Global EMC Inc. Labs

EMC & RF Test Report

As per

RSS 210 Issue 8:2010

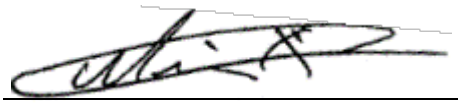
&

FCC Part 15 Subpart C:2013

Unlicensed Intentional Radiators

on the

TVTXP916A04



Min Xie
Project Engineer
11 Gordon Collins Dr,
Gormley, ON, L0H 1G0 Canada
Ph: (905) 883-8189

Testing produced for

TELECO AUTOMATION

See Appendix A for full customer & EUT details.

Industry Canada

LAB REGISTRATION #6844A-3

FCC REGISTRATION #377448

R-4023
C-4498

ACCREDITED

Testing Laboratory Certificate #2555.01

Table of Contents

Report Scope

This report addresses the EMC verification testing and test results of the Teleco Automation Inc's TVTXP916A04, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 210 Issue 8:2010
FCC Part 15 Subpart C 15:2013

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.

Summary

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

EUT FCC Certification #, FCC ID:	P59TVTXP916
EUT Industry Canada Certification #, IC:	11242A-TVTXP916
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Min Xie

Client	**Teleco Automation Inc**
Product	TVTXP916A04
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2013

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	N/A See Justification
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.249(a), (c) RSS-210 A2	Power requirement	< 50 mV/m @ 3m	Pass
Overall Result			**PASS**

All tests were performed by Min Xie.

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. Note that ‘PASS’ / ‘FAIL’ grade is independent of any measurement uncertainties. A ‘PASS’ / ‘FAIL’ grade within measurement uncertainty is marked with a ‘*’.

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), the unit uses a PCB antenna and does not have any provision for connection of any other antennas.

For the Restricted Bands of operation, the EUT is designed to only operate between 902 – 928 MHz.

For FCC 15.207 power line conducted emission, this requirement is not applicable as this EUT is a battery power device.

For the scope of this test report the EUT was mounted in three orthogonal axes to maximize emissions. Worst case results are presented.

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	- Code of Federal Regulations – Radio Frequency Devices
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
RSS-GEN	General Requirements and Information for the Certification of Radio Apparatus
RSS 210:2010	- Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power License-Exempt Radiocommunication Devices

Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.5 dB

Document Revision Status

Revision 1 - July 25, 2013
Initial release

Definitions and Acronyms

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

AE – Auxiallary 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 in Toronto, Ontario, Canada. 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 semi-anechoic chamber complies with the requirements of EN55016-2-3:2006, section 7.5 and the site attenuation requirements of EN55016-1-4. This chamber was additionally 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 chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at Global EMC. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at Global EMC. Global EMC Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratories current scope of accreditation listing can be found as listed on the A2LA website. 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)
June-28, 2013	All	MX	21-25ºC	35 - 41%	98 -103kPa

Detailed Test Results Section

Radiated 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.

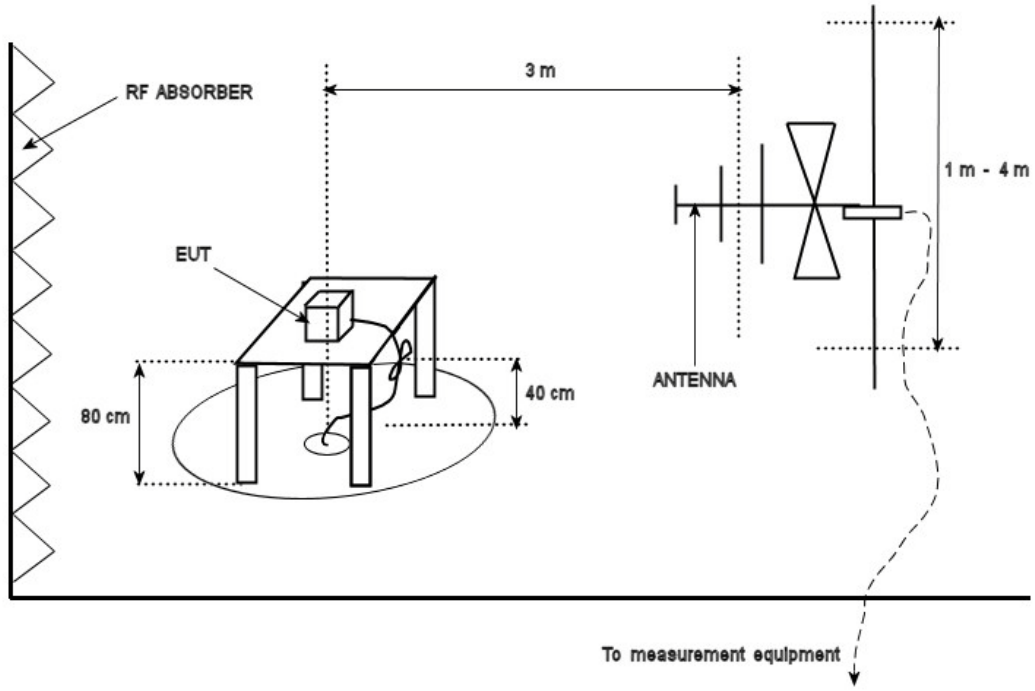
Limit(s) and Method

The method is as defined in ANSI C63.4:2003.
The limits are as defined in FCC Part 15, Section 15.209:

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m[1]
0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m[1]
1.705 MHz – 30 MHz, 30 uV/m at 30 m[1]
30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m[1]) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m[1]) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m[1]) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m[1]) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m[2]) at 3m
Above 1000 MHz, 500 uV/m (74 dBuV/m[3]) at 3m

[1]Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector
[3]Limit is with 1 MHz measurement bandwidth and using a 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.

Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater then 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.

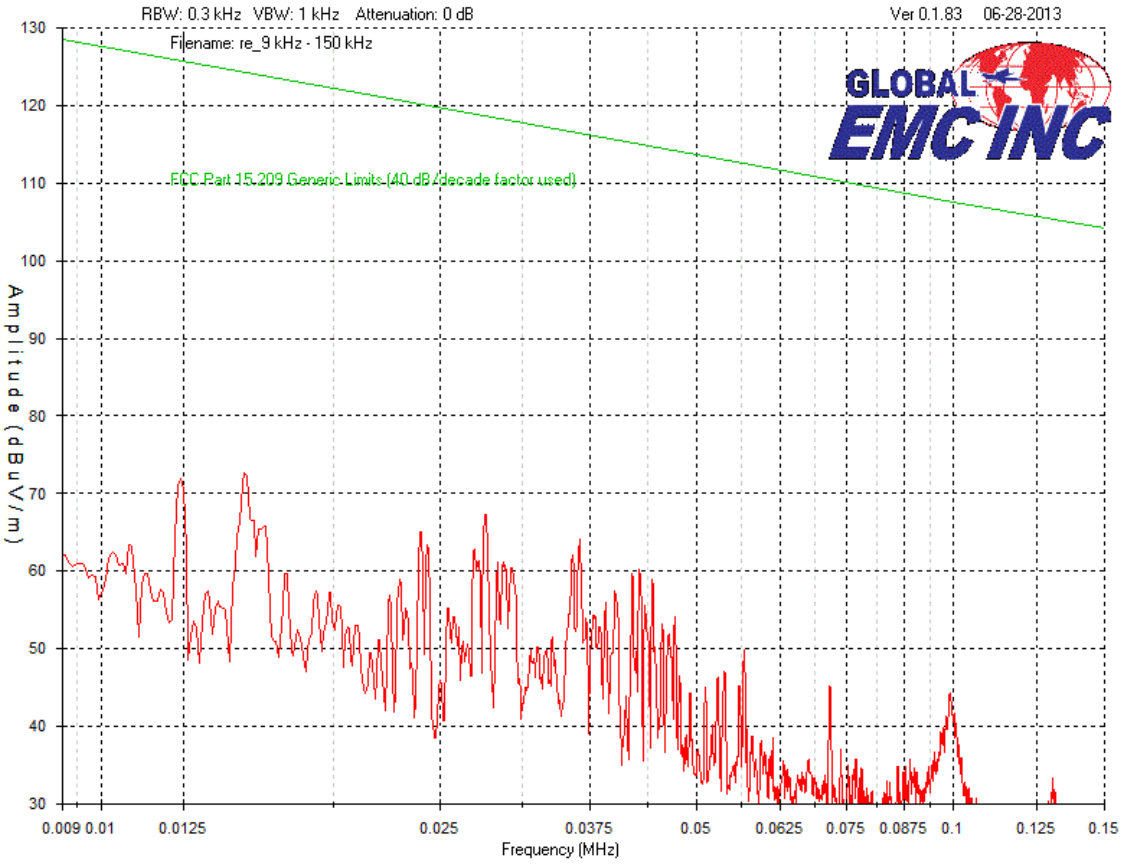
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10^{th} harmonic, a minimum of 9.16 GHz.

Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above

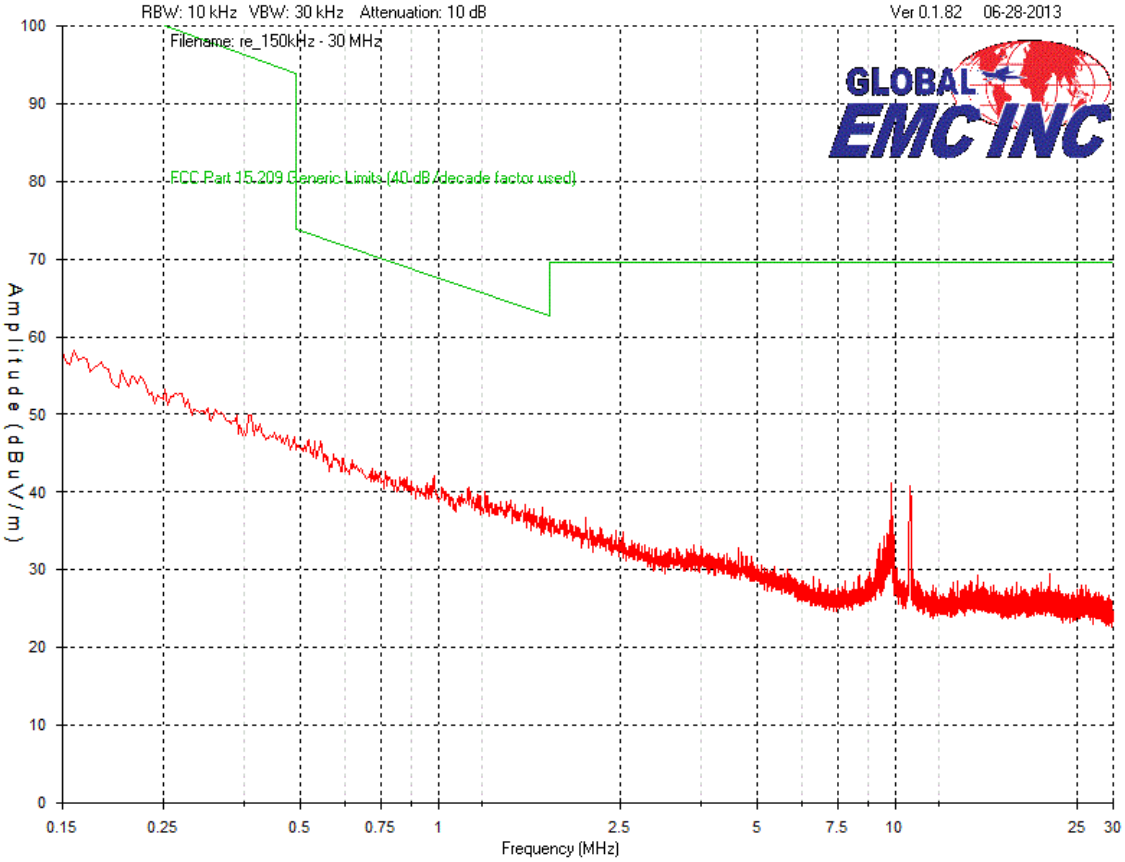
30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

The EUT was mounted in three orthogonal axes to maximize emissions. Worst case results are presented.

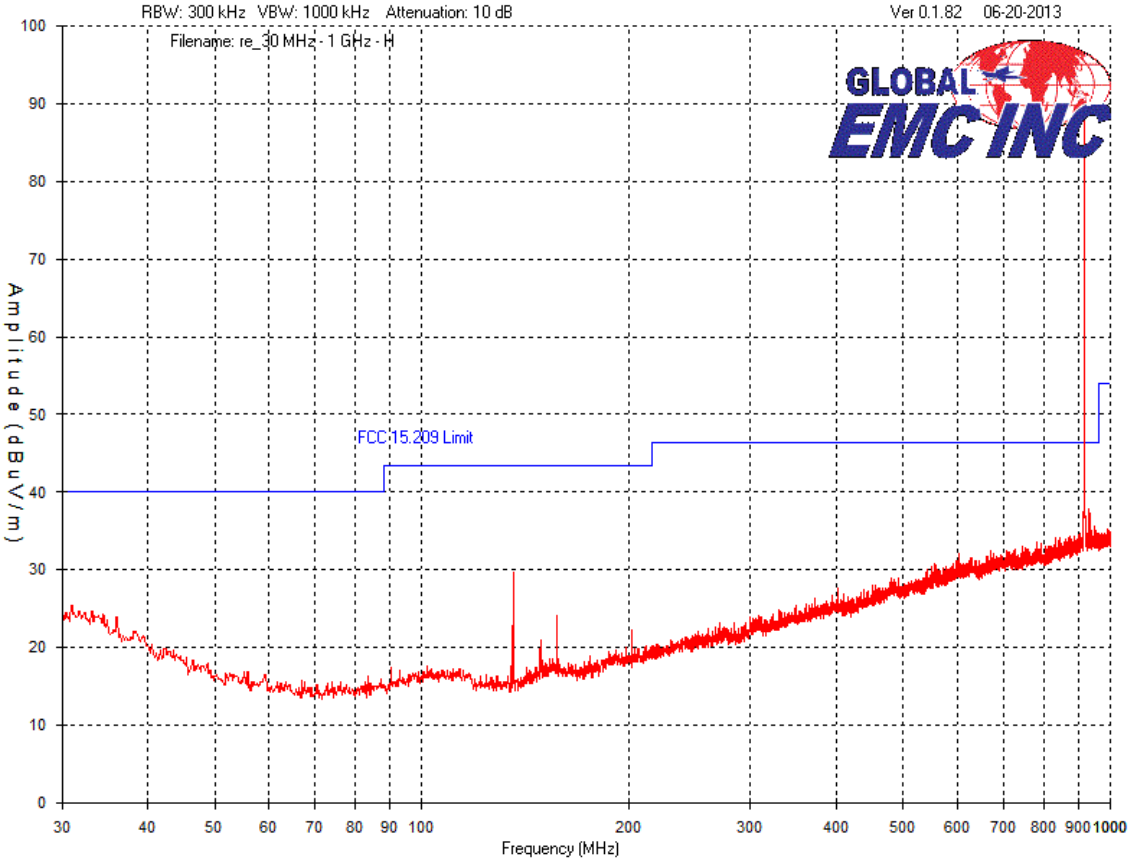
Peak Emissions Graph
9 kHz - 150 kHz



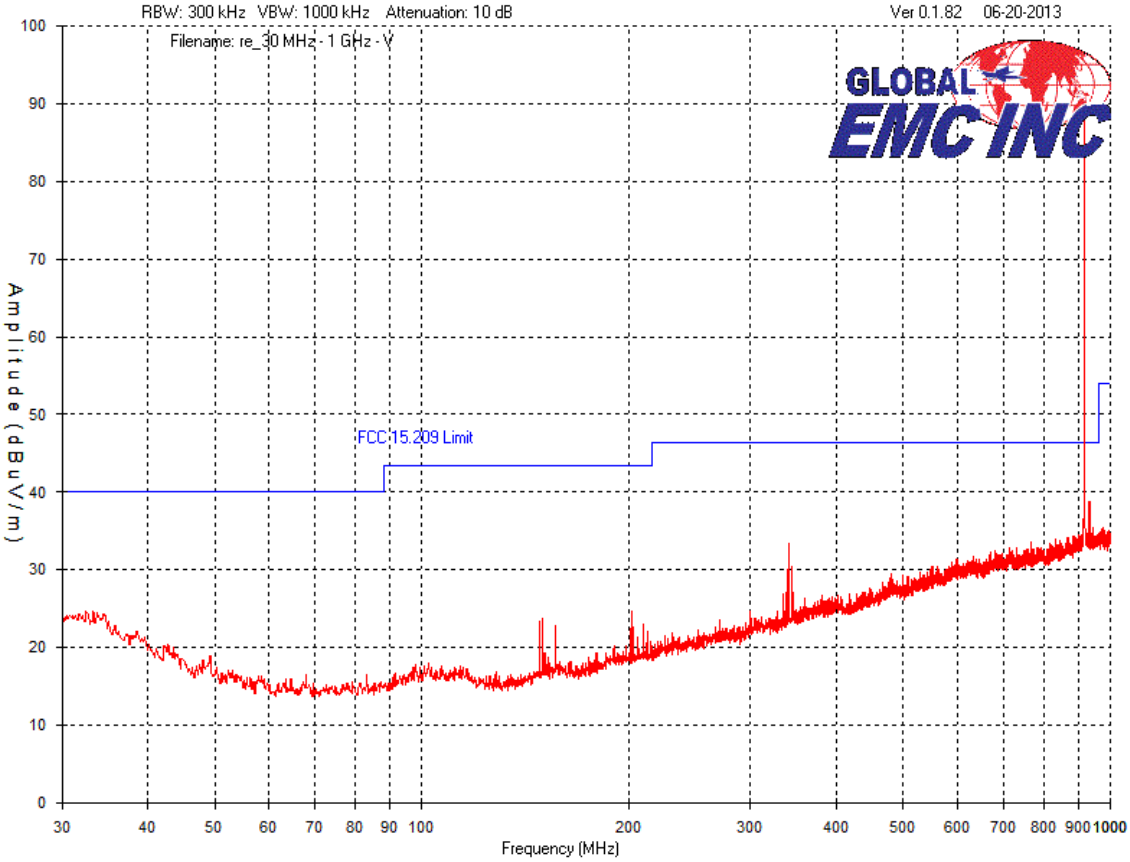
Peak Emission
150 kHz – 30 MHz



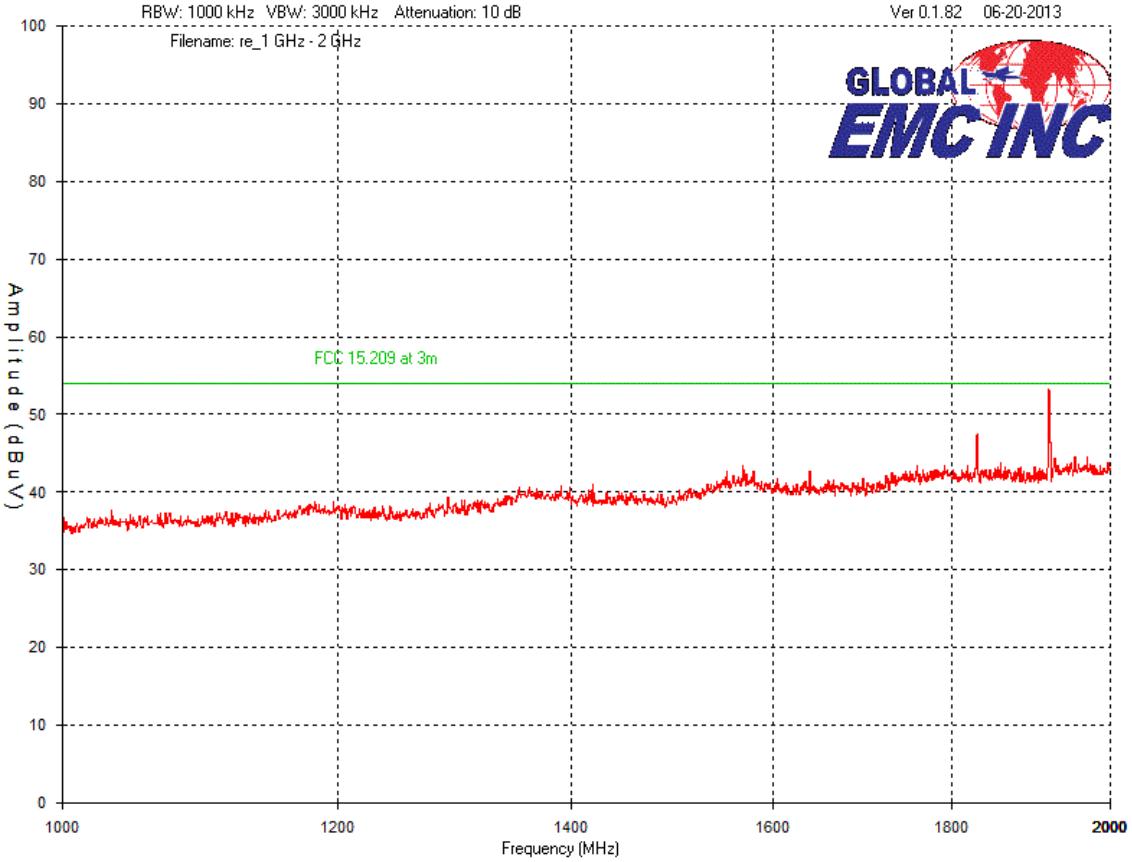
Horizontal – Peak Emissions Graph
30 MHz – 1 GHz



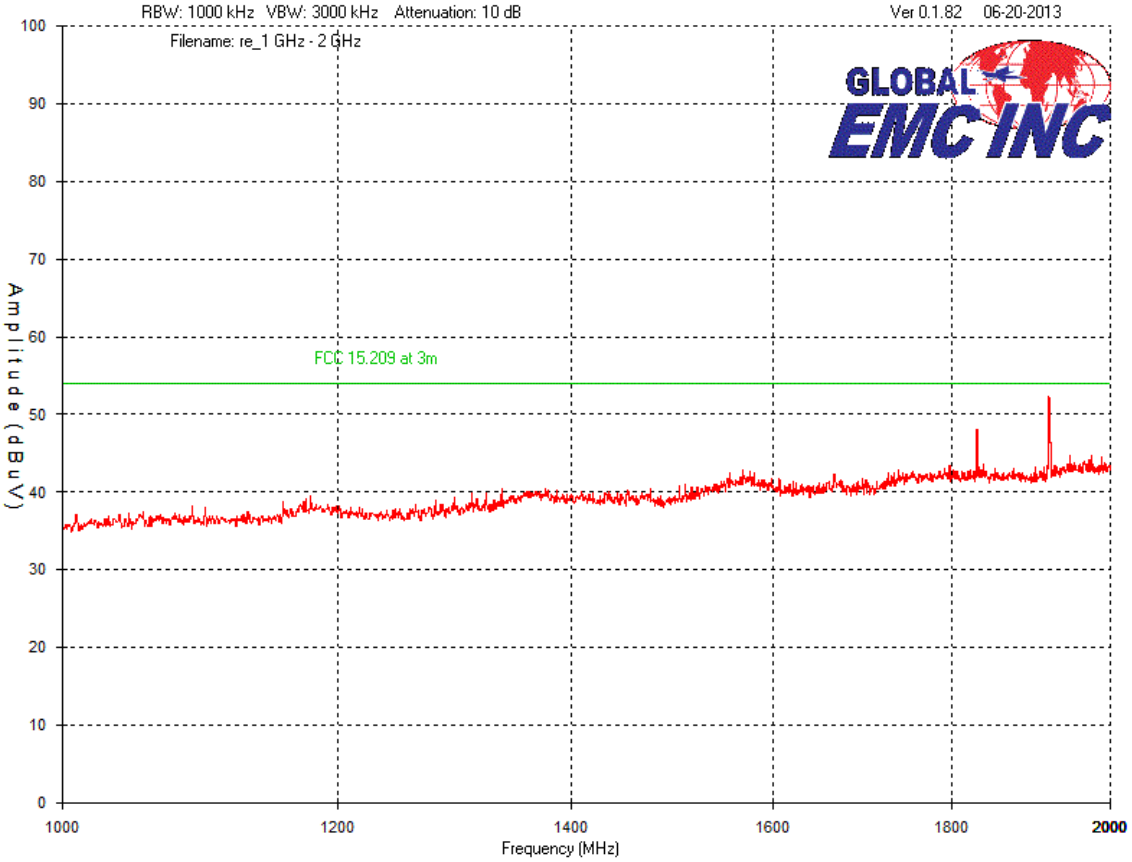
Vertical – Peak Emissions Graph
30 MHz – 1 GHz



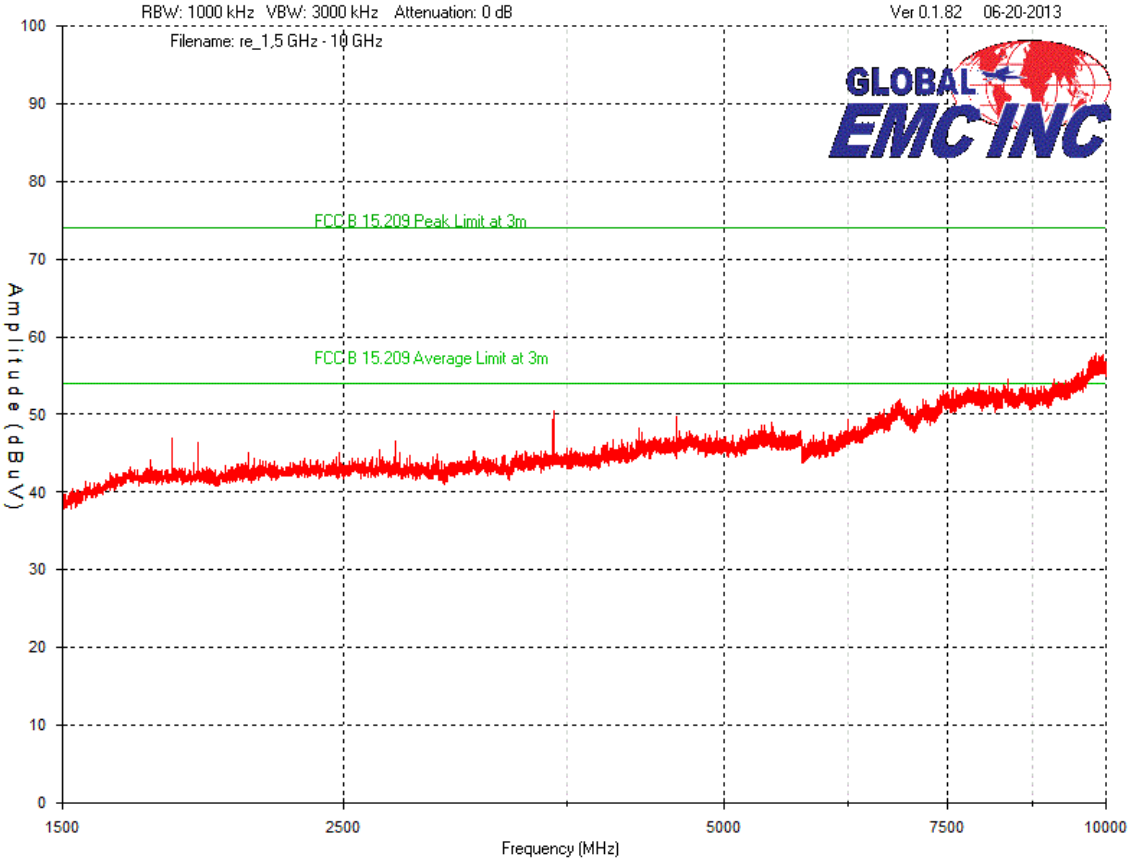
Horizontal – Peak Emissions Graph
1 GHz – 2 GHz



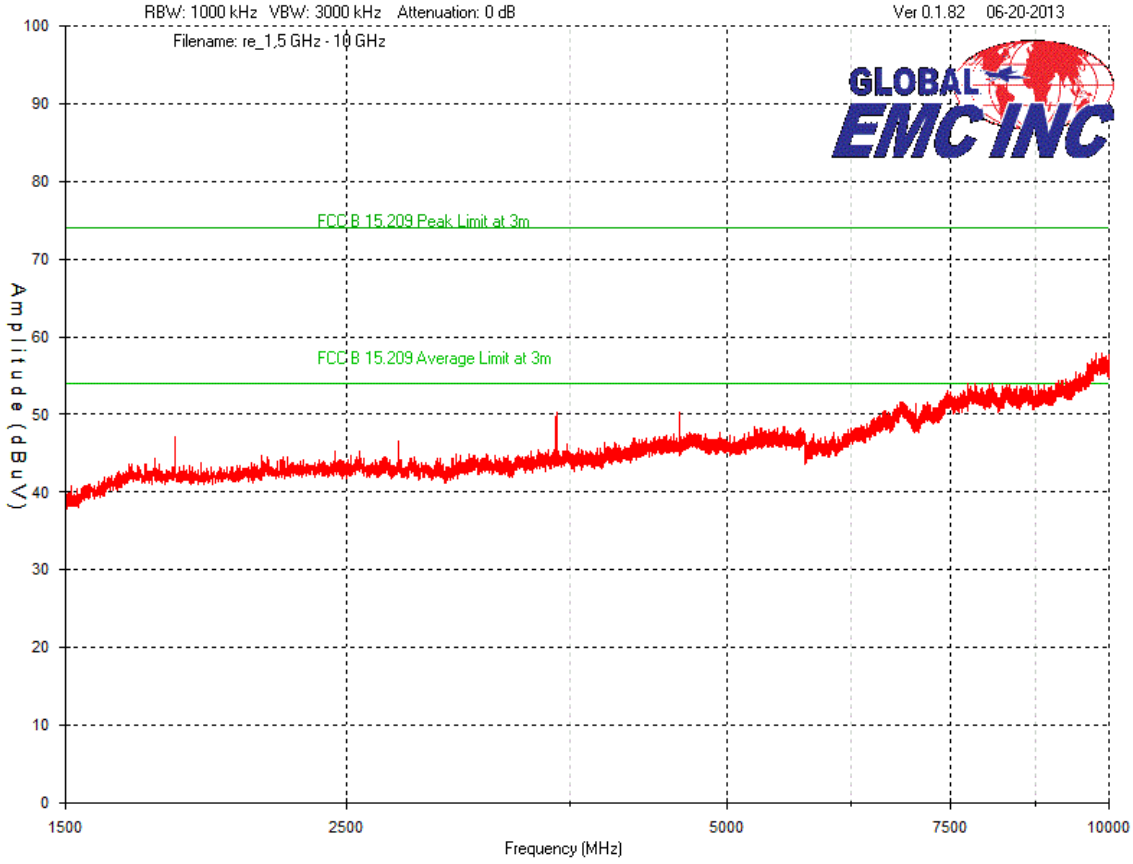
Vertical – Peak Emissions Graph
1 GHz – 2 GHz



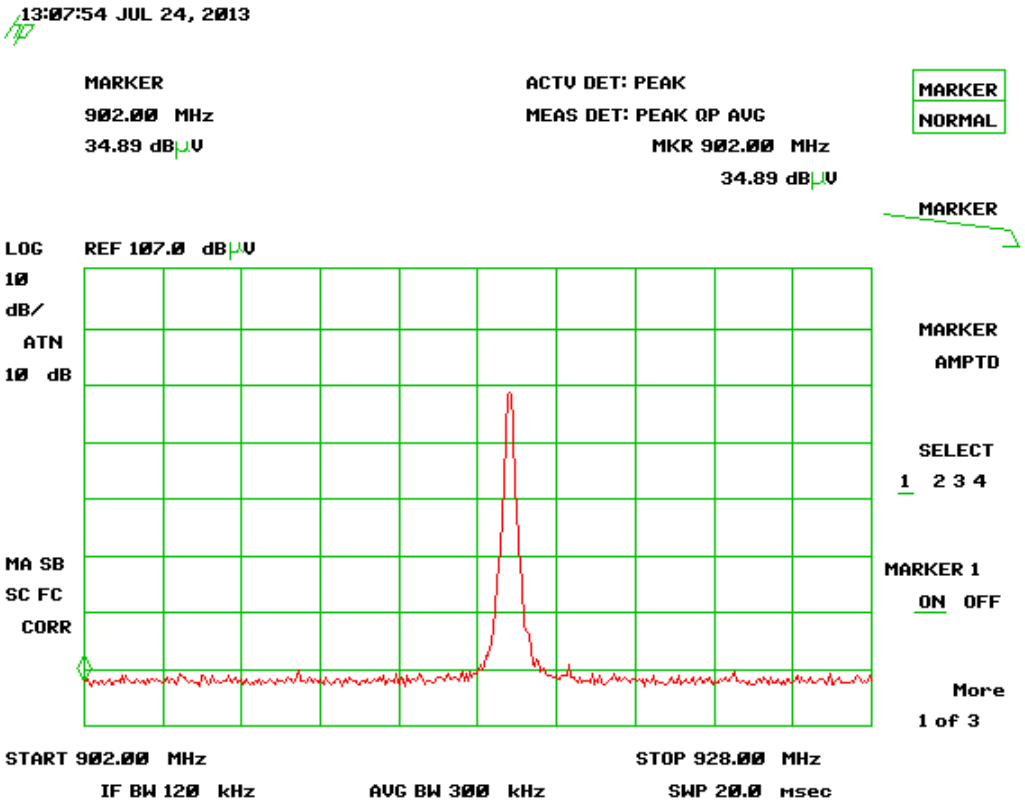
Horizontal – Peak Emissions Graph
1.5 GHz – 10 GHz



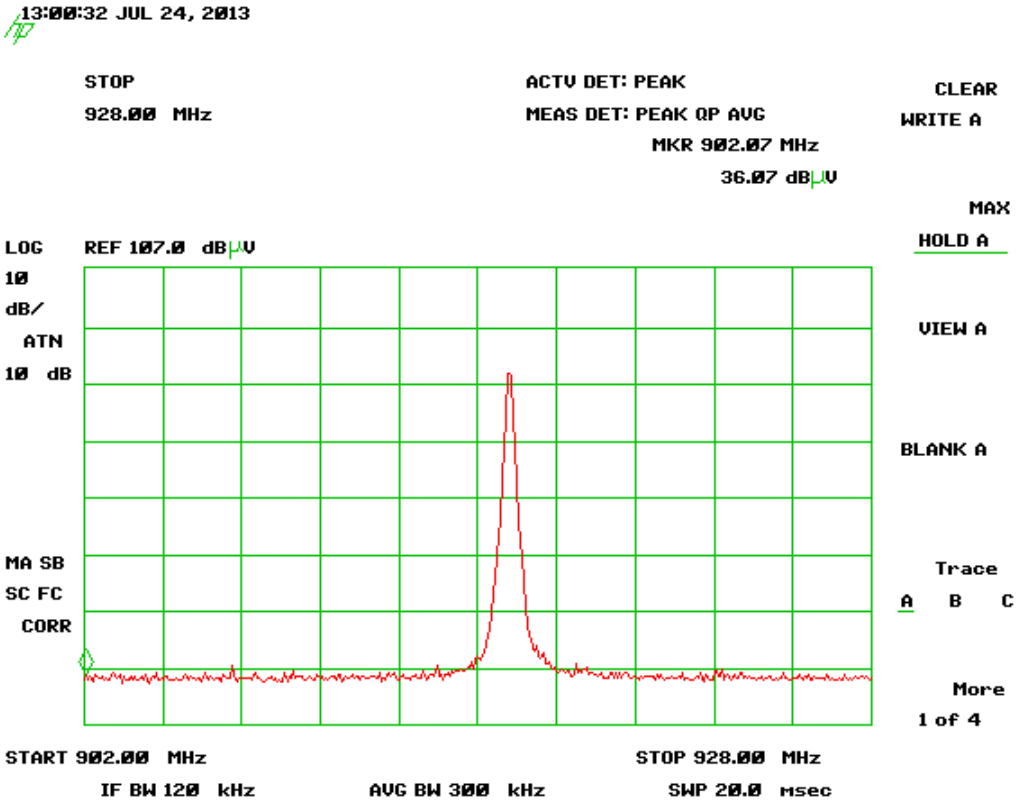
Vertical – Peak Emissions Graph
1.5 GHz – 10 GHz



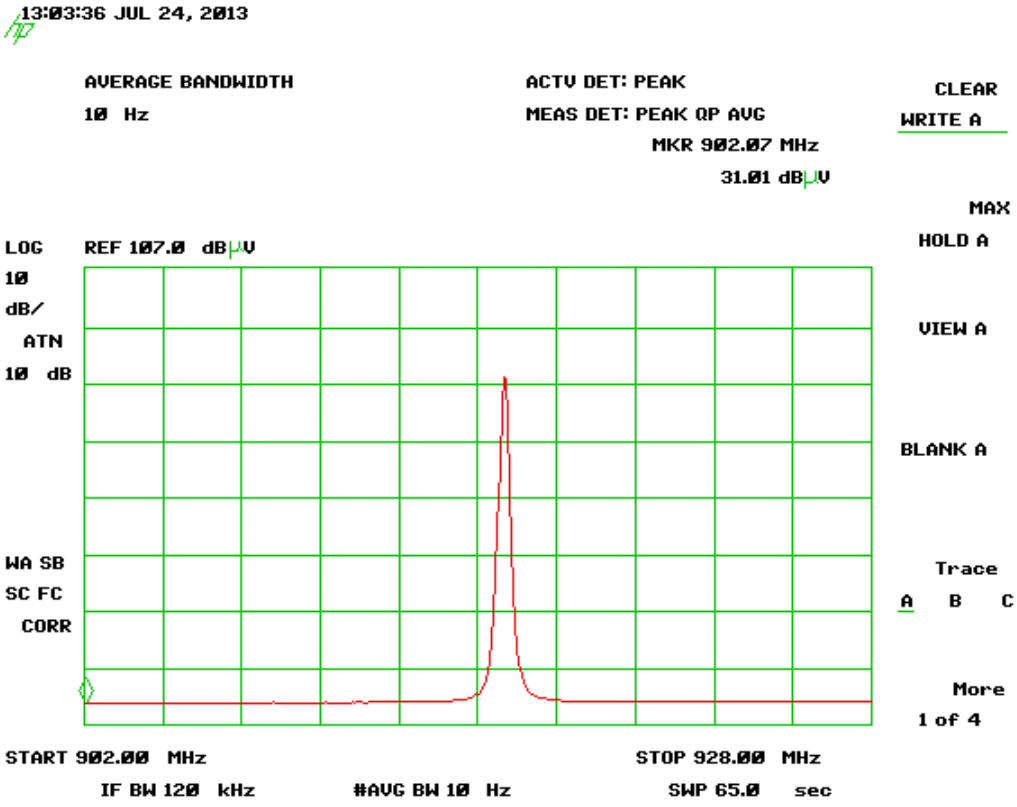
Band Edge – Vertical Peak Emission



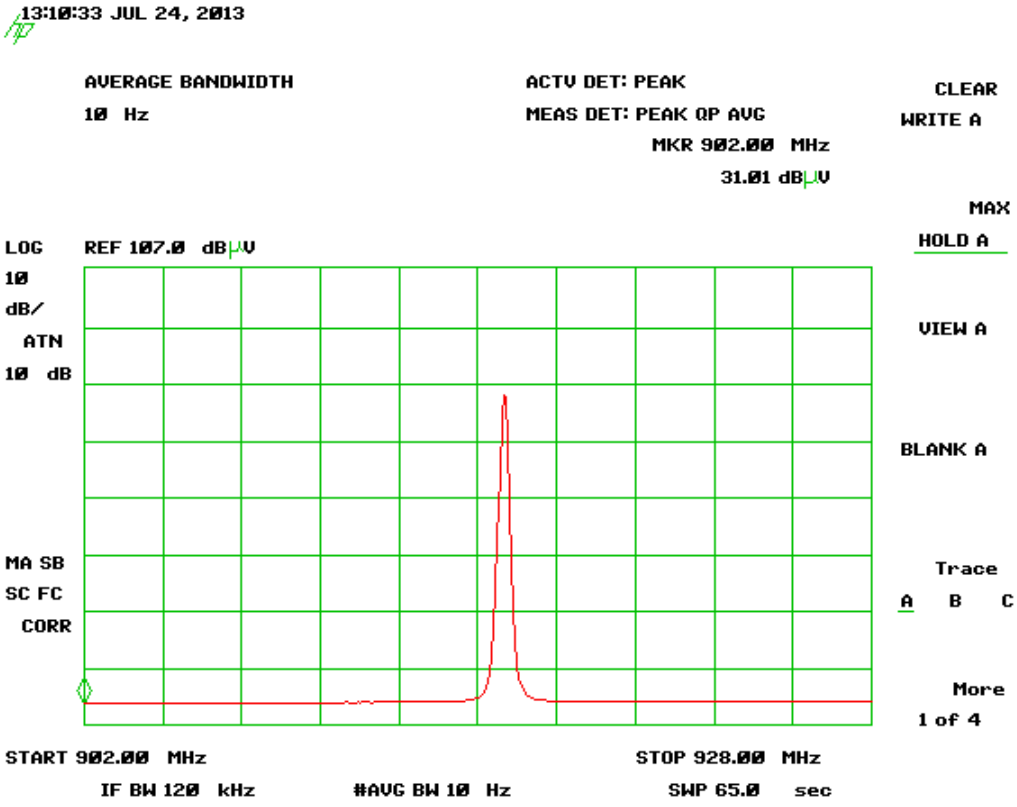
Band Edge – Horizontal Peak Emission



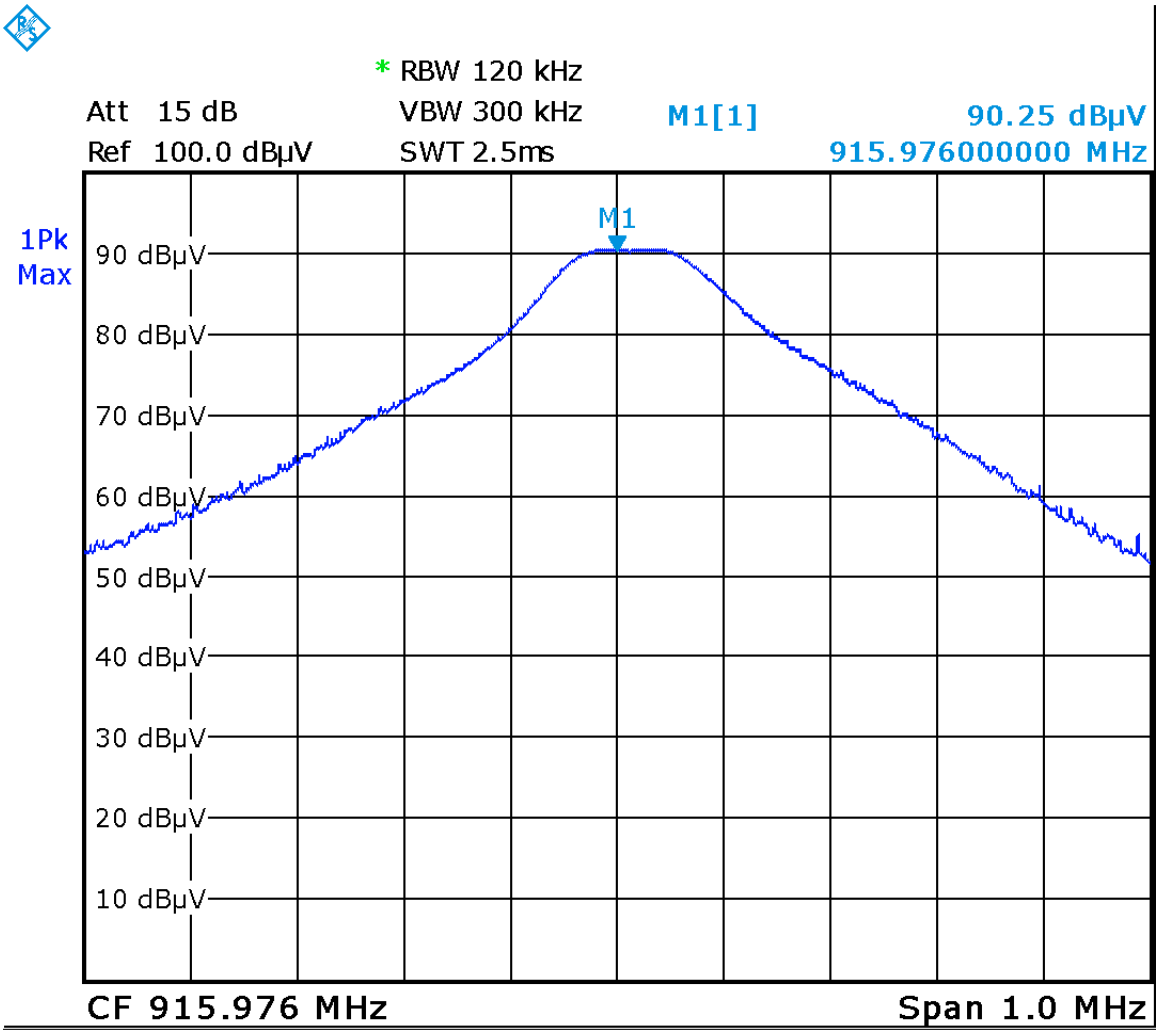
Band Edge – Horizontal Average Emission



Band Edge – Vertical Average Emission

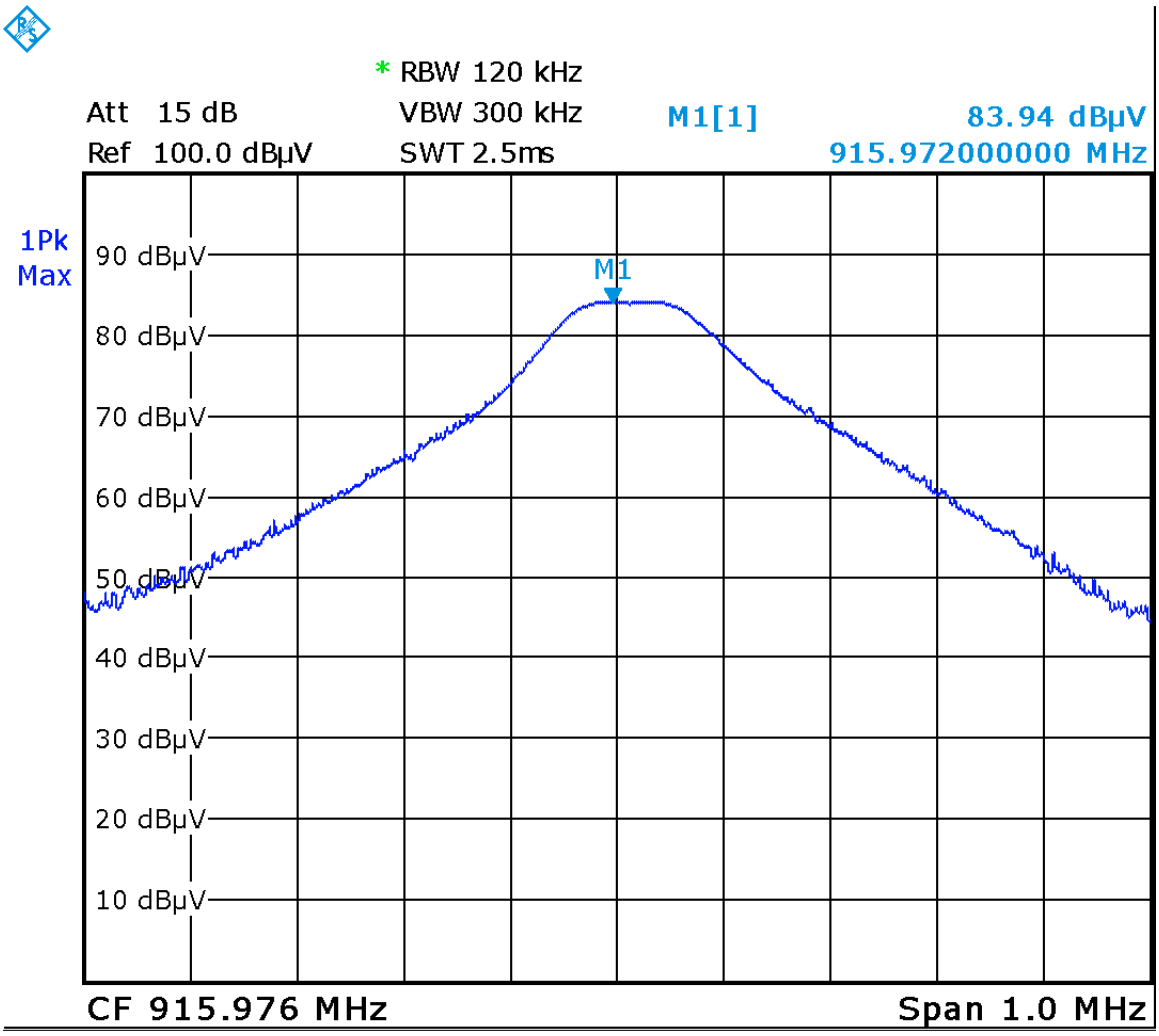


Fundamental – Horizontal Peak Emissions



Date: 20.JUN.2013 16:06:28

Fundamental – Vertical Peak Emissions



Date: 20.JUN.2013 16:25:44

Client	**Teleco Automation Inc**
Product	TVTXP916A04
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2013

Final Measurements

Fundamental, Band Edge, Harmonics and Spurious Emissions

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
916 MHz TCTXP916A04											
916	Peak	Vert	83.9	22.7	2.4	3.0	28.6	83.5	94.0	10.5	PASS
916	Peak	Horz	90.2	23.8	2.4	3.0	28.6	90.9	94.0	3.1	PASS
902	Peak	Vert	36.1	22.7	2.4	3.0	28.6	35.7	74.0	38.3	PASS
902	AVG	Vert	31.0	23.8	2.4	3.0	28.6	31.7	54.0	22.3	PASS
902	Peak	Horz	34.9	22.7	2.4	3.0	28.6	34.5	74.0	39.6	PASS
902	AVG	Horz	31.0	23.8	2.4	3.0	28.6	31.7	54.0	22.3	PASS
928	Peak	Vert	35.2	22.7	2.4	3.0	28.6	34.8	74.0	39.2	PASS
928	AVG	Vert	31.0	23.8	2.4	3.0	28.6	31.7	54.0	22.3	PASS
928	Peak	Horz	36.5	22.7	2.4	3.0	28.6	36.1	74.0	37.9	PASS
928	AVG	Horz	31.0	23.8	2.4	3.0	28.6	31.7	54.0	22.3	PASS
1832	Peak	Vert	51.7	30.4	3.5	0.0	36.3	49.3	74.0	24.7	PASS
1832	Average	Vert	47.9	30.4	3.5	0.0	36.3	45.5	54.0	8.5	PASS
1832	Peak	Horz	49.3	30.1	3.5	0.0	36.3	46.6	74.0	27.4	PASS
1832	Average	Horz	42.8	30.1	3.5	0.0	36.3	40.1	54.0	13.9	PASS
2748	Peak	Vert	47.8	30.9	4.4	0.0	36.1	46.9	74.0	27.1	PASS
2748	Average	Vert	41.4	30.9	4.4	0.0	36.1	40.5	54.0	13.5	PASS
2748	Peak	Horz	46.1	30.9	4.4	0.0	36.1	45.2	74.0	28.8	PASS
2748	Average	Horz	37.3	30.9	4.4	0.0	36.1	36.4	54.0	17.6	PASS
3664	Peak	Vert	48.3	31.8	5.3	0.0	35.7	49.8	74.0	24.3	PASS
3664	Average	Vert	43.0	31.8	5.3	0.0	35.7	44.4	54.0	9.6	PASS
3664	Peak	Horz	49.2	31.8	5.3	0.0	35.7	50.7	74.0	23.4	PASS
3664	Average	Horz	44.2	31.8	5.3	0.0	35.7	45.6	54.0	8.4	PASS
4580	Peak	Vert	46.7	33.7	5.7	0.0	35.7	50.4	74.0	23.6	PASS
4580	Average	Vert	42.3	33.7	5.7	0.0	35.7	46.0	54.0	8.0	PASS
4580	Peak	Horz	43.3	33.7	5.7	0.0	35.7	47.0	74.0	27.0	PASS
4580	Average	Horz	36.6	33.7	5.7	0.0	35.7	40.3	54.0	13.7	PASS
9822.15	Average	Horz	34.6	40.1	9.3	0.0	35.7	48.3	54.0	5.7	PASS
9822.15	Average	Horz	34.5	40.1	9.3	0.0	35.7	48.2	54.0	5.8	PASS

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
Quasi Peak Adapter	85650A	HP	12/21/ 2011	12/21/2013	GEMC 7
Loop Antenna	EM 6871	Electro-Metrics	Feb 5, 2013	Feb 5, 2015	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 5, 2013	Feb 5, 2015	GEMC 71
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	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 Measurement

15.215 c) intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

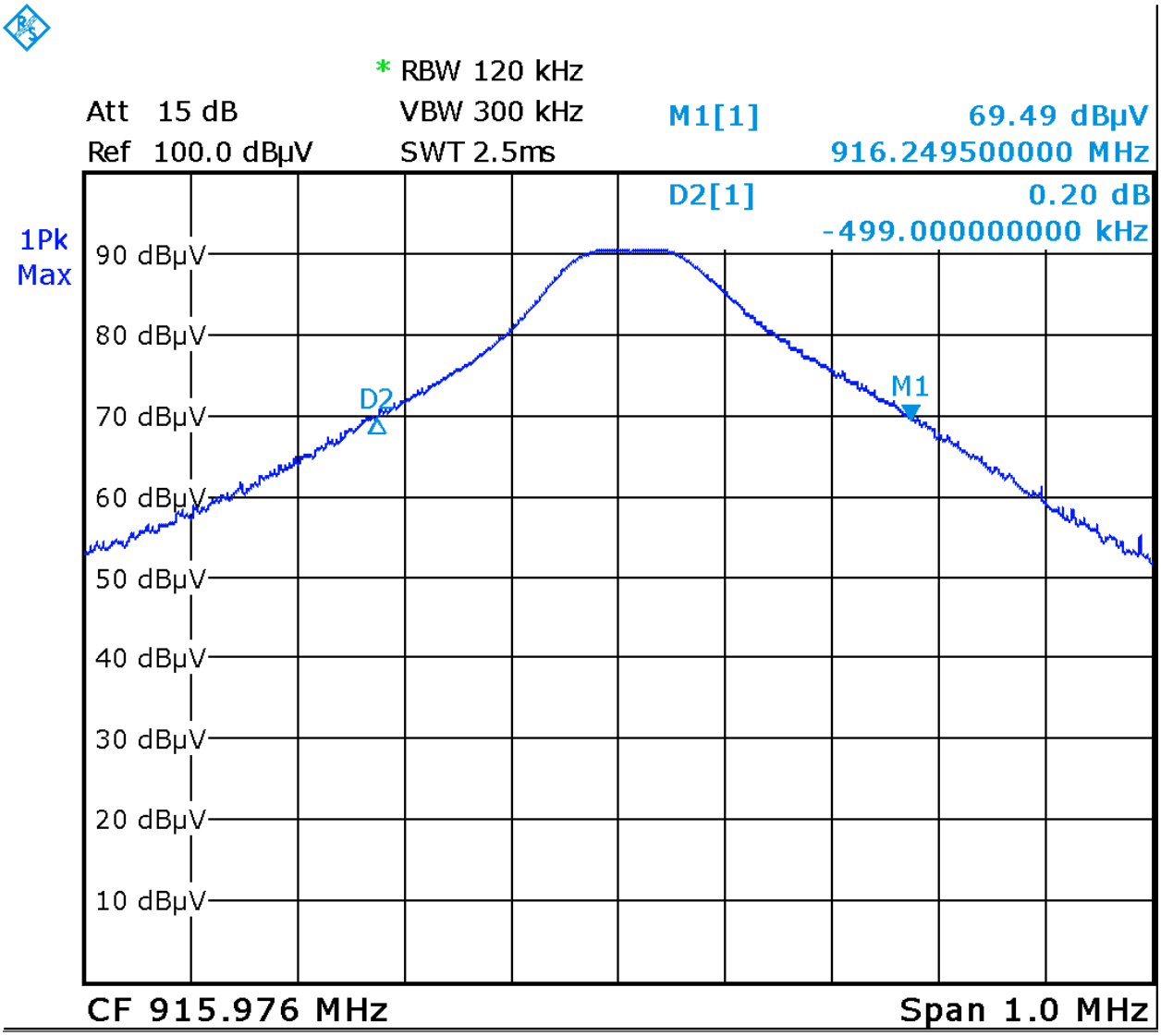
Test Results

The EUT passed. The 20 dB BW was wholly contained within the 15.249 emission band of 902 - 928 MHz.

Channel Frequency (MHz)	20dB Measured Bandwidth (kHz)
916	499

20 dB Bandwidth measurement graph

The graph below shows the 20 dB bandwidth the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 20 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.



Date: 20.JUN.2013 16:08:56

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	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 - 15.225 - RFID Emissions Mask_Rev1.doc”

Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.

General EUT Description

Client	
Organization	Teleco Automation srl Via dell' Artigianato, 16 - 31014 Colle Umberto Treviso, Italy
Contact	Roberto Collovini
Phone	+39 0438-388511
Email	teleco.luigi@telecoautomation.com
EUT Details	
EUT Model number	TVTXP916A04
Equipment Category	Wireless transmitter
Basic EUT Functionality	Remote control transmitter
Input Voltage and Frequency	3 Vdc, battery operated equipment
Connectors available on EUT	None.
Peripherals Required for Test	None.
Release type	Final
Intentional Radiator Frequency	916 MHz in applications as described above.

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 and Test Setup Photographs

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

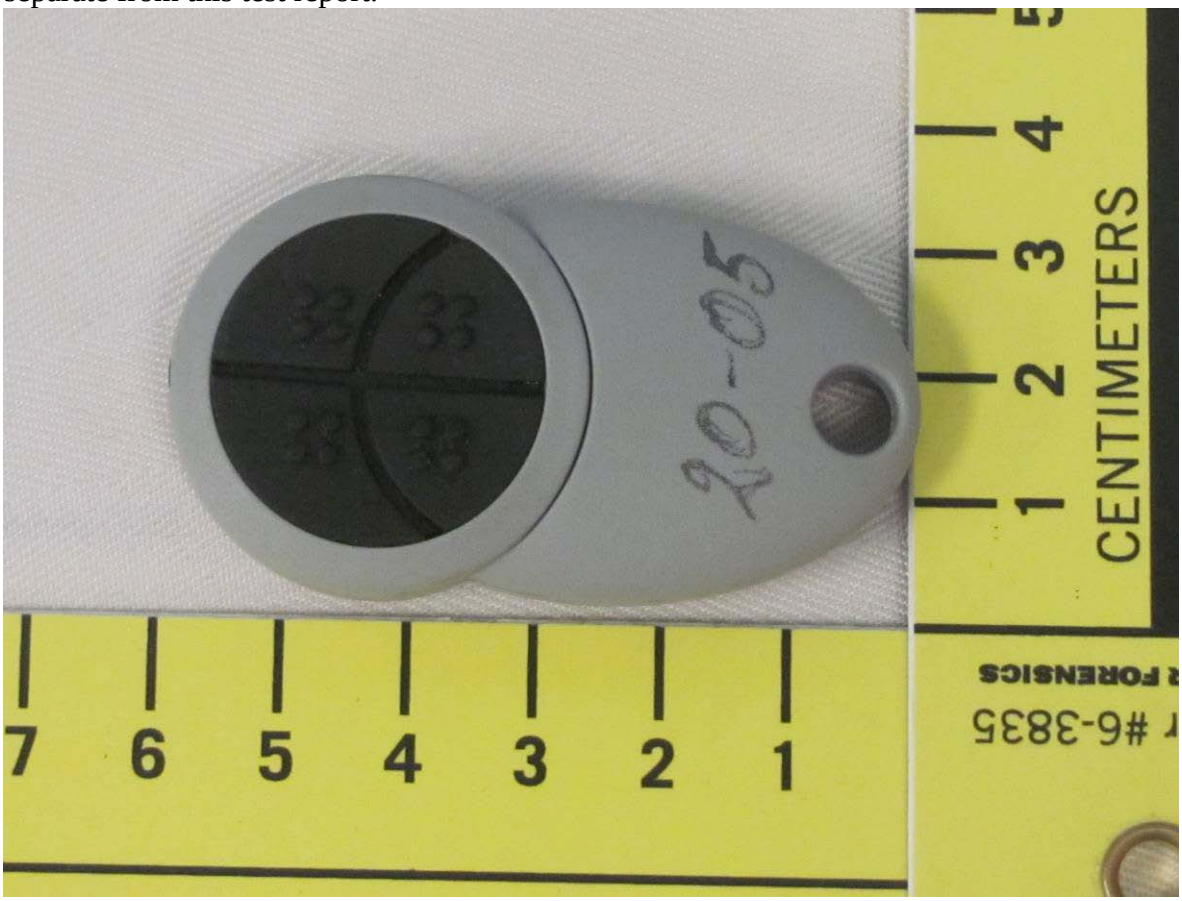


Illustration 1: EUT front view

Illustration 2: EUT rear view

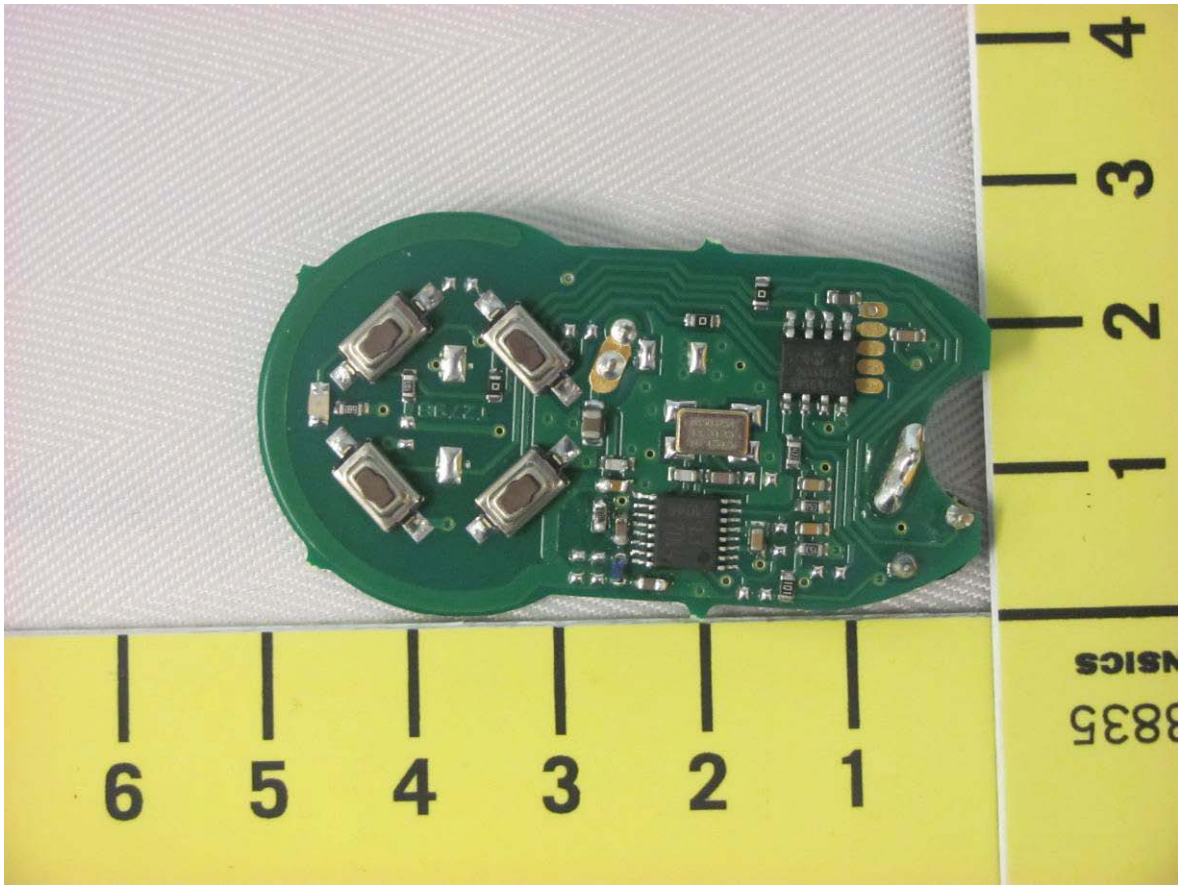


Illustration 3: EUT internal view - front

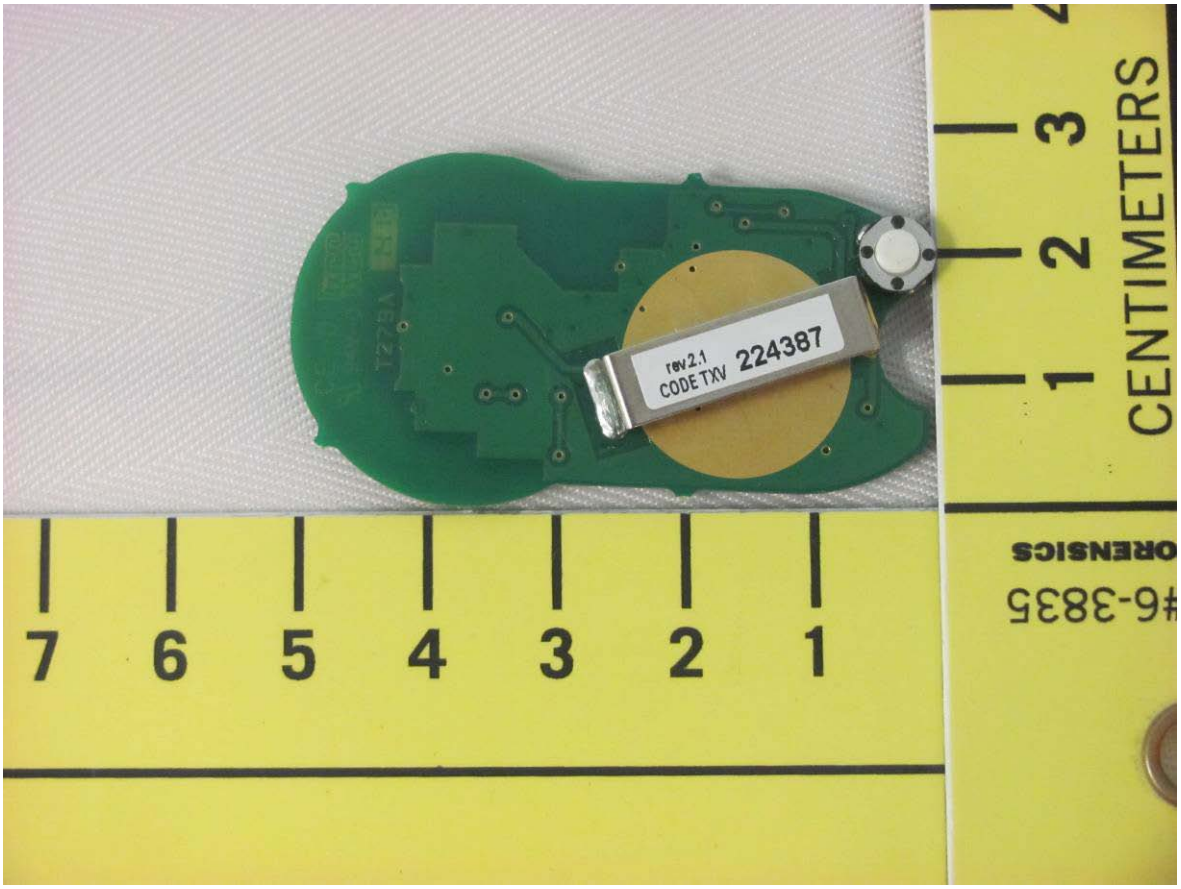


Illustration 4: EUT internal view - rear

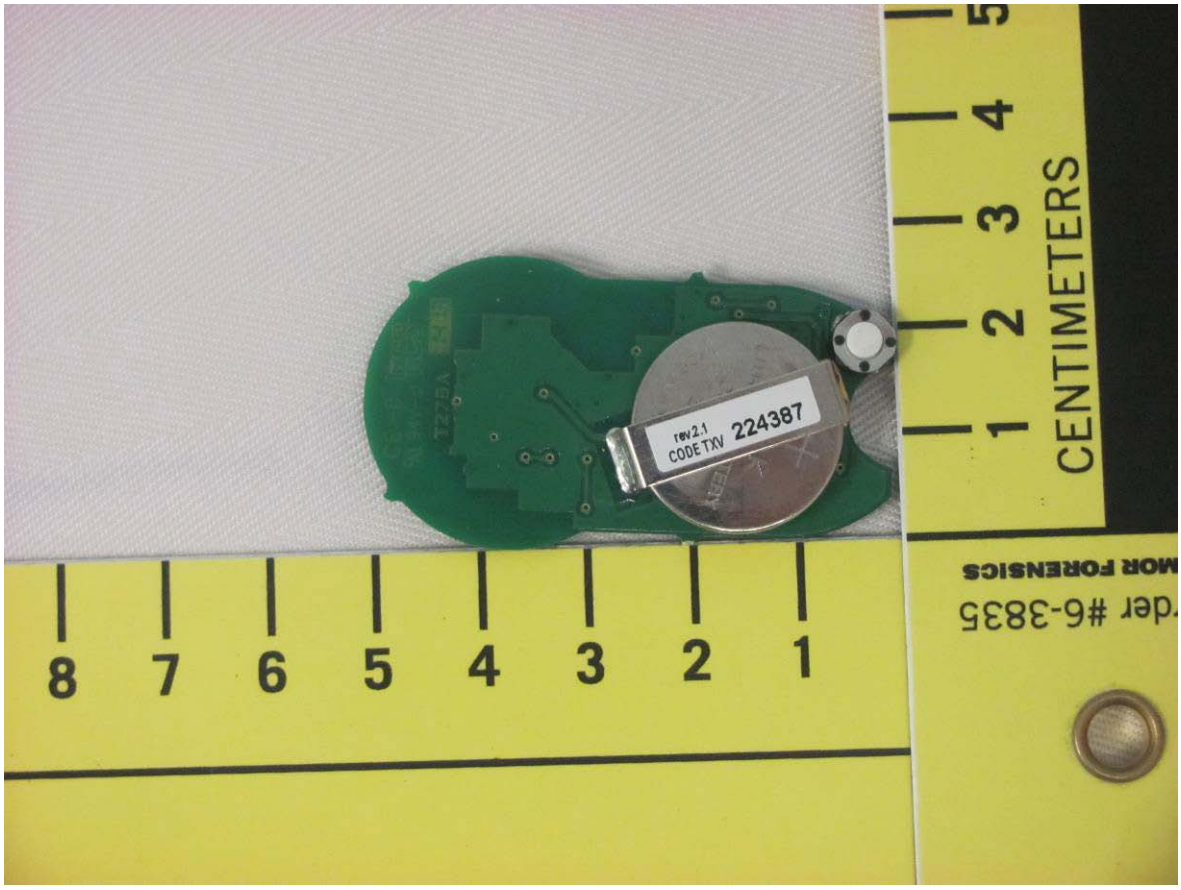


Illustration 5: EUT internal view – rear with battery

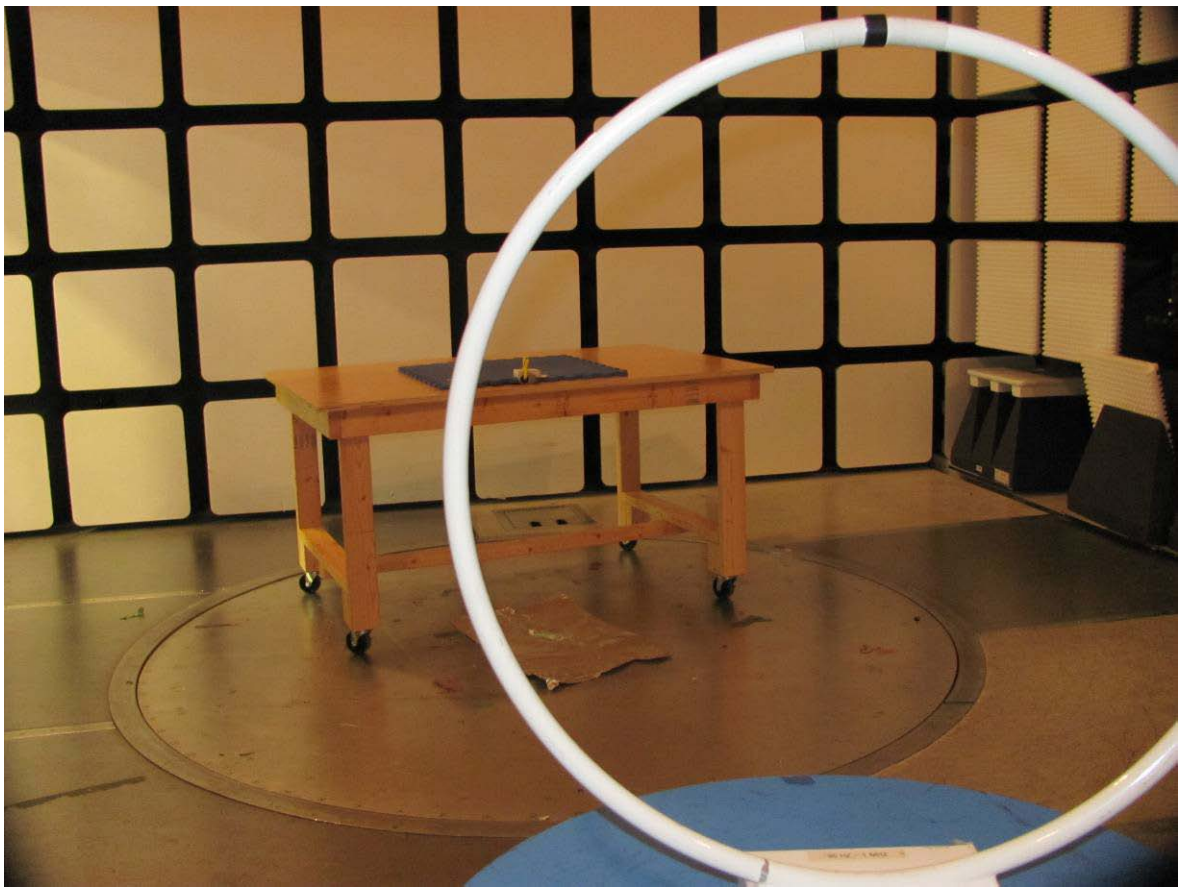


Illustration 6: Radiated emission setup – photo 1

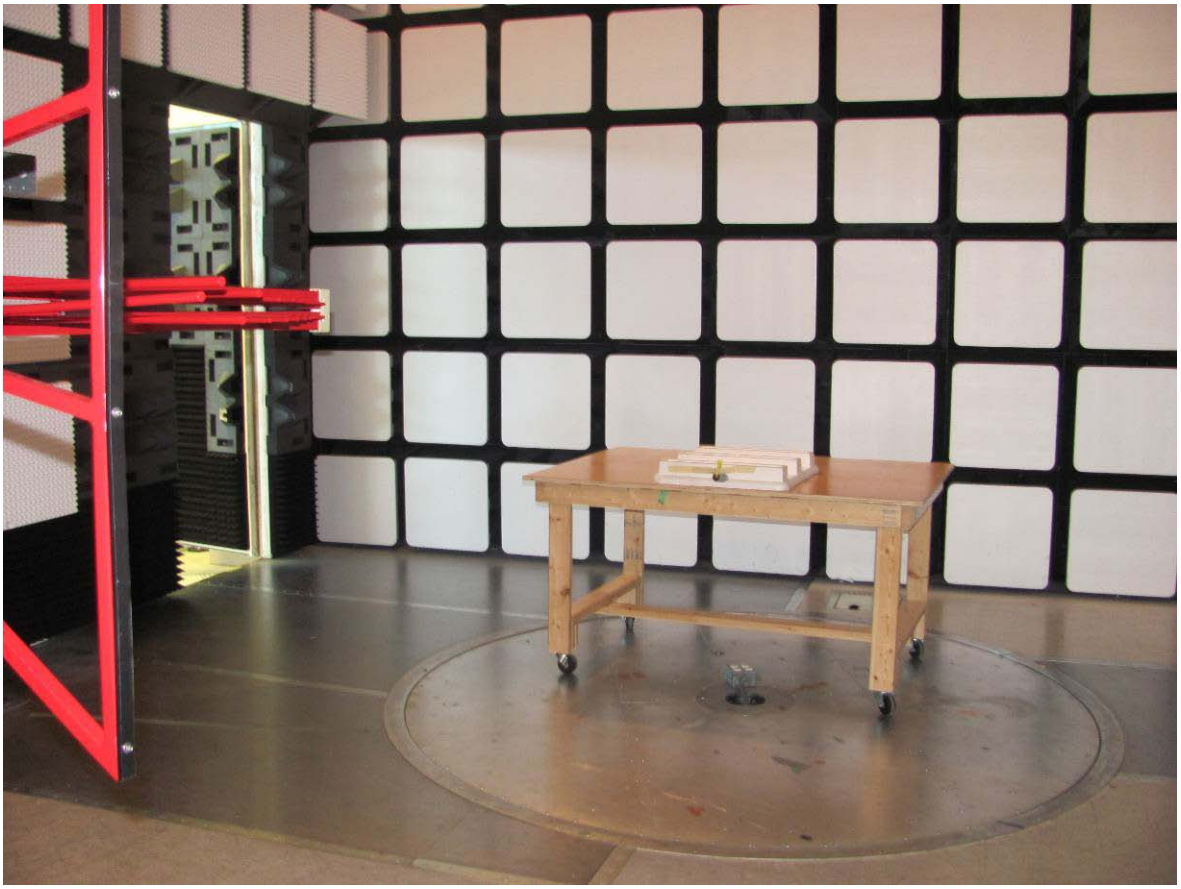


Illustration 7: Radiated emission setup - photo 2

Illustration 8: Radiated setup - photo 3

Illustration 9: Radiated emission setup – photo 4