



# REPORT

For

## Guard RFID Solutions

#140 – 766 Cliveden Place  
Delta, British Columbia  
V3M 6C7, Canada

Date: 23 August, 2017  
Report No.: 16459-1E  
Revision No.: 1  
Project No.: 16459  
Model #: E-Kanban Call Button(ECB)  
FCC ID: VZKECB  
IC ID.: 9937A-ECB




### ONE STOP GLOBAL CERTIFICATION SOLUTIONS



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<b>TEST REPORT_FCC 15.231 &amp; RSS-210</b>	
<b>Periodic operation in the band 40.66-40.70 MHz and above 70 MHz / License-Exempt Radio Apparatus: Category I Equipment</b>	
Report Reference No. ....:	16459-1E
Report Revision History. ....:	✓ Rev. 0: 08 August 2017 ✓ Rev. 1: 23 August 2017, add test results of AC Power Line Emissions and Radiated emissions with AC Adapter. Revised Summary of the operation.
Compiled by (+ signature) .....	Jeremy Lee 
Approved by (+ signature) .....	David Johanson 
Date of issue .....	23 August, 2017
Total number of pages .....	41
<b>FCC Site Registration No.:</b> 721268	
<b>IC Site Registration No.:</b> 5970A	
<b>Testing Laboratory</b> .....: LabTest Certification Inc.	
Address .....: 3128 – 20800 Westminster Hwy, Richmond, B.C. V6V2W3	
<b>Applicant's name</b> .....: Guard RFID Solutions	
Address .....: #140-766 Cliveden Place, Delta, BC, V3M 6C7, Canada	
<b>Manufacture's Name</b> .....: Same as Applicant	
Address .....: Same as Applicant	
<b>Test specification:</b>	
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
<b>Test item description :</b>	
Trade Mark .....	

Model/Type reference .....	E-Kanban Call Button(ECB)
Serial Number .....	000055
FCC ID .....	VZKECB
IC ID .....	9937A-ECB
<b>Possible test case verdicts:</b>	
- 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)
<b>Testing:</b>	
Date of receipt of test item .....	26 July 2017
Date (s) of performance of tests.....	26 July to 03 August 2017 & <a href="#">21 to 23 August 2017</a>

### Device Under Test Description

Application for .....	Radio Frequency Identification (RFID)
Operating Transmit Frequency .....	433.92MHz
Operating Receive Frequency .....	433.92MHz
Beacon Interval .....	6 Seconds
Equipment mobility .....	Yes, but normally installed on Work Bench
Operating condition.....	-20 to +50 °C
Mass of equipment (g) .....	141 without Batteries, 238 with Batteries
Dimension	127 mm X 79 mm X 31 mm
<b>Nominal Voltages for:</b>	<input checked="" type="checkbox"/> stand-alone equipment <input type="checkbox"/> combined (or host) equipment
Supply Voltage:	<input type="checkbox"/> AC <input type="checkbox"/> Amps <input checked="" type="checkbox"/> 6V DC with Batteries <input type="checkbox"/> 12V DC with AC/DC adapter

If DC Power:	<input type="checkbox"/> Internal Power Supply <input checked="" type="checkbox"/> External Power Supply or AC/DC adapter <input checked="" type="checkbox"/> Battery <ul style="list-style-type: none"> <li><input type="checkbox"/> Nickel Cadmium</li> <li><input checked="" type="checkbox"/> Alkaline, 4 X AA</li> <li><input type="checkbox"/> Nickel-Metal Hydride</li> <li><input type="checkbox"/> Lithium-Ion</li> <li><input type="checkbox"/> Other</li> </ul>
--------------	--

### Program details

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

<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b>	<b>Testing location:</b>
Radiated Field strength and Emissions AC Power Line Conducted Emissions	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 <b>complies</b> 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

<p><b>Description:</b></p> <p>The ECB is a call button intended for just-in-time parts replenishment to assembly lines in manufacturing operations (e-Kanban). Its true wireless nature enables easy deployment without need for wired power or communication lines. Alternately, a hard-wired power supply can be used if desired.</p> <p>The ECB has a large multi-color LED indicator which is constructed in such a way that it can be observed from a distance in the well-lit environments characteristic of a production line.</p> <p>Two large buttons enable workers to call for parts, and their robust construction allows for rough handling without fear of damage. Button functions are software configurable.</p>
--

The ECB communicates to the rest of GuardRFID system utilizing the same infrastructure as GuardRFID tags, and communication frequency used (433 MHz), ensures reliable 2-way communication in the most difficult RF conditions. A variety of LED flashing patterns, colors and buzzer annunciations enable the device to signal a wide spectrum of notifications, under full control of software application.

### SPECIFICATIONS:

Part Number	61-10600	
Transmit and Receive Frequency	433 MHz	
User Interfaces	2 buttons Multi-color LED (red, green, yellow) Buzzer	
Power Supply	Battery	4 x AA, 12 months battery life
	Hard-Wired	12VDC
Beacon Interval	6 seconds	
Sensors	Dry Contact Input	
Dimensions	5.00" x 3.10" x 1.21" (127 x 79 x 31 mm)	
Weight	Without batteries: 141 g With batteries: 238 g	
Operating Temperature	-4° F to 122°F (-20°C to 50°C)	
Humidity	0 – 95% RH non-condensing	
Regulatory	FCC, IC	

- Top view



- Bottom View



**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. Intertek 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	Y1, Ref. Clock for CC430	26	Y2, RF Clock for CC430
433.92	W3127, Transmitting Radio	-	-

**Client Equipment Used During Test**

Use*	Product Type	Manufacturer	Model	Comments
EUT	RFID	Guard RFID	ECB	-
SIM	AC/DC Adapter	CUI Inc.	EPSA120200U	Input: 120~240VAC, 50/60Hz, 0.8A Output: 12VDC, 2.0A

Abbreviations:  
 EUT - Equipment Under Test, SIM - Simulator (Not Subjected to Test)

**Software and Firmware**

Use*	Description	Version
EUT	Hardware	R1.05
EUT	Firmware	R1.0.0.b

Abbreviations:  
 EUT - Equipment Under Test,

**Input/Output Ports**

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	DC Power In	DC	No	No	12VDC 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	6	-	-	DC	-	4 X AA Batteries, New
1	12	-	-	DC	-	With AC/DC Adapter

### EUT Operation Modes

Mode #	Description
1	Keep transmitting Beacon Signal with new Batteries.
2	Keep transmitting Beacon Signal with AC/DC Adapter.

### EUT Configuration Modes

Mode #	Description
1	Orthogonal X 
2	Orthogonal Y 
3	Orthogonal Z 
4	The EUT was set on table as Orthogonal X and connected an AC/DC Adapter to supply 12VDC via DC input connector.



### Test Equipment Verified for function

Model #	Description	Checked Function	Results
N9038A	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_sigantl and checked OK.
JB1	Antenna, 30 to 2000MHz	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.

<b>FCC Part 15.231 and IC RSS-210</b>			
<b>Test Type</b>	<b>Regulation</b>	<b>Measurement Method</b>	<b>Result</b>
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)	25.8
Basic Standard	-	Relative Humidity (%)	35
Test Location	Richmond	Barometric Pressure (kPa)	101.4
Test Engineer	Jeremy Lee	Date	26 July 2017
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA		
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. Please see EUT photo for details.



## AC Power Line Conducted Emissions

Governing Doc	FCC 15.207 & RSS-GEN	Room Temperature (°C)	25.2		
Basic Standard	ANSI C63.4	Relative Humidity (%)	53.0		
Test Location	Richmond	Barometric Pressure (kPa)	101.5		
Test Engineer	Jeremy Lee	Date	22 August 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 checked="" type="checkbox"/> Quasi-Peak <input checked="" 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.

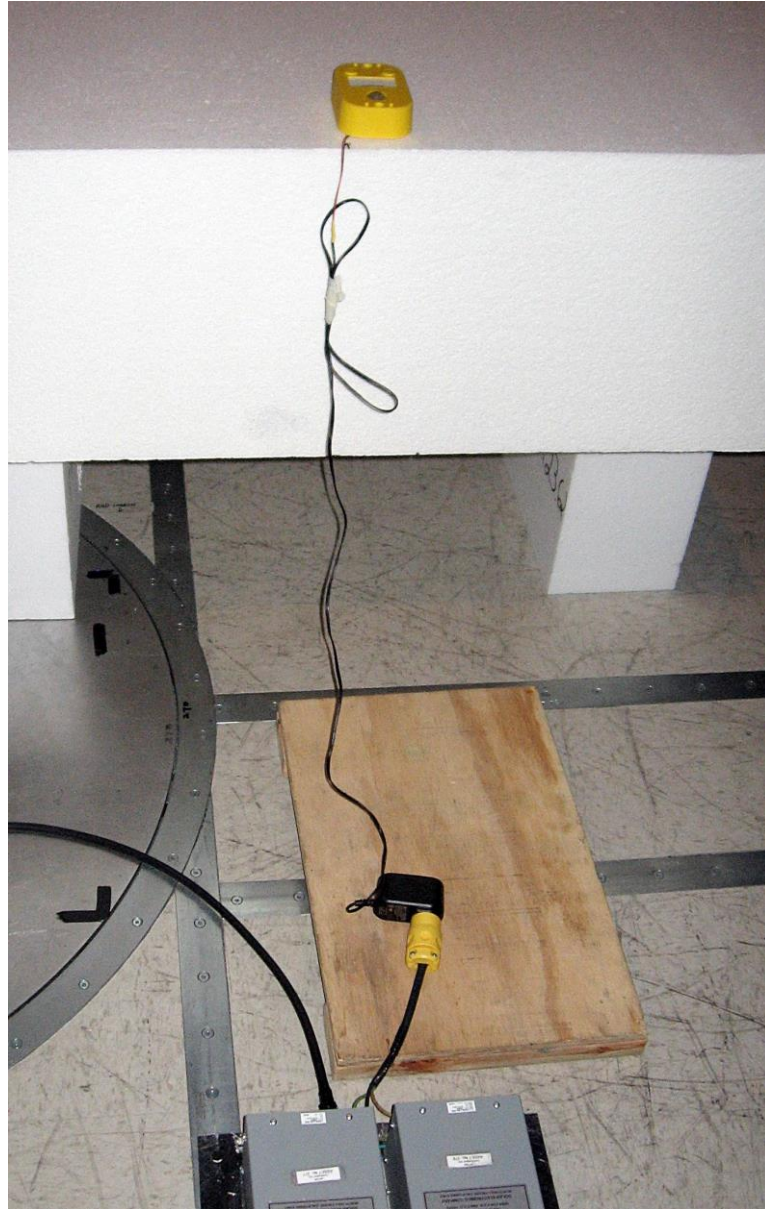
### Test Result

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



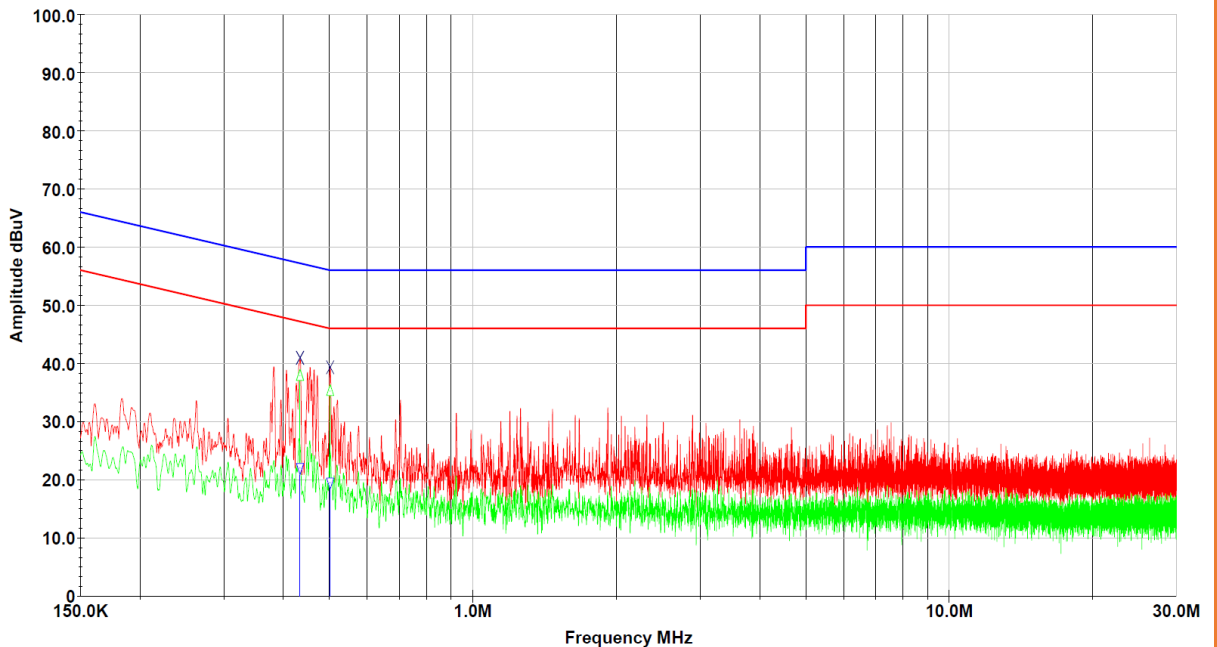
FCC 15.107\_Class B

Project Number - 16459  
 Model Number - ECB  
 Serial Number - 000055  
 FCC ID - VZKECB

Line 1

- QP Limit
- Average Limit
- Line 1 Scan
- Ave Trace
- X Suspects (Top 10)
- △ QP
- ▽ Ave

Setup - Keep transmitting Beacon with AC Adapter, EPSA120200U



Operator: Jeremy Lee

Temp: 25.2 C / 53.0 % RH / 101.5 kPa

Company: Guard RFID Solutions

Current Time -11:08:38 AM, Tuesday, August 22, 2017

Contact: Dalibor Pokrajac

Table : Table\_Line 1

Timestamp: 11:08:38 AM, Tuesday, August 22, 2017

Frequency (MHz)	Peak (dBuV)	Qp (dBuV)	QP Limit (dBuV)	Margin_QP (dB)	Ave (dBuV)	Ave Limit (dBuV)	Margin_AVG (dB)	LISN Losses (dB)	Path Losses (dB)
433.655 KHz	46.57	37.87	57.18	-19.31	22.02	47.18	-25.16	0.03	9.92
501.425 KHz	37.78	35.22	56.00	-20.78	19.46	46.00	-26.54	0.03	9.92

- Line 2



FCC 15.107\_Class B

Project Number - 16459

Model Number - ECB

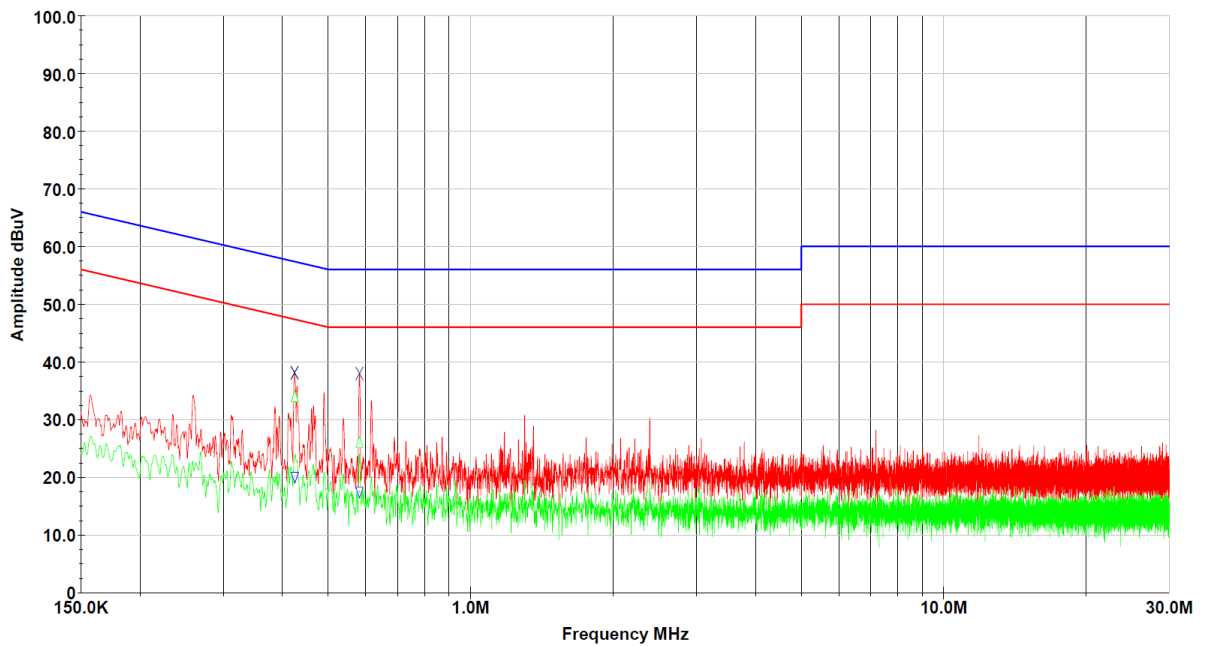
Serial Number - 000055

FCC ID - VZKECB

Setup - Keep transmitting Beacon with AC Adapter, EPSA120200U

Line 2

- QP Limit
- Average Limit
- Line 2 Scan
- Ave Trace
- X Suspects (Top 10)
- △ QP
- ▽ Ave



Operator: Jeremy Lee

Temp: 25.2 C / 53.0 % RH / 101.5 kPa

Company: Guard RFID Solutions

Current Time -11:18:29 AM, Tuesday, August 22, 2017

Contact: Dalibor Pokrajac

Table : Table\_Line 2

Page 1 of 1

Timestamp: 11:18:29 AM, Tuesday, August 22, 2017

Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Limit (dBuV)	Margin_QP (dB)	AVG (dBuV)	AVG Limit (dBuV)	Margin_AVG (dB)	LISN Losses (dB)	Path Losses (dB)
424.735 KHz	47.81	33.89	57.36	-23.47	20.10	47.36	-27.26	0.03	9.92
582.145 KHz	40.44	25.89	56.00	-30.11	17.53	46.00	-28.47	0.03	9.92

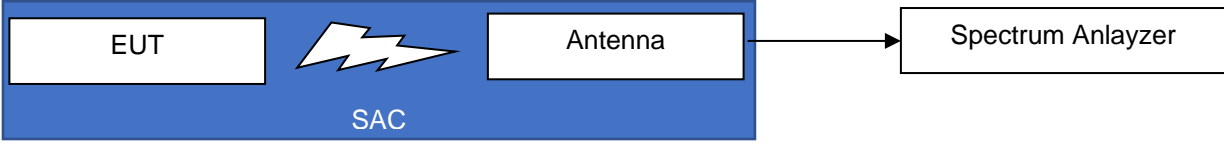
### Summary of the operation of RF Transmission

Governing Doc	FCC Part 15.231(a) & RSS-210, Annex A.1	Room Temperature (°C)	26.1		
Basic Standard	-	Relative Humidity (%)	53.0		
Test Location	Richmond	Barometric Pressure (kPa)	101.5		
Test Engineer	Jeremy Lee	Date	23 August 2017		
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA				
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					
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>					

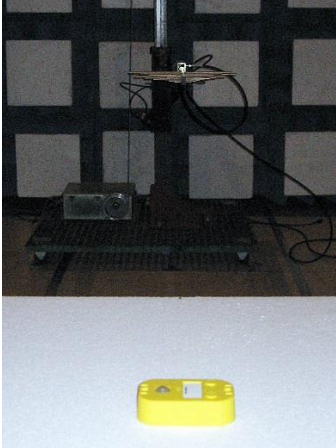
### Test setup

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.**



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





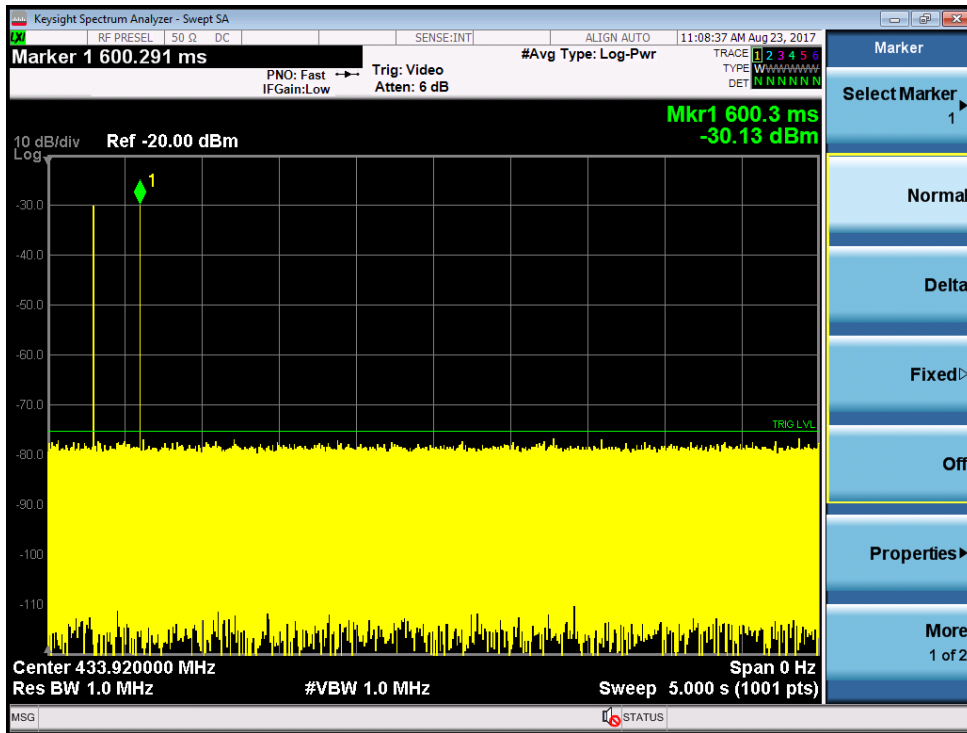
**Reviewed Results**

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) <sup>1</sup>	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) <sup>2</sup>	Periodic transmission at regular predetermined intervals	<input checked="" type="checkbox"/>	<input 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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"/>

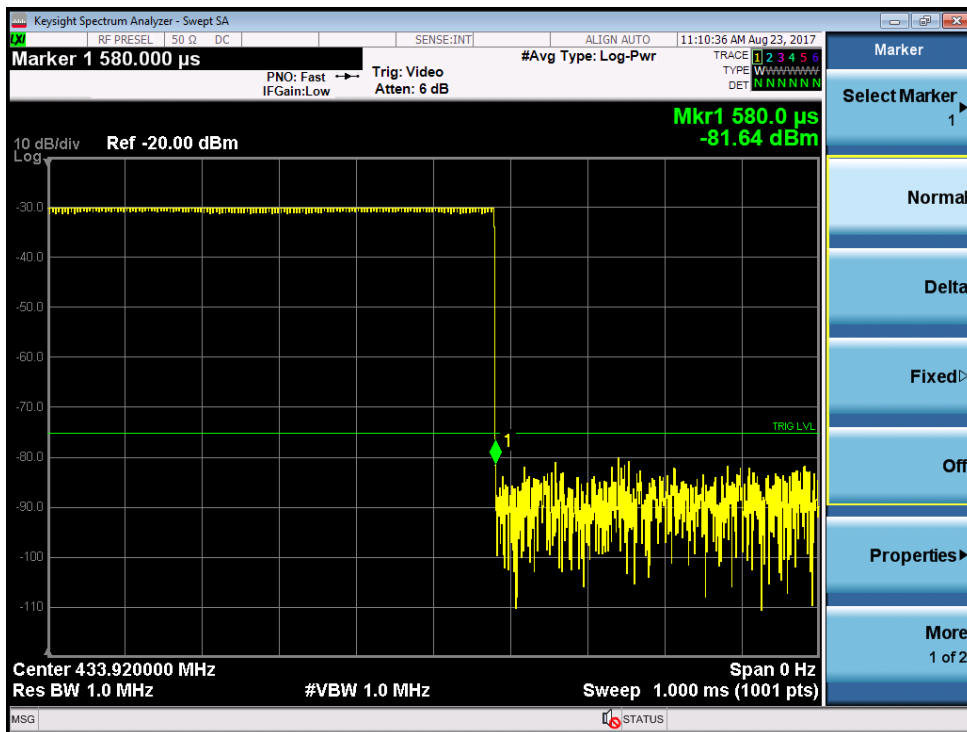
Note1)The EUT is operating as manually when pressed one of PUSH Buttons or RFID detected. When Activated Transmitter, there are three 580µs pulses were activated and deactivated after 600.3ms. Please see below screen capture, which was deactivated transmitter within not more than 5sec.

Note2) The Beacon signal is turned on as Periodic transmission at regular predetermined interval, 6.6Sec. Therefore, the total turned on time in one hour is 580us X 3 pulses X 546 times(3600/6.6sec). It means 0.95s was turned on every 1 Hour. It is not exceeding 2s/hr.

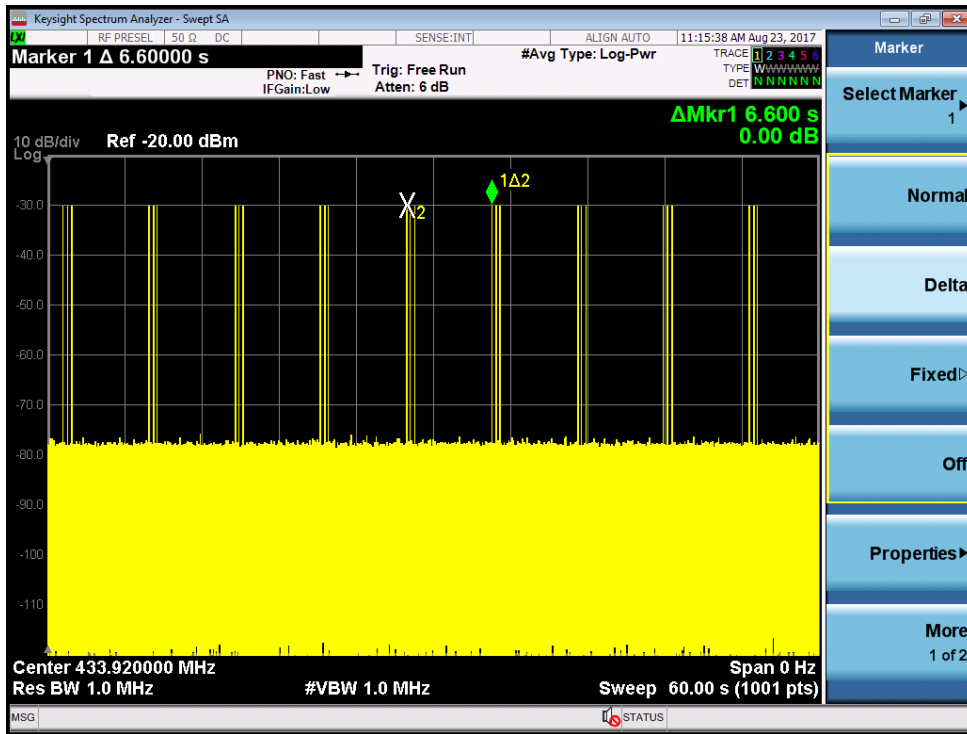
- Screen Capture pressed one of buttons, manually activated and deactivated in 600.3ms



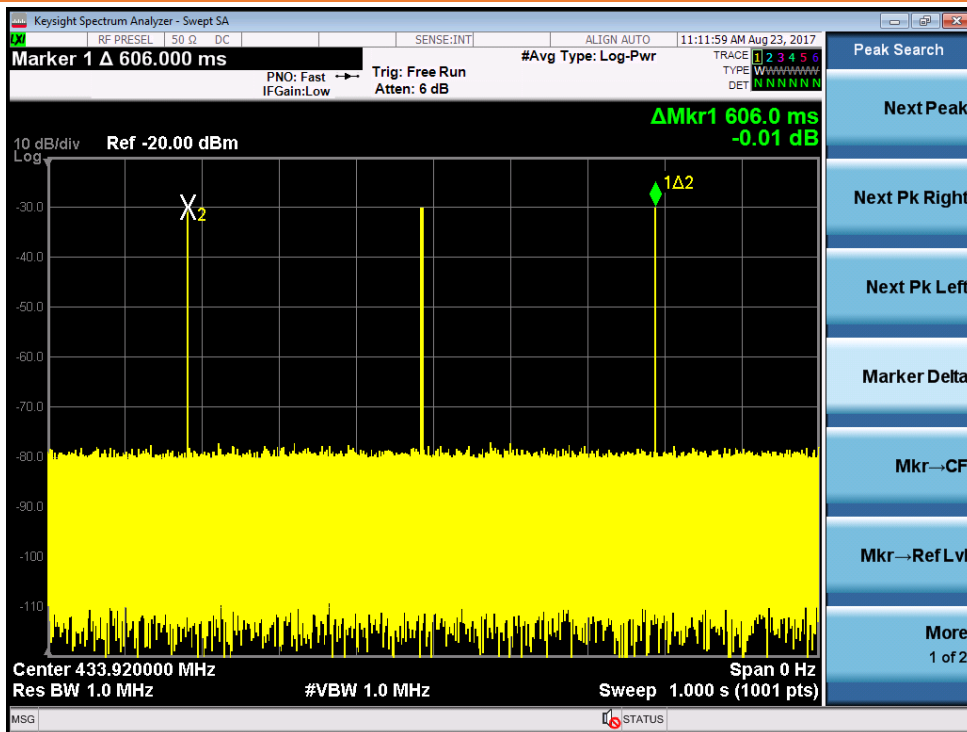
- Screen Capture, Turned on time of one pulse.



- Screen Capture for Beacon, Periodic transmission every 6.6sec, 9 times in 60sec.



- Screen Capture for Beacon, Interval of each pulses, 303ms apart each others.



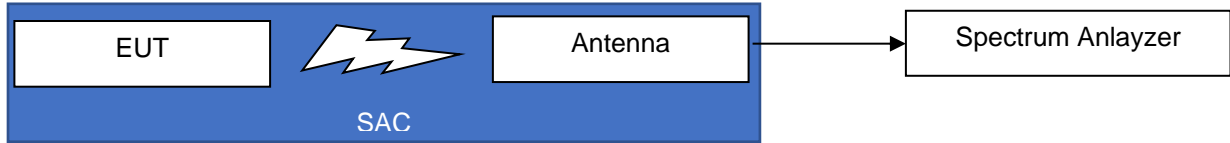
### Field Strengths

Governing Doc	FCC Part 15.231(b) & RSS-210, Annex A.2	Room Temperature (°C)	26.5				
Basic Standard	ANSI C63.4:2014 & ANSI	Relative Humidity (%)	48.0				
Test Location	Richmond	Barometric Pressure	101.5				
Test Engineer	Jeremy Lee	Date	02 AUG. 2017				
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA						
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 <sup>1</sup>	NCR <sup>1</sup>		
Note1) NCR = No Calibration Required, but NSA was done at 2016.							
Detector:	<input checked="" type="checkbox"/> Peak		<input checked="" type="checkbox"/> Quasi-Peak/AVG				
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"/> <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		
Frequency (MHz)	Orthogonal	Detector	POL	Emissions (dBuV/m)	Limit (dB)	Margin (dB)	Comments
433.92	X	QP <sup>1</sup>	H	76.04	80.83 <sup>2</sup>	4.79	PASS
		QP <sup>1</sup>	V	70.98	80.83 <sup>2</sup>	9.85	PASS
	Y	QP <sup>1</sup>	H	80.49	80.83 <sup>2</sup>	0.34	PASS
		QP <sup>1</sup>	V	71.80	80.83 <sup>2</sup>	9.03	PASS
	Z	QP <sup>1</sup>	H	62.92	80.83 <sup>2</sup>	17.91	PASS
		QP <sup>1</sup>	V	79.31	80.83 <sup>2</sup>	1.52	PASS
Note 1) Measured by CISPR quasi-peak detector.							
Note 2) Cconverted from 11,000uV/m at 3 meter.							
Compliant <input checked="" type="checkbox"/> Non-Compliant <input type="checkbox"/> Not Applicable <input type="checkbox"/>							

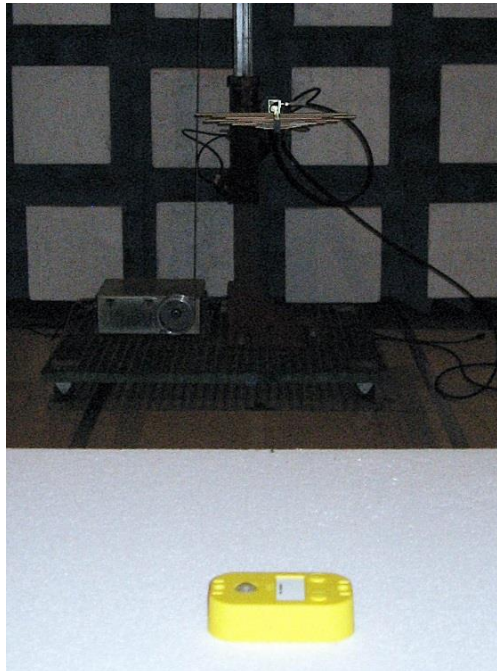
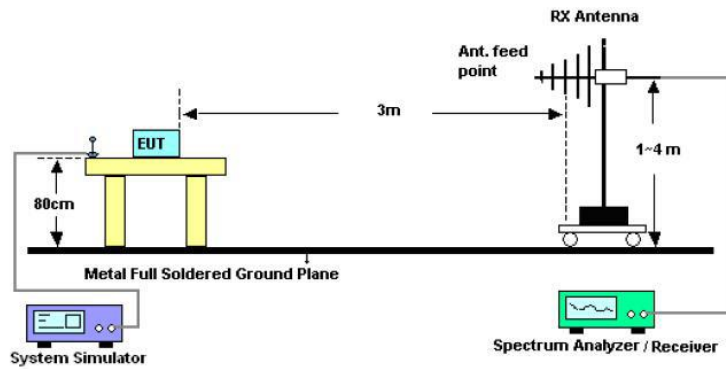
### Test setup

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, 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 433.92MHz 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 orthogonal. 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)	26.5			
Basic Standard	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6		Relative Humidity (%)	48.0			
Test Location	Richmond		Barometric Pressure (kPa)	101.5			
Test Engineer	Jeremy Lee		Date	02 AUG. 2017			
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA						
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	28-Oct-2015	28-Oct-2017		
EMC Shielded Enclosure	USC	USC-26	374	NCR <sup>1</sup>	NCR <sup>1</sup>		
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"/> Quasi-Peak/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"/> <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		
Frequency (MHz)	Orthogonal	Detector	POL	Emissions (dBuV/m)	Limit (dB)	Margin (dB)	Comments
867.84	X	QP	H	47.32 <sup>1</sup>	60.83	13.51	PASS
		QP	V	47.05 <sup>1</sup>	60.83	13.78	PASS
	Y	QP	H	47.32 <sup>1</sup>	60.83	13.51	PASS
		QP	V	47.06 <sup>1</sup>	60.83	13.77	PASS
	Z	QP	H	47.34 <sup>1</sup>	60.83	13.49	PASS
		QP	V	47.34 <sup>1</sup>	60.83	13.49	PASS
1301.76	Y	Peak	H	UNF <sup>2</sup>	73.98	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	53.98	N/A <sup>3</sup>	PASS
2169.6	Y	Peak	H	UNF <sup>2</sup>	80.83	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	60.83	N/A <sup>3</sup>	PASS
2603.52	Y	Peak	H	UNF <sup>2</sup>	80.83	N/A <sup>3</sup>	PASS

		AVG	H	UNF <sup>2</sup>	60.83	N/A <sup>3</sup>	PASS
3037.44	Y	Peak	H	UNF <sup>2</sup>	80.83	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	60.83	N/A <sup>3</sup>	PASS
3471.36	Y	Peak	H	UNF <sup>2</sup>	80.83	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	60.83	N/A <sup>3</sup>	PASS
3905.28	Y	Peak	H	UNF <sup>2</sup>	73.98	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	53.98	N/A <sup>3</sup>	PASS
4339.2	Y	Peak	H	UNF <sup>2</sup>	73.98	N/A <sup>3</sup>	PASS
		AVG	H	UNF <sup>2</sup>	53.98	N/A <sup>3</sup>	PASS

Note 1) Measured by CISPR quasi-peak detector, all emissions were under noise floor.

Note 2) UNF:Under Noise Floor, all emissions were under noise floor.

Note 3) Cause of all emissions was under Noise Floor.

Compliant

Non-Compliant

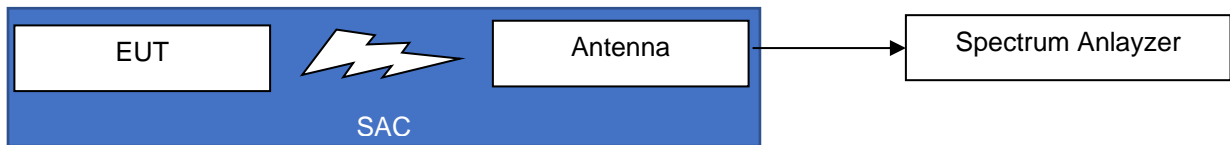
Not Applicable

### Test setup

#### Description of test set-up:

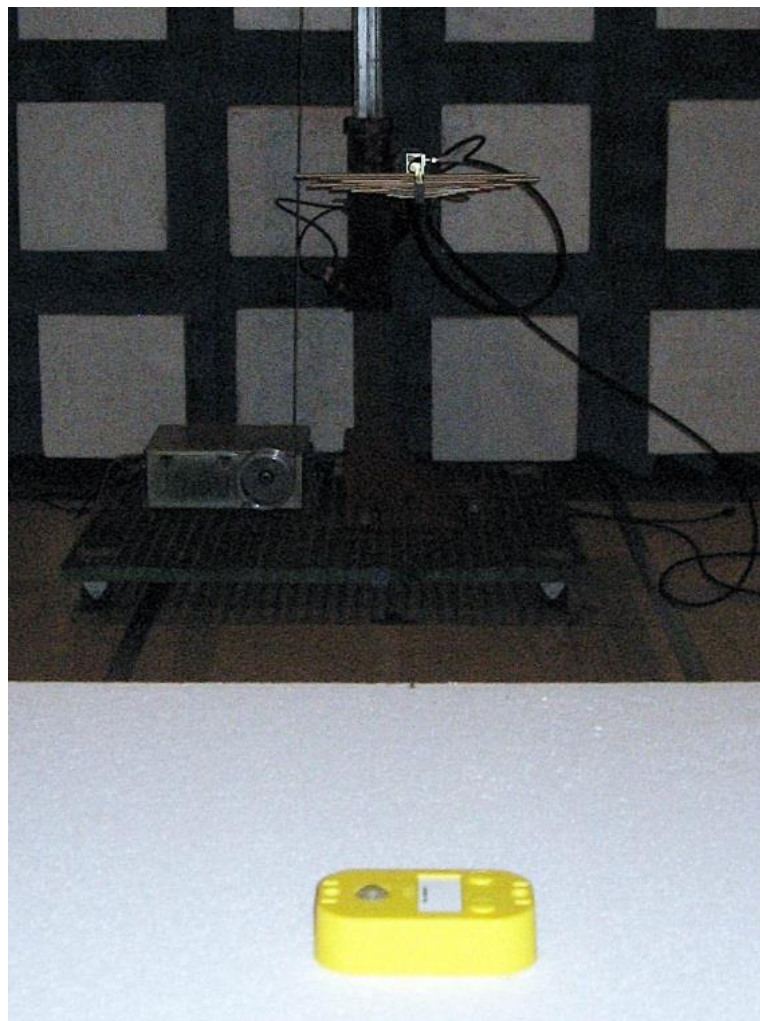
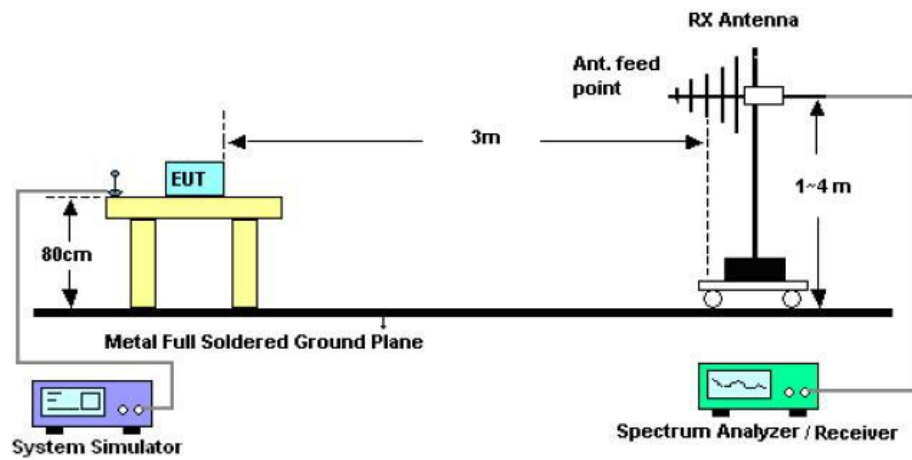
The EUT was placed on a 0.8 m for under 1GHz and 1.5m for over 1GHz non-conducting table above a Turn table in SAC.

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

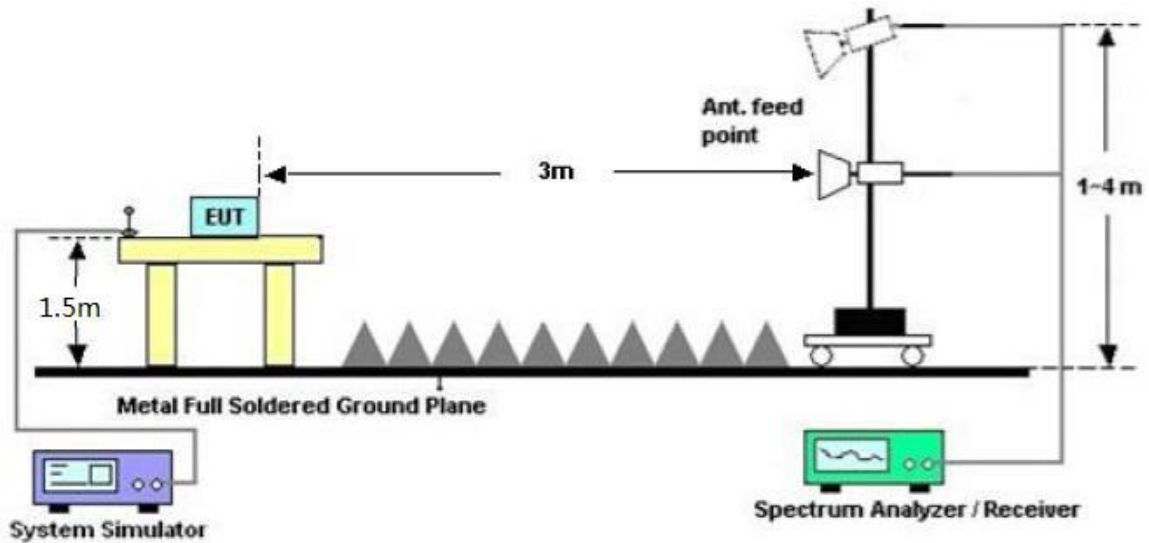




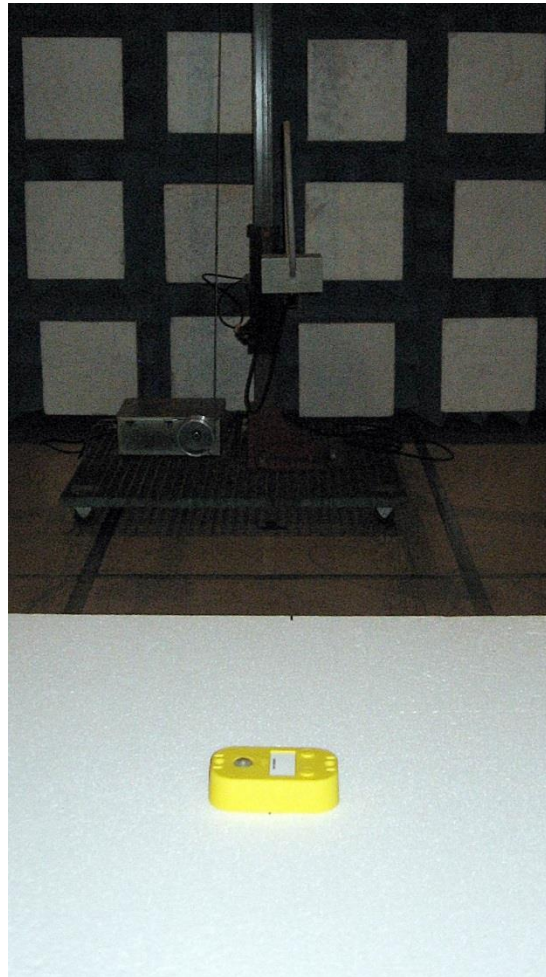
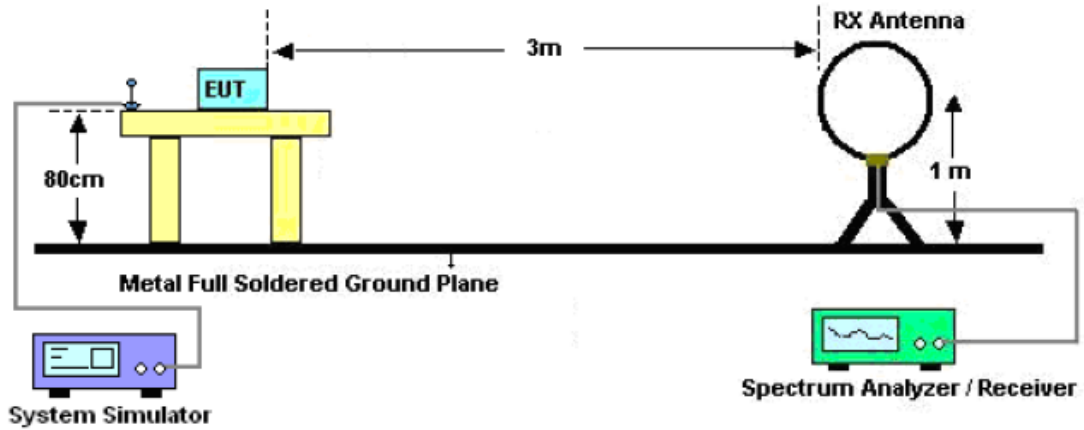
- Tested with SAS-510-2 for 867.84MHz, LPDA Antenna as followed by ANSI C63.10, Table 1



- 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

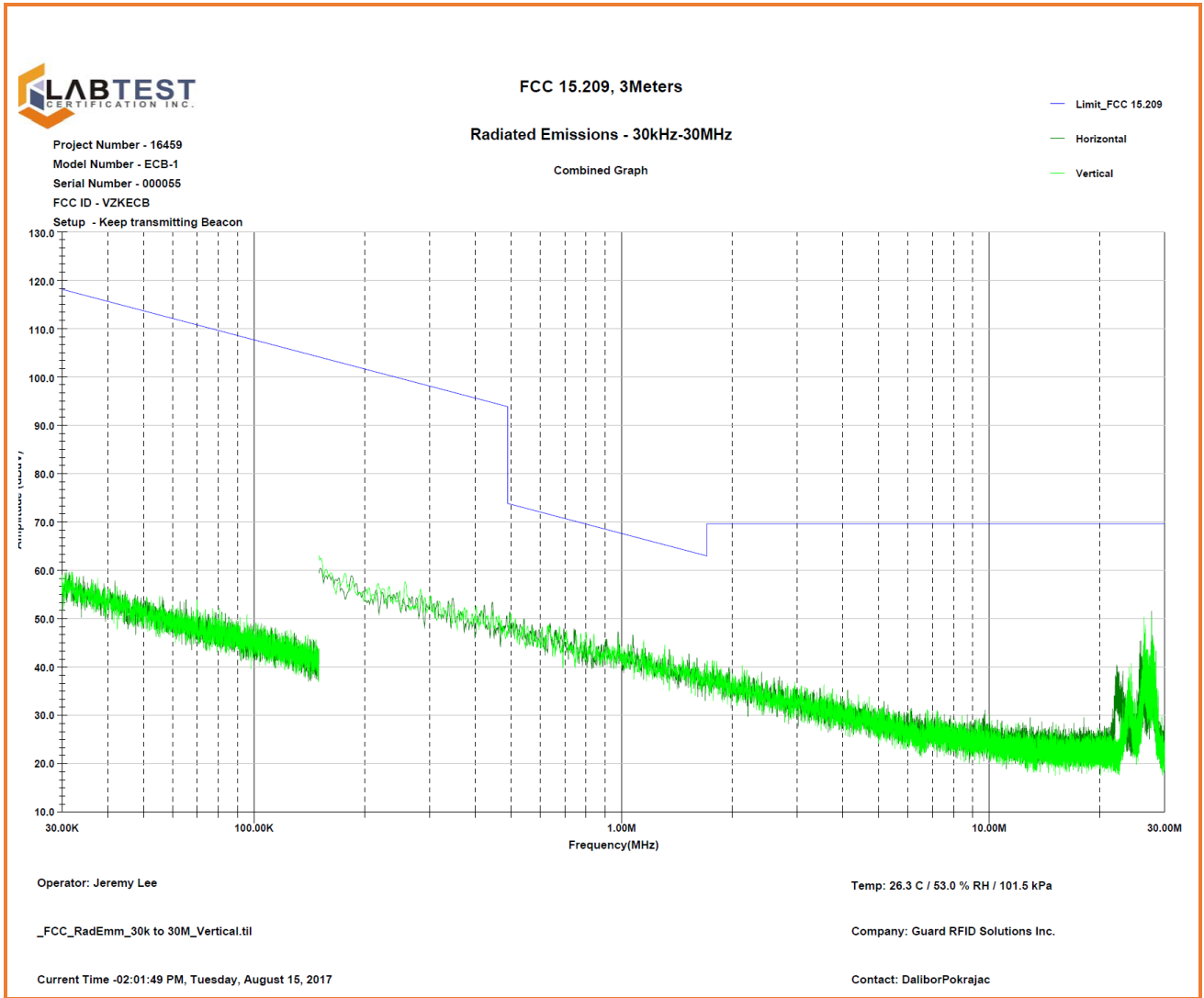
This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test (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 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 (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)

**Graphical Representation for Emission - Radiated 30kHz to 30MHz**



### Radiated Emissions for Digital Parts and Receiver

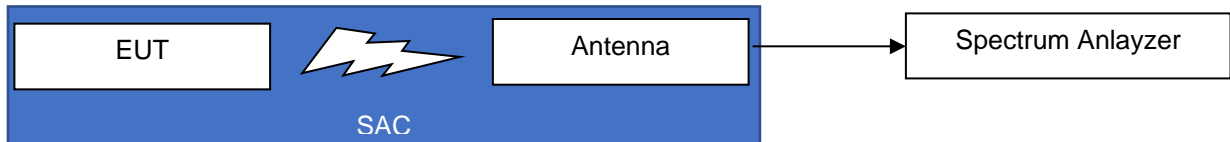
Governing Doc	FCC 15.109(a) & ICES-003	Room Temperature (°C)	25.2 & 26.3		
Basic Standard	ANSI C63.4:2014	Relative Humidity (%)	53.0		
Test Location	Richmond	Barometric Pressure (kPa)	101.4 & 101.5		
Test Engineer	Jeremy Lee	Date	03 & 22 August 2017		
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA <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 <sup>1</sup>	NCR <sup>1</sup>
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"/> 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		
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

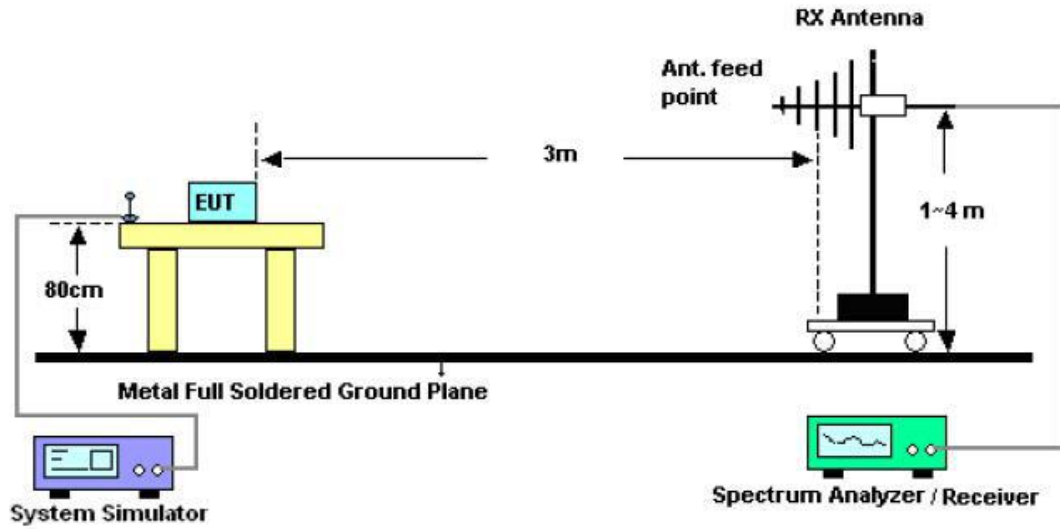
#### Description of test set-up:

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

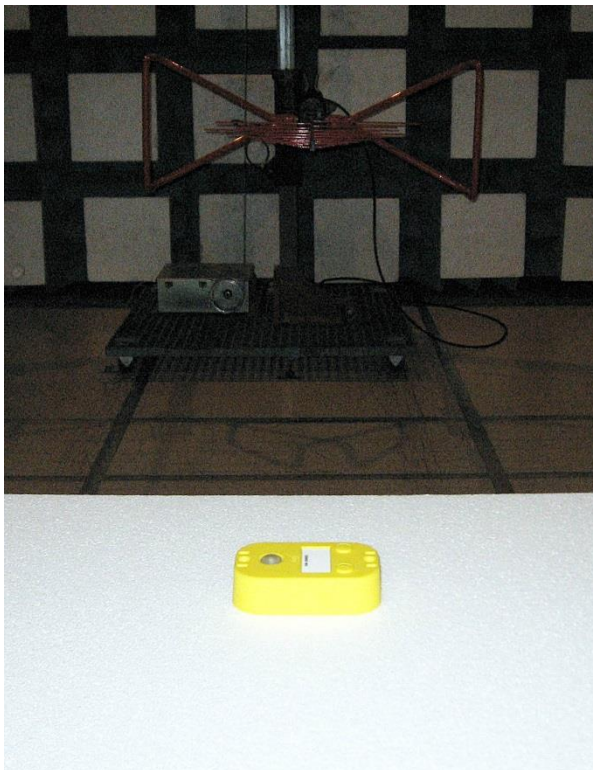
The EUT was set to **Operation Mode #1 with configuration Mode #1 for Battery Operated and Operation Mode #2 with configuration Mode #4 with AC/DC adapter.**



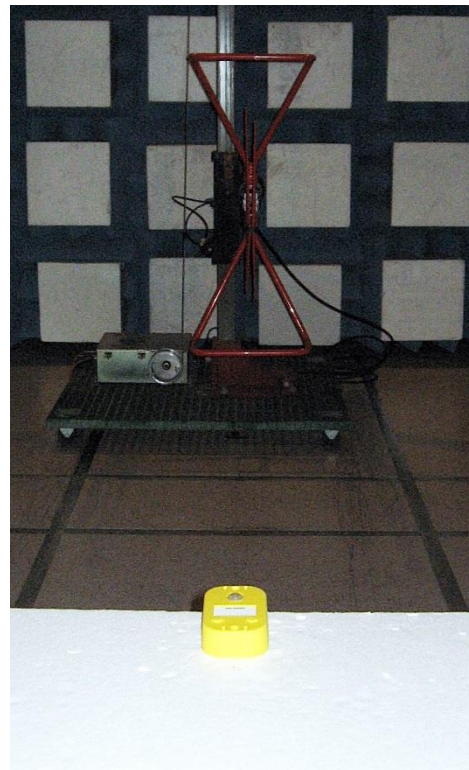
- Radiated Emission 30 to 1,000MHz, with JB-1



- Emissions with Batteries



- Emissions with AC/DC Adapter



## 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.

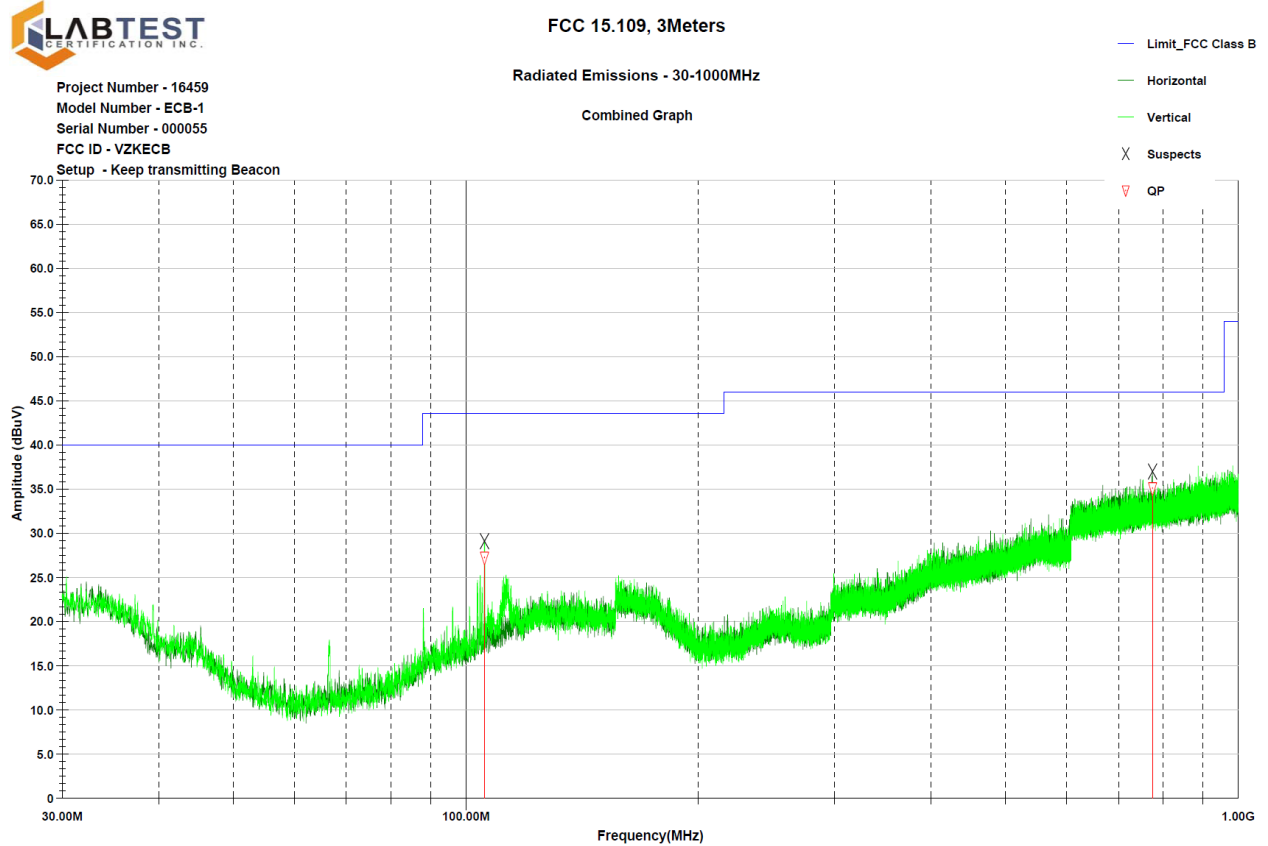
### *Test Result*

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



Operator: Jeremy Lee

Temp: 26.0 C / 52.0 % RH / 101.6 kPa

\_FCC\_RadEmm\_30-1000MHz\_CLASSAB\_20170510.til

Company: Guard RFID Solutions Inc.

Current Time -01:37:12 PM, Tuesday, August 22, 2017

Contact: DaliborPokrajac

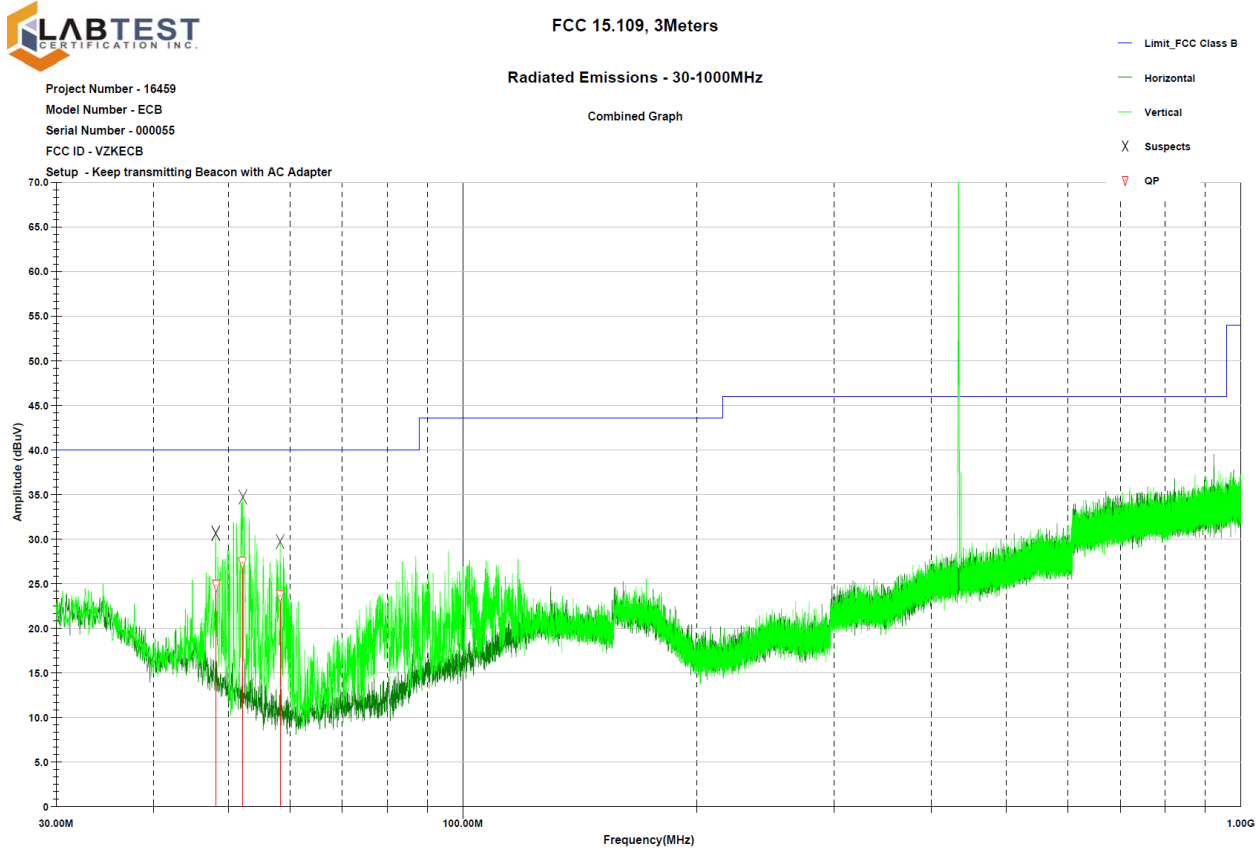
Table : Top\_Horizontal

Frequency (MHz)	Ant Fac (dB)	CableLoss (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
774.701800 MHz	21.5	4.2	0.0	102.0	143.9	35.099	47.460	12.361

Table : Top\_Vertical

Frequency (MHz)	Ant Fac (dB)	Cable Fac (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
105.684200 MHz	13.63	1.22	0.0	148	100	27.254	40.460	13.206

- Radiated Emissions with AC/DC Adapter



Operator: Jeremy Lee

Temp: 25.2 C / 53.0 % RH / 101.5 kPa

01\_RadEmm\_w\_AC Adapter.ttl

Company: Guard RFID Solutions

Current Time -10:20:02 AM, Tuesday, August 22, 2017

Contact: Dalibor Pokrajac

Table : Top\_Vertical

Frequency (MHz)	Ant Fac (dB)	Cable Fac (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	QP (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.174750 MHz	9.53	0.80	0.00	352	109	24.80	40.46	15.66
52.080250 MHz	7.60	0.84	0.00	268	100	27.37	40.46	13.09
58.227000 MHz	6.44	0.88	0.00	295	100	23.64	40.46	16.82

### The Bandwidth of the emission

Governing Doc	FCC Part 15.231(c) & RSS-210, Annex A.3	Room Temperature (°C)	25.8		
Basic Standard	ANSI C63.10:2013, Clause 6.9	Relative Humidity (%)	35		
Test Location	Richmond	Barometric Pressure	101.4		
Test Engineer	Jeremy Lee	Date	24 May 2017		
EUT Voltage	<input checked="" type="checkbox"/> Batteries, 4 X AA				
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					
Frequency(MHz)	Test Method	Bandwidth(kHz)	Limit(kHz)	Margin(kHz)	Comments
433.92	20dB <sup>1</sup>	961.4	1084.8	123.4	PASS
	99% <sup>2</sup>	1040.8	1084.8	40	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:

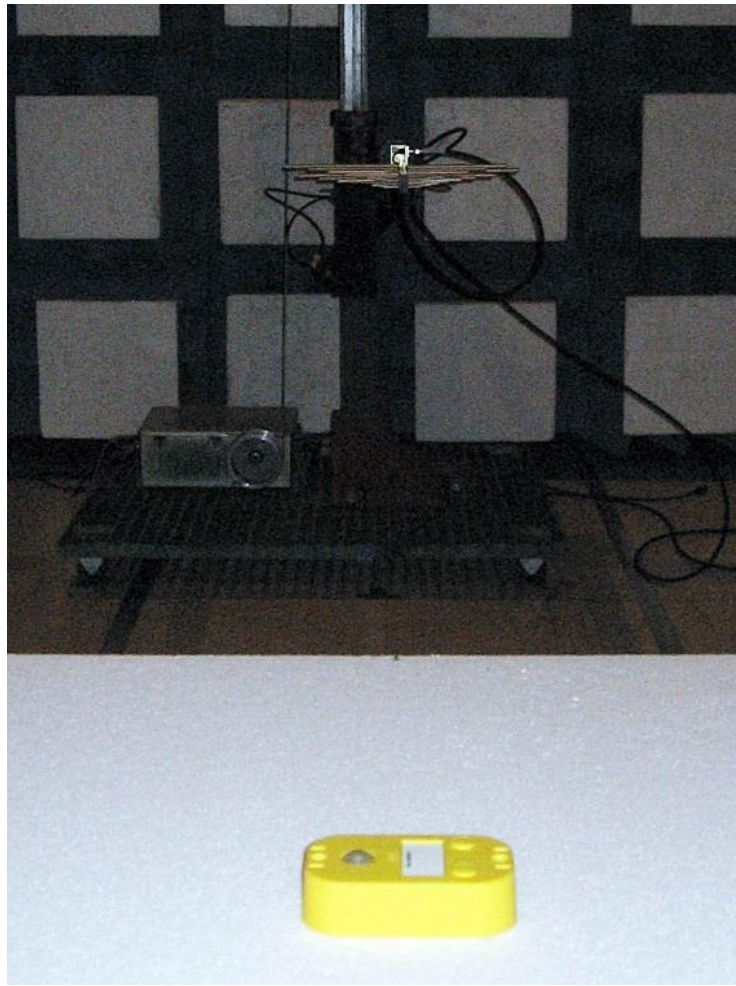
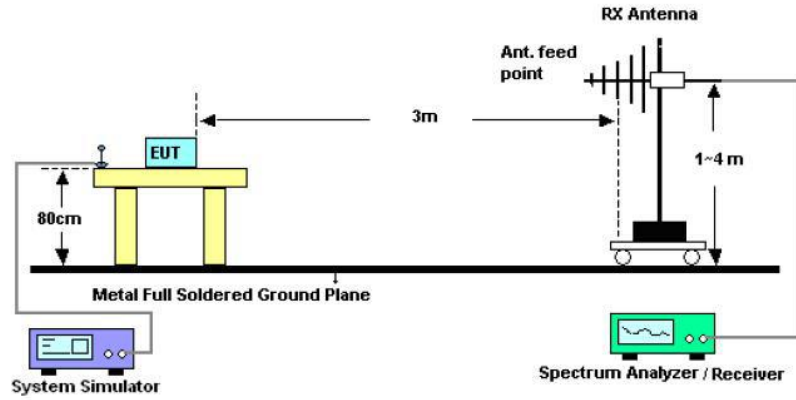
The EUT was placed on a 0.8 m non-conducting table above a Turn table in SAC.

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

```

    graph LR
      subgraph SAC [SAC]
        EUT[EUT]
        Antenna[Antenna]
      end
      EUT --> Antenna
      Antenna --> SA[Spectrum Analyzer]
  
```

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



**Results**



## APPENDIX A: 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).



**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 rubenUgarte@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) • Consumer ISM equipment	• FCC MP-5, (February 1986)		
Intentional Radiators (FCC Part 15 Subpart C)	• ANSI C63.10-2013		
UPCS (FCC Part 15, Subpart D) •Unlicensed Personal Communication Systems devices	• ANSI C63.17-2013		
U-NII without DFS Intentional Radiators (FCC Part 15, Subpart E) •Unlicensed National Information Infrastructure Devices (U-NII without DFS)	• ANSI C63.10-2013	KDB Publication 789033	
U-NII with DFS Intentional Radiators (FCC Part 15 Subpart E) • Unlicensed National Information Infrastructure U-NII Devices with Dynamic Frequency Selection (DFS)	• FCC KDB Publication 905462 D02 UNII DFS Compliance Procedures New Rules v01 (April 8, 2016)		
UWB Intentional Radiators (FCC Part 15, Subpart F) •Ultra-wideband Operation	• ANSI C63.10-2013		
BPL Intentional Radiators (FCC Part 15, Subpart G) •Access Broadband Over Power Line (Access BPL)	• ANSI C63.10-2013		
White Space Device Intentional Radiators (FCC Part 15, Subpart H) •White Space Devices	• ANSI C63.10-2013		





**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	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> <li>TIA-102.CAAA-D</li> </ul>	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)	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> <li>TIA-102.CAAA-D</li> </ul>		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	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> <li>TIA-102.CAAA-D</li> </ul>	KDB Publication 971168	
Maritime and Aviation Radio Services (FCC Licensed Radio Service Equipment) •Part 80 •Part 87	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> </ul>		
Microwave and Millimeter Bands Radio Services (FCC Licensed Radio Service Equipment) •Part 25 •Part 74 •Part 90 (90Y, 90Z, D SRC) •Part 101	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> <li>TIA-102.CAAA-D</li> </ul>		
Broadcast Radio Services (FCC Licensed Radio Service Equipment) •Part 73 •Part 74 (non-microwave)	<ul style="list-style-type: none"> <li>ANSI/TIA-603-D</li> <li>TIA-102.CAAA-D</li> </ul>		
RF Exposure •Devices subject to SAR requirements	<ul style="list-style-type: none"> <li>IEEE Std 1528™-2013</li> </ul>	KDB Publication 865664 KDB Publication 447498	
Hearing Aid Compatibility (Part 20) •HAC for Commercial mobile services	<ul style="list-style-type: none"> <li>ANSI C63.19-2007; or</li> <li>ANSI C63.19-2011</li> </ul>		







**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"> <li>FCC KDB Publication 935210 D03 Signal Booster Measurements v04 (February 12, 2016)</li> <li>FCC KDB Publication 935210 D04 Provider Specific Booster Measurements v02 (February 12, 2016)</li> <li>FCC KDB Publication 935210 D05 Indus Booster Basic Meas v0 1r01 (February 12, 2016)</li> </ul>		

**Electromagnetic Compatibility (EMC)**

Test Method	Test Specification(s)	Range	Comments
Unintentional Radiators	ANSI C63.4-2003 ANSI C63.4-2009		
Radiated and Conducted Emissions	ANSI C63.4:2014; 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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