

# Test Report # TR 316356 E (RFx)

**Equipment Under Test:** Sterling LWB-5

<b>Test Date(s):</b>	February 20, 2017	March 6, 2017
	February 28, 2017	March 15, 2017
	March 1, 2017	March 27-29, 2017

**Prepared for:**  
 Laird Technology, Inc.  
 Attn: Bill Steinike  
 W66N220 Commerce Ct.  
 Cedarburg, WI 53012

**Report Issued by:**

Signature:  Date: 5/9/2017

**Report Reviewed by:** Adam Alger, Quality Systems Engineer

Signature:  Date: 5/9/2017

**Report Constructed by:**

Signature:  Date: 4/28/17

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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*



**Government  
of Canada**

### **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 Technologies, Inc.	Page 3 of 19	Name: Sterling-LWB5
Report: TR 315356 E (RFx)		Model: Sterling-LWB5
Job: C-2602		Serial: WLAN/UNII – 00008, 00035 BLE/Bluetooth – 00009,00015,00019,00032

## 1 TEST REPORT SUMMARY

During **February 20, 2017-March 29, 2017** the Equipment Under Test (EUT), **Sterling-LWB5 Module**, as provided by **Laird Technologies, Inc.** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC Part 1.1307, 2.1091, 2.1093	RF Exposure and equipment authorization requirements	Reported	FCC KDB 447498	Reported
ISED Canada RSS-102	Exemption Limits for Routine Evaluation — SAR Evaluation	Reported	RSS-102 Section 2.5.1	Reported

### 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

<b>Company Name</b>	Laird Technologies, Inc.
<b>Contact Person</b>	Bill Steinike
<b>Address</b>	W66N220 Commerce Ct. Cedarburg, WI 53012

### 2.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the client*

<b>Product Name</b>	Sterling-LWB5
<b>Model Number</b>	Sterling-LWB5
<b>Serial Number</b>	WLAN/UNII – 00008, 00032 BLE/Bluetooth – 00009, 00015, 00019, 00032

### 2.2 Product Description

The Sterling-LWB5 is a multi-standard module with support for WLAN (802.11 a/b/g/n/ac), Bluetooth 2.1+EDR, Bluetooth 3.0, and Bluetooth 4.1 (Bluetooth Low Energy) with multiple antenna options.

Chip Antenna: Johanson Part # 2450AD14A5500 peak gain 1.0 dBi (2.4 GHz) / 4.0 dBi (5.5 GHz)

U.FL Antenna port utilizes the following antenna options:

LSR Part #001-0009 2.4 GHz Dipole Antenna peak gain 2.0 dBi (2.4 GHz & 5.5 GHz)

LSR Part #001-0016 2.4 GHz FlexPIFA peak gain 2.5 dBi (2.4 GHz) / 3.0 dBi (5.5 GHz)

Manufacturer declaration of 2dB for tune-up tolerance

### 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.

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## 2.5 Additional Information

Module was powered at 3.3VDC using a variable DC power supply.

Bluetooth settings were programmed using Bluetooth RF Eval Tool Version 8.7.0.0. Modulation used: GFSK, EDR2, EDR3. Frequencies used: 2402 MHz, 2440 MHz, 2480 MHz.

WLAN settings were programmed using Sterling WLAN RF Eval Tool Version 2.8.0.0. WLAN modes, data rates and frequencies used for testing:

<u>802.11b HT-20, 1 Mbps:</u> 2412, 2437, 2462 MHz
<u>802.11g HT-20, 6 Mbps:</u> 2412, 2437, 2462 MHz
<u>802.11n HT-20, MCS0:</u> 2412, 2437, 2462 MHz
<u>802.11n HT-40, MCS0:</u> 2422, 2442, 2462 MHz
<u>BLE:</u> 2402, 2440, 2480 MHz

WLAN settings were programmed using Sterling WLAN RF Eval Tool Version 2.8.0.0. WLAN modes, data rates and frequencies used for testing:

<u>802.11a HT-20, 6 Mbps:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only) MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5700 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<u>802.11ac HT-20, MCS0:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only)MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5720 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<u>802.11ac HT-40, MCS0:</u> 5190, 5230 MHz (U-NII-1); 5270, 5310 MHz (U-NII-2A); 5510, 5550, 5710 MHz (U-NII-2C); 5755, 5795 MHz (U-NII-3)
<u>802.11ac HT-80, MCS0:</u> 5210 MHz (U-NII-1); 5290 MHz (U-NII-2A); 5530, 5610 (FCC Only), 5690 MHz (U-NII-2C); 5775 MHz (U-NII-3)
<u>802.11n HT-20, MCS0:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only)MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5700 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<u>802.11n HT-40, MCS0:</u> 5190, 5230 MHz, (U-NII-1); 5270, 5310 MHz(U-NII-2A); 5510, 5550, 5670 MHz(U-NII-2C); 5755, 5795 MHz (U-NII-3)

### 3 REFERENCES

Publication	Edition	Date
47 CFR, Parts 0-15 (FCC)		2017
RSS 247	2	2017
RSS GEN	4	2014
ANSI C63.10		2013
FCC KDB 558074 D01 v04		2017
FCC KDB 789033 D02 v01r04		2017
RSS-102	5	2015
FCC KDB 447498	D01 v06	2015

## 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	$1 \times 10^{-7}$	$0.55 \times 10^{-7}$
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 %

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## 5 TEST DATA

### 5.1 Fundamental Emission – 2.4 GHz WLAN/DTS

<b>Operator</b>	Kimberly Bay / Shane Dock
<b>QA</b>	Shane Dock / Kimberly Bay
<b>Test Date</b>	March 1, 2017 / March 29, 2017
<b>Location</b>	Conducted RF Test Bench
<b>Temp. / R.H.</b>	21-22°C / 34-35% RH
<b>Requirement</b>	FCC 15.247 (b)(3) / RSS-247 Section 5.4 (d)
<b>Method</b>	WLAN - ANSI C63.10 2013 Section 11.9.1.2 Integrated band power method

#### Test Parameters

<b>Settings</b>	<u>802.11b HT-20, 1 Mbps:</u> 2412, 2437, 2462 MHz
<b>Settings</b>	<u>802.11g HT-20, 6 Mbps:</u> 2412, 2437, 2462 MHz
<b>Settings</b>	<u>802.11n HT-20, MCS0:</u> 2412, 2437, 2462 MHz
<b>Settings</b>	<u>802.11n HT-40, MCS0:</u> 2422, 2442, 2462 MHz

#### Instrumentation



Date : 6-Feb-2017

Type Test : DTS Conducted RF Measurements

Job # : C-2602

Prepared By: Kim/Shane

Customer : Laird Technologies, Inc.

Quote # : 216356

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5548519	6/26/2015	6/25/2017	Active Calibration
3	AA 960172	Cable - low loss 1m	A.H. Systems, Inc	SAC-26G-1	387	5/16/2016	5/16/2017	Active Verification
4	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration

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### Setup Photos

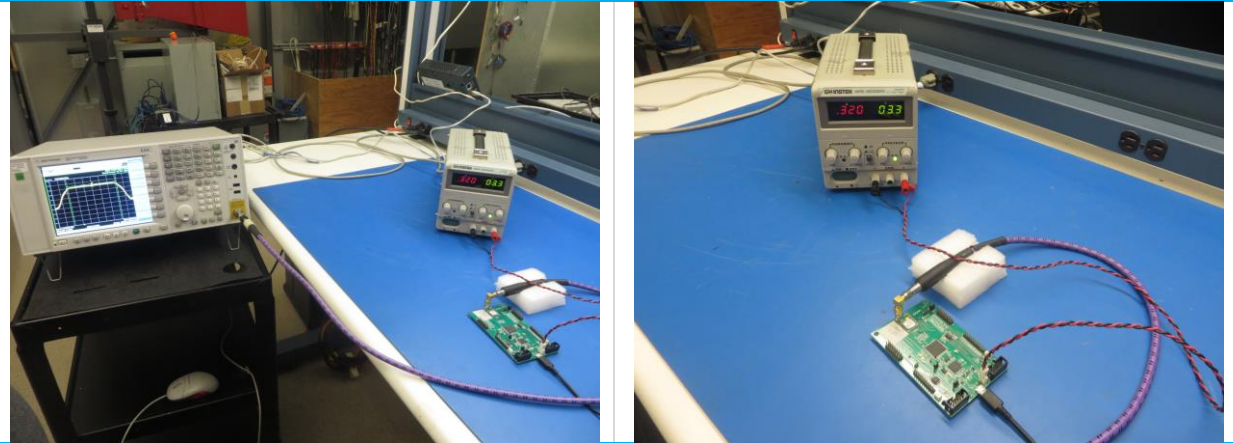
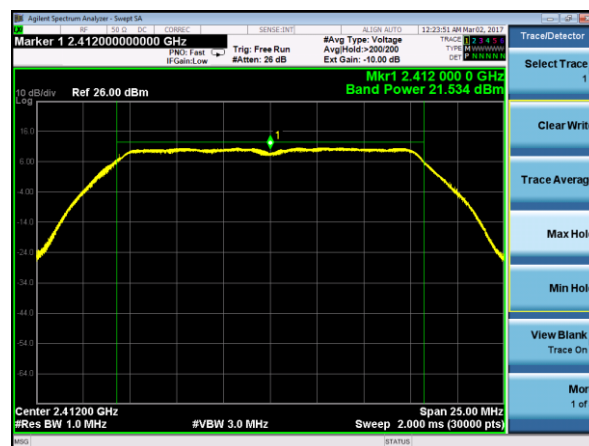


Table – 2.4 WLAN/DTS Power Out

Channel	Limit (dBm)	802.11b (dBm)	Margin 802.11b (dB)	802.11g (dBm)	Margin 802.11g (dB)	802.11n (dBm)	Margin 802.11n (dB)	802.11n - HT40 (dBm)	Margin 802.11n - HT40 (dB)
Low	30	18.2	11.8	21.5	8.5	19.8	10.2	17.3	12.7
Mid	30	19.0	11.0	21.2	8.8	19.8	10.2	17.0	13.0
High	30	16.7	13.3	18.9	11.1	18.8	11.2	16.9	13.1

### Plot – Power Out



Highest DTS Power Out

## 5.2 Fundamental Emission – 2.4 GHz Bluetooth/FHSS

<b>Operator</b>	Kimberly Bay / Shane Dock
<b>QA</b>	Shane Dock / Kimberly Bay
<b>Test Date</b>	February 20, 2017 / March 29, 2017
<b>Location</b>	Conducted RF Test Bench
<b>Temp. / R.H.</b>	21°C / 31% R.H. / 22°C / 35% R.H.
<b>Requirement</b>	FCC 15.247 (b)(1) / RSS-247 Section 5.4 (b)
<b>Method</b>	ANSI C63.10 2013 Section 7.8.5

### Test Parameters

<b>Frequency</b>	2402 MHz, 2440 MHz, 2480 MHz
<b>Settings</b>	Maximum power setting
<b>Settings</b>	Data pattern = PRBS9
<b>Settings</b>	GFSK, EDR2, EDR3
<b>Settings</b>	Single channel mode

### Instrumentation



Date: 6-Feb-2017 Type Test: Bluetooth Conducted RF Measurements Job #: C-2602  
 Prepared By: Kim/Shane Customer: LSR Quote #: 316356

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	6/26/2015	6/25/2017	Active Calibration
3	AA 960172	Cable - low loss 1m	A.H. Systems, Inc	SAC-26G-1	387	5/16/2016	5/16/2017	Active Verification

### Setup Photos

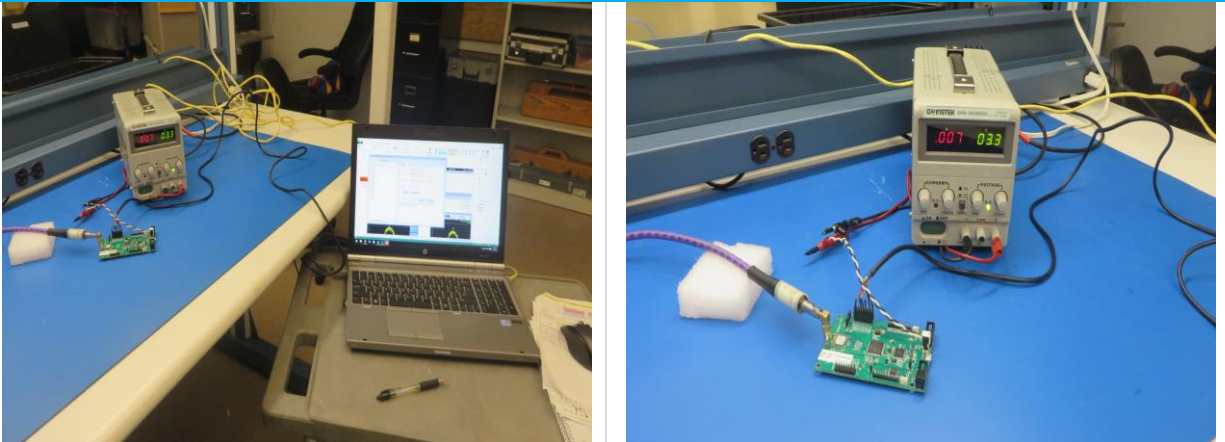
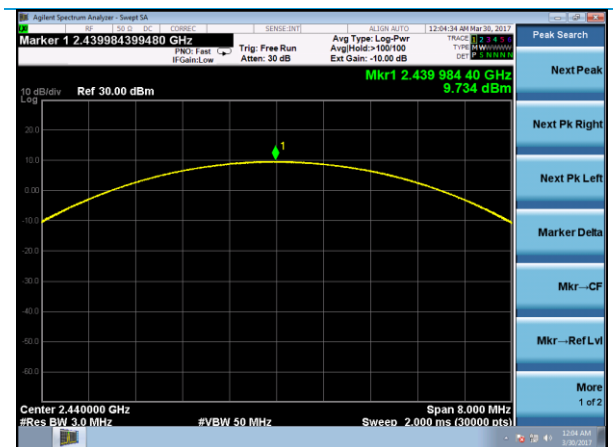


Table – 2.4 GHz Bluetooth/FHSS Power Out

Channel	Limit (dBm)	GFSK (dBm)	Margin GFSK (dB)	EDR2 (dBm)	Margin EDR2 (dB)	EDR3 (dBm)	Margin EDR3 (dB)
Low	30	8.45	21.55	9.22	20.78	9.45	20.55
Mid	30	9.22	20.79	9.40	20.60	9.73	20.27
High	30	7.78	22.22	7.91	22.09	8.33	21.67

### Plot – Power Out



Highest FHSS Power Out

### 5.3 Fundamental Emission – UNII Device

<b>Operator</b>	Kimberly Bay
<b>QA</b>	Aidi Zainal / Shane Dock
<b>Test Date</b>	U-NII-1: March 6, 2017; U-NII-2A: March 15, 2017 U-NII-2C: March 27, 2017; U-NII-3: February 28, 2017
<b>Location</b>	Conducted RF Test Bench
<b>Temp. / R.H.</b>	21°- 22°C / 30%-53% RH
<b>Requirement</b>	FCC.407 (a)(1)(iv), (a)(2), (a)(3) RSS 247 Issue 2 Sections 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1
<b>Method</b>	KDB 789033 D02 v01r03 Section II.E.2.d Method SA-2 U-NII-2C HT-20 signals: KDB 789033 D02 v01r03 Section II.E.2.b Method SA-1

#### Test Parameters

<b>Settings</b>	<u>802.11a HT-20, 6 Mbps:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only) MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5700 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<b>Settings</b>	<u>802.11ac HT-20, MCS0:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only)MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5720 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<b>Settings</b>	<u>802.11ac HT-40, MCS0:</u> 5190, 5230 MHz (U-NII-1); 5270, 5310 MHz (U-NII-2A); 5510, 5550, 5710 MHz (U-NII-2C); 5755, 5795 MHz (U-NII-3)
<b>Settings</b>	<u>802.11ac HT-80, MCS0:</u> 5210 MHz (U-NII-1); 5290 MHz (U-NII-2A); 5530, 5610 (FCC Only), 5690 MHz (U-NII-2C); 5775 MHz (U-NII-3)
<b>Settings</b>	<u>802.11n HT-20, MCS0:</u> 5180, 5200, 5220 (ISED only), 5240 (FCC only)MHz (U-NII-1) 5260, 5300, 5320 MHz (U-NII-2A) 5500, 5580, 5700 MHz (U-NII-2C) 5745, 5785, 5825 MHz (U-NII-3)
<b>Settings</b>	<u>802.11n HT-40, MCS0:</u> 5190, 5230 MHz, (U-NII-1); 5270, 5310 MHz(U-NII-2A); 5510, 5550, 5670 MHz(U-NII-2C); 5755, 5795 MHz (U-NII-3)
<b>Note</b>	Maximum antenna gain: 4 dBi
<b>Note</b>	U-NII-1, U-NII-2A, and U-NII-3 each have only two HT-40 channels and one HT-80 channel. U-NII-2C has only two HT-40 channels in 802.11n mode.
<b>Note</b>	U-NII-2C 802.11ac HT-80 frequency 5610 MHz tested here, but not used in Canada. U-NII-2C 802.11ac HT-80 has only two available ISED channels.

## Instrumentation

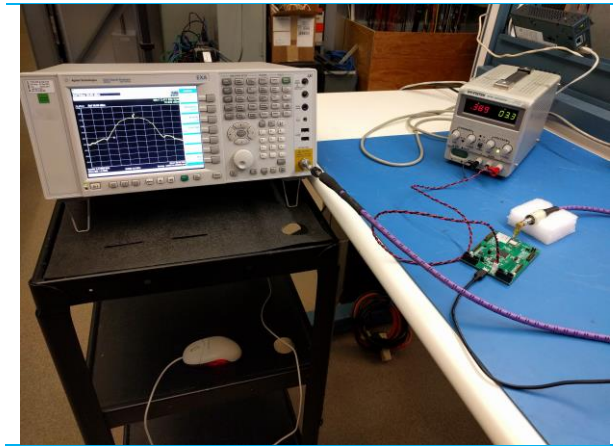


Date: 6-Feb-2017 Type Test: Conducted RF Measurements Job #: C-2602

Prepared By: Kim Customer: LSR Quote #: 316356

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD0ID01048.0	5546519	6/26/2015	6/25/2017	Active Calibration
3	AA 960172	Cable - low loss 1m	A.H. Systems, Inc	SAC-26G-1	387	5/16/2016	5/16/2017	Active Verification

## Setup Photo



**Table – U-NII-1 Conducted Output Power**

Mode	Frequency (MHz)	Data Rate	BW	Correction Factor (dB)	Pout Measured (dBm)	ERP Pout (dBm)	FCC Limit (dBm)	FCC Margin (dB)	ISED EIRP Limit (dBm)	ISED EIRP margin (dB)
802.11a	5180	6 Mbps	HT-20	0.132	11.69	11.82	24.00	12.18	22.26	6.44
802.11a	5200	6 Mbps	HT-20	0.132	11.36	11.49	24.00	12.51	22.26	6.77
802.11a	5220 (ISED)	6 Mbps	HT-20	0.132	11.20	11.33	24.00	12.67	22.25	6.92
802.11a	5240 (FCC)	6 Mbps	HT-20	0.132	10.94	11.07	24.00	12.93	22.26	7.19
802.11ac	5180	MCSO	HT-20	0.132	9.47	9.61	24.00	14.40	22.55	8.95
802.11ac	5200	MCSO	HT-20	0.132	9.09	9.23	24.00	14.78	22.55	9.33
802.11ac	5220 (ISED)	MCSO	HT-20	0.132	8.88	9.01	24.00	14.99	22.55	9.54
802.11ac	5240 (FCC)	MCSO	HT-20	0.132	8.83	8.97	24.00	15.04	22.55	9.58
802.11ac	5190	MCSO	HT-40	0.292	5.61	5.91	24.00	18.09	23.00	13.09
802.11ac	5230	MCSO	HT-40	0.292	5.13	5.42	24.00	18.58	23.00	13.58
802.11ac	5210	MCSO	HT-80	0.555	4.90	5.46	24.00	18.54	23.00	13.54
802.11n	5180	MCSO	HT-20	0.132	9.53	9.67	24.00	14.34	22.55	8.88
802.11n	5200	MCSO	HT-20	0.132	9.28	9.41	24.00	14.59	22.55	9.13
802.11n	5220 (ISED)	MCSO	HT-20	0.132	9.10	9.24	24.00	14.76	22.54	9.31
802.11n	5240 (FCC)	MCSO	HT-20	0.132	8.86	9.00	24.00	15.00	22.54	9.55
802.11n	5190	MCSO	HT-40	0.292	5.74	6.04	24.00	17.97	23.00	12.97
802.11n	5230	MCSO	HT-40	0.292	5.35	5.64	24.00	18.36	23.00	13.36

**Table – U-NII-2A Conducted Output Power**

Mode	Frequency (MHz)	Data Rate	BW	Correction Factor (dB)	Pout Measured (dBm)	ERP Pout (dBm)	FCC Limit (dBm)	FCC Margin (dB)	ISED ERP Limit (dBm)	ISED Margin (dB)	ISED EIRP Limit (dBm)	ISED EIRP margin (dB)
802.11a	5260	6 Mbps	HT-20	0.132	13.66	13.79	24.00	10.21	23.27	9.48	29.27	11.48
802.11a	5300	6 Mbps	HT-20	0.132	13.63	13.76	24.00	10.24	23.31	9.54	29.31	11.54
802.11a	5320	6 Mbps	HT-20	0.132	12.38	12.51	24.00	11.49	23.29	10.77	29.29	12.77
802.11ac	5260	MCSO	HT-20	0.177	11.64	11.81	24.00	12.19	23.55	11.74	29.55	13.74
802.11ac	5300	MCSO	HT-20	0.177	11.52	11.70	24.00	12.30	23.58	11.88	29.58	13.88
802.11ac	5320	MCSO	HT-20	0.177	11.39	11.57	24.00	12.43	23.57	12.00	29.57	14.00
802.11ac	5270	MCSO	HT-40	0.386	7.66	8.05	24.00	15.95	24.00	15.95	30.00	17.95
802.11ac	5310	MCSO	HT-40	0.386	7.43	7.81	24.00	16.19	24.00	16.19	30.00	18.19
802.11ac	5290	MCSO	HT-80	0.580	7.14	7.72	24.00	16.28	24.00	16.28	30.00	18.28
802.11n	5260	MCSO	HT-20	0.223	11.50	11.73	24.00	12.27	23.57	11.85	29.57	13.85
802.11n	5300	MCSO	HT-20	0.223	11.38	11.60	24.00	12.40	23.56	11.96	29.56	13.96
802.11n	5320	MCSO	HT-20	0.223	11.50	11.73	24.00	12.28	23.56	11.84	29.56	13.84
802.11n	5270	MCSO	HT-40	0.339	7.64	7.98	24.00	16.02	24.00	16.02	30.00	18.02
802.11n	5310	MCSO	HT-40	0.339	7.37	7.71	24.00	16.29	24.00	16.29	30.00	18.29



**Table – U-NII-2C Conducted Output Power**

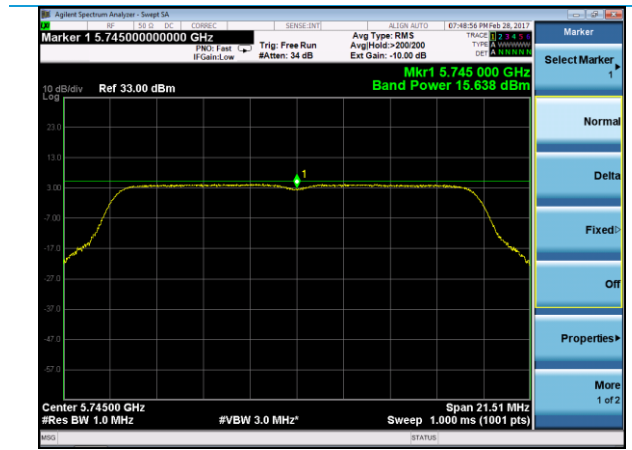
Mode	Frequency (MHz)	Data Rate	BW	Correction Factor (dB)	Pout Measured (dBm)	ERP Pout (dBm)	FCC Limit (dBm)	FCC Margin (dB)	ISED ERP Limit (dBm)	ISED Margin (dB)	ISED EIRP Limit (dBm)	ISED EIRP margin (dB)
802.11a	5500	6 Mbps	HT-20	0.0	14.13	14.13	24.00	9.87	23.25	9.12	29.25	11.12
802.11a	5580	6 Mbps	HT-20	0.0	15.15	15.15	24.00	8.85	23.26	8.10	29.26	10.10
802.11a	5700	6 Mbps	HT-20	0.0	15.02	15.02	24.00	8.98	23.27	8.25	29.27	10.25
802.11ac	5500	MCS0	HT-20	0.0	13.15	13.15	24.00	10.85	23.56	10.41	29.56	12.41
802.11ac	5580	MCS0	HT-20	0.0	12.80	12.80	24.00	11.20	23.55	10.75	29.55	12.75
802.11ac	5710	MCS0	HT-20	0.0	12.93	12.93	24.00	11.08	23.55	10.62	29.55	12.62
802.11ac	5510	MCS0	HT-40	0.315	9.06	9.38	24.00	14.62	24.00	14.62	30.00	16.63
802.11ac	5550	MCS0	HT-40	0.315	8.85	9.16	24.00	14.84	24.00	14.84	30.00	16.84
802.11ac	5710	MCS0	HT-40	0.315	9.36	9.68	24.00	14.32	24.00	14.32	30.00	16.33
802.11ac	5530	MCS0	HT-80	0.580	8.43	9.01	24.00	14.99	24.00	14.99	30.00	16.99
802.11ac	5610	MCS0	HT-80	0.580	8.87	9.45	24.00	14.55	24.00	14.55	30.00	16.55
802.11ac	5690	MCS0	HT-80	0.580	9.06	9.64	24.00	14.36	24.00	14.36	30.00	16.36
802.11n	5500	MCS0	HT-20	0.0	13.17	13.17	24.00	10.83	23.55	10.38	29.55	12.38
802.11n	5580	MCS0	HT-20	0.0	12.81	12.81	24.00	11.19	23.56	10.75	29.56	12.75
802.11n	5700	MCS0	HT-20	0.0	12.90	12.90	24.00	11.10	23.55	10.65	29.55	12.65
802.11n	5510	MCS0	HT-40	0.315	9.16	9.48	24.00	14.52	24.00	14.52	30.00	16.52
802.11n	5550	MCS0	HT-40	0.315	8.77	9.09	24.00	14.91	24.00	14.91	30.00	16.91
802.11n	5670	MCS0	HT-40	0.315	8.87	9.19	24.00	14.81	24.00	14.81	30.00	16.81

**Table – U-NII-3 Conducted Output Power**

Mode	Frequency (MHz)	Data Rate	BW	Correction Factor (dB)	Pout Measured (dBm)	ERP Pout (dBm)	Limit (dBm)	Margin (dB)
802.11a	5745	6 Mbps	HT-20	0.132	15.64	15.77	30.0	14.23
802.11a	5785	6 Mbps	HT-20	0.132	15.13	15.26	30.0	14.74
802.11a	5825	6 Mbps	HT-20	0.132	15.16	15.29	30.0	14.71
802.11ac	5745	MCS0	HT-20	0.155	13.47	13.63	30.0	16.37
802.11ac	5785	MCS0	HT-20	0.155	12.81	12.96	30.0	17.04
802.11ac	5825	MCS0	HT-20	0.155	12.92	13.07	30.0	16.93
802.11ac	5755	MCS0	HT-40	0.315	9.81	10.12	30.0	19.88
802.11ac	5795	MCS0	HT-40	0.315	9.23	9.54	30.0	20.46
802.11ac	5775	MCS0	HT-80	0.555	9.22	9.77	30.0	20.23
802.11n	5745	MCS0	HT-20	0.177	13.56	13.74	30.0	16.26
802.11n	5785	MCS0	HT-20	0.177	12.84	13.02	30.0	16.98
802.11n	5825	MCS0	HT-20	0.177	13.05	13.23	30.0	16.77
802.11n	5755	MCS0	HT-40	0.315	9.69	10.01	30.0	19.99
802.11n	5795	MCS0	HT-40	0.315	9.38	9.69	30.0	20.31



Plot – Power Out



Highest UNII Power Out

## 6 EXCLUSION CALCULATION

### 6.1.1 Minimum Separation Distance for SAR Test Exclusion

FCC KDB 447498 D01 General RF Exposure Guidance v06  
Section 4.3, Appendix A, Appendix B

RSS-102 Issue 5  
Section 2.5.1

1-gram standalone SAR Test exclusion  
Source based duty cycle assumed worst case 100%  
Rounded to the largest distance based on Declared Output Power

**SAR testing is not required when used at a distance equal to or greater than the following:**

Band (GHz)	Type / Technology	Frequency (MHz)	Measured Output Power (dBm)	Tune-up (dB)	Declared Output (dBm)	Declared Output Power (mW)	FCC Distance (mm)	ISED Canada Distance (mm)
2.4	DTS (WLAN)	2412	21.50	2.00	23.50	223.87	<b>70</b>	<b>45</b>
2.4	FHSS (Bluetooth)	2440	9.80	2.00	11.80	15.14	<b>10</b>	<b>20</b>
5.8	UNII (WLAN)	5745	15.80	2.00	17.80	60.26	<b>50</b>	<b>35</b>

## 7 REVISION HISTORY

Version	Date	Notes	Person
V0	5/5/2017	Initial Draft Release	KB
V1	5/9/2017	Final	KB
V2	5/23/2017	Addition of SAR Test Exclusion Distance	AA

**END OF REPORT**