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TESTING CERT #1255.01

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ENGINEERING TEST REPORT # 315096 C

LSR Job #: C-2202

Compliance Testing of:

X3 SEMS + BT

Test Date(s):

4/30/15, 9/21/15

Prepared For:

Tyco/Scott Health and Safety

Attn: Ann Carver

4320 Goldmine Road

Monroe, NC 28110

This Test Report is issued under the Authority of:

Tom Smith, VP EMC Test services

Signature: *Thomas T. Smith*

Date: 9-21-15

Test Report Reviewed by:

Tom Smith, VP EMC Test services

Signature: *Thomas T. Smith*

Date: 9-21-15

Report written by:

Khairul Aidi Zainal, Sr. EMC Engineer

Signature: *Khairul Aidi Zainal*

Date: 9-21-15

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Prepared For: Tyco/Scott	Name: X3 SEMS + BT
Report: TR 315096	Model: 201122-31, 201122-32 and 201122-33
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LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation

A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948

FCC Registration Number: 90756



Industrie
Canada Industry
Canada

Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1

File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1

File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union

Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).

Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union

Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

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1.0 Summary of Test Report

In April and September, 2015, the EUT, X3 SEMS + BT, was tested and MEETS the following requirements:

FCC and IC Paragraph	Test Requirements	Compliance (Yes/No)
N/A	Bandwidth	Yes
FCC: 15.209 IC: RSS-GEN Section 8.9	Fundamental and Spurious Emissions below 30 MHz	Yes
FCC : 15.207 IC : RSS GEN sect. 8.8	Power Line Conducted Emissions Measurements	N/A ⁽¹⁾
N/A	RF Conducted Output Power Verification	N/A

Note 1: Manufacturer declares EUT powered by DC battery only.

2.0 Test Facilities

All testing was performed at:

LS Research, LLC
W66 N220 Commerce Court
Cedarburg, Wisconsin, 53012 USA

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to the requirements of ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted.

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3.0 Client Information

Manufacturer Name:	Tyco/Scott Health and Safety
Address:	4320 Goldmine Road
Contact Person:	Ann Carver

3.1 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	X3 SEMS + BT
Model Number:	201122-31, 201122-32 and 201122-33
Serial Number:	Test
FCC ID	T5E201122A
IC Number	6453A-201122A

3.2 Product Description

Scott Emergency Management System (SEMS II) with Blue Tooth is a telemetry system for firefighter, comprises mainly of two devices a (1) Control Module which house the piezos for the Personnel Alarm Safety System (PASS) and (2) an Console unit which houses the telemetry radio being capable of bidirectional communications with a base station (gateway) comprised of a USB or PCMCIA card. The system operates on a radio frequency of 2.4 GHz, where by the console unit is capable of transmitting and receiving information to and from the base station. The transmission range is 450ft in a typical indoor environment and 2000ft line of sight (LOS). The Console also contains a blue tooth radio with ability to pair and transmit data every 60 seconds to an external APX Motorola radio which then forwards the data over a Motorola network. The console also contains a RFID scanner which allows a user to read RFID tag which can be programmed with information about the firefighter and the information is transmitted to the base station.

3.3 Modifications Incorporated In the EUT for Compliance Purposes

None noted at time of test

3.4 Deviations & Exclusions from Test Specifications

None noted at time of test

3.5 Additional Information

Manufacturer declares use of single 2.4 GHz channel of 2.405 GHz.

2.4 GHz radio programmed for continuous transmit and receive via serial to Ember redbox controller connected to a laptop with use of telnet commands. RFID did not require programming as it was configured for continuous transmit mode.

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4.0 Conditions of Test

Environmental:

Temperature: 20-25° C
Relative Humidity: 30-60%
Atmospheric Pressure: 86-106 kPa

Mains Voltage: 120VAC 60Hz
DC Supply: 12 VDC

5.0 Test Equipment

All test equipment is calibrated by a calibration laboratory accredited by A2LA to the requirements of ISO 17025. For a complete list of test equipment and calibration dates, see Appendix A. Unless otherwise noted, resolution bandwidth of measuring instrument used during testing for given frequency range, see below.

Frequency Range	Resolution Bandwidth
9 kHz – 150 kHz	100 Hz
150 kHz – 30 MHz	9 kHz
30 MHz – 1000 MHz	120 kHz
Above 1000 MHz	1 MHz

6.0 Conformance Summary

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.209 and 15.109, and Industry Canada RSS-GEN Issue 4.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

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Appendix A – Test Equipment



Date : 17-Apr-2015

Type Test : Emissions

Job # : C-2202

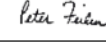
Prepared By: Shane Rismeyer

Customer : Tyco/Scott Health and Safety

Quote #: 315096

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960073	Spectrum Analyzer	Agilent	E4448A	US45300584	10/19/2014	10/19/2015	Active Calibration
2	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	1/9/2015	1/9/2016	Active Calibration
3	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	1/19/2015	1/19/2016	Active Calibration
4	AA 960150	Biconical Antenna	ETS	3110B	0003-3348	1/22/2015	1/22/2016	Active Calibration
5	EE 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro / EMCO	WLAB22-4 / 3160-09	123001	8/19/2014	8/19/2015	Active Calibration
6	AA 960137	Standard Gain Horn Ant.	EMCO	3160-10	69259	8/19/2014	8/19/2015	Active Calibration
7	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	7/9/2014	7/9/2015	Active Calibration
8	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213K-S+	740411007	7/9/2014	7/9/2015	Active Calibration
9	AA 960161	Highpass Filter	K&L Microwave	11SH10-3000	2	2/6/2015	2/6/2016	Active Calibration
10	AA 960006	Active Loop Antenna	EMCO	6502	9205-2753	8/19/2014	8/19/2015	Active Calibration

Project Engineer: 

Quality Assurance: 



Date : 17-Apr-2015

Type Test : Spurious Emissions

Job # : C-2202

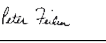
Prepared By: Aidi

Customer : Tyco/Scott Health and Safety

Quote #: 315096

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960006	Active Loop Antenna	EMCO	6502	9205-2753	8/14/2015	8/14/2017	Active Calibration
2	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	1/9/2015	1/9/2016	Active Calibration

Project Engineer: 

Quality Assurance: 

Note: The equipment list directly above is for measurements performed on 9-21-15

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Serial: none (engineering sample)

Appendix B – Test Data

B.1 – Radiated Emissions

Rule Part(s)	FCC: 15.209 / 15.205 / 15.109 IC: RSS-GEN Section 8.9,8.10			
Measurement Procedure	ANSI C63.4 - 2014 ANSI C63.10 – 2013			
Test Location	LS Research, LLC - FCC Listed 3 meter Semi-Anechoic Chamber			
Test Distance	See data section			
EUT Placement	80 cm height non-conductive table above reference ground plane			
Frequency Range of Measurement	Loop Antenna: 9 kHz – 30 MHz	Biconical: 30-300 MHz	Log Periodic Dipole Array: 300-1000 MHz	Double-Ridged Waveguide Horn: 1-18 GHz
Measurement Detectors	RBW: 9-150 kHz: 100 Hz RBW: 150 kHz -30MHz: 9kHz Peak, Quasi-Peak, Average	30-1000MHz RBW: 120 kHz VBW: At least 300 kHz Peak, Quasi-Peak, Average		1 - 40 GHz: RBW: 1MHz VBW: 3(MHz) Peak 10 Hz Average
Description of Measurement	1) The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are preformed. The data is gathered and reported as the corrected values. 2) The EUT is placed on a non-conductive pedestal centered on a turn-table in the test location with the antenna at the test distance from the EUT 3) Above 30 MHz the maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height. 4) Below 30 MHz the loop antenna was set at a 3 meter distance from the EUT with the center of the loop at 1 m above the ground plane. The EUT was positioned in three orthogonal positions with maximum results reported.			
Example Calculations	Reported Measurement data = Raw receiver measurement + Antenna Correction Factor + Cable factor (dB) - amplification factor (when applicable) + Additional factor (when applicable)			

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FCC Part 15.209 / IC RSS-GEN Limits:

Frequency (MHz)	Limit (μ V/m)	3 m Limit (dB μ V/m)	Distance	Type
0.009 - 0.490	2400/F(kHz)	128.5 - 93.8	300	Quasi-Peak / Average*
0.490 - 1.705	24000/F(kHz)	73.8 - 62.97	30	Quasi-Peak
1.705 - 30	30	69.54	30	Quasi-Peak

*Average Limit 9-90 and 110-490 kHz

Below 30 MHz distance correction = $40 \cdot \log(300/3)$ or $40 \cdot \log(30/3)$

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B.1.1 – Radiated Fundamental and Emissions below 30 MHz

Manufacturer	Tyco/Scott
Date	4/30/15, 9/21/15
Operator	Mike Hintzke, Peter Feilen
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.209 / 15.109 / RSS-GEN
Measurement Procedure	ANSI C63.4 - 2014 ANSI C63.10 - 2013
Test Distance	3 meter
EUT Placement	80 cm height non-conductive table centered on turn-table
Detectors	Peak
Additional Notes	1) Peak emissions compared to applicable limits. 2) 125 kHz fundamental (RFID) tested in continuous transmission mode 3) Tested with 2.4 GHz radio in continuous transmit on single channel, continuous receive on single channel, and stand-by. No appreciable difference in emissions noted. Worst case reported.

Example Calculation:

FCC 15.209 Limit @ 3 meter (dB μ V/m) – Peak Reading (dB μ V/m) = Margin

Bandwidth

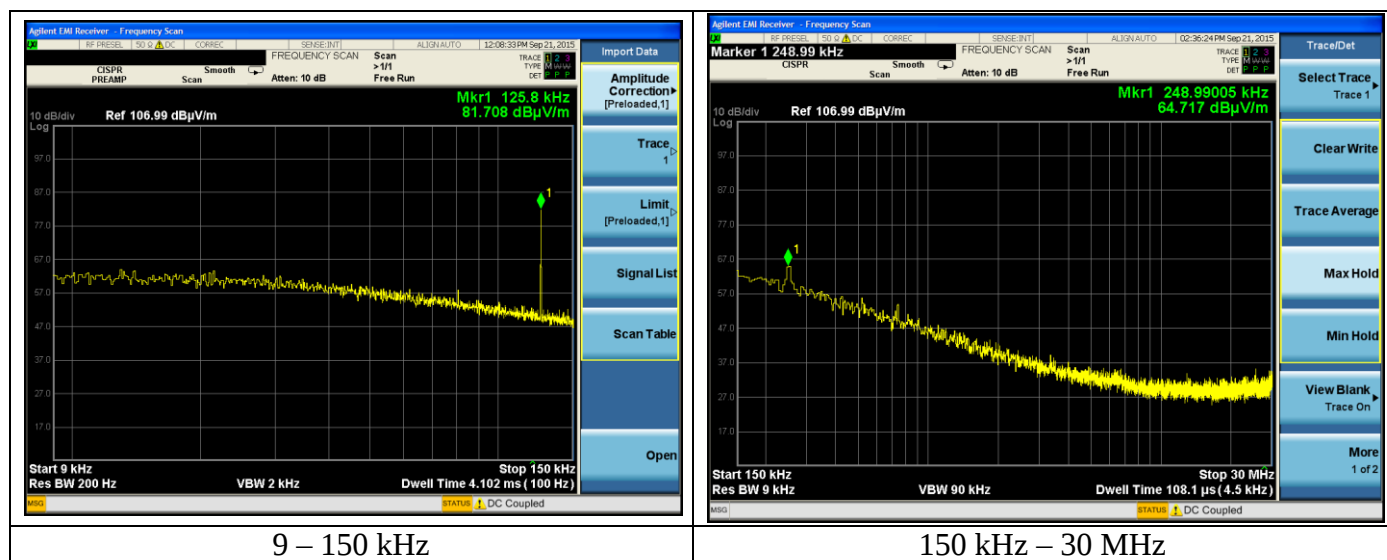
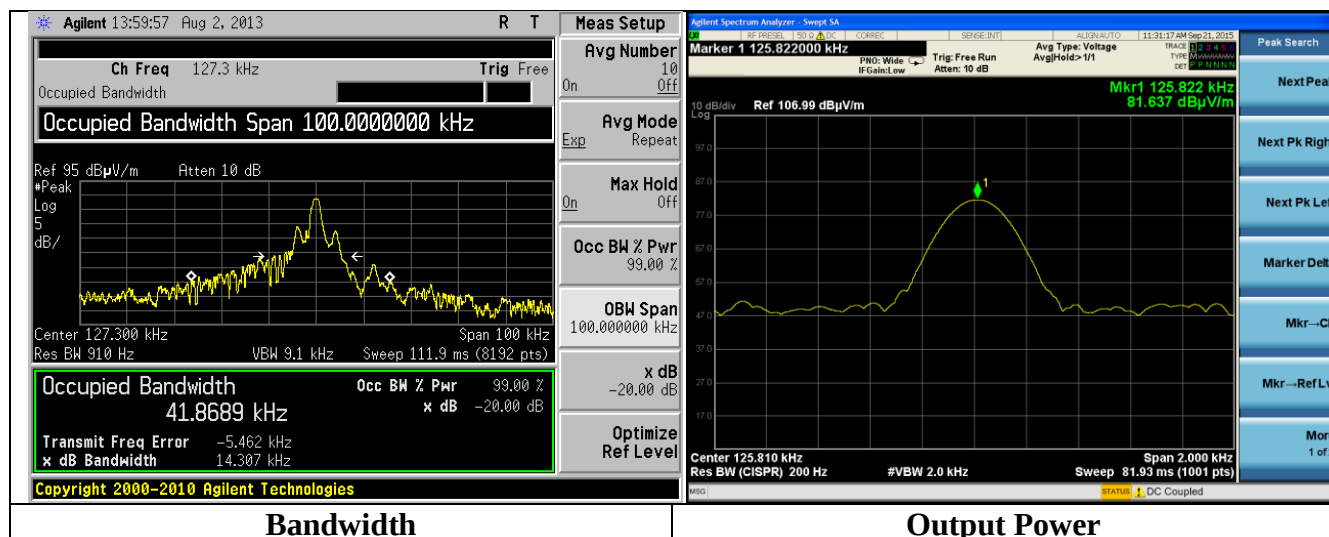
20 dB (kHz)	99 % (kHz)
14.31	41.86

Emissions

Frequency (kHz)	Antenna Orientation	Azimuth (Degree)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin
125.8	Horizontal	0	81.6	105.6	24.0

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Plots



Prepared For: Tyco/Scott

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Serial: none (engineering sample)

Appendix C - Uncertainty Summary

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k=2$.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.82 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.88 dB
Radiated Emissions	3-Meter Chamber, Horn Antenna	4.85 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.32 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.63 dB
Absolute Conducted Emissions	Agilent PSA/ESA Series	1.38 dB
AC Line Conducted Emissions	Shielded Room/EMCO LISN	3.20 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	2.05 Volts/Meter
Conducted Immunity	3 Volts level	2.33 V
EFT Burst, Surge, VDI	230 VAC	54.4 V
ESD Immunity	Discharge at 15kV	3200 V
Temperature/Humidity	Thermo-hygrometer	0.64° / 2.88 %RH

Appendix D - References

Publication	Year	Title
FCC CFR Parts 0-15	2015	Code of Federal Regulations – Telecommunications
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-GEN Issue 4	2014	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

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END OF REPORT

Date	Version	Comments	Person
9-21-15	V0	Final Release	Aidi
9-23-15	V0a	Final release with responses	Aidi

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