



Report Number:	14193908-E2V2
Issue Date:	2022/6/20
Product Name:	BLE Sensor
FCC ID:	VRBJSGS006
Model Number:	JSG-S006

Electromagnetic Compatibility Test Report

For

Sage Co.Ltd.
2F, KY Bldg.
2-24 Sumiyoshi-Cho Naka-Ku
Yokohama-City, 231-0013 Japan



Copyright © 2022 UL LLC

UL Verification Services Inc. authorizes the above-named company to reproduce this Report provided it is reproduced in its entirety.

Test Report Details

Tests Performed By: UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.

Tests Performed For: Sage Co.Ltd.
2F, KY Bldg.
2-24 Sumiyoshi-Cho Naka-Ku
Yokohama-City, 231-0013 Japan

Issue Date: 2022/6/20

Product Name: BLE Sensor

Model Number Tested: JSG-S006

Sample Serial Number: #22

Applicable Standards: FCC 47 CFR PART 15 SUBPART B

Date Test Item Received: March 22,2022

Testing Start Date: March 29,2022

Date Testing Complete: March 29,2022

Overall Results: Compliant

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

*This report contains data that are not covered by the A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the A2LA websites referenced at the end of this report.

Report Directory

1.0	TEST METHODOLOGY	5
1.1	Deviations from standard test methods	5
1.2	Device Modifications Necessary for Compliance	5
1.3	TEST RESULTS SUMMARY	5
2.0	DECISION RULES AND MEASUREMENT UNCERTAINTY	6
2.1	Metrological Traceability	6
2.2	Decision Rules	6
2.3	Measurement Uncertainty	6
2.4	Sample Calculation	6
3.0	GENERAL - Product Description	7
3.1	Equipment Description	7
3.2	Device Configuration During Test	7
3.2.1	Equipment Used During Test:	7
3.2.2	Input/Output Ports:	7
3.2.3	EUT Highest Frequencies:	7
3.2.4	Power Interface:	7
3.3	Block Diagram:	8
3.4	Worst- Case Configuration and Mode	8
3.5	EUT Configurations	9
3.6	EUT Operation Modes	9
3.7	Rationale for EUT Configurations	9
3.8	Rationale for EUT Mode of Operation	9
4.0	APPLICABLE EMISSIONS LIMITS AND TEST RESULTS	10
4.1	Test Conditions and Results - RADIATED EMISSIONS	10
Appendix A		18
Facilities, Accreditations and Authorizations		18

Report Revision History

Revision Date	Revision Version	Description	Revised By	Revision Reviewed By
05/09/2022	V1	Initial Issue		
06/20/2022	V2	Updated Cover Page, Section 3.2.3,3.8 and 4.1		Kiya Kedida

1.0 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4:2014.

1.1 Deviations from standard test methods

None

1.2 Device Modifications Necessary for Compliance

None

1.3 TEST RESULTS SUMMARY

This product is considered Class B

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

Requirement – Test	Result (Compliant / Non-Compliant)
RADIATED EMISSIONS	Complies

Approved & Released For
UL Verification Services Inc. By:



Dan Corona
Operations Leader
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



Kiya Kedida
Senior Project Engineer
Consumer Technology Division
UL Verification Services Inc.

2.0 DECISION RULES AND MEASUREMENT UNCERTAINTY

2.1 Metrological Traceability

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers’ recommendation, whichever is less, and where applicable is traceable to recognized national standards

2.2 Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement).

2.3 Measurement Uncertainty

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

PARAMETER	U _{lab}	U _{Cispr}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 db	3.8 db
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 db	3.4 db
Worst Case Conducted Disturbance Voltage Probe, 9KHz to 30 MHz	2.8 db	2.9 db
Worst Case Conducted Power, 30 MHz to 300MHz	4.04 db	--
Worst Case Radiated Disturbance, 9KHz to 30 MHz (60cm Loop)	2.52 db	--
Worst Case Radiated Disturbance, 9KHz to 30 MHz (LLAS)	3.03	3.3
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 db	6.3 db
Worst Case Radiated Disturbance, 1000 to 6000 MHz	4.24 db	5.2 db
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 db	5.5
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 db	--
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 db	--

Uncertainty figures are valid to a confidence level of 95%.

2.4 Sample Calculation

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss.}$$

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

3.0 GENERAL - Product Description

3.1 Equipment Description

BLE sensor is connected to the TCU. BLE sensor (via TCU) downloads and updates if necessary. BLE sensor (via TCU) publishes message and PF is updated about BLE sensor's status. The product contains BLE module with FCC ID: QQQ-GM220P.

3.2 Device Configuration During Test

3.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	BLE Sensor	Sage Co.Ltd.	JSG-S006	None
Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)				

3.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

3.2.3 EUT Highest Frequencies:

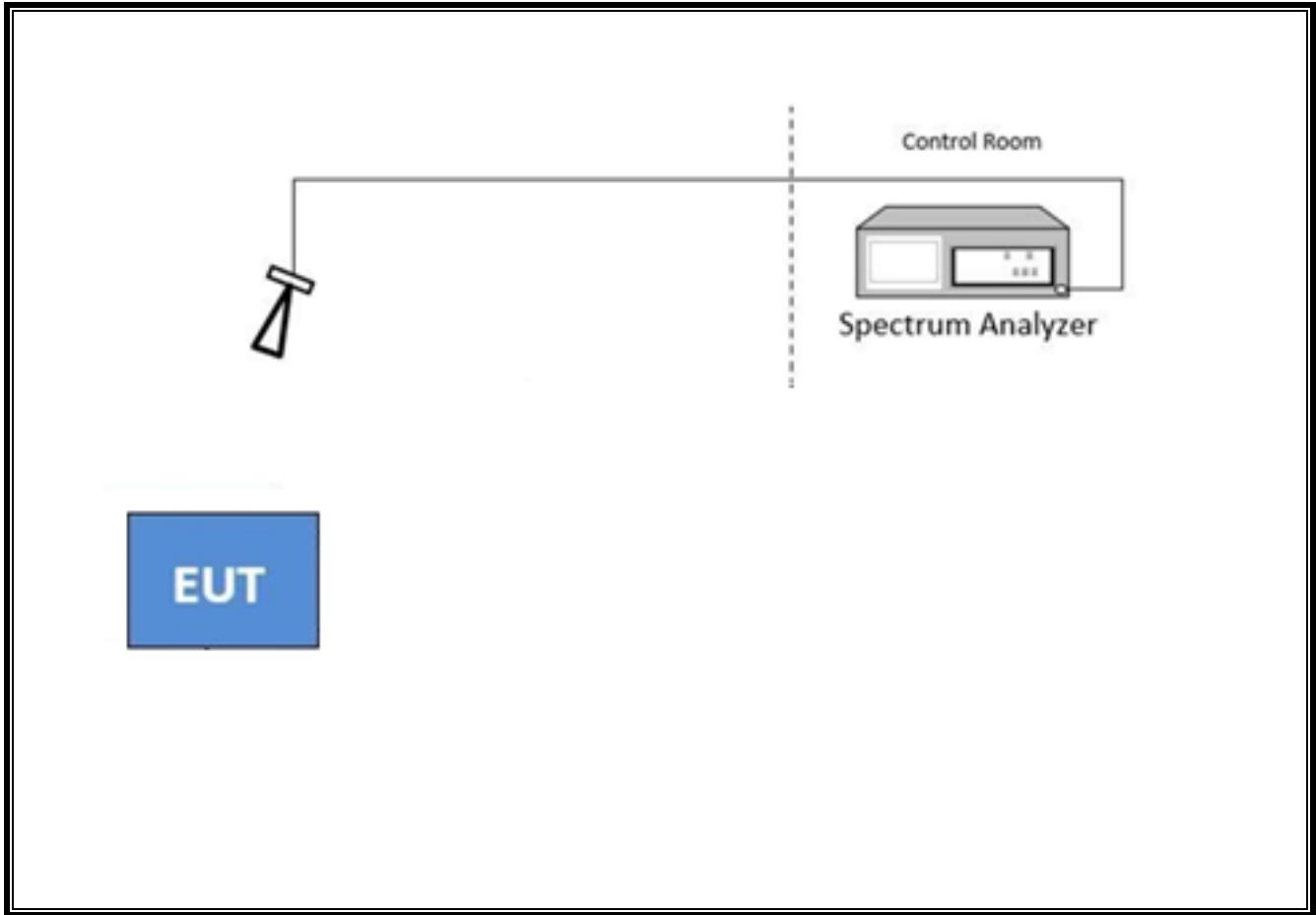
Frequency (MHz)	Description
2480 MHz	Highest frequency generated or used by the EUT

3.2.4 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated					Single	
	3 Vdc	-	-	-	Single	CR2032 Battery

3.3 Block Diagram:

The diagram below illustrates the configuration of the equipment above.



3.4 Worst- Case Configuration and Mode

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, & Z. It was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

3.5 EUT Configurations

Configuration #	Description
1	The EUT was powered by a Coin cell battery.

3.6 EUT Operation Modes

Mode of Operation#	Description
1	The EUT was powered on and stand alone.

3.7 Rationale for EUT Configurations

Configuration #	Description
1	The selected EUT configuration was chosen to maximize emissions.

3.8 Rationale for EUT Mode of Operation

Mode of Operation #	Description
1	The mode of operations was determined by the manufacturer.

4.0 APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

4.1 Test Conditions and Results - RADIATED EMISSIONS

Test Engineer	23529 DL	
Test Date	4/26/2022	
Laboratory Parameters	Required prior to the test	During the test
Ambient Temperature	15 to 35 °C	21°C
Humidity	30 % to 60 %	48%
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 18GHz	3 meter
Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
CISPR Limits for radiated disturbance of Class B ITE at measuring distance of 3 m		
30-230	40	NA
230-1000	47	NA
FCC/ICES Limits for radiated disturbance of Class B ITE at measuring distance of 3 m		
30-88	40	NA
88-216	43.5	NA
216-230	46	NA
230-960	46/47	NA
Above 960	54	NA
	Peak	Average
Above 1 GHz	74	54
Supplementary information: None		

Radiated Emissions EUT Configuration Settings

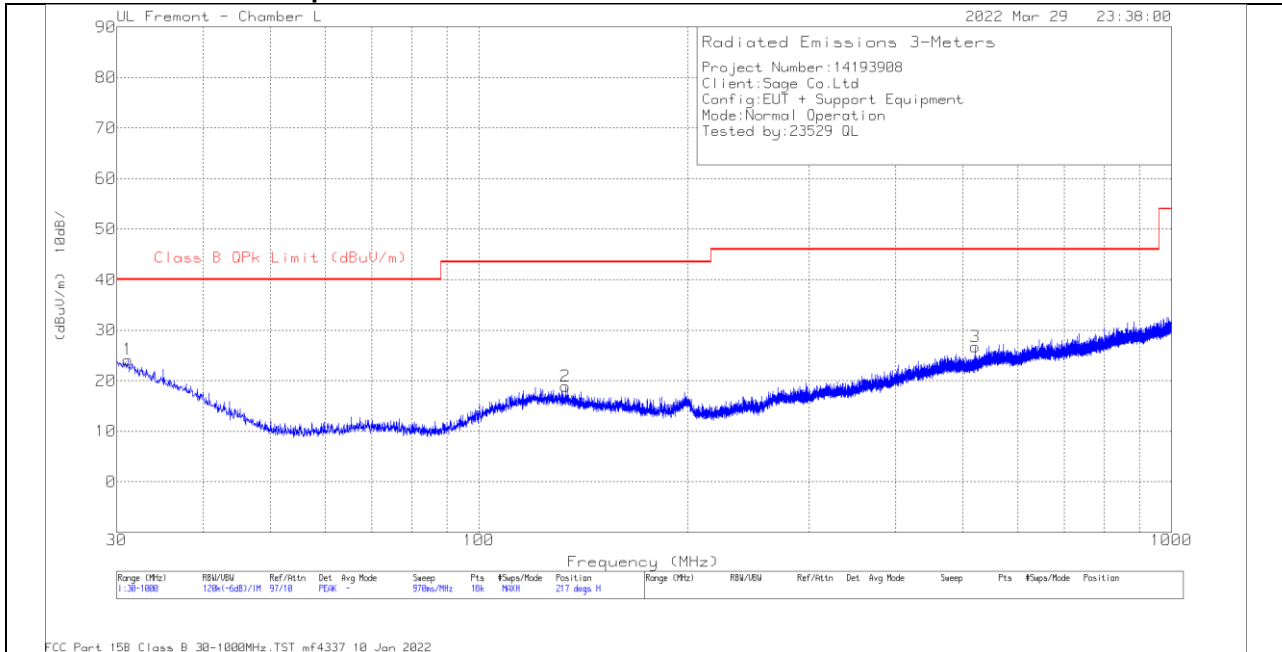
Power Interface #	EUT Configurations #	EUT Mode of Operation#
1	1	1
Supplementary information: None		

Radiated Emissions Test Equipment

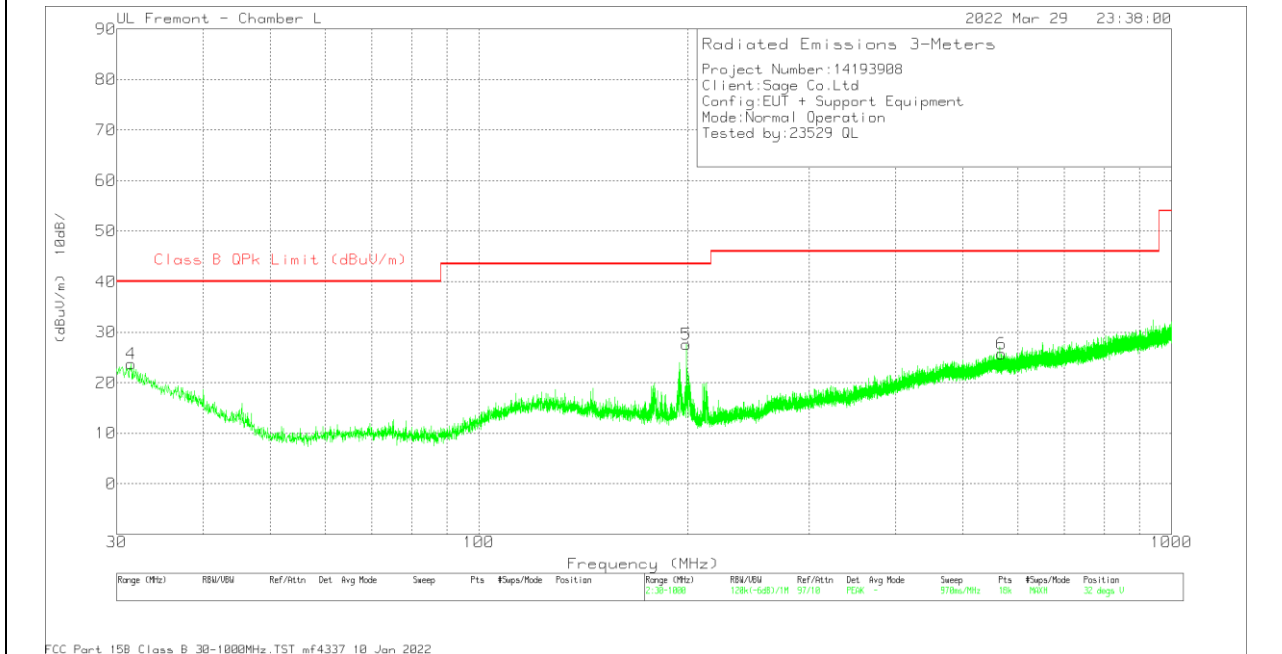
TEST EQUIPMENT LIST					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T119	05/07/2022	05/07/2021
Amplifier 1-8GHz 30dB gain	L3 Narda	AMF-4D-01000800-30-29P	167495	03/09/2023	03/09/2022
Amplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25-S-42	T1568	03/09/2023	03/09/2022
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	T300	04/09/2022	04/09/2021
Amplifier, 1-7GHz, 24dB	AMPLICAL	AMP1G7-24-27	T1607	03/09/2023	03/09/2022
Antenna, BroadBand Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	171862	09/28/2022	09/28/2021
EMI TEST RECEIVER, with B8 option	Rohde & Schwarz	ESW44	PRE0179377	02/20/2023	02/20/2022
NSA, Test Site Validation	TDK RF SOLUTIONS INC.	ANSI C63.4 & CISPR 16-1-4	210613	09/18/2022	09/18/2021
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight Technologies Inc	8449B	80671	04/19/2022	04/19/2021
Test Software List					
Description	Manufacturer	Model	Version		
Radiated Software	UL	UL EMC	Rev 9.5, April 30, 2020, Oct 21, 2019		

RADIATED EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

Radiated Emissions Graph



Horizontal



Vertical

Radiated Emissions Data Points

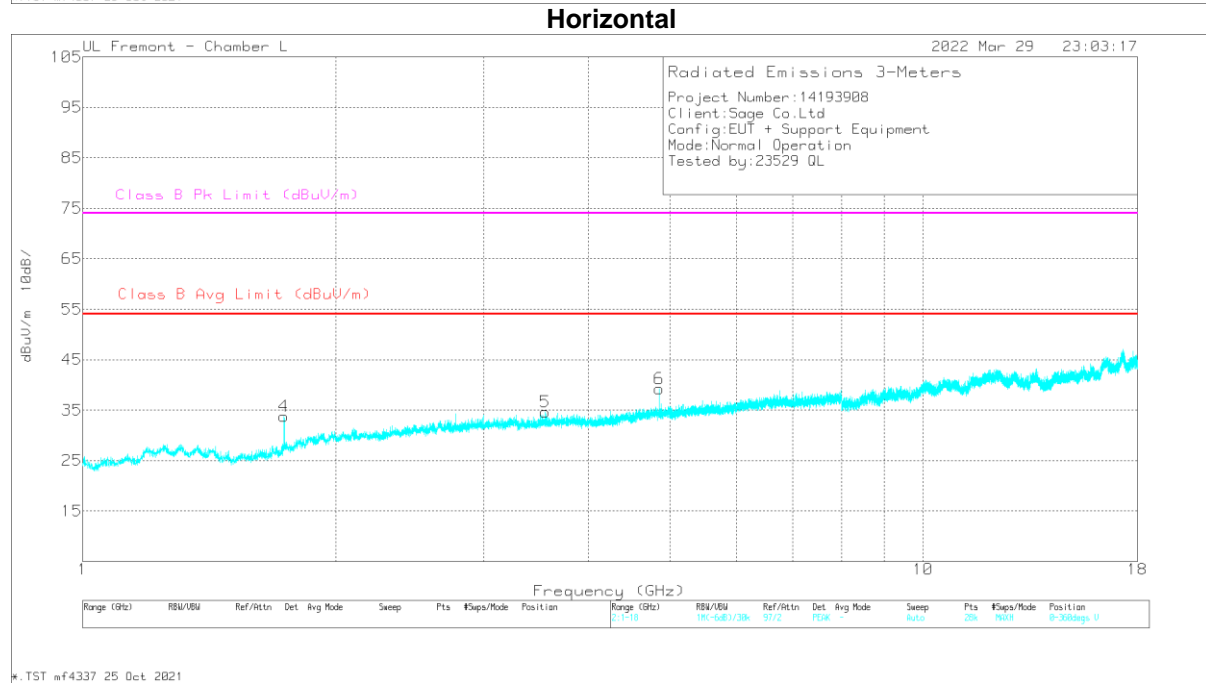
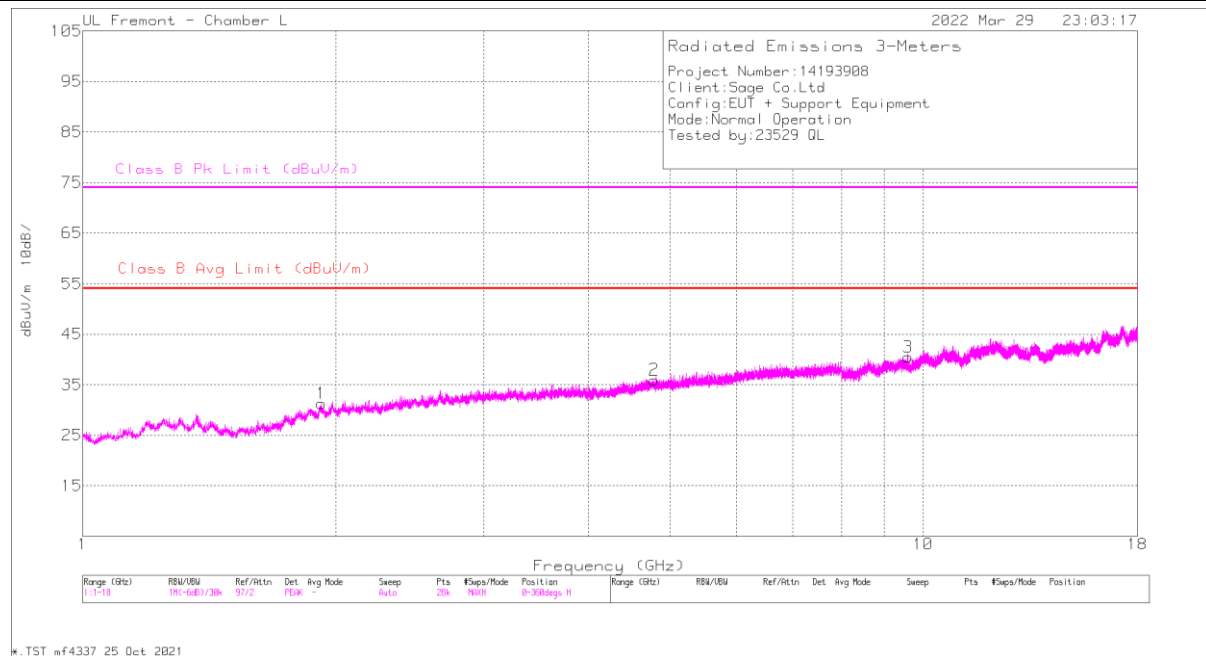
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	171862 ACF (dB)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.1317	29.57	Pk	26	-31.4	24.17	40	-15.83	26	299	H
2	133.413	29.74	Pk	19.5	-30.4	18.84	43.52	-24.68	229	100	H
3	521.09	31.94	Pk	23.6	-28.8	26.74	46.02	-19.28	255	100	H
4	31.455	29.38	Pk	25.7	-31.4	23.68	40	-16.32	282	99	V
5	198.287	29.71	Pk	18.5	-29.9	18.31	43.52	-25.21	28	370	V
	198.287	20.7	Qp	18.5	-29.9	9.3	43.52	-34.22	28	370	V
6	568.459	29.95	Pk	24.3	-28.5	25.75	46.02	-20.27	98	99	V

Pk - Peak detector

Qp - Quasi-Peak detector

RADIATED EMISSIONS 1000 TO 18,000 MHz – FCC

Radiated Emissions Graph



Radiated Emissions Data Points

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.92698	39.96	Pk	31.2	-30.7	40.46	54	-13.54	74	-33.54	34	384	H
	1.92698	25.93	Av	31.2	-30.7	26.43	54	-27.57	-	-	34	384	H
2	4.788033	32.06	Pk	34.1	-24.6	41.56	54	-12.44	74	-32.44	256	152	H
	4.788033	17.35	Av	34.1	-24.6	26.85	54	-27.15	-	-	256	152	H
3	9.602514	29.51	Pk	36.7	-17.6	48.61	54	-5.39	74	-25.39	19	104	H
	9.602514	16.7	Av	36.7	-17.6	35.8	54	-18.2	-	-	19	104	H
4	1.738383	39.35	Pk	29.5	-31.2	37.65	54	-16.35	74	-36.35	74	178	V
	1.738383	25.71	Av	29.5	-31.2	24.01	54	-29.99	-	-	74	178	V
5	3.552181	35.26	Pk	33	-26.4	41.86	54	-12.14	74	-32.14	260	191	V
	3.552181	21.1	Av	33	-26.4	27.7	54	-26.3	-	-	260	191	V
6	4.852504	63.51	Pk	34.2	-25	72.71	54	18.71	74	-1.29	80	342	V
	4.852504	25.34	Av	34.2	-25	34.54	54	-19.46	-	-	80	342	V

Pk - Peak detector

Av - Average detection

Appendix A

Facilities, Accreditations and Authorizations

UL Verification Services Inc. is accredited by A2LA, Certificate Number #0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	208313
<input type="checkbox"/>	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	208313
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324B	208313

END OF TEST REPORT