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Alcohol Monitoring Systems, Inc. TEST REPORT

SCOPE OF WORK
EMC TESTING – US BASE STATION

REPORT NUMBER
103705988LEX-004

ISSUE DATE

3/19/2019

PAGES
22

DOCUMENT CONTROL NUMBER
Non-Specific EMC Report Shell Rev. December 2017
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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 103705988LEX-004
Project Number: G103705988

Report Issue Date: 3/19/2019

Model(s) Tested: US Base Station
BS600

Standards: FCC Part 15B
ICES-003 Issue 6

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Dr.
Lexington, KY 40510
USA

Client:
Alcohol Monitoring Systems, Inc.
1241 W Mineral Ave
Suite 200
Littleton, CO 80120
USA

Report prepared by

Brian Lackey, Project Engineer

Report reviewed by

Bryan Taylor, Team Leader

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Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
6	Radiated Emissions (ANSI C63.4:2014)	Pass
7	Conducted Emissions (ANSI C63.4:2014)	Pass

3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Alcohol Monitoring Systems, Inc.
Address:	1241 W Mineral Ave Suite 200 Littleton, CO 80120 USA
Contact:	John Chabon
Telephone:	+1 (303) 483-0543
Email:	jchabon@alcoholmonitoring.com
Manufacturer Information	
Manufacturer Name:	Alcohol Monitoring Systems, Inc.
Manufacturer Address:	1241 W Mineral Ave Suite 200 Littleton, CO 80120 USA

4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	US Base Station
Model Number	BS600
Serial Number	1078574
Receive Date	1/22/2019
Test Start Date	1/23/2019
Test End Date	3/11/2019
Device Received Condition	Good
Test Sample Type	Production
Input Ratings	10VDC/650mA via 120V/60Hz AC/DC adapter 7.4VDC/2250mAh battery
Software Used By EUT	1.00.3401
Description of Equipment Under Test (provided by client)	
Base Station works as a communication hub for bracelets.	

4.1 Variant Models:

There were no variant models covered by this evaluation.

5 System Setup and Method

5.1 Method:

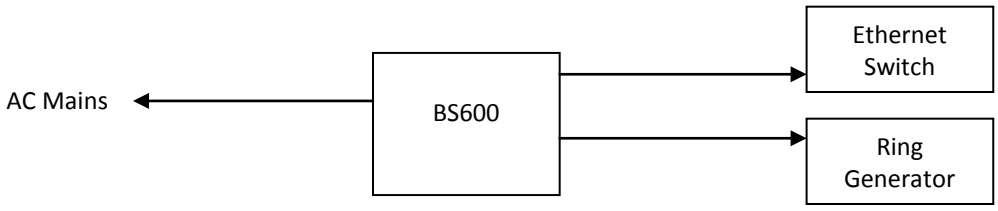
Configuration as required by ANSI C63.4:2014.

No.	Descriptions of EUT Exercising
1	Unit powered via AC/DC adapter, radios idle

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	AC Mains	1	No	No	Plug
2	Ethernet	1	Yes	Yes	RJ45
3	Phone	1	No	No	RJ11

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Ethernet Switch	Cisco	-	-
Ring Generator	Skutch	-	-

5.2 EUT Block Diagram:



5.3 EUT Photo (Front):

5.4 EUT Photo (Back):

6 Radiated Emissions

6.1 Method

Tests are performed in accordance with ANSI C63.4:2014.

TEST SITE: 10m ALSE

Site Designation: 10m Chamber

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	3.9dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.0dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.

6.2 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

6.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde & Schwarz	ESU40	9/18/2018	9/18/2019
Bilog Antenna	7088	SunAR	JB6	7/24/2018	7/24/2019
Horn Antenna	3780	ETS Lindgren	3117	6/11/2018	6/11/2019
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
3m Cable Antenna→Preamp	3074			11/26/2018	11/26/2019
3m Cable Preamplifier	3918	Rohde & Schwarz	TS-PR18	11/26/2018	11/26/2019
3m Cable Preamp→Chamber	2588			11/26/2018	11/26/2019
3m Cable Chamber→Control Room	2593			11/26/2018	11/26/2019
3m Cable Control Room→Receiver	2592			11/26/2018	11/26/2019

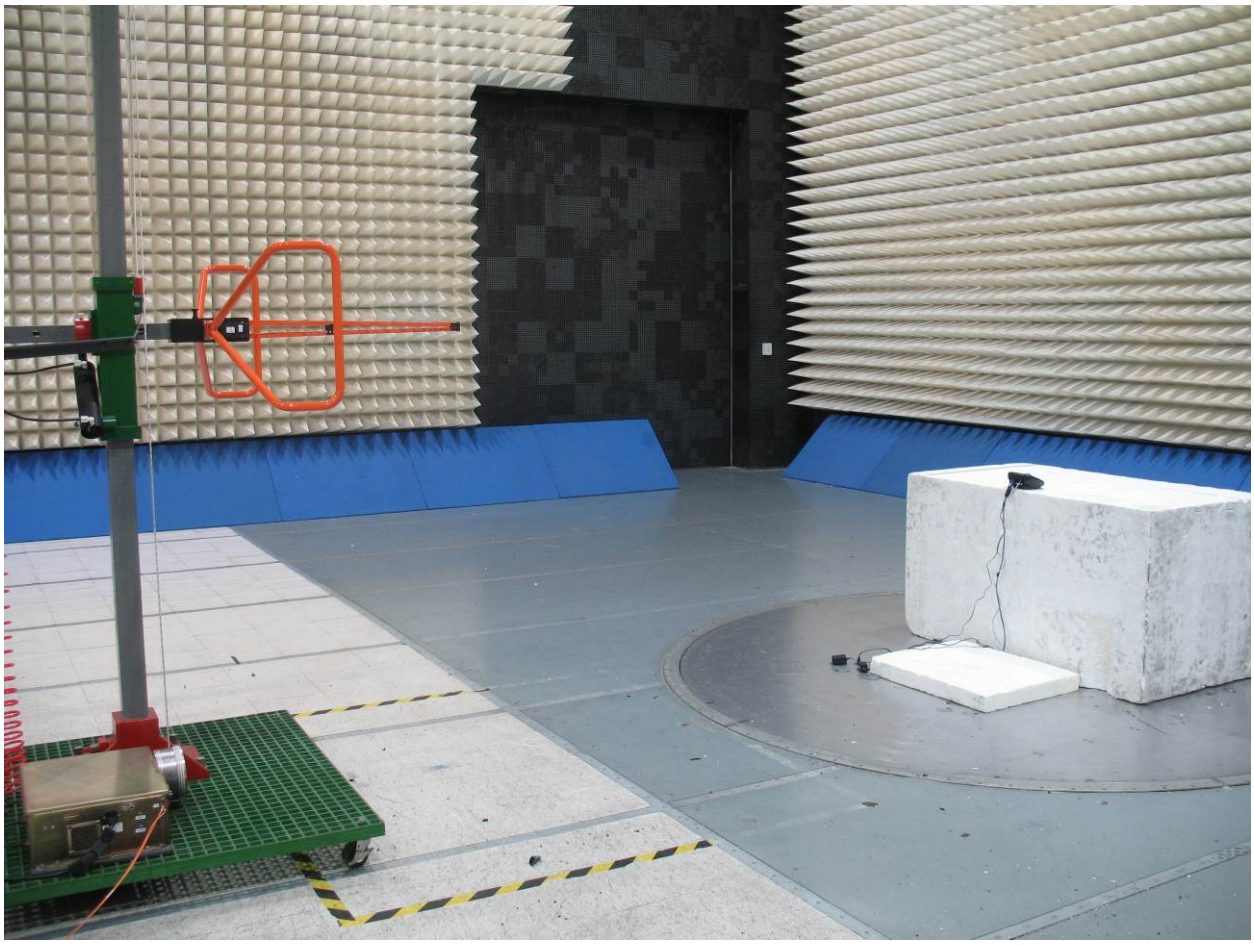
6.4 Software Utilized:

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

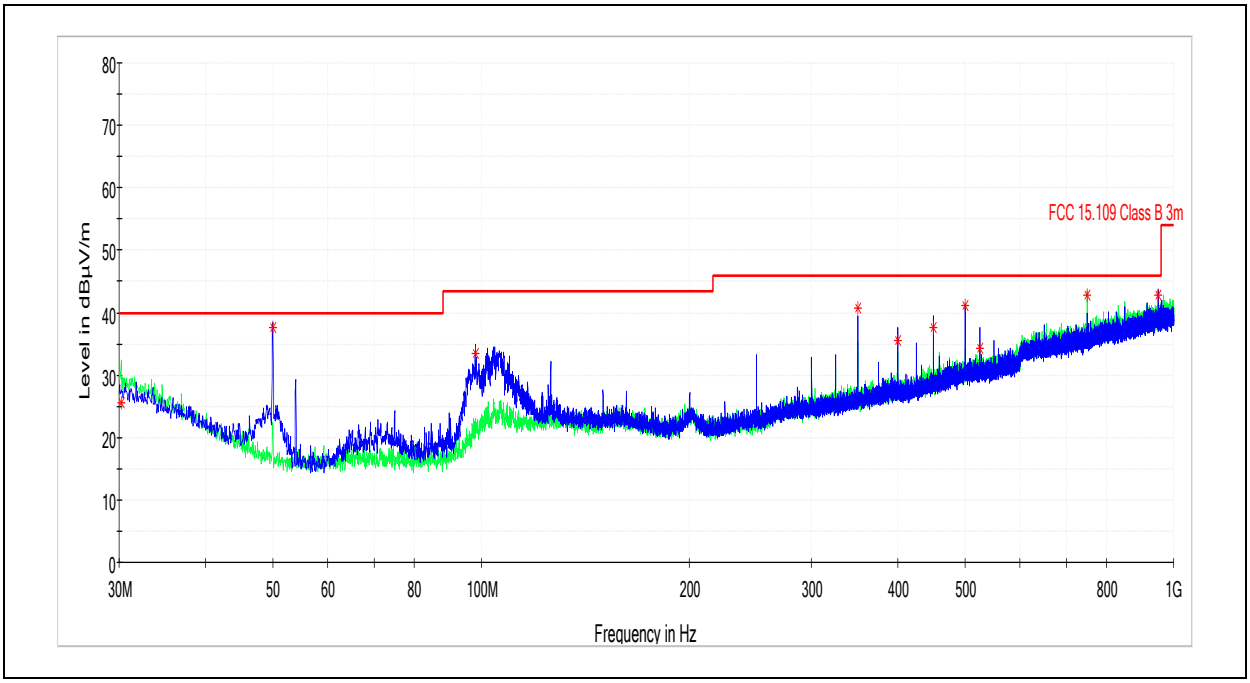
6.5 Results:

The sample tested was found to Comply.

6.6 Setup Photographs: Radiated Emissions, 30MHz – 1GHz



6.7 Plots/Data: Radiated Emissions, 30MHz – 1GHz

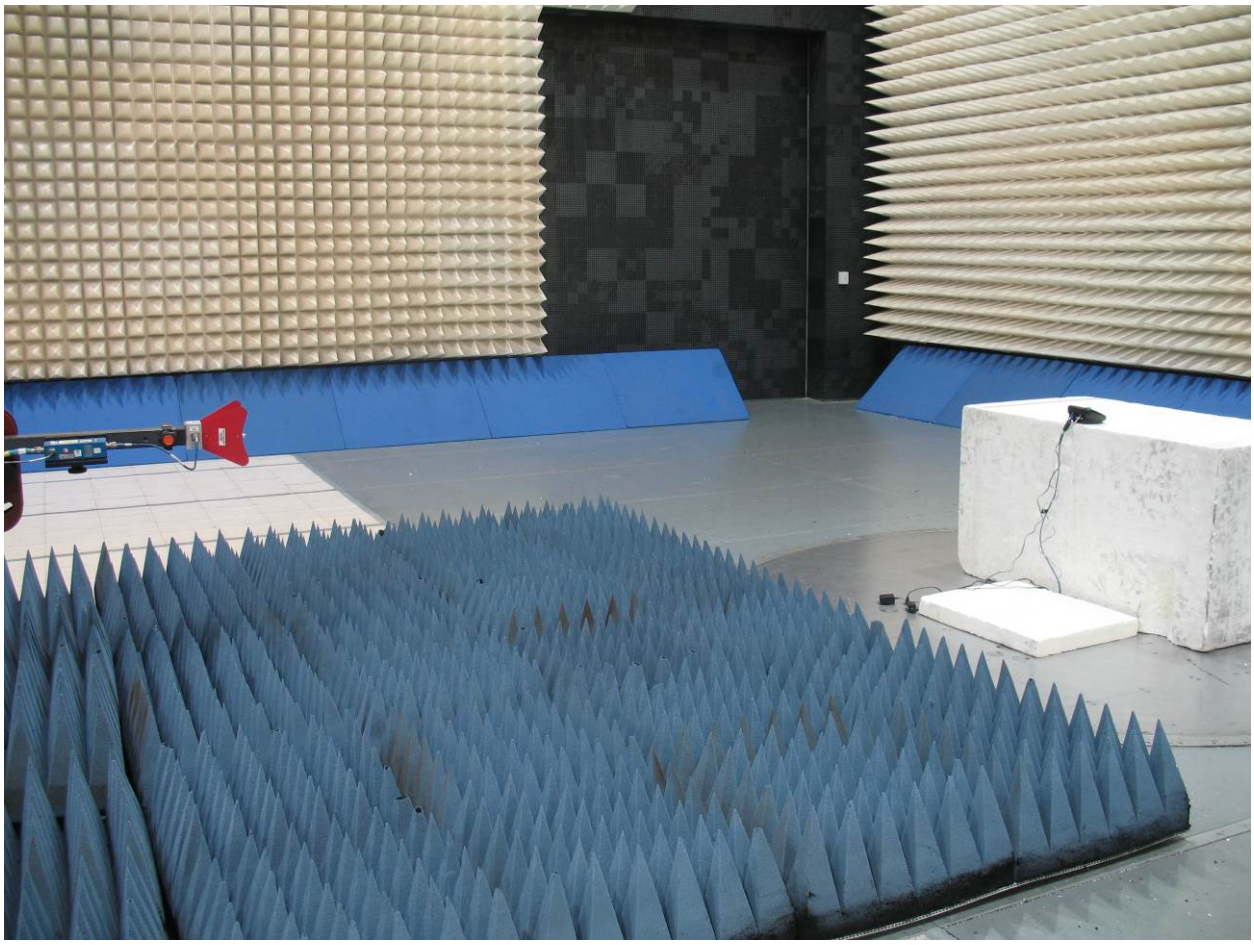


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.215556	25.57	40.00	14.43	120.000	400.0	H	110.0	28.0
49.992778	37.55	40.00	2.45	120.000	100.3	V	156.0	15.3
98.115556	33.55	43.52	9.97	120.000	105.3	V	172.0	18.7
349.992222	40.66	46.02	5.36	120.000	153.7	V	338.0	24.5
400.001111	35.63	46.02	10.39	120.000	107.5	V	284.0	25.9
450.010000	37.63	46.02	8.39	120.000	100.3	V	73.0	27.2
500.018889	41.06	46.02	4.96	120.000	107.5	V	236.0	28.3
525.023333	34.34	46.02	11.68	120.000	102.2	V	117.0	28.7
750.009444	42.71	46.02	3.31	120.000	165.3	H	130.0	32.8
949.991111	42.72	46.02	3.30	120.000	100.3	V	130.0	35.3

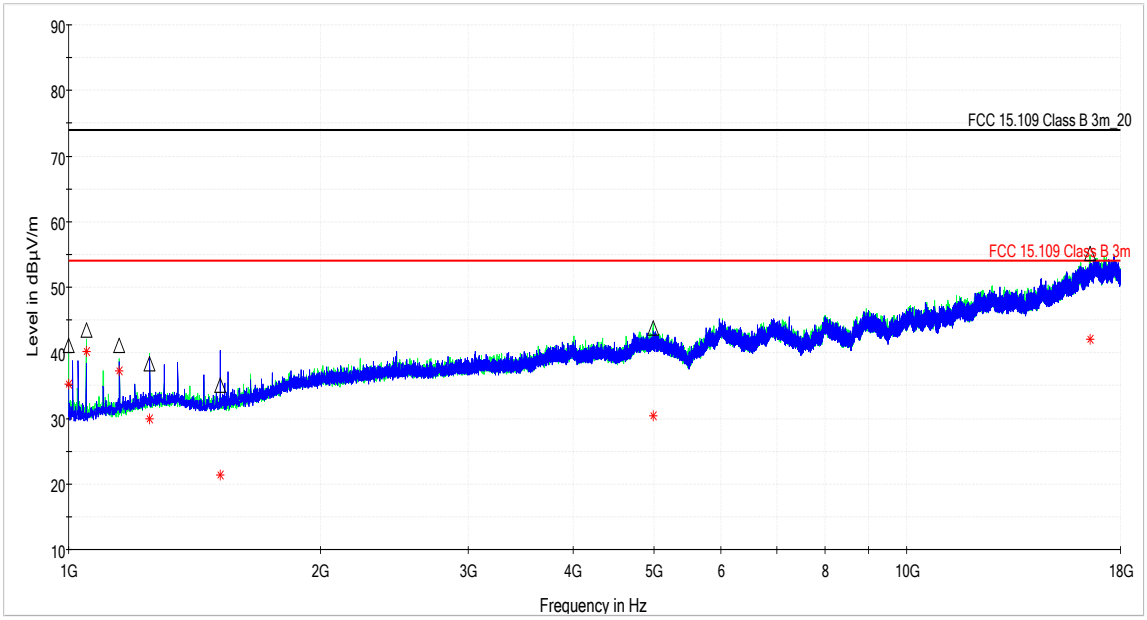
Test Personnel:	Brian Lackey	Test Date:	1/23/2019
Supervising/Reviewing Engineer: (Where Applicable)	NA	Limit Applied:	Class B
Product Standard:	FCC Part 15B ICES-003 Issue 6	Ambient Temperature:	22.6C
Input Voltage:	120V/60Hz	Relative Humidity:	26.5%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	982.0mbar

Deviations, Additions, or Exclusions: None

6.8 Setup Photographs: Radiated Emissions, 1GHz – 18GHz



6.9 Plots/Data: Radiated Emissions, 1GHz – 18GHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1000.000000	41.07	74.00	32.93	1000.000	312.0	H	14.0	-3.0
1050.000000	43.41	74.00	30.59	1000.000	282.0	H	11.0	-3.8
1150.000000	41.20	74.00	32.80	1000.000	269.0	H	1.0	-3.0
1249.500000	38.36	74.00	35.64	1000.000	307.0	H	265.0	-1.4
1516.500000	34.99	74.00	39.01	1000.000	203.0	V	347.0	-1.9
4983.500000	43.72	74.00	30.28	1000.000	410.0	H	212.0	7.9
16561.000000	55.08	74.00	18.92	1000.000	314.0	H	1.0	23.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1000.000000	35.14	54.00	18.86	1000.000	312.0	H	14.0	-3.0
1050.000000	40.14	54.00	13.86	1000.000	282.0	H	11.0	-3.8
1150.000000	37.25	54.00	16.75	1000.000	269.0	H	1.0	-3.0
1249.500000	30.00	54.00	24.00	1000.000	307.0	H	265.0	-1.4
1516.500000	21.34	54.00	32.66	1000.000	203.0	V	347.0	-1.9
4983.500000	30.45	54.00	23.55	1000.000	410.0	H	212.0	7.9
16561.000000	42.05	54.00	11.95	1000.000	314.0	H	1.0	23.0

Test Personnel:	Brian Lackey	Test Date:	1/23/2019
Supervising/Reviewing Engineer: (Where Applicable)	NA	Limit Applied:	Class B
Product Standard:	FCC Part 15B ICES-003 Issue 6	Ambient Temperature:	22.6C
Input Voltage:	120V/60Hz	Relative Humidity:	26.5%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	982.0mbar

Deviations, Additions, or Exclusions: None

7 Conducted Emissions

7.1 Method

Tests are performed in accordance with ANSI C63.4:2014.

TEST SITE: Ground Plane

Site Designation: Ground Plane

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted Emissions	150 kHz - 30 MHz	3.1dB	3.4dB
Telco Port Emissions	150 kHz - 30 MHz	3.2dB	5.0dB

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.

7.2 Sample Calculations

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN or ISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

7.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ESI26	9/21/2018	9/21/2019
LISN	2509	Fischer Custom Communication	FCC-LISN-50-50-2M	4/10/2018	4/10/2019
Coaxial Cable (COND 2)	5025			11/26/2018	11/26/2019

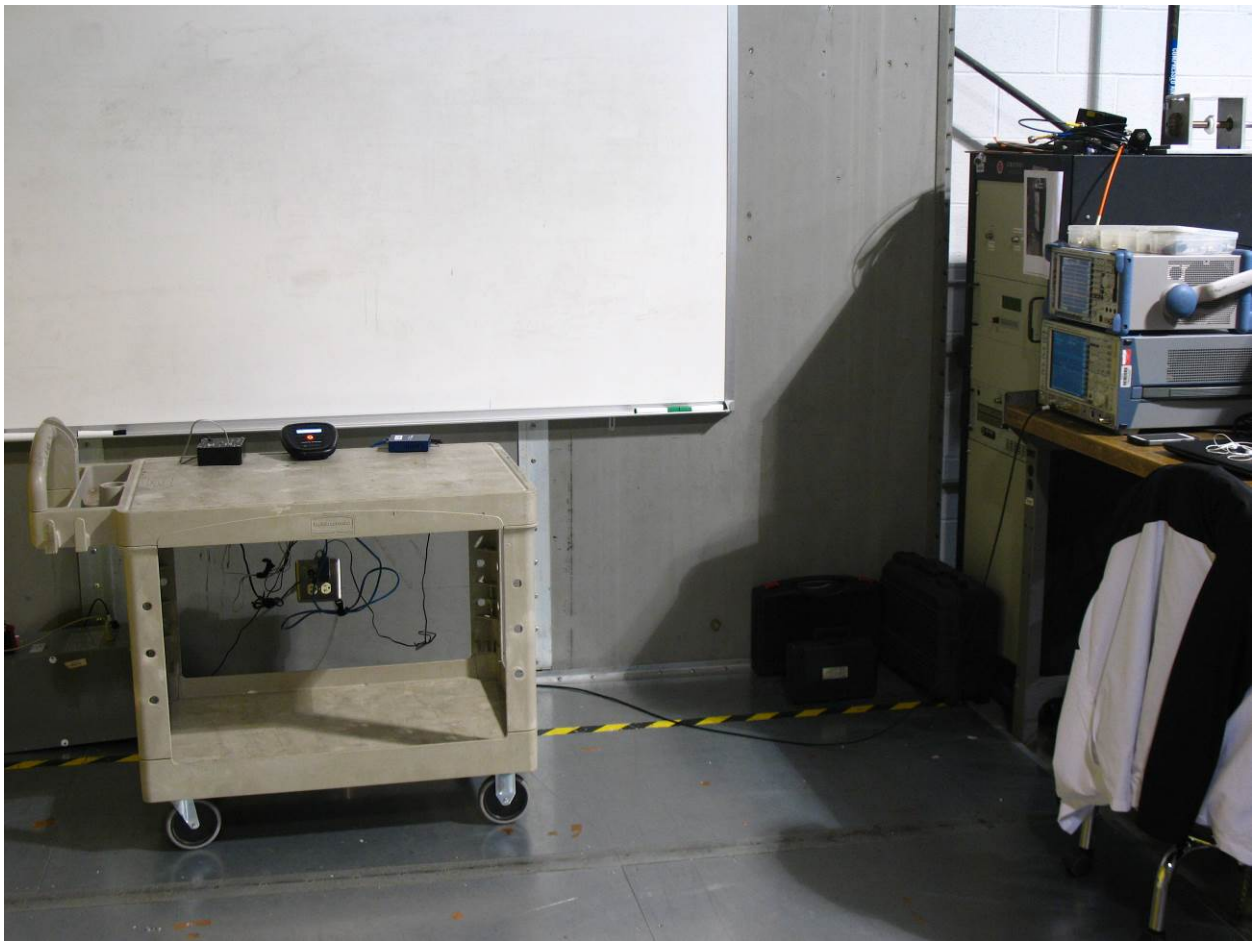
7.4 Software Utilized:

Name	Manufacturer	Version
TILE	ETS Lindgren	V7.0.6.545

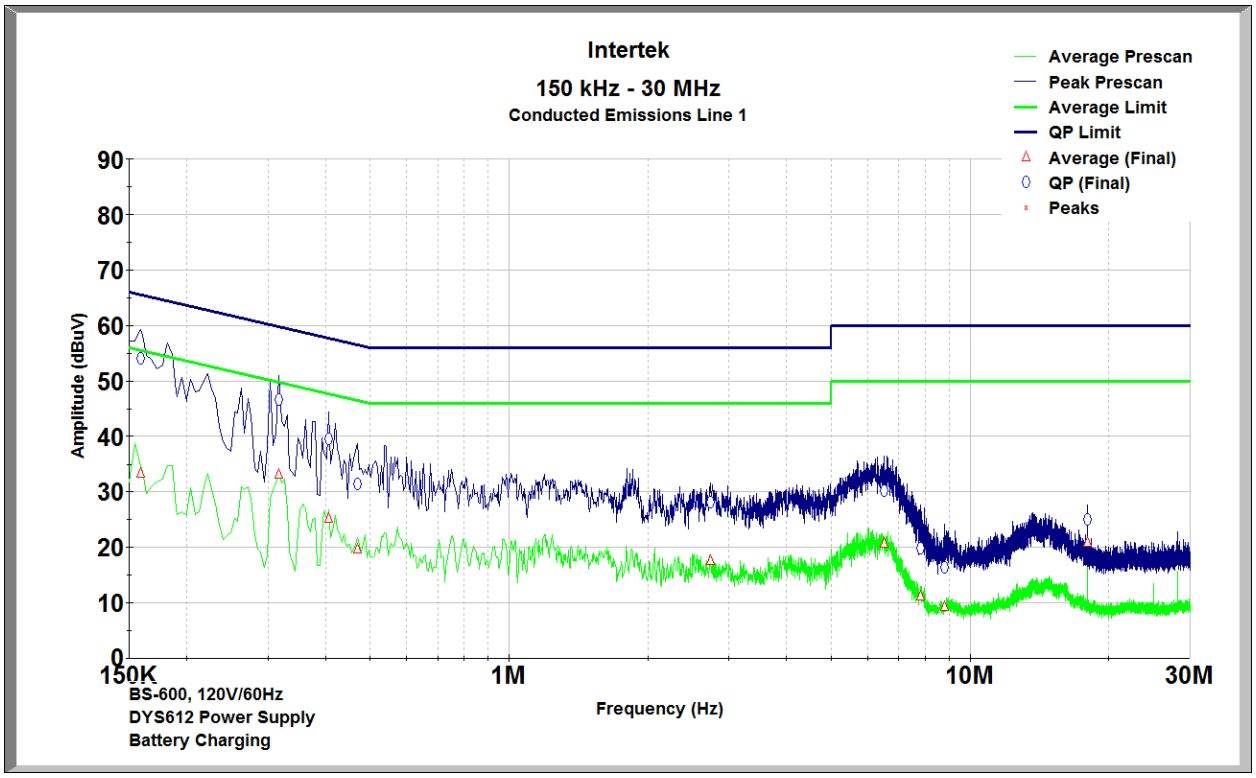
7.5 Results:

The sample tested was found to Comply.

7.6 Setup Photographs: Conducted Emissions



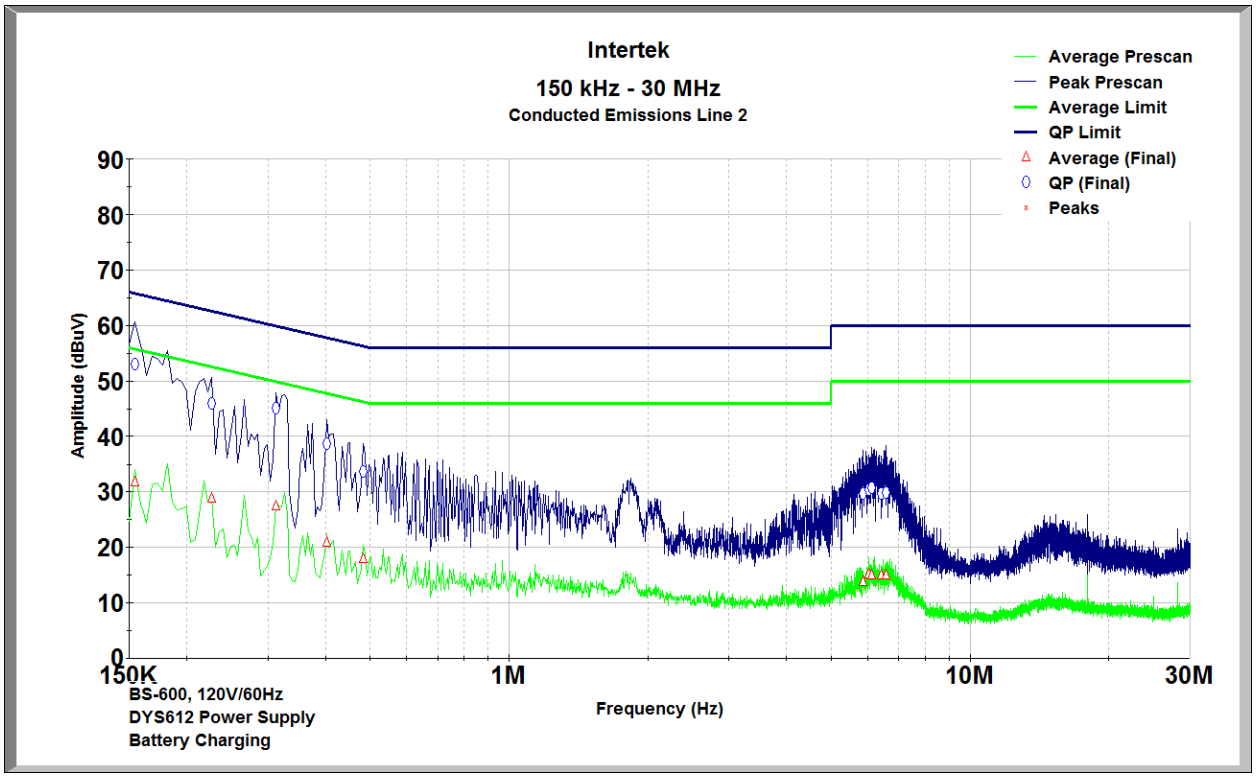
7.7 Plots/Data: Conducted Emissions



Line

Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.159	54.043	65.743	11.700	33.301	55.743	22.442
0.317	46.613	61.243	14.630	33.074	51.243	18.168
0.406	39.505	58.671	19.166	25.230	48.671	23.441
0.469	31.386	56.871	25.485	19.668	46.871	27.203
2.733	28.222	56.000	27.778	17.551	46.000	28.449
6.518	30.214	60.000	29.786	20.750	50.000	29.250
7.801	19.801	60.000	40.199	11.128	50.000	38.872
8.805	16.363	60.000	43.637	9.341	50.000	40.659
18.000	24.981	60.000	35.019	20.833	50.000	29.167

Line



Neutral

Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.155	53.020	65.871	12.851	31.777	55.871	24.094
0.227	46.017	63.814	17.797	28.822	53.814	24.993
0.312	45.150	61.371	16.222	27.477	51.371	23.894
0.402	38.682	58.800	20.118	20.901	48.800	27.899
0.483	33.631	56.486	22.855	17.891	46.486	28.595
5.856	29.660	60.000	30.340	13.848	50.000	36.152
6.018	30.363	60.000	29.637	15.074	50.000	34.926
6.126	30.671	60.000	29.329	14.948	50.000	35.052
6.423	29.657	60.000	30.343	14.965	50.000	35.035
6.572	29.831	60.000	30.169	15.022	50.000	34.978

Neutral

Test Personnel:	Brian Lackey	Test Date:	3/11/2019
Supervising/Reviewing Engineer: (Where Applicable)	NA	Limit Applied:	Class B
Product Standard:	FCC Part 15B ICES-003 Issue 6	Ambient Temperature:	23.1C
Input Voltage:	120V/60Hz	Relative Humidity:	24.%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	988.8mbar

Deviations, Additions, or Exclusions: None

8 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	3/19/2019	103705988LEX-004	BL	BCT	Original Issue