EMC Test Report

Project Number: **4302247 / 6221**

Report Number: **4302247EMC02** **Revision Level:** **0**

Client: **Trellis Inc.**

Equipment Under Test: **Wireless Central Base Station with Mercury Module**

Models: **Base Station rev 5**
Mercury Module rev B

FCC ID/ IC ID: **2AP6L-MERCURY**

Applicable Standards: **ANSI C63.10: 2013**
FCC Part 15 Subpart C, § 15.247
RSS-247, Issue 2
RSS-GEN, Issue 5

Report issued on: **31 December 2018**

Test Result: **Compliant**

Tested by: _____
Shawn McGuinness, EMC Engineering Leader for
Jerry Chen, Technical Manager

Reviewed by: _____
David Schramm, Operations Manager

Remarks: This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Table of Contents

1 SUMMARY OF TEST RESULTS 4
1.1 MODIFICATIONS REQUIRED FOR COMPLIANCE 4
2 GENERAL INFORMATION 5
2.1 CLIENT INFORMATION 5
2.2 TEST LABORATORY 5
2.3 GENERAL INFORMATION OF EUT 5
2.4 EUT CONNECTION BLOCK DIAGRAM 6
2.5 SYSTEM CONFIGURATIONS 6
2.6 CABLE LIST 6
3 OCCUPIED BANDWIDTH 7
3.1 TEST RESULT 7
3.2 TEST METHOD 7
3.3 TEST SITE 7
3.4 TEST EQUIPMENT 7
3.5 TEST DATA 7
4 PEAK OUTPUT POWER 9
4.1 TEST RESULT 9
4.2 TEST METHOD 9
4.3 TEST SITE 9
4.4 TEST EQUIPMENT 9
4.5 TEST DATA 9
5 POWER SPECTRAL DENSITY 12
5.1 TEST RESULT 12
6 CONDUCTED SPURIOUS EMISSIONS 13
6.1 TEST RESULT 13
6.2 TEST METHOD 13
6.3 TEST SITE 13
6.4 TEST EQUIPMENT 13
6.5 TEST DATA (BAND-EDGE) 14
6.6 TEST DATA (SPURIOUS EMISSIONS) 15
7 FIELD STRENGTH OF SPURIOUS RADIATION 16
7.1 TEST RESULT 16
7.2 TEST METHOD 16
7.3 TEST SITE 17
7.4 TEST EQUIPMENT 17
7.5 TEST DATA – PEAK DATA 18
8 PSEUDO-RANDOM HOP SEQUENCE 26
8.1 TEST RESULT 26
8.2 TEST METHOD 26
9 CHANNEL SEPARATION 27
9.1 TEST RESULT 27
9.2 TEST METHOD 27
9.3 TEST SITE 27
9.4 TEST EQUIPMENT 27
9.5 TEST DATA 28

10 NUMBER OF HOPPING CHANNELS 29

10.1 TEST RESULT 29
10.2 TEST METHOD 29
10.3 TEST SITE 29
10.4 TEST EQUIPMENT 29
10.5 TEST DATA 30

11 DWELL TIME 31

11.1 TEST RESULT 31
11.2 TEST METHOD 31
11.3 TEST SITE 31
11.4 TEST EQUIPMENT 31
11.5 TEST DATA 32

12 REVISION HISTORY 33

1 Summary of Test Results

Test Description	Test Specification	Test Result
Occupied Bandwidth	15.247(a) (1) RSS-GEN 6.6 / RSS-247 5.1 b	Compliant
Peak Power Output	15.247(a) (1) RSS-247 5.1 b / 5.4 a	Compliant
Power Spectral Density	15.247(f) RSS-247 5.2 b	NA (1)
Conducted Spurious Emissions	15.247(d) RSS-247 5.5	Compliant
Radiated Spurious Emissions in / out the restricted bands	15.247(d), 15.35(b),15.205, 15.209 RSS-GEN 8.9/ RSS-247 5.5	Compliant
Dwell time	15.247(f) RSS-247 5.1 c	Compliant
Number of Hopping Frequencies	15.247(a)(1)(i) RSS-247 5.1 c	Compliant
Channel separation	15.247(a)(1)	Compliant
AC Power Line Conducted Emission	15.107, 15.207 & RSS-GEN 8.8	N/A (2)
Antenna Requirement	15.203	Compliant

(1) Not Applicable – The device is FHSS device, not DTS device.
(2) Not Applicable – The device is powered via battery.

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	Trellis Inc.
Address:	147 Technology Parkway, Suite 100,
City, State, Zip, Country:	Peachtree Corners, GA 30092, USA

2.2 *Test Laboratory*

Name:	SGS North America, Inc.
Address:	620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country:	Suwanee, GA 30024, USA

2.3 *General Information of EUT*

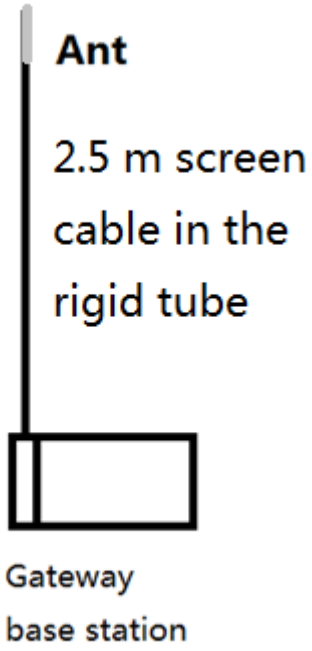
EUT:	Wireless Gateway Base Station Sensor with Mercury Module
Model Number:	Base Station rev 3.5 Mercury Module rev B
Serial Number:	636 (Base Station)
Frequency Range:	902.5 to 927.5 MHz
Number of channels:	15.247 device employing 51 channels
Modulation type:	LoRa
Channel spacing:	500 kHz
Antenna:	Internal fixed, 2dBi
Rated and Tested Voltage:	3.7Vdc
Sample Received Date:	May 04, 2018
Dates of testing:	May 7~11, 2018

Operating Modes and Conditions

The EUT was configured to operate in the following modes:

1. Continuously hopping through low, mid and high channels
2. Hopping through all channels

2.4 *EUT Connection Block Diagram*



2.5 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Serial Number
1	**Trellis Inc.**	**Central Base Station**	**Base Station rev 3.5 w/ Mercury Module rev B**	**636**

2.6 *Cable List*

None

3 Occupied Bandwidth

3.1 *Test Result*

Test Description	Basic Standards	Test Result
Bandwidth	15.247(a) (1) RSS-GEN 6.6 / RSS-247 5.1 b	Compliant

3.2 *Test Method*

The procedures from ANSI C63.10 Clause 6.9.2 and 6.9.3 were used to determine the 20 dB and 99% bandwidths.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range shall be between 2 to 5 times the OBW.
b) RBW shall be in the range of 1% to 5% of the OBW and VBW shall be approximately 3 x RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Steps a) through c) might require iteration to adjust within the specified tolerances.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.4 %

3.4 *Test Equipment*

Test End Date: 7-May-2018 Tester: JC

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

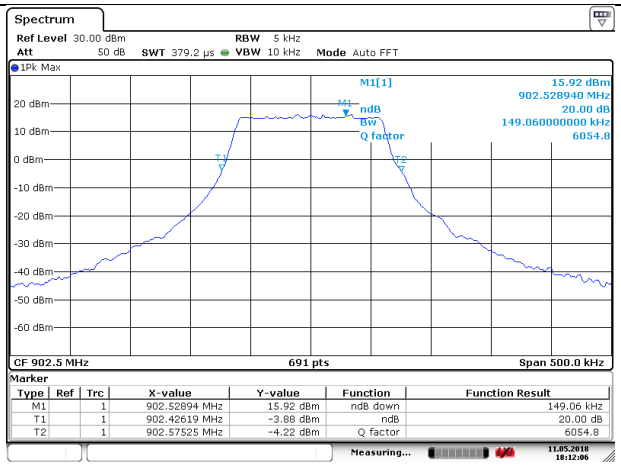
Note: The equipment calibration period is 1 year.

3.5 *Test Data*

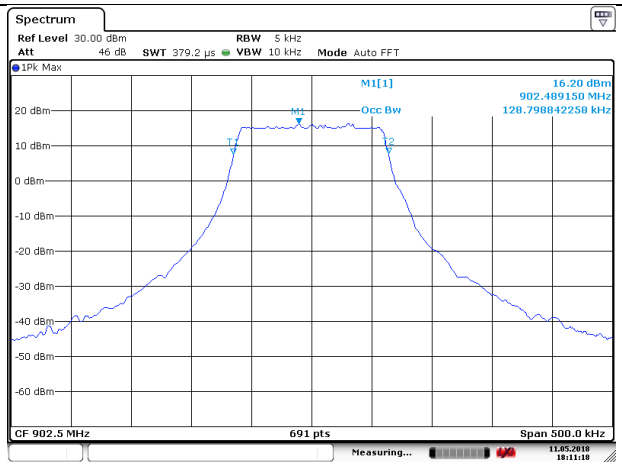
Frequency (MHz)	20 dB bandwidth (kHz)	99% OBW (kHz)
902.5	149.06	128.80
915.0	148.34	128.80
927.5	148.34	128.80

Representative Plot

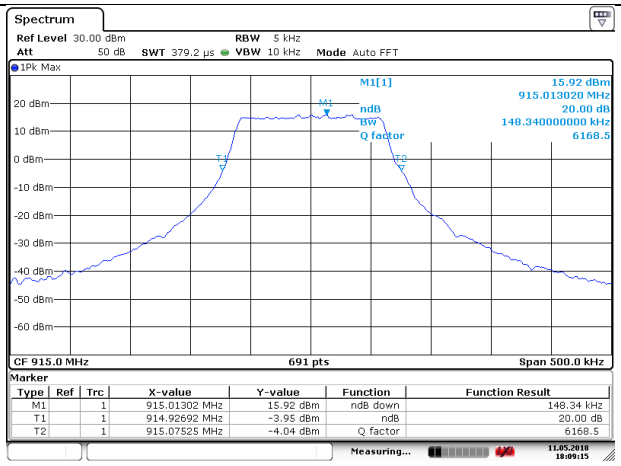
20dB BW



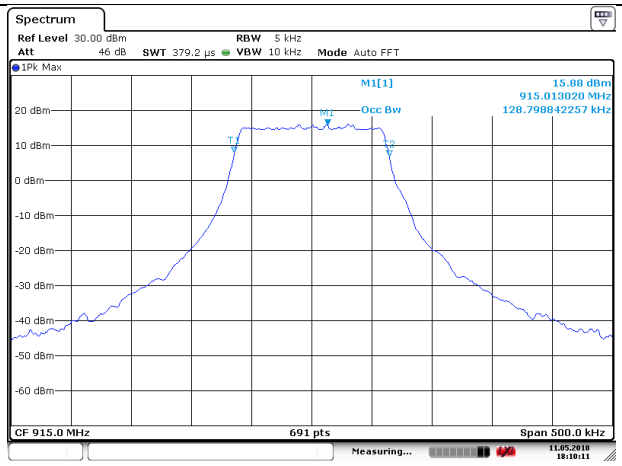
99% OBW



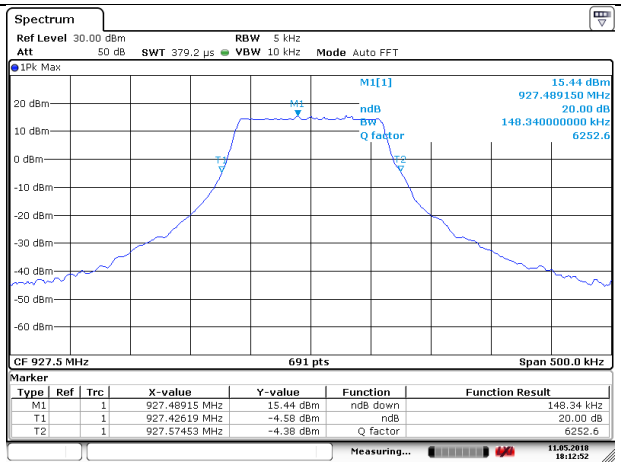
Low Channel



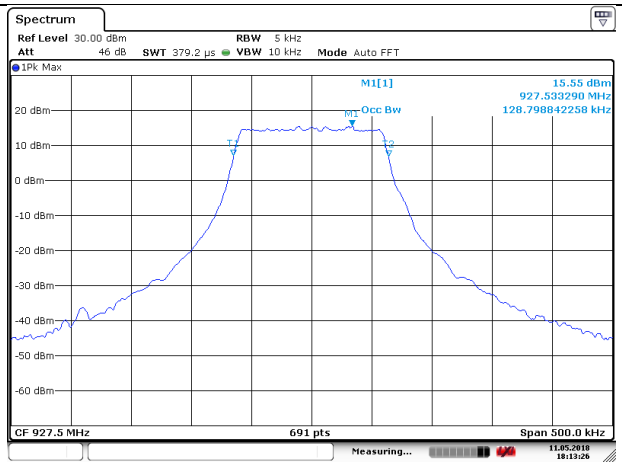
Low Channel



Middle Channel



Middle Channel



High Channel

High Channel

4 Peak Output Power

4.1 *Test Result*

Test Description	Test Specification	Test Result
Peak Output Power	15.247(a) (1) RSS-247 5.1 b / 5.4 a	Compliant

4.2 *Test Method*

Measurements were recorded using the test methods defined in ANS C63.10, Clause 7.8.5.
a) Use the following spectrum analyzer settings:
   1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
   2) RBW > 20 dB bandwidth of the emission being measured.
   3) VBW ⩾ RBW.
   4) Sweep: Auto.
   5) Detector function: Peak.
   6) Trace: Max hold.
b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
e) A plot of the test results and setup description shall be included in the test report.

Limit
For hybrid DTS / frequency hopping systems operating in the 902-928 MHz band: 1 watt.

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.5 %

4.4 *Test Equipment*

Test End Date: 7-May-2018 Tester: JC

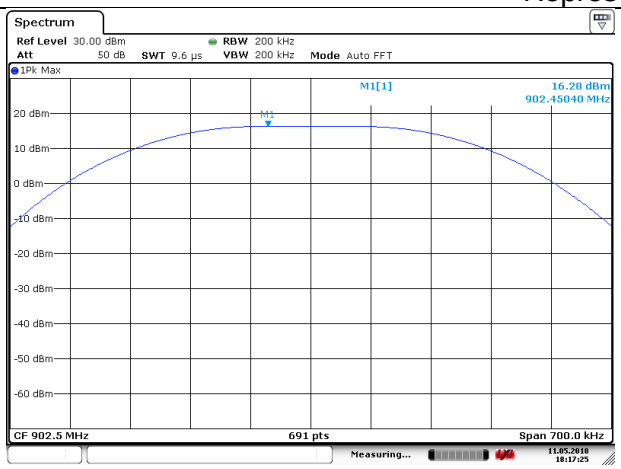
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

Note: The equipment calibration period is 1 year.

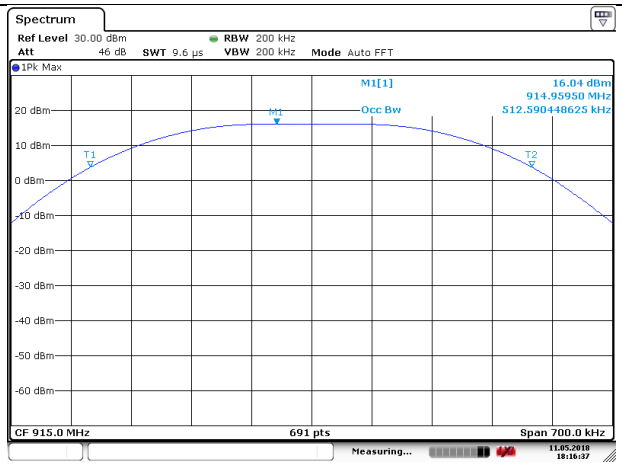
4.5 *Test Data*

Frequency	Peak Output Power (dBm)	Peak Output Power (W)	Output Power limit (W)
902.5	16.28	0.042	1
915.0	16.04	0.040	1
927.5	15.88	0.039	1

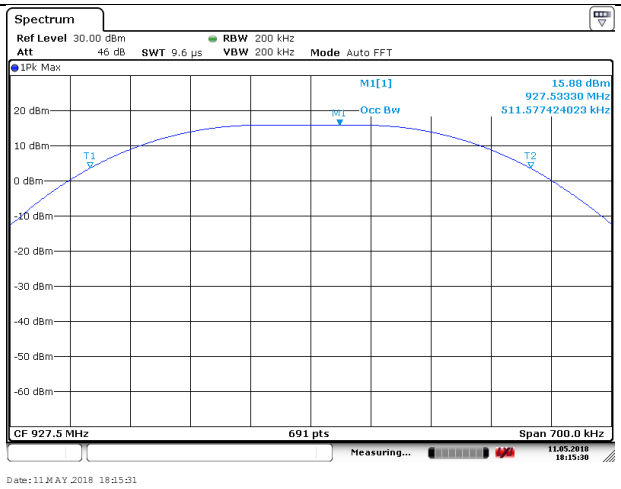
Representative Plot



Low Channel

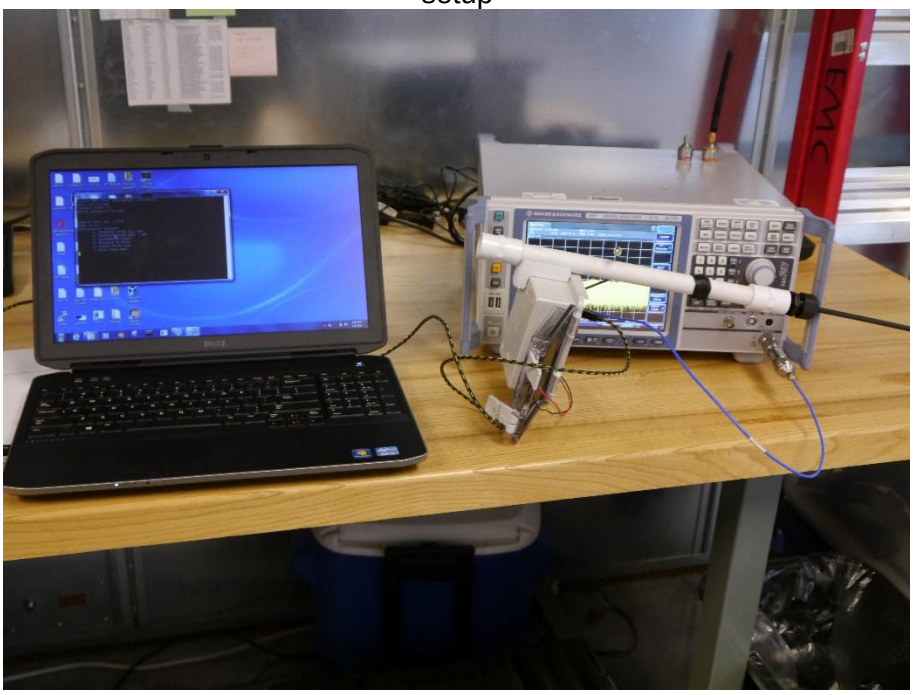


Middle Channel



High Channel

setup



5 Power Spectral Density

5.1 *Test Result*

Test Description	Test Specification	Test Result
Power Spectral Density	15.247(f) & RSS-247 5.2 b	Not applicable

6 Conducted Spurious Emissions

6.1 *Test Result*

Test Description	Test Specification	Test Result
Conducted Spurious Emissions	15.247(d) & RSS-247 5.5	Compliant

6.2 *Test Method*

Measurements were recorded using the test methods defined in ANS C63.10, Clause 7.8.8.
The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

The limit is 20 dB below the measured peak power.

6.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.5 %

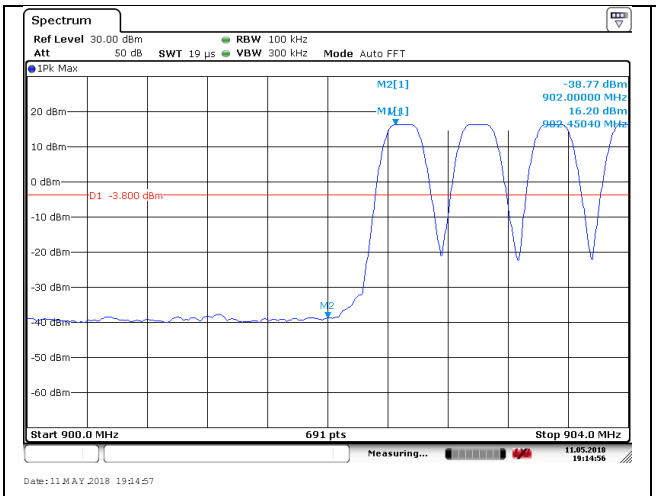
6.4 *Test Equipment*

Test End Date: 7-May-2018 Tester: JC

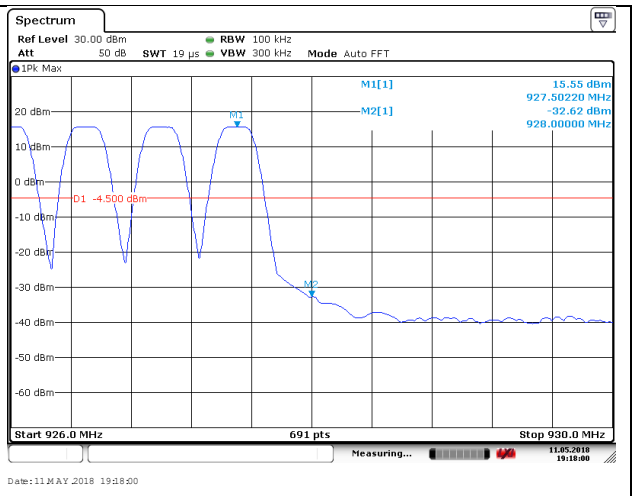
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

Note: The equipment calibration period is 1 year.

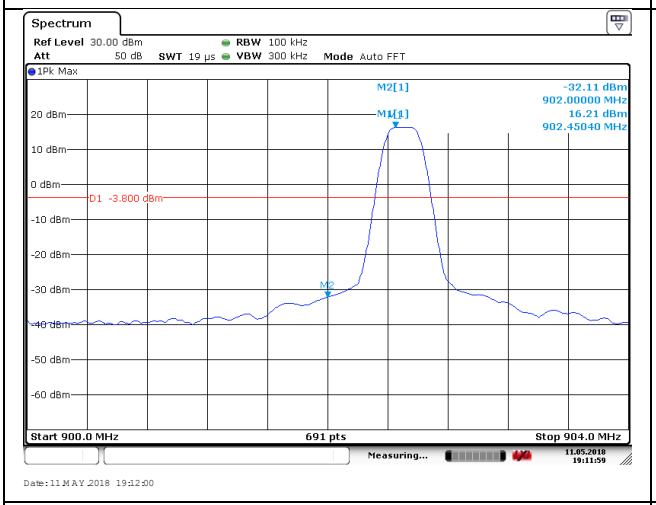
6.5 *Test Data (Band-Edge)*



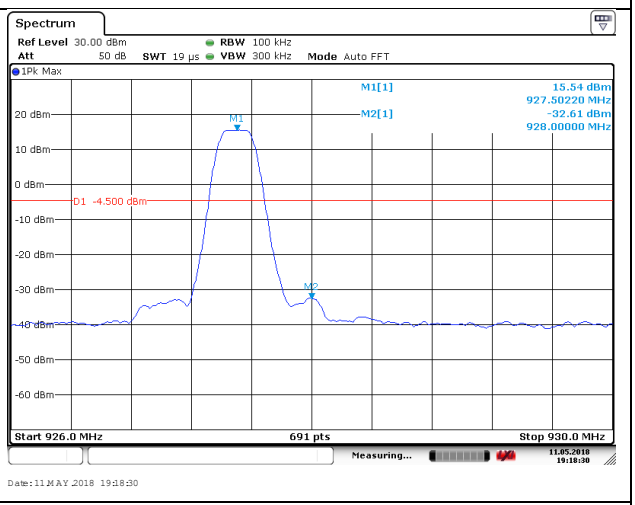
Hopping mode_Low channel



Hopping mode_High channel



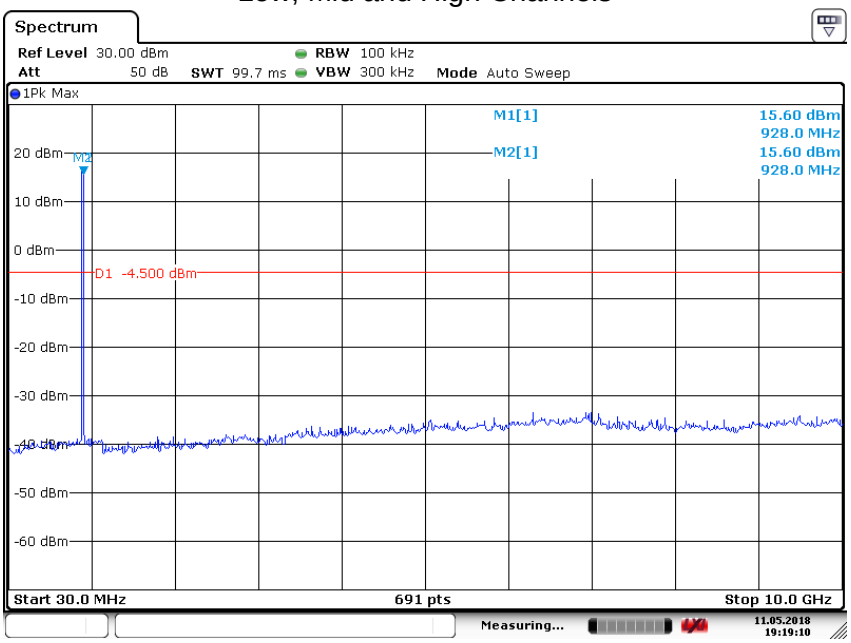
Non-hopping mode_Low channel



Non-hopping mode_High channel

6.6 *Test Data (Spurious Emissions)*

Low, Mid and High Channels



Date:11.MAY.2018 19:19:10

No data is shown as the level is same as background noise except the intentional transmission.

7 Field Strength of Spurious Radiation

7.1 *Test Result*

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247(d), 15.35(b),15.205, 15.209 & RSS-GEN 8.9/ RSS-247 5.5	Compliant

7.2 *Test Method*

Radiated spurious emissions measurements were recorded with the device configured to transmit at the lowest, middle, and highest channels. The frequency range investigated was up through the 10th harmonic of the fundamental transmit frequency. The methods defined in ANSI C63.10: 2013 were used.

For measurements below 1GHz, the device was manipulated through three orthogonal axes. Above 1GHz, the alternative method in Clause 6.6.5 was used.

Test distance:

30 MHz to 1 GHz - The EUT to measurement antenna distance is 3 meters
1 to 18 GHz - The EUT to measurement antenna distance is 3 meters
18 to 40 GHz - The EUT to measurement antenna distance is 1 meter

Frequency	Limits(1)		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 (2)	--
88 - 216 MHz	150	43.5 (2)	--
216 - 960 MHz	200	46 (2)	--
960 - 1000 MHz	500	54 (2)	--
1 - 40 GHz	500	54 (3)	74

(1) These limits are applicable to emissions within the restricted bands of operation defined in FCC §15.205.
(2) Quasi-peak limit
(3) Average limit

7.3 *Test Site*

3m/ 10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions
Temperature: 24.4 °C
Relative Humidity: 31.2 %

7.4 *Test Equipment*

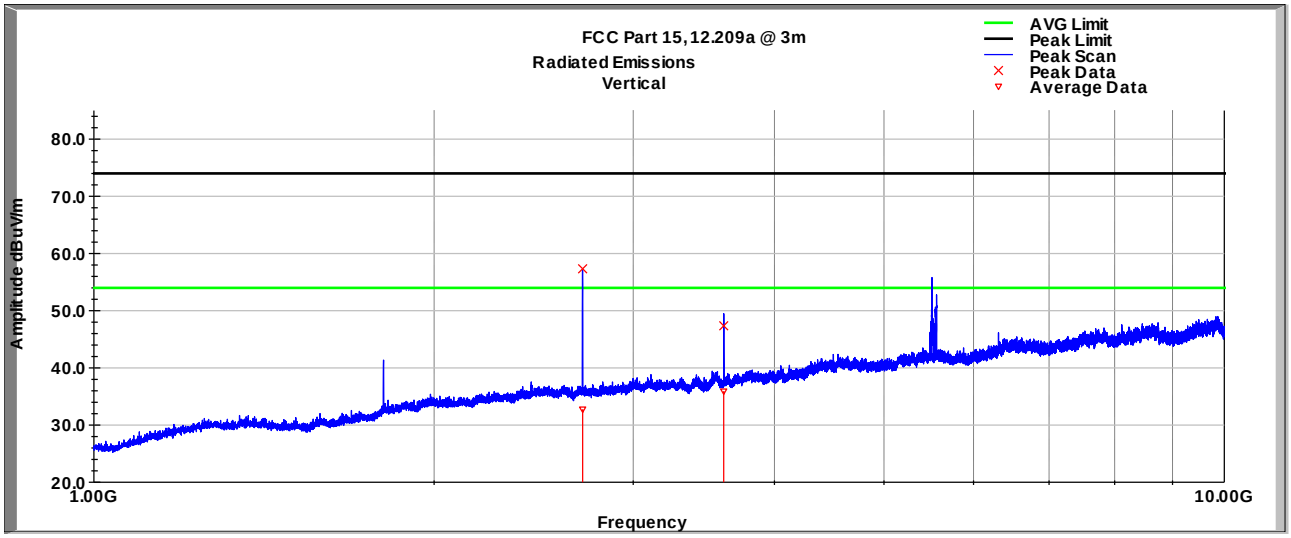
Test End Date: 9-May-2018 Tester: JC

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	29-Nov-2018
RF CABLE	SF106	HUBER & SUHNER	B079661	25-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079713	24-Jul-2018
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	25-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Jul-2018
RF CABLE	104PE	HUBER & SUHNER	B079793	24-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	31-May-2018
RF CABLE	SF106	HUBER & SUHNER	B079716	24-Jul-2018
FILTER, HIGH PASS (>1150MHZ)	HPM50108	MICRO-TRONICS	B079802	27-Jul-2018
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	16-May-2018
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2018
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2018
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2018

Note: The equipment calibration period is 1 year.

7.5 *Test Data – Peak Data*

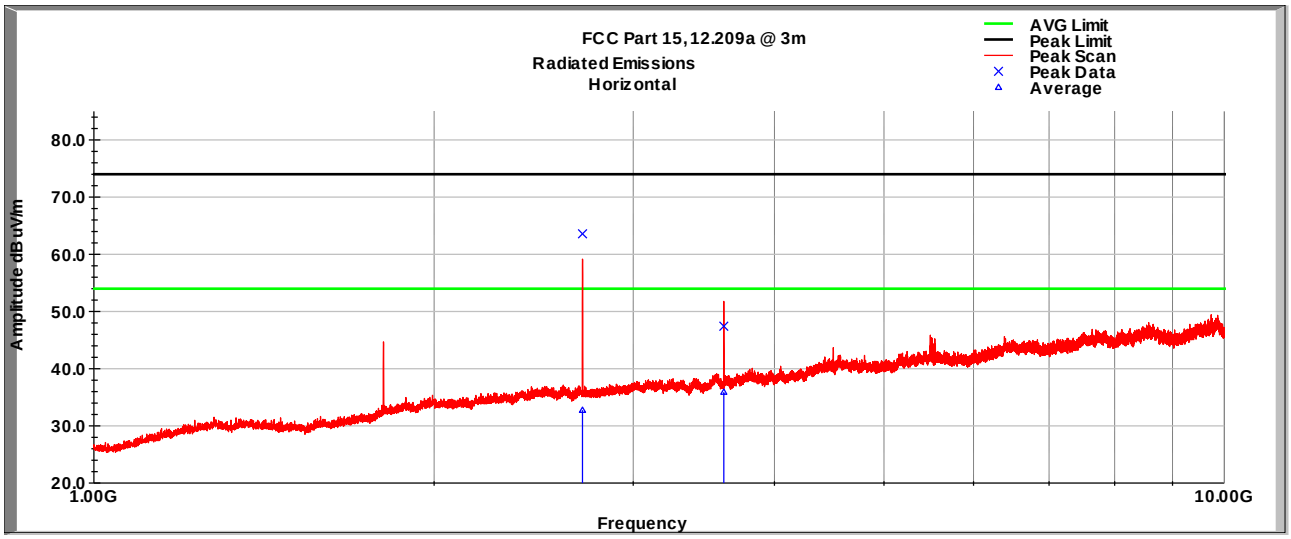
Low Channel, Vertical



Radiated Emissions 1-18 GHz
Top 10 Vertical - Average
Operator: Operator Info:: Trellis / Sensor-Gatew ay

Frequency MHz	Raw Avg (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
2706.10	28.2	V	19.0	203.0	32.4	5.7	33.8	32.7	54.0	-21.2
3607.90	29.8	V	25.0	100.0	33.1	6.7	33.9	35.9	54.0	-18.1
= Level + AF + CL - Amp										
ı = Avg Value - Limit										

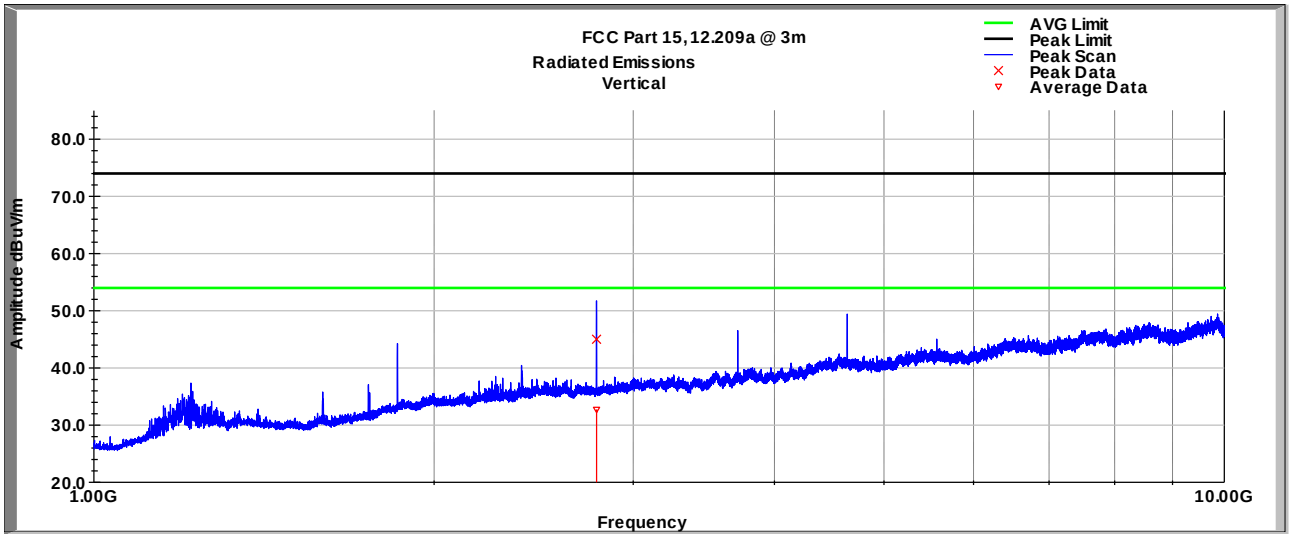
Low Channel, Horizontal



Radiated Emissions 30 MHz - 1 GHz
Top 10 Horizontal - Average
Operator: Operator Info:: Trellis / Sensor-Gateway

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	Avg Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2705.80	28.2	H	233.0	116.0	32.4	5.7	33.8	32.7	54.0	-21.2
3608.20	29.8	H	108.0	136.0	33.1	6.7	33.9	35.9	54.0	-18.1
= Level + AF + CL - Amp										
= Avg Value - Limit										

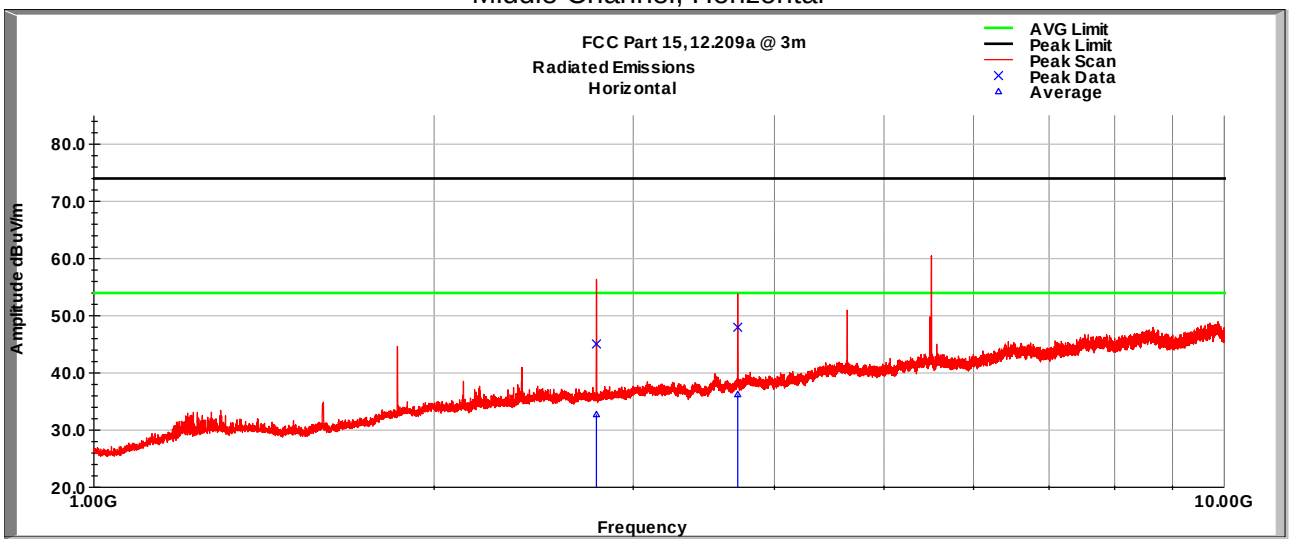
Middle Channel, Vertical



Radiated Emissions 1-18 GHz
Top 10 Vertical - Average
erator: Operator Info:: Trellis / Sensor-Gatew ay

Frequency	Raw Avg	Polarity	Azimuth	Height	AF	CL	Amp	Avg Value	Limit	Margin
MHz	(dBuV)	(V/H)	(degrees)	(cm)	(dB/m)	(dB)	(dB)	dBuV/m	(dBuV/m)	(dB)
2784.10	28.1	V	25.0	155.0	32.4	5.8	33.8	32.7	54.0	-21.2
= Level + AF + CL - Amp										
= Avg Value - Limit										

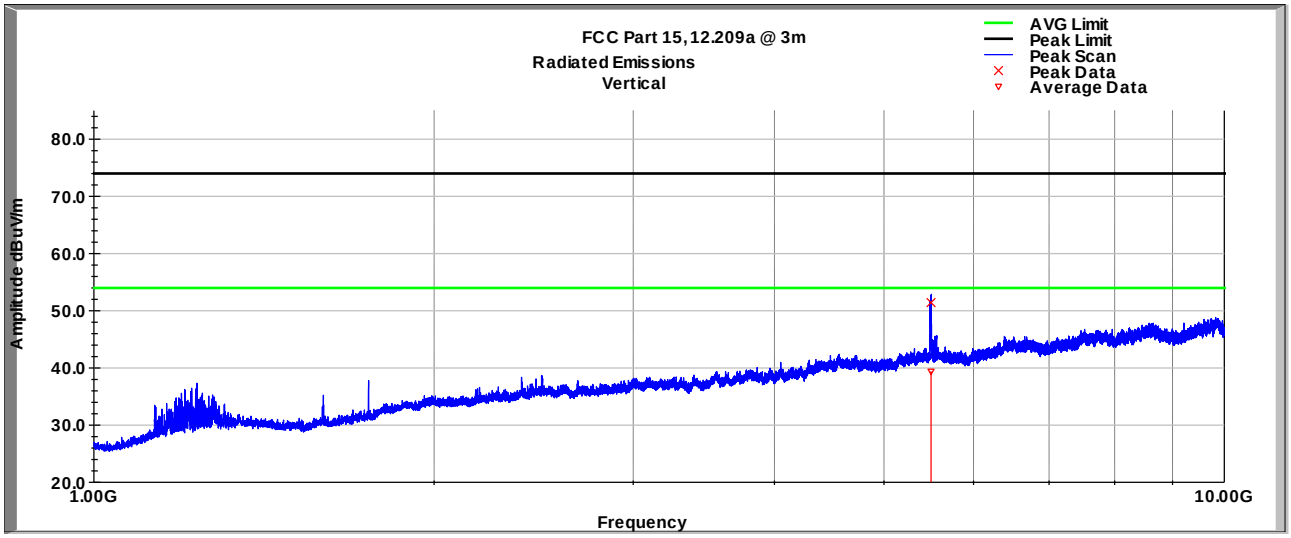
Middle Channel, Horizontal



Radiated Emissions 30 MHz - 1 GHz
Top 10 Horizontal - Average
Operator: Operator Info:: Trellis / Sensor-Gateway

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	Avg Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2783.80	28.1	H	241.0	100.0	32.4	5.8	33.8	32.7	54.0	-21.2
3712.30	29.7	H	151.0	100.0	33.3	6.8	33.9	36.2	54.0	-17.8
= Level + AF + CL - Amp										
n = Avg Value - Limit										

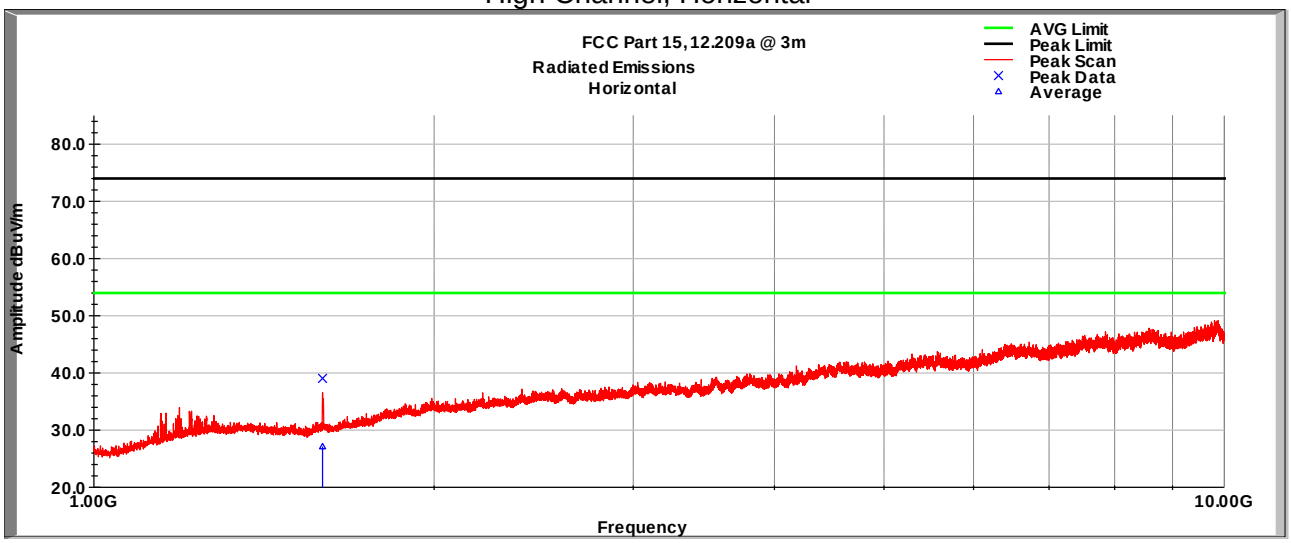
High Channel, Vertical



Radiated Emissions 1-18 GHz
Top 10 Vertical - Average
Operator: Operator Info:: Trellis / Sensor-Gateway

Frequency MHz	Raw Avg (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
5503.30	29.9	V	165.0	306.0	34.7	8.5	34.2	39.4	54.0	-14.6
= Level + AF + CL - Amp										
n = Avg Value - Limit										

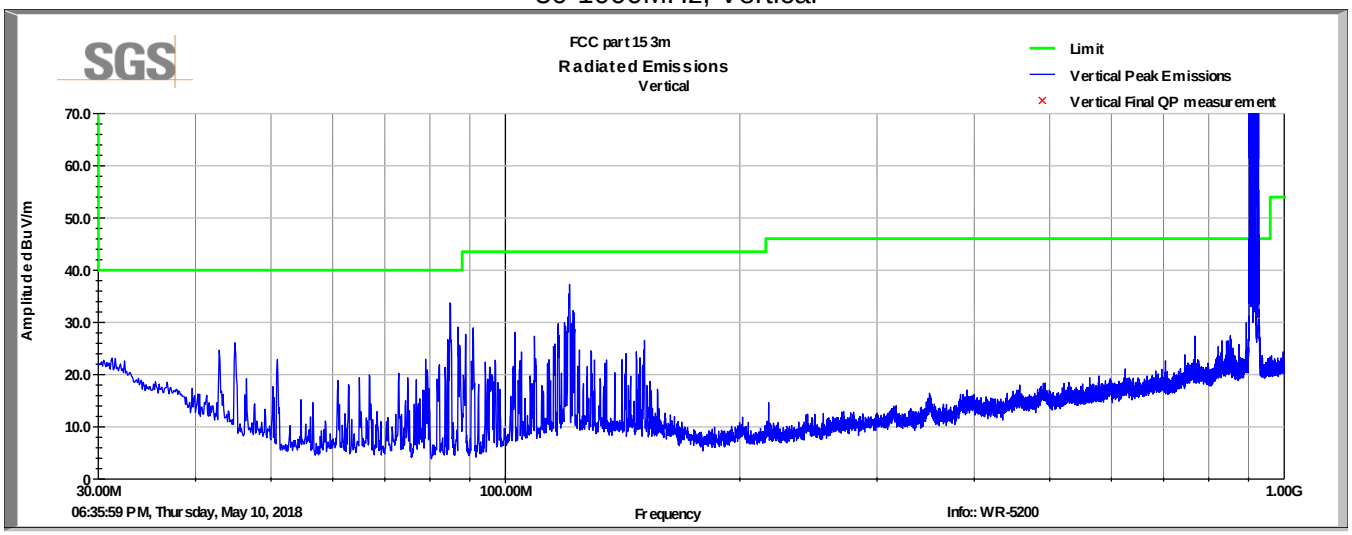
High Channel, Horizontal



Radiated Emissions 30 MHz - 1 GHz
Top 10 Horizontal - Average
Operator: Operator Info:: Trellis / Sensor-Gateway

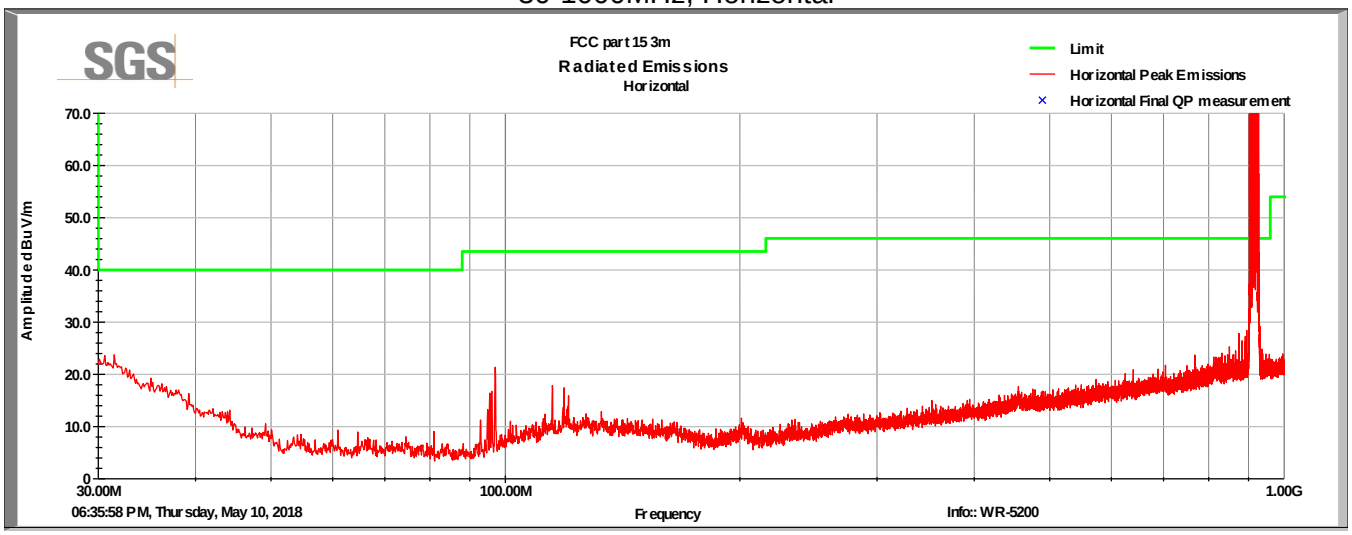
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	CL (dB)	Amp (dB)	Avg Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1593.40	27.9	H	301.0	134.0	28.4	4.2	33.6	27.1	54.0	-26.9
= Level + AF + CL - Amp										
n = Avg Value - Limit										

Low, Mid and High Channels
30-1000MHz, Vertical



Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
44.924	18.2	V	43	114	11.2	20.8	32.6	17.6	40.0	-22.4
84.904	24.3	V	135	132	7.8	24.9	33.0	24.0	40.0	-16.0
120.899	26.2	V	57	109	13.8	19.0	33.0	26.0	43.5	-17.5

Low, Mid and High Channels
30-1000MHz, Horizontal



Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
97.220	16.5	H	176	250	9.5	23.4	33.8	15.6	40.0	-24.4

8 Pseudo-Random Hop Sequence

8.1 *Test Result*

Test Description	Test Specification	Test Result
Pseudo-Random Hop Sequence	15.247(d)	Compliant(1)

Note (1): The theory of operation states that the device is LoRa and operates using a pseudo-random hopping technique.

8.2 *Test Method*

Compliance is demonstrated by Manufacturer's declaration or is stated in the Theory of Operation.

Requirement

The hop-set shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hop-set, while the long-term distribution appears evenly distributed.

9 Channel Separation

9.1 *Test Result*

Test Description	Test Specification	Test Result
Channel Separation	15.247(a)(1)	Compliant

9.2 *Test Method*

Measurements were recorded using the test methods defined in ANSI C63.10, Clause 7.8.2.
Use the following spectrum analyzer settings:
a) Span: Wide enough to capture the peaks of two adjacent channels.
b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c) Video (or average) bandwidth (VBW) ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.

Requirement
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the -20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

9.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.5 %

9.4 *Test Equipment*

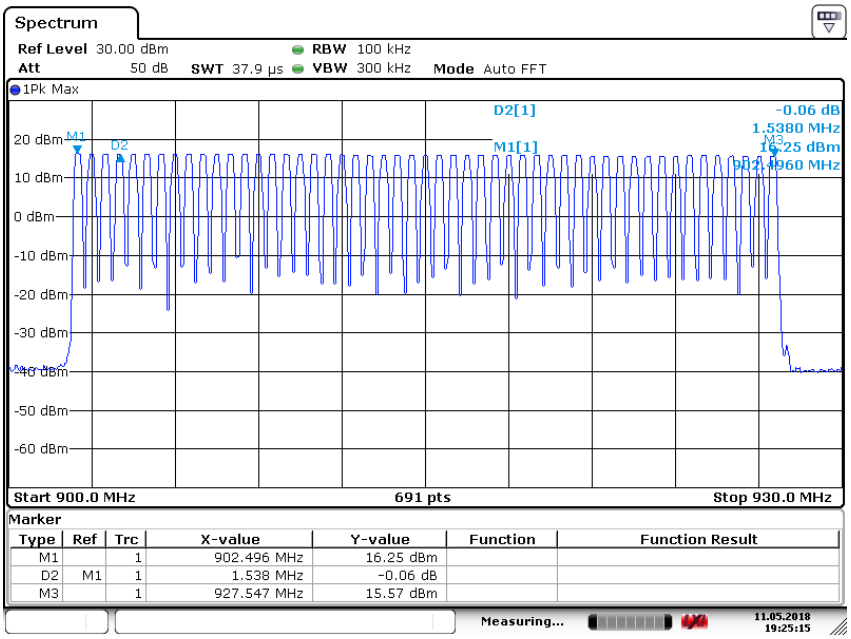
Test End Date: 7-May-2018 Tester: JC

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

Note: The equipment calibration period is 1 year.

9.5 *Test Data*

The minimum channel separation was 500kHz which is greater than the worst-case 20dB bandwidth of 0.149 MHz. Disregard Plot Markers.



10 Number of Hopping Channels

10.1 *Test Result*

Test Description	Test Specification	Test Result
Number of Hopping Channels	15.247(a)(1)(i) RSS-247 5.1 c	Compliant

10.2 *Test Method*

Measurements were recorded using the methods defined in ANSI C63.10, Clause 7.8.3.
Use the following spectrum analyzer settings:

a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
c) VBW ≥ RBW.
d) Sweep: Auto.
e) Detector function: Peak.
f) Trace: Max hold.
g) Allow the trace to stabilize.

<u>Requirement</u>

✓ For frequency hopping systems operating in the 902-928 MHz band:
if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;

x if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

10.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.5 %

10.4 *Test Equipment*

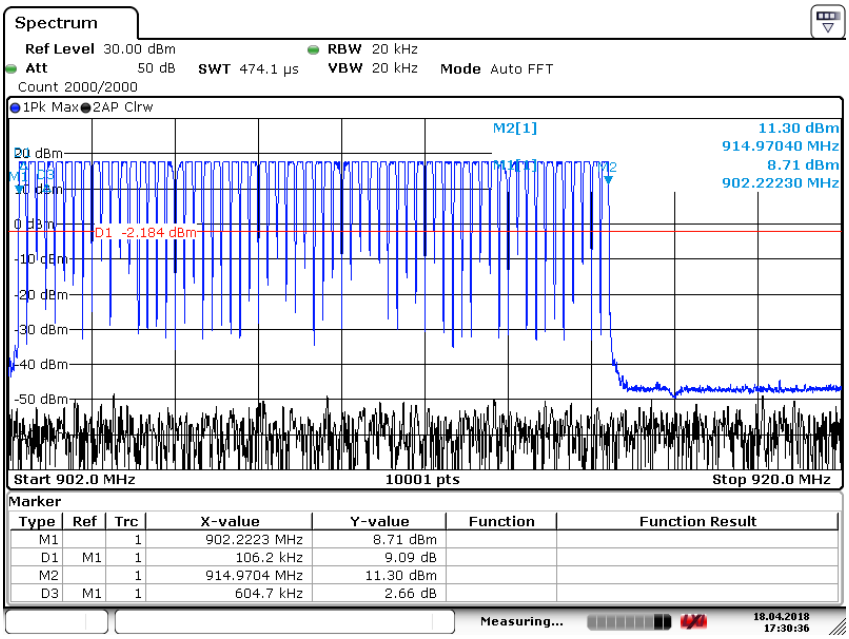
Test End Date: 7-May-2018 Tester: JC

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

Note: The equipment calibration period is 1 year.

10.5 *Test Data*

The LoRa device is employing 51 hopping frequencies > 50 hopping.



11 Dwell Time

11.1 *Test Result*

Test Description	Test Specification	Test Result
Dwell Time	15.247(f) RSS-247 5.1 c	Compliant

11.2 *Test Method*

Measurements were recorded using the methods defined in ANSI C63.10, Clause 7.8.4.
Setting the spectrum analyzer to the following:
a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / *T*, where *T* is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.

<u>Requirement</u>

✓ For frequency hopping systems operating in the 902-928 MHz band:
if the 20dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;

x if the 20dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

11.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.6 °C
Relative Humidity: 44.5 %

11.4 *Test Equipment*

Test End Date: 7-May-2018 Tester: JC

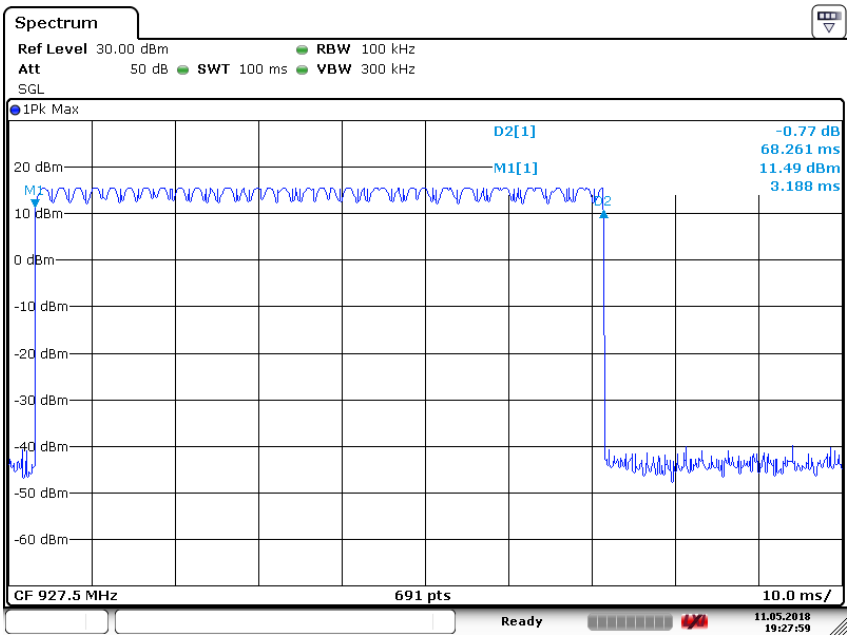
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Signal Analyzer	FSV30	Rohde & Schwarz	S/N:103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2018

Note: The equipment calibration period is 1 year.

11.5 *Test Data*

As per manufacturer declaration， the interver between two pulse will be set to about 2 hours

Pulse Width = 0.068 s < 0.4s



12 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	31 August 2018
1	Revised address	31 December 2018