

EMC Test Report

Project Number: 4094529

Report Number: 4094529EMC01

Revision Level: 0

Client: Scott Safety

Equipment Under Test: RFID Card Reader/Writer

Model: 8005112

FCC ID: T5E8005102

IC ID: 6453A-8005102

Applicable Standards: FCC Part 15 Subpart C, § 15.209

RSS-210, Issue 9, August 2016

ANSI C63.10: 2013

RSS-GEN, Issue 4, November 2014

Report issued on: 18 January 2017

Test Result: Compliant

Tested by:


Fabian Nica, Senior Engineering Technician

Reviewed by:


Jeremy Pickens, Senior EMC 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 report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

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1 Summary of Test Results

Basic Standards	Test Result
Emissions Testing	
FCC Part 15, Subpart C, 15.209 / RSS-210, Annex B.6 / RSS-Gen S7.2.5 - Radiated Emissions	Compliant
FCC Part 15, Subpart C, 15.207 / RSS-Gen S7.2.4 - Conducted Emissions	Compliant

1.1 Modifications Required to Compliance

None

2 General Information

2.1 Client Information

Name: Scott Safety
Address: 4320 Goldmine Road
City, State, Zip, Country: Monroe, NC 28110, USA

2.2 Test Laboratory

Name: SGS Consumer and Retail
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

2.3 General Information of EUT

Type of Product: RFID Card Reader/Writer
Model: 8005112
Serial Number: 115A1646017546

Frequency Range: 13.56 MHz
Antenna: PCB Trace

Rated Voltage: 5 Vdc USB

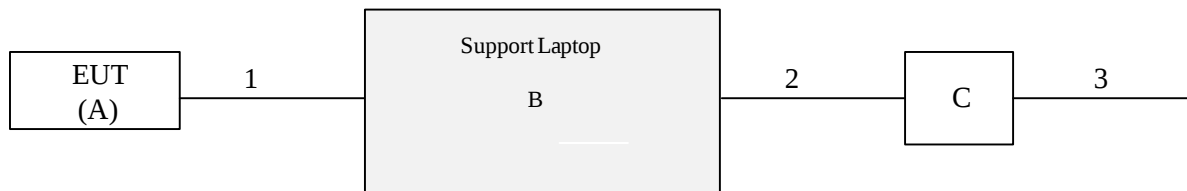
Sample Received Date: 5 January 2017
Date of testing: 17 January 2017

2.4 Operating Modes and Conditions

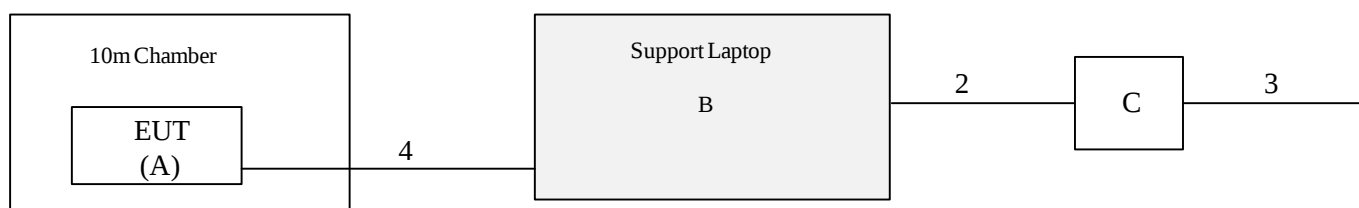
EUT power was provided over USB provided by connection to a laptop. Once connected, the EUT continuously transmitted at 13.56MHz. A tag was placed on top of the RFID reader to generate modulation.

2.1 EUT Connection Block Diagram

Conducted Emissions Test Setup



Radiated Emissions Test Setup



2.2 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Scott Safety	RFID Card Reader/Writer	8005112	115A1646017546
Support Equipment				
B	Lenovo	Laptop	T440p	PC-OAAVYZ 16/01
C	Lenovo	Switching Power Supply	ADLX90NDC2A	11S36200285ZZ500663082

2.3 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	USB	EUT	Laptop	1.80	No	No
2	DC Input	Laptop	Power Supply	1.53	Yes	Yes
3	AC Input	Power Supply	AC Mains	1.00	No	No
4	USB	EUT	Laptop	10.00	No	No

3 Occupied Bandwidth

3.1 Test Result

Test Description	Basic Standards	Test Result
99% Bandwidth	RSS-GEN 4.6.1	Reported

3.2 Test Method

The 99% occupied bandwidth measurement function of the spectrum analyzer was employed.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 25.9 °C

Relative Humidity: 42.2 %

3.4 Test Equipment

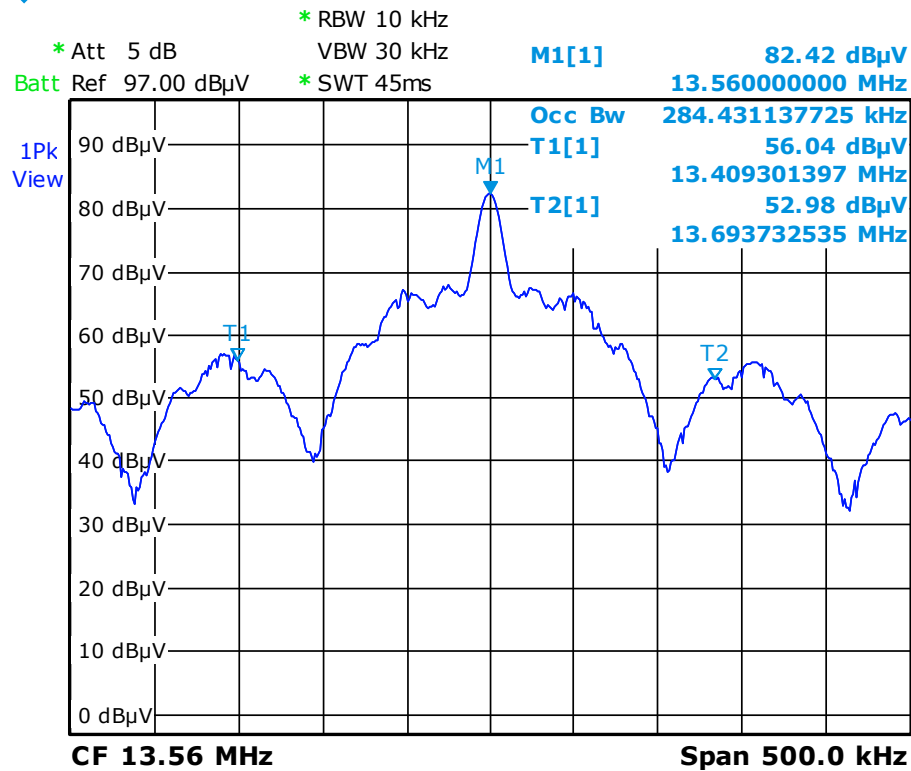
Test Date: 18-Jan-2017

Tester: FRN

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
NETWORK ANALYZER	ZVL	ROHDE & SCHWARZ	B079799	12-Feb-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

Note: The calibration period equipment is 1 year.

3.5 Test Data



Date: 18.JAN.2017 16:37:28

Occupied Bandwidth = 284.4kHz

4 Radiated Emissions

4.1 Test Result

Test Description	Basic Standards	Test Result
Radiated Emissions	FCC Part 15, Subpart C, 15.209 RSS-Gen S7.2.5 ANSI C63.10: 2013	Compliant

4.2 Test Method

Exploratory scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector below 1GHz and a Peak and Average detector above 1GHz. The receivers resolution bandwidth was set to 1kHz for measurements taken below 150kHz, 9kHz for in the 150kHz to 30MHz range, 120 kHz in the 30MHz to 1GHz frequency range, and 1MHz for measurements of 1GHz and higher. For testing below 30MHz, a loop antenna was employed, and peak scans were taken with the loop open towards the EUT (Co-Axial) and with the loop in-line with the EUT (Co-Planar). Above 30MHz, a biconilog antenna was used and measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

Radiated emissions limits (testing above 1GHz was not required for this device)

Frequency Range (MHz)	Limits (uV/m) Quasi-Peak or Average	Measurement Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note: Limits were converted to dBuV/m using the equation $20 \cdot \text{LOG}(x)$. Additionally, for measurements below 30MHz, the limits were adjusted to a distance of 3m using a 40dB/decade correction per §15.31(f)(2)

Example: at 20MHz, the limit is expressed as 30uV/m at 30m

$$20 \cdot \log(30) = 29.5 \text{ dBuV/m}$$

30 to 3 meters is a single decade, so $29.5 + 40 = 69.5 \text{ dBuV/m}$

4.3 Test Site

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

Environmental Conditions

Temperature: 24.8 °C
Relative Humidity: 42 %
Atmospheric Pressure: 98.1 kPa

4.4 Test Equipment

Test Date: 17-Jan-2017

Tester: FRN

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
9kHz-30MHz				
LOOP, ACTIVE	6502	EMCO	B085752	9-Aug-2017
RF CABLE	SF106	HUBER & SUHNER	B079716	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079661	29-Jul-2017
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
30-1GHz				
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
ANTENNA, BILOG	JB6	SUNOL	B079690	10-Nov-2017
RF CABLE	SF106	HUBER & SUHNER	B079716	27-Jul-2017
RF CABLE	104PE	HUBER & SUHNER	B079793	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079661	29-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	16-Feb-2017

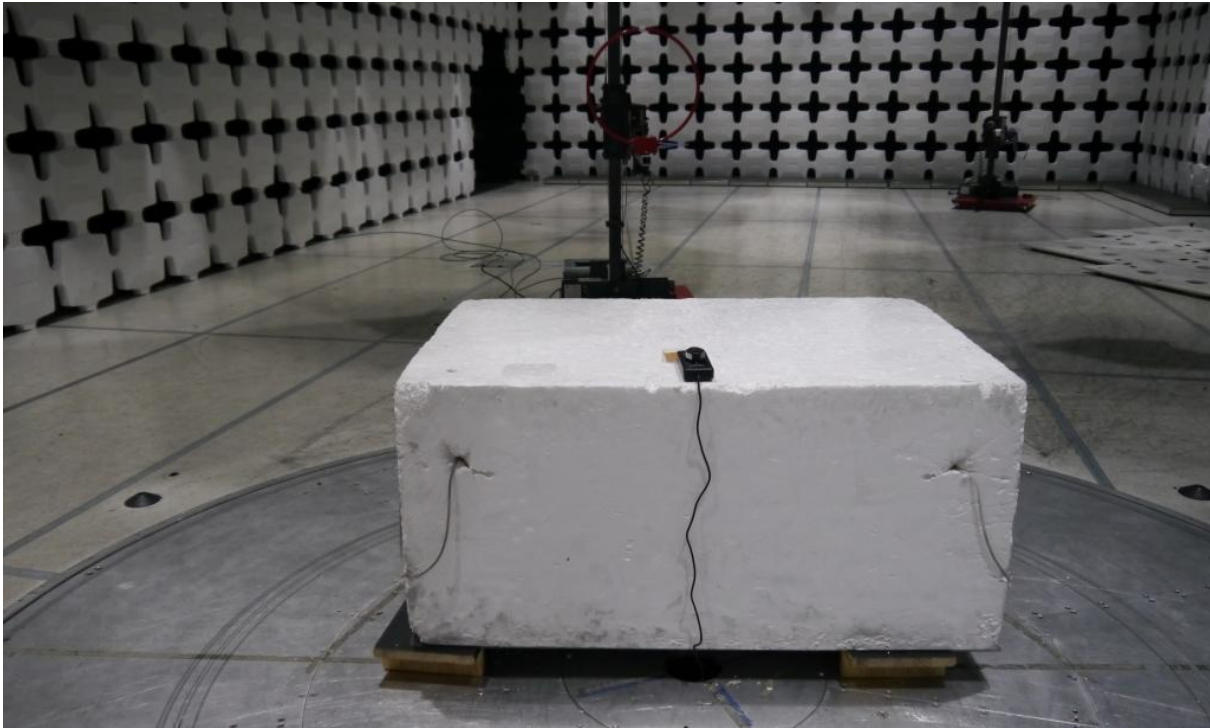
Note: The calibration period equipment is 1 year.

Software:

“Radiated Emissions” TILE! profile dated (12- 2015)

4.5 Test Setup Photographs

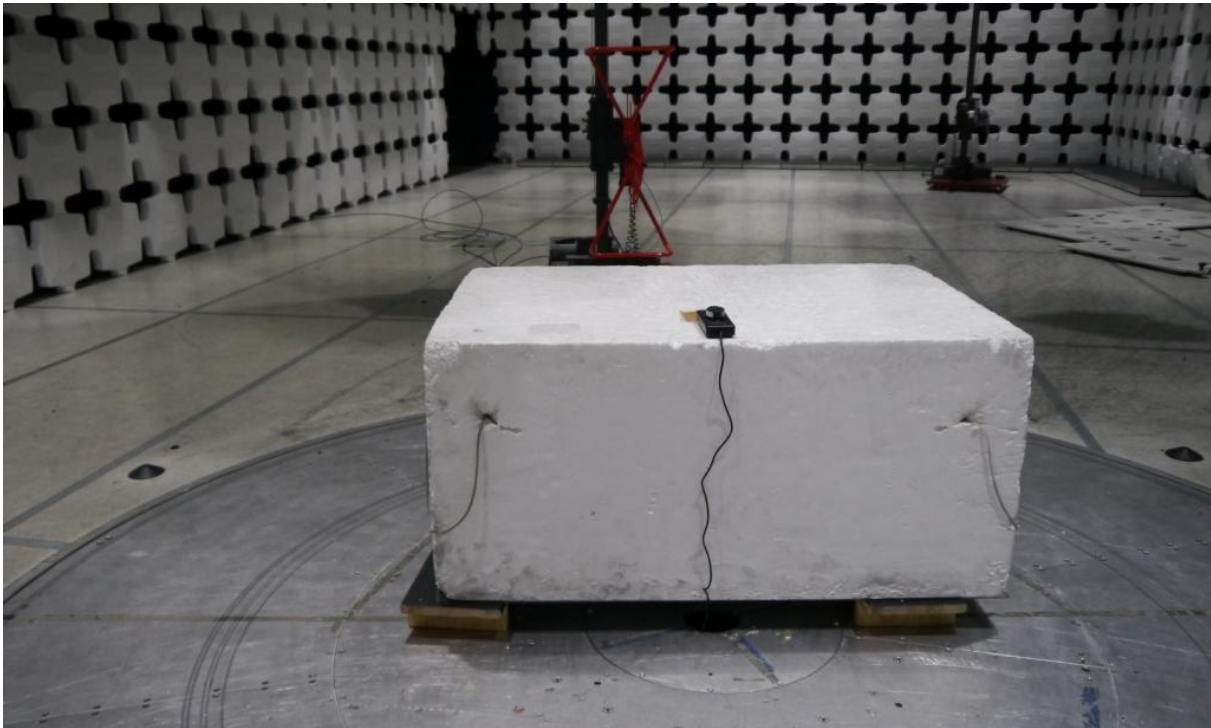
9kHz-30MHz



9kHz-30MHz



30-1GHz

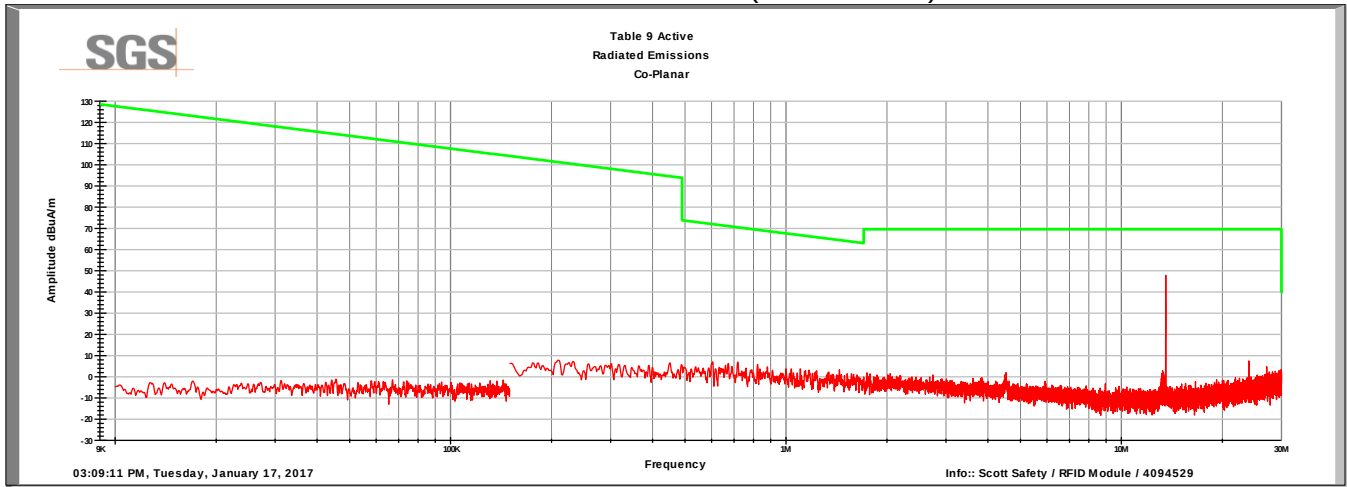


30-1GHz



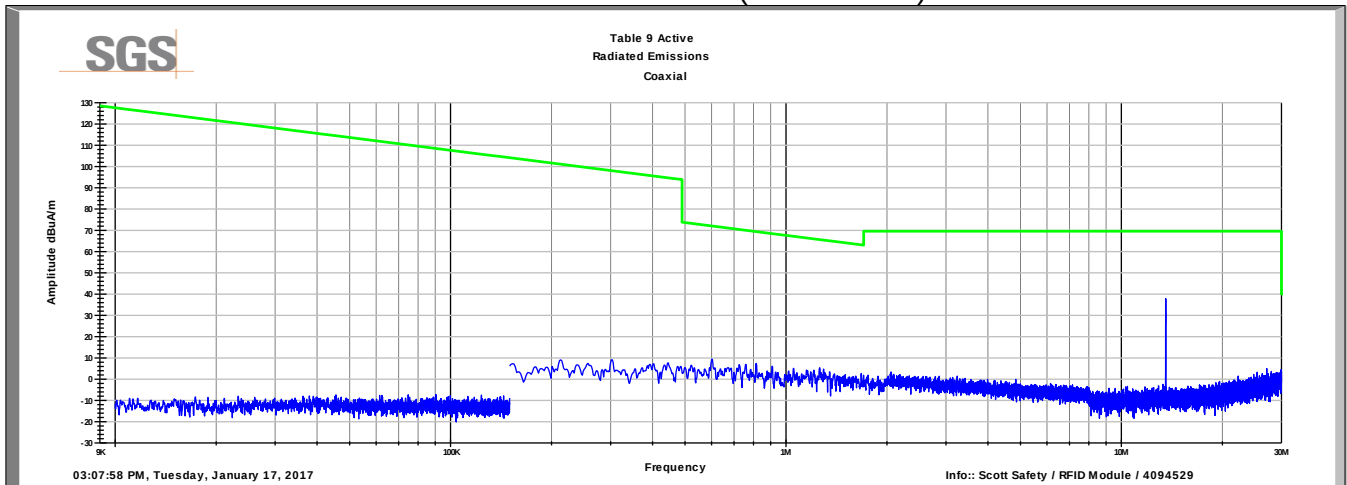
4.6 Test Data

Co-Planar Radiated Emissions Data (9kHz-30MHz) – 3 meters



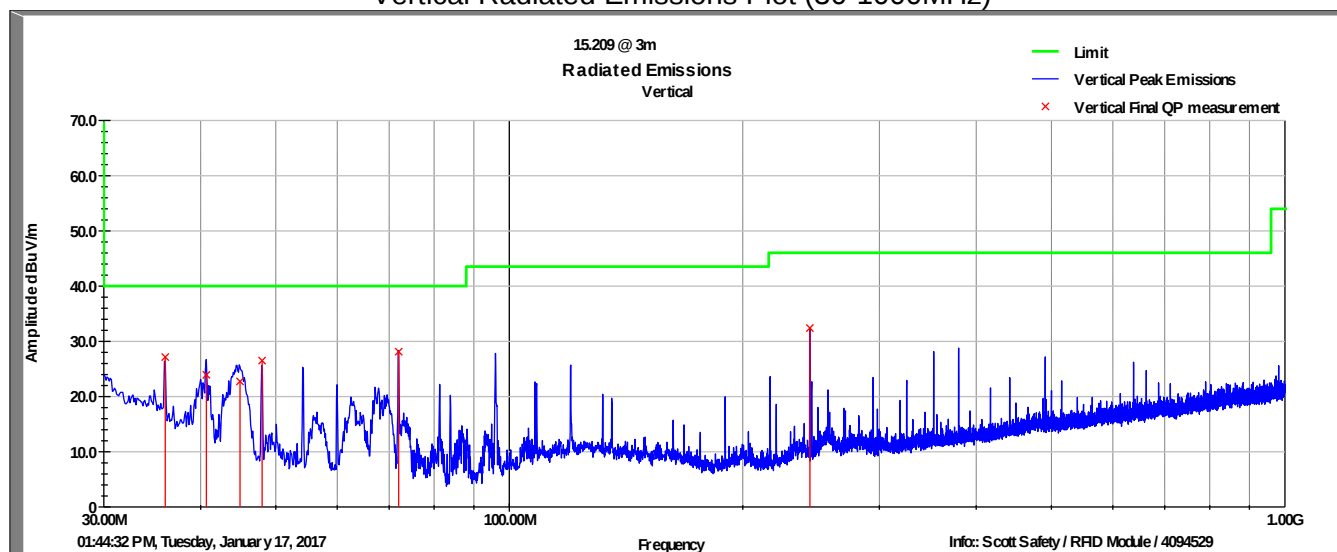
47.9dB μ V/m Peak @ 3m (21.6dB Margin)

Co-Axial Radiated Emissions Data (9kHz-30MHz) – 3 meters



37.8dB μ V/m Peak @ 3m (31.7dB Margin)

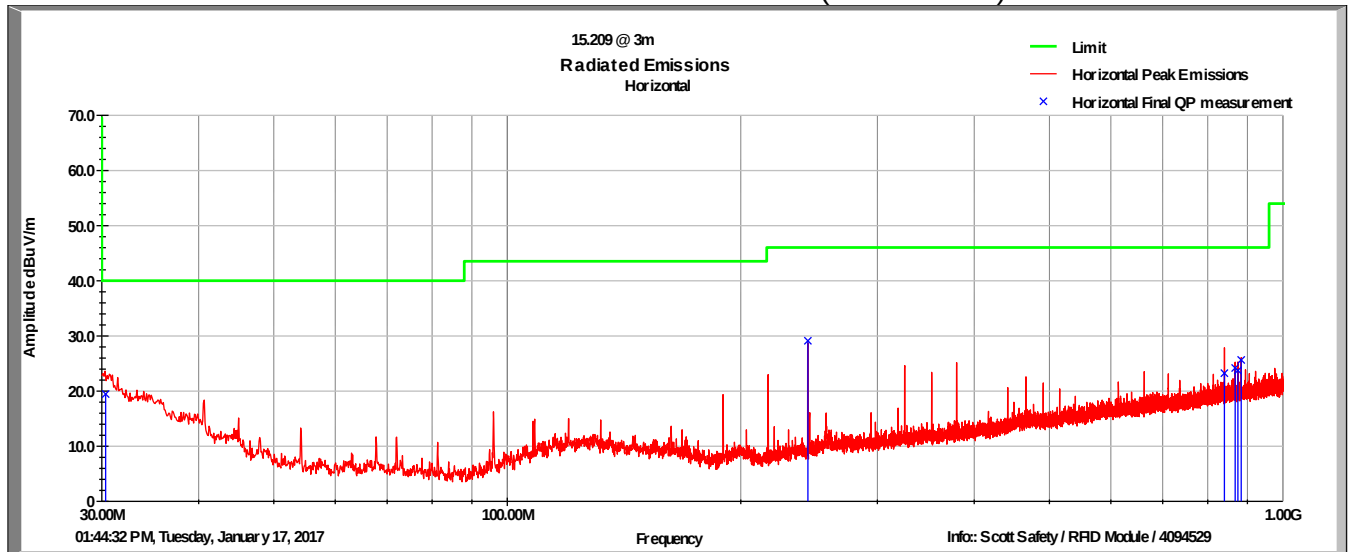
Vertical Radiated Emissions Plot (30-1000MHz)



Vertical Radiated Emissions Data (30-1000MHz)

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)
36.01	41.3	V	53.0	100.0	17.6	0.4	32.2	27.1	40.0	-12.9
40.68	41.8	V	46.0	100.0	14.1	0.4	32.4	23.9	40.0	-16.1
44.95	43.6	V	211.0	100.0	11.2	0.4	32.5	22.7	40.0	-17.3
48.01	49.2	V	266.0	100.0	9.5	0.5	32.6	26.5	40.0	-13.5
72.01	52.5	V	319.0	110.0	8.2	0.5	33.1	28.1	40.0	-11.9
244.08	52.6	V	226.0	222.0	12.2	1.0	33.5	32.4	46.0	-13.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot (30-1000MHz)



Horizontal Radiated Emissions Data (30-1000MHz)

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)
30.35	29.1	H	257.0	177.0	22.0	0.3	32.0	19.5	40.0	-20.5
244.08	49.3	H	270.0	100.0	12.2	1.0	33.5	29.1	46.0	-16.9
840.72	31.9	H	90.0	322.0	22.4	2.0	33.1	23.2	46.0	-22.8
867.84	32.5	H	33.0	168.0	22.7	2.1	33.1	24.2	46.0	-21.8
875.09	32.1	H	277.0	269.0	22.6	2.1	33.1	23.7	46.0	-22.3
883.63	34.0	H	252.0	269.0	22.6	2.1	33.1	25.6	46.0	-20.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

5 Conducted Emissions

5.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions, Class B	FCC Part 15, Subpart C, 15.207 RSS-Gen S7.2.4 ANSI C63.4:2014	Compliant

5.2 Test Method

With the receivers resolution bandwidth was set to 9 kHz the initial preliminary exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV)
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.4°C

Relative Humidity: 45.3%

Atmospheric Pressure: 98.5 kPa

5.4 Test Equipment

Test Date: 17-Jan-2017

Tester: FRN

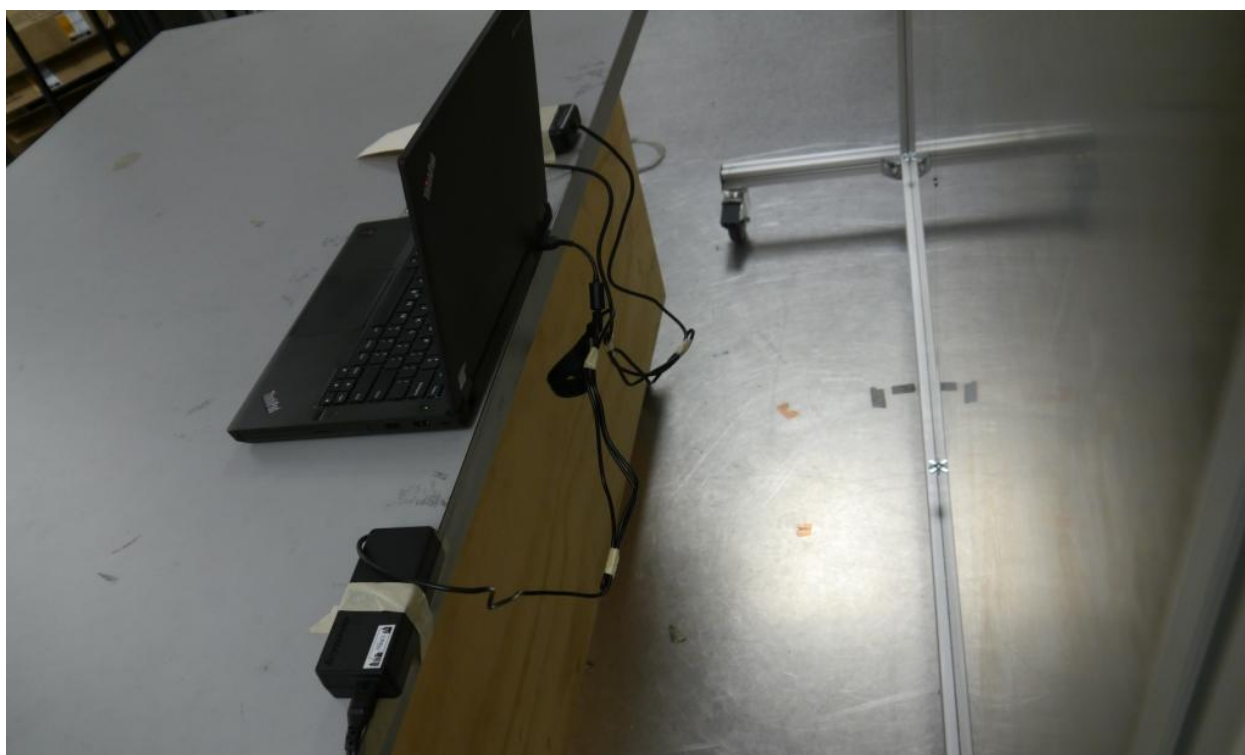
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	21-Jul-2017
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B085882	1-Nov-2017
RF CABLE	SF106	HUBER & SUHNER	B085892	27-Jul-2017

Note: The calibration period equipment is 1 year.

Software:

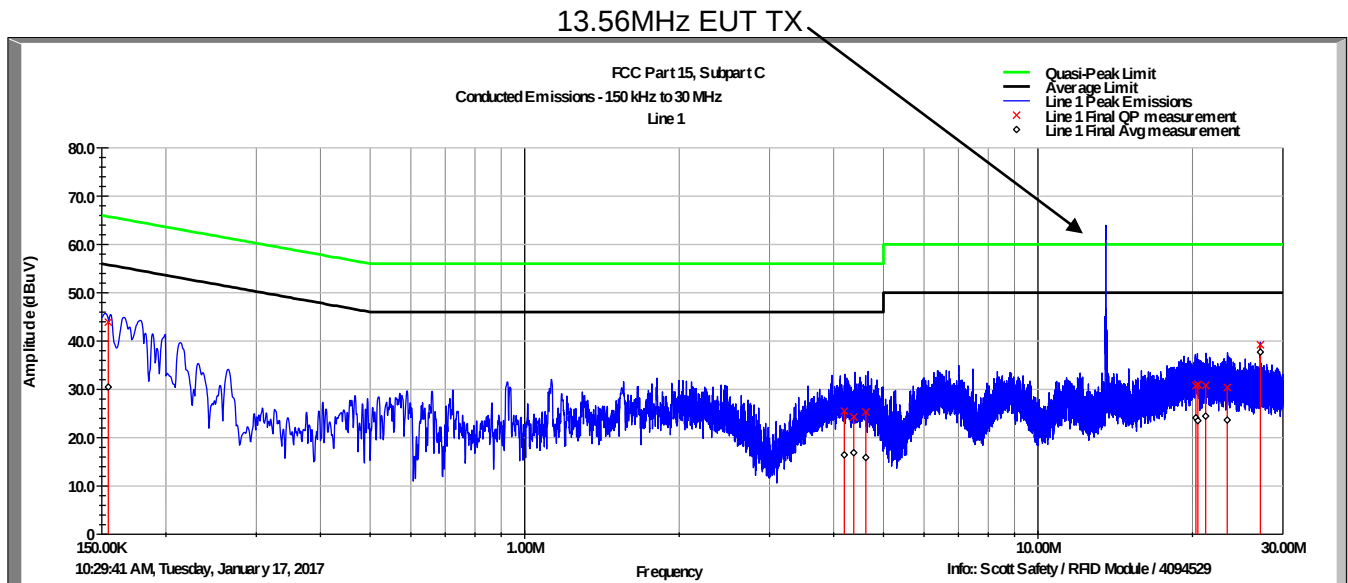
“Conducted Emissions” TILE! profile dated (12- 2015)

5.5 Test Setup Photographs



5.6 Test Data

Conducted Emissions Plot 150-30MHz Line 1

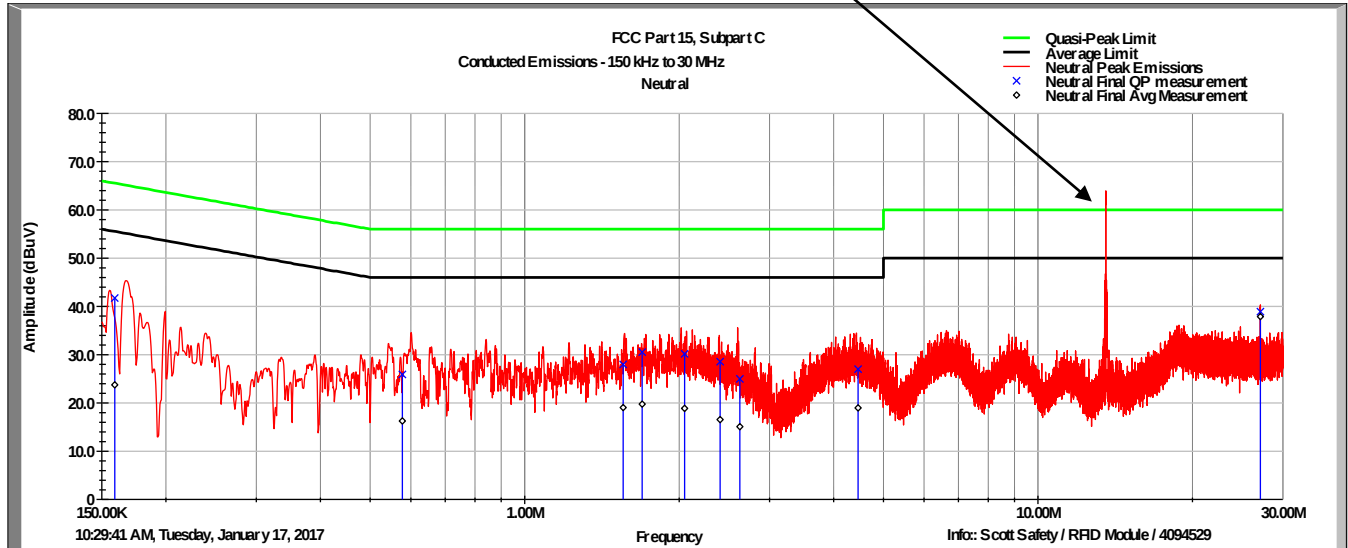


Conducted Emissions Data 150-30MHz Line 1

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.155	43.9	65.7	-21.8	30.5	55.7	-25.3
4.196	25.5	56.0	-30.5	16.4	46.0	-29.6
4.376	24.3	56.0	-31.7	16.9	46.0	-29.1
4.620	25.3	56.0	-30.7	15.9	46.0	-30.1
20.312	30.8	60.0	-29.2	24.1	50.0	-25.9
20.485	31.0	60.0	-29.0	23.5	50.0	-26.5
21.226	30.8	60.0	-29.2	24.5	50.0	-25.5
23.381	30.4	60.0	-29.6	23.6	50.0	-26.4
27.119	39.2	60.0	-20.8	37.7	50.0	-12.3

Conducted Emissions Plot 150-30MHz Neutral

13.56MHz EUT TX



Conducted Emissions Data 150-30MHz Neutral

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.159	41.7	65.5	-23.8	23.7	55.5	-31.8
0.578	25.9	56.0	-30.1	16.3	46.0	-29.7
1.556	28.0	56.0	-28.0	19.0	46.0	-27.0
1.694	30.5	56.0	-25.5	19.7	46.0	-26.3
2.050	30.2	56.0	-25.8	18.9	46.0	-27.1
2.403	28.5	56.0	-27.5	16.5	46.0	-29.5
2.626	25.0	56.0	-31.0	15.1	46.0	-30.9
4.461	27.0	56.0	-29.0	19.0	46.0	-27.0
27.120	38.9	60.0	-21.1	37.9	50.0	-12.1

6 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	18 January 2017