

Diehl Metering GmbH

TEST REPORT

SCOPE OF WORK

FCC PART 15B / ICES-003 ISSUE 6 – IZAR OH BT 2

REPORT NUMBER

103477146LEX-001.1

ISSUE DATE

6/5/2018

[REVISED DATE]

6/5/2018

PAGES

22

DOCUMENT CONTROL NUMBER

Non-Specific EMC Report Shell Rev. December 2017
© 2017 INTERTEK



EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 103477146LEX-001.1

Project Number: G103477146

Report Issue Date: 6/5/2018

Model(s) Tested: IZAR OH BT 2

Standards: Title 47 CFR Part 15 Subpart B
ICES-003 Issue 6

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

Client:
Diehl Metering GmbH
Industriestr. 13
91522 Ansbach
Germany

Report prepared by



Brian Lackey, Project Engineer

Report reviewed by



Bryan Taylor, Team Leader

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.



Table of Contents

1	<i>Introduction and Conclusion.....</i>	4
2	<i>Test Summary</i>	4
3	<i>Client Information</i>	5
4	<i>Description of Equipment under Test and Variant Models.....</i>	6
5	<i>System Setup and Method</i>	7
6	<i>Radiated Emissions</i>	10
7	<i>Conducted Emissions</i>	17
8	<i>Revision History.....</i>	22



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:	Diehl Metering GmbH
Address:	Industriestr. 13 91522 Ansbach Germany
Contact:	Heiko Hitz
Telephone:	+49 981 1806-613
Email:	Heiko.hitz@diehl.com
Manufacturer Information	
Manufacturer Name:	Diehl Metering GmbH
Manufacturer Address:	Industriestr. 13 91522 Ansbach Germany



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	IZAR OH BT 2
Model Number	3094452
Serial Number	00802543B240
Receive Date	5/14/2018
Test Start Date	5/14/2018
Test End Date	5/25/2018
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	Battery
Rated Current	-
Rated Frequency	-
Number of Phases	1
Software Used By EUT	NA
Description of Equipment Under Test (provided by client)	
<p>The IZAR OPTO HEAD BT 2 (IZAR OH BT 2) is an optical reading head that can be connected to static or mobile computers via a Bluetooth interface. Laptops or PCs can be retrofitted with this interface if necessary using a Bluetooth USB adapter.</p> <p>The optical interface offers the two standards IrDA and ZVEI, which means all Diehl Metering Group meters with an optical interface can be read and configured. The IZAR OH BT 2 is switched between ZVEI and IrDA by Diehl Metering programs either automatically or must be set in the software according to the interface of the meter to be read.</p> <p>The IZAR OH BT 2 is equipped with a lithium ion battery for approx. 14 hours of continuous operation. Charging a completely flat battery takes about 3.5 hours.</p> <p>The operating statuses are indicated by four coloured LEDs. An on/off switch is built into the device for easy operation. The IZAR OH BT also has a metal ring to fasten a carrying strap.</p>	

4.1 Variant Models:

There were no variant models covered by this evaluation.



5 System Setup and Method

5.1 Method:

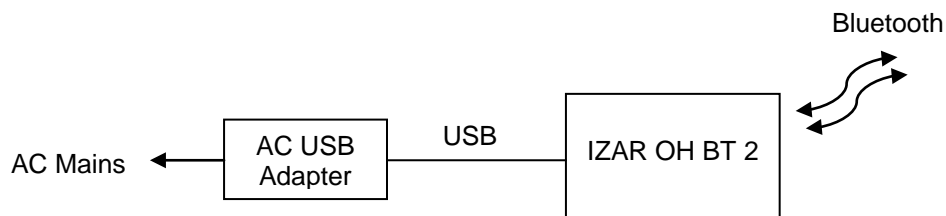
Configuration as required by ANSI C63.4: 2014

No.	Descriptions of EUT Exercising
1	Unit powered, radios idle

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	USB A-micro B	1	No	No	USB

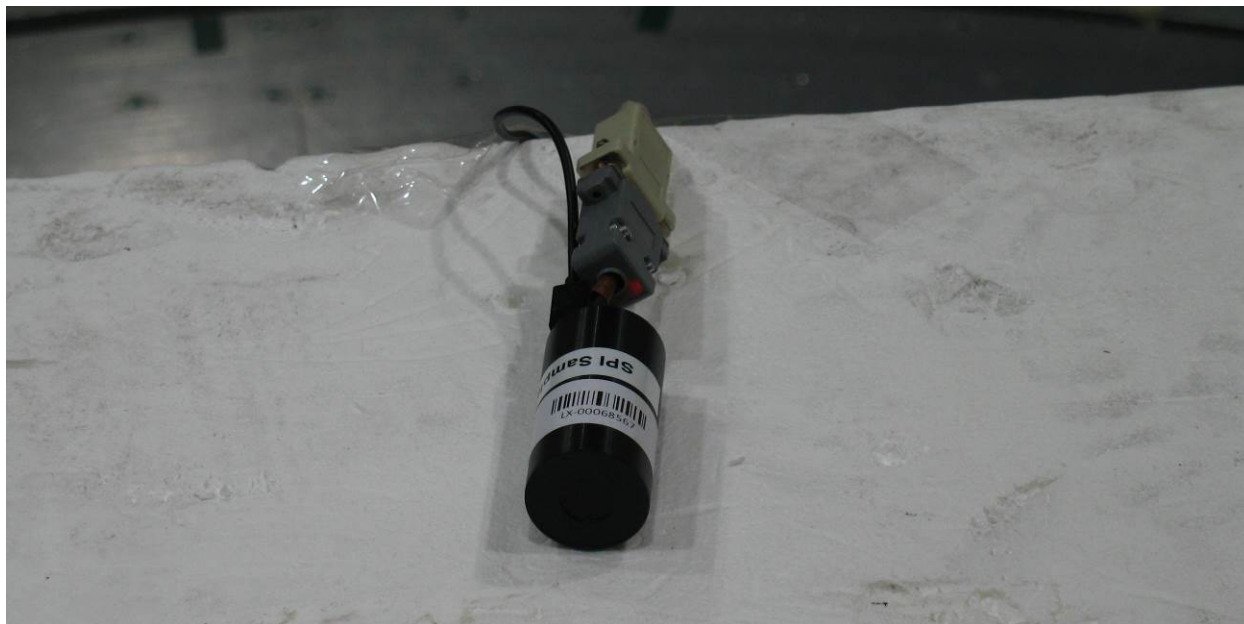
Support Equipment			
Description	Manufacturer	Model Number	Serial Number
AC Power Adapter	Phihong	PSM03A-050Q-3	PH12047385

5.2 EUT Block Diagram:





5.3 EUT Photo (Front):



Note: Sample shown has additional SPI connector for testing purposes and is not included in normal configuration



5.4 EUT Photo (Back):



Note: Sample shown has additional SPI connector for testing purposes and is not included in normal configuration



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)	U _{CISPR}
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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

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



6.3 Test Equipment Used:

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde&Schwarz	ESU40	9/20/2017	9/20/2018
Bilog Antenna	3133	ETS Lindgren	3142C	4/6/2017	10/6/2018
Horn Antenna	3780	ETS Lindgren	3117	6/1/2017	6/1/2018
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			11/29/2017	11/29/2018
3m Cable Preamplifier	3918	TS-PR18	122005	11/29/2017	11/29/2018
3m Cable Preamp→Chamber	2588			11/29/2017	11/29/2018
3m Cable Chamber→Control Room	2593			11/29/2017	11/29/2018
3m Cable Control Room→Receiver	2592			11/29/2017	11/29/2018
10m Cable Antenna→Preamp	3339			11/29/2017	11/29/2018
10m Cable Preamplifier	7019	ZX60-3018G-S+	SUU63801252	11/29/2017	11/29/2018
10m Cable Preamp→Chamber	3172			11/29/2017	11/29/2018
10m Cable Chamber→Control Room	2590			11/29/2017	11/29/2018
10m Cable Control Room→Receiver	2589			11/29/2017	11/29/2018

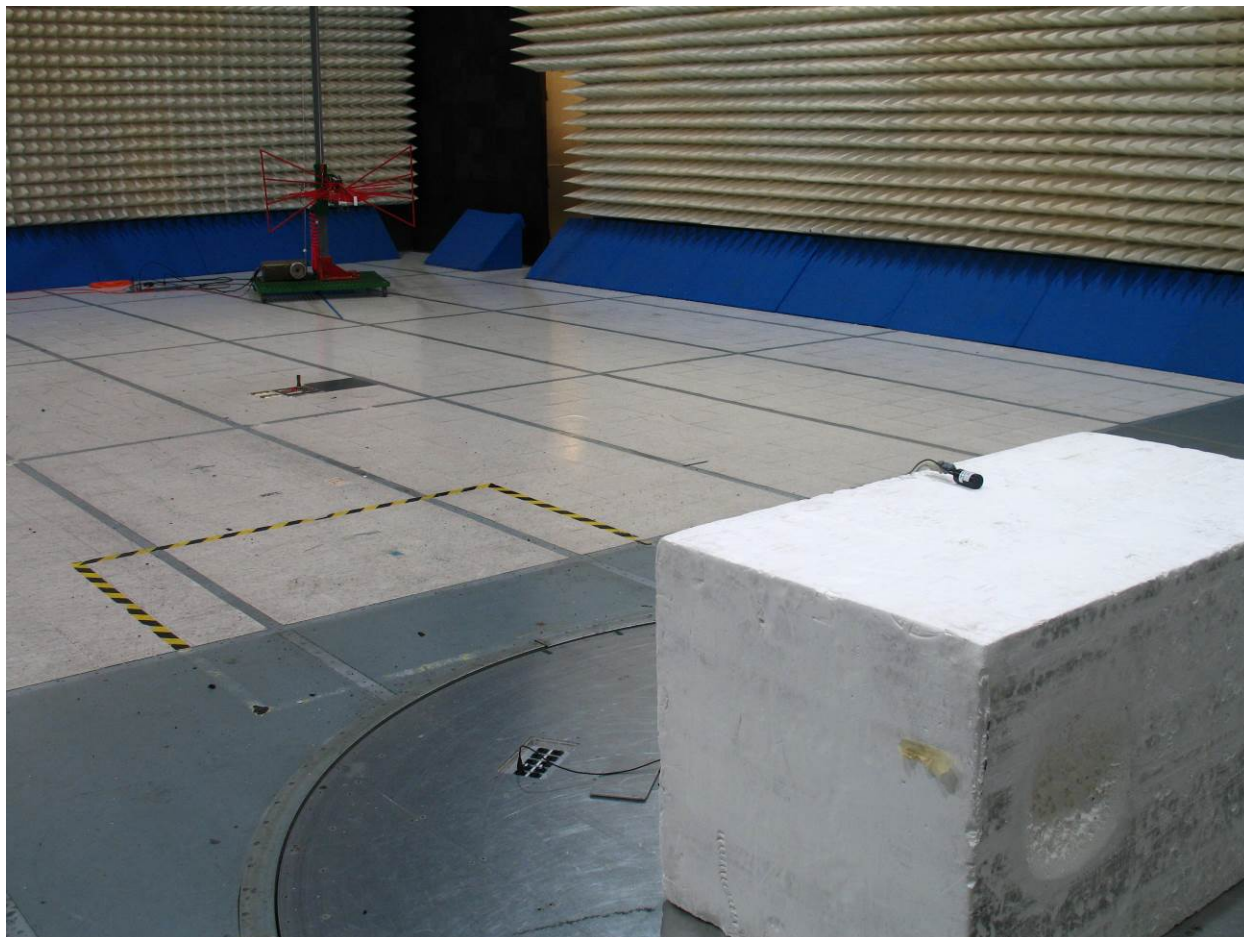
6.4 Software Utilized:

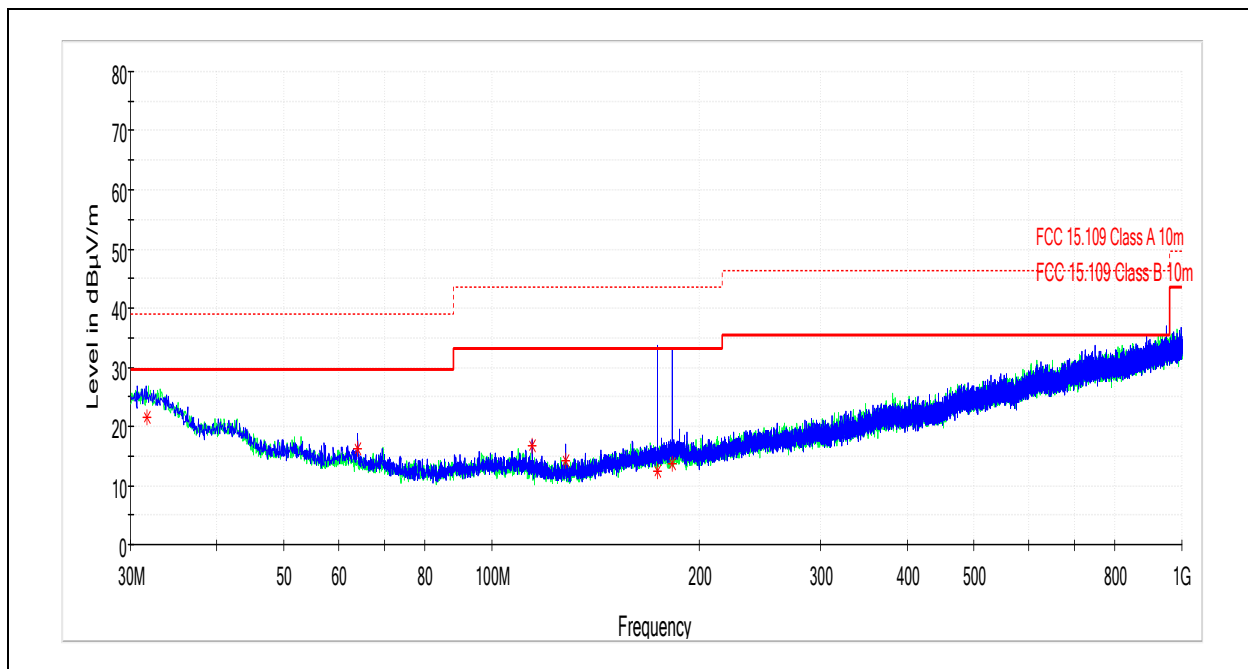
Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

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**

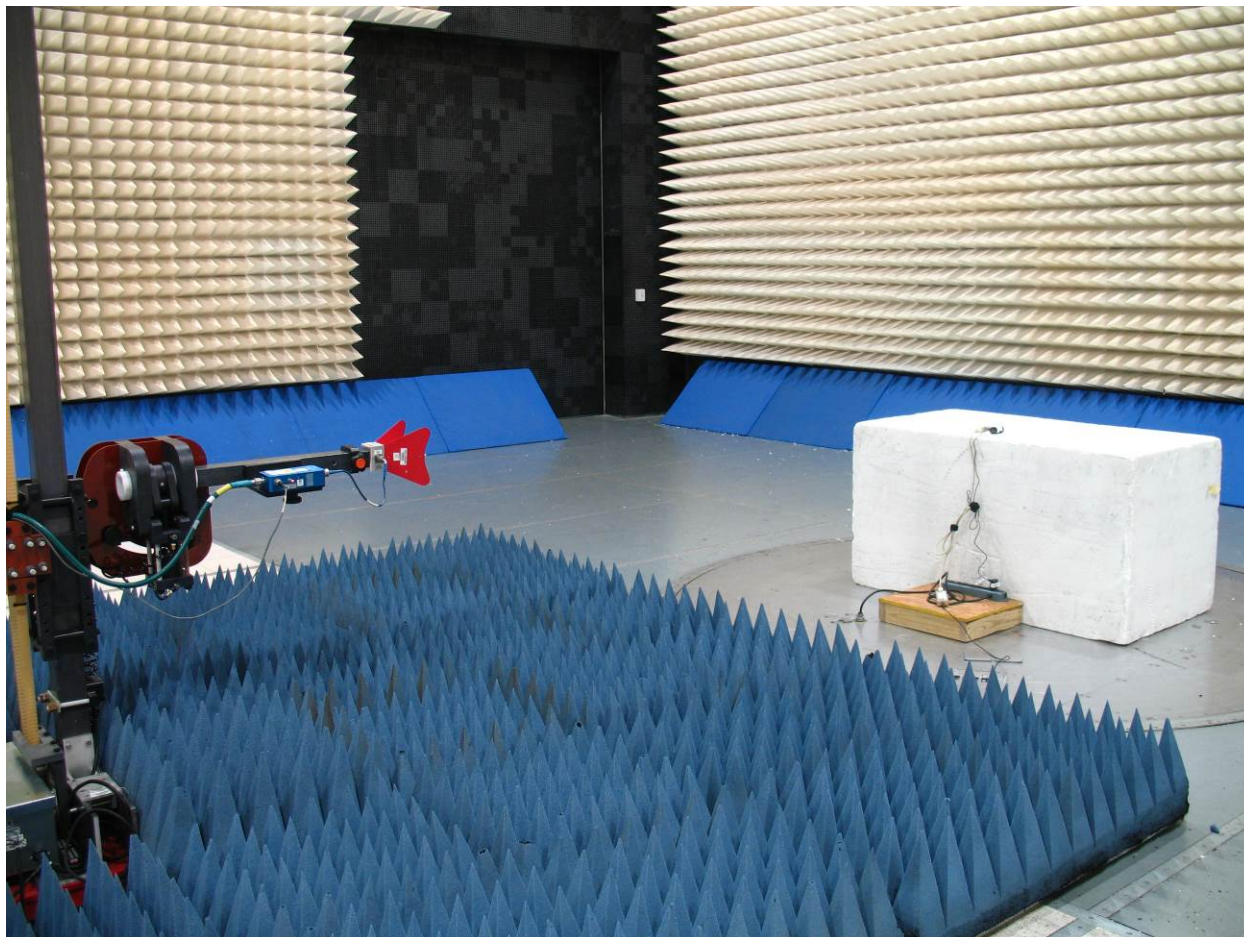
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.678222	21.58	29.00	7.42	120.000	400.3	H	102.0	0.2
64.024000	16.30	29.00	12.70	120.000	176.8	V	136.0	-8.5
114.545778	16.67	33.50	16.83	120.000	357.7	V	147.0	-8.0
127.968000	14.13	33.50	19.37	120.000	100.2	V	263.0	-8.3
173.696444	12.35	33.50	21.15	120.000	100.4	V	35.0	-4.9
182.711889	13.78	33.50	19.72	120.000	104.5	V	145.0	-4.5

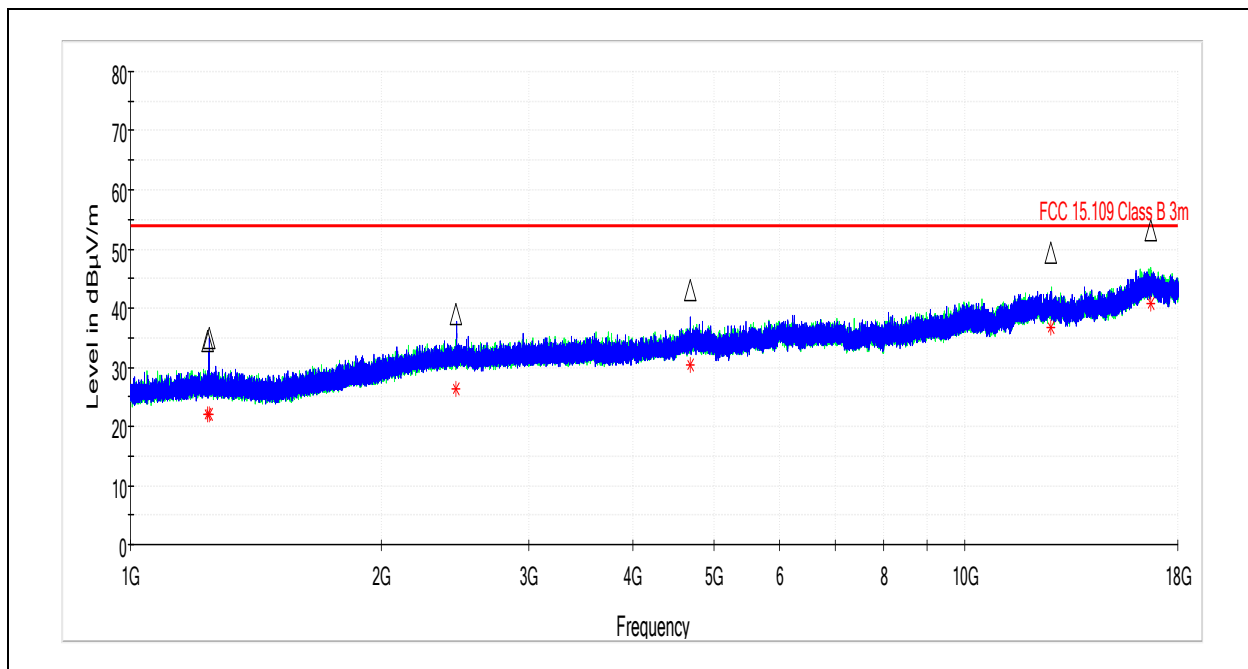
Test Personnel: B. Lackey
 Supervising/Reviewing Engineer: NA
 (Where Applicable) FCC Part 15B
 Product Standard: ICES-003 Issue 6
 Input Voltage: 120V/60Hz to 5V USB
 Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 5/16/2018
 Limit Applied: Class B
 Ambient Temperature: 25.3C
 Relative Humidity: 44.2%
 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****Peak**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1236.823500	34.55	74.00	39.45	1000.000	184.0	V	220.0	-1.1
1242.417000	34.96	74.00	39.04	1000.000	300.0	V	237.0	-1.0
2454.443000	39.08	74.00	34.92	1000.000	300.0	V	183.0	3.9
4682.581000	42.98	74.00	31.02	1000.000	300.0	V	5.0	8.4
12690.958500	49.29	74.00	24.71	1000.000	400.0	H	95.0	16.9
16717.426500	53.08	74.00	20.92	1000.000	170.0	H	247.0	21.8

Average

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1236.823500	21.96	54.00	32.04	1000.000	184.0	V	220.0	-1.1
1242.417000	22.02	54.00	31.98	1000.000	300.0	V	237.0	-1.0
2454.443000	26.45	54.00	27.55	1000.000	300.0	V	183.0	3.9
4682.581000	30.45	54.00	23.55	1000.000	300.0	V	5.0	8.4
12690.958500	36.64	54.00	17.36	1000.000	400.0	H	95.0	16.9
16717.426500	40.67	54.00	13.33	1000.000	170.0	H	247.0	21.8

Test Personnel: B. Lackey
 Supervising/Reviewing Engineer: NA
 (Where Applicable)
 Product Standard: FCC Part 15B
 Input Voltage: ICES-003 Issue 6
 Pretest Verification w / Ambient Signals or BB Source: 120V/60Hz to 5V USB
 Yes

Test Date: 5/16/2018
 Limit Applied: Class B
 Ambient Temperature: 25.3C
 Relative Humidity: 44.2%
 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)	Ucisp
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 dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

**7.3 Test Equipment Used:**

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde&Schwarz	ESi26	9/20/2017	9/20/2018
LISN	3333	Teseq	NNB52	6/15/2017	6/15/2018
COND3	7024			12/1/2017	12/1/2018

7.4 Software Utilized:

Name	Manufacturer	Version
TILE	ETS Lindgren	V7.0.6.545

7.5 Results:

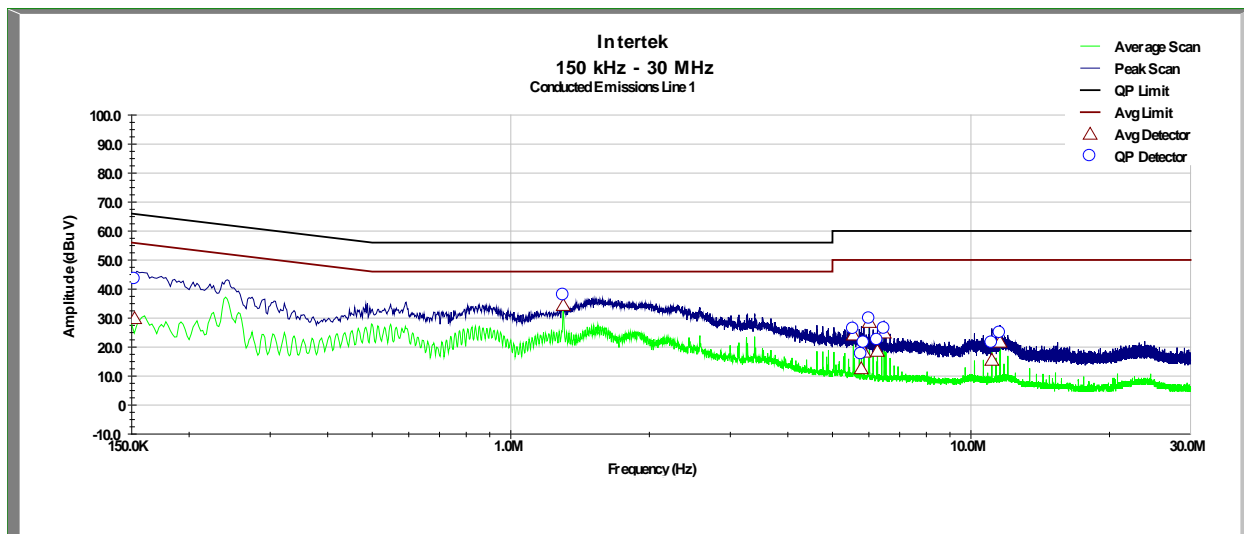
The sample tested was found to Comply.

7.6 Setup Photographs: Conducted Emissions





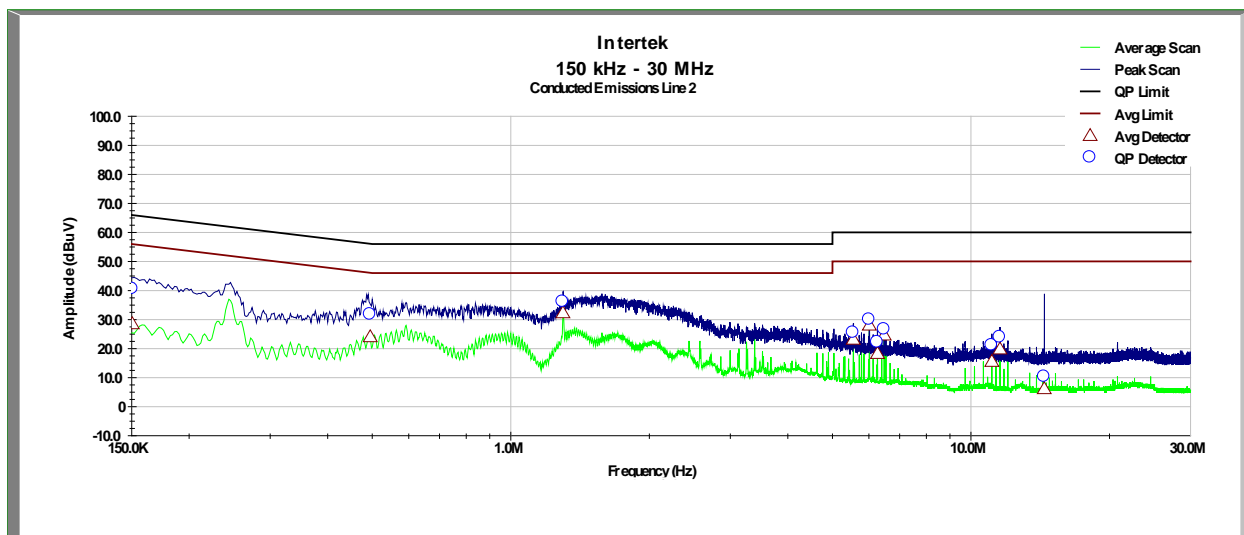
7.7 Plots/Data: Conducted Emissions



Line

Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.152	43.391	65.937	22.546	29.790	55.937	26.148
1.300	37.873	56.000	18.839	34.339	46.000	12.372
5.551	26.260	60.000	29.828	24.139	50.000	21.949
5.775	17.541	60.000	38.583	12.514	50.000	33.610
5.853	21.450	60.000	34.686	18.222	50.000	27.914
6.014	29.779	60.000	26.383	28.490	50.000	17.673
6.263	22.364	60.000	33.838	18.512	50.000	27.690
6.477	26.348	60.000	29.888	24.821	50.000	21.415
11.099	21.460	60.000	35.515	15.419	50.000	31.557
11.564	24.855	60.000	32.195	21.688	50.000	25.362

Line



Neutral

Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Margin (dB)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)
0.150	40.536	65.986	25.450	28.545	55.986	27.441
0.495	31.699	56.146	24.447	24.072	46.146	22.074
1.298	36.074	56.000	20.636	32.339	46.000	14.370
5.549	25.425	60.000	30.663	23.231	50.000	22.857
6.015	29.923	60.000	26.240	28.084	50.000	18.079
6.265	22.136	60.000	34.067	18.319	50.000	27.883
6.478	26.559	60.000	29.677	24.657	50.000	21.580
11.099	21.075	60.000	35.901	15.586	50.000	31.389
11.562	23.870	60.000	33.180	19.870	50.000	27.180
14.432	10.300	60.000	47.209	6.187	50.000	41.322

Neutral

Test Personnel: B. Lackey
Supervising/Reviewing Engineer: NA
(Where Applicable) FCC Part 15B
Product Standard: ICES-003 Issue 6
Input Voltage: 120V/60Hz to 5V USB
Pretest Verification w / Ambient Signals or BB Source: Yes

Test Date: 5/25/2018
Limit Applied: Class B
Ambient Temperature: 22.6C
Relative Humidity: 54.6%
Atmospheric Pressure: 982.0mbar

Deviations, Additions, or Exclusions: None



8 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	5/31/2018	103477146LEX-001	BZ	BCT	Original Issue
1	6/5/2018	103477146LEX-001.1	BZ	BCT	Updated model number and contact information.