



REPORT

For

EOS Innovation Ltd.

1673 Grant Rd.
Duncan, British Columbia
V9L 5N7, Canada

Date: 13 December 2017
Report No.: 16440-1E
Revision No.: 3
Project No.: 16440
Model #: RS31501
FCC ID: 2AM42-RS31501
IC ID.: 23010-RS31501




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TEST REPORT_FCC 15.231 & RSS-210	
Periodic operation in the band 40.66-40.70 MHz and above 70 MHz / License-Exempt Radio Apparatus: Category I Equipment	
Report Reference No.	16440-1E
Report Revision History.	✓ Rev. 1: 17 November 2017 ✓ Rev. 2: 27 November 2017, removed some photos. ✓ Rev. 3: 13 December 2017, Revised Field strength and Spurious as Peak and AVG level.
Compiled by (+ signature)	Jeremy Lee 
Approved by (+ signature)	David Johanson 
Date of issue	13 December 2017
Total number of pages	36
FCC Site Registration No.:	CA5970
IC Site Registration No.:	5970A
Testing Laboratory	LabTest Certification Inc.
Address	3128 – 20800 Westminster Hwy, Richmond, B.C. V6V2W3
Applicant's name	Eos Innovation Ltd.
Address	1673 Grant Rd. Duncan, B.C. V9L 5N7 Canada
Manufacturer's Name	Same as Applicant
Address	Same as Applicant
Test specification:	
Standards	FCC15.231:2017 / RSS-210, Issue 9, August 2016
Test procedure	➤ ANSI C63.10:2013 ➤ ANSI C63.4:2014 ➤ RSS-Gen, Issue 4, November 2014
Non-standard test method	N/A
Test Report Form(s) Originator	Jeremy Lee
Master TRF	1036_Rev2 – RF Report Template
Test item description :	
Trade Mark	
Model/Type reference	RS31501

Serial Number	n/p
FCC ID	2AM42-RS31501
IC ID	23010-RS31501
Possible test case verdicts:	
- test case does not apply to the test object.....	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing:	
Date of receipt of test item	14 November 2017
Date (s) of performance of tests.....	14 to 17 November 2017 & 07 December 2017

Device Under Test Description

Application for	Handheld Remote Control
Operating Transmit Frequency	315MHz
Operating Receive Frequency	n/a
Equipment mobility	Yes
Operating condition.....	- to + °C
Mass of equipment	86 grams (3 oz)
Dimension of equipment	6.58" X 1.45" X 0.41"
Enclosure Material	Anodized Aluminium
Color	Black, Silver, Gold
Display Type	E-Paper (Daylight Readable)
Nominal Voltages for:	<input checked="" type="checkbox"/> stand-alone equipment <input type="checkbox"/> combined (or host) equipment
If DC Power:	<input type="checkbox"/> Internal Power Supply <input checked="" type="checkbox"/> Battery <ul style="list-style-type: none"> <input type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Alkaline <input type="checkbox"/> Nickel-Metal Hydride <input checked="" type="checkbox"/> Lithium Polymer, 3.7Volts, 320mah X 2, rechargeable via microUSB <input type="checkbox"/> Other

Program details

Testing procedure and testing location:		
<input checked="" type="checkbox"/>	Testing Laboratory:	LabTest Certification Inc.
Testing location/ address.....:		3128-20800 Westminster HWY, Richmond, B.C. V6V 2W3 Canada

Summary of testing:	
Tests performed (name of test and test clause): Radiated Field strength and Emissions AC Power Line Conducted Emissions	Testing location: In SAC, Richmond In SAC, Richmond
<p>The tests indicated in Test Summary were performed on the product constructed as described below. The test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.</p> <p>Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. LabTest does not make any claims of compliance for samples or variants which were not tested.</p>	

Description of Equipment Under Test and Variant Models

Description: The EUT, RS31501 is a hand held remote control intended for use with GAS fireplaces equipped with controls manufactured by SIT Controls. It emulates the language used by these controls and offers a more aesthetically pleasing package. While offering features that are not found on the current sit remote control.
Variant Models: The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Labtest does not make any claims of compliance for samples or variants which were not tested.
None

EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description
0.032768	X1	9.84375	X3
8	X2		

Client Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Remote Control	Eos Innovation	RS31501	
SIM	USB Wall Adapter	Apple	12W USB Power Adapter	
Abbreviations: EUT - Equipment Under Test, SIM - Simulator (Not Subjected to Test)				

Software and Firmware

Use*	Description	Version
EUT	Firmware	-
EUT	Board	DH001 Rev 03
Abbreviations: EUT - Equipment Under Test,		

Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	microUSB	DC	No	No	5.0 VDC In.
*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical					

Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
0	5	-	-	DC		

EUT Operation Modes

Mode #	Description
1	Keep turning on "ON_PACKET" every one second with fully charged Batteries.
2	Charging on Batteries via USB Power Adapter.

EUT Configuration Modes

Mode #	Description
1	Orthogonal X

	Faced up the Button Side and head to antenna of the top side.
2	Orthogonal Y Faced up the Left side and head to antenna of the Button side.
3	Orthogonal Z Faced up the Top side and head to antenna of the Button side.
4	The EUT was set on table as Orthogonal X and connected an USB Power Adapter to supply 5 VDC via micro USB connector.

Test Equipment Verified for function

Model #	Description	Checked Function	Results
N9038A	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_signal and checked OK.
JB1	Antenna, 30 to 2000MHz	Checked structure	Normal – no damage.
SAS-510-2	Antenna, 300 to 1000MHz	Checked structure	Normal – no damage.
SAS-571	Antenna, 1 to 18GHz	Checked structure	Normal – no damage.
AL-130	Antenna, 9kHz to 30MHz	Checked structure	Normal – no damage.

Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests:

Parameter	Uncertainty
Radiated Emission, 30 to 6,000MHz	± 4.95 dB
Conducted Measurements, 0.15 to 30MHz	± 3.50 dB

Uncertainty figures are valid to a confidence level of 95%.

Result Summary

The Compliance Status is a judgment based on the direct measurements and calculated highest emissions to appropriate standard limits. Measurement uncertainty values, provided on calibration certificates, were not be used in the judgment of the final status of compliance.

FCC Part 15.231 and IC RSS-210			
Test Type	Regulation	Measurement Method	Result
Antenna Requirement	15.203 & RSS-Gen	-	PASS
AC Power Line Conducted Emissions	15.207(a) & RSS-Gen	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.2	PASS
Summary of the operation of RF Transmission	15.231(a) & RSS-210, Annex A.1.1	-	PASS
Field Strengths	15.231(b) & RSS-210, Annex A.1.2	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	PASS
Spurious Emissions (Unwanted Emissions)	15.231(b), 15.205, 15.209 & RSS-210, Annex A.1.2	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	PASS
Radiated Emissions for Digital Parts & Receiver	FCC 15.109(a), Class(B) & ICES-003	ANSI C63.4:2014	PASS
The Bandwidth of the emission	15.231(c) & RSS-210, Annex A.1.3	ANSI C63.10:2013, Clause 6.9	PASS

Antenna Requirement

Governing Doc	FCC 15.203 & RSS-GEN	Room Temperature (°C)	-
Basic Standard	-	Relative Humidity (%)	-
Test Location	Richmond	Barometric Pressure (kPa)	-
Test Engineer	Jeremy Lee	Date	14 November 2017
EUT Voltage	<input checked="" type="checkbox"/> LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE		
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>			

Results

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The EUT has fixed antenna, which accordance to the above sections, is considered sufficient to comply with the provisions of these sections.

AC Power Line Conducted Emissions

Governing Doc	FCC 15.207 & RSS-GEN	Room Temperature (°C)	22.7		
Basic Standard	ANSI C63.4	Relative Humidity (%)	43.0		
Test Location	Richmond	Barometric Pressure (kPa)	102.6		
Test Engineer	Jeremy Lee	Date	14 November 2017		
EUT Voltage	<input type="checkbox"/> Batteries, 4 X AA <input checked="" type="checkbox"/> 120VAC @ 60Hz				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMC Analyzer	KeySight	N9038A	702	18-Apr-2017	18-Apr-2018
LISN	Solar	8611-50-TS-10-N	377	01-Mar-2017	01-Mar-2018
LISN	Solar	8611-50-TS-10-N	378	01-Mar-2017	01-Mar-2018
EMC Shielded Enclosure	USC	USC-26	374	NCR	NCR
AC Power Source	California Instruments	5001i	059	NCR	NCR
Note) NCR = No Calibration Required					
Frequency Range:	<input checked="" type="checkbox"/> 150kHz-30MHz <input type="checkbox"/> 9-150kHz				
Detector:	<input checked="" type="checkbox"/> Peak <input type="checkbox"/> Quasi-Peak <input type="checkbox"/> Averaging				
RBW/VBW:	<input checked="" type="checkbox"/> 9/30kHz <input type="checkbox"/> 200/300Hz				
Coupling device:	<input checked="" type="checkbox"/> LISN <input type="checkbox"/> ISN <input type="checkbox"/> Current Probe <input type="checkbox"/> CVP				
Arrangement of EUT:	<input checked="" type="checkbox"/> Table-top only <input type="checkbox"/> Floor-standing only <input type="checkbox"/> Rack Mounted				
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>					

Test Method

This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (EUT) was configured based upon the requirements of the applicable test standard. Initially a scan was made with an EMC Analyzer, controlled by EMC Test Software, Tile7!, from 150 kHz to 30 MHz on each phase with the receiver in the peak mode. The measuring bandwidth was set up 9 kHz. Measurements were then made using CISPR16-1 quasi peak and averaging detectors when the peak readings were within 10dB of the Quasi-peak limit line.

Test Result

Conducted Emission (dBuV) = Measured Emission (dBuV) + Cable Loss(dB)+LISN(dB)

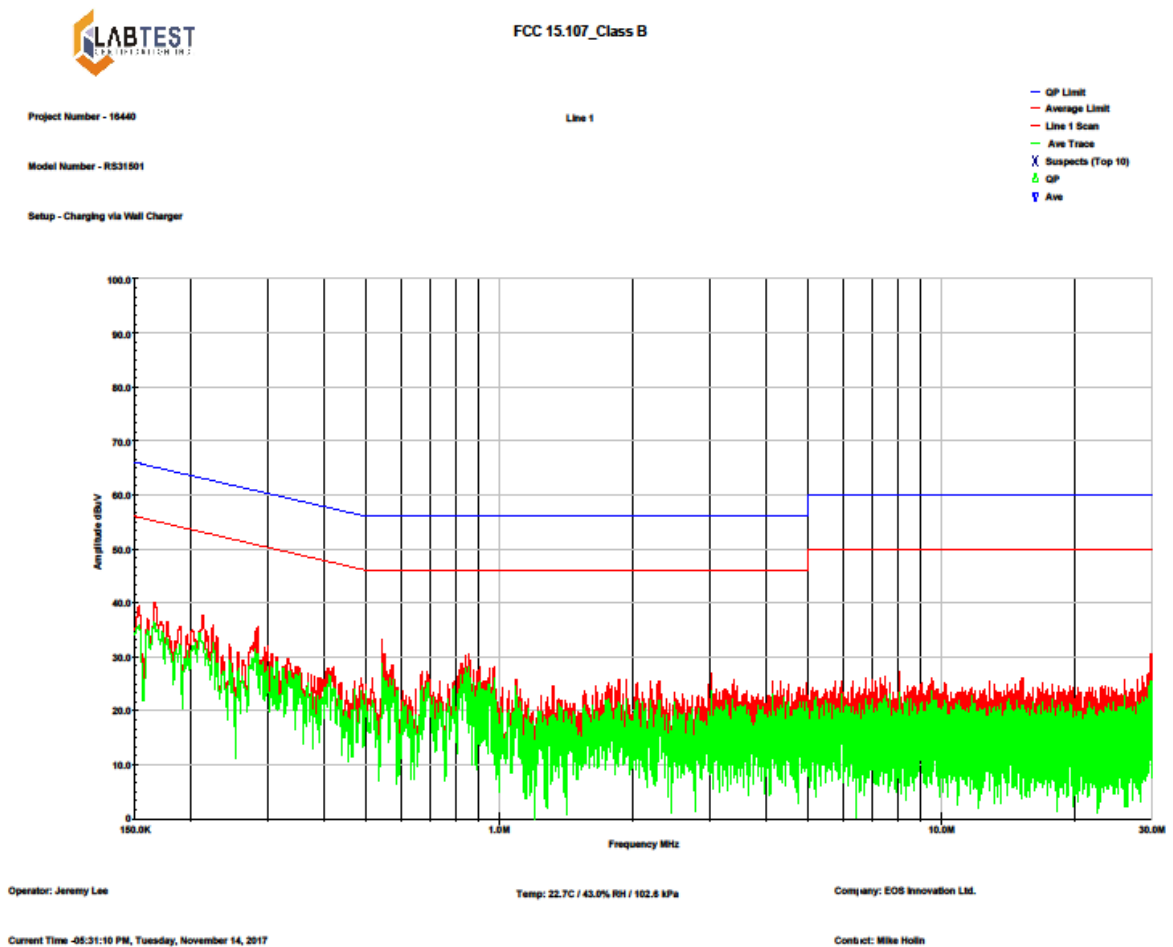
Test Setup

Description of test set-up:

. The EUT was placed on a 0.8 m non-conducting table above a ground reference plane (GRP).
The EUT was set to **Operation Mode #2 with configuration Mode #4**

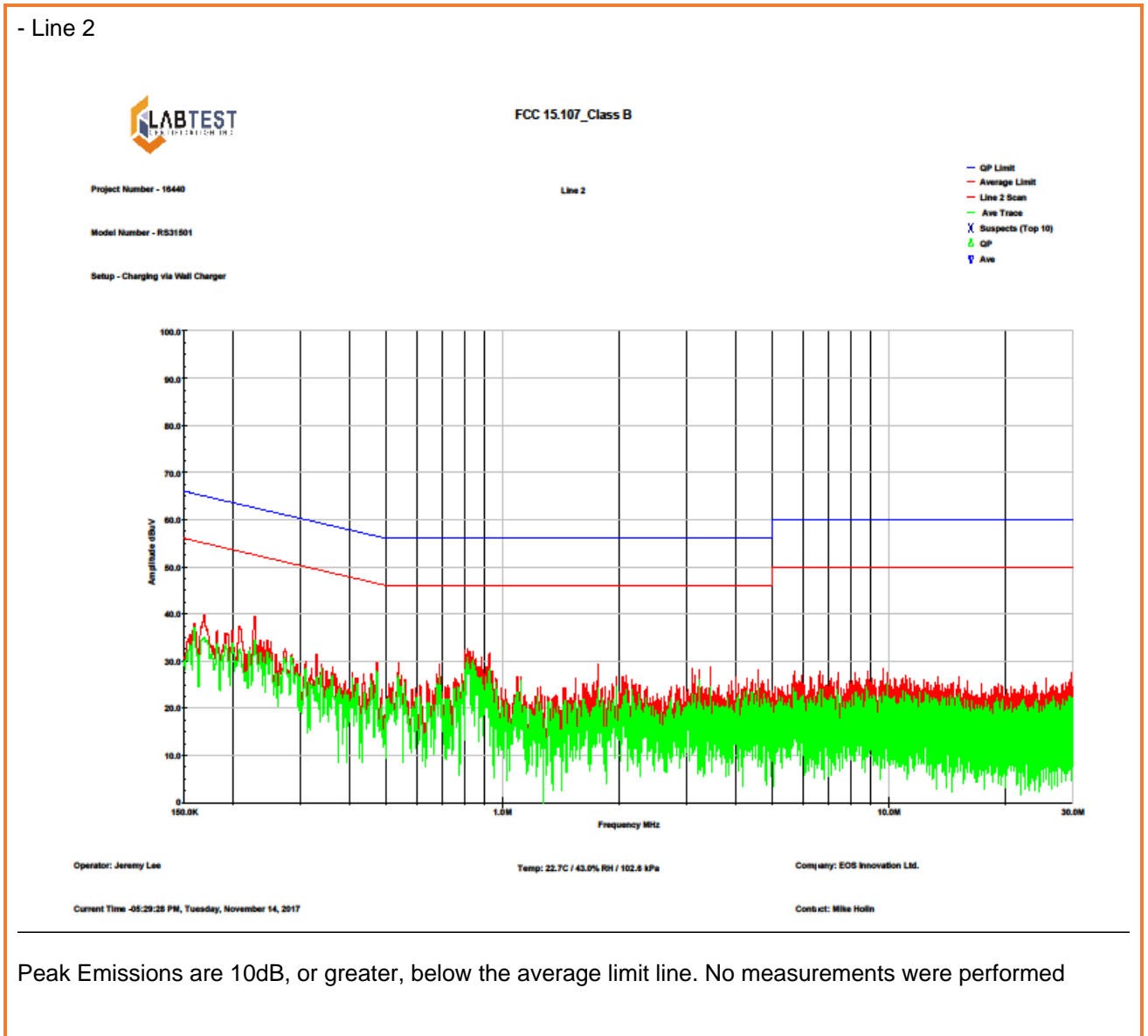
Measurement / Graphical Representation for Emission – Conducted Emissions

- Line 1



Peak Emissions are 10dB, or greater, below the average limit line. No measurements were performed

- Line 2



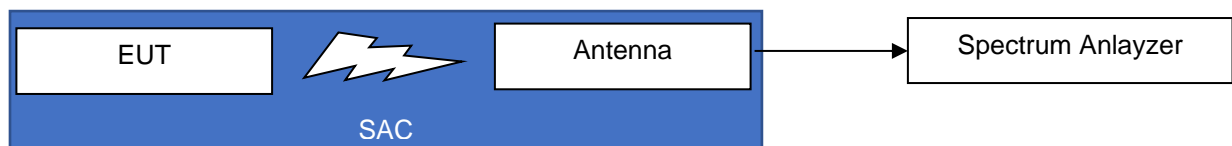
Summary of the operation of RF Transmission

Governing Doc	FCC Part 15.231(a) & RSS-210, Annex A.1	Room Temperature (°C)	23.6		
Basic Standard	-	Relative Humidity (%)	37.0		
Test Location	Richmond	Barometric Pressure (kPa)	102.0		
Test Engineer	Jeremy Lee	Date	17 November 2017		
EUT Voltage	☒ LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LPDA Antenna	A.H.Systems	SAS-510-2	227B	08-Dec-2015	08-Dec-2017
EMC Shielded Enclosure	USC	USC-26	374	NCR	NCR
Note) NCR = No Calibration Required					
Compliant ☒ Non-Compliant ☐ Not Applicable ☐					

Test setup

Description of test set-up:

The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC.
 The EUT was set to **Operation Mode #1 with configuration Mode #1**.

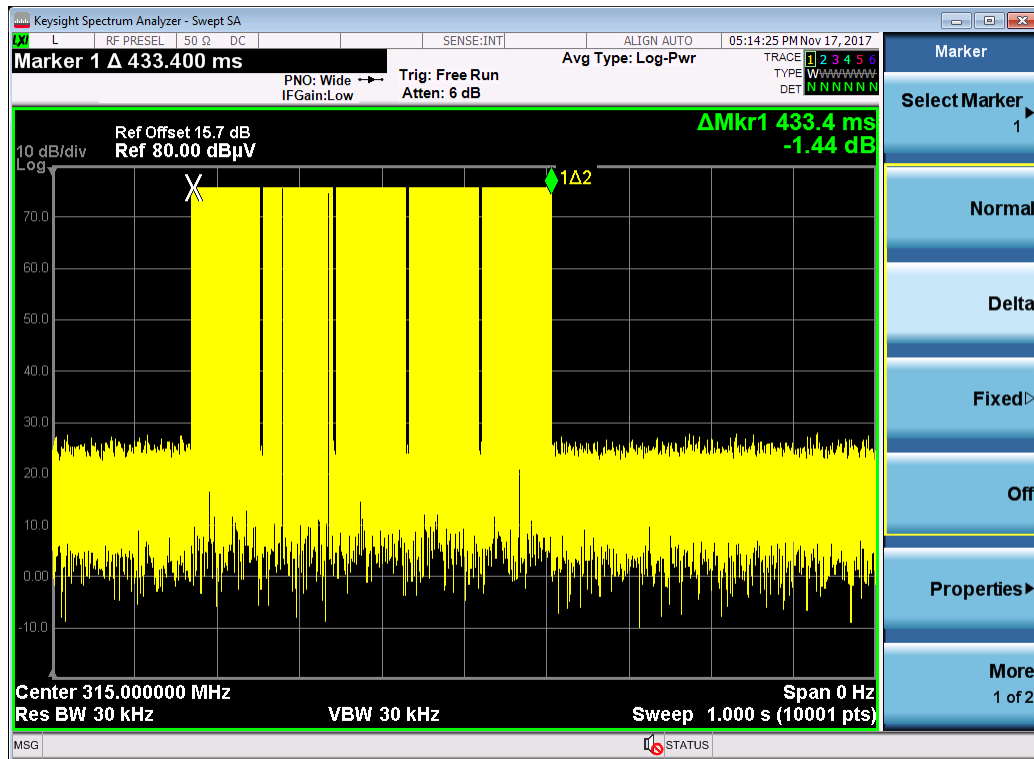


- Tested with SAS-510-2, LPDA Antenna as followed by ANSI C63.10, Table 1

Reviewed Results

Rule Part No.	Description of Rule	Yes	No	N/A
FCC 15.231(a)	Continuous transmissions, voice, video and the radio control of toys are not permitted.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 15.231(a)	Data is permitted to be sent with a control signal.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC 15.231(a)(1) ¹	Manually operated	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Automatically deactivate within 5 seconds of being released	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC 15.231(a)(2)	Automatically operated	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Deactivate within 5 seconds after activation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FCC 15.231(a)(3) ²	Periodic transmission at regular predetermined intervals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Polling or supervision transmission, including data, to determine system integrity or transmitters used in security or safety applications requires no total duration of transmission not exceeding 2s/hr.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FCC 15.231(a)(4)	Radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FCC 15.231(a)(5)	Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Note1)The EUT is operating as manually when pressing one of PUSH Buttons. When the Transmitter is Activated, it is deactivated after 434ms. Please see below screen capture, which shows transmitter was deactivated less than 5sec.</p>				

- Screen Capture pressed one of buttons, manually activated and deactivated in 433.4ms



Field Strengths

Governing Doc	FCC Part 15.231(b) & RSS-210, Annex A.2	Room Temperature (°C)	23.0
Basic Standard	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	Relative Humidity (%)	38.0
Test Location	Richmond	Barometric Pressure	102.6
Test Engineer	Jeremy Lee	Date	07 December 2017
EUT Voltage	<input checked="" type="checkbox"/> LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE		

Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LPDA Antenna	A.H.Systems	SAS-510-2	227B	08-Dec-2015	08-Dec-2017
EMC Shielded Enclosure	USC	USC-26	374	NCR ¹	NCR ¹

Note 1) NCR = No Calibration Required, but NSA was done at 2016.

Detector:	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> Average	<input type="checkbox"/> Quasi-Peak
RBW/VBW:	<input checked="" type="checkbox"/> 120/300kHz	<input type="checkbox"/> 1/3MHz	
Type of Facility:	<input checked="" type="checkbox"/> SAC	<input type="checkbox"/> FSOATS	<input type="checkbox"/> in-situ
Distance:	<input checked="" type="checkbox"/> 3meter	<input type="checkbox"/> 10meter	<input type="checkbox"/> 1meter
Arrangement of EUT:	<input checked="" type="checkbox"/> Table-top only	<input type="checkbox"/> Floor-standing only	<input type="checkbox"/> Rack Mounted

Frequency (MHz)	Orthogonal	Detector	POL	Emissions (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
315	X	Peak	H	83.37	95.62	12.25	PASS
		AVG ¹	H	74.20	75.62 ²	1.42	PASS
		Peak	V	72.70	95.62	22.92	PASS
		AVG ¹	V	63.53	75.62 ²	12.09	PASS
	Y	Peak	H	83.83	95.62	11.79	PASS
		AVG ¹	H	74.66	75.62 ²	1.04	PASS
		Peak	V	70.65	95.62	24.97	PASS
		AVG ¹	V	61.48	75.62 ²	14.14	PASS
	Z	Peak	H	66.34	95.62	29.28	PASS
		AVG ¹	H	57.17	75.62 ²	18.45	PASS
		Peak	V	79.17	95.62	16.45	PASS
		AVG ¹	V	70.00	75.62 ²	5.62	PASS

Note 1) Calculated Average level with below;
Average = Peak - Duty cycle factor(dB) = Peak - 9.17(dB), see Appendix A for Duty Cycle Factor.

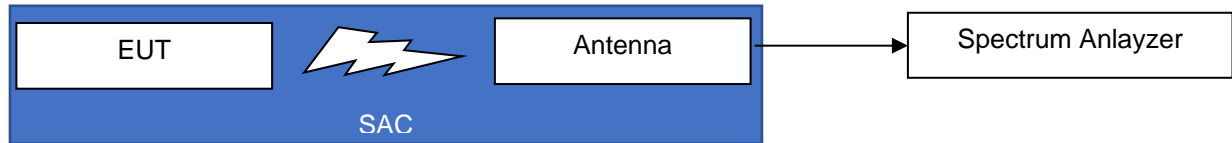
Note 2) Converted from 6041.67uV/m at 3 meter.

Compliant ☒ Non-Compliant ☐ Not Applicable ☐

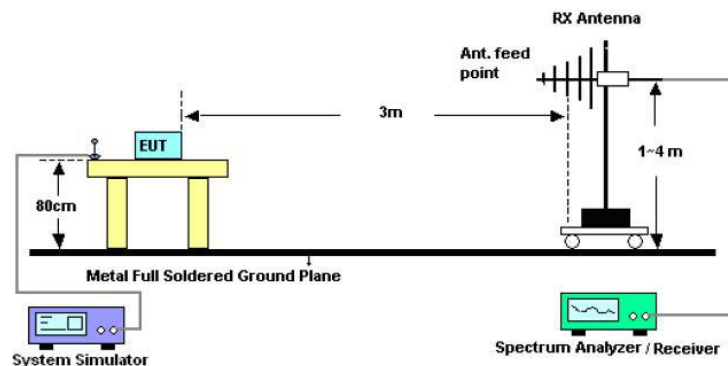
Test setup

Description of test set-up:

The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC.
The EUT was set to **Operation Mode #1 with configuration Mode #1, 2 & 3.**



- Tested with SAS-510-2, LPDA Antenna as followed by ANSI C63.10, Table 1



Measurement Procedure

This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (EUT) was configured based upon the requirements of the applicable test standard. Initially, the primary emission frequencies are identified by positioning a broadband receive antenna three meter from the EUT.

A test was made with an Spectrum Analyzer, controlled by Test Software, Tile7!, at 315MHz with the Analyzer in the peak mode. The IF bandwidth was 120 kHz. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities while the turntable is rotated to determine the worst emitting configuration. Measurements were then made using CISPR quasi peak (and Averaging for RSS-210) at each orthogonals. It was repeated again for three different Orthogonals as described in configuration mode. The numerical results are included herein to demonstrate compliance.

Test Result

Emission level (dBuV/m) = Detected level (dBuV) + Cable Loss (dB) + Antenna Factor (dB/m)

Spurious Emissions (Unwanted Emissions)

Governing Doc	FCC Part 15.231(b), 15.205, 15.209 & RSS-210, Annex A.2	Room Temperature (°C)	23.0
Basic Standard	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	Relative Humidity (%)	38.0
Test Location	Richmond	Barometric Pressure (kPa)	102.6
Test Engineer	Jeremy Lee	Date	07 December 2017
EUT Voltage	<input checked="" type="checkbox"/> LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE		

Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LPDA Antenna	A.H.Systems	SAS-510-2	227B	08-Dec-2015	08-Dec-2017
Double-ridged Guide Horn Antenna	A.H.Systems	SAS-571	227C	22-Sep-2016	22-Sep-2018
Loop Antenna	ComPower	AL-130	241	08-Nov-2017	08-Nov-2019
EMC Shielded Enclosure	USC	USC-26	374	NCR ¹	NCR ¹
RF Preamplifier	Agilent	8449B	273	NCR	NCR

Note1) NCR = No Calibration Required, but NSA & sVSWR was done at 2016.

Detector:	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> AVG
RBW/VBW:	<input checked="" type="checkbox"/> 9/30kHz	<input checked="" type="checkbox"/> 120/300kHz <input checked="" type="checkbox"/> 1/3MHz
Type of Facility:	<input checked="" type="checkbox"/> SAC(30kHz to 1GHz) <input checked="" type="checkbox"/> FSOATS(1 to 5GHz) <input type="checkbox"/> in-situ	
Distance:	<input checked="" type="checkbox"/> 3meter	<input type="checkbox"/> 10meter <input type="checkbox"/> 1meter
Arrangement of EUT:	<input checked="" type="checkbox"/> Table-top only <input type="checkbox"/> Floor-standing only <input type="checkbox"/> Rack Mounted	

Frequency (MHz)	Orthogonal	Detector	POL	Emissions (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comments
316.1742	X	Peak	V	50.91	75.62	24.71	PASS
	X	AVG	V	26.33	55.62 ²	29.29	PASS
316.5780	X	Peak	H	65.36	75.62	10.26	PASS
	X	AVG	H	33.37	55.62 ²	22.25	PASS
630	X	Peak	H	33.87	75.62	31.75	PASS
	Y	Peak	H	35.77	75.62	39.85	PASS
	Z	Peak	V	32.98	75.62	42.64	PASS
945	X	Peak	H	34.89	75.62	40.73	PASS
	Y	Peak	H	34.61	75.62	41.01	PASS
	Z	Peak	V	35.24	75.62	40.38	PASS

1260	X	Peak	H	35.88	75.62	39.74	PASS
	Y	Peak	H	33.33	75.62	42.29	PASS
	Z	Peak	V	33.76	75.62	41.86	PASS
1575	X	Peak	V	42.57	73.98 ³	31.41	PASS
	Y	Peak	H	43.74	73.98 ³	30.24	PASS
	Z	Peak	V	44.01	73.98 ³	29.97	PASS
1890	X	Peak	V	44.12	75.62	31.50	PASS
	Y	Peak	V	47.97	75.62	27.65	PASS
	Z	Peak	H	49.73	75.62	25.89	PASS
2205	X	Peak	V	54.10	73.98 ³	19.88	PASS
		AVG	V	44.93	53.98 ³	9.05	PASS
	Y	Peak	V	58.75	73.98 ³	15.23	PASS
		AVG	V	49.58	53.98 ³	4.40	PASS
	Z	Peak	H	62.03	73.98 ³	11.95	PASS
		AVG	H	52.86	53.98 ³	1.12	PASS
2520	X	Peak	H	61.99	75.62	13.63	PASS
		AVG	H	52.82	55.62 ²	2.80	PASS
	Y	Peak	H	61.80	75.62	13.82	PASS
		AVG	H	52.63	55.62 ²	2.99	PASS
	Z	Peak	V	58.61	75.62	17.01	PASS
		AVG	V	49.44	55.62 ²	6.18	PASS
2835	X	Peak	V	48.39	73.98 ¹	25.59	PASS
	Y	Peak	H	53.09	73.98 ¹	20.89	PASS
	Z	Peak	V	53.08	73.98 ¹	20.90	PASS
3150	X	Peak	V	44.96	75.62	30.66	PASS
	Y	Peak	V	45.77	75.62	29.85	PASS
	Z	Peak	H	54.25	75.62	21.37	PASS

Note 1) Calculated Average level with below;

Average = Peak - Duty cycle factor(dB) = Peak - 9.17(dB), see Appendix A for Duty Cycle Factor.

Note 2) Converted from 604.17uV/m at 3 meter.

Note 3) Restricted Bands by FCC 15.205

Compliant ☒

Non-Compliant ☐

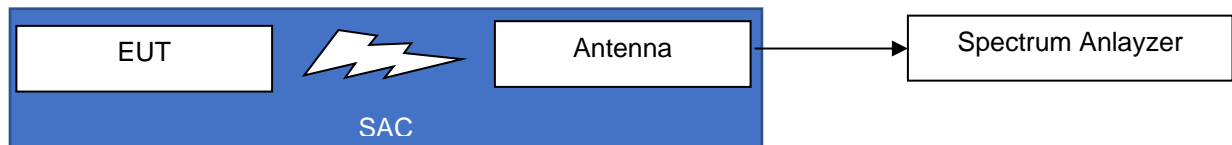
Not Applicable ☐

Test setup

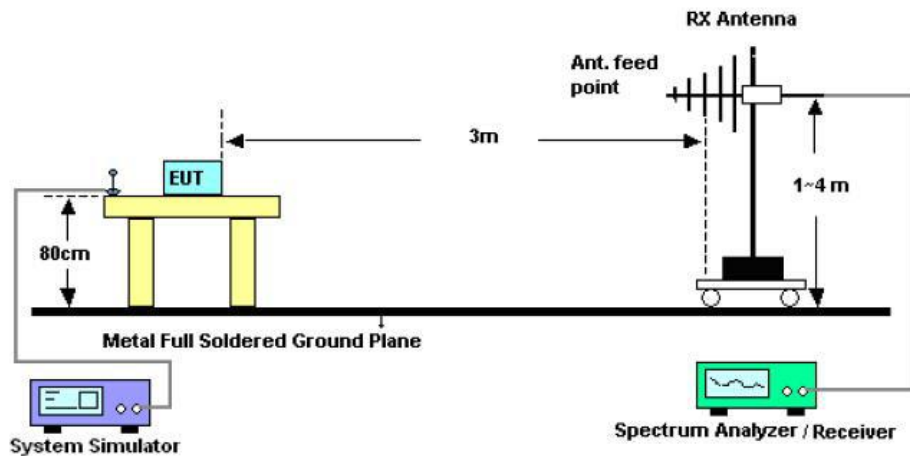
Description of test set-up:

The EUT was placed on a 0.8 m for under 1GHz and 1.5m for over 1GHz non-conducting table above a Turn table in SAC.

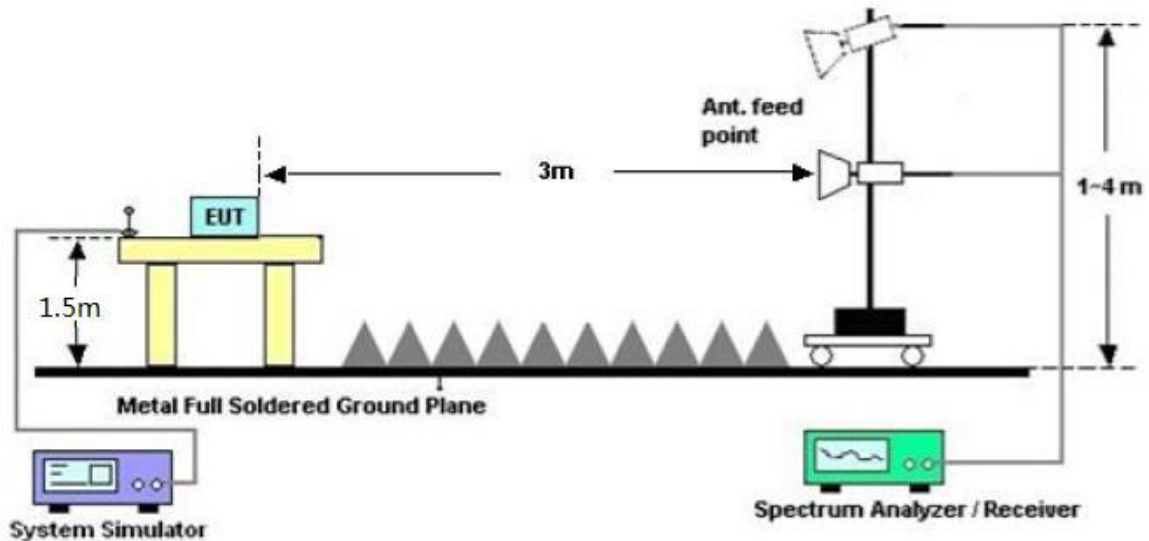
The EUT was set to **Operation Mode #1 with configuration Mode #1, 2 & 3.**



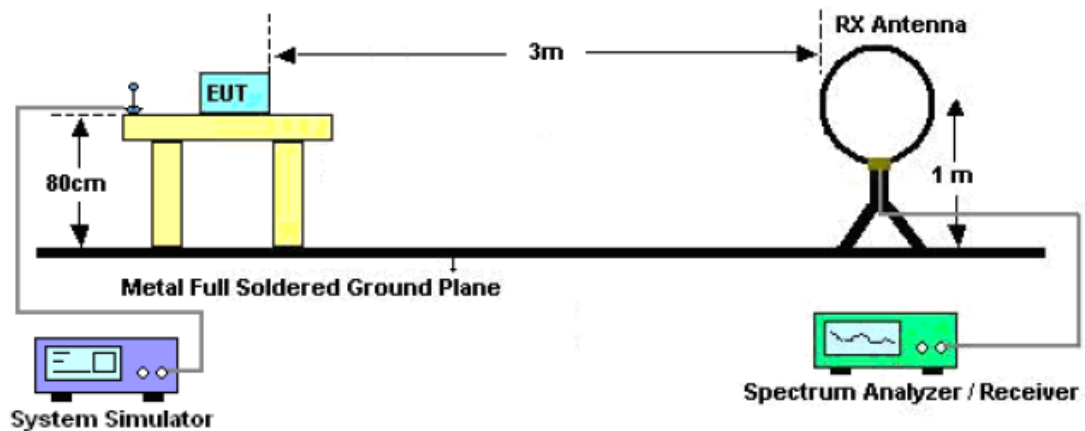
- Tested with SAS-510-2 for 867.84MHz, LPDA Antenna as followed by ANSI C63.10, Table 1



- Tested with SAS-571 for over 1GHz, Double-ridged Guided Horn Antenna as followed by ANSI C63.10, Table 1



- Radiated Emission below 30MHz, with AL-130



Measurement Procedure

This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (EUT) was configured based upon the requirements of the applicable test standard. Initially, the primary emission frequencies are identified by positioning a broadband receive antenna three meter from the EUT.

A test was made with an Spectrum Analyzer, controlled by Test Software, Tile7!, for all Harmonics with the Analyzer in the peak mode. The IF bandwidth was 9kHz(under 30MHz), 120 kHz(under 1GHz) and 1MHz(over 1GHz). To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities while the turntable is rotated to determine the worst emitting configuration. Measurements were then made using CISPR quasi peak(under 1GHz) and Averaging (under 30MHz & over 1GHz). It was repeated again for three different Orthogonals as described in configuration mode. The numerical results are included herein to demonstrate compliance. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

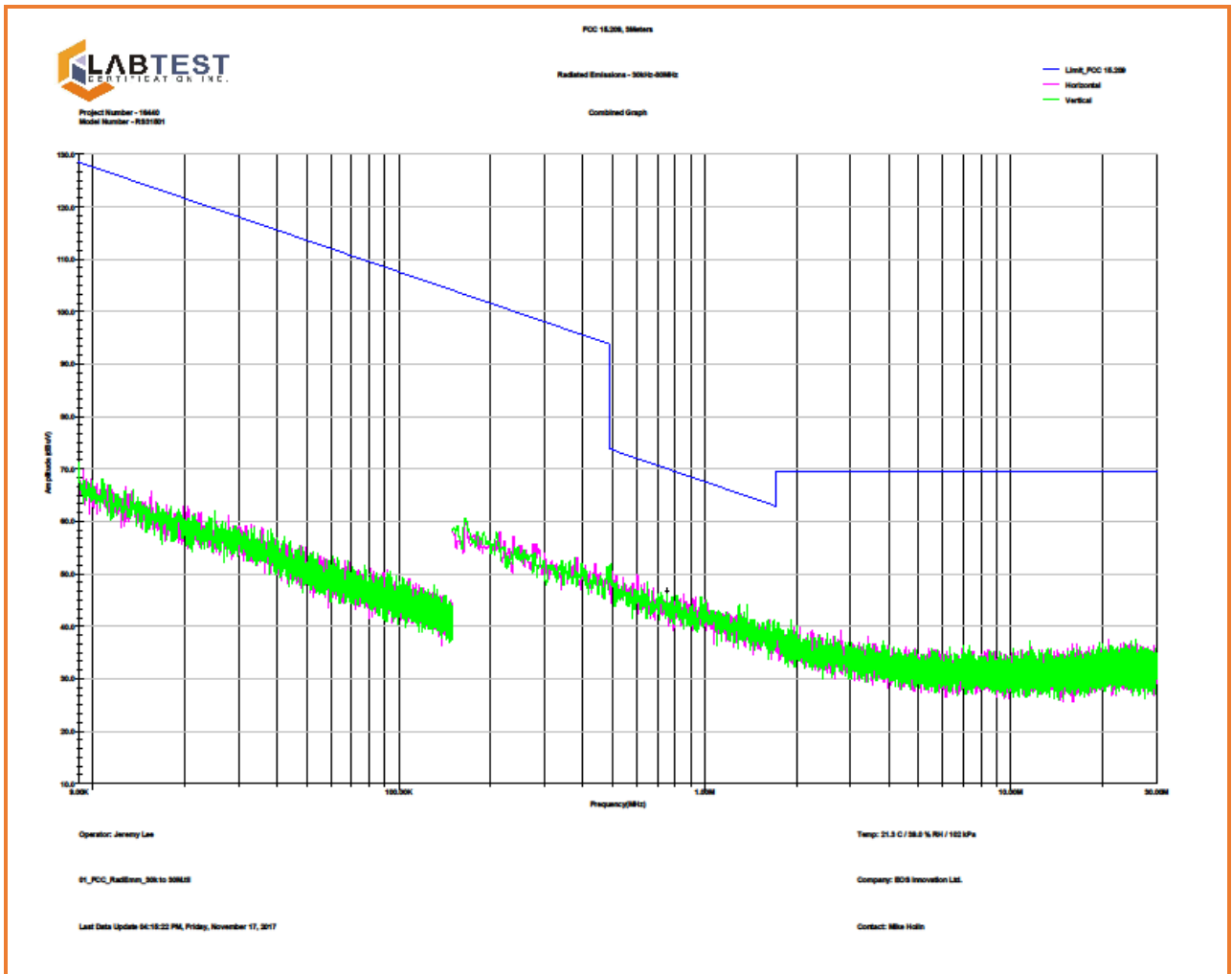
Test Result

Emission level (dBuV/m) = Detected level (dBuV) +Cable Loss (dB) + Antenna Factor (dB/m)

Prepared by: LabTest Certification Inc.
Date Issued: 13 December 2017
Project No.: 16440

Client: Eos Innovation Ltd.
Report No.: 16440-1E
Revision No.: 3

Graphical Representation for Emission - Radiated 9kHz to 30MHz



Radiated Emissions for Digital Parts and Receiver

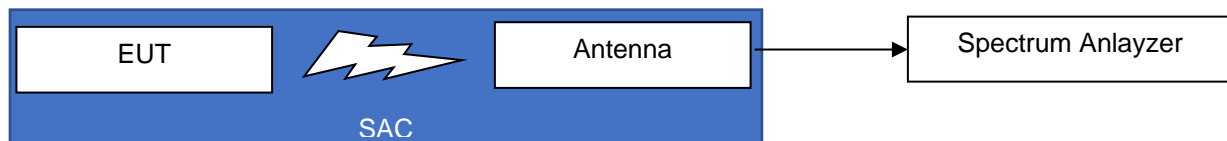
Governing Doc	FCC 15.109(a) & ICES-003	Room Temperature (°C)	22.7		
Basic Standard	ANSI C63.4:2014	Relative Humidity (%)	43.0		
Test Location	Richmond	Barometric Pressure	102.6		
Test Engineer	Jeremy Lee	Date	14 November 2017		
EUT Voltage	<input checked="" type="checkbox"/> LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE <input checked="" type="checkbox"/> 120VAC @ 60Hz				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	KeySight	N9038A	702	18-Apr-2017	18-Apr-2018
Broadband Antenna	Sunol	JB1	371	29-Mar-2016	29-Mar-2018
AC Power Source	California Instrument	5001i	059	NCR	NCR
EMC Shielded Enclosure	USC	USC-26	374	NCR ¹	NCR ¹
Note1) NCR = No Calibration Required, but NSA was done at 2016.					
Frequency Range:	<input checked="" type="checkbox"/> 30kHz-30MHz	<input checked="" type="checkbox"/> 30-1000MHz	<input type="checkbox"/> 1-6GHz		
Detector:	<input checked="" type="checkbox"/> Peak (for Prescan)	<input checked="" type="checkbox"/> Quasi-Peak(for Formal)			
RBW/VBW:	<input checked="" type="checkbox"/> 9/30kHz	<input checked="" type="checkbox"/> 120/300kHz	<input type="checkbox"/> 1/3MHz		
Type of Facility:	<input checked="" type="checkbox"/> SAC	<input type="checkbox"/> FSOATS	<input type="checkbox"/> <i>in-situ</i>		
Distance:	<input checked="" type="checkbox"/> 3meter	<input type="checkbox"/> 10meter	<input type="checkbox"/> 1meter		
Arrangement of EUT:	<input checked="" type="checkbox"/> Table-top only	<input type="checkbox"/> Floor-standing only	<input type="checkbox"/> Rack Mounted		
Classification:	<input checked="" type="checkbox"/> Class B	<input type="checkbox"/> Class A			
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>					

Test setup

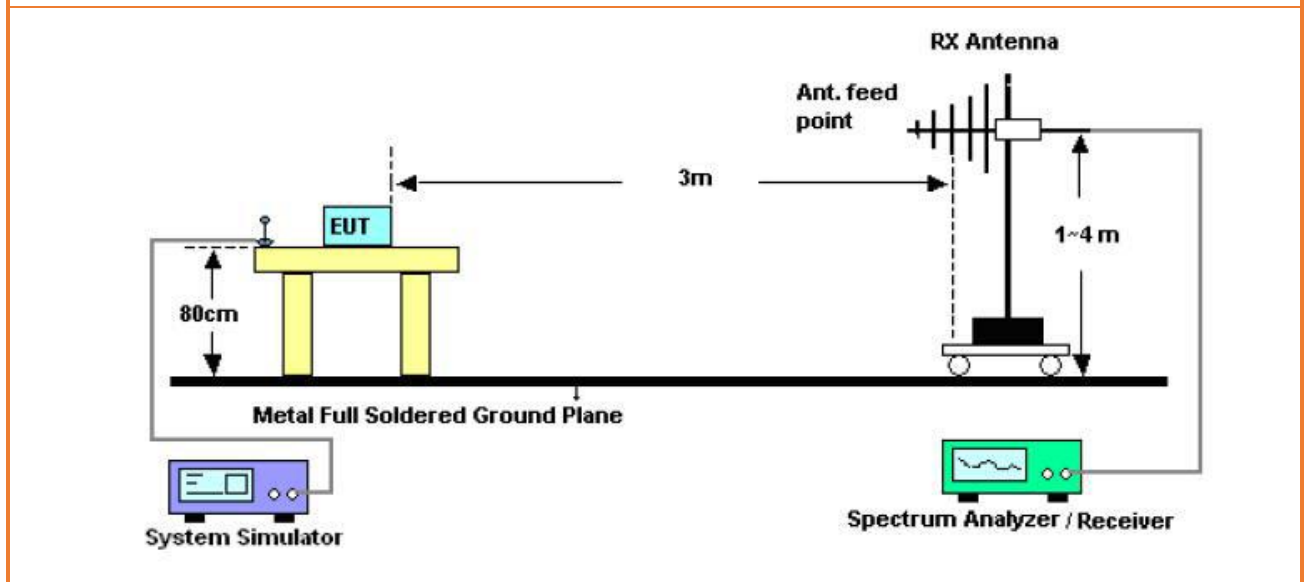
Description of test set-up:

The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC.

The EUT was set to **Operation Mode #1 with configuration Mode #1 for Battery Operated and Operation Mode #2 with configuration Mode #4 with AC/DC adapter.**



- Radiated Emission 30 to 1,000MHz, with JB-1



Measurement Results

This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (EUT) was configured based upon the requirements of the applicable test standard. Initially, the primary emission frequencies are identified by positioning a broadband receive antenna three meter from the EUT.

A scan was made with an EMC Analyzer, controlled by EMC Test Software, Tile7!, from 30kHz to 1,000 MHz with the receiver in the peak mode. The receiver IF bandwidth was 9/120 kHz and scan step was about 3/30kHz. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities while the turntable is rotated to determine the worst emitting configuration. Under 30MHz was only tested at 1meter height and Antenna was changed both polarization, Horizontal and Vertical. Measurements were then made using CISPR quasi peak when the peak readings were within 10dB of the limit line. The numerical results are included herein to demonstrate compliance.

Test Result

Emission level (dBuV/m) = Quasi-Peak detected level (dBuV) + Cable Loss (dB) + Antenna Factor (dB/m)

Graphical Representation for Emission - Radiated 30MHz to 1GHz

- Radiated Emissions with Batteries

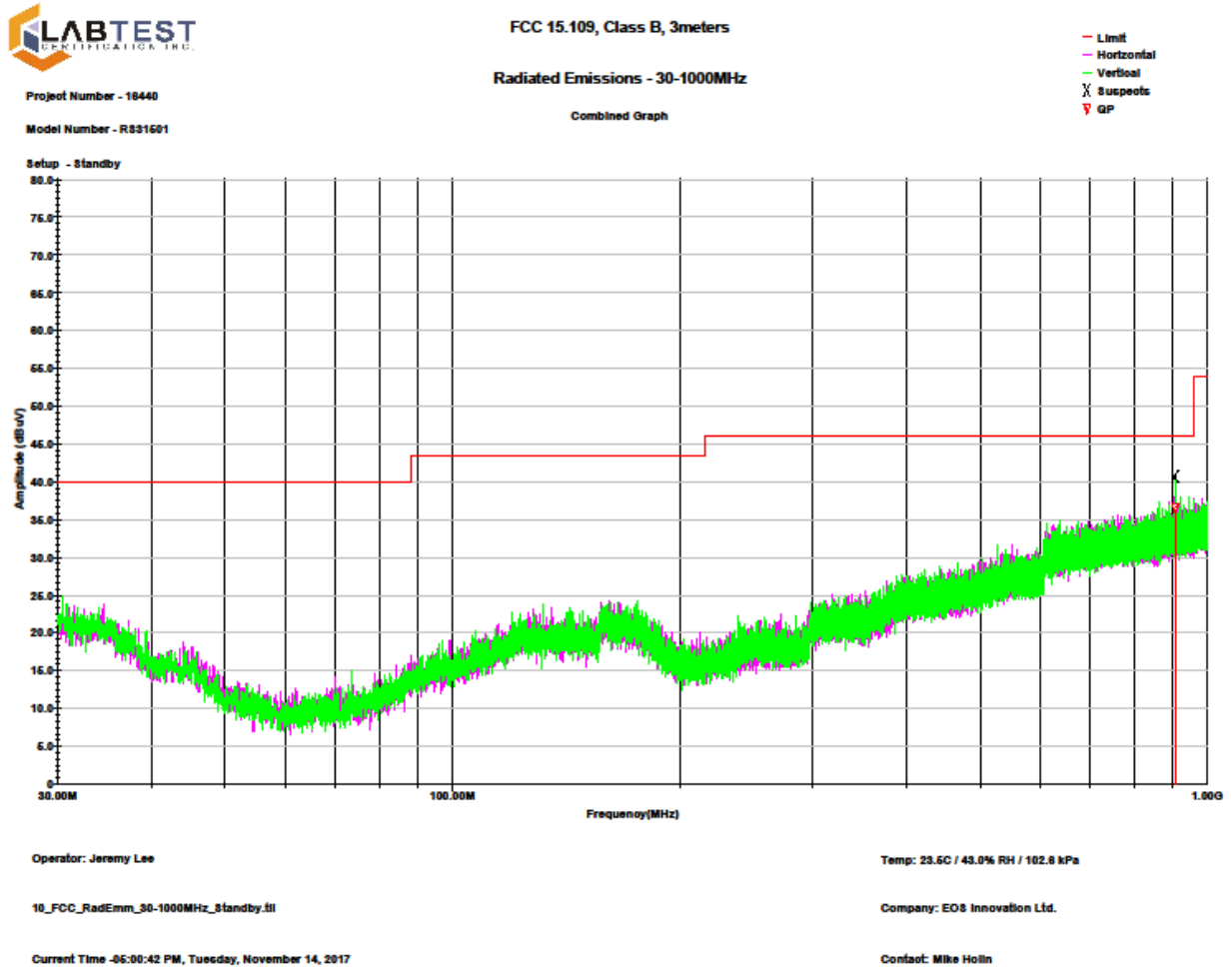


Table : Top_Vertical

Page 1 of 1

Frequency (MHz)	Ant Fac (dB)	Cable Fac (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV/m)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
906.0555 MHz	22.70	5.32	0.0	159	165	41.276	36.643	46.020	-9.377

- Radiated Emissions with AC/DC Adapter

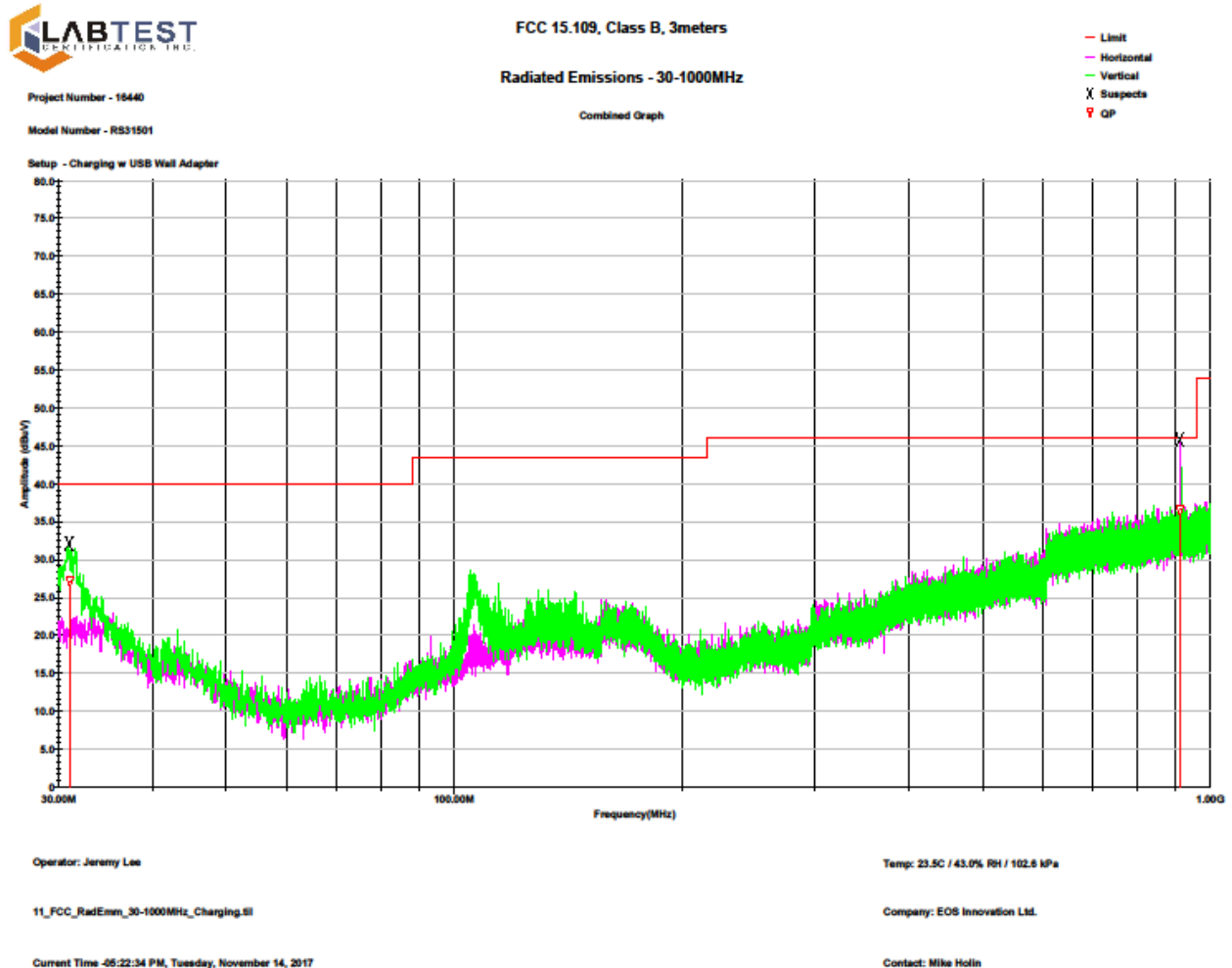


Table : Top_Horizontal

Page 1 of 1

Frequency (MHz)	Ant Fac (dB)	CableLoss (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV/m)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
912.0452 MHz	22.6	5.3	0.0	351.5	102.0	40.608	36.605	46.020	-9.415

Table : Top_Vertical

Page 1 of 1

Frequency (MHz)	Ant Fac (dB)	Cable Fac (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV/m)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.0300 MHz	17.32	0.71	0.0	12	366	32.072	27.093	40.000	-12.907

The Bandwidth of the emission

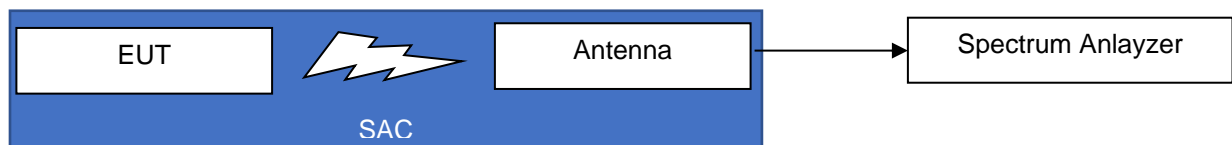
Governing Doc	FCC Part 15.231(c) & RSS-210, Annex A.3	Room Temperature (°C)	23.6		
Basic Standard	ANSI C63.10:2013, Clause 6.9	Relative Humidity (%)	37.0		
Test Location	Richmond	Barometric Pressure	102.0		
Test Engineer	Jeremy Lee	Date	17 November 2017		
EUT Voltage	<input checked="" type="checkbox"/> LITHIUM POLYMER, 3.7VOLTS, 320MAH X 2, RECHARGEABLE				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LPDA Antenna	A.H.Systems	SAS-510-2	227B	08-Dec-2015	08-Decr-2017
EMC Shielded Enclosure	USC	USC-26	374	NCR	NCR
Note) NCR = No Calibration Required					
Frequency(MHz)	Test Method	Bandwidth(kHz)	Limit(kHz)	Margin(kHz)	Comments
315	-20dB ¹	8.14	787.5	779.36	PASS
	99% ²	25.37	787.5	762.13	PASS
Note 1) referenced by FCC 15.231(c), " The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier."					
Note 2) referenced by RSS-210, Annex A.3, " The 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz."					
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>					

Test setup

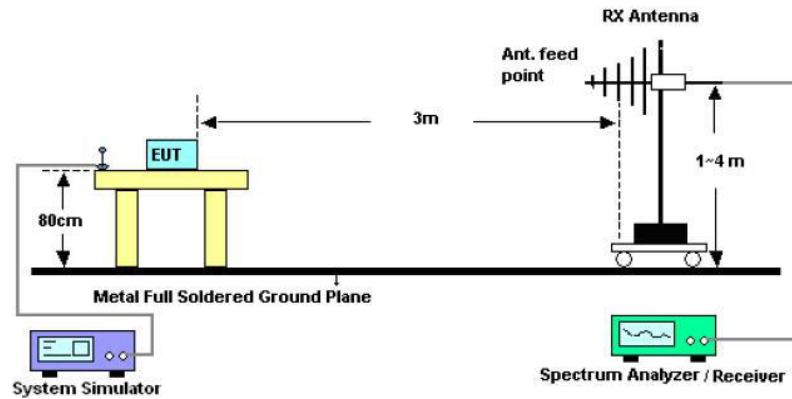
Description of test set-up:

The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC.

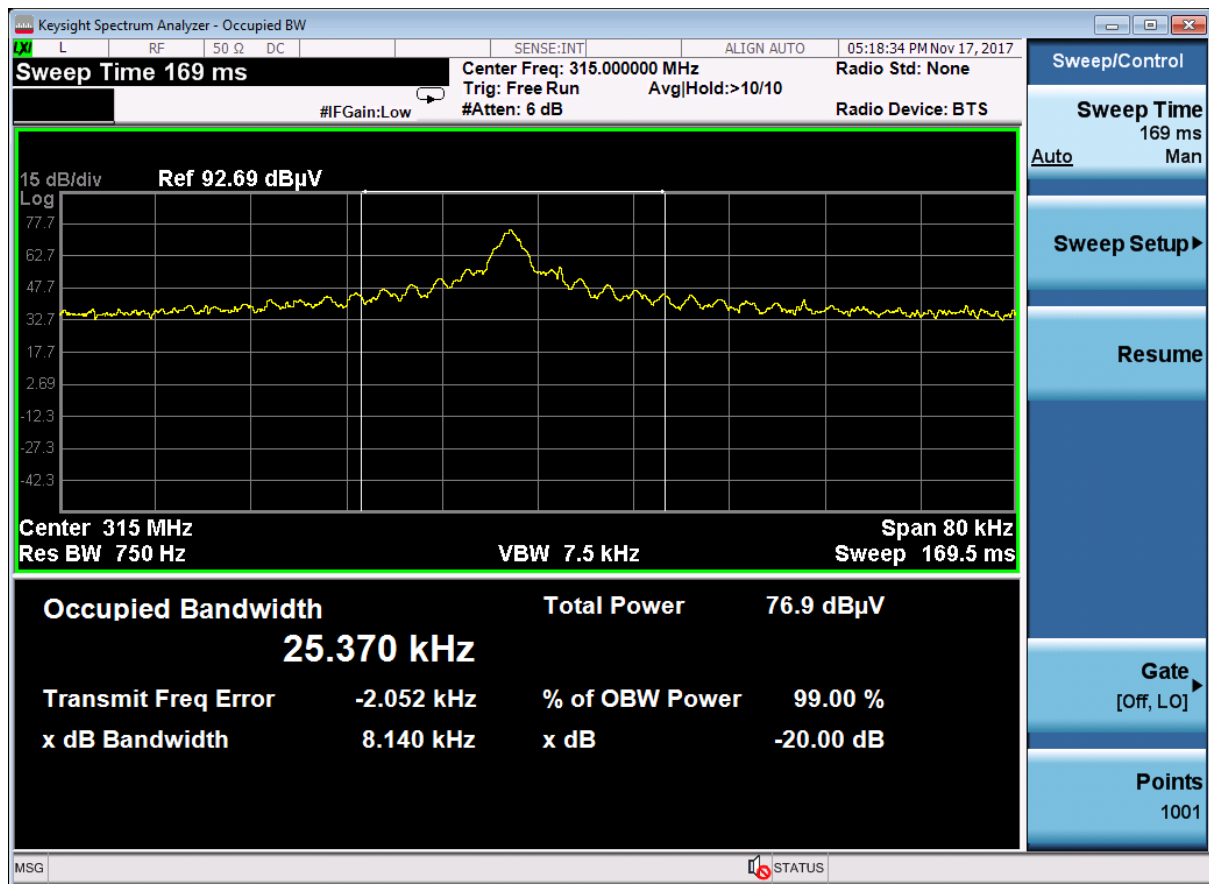
The EUT was set to **Operation Mode #2 with configuration Mode #1.**



- Tested with SAS-510-2, LPDA Antenna as followed by ANSI C63.10, Table 1



Results



APPENDIX A: Duty Cycle Factor

RS31501 – DUTY CYCLE CALCULATION

REPETITIONS	5	PACKET TOTAL ON TIME	203750 uS
WORDS PER REPETITION	7	PACKET TOTAL OFF TIME	381400 uS
BITS PER WORD	11	PACKET TOTAL TIME	585150 uS
		DUTY CYCLE (ON / TOTAL)	0.348 35%

PACKET START

WAKE UP RX AGC	50	180000
REPETITION 1	40740	40280
REPETITION 2	40740	40280
REPETITION 3	40740	40280
REPETITION 4	40740	40280
REPETITION 5	40740	40280

AVERAGE dBuV = PEAK dBuV – (20*LOG(DUTY CYCLE))

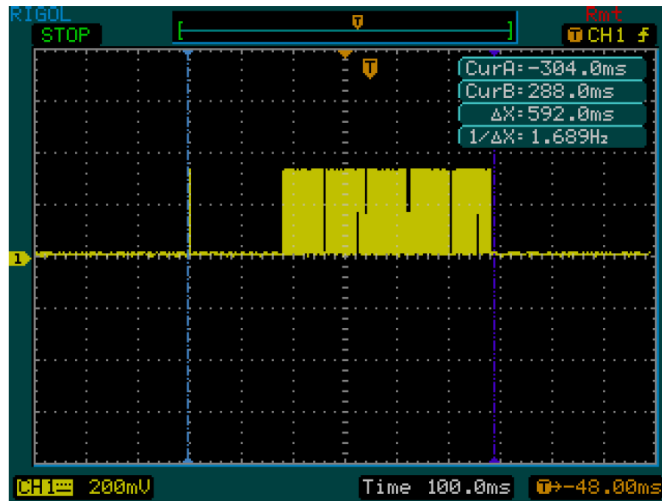
AVERAGE dBuV = PEAK dBuV – (20*LOG(0.348))

AVERAGE dBuV = PEAK dBuV – (20*0.458)

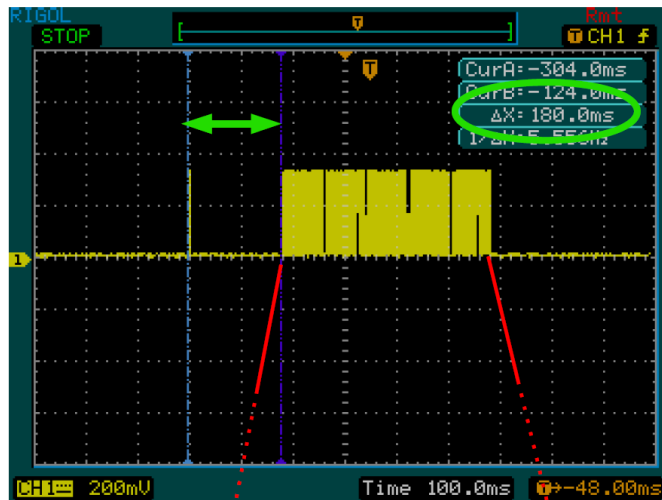
AVERAGE dBuV = PEAK dBuV – 9.17 dBuV

PACKET END

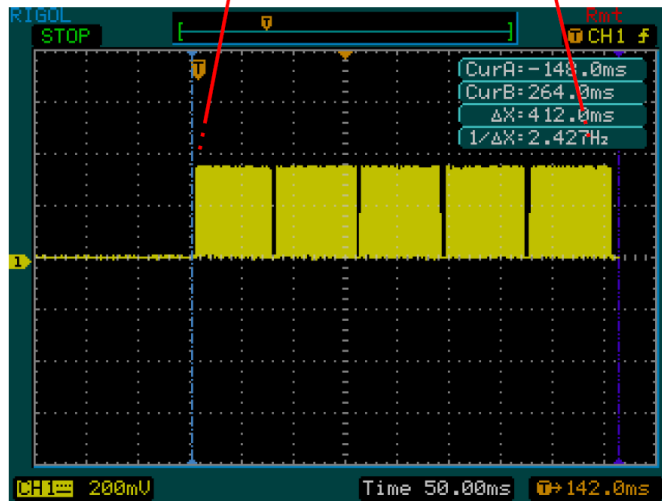
	On time (uS)	Off time (uS)		On time (uS)	Off time (uS)		On time (uS)	Off time (uS)		On time (uS)	Off time (uS)			
Rep start		0			5000									
word start 1		1200		word start 3	1200	420		word start 5	1200	420		word start 7	1200	420
Data 1		420		Data 1	420	420		Data 1	420	420		Data 1	420	420
Data 2		420		Data 2	420	420		Data 2	420	420		Data 2	420	420
Data 3		420		Data 3	420	420		Data 3	420	420		Data 3	420	420
Data 4		420		Data 4	420	420		Data 4	420	420		Data 4	420	420
Data 5		420		Data 5	420	420		Data 5	420	420		Data 5	420	420
Data 6		420		Data 6	420	420		Data 6	420	420		Data 6	420	420
Data 7		420		Data 7	420	420		Data 7	420	420		Data 7	420	420
Data 8		420		Data 8	420	420		Data 8	420	420		Data 8	420	420
Data 9		420		Data 9	420	420		Data 9	420	420		Data 9	420	420
Data 10		420		Data 10	420	420		Data 10	420	420		Data 10	420	420
Data 11		420		Data 11	420	420		Data 11	420	420		Data 11	420	420
word start 2		1200		word start 4	1200	420		word start 6	1200	420		Rep End	0	0
Data 1		420		Data 1	420	420		Data 1	420	420				
Data 2		420		Data 2	420	420		Data 2	420	420				
Data 3		420		Data 3	420	420		Data 3	420	420				
Data 4		420		Data 4	420	420		Data 4	420	420				
Data 5		420		Data 5	420	420		Data 5	420	420				
Data 6		420		Data 6	420	420		Data 6	420	420				
Data 7		420		Data 7	420	420		Data 7	420	420				
Data 8		420		Data 8	420	420		Data 8	420	420				
Data 9		420		Data 9	420	420		Data 9	420	420				
Data 10		420		Data 10	420	420		Data 10	420	420				
Data 11		420		Data 11	420	420		Data 11	420	420				



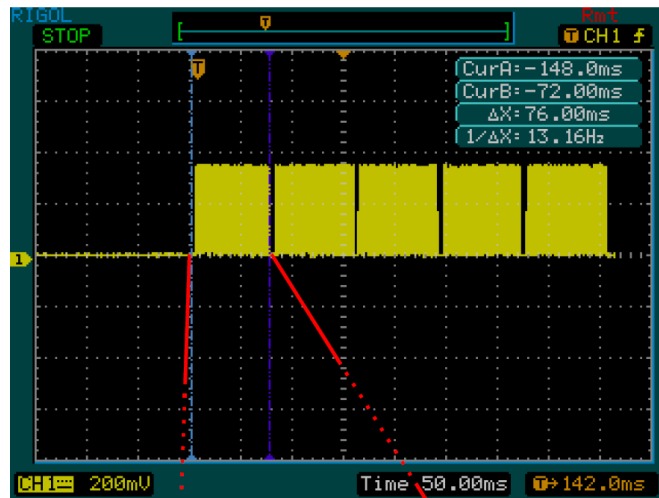
Full Message with packet-start / AGC wake-up preamble



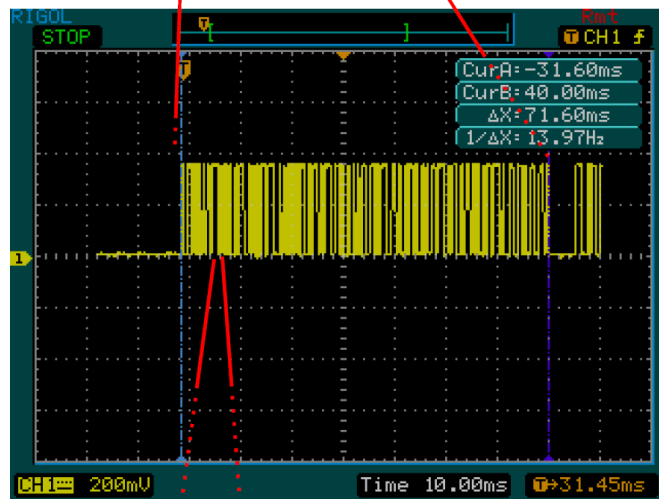
Packet start timing: 50 μ s on – 180 ms off (nominal)



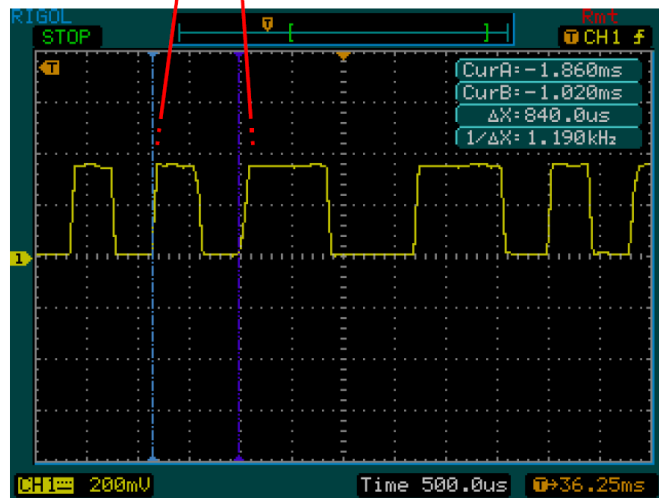
Message repeated 5x



First repetition



First repetition zoomed-in



One data bit (Manchester)

APPENDIX B: ISO 17025:2005 Accreditation Certificate



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Labtest Certification, Inc.
3128, 20800 Westminster HWY
Richmond B.C. V6V 2W3

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

while demonstrating technical competence in the field of

TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of tests to which this accreditation applies.

AT-2033

Certificate Number


ANAB Approval

Certificate Valid: 08/07/2017-03/04/2018
Version No. 004 Issued: 08/07/2017



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Labtest Certification, Inc.
 3128, 20800 Westminster HWY
 Richmond, B.C. V6V 2W3
 Kavinder Dhillon Ruben Ugarte Phone: 604-247-0444
 kdhillon@labtestcert.com ruben.ugarte@labtestcert.com
 www.labtestcert.com

TESTING

Valid to: March 4, 2018

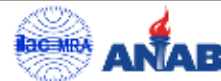
Certificate Number: A-T-2033

Testing performed in support of FCC DoC and Certification approval procedures

Type of Device Examples	Scope of Accreditation	Supporting FCC Guidance	Comments
Unintentional Radiators (FCC Part 15, Subpart B)	• ANSI C63.4-2014		
Industrial, Scientific, and Medical Equipment (FCC Part 18)	• FCC MP-5, (February 1986)		
• Consumer ISM equipment			
Intentional Radiators (FCC Part 15 Subpart C)	• ANSI C63.10-2013		
UPCS (FCC Part 15, Subpart D)	• ANSI C63.17-2013		
• Unlicensed Personal Communication Systems devices			
U-NII without DFS Intentional Radiators (FCC Part 15, Subpart E)	• ANSI C63.10-2013	KDB Publication 789033	
• Unlicensed National Information Infrastructure Devices (U-NII without DFS)			
U-NII with DFS Intentional Radiators (FCC Part 15 Subpart E)	• FCC KDB Publication 905462 D02 UNII DFS Compliance Procedures New Rules v01 (April 8, 2016)		
• Unlicensed National Information Infrastructure U-NII Devices with Dynamic Frequency Selection (DFS)			
UWB Intentional Radiators (FCC Part 15, Subpart F)	• ANSI C63.10-2013		
• Ultra-wideband Operation			
BPL Intentional Radiators (FCC Part 15, Subpart G)	• ANSI C63.10-2013		
• Access Broadband Over Power Line (Access BPL)			
White Space Device Intentional Radiators (FCC Part 15, Subpart H)	• ANSI C63.10-2013		
• White Space Devices			

Version 003 Issued: 08/07/2017

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Testing performed in support of FCC DoC and Certification approval procedures

Type of Device Examples	Scope of Accreditation	Supporting FCC Guidance	Comments
Commercial Mobile Services (FCC Licensed Radio Service Equipment) •Part 22 (cellular) •Part 24 •Part 25 (non-microwave) •Part 27	• ANSI/TIA-603-D • TIA-102.CAAA-D	KDB Publication 971168	
General Mobile Radio Services (FCC Licensed Radio Service Equipment) •Part 22 (non-cellular) •Part 90 (non-microwave) •Part 95 •Part 97 •Part 101 (non-microwave)	• ANSI/TIA-603-D • TIA-102.CAAA-D		Microwave Frequencies, as used in this part, refers to frequencies of 890 MHz and above.
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) •Part 96	• ANSI/TIA-603-D • TIA-102.CAAA-D	KDB Publication 971168	
Maritime and Aviation Radio Services (FCC Licensed Radio Service Equipment) •Part 80 •Part 87	• ANSI/TIA-603-D		
Microwave and Millimeter Bands Radio Services (FCC Licensed Radio Service Equipment) •Part 25 •Part 74 •Part 90 (90Y, 90Z, D SRC) •Part 101	• ANSI/TIA-603-D • TIA-102.CAAA-D		
Broadcast Radio Services (FCC Licensed Radio Service Equipment) •Part 73 •Part 74 (non-microwave)	• ANSI/TIA-603-D • TIA-102.CAAA-D		
RF Exposure •Devices subject to SAR requirements	• IEEE Std 1528™-2013	KDB Publication 865664 KDB Publication 447498	
Hearing Aid Compatibility (Part 20) •HAC for Commercial mobile services	• ANSI C63.19-2007; or • ANSI C63.19-2011		



Testing performed in support of FCC DoC and Certification approval procedures

Type of Device Examples	Scope of Accreditation	Supporting FCC Guidance	Comments
Signal Boosters (Part 20) •Wideband Consumer signal boosters •Provider-specific signal boosters •Industrial signal boosters	<ul style="list-style-type: none"> FCC KDB Publication 935210 D03 Signal Booster Measurements v04 (February 12, 2016) FCC KDB Publication 935210 D04 Provider Specific Booster Measurements v02 (February 12, 2016) FCC KDB Publication 935210 D05 Indus Booster Basic Meas v01r01 (February 12, 2016) 		

Electromagnetic Compatibility (EMC)

Test Method	Test Specification(s)	Range	Comments
Unintentional Radiators	ANSI C63.4-2003 ANSI C63.4-2009 ANSI C63.4:2014;		
Radiated and Conducted Emissions	FCC O STMP-05 (1986); ICES-001(2006); ICES-002(2013); ICES-003(2016); ICES-005(2009); CISPR 16-1-1(2015); CISPR 16-1-2(2014); CISPR 16-1-3(2006); CISPR 16-2-1(2014); CISPR 16-2-2(2010); CISPR 16-2-3(2014); CISPR 16-2-5(2008); CISPR 16-4-2(2014); EN 55016-1-1(2010); EN 55016-1-2(2014); EN 55016-1-3(2006); EN 55016-1-4(2010); EN 55016-2-1(2014); EN 55016-2-2(2011); EN 55016-2-3(2014); EN 55016-4-2(2014); CISPR 11(2012); EN 55011(2013); AS/NZS CISPR 11(2013); KN 11 (RRA Announce 2015-110, Dec, 03, 2015); VCCI V-3 (up to 6 GHz); VCCI V-5; CNS 13438	9 kHz to 40 GHz	



END OF REPORT

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