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Report Number:	R11694639-E14
Order Number:	11694639
Date:	2018-06-21
Model:	M1001\M1002
FCC ID:	2AM5NM1000
IC:	23045-M1000

Electromagnetic Compatibility Certification Test Report

For

MAGIC LEAP, INC.
7500 WEST SUNRISE BOULEVARD
PLANTATION, FL 33322, USA

Certification Report Details

Tests Performed By:	**UL LLC** **12 Laboratory Dr.** **Research Triangle Park, NC 27709**
Tests Performed For:	**Magic Leap, Inc.** **7500 West Sunrise Boulevard** **Plantation, FL 33322, USA**
Applicant Contact: Title: E-mail:	**Kim Uong** **Compliance Engineer** kuong@magicleap.com
Test Report Date:	**2018-06-21**
Product Type:	**Magic Leap One – Lightpack Lightwear**
Product standards	**CFR 47 FCC Part 15 Subpart B: 2018, ICES-003 - 2016**
Model Number:	**M1001\M1002**
Sample Serial Number:	**PA1067B03432, PA1067B03430**
FCC ID:	**2AM5NM1000**
IC:	**23045-M1000**
EUT Category:	**ITE**
Testing Start Date:	**2018-03-27**
Date Testing Complete:	**2018-04-24**
Overall Results:	**Compliant**

UL LLC reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Report Directory

Report Revision History

Revision Date	Description	Revised By
2018-06-21	Added IC number to cover and report details pages	Brian T. Kiewra
2018-06-25	Added XYZ investigation statement to section 4.2.	Brian T. Kiewra

1.0 G E N E R A L - Product Description

1.1 Equipment Description

Magic Leap One – Lighpack Lightwear with BT/BLE/802.11a/b/g/n transceivers. Test report covers models M1001 and M1002. The difference between the two models is size of the headband on the Lightwear.

1.2 Equipment Marking Plate

None

1.3 Device Configuration During Test

1.3.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Lightwear	Magic Leap	M1001/M1002	Hardwired to Lightpack
EUT	Lightpack	Magic Leap	M1001/M1002	Hardwired to Lightwear
AE	Power Supply	Salcomp	M3002	45W Power Supply
AE	Laptop	HP	V2W71UT#ABA	SN: 5CG65235AQJ
AE	Laptop PS	HP	740015-002	SN: WDUVA0E2G53WR9
Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)				

1.3.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	NA
1	USB-C	DC	N	N	Connects to DC power supply
2	Data	I/O	N	N	Connects Lightpack to Lightwear.

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

1.3.3 EUT Internal Operating Frequencies:

Frequency (MHz)	Description
5825MHz	Highest operating frequency.

1.3.4 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	100-240	-	-	50-60	1	None
1	120	-	-	60	1	None

1.4 Block Diagram:

Refer to UL Document R11694639-EP14.

1.5 EUT Configurations

Mode #	Description
1	The EUT was configured as table top equipment.

1.6 EUT Operation Modes

Mode #	Description
1	Operating as intended using power supply.
2	Operating as intended connected to laptop. Laptop recognized device during connection.

1.7 Rational for EUT Configuration

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

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL LLC in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
47 CFR Part 15, Subpart B	Radio Frequency Devices – Unintentional Radiators	2018
ICES-003	Information Technology Equipment (ITE) — Limits and methods of measurement	2016

2.4 Results Summary

This product is considered Class B.

Requirement – Test	Result (Compliant / Non-Compliant)*
Conducted Emissions - Mains	Compliant
Radiated Emissions	Compliant

Test Engineer:

Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

Reviewer:

Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

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3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

---------- United States ----------

Code of Federal Regulations Title 47	Part 15, Subpart B, Radio Frequency Devices

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

Measurement Uncertainty

Test	Uncertainty
Conducted Emissions (0.150-30MHz)	+/- 2.94 dB
Radiated Emissions (30-18 GHz)	+/- 5.36 dB

Note – The above values represent worst-case for each frequency range.

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.1 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.		
Basic Standard		FCC Part 15, Subparts A & B in conjunction with ANSI C63.4:2014	
UL LPG		80-EM-S0026	
		Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range		150kHz to 30MHz	Mains
Limits - Class B			
Frequency (MHz)	Limit (dBµV)		
	Quasi-Peak	Average	
0.15-0.5	66 to 56	56 to 46	
0.5-5	56	46	
5-30	60	50	
Supplementary information: None			

Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1 (PS) 2 (Laptop)
Supplementary information: None		

Table 2 Conducted Emissions Test Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL076	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3476-240	2017-08-12	2018-08-12
SN 161024885	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2017-08-22	2018-08-22
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2017-08-23	2018-08-23
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2017-06-12	2018-06-12
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Miscellaneous (if needed)					
MM0168	Multi-meter	Agilent	U1232A	2017-09-25	2018-09-30

Figure 1 Test Setup for Conducted Emissions

Refer to UL Document R11694639-EP14.

Figure 2 Conducted Emissions Graph Line 1 – Power Supply

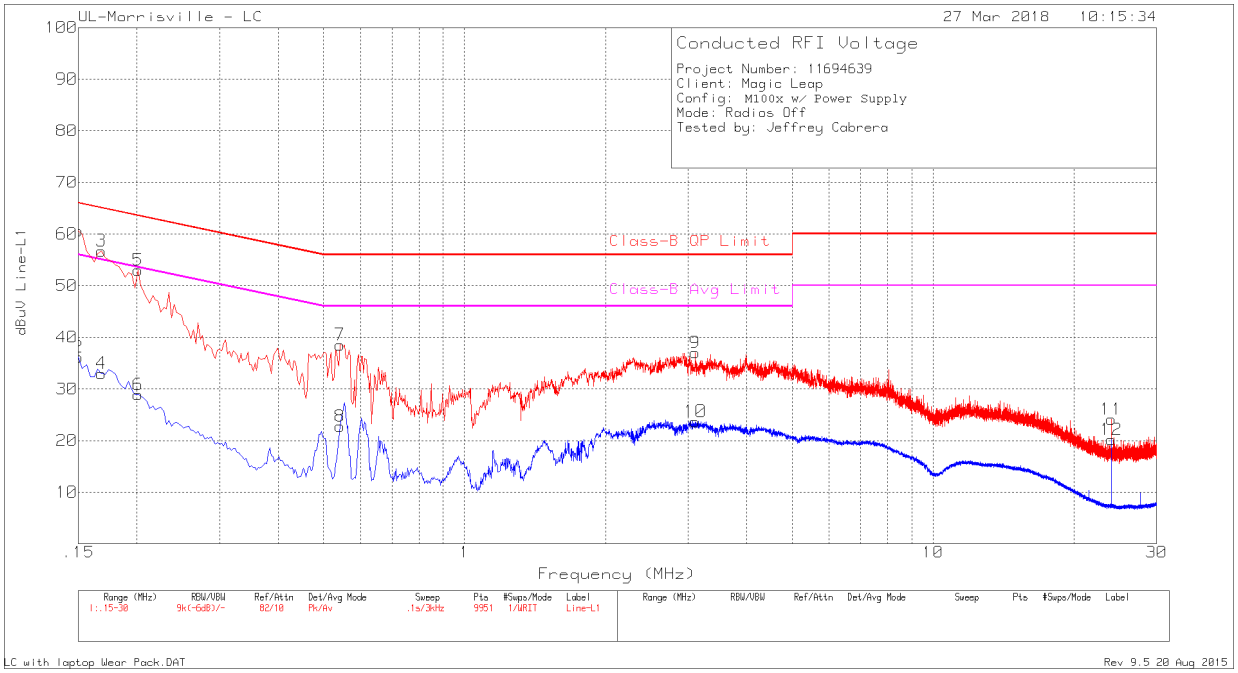

Figure 3 Conducted Emissions Data Points Line 1 – Power Supply

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.159	38.5	Qp	.2	10	48.7	65.52	-16.82	-	-
2	.15	25.97	Av	.2	10	36.17	-	-	56	-19.83
3	.168	46.54	Pk	.2	10	56.74	65.06	-8.32	-	-
4	.168	22.8	Av	.2	10	33	-	-	55.06	-22.06
5	.201	42.86	Pk	.1	10	52.96	63.57	-10.61	-	-
6	.201	18.77	Av	.1	10	28.87	-	-	53.57	-24.7
7	.543	28.63	Pk	0	9.9	38.53	56	-17.47	-	-
8	.543	12.87	Av	0	9.9	22.77	-	-	46	-23.23
9	3.111	27.03	Pk	0	10	37.03	56	-18.97	-	-
10	3.111	13.67	Av	0	10	23.67	-	-	46	-22.33
11	24	13.7	Pk	.2	10.2	24.1	60	-35.9	-	-
12	24	9.77	Av	.2	10.2	20.17	-	-	50	-29.83

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

Table 3 Conducted Emissions Graph Line 2 – Power Supply

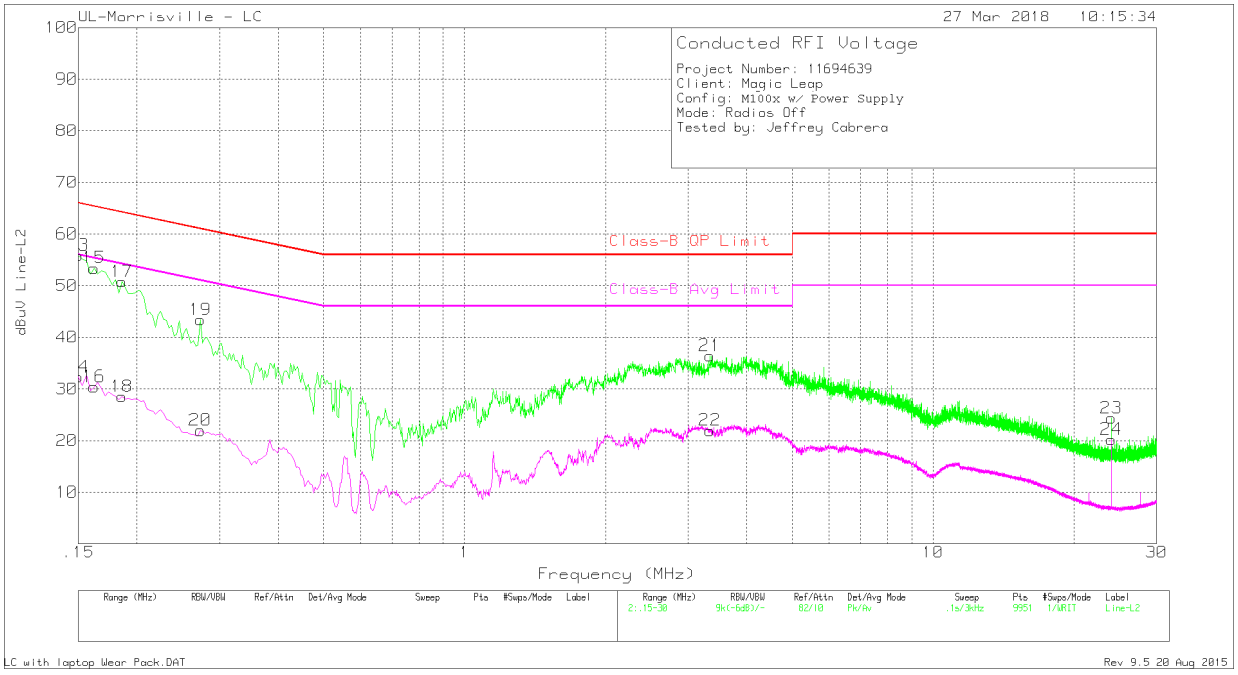

Table 4 Conducted Emissions Data Points Line 2 – Power Supply

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
13	.15	45.68	Pk	.2	10	55.88	66	-10.12	-	-
14	.15	22.14	Av	.2	10	32.34	-	-	56	-23.66
15	.162	43.23	Pk	.2	10	53.43	65.36	-11.93	-	-
16	.162	20.23	Av	.2	10	30.43	-	-	55.36	-24.93
17	.186	40.56	Pk	.2	10	50.76	64.21	-13.45	-	-
18	.186	18.36	Av	.2	10	28.56	-	-	54.21	-25.65
19	.273	33.39	Pk	.1	9.9	43.39	61.03	-17.64	-	-
20	.273	11.97	Av	.1	9.9	21.97	-	-	51.03	-29.06
21	3.339	26.44	Pk	0	10	36.44	56	-19.56	-	-
22	3.339	11.96	Av	0	10	21.96	-	-	46	-24.04
23	24	13.95	Pk	.2	10.2	24.35	60	-35.65	-	-
24	24	9.82	Av	.2	10.2	20.22	-	-	50	-29.78

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

Figure 4 Conducted Emissions Graph Line 1 – Laptop Accessory

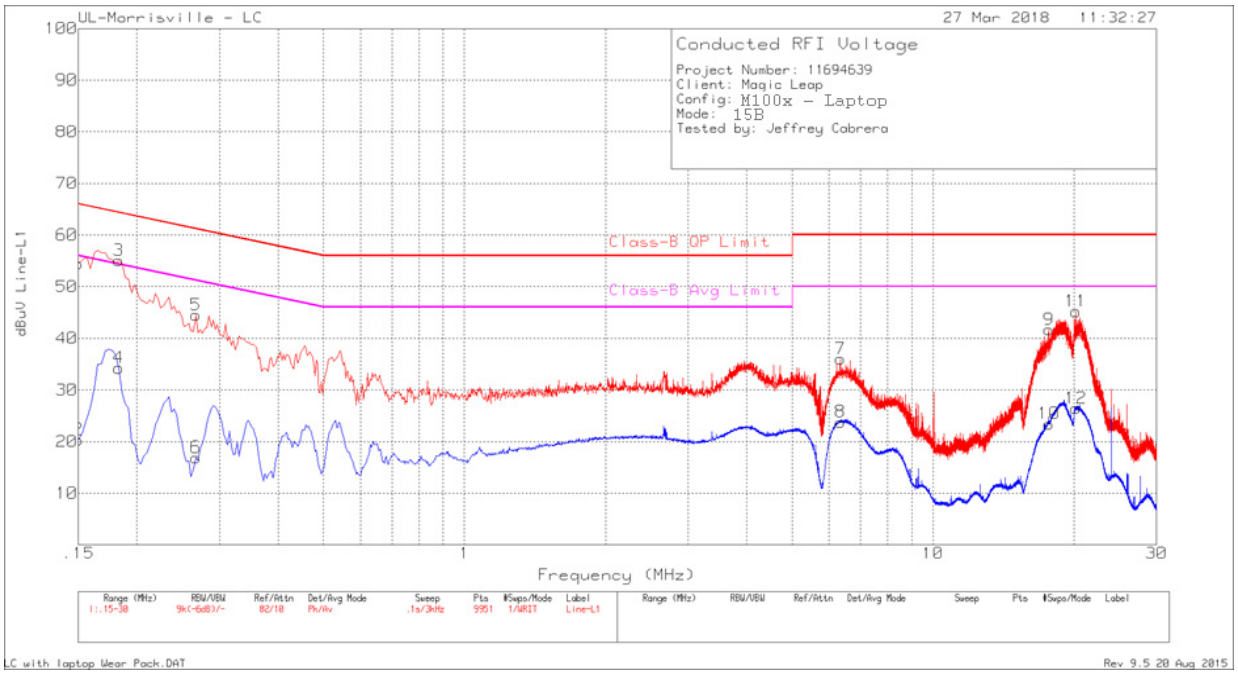

Figure 5 Conducted Emissions Data Points 1 – Laptop Accessory

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.15	44.3	Pk	.2	10	54.5	66	-11.5	-	-
2	.15	10.16	Av	.2	10	20.36	-	-	56	-35.64
3	.183	44.88	Pk	.2	10	55.08	64.35	-9.27	-	-
4	.183	24.06	Av	.2	10	34.26	-	-	54.35	-20.09
5	.267	34.51	Pk	.1	9.9	44.51	61.21	-16.7	-	-
6	.267	6.91	Av	.1	9.9	16.91	-	-	51.21	-34.3
7	6.345	25.93	Pk	.1	10	36.03	60	-23.97	-	-
8	6.345	13.7	Av	.1	10	23.8	-	-	50	-26.2
9	17.655	31.36	Pk	.1	10.2	41.66	60	-18.34	-	-
10	17.655	13.14	Av	.1	10.2	23.44	-	-	50	-26.56
11	20.196	34.8	Pk	.2	10.2	45.2	60	-14.8	-	-
12	20.196	16.04	Av	.2	10.2	26.44	-	-	50	-23.56

Pk - Peak detector
Av - Average detection

Table 5 Conducted Emissions Graph Line 2 – Laptop Accessory

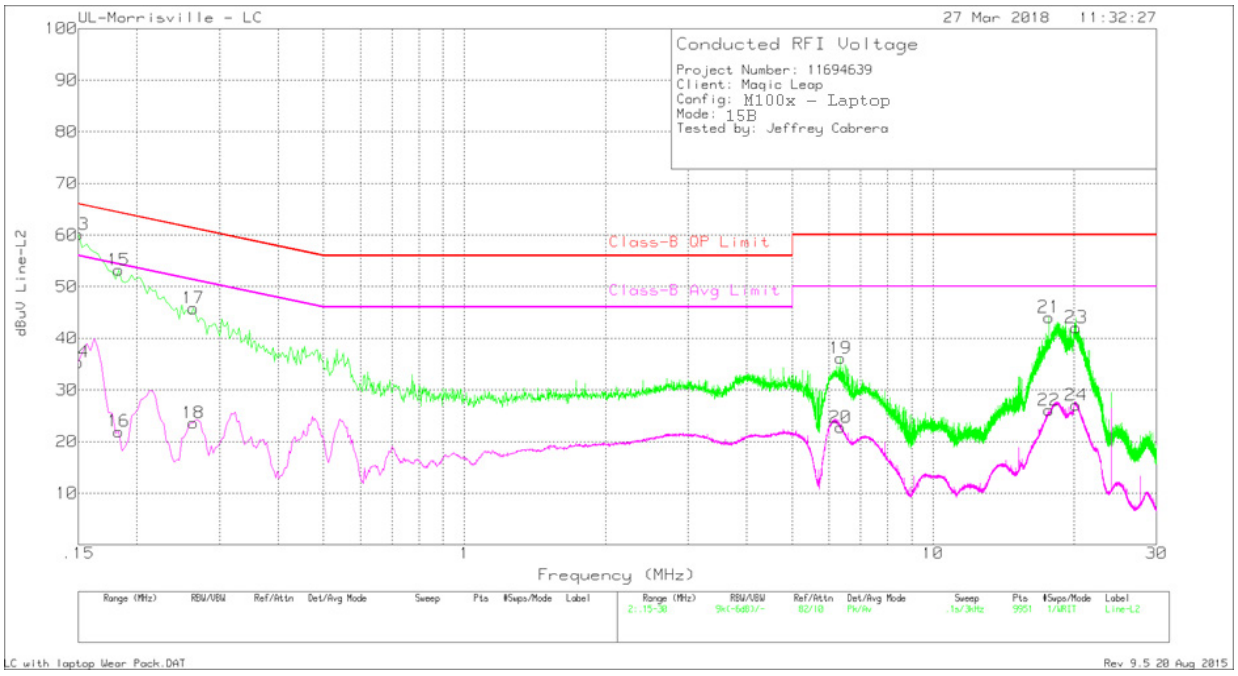

Table 6 Conducted Emissions Data Points Line 2 – Laptop Accessory

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
13	.159	44.62	Qp	.2	10	54.82	65.52	-10.7	-	-
14	.15	25.17	Av	.2	10	35.37	-	-	56	-20.63
15	.183	43.02	Pk	.2	10	53.22	64.35	-11.13	-	-
16	.183	11.76	Av	.2	10	21.96	-	-	54.35	-32.39
17	.264	35.82	Pk	.1	9.9	45.82	61.3	-15.48	-	-
18	.264	13.64	Av	.1	9.9	23.64	-	-	51.3	-27.66
19	6.345	26.04	Pk	.1	10	36.14	60	-23.86	-	-
20	6.345	12.67	Av	.1	10	22.77	-	-	50	-27.23
21	17.679	33.78	Pk	.1	10.2	44.08	60	-15.92	-	-
22	17.679	15.79	Av	.1	10.2	26.09	-	-	50	-23.91
23	20.211	31.7	Pk	.2	10.2	42.1	60	-17.9	-	-
24	20.211	16.66	Av	.2	10.2	27.06	-	-	50	-22.94

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

4.2 Test Conditions and Results – RADIATED EMISSIONS

Test Description	Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.		
Basic Standard		FCC Part 15, Subparts A & B in conjunction with ANSI C63.4:2014	
UL LPG		80-EM-S0029	
		Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range		30MHz – 1GHz	3 meter – Class B
		1-18 GHz	3 meter
		18-40 GHz	3 meter
Limits - Class B			
Frequency (MHz)		Limit (dBµV/m)	
		Quasi-Peak	Average
30-88		40	NA
88-216		43.5	NA
216-960		46	NA
960-1000		54	NA
1,000-18,000		NA	54
18,000-40,000		NA	54
Supplemental Information: Note, the EUT was investigated in XYZ orientations and the X-Axis was determined to be worst-case based on 30-1000MHz PK scan. Therefore all radiated testing done in the X-Axis.			

Table 7 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1 (PS) 2 (Laptop)
Supplementary information: None		

Table 8 Radiated Emissions Test Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0074	Hybrid Broadband Antenna (30-1000MHz)	Sunol Sciences Corp.	JB3	2017-06-15	2018-06-15
AT0069	Double-Ridged Waveguide Horn Antenna (1 to 18 GHz)	ETS Lindgren	3117	2017-04-05	2018-04-30
AT0076	Horn Antenna (18-26.5GHz)	ARA	MWH-1826/B	2017-10-10	2018-10-10
AT0077	Horn Antenna(26-40GHz)	ARA	MWH-2640/B	2017-10-10	2018-10-10
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2017-06-11	2018-06-11
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2018-03-20	2019-03-20
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2018-04-02	2019-04-02
SA0026	Spectrum Analyzer	Agilent	N9030A	2018-03-20	2019-03-20
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

Test setup for Radiated Emissions

Refer to UL Document R11694639-EP14.

Figure 6 Radiated Emissions Graph – 30-1000 MHz – X-Axis Power Supply

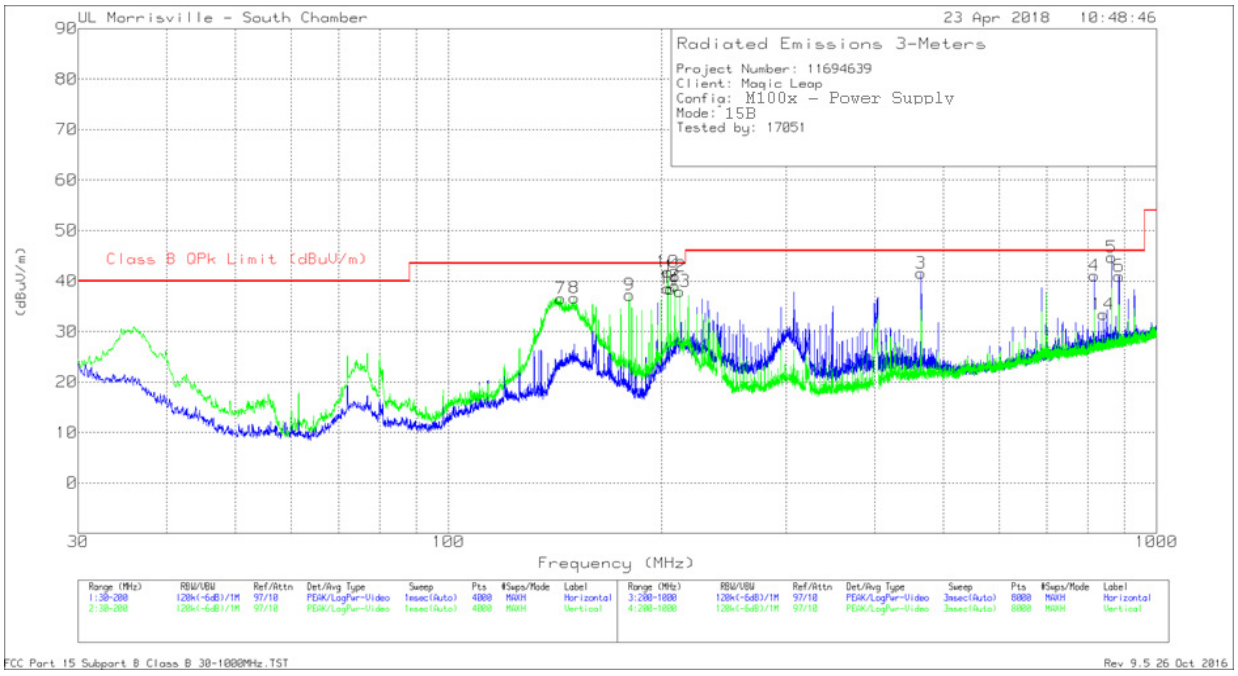

Table 9 Radiated Emissions Data Points - 30-1000 MHz – X-Axis Power Supply

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	204.0015	52.54	Qp	16	-30.2	38.34	43.52	-5.18	209	170	H
2	208.9003	54.12	Qp	15.4	-30.1	39.42	43.52	-4.1	52	166	H
3	465.0925	48.96	Qp	21.6	-29	41.56	46.02	-4.46	343	100	H
4	816.0018	41.86	Qp	26.4	-27.7	40.56	46.02	-5.46	112	107	H
14	839.9986	32.03	Qp	26.4	-27.5	30.93	46.02	-15.09	117	102	H
5	864.0022	45.5	Qp	26.6	-27.4	44.7	46.02	-1.32	115	101	H
6	884.7417	41.26	Qp	26.7	-27.2	40.76	46.02	-5.26	122	100	H
7	143.972	50.06	Pk	17.2	-30.7	36.56	43.52	-6.96	0-360	101	V
8	150.5344	49.13	Qp	16.9	-30.6	35.43	43.52	-8.09	329	102	V
9	180.0036	51.48	Qp	15.7	-30.3	36.88	43.52	-6.64	7	100	V
10	204.0002	55.38	Qp	16	-30.2	41.18	43.52	-2.34	10	100	V
11	205.8279	52.35	Qp	15.5	-30.1	37.75	43.52	-5.77	7	100	V
12	208.8988	55	Qp	15.4	-30.1	40.3	43.52	-3.22	8	100	V
13	211.9707	52.02	Qp	15.3	-30.2	37.12	43.52	-6.4	4	100	V

Pk - Peak detector
Qp - Quasi-Peak detector

Figure 7 Radiated Emissions Graph – 30-1000 MHz – X-Axis Laptop Accessory

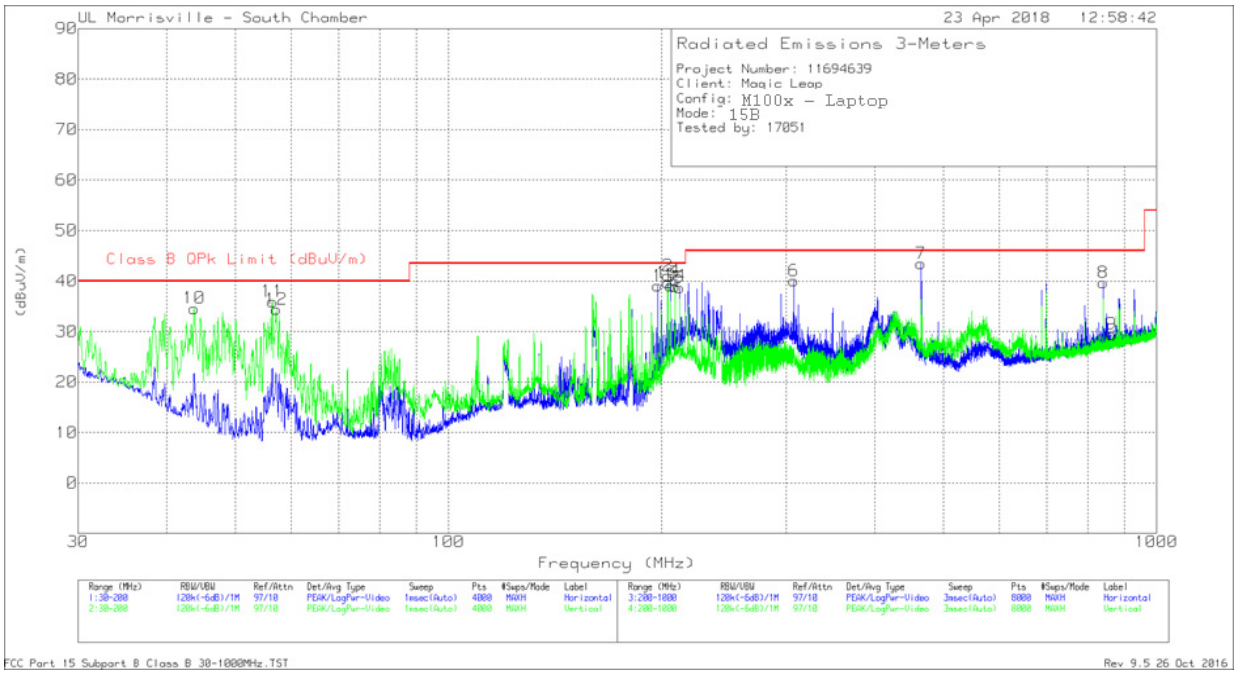

Table 10 Radiated Emissions Data Points - 30-1000 MHz – X-Axis Laptop Accessory

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	197.3706	49.3	Qp	17.2	-30.3	36.2	43.52	-7.32	299	172	H
2	204.0016	55.05	Qp	16	-30.2	40.85	43.52	-2.67	296	187	H
3	205.8262	53.04	Qp	15.5	-30.1	38.44	43.52	-5.08	302	170	H
4	208.8974	55.51	Qp	15.4	-30.1	40.81	43.52	-2.71	33	169	H
5	211.9708	54.34	Qp	15.3	-30.2	39.44	43.52	-4.08	295	159	H
6	307.1958	50.63	Qp	18.2	-29.6	39.23	46.02	-6.79	160	100	H
7	465.0929	50.21	Qp	21.6	-29	42.81	46.02	-3.21	346	100	H
8	839.9991	44.22	Qp	26.4	-27.5	43.12	46.02	-2.9	93	100	H
9	863.9907	28.87	Qp	26.6	-27.4	28.07	46.02	-17.95	111	100	H
10	43.2942	45.12	Qp	16	-31.6	29.52	40	-10.48	264	100	V
11	54.8944	49.16	Qp	11.8	-31.5	29.46	40	-10.54	348	100	V
12	56.3691	44.48	Qp	11.8	-31.5	24.78	40	-15.22	348	100	V
13	204.0035	52.88	Qp	16	-30.2	38.68	43.52	-4.84	346	100	V
14	208.8981	52.67	Qp	15.4	-30.1	37.97	43.52	-5.55	39	100	V

Pk - Peak detector
Qp - Quasi-Peak detector

Figure 8 Radiated Emissions Graph – 1 to 18 GHz – X-Axis Power Supply

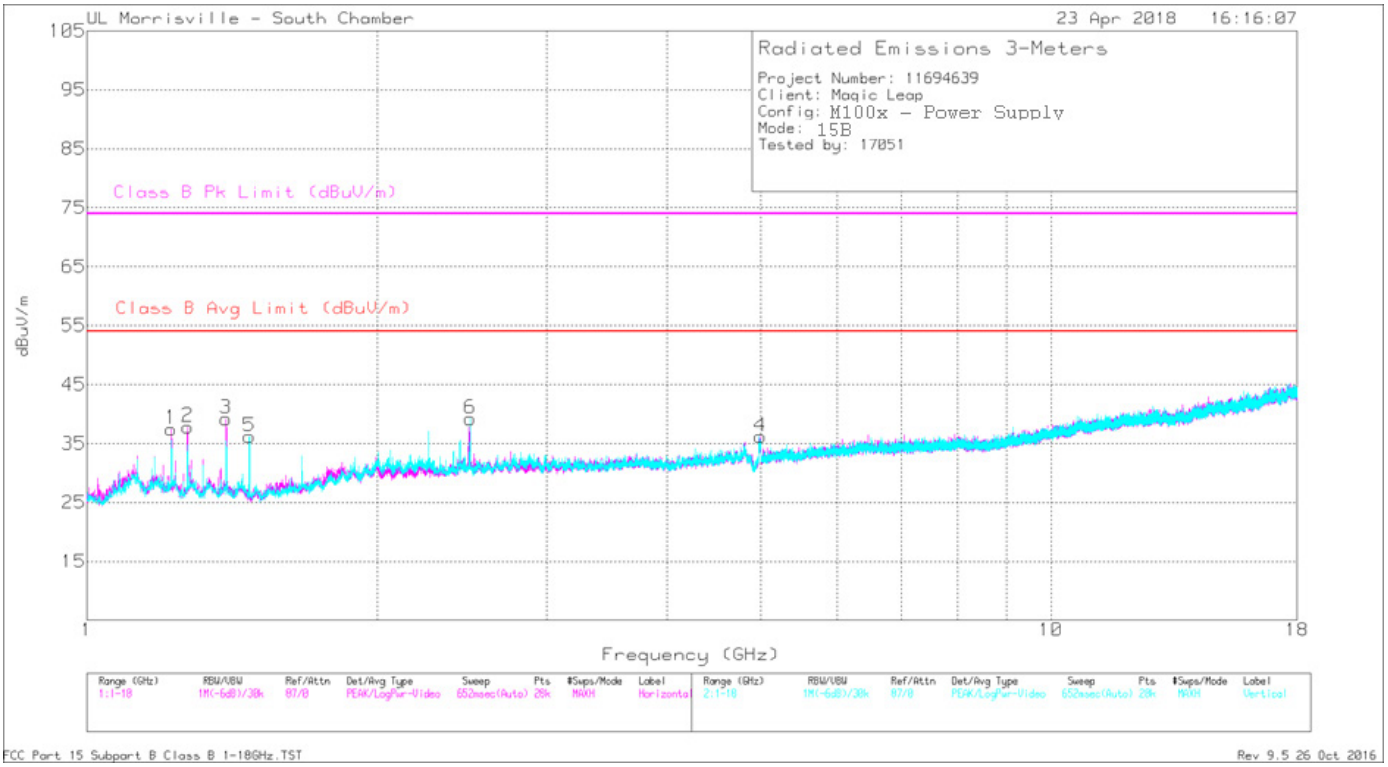

Table 11 Radiated Emissions Data Points – 1 to 18 GHz – X-Axis Power Supply

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.224	49.14	Pk	28.8	-35.3	42.64	-	-	74	-31.36	102	173	H
	1.224	43.74	Av	28.8	-35.3	37.24	54	-16.76	-	-	102	173	H
2	1.272	49.85	Pk	29.5	-35.1	44.25	-	-	74	-29.75	264	198	H
	1.272	42.83	Av	29.5	-35.1	37.23	54	-16.77	-	-	264	198	H
3	1.395	49.44	Pk	28.7	-35	43.14	-	-	74	-30.86	88	101	H
	1.395	44.72	Av	28.7	-35	38.42	54	-15.58	-	-	88	101	H
4	4.997	47.49	Pk	34.2	-31.7	49.99	-	-	74	-24.01	9	156	H
	4.994	31.15	Av	34.2	-31.7	33.65	54	-20.35	-	-	9	156	H
5	1.474	47.98	Pk	28.1	-34.9	41.18	-	-	74	-32.82	92	129	V
	1.475	42.41	Av	28.1	-34.9	35.61	54	-18.39	-	-	92	129	V
6	2.494	60.8	Pk	32.3	-34.1	59	-	-	74	-15	23	302	V
	2.492	34.04	Av	32.3	-34.1	32.24	54	-21.76	-	-	23	302	V

Pk - Peak detector
Av - Average detection
Note: All final peak and average measurements were made with an RBW/VBW of 1MHz/3MHz.

Figure 9 Radiated Emissions Graph – 1 to 18 GHz – X-Axis Laptop Accessory

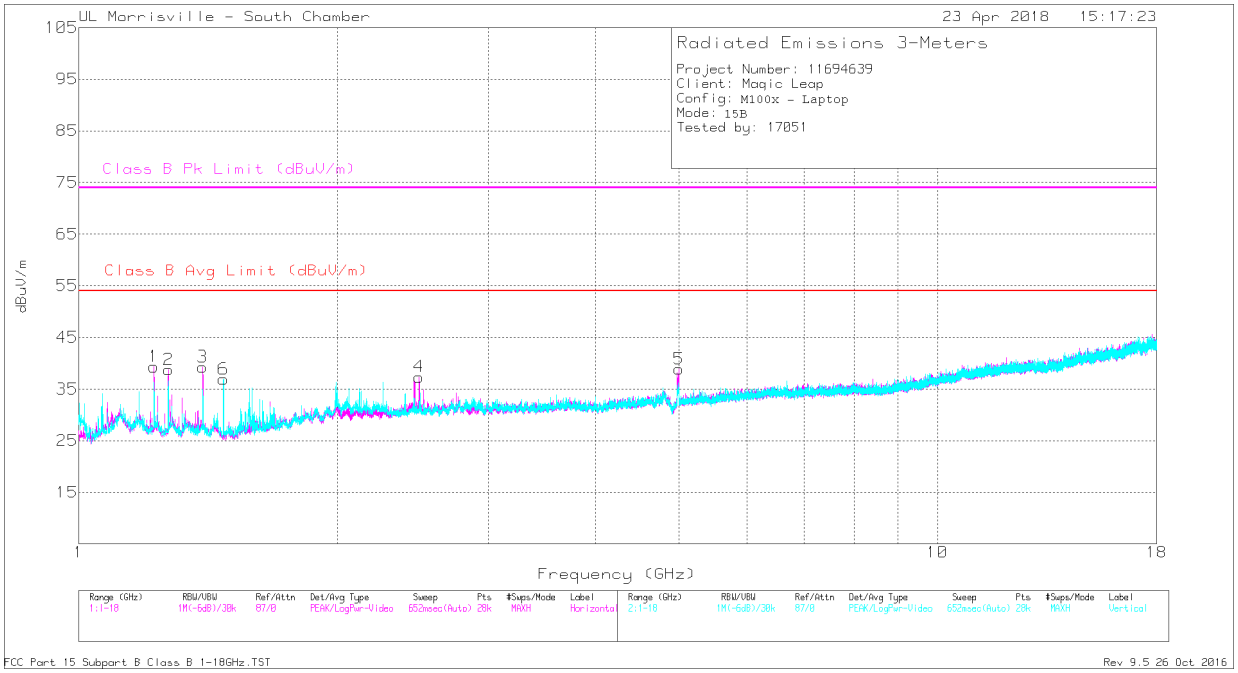

Table 12 Radiated Emissions Data Points – 1 to 18 GHz – Laptop Accessory

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.224	49.61	Pk	28.8	-35.3	43.11	-	-	74	-30.89	103	101	H
	1.224	44.99	Av	28.8	-35.3	38.49	54	-15.51	-	-	103	101	H
2	1.272	51.32	Pk	29.5	-35.1	45.72	-	-	74	-28.28	254	293	H
	1.272	44.42	Av	29.5	-35.1	38.82	54	-15.18	-	-	254	293	H
3	1.395	49.68	Pk	28.7	-35	43.38	-	-	74	-30.62	73	101	H
	1.395	44.75	Av	28.7	-35	38.45	54	-15.55	-	-	73	101	H
4	2.494	60.55	Pk	32.3	-34.1	58.75	-	-	74	-15.25	6	101	H
	2.489	34.24	Av	32.4	-34.1	32.54	54	-21.46	-	-	6	101	H
5	4.994	51.04	Pk	34.2	-31.7	53.54	-	-	74	-20.46	301	216	H
	4.997	32.33	Av	34.2	-31.7	34.83	54	-19.17	-	-	301	216	H
6	1.474	47.91	Pk	28.1	-34.9	41.11	-	-	74	-32.89	90	101	V
	1.475	43	Av	28.1	-34.9	36.2	54	-17.8	-	-	90	101	V

Pk - Peak detector
Av - Average detection

Note: All final peak and average measurements were made with an RBW/VBW of 1MHz/3MHz.

Figure 10 Radiated Emissions Graph – 18 to 26.5 GHz – X-Axis Power Supply

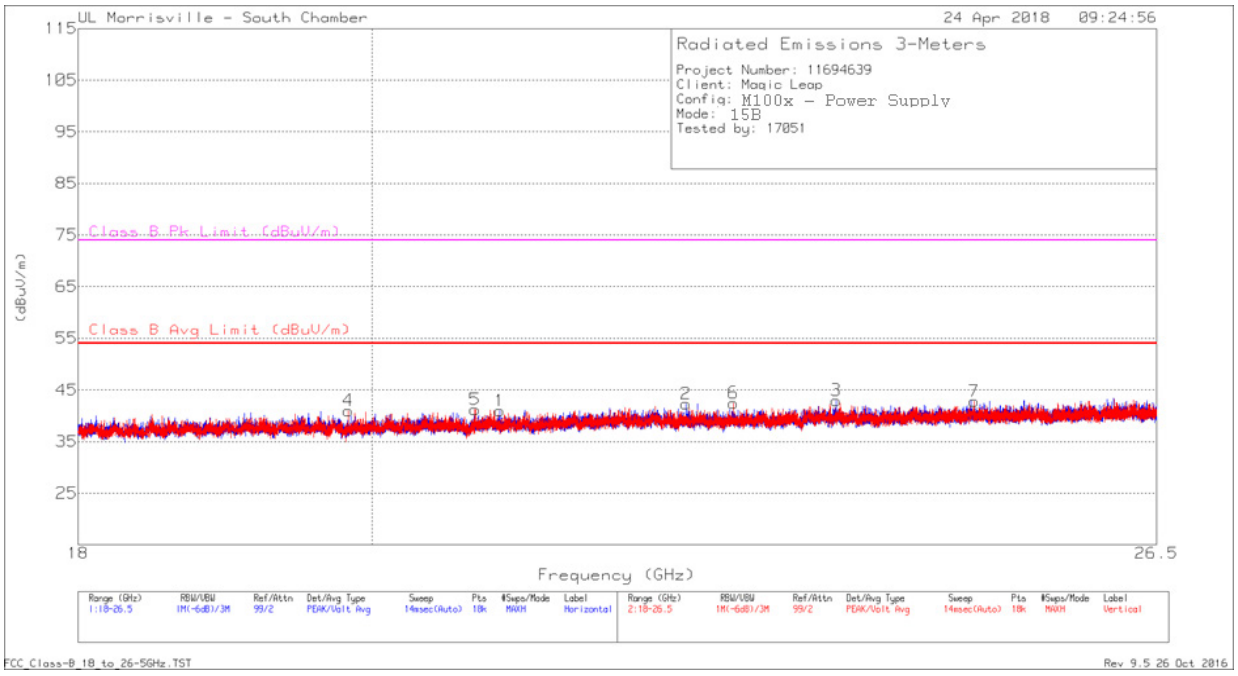

Table 13 Radiated Emissions Data Points – 18 to 26.5 GHz – X-Axis Power Supply

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (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
1	20.939	46.87	Pk	33.2	-39.1	40.97	54	-13.03	74	-33.03	0-360	100	H
2	22.385	47.37	Pk	33.8	-38.9	42.27	54	-11.73	74	-31.73	0-360	299	H
3	23.622	47.27	Pk	33.9	-38.2	42.97	54	-11.03	74	-31.03	0-360	149	H
4	19.832	47.8	Pk	32.7	-39.5	41	54	-13	74	-33	0-360	151	V
5	20.753	47.22	Pk	33	-39	41.22	54	-12.78	74	-32.78	0-360	201	V
6	22.767	47.37	Pk	33.7	-38.6	42.47	54	-11.53	74	-31.53	0-360	299	V
7	24.821	45.71	Pk	34.5	-37.4	42.81	54	-11.19	74	-31.19	0-360	101	V

Pk - Peak detector

Figure 11 Radiated Emissions Graph – 18 to 26.5 GHz – X-Axis Laptop Accessory

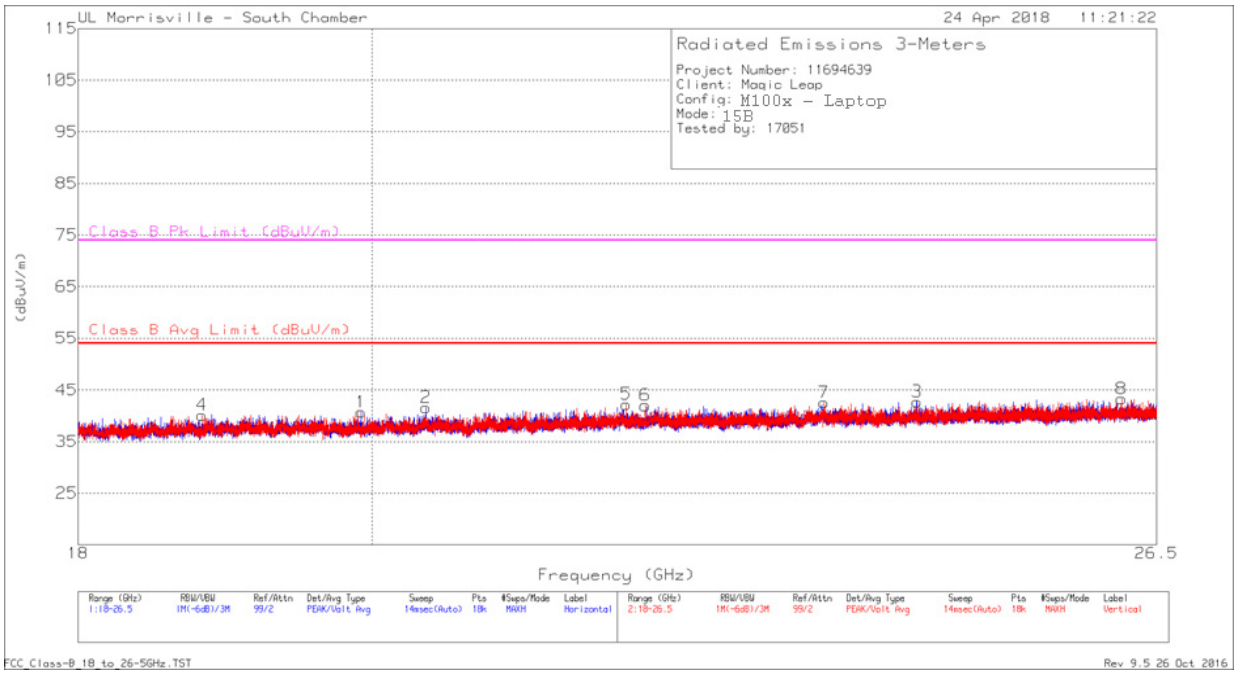

Table 14 Radiated Emissions Data Points – 18 to 26.5 GHz – X-Axis Laptop Accessory

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (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
1	19.924	47.42	Pk	32.9	-39.6	40.72	54	-13.28	74	-33.28	0-360	149	H
2	20.39	47.61	Pk	33.1	-39.1	41.61	54	-12.39	74	-32.39	0-360	102	H
3	24.316	46.32	Pk	34.2	-37.8	42.72	54	-11.28	74	-31.28	0-360	299	H
4	18.818	47.44	Pk	32.5	-39.8	40.14	54	-13.86	74	-33.86	0-360	299	V
5	21.909	47.64	Pk	33.6	-39	42.24	54	-11.76	74	-31.76	0-360	299	V
6	22.059	47.01	Pk	33.7	-38.7	42.01	54	-11.99	74	-31.99	0-360	151	V
7	23.519	46.66	Pk	34.1	-38.2	42.56	54	-11.44	74	-31.44	0-360	151	V
8	26.169	45.51	Pk	34.6	-36.8	43.31	54	-10.69	74	-30.69	0-360	251	V

Pk - Peak detector

Figure 12 Radiated Emissions Graph – 26.5 to 30 GHz – X-Axis Power Supply

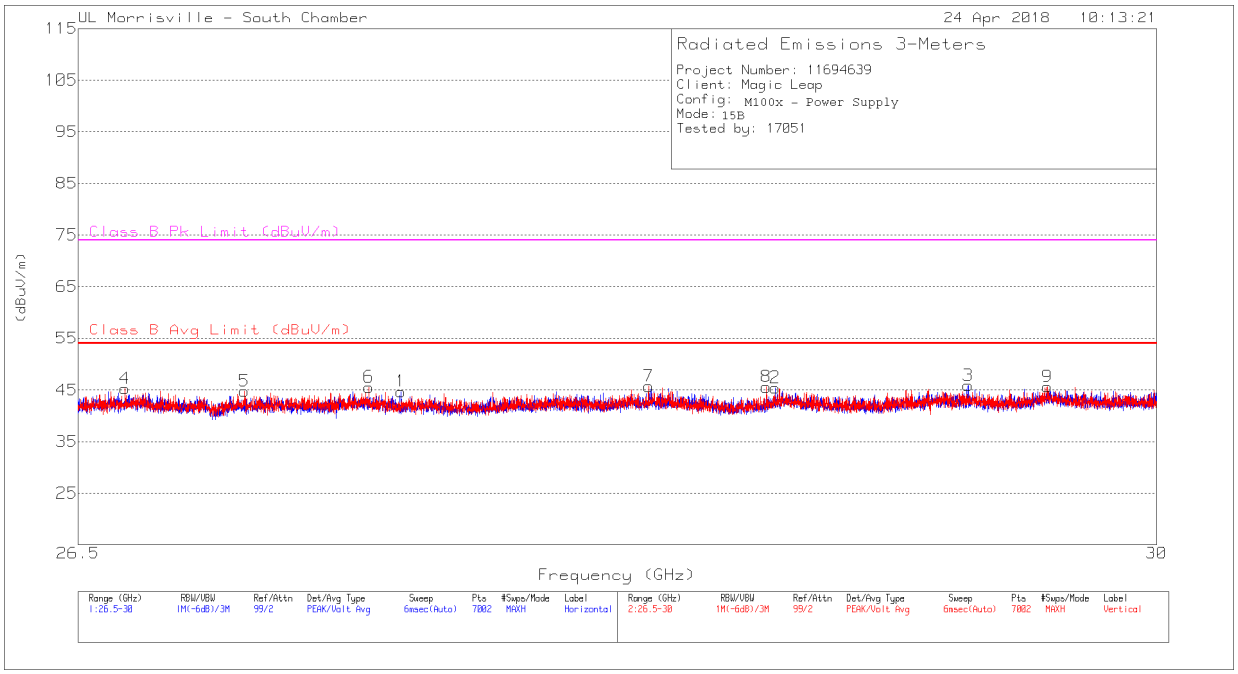

Table 15 Radiated Emissions Data Points – 26.5 to 30 GHz – X-Axis Power Supply

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0077 AF (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
1	27.503	44.81	Pk	35.7	-35.8	44.71	54	-9.29	74	-29.29	0-360	101	H
2	28.713	43.93	Pk	36.3	-34.8	45.43	54	-8.57	74	-28.57	0-360	149	H
3	29.357	43.79	Pk	36.3	-34.2	45.89	54	-8.11	74	-28.11	0-360	101	H
4	26.643	45.82	Pk	35.8	-36.4	45.22	54	-8.78	74	-28.78	0-360	299	V
5	27.012	45.08	Pk	35.9	-36.2	44.78	54	-9.22	74	-29.22	0-360	151	V
6	27.401	45.56	Pk	35.8	-35.8	45.56	54	-8.44	74	-28.44	0-360	299	V
7	28.297	44.5	Pk	36.4	-35.2	45.7	54	-8.3	74	-28.3	0-360	151	V
8	28.683	44.18	Pk	36.3	-34.9	45.58	54	-8.42	74	-28.42	0-360	101	V
9	29.625	43.25	Pk	36.4	-34	45.65	54	-8.35	74	-28.35	0-360	251	V

Pk - Peak detector

Figure 13 Radiated Emissions Graph – 26.5 to 30 GHz – X-Axis Laptop Accessory

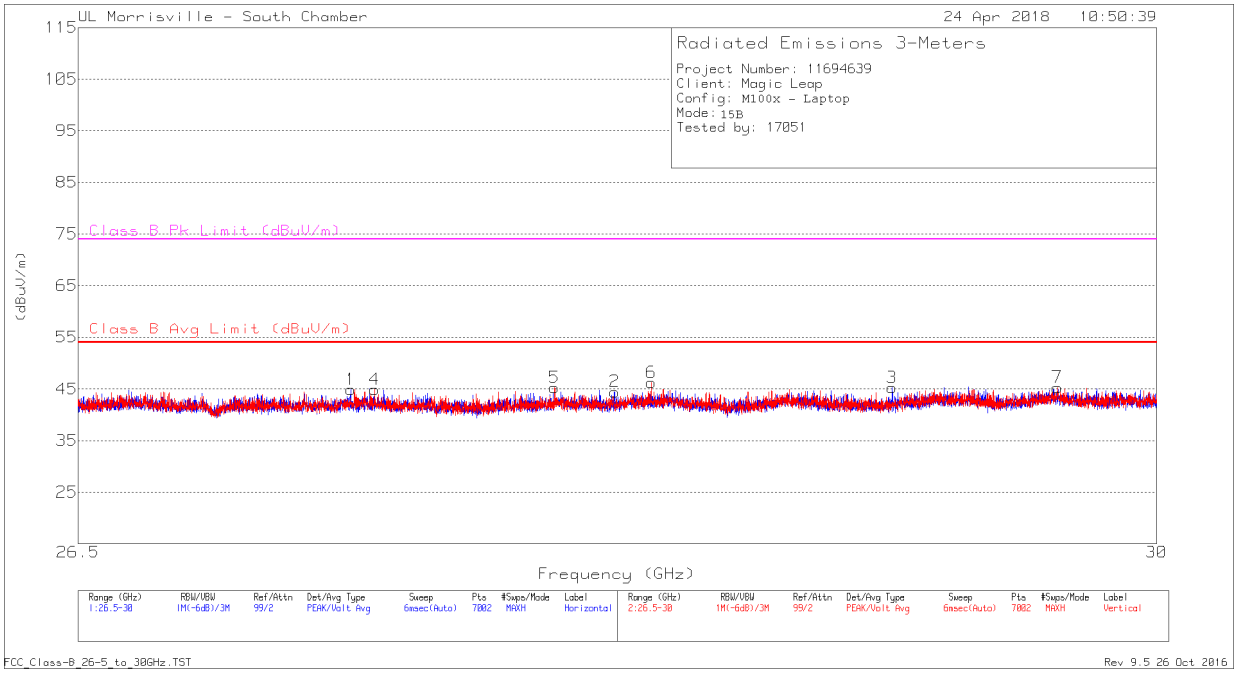

Table 16 Radiated Emissions Data Points – 26.5 to 30 GHz – X-Axis Laptop Accessory

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0077 AF (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
1	27.344	45.09	Pk	35.8	-36	44.89	54	-9.11	74	-29.11	0-360	149	H
2	28.186	43.36	Pk	36.2	-35.1	44.46	54	-9.54	74	-29.54	0-360	199	H
3	29.102	43.67	Pk	36.1	-34.5	45.27	54	-8.73	74	-28.73	0-360	100	H
4	27.419	44.81	Pk	35.8	-35.7	44.91	54	-9.09	74	-29.09	0-360	151	V
5	27.993	44.62	Pk	36.1	-35.5	45.22	54	-8.78	74	-28.78	0-360	101	V
6	28.305	44.97	Pk	36.4	-35.1	46.27	54	-7.73	74	-27.73	0-360	151	V
7	29.66	42.91	Pk	36.5	-34.1	45.31	54	-8.69	74	-28.69	0-360	151	V

Pk - Peak detector

Appendix A

Accreditations and Authorizations

NVLAP Lab code: 200246-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see http://www.nist.gov/nvlap/

FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91039).

Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP-100, Issue 7, Section 3.3. File #: IC 2180C

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.:

- Test Station 5 (Location A): G-246
- All Other Test Stations: A-0046

ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).

NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III. Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22).