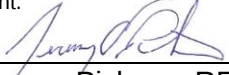
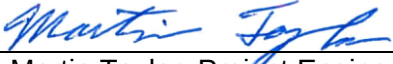


RF Test Report

Project Number: 4804611**Proposal:** SUW-202106001163**Report Number:** 4804611EMC01**Revision Level:** 0**Client:** Fan Innovations, LLC**Equipment Under Test:** Bite Force Amplitude Controller (Transmitter)**Model Name:** BFAC**Type/HVIN:** 20030**FCC ID:** 2A2WP-20030**IC ID:** 27702-20030**Applicable Standards:** ANSI C63.10: 2013 (FCC Part 15 Subpart C, § 15.247)**RSS-247, Issue 2****RSS-GEN Issue 5****Report issued on:** 22 September 2021**Test Result:** Compliant

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared by:
Jeremy Pickens, RF Lab Manager**Reviewed by:**
Martin Taylor, Project Engineer

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.

This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful, and offenders may be prosecuted to the fullest extent of the law.

Table of Contents

1	SUMMARY OF TEST RESULTS	3
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	3
2	GENERAL INFORMATION	4
2.1	CLIENT INFORMATION	4
2.2	TEST LABORATORY	4
2.3	GENERAL INFORMATION OF EUT	4
2.4	OPERATING MODES AND CONDITIONS	4
2.5	EUT CONNECTION BLOCK DIAGRAM – CONDUCTED MEASUREMENTS	5
2.6	EUT CONNECTION BLOCK DIAGRAM – RADIATED MEASUREMENTS	5
2.7	SYSTEM CONFIGURATIONS	6
2.8	CONFIGURATION DIAGRAMS (RADIATED)	6
3	BANDWIDTH	7
3.1	TEST RESULT	7
3.2	TEST METHOD	7
3.3	TEST SITE	7
3.4	TEST EQUIPMENT	7
3.5	TEST DATA – 6dB BANDWIDTH	8
3.6	TEST DATA – 99% BANDWIDTH	9
4	PEAK OUTPUT POWER	10
4.1	TEST RESULT	10
4.2	TEST METHOD	10
4.3	TEST SITE	10
4.4	TEST EQUIPMENT	10
4.5	TEST DATA	10
5	POWER SPECTRAL DENSITY	12
5.1	TEST RESULT	12
5.2	TEST METHOD	12
5.3	TEST SITE	12
5.4	TEST EQUIPMENT	12
5.5	TEST DATA	12
6	CONDUCTED SPURIOUS EMISSIONS / BAND EDGE	14
6.1	TEST RESULT	14
6.2	TEST METHOD	14
6.3	TEST SITE	14
6.4	TEST EQUIPMENT	14
6.5	TEST DATA	14
7	FIELD STRENGTH OF SPURIOUS RADIATION (RESTRICTED BANDS)	17
7.1	TEST RESULT	17
7.2	TEST METHOD	17
7.3	TEST SITE	17
7.4	TEST EQUIPMENT	18
7.5	TEST DATA – PEAK PLOTS	19
7.6	TEST DATA – TABULAR DATA	26
8	MEASUREMENT UNCERTAINTY	27
9	REVISION HISTORY	28

1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(a)(2)	RSS-247 5.2(a) RSS-GEN 6.7	Compliant
Peak Output Power	15.247(b)(3)	RSS-247 5.4 (d)	Compliant
Power Spectral Density	15.247(e)	RSS-247 5.2 (b)	Compliant
Conducted Spurious Emissions / Band Edge	15.247(d)	RSS-247 5.5	Compliant
Field Strength of Spurious Radiation	15.247(d)	RSS-247 5.5	Compliant
Emissions in Restricted Frequency Bands	15.205, 15.209	RSS-GEN 8.9, 8.10	Compliant
Antenna Requirement	15.203	RSS-GEN 6.8	Compliant ¹
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN 8.8	NA ²

1) The device employs an external Reverse-Polarity SMA connector

2) The device has no facility for connection to the AC mains.

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Fan Innovations, LLC
Address: 6405 Lake Shadows
City, State, Zip, Country: Hixson, TN 37343, 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
Designation Number: US1126
ISED Registration: 9984A
CAB Identifier: US0186

2.3 General Information of EUT

Product Description: Bite Force Amplitude Controller (Transmitter)
Type/HVIN: 20030
Serial Number: 165990011 (Low), 165990001 (Middle), 165990002 (High)

Frequency Range: 912 – 919 MHz
Data Modes: GFSK
Antenna: External Dipole (1.2dBi Peak Gain) Linx, P/N: ANT -916-CW-HWR-CC

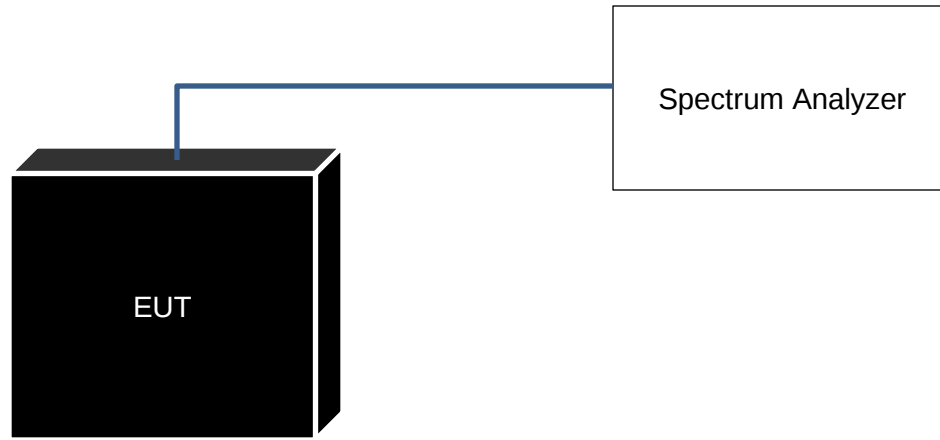
Rated Voltage: 9Vdc
Test Voltage: 9Vdc

Sample Received Date: 02 August 2021
Dates of testing: 02– 11 August 2021

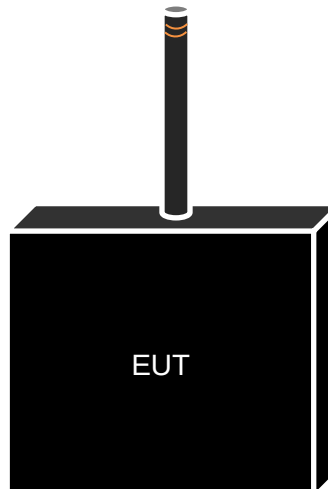
2.4 Operating Modes and Conditions

The device was powered from a standard 9V battery. Three devices were provided for testing and pre-programmed to transmit on a single channel at maximum intended power. Low, middle, and highest operating channels were evaluated.

2.5 *EUT Connection Block Diagram – Conducted Measurements*



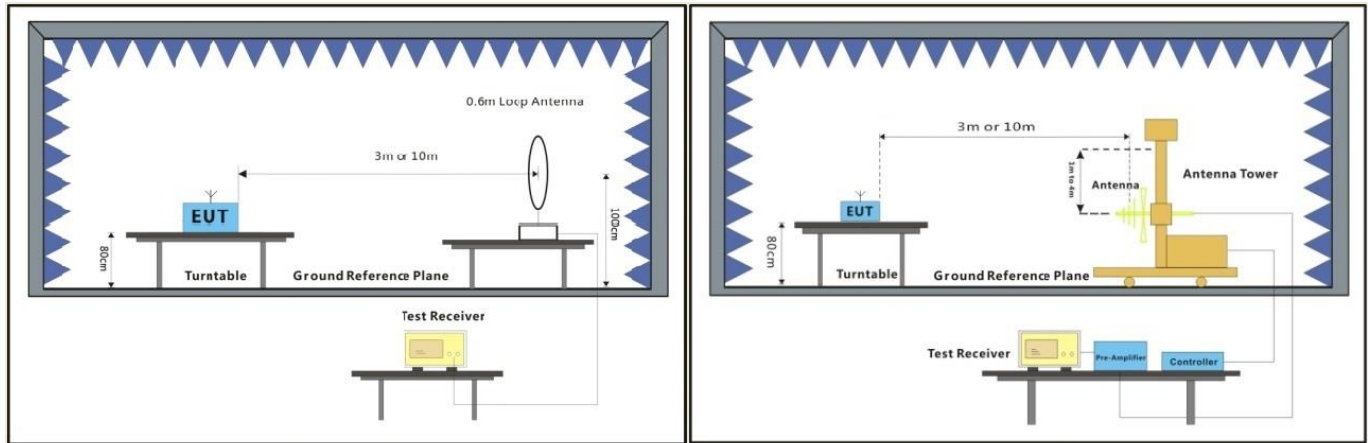
2.6 *EUT Connection Block Diagram – Radiated Measurements*



2.7 System Configurations

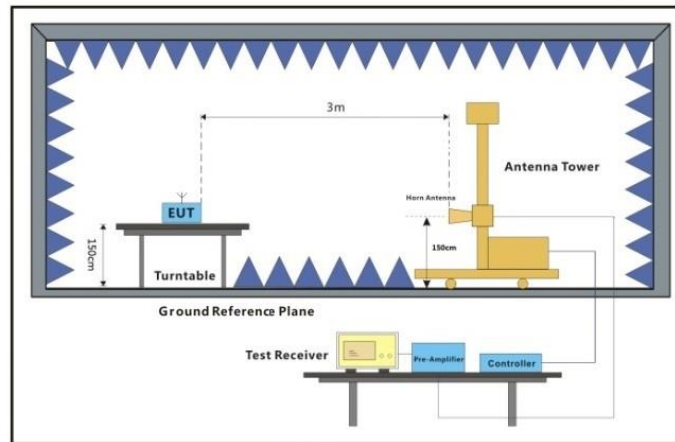
Device reference	Manufacturer	Description	Model Number	Serial Number
EUT	Fan Innovations, LLC	Bite Force Amplitude Controller	20030	165990011 (Low Channel) 165990001 (Mid Channel) 165990002 (High Channel)

2.8 Configuration Diagrams (Radiated)



Below 30MHz

30MHz-1GHz



Above 1GHz

3 Bandwidth

3.1 Test Result

Test Description	Test Specification		Test Result
6 dB Bandwidth 99% Occupied Bandwidth	15.247(a)(2)	RSS-247 5.2(a) RSS-GEN 6.7	Compliant

3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v05r2 were used to determine the 6 dB bandwidth.

The procedures from ANSI C63.10: 2013 clause 6.9.2 were used to measure the 99% Occupied Bandwidth.

3.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.6 °C

Relative Humidity: 51.6 %

Atmospheric Pressure: 97.9 kPa

3.4 Test Equipment

Test End Date: 2-Aug-21

Tester: JOP

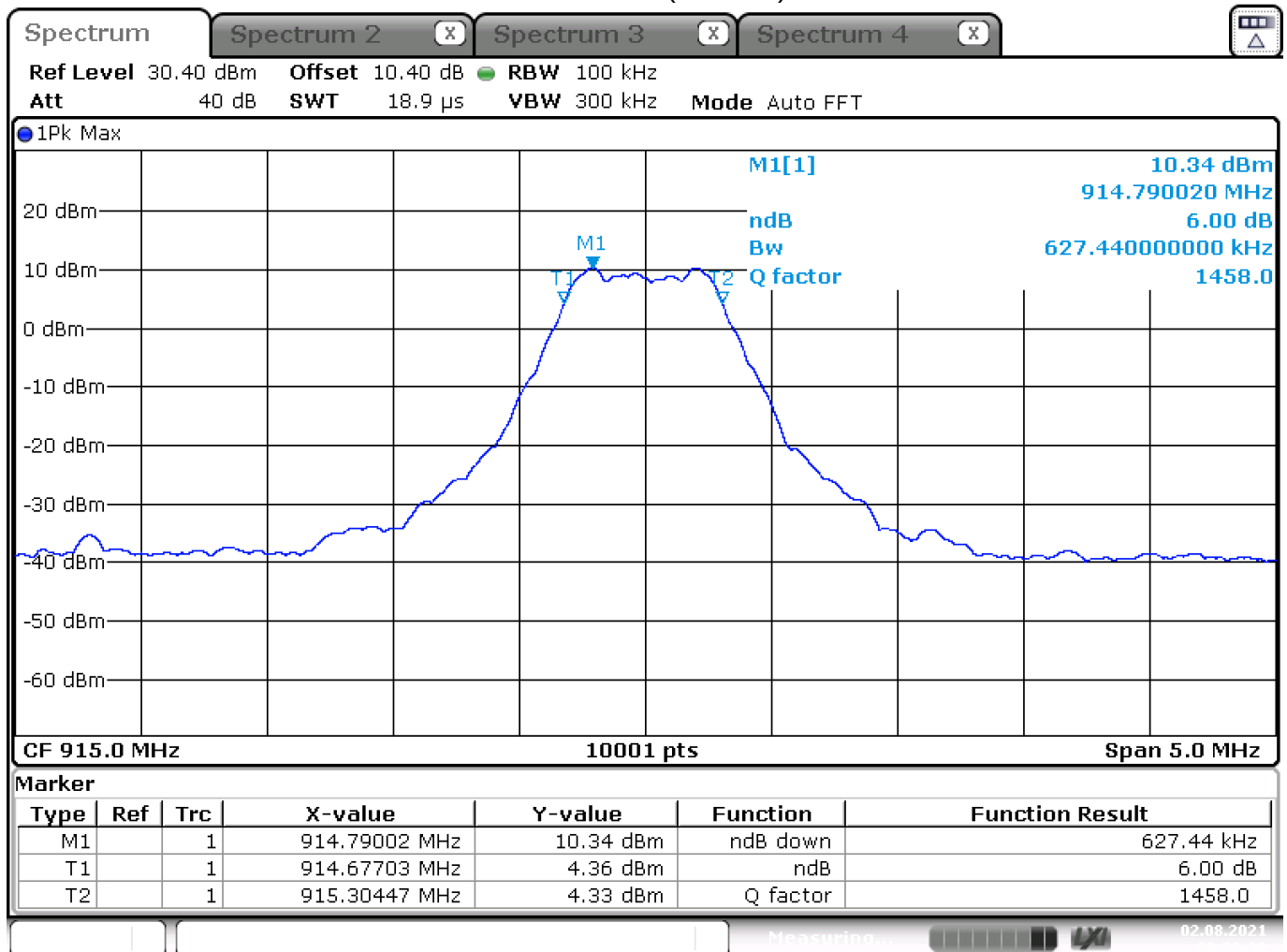
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ATTENUATOR, 10DB	BW-S10W2	Mini-Circuits	15032	9-Jul-21	9-Jul-22
RF Cable SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19101	16-Mar-21	16-Mar-22
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-19	27-Dec-21

3.5 Test Data – 6dB Bandwidth

Frequency (MHz)	TX Type	ANT No.	6dB BW (MHz)	Limit (MHz)	Verdict
912	SISO	1	0.6368	≥0.5	PASS
915	SISO	1	0.6274	≥0.5	PASS
919	SISO	1	0.6379	≥0.5	PASS

Sample Plot

Mid Channel (915MHz)



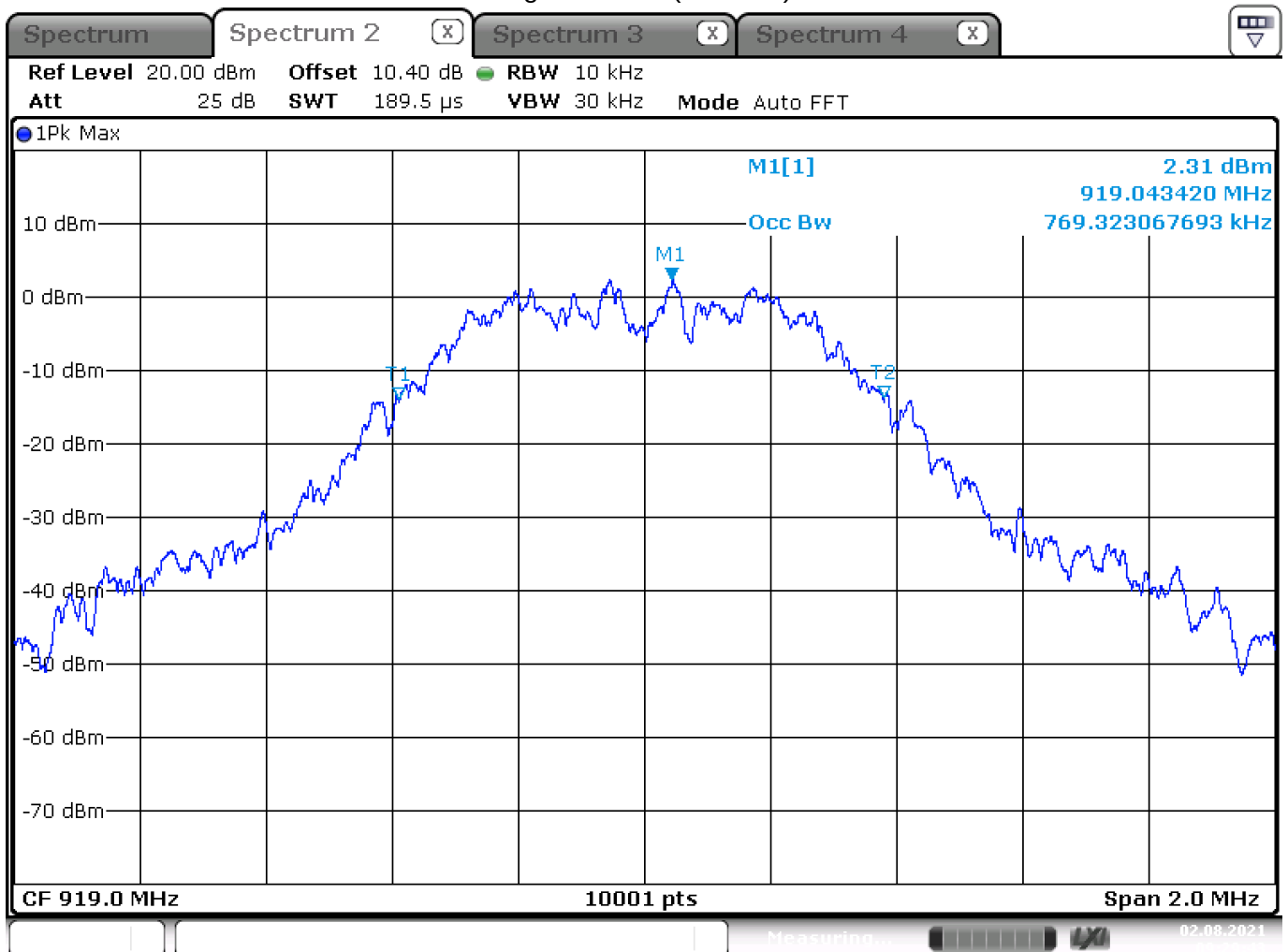
Date: 2.AUG.2021 09:53:39

3.6 Test Data – 99% Bandwidth

Frequency (MHz)	TX Type	ANT No.	99% OBW (MHz)	Limit (MHz)	Verdict
912	SISO	1	0.7294	≥ 0.5	Reported
915	SISO	1	0.7597	≥ 0.5	Reported
919	SISO	1	0.7693	≥ 0.5	Reported

Sample Plot

High Channel (919MHz)



Date: 2.AUG.2021 09:29:44

4 Peak Output Power

4.1 Test Result

Test Description	Test Specification		Test Result
Peak Output Power	15.247(b)(3)	RSS-247 S5.4 (d)	Compliant

4.2 Test Method

Fundamental peak power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.9 and KDB 558074 D01 Measurement Guidance v05r2.

Limit

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi (e.g. for a 7.4dBi antenna, the limit is reduced from 30dBm to 28.6dBm)

4.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.6 °C

Relative Humidity: 51.6 %

Atmospheric Pressure: 97.9 kPa

4.4 Test Equipment

Test End Date: 2-Aug-21

Tester: JOP

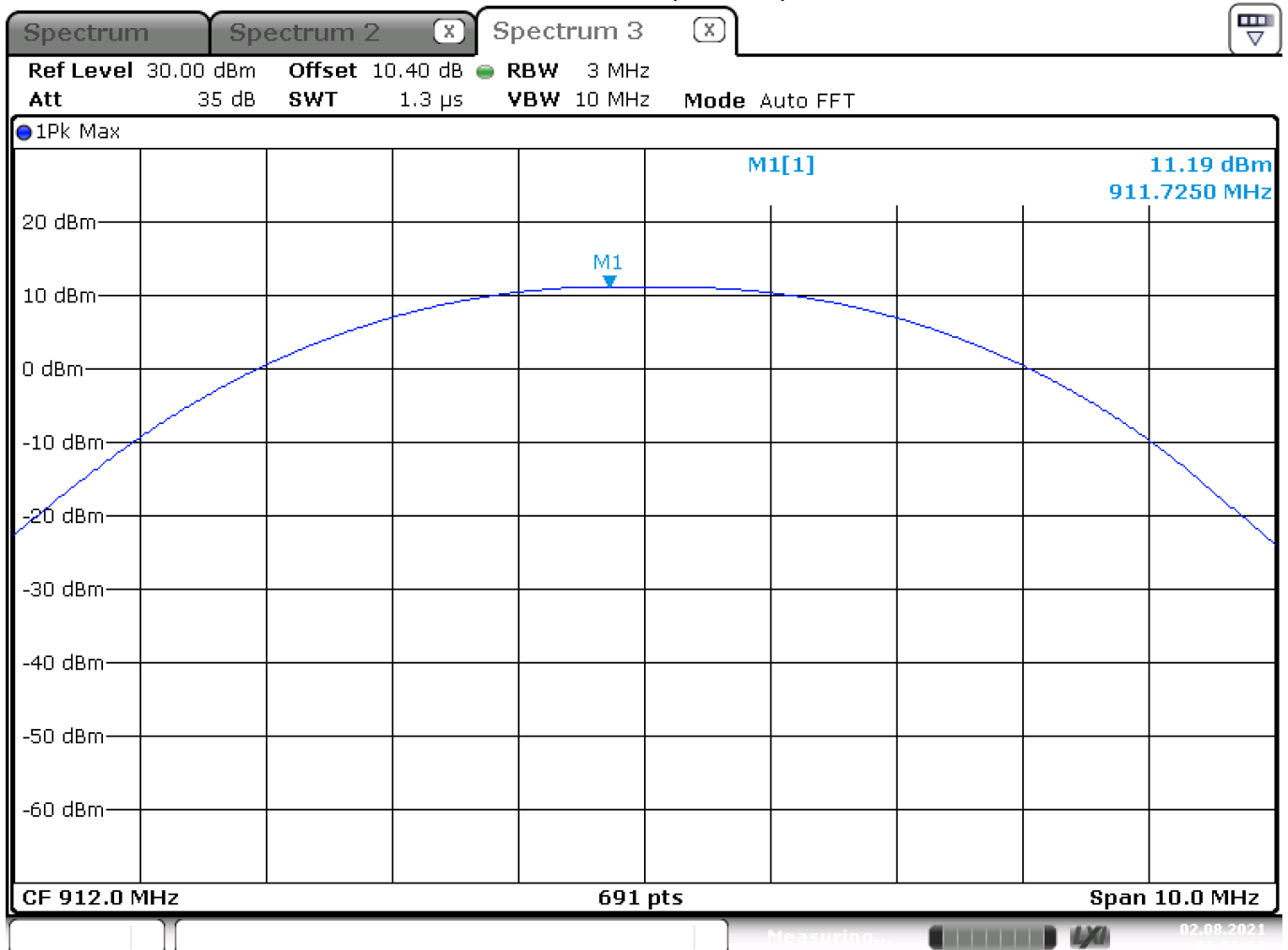
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ATTENUATOR, 10DB	BW-S10W2	Mini-Circuits	15032	9-Jul-21	9-Jul-22
RF Cable SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19101	16-Mar-21	16-Mar-22
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-19	27-Dec-21

4.5 Test Data

Frequency (MHz)	TX Type	ANT No.	Peak Output Power (dBm)	Limit (dBm)	Verdict
912	SISO	1	11.19	30	PASS
915	SISO	1	10.72	30	PASS
919	SISO	1	11.00	30	PASS

Sample Plot

Low Channel (912MHz)



Date: 2.AUG.2021 08:56:02

5 Power Spectral Density

5.1 Test Result

Test Description	Test Specification		Test Result
Power Spectral Density	15.247(e)	RSS-247 S5.2 (b)	Compliant

5.2 Test Method

Power spectral density measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.10 and KDB 558074 D01 Measurement Guidance v05r2.

Limit

The limit is 8 dBm.

5.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.6 °C

Relative Humidity: 51.6 %

Atmospheric Pressure: 97.9 kPa

5.4 Test Equipment

Test End Date: 2-Aug-21

Tester: JOP

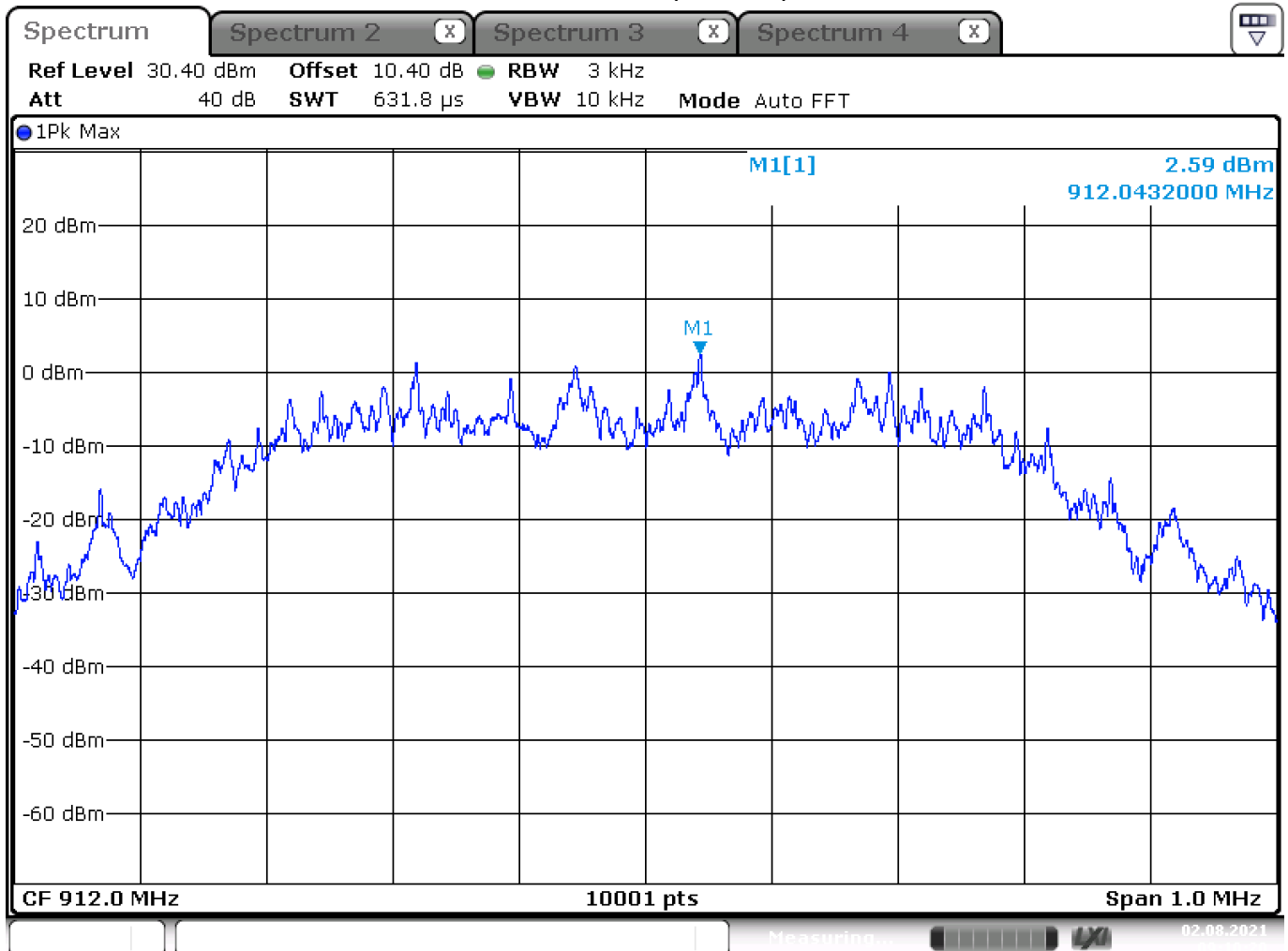
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ATTENUATOR, 10DB	BW-S10W2	Mini-Circuits	15032	9-Jul-21	9-Jul-22
RF Cable SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19101	16-Mar-21	16-Mar-22
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-19	27-Dec-21

5.5 Test Data

Frequency (MHz)	TX Type	ANT No.	Peak PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
912	SISO	1	2.59	≤8	PASS
915	SISO	1	1.99	≤8	PASS
919	SISO	1	2.41	≤8	PASS

Sample Plot

Low Channel (912MHz)



Date: 2.AUG.2021 09:10:21

6 Conducted Spurious Emissions / Band Edge

6.1 Test Result

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

6.2 Test Method

Spurious emissions in non-restricted frequency bands were recorded using the methods defined in ANSI C63.10: 2013 clause 11.11 and KDB 558074 D01 Measurement Guidance v05r2.

Lowest, middle, and highest channels were investigated.

Because the maximum conducted peak output power was used to determine compliance with the output power limits, the limit in any 100 kHz band outside of the authorized band is 20 dB below the maximum in-band peak level.

6.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.6 °C

Relative Humidity: 51.6 %

Atmospheric Pressure: 97.9 kPa

6.4 Test Equipment

Test End Date: 2-Aug-21

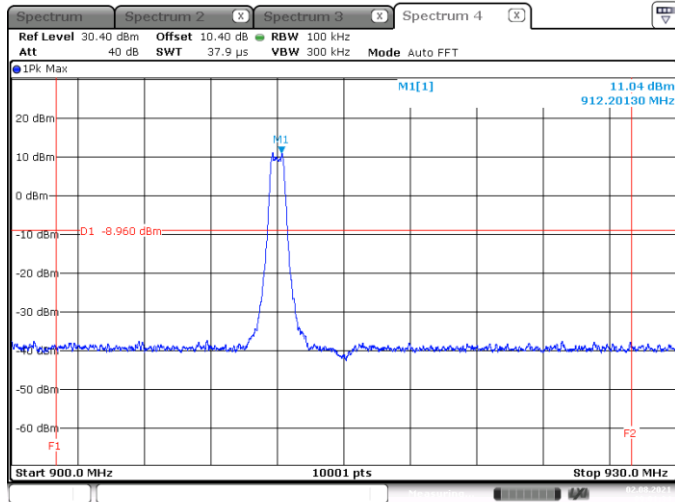
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ATTENUATOR, 10DB	BW-S10W2	Mini-Circuits	15032	9-Jul-21	9-Jul-22
RF Cable SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19101	16-Mar-21	16-Mar-22
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-19	27-Dec-21

6.5 Test Data

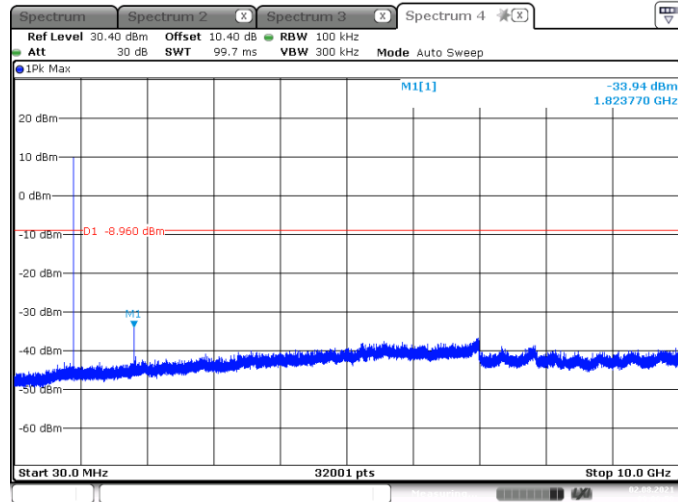
Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limit (dBm)	Verdict
912	SISO	1	-33.94	-8.96	PASS
915	SISO	1	-35.81	-10.25	PASS
919	SISO	1	-36.7	-9.38	PASS

Band Edge - Low Channel (912MHz)



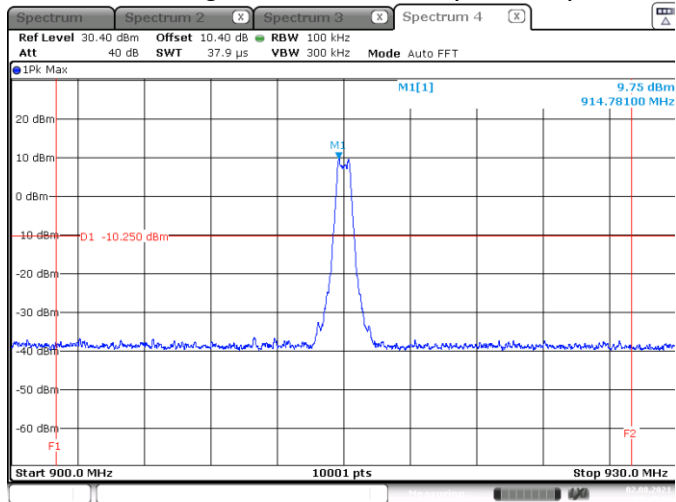
Date: 2.AUG.2021 09:01:35

Full Spectrum - Low Channel (912MHz)



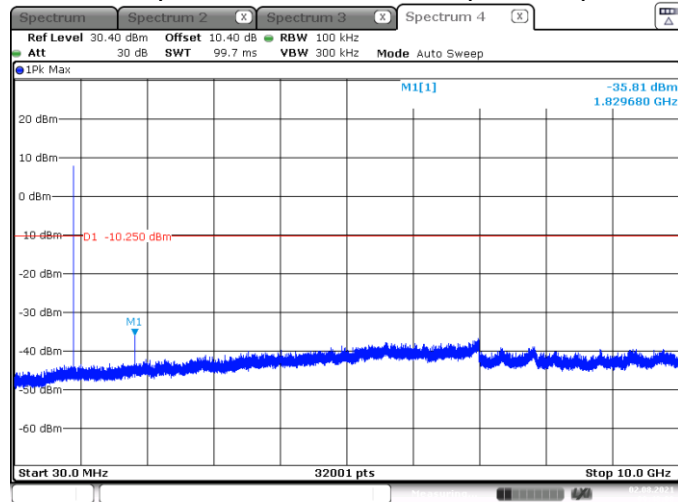
Date: 2.AUG.2021 09:06:51

Band Edges - Mid Channel (915MHz)



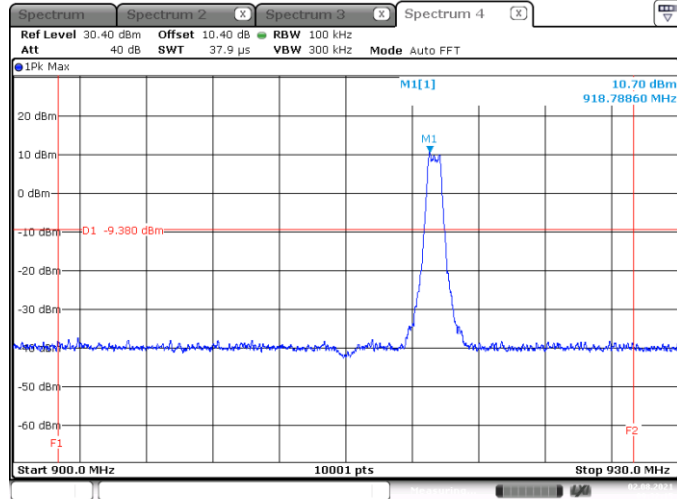
Date: 2.AUG.2021 09:45:03

Full Spectrum - Mid Channel (915MHz)

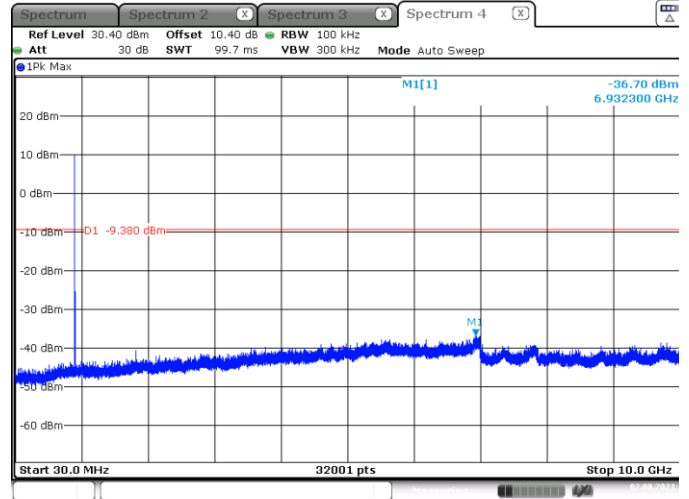


Date: 2.AUG.2021 09:48:09

Band Edge – High Channel (919MHz)



Full Spectrum - High Channel (919MHz)



7 Field Strength of Spurious Radiation (Restricted Bands)

7.1 Test Result

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

7.2 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 low, middle, and high channels.

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 3 meters

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

7.3 Test Site

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

Temperature: 22.4 °C

Relative Humidity: 55.1 %

Atmospheric Pressure: 98.85 kPa

7.4 Test Equipment

Test End Date: 8/11/2021

Tester: EW/AB/ZH

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
RF Cable Nm to Nf, 0.01-18GHz	90-213-118	TELEDYNE STORM MICROWAVE	20117	17-Feb-2021	17-Feb-2022
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	TELEDYNE STORM MICROWAVE	20120	17-Feb-2021	17-Feb-2022
RF Cable Nm to Nm, 0.01-18GHz	90-195-157	TELEDYNE STORM MICROWAVE	20121	17-Feb-2021	17-Feb-2022
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	21-Jun-2021	21-Jun-2022
ANTENNA, BILOG	JB6	SUNOL	B079689	5-Nov-2020	5-Nov-2022
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079699	15-Jul-2020	15-Jul-2022
RF CABLE	104PE	HUBER & SUHNER	B079793	3-Sep-2020	3-Sep-2021
LOW NOISE AMPLIFIER	ZKL-2+	Mini-Circuits	B079800	7-Jul-2021	7-Jul-2022
FILTER, HIGH PASS, >1000MHz	HPM50108	MICRO-TRONICS	B079802	6-Jul-2021	6-Jul-2022
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	9-Jul-2021	9-Jul-2022
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021

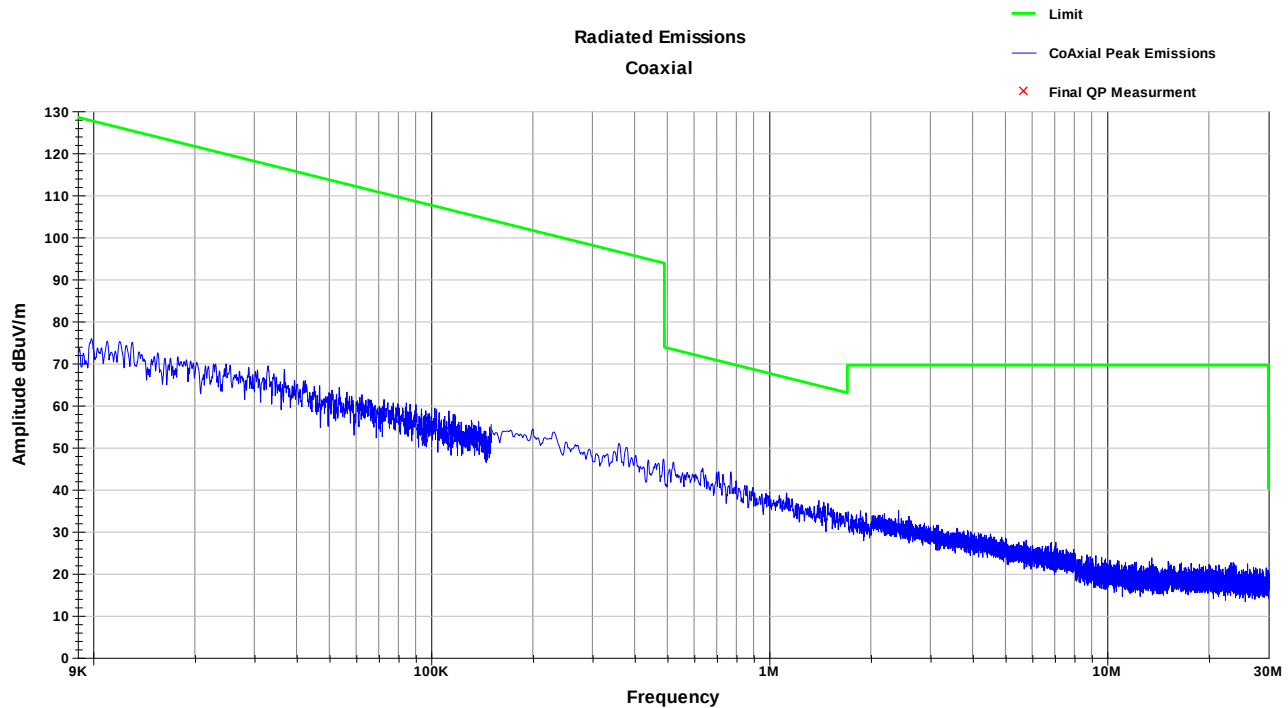
Software:

“RSE 30-1000 MHz T7 201007” TILE! profile dated 07 October 2020

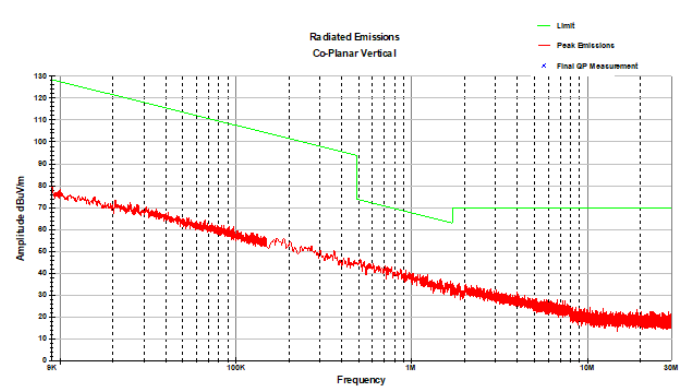
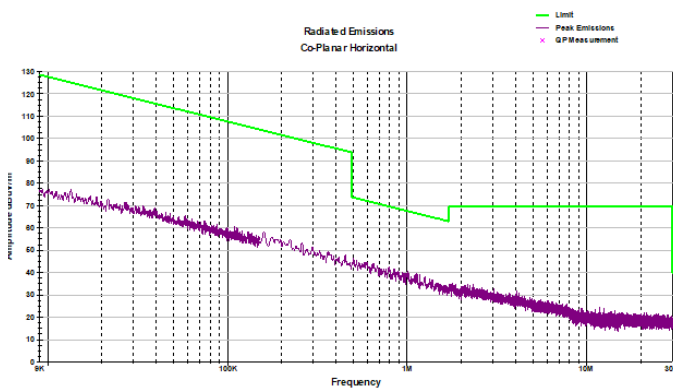
“RSE 1-18 GHz T7 201007” TILE! profile dated 7 October 2020

7.5 Test Data – Peak Plots

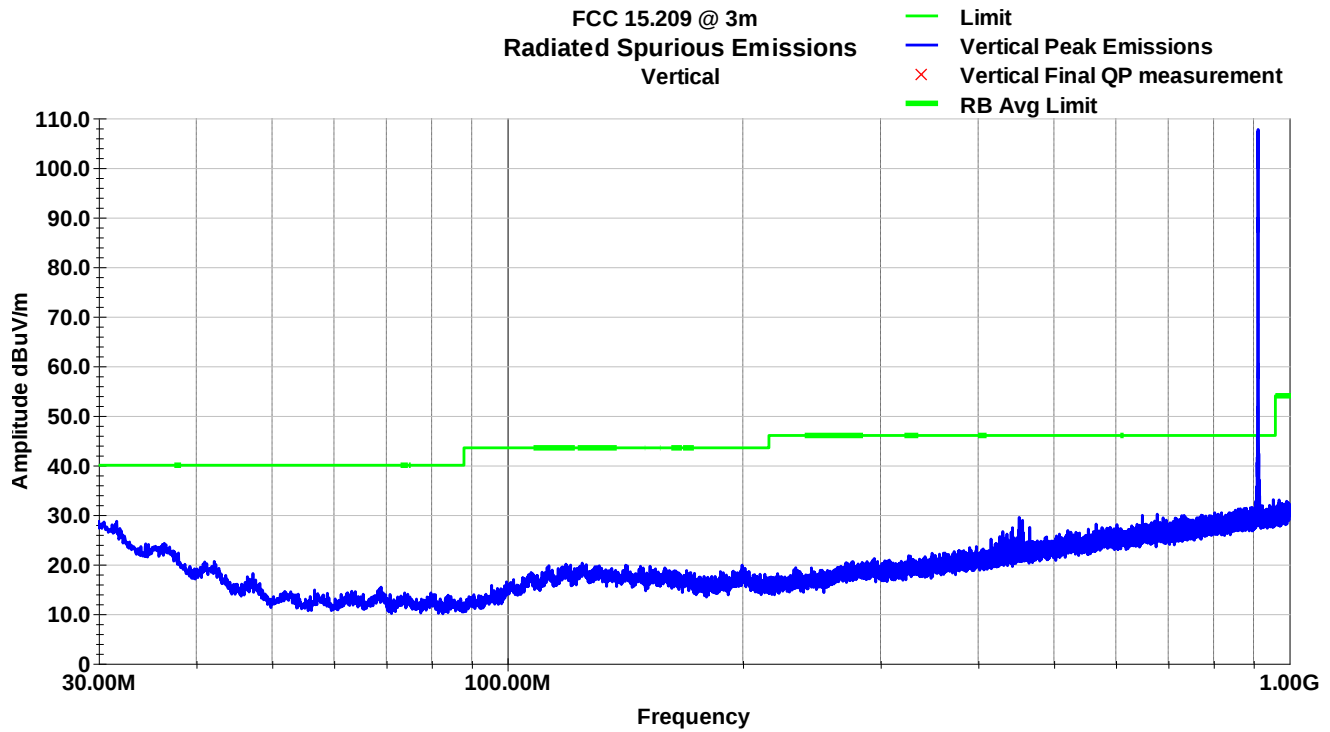
Between 9kHz and 30MHz, there was no significant deviation with respect to axis or channel
Co-Axial Radiated Spurious Emissions – 9kHz-30MHz (LCH)



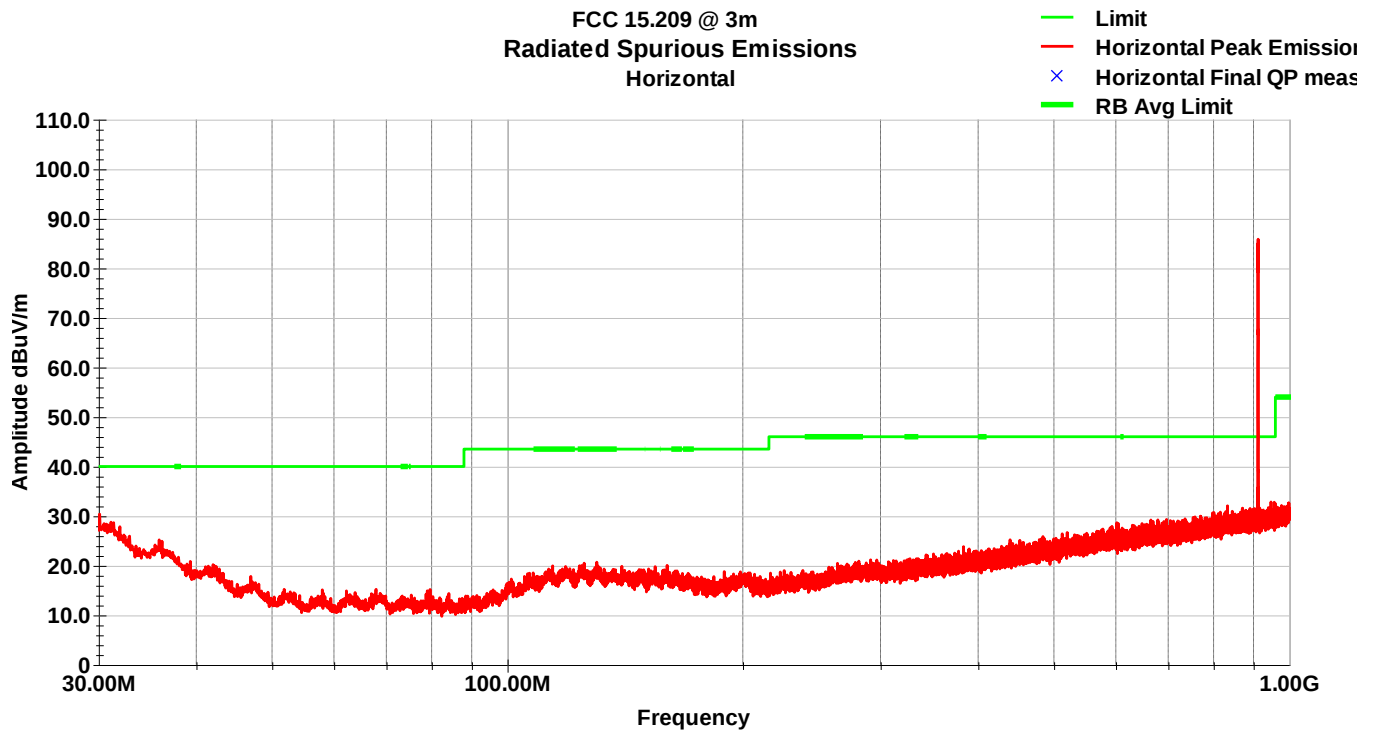
Co-Planar Radiated Spurious Emissions – 9kHz-30MHz (LCH)



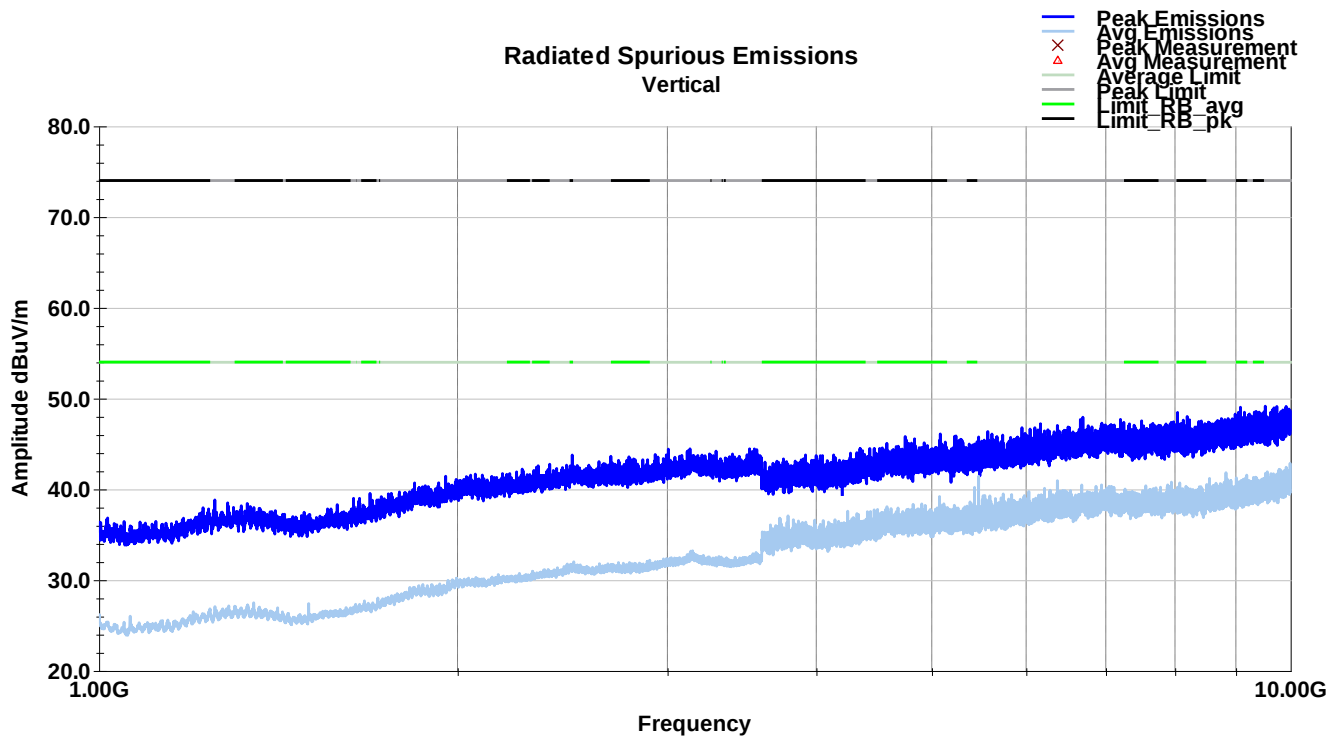
Vertical Radiated Spurious Emissions – 30-1000MHz (LCH)



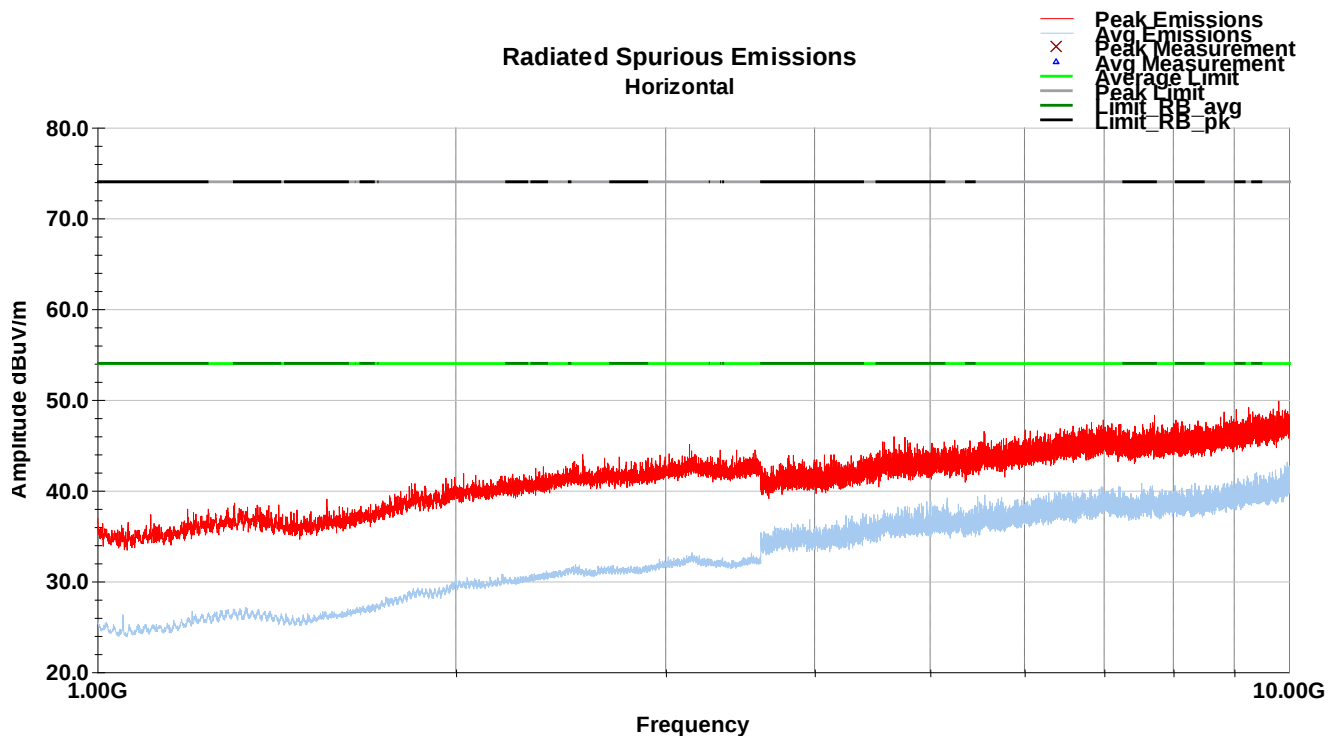
Horizontal Radiated Spurious Emissions – 30-1000MHz (LCH)



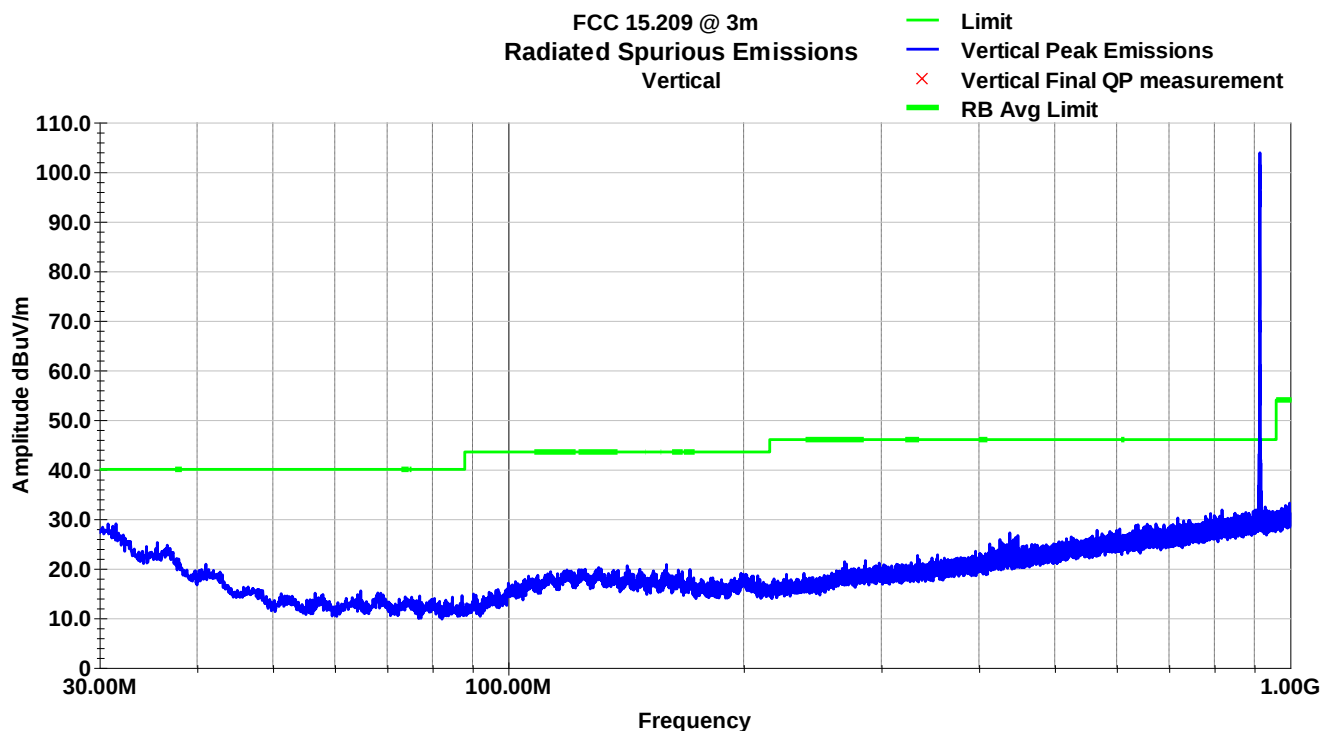
Vertical Radiated Spurious Emissions – 1-10GHz (LCH)



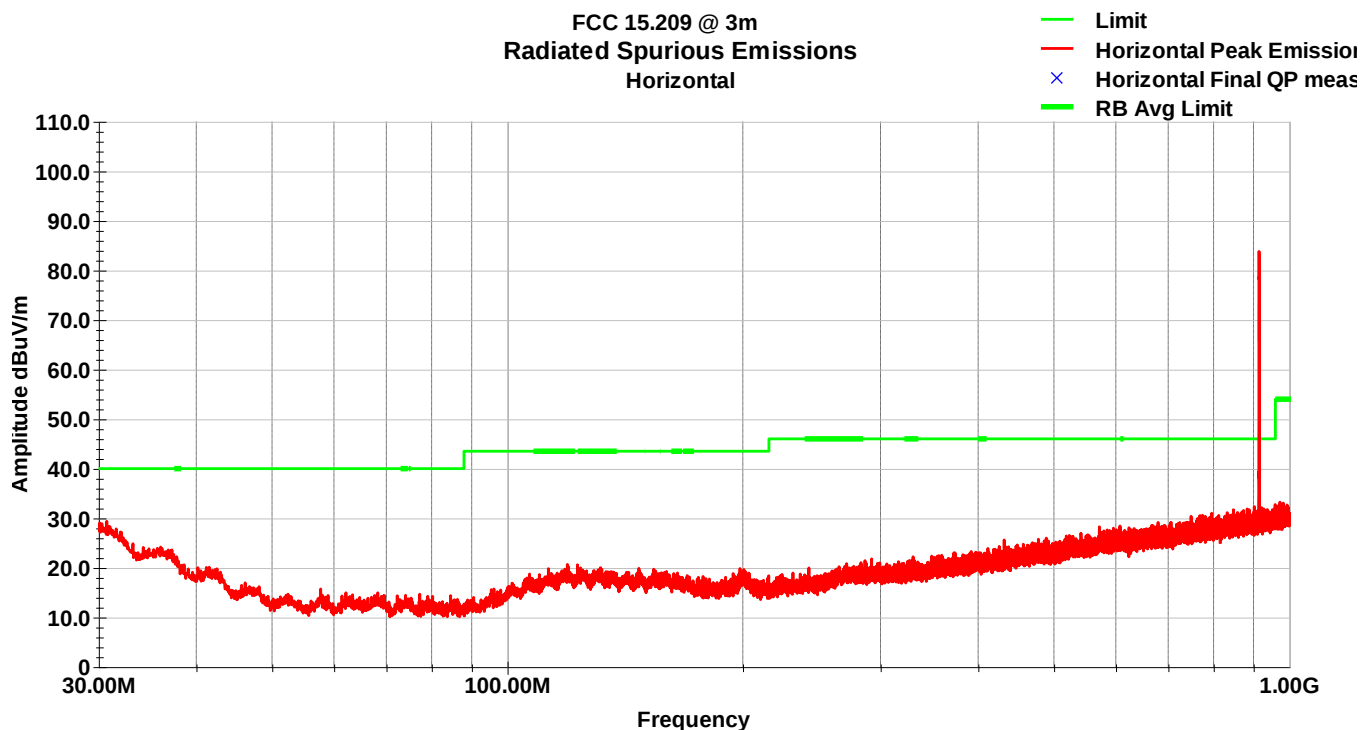
Horizontal Radiated Spurious Emissions – 1-10GHz (LCH)



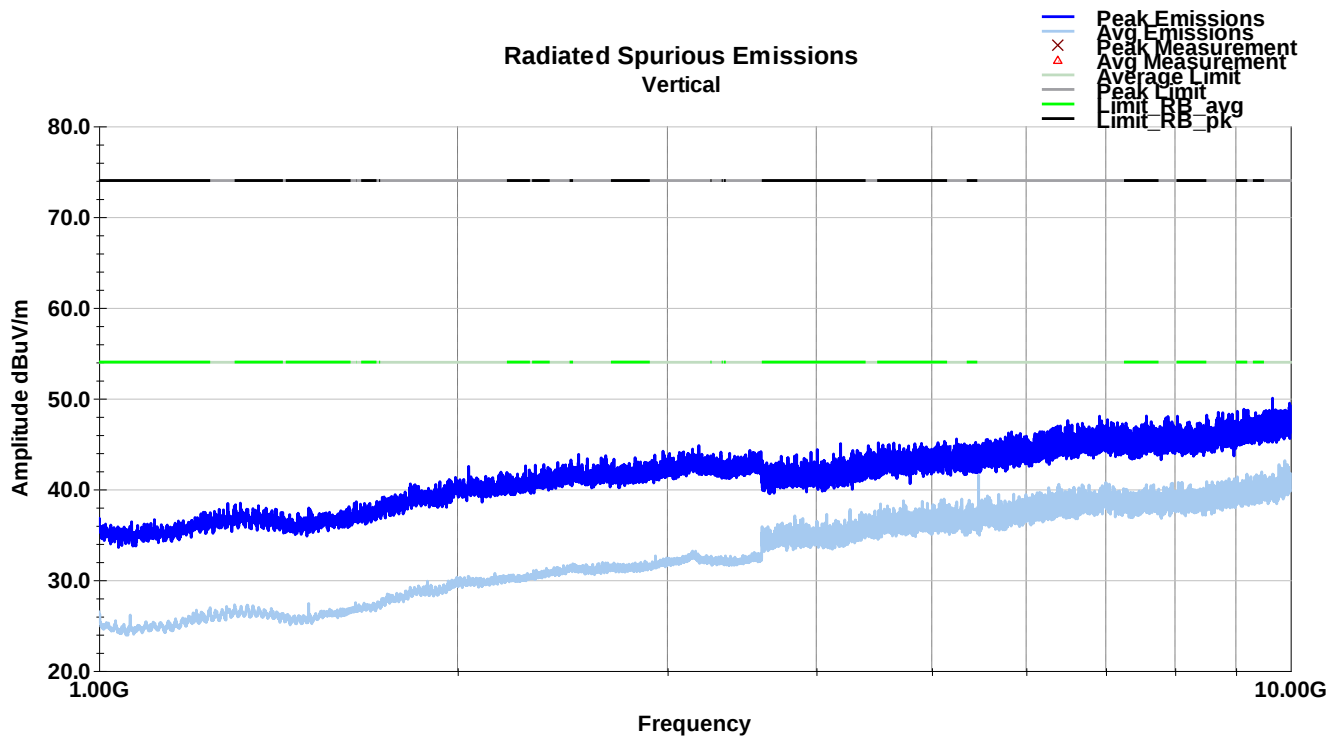
Vertical Radiated Spurious Emissions – 30-1000MHz (MCH)



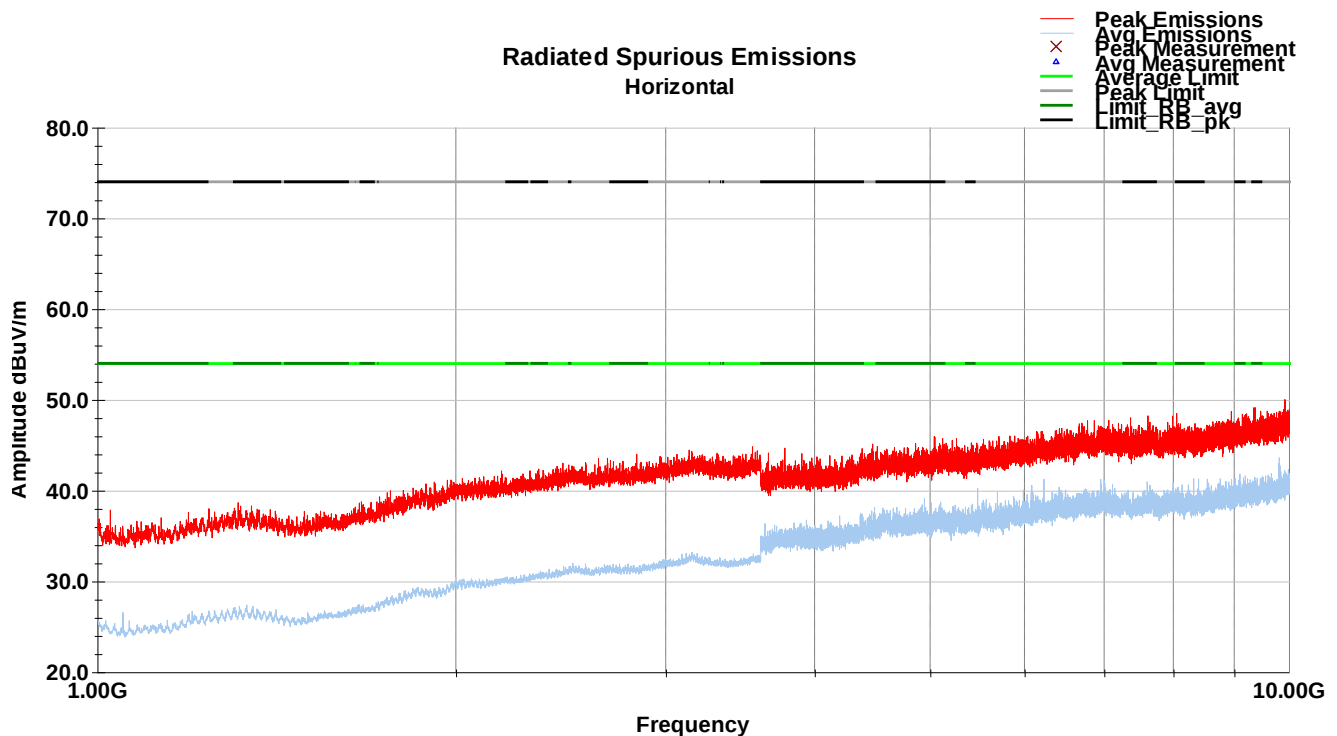
Horizontal Radiated Spurious Emissions – 30-1000MHz (MCH)



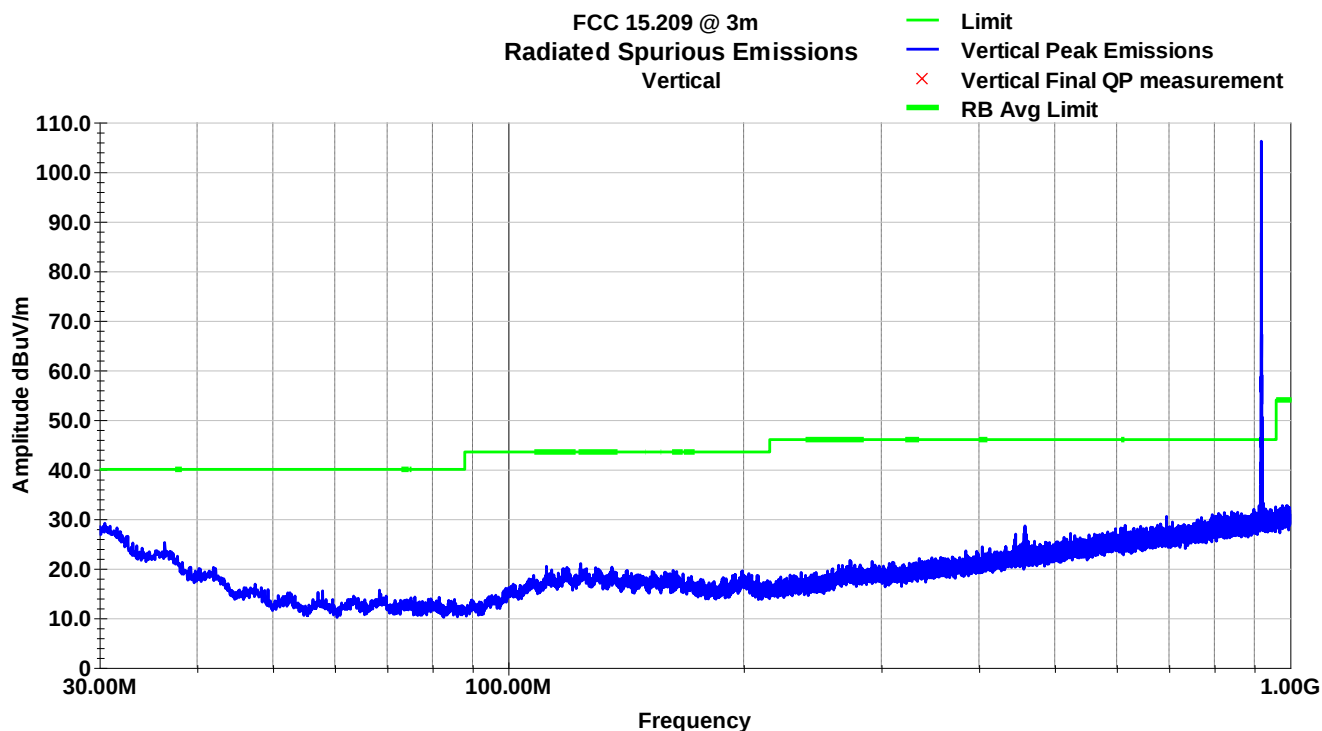
Vertical Radiated Spurious Emissions – 1-10GHz (MCH)



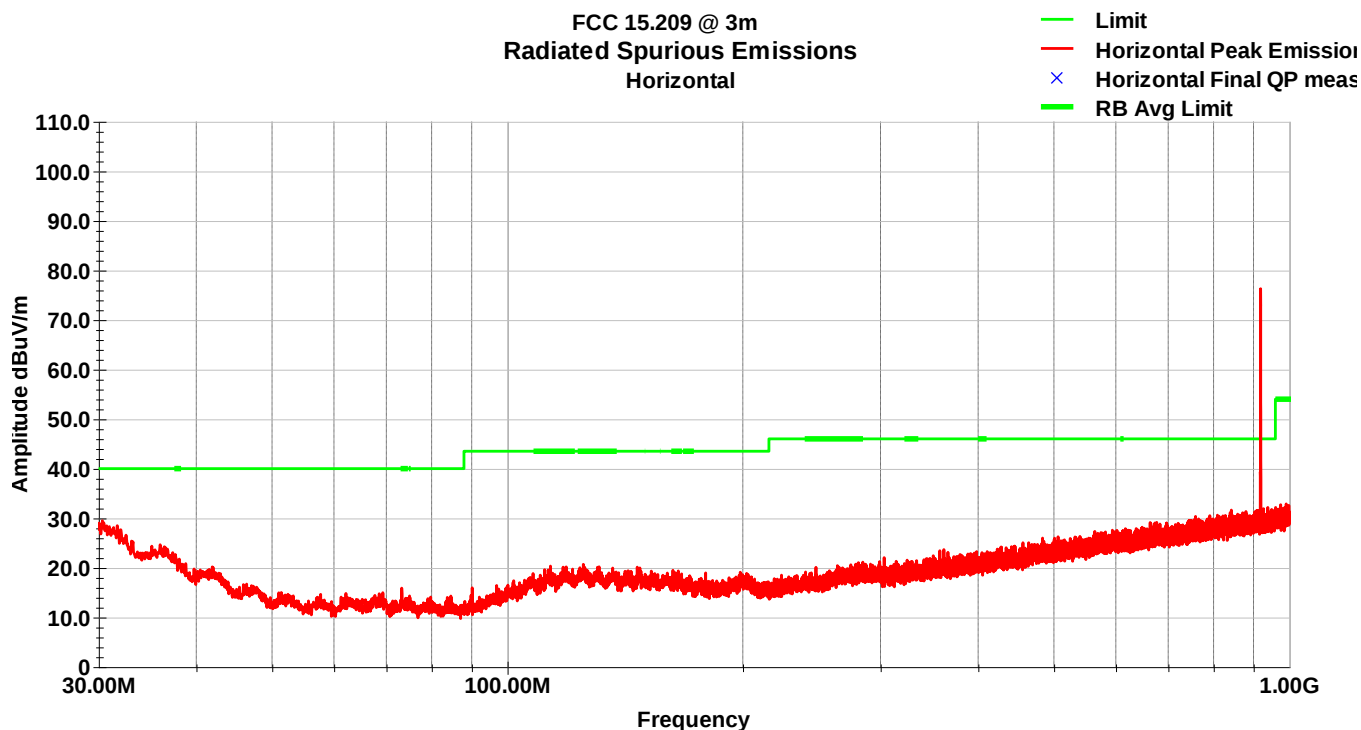
Horizontal Radiated Spurious Emissions – 1-10GHz (MCH)



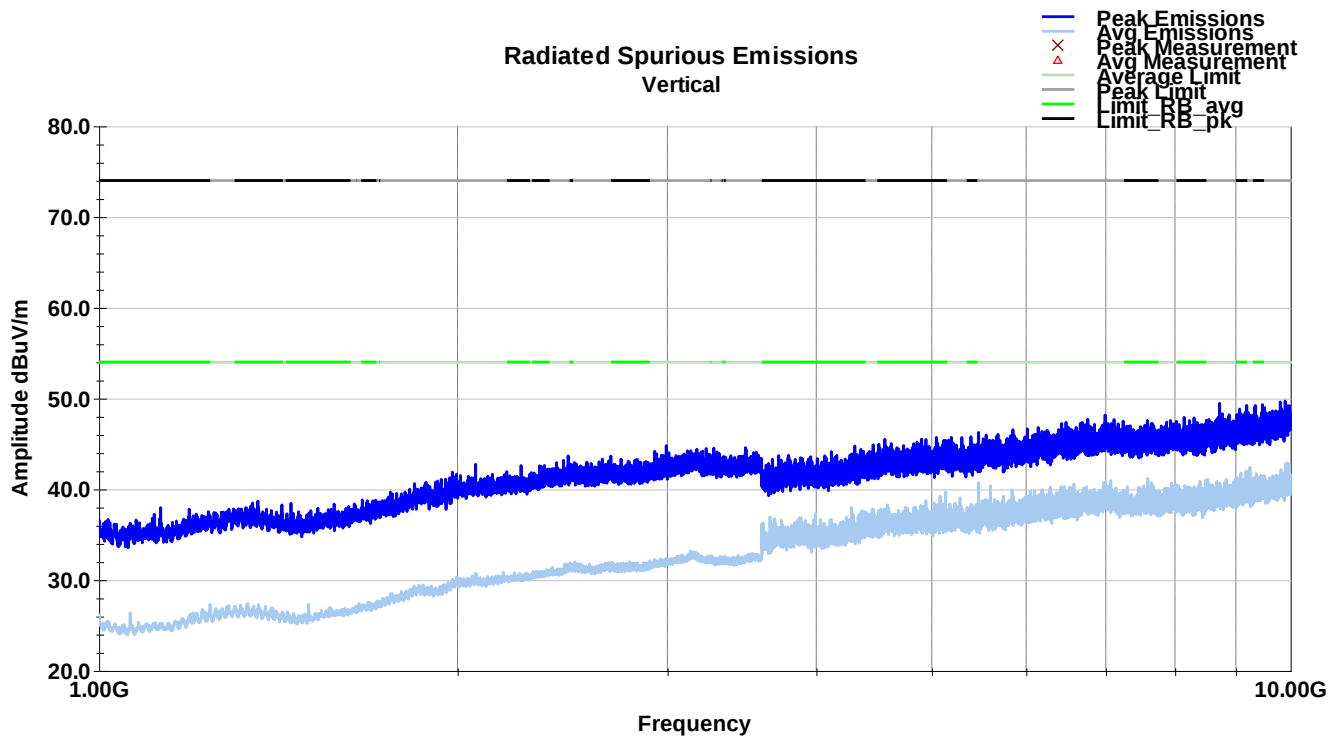
Vertical Radiated Spurious Emissions – 30-1000MHz (HCH)



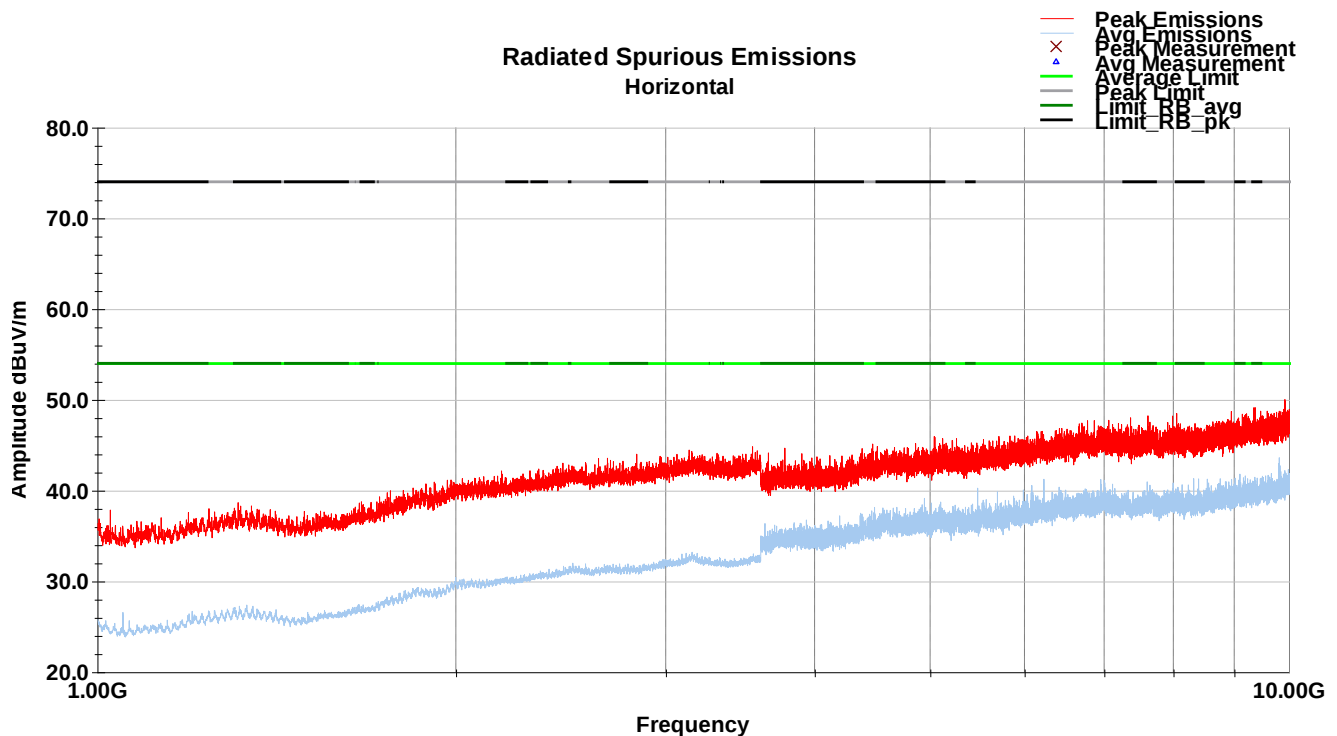
Horizontal Radiated Spurious Emissions – 30-1000MHz (HCH)



Vertical Radiated Spurious Emissions – 1-10GHz (HCH)



Horizontal Radiated Spurious Emissions – 1-10GHz (HCH)



7.6 *Test Data – Tabular Data*

There were no spurious emissions that were detectable above the noise floor of the measurement system.

8 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 %	± 3.5 %
DC and low frequency voltages	± 3 %	± 0.4 %

9 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	22 September 2021