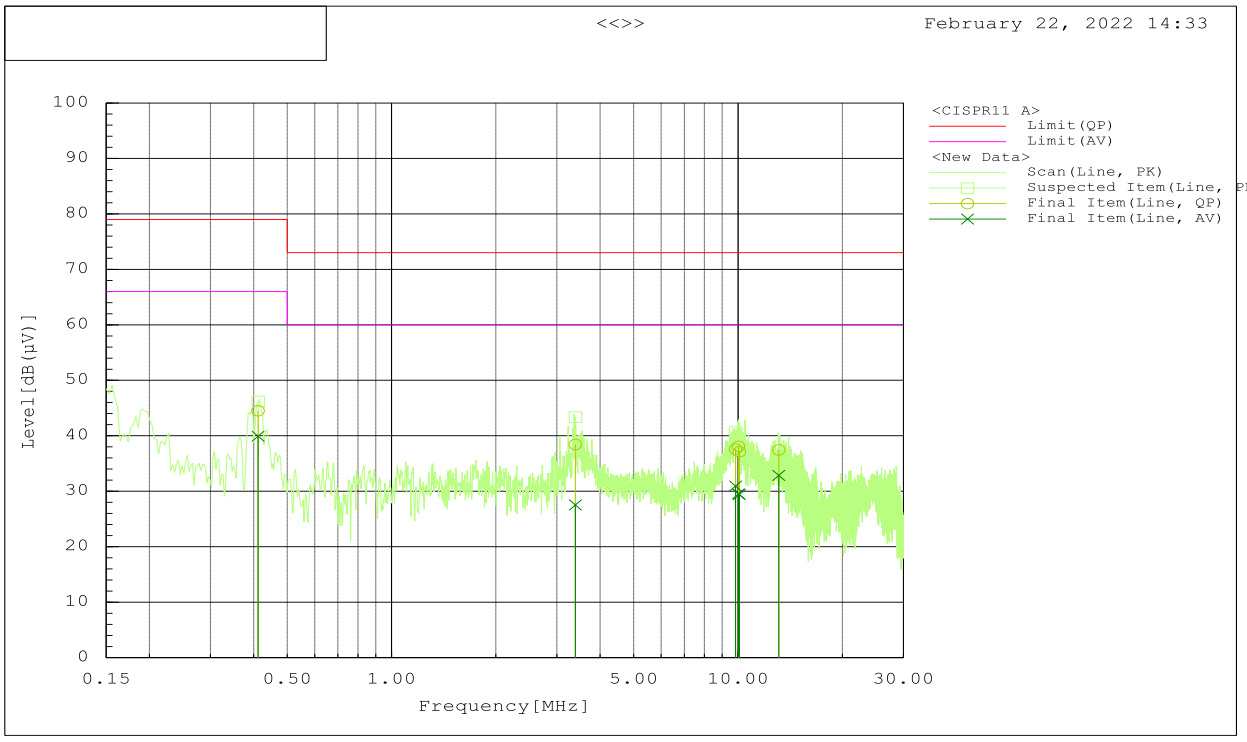
5.4 Test Results

Frequency Range	0.15-30 MHz	Phase	Line
Input Power	5V DC	Environmental Conditions	22 °C, 55% RH
Tested by	Abhijit Patibandla	Test Date	02/22/2022
Test Mode	Normal mode		

No	Frequency [MHz]	Line	Reading QP [dB(µV)]	Reading AV [dB(µV)]	Factor [dB]	Level QP [dB(µV)]	Level AV [dB(µV)]	Limit QP [dB(µV)]	Limit AV [dB(µV)]	Margin QP [dB]	Margin AV [dB]	Pass/Fail
1	0.412	Line	35.1	30.5	9.4	44.5	39.9	79	66	34.5	26.1	Pass
2	3.394	Line	29	18.1	9.4	38.4	27.5	73	60	34.6	32.5	Pass
3	10.085	Line	27.6	19.9	9.5	37.1	29.4	73	60	35.9	30.6	Pass
4	10.031	Line	28.6	20	9.5	38.1	29.5	73	60	34.9	30.5	Pass
5	13.119	Line	27.9	23.4	9.5	37.4	32.9	73	60	35.6	27.1	Pass
6	9.841	Line	28.1	21.4	9.5	37.6	30.9	73	60	35.4	29.1	Pass

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value

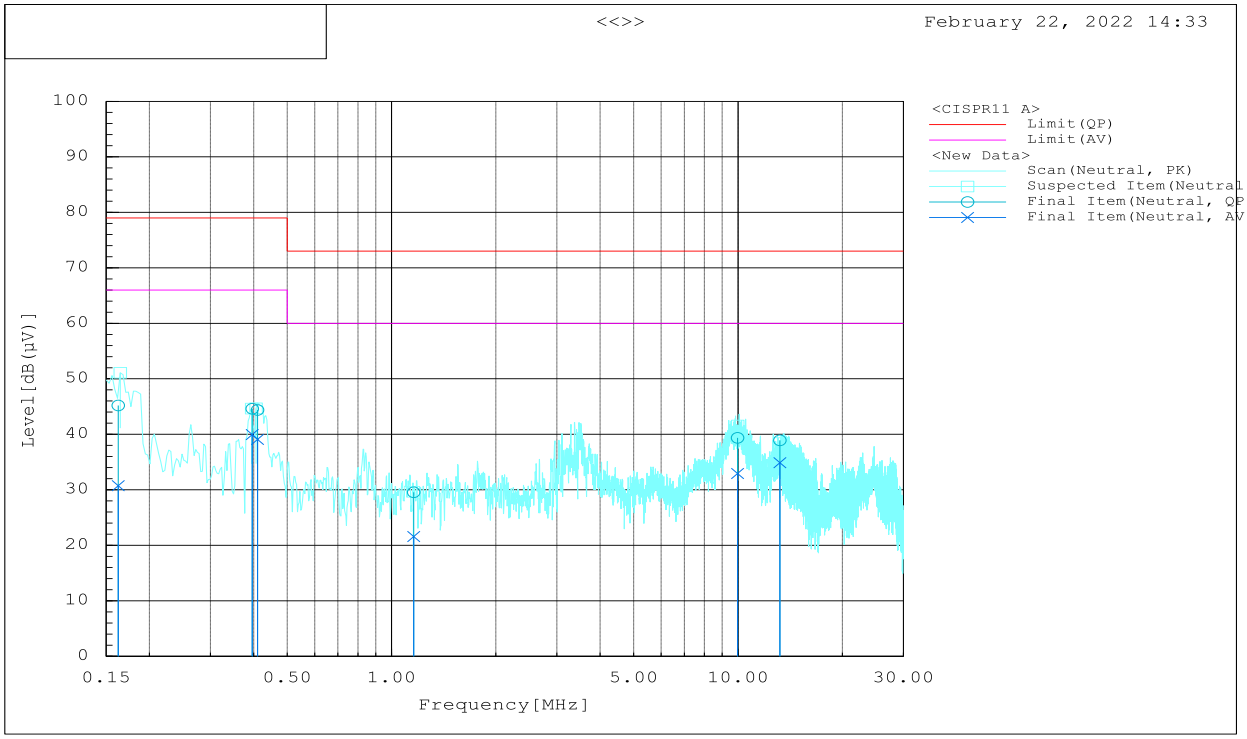


Frequency Range	0.15-30 MHz	Phase	Line
Input Power	5V DC	Environmental Conditions	22 °C, 55% RH
Tested by	Abhijit Patibandla	Test Date	02/22/2022
Test Mode	Normal mode		

No	Frequency [MHz]	Line	Reading QP [dB(µV)]	Reading AV [dB(µV)]	Factor [dB]	Level QP [dB(µV)]	Level AV [dB(µV)]	Limit QP [dB(µV)]	Limit AV [dB(µV)]	Margin QP [dB]	Margin AV [dB]	Pass/Fail
1	1.159	Neutral	20.2	12.2	9.4	29.6	21.6	73	60	43.4	38.4	Pass
2	0.411	Neutral	35	29.7	9.4	44.4	39.1	79	66	34.6	26.9	Pass
3	9.973	Neutral	29.9	23.4	9.5	39.4	32.9	73	60	33.6	27.1	Pass
4	13.201	Neutral	29.4	25.4	9.5	38.9	34.9	73	60	34.1	25.1	Pass
5	0.163	Neutral	35.6	21.1	9.6	45.2	30.7	79	66	33.8	35.3	Pass
6	0.396	Neutral	35.2	30.6	9.4	44.6	40	79	66	34.4	26	Pass

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value



6 Conducted Disturbance at Telecommunication Ports

No Tele port on the unit

7 Radiated Disturbance up to 1 GHz

7.1 Limits

Frequency (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 - 230	40	30
230 - 1000	47	37

Frequency (MHz)	Class A (at 3m)	Class B (at 3m)
	dBuV/m	dBuV/m
30 - 230	50	40
230 - 1000	57	47

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

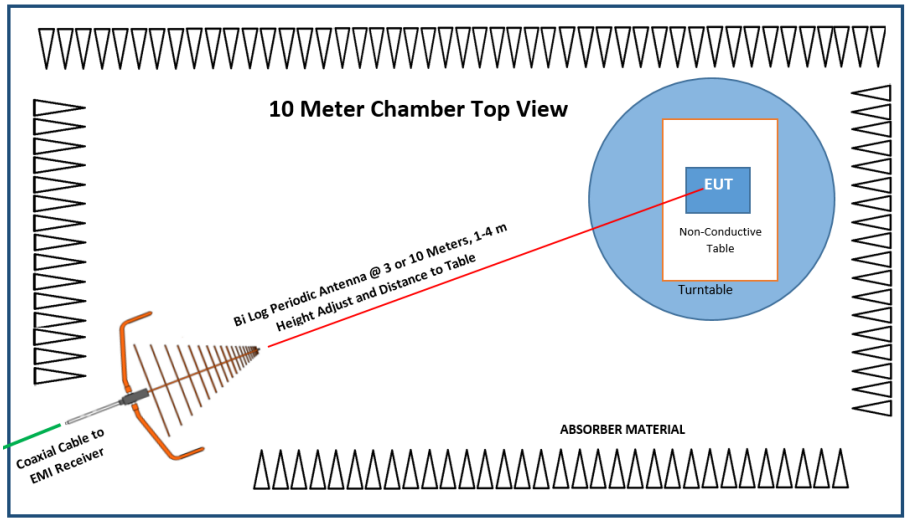
7.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Keysight	N9038A	MY55330108	09/22/2021	09/22/2022
Biconilog Antenna Sunol	JB6	A111717	9/4/2020	9/4/2022

7.3 Test Arrangement

a. 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.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
d. 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.
e. 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.



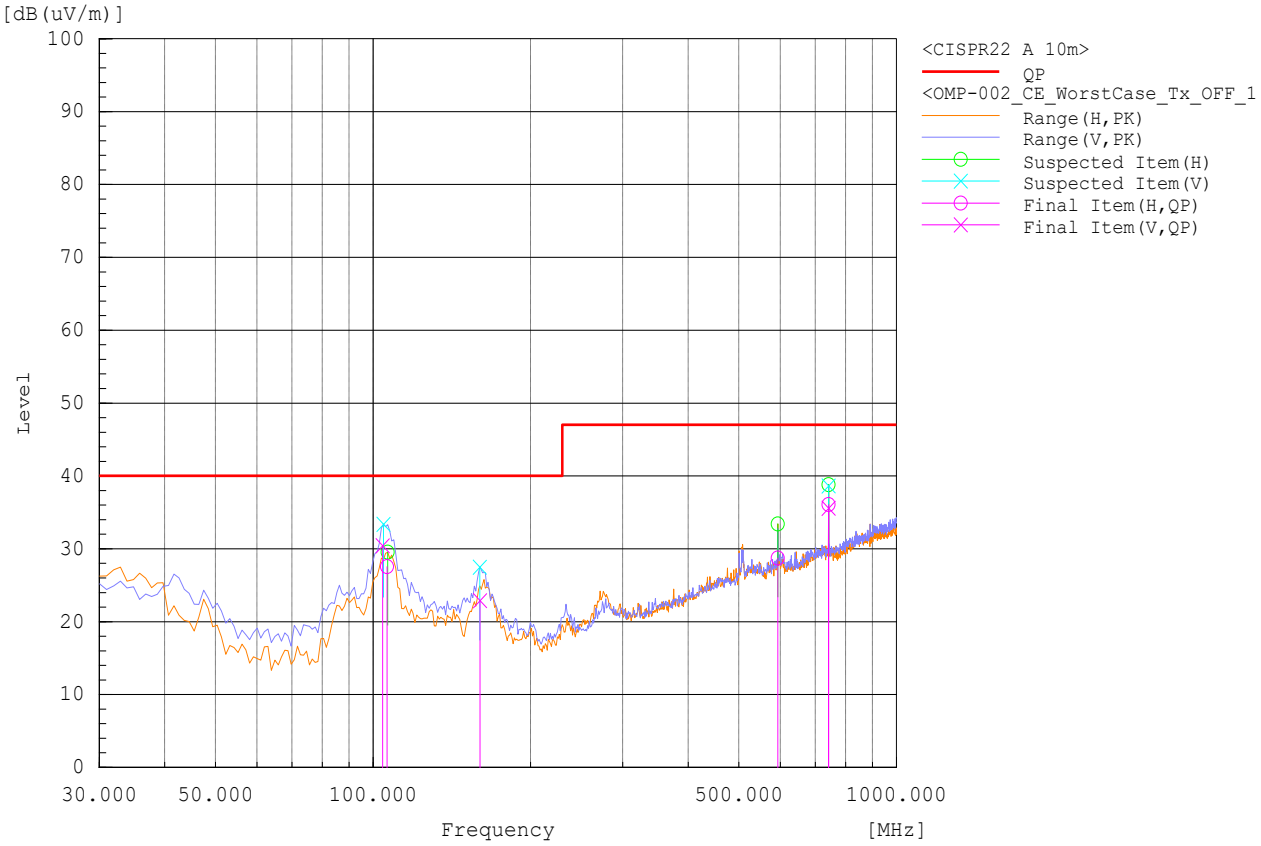
7.4 Test Results

Frequency Range	30-1000 MHz		
Input Power	5V DC	Environmental Conditions	22 °C, 55% RH
Tested by	Abhijit Patibandla	Test Date	02/27/2022
Test Mode	Normal mode		

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	104.29	V	13.5	16.9	30.4	40	9.6	122	37.6	Pass
2	106.375	H	10.2	17.4	27.6	40	12.4	352	124	Pass
3	160.006	V	4.3	18.6	22.9	40	17.1	132	123	Pass
4	593.397	H	1.5	27.2	28.7	47	18.3	290	126	Pass
5	741.752	H	7.4	28.7	36.1	47	10.9	248	269	Pass
6	741.758	V	6.4	29.2	35.6	47	11.4	242	11.1	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)



8 Radiated Disturbance above 1 GHz

8.1 Limits

Frequency (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Frequency Range of Radiated Measurement (For unintentional radiators)

Highest frequency generated or used in the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

8.2 Test Instruments

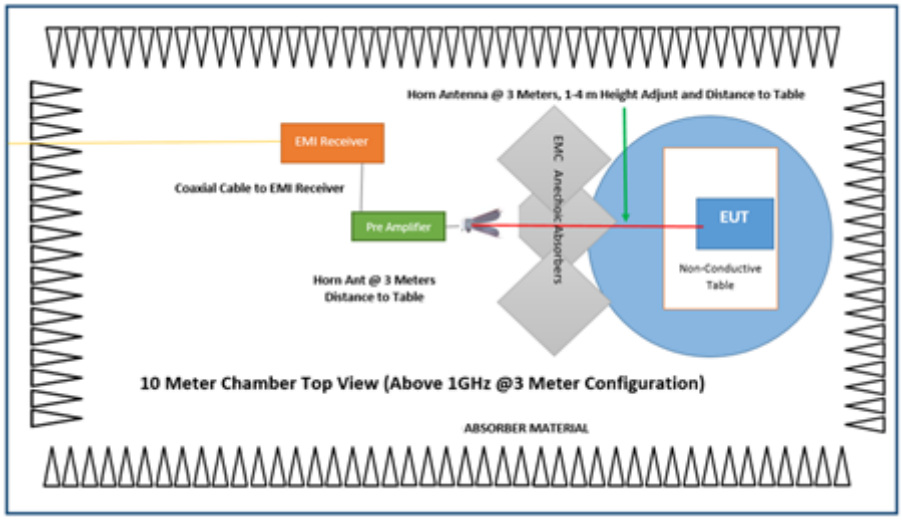
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMI Receiver Keysight	N9038A	MY55330108	09/22/2021	09/22/2022
Horn Antenna ETS-Lindgren	3117	218553	04/21/2021	04/21/2023
Pre-Amplifier RF-Lambda	RAMP00M50GA	17032300048	05/07/2021	05/07/2022

8.3 Test Arrangement

a. 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.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
d. 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.
e. 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:

1. 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.



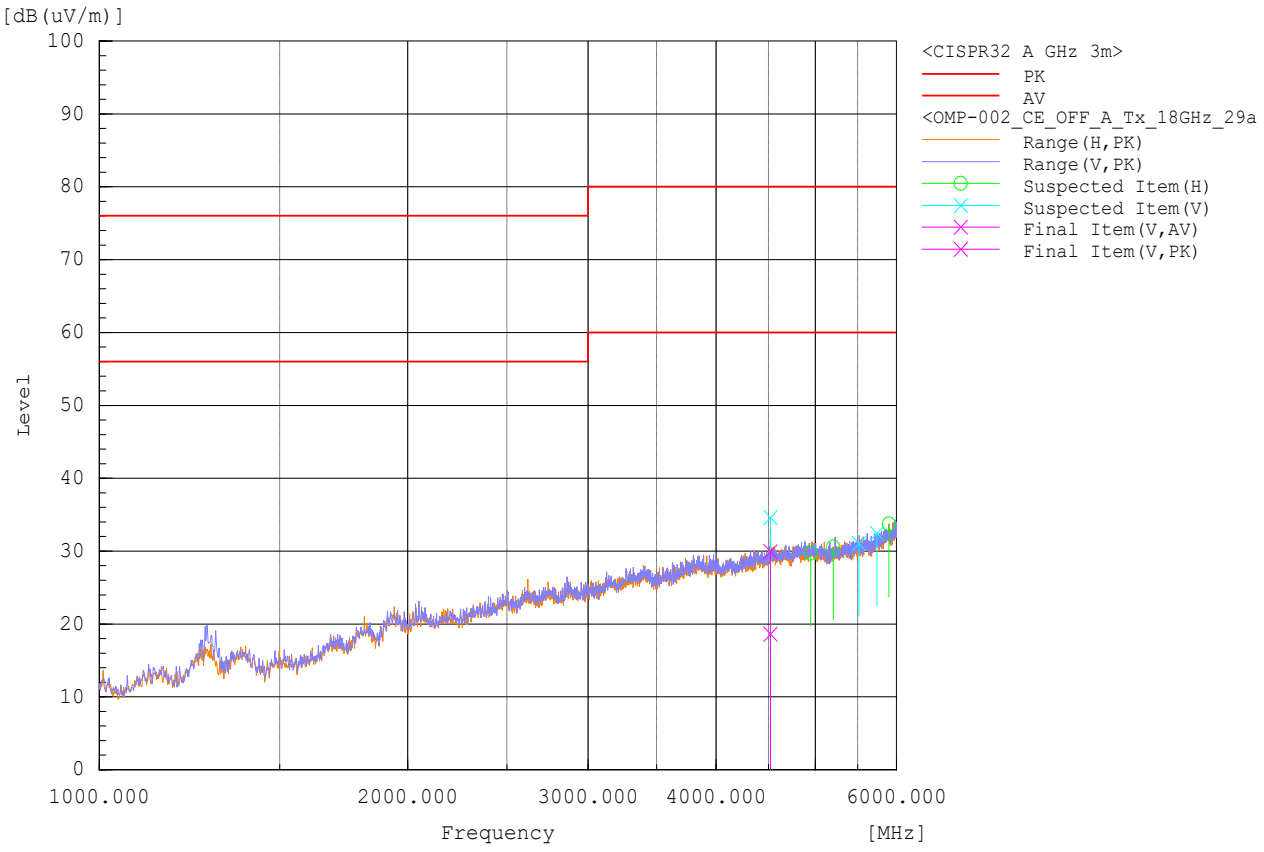
8.4 Test Results

Frequency Range	1000-18000 MHz		
Input Power	5V DC	Environmental Conditions	22 °C, 55% RH
Tested by	Abhijit Patibandla	Test Date	02/27/2022
Test Mode	Normal mode		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m												
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Factor [dB(1/m)]	Level AV [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	4519	V	41.1	-6.5	34.6	60	80	25.4	45.4	100	351	Pass
2	5204.1	H	36.2	-5.6	30.6	60	80	29.4	49.4	400	350	Pass
3	4947.4	H	35.6	-5.9	29.7	60	80	30.3	50.3	150	2.9	Pass
4	5899.4	H	37.4	-3.7	33.7	60	80	26.3	46.3	300	8.9	Pass
5	5741.3	V	36.6	-4.2	32.4	60	80	27.6	47.6	150	177	Pass
6	5513.5	V	35.8	-4.8	31	60	80	29	49	150	157	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)



9 Harmonics Current Measurement

Test not applicable

10 Voltage Fluctuations and Flicker Measurement

Test not applicable

Specific Immunity requirements by manufacturer

Monitored for the constant transmission and receiving distance data on the Laptop.

10.2 Performance Criteria

General Performance Criteria for EN 55035

These criteria shall be used during the testing of primary functions where no relevant annex is applicable.

When assessing the impact of a disturbance on a function, the assessment should take into consideration the function's performance prior to the application of the disturbance and only identify as failures those changes in performance that are a result of the disturbance

Performance Criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance Criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is
not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance Criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

General Performance Criteria For 301 489 series

- Performance criteria for continuous phenomena applied to transmitters and receivers (CT/CR)

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

- Performance criteria for transient phenomena applied to transmitters and receivers (TT/TR)

After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

- Performance criteria for equipment which does not provide a continuous communication link

For radio equipment which does not provide a continuous communication link, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

- Performance criteria for ancillary equipment tested on a stand alone basis

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

Product Specific Performance Criteria

The particular performance criteria which are specified in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, take precedence over the corresponding parts of the general performance criteria.

Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

EN 301 489-3, Short-Range Devices (SRD) Operating on Frequencies Between 9 kHz and 246 GHz
Applicable for 301 489-3

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature
- performance criteria B for immunity tests with phenomena of a transient nature

Special conditions for EN 301489-3		
Criteria	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

11 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

11.1 Test Specification

Basic Standard:	EN 61000-4-3
Frequency Range:	80 MHz ~ 6000 MHz***
Field Strength:	10 V/m***
Modulation:	1kHz or 2kHz Sine Wave, 80%, AM Modulation***
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	3 seconds

***Test levels vary based on test standard see test arrangement section or test result section for specific test values

11.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Signal Generator (0.1-6000MHz) Agilent	N5182A	MY47071065	01/13/2022	01/13/2023
EMC Field Probe ETS-Lindgren	HI-6005	156327	04/29/2021	04/29/2022
250 Watt Amplifier (80-1000 MHz) Amplifier Research	250W1000C	353461	09/22/2021	09/22/2022
RF Power Amplifier (700-6000 MHz) Ophir RF Inc.	5293RE	1035	09/22/2021	09/22/2022
Biconilog Antenna (26 MHz – 2GHz) EMCO	3141	1203	N/A	N/A
Horn Antenna (700 MHZ – 18 GHz)	SAS-571	411	N/A	N/A

11.3 Test Arrangement

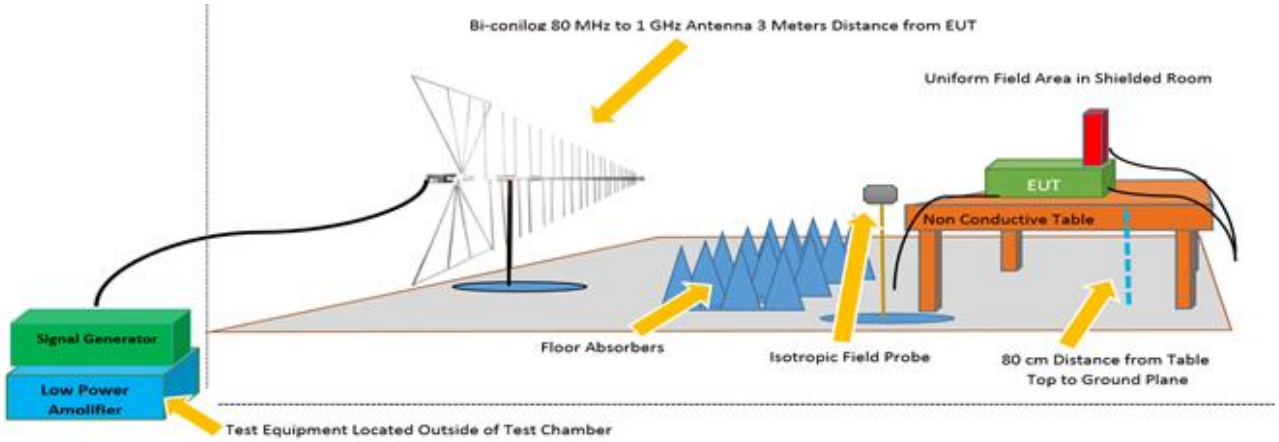
The test procedure was in accordance with EN 61000-4-3.

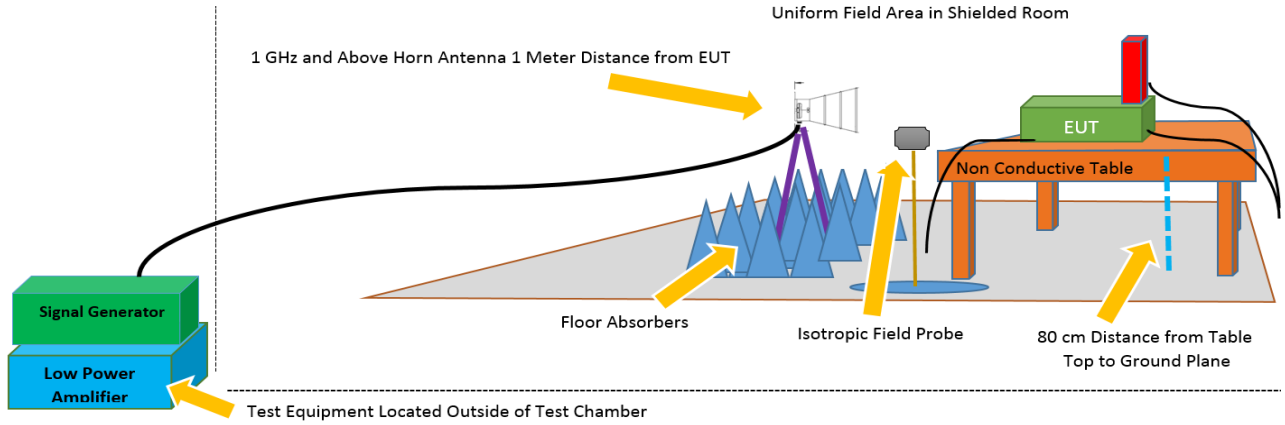
a. The testing was performed in a semi anechoic chamber.

b. The frequency range is swept from 80 MHz to 6000 MHz. The signal was 80% amplitude modulated with a 1kHz sine wave.

c. The field strength level was **Error! Reference source not found.**V/m or 10V/m.

d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.





11.4 Test Results

Input Power	5V DC	Tested by	Abhijit Patibandla
Environmental conditions	22 °C, 55% RH	Test Date	03/1/2022
Test mode	Normal Mode		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Remarks	Performance Criterion
			(V/m)	Modulation			
80 - 1000	V&H	0, 90, 180, 270	10	80% AM (1kHz)	Note 1	-	A
1000 - 6000	V&H	0, 90, 180, 270	10	80% AM (1kHz)	Note 1	-	A

Note: 1. The EUT showed no susceptibility during testing

12 Electrical Fast Transient/Burst Immunity Test (EFT)

NA

13 Surge Immunity Test

NA

14 Immunity to Conducted Disturbances Induced by RF Fields (CS)

NA

15 Power Frequency Magnetic Field

15.1 Test Specification

Basic Standard:	EN 61000-4-8
Frequency Range:	50Hz
Field Strength	3 A/m
Observation Time	1 minute
Inductance Coil	Rectangular coil, 1 m x 1 m (L x W)

15.2 Test Instruments

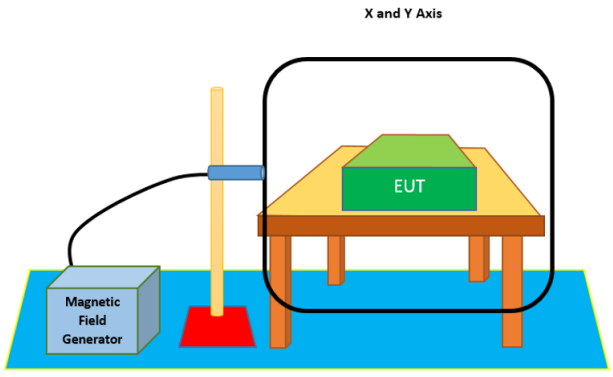
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
150 Watt Amplifier (10 KHz- 100 MHz) Amplifier Research	150A100D	353606	09/22/2021	09/22/2022
RF Signal Generator (100kHz-2100MHz) Fluke	6062A	5285403	01/05/2022	01/05/2023
Power Line CDN M2 Compower	M225E	34070020	09/22/2021	09/22/2022

15.3 Test Arrangement

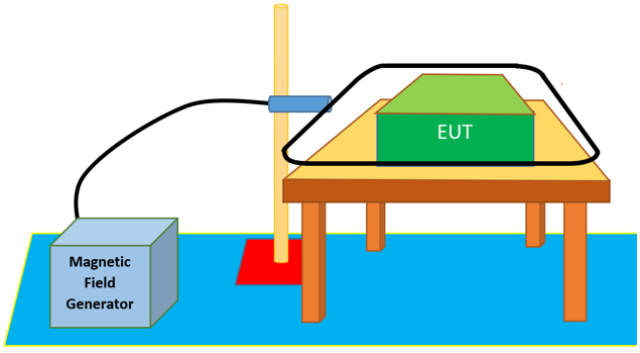
a. The equipment is configured and connected to satisfy its functional requirements

b. The power supply, input and output circuits chall be connected to the source of power supply, control and signal

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic



Z Axis



15.4 Test Results

Input Power	5V DC	Tested by	Abhijit Patibandla
Environmental conditions	22 °C, 55% RH	Test Date	03/1/2022
Test mode	Normal		

Application	Field Strength (A/m)	Observation	Performance Criterion
X – Axis	3	Note 1	A
Y – Axis	3	Note 1	A
Z – Axis	3	Note 1	A

Note: 1. The EUT showed no susceptibility during testing

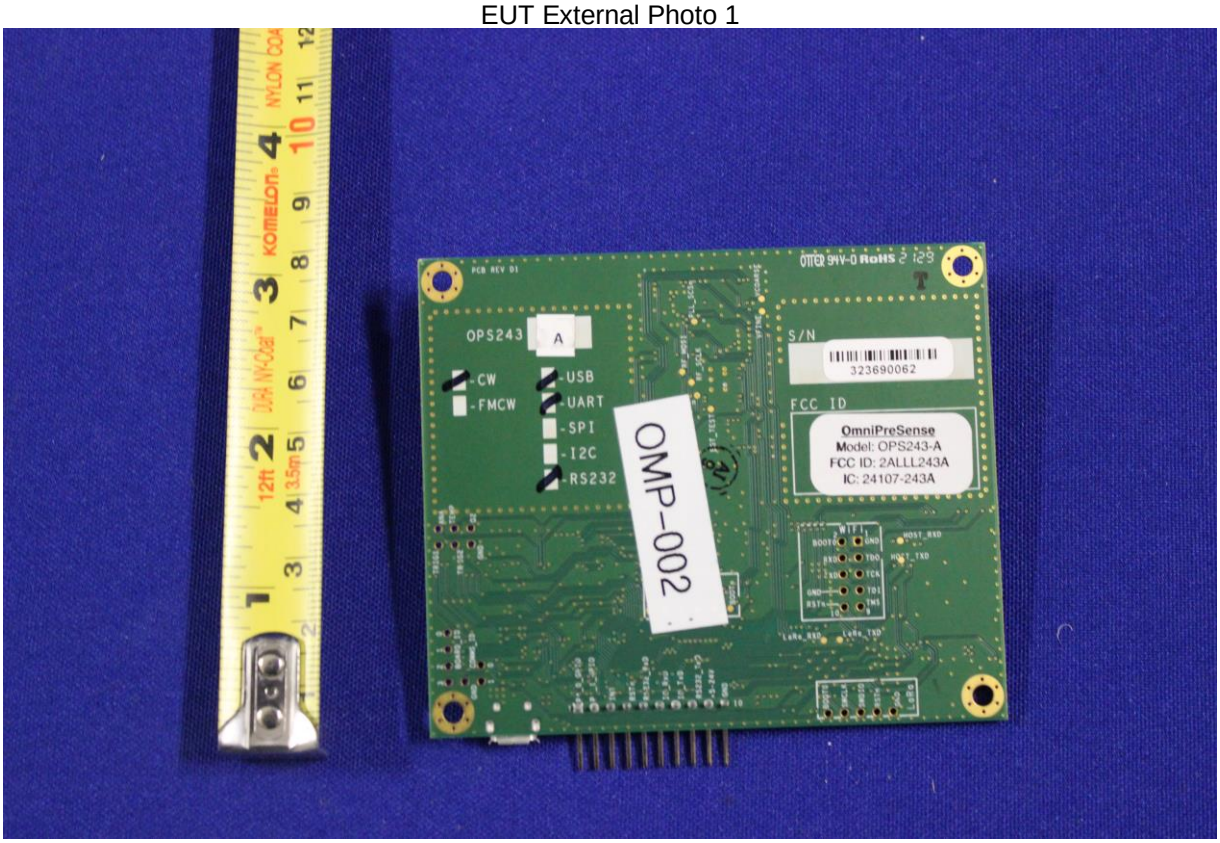
16 Voltage Dips and Interruptions

NA

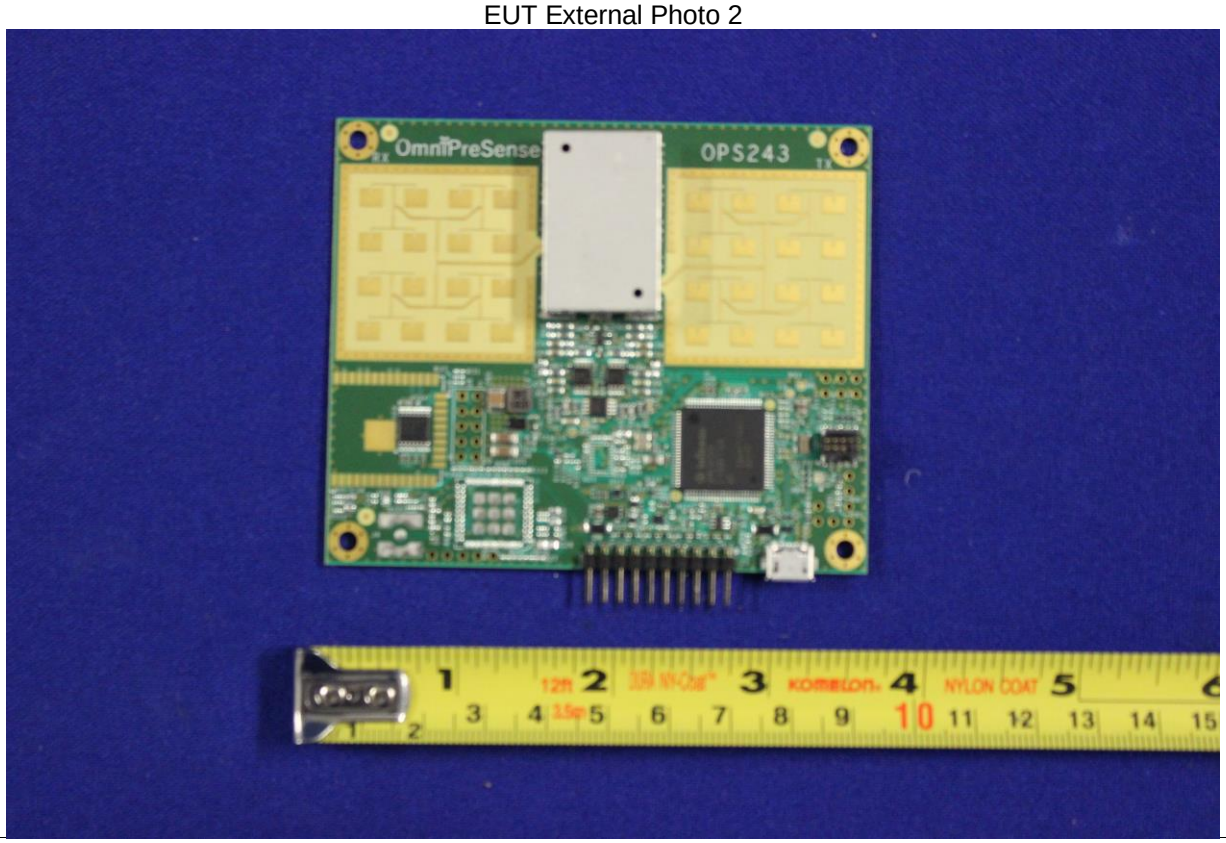
17 Pictures of Test Arrangements

17.1 EUT Photos

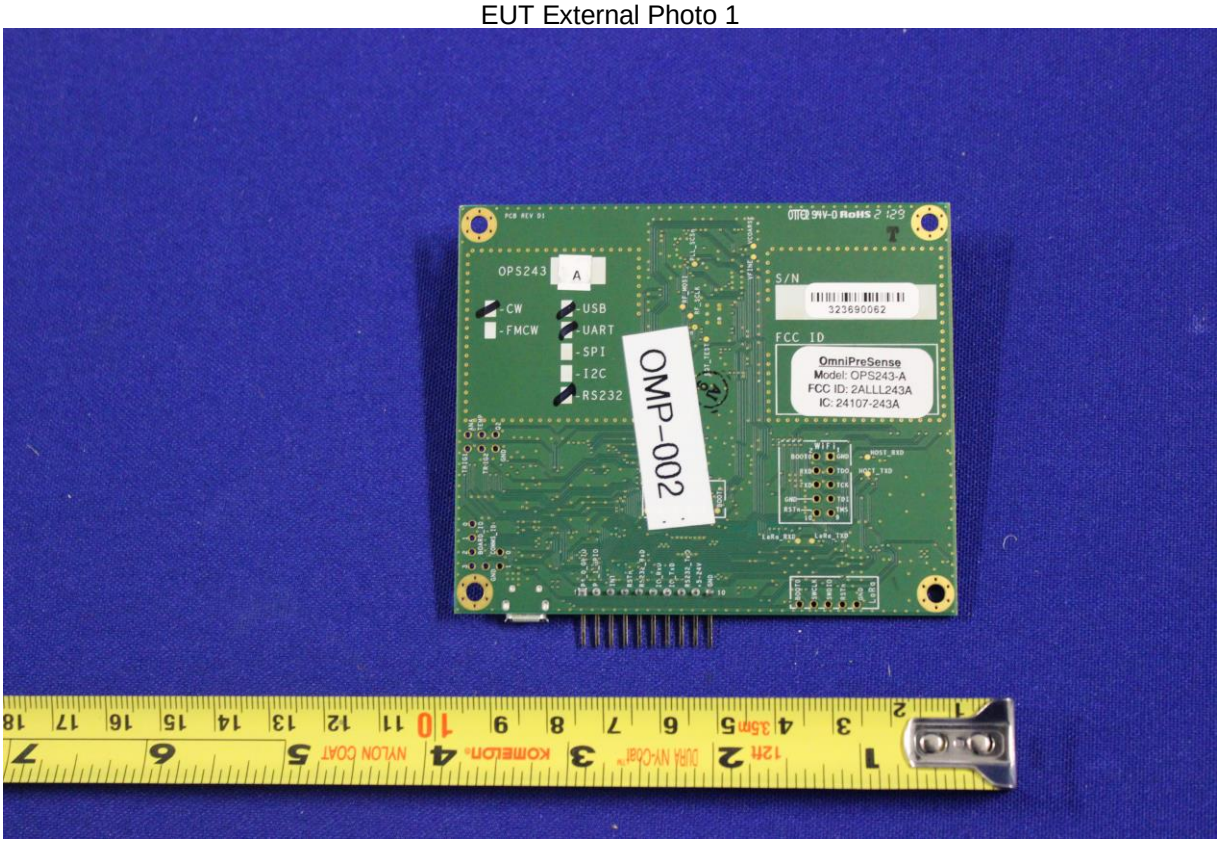
EUT External Photo 1



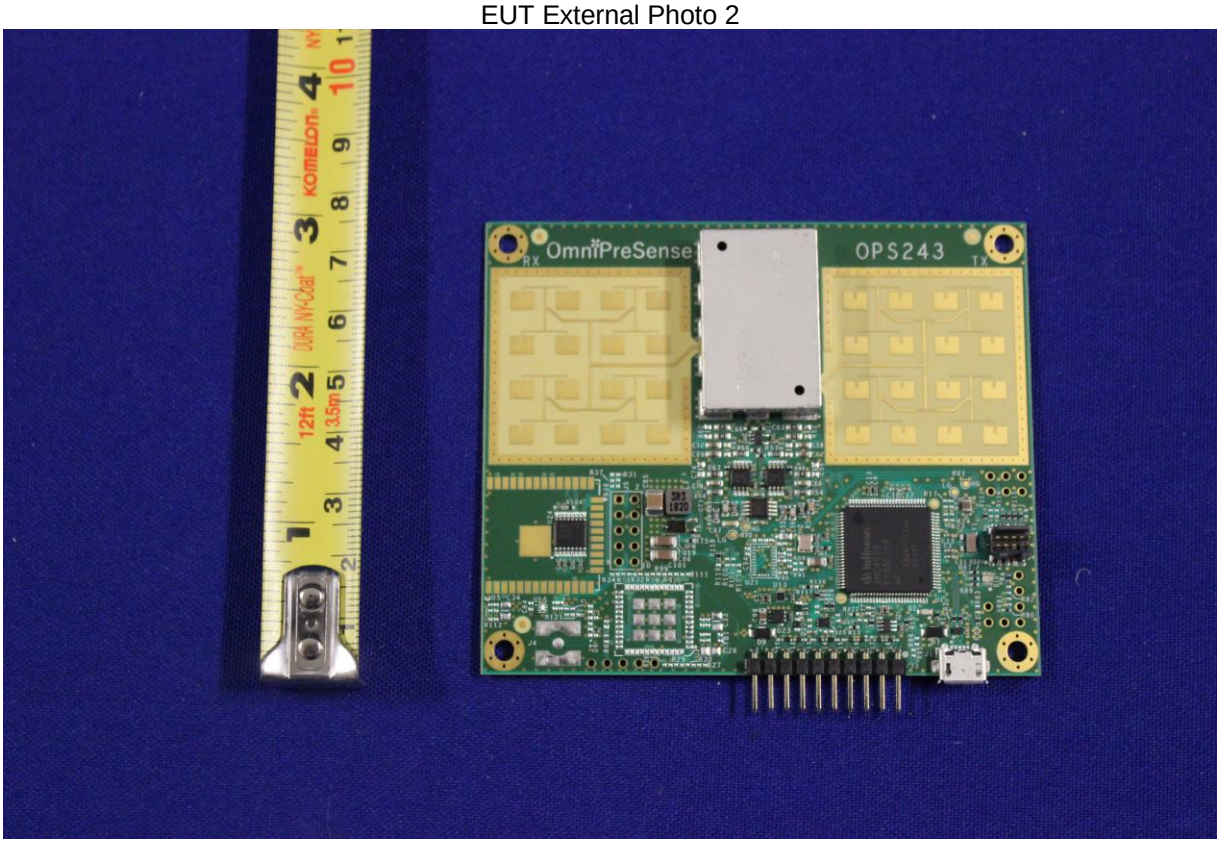
EUT External Photo 2



EUT External Photo 1

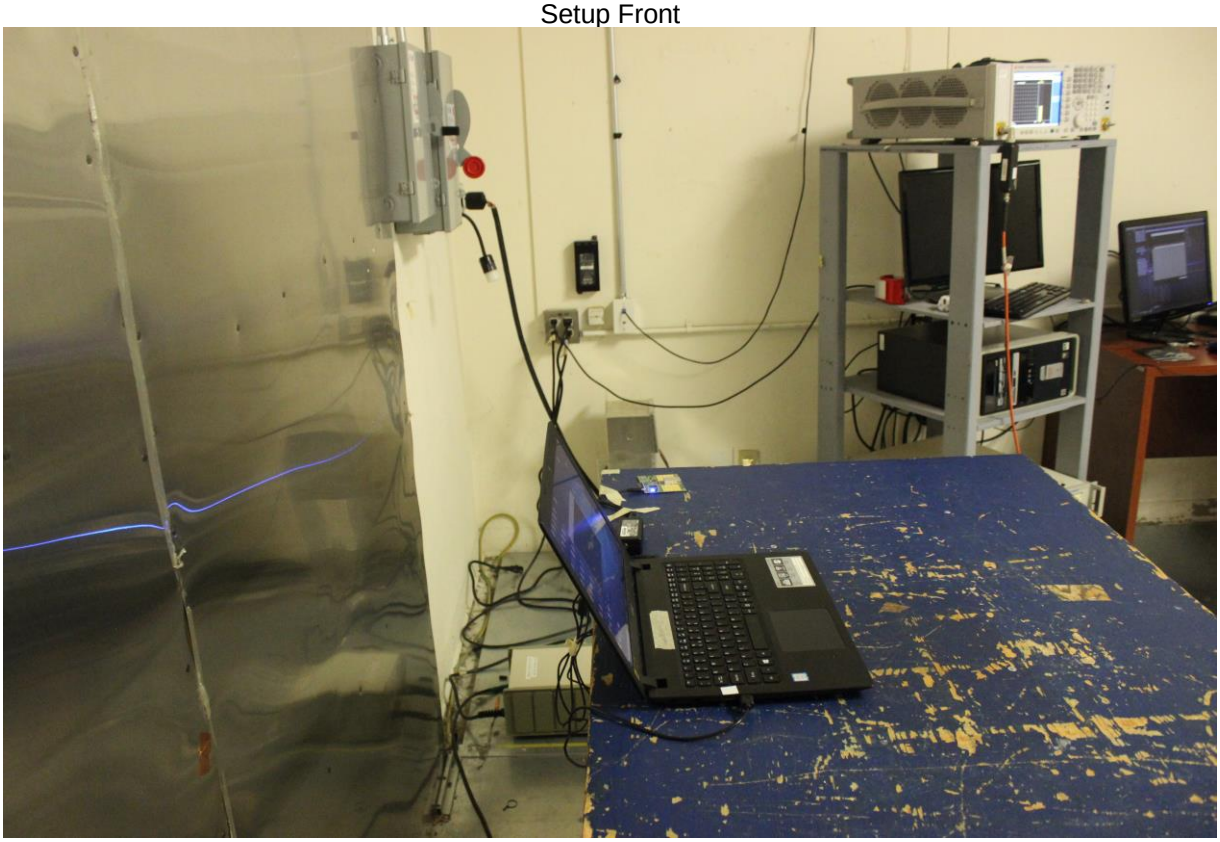


EUT External Photo 2

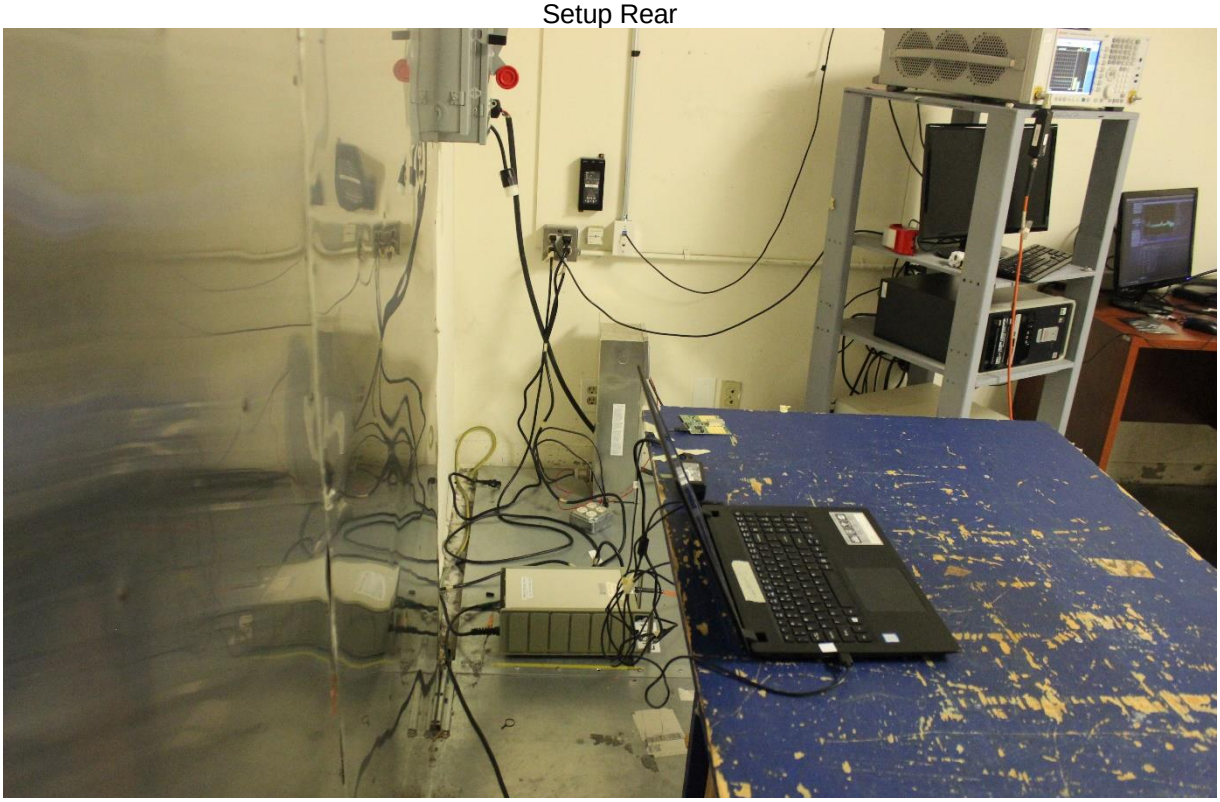


17.2 Conducted Emission from the AC Mains Power Port

Setup Front



Setup Rear



17.3 Radiated Emission at Frequencies up to 1GHz

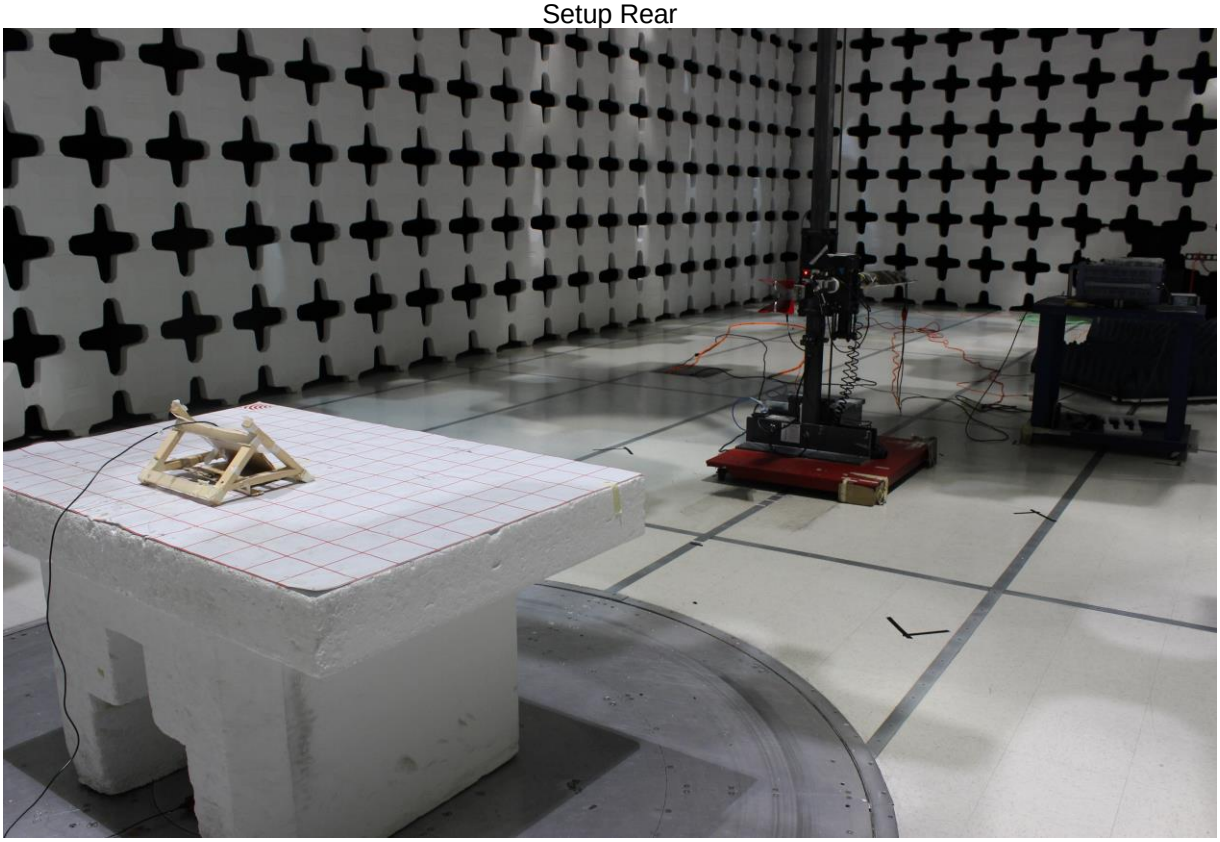
Setup Front

Setup Rear

17.4 Radiated Emission at Frequencies above 1GHz

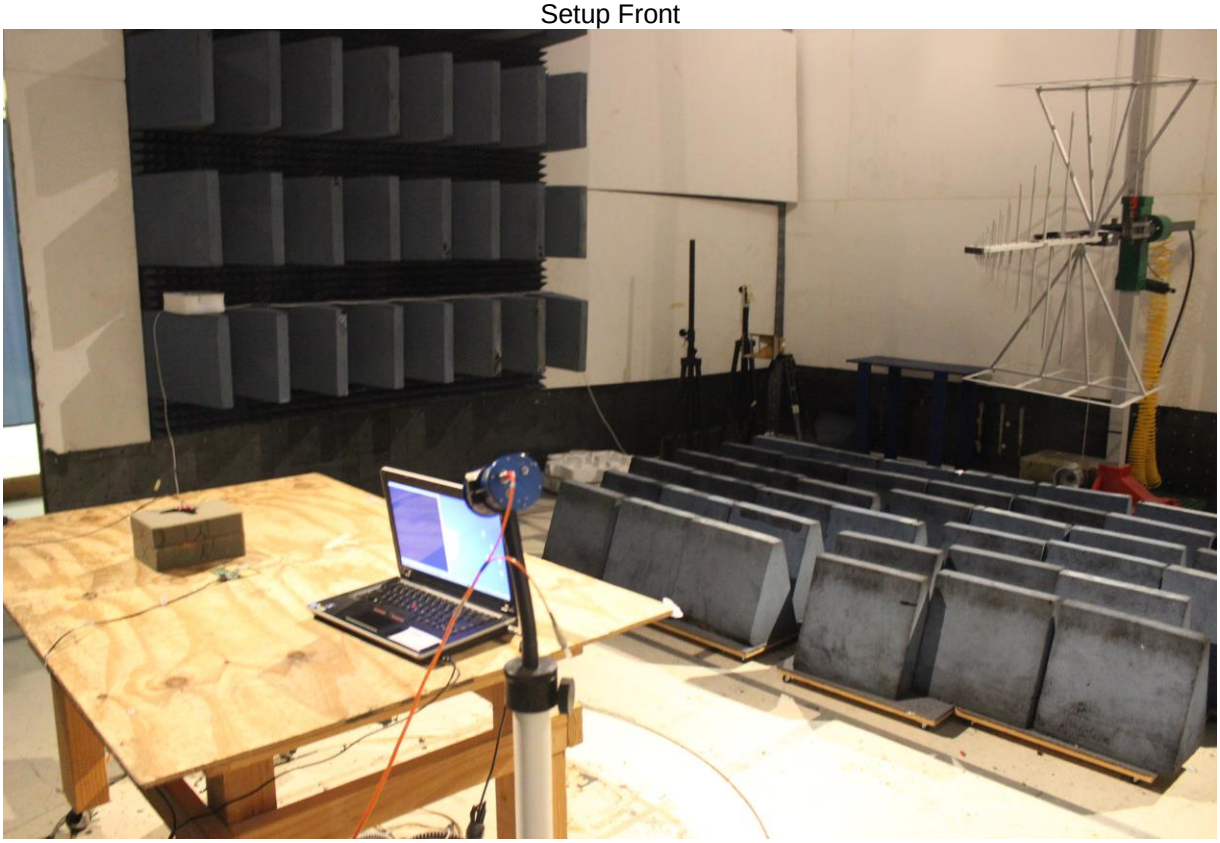
Setup Front

Setup Rear

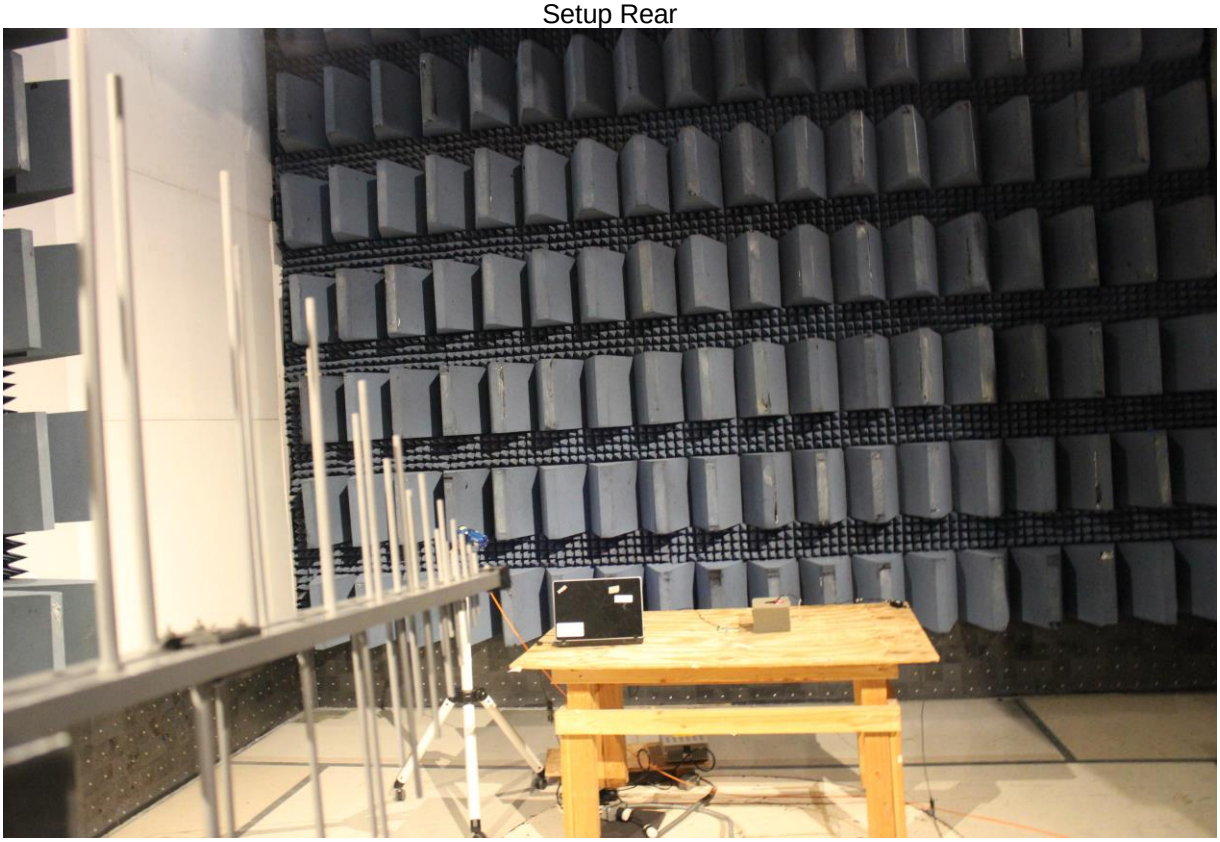


17.5 Radio-frequency, Electromagnetic Field Immunity Test (RS)

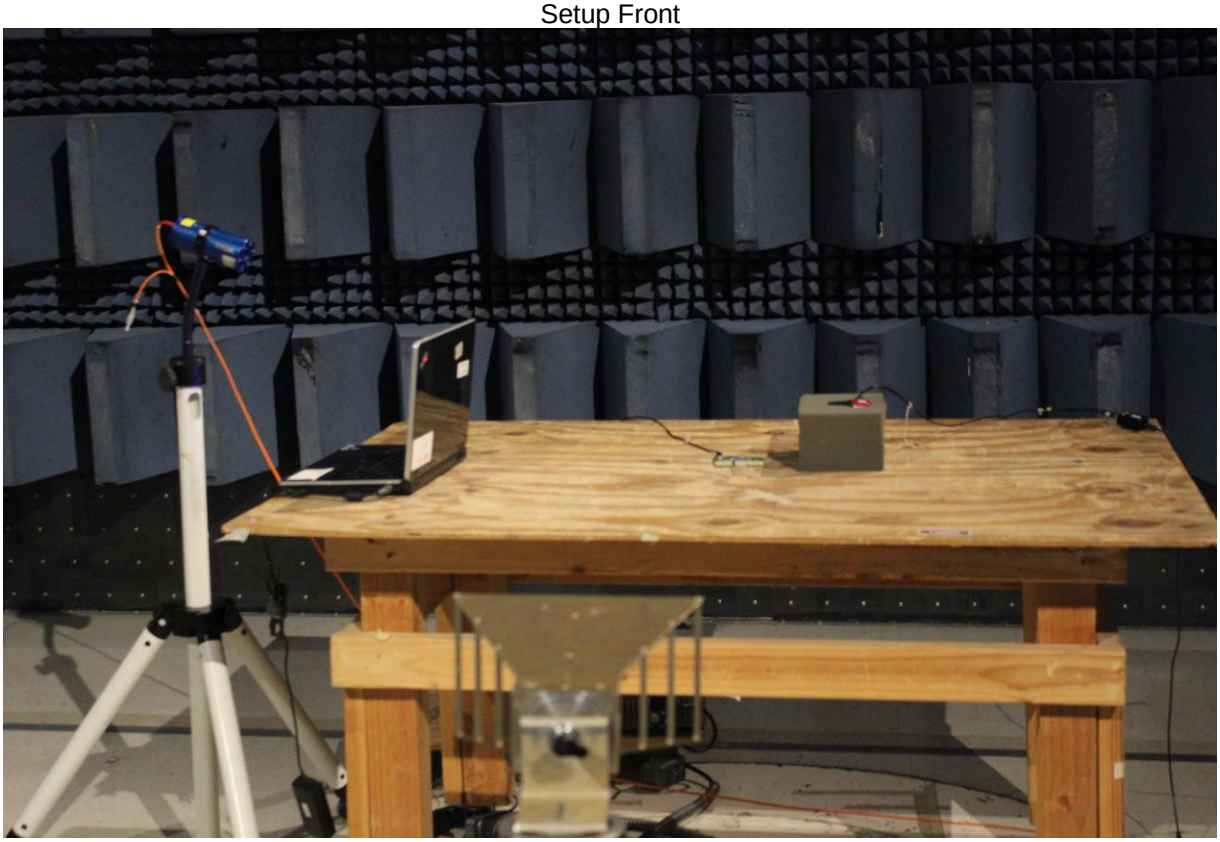
Setup Front



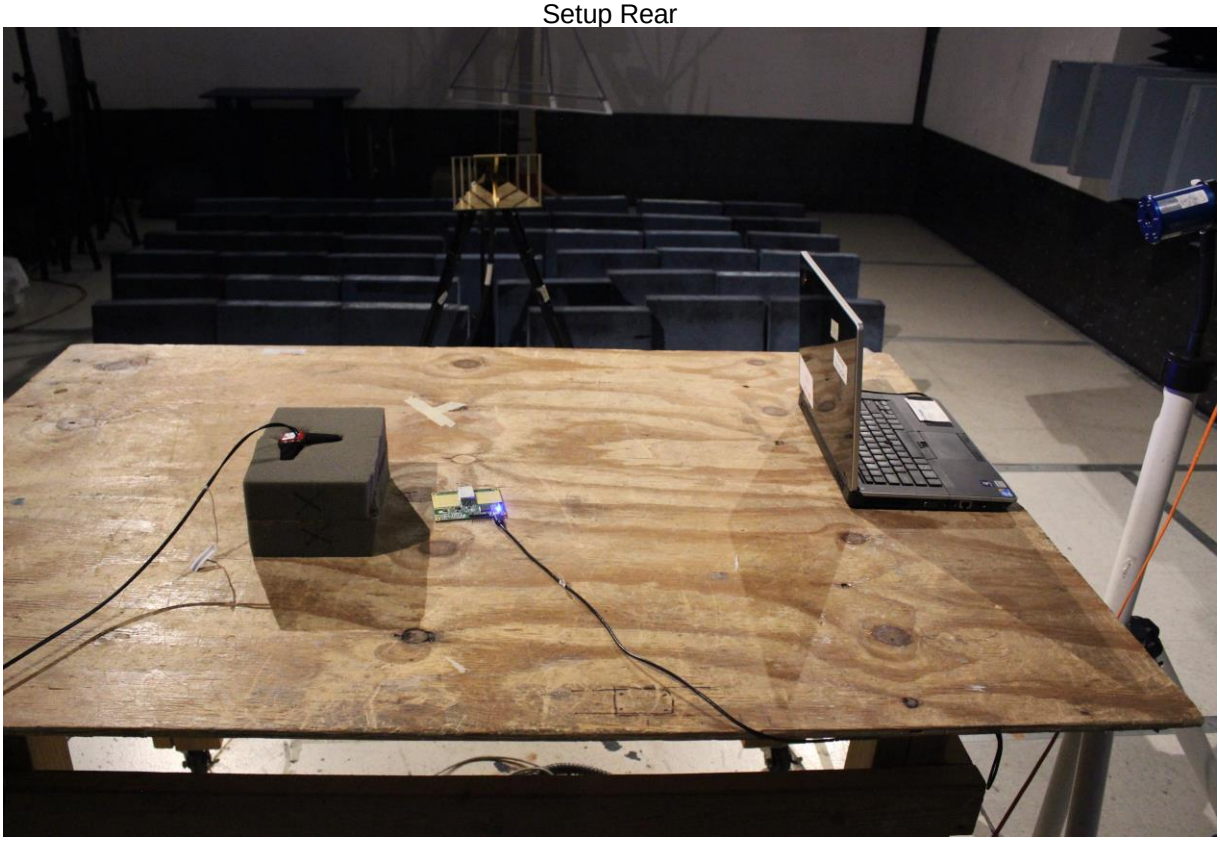
Setup Rear



Setup Front

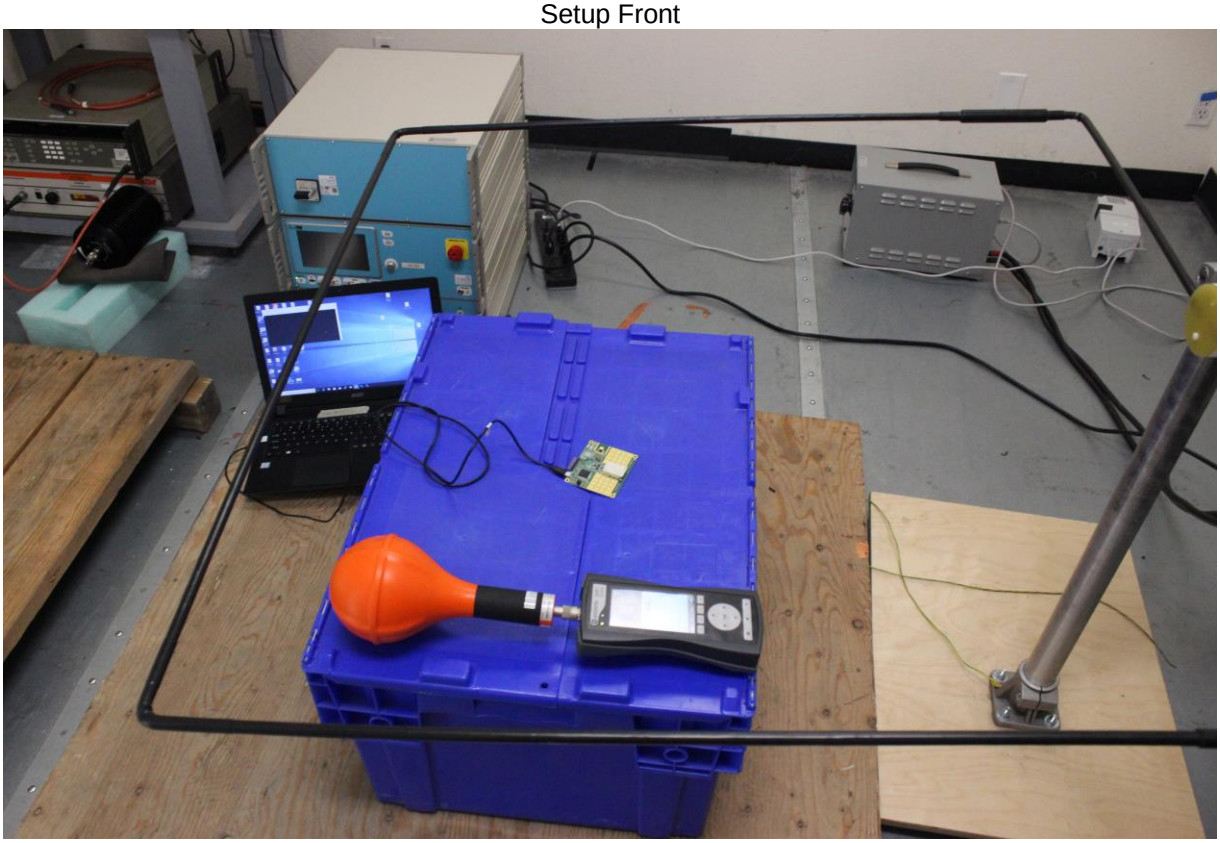


Setup Rear

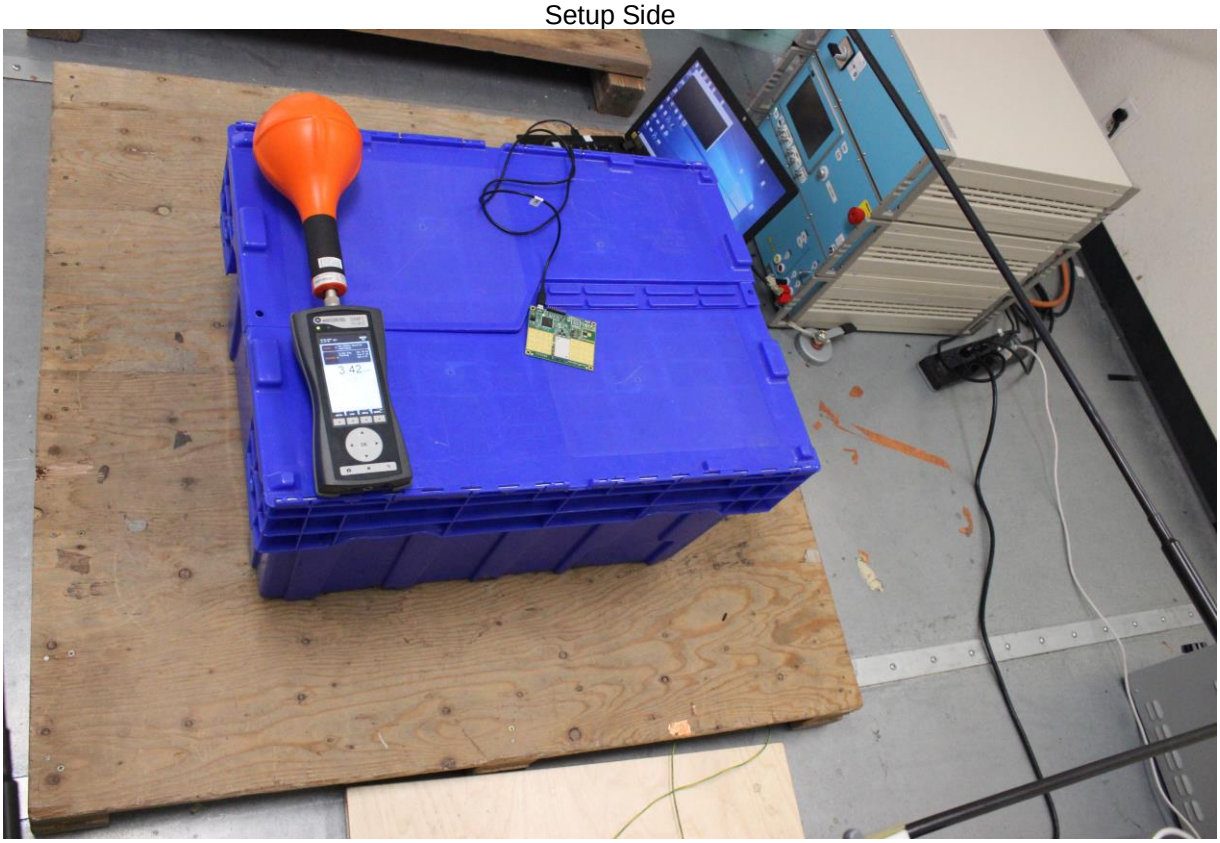


17.6 Power Frequency Magnetic Field

Setup Front



Setup Side



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 ---