

EMC Test Report

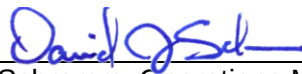
Project Number: 4278564**Report Number:** 4278564EMC02**Revision Level:** 0**Client:** Air Innovations**Equipment Under Test:** Wine Cellar Climate System**Model / HVIN:** 39H0043**HMN:** FG13578**FCC ID:** 2AQX3-WG**IC ID:** 24453-2AQX3WG**Applicable Standards:** ANSI C63.10: 2013 (FCC Part 15 Subpart C, § 15.247)**RSS-247, Issue 2****RSS-GEN Issue 4****Report issued on:** 14 December 2020**Test Result:** Compliant

Tested by:



Jeremy Pickens, RF Lab Manager

Reviewed by:



David Schramm, Operations Manager

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

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1 Summary of Test Results

Test Description	Test Specification		Test Result
DTS / Occupied Bandwidth	15.247(a)(2)	RSS-247 S5.2a RSS-GEN S6.6	NT ¹
Fundamental Output Power	15.247(b)(3)	RSS-247 S5.4	NT ¹
Power Spectral Density	15.247(e)	RSS-247 S5.2b	NT ¹
Conducted Spurious Emissions / Band Edge	15.247(d)	RSS-247 S5.5	NT ¹
Field Strength of Spurious Radiation	15.247(d), 15.209	RSS-247 S5.5	Compliant
Emissions in Restricted Frequency Band Edges	15.205, 15.209	RSS-GEN S8.9, S8.10	NT ¹
Antenna Requirement	15.203	RSS-GEN S8.3	Compliant ²
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN S8.8	N/A ³

- 1) Radiated spurious emissions only to show compliance of the tested module within the host device
- 2) Internal PCB trace antenna
- 3) The DUT is battery powered.

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Air Innovations
Address: 7000 Performance Drive
City, State, Zip, Country: North Syracuse, NY 13212 USA

2.2 Test Laboratory

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

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01

2.3 General Information of EUT

Type of Product: Wine Cellar Wireless Thermostat
Tested Part Number: 90H0064-02
Serial Number: 17090161000043

Frequency Range: 2402-2480MHz
Data Modes: GFSK
Antenna: Internal PCB Trace

Rated Voltage: 3.6VDC (3xAAA Batteries)
Test Voltage: 9.6VDC (Required to enable RS485 Communication with the Module)

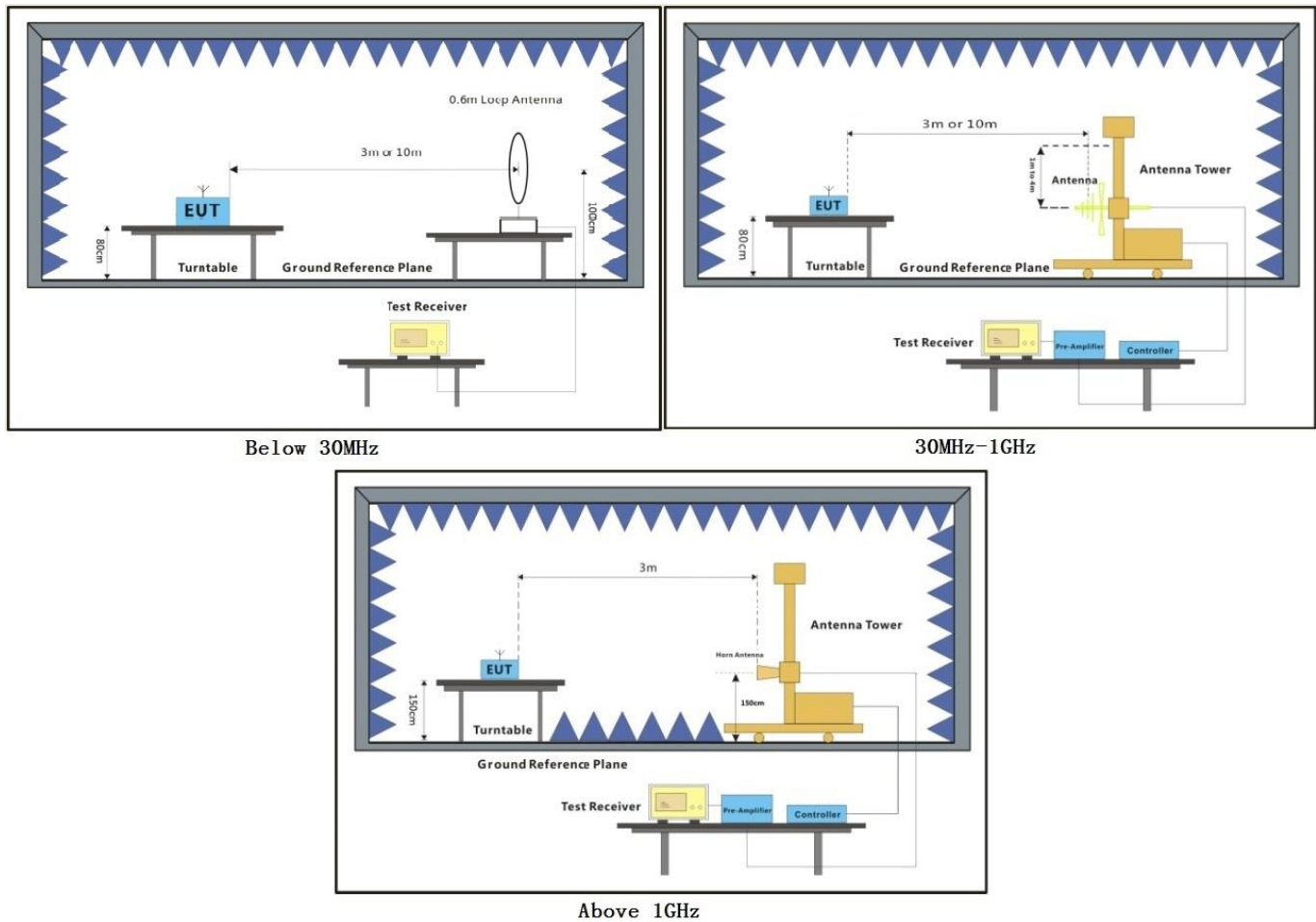
Sample Received Date: 24 January 2018
Dates of testing: 11 December 2020

2.4 Operating Modes and Conditions

The EUT was operated at low, middle, and high channels with modulation. The radio utilized the “FTDI VCP Chip Driver Software” Supported by “MegaLoad V3.b6.” Communication with the module was via the RS485 interface using a terminal program. Hex file loads were used to set the channel and target power (0dBm).

2.5 EUT Connection Block Diagram – Radiated Measurements





2.6 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Wilson-Hurd	Thermostat	90H0064-02	17090161000043
B	Rigol	DC Power Supply	DP711	DP7A202200419

2.7 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	DC Power	Power Supply	DUT	2m	No	No

4 Emissions in Restricted Frequency Bands

4.1 Test Result

Test Description	Test Specification		Test Result
Radiated Spurious Emissions	15.247 (d) and 15.209	RSS-247 S5.5	Compliant

4.2 Test Method

The measurement methods defined in ANSI C63.10: 2013 were used.

Lowest, middle, and highest channels were investigated – the device was commanded to continuously transmit on channels 0, 19, and 39.

Test distance:

- 9k to 30 MHz – The EUT to measurement antenna distance was 3 meters
- 30 to 1000 MHz - The EUT to measurement antenna distance was 3 meters
- 1 to 18 GHz - The EUT to measurement antenna distance was 3 meters
- 18 to 26 GHz - The EUT to measurement antenna distance was 1 meter

Limits within restricted bands of operation:

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

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.2 °C

Relative Humidity: 30.2 %

Atmospheric Pressure: 98.2 kPa

4.4 Test Equipment

Test End Date: 11-Dec-2020

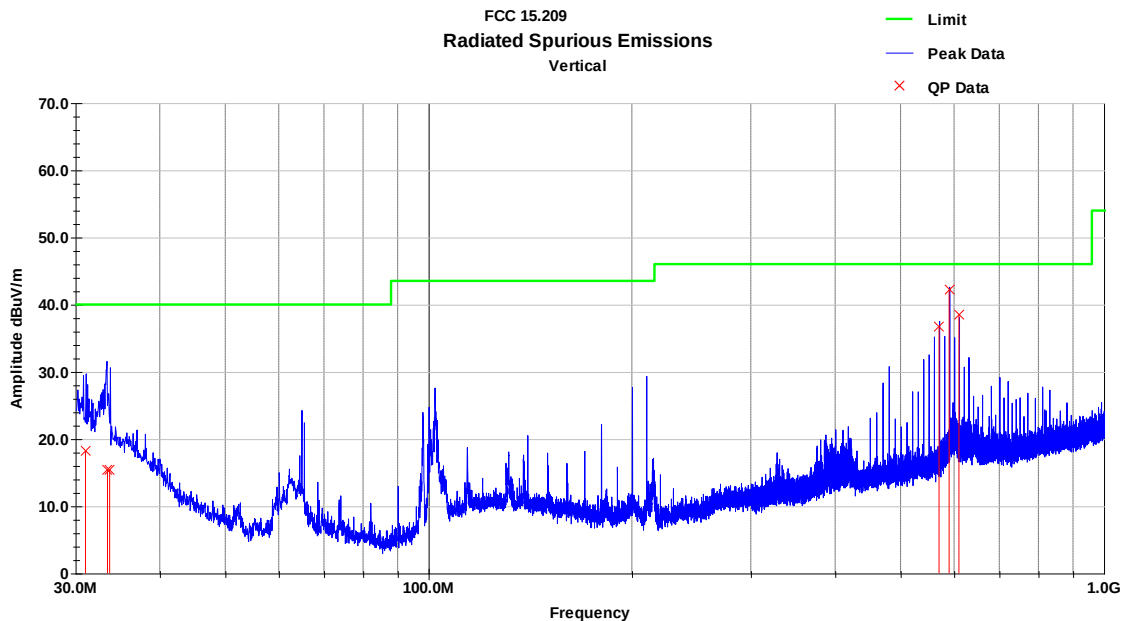
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079699	15-Jul-2020	15-Jul-2022
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
PROBE CALIBRATION JIG	PCJ 9201B	TESEQ	17016	3-Sep-2020	3-Sep-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nf, 0.01-18GHz	90-213-118	TELEDYNE STORM MICROWAVE	20117	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-157	TELEDYNE STORM MICROWAVE	20122	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-079	TELEDYNE STORM MICROWAVE	20124	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-118	TELEDYNE STORM MICROWAVE	20126	2-Mar-2020	2-Mar-2021
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
ANTENNA, BILOG	JB6	SUNOL	B079689	5-Nov-2020	5-Nov-2022
RF CABLE	104PE	HUBER & SUHNER	B079793	3-Sep-2020	3-Sep-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	24-Nov-2020	24-Nov-2021

4.5 Test Data – Peak Plots

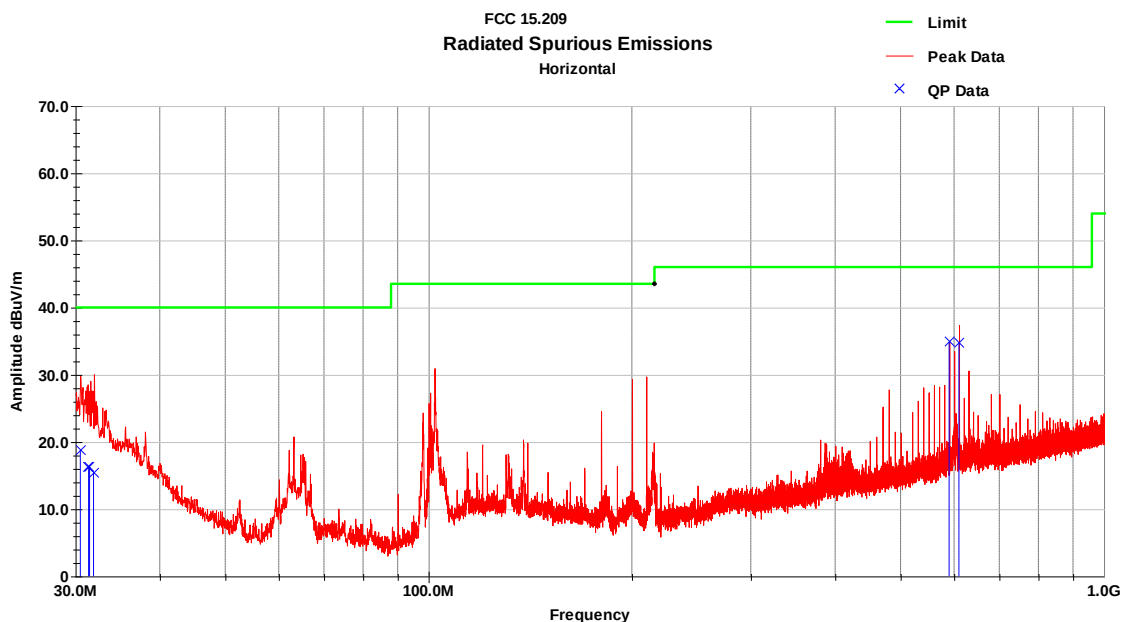
No emissions were detected in the range 9kHz to 30MHz.

Low Channel
Vertical (30-1000MHz)



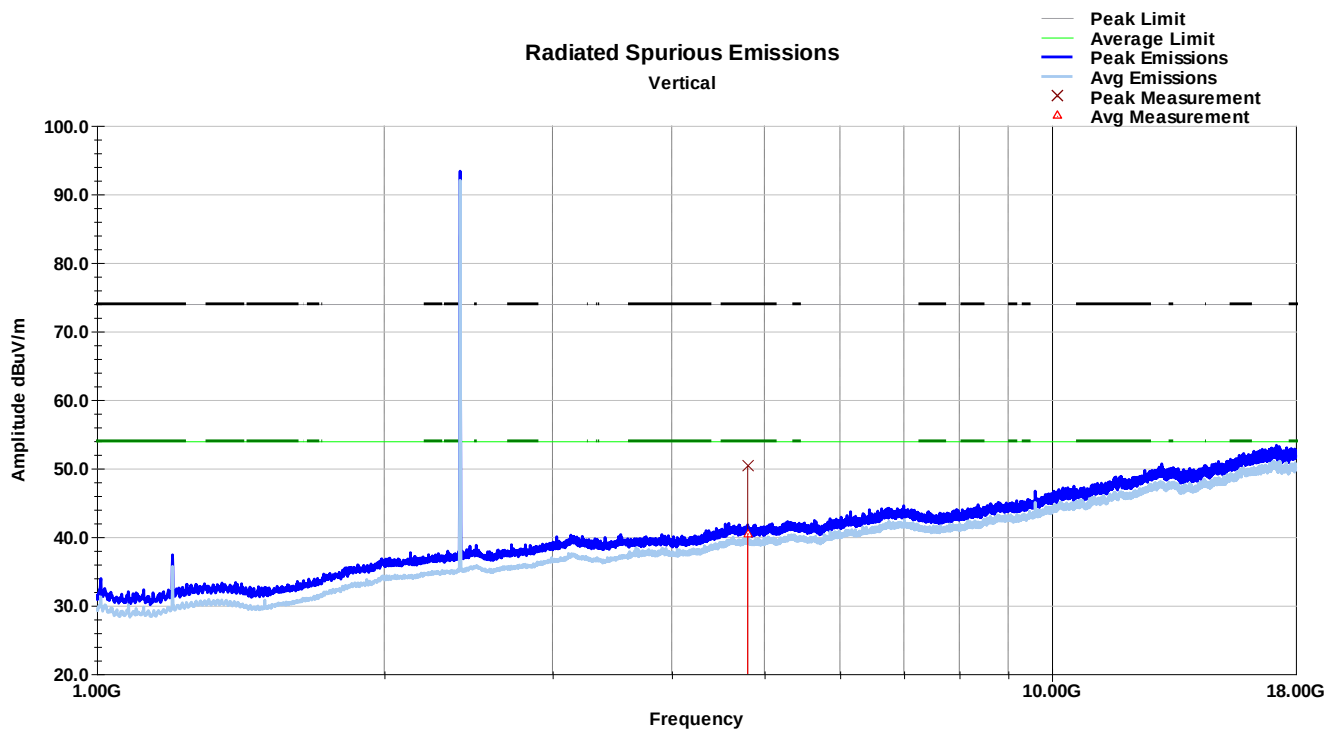
Below 1GHz, there was no discernible difference among the different transmit channels.

Low Channel
Horizontal (30-1000MHz)

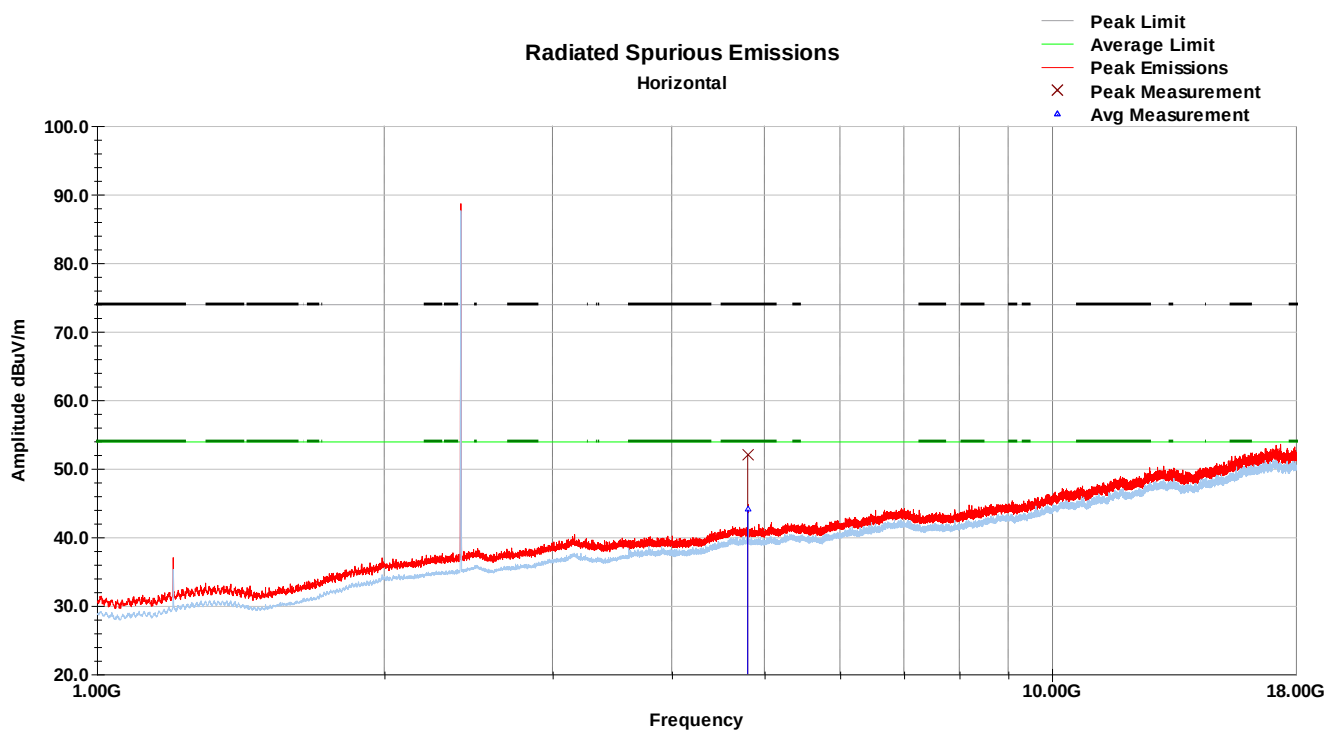


Below 1GHz, there was no discernible difference among the different transmit channels.

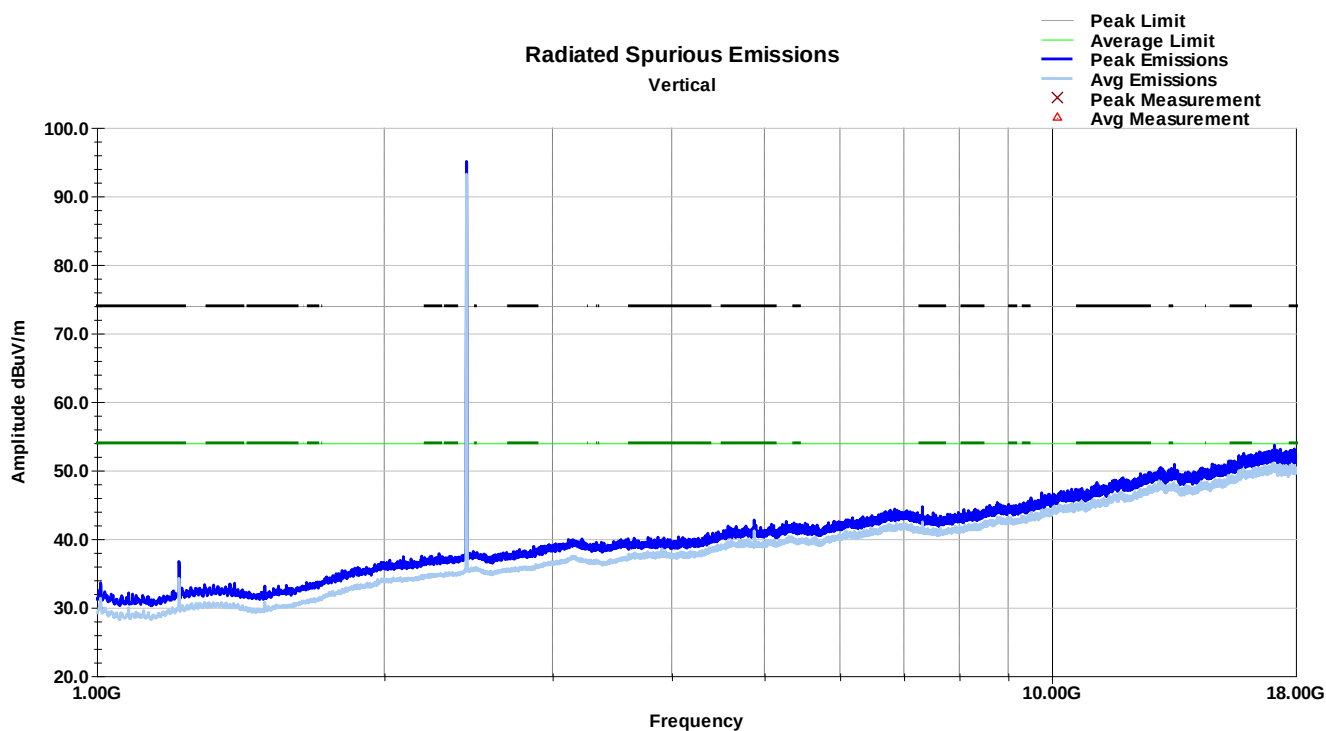
Low Channel Vertical (1-18GHz)



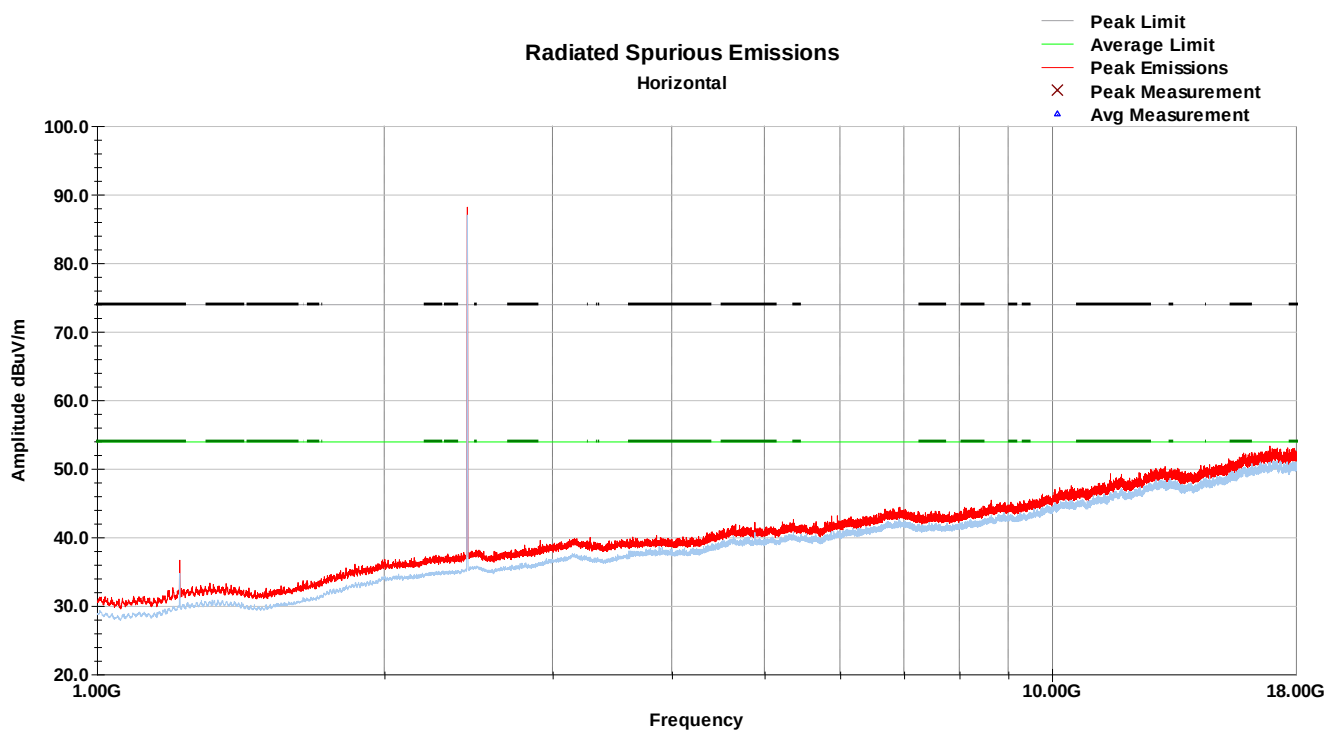
Low Channel Horizontal (1-18GHz)



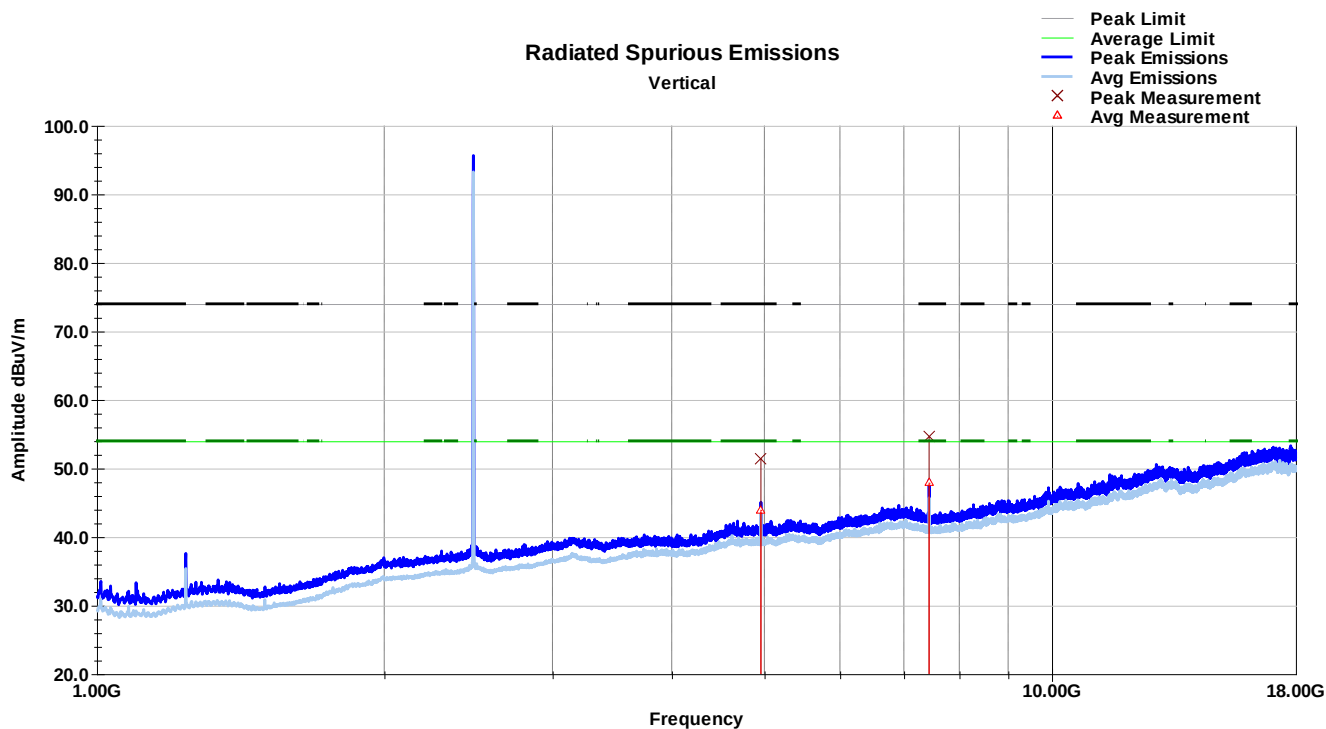
Mid Channel Vertical (1-18GHz)



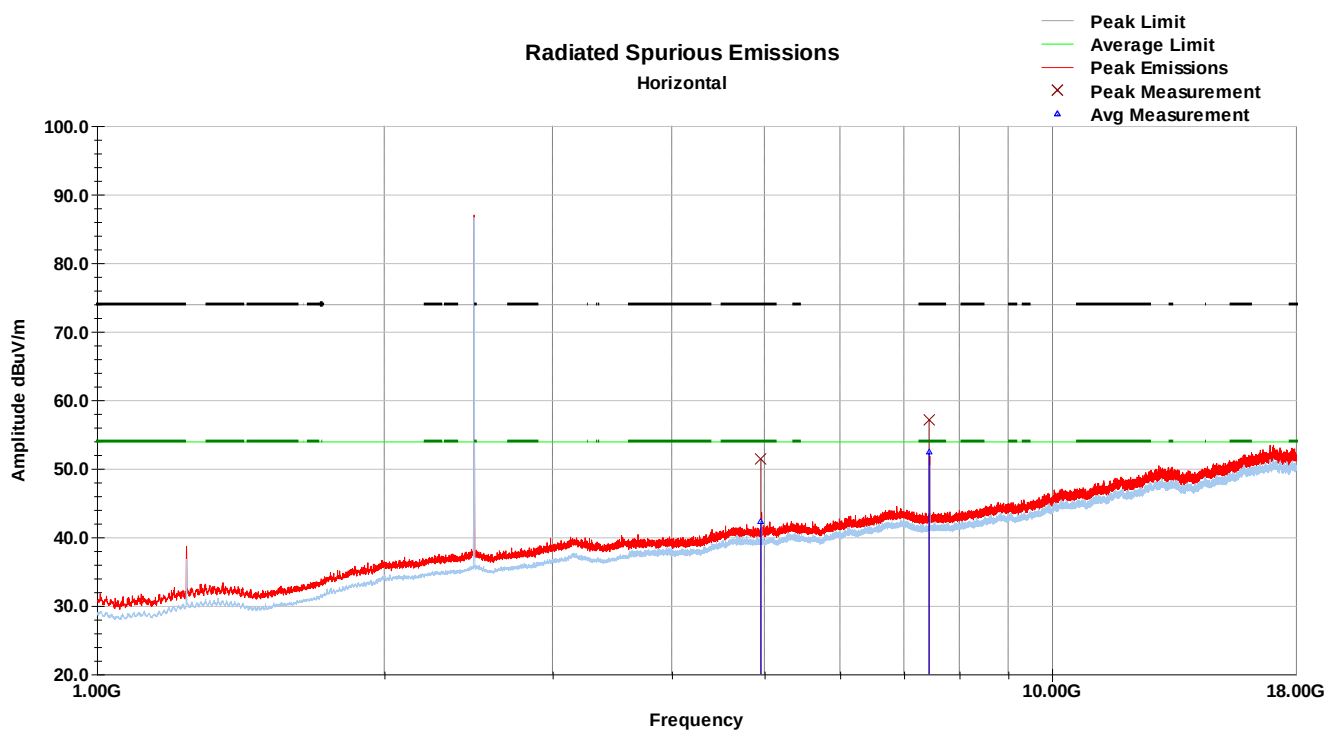
Mid Channel Horizontal (1-18GHz)



High Channel Vertical (1-18GHz)



High Channel Horizontal (1-18GHz)



4.6 Test Data – Tabular Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
Low Channel											
30.50	36.3	H	161.0	125.0	21.9	0.4	39.9	18.8	40.0	-21.2	QP
31.05	36.2	V	15.0	162.0	21.5	0.4	40.0	18.2	40.0	-21.8	QP
31.38	34.7	H	177.0	108.0	21.2	0.4	40.0	16.3	40.0	-23.7	QP
31.48	34.6	H	217.0	123.0	21.2	0.5	40.0	16.2	40.0	-23.8	QP
31.91	34.2	H	213.0	104.0	20.9	0.5	40.1	15.4	40.0	-24.6	QP
33.47	35.8	V	164.0	145.0	19.6	0.5	40.4	15.5	40.0	-24.5	QP
33.71	36.1	V	237.0	139.0	19.4	0.5	40.5	15.5	40.0	-24.5	QP
570.03	57.9	V	129.0	100.0	19.4	2.2	42.8	36.7	46.0	-9.3	QP
590.01	63.1	V	122.0	100.0	19.7	2.2	42.8	42.2	46.0	-3.8	QP
590.01	55.8	H	3.0	187.0	19.7	2.2	42.8	34.9	46.0	-11.2	QP
609.99	59.3	V	104.0	126.0	19.8	2.2	42.8	38.6	46.0	-7.5	QP
610.02	55.5	H	293.0	164.0	19.8	2.2	42.8	34.8	46.0	-11.2	QP
4803.42	44.9	V	239.0	223.0	34.6	5.4	34.6	50.4	74.0	-23.6	Peak
4803.42	35.1	V	239.0	223.0	34.6	5.4	34.6	40.5	54.0	-13.5	Average
4803.42	46.6	H	125.0	109.0	34.6	5.4	34.6	52.0	74.0	-22.0	Peak
4803.42	38.6	H	125.0	109.0	34.6	5.4	34.6	44.0	54.0	-10.0	Average
Middle Channel											
No emissions detected											
High Channel											
4959.35	46.1	V	131.0	219.0	34.5	5.5	34.6	51.5	74.0	-22.5	Peak
4959.35	38.6	V	131.0	219.0	34.5	5.5	34.6	44.0	54.0	-10.0	Average
7438.80	47.4	V	7.0	194.0	35.7	6.6	35.1	54.7	74.0	-19.3	Peak
7438.80	40.7	V	7.0	194.0	35.7	6.6	35.1	47.9	54.0	-6.1	Average
4959.25	46.0	H	211.0	238.0	34.5	5.5	34.6	51.3	74.0	-22.7	Peak
4959.25	37.0	H	211.0	238.0	34.5	5.5	34.6	42.3	54.0	-11.7	Average
7438.80	49.9	H	16.0	217.0	35.7	6.6	35.1	57.1	74.0	-16.9	Peak
7438.80	45.3	H	16.0	217.0	35.7	6.6	35.1	52.5	54.0	-1.5	Average
QP Value = Level + AF + CL - Amp											
Margin = QP Value - Limit											

5 Measurement Uncertainty

The measurement uncertainty figures are be calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor) $k = 2$ (which provide confidence levels of 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Expanded Uncertainty for Normal k factor equal to 2	
	Required	Laboratory Actual
Radio Frequency	$\pm 1 \times 10^{-5}$	$\pm 9.8 \times 10^{-8}$
total RF power, conducted	± 1.5 dB	± 1.2 dB
RF power density, conducted	± 3 dB	± 0.7 dB
spurious emissions, conducted	± 3 dB	± 2.1 dB
all emissions, radiated	± 6 dB	± 4.8 dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	± 5 %	$\pm 3.5\%$
DC and low frequency voltages	± 3 %	$\pm 0.4\%$

6 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	14 December 2020