Global EMC Labs

EMC / EMI Test Report

As per

FCC Part 15.231, Subpart C: 2014

RSS 210 Issue 8:2010

on the

Unlicensed Intentional Radiators

Lost & Found

Models ID: 01

Sanjiv Vyas
Project Engineer
Global EMC Inc.
11 Gordon Collins Dr,
Gormley, ON, L0H 1G0 Canada
Ph: (905) 883-8189

Testing produced for

Lamanna Co.

See appendix A for full customer & EUT details.

REGISTRATION #6844A-3

Testing Laboratory Certificate #2555.01

R-4023
C-4498

REG#377448

Table of Contents

Report Scope

This report addresses the EMC verification testing and test results of the **Lost & Found, from Lamanna Co.,** performed at Global EMC Labs. This unit is herein referred to as EUT (Equipment Under Test).

The EUT was tested for compliance against the following standards:

RSS 210 Issue 8:2010
FCC Part 15 Subpart C 15.231:2014

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.

Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	Lamanna Co.
Product	Lost & Found
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C:2014

Summary

The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	2AB6J-01
EUT Industry Canada Certification #, IC:	11064A-01
Equipment Under Test	Lost & Found
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Sanjiv Vyas

Test Results Summary

Table 1 – Manual operation or periodic transmission for safety/security applications
For EUT which complies with 15.231(a) & Annex 1 of RSS-210.

Standard/Method	Description	Class/Limit	Result
FCC 15.203 RSS-Gen 7.1.2	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1) RSS-Gen Table 3	Restricted Bands for intentional operation	Quasi Peak Average	Pass
FCC 15.207 RSS 210	Power Line Conducted Emissions	QuasiPeak Average	N/A See Justification
FCC 15.209 RSS-210 (Table 2) RSS-GEN Tables 5 & 6 FCC 15.231(b) RSS-210 (Table 4)	Intentional / Spurious Radiated emissions	Quasi Peak Average	Pass
FCC 15.231(a) RSS-210 A1.1	Type of transmission	Not a continuous transmissions, voice, video or radio control of toys.	N/A See Justification
FCC 15.231 (a)(1) RSS-210 A1.1.1(a)	Manual transmission Release holdover	< 5 seconds	Pass
FCC 15.231 (a)(2) RSS-210 A1.1.1(b)	Automatic transmission Transmission time	< 5 seconds	N/A See Justification
FCC 15.231 (a)(3) RSS-210 A1.1.1(c)	Predetermined intervals Transmission Security/Safety	< 2 seconds per hour	N/A See Justification
FCC 15.231 (c) RSS-210 A1.1.3	20 dB Bandwidth	< 0.25% of carrier	Pass
Overall Result			**PASS**

All tests were performed by Sanjiv Vyas.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a ‘PASS’ grade. If not ‘FAIL’ grade will be issued.

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), this device uses a helical antenna soldered onto the PCB inside the enclosure, and has no provisions for end-user replacement.

For the Restricted Bands of operation as specified in FCC 15.205 & RSS 210-Table 1, the EUT is designed to only operate at 315MHz. This does not fall within the restricted bands as listed.

For the power line conducted emissions requirements, the EUT is powered by two nos. integral 3Vdc coin cell battery. This test does not apply.

The EUT is a manually operated transmitter activated by a switch. As per 15.231(a)(1) and RSS-210 A1.1.1(a), EUT has a switch that automatically deactivates the transmission within 5 seconds of being released. Refer relevant test section/data for details.

The EUT does not support wireless continuous transmissions, voice, video and the radio signal control of toys. The transmission data is sent with a control signal, which complies with the requirements of 15.231(a).

15.231(a)(2) and RSS-210 A1.1.1(b) is not applicable. The EUT does not have transmitter which is activated automatically.

As attested by the manufacturer, no periodic transmissions are programmed at regular predetermined intervals. This meets the requirement FCC 15.231(a)(3) and RSS-210 A1.1.1(c).

As this device is handheld, it was scanned in three orthogonal axis for the applicable radiated emissions and worst case results (X-axis) are presented in this test report.

Applicable Standards, Specifications and Methods

ANSI C63.4:2009	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2009	- American national standard for testing unlicensed wireless devices
CFR 47 FCC 15:2014	- Code of Federal Regulations – Radio Frequency Devices
RSS 210:2010	- Issue 8: Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
CISPR 22:2008	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2012	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories

Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.0 dB

Document Revision Status

Revision 1 - May 15, 2014

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiliary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs at 11 Gordon Collins Dr, Gormley, ON. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, 377448), Industry Canada (IC, 6844A-3) and VCCI (R-4023 and C-4498). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
April 15, 2014	All	SV	20-23ºC	40-48%	96 -99kPa

Detailed Test Results Section

Radiated Emissions of Fundamental

Purpose

The purpose of this test is to ensure that the RF energy intentionally emitted from the EUT does not exceed the limit listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

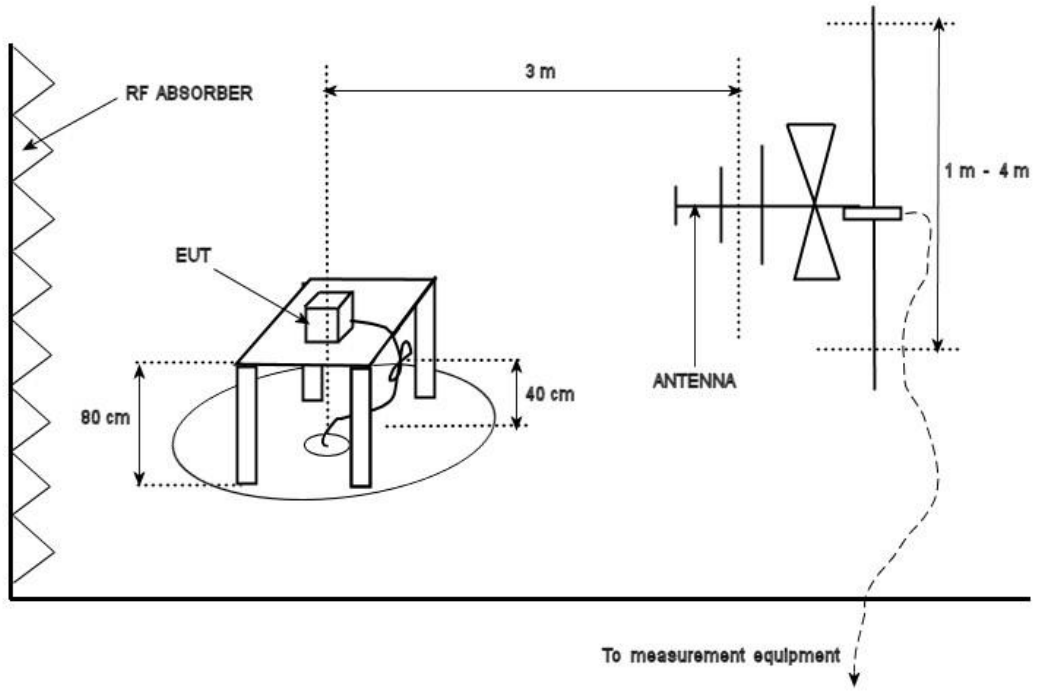
The method is as defined in ANSI C63.4:2009.
The fundamental emission limits for periodic operation are defined in FCC Part 15, Section 15.231(b) and RSS-210 (Table A)

40.66 - 40.70 MHz, 2250 uV/m (67.0 dBuV/m[1]) at 3 m
70 - 130 MHz, 1250 uV/m (61.9 dBuV/m[1]) at 3 m
130 - 174 MHz, 1250 to 3750 uV/m (linear interpolations) (61.9 to 71.4 dBuV/m[1]) at 3 m
174 - 260 MHz, 3750 uV/m (71.4 dBuV/m[1]) at 3 m
260 - 470 MHz, 3750 to 12500 uV/m (linear interpolations) (71.4 to 81.9 dBuV/m[1]) at 3 m
Above 470 MHz, 12500 uV/m (81.9 dBuV/m[1]) at 3 m

Lowest fundamental limit occurs at the carrier frequency: 315MHz
Fundamental limit: 75.6 dBuV/m[1].

[1]Based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

Final Measurements

The device complies with the requirement. EUT was scanned for all three orthogonal axis. The highest fundamental field strength is presented in the table below. A worst case measurement of 91.7 dBuV/m at 3 meter was obtained using a peak detector at a fundamental frequency of 315 MHz (carrier frequency) in the horizontal polarity. See spurious emissions section for related graphs. This is passing with 3.9 dB of margin to the peak measured emission requirement.

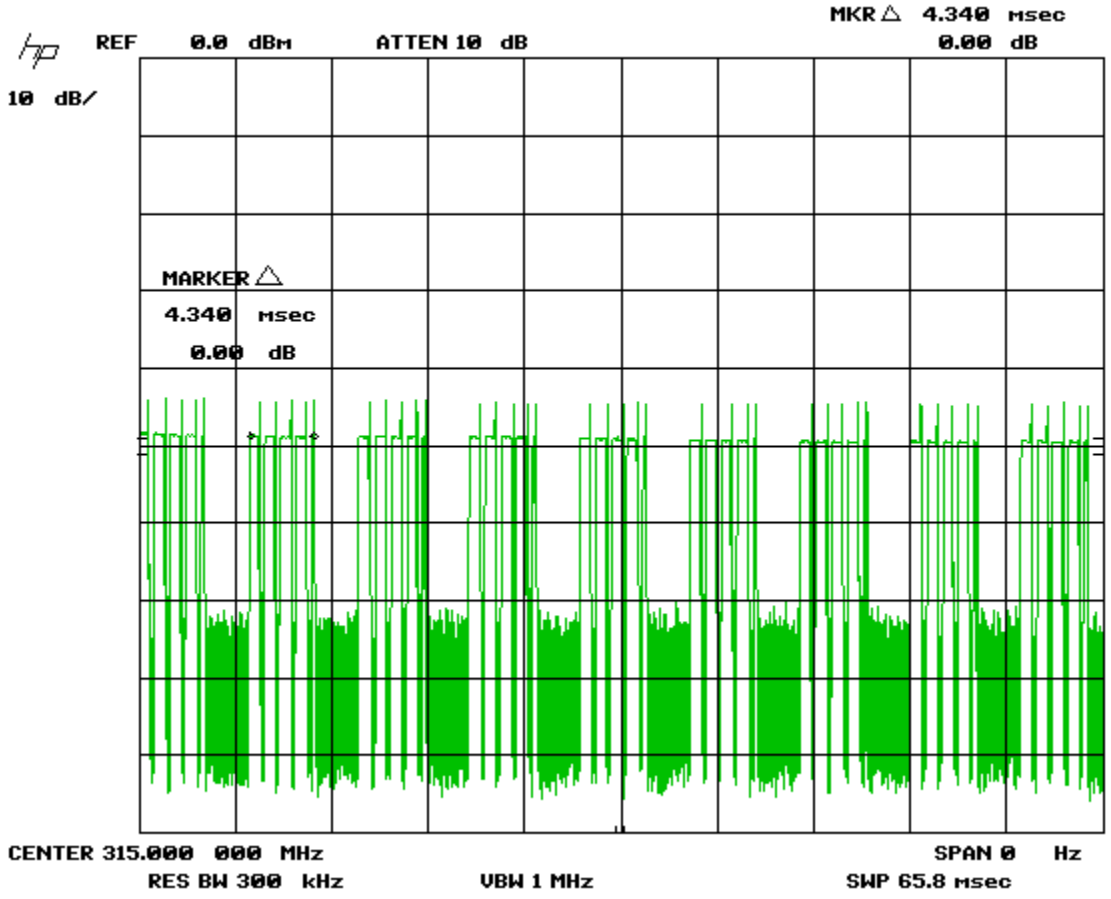
The averaging factor for this pulse modulated device was not applied to the measurements as the device meets requirements without using duty cycle factor.

Maximum Fundamental Field Strength Table

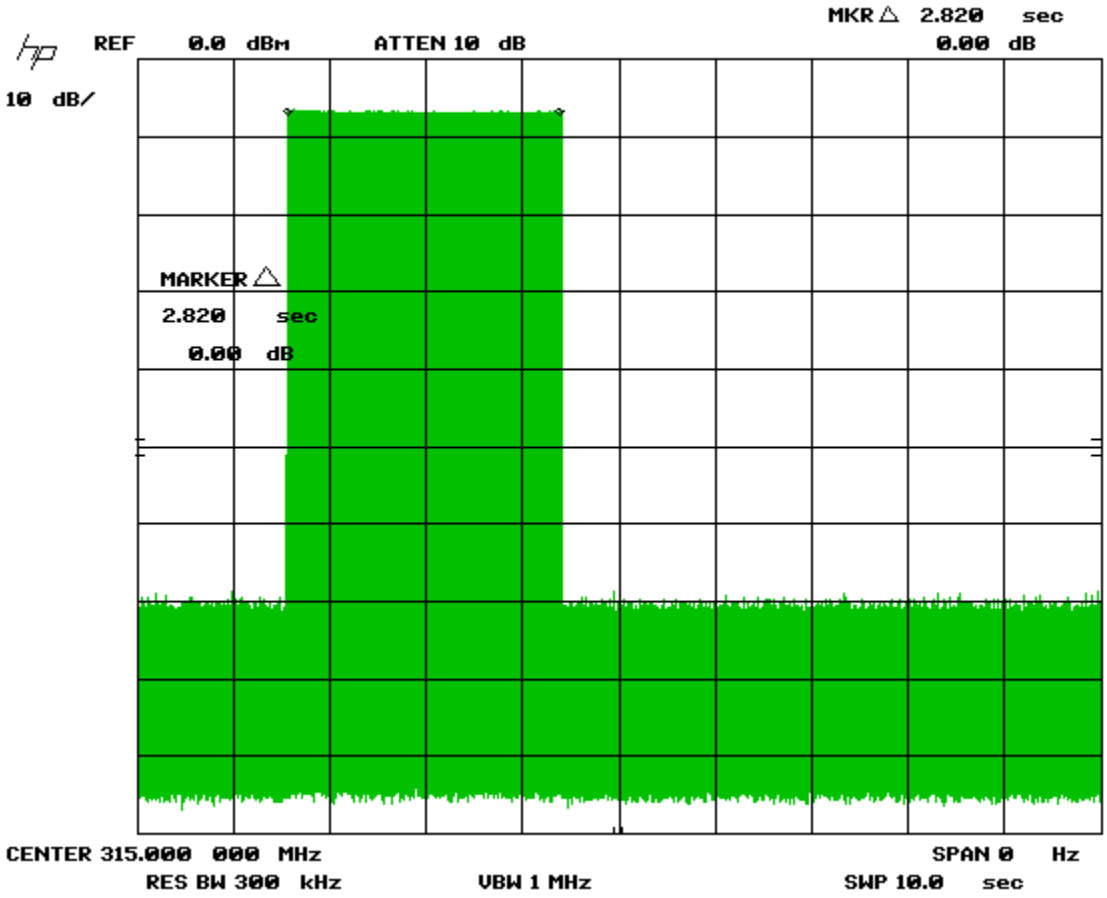
Test Freq. (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/ Vert)	Raw signal dB(µV)	Antenna factor dB	Attenuator dB	Cable loss dB + Pre-selector	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
314.95	Peak	Horz	96.2	14.4	10.0	1.4	-30.3	91.7	95.6	3.9	PASS
314.95	Avg	Horz	61.3	14.4	10.0	1.4	-30.3	56.8	75.6	18.8	PASS
314.95	Peak	Vert	88.3	14.2	10.0	1.4	-30.3	83.6	95.6	12.0	PASS
314.95	Avg	Vert	54.8	14.2	10.0	1.4	-30.3	50.1	75.6	25.5	PASS

Note: The worst case measurement results for horizontal polarization of antenna and EUT mounted in X-axis are reported in the table above.

Pulse Width

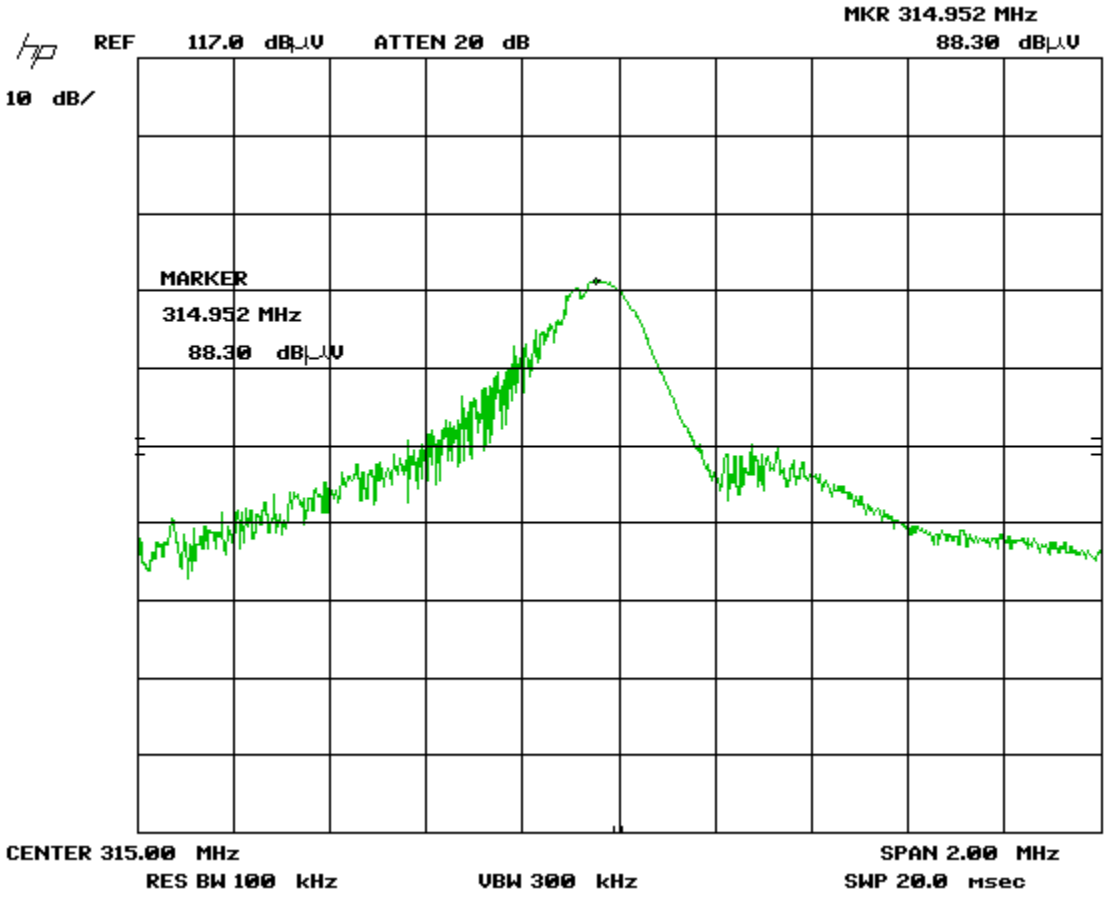


Pulse Train

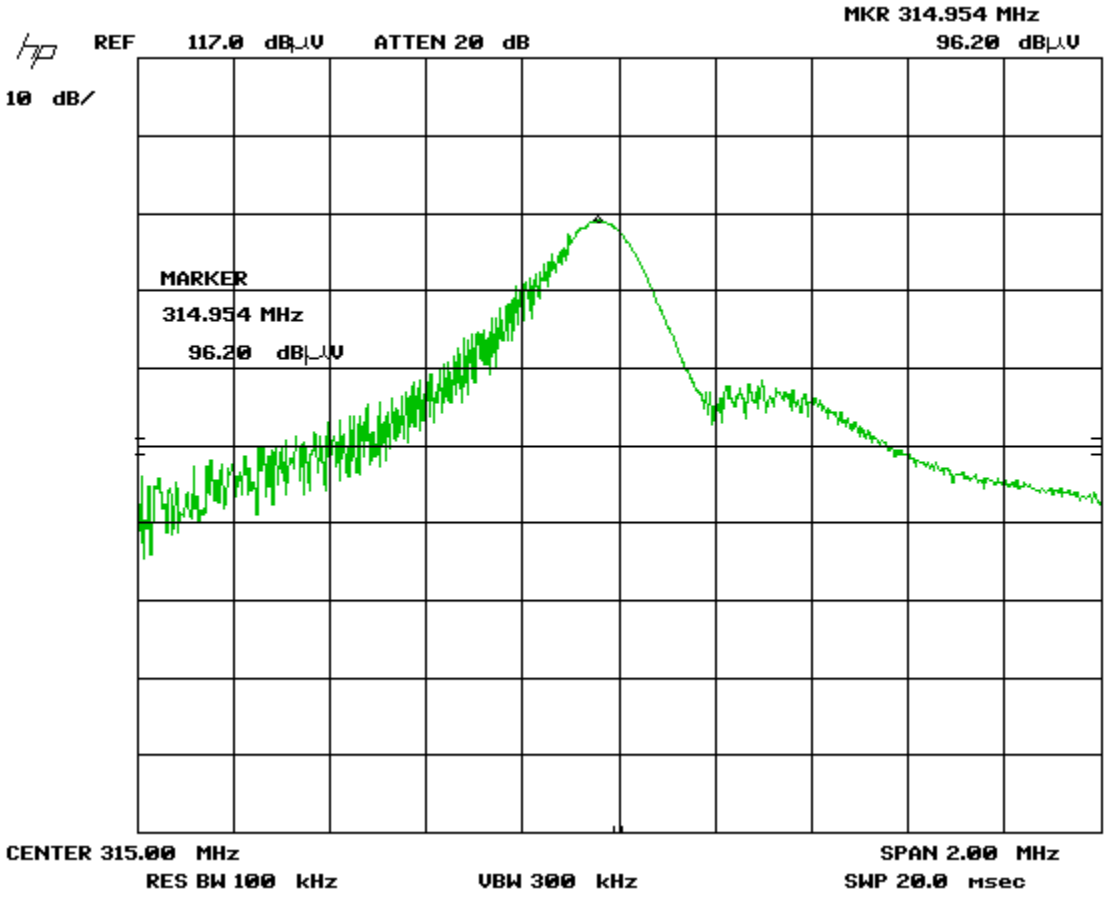


Note: The EUT is a manually operated transmitter activated by a switch. As per 15.231(a)(1) and RSS-210 A1.1.1(a), EUT has a switch that automatically deactivates the transmission within 5 seconds of being released. Refer the Plot above which is presented for 10 seconds duration, which indicates the immediate deactivation of the transmitter after switch being released.

Peak fundamental - Vertical
(Raw signal, no factors applied)



Peak fundamental - Horizontal
(Raw signal, no factors applied)



Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Jan 22, 2013	Jan 22, 2015	GEMC 141
Quasi-Peak Adapter	85650A	HP	Jan 22, 2013	Jan 22, 2015	GEMC 7
BiLog Antenna	3142-C	ETS	Aug 28, 2012	Aug 28, 2014	GEMC 8
Chase Preamp 9kHz - 1 GHz	CPA9231A	Chase	Aug 29, 2012	Aug 29, 2014	GEMC 6403
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

Radiated Emissions of Spurious Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4:2009. The limits are as defined in FCC Part 15, Section 15.209 and 15.231 (b). Whichever limit permits the higher field strength is allowed.

The following are radiated emission limits for general requirements as defined in FCC Part 15, Section 15.209. All scans are performed at a 3m test distance. Where limits are specified for a farther distance, limits are extrapolated as specified in FCC Part 15 Section 15.31(f)(2). Note that *F* = frequency in kHz:

0.009 – 0.090 MHz[1], (2400/*F*) uV/m at 300m (128.5-108.5 dBuV/m at 3m)
0.090 – 0.110 MHz[2], (2400/*F*) uV/m at 300m (108.5-106.7 dBuV/m at 3m)
0.110 – 0.150 MHz[3], (2400/*F*) uV/m at 300m (106.7-104.0 dBuV/m at 3m)
0.150 – 0.490 MHz[4], (2400/*F*) uV/m at 300m (104.0-93.8 dBuV/m at 3m)
0.490 – 1.705 MHz[5], (24000/*F*) uV/m at 30m (73.8-62.9 dBuV/m at 3m)
1.705 – 30 MHz[5], 30 uV/m (29.5 dBuV/m) at 30m (69.5 dBuV/m at 3m)
30 - 88 MHz[6], 100 uV/m (40.0 dBuV/m) at 3 m
88 - 216 MHz[6], 150 uV/m (43.5 dBuV/m) at 3 m
216 - 960 MHz[6], 200 uV/m (46.0 dBuV/m) at 3 m
Above 960 MHz[6], 500 uV/m (53.9 dBuV/m) at 3 m
Above 1000 MHz[7], 500 uV/m (53.9 dBuV/m) at 3m

[1]Limit is with 100 Hz measurement bandwidth and using an Average detector
[2]Limit is with 200 Hz measurement bandwidth and using a Quasi Peak detector
[3]Limit is with 100 Hz measurement bandwidth and using an Average detector
[4]Limit is with 9 kHz measurement bandwidth and using an Average detector
[5]Limit is with 9 kHz measurement bandwidth and using a Quasi Peak detector
[6]Limit is with 120 kHz measurement bandwidth and using a Quasi Peak detector.
[7]Limit is with 1 MHz measurement bandwidth and using an Average detector

The following are spurious emission limits for the EUT as defined in FCC Part 15, Section 15.231(b) and RSS 210. The value is calculated for the fundamental frequency (315MHz):

> For all spurious emissions, the limit is 604.2 uV/m (55.6 dBuV/m) at 3m using an Average detector. However, if the values of the measured emissions based on the use of measurement instrumentation with a CISPR quasi-peak detector meets those limits, that is permissible as well. Measurement bandwidths are as listed above in the corresponding frequency ranges.

The spurious emission limit defined in FCC 15.231(b) is applied for the second harmonic at 630MHz, third harmonic at 945MHz and any other spurious frequency less than 1000MHz. The radiated emission limits for general requirements defined in FCC 15.209, which are tighter than those of FCC 15.231(b) for the EUT, is applied for subsequent measurements. When the emission meets the requirements in FCC 15.209, it automatically meets the requirements in 15.231(b) & RSS 210.

For reference, the tables below show the limits of FCC 15.231(b), FCC 15.209, and FCC 15.205(a) Restricted Frequency Bands:

FCC 15.231 (b), RSS210 (Table A) Emission Limits:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66–40.70	2,250	225
70–130	1,250	125
130–174	[1]1,250 to 3,750	[1]125 to 375
174–260	3,750	375
260–470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

FCC 15.209, RSS-GEN (Table 5&6) Emission Limits

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

FCC 15.205 (a), RSS-GEN (Table 3) Restricted Frequency Bands:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1]0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

[2]Above 38.6

Notes:

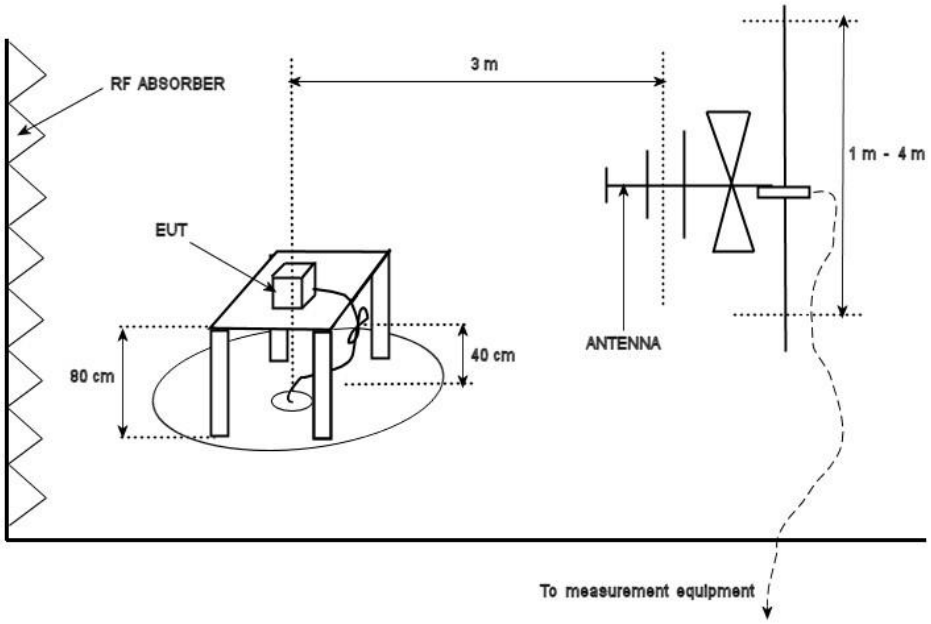
As specified in 15.231(b)(3) & RSS 210, spurious emissions may meet the higher limit permitted by 15.209 or 15.231(b), in addition to the requirements of 15.205. The provisions in Section 15.35 apply to these measurements. The method used is noted in the *Final Measurements* table in this report.

Where average limits are specified, a peak limit that is 20 dB higher than the average limit applies.

Where peak measurements are under the quasi-peak and/or average limits, the emission is considered a pass, since peak measurements are always greater than or equal to readings with these detectors.

Frequency range is scanned in accordance with 15.33.

Typical Radiated Emissions Setup



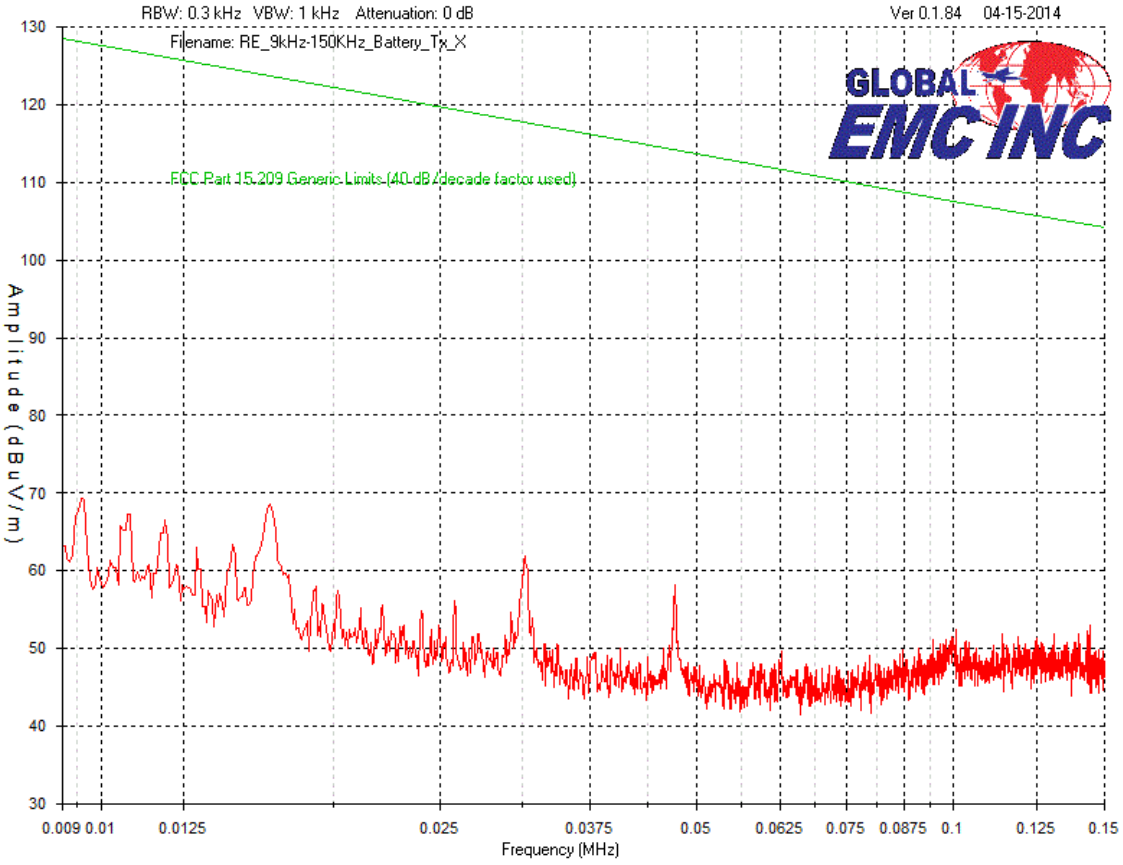
Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

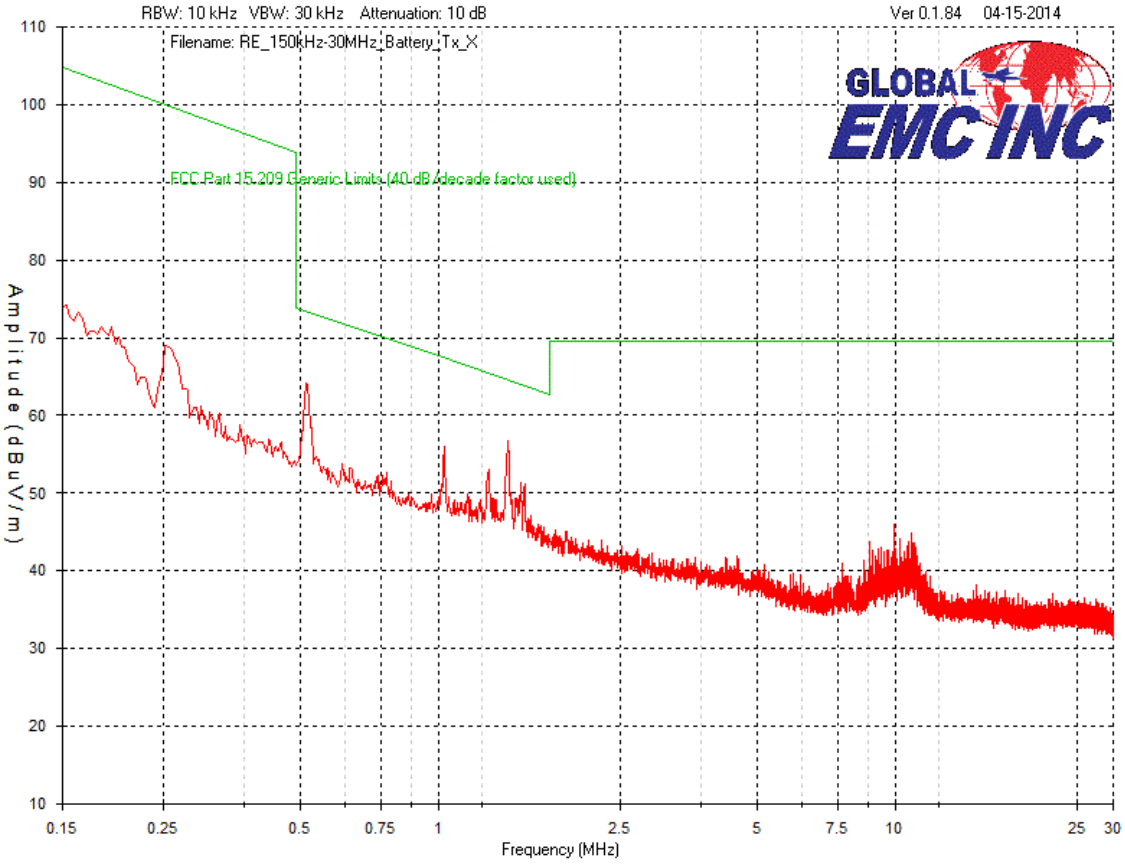
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurements table where applicable. The graphs shown below are maximized peak measurement graphs, measured with a resolution bandwidth greater than the final required detector and over a full 0-360° rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings. In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to a minimum of a 5.5 GHz in Transmitter mode.

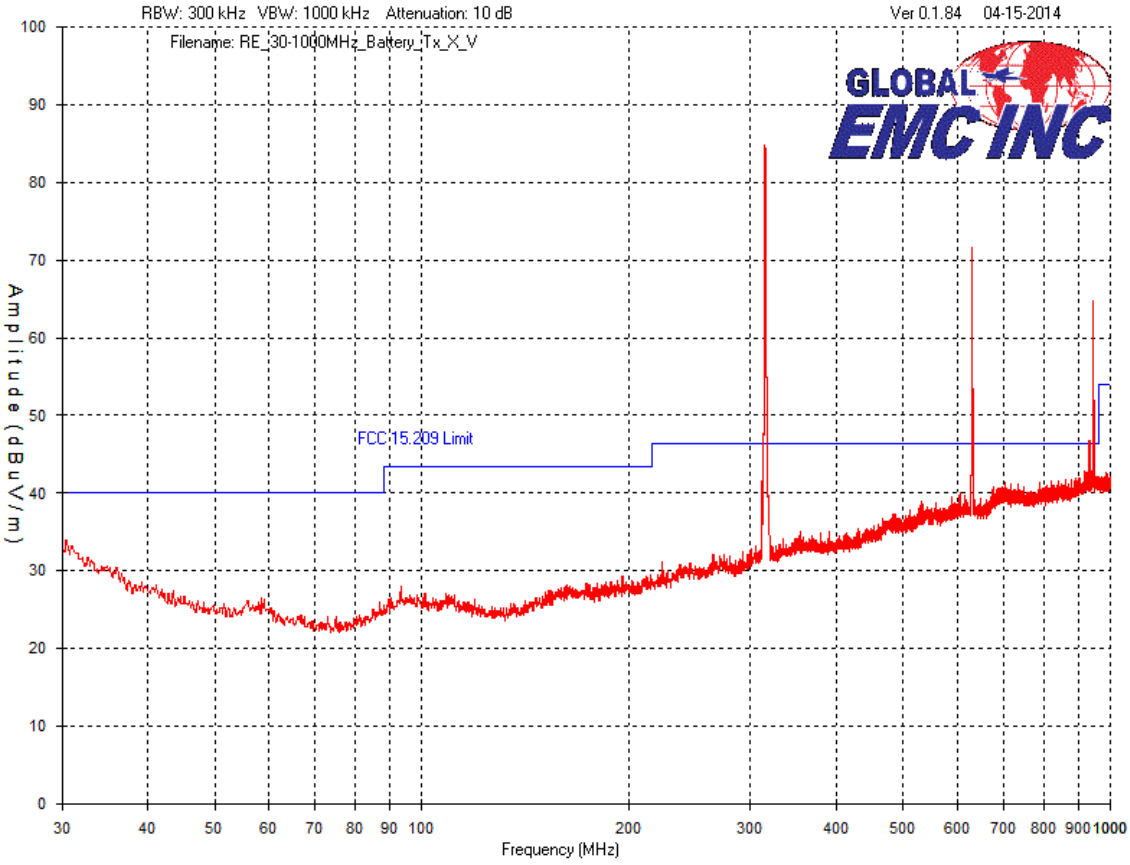
Peak Emissions Graph
9kHz – 150kHz



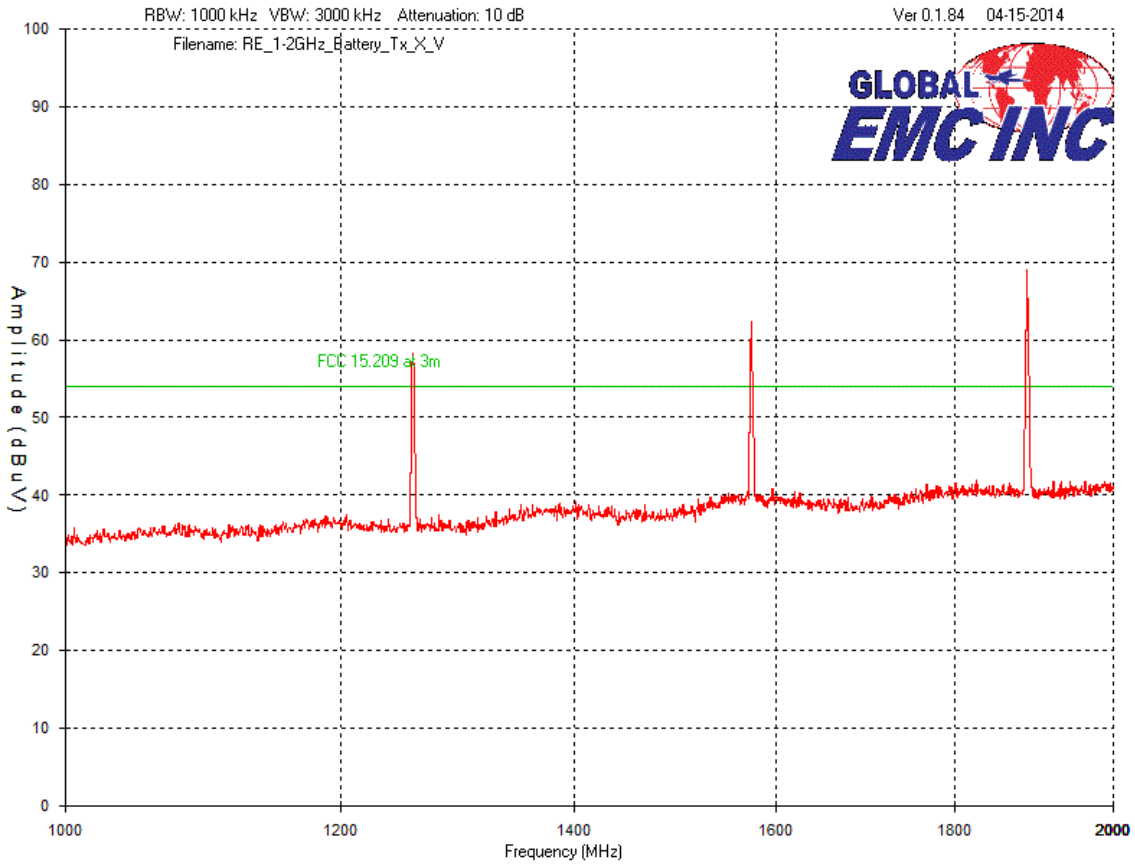
Peak Emissions Graph
150kHz – 30MHz



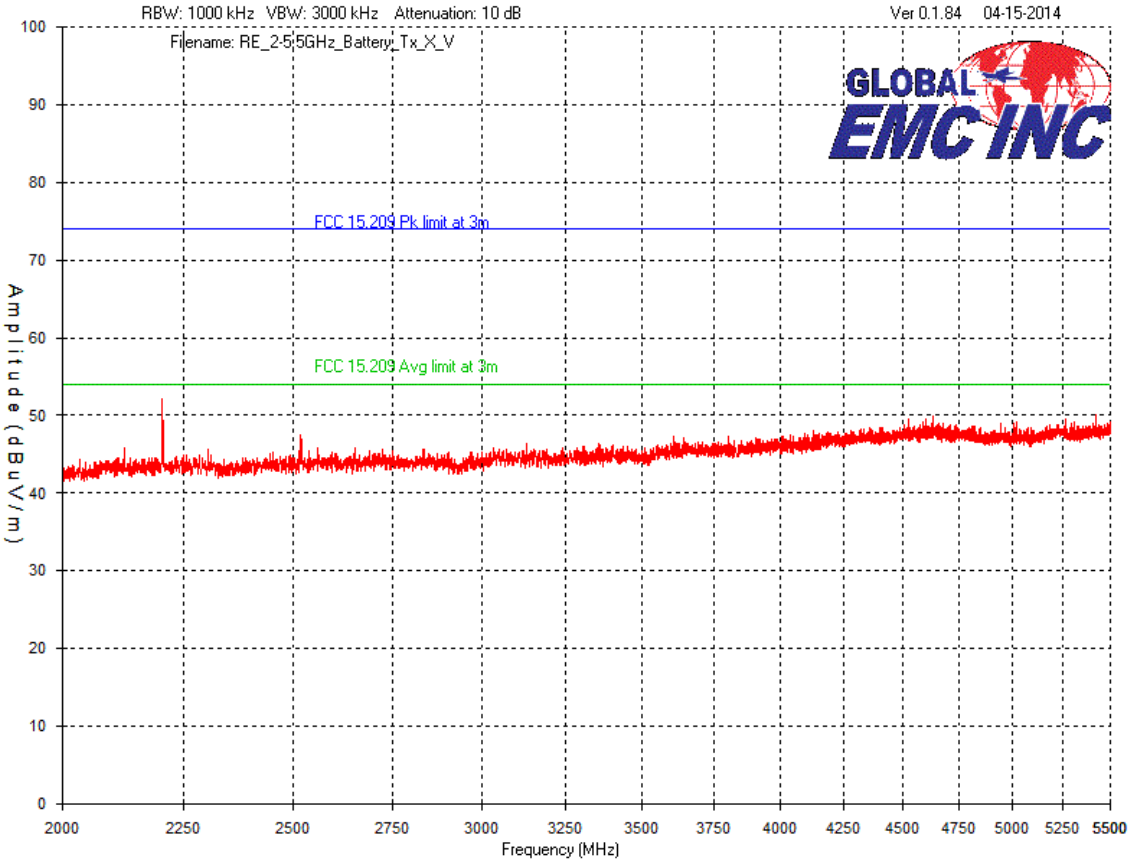
Vertical – Peak Emissions Graph
30MHz – 1GHz



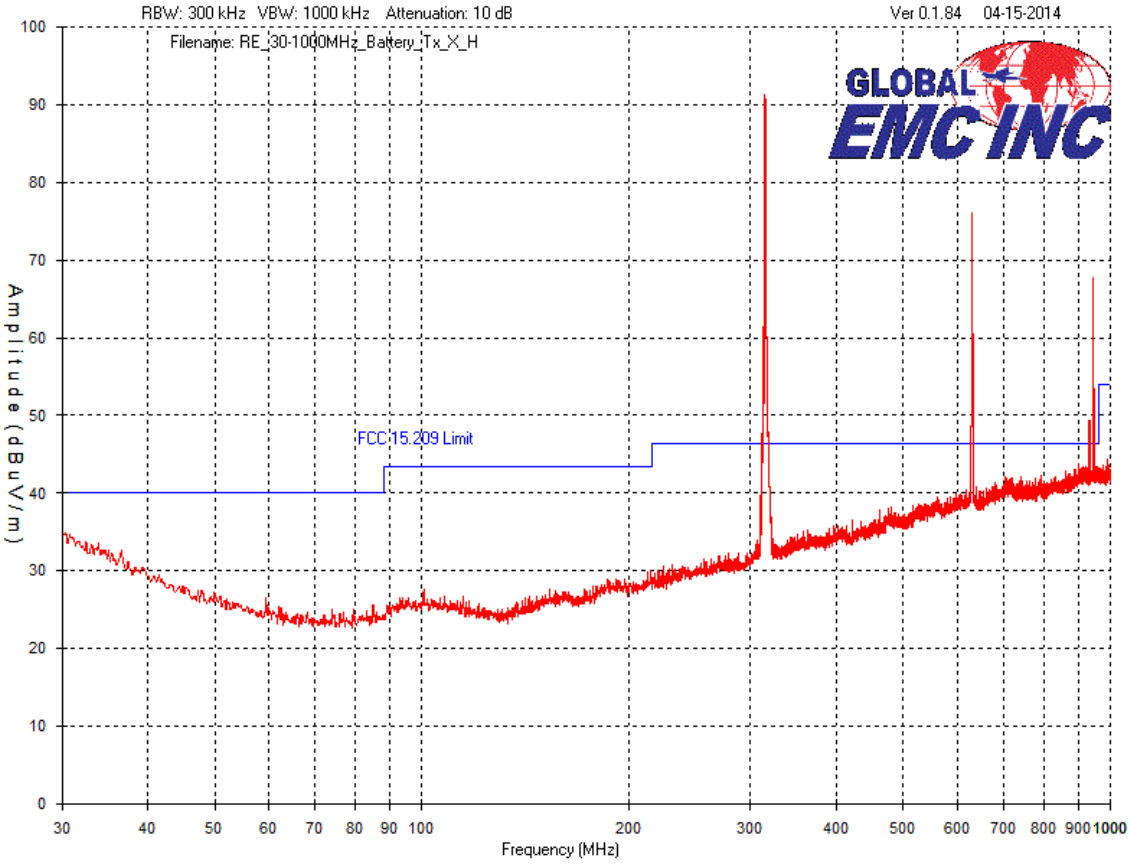
Vertical – Peak Emissions Graph
1GHz – 2GHz



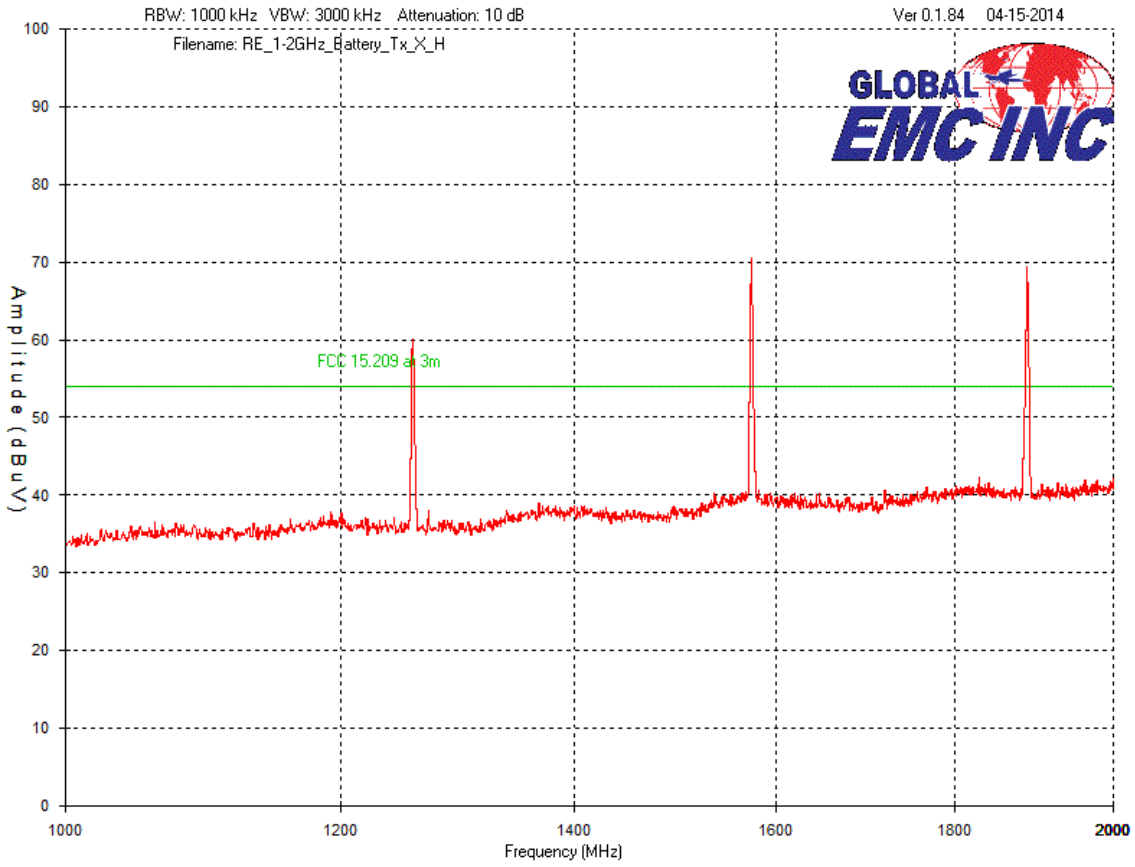
Vertical – Peak Emissions Graph
2GHz – 5.5GHz



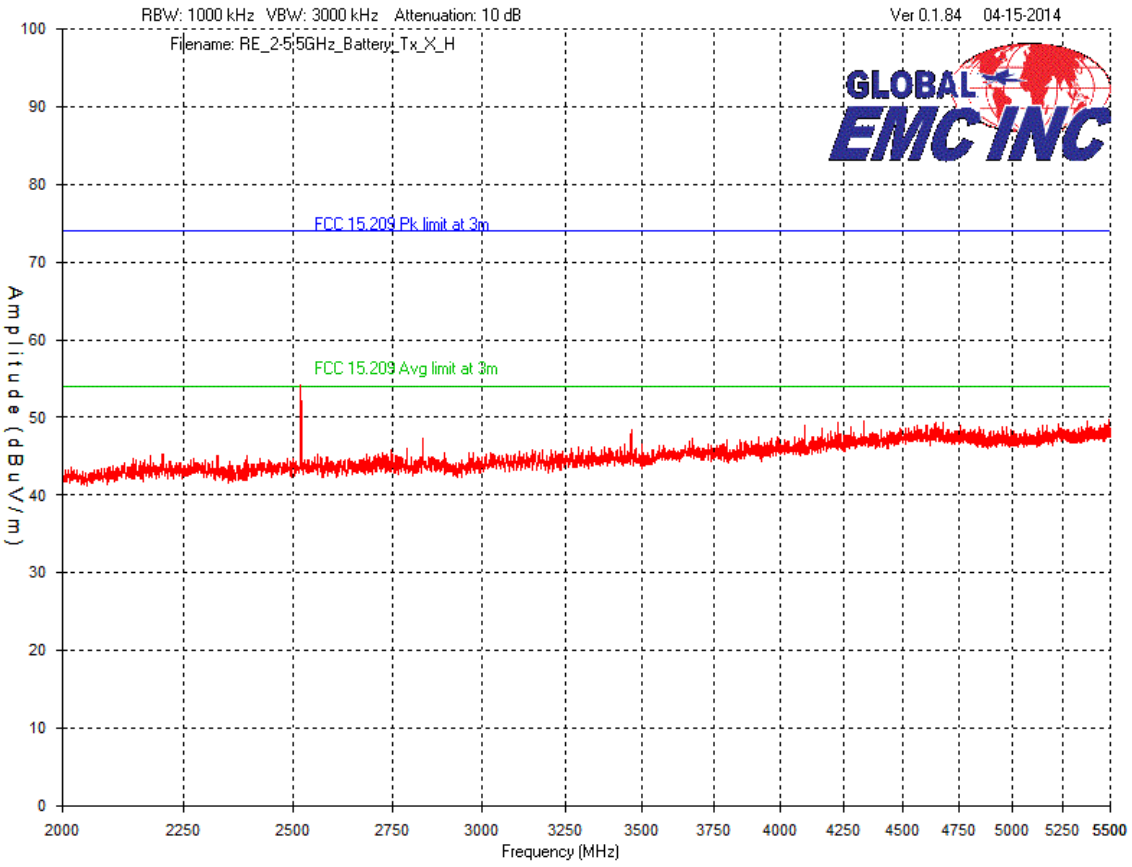
Horizontal – Peak Emissions Graph
30MHz – 1GHz



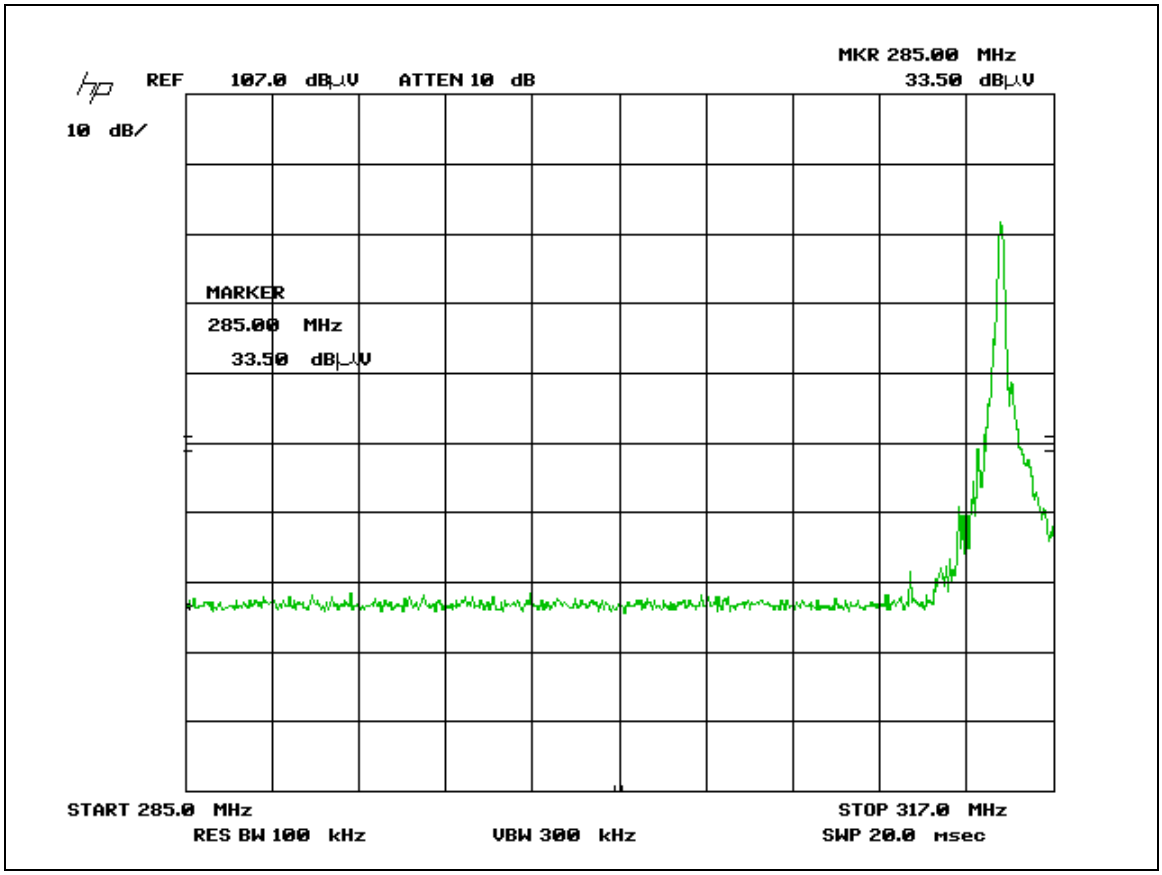
Horizontal – Peak Emissions Graph
1GHz – 2GHz



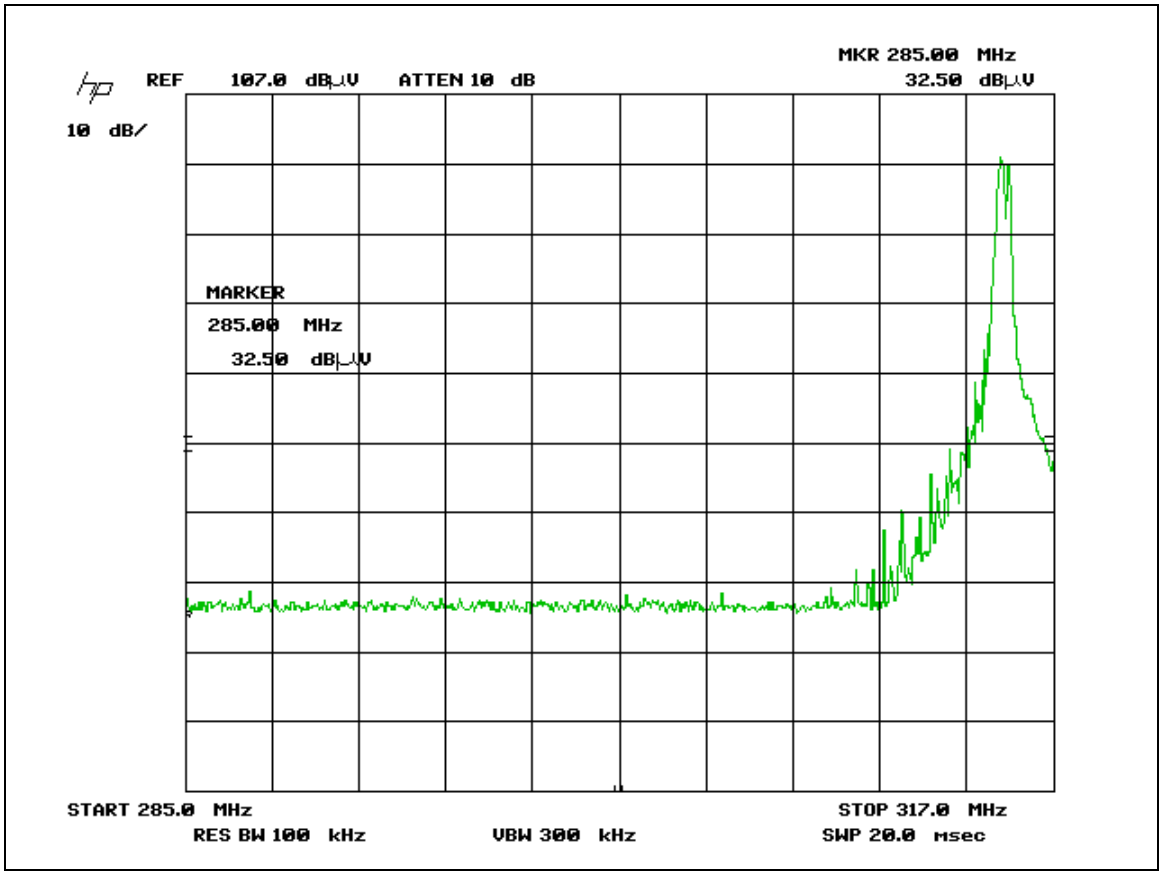
Horizontal – Peak Emissions Graph
2GHz – 5.5GHz



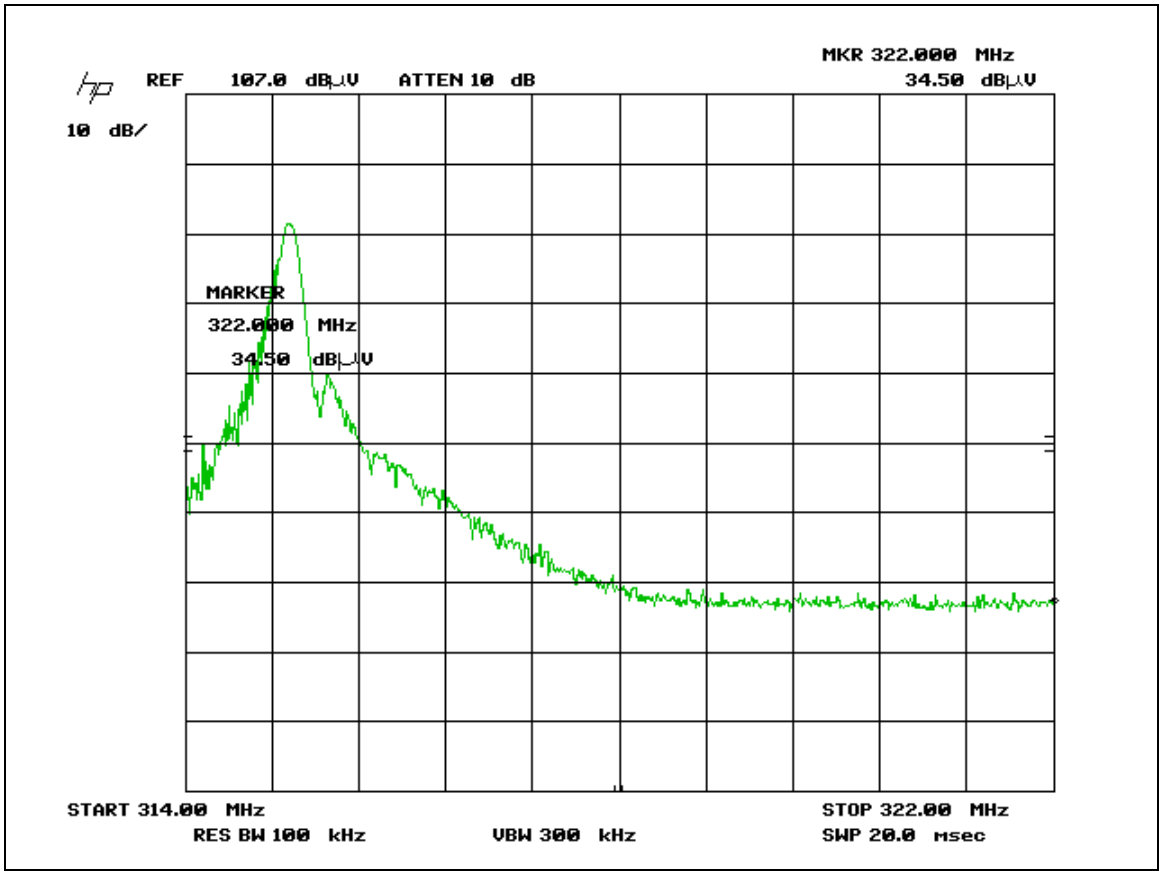
Vertical – Peak Emissions Graph
Restricted Band edge at 285 MHz



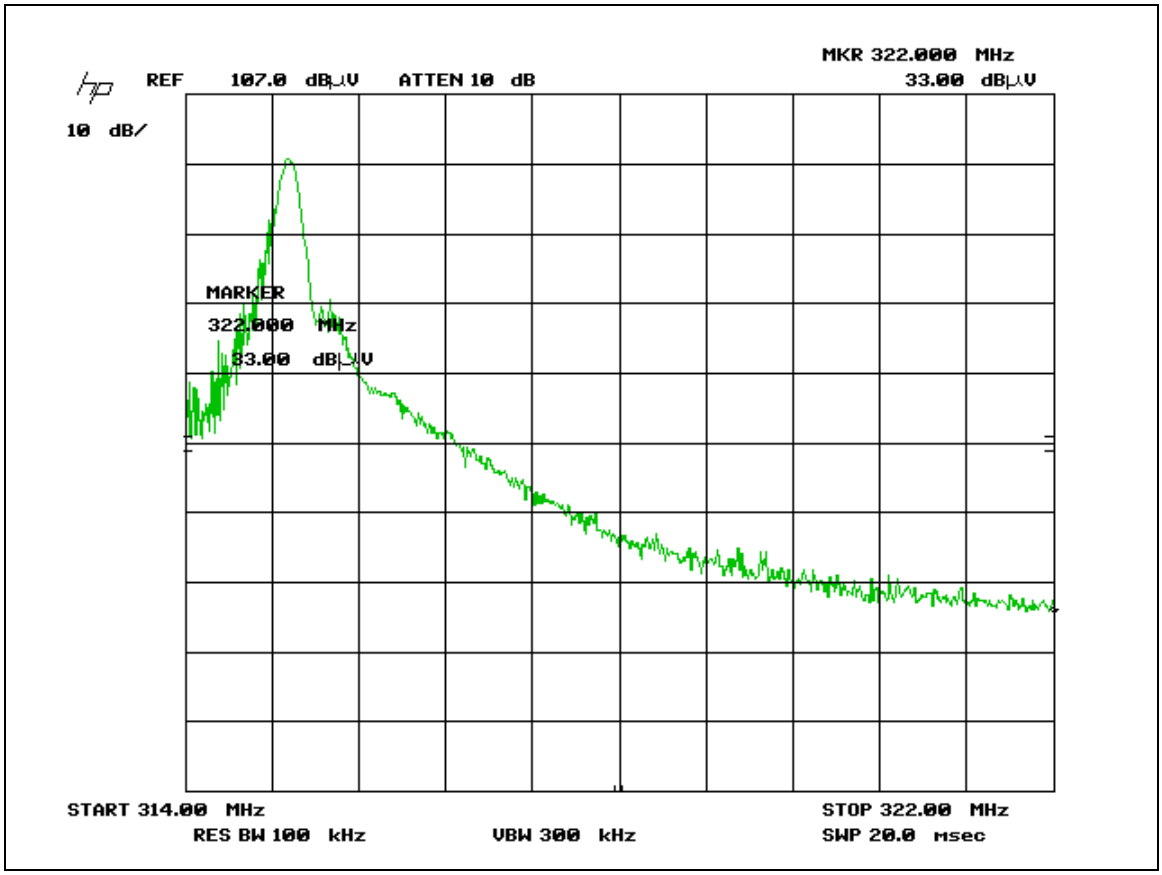
Horizontal – Peak Emissions Graph
Restricted Band edge at 285 MHz



Vertical – Peak Emissions Graph
Restricted Band edge at 322 MHz



Horizontal – Peak Emissions Graph
Restricted Band edge at 322 MHz



Final Measurements

Spurious Emissions Table

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/ Vert)	Raw signal dB(µV)	Antenna factor dB	Attenuator dB	Cable loss dB + Pre-selector	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
629.964	Peak	Horz	72.0	21.0	10.0	1.9	-29.8	75.1	75.6	0.5	PASS
629.964	Avg	Horz	46.0	21.0	10.0	1.9	-29.8	49.1	55.6	6.5	PASS
629.966	Peak	Vert	70.1	19.4	10.0	1.9	-29.8	71.6	75.6	4.0	PASS
629.966	Avg	Vert	43.6	19.4	10.0	1.9	-29.8	45.1	55.6	10.5	PASS
944.942	Peak	Horz	61.1	24.0	10.0	2.4	-29.8	67.7	75.6	7.9	PASS
944.942	Avg	Horz	39.2	24.0	10.0	2.4	-29.8	45.8	55.6	9.8	PASS
944.613	Peak	Vert	59.2	22.9	10.0	2.4	-29.8	64.7	75.6	10.9	PASS
944.613	Avg	Vert	36.3	22.9	10.0	2.4	-29.8	41.8	55.6	13.8	PASS
931.615	Peak	Horz	42.9	24.0	10.0	2.3	-29.9	49.3	75.6	26.3	PASS
931.615	Avg	Horz	28.1	24.0	10.0	2.3	-29.9	34.5	55.6	21.1	PASS
931.518	Peak	Vert	41.3	23.0	10.0	2.3	-29.9	46.7	75.6	28.9	PASS
931.518	Avg	Vert	34.4	23.0	10.0	2.3	-29.9	39.8	55.6	15.8	PASS
1258.67	Peak	Horz	69.5	24.5	0.0	2.8	-36.7	60.1	74.0	13.9	PASS
1258.67	Avg	Horz	43.1	24.5	0.0	2.8	-36.7	33.7	54.0	20.3	PASS
1258.33	Peak	Vert	67.7	24.5	0.0	2.8	-36.7	60.1	74.0	13.9	PASS
1258.33	Avg	Vert	42.8	24.5	0.0	2.8	-36.7	33.4	54.0	20.6	PASS
1574.00	Peak	Horz	76.0	27.7	0.0	3.1	-36.4	70.4	74.0	3.6	PASS
1574.00	Avg	Horz	44.4	27.7	0.0	3.1	-36.4	38.8	54.0	15.2	PASS
1574.00	Peak	Vert	67.9	27.7	0.0	3.1	-36.4	62.3	74.0	11.7	PASS
1574.00	Avg	Vert	43.7	27.7	0.0	3.1	-36.4	38.1	54.0	15.9	PASS
1889.00	Peak	Horz	74.1	28.1	0.0	3.4	-36.3	69.3	74.0	4.7	PASS
1889.00	Avg	Horz	41.1	28.1	0.0	3.4	-36.3	36.3	54.0	17.7	PASS
1889.00	Peak	Vert	73.7	28.1	0.0	3.4	-36.3	68.9	74.0	5.1	PASS
1889.00	Avg	Vert	39.7	28.1	0.0	3.4	-36.3	34.9	54.0	19.1	PASS

Restricted Band Edge Emissions Table

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/ Vert)	Raw signal dB(µV)	Antenna factor dB	Attenuator dB	Cable loss dB + Pre-selector	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
285	Peak	Horz	32.5	14.3	10	1.3	-30.3	27.8	46.4	18.6	PASS
285	Peak	Vert	33.5	14.0	10	1.4	-30.3	28.6	46.4	17.8	PASS
322	Peak	Horz	33.0	14.4	10	1.4	-30.3	28.5	46.4	17.9	PASS
322	Peak	Vert	34.5	14.2	10	1.4	-30.3	29.8	46.4	16.6	PASS

Notes:
Peak readings at the band edges are under the tighter quasi-peak limits of 15.209 as required by 15.231(b)(1). The EUT passes requirements at the band edges.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Jan 22, 2013	Jan 22, 2015	GEMC 141
Quasi-Peak Adapter	85650A	HP	Jan 22, 2013	Jan 22, 2015	GEMC 7
BiLog Antenna	3142-C	ETS	Aug 28, 2012	Aug 28, 2014	GEMC 8
Loop Antenna 30Hz – 1MHz	EM 6871	Electro-Metrics	Feb 05, 2013	Feb 05, 2015	GEMC 70
Loop Antenna 100kHz – 30MHz	EM 6872	Electro-Metrics	Feb 05, 2013	Feb 05, 2015	GEMC 71
Q-Par Horn 1.5GHz -18 GHz	6878/24	Q-par	Aug 23, 2012	Aug 23, 2014	GEMC 6365
Loop Antenna 30Hz – 1MHz	EM 6871	Electro-Metrics	Feb 05, 2013	Feb 05, 2015	GEMC 70
Chase Preamp 9kHz - 1 GHz	CPA9231A	Chase	Aug 29, 2012	Aug 29, 2014	GEMC 6403
Pre-amp 1-26GHz	HP 8449B	HP	Aug 22, 2012	Aug 22, 2014	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

20 dB Bandwidth of Periodically Operated Transmitters

Purpose

The purpose of this test is to ensure that the bandwidth occupied does not exceed a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently narrow and not occupying excessive spectrum. This also helps prevent accidental interference of data by ensuring adequate data separation to distinguish the reception of the intended information by enabling the receiver to have a relatively narrow band response tuned to the transmitter's frequency.

Limits

The Limit is as specified in FCC Part 15 and RSS 210.

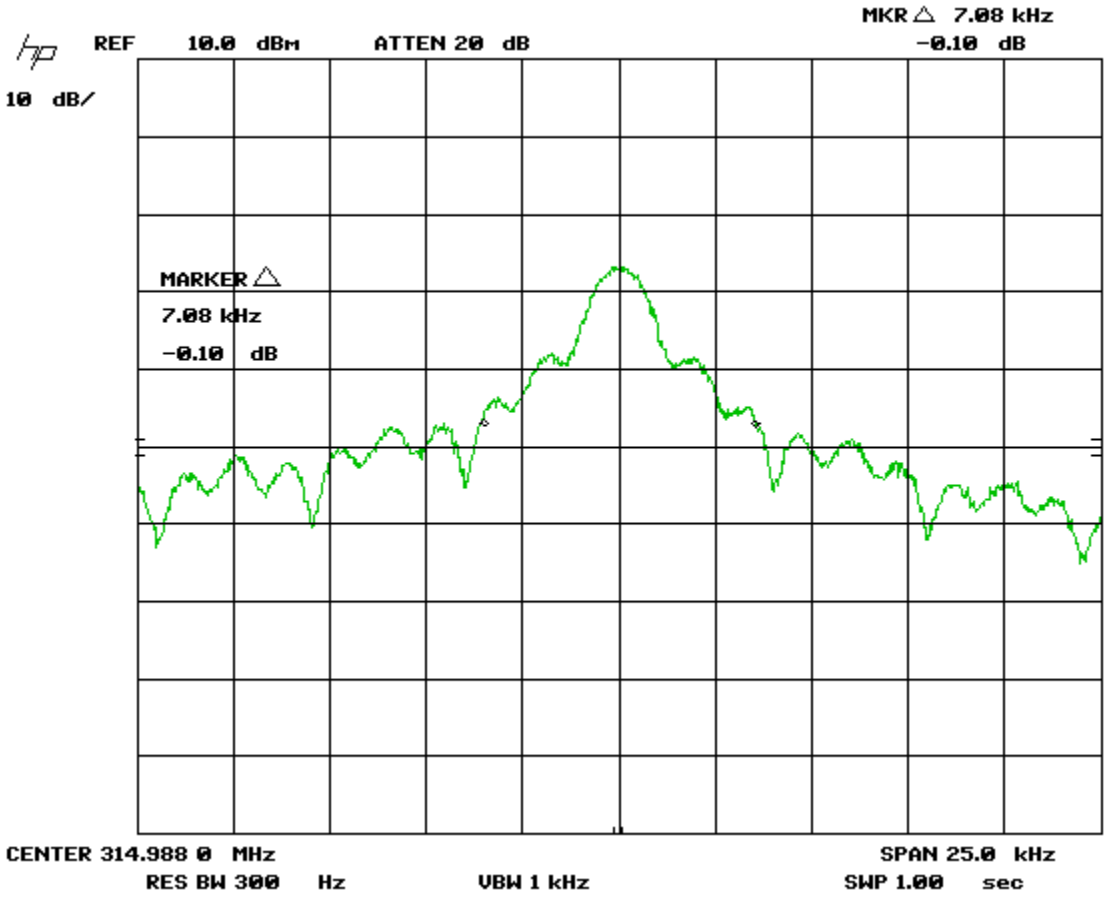
For periodic transmitters below 900 MHz, this should not exceed 0.25% of the fundamental frequency. For periodic transmitters above 900 MHz, this should not exceed 0.5 % of the fundamental frequency. This should be measured with a RBW equal to approximately 1% of the 20 dB BW of the signal and a VBW more than the RBW.

Results

The EUT passed. The 20 dB bandwidth measured was 7.08 kHz and the requirement was that, this be less than 787.5 kHz.

Graph(s)

The graph shown below shows modulated waveform during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is approximately 1% of the 20 dB BW during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute. The markers are set at approximately 20dB below the peak.



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Jan 22, 2013	Jan 22, 2015	GEMC 141
Quasi-Peak Adapter	85650A	HP	Jan 22, 2013	Jan 22, 2015	GEMC 7
BiLog Antenna	3142-C	ETS	Aug 28, 2012	Aug 28, 2014	GEMC 8
Chase Preamp 9kHz - 1 GHz	CPA9231A	Chase	Aug 29, 2012	Aug 29, 2014	GEMC 6403
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Appendix A – EUT Summary

General EUT Description

Client Details	
Organization / Address	Lamanna Co.
Contact	Ryan Lamanna
Phone	647-821-2143
Email	lostandfoundproduct@gmail.com
EUT (Equipment Under Test) Details	
EUT Name (for report title)	Lost & Found
EUT Model / SN (if known)	01 / 009999859
EUT revision	1.0
Software version	1.0
Equipment category	Transmitter
EUT is powered using	Internal coil cell battery (2 Nos)
Input voltage range(s) (V)	Nominal 6.0V
Rated input current (A)	0.15A
Frequency range(s) (Hz)	DC
Transmits RF energy? (describe)	Yes at carrier frequency of 315MHz
Basic EUT functionality description	Device to locate frequently lost items
Modes of operation	Single channel Sleep or Transmit
Step by step instructions for setup and operation	-Insert the CR2032 coin cell battery into battery holder. -Turn dial on transmitter to selected receiver number. -Press button on transmitter for 3 seconds to active corresponding receiver beeping. -Press button on receiver to stop beeping.
Frequency of all clocks present in EUT	Crystal Oscillator: 315MHz
I/O cable description Specify length and type	None
Available connectors on EUT	None
Peripherals required to exercise EUT Ex. Signal generator	None

Note: The EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

Appendix B – EUT & Test Setup Photos

EUT exterior: View 1

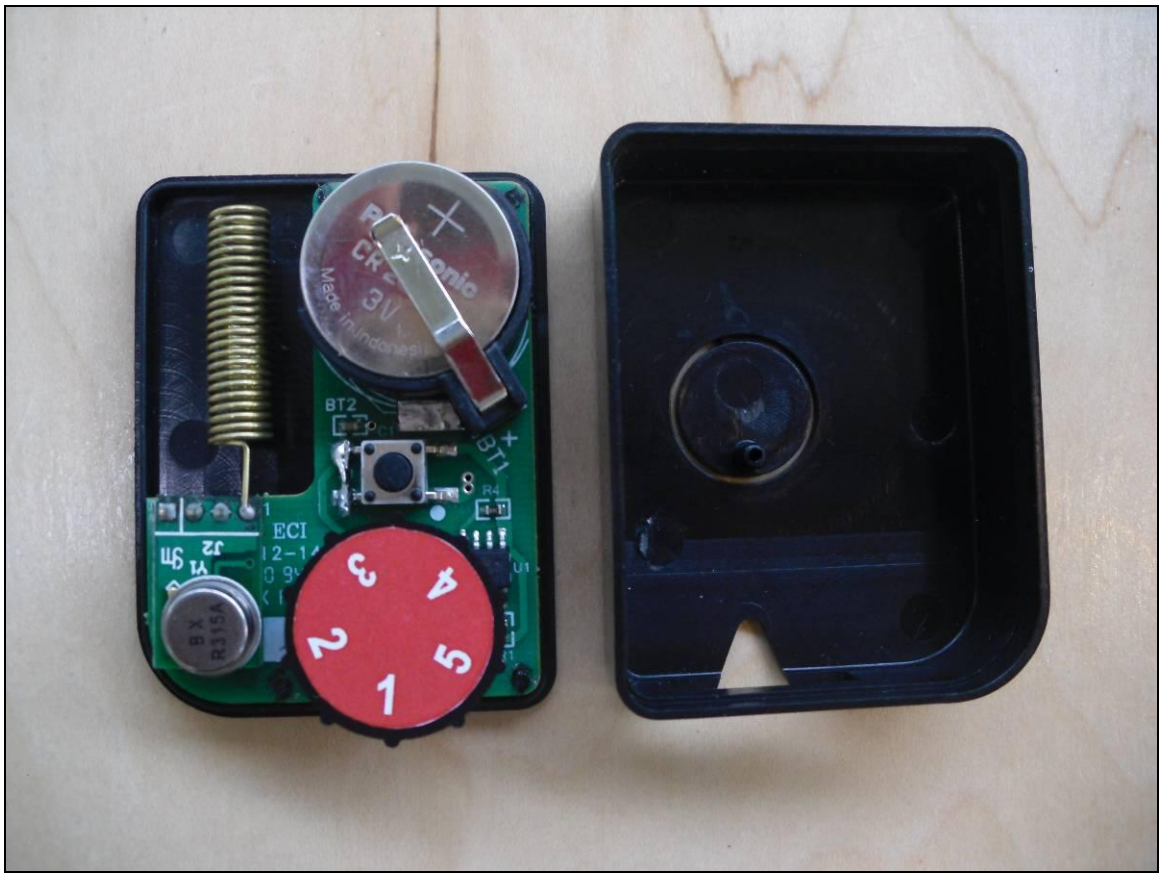
EUT exterior: View 2

EUT exterior: View 3

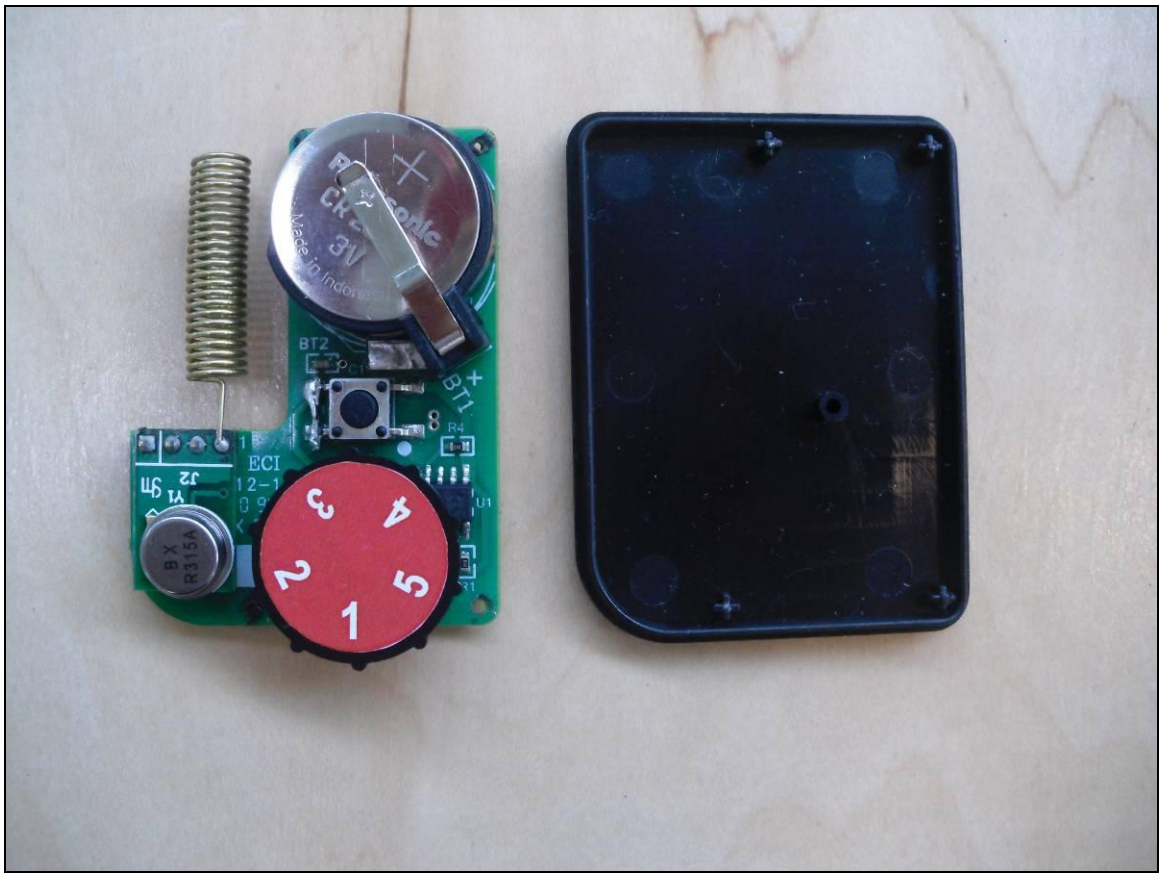
EUT exterior: View 4

EUT exterior: View 5

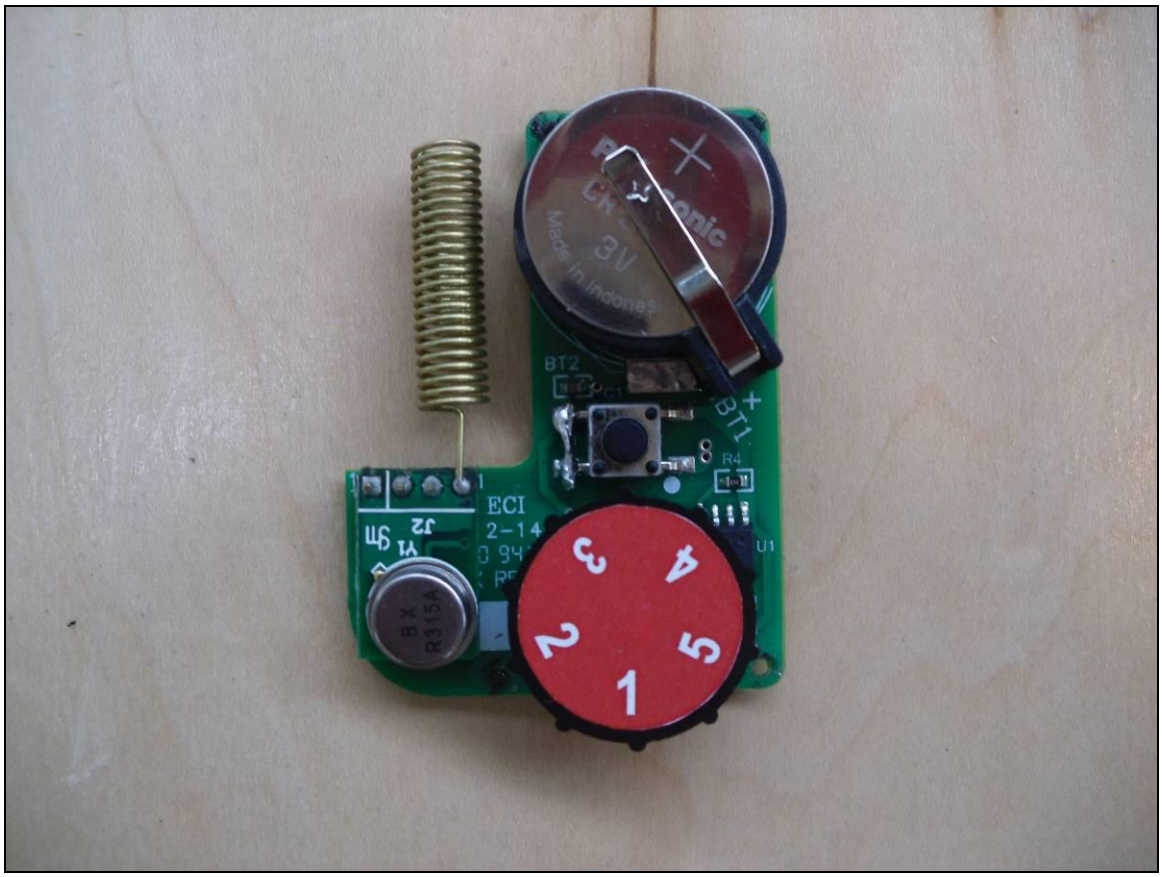
EUT exterior with receiver tags



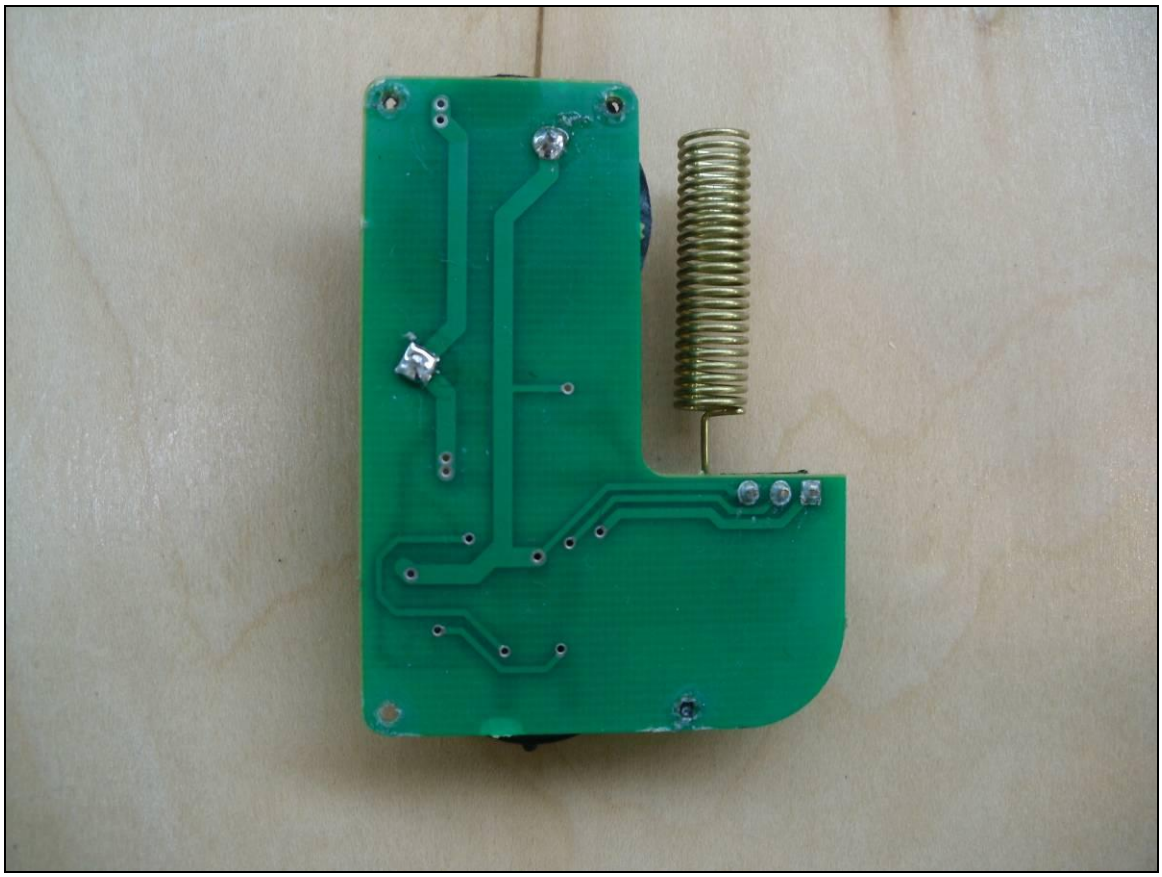
EUT interior: Enclosure opened, view 1



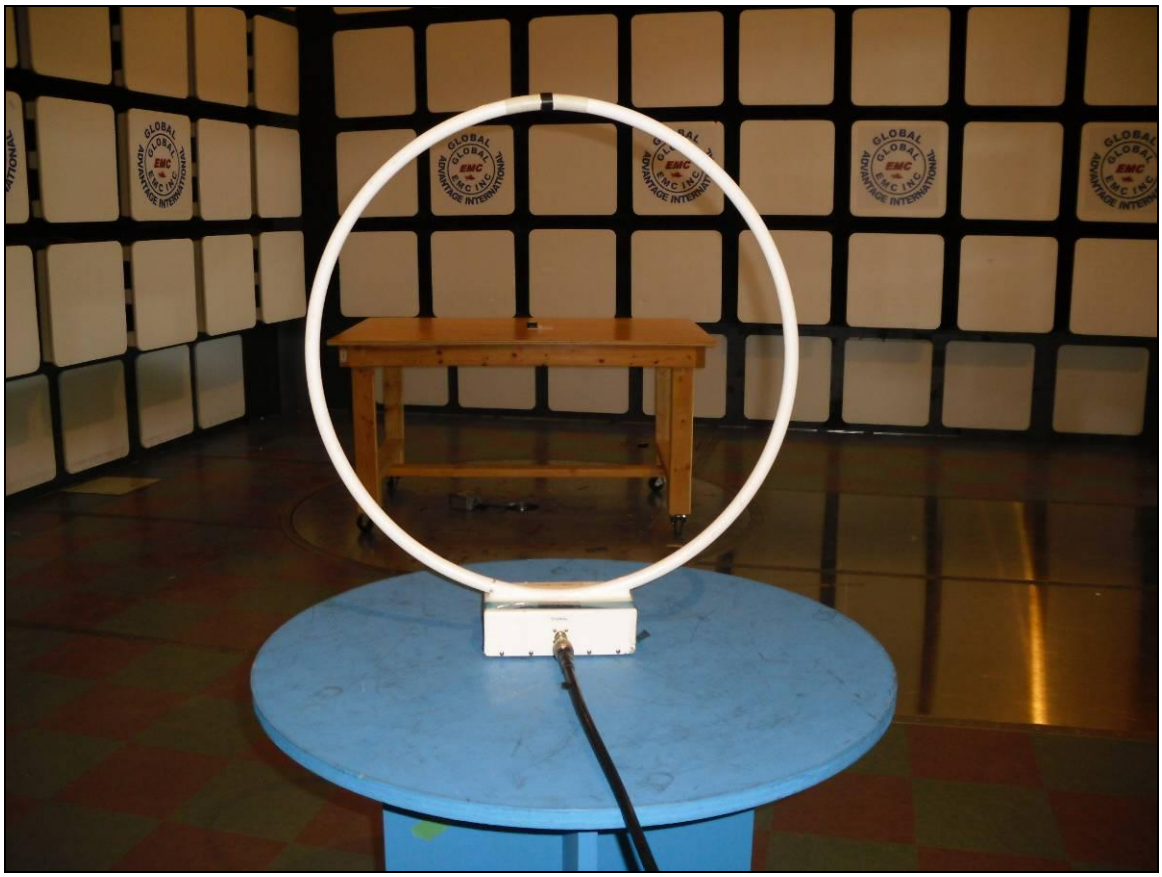
EUT interior: Enclosure opened, view 2



EUT interior: PCB close-up side 1



EUT interior: PCB close-up side 2



Radiated emissions testing (less than 30MHz)

Radiated emissions testing (greater than 30MHz)

Radiated emissions testing (greater than 1GHz)