EMC Test Report

Project Number: 4050119

Report Number: 4050119EMC02 **Revision Level:** 0

Client: Windrock, Inc.

Equipment Under Test: Wireless Encoder

Models: A6420

FCC ID: VYK-A6420

IC ID: 7549A-A6420

Applicable Standards: FCC Part 15 Subpart C, § 15.247
RSS-247, Issue 2
ANSI C63.10: 2013
RSS-GEN Issue 4

Report issued on: 31 May 2017

Test Result: Compliant

Tested by: _____
Jeremy O. Pickens, Senior EMC Engineer

Reviewed by: _____
David Schramm, EMC/RF/SAR/HAC 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.

Table of Contents

1 Summary of Test Results

Test Description	Test Specification	Test Result
Occupied Bandwidth	15.247(a)(2)	Compliant
Peak Power Output	15.247(b)(3)	Compliant
Power Spectral Density	15.247(e)	Compliant
Bande Edge / Out of Band Emissions	15.247(d)	Compliant
Radiated Spurious Emissions	15.247(c), 15.35(b),15.205, 15.209	Compliant
AC Power Line Conducted Emission	15.107, 15.207	Compliant

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	Windrock, Inc
Address:	1832 Midpark Rd, Suite 102
City, State, Zip, Country:	Knoxville, TN 37921

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

2.3 *General Information of EUT*

EUT:	Wireless Encoder
Model Number:	A6420-00-00
Serial Number:	1609642015
Frequency Range:	903.45 to 921.45 MHz
Channels:	8
Modulation type:	GFSK
Antenna:	¼ Wave Dipole (Linx Technologies, ANT-916-CW-QW)
Rated Voltage:	7.2 Vdc Li Ion Battery
Sample Received Date:	22 November 2016
Dates of testing:	29 – 30 November 2016

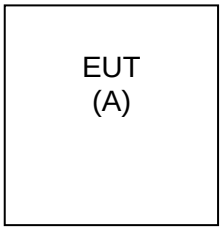
Operating Modes and Conditions

During testing, the device was placed into continuous transmit mode using firmware configurations in the radio. Low, middle, and high channels were evaluated.

As specified in Section 5.10.5 of ANSI C63.10:2013:

- Software was designed to allow the EUT to operate
  - at 98 % duty cycle
  - at the worst-case duty cycle to allow measurements in instances where an average correction factor needs to be determined to calculate the average field strength from the measured peak field strength
- The software allowed configuration and operation on all available unlicensed wireless device channels.
- The software allowed configuration and operation using all available modulations and data rates
- The software allowed configuration and operation on all available power out levels

2.4 *EUT Connection Block Diagram*



2.5 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Windrock	Wireless Encoder	A6420-00-00	1609642015

2.6 *Cable List*

None

3 Occupied Bandwidth

3.1 *Test Result*

Test Description	Basic Standards	Test Result
Bandwidth	15.247(a)(2)	Pass

3.2 *Test Method*

The antenna port conducted measurement procedures from KDB 558074 D01 DTS Meas Guidance v04 Clause 8 were applied.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 22.8 °C
Relative Humidity: 41.7 %

3.4 *Test Equipment*

Test Date: 29-Nov-2016 Tester: MT

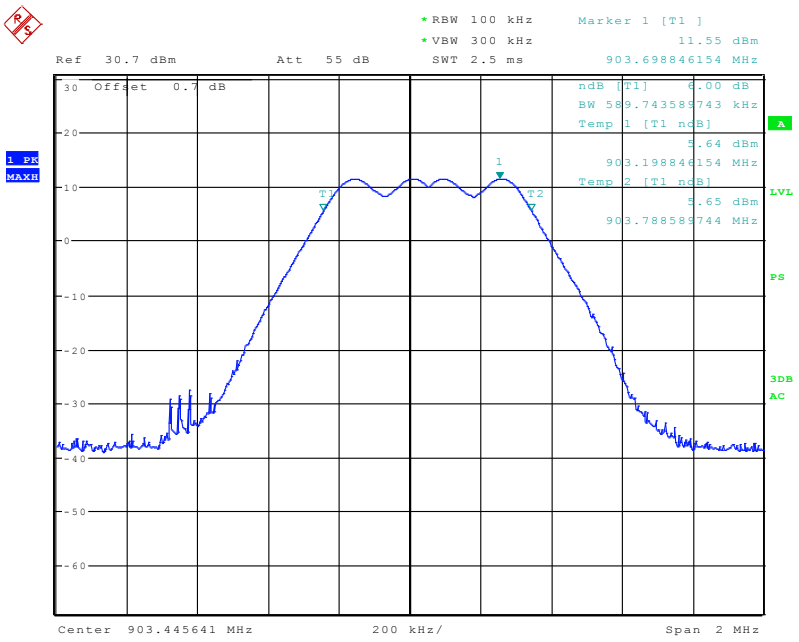
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
RF CABLE	141	HUBER & SUHNER	B095590	26-Jul-2017

Note: The equipment calibration period is 1 year.

3.5 *Test Data*

Frequency (MHz)	6 dB bandwidth **(MHz)**	99% bandwidth **(MHz)**
903.45	0.590	0.705
909.45	0.590	0.702
921.45	0.590	0.705

Sample Plots



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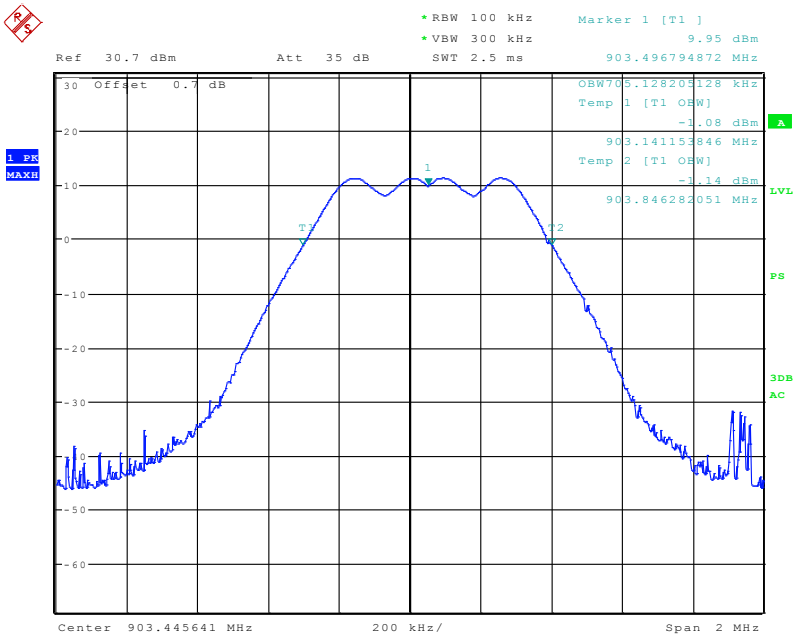

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4 Peak Output Power

4.1 *Test Result*

Test Description	Test Specification	Test Result
Peak Output Power	15.247(b)(3)	Compliant

4.2 *Test Method*

The average antenna port conducted power measurement procedures from KDB 558074 D01 DTS Meas Guidance v04 Clause 9.2.2 were applied.

Limit
For DTS systems operating in the 902-928 MHz band: 1 watt (30dBm ERP).

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 22.8 °C
Relative Humidity: 41.7 %

4.4 *Test Equipment*

Test Date: 29-Nov-2016 Tester: MT

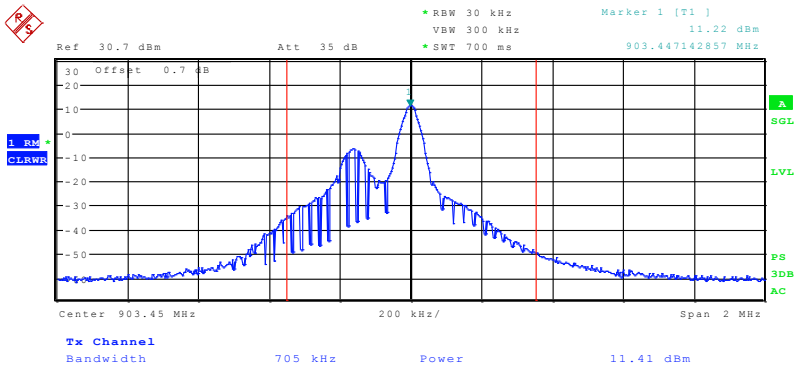
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
RF CABLE	141	HUBER & SUHNER	B095590	26-Jul-2017

Note: The equipment calibration period is 1 year.

4.5 *Test Data*

Frequency	Peak Output Power (dBm)	Peak Output Power (W)
903.45	11.41	0.0138
912.45	11.44	0.0139
921.45	11.36	0.0137

Sample Plot



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5 Power Spectral Density

5.1 *Test Result*

Test Description	Test Specification	Test Result
Power Spectral Density	15.247(e)	Compliant

5.2 *Test Method*

The average PSD procedures from KDB 558074 D01 DTS Meas Guidance v04 Clause 10.3 were applied.

Limit
The limit is 8 dBm.

5.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 22.8 °C
Relative Humidity: 41.7 %

5.4 *Test Equipment*

Test Date: 29-Nov-2016 Tester: MT

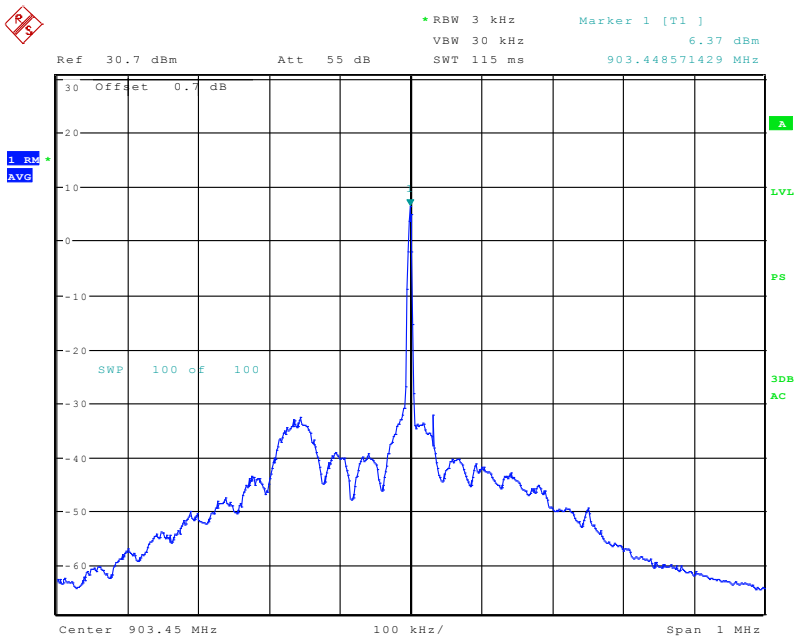
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
RF CABLE	141	HUBER & SUHNER	B095590	26-Jul-2017

Note: The equipment calibration period is 1 year.

5.5 *Test Data*

Channel	Peak PSD (dBm)	Limit (dBm)	Margin (dB)
903.45	6.37	8	1.63
912.45	6.53	8	1.47
921.45	6.47	8	1.53

Sample Plot



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6 Band Edge / Out of Band Emissions

6.1 *Test Result*

Test Description	Test Specification	Test Result
Conducted Spurious Emissions	15.247(d)	Compliant

6.2 *Test Method*

Using radiated methods due to a non-detachable antenna, the procedures from KDB 558074 D01 DTS Meas Guidance v04 Clause 11 were applied.

Because average measurement procedures were applied for output power and PSD, the limit is 30 dB below the measured peak power in an 100kHz band.

6.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C
Relative Humidity: 41.7 %

6.4 *Test Equipment*

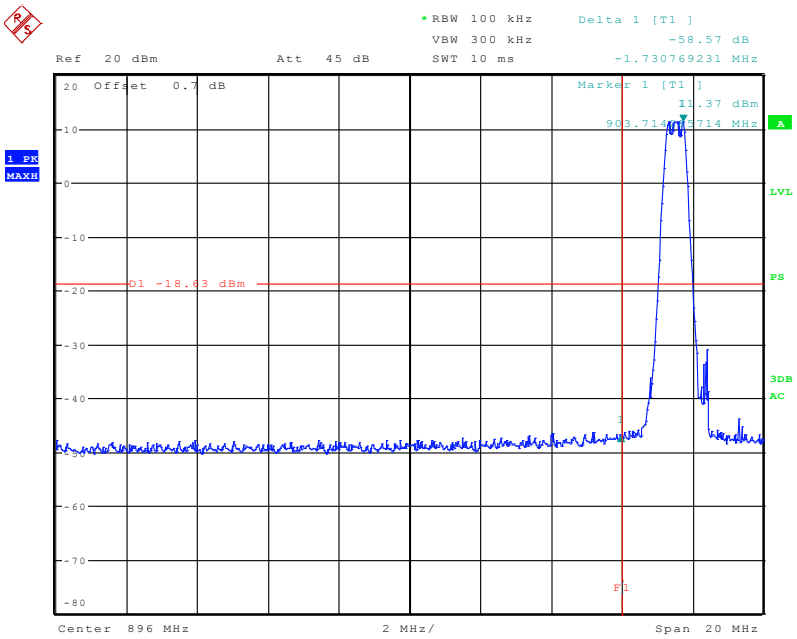
Test Date: 29-Nov-2016 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
RF CABLE	141	HUBER & SUHNER	B095590	26-Jul-2017

Note: The equipment calibration period is 1 year.

6.5 *Test Data (Band-Edge)*

Low Channel – 903.45 MHz



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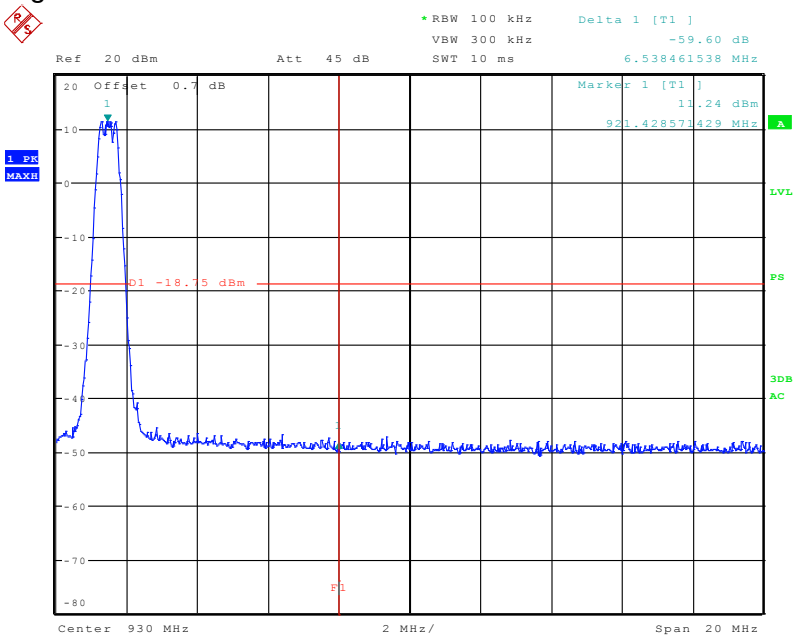
High Channel – 921.45 MHz



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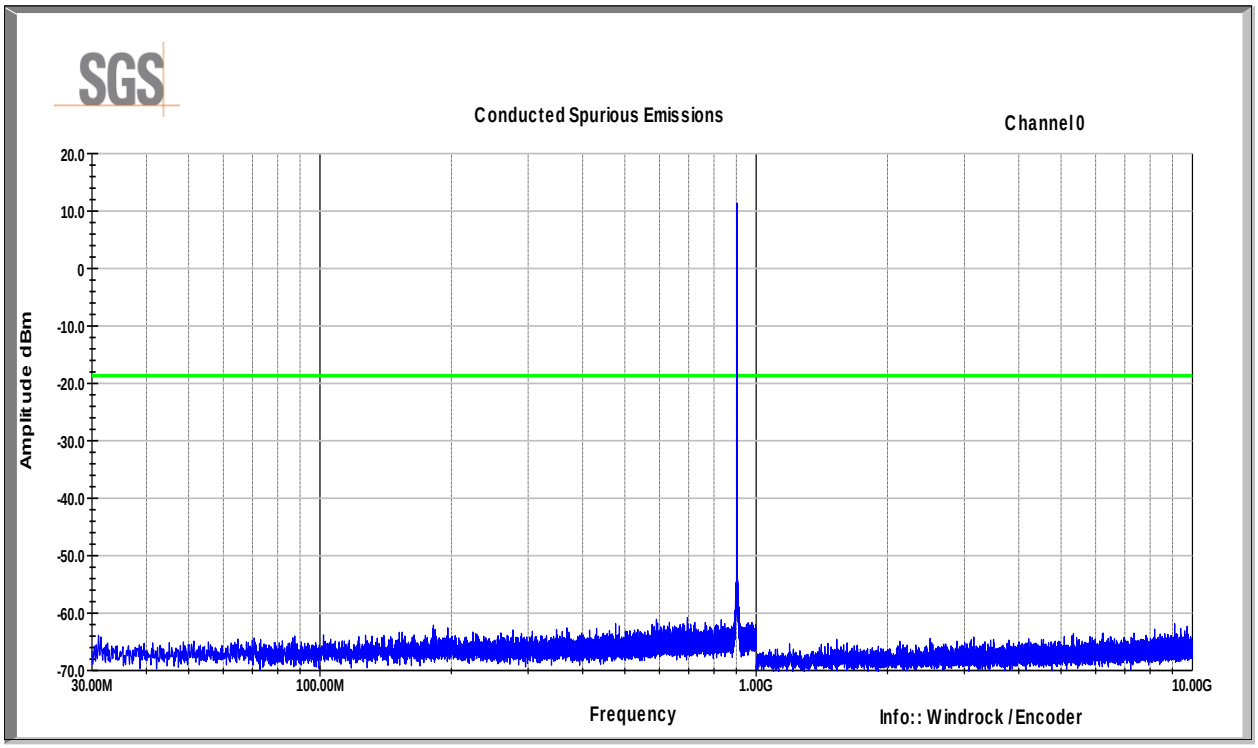
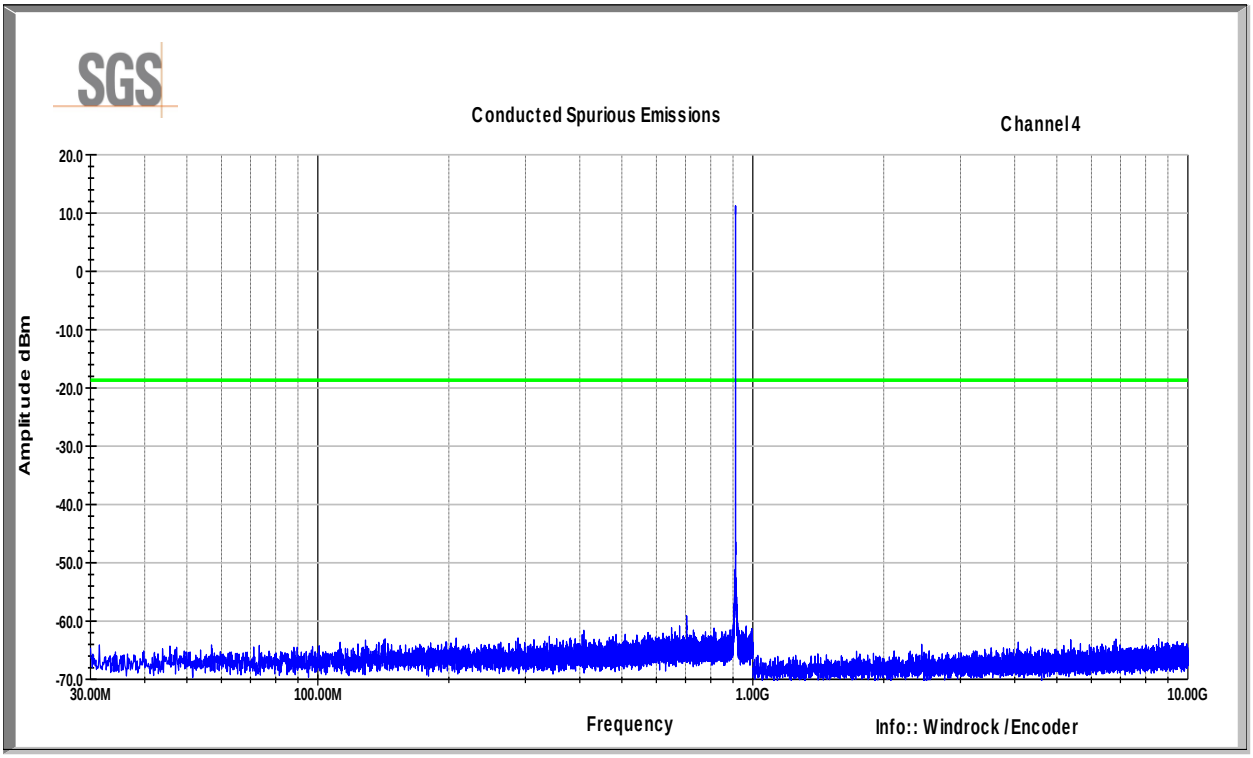
6.6 *Test Data (Spurious Emissions)*

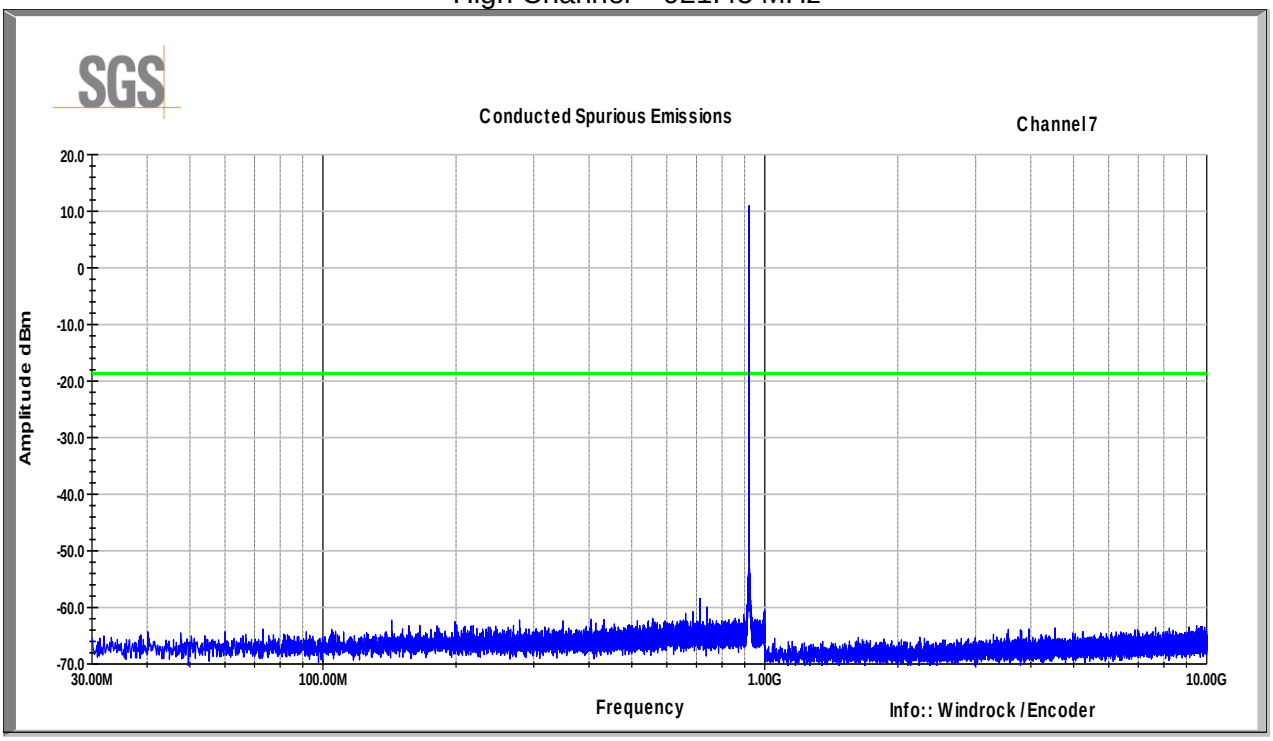
Low Channel – 903.45 MHz



Mid Channel – 912.45 MHz



High Channel – 921.45 MHz



7 Field Strength of Spurious Radiation

7.1 *Test Result*

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247(d), 15.35(b),15.205, 15.209	Compliant

7.2 *Test Method*

Radiated spurious emissions measurements were recorded with the device configured to transmit at the lowest, middle, and highest channels. The frequency range investigated was up through the 10th harmonic of the fundamental transmit frequency. The methods defined in ANSI C63.10: 2013 were used.

For measurements below 1GHz, the device was manipulated through three orthogonal axes. Above 1GHz, the alternative method in Clause 6.6.5 was used.

Test distance:

9k to 30 MHz – Near field prescan to determine if there were any emissions.
30 MHz to 1 GHz - The EUT to measurement antenna distance is 3 meters
1 to 18 GHz - The EUT to measurement antenna distance is 3 meters
18 to 40 GHz - The EUT to measurement antenna distance is 1 meter

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 within the restricted bands of operation defined in FCC §15.205.
(2) Quasi-peak limit
(3) Average limit

7.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.9 °C
Relative Humidity: 50.9 %

7.4 *Test Equipment*

Test End Date: 21-Oct-2016 Tester: JOP

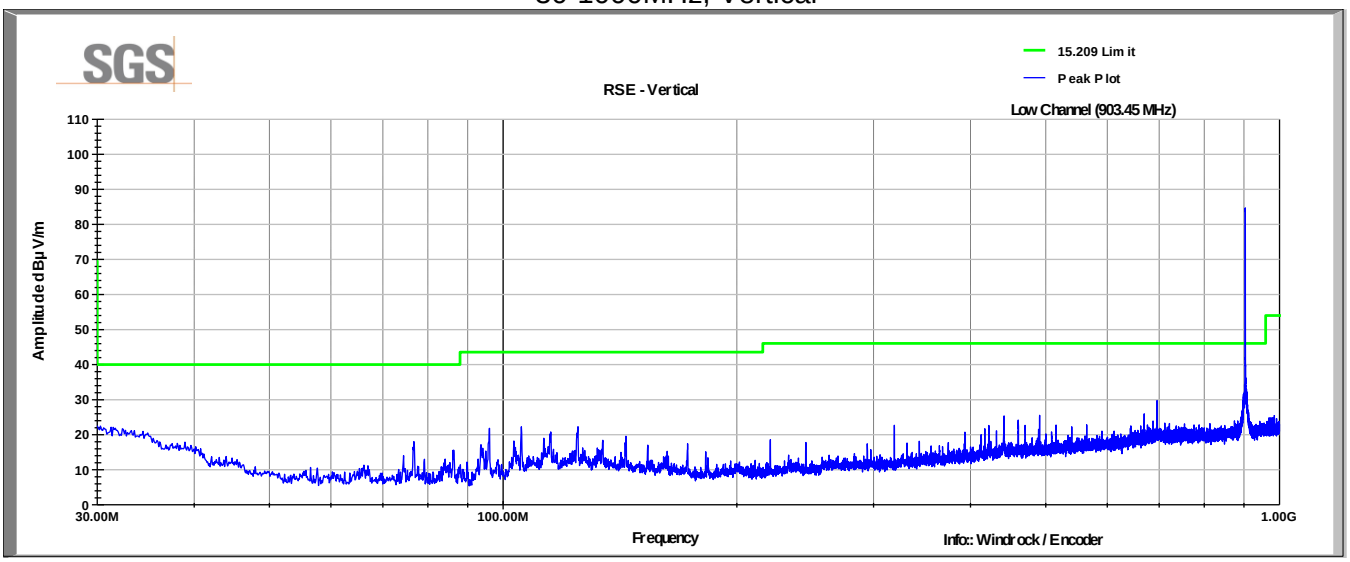
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
ANTENNA, BILOG	JB6	SUNOL	B079690	21-Oct-2016
RF CABLE	SF106	HUBER & SUHNER	B079712	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079716	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079824	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B085892	27-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	16-Feb-2017
DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017

Note: The equipment calibration period is 1 year.

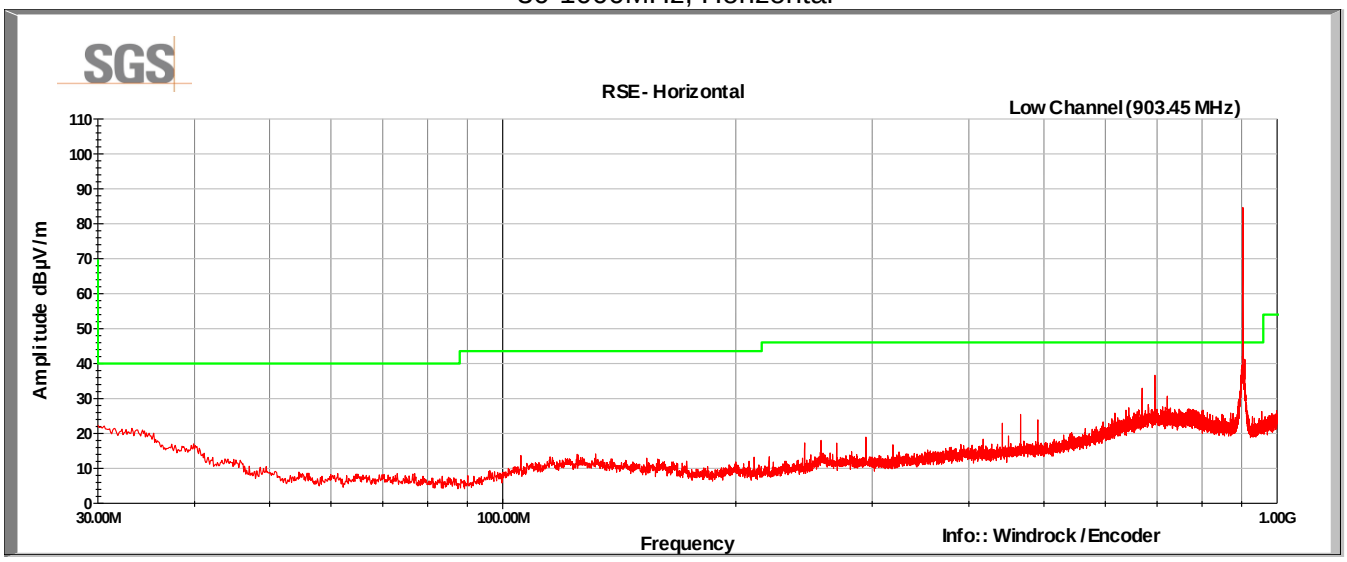
7.5 *Test Data – Peak Data*

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

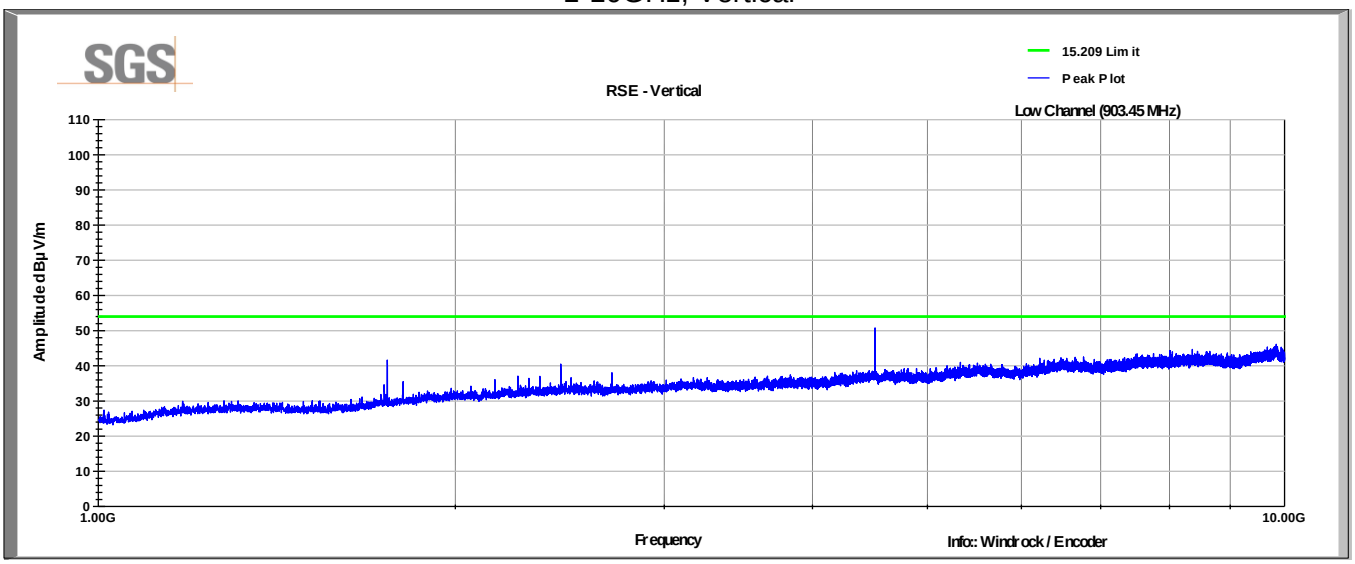
Low Channel, 903.45 MHz
30-1000MHz, Vertical



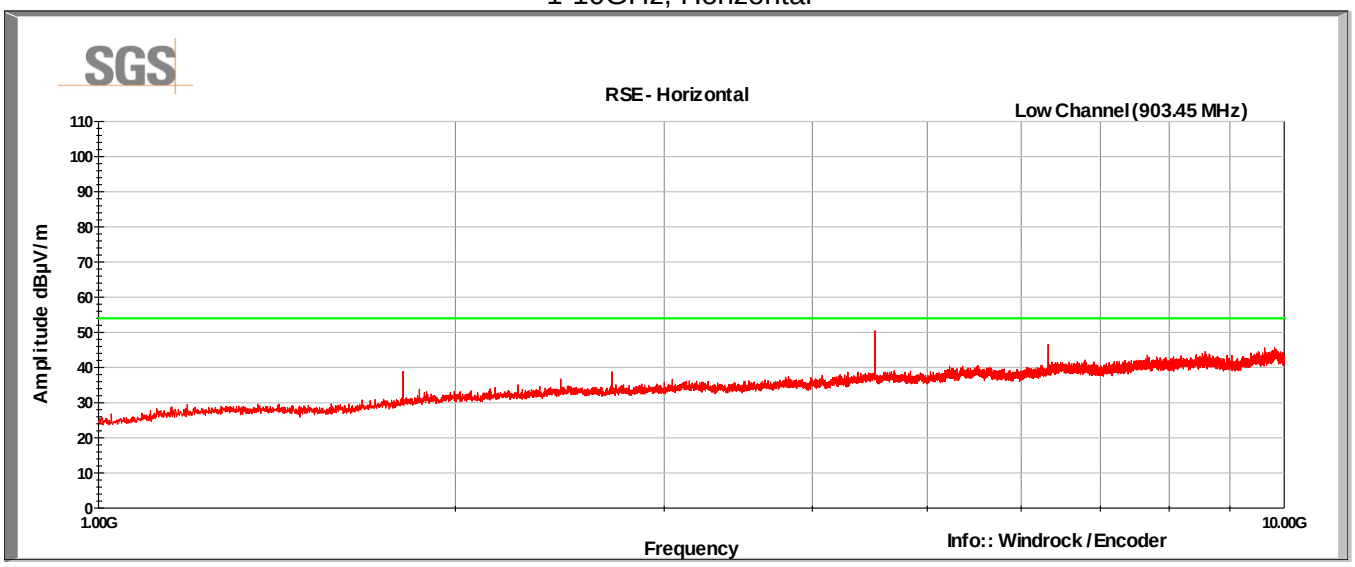
Low Channel, 903.45 MHz
30-1000MHz, Horizontal



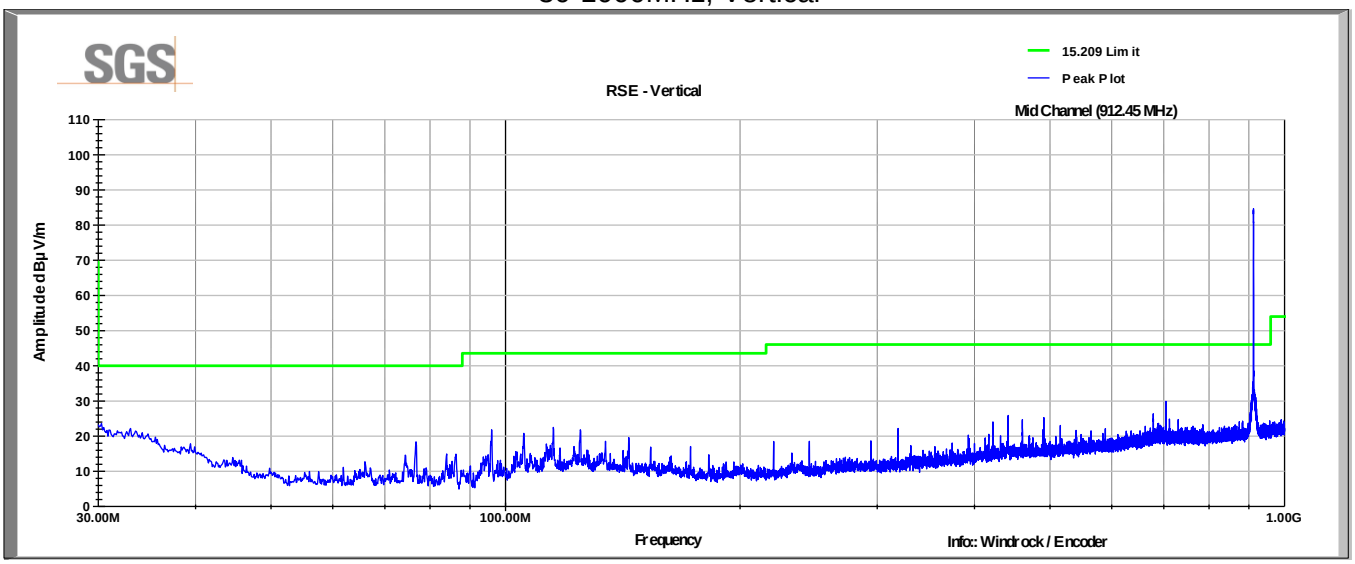
Low Channel, 903.45 MHz
1-10GHz, Vertical



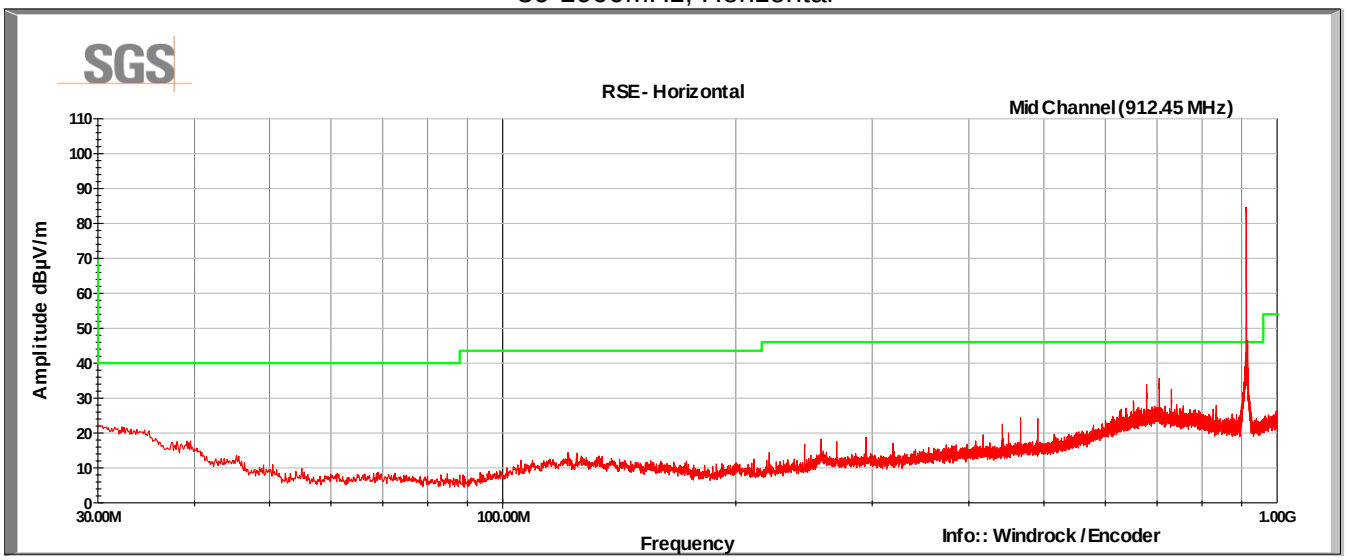
Low Channel, 903.45 MHz
1-10GHz, Horizontal



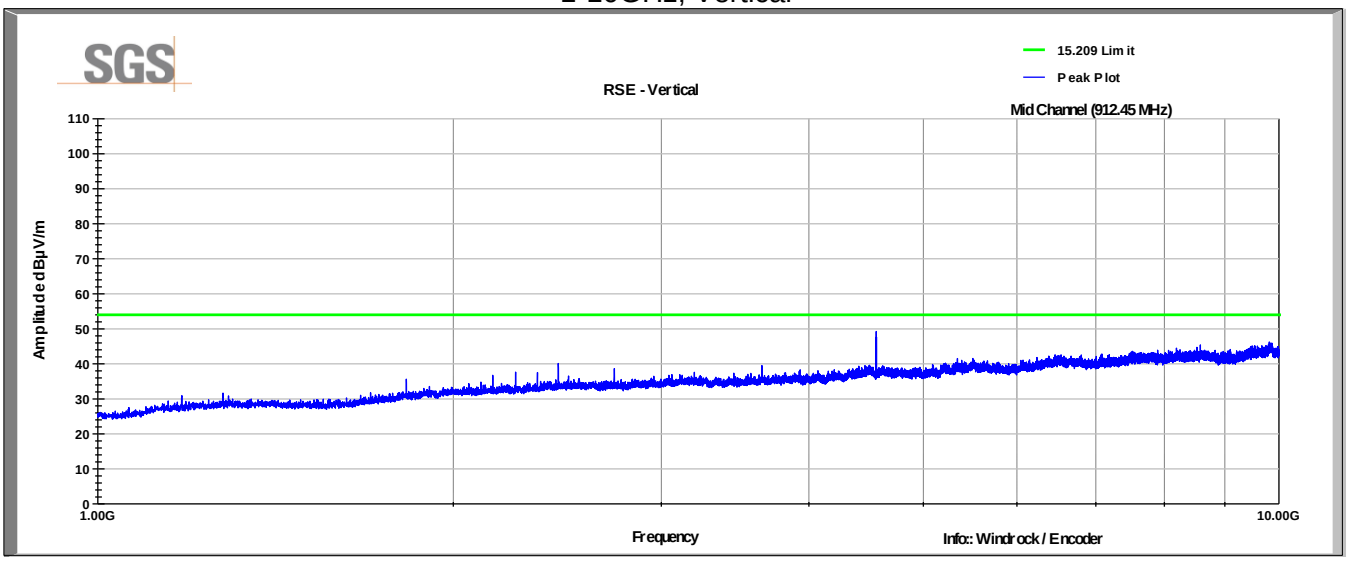
Mid Channel, 912.45 MHz
30-1000MHz, Vertical



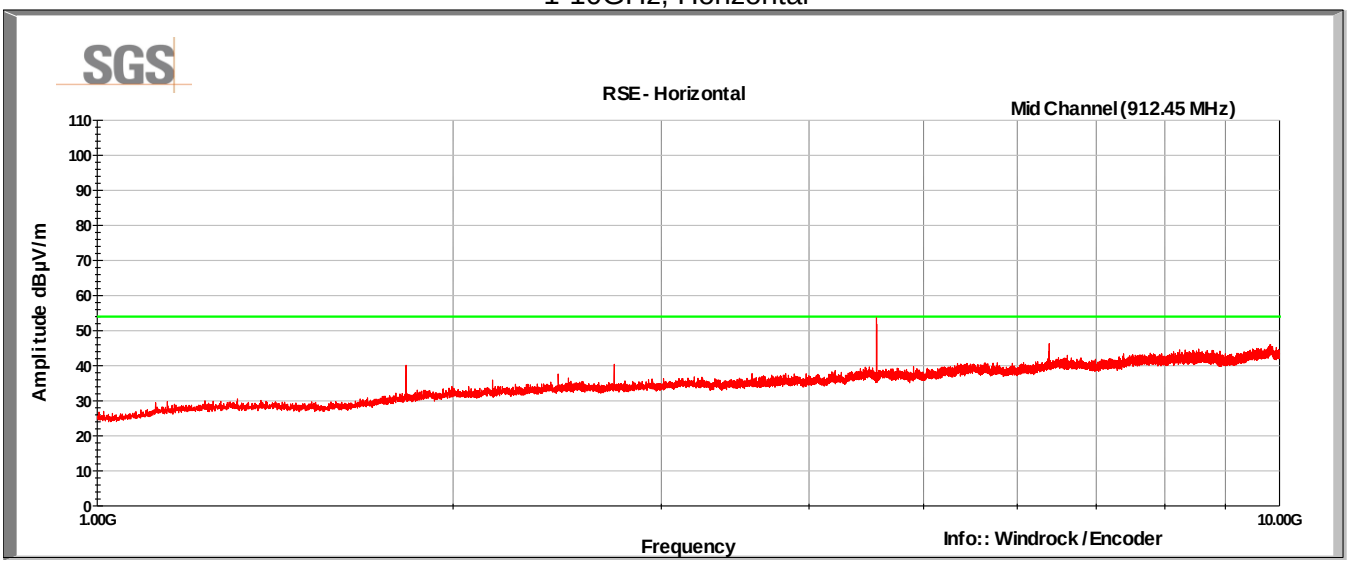
Mid Channel, 912.45 MHz
30-1000MHz, Horizontal



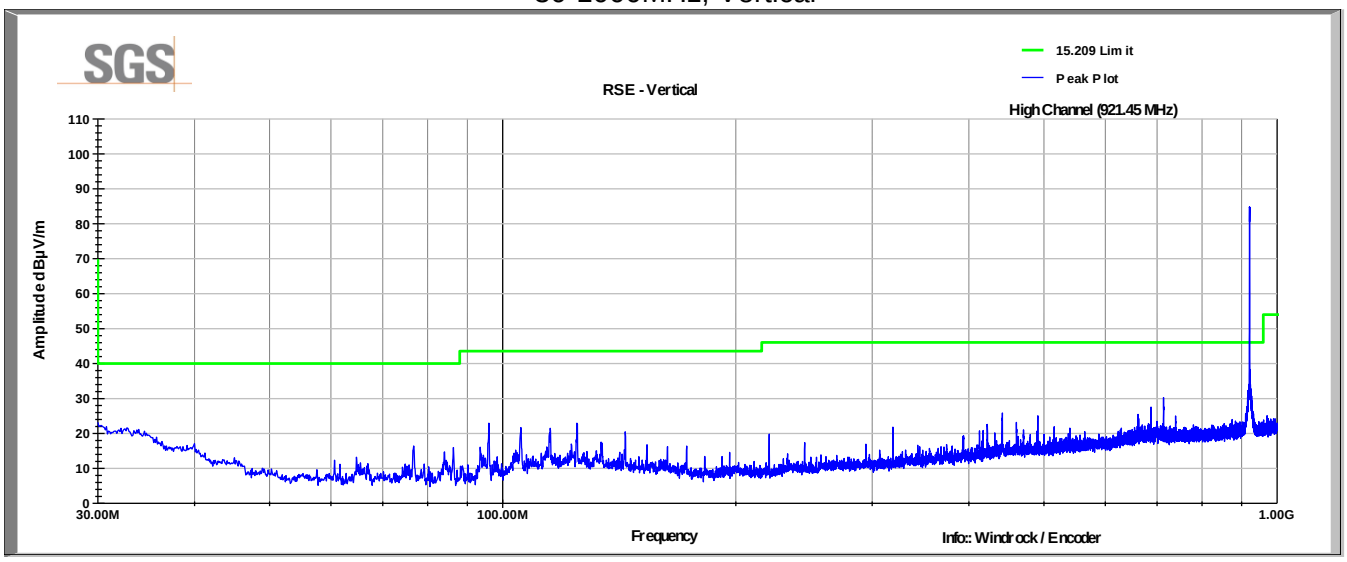
Mid Channel, 912.45 MHz
1-10GHz, Vertical



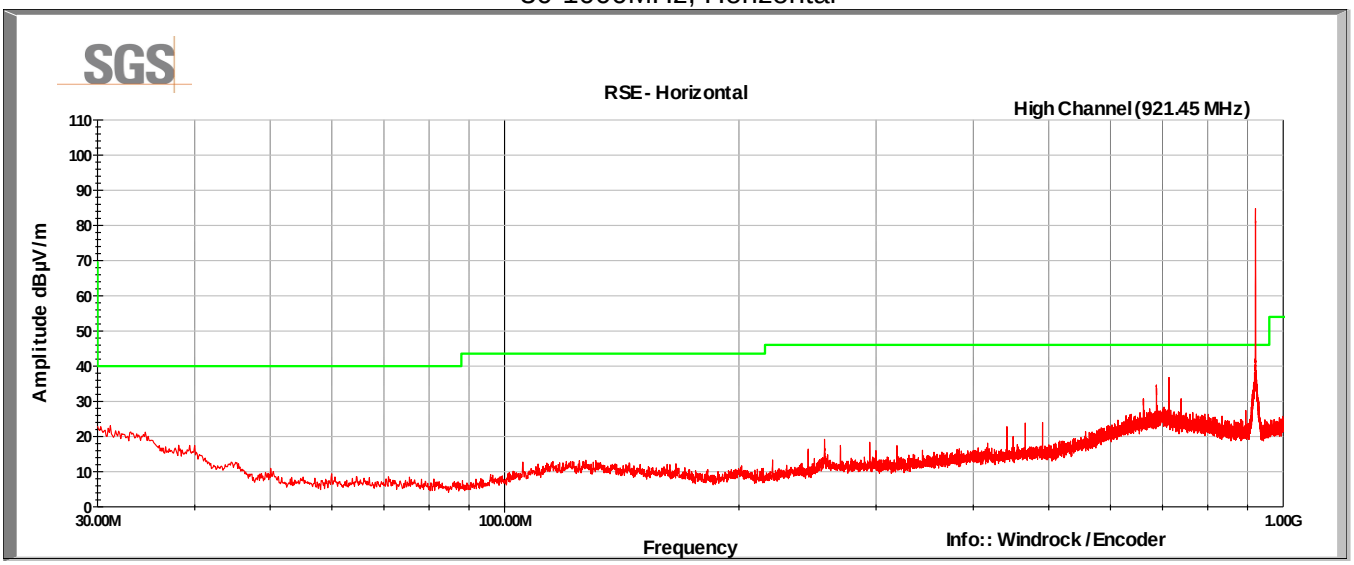
Mid Channel, 912.45 MHz
1-10GHz, Horizontal



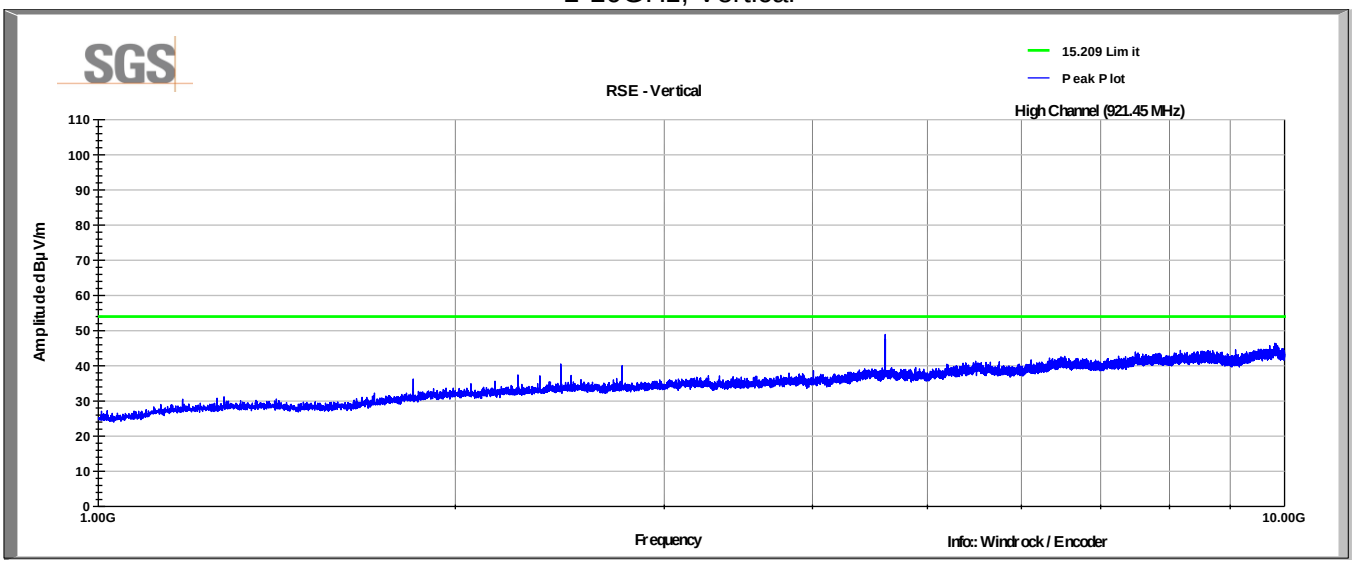
High Channel, 921.45 MHz
30-1000MHz, Vertical



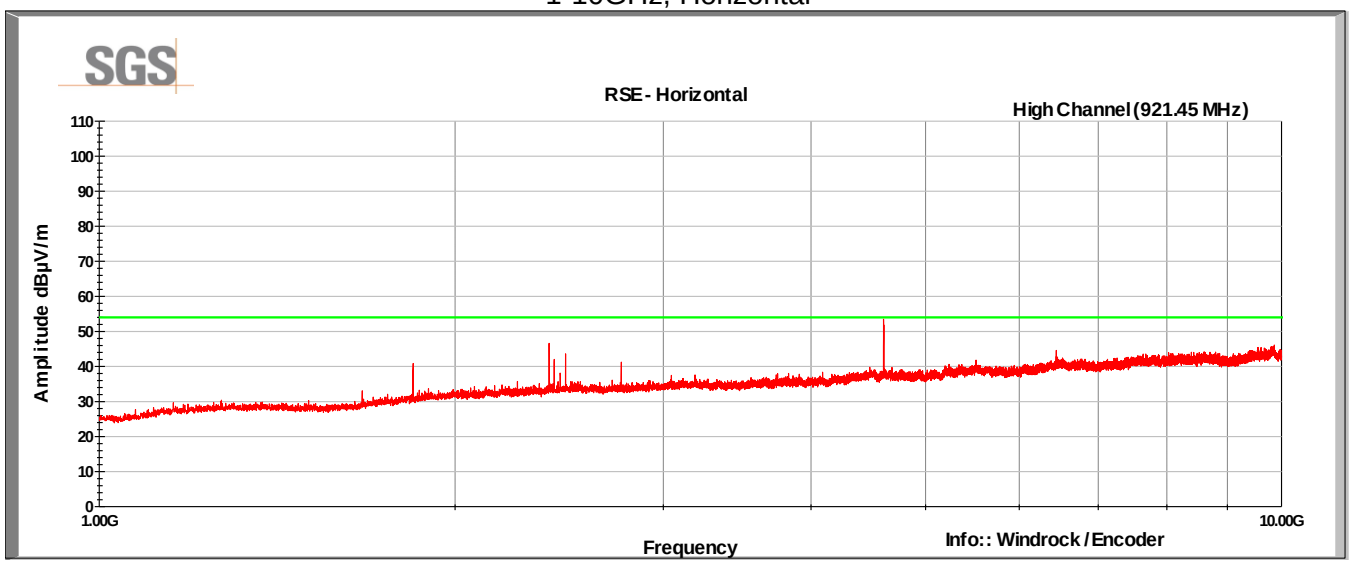
High Channel, 921.45 MHz
30-1000MHz, Horizontal



High Channel, 921.45 MHz
1-10GHz, Vertical



High Channel, 921.45 MHz
1-10GHz, Horizontal



7.6 *Test Data – Tabular Data*

Frequency MHz	Raw Meas (dBuV)	Polarity (V/H)	Correction (dB/m)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)	Detector
Low Channel							
4517.25	43.0	V	7.1	50.1	74.0	-23.9	Peak
4517.25	42.0	V	7.1	49.1	54.0	-4.9	Average
4517.25	43.3	H	7.1	50.4	74.0	-23.6	Peak
4517.25	42.3	H	7.1	49.4	54.0	-4.6	Average
Mid Channel							
4562.25	41.9	V	7.3	49.2	74.0	-24.8	Peak
4562.25	40.9	V	7.3	48.2	54.0	-5.8	Average
4562.25	46.3	H	7.3	53.6	74.0	-20.4	Peak
4562.25	45.3	H	7.3	52.6	54.0	-1.4	Average
High Channel							
4607.25	41.5	V	7.4	48.9	74.0	NA	Peak
4607.25	40.5	V	7.4	47.9	54.0	NA	Average
4607.25	46.0	H	7.4	53.4	74.0	NA	Peak
4607.25	45.0	H	7.4	52.4	54.0	NA	Average

8 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	31 May 2017