

Test Report # 317194

Equipment Under Test: BL600

Test Date(s): March 14 and May 24, 2017

Prepared for: Laird
Attn: Bill Steinike
W66 N220 Commerce Ct.
Cedarburg, WI 53012

Report Issued by: Adam Alger, Quality Systems Engineer

Signature: 

Date: June 2, 2017

Report Reviewed by: Adam Alger, Quality Systems Engineer

Signature: 

Date: June 2, 2017

Report Constructed by: Zach Wilson, EMC Technician

Signature: 

Date: June 1, 2017

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Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

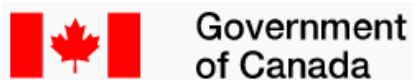
Scope of accreditation includes all test methods listed herein, unless otherwise noted.



Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492



Innovation, Science and Economic Development Canada

ISED Site listing of two 3 meter Semi-Anechoic Chambers based on RSS-GEN – Issue 4

File Number: IC 3088A-2

File Number: IC 3088A-3

Company: Laird	Page 3 of 16	Name: BL600
Report: TR 317194		Model: BL600
Job: C-2750		Serial: 204-320050

1 TEST REPORT SUMMARY

On **March 14 and May 24, 2017**, the Equipment Under Test (EUT), **BL600**, as provided by **Laird** was tested to the following requirements:

ETSI EN 300 328 V2.1.1

Requirement	Description	Specification	Method	Compliant
4.3.2.11	Receiver Blocking	Manufacture Declared*	5.4.11	Yes

ETSI EN 300 489-17 V3.1.1 referencing ETSI EN 300 489-1 V2.1.1

Method	Phenomenon	Application	Specification	Compliant
EN 61000-4-3	Radiated RF Immunity	Enclosure	1 - 6 GHz: 3 V/m	Yes

*See test data for details

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

2 CLIENT INFORMATION

Company Name	Laird
Contact Person	Bill Steinike
Address	W66 N220 Commerce Ct. Cedarburg, WI 53012

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	BL600
Model Number	BL600
Serial Number	204-320050

2.2 Product Description

Bluetooth Low Energy (BLE 4.0) module with multiple antenna options having a maximum peak gain of +2.2 dBi

Associated models: BL600-SA, BL600-SC, BL600-ST, BL620-SA, BL620-SC, BL620-ST

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Performance Criteria (Immunity)

Product Specific Criteria:

EUT setup during immunity and susceptibility testing:

The system was setup to have continuous communication, with the EUT communicating to an Android app.

Minimum Performance level specified by manufacturer:

The device may have loss of connection to the app while the test is performed. When the stress is removed, the device shall operate as intended, with no loss of function and connect to app. No user intervention on the EUT is permitted.

3 REFERENCES

Publication	Edition	Date
ETSI EN 300 328	V2.1.1	2016-11
ETSI EN 301 489-17	V3.1.1	2017-02
ETSI EN 301 489-1	V2.1.1	2017-02

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty \pm
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

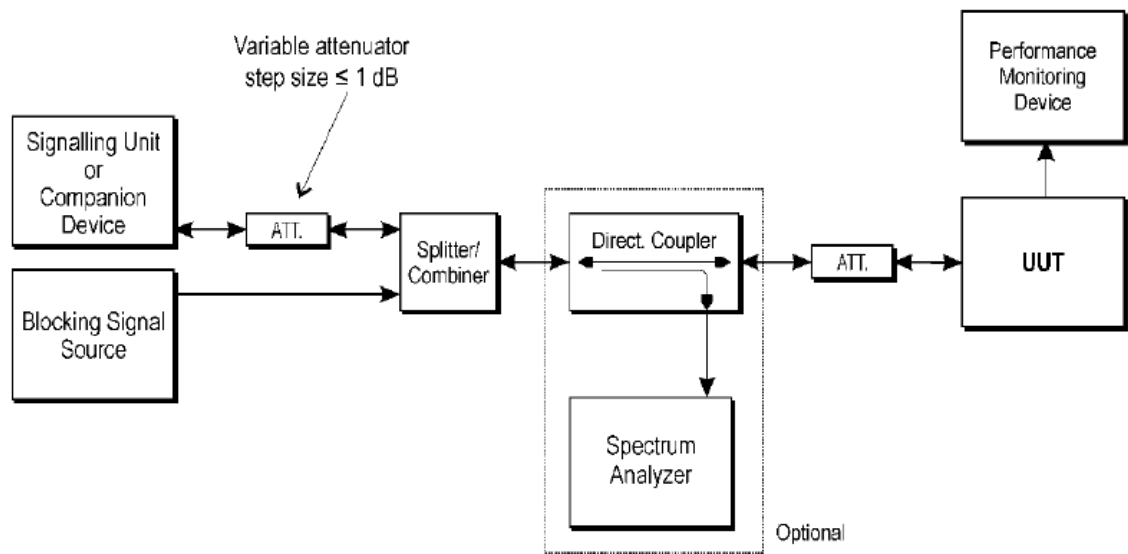
5.1 Antenna Port Conducted Emissions – Receiver Blocking

Operator	Aidi Zainal
QA	Adam Alger
Test Date	3/14/2017
Location	Screen room
Temp. / R.H.	20-25° C / 30-50 % R.H.
Requirement	ETSI EN 300 328 V2.1.1 Section 4.3.2.11
Method	ETSI EN 300 328 V2.1.1 Section 5.4.11

Receiver Blocking parameters receiver category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW
$P_{min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW
<p>NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.</p> <p>NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p>			

Block Diagram

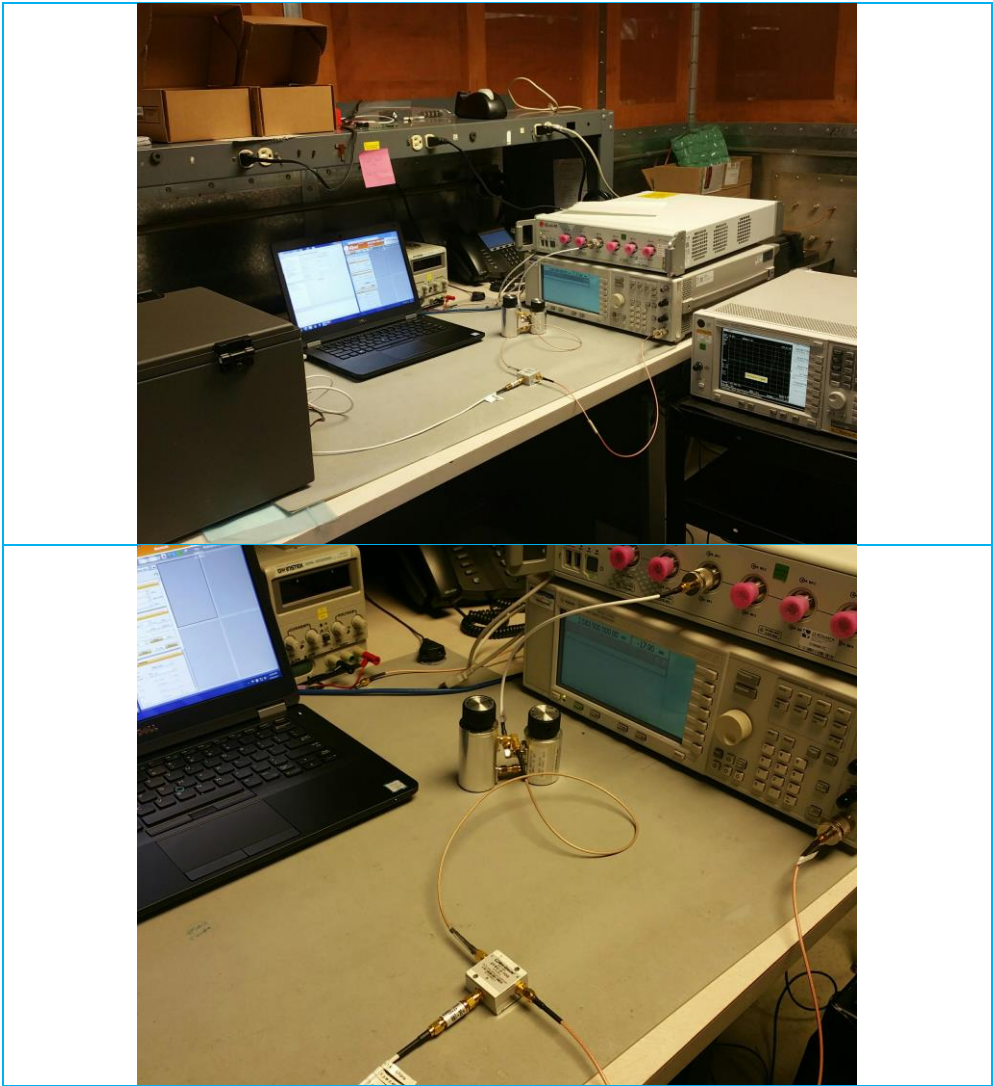


Instrumentation



No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	11/21/2016	11/21/2017	Active Calibration
2	CC 000284C	Signal Generator	Agilent	E4421B	MY41000402	11/17/2016	11/17/2017	Active Verification
3	EE 960093	Splitter/Combiner	mini-circuits	ZFSC-2-10G	SF702900616	2/27/2017	2/27/2018	Active Verification

Setup Photos



Test Parameters

Frequency (MHz)	Litepoint level for test(dBm)	Var. Att (dB)	Additional Path Att. (dB)
2402	-25.6	30.0	20.0
2480	-25.3	30.0	20.0

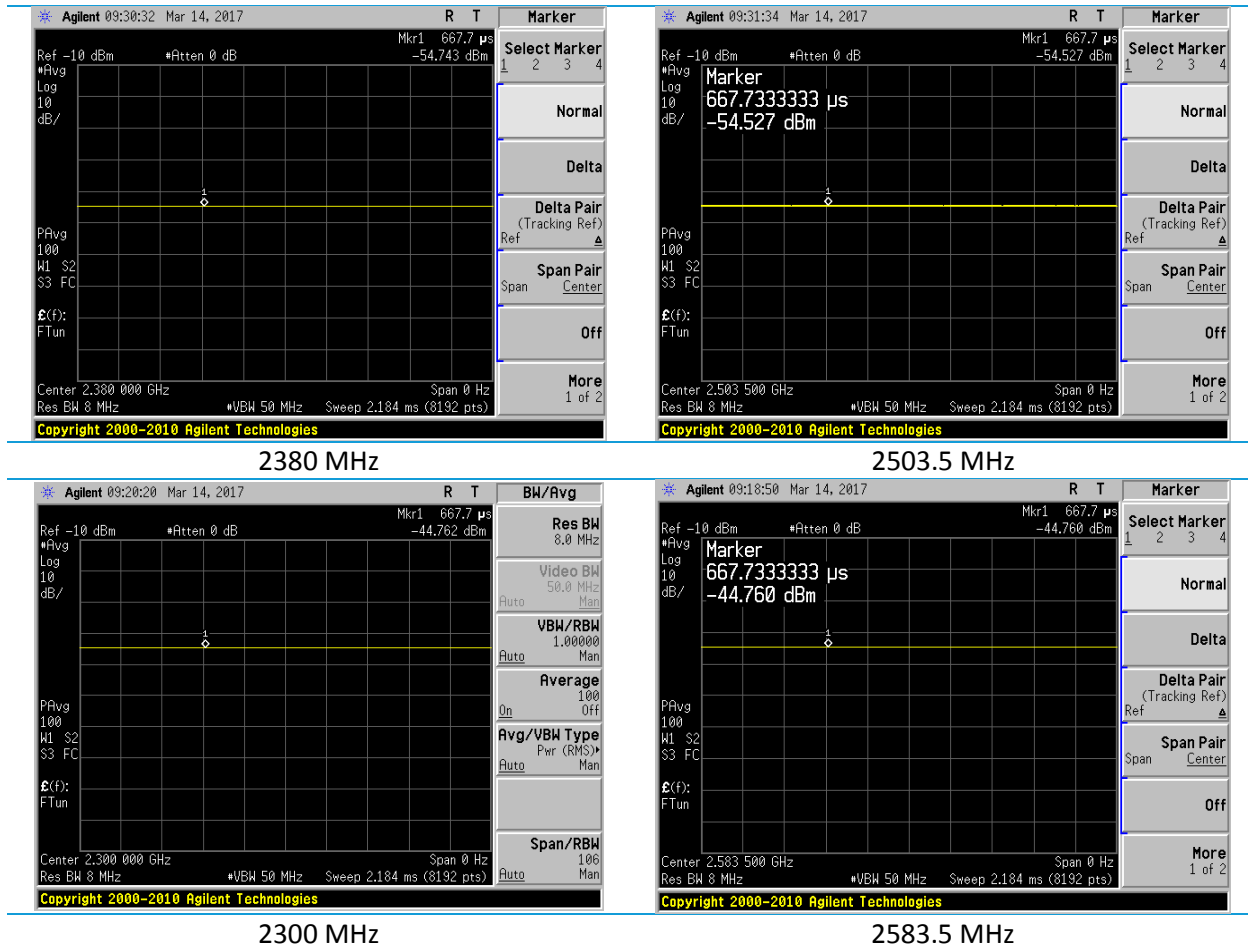
Frequency (MHz)	Level	Ant Gain	Blocking level	Sig gen setting (dBm)
2380.0	-57.0	2.2	-54.8	-27.3
2503.5	-57.0	2.2	-54.8	-27.3
2300.0	-47.0	2.2	-44.8	-17.7
2583.5	-47.0	2.2	-44.8	-17.9

Results

Mode	Data rate	EUT Channel	PER Result at Blocking frequencies listed				Result
			2380	2503.5	2300	2583.5	
Bluetooth Low Energy	BLE 4.0	2402	0.7%	0.1%	0.7%	1.2%	Pass
Bluetooth Low Energy	BLE 4.0	2480	0.6%	1.0%	1.4%	4.4%	Pass

Test Notes	1. Category 2 receiver
	2 - Minimum performance is 30.8% PER
	3 - In addition to variable attenuation, path has a 20dB loss + cable losses.
	4. EUT receiving data from litepoint. On RX side use BLE TEST RX, on Transmit side use litepoint.
	On nRFgo studio, setup the EUT for receive mode at the appropriate channel and press 'Start test'. Set Litepoint to send 1600 packets. On the nRFgo studio, press on "stop test" and note how many packet is received.
	6. Packet count need to be better than 1107 in order for PER to be 30.8% or better for testing.
	7.Variable attenuator left at 30dB, Lite point level for high channel PER > 30.8% is -31.3dBm, Low channel PER>30.8% is -31.6dBm

Blocking Level at input of EUT



5.2 Radiated Immunity

Description of Measurement

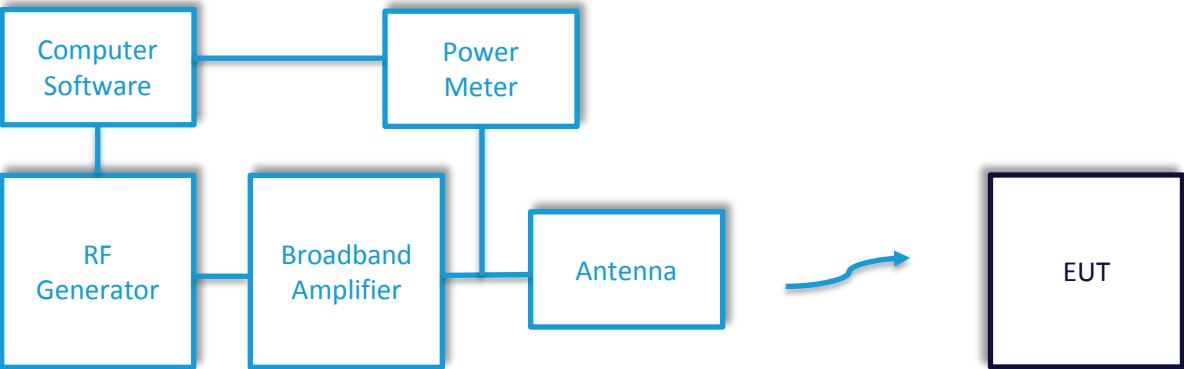
The EUT is illuminated with uniform electromagnetic radiation by means of a RF generator, power amplifier, and field generating antenna.

Ferrite panels and/or absorbers are placed on the ground between the antenna and EUT to achieve a uniform field area. The UFA is measured with an isotropic probe positioned in a planar grid at the desired test distance.

The power required to create a uniform test field strength is stored in a calibration file for each frequency and antenna polarity.

The response of the EUT during and after test is observed, recorded, and compared to the defined performance criteria.

Block Diagram



5.2.1 Radiated Immunity

Operator	Ryan Urness
QA	Adam Alger
Test Date	5/24/2017
Location	Chamber 5
Temp. / R.H.	20-25° C / 30-50 % R.H.
Requirement	ETSI EN 301 489-17 / ETSI EN 301 489-1
Method	EN 61000-4-3

Test Parameters

Frequency	1.0 - 6.0 GHz, Exclusion Band 2280-2603.5 MHz
Level	3 V/m
Modulation	80% 1 kHz Sine Wave
Step / Dwell	Logarithmic 1%, 3 sec
Power	USB
Tx Mode	BLE
Notes	Continuous BT communication without data corruption. Data sent is Temp.
EUT Orientation	Front, Back
Notes	1) Tested on DVK-BL600 Dev Kit 2) Additional monitoring by Android Tabled running Laird Tools App

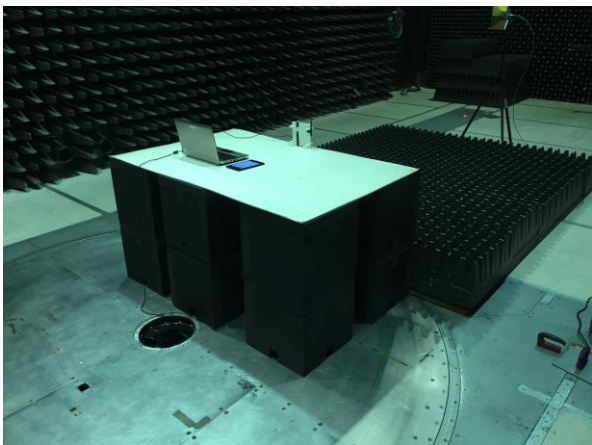
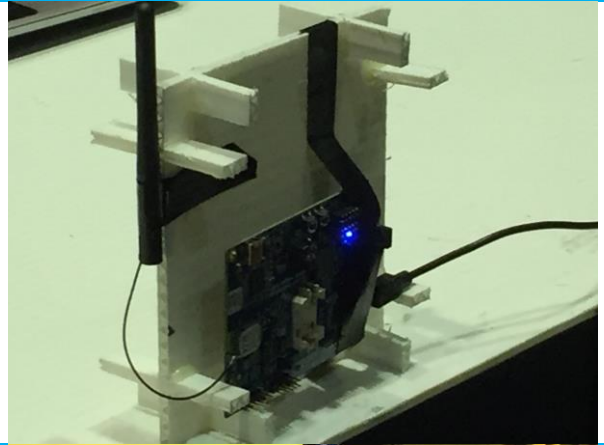
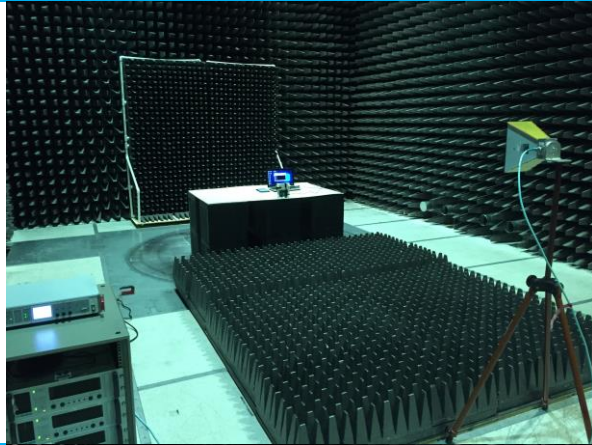
Instrumentation



No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960098	RF Generator	Teseq	ITS 6006	33022	1/23/2017	1/23/2018	Active Calibration
2	EE 960099	Power Meter	Teseq	PM 6006	73409	1/23/2017	1/23/2018	Active Calibration
3	EE 960101	Power Meter	Teseq	PM 6006	73410	1/23/2017	1/23/2018	Active Calibration
4	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	3/17/2017	3/17/2018	Active Calibration
5	EE 960108	Power Amplifier	Milmega	AS1860-100	1060507	3/5/2017	3/5/2018	Active Validation
6	EE 960107	Power Amplifier	Milmega	AS0102-250	1060508	3/5/2017	3/5/2018	Active Validation

Company: Laird	Page 14 of 16	Name: BL600
Report: TR 317194		Model: BL600
Job: C-2750		Serial: 204-320050

Setup Photos



6 REVISION HISTORY

Version	Date	Notes	Person
V0	6/1/2017	Draft	Zach Wilson
V1	6/2/2017	Review and Release	Adam Alger

END OF REPORT