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FCC Certification Test Report
For the
Strata Proximity Systems
Surface Proximity Module
Models IA and MA

FCC ID: ZQ3-SPS-SPROX

WLL JOB# **12030**
October 14, 2011

Prepared for:

Strata Proximity Systems
1769 Jeff Road
Huntsville, AL 35806

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879

ACCREDITED TESTING

Testing Certificate AT-1448

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Abstract

This report has been prepared on behalf of Strata Proximity Systems to support the attached Application for Equipment Authorization. The test report and application are submitted for a Transmitter under Part 15.209 (10/2009) of the FCC Rules and Regulations. This Certification Test Report documents the test configuration and test results for the Strata Proximity Systems Surface Proximity Module.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

The Strata Proximity Systems Surface Proximity Module complies with the limits for a Transmitter device under FCC Part 15.209.

Revision History	Description of Change	Date
Rev 0	Initial Release	October 14, 2011

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1 Introduction

1.1 Compliance Statement

The Strata Proximity Systems Surface Proximity Module complies with the limits for an Intentional Radiator device under Part 15.209 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated emissions were performed. All measurements were performed according to the 2003 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Strata Proximity Systems 1769 Jeff Road Huntsville, AL 35806
Purchase Order Number:	SP5195
Quotation Number:	66219

1.4 Test Dates

Testing was performed on the following date(s):	7/7/11

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steven Dovell
Client Representative	Stephen Gilbert

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
dB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The Surface Proximity Module is part of a complete HazardAvert proximity warning system from Strata Proximity Systems which provides warnings to both individuals and to machinery to alert them that the individual has entered too close to an operating piece of equipment and is in a dangerous situation or that vehicles or machinery are getting close enough that a collision possibility exists. The Surface Proximity Module is mounted on a vehicle or piece of machinery and is connected to a central control unit.

The functions of the Surface Proximity Module are:

- To transmit a 73kHz field around a vehicle or piece of machinery to act as a protection zone for collision avoidance and for proximity detection for the protection of individuals.
- To receive a 916.48MHz RF signal from other vehicles or Personal Alarm Devices (PAD).
- To receive a 73 kHz field that might be transmitted by other vehicles.
- To generate a 916MHz RF signal to alert other vehicles or machinery that a collision possibility exists.

The Surface Proximity Module generates a 73 kHz field at the rate of 3mS on and 3mS off at a repetition rate of approximately 200mS. This creates a protection zone around the vehicle or machine. The Surface Proximity module has its 916.48MHz receiver on at this time to receive any transmissions from another vehicle, machine or individual equipped with the HazardAvert system that would indicate the individual or other piece of machinery is too close and warrants a warning or danger condition. During the time that the 73kHz generator is not transmitting, the Surface Proximity Generator 73kHz receiver is on to receive the field that may be emitted by another vehicle or piece of machinery in close proximity. If the received 73 kHz field strength is above a level determined to represent a possible collision or individual in too close of proximity, the Surface Proximity Module will turn off its 916MHz receiver and will transmit its own 916MHz signal to alert other vehicles or machinery of its close proximity to them.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Strata Proximity
FCC ID:	ZQ3-SPS-SPROX
EUT Name:	Surface Proximity Module
Model:	IA, MA
FCC Rule Parts:	15.209
Frequency Range:	73kHz
Occupied Bandwidth:	N/A CW
Keying:	Automatic
Type of Information:	CW
Number of Channels:	1
Power Output Level	Fixed
Antenna Type	Integral Magnetic Induction
Interface Cables:	Power
Power Source & Voltage:	Battery

2.2 Test Configuration

The Strata Proximity Systems Surface Proximity Module, Equipment Under Test (EUT), was operated from a 24VDC via a 120V AC/DC power supply. The EUT normally is powered via vehicle power.

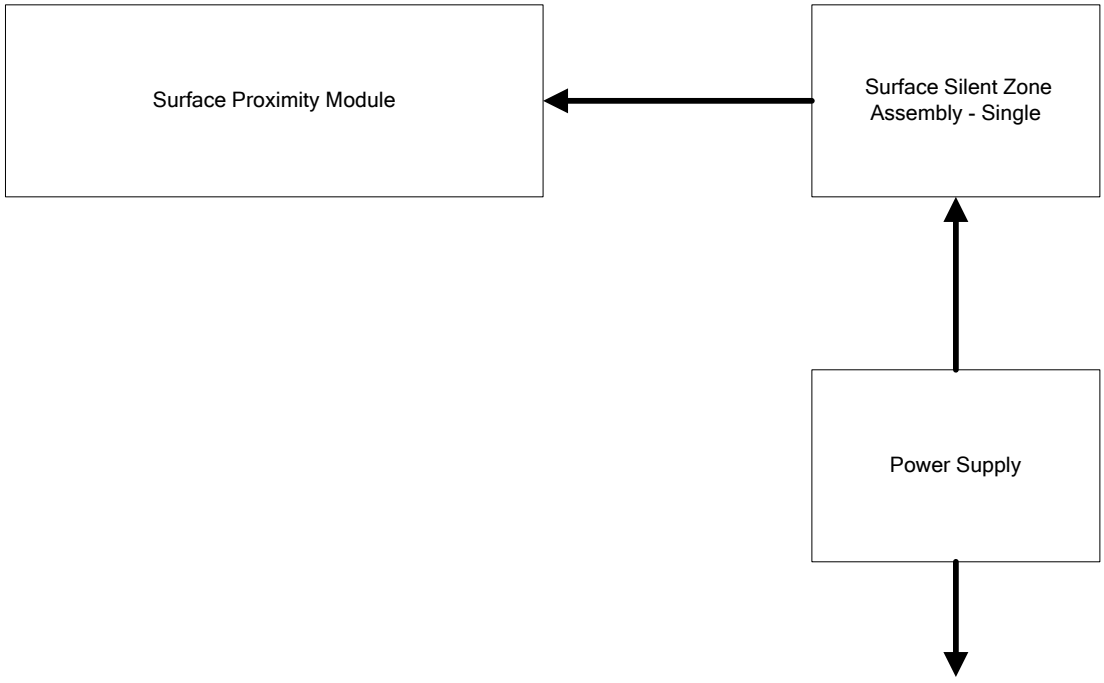

Figure 1: Test Configuration

2.3 Equipment Configuration

The EUT was set up as outlined in Figure 1. The EUT was comprised of the following equipment. (All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.)

Table 2: Equipment Configuration

Name / Description	Model Number	Part Number	Serial Number	Revision
Surface Proximity Module	IA, MA	N/A	N/A	A
Surface Silent Zone Assembly	SSZIFN	N/A	SZAAF000126	A

2.4 Support Equipment

The following support equipment was used during testing:

Table 3: Support Equipment

Item	Model/Part Number	Serial Number
AC/DC Power Supply	Mean Well SP300_24	EB05364225

2.5 Interface Cables

Table 4: Interface Cables

Port Identification	Connector Type	Cable Length	Shielded (Y/N)	Termination Point
I/O	DIN	5m	Y	Surface Silent Zone Assembly
I/O	Barrier Strip	5m	Y	Surface Proximity Module
Power	Barrier Strip	1m	N	Power Supply

2.6 Testing Algorithm

The EUT was operated continuously by being placed into a continuous 73kHz transmit mode.

Worst case emission levels are provided in the test results data.

2.7 Test Location

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ACLASS under Certificate AT-1448 as an independent FCC test laboratory

2.8 Measurements

2.8.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 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

2.9 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

Where u_c = standard uncertainty

a, b, c,.. = individual uncertainty elements

$Div_{a, b, c}$ = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where U = expanded uncertainty

k = coverage factor

$k \leq 2$ for 95% coverage (ANSI/NCSL Z540-2 Annex G)

u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 5 below.

Table 5: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR14, FCC Part 15	4.55 dB

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3 Test Equipment

Table 6 shows a list of the test equipment used for measurements along with the calibration information.

Table 6: Test Equipment List

Test Name:	**Radiated Emissions**	Test Date:	**07/07/2011**
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
68	HP - 85650A	ADAPTER QP	6/22/2012
70	HP - 85685A	PRESELECTOR RF W/OPT 8ZE	6/22/2012
72	HP - 8568B	ANALYZER SPECTRUM	6/22/2012
382	SUNOL SCIENCES CORPORATION - JB1	ANTENNA BICONLOG	1/12/2012
31	EMCO - 6502	ANTENNA ACTIVE LOOP	3/8/2012

4 Test Results

4.1 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by setting the EUT near the loop antenna to allow for sufficient pickup of the signal.

The transmit signal is a 73 kHz non-modulated CW signal; therefore there is no measurable bandwidth.

Radiated Spurious Emissions: (FCC Part §15.209)

Transmitters operating under §15.209 must comply with the radiated emissions listed in the following table:

Table 7. Radiated Emissions 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

4.1.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 30-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Both the horizontal and vertical field components were measured. Measurements of frequencies above 30MHz were made at a distance of 3m.

The EUT was scanned from 10k to 1GHz. The limit has been interpolated to 30m.

The roll-off was determined as specified in FCC part 15.31 (f)(2) two measurements were made at two distances, 3m and 30m.

The level of the fundamental frequency at 3m was measured as 113.6dBuV/m

The level of the fundamental frequency at 30m was measured as 60.9dBuV/m

The difference between the two readings is 52.7dB therefore the roll-off is 52.7dB/decade.

This offset was added to the 300m limit to adjust the limit to 30m:

Example @ 73kHz:

300m limit = 2400/73 = 32.9uV/m = 20*LOG(32.9) = 30.3dBuV/m

30m limit = 30.3dBuV/m +52.7dB = 83dBuV/m = 10^(83/20) = 14186.9uV/m

The EUT was examined in three orthogonals and the orthogonal the demonstrated the highest emission was reported.

In accordance with FCC Part 15.209(d) emissions in the bands 9-90kHz and 110-490kHz are performed using an average detector. All other readings below 1000MHz were taken with a quasi-peak detector.

Table 8. Radiated Emissions Test Data < 30MHz @ 30m

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)
0.0730	X	0.00	1.00	60.90	10.9	3898.0	14,186.9	-11.2
0.0730	Y	90.00	1.00	57.80	10.9	2728.0	14,186.9	-14.3
0.0730	Z	15.00	1.00	54.60	10.9	1887.3	14,186.9	-17.5
0.1460	X	180.00	1.00	40.10	10.8	350.0	7,093.5	-26.1
0.2190	X	0.00	1.00	37.90	10.8	271.1	4,729.0	-24.8
0.2920	X	125.00	1.00	47.60	10.7	824.9	3,546.7	-12.7
0.3650	X	200.00	1.00	35.10	10.7	196.1	2,837.4	-23.2
0.4380	X	0.00	1.00	37.40	10.8	256.2	2,364.5	-19.3

Table 9. Radiated Emissions Test Data > 30MHz @ 3m

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)
32.449	V	0.00	1.00	16.00	18.8	55.3	100.0	-5.2
45.690	V	180.00	1.00	28.30	10.2	83.7	100.0	-1.5
52.149	V	180.00	1.00	31.20	8.2	93.5	100.0	-0.6
32.449	V	180.00	1.00	8.80	18.8	24.1	100.0	-12.4
45.690	V	135.00	1.00	13.50	10.2	15.2	100.0	-16.3
50.020	V	135.00	1.00	28.10	8.5	67.6	100.0	-3.4
52.149	V	135.00	1.00	14.10	8.2	13.1	100.0	-17.7
62.232	V	180.00	1.00	7.50	8.1	6.1	100.0	-24.4
84.350	V	180.00	1.00	6.90	9.1	6.3	100.0	-24.0
150.000	V	135.00	1.00	7.50	13.9	11.8	150.0	-22.1
250.000	V	135.00	1.00	3.00	13.6	6.8	200.0	-29.4
300.000	V	135.00	1.50	2.30	15.6	7.9	200.0	-28.1
500.000	V	135.00	1.50	2.50	20.6	14.3	200.0	-22.9
33.412	H	0.00	4.00	2.10	18.0	10.1	100.0	-19.9
45.690	H	0.00	4.00	4.80	10.2	5.6	100.0	-25.0
50.010	H	180.00	4.00	27.20	8.5	60.9	100.0	-4.3
52.149	H	180.00	4.00	4.20	8.2	4.2	100.0	-27.6
62.232	H	180.00	4.00	4.20	8.1	4.1	100.0	-27.7
84.350	H	180.00	4.00	2.90	9.1	4.0	100.0	-28.0
150.000	H	270.00	3.70	5.30	13.9	9.1	150.0	-24.3
250.000	H	315.00	3.20	5.90	13.6	9.4	200.0	-26.5
300.000	H	180.00	3.20	2.30	15.6	7.9	200.0	-28.1
450.000	H	180.00	3.20	4.50	20.2	17.1	200.0	-21.4

