



# REPORT

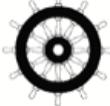
For

## Clad Innovations Ltd.

110 East Cordova Street  
Vancouver, BC  
V6A 1K9, Canada

Date: 11 February 2019  
Report No.: 17465-1E  
Revision No.: 1  
Project No.: 17465  
Equipment: Home Air Monitor  
Model No.: HAVEN  
FCC ID: 2ANU9HAVENA  
IC ID.: 23327-HAVENA

### ONE STOP GLOBAL CERTIFICATION SOLUTIONS



Unit 205 – 8291 92 ST., Delta, BC  
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Prepared by: LabTest Certification Inc.  
Date Issued: 11 February 2019  
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## TEST REPORT\_FCC Part 15, Subpart B & 15.247/RSS-247 & RSS-Gen

Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement  
EN 61000-6-2 ESD test only

<b>Report Reference No.</b>	17465-1E
<b>Report Revision History</b>	✓ Rev. 0: 10 December 2018 ✓ Rev. 1: 11 February 2019
Compiled by (+ signature)	Jeremy Lee 
Approved by (+ signature)	David Johanson 
Date of issue	11 February 2019
Total number of pages	22
<b>FCC Site Designation No.:</b>	CA5970
<b>IC Site Registration No.:</b>	5970A-2
<b>Testing Laboratory</b>	LabTest Certification Inc.
Address	Unit 205 – 8291 92ST. Delta, B.C. V4G 0A4, Canada
<b>Applicant's name</b>	Clad Innovations Ltd.
Address	110 East Cordova St., Vancouver, V6A 1K9, Canada
<b>Manufacture's Name</b>	Same as Applicant
Address	Same as Applicant
<b>Test specification:</b>	
Standards	➤ FCC Part 15, Subpart B: 2018/RSS-Gen, Issue 5, 2018 ➤ FCC 15.247:2018 & RSS-247, Issue 2, 2017
Test procedure	➤ ANSI C63.4:2014
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	TZOA HAVEN
Model/Type reference	HAVEN
Serial Number	D1839-00800
FCC ID	2ANU9HAVENA
IC ID	23327-HAVENA

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<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.....	23 November 2018
Date (s) of performance of tests .....	23 November 2018

## Revision History

Revision	Date	Reason For Change	Author(s)
0	10 Dec. 2018	Release version	Jeremy Lee
1	11 Feb. 2019	Revised ISED number from 23325 to 23327	David Johanson

## Device Under Test Description

Application for .....	Receiver and Digital emissions from a product with a transmitter.
Operating Transmit Frequency .....	2.412 to 2.467 GHz
Operating Receive Frequency .....	2.412 to 2.467 GHz
Number of Channels .....	Depends on 802.11 communication Protocol
Rated RF Output .....	0.0364 Watts
Modulation Type .....	802.11b/g/n Protocols
Antenna Type/Gain.....	TRF1001 Dipole 2.4-2.5GHz 2dBi
Equipment mobility .....	Fixed
Operating condition .....	0 to +50°C
<b>Nominal Voltages for:</b>	12 to 24V
Supply Voltage:	24V AC_20VA

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## Program details

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

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

Description: Air Quality Sensor
Details: This product is based on using an existing Wireless Module of ublox AG, FCC ID: XPYNINAW10 and IC ID:8595A-NINAW10. The only differences are: <ul style="list-style-type: none"><li>➤ Only Protocol 802.11g is used</li><li>➤ The antenna is changed to use either of the following:<ul style="list-style-type: none"><li>a) Aristotle RFA-02-L2H1 Description: 2 dBi 2.4 GHz External Dipole Antenna.</li></ul></li></ul>

- Top view



**Variant Models:**

The following variant models were part of this evaluation, and 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.

The 2 different product variations are based on the antenna capabilities.

2dBi short Dipole antenna



## EUT Internal Operating Frequencies

Frequency	Description	Frequency	Description
16.00 MHz	Crystal	1.5625 MHz	SPI Memsic
32.768 kHz	RTC	400 kHz	I2C
25 MHz	SPI Flash	2.1 MHz	Switching supply
25 MHz	Spi MCU-MCU	115.2kHz	Baud rate to WiFi

## Additional Client Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Power Supply	TRIAD Magnetics	TCT50-01E07AB	
AE	Laptop	ACER	ASPIRE/V5	Windows

Abbreviations:  
EUT - Equipment Under Test,  
AE - Auxiliary/Associated Equipment, or  
SIM - Simulator (Not Subjected to Test)

## Software and Firmware

Use*	Description	Version
AE	Module programming Software	ETF_FW_A08.28.0165-SPI
EUT	SPWF01 Wifi module firmware - SPWF01S = SPWF01 module with external antenna - 170111 = date code - 665d284 = CRC	SPWF01S-170111-665d284

Abbreviations:  
EUT - Equipment Under Test,  
AE - Auxiliary/Associated Equipment, or  
SIM - Simulator (Not Subjected to Test)

## Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	Power 24Vac	AC	Yes	No	Could be any power supply 12 to 24V AC or DC

\*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
1	120	0.3	20VA	AC	1	Used for 24vAC power adapter

## EUT Operation Modes

Mode #	Description
1	Continuous Operating Mode

## EUT Configuration Modes

Mode #	Description
1	Antenna and EUT Flat on table top with AC 24VAC

## Test Equipment Verified for function

Model #	Description	Checked Function	Results
N9038A	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_sigal and checked OK.
JB1	Antenna, 30 to 2000MHz	Checked structure	Normal – no damage.
SAS-542	Antenna, 30 to 300MHz	Checked structure	Normal – no damage.
SAS-510-2	Antenna, 300 to 100MHz	Checked structure	Normal – no damage.
SAS-571	Antenna, 1 to 18GHz	Checked structure	Normal – no damage.
SAS-572	Antenna, 18 to 26.5GHz	Checked structure	Normal – no damage.

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## Measurement Uncertainty

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

Parameter	Uncertainty
Temperature	± 1.0 °C
Humidity	± 5.0 %
DC and Low Frequency Voltages	± 3.0 %
Radiated Emission, 30 to 18,000MHz	± 4.93 dB
Conducted Measurements, 0.15 to 30MHz	± 3.52 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, Subpart B/RSS-Gen & FCC15.247/RSS-247			
Test Type	Regulation	Measurement Method	Result
AC Power Line Conducted Emissions	FCC 15.107(a) & ICES-003 Class B	ANSI C63.4:2014	PASS
Radiated Emissions for Digital Parts	FCC 15.109(a), & ICES-003 Class B	ANSI C63.4:2014	PASS
Field Strength of Spurious Radiation	FCC Part 15.247(d) IC RSS-247 § 5.5	ANSI C63.10:2013	PASS
Antenna Requirement	FCC Part 15.203	n/a	PASS

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## AC Power Line Conducted Emissions

Governing Doc	FCC 15.107(a) & ICES-003		Room Temperature (°C)	20.8	
Basic Standard	ANSI C63.4		Relative Humidity (%)	39.6	
Test Location	Richmond		Barometric Pressure (kPa)	100.4	
Test Engineer	Jeremy Lee		Date	23 November 2018	
EUT Voltage	<input type="checkbox"/> 24VAC	<input checked="" type="checkbox"/> 120VAC @ 60Hz via AC/AC Transformer			
Test Equipment Used	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMC Analyzer	KeySight	N9038A	702	26-Apr-2018	26-Apr-2019
LISN	Solar	8611-50-TS-10-N	377	19-Sep-2018	19-Sep-2020
LISN	Solar	8611-50-TS-10-N	378	19-Sep-2018	19-Sep-2020
EMC Shielded Enclosure	USC	USC-26	374	IHC <sup>1</sup>	IHC <sup>1</sup>
Transient Limiter	Com-Power	LIT-930	215	IHC <sup>2</sup>	IHC <sup>2</sup>
RF Cable	MRO	n/a	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>
AC Power Source	California Instruments	5001i	059	IHC <sup>3</sup>	IHC <sup>3</sup>
Used Software	<input checked="" type="checkbox"/> Tile 7! v7.3.0.6				
Used Template	_FCC_ConEmi_AC Mains_with_LIT-930_20181123.TIL				
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.

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## Test Result

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

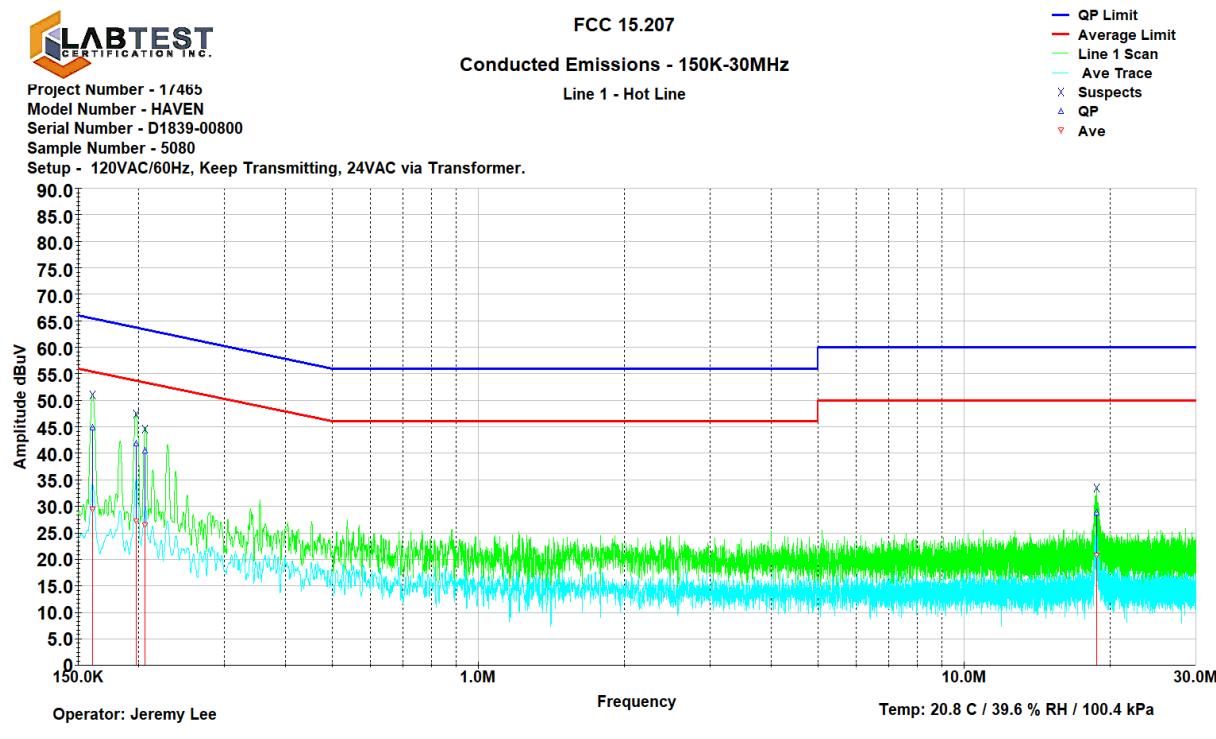
## **Test Setup**

### 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 #1 with configuration Mode #1**

Measurement / Graphical Representation for Emission – Conducted Emissions

### - Graph of Line 1 – Hot



**Operator: Jeremy Lee**

Company: Clad Innovations Ltd.

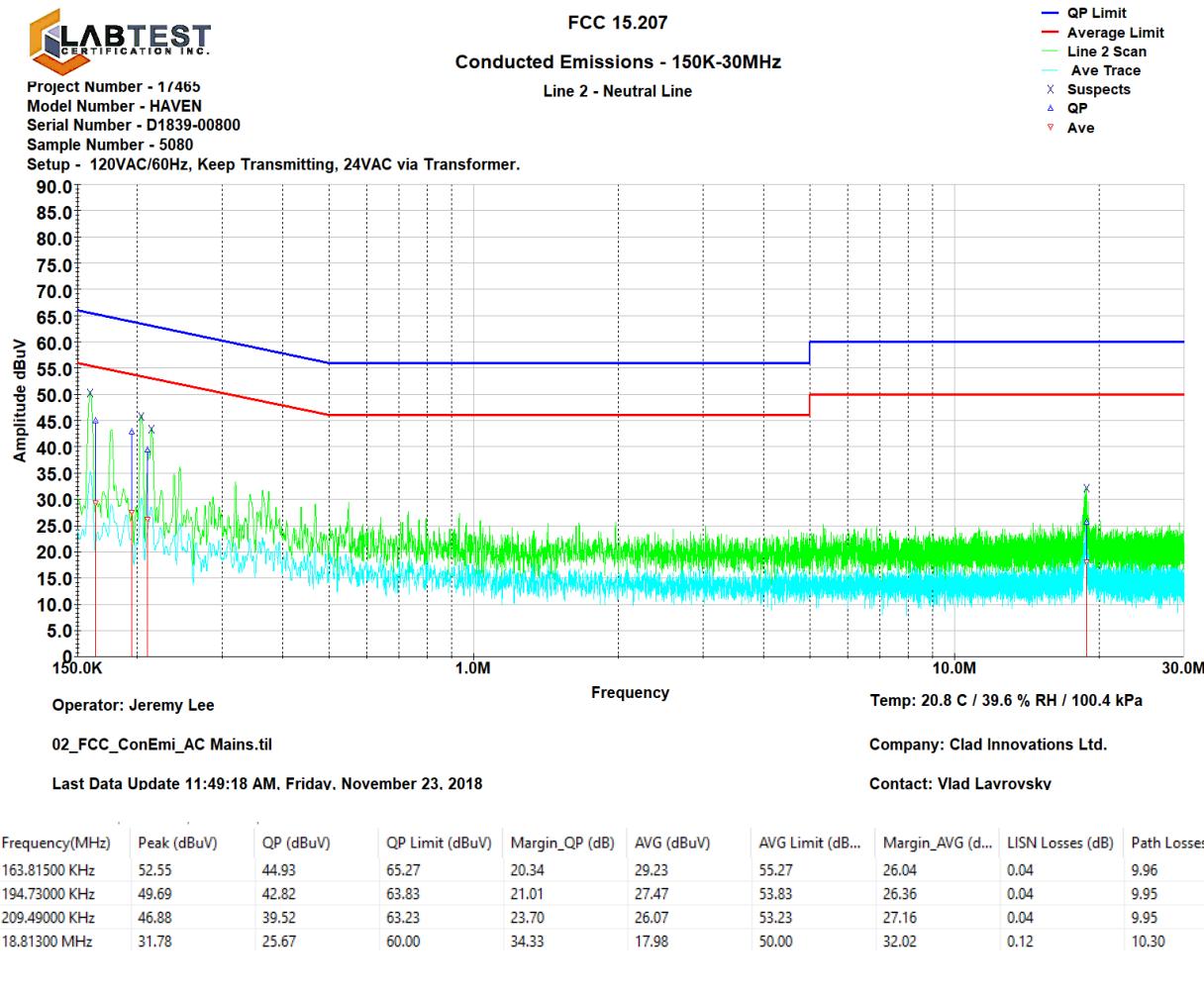
Last Data Update 12:01:08 PM

Frequency (MHz) Peak (dBuV) OP (dBuV) OP Limit (dBuV)

Contact: Vlad Lavrovsky

Frequency(MHz)	Peak (dBuV)	QP (dBuV)	QP Limit (dBuV)	Margin_QP (dB)	AVG (dBuV)	AVG Limit (dB...)	Margin_AVG (dB)	LISN Losses (dB)	Path Losses (dB)
160.54000 KHz	52.04	44.87	65.44	20.56	29.42	55.44	26.02	0.07	9.96
197.25000 KHz	48.49	41.85	63.73	21.88	27.16	53.73	26.57	0.05	9.95
205.89000 KHz	47.77	40.47	63.37	22.90	26.44	53.37	26.93	0.05	9.95
18.76200 MHz	33.88	28.76	60.00	31.24	20.72	50.00	29.28	0.13	10.30

- Graph of Line 2 - Neutral



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## Radiated Emissions for Digital Parts

Governing Doc	FCC 15.109(a) & ICES-003	Room Temperature (°C)	20.8
Basic Standard	ANSI C63.4	Relative Humidity (%)	39.8
Test Location	Richmond	Barometric Pressure (kPa)	100.3
Test Engineer	David Johanson	Date	23 November 2018
EUT Voltage	<input checked="" type="checkbox"/> 24VAC <input type="checkbox"/> 120VAC @ 60Hz		

Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due
BiCon Antenna	A.H Systems	SAS-542	227A	07-Feb-2018	07-Feb-2020
LPDA Antenna	A.H Systems	SAS-510-2	227B	12-Mar-2018	12-Mar-2020
EMC Analyzer	KeySight	N9038A	702	26-Apr-2018	26-Apr-2019
Broadband Antenna	Sunol	JB1	967	12-Oct-2018	12-Oct-2020
Motion Controller	Sunol	SC104V	235A	IHC <sup>1</sup>	IHC <sup>1</sup>
Antenna Tower	Sunol	TWR95-4	235B	IHC <sup>1</sup>	IHC <sup>1</sup>
Turn Table	Sunol	SM46C	235C	IHC <sup>1</sup>	IHC <sup>1</sup>
EMC Shielded Enclosure	USC	USC-26	374	IHC <sup>1</sup>	IHC <sup>1</sup>
RF Cable	MRO	n/a	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>
Attenuator	Mini-circuit	UNAT-6+	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>
AC Power Source	California Instruments	5001i	059	IHC <sup>3</sup>	IHC <sup>3</sup>
Used Software		<input checked="" type="checkbox"/> Tile 7! v7.3.0.6			
Used Template		_FCC_RadEmi_30-1000MHz_20181106.TIL			

Note1) In House Calibration Ref. # 4

Note2) In House Calibration Ref. # 6

Note3) In House Calibration Ref. # 7

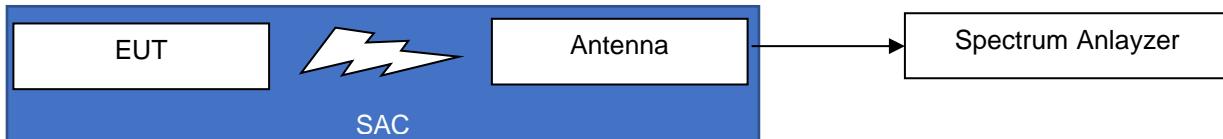
Frequency Range:	<input type="checkbox"/> 9kHz-30MHz <input checked="" type="checkbox"/> 30-1000MHz <input type="checkbox"/> 1-6GHz
Detector:	<input checked="" type="checkbox"/> Peak (for Prescan) <input checked="" type="checkbox"/> Quasi-Peak(for Formal)
RBW/VBW:	<input type="checkbox"/> 9/30kHz <input 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

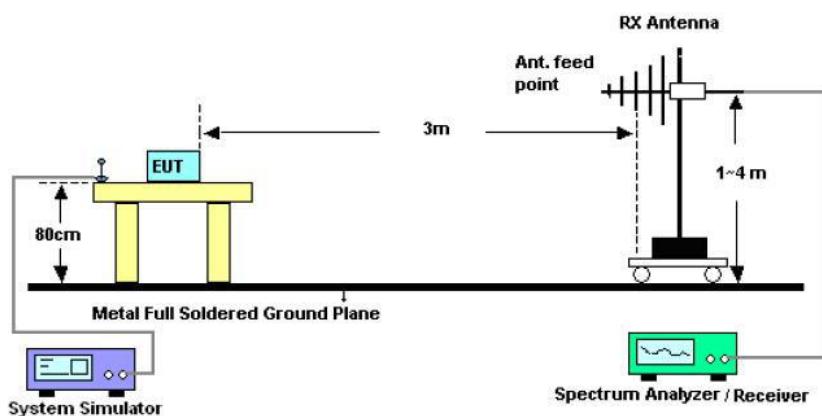
### Description of test set-up:

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**.



- Radiated Emission 30 to 1,000MHz, with JB1, SAS-542 & SAS-510-2



## Measurement Procedure

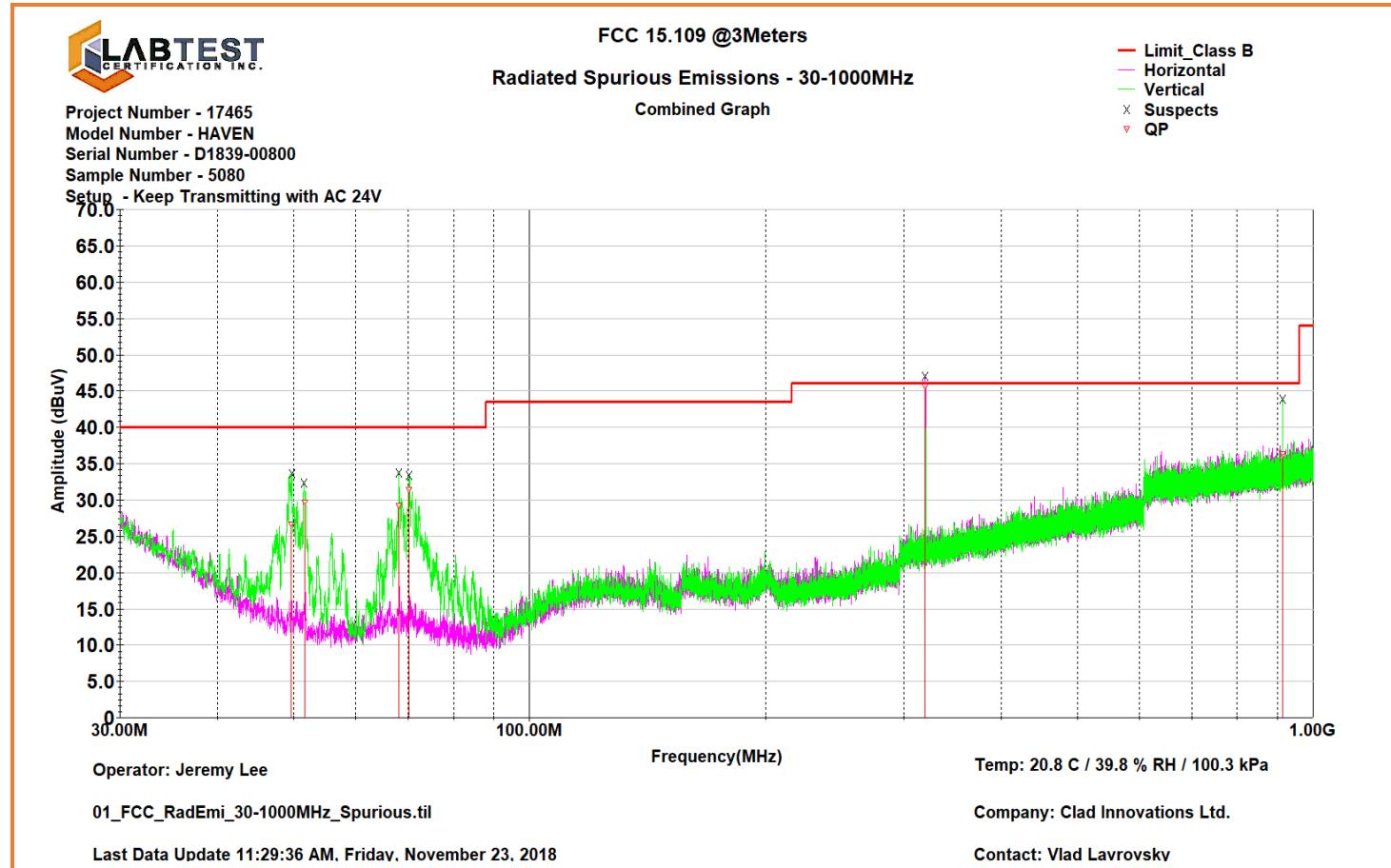
This test measures the radiating levels from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Testing was performed in accordance with the test standard(s) referenced in the test summary section of this report. The Equipment Under Test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



### Table Representation for Emission - Radiated 30MHz to 1GHz

Table : Top\_Vertical

Frequency(MHz)	Ant Fac (dB)	Cable loss (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV)	QP (dBuV)	Limit (dBuV)	Margin (dB)
49.6310 MHz	9.24	0.82	0.00	199	100	30.36	26.54	40.00	13.46
51.6183 MHz	9.30	0.84	0.00	359	100	32.84	29.60	40.00	10.40
68.1082 MHz	9.87	0.96	0.00	352	112	33.06	29.14	40.00	10.86
70.2180 MHz	9.36	0.98	0.00	347	102	34.82	31.36	40.00	8.64
Frequency(MHz)	Ant Fac (dB)	Cable loss (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV)	QP (dBuV)	Limit (dBuV)	Margin (dB)
914.0695 MHz	22.49	5.00	0.00	360	321	40.87	36.26	46.02	9.76

Table : Top\_Horizontal

Frequency(MHz)	Ant Fac (dB)	Cable Loss (dB)	Preamp (dB)	AZ (Deg)	HGT (cm)	Peak (dBuV)	QP (dBuV)	Limit (dBuV)	Margin (dB)
319.9700 MHz	14.00	2.53	0.00	274	102	46.74	45.60	46.02	0.42

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## Field Strength of Spurious Radiation

Governing Doc	FCC Part 15.247(d) IC RSS-247 § 5.5	Room Temperature (°C)	21.1				
Basic Standard	ANSI c63.10	Relative Humidity (%)	39.4				
Test Location	Richmond	Barometric Pressure (kPa)	100.3				
Test Engineer	David Johanson	Date	23 November 2018				
EUT Voltage	<input checked="" type="checkbox"/> 24VAC <input type="checkbox"/> 120VAC @ 60Hz						
Test Equipment Used	Manufacturer	Model	Identifier	Calibration	Calibration due		
BiCon Antenna	A.H Systems	SAS-542	227A	07-Feb-2018	07-Feb-2020		
LPDA Antenna	A.H Systems	SAS-510-2	227B	12-Mar-2018	12-Mar-2020		
Horn Antenna	A.H Systems	SAS-571	227C	18-Oct-2018	18-Oct-2020		
Horn Antenna	A.H Systems	SAS-572	227D	11-Dec-2018	11-Dec-2021		
Loop Antenna	Com-Power	AL-130	241	08-Nov-2017	08-Nov-2019		
EMC Analyzer	KeySight	N9038A	702	26-Apr-2018	26-Apr-2019		
Motion Controller	Sunol	SC104V	235A	IHC <sup>1</sup>	IHC <sup>1</sup>		
Antenna Tower	Sunol	TWR95-4	235B	IHC <sup>1</sup>	IHC <sup>1</sup>		
Turn Table	Sunol	SM46C	235C	IHC <sup>1</sup>	IHC <sup>1</sup>		
EMC Shielded Enclosure	USC	USC-26	374	IHC <sup>1</sup>	IHC <sup>1</sup>		
RF Cable	A.H. Systems	SAC-26G-3	227D	IHC <sup>2</sup>	IHC <sup>2</sup>		
RF Cable	MRO	n/a	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>		
RF Preamplifier	Agilent	8449B	273	IHC <sup>2</sup>	IHC <sup>2</sup>		
ATTEN20dB20W	Mini-Circuits	BW-S20W20	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>		
ATTEN20dB1W	Mini-Circuits	VAT-20	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>		
Low Pass Filter	Mini-circuits	VLF-1800+	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>		
High Pass Filter	Mini-Circuits	VHF-3100+	n/a	IHC <sup>2</sup>	IHC <sup>2</sup>		
AC Power Source	California Instruments	5001i	059	IHC <sup>3</sup>	IHC <sup>3</sup>		
Used Software	<input checked="" type="checkbox"/> Tile 7! v7.3.0.6						
Used Template	<a href="#">_FCC_RadEmi_30-1000MHz_20181106.TIL</a> <a href="#">_FCC_RadEmi_1-18GHz_20181016.TIL</a> <a href="#">_FCC_RadEmi_18-26.5GHz_20181016.TIL</a>						
Note1) In House Calibration Ref. # 4 & 5							
Note2) In House Calibration Ref. # 6							
Note3) In House Calibration Ref. # 7							
Frequency Range:	<input checked="" type="checkbox"/> 1.0-26.5GHz	<input checked="" type="checkbox"/> 30-1000MHz	<input checked="" type="checkbox"/> 9kHz-30MHz				
Detector:	<input checked="" type="checkbox"/> Peak(for Prescan and Formal)	<input checked="" type="checkbox"/> Average (for Formal)					
	<input checked="" type="checkbox"/> Quasi-Peak(for Formal 30-1000MHz)						
RBW/VBW:	<input checked="" type="checkbox"/> 1/3MHz	<input checked="" type="checkbox"/> 120/300kHz	<input checked="" type="checkbox"/> 9/30kHz				

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Type of Facility:	<input checked="" type="checkbox"/> SAC/FSOATS	<input type="checkbox"/> OATS	<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
Compliant <input checked="" type="checkbox"/>		Non-Compliant <input type="checkbox"/>	Not Applicable <input type="checkbox"/>

### Test Method

The EUT and test equipment were set up and measurements taken using the procedures is based on ANSI c63.10

Adjust the spectrum analyzer for the following setting:

- RBW : 100 kHz (< 1 GHz), 1 MHz (> 1 GHz).
- VBW : 300 kHz (< 1 GHz), 3 MHz (> 1 GHz).
- Detector mode : Positive Peak

The transmitter was placed on a Styrofoam table, and it was set for continuous transmission

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

Requirements – Radiated Spurious Emissions:

Emissions found in Restricted bands, the levels must comply with the general limits found in FCC Part 15.209.

Frequency	Limits
FCC Part 15.209, IC RSS-GEN 8.9	
9 to 490 kHz	2400/F (kHz) $\mu$ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu$ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu$ V/m @ 30 meters
30 – 88	40.0 dB $\mu$ V/m @ 3 meters
80 – 216	43.5 dB $\mu$ V/m @ 3 meters
216 – 960	46.0 dB $\mu$ V/m @ 3 meters
Above 960	54.0 dB $\mu$ V/m @ 3 meters

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

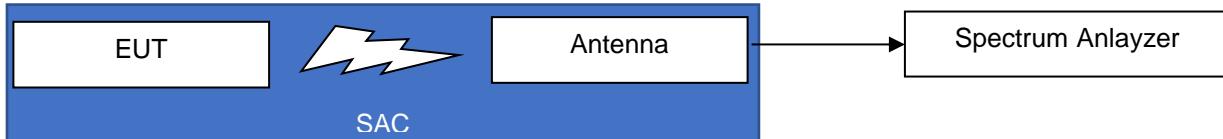
## Test setup

### Description of test set-up:

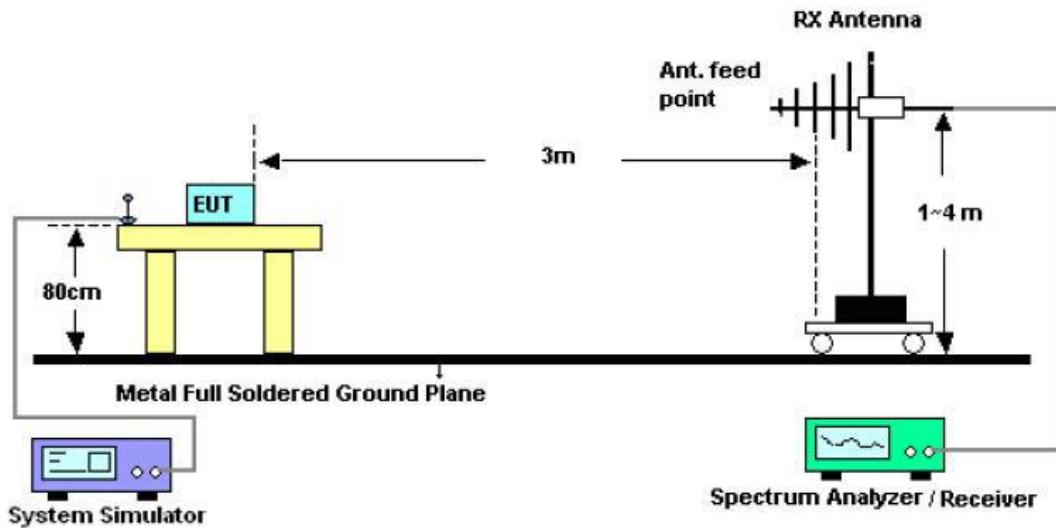
The EUT was placed on a 0.8m non-conducting table above a ground reference plane (GRP) for the frequency range 9kHz to 1GHz.

The EUT was placed on a 1.5m non-conducting table above a ground reference plane (GRP) for the frequency range 1 to 25GHz.

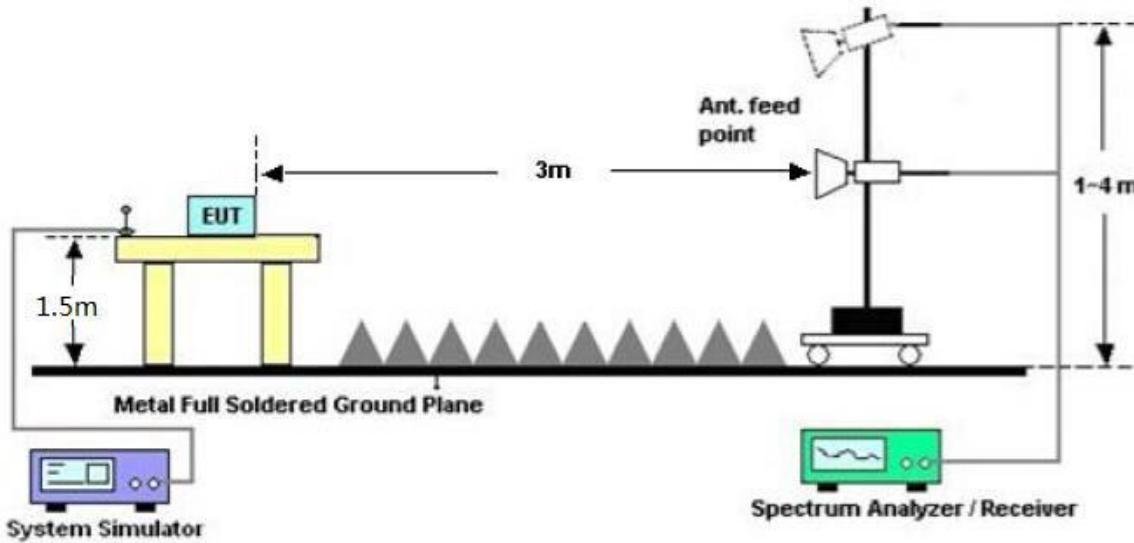
The EUT was set to **Operation Mode #1 with configuration Modes #1**.



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



- Radiated Emission 1 to 26.5GHz, with SAS-571 & SAS-572



## Results

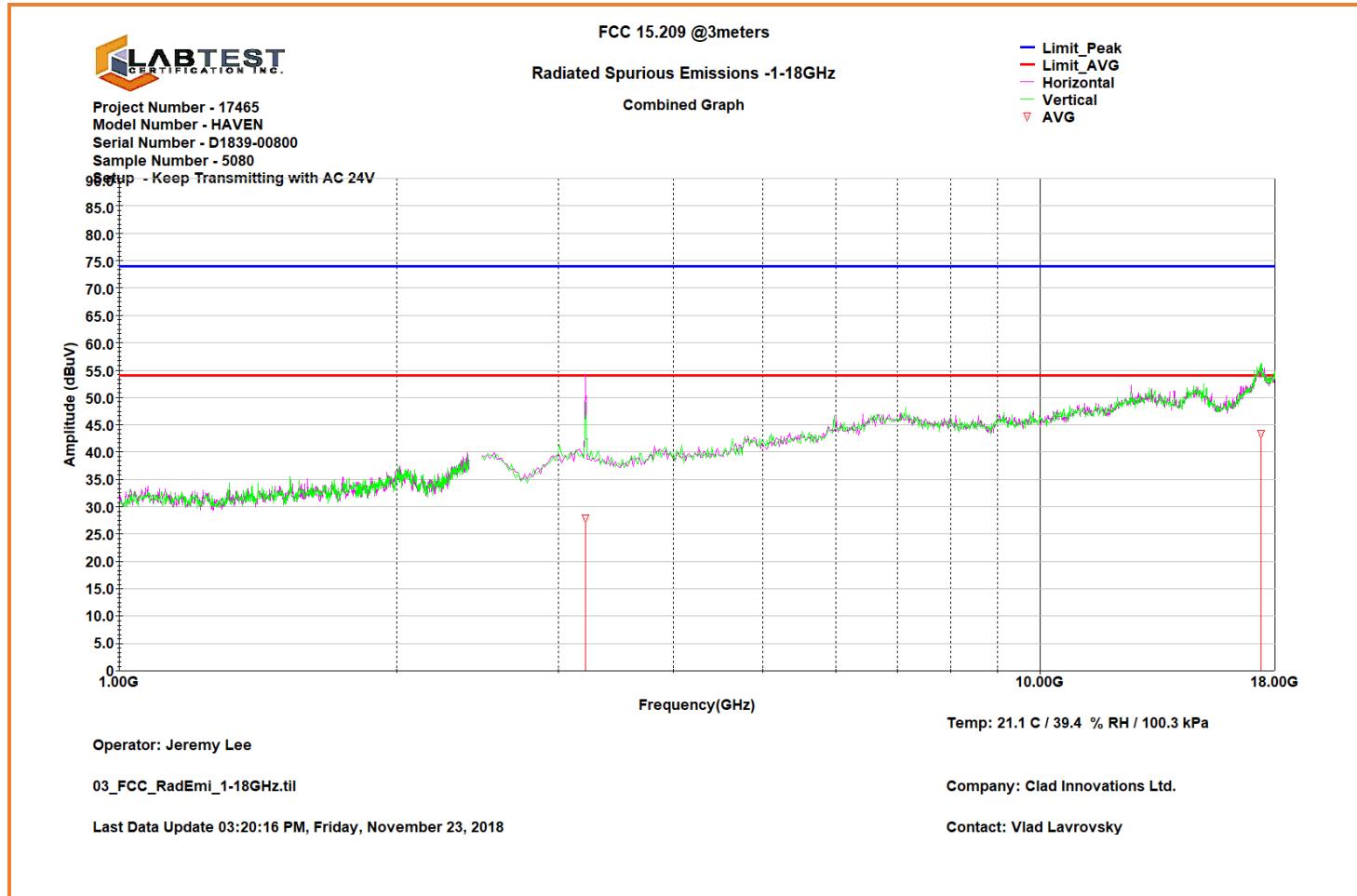
All Radiated spurious emissions from the transmitter were greater than 10dB below the limit line and were not measured.

All other emissions detected are from the Power Supply or digital circuitry

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### Graphical Representation for Spurious Emission - Radiated 1 to 18GHz



### Table Representation for Spurious Emission - Radiated 1 to 18GHz

Table : Top Horizontal

Frequency(GHz)	Ant Fac (dB)	CableLoss (dB)	PreAmp (dB)	HGT (cm)	AZ (Deg)	Peaks (dBuV/m)	Limit_PeAK (dBuV/m)	AVG (dBuV/m)	Limit_AVG (dBuV/m)	Margin_AVG (dB)
3.209430 GHz	31.51	1.54	-33.80	300	202	40.19	73.98	27.89	53.98	26.09

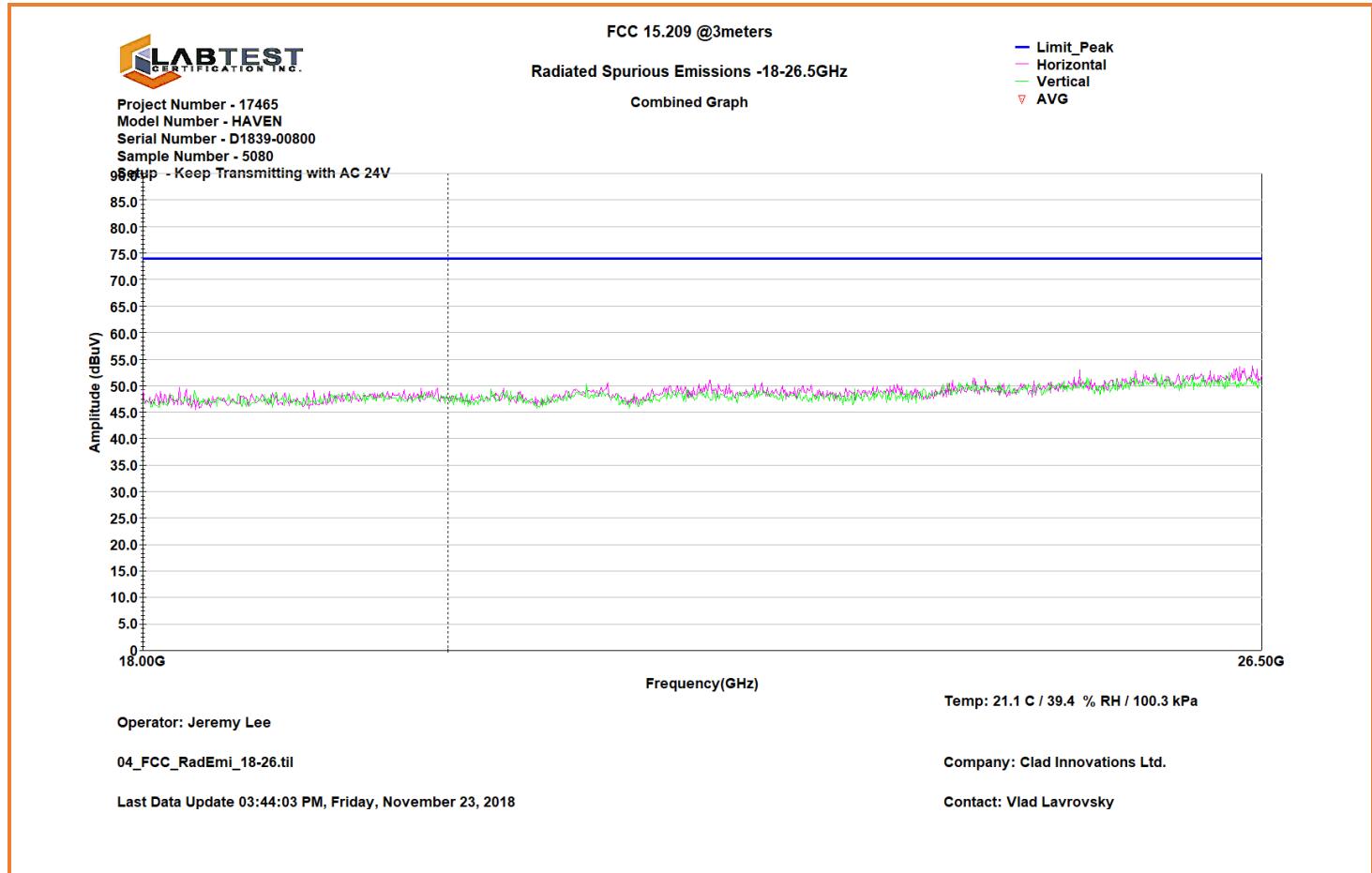
Table : Top Vertical

Frequency(GHz)	Ant Fac...	CableLoss (dB)	PreAmp (dB)	HGT (cm)	AZ (Deg)	PEAK (dBuV/m)	Limit_PeAK (dBuV/m)	AVG (dBuV/m)	Limit_AVG (dBuV/m)	Vert_Margin (dB)
17.379310 GHz	44.35	4.08	-30.96	224	284	55.44	73.98	43.41	53.98	10.57

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## Graphical Representation for Spurious Emission - Radiated 18 to 26.5GHz



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## Antenna Requirement

Governing Doc	15.203	Room Temperature (°C)	N/A
Basic Standard	15.203	Relative Humidity (%)	N/A
Test Location	Richmond	Barometric Pressure (kPa)	N/A
Test Engineer	David Johanson	Date	10 Dec. 2018
EUT Voltage	<input checked="" type="checkbox"/> 24AC <input type="checkbox"/> 120VAC @ 60Hz	Not Applicable	<input type="checkbox"/>
Compliant	<input checked="" type="checkbox"/>	Non-Compliant	<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 one approved antenna, which accordance to the above sections, is considered sufficient to comply with the provisions of these sections. The antenna is permanently mounted inside the EUT and can not be easily replaced without using special tools and appropriate mounting hardware.

TZOA Part Number: TRF1001

Manufacturer: Aristotle P/N: RFA-02-L2H1 Description: 2 dBi 2.4 GHz External Antenna.

TRF1001



**END of REPORT**