



REPORT

For

Guard RFID Solutions Inc.

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

Date: 30 April 2018
Report No.: 16922-1E
Revision No.: 2
Project No.: 16922
Model No.: Proximity Tag Exciter
FCC ID: VZKPTE2
IC ID.: 9937A-PTE2

ONE STOP GLOBAL CERTIFICATION SOLUTIONS



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Prepared by: LabTest Certification Inc.
Date Issued: 30 April 2018
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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.	16922-1E
Report Revision History.	<input checked="" type="checkbox"/> Rev. 0: 20 March 2018 <input checked="" type="checkbox"/> Rev. 1: 26 April 2018, add conducted emission via PoE and attached test data of 125kHz <input checked="" type="checkbox"/> Rev. 1: 30 April 2018, Removed Appendix.
Compiled by (+ signature)	Jeremy Lee 
Approved by (+ signature).....	David Johanson 
Date of issue	30 April 2018
Total number of pages	31
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	Guard RFID Solutions Inc.
Address	#140-766 Cliveden Place, Delta, BC, V3M 6C7, Canada
Manufacture's Name	Same as Applicant
Address	Same as Applicant
Test specification:	
Standards	FCC15.231:2018 / RSS-210, Issue 9, August 2016
Test procedure	➤ ANSI C63.4:2014 ➤ ANSI C63.10:2013 ➤ 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	Proximity Tag Exciter
Serial Number	000C30
FCC ID	VZKPTE2
IC ID	9937A-PTE2
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	09 March 2018
Date (s) of performance of tests.....	12 to 28 March 2018, 26 April, 2018.

Device Under Test Description

Application for	Radio Frequency Identification (RFID)
Operating Transmit Frequency	433.92MHz
Number of Channel	1 Channel
Equipment mobility	No
Type of Mounting	Wall or Ceiling (Non-metallic surface only)
Type of Antenna.....	Internal(Loop Coil Antenna)
Operating condition.....	-10 to +50 °C
Mass of equipment (g)	500
Dimension	41 mm X 33 mm X 7 mm
Nominal Voltages for:	<input checked="" type="checkbox"/> stand-alone equipment <input type="checkbox"/> combined (or host) equipment
Supply Voltage:	<input type="checkbox"/> 12V DC <input type="checkbox"/> 1 Amps Max.
If DC Power:	<input type="checkbox"/> Internal Power Supply <input checked="" type="checkbox"/> Host system is supplied 12VDC <input checked="" type="checkbox"/> PoE via PoE Splitter

Program details

Testing procedure and testing location:	
<input checked="" type="checkbox"/>	Testing Laboratory:
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	Testing location: 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 Proximity Tag Exciter creates a 125 KHz radio frequency (RF) zone with a unique ID that allows instant and accurate location of GuardRFID's Active Tags equipped with 125KHz Receivers. When such an active tag enters the PTE zone, it immediate transmits the zone's unique ID to the system. This real-time tag location information can then be used by GuardRFID's Argus network to detect the precise location of the tag. The PTE is primarily used for very close proximity tag detection, such as for room or bed level location, a narrow choke point leading from one manufacturing cell to another or tagged items on a conveyor belt, for example.

The field strength of the Exciter's LF field can be adjusted from 2' to 10', creating a defined detection zone. By adjusting the LF field the Exciter can tightly define a specified area. The Tag Exciter also has a UHF transceiver, so that it can communicate with the network. This communications capability is used to monitor the health of the PTE in real-time, and to enable remote adjustment of its LF field size.

The PTE can be either recessed within a wall or can be surface mounted on the wall.

FEATURES:

- **Creates a precise and definable tag detection zone at a specific location**
- **Adjustable detection zone from 2 – 10'**

- Simple installation – only requires mounting and power
- May be mounted above the ceiling or surface-mounted on a wall
- Fully supervised device, using 433MHz transceiver
- PoE compatible – simplifies and reduces installation costs

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	16	Y2, RF Clock
433.92	Transmitting Radio	-	-

Client Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	RFID	Guard RFID	PTE	-
AE	PoE Splitter	Silver Telecom	PA-1212 Ethernet PD Splitter	-
AE	PoE Switcher	Planet Tech. Co.	FSD804-PS	Connected Channel #1, PoE Port

Abbreviations:
EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment

Software and Firmware

Use*	Description	Version
EUT	Hardware	n/p
EUT	Firmware	n/p

Abbreviations:
EUT - Equipment Under Test

Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	DC input	DC	Yes	No	12VDC

*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
0	12	-	-	DC	-	

EUT Operation Modes

Mode #	Description
1	Keep transmitting 433.92MHz Radio Signal every 1 second, modified for Radio Testing.
2	Keep transmitting 433.92MHz Radio Signal every 30 seconds, normal operation.

EUT Configuration Modes

Mode #	Description
1	Mounted as see below as Wall Hanging. 
2	Put on Tabla for Conducted Emission Testing. EUT was connected via PoE Splitter and PoE Switch as see below. 

Test Equipment Verified for function

Model #	Description	Checked Function	Results
N9038A	EMC Analyzer	Frequency and Amplitude	Checked 433.92MHz and 0dBm Reference Signal from Signal Generator and both Freq. and Level were OK.
E74005A	EMC Analyzer	Frequency and Amplitude	Checked 50MHz and -20dBm Reference Signal and both Freq. and Level were OK.
JB1	Antenna, 30 to 2000MHz	Checked structure	Normal – no damage.
SAS-510-2	Antenna, 200 to 1,000MHz	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.
8449B	Pre-Amplifier, 1 to 26.5GHz	Gain at 1 to 26.5GHz	Gains were normal.

Measurement Uncertainty

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

Parameter	Uncertainty
Radiated Emission, 30 to 6,000MHz	± 4.93 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
Summary of the operation of RF Transmission	15.231(a) & RSS-210, Annex A.1.1	-	PASS
Field Strength of Fundamental - Intentional radiator	15.231, 15.205, 15.209 & RSS-210	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5	PASS
Field Strength of Spurious Emissions - Intentional radiator	15.231, 15.205, 15.209 & RSS-210	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	PASS
Radiated Emissions-Intentional radiators	15.209 and RSS-210	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5	PASS
The Bandwidth of the emission	15.231 and RSS-210	ANSI C63.10:2013, Clause 6.9	PASS
AC Power Line Conducted Emission	15.207(a) and RSS-Gen	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.2	PASS

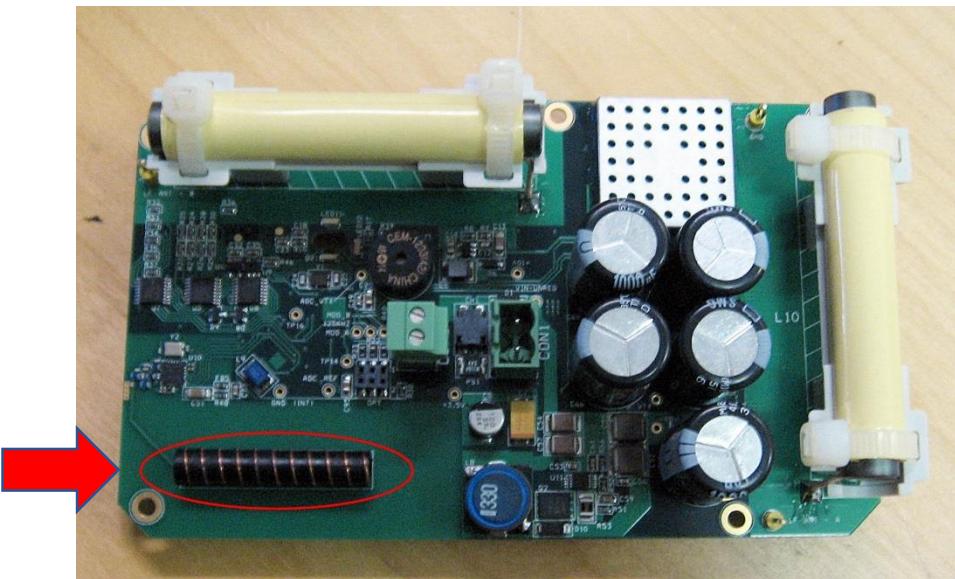
Antenna Requirement

Governing Doc	FCC 15.203 & RSS-GEN	Room Temperature (°C)	24.1
Basic Standard	-	Relative Humidity (%)	34.0
Test Location	Richmond	Barometric Pressure (kPa)	102.5
Test Engineer	Jeremy Lee	Date	13 March 2018
EUT Voltage	<input checked="" type="checkbox"/> DC 12V		
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.



Summary of the operation of RF Transmission

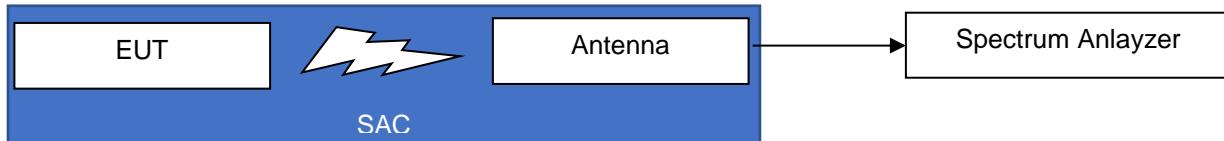
Governing Doc	FCC Part 15.231(a) & RSS-210, Annex A.1	Room Temperature (°C)	24.1		
Basic Standard	-	Relative Humidity (%)	34.0		
Test Location	Richmond	Barometric Pressure (kPa)	102.5		
Test Engineer	Jeremy Lee	Date	13 March 2018		
EUT Voltage	<input checked="" type="checkbox"/> DC 12V				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LP Antenna	A.H.Systems	SAS-510-2	227B	07-Feb-2018	07-Feb-2020
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 & 2 with configuration Mode #1**.



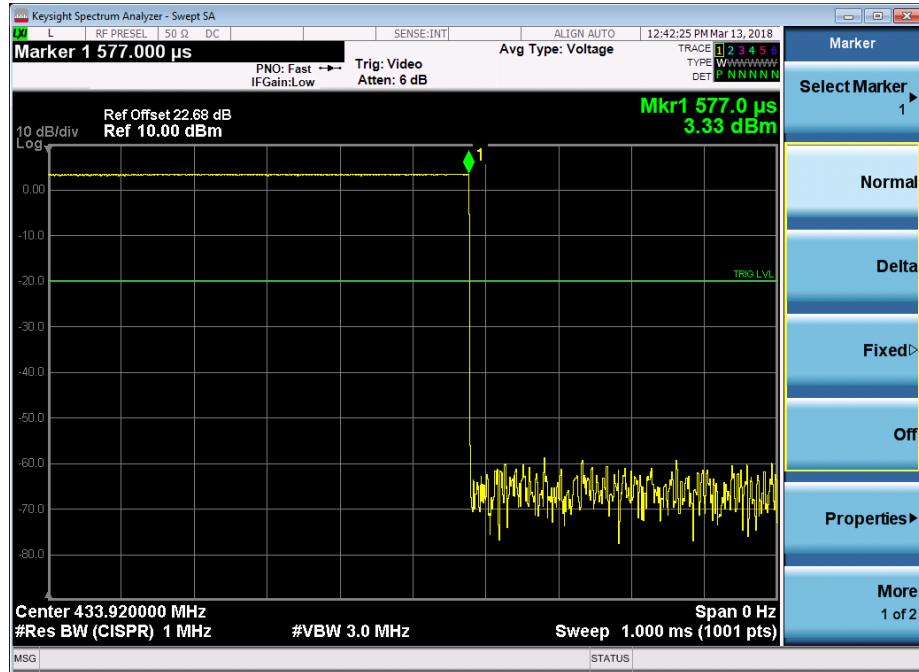
Reviewed Results

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)	Manually operated	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Automatically deactivate within 5 seconds of being released	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FCC 15.231(a)(2) ¹	Automatically operated	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Deactivate within 5 seconds after activation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC 15.231(a)(3) ²	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 type="checkbox"/>	<input checked="" 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 checked="" type="checkbox"/>	<input 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"/>

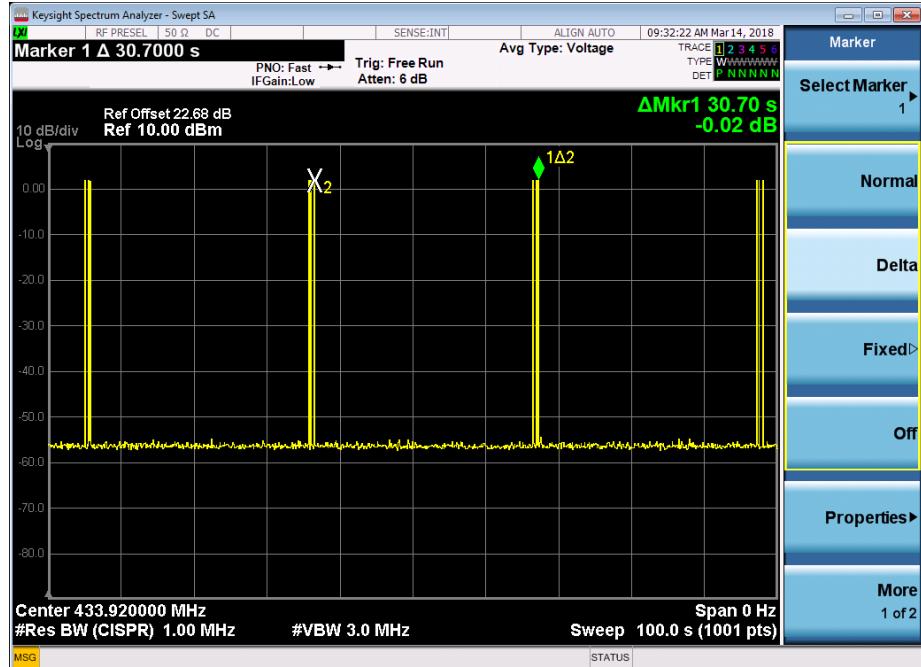
Note1)The EUT is operating as automatically when moved or detected 125kHz Exiting Signal. When Activated Transmitter, the signal was deactivated after 590 μ s.

Note2) Tag transmits one 590 μ s pulse every 10 minutes in static or every 12sec. in during motion.

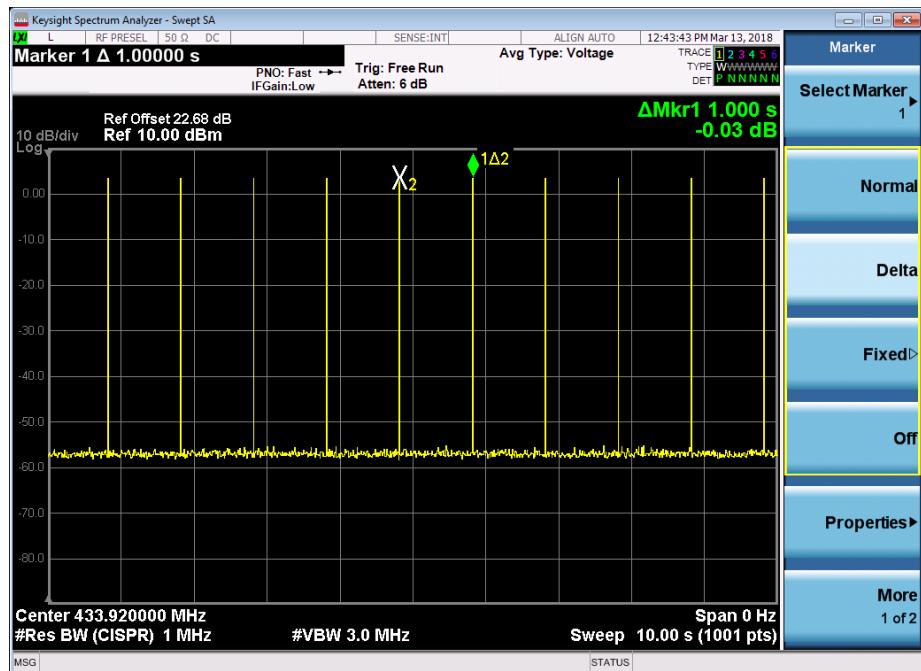
- Screen Capture, Automatic turned on and off time



- Screen Capture, periodic for Automatic Turned -on period, Normal.



- Screen Capture, modified for RF testing as turned on every 1 second.



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Field Strengths

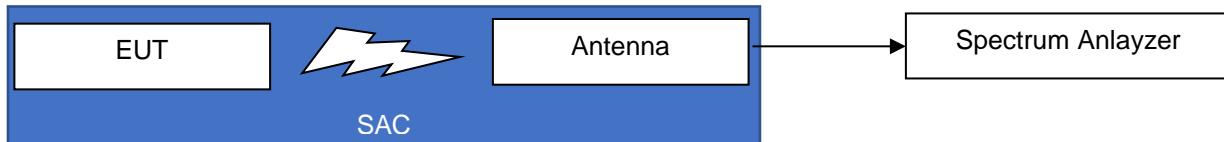
Governing Doc	15.231, 15.205, 15.209 & RSS-210		Room Temperature (°C)		20.5	
Basic Standard	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5		Relative Humidity (%)		42.2	
Test Location	Richmond		Barometric Pressure		102.4	
Test Engineer	Jeremy Lee		Date		27 March 2018	
EUT Voltage	<input checked="" type="checkbox"/> DC 12V					
Test Equipment Used	Manufacturer		Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight		N9038A	702	27-Apr-2017	27-Apr-2018
LP Antenna	A.H.Systems		SAS-510-2	227B	07-Feb-2018	07-Feb-2020
EMC Shielded Enclosure	USC		USC-26	374	NCR ¹	NCR ¹
Note1) NCR = No Calibration Required, but NSA was done at 2015.						
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)	Detector	POL	Emissions (dBuV/m)	Limit (dB)	Margin (dB)	Comments
433.92	Peak	H	90.72	100.83	10.11	PASS
	AVG ¹	H	30.89	80.83 ²	49.94	PASS
	Peak	V	96.99	100.83	3.84	PASS
	AVG ¹	V	37.91	80.83 ²	42.92	PASS
Note 1) Measured by CISPR Averaging detector. Note 2) Converted from 11,000uV/m at 3 meter.						
Compliant <input checked="" type="checkbox"/>	Non-Compliant <input type="checkbox"/>		Not Applicable <input type="checkbox"/>			

Test setup

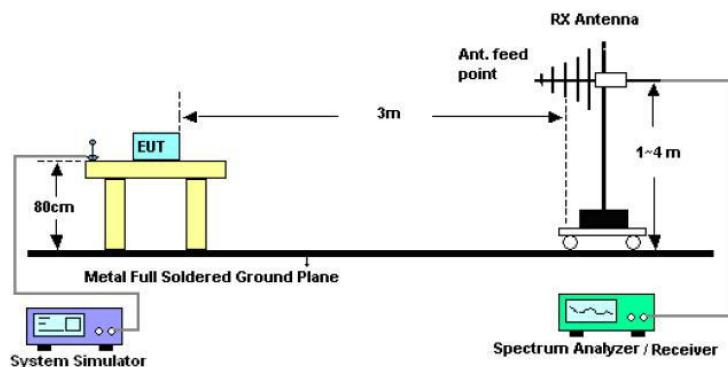
Description of test set-up:

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**.



- 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 Averaging detector 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)

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Spurious Emissions (Unwanted Emissions)

Governing Doc	FCC Part 15.231(b), 15.205, 15.209 & RSS-210, Annex A.2	Room Temperature (°C)	20.5 to 24.1
Basic Standard	ANSI C63.4:2014 & ANSI C63.10:2013, Clause 6.5 & 6.6	Relative Humidity (%)	34.0 to 42.2
Test Location	Richmond	Barometric Pressure (kPa)	100.5 to 102.4
Test Engineer	Jeremy Lee	Date	27 & 28 March 2018
EUT Voltage	<input checked="" type="checkbox"/> DC 12V		

Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LP Antenna	A.H.Systems	SAS-510-2	227B	07-Feb-2018	07-Feb-2020
Double-ridged Guide Horn Antenna	A.H.Systems	SAS-571	227C	22-Sep-2016	22-Sep-2018
Loop Antenna	ComPower	AL-130	241	11-Nov-2017	11-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"/> 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"/> 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)	Detector	POL	Emissions (dBuV/m)	Limit (dB)	Margin (dB)	Comments
867.84	Peak	H	41.90	81.94	40.04	PASS
	AVG ¹	H	28.06	61.94	33.88	PASS
	Peak	V	42.42	81.94	39.52	PASS
	AVG ¹	V	28.22	61.94	33.72	PASS
1301.8	Peak	H	64.44	73.98	9.54	PASS
	AVG ¹	H	23.72	53.98	30.26	PASS
	Peak	V	63.88	73.98	10.10	PASS
	AVG ¹	V	23.66	53.98	53.98	PASS

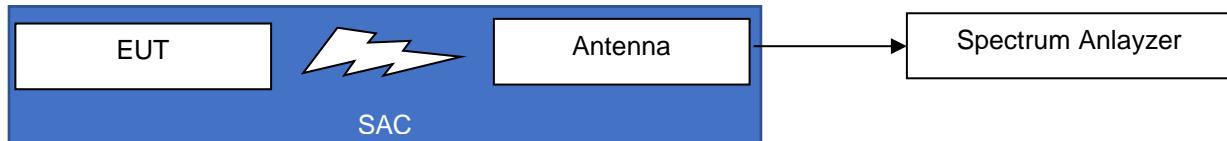
1735.7	Peak	H	42.46	81.94	39.48	PASS
	AVG1	H	23.40	61.94	38.54	PASS
	Peak	V	41.45	81.94	40.49	PASS
	AVG1	V	23.18	61.94	38.76	PASS
2169.6	Peak	H	44.16	81.94	37.78	PASS
	AVG1	H	25.63	61.94	36.31	PASS
	Peak	V	44.41	81.94	37.53	PASS
	AVG1	V	25.73	61.94	36.21	PASS
2603.5	Peak	H	44.90	81.94	37.04	PASS
	AVG1	H	25.49	61.94	36.45	PASS
	Peak	V	41.75	81.94	40.19	PASS
	AVG1	V	25.72	61.94	36.22	PASS
3037.4	Peak	H	48.50	81.94	33.44	PASS
	AVG1	H	28.19	61.94	33.75	PASS
	Peak	V	44.28	81.94	37.66	PASS
	AVG1	V	28.24	61.94	33.70	PASS
3471.4	Peak	H	43.40	81.94	38.54	PASS
	AVG1	H	28.00	61.94	33.94	PASS
	Peak	V	44.10	81.94	37.84	PASS
	AVG1	V	28.08	61.94	33.86	PASS
3905.3	Peak	H	53.35	73.98	20.63	PASS
	AVG1	H	32.77	53.98	21.21	PASS
	Peak	V	48.27	73.98	25.71	PASS
	AVG1	V	33.04	53.98	20.94	PASS
4339.2	Peak	H	46.77	73.98	27.21	PASS
	AVG1	H	32.86	53.98	21.12	PASS
	Peak	V	45.90	73.98	28.08	PASS
	AVG1	V	32.98	53.98	21.00	PASS
Note 1) Measured by CISPR Averaging detector, all emissions were under noise floor.						
Compliant <input checked="" type="checkbox"/>		Non-Compliant <input type="checkbox"/>		Not Applicable <input type="checkbox"/>		

Test setup

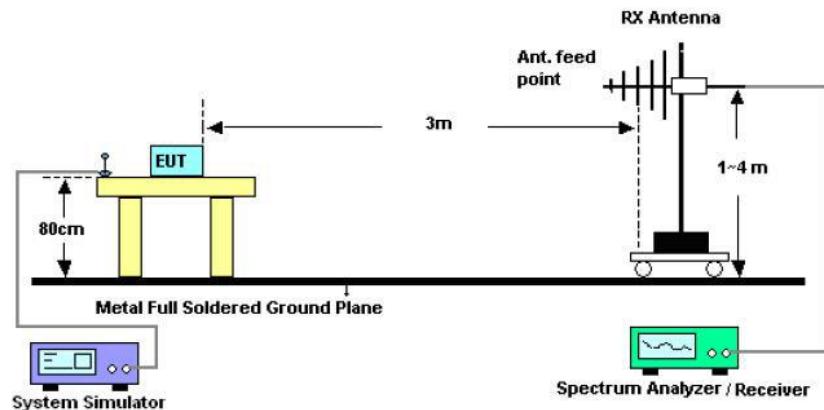
Description of test set-up:

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

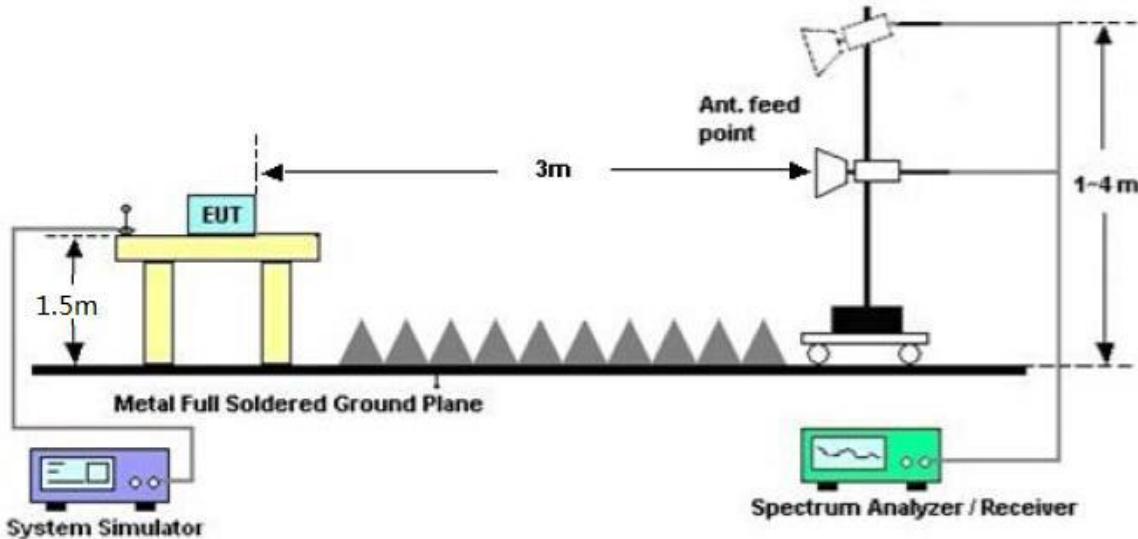
The EUT was set to **Operation Mode #1 with configuration Mode #1**.



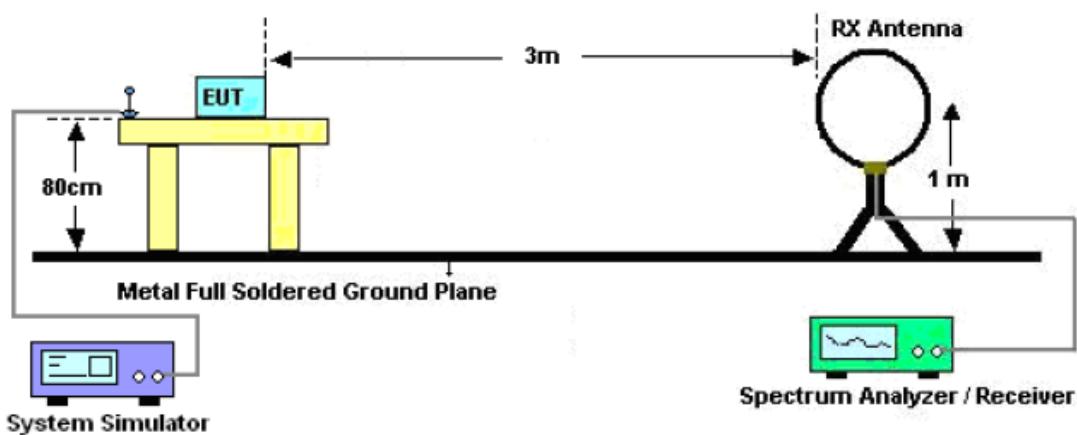
- Tested with SAS-510-2, LPDA Antenna as followed by ANSI C63.10, Table 1



- Tested spurious with SAS-571 for over 1GHz



- Tested with AL-130, below 30MHz.



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 Averaging detector. 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 (dB_{UV}/m) = Detected level (dB_{UV}) +Cable Loss (dB) + Antenna Factor (dB/m)

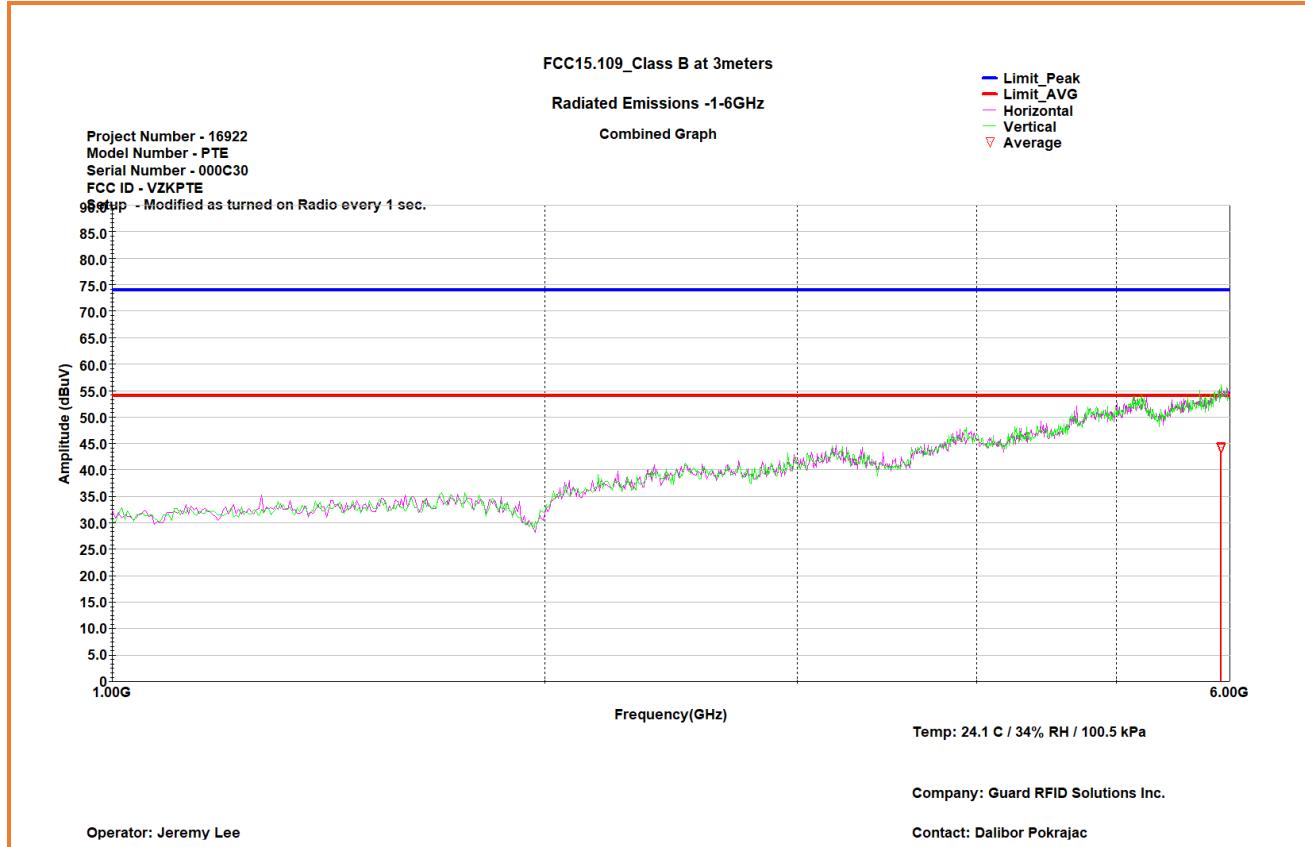
Graphical Representation for Emission - Radiated 10kHz to 30MHz

Spectrum was scanned manually from 10kHz to 30MHz. No automated plot is available for this frequency range. No spurious emissions from the product were detectable.

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Graphical Representation for Emission - Radiated 1GHz to 6GHz



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Radiated Emissions for Digital Parts and Receiver

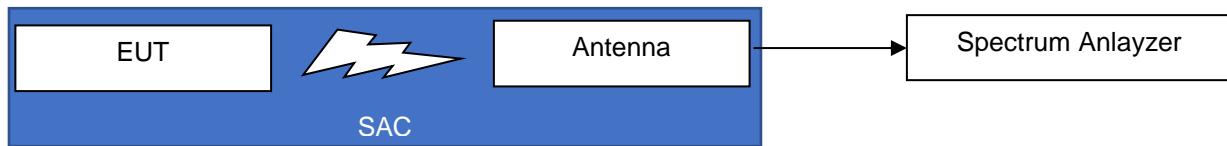
Governing Doc	FCC 15.109(a) & ICES-003	Room Temperature (°C)	24.5		
Basic Standard	ANSI C63.4:2014	Relative Humidity (%)	33.0		
Test Location	Richmond	Barometric Pressure (kPa)	100.5		
Test Engineer	Jeremy Lee	Date	28 March 2018		
EUT Voltage	<input checked="" type="checkbox"/> DC 12V				
Test Equipment 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
EMC Shielded Enclosure	USC	USC-26	374	NCR ¹	NCR ¹
Note1) NCR = No Calibration Required, but NSA was done at 2015.					
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

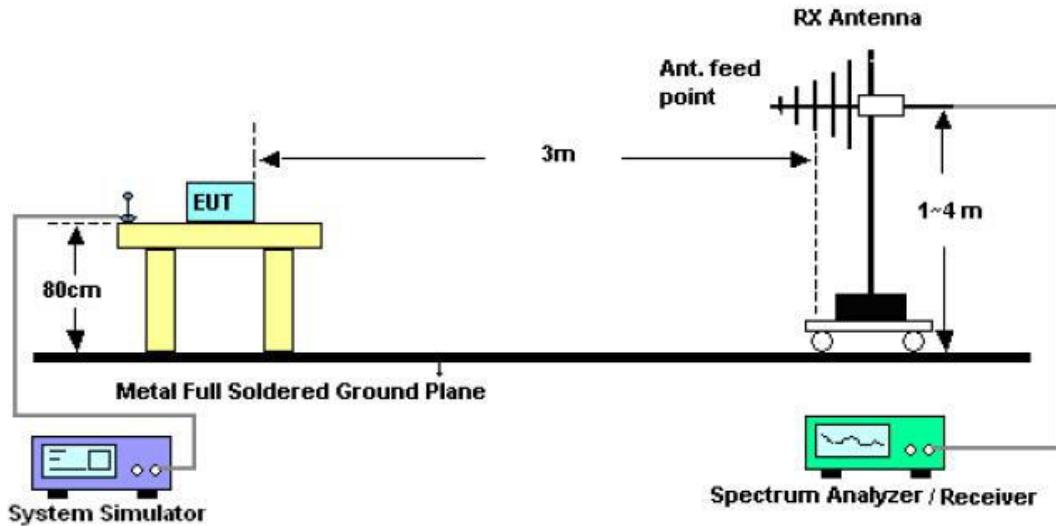
Description of test set-up:

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**.



- 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.

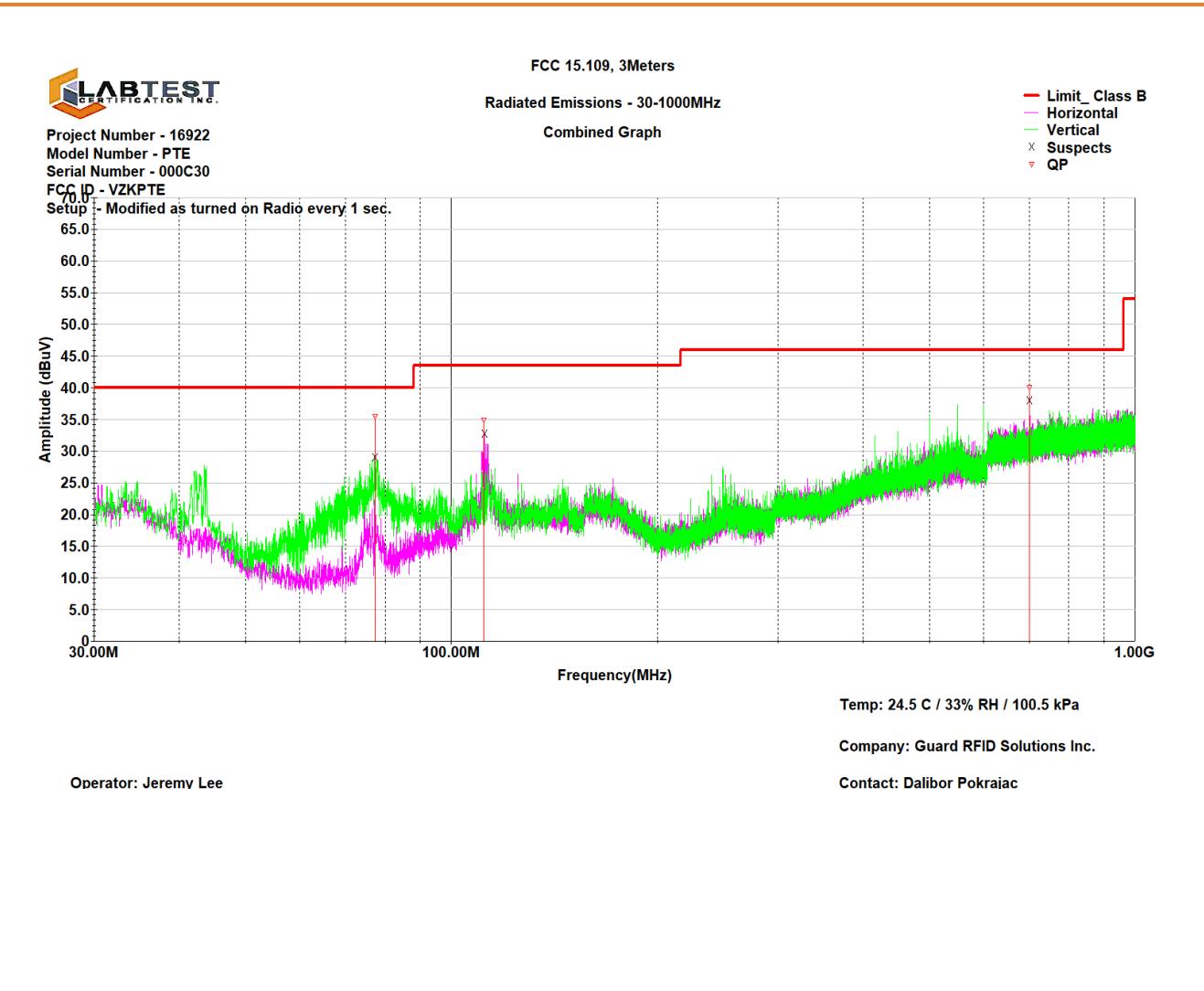
Test Result

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

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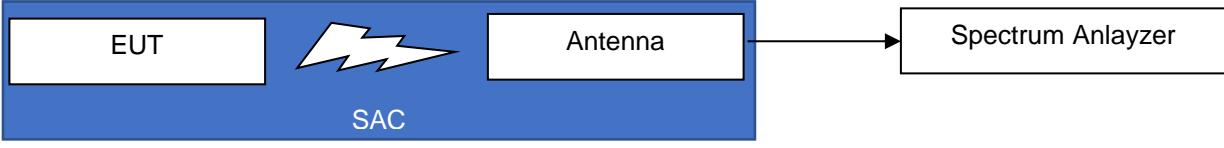
Graphical Representation for Emission - Radiated 30MHz to 1GHz



The Bandwidth of the emission

Governing Doc	FCC Part 15.231(c) & RSS-210, Annex A.3		Room Temperature (°C)	24.0	
Basic Standard	ANSI C63.10:2013, Clause 6.9		Relative Humidity (%)	35.0	
Test Location	Richmond		Barometric Pressure	102.3	
Test Engineer	Jeremy Lee		Date	12 March 2018	
EUT Voltage	<input checked="" type="checkbox"/> DC 12V				
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
Spectrum Analyzer	Keysight	N9038A	702	27-Apr-2017	27-Apr-2018
LP Antenna	A.H.Systems	SAS-510-2	227B	07-Feb-2018	07-Feb-2020
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 ¹	961.5	1084.8	123.3	PASS
	99% ²	1023.0	1084.8	61.8	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 .


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Results



Conducted Emissions- AC mains port

Governing Doc	FCC 15.207 & RSS-Gen		Room Temperature (°C)	21.9				
Basic Standard	ANSI C63.4		Relative Humidity (%)	33.5				
Test Location	Richmond		Barometric Pressure (kPa)	101.8				
Test Engineer	Jeremy Lee		Date	26 April 2018				
EUT Voltage	<input checked="" type="checkbox"/> DC 12V via PoE Splitter and PoE Switch on AC Main							
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due			
EMC Analyzer	Agilent	E7405A	272	17-Jun-2017	17-Jun-2018			
LISN	COM-POWER	LIN-120C	920	01-Mar-2018	01-Mar-2019			
EMC Shielded Enclosure	USC	USC-26	374	NCR	NCR			
AC Power Source	California Instrument	5001i	059	NCR	NCR			
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"/> AMN	<input type="checkbox"/> AAN	<input type="checkbox"/> Current Probe	<input type="checkbox"/> CVP				
Arrangement of EUT:	<input type="checkbox"/> Table-top only	<input type="checkbox"/> Floor-standing only	<input type="checkbox"/> Rack Mounted					
Classification:	<input type="checkbox"/> Class A			<input type="checkbox"/> Class B				
Meas. Freq(MHz)	Detector	Meter Reading (dBuV)	Correction Factor(dB)	Emissions (dBuV)	Limit (dBuV)	Margin (dB)	Comments	
29.76481	QP	38.72	10.29	49.01	60.00	10.99	PASS	
	AVG	38.69	10.29	48.98	50.00	1.02	PASS	
Compliant <input checked="" type="checkbox"/>		Non-Compliant <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

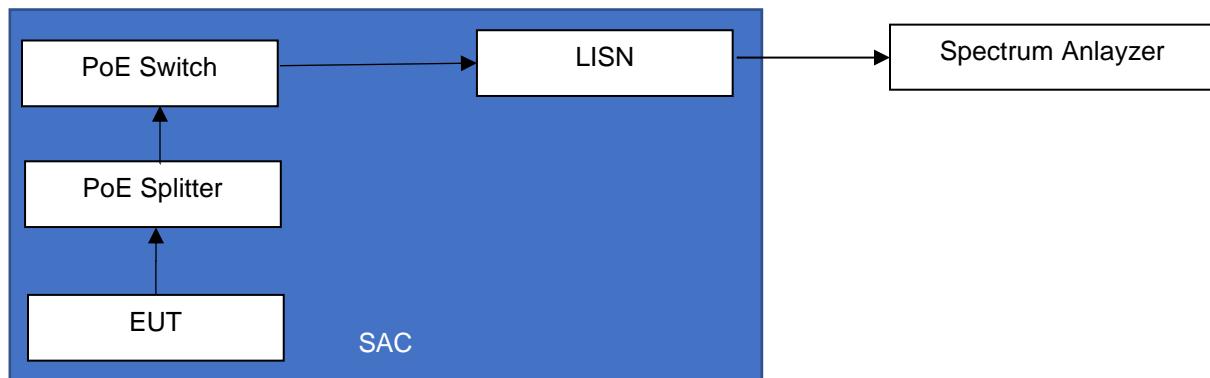
Conducted Emission (dBuV) = Measured Emission (dBuV) + Cable Loss(dB)+LISN(dB)

Test setup

Description of test set-up:

The EUT was placed on a 0.8m non-conducting table above a ground reference plane (GRP).

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

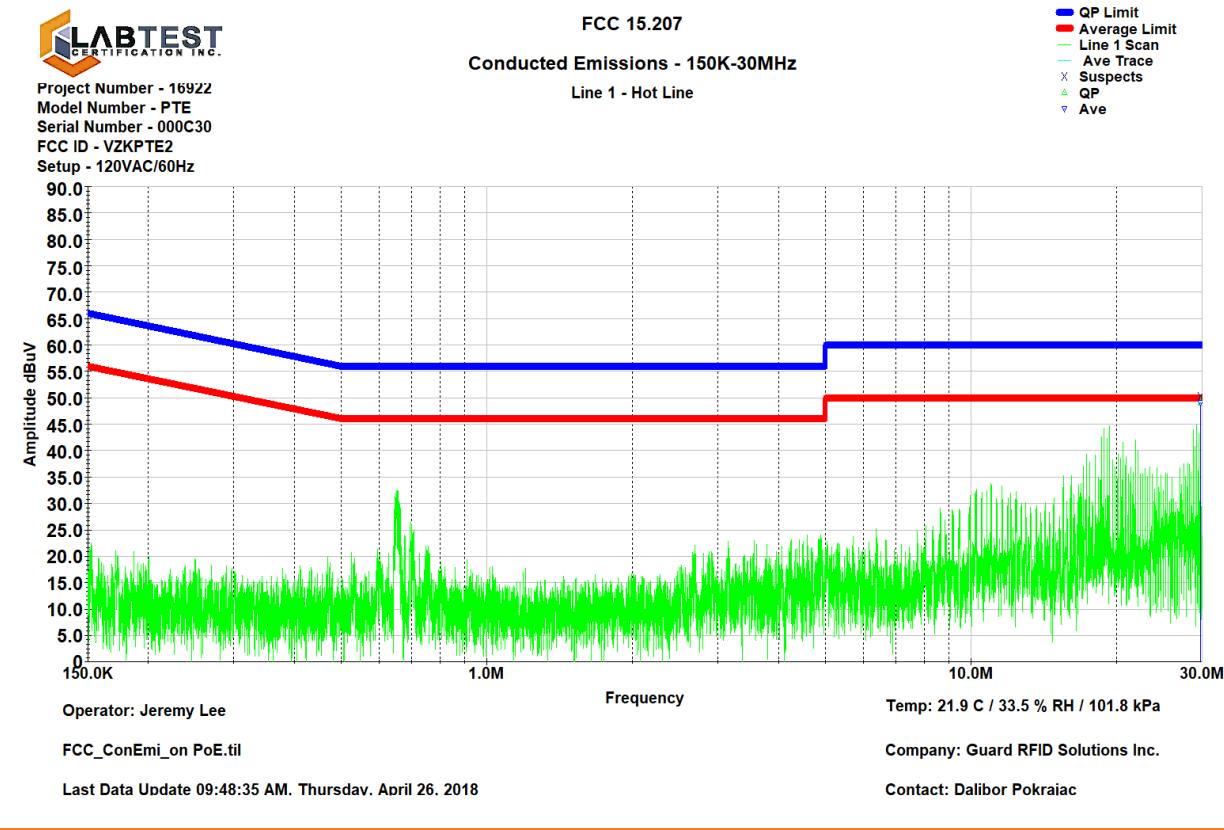


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Measurement Graphical representation for Emission

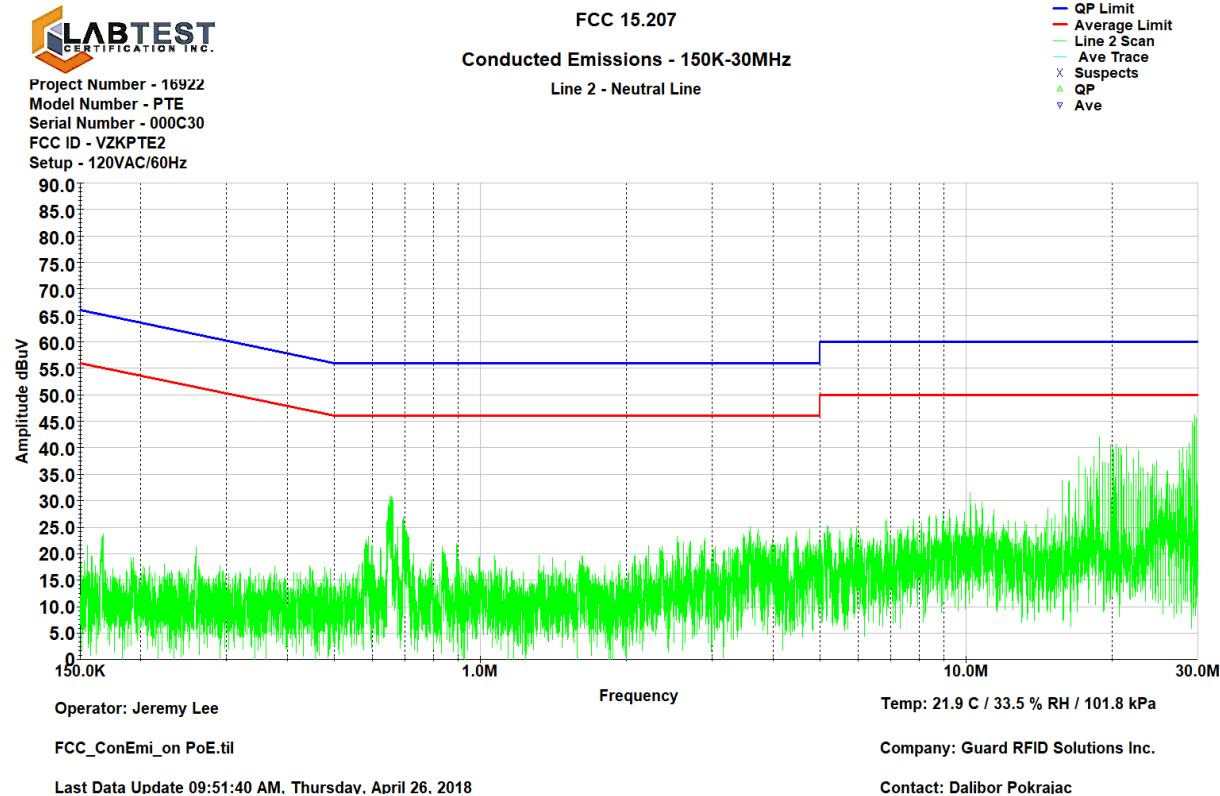
- Graph of Line 1



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- Graph of Line 2



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