

EMC Test Report

Report Number: 4120511EMC01**Revision Level:** 1**Project Number:** 4120511**Client:** Emergency Traffic Systems, Inc.**Equipment Under Test:** Emergency Vehicle Pre-Emption Transmitter**Model Number:** TR-1**FCC ID:** 2AK93TR1**FCC Rule Parts:** FCC Part 90 Subpart I**Report issued on:** 02 August 2017**Test Result:** Compliant

Tested by:



Jeremy Pickens, Senior EMC Engineer

Reviewed by:



Shawn McGuinness, EMC Engineering Leader**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 General Information

1.1 Client Information

Name: Emergency Traffic Systems, Inc.
Address: 540 West 18th St
City, State, Zip, Country: Erie, PA, 16502, USA

1.2 Test Laboratory

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

Environmental Conditions over duration of testing

	Min	Max
Temperature:	23.6 °C	26.6 °C
Relative Humidity:	38.8 %	53.9%

1.3 General Information of EUT

Type of Product: Emergency Vehicle Pre-Emption Transmitter
Model Number: TR-1
Serial Number: 3906-160004

§90.207 Type of emission A3N

Rated Voltage: 12.6Vdc
Tested Voltage: 12.6Vdc
Sample Received Date: 10 March 2017
Dates of testing: 05 to 07 April 2017

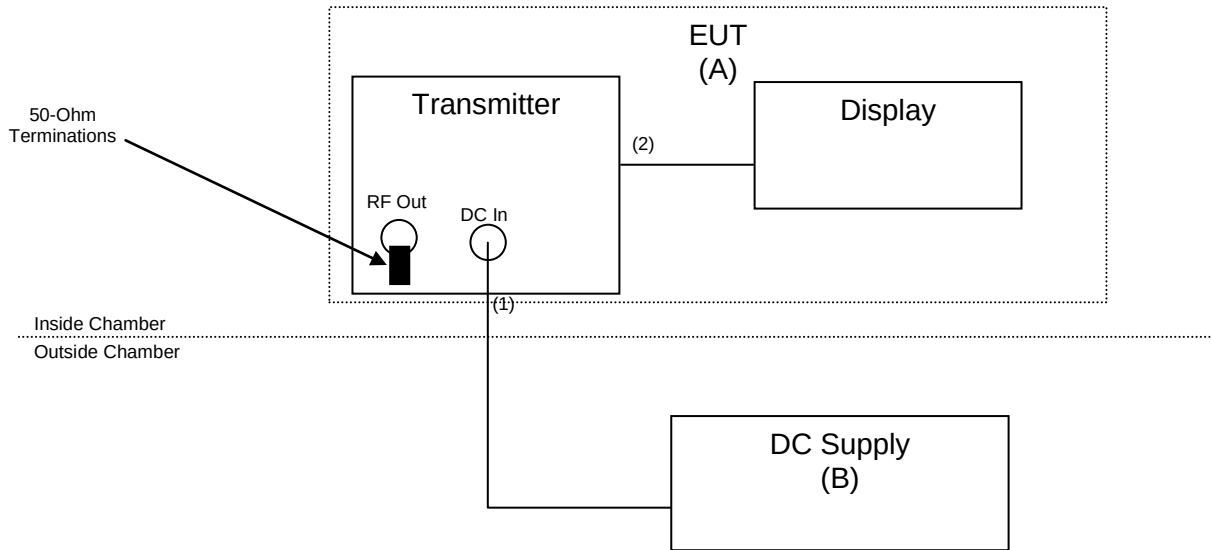
1.4 Operating Modes and Conditions

During testing, the display was used to select the modulation frequency. Once the touch screen was pressed, the transmitter was placed into a constant Tx mode amplitude modulated with the selected tone.

1.5 Modifications Required to Compliance

None

1.6 EUT Connection Block Diagram



1.1 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Emergency Traffic Systems	Pre-Emption Transmitter	TR1	3906-160004
B	Rigol	DC Power Supply	DP711	DP7A182700833

1.2 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	DC Input	DC Supply	EUT	8	No	No
2	Display	Transmitter	Display	1	No	No

1.3 Test Equipment

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	21-Jul-2017
ANTENNA, BILOG	JB6	SUNOL	B079690	10-Nov-2017
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B085892	27-Jul-2017
RF CABLE	104PE	HUBER & SUHNER	B079793	27-Jul-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	22-Feb-2018
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095591	27-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV which is on a 2 year cycle.

2 Output Power

2.1 Test Result

Test Description	Requirement / Basic Standards	Test Result
Power	§90.205(b) ANSI C63.26:2015	Reported

2.2 Test Method

Testing was performed according to ANSI C63.26, Section 5.2.

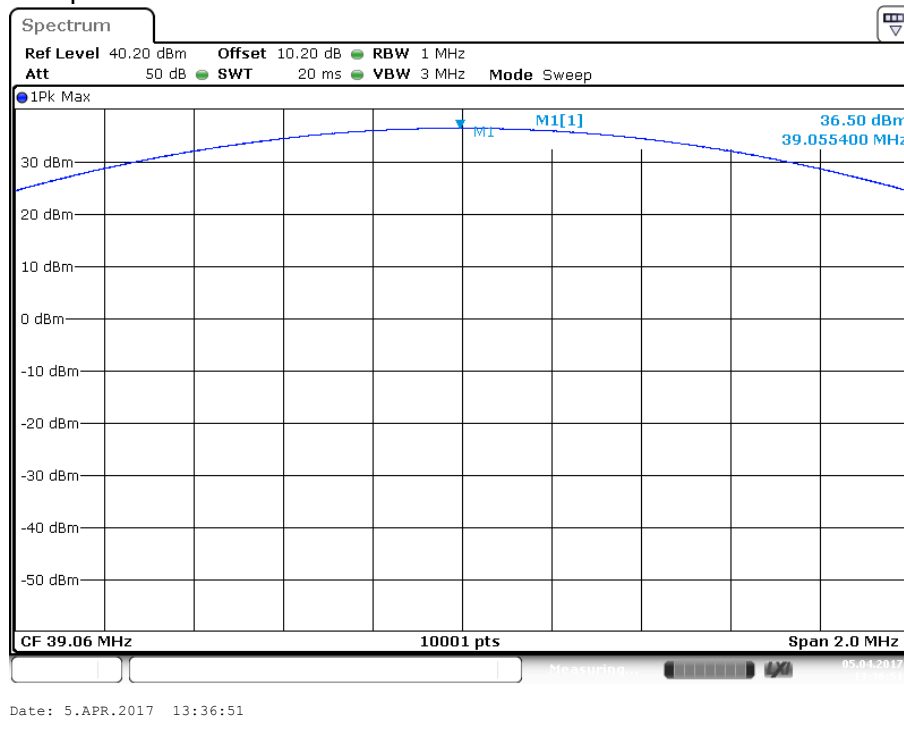
Limit:

For transmitters operating in the 25-50MHz band, 300W

2.3 Test Data

Frequency (MHz)	Modulation Frequency (Hz)	Peak Power (dBm)	Peak Power (W)
39.06	9700	36.50	4.467
39.06	7300	36.36	4.325
39.06	5498	36.31	4.276
39.06	4137	36.29	4.256
39.06	3115	36.29	4.256
39.06	2345	36.28	4.246

Sample Plot



3 Occupied Bandwidth

3.1 Test Result

Test Description	Requirement / Basic Standards	Test Result
Occupied Bandwidth	FCC Part 2.1049 §90.209 ANSI C63.26:2015	Compliant

3.2 Test Method

Testing was performed according to ANSI C63.26, Section 5.4.

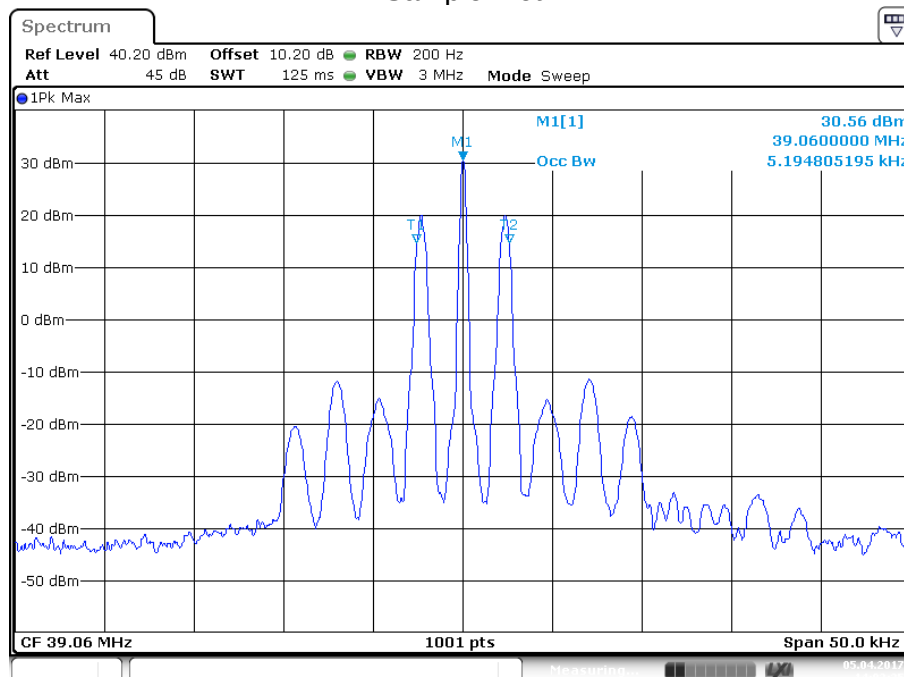
Limit:

For transmitters operating in the 25-50MHz band, 20kHz

3.3 Test Data

Frequency (MHz)	Modulation Frequency (Hz)	99% Occupied Bandwidth (kHz)
39.06	9700	19.930
39.06	7300	15.135
39.06	5498	11.489
39.06	4137	8.791
39.06	3115	6.793
39.06	2345	5.195

Sample Plot



4 Emission Masks

4.1 Test Result

Test Description	Requirement / Basic Standards	Test Result
Emission Masks	§90.210	Pass

4.2 Test Method

Emission Mask B was applied to each of the different modulation frequencies.

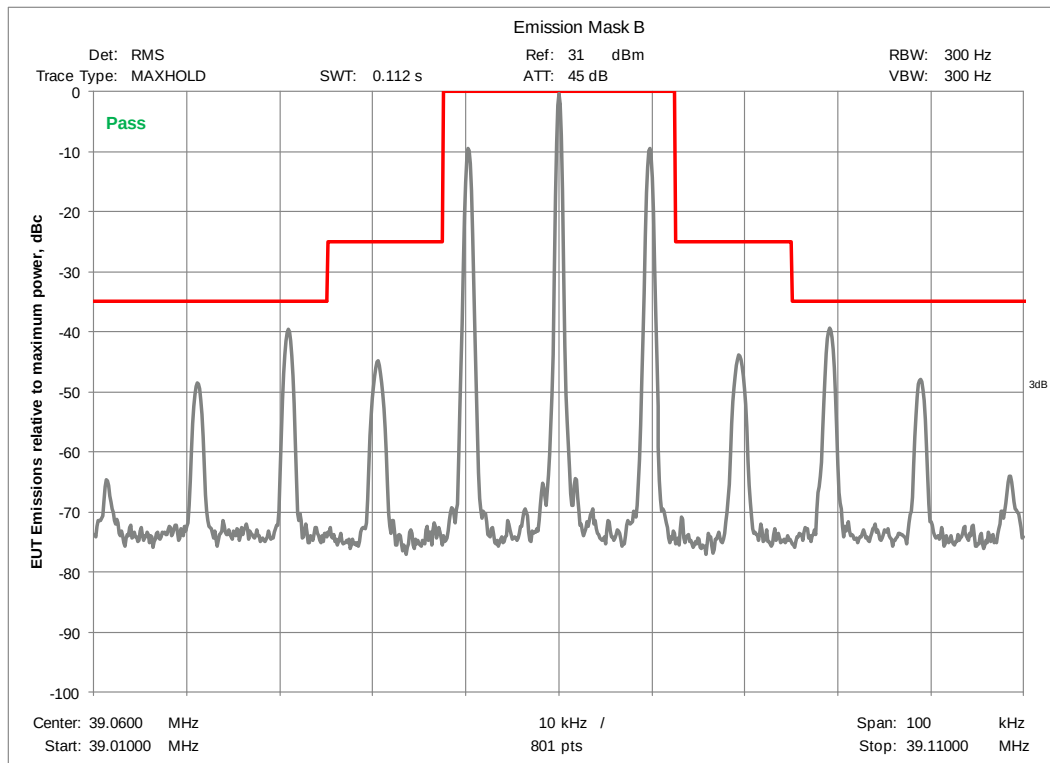
Limit:

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

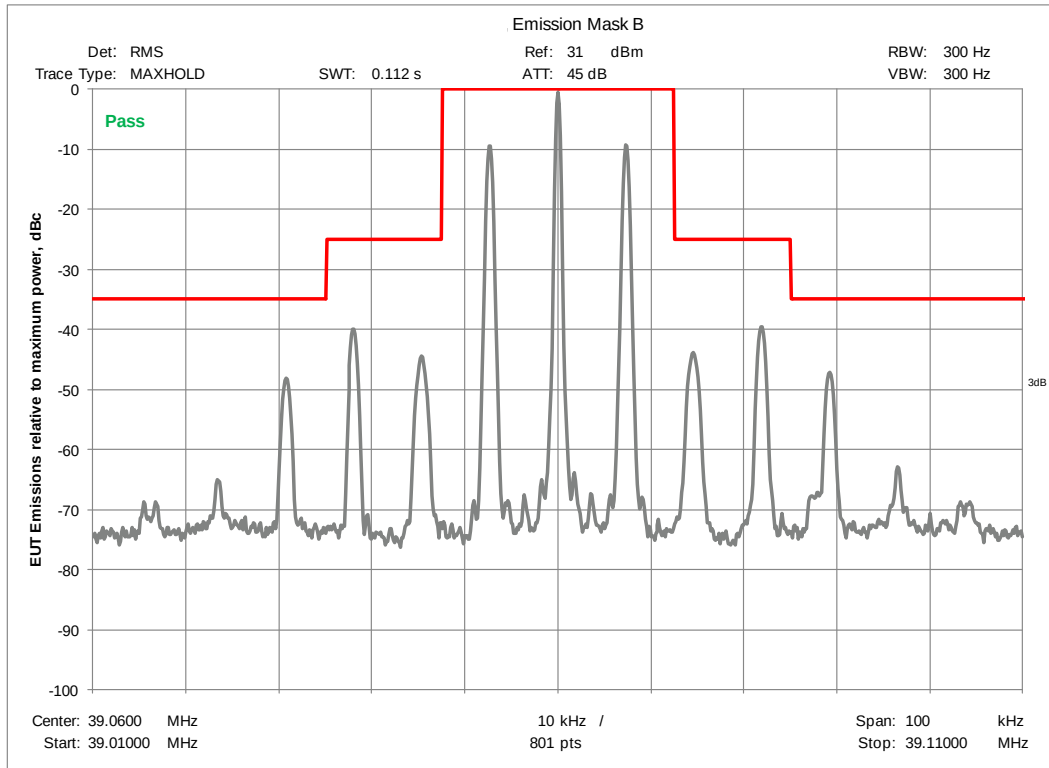
- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

4.3 Test Data

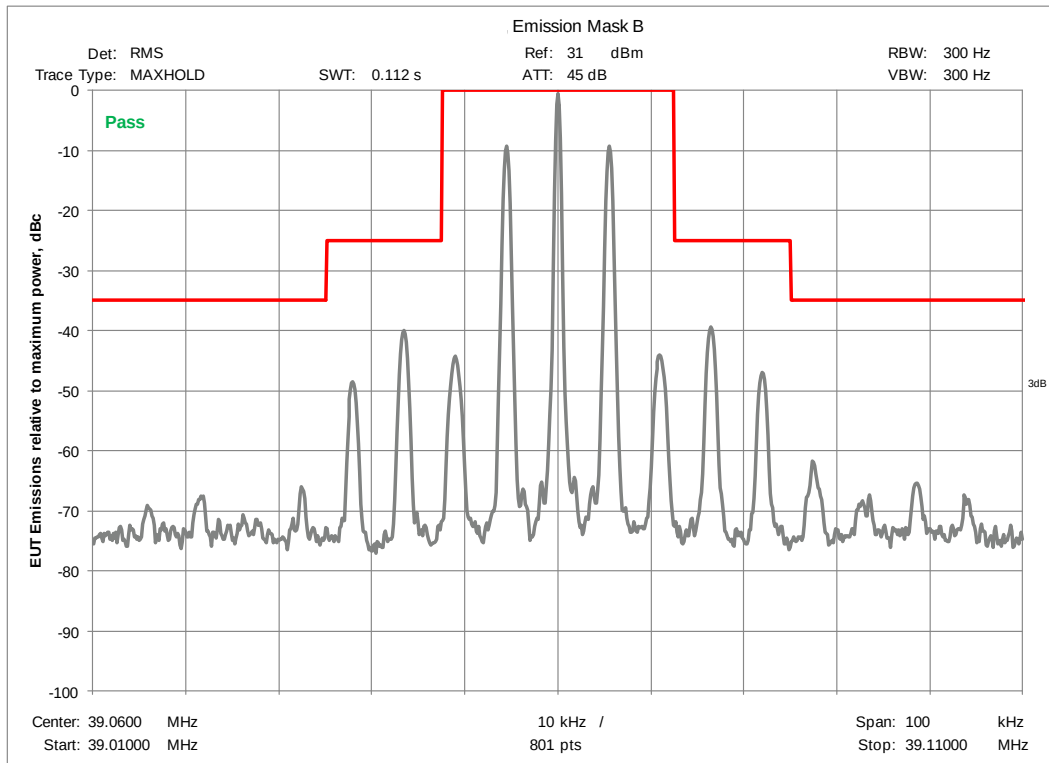
4.3.1 9700Hz Modulation



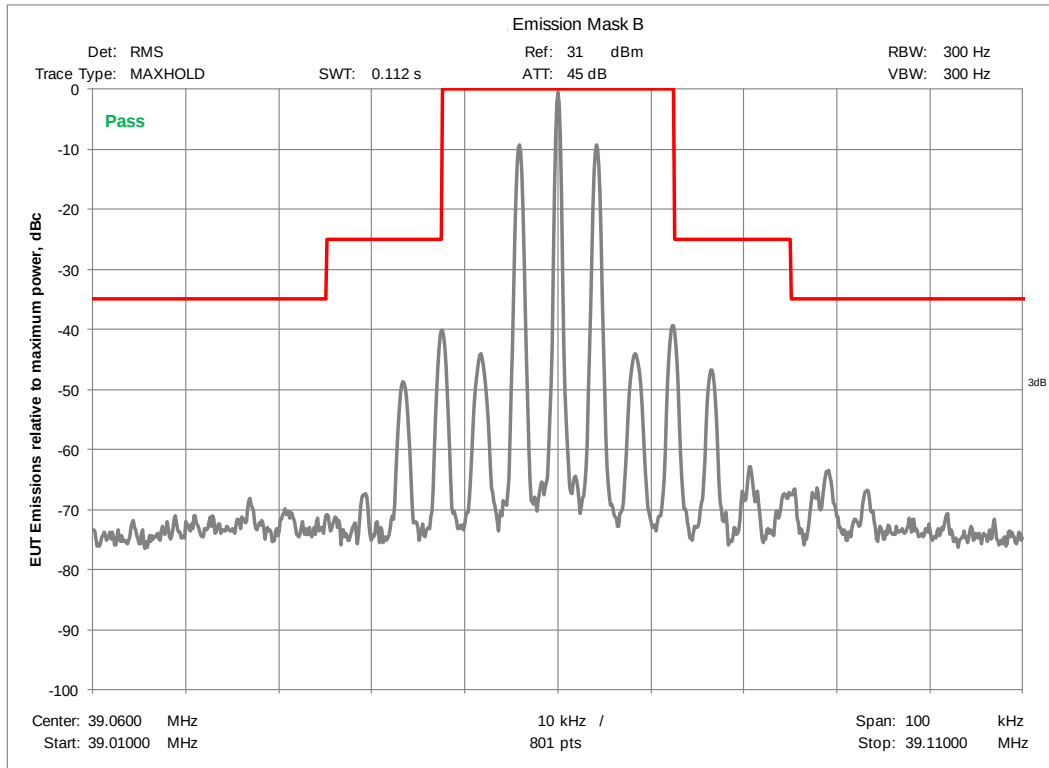
4.3.2 7300Hz Modulation



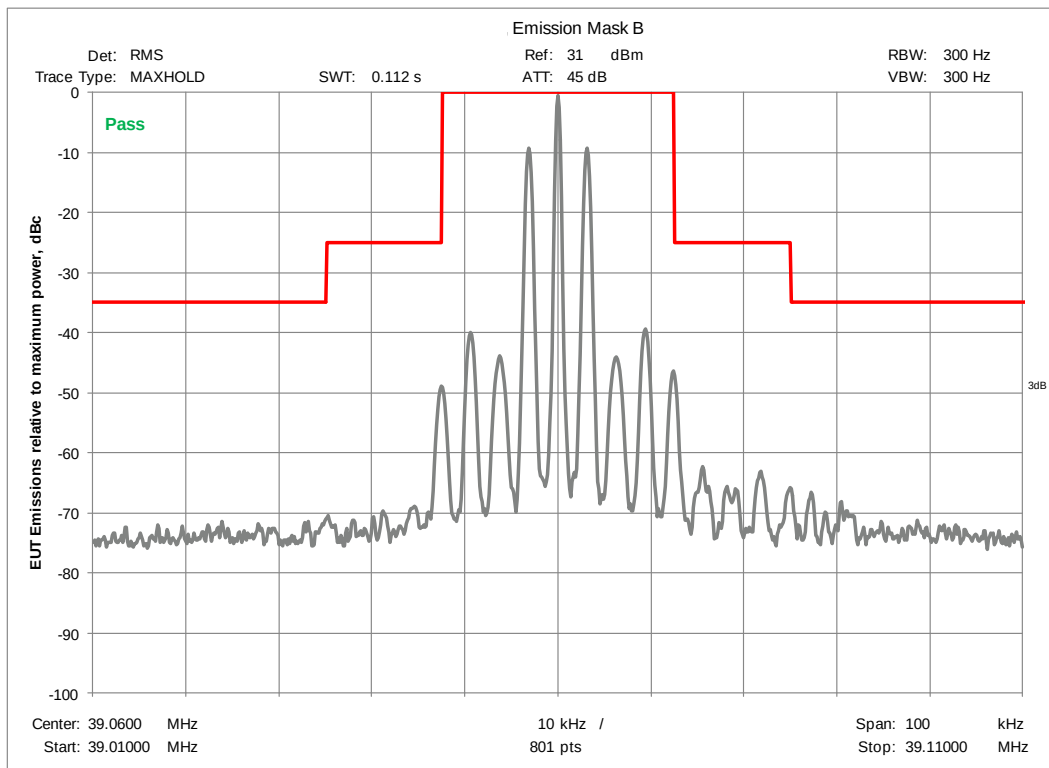
4.3.3 5498Hz Modulation



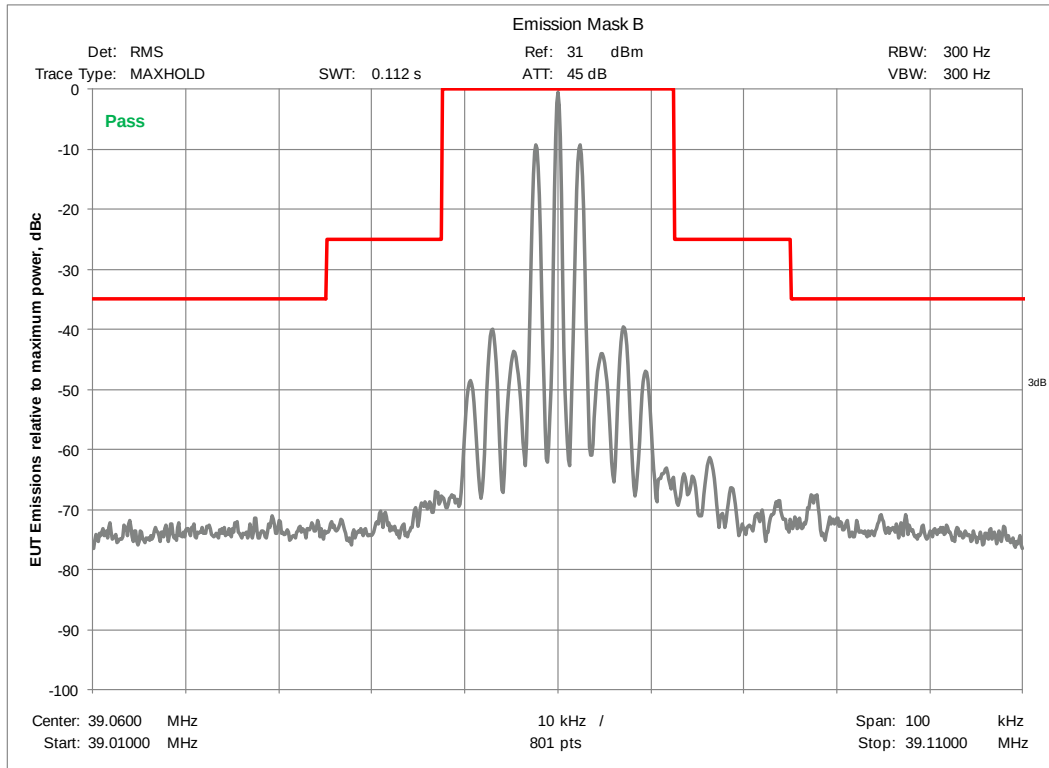
4.3.4 4137Hz Modulation



4.3.5 3115Hz Modulation



4.3.6 2345Hz Modulation



5 Conducted Spurious Emissions

5.1 Test Result

Test Description	Basic Standards	Test Result
Conducted spurious emissions	§2.1051 §90.210 ANSI C63.26:2015	Pass

5.2 Test Method

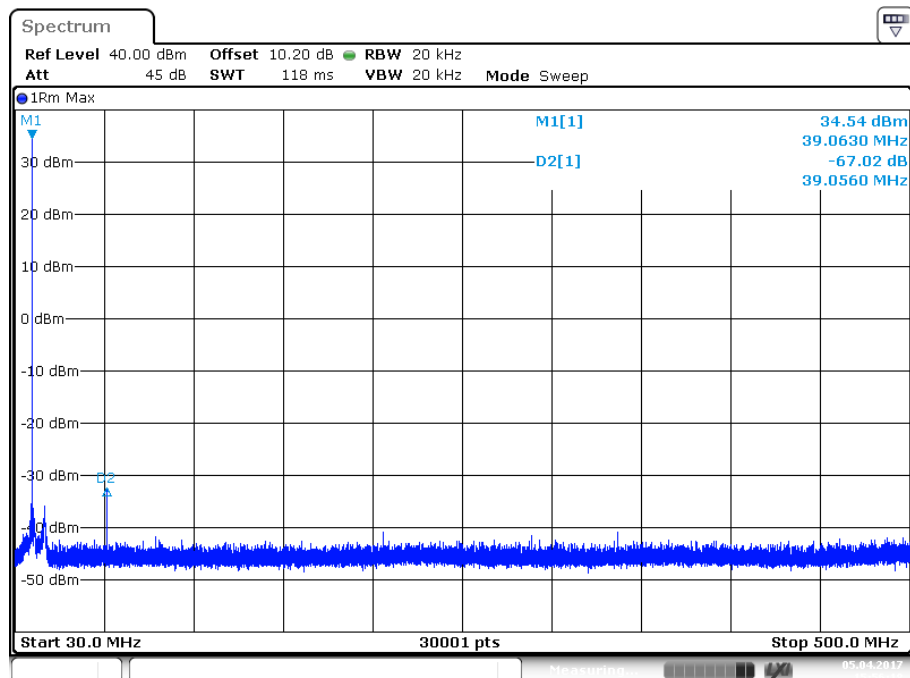
Testing was performed according to ANSI C63.26, Section 5.7.

Limit:

43 + 10 log (P) dB below the fundamental (-13dBm)

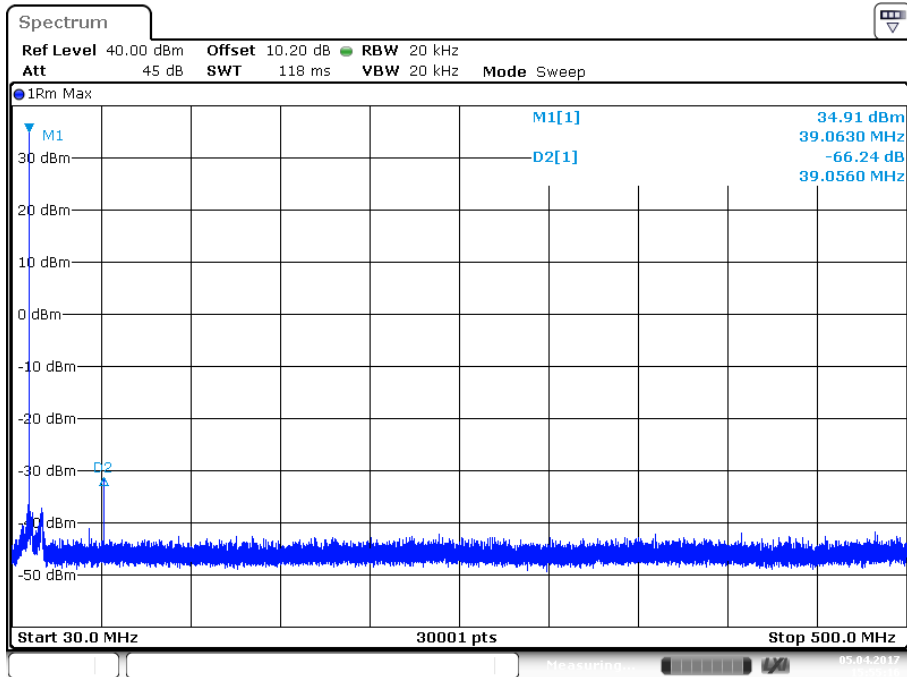
5.3 Test Data – Conducted Spurious Emissions Plots

5.3.1 9700Hz Modulation

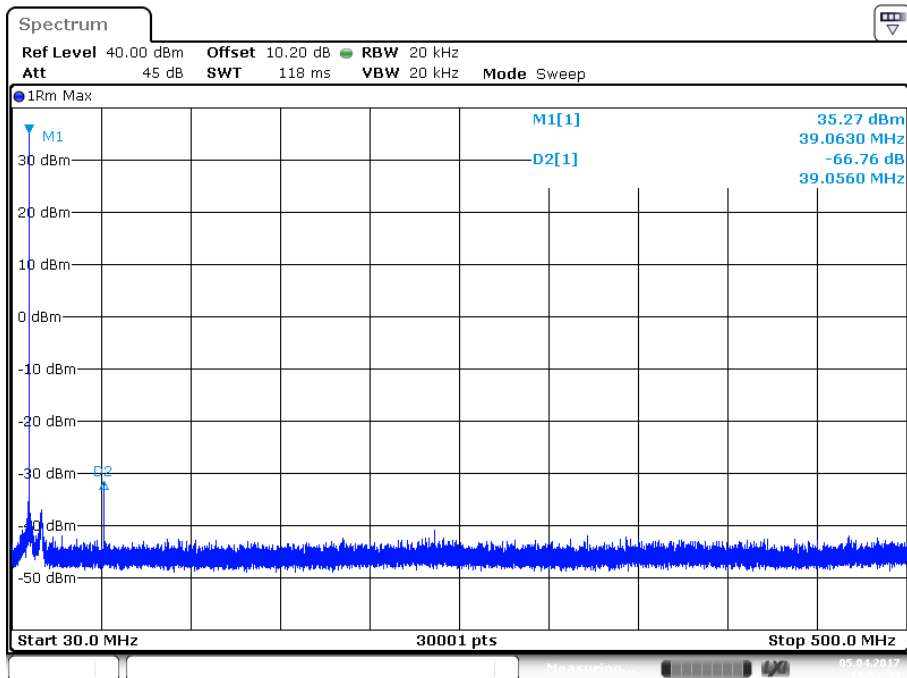


Date: 5.APR.2017 15:56:18

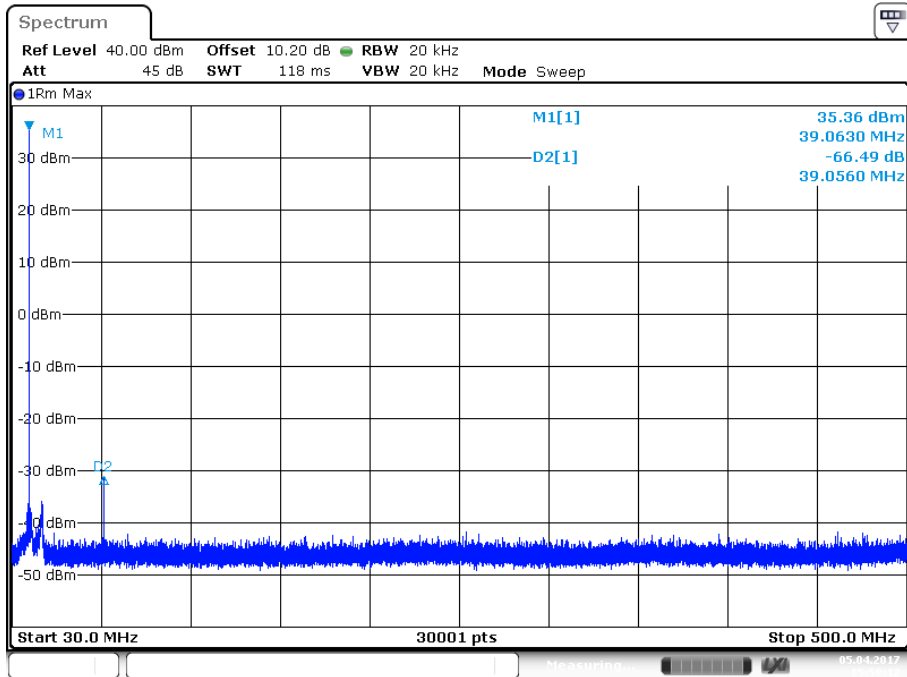
5.3.2 7300Hz Modulation



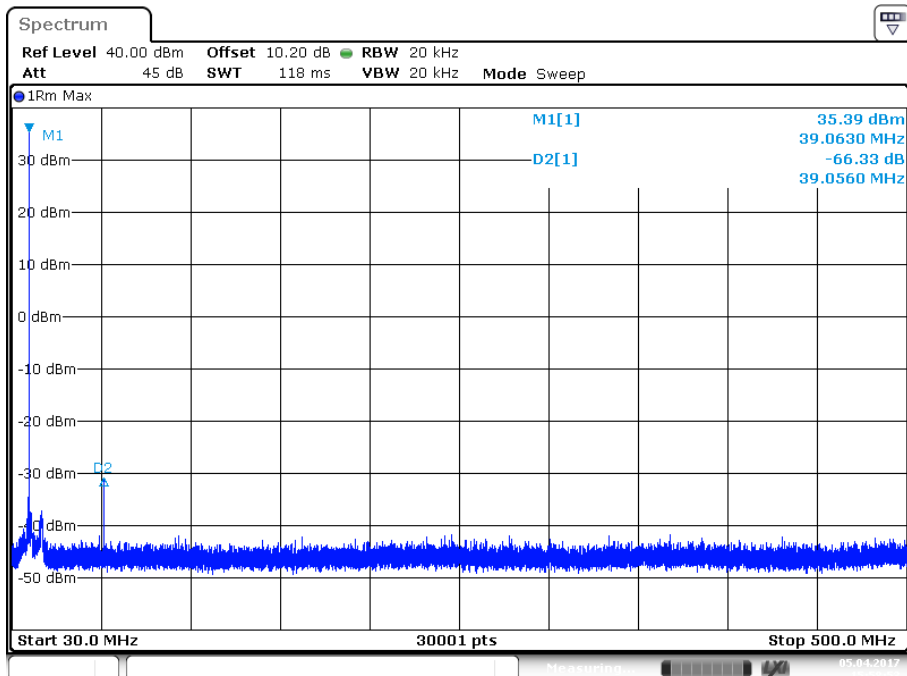
5.3.3 5498Hz Modulation



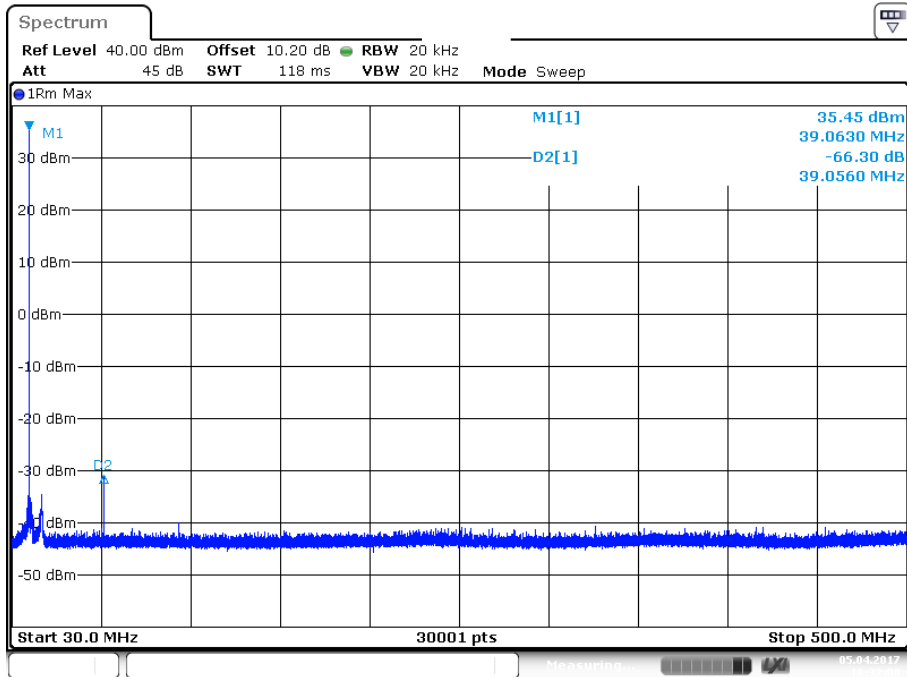
5.3.4 4137Hz Modulation



5.3.5 3115Hz Modulation



5.3.6 2345Hz Modulation



Date: 5.APR.2017 16:32:00

6 Frequency stability

6.1 Test Result

Test Description		Test Result
Frequency stability	§2.1055 §90.213 ANSI C63.26:2015	Compliant

6.2 Test Method

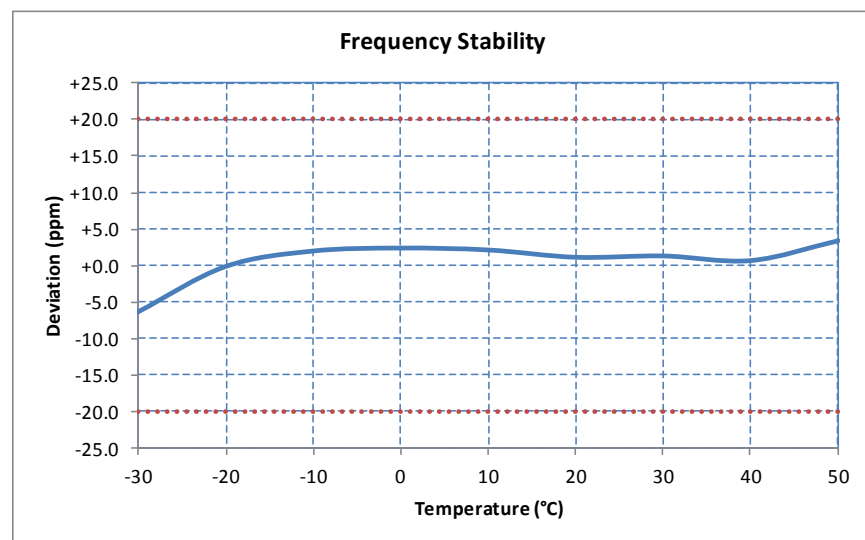
Testing was performed according to ANSI C63.26, Clause 5.6

Limit:

For a device operating in the 25-50MHz range and over 2 Watts of output power: +/-20ppm.

6.3 Test Data

Voltage %	Voltage V	Temp °C	Frequency MHz	Freq Dev Hz	Freq Dev ppm
100%	12.60	+20 (Ref)	39.0600399	+40	+1.02
100%	12.60	-30	39.0597490	-251	-6.43
100%	12.60	-20	39.0599907	-9	-0.24
100%	12.60	-10	39.0600732	+73	+1.87
100%	12.60	0	39.0600891	+89	+2.28
100%	12.60	+10	39.0600789	+79	+2.02
100%	12.60	+20	39.0600400	+40	+1.02
100%	12.60	+30	39.0600471	+47	+1.21
100%	12.60	+40	39.0600225	+23	+0.58
100%	12.60	+50	39.0601281	+128	+3.28
115%	14.49	+20	39.0600384	+38	+0.98
85%	10.71	+20	39.0600384	+38	+0.98



7 Spurious emissions radiated measurements

7.1 Test Result

Test Description		Test Result
Spurious emissions radiated measurements	§2.1051 §90.210 ANSI C63.26:2015	Pass

7.2 Test Method

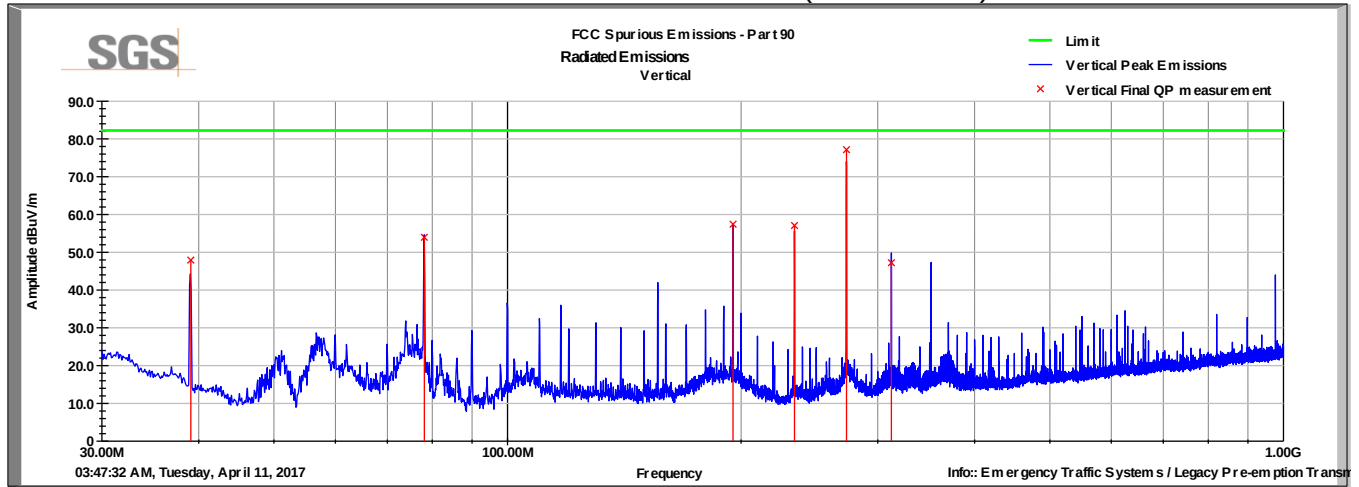
Testing was performed according to ANSI C63.26, Clause 5.5. Measurements were recorded using the 9700Hz modulation which resulted in the highest conducted power.

7.3 Test Site

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

7.4 Test Data

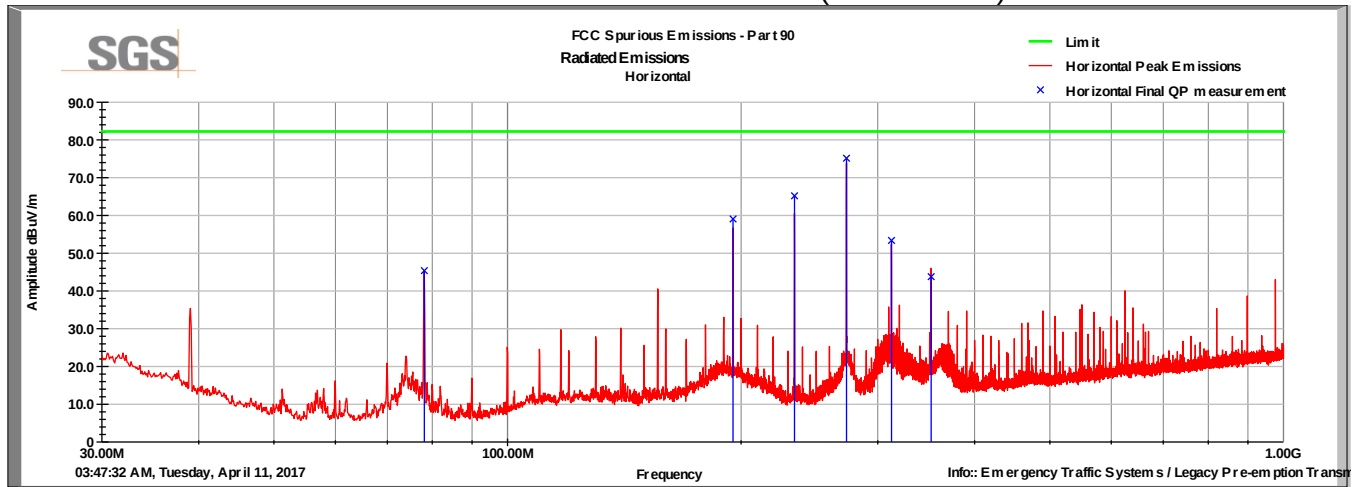
Vertical Radiated Emissions Plot (30-1000MHz)



Vertical Emissions 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)
39.06	64.1	V	351.0	100.0	15.3	0.9	32.3	47.9	82.2	-34.3
78.12	77.9	V	90.0	100.0	8.0	1.3	33.3	53.9	82.2	-28.3
195.30	76.8	V	191.0	157.0	12.2	2.0	33.6	57.4	82.2	-24.8
234.36	76.3	V	257.0	275.0	12.1	2.2	33.5	57.1	82.2	-25.1
273.42	94.3	V	302.0	195.0	13.9	2.4	33.5	77.1	82.2	-5.1
312.47	63.6	V	50.0	337.0	14.4	2.6	33.5	47.2	82.2	-35.0
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot (30-1000MHz)



Horizontal Emissions 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)
78.12	69.4	H	56.0	250.0	8.0	1.3	33.3	45.4	82.2	-36.8
195.31	78.4	H	309.0	175.0	12.2	2.0	33.6	59.0	82.2	-23.2
234.36	84.4	H	302.0	110.0	12.1	2.2	33.5	65.2	82.2	-17.0
273.42	92.3	H	34.0	108.0	13.9	2.4	33.5	75.1	82.2	-7.1
312.48	69.8	H	103.0	100.0	14.4	2.6	33.5	53.4	82.2	-28.8
351.54	59.1	H	48.0	267.0	15.3	2.8	33.5	43.8	82.2	-38.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	07 April 2017
1	- Corrected center frequency designation from 39.6 to 39.06 throughout report.	02 August 2017