Report Number:	13812998-E8V1
Issue Date:	2022-04-08
Product Name:	NETWORK ADAPTER
Model Number:	A2657

Electromagnetic Compatibility Test Report

For

APPLE INC
1 APPLE PARKWAY
CUPERTINO, CA 95014, U.S.A

Test Report Details

Tests Performed By:	UL VERIFICATION SERVICES INC. 47173 BENICIA STREET FREMONT, CA 94538, U.S.A.
Tests Performed For:	APPLE INC 1 APPLE PARKWAY CUPERTINO, CA 95014, U.S.A
Issue Date:	2022-04-08
Product Name:	NETWORK ADAPTER
Model Number Tested:	A2657
Sample Serial Number:	KVDCFJXWCM
Applicable Standards:	FCC 47 CFR PART 15 SUBPART B
Date Test Item Received:	2022-02-25
Testing Start Date:	2022-03-04
Date Testing Complete:	2022-03-18
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.

Report Directory

Report Revision History

Revision Date	Revision Version	Description	Revised By	Revision Reviewed By
2022-04-08	V1	Initial Issue	--	--

1.0 TEST METHODOLOGY

The tests documented in this report were performed in accordance with 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

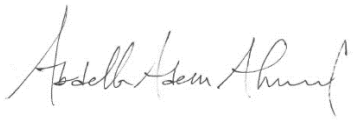
Requirement – Test	Result (Compliant / Non-Compliant)
CONDUCTED EMISSIONS	Not Applicable
RADIATED EMISSIONS	Compliant

Approved & Released For

UL Verification Services Inc. By:

Edgard Rincand
Operations Leader
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



Abdella Ahmed
Test 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:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS
Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

3.0 GENERAL - Product Description

3.1 Equipment Description

A2657 is a network adapter. It has an integral battery, two gigabit ethernet ports, USB-C connector and antenna. The device supports IEEE 802.11b/g/n radio, Bluetooth radio, and NFC. The network adapter comes with 32 GB memory storage and 1.5 GB RAM.

The device is intended to be connected to a host computer and receive its power through a USB-A port during normal use.

3.2 Device Configuration During Test

3.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Network Adapter	Apple Inc	A2657	None
AE	iMAC	Apple Inc	MNE92LL/A	
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
1	Ethernet	I/O	Y	Y	Input
2	Ethernet	I/O	N	Y	Output
3	USB	DC	Y	N	

*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
2.4 GHz	Highest Frequency generated or used by EUT

3.2.4 Power Interface:

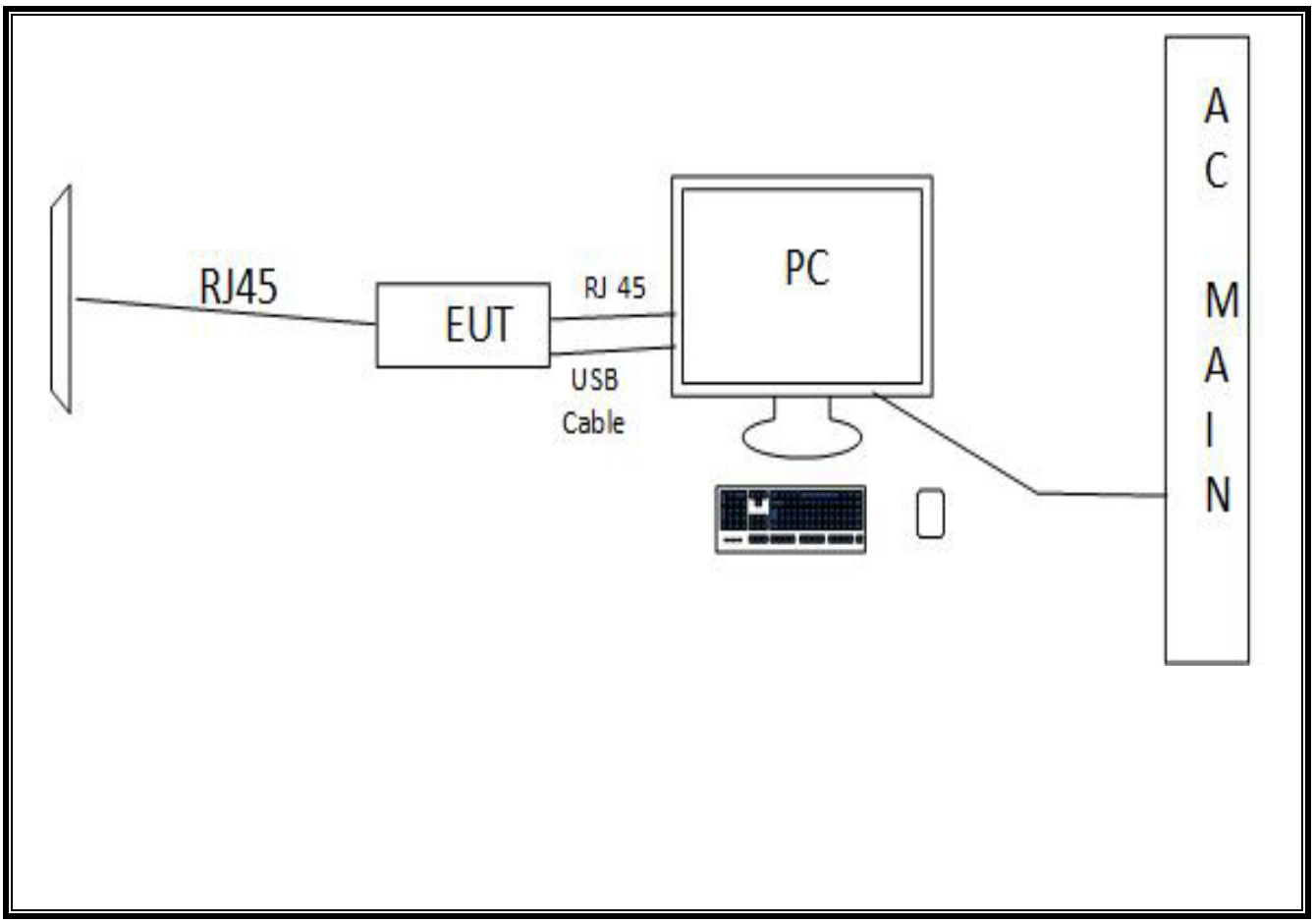
Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	5 Vdc	--	--	DC	--	--
1	5 Vdc	-	-	DC	--	From Host

3.2.5 Software and Firmware

The test utility software used during testing was F19F49.

3.3 Block Diagram:

The diagram below illustrates the configuration of the equipment above.



3.4 EUT Configurations

Configuration #	Description
1	EUT powered to Host via USB-C. RJ45 connected to Host and RJ45 Port connected to LAN.

3.5 EUT Operation Modes

Mode of Operation#	Description
1	Continuously generating traffic via video streaming

3.6 Rationale for EUT Configurations

Configuration #	Description
1	The configuration was selected to fully exercise the EUT.

3.7 Rationale for EUT Mode of Operation

Mode of Operation #	Description
1	The mode of operation was selected to fully exercise the EUT.

4.0 APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

4.1 Test Conditions and Results - MAINS TERMINAL - CONDUCTED EMISSIONS

This test was not applicable since EUT is not intended to directly or indirectly connect to AC Mains.

4.2 Test Conditions and Results - RADIATED EMISSIONS

Test Engineer	19410 SN, 10628 AA	
Test Date	2022-03-11	
Laboratory Parameters	Required prior to the test	During the test
Ambient Temperature	0 to 32 °C	21.7°C
Humidity	0 % to 90 %	29%
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1000MHz	10m
Fully configured sample scanned over the following frequency range	1GHz – 18GHz	3m
Limits - Class B		
Frequency (MHz)	Limit (dBµV/m)	
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		

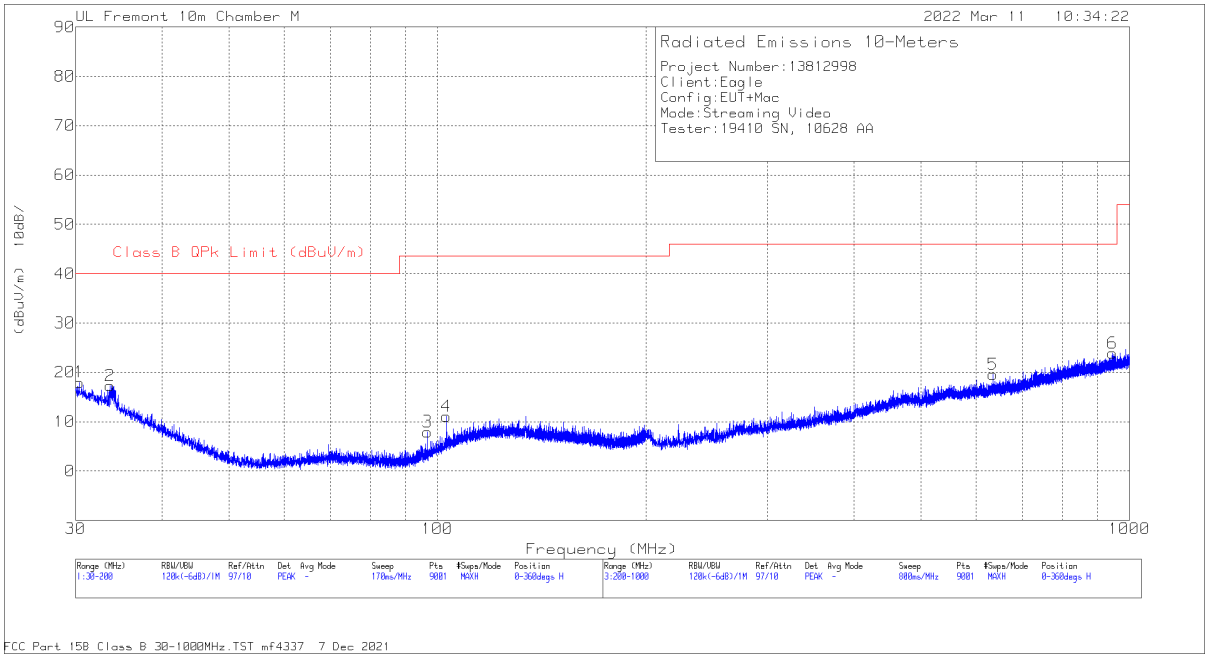
Radiated Emissions Test Equipment

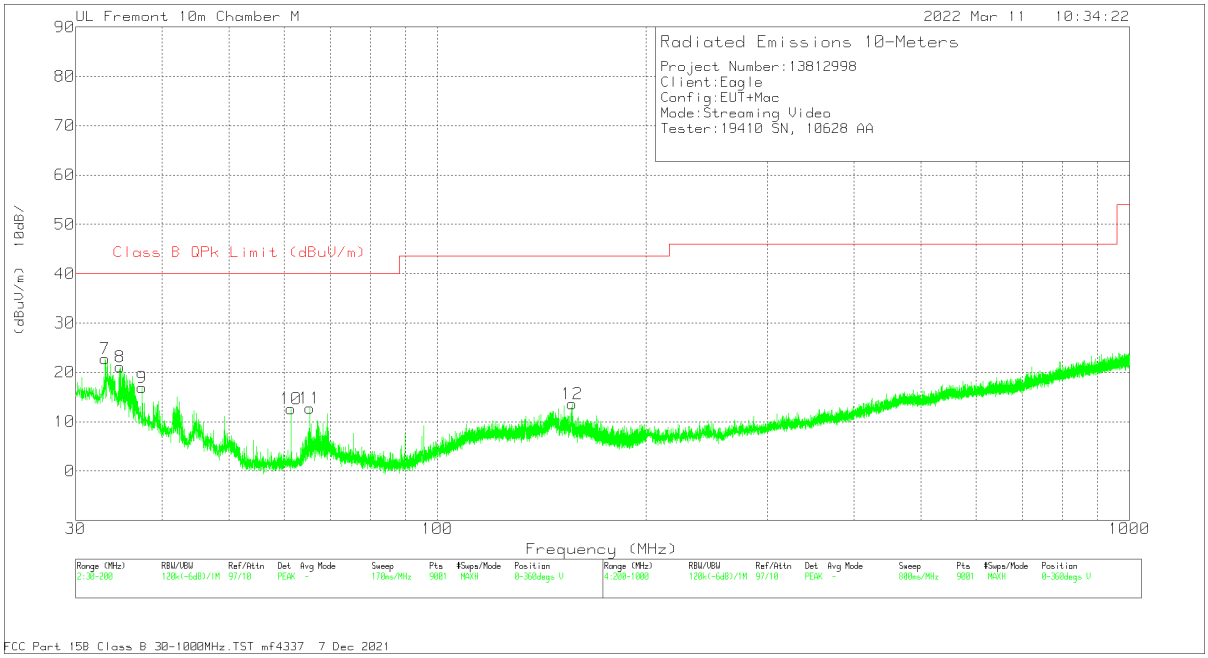
Test Equipment List					
Description	**Manufacturer**	**Model**	**Local ID (T No.)**	**Cal Date**	**Cal Due**
Antenna,Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	173997	2022-01-18	2023-01-18
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	170567	2021-07-20	2022-07-10
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	200784	2022-01-12	2023-01-12
RF Filter Box, 1-18GHz	UL (IN HOUSE)	N/A	PRE0211790	2021-06-15	2022-06-15
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169935	2022-02-19	2023-02-19
Thermometer - Digital	Control Company	14-650-118	175731	2022-02-03	2023-02-03
Radiated Software	Underwriter's Laboratories Inc.	UL-EMS	Release 9.5 15 Jul 2021		

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

Radiated Emissions Graph

HORIZONTAL AND VERTICAL PLOTS





Radiated Emissions Data Points

Trace Markers

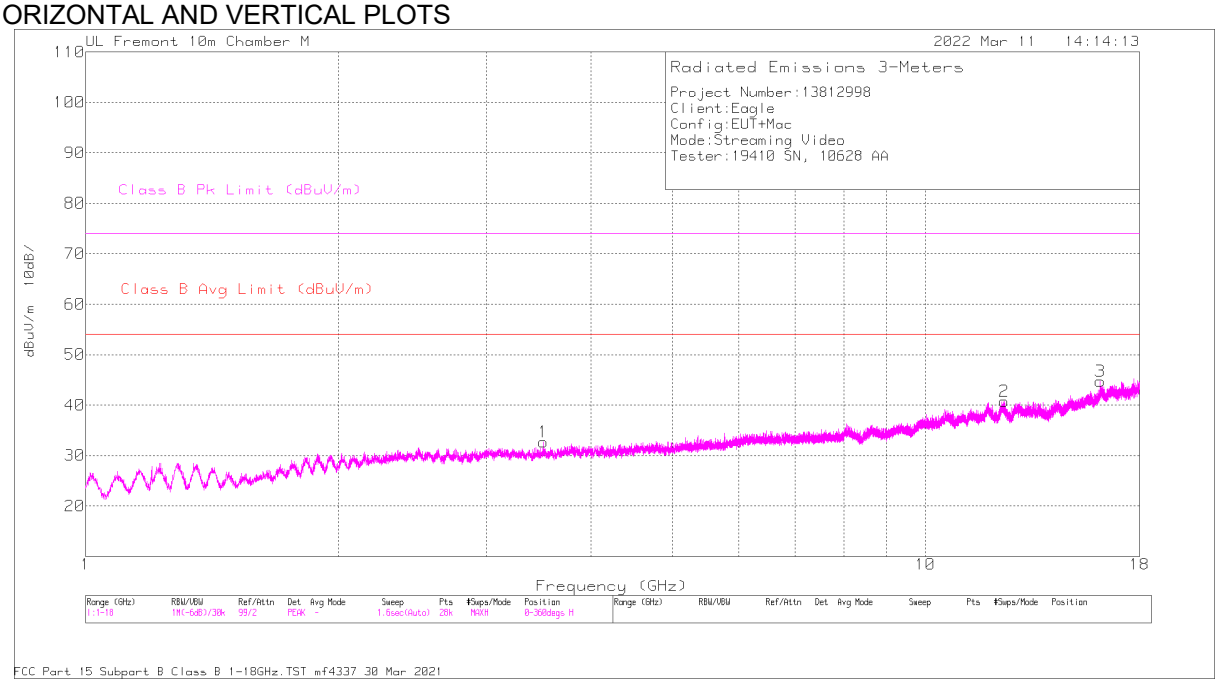
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	173997 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB) 20Log	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.678	28.9	Qp	27.7	-28.9	-10.5	17.2	40	-22.8	156	276	H
2	33.6078	31.42	Pk	25.3	-28.9	-10.5	17.32	40	-22.68	0-360	199	H
3	96.7915	31.47	Pk	15.2	-28.2	-10.5	7.97	43.52	-35.55	0-360	400	H
4	103.044	32.62	Pk	17.1	-28.1	-10.5	11.12	43.52	-32.4	0-360	400	H
7	33.0789	36.36	Pk	25.7	-28.8	-10.5	22.76	40	-17.24	0-360	100	V
8	34.76	35.9	Pk	24.5	-28.8	-10.5	21.1	40	-18.9	0-360	100	V
9	37.4423	33.83	Pk	22.4	-28.8	-10.5	16.93	40	-23.07	0-360	100	V
10	61.3935	37.95	Pk	13.7	-28.5	-10.5	12.65	40	-27.35	0-360	100	V
11	65.3413	37.68	Pk	14	-28.5	-10.5	12.68	40	-27.32	0-360	100	V
12	156.462	33.31	Pk	18.6	-27.8	-10.5	13.61	43.52	-29.91	0-360	100	V
5	635.467	29.6	Pk	26.1	-25.6	-10.5	19.6	46.02	-26.42	0-360	100	H
6	944.534	28.15	Pk	29.3	-23.1	-10.5	23.85	46.02	-22.17	0-360	298	H

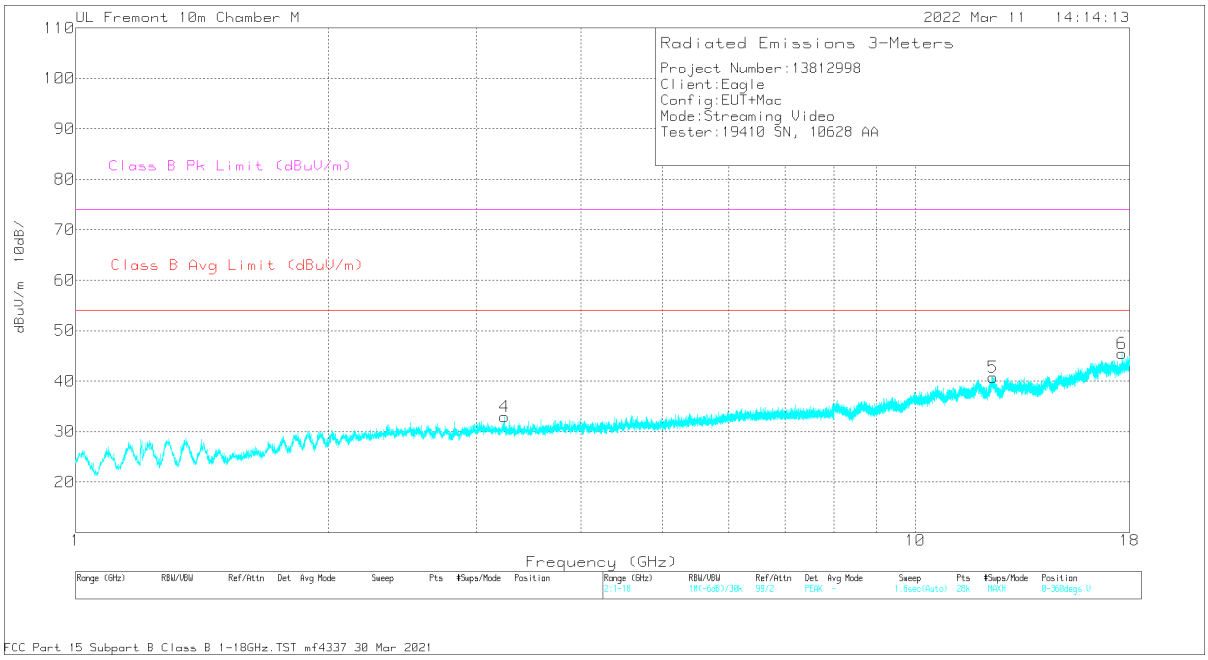
Pk - Peak detector
Qp - Quasi-Peak detector

RADIATED EMISSIONS 1000 TO 18,000 MHz – FCC

Radiated Emissions Graph

HORIZONTAL AND VERTICAL PLOTS





Radiated Emissions Data Points

Frequency (GHz)	Meter Reading (dBuV)	Det	AF 200784 (dB/m)	Amp/Cbl (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
3.511705	50.49	Pk	32.8	-42.2	41.09	-	-	74	-32.91	302	163	H
3.511705	37.06	Ca	32.8	-42.2	27.66	54	-26.34	-	-	302	163	H
12.418807	43.97	Pk	39	-33.7	49.27	-	-	74	-24.73	184	243	H
12.418807	30.43	Ca	39	-33.7	35.73	54	-18.27	-	-	184	243	H
16.1678	44.42	Pk	40.8	-32.9	52.32	-	-	74	-21.68	184	243	H
16.1678	29.72	Ca	40.8	-32.9	37.62	54	-16.38	-	-	184	243	H
3.242558	51.14	Pk	32.7	-42.5	41.34	-	-	74	-32.66	127	341	V
3.242558	37.23	Ca	32.7	-42.5	27.43	54	-26.57	-	-	127	341	V
12.369312	43.81	Pk	39	-34.1	48.71	-	-	74	-25.29	348	252	V
12.369312	29.58	Ca	39	-34.1	34.48	54	-19.52	-	-	348	252	V
17.643388	41.38	Pk	41.3	-29.6	53.08	-	-	74	-20.92	299	185	V
17.643388	28.31	Ca	41.3	-29.6	40.01	54	-13.99	-	-	299	185	V

Pk - Peak detector
Ca - CISPR average detection

5.0 SETUP PHOTOS

Please refer to 13812998-EP1 for setup photos

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
☐	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	22541	550739
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324B	550739

The UL Verification Services Inc. VCCI laboratory facility registration number is A-0043.

END OF TEST REPORT