

Test Report # 318246 A

Equipment Under Test: IoT LoRa Module

Test Date(s): May 25th, 2019 to August 18th, 2020


Prepared for: Georgia Pacific
Attn: Kim Cannon
1915 Marathon Avenue
Neenah, WI 54956

Report Issued by: Zach Wilson, EMC Engineer

Signature: 

Date: 8/20/2020

Report Reviewed by: Adam Alger, Quality Manager

Signature: 

Date: 8/20/2020

Report Constructed by: Zach Wilson, EMC Engineer

Signature: 

Date: 7/10/2019

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Company: Georgia Pacific	Page 1 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

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Laird Connectivity Test Services in Review

The Laird Connectivity, 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 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

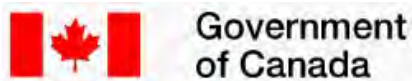
Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

Company: Georgia Pacific	Page 3 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

1 TEST REPORT SUMMARY

During **May 25th, 2019 to August 18th, 2020** the Equipment Under Test (EUT), **IoT LoRa Module**, as provided by **Georgia Pacific** was tested to the following requirements of the **Federal Communications Commission** and **Innovation, Science and Economic Development Canada** :

FHSS/Hybrid (Frequency Hopping Spread Spectrum and Hybrid Operation of a 900 MHz radio)

Requirement	Description	Specification	Method	Result
FCC: 15.247 (f) FCC: 15.247 (a)(1) IC: RSS 247 5.3 (a)	Average Time of Occupancy for a Hybrid System and Number of Hopping Frequencies, Channel Separation	FHSS	ANSI C63.10	Compliant
FCC: 15.247 (f) IC: RSS-247 5.3 (b)	Power Spectral Density of a Hybrid System	8dBm/3kHz	ANSI C63.10	Compliant
FCC: 15.247 (a)(1)(i) IC: RSS-247 5.1 (c)	20 dB Bandwidth	< 500 kHz	ANSI C63.10	Compliant
FCC: 15.247 (b)(2) IC: RSS-247 5.4 (a)	Maximum Conducted Output Power	30 dBm e.i.r.p.	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	20 dBc	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Compliant
FCC: 2.1049 IC: RSS-GEN	99% Occupied Bandwidth	Reported	ANSI C63.10	Reported

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	Below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Georgia Pacific
Contact Person	Kim Cannon
Address	1915 Marathon Avenue Neenah, WI 54956

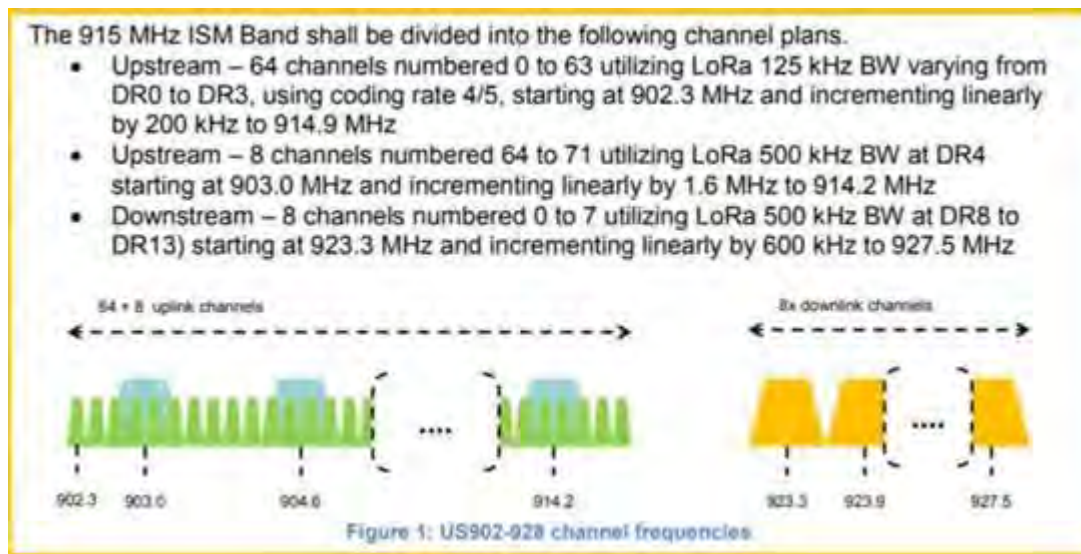
2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	IoT LoRa Module
Model Number	A-101129
Serial Number	Engineering Sample
LoRa Radio FCC ID	2AALY-529GP
LoRa Radio IC ID	21620-529GP

2.2 Product Description

The EUT contains a LoRa radio with the below channel plan, data rates, and nominal bandwidths.



The EUT also contains the pre-certified Laird BL654 BLE radio utilizing an internal PCB F-type antenna with a maximum gain of -1.0 dBi.

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Job: C-3164		Serial: Engineering Sample

There are two PCB versions of the EUT. The Laird Rev_B contains a Johanson 0900AT43A0070 chip antenna, peak gain -0.5 dBi. The Laird Rev_B1 has the PCB configured for a SMA connector and is fitted with the Molex 206764 Flexible Dipole Antenna, peak gain of 1.3 dBi.

Both versions of the EUT were tested.

The EUT input voltage was 3.3 VDC provided by a lab power supply. The EUT can also be powered by removable batteries.

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 Radio Programming Information

EUT programmed using Tera Term v4.99. The radio manufacturer provided the commands to put the radio into the correct test modes. The firmware version was PRT-0000000174. The tested channels were, 902.3 MHz (Low), 908.7 MHz (Mid), and 914.9 MHz (High).

2.6 Radio Power Information

The end user will have the capability of changing the power levels of the Laird Rev_B. The minimum power setting is -17 . The maximum power setting is 18. The EUT was tested at both power levels.

The Laird Rev_B1 was tested at power setting 12 only which will be considered maximum power for that board variant..

3 REFERENCES

Publication	Edition	Date
CFR Title 47	-	2020
ANSI C63.10	-	2013
RSS 247	2	2017
RSS GEN	5	2019

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

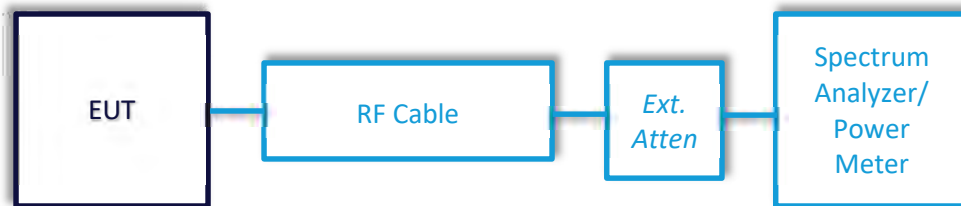
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %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

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram




5.1.1 20 dB Occupied Bandwidth

Operator	Zach Wilson	QA	Anthony Smith
Temperature	21.0°C, 22.4°C	R.H. %	44.1, 47.3
Test Date	6/3/2019, 8/18/2020	Location	Conducted Radio Bench
Requirement	FCC 15.247, RSS-247, FCC 2.1049, RSS-GEN	Method	ANSI C63.10 6.9.2, 6.9.3

Test Parameters


Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Setup	Conducted
RBW	2 kHz	VBW	6.2 kHz
Detector(s)	Peak Detector with Max Hold	Span	300 kHz

Instrumentation



Date: 3-Jun-2019 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960172	Cable	A.H. Systems, Inc	SAC-28G-1	387	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration



Date: 18-Aug-2020 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960173	Cable	A.H. Systems, Inc	SAC-28G-1	388	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration

EUT Parameters

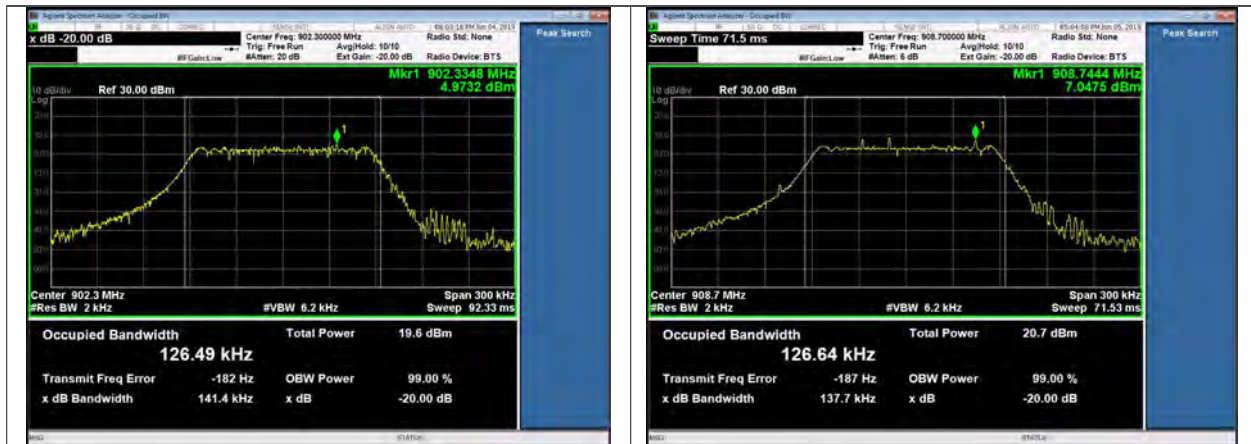
Input Power	3.3 VDC	Mode	125 kHz BW TX Single Channel
Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Data Rates	DR0, DR3
Power Settings	Laird Rev_B: 18 Laird Rev_B1: 12		

Data Tables

99%/20dB OBW - Laird Rev_B					
Frequency (MHz)	Power Setting	Data Rate	Fundamental BW (kHz)	99% OBW (kHz)	20 dB OWB (kHz)
902.3	18.0	DR3	125.0	126.5	141.4
902.3	18.0	DR0	125.0	124.9	137.7
908.7	18.0	DR3	125.0	126.6	137.7
908.7	18.0	DR0	125.0	124.8	135.6
914.9	18.0	DR3	125.0	126.7	138.7
914.9	18.0	DR0	125.0	124.6	137.0

99%/20dB OBW - Laird Rev_B1					
Frequency (MHz)	Power Setting	Data Rate	Fundamental BW (kHz)	99% OBW (kHz)	20 dB OWB (kHz)
902.3	12.0	DR3	125.0	125.8	141.1
902.3	12.0	DR0	125.0	124.6	136.4
908.7	12.0	DR3	125.0	125.8	139.2
908.7	12.0	DR0	125.0	124.7	137.1
914.9	12.0	DR3	125.0	126.0	140.0
914.9	12.0	DR0	125.0	124.4	136.3

Plots



OBW, DR3 Low Channel
Rev_B, Power Setting 18

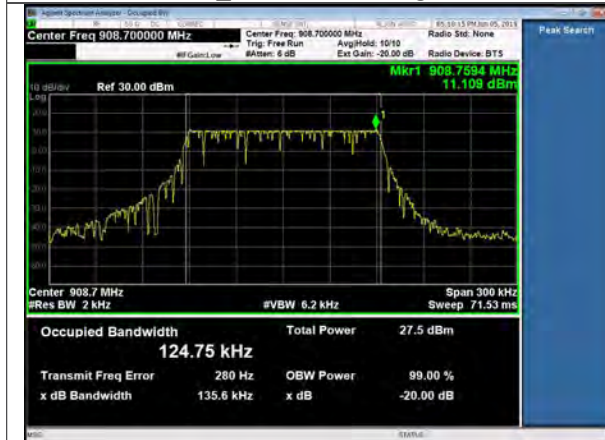
OBW, DR3 Mid Channel
Rev_B, Power Setting 18



OBW, DR3 High Channel
Rev_B, Power Setting 18



OBW, DR0 Low Channel
Rev_B, Power Setting 18

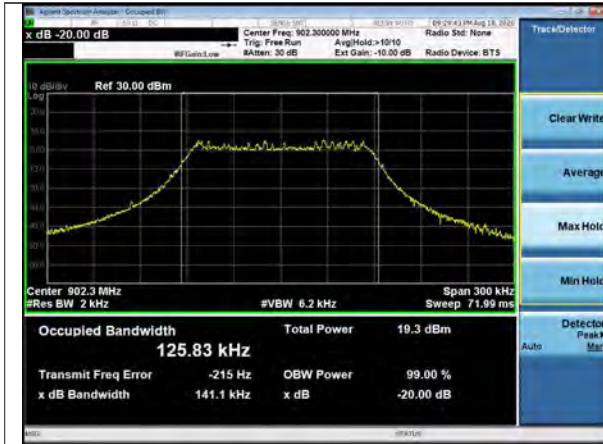


OBW, DR0 Mid Channel
Rev_B, Power Setting 18



OBW, DR0 High Channel
Rev_B, Power Setting 18

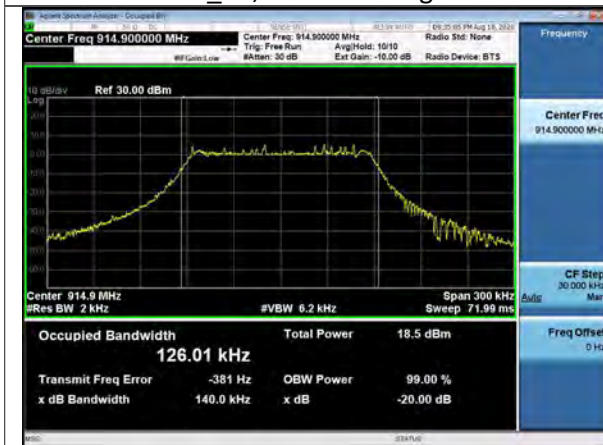
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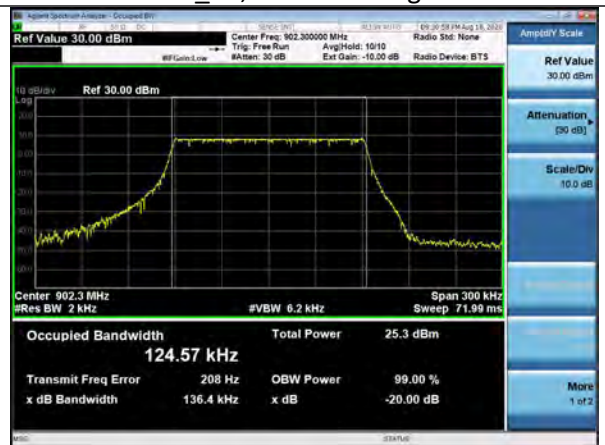
OBW, DR3 Low Channel
Rev_B1, Power Setting 12



OBW, DR3 Mid Channel
Rev_B1, Power Setting 12



OBW, DR3 High Channel
Rev_B1, Power Setting 12



OBW, DR0 Low Channel
Rev_B1, Power Setting 12



OBW, DR0 Mid Channel
Rev_B1, Power Setting 12



OBW, DR0 High Channel
Rev_B1, Power Setting 12

5.1.2 Average Time of Occupancy for a Hybrid System

Operator	Zach Wilson		
Temperature	21.0 C	R.H. %	44.1
Test Date	6/3/2019	Location	Conducted Radio Bench
Requirement	FCC 15.247, RSS-247	Method	ANSI C63.10 7.8.4


Test Parameters

Frequency	902.3 MHz (Channel 0)	Setup	Conducted
RBW	100 kHz	VBW	# of Hopping Channels: 30 kHz TX Time: 100 kHz
Detector(s)	Peak Detector with Max Hold	Span	0 Hz

Requirement


With the digital transmission operation of the hybrid system turned off, the frequency hopping operation shall have an average time of occupancy on any frequency not exceeding 0.4 seconds within a duration in seconds equal to the number of hopping frequencies multiplied by 0.4.

Instrumentation



Date: 3-Jun-2019 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960172	Cable	A.H. Systems, Inc	SAC-26G-1	387	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration



Date: 18-Aug-2020 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960173	Cable	A.H. Systems, Inc	SAC-26G-1	388	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration

EUT Parameters

Input Power	3.3 VDC	Mode	125 kHz BW TX Hopping
Frequency	902.3 MHz (Channel 0)	Data Rates	DR0, DR3
Power	18	EUT Version	Laird Rev_B

Table

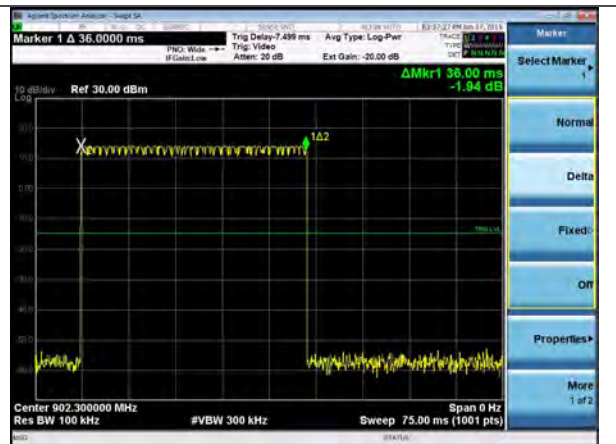
Average Time of Occupancy									
Frequency (MHz)	Data Rate	Fundamental BW (kHz)	Power Setting	Transmit Time Per Hop (ms)	Hops in 25.6 s	Number of Channels	Time of Occupancy (ms)	Limit (ms)	Margin (s)
902.3	DR3	125.0	High	36.0	1	64	36.0	400.0	364.0
902.3	DR0	125.0	High	247.5	1	64	247.5	400.0	152.5

Channel Frequency Separation				
Frequency (MHz)	Data Rate	Channel Separation (kHz)	20 dB OWB (kHz)	Margin (kHz)
902.3, 902.5	DR3	194.8	141.4	53.4
902.3, 902.5	DR0	200.0	137.7	62.3

Plots



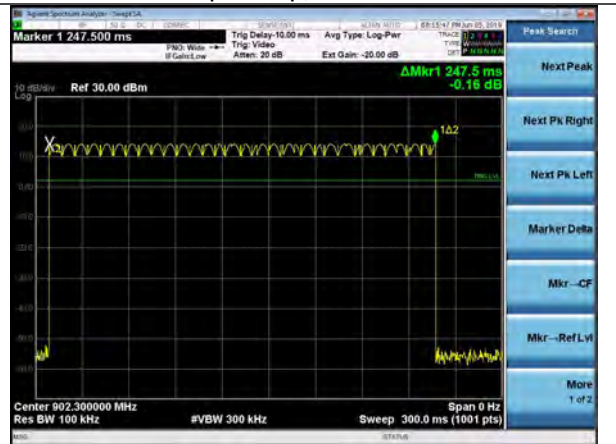
Number of Hopping Channels



Transmit Time per Hop, DR3 Maximum Power



Hops per 25.6s, DR3 Maximum Power



Transmit Time per Hop, DR0 Maximum Power



Hops per 25.6s, DR0 Maximum Power



Channel Separation, DR0

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5.1.3 Transmitter Output Power

Operator	Zach Wilson	QA	Anthony Smith
Temperature	21.0°C, 22.4°C	R.H. %	44.1, 47.3
Test Date	6/3/2019, 8/18/2020	Location	Conducted Radio Bench
Requirement	FCC 15.247, RSS-247	Method	ANSI C63.10 7.8.5


Test Parameters

Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Setup	Conducted
RBW	300 kHz, 1 MHz	VBW	1 MHz
Detector(s)	Peak Detector with Max Hold	Span	750 kHz

Requirement


For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels

Instrumentation



Date: 3-Jun-2018 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960172	Cable	A.H. Systems, Inc	SAC-26G-1	387	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration



Date: 18-Aug-2020 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960173	Cable	A.H. Systems, Inc	SAC-26G-1	388	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration

EUT Parameters

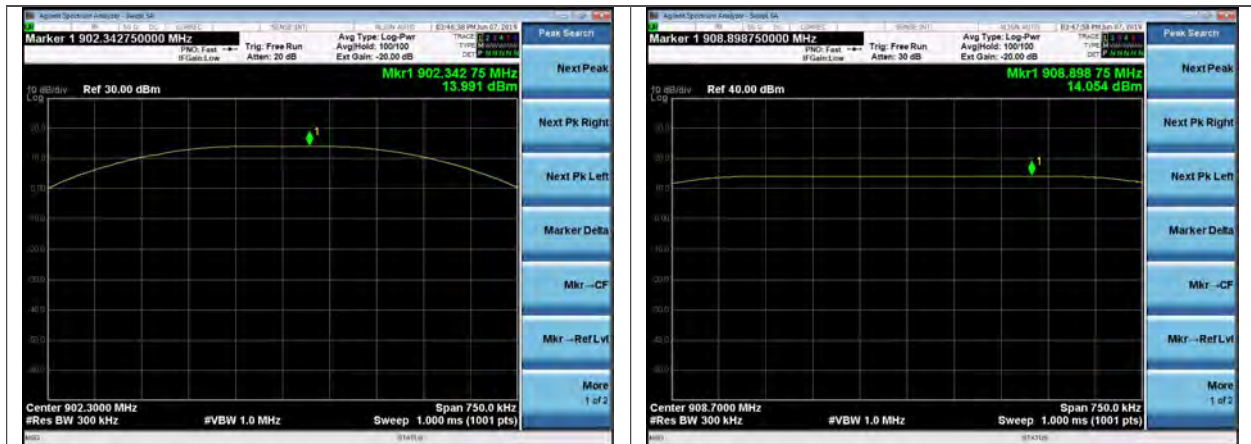
Input Power	3.3 VDC	Mode	125 kHz BW TX Single Channel
Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Data Rates	DR0, DR3
Power Settings	Laird Rev_B: 18, -17 Laird Rev_B1: 12		

Data Tables

Transmitter Output Power - Laird Rev_B						
Frequency (MHz)	Data Rate	Fundamental BW (kHz)	Power Setting	Peak Output Power (dBm)	Limit (dBm)	Peak Output Power Margin (dB)
902.3	DR3	125	18	14.0	30.0	16.0
902.3	DR0	125	18	14.0	30.0	16.0
908.7	DR3	125	18	14.1	30.0	15.9
908.7	DR0	125	18	14.1	30.0	15.9
914.9	DR3	125	18	14.1	30.0	15.9
914.9	DR0	125	18	14.1	30.0	15.9
902.3	DR3	125	-17	-16.6	30.0	46.6
902.3	DR0	125	-17	-16.6	30.0	46.6
908.7	DR3	125	-17	-16.7	30.0	46.7
908.7	DR0	125	-17	-16.7	30.0	46.7
914.9	DR3	125	-17	-16.7	30.0	46.7
914.9	DR0	125	-17	-16.7	30.0	46.7

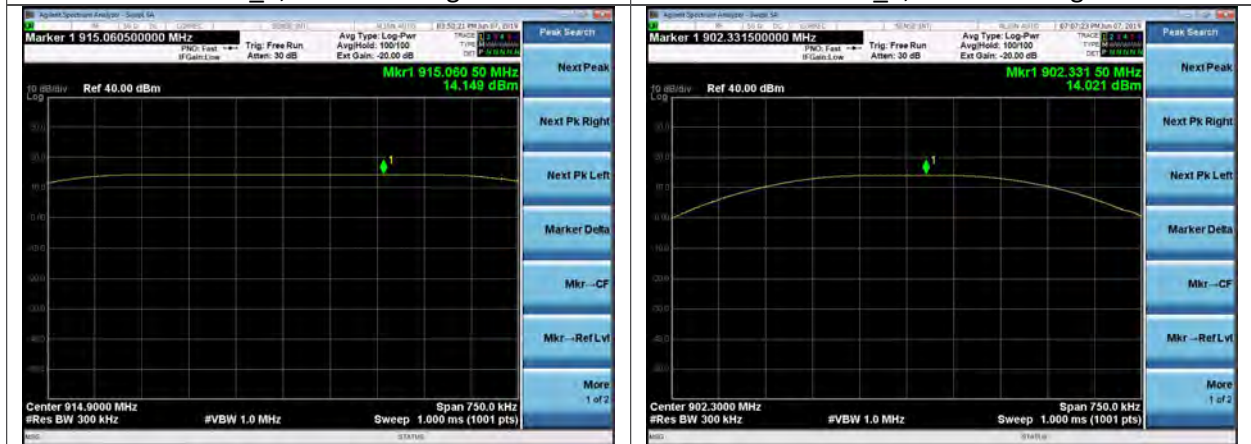
Transmitter Output Power - Laird Rev_B1						
Frequency (MHz)	Data Rate	Fundamental BW (kHz)	Power Setting	Peak Output Power (dBm)	Limit (dBm)	Peak Output Power Margin (dB)
902.3	DR3	125	12	11.4	30.0	18.6
902.3	DR0	125	12	11.4	30.0	18.6
908.7	DR3	125	12	11.4	30.0	18.6
908.7	DR0	125	12	11.4	30.0	18.6
914.9	DR3	125	12	11.3	30.0	18.7
914.9	DR0	125	12	11.3	30.0	18.7

Plots



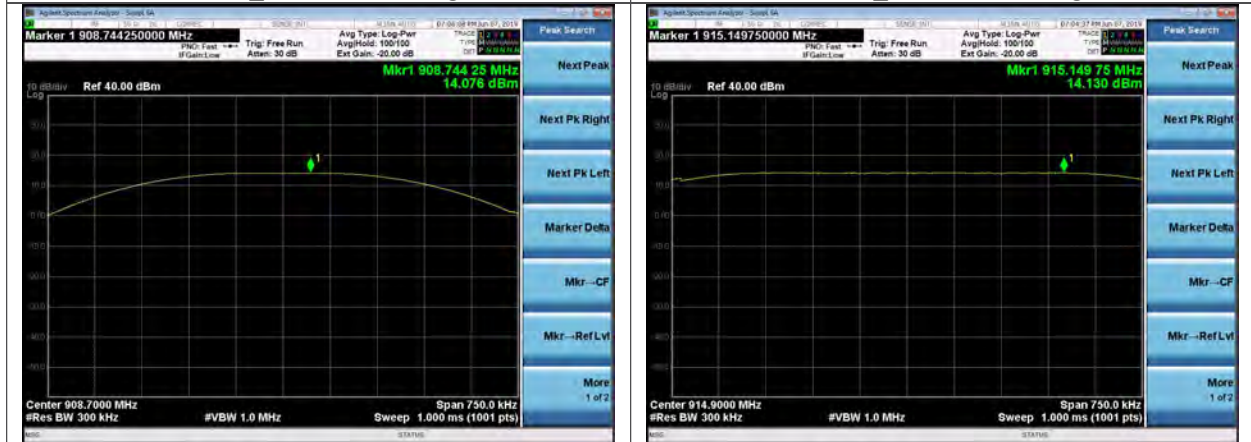
Output Power, DR3, 902.3 MHz
Laird Rev_B, Power Setting 18

Output Power, DR3, 908.7 MHz
Laird Rev_B, Power Setting 18



Output Power, DR3, 914.9 MHz
Laird Rev_B, Power Setting 18

Output Power, DR0, 902.3 MHz
Laird Rev_B, Power Setting 18



Output Power, DR0, 908.7 MHz
Laird Rev_B, Power Setting 18

Output Power, DR0, 914.9 MHz
Laird Rev_B, Power Setting 18



Output Power, DR3, 902.3 MHz
Laird Rev_B, Power Setting -17



Output Power, DR3, 908.7 MHz
Laird Rev_B, Power Setting -17



Output Power, DR3, 914.9 MHz
Laird Rev_B, Power Setting -17



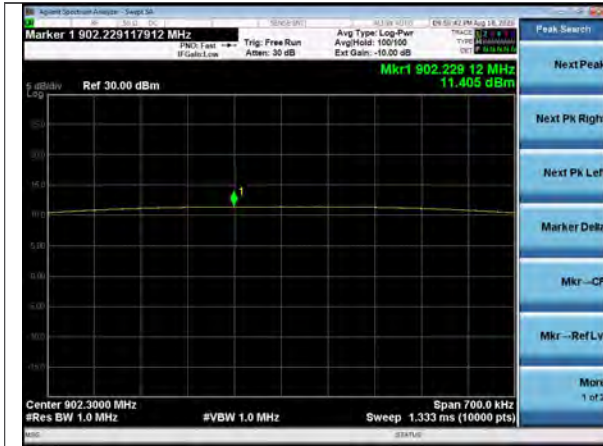
Output Power, DR0, 902.3 MHz
Laird Rev_B, Power Setting -17



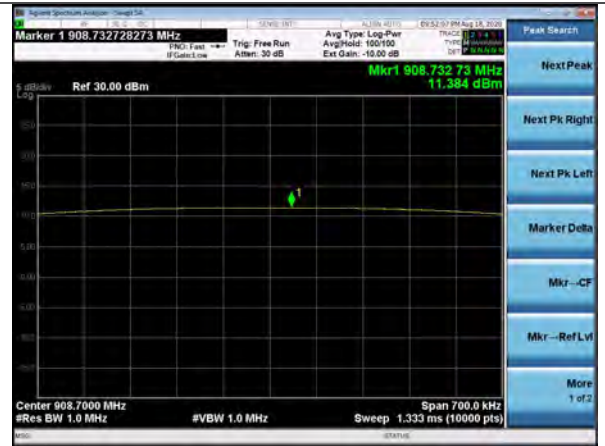
Output Power, DR0, 908.7 MHz
Laird Rev_B, Power Setting -17



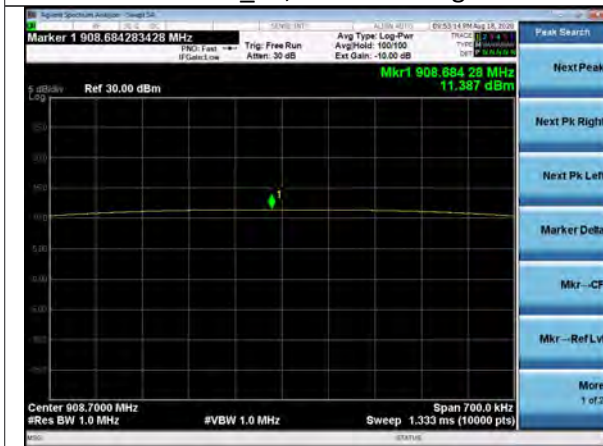
Output Power, DR0, 914.9 MHz
Laird Rev_B, Power Setting -17



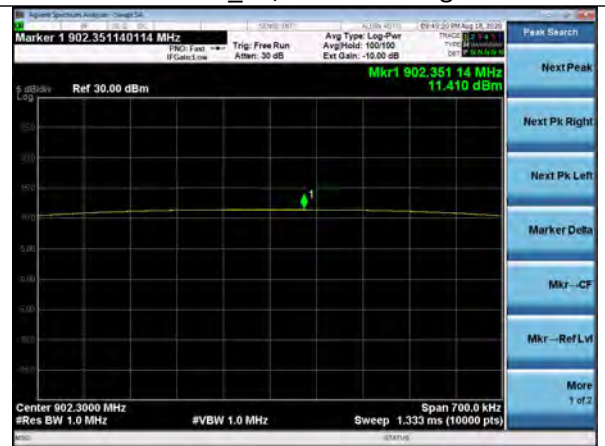
Output Power, DR3, 902.3 MHz
Laird Rev_B1, Power Setting 12



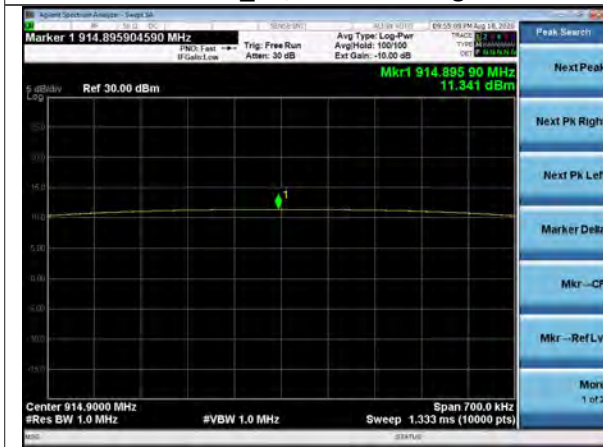
Output Power, DR3, 908.7 MHz
Laird Rev_B1, Power Setting 12



Output Power, DR3, 914.9 MHz
Laird Rev_B1, Power Setting 12



Output Power, DR0, 902.3 MHz
Laird Rev_B1, Power Setting 12



Output Power, DR0, 908.7 MHz
Laird Rev_B1, Power Setting 12



Output Power, DR0, 914.9 MHz
Laird Rev_B1, Power Setting 12

5.1.4 Power Spectral Density of a Hybrid System

Operator	Zach Wilson	QA	Anthony Smith
Temperature	21.0°C, 22.4°C	R.H. %	44.1, 47.3
Test Date	6/3/2019, 8/18/2020	Location	Conducted Radio Bench
Requirement	FCC 15.247, RSS-247	Method	ANSI C63.10 11.10.2


Test Parameters

Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Setup	Conducted
RBW	3 kHz	VBW	10 kHz
Detector(s)	Peak Detector with Max Hold	Span	1.5xDTSBW

Requirement


The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Instrumentation



Date: 3-Jun-2019 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960172	Cable	A.H. Systems, Inc	SAC-26G-1	387	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration



Date: 18-Aug-2020 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960173	Cable	A.H. Systems, Inc	SAC-26G-1	388	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration

Company: Georgia Pacific	Page 22 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

EUT Parameters

Input Power	3.3 VDC	Mode	125 kHz BW TX Single Channel
Frequency	902.3 MHz (Low) 908.7 MHz (Mid) 914.9 MHz (High)	Data Rates	DR0, DR3
Power Settings	Laird Rev_B: 18 Laird Rev_B1: 12		

Data Tables

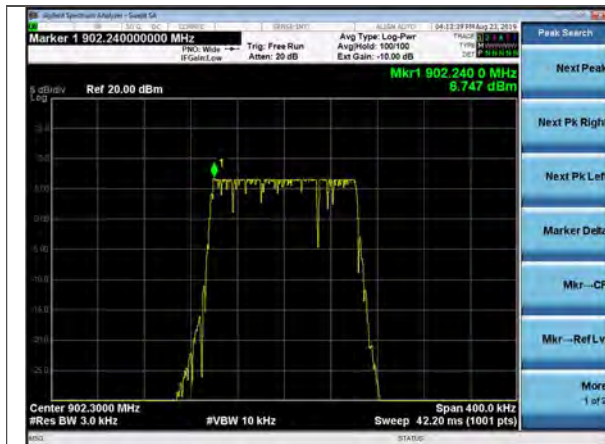
PSD - Laird Rev_B						
Frequency (MHz)	Data Rate	Power Setting	Fundamental BW (kHz)	Peak Power Spectral Density (dBm/3kHz)	PSD Limit (dBm/3kHz)	Margin (dBm)
902.3	DR0	18	125.0	4.6	8.0	3.4
902.3	DR3	18	125.0	6.7	8.0	1.3
908.7	DR0	18	125.0	5.2	8.0	2.8
908.7	DR3	18	125.0	6.7	8.0	1.3
914.9	DR0	18	125.0	5.6	8.0	2.4
914.9	DR3	18	125.0	6.7	8.0	1.3

PSD - Laird Rev_B1						
Frequency (MHz)	Data Rate	Power Setting	Fundamental BW (kHz)	Peak Power Spectral Density (dBm/3kHz)	PSD Limit (dBm/3kHz)	PSD Margin (dB)
902.3	DR0	12	125.0	4.2	8.0	3.8
902.3	DR3	12	125.0	0.1	8.0	7.9
908.7	DR0	12	125.0	4.3	8.0	3.7
908.7	DR3	12	125.0	1.2	8.0	6.8
914.9	DR0	12	125.0	2.0	8.0	6.0
914.9	DR3	12	125.0	1.6	8.0	6.4

DTS OBW - Laird Rev_B			
Frequency (MHz)	Data Rate	Fundamental BW (kHz)	DTS BW (kHz)
902.3	DR0	125.0	251.9
902.3	DR3	125.0	255.0
908.7	DR0	125.0	251.9
908.7	DR3	125.0	262.4
914.9	DR0	125.0	251.0
914.9	DR3	125.0	251.5

DTS OBW - Laird Rev_B1			
Frequency (MHz)	Data Rate	Fundamental BW (kHz)	DTS BW (kHz)
902.3	DR0	125.0	261.8
902.3	DR3	125.0	265.7
908.7	DR0	125.0	262.4
908.7	DR3	125.0	266.0
914.9	DR0	125.0	260.0
914.9	DR3	125.0	264.1

Plots



PSD, DR3, 902.3 MHz
Laird Rev_B, Power Setting 18



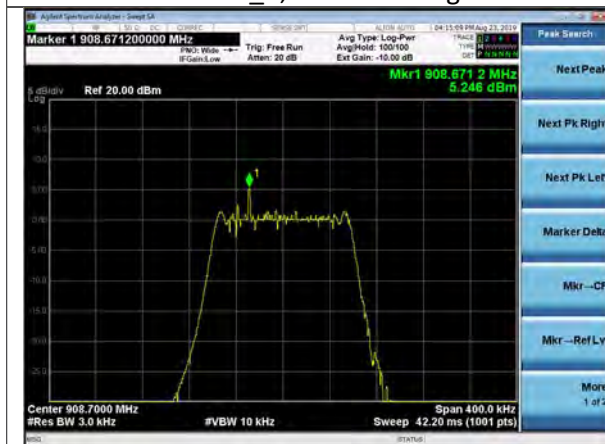
PSD, DR3, 908.7 MHz
Laird Rev_B, Power Setting 18



PSD, DR3, 914.9 MHz
Laird Rev_B, Power Setting 18



PSD, DR0, 902.3 MHz
Laird Rev_B, Power Setting 18

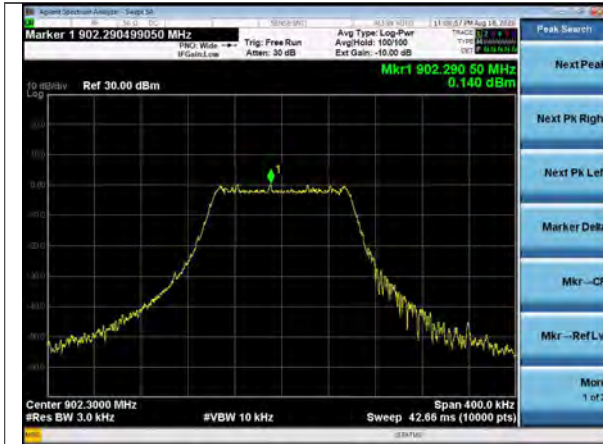


PSD, DR0, 908.7 MHz
Laird Rev_B, Power Setting 18

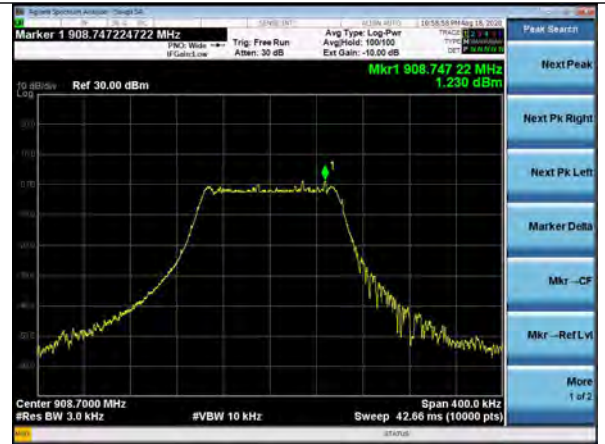


PSD, DR0, 914.9 MHz
Laird Rev_B, Power Setting 18

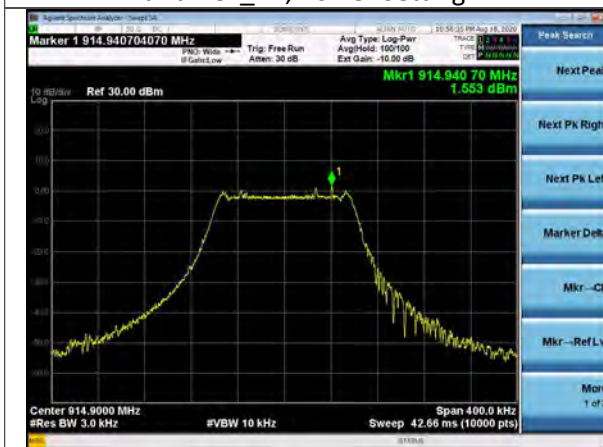
Company: Georgia Pacific	Page 25 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample



PSD, DR3, 902.3 MHz
Laird Rev_B1, Power Setting 12



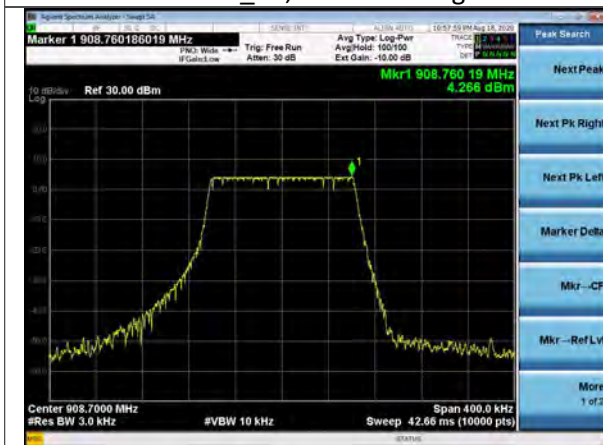
PSD, DR3, 908.7 MHz
Laird Rev_B1, Power Setting 12



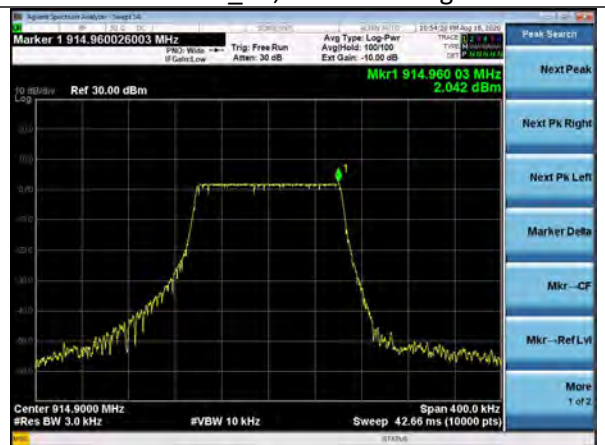
PSD, DR3, 914.9 MHz
Laird Rev_B1, Power Setting 12



PSD, DR0, 902.3 MHz
Laird Rev_B1, Power Setting 12



PSD, DR0, 908.7 MHz
Laird Rev_B1, Power Setting 12



PSD, DR0, 914.9 MHz
Laird Rev_B1, Power Setting 12

5.1.5 Conducted Spurious Emissions

Operator	Zach Wilson, Anthony Smith		
Temperature	21.3°C, 21.0°C, 22.4°C	R.H. %	40.6, 44.1, 47.3
Test Date	7/15/2019, 11/11/2019, 8/18/2020	Location	Conducted Radio Bench
Requirement	FCC 15.247, RSS-247	Method	ANSI C63.10 7.8.8

Test Parameters

Frequency	30 MHz – 10 GHz	Setup	Conducted
RBW	100 kHz	VBW	300 kHz
Detector(s)	Peak Detector with Max Hold		
Example Calculation	Highest Output Power (dBm) – 20 (dBm) = Limit (dBm)		

Limits:


In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies

Laird Rev_B Power Setting 18 Limit: 14.1 dBm highest peak output power. Limit set to -5.9 dBm

Laird Rev_B Power Setting -17 Limit: -16.9 dBm highest peak output power. Limit set to -36.9 dBm


Laird Rev_B1 Power Setting 12 Limit: 11.4 dBm highest peak output power. Limit set to -8.6 dBm

Instrumentation



Date: 3-Jun-2019 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960172	Cable	A.H. Systems, Inc	SAC-26G-1	387	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration



Date: 18-Aug-2020 Test: Conducted Radio Job: C-3164
 PE: Zach Wilson Customer: Georgia Pacific Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960173	Cable	A.H. Systems, Inc	SAC-26G-1	388	12/9/2018	12/9/2020	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration

Company: Georgia Pacific	Page 27 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

EUT Parameters

Input Power	3.3 VDC	Mode	125 kHz BW TX Single Channel and Hopping
Frequency	902.3 MHz (Low) 914.9 MHz (High)	Data Rates	DR0, DR3
Power Settings	Laird Rev_B: 18, -17 Laird Rev_B1: 12		

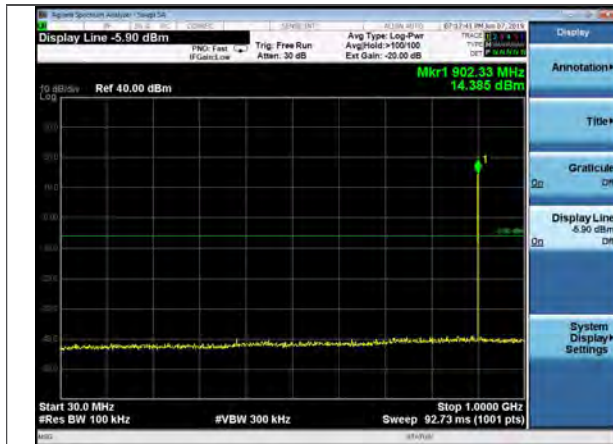
Data Tables

Conducted Spurious Emissions - Laird Rev_B							
Frequency (MHz)	Data Rate	Single Channel or Hopping	Fundamental Frequency (MHz)	Power Setting	Peak Reading (dBm)	Peak Limit (dBm)	Peak Margin (dB)
8920.0	DR0	Single	902.3	18	-33.9	-5.9	28.0
2746.0	DR0	Single	914.9	18	-43.2	-5.9	37.3
2710.0	DR3	Single	902.3	18	-42.5	-5.9	36.6
2746.0	DR3	Single	914.9	18	-42.4	-5.9	36.5
610.8	DR0	Single	902.3	18	-51.8	-5.9	45.9
608.9	DR0	Single	914.9	18	-52.2	-5.9	46.3
609.3	DR3	Single	902.3	18	-51.9	-5.9	46.0
613.9	DR3	Single	914.9	18	-51.4	-5.9	45.5
610.3	Hopping	Hopping	Hopping	18	-51.6	-5.9	45.7
1095.2	Hopping	Hopping	Hopping	18	-50.9	-5.9	45.0

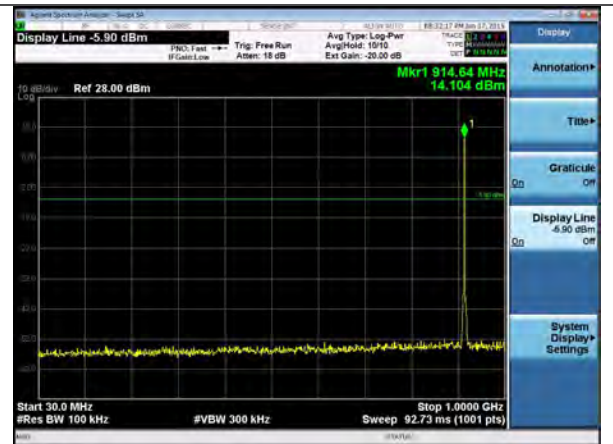
Conducted Spurious Emissions - Laird Rev_B							
Frequency (MHz)	Data Rate	Single Channel or Hopping	Fundamental Frequency (MHz)	Power Setting	Peak Reading (dBm)	Peak Limit (dBm)	Peak Margin (dB)
613.3	DR0	Single	902.3	-17	-66.6	-36.9	29.7
612.7	DR0	Single	914.9	-17	-66.3	-36.9	29.4
609.4	DR3	Single	902.3	-17	-66.4	-36.9	29.5
1044.3	DR3	Single	914.9	-17	-65.4	-36.9	28.5
1046.0	DR0	Single	902.3	-17	-64.8	-36.9	27.9
3817.0	DR0	Single	914.9	-17	-58.8	-36.9	21.9
3736.0	DR3	Single	902.3	-17	-58.9	-36.9	22.0
3754.0	DR3	Single	914.9	-17	-58.3	-36.9	21.4
1213.6	Hopping	Hopping	Hopping	-17	-64.6	-36.9	27.7
610.7	Hopping	Hopping	Hopping	-17	-66.2	-36.9	29.3

Conducted Spurious Emissions - Laird Rev_B1							
Frequency (MHz)	Data Rate	Single Channel or Hopping	Fundamental Frequency (MHz)	Power Setting	Peak Reading (dBm)	Peak Limit (dBm)	Peak Margin (dB)
485.8	DR3	Single	902.3	12	-51.3	-8.6	42.7
609.5	Hopping	Hopping	Hopping	12	-53.6	-8.6	45.0
611.6	DR0	Single	902.3	12	-53.6	-8.6	45.0
821.7	DR0	Single	902.3	12	-54.4	-8.6	45.8
1160.2	DR3	Single	914.9	12	-51.6	-8.6	43.0
1195.9	DR3	Single	902.3	12	-50.2	-8.6	41.6
1218.4	Hopping	Hopping	Hopping	12	-51.7	-8.6	43.1
3754.3	DR0	Single	914.9	12	-45.8	-8.6	37.2

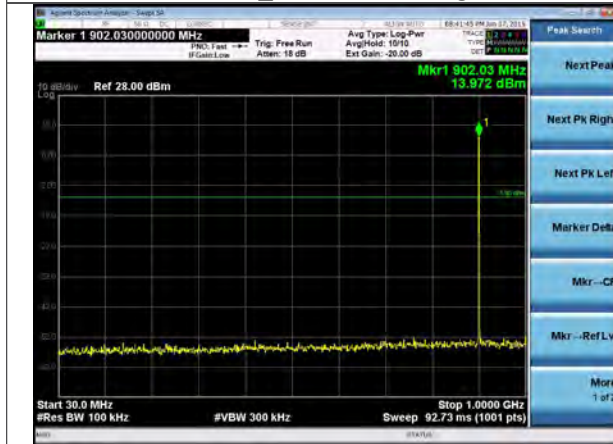
Plots



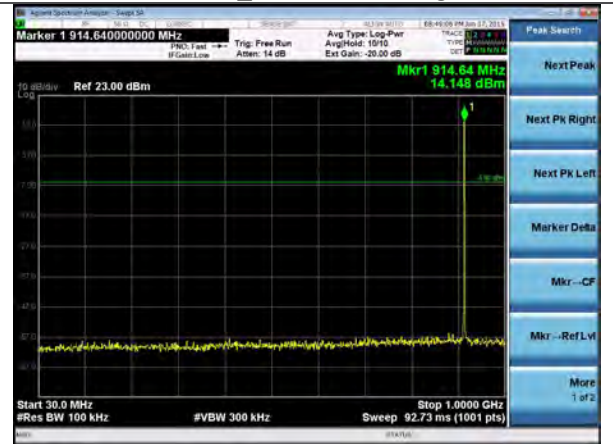
30-1000 MHz, DR0, 902.3 MHz
Laird Rev_B, Power Setting 18



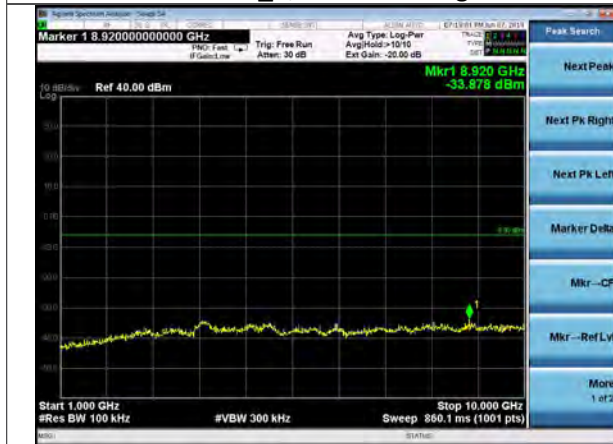
30-1000 MHz, DR0, 914.9 MHz
Laird Rev_B, Power Setting 18



30-1000 MHz, DR3, 902.3 MHz
Laird Rev_B, Power Setting 18



30-1000 MHz, DR3, 914.9 MHz
Laird Rev_B, Power Setting 18



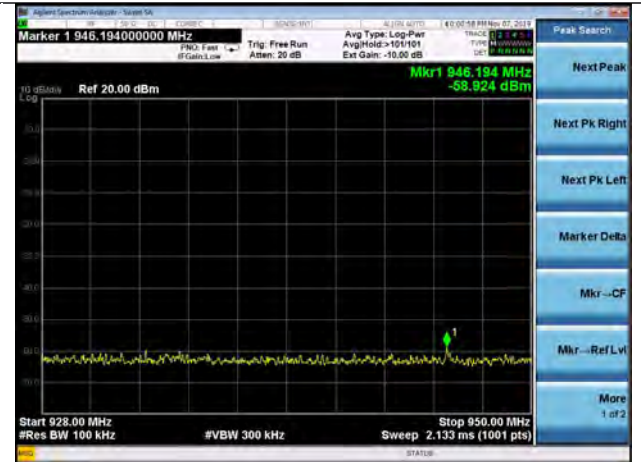
1-10 GHz, DR0, 902.3 MHz
Laird Rev_B, Power Setting 18



1-10 GHz, DR0, 914.9 MHz
Laird Rev_B, Power Setting 18



875-902 MHz, DR0, 902.3 MHz
Laird Rev_B, Power Setting 18



928-950 MHz, DR0, 914.9 MHz
Laird Rev_B, Power Setting 18

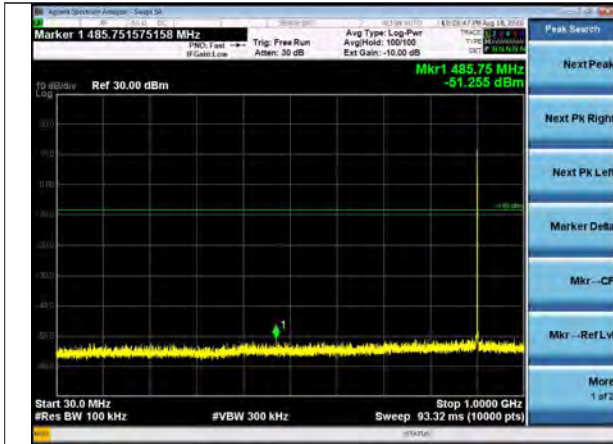


875-902 MHz, Hopping
Laird Rev_B, Power Setting 18

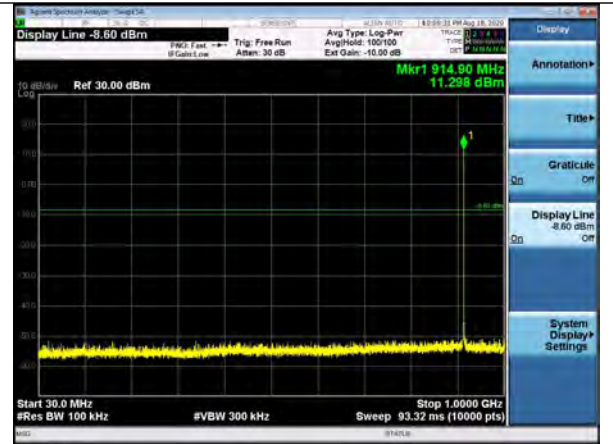


928-950 MHz, Hopping
Laird Rev_B, Power Setting 18

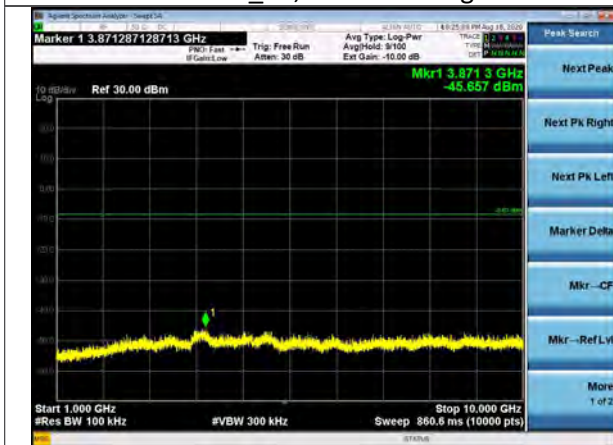
Company: Georgia Pacific	Page 31 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample



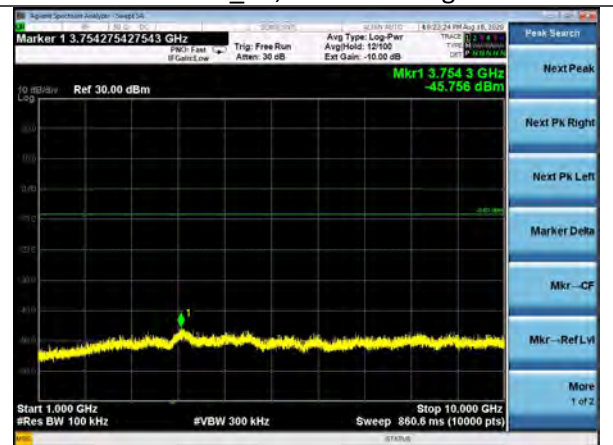
30-1000 MHz, DR0, 902.3 MHz
Laird Rev_B1, Power Setting 12



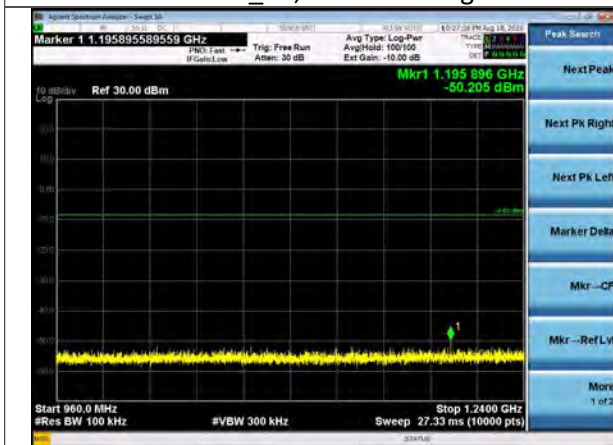
30-1000 MHz, DR3, 914.9 MHz
Laird Rev_B1, Power Setting 12



1-10 GHz, DR0, 902.3 MHz
Laird Rev_B1, Power Setting 12



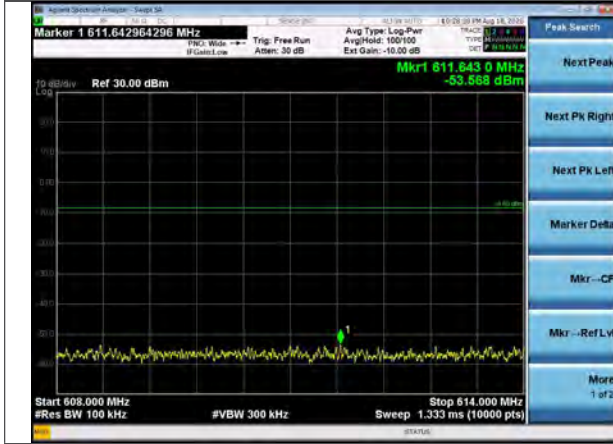
1-10 GHz, DR3, 914.9 MHz
Laird Rev_B1, Power Setting 12



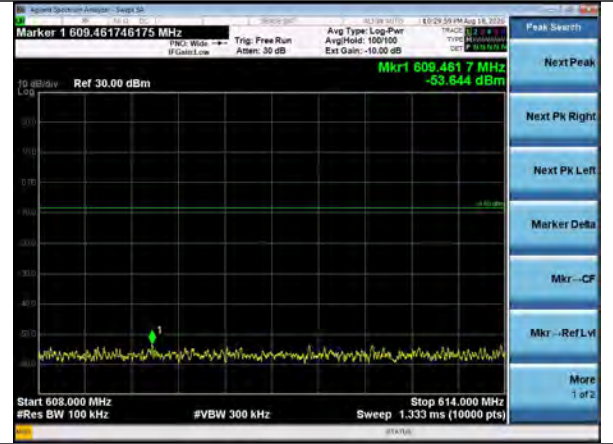
960-1240 MHz, DR0, 914.9 MHz
Laird Rev_B1, Power Setting 12



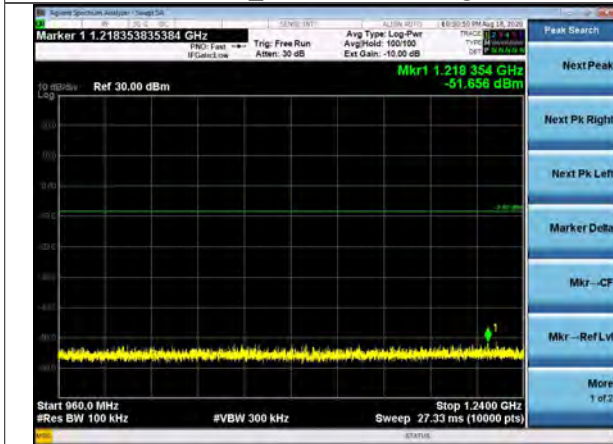
960-1240 MHz, DR3, 914.9 MHz
Laird Rev_B1, Power Setting 12



608-614 MHz, DRO, 902.3 MHz
Laird Rev_B1, Power Setting 12



608-614 MHz, Hopping
Laird Rev_B1, Power Setting 12



960-1240 MHz, Hopping
Laird Rev_B1, Power Setting 12

Company: Georgia Pacific	Page 33 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

5.2 Radiated Emissions

<p>Description of Measurement</p>	<p>The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna.</p> <p>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values.</p> <p>The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.</p>
<p>Example Calculations</p>	<p>Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m)</p> <p>Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m)</p> <p>Example at 4000 MHz: Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m Average Limit = 20 log (500) = 54 dBμV/m Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB</p>

Block Diagram



5.2.1 Radiated Emissions

Operator	Braden Smith, Anthony Smith, Jon Dilley	QA	Zach Wilson, Jeysson Gonzalez, Shane Dock
Temperature	23.3°C, 25.1°C, 24.3°C	R.H. %	48.2%, 42.2%, 44.0%
Test Date	5/23-5/30/2019, 7/31/2020	Location	Chamber 3
Requirement	FCC 15.209, RSS GEN	Method	ANSI C63.10 Section 6.3

Limits

Frequency (MHz)	Quasi Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Limit (dBµV/m)
30-88	40	-	-
88-216	43.5	-	-
216-960	46	-	-
960-1000	54	-	-
1000-10000	-	54	74

Test Parameters

Frequency	30 MHz – 10 GHz	Distance	3m
Detector(s)	Peak Detector with Max Hold for Plots. Quasi peak detector for measurements under 1 GHz. Average measurements taken with a 50 Hz VBW per the duty cycle.	Table height	Below 1 GHz: 80cm Above 1 GHz: 150cm
RBW	Below 1 GHz: 120 kHz Above 1 GHz : 1 MHz	VBW	Below 1 GHz: 1.2 MHz Above 1 GHz Peak: 3 MHz Above 1 GHz Average: 50 Hz

Instrumentation



Date : 23-May-2019

Test : Radiated Emissions

Job : C-3164

PE : Zach Wilson

Customer : Georgia Pacific

Quote : 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	7/13/2018	7/13/2021	Active Calibration
2	AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	10/7/2018	10/7/2020	Active Calibration
3	AA 960195	Antenna - Log Periodic	A.H. Systems, Inc	SAS-512-2	557	7/24/2018	7/24/2021	Active Calibration
4	AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	10/9/2018	10/9/2020	Active Calibration
5	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	7/14/2018	7/14/2021	Active Calibration
6	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	7/14/2018	7/14/2021	Active Calibration
7	EE 960160	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S*	977711030	10/7/2018	10/7/2020	Active Calibration

Company: Georgia Pacific	Page 35 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample



Date: 29-Jul-2020

Test: Radiated Emissions - Harmonics

Job: C-3164

PE: Zach Wilson

Customer: Georgia Pacific

Quote: 318246

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	10/18/2019	10/18/2020	Active Calibration
2	EE 960096	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S	40201429	10/18/2019	10/18/2020	Active Calibration
3	EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	7/14/2020	7/14/2021	Active Calibration
4	AA 960155	Filter - High Pass Filter 900 MHz	KVM	HPF-L-14185	7272-03	7/16/2020	7/16/2021	Active Calibration
5	LSC-300	Cable	Chamber 3 Emiss -			12/9/2019	12/9/2020	Active Verification

EUT Parameters

Input Power	3VDC (2 D Batteries)	Mode	Lora Tx Single Channel and Hopping, 125 kHz BW
Data Rates	DR3, DR0	Power Settings	Laird Rev_B: 18, -17 Laird Rev_B1: 12
Channels	Low (902.3 MHz), Mid (908.7 MHz), High (914.9 MHz)		
EUT Orientations	Vertical, Side, Flat		

Data Tables – Laird Rev_B – Power Setting 18

Spurious Below 1 GHz, Laird Rev_B							
Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (deg)	Data Rate	Quasi-Peak Reading (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
180.3	Horizontal	170	0	DR3, Single	29.3	43.5	14.2
180.3	Vertical	100	0	DR0, Single	29.8	43.5	13.7
180.3	Vertical	207	0	DR0, Single	26.1	43.5	17.4
194.3	Vertical	100	0	DR3, Single	24.4	43.5	19.1

Band Edges Below 1 GHz, Laird Rev_B							
Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (deg)	Data Rate	Quasi-Peak Reading (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
608.1	Horizontal	150	176	DR3, Single	35.5	46.0	10.5
611.7	Horizontal	150	176	DR0, Single	35.6	46.0	10.4
885.4	Horizontal	100	0	DR0 Hop	30.1	46.0	15.9
894.3	Horizontal	100	0	DR3 Hop	29.6	46.0	16.4
983.0	Horizontal	155	174	DR3 Hop	28.0	54.0	26.0
995.6	Horizontal	155	174	DR0 Hop	28.0	54.0	26.0

Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (degree)	Average Reading (dBuV/m)	Peak Reading (dBuV/m)	Average Limit (dBuV/m)	Peak Limit (dBuV/m)	Average Margin (dB)	Peak Margin (dB)	Note
1210.2	H	155	174	35.9	47.8	54.0	74.0	18.1	26.2	EUT Side, High Sub Band DR3 125 kHz DR3 Hopping
1011.9	H	155	174	35.7	45.6	54.0	74.0	18.3	28.4	EUT Side, High Sub Band DR0 125 kHz DR0 Hopping
1098.1	H	155	174	35.9	45.4	54.0	74.0	18.1	28.6	EUT Side, High Channel, DR3, 125 kHz, DR3 Single
1221.6	H	155	174	36.2	45.0	54.0	74.0	17.8	29.0	EUT Side, High Channel, DR0, 125 kHz, Single

Frequency (GHz)	EUT Orientation	Antenna Polarity	Height (cm)	Azimuth (degree)	Average Reading (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Peak Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Note
2.707	Side	Horizontal	150	0	29.3	54.0	24.7	37.5	74.0	36.5	Low Channel
2.707	Flat	Horizontal	126	245	28.6	54.0	25.4	37.7	74.0	36.3	Low Channel

Frequency (GHz)	EUT Orientation	Antenna Polarity	Height (cm)	Azimuth (degree)	Average Reading (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Peak Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Note
5.414	Vertical	Horizontal	191	90	38.2	54.0	15.8	44.1	74.0	29.9	Low Channel 902.3 MHz
5.414	Vertical	Vertical	280	300	39.3	54.0	14.7	45.0	74.0	29.0	Low Channel 902.3 MHz
5.414	Side	Vertical	100	0	37.0	54.0	17.0	43.5	74.0	30.5	Low Channel 902.3 MHz
5.414	Side	Horizontal	301	70	40.1	54.0	13.9	45.2	74.0	28.8	Low Channel 902.3 MHz
5.414	Flat	Horizontal	100	240	38.6	54.0	15.4	44.3	74.0	29.7	Low Channel 902.3 MHz
5.414	Flat	Vertical	100	75	36.6	54.0	17.4	43.3	74.0	30.7	Low Channel 902.3 MHz
5.489	Side	Horizontal	300	70	40.7	54.0	13.3	45.8	74.0	28.2	High Channel 914.9 MHz
5.452	Side	Horizontal	300	70	41.7	54.0	12.3	46.1	74.0	27.9	Mid Channel 908.7 MHz

DR0

Duty Cycle Calculation			
Observation Period (ms)	On Time (ms)	Duty Cycle	Minimum Average VBW
585.9	46.2	8%	12.7

Data Table – Laird Rev_B1

Band Edges Below 1 GHz, Laird Rev_B1							
Frequency (MHz)	Antenna Polarity	Height (cm)	Azimuth (deg)	Data Rate	Quasi-Peak Reading (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
892.0	Horizontal	150	0	DR3, Hop	29.9	46.0	16.1
893.8	Horizontal	150	0	DR0, Hop	30.0	46.0	16.0
975.6	Vertical	160	100	DR3, Hop	28.3	54.0	25.7
981.6	Vertical	155	100	DR0, Hop	28.8	54.0	25.2

Laird Rev_B1											
Frequency (MHz)	Antenna Polarity	EUT Orientation	Height (cm)	Azimuth (degree)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Power Setting
2744.8	Horizontal	Vertical	320	0	52.8	54.0	1.2	54.0	74.0	20.0	12
2744.8	Vertical	Vertical	295	0	44.9	54.0	9.1	47.2	74.0	26.8	12
2744.8	Horizontal	Flat	292	172	53.3	54.0	0.7	54.5	74.0	19.5	12
2744.8	Vertical	Flat	110	138	44.9	54.0	9.1	47.5	74.0	26.5	12
2744.8	Vertical	Side	100	146	53.2	54.0	0.8	54.4	74.0	19.6	12
2744.8	Horizontal	Side	150	186	43.9	54.0	10.2	47.1	74.0	26.9	12

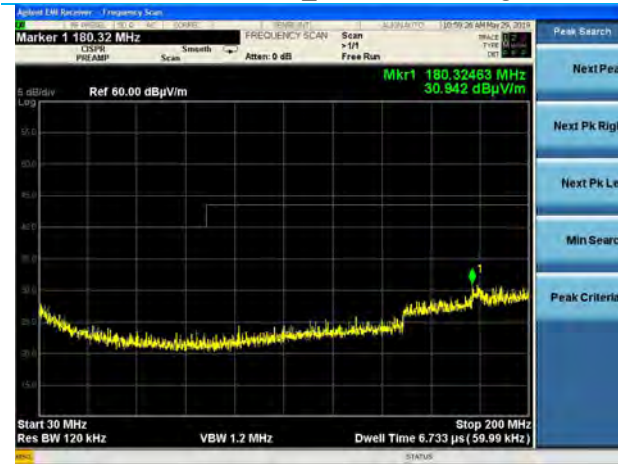
Plots



30-200 MHz, EUT Side, Low Chan, DR3, Horizontal Antenna, Laird Rev_B, Power Setting 18



30-200 MHz, EUT Side, Low Chan, DR3, Vertical Antenna, Laird Rev_B, Power Setting 18

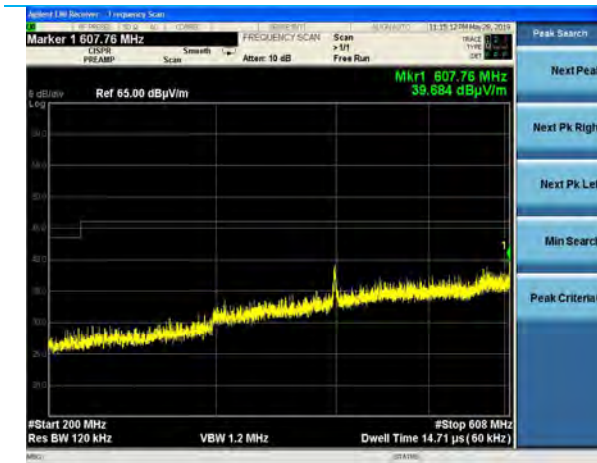


30-200 MHz, EUT Side, High Chan, DR0, Horizontal Antenna
Laird Rev_B, Power Setting 18

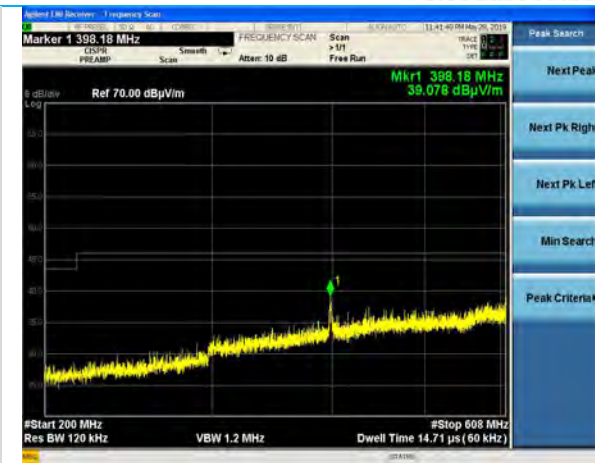


30-200 MHz, EUT Side, High Chan, DR0, Vertical Antenna, Laird Rev_B, Power Setting 18

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Job: C-3164		Serial: Engineering Sample



200-608 MHz, EUT Side, Low Chan, DR0,
Horizontal Antenna
Laird Rev_B, Power Setting 18



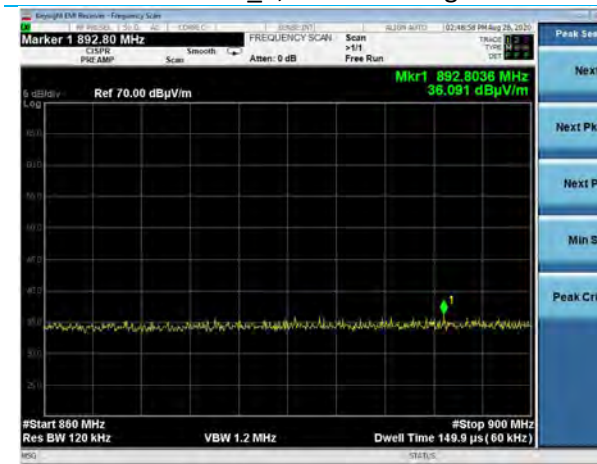
200-608 MHz, EUT Side, Hopping, DR0, Horizontal
Antenna, Laird Rev_B, Power Setting 18



608-614 MHz, EUT Side, Low Chan, DR3,
Horizontal Antenna
Laird Rev_B, Power Setting 18



608-614 MHz, EUT Side, Hopping, DR3, Horizontal
Antenna, Laird Rev_B, Power Setting 18



860-900 MHz, Horizontal Antenna
Hopping, DR3, EUT Flat
Laird Rev_B, Power Setting 18



860-900 MHz, Horizontal Antenna
Hopping, DR3, EUT Flat
Laird Rev_B1, Power Setting 12

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Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample



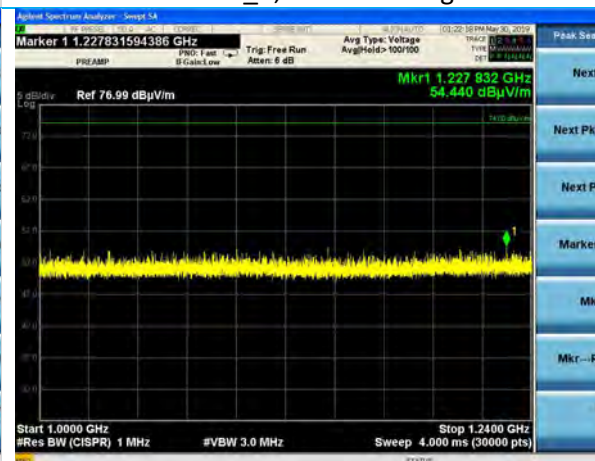
960-1000 MHz, EUT Side, High Chan, DRO,
Horizontal Antenna
Laird Rev_B, Power Setting 18



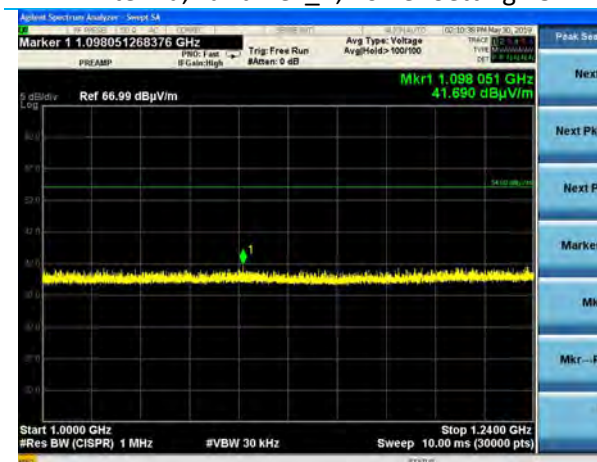
960-1000 MHz, EUT Side, Hopping, DRO,
Horizontal Antenna
Laird Rev_B, Power Setting 18



1000-1240 MHz, EUT Side, Hopping, DR3,
Horizontal Antenna, Average
Antenna, Laird Rev_B, Power Setting 18



1000-1240 MHz, EUT Side, Hopping, DR3,
Horizontal Antenna, Peak
Antenna, Laird Rev_B, Power Setting 18

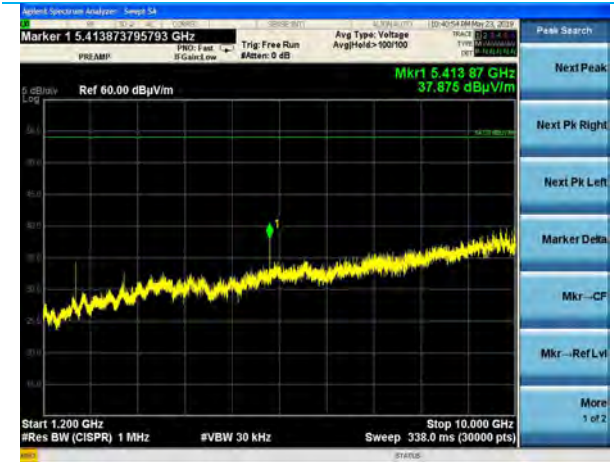


1000-1240 MHz, EUT Side, High Chan, DR3,
Horizontal Antenna, Average
Antenna, Laird Rev_B, Power Setting 18



1000-1240 MHz, EUT Side, High Chan, DR3,
Horizontal Antenna, Peak
Laird Rev_B, Power Setting 18

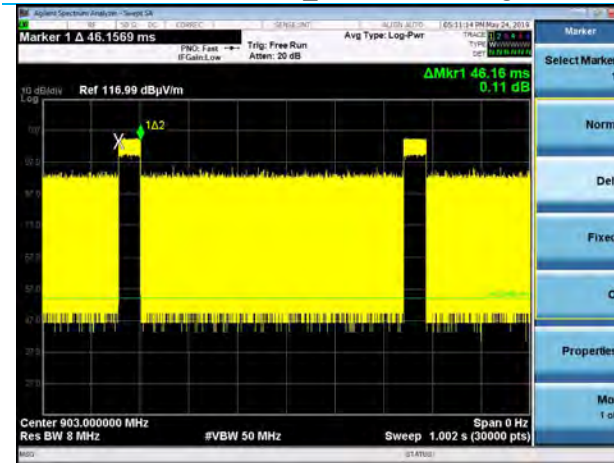
Company: Georgia Pacific	Page 41 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample



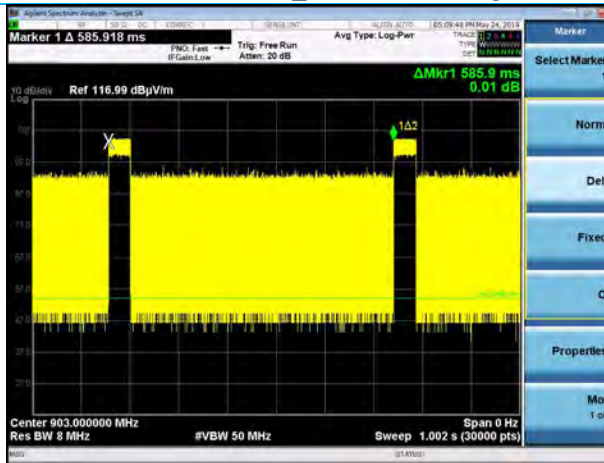
1.2-10 GHz, EUT Vert, Mid Chan, DR0, Vertical Antenna, Laird Rev_B, Power Setting 18



1.2-10 GHz, EUT Vert, Mid Chan, DR0, Horizontal Antenna, Laird Rev_B, Power Setting 18



Duty Cycle On Time



Duty Cycle Observation Period



1.2-10 GHz, EUT Vert, Mid Chan, DR3, Vertical Antenna, Laird Rev_B1, Power Setting 12

Company: Georgia Pacific	Page 42 of 43	Name: IoT LoRa Module
Report: TR 318246 A		Model: A-101129
Job: C-3164		Serial: Engineering Sample

6 REVISION HISTORY

Version	Date	Notes	Person
v0.3	8-9-2019	Initial Draft	Zach Wilson
v0.4	10-8-2019	Revised per internal review	Zach Wilson
v0.5	11-1-2019	General report revisions per internal review.	Zach Wilson
v1.0	11-6-2019	Revised per internal review	Zach Wilson
v1.1	11-26-2019	Added band edge plots	Zach Wilson
v2.0	8-19-2020	Added Rev_B1	Zach Wilson
v2.1	8-20-2020	Revisions following internal review	Zach Wilson

END OF REPORT