

Report No.: 307625324.001 Page 1 of 68

Electromagnetic Compatibility Test Report

Prepared in accordance with

Product Standard:

FCC Part 15: 2007, RSS-210: 2007

on

Lighting Control System

Radio Bridge

Prepared for:

Sensor Switch, Inc.

900 Northrop Road

Wallingford, CT 06492

Prepared by:

TUV Rheinland of North America, Inc.



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Aı	ıftraggeber : Client:	Sensor Switch, Inc. 900 Northrop Road Wallingford, CT 06	492					
Bezeichnung: Identification:	Lighting (Control System	Serien-Ni Serial No.	PROTO) ҮРЕ			
Gegenstand der Prüfung: Test item:	Radio Br	ridge	Prüfdatu Date teste	()ctober	r 8th -10th 2007			
Prüfort: Testing location:	12 Comm Newtown	TUV Rheinland of North America 12 Commerce Road Newtown, CT 06470-1607 NVLAP # 200111-0						
Prüfgrundlage: Test specification:	FCC Part	FCC Part 15: FCC Part 15C Section 15.247 FCC Part 15.247 (a)(2), FCC Par 15.247 (b)(3), FCC Part 15.247 (b)(5) and 1.1310, FCC Part 15.247 (c), 15.205, 15.209, FCC Part 15, FCC Part 15.247 (d), FCC Part 15.215 (b), FCC Part 15.215 (c), RSS-210						
Prüfergebnis: Test Result	oben gen	stehend beschrieben annter Prüfgrundla ove test standard(s)						
geprüft / tested by:	Dieter Balda	amus	kontrolliert / reviewed by: Bruce Fagley					
24 June 2008 Datum Date	Name Name	Unterschrift Signature	24 June 2008 Datum Date	Name Name	Unterschrift Signature			
Sonstiges: Other Aspects:			None					
Abkürzungen: OK, Pass, Cor	npliant, Does not Cor	entspricht Prüfgrundlage mply = entspricht nicht	Fa	K, Pass, Compliant, Compliant, Does I /A = not applicable				
F©		NV	لمع	Indus	try Canada			
US5112	2	200111	-0	3	466D-1			

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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C, based on the results of testing performed on October 8th -10th 2007 on the Lighting Control System, Model No. Radio Bridge, manufactured by Sensor Switch, Inc.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

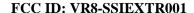
1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.



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1.3	Sum	m	ary of Test Results						
			itch, Inc.	Tel	(203) 263	5-2842	Contact	William J F	assbender
Applicant			rop Road rd, CT 06492	Fax	(203) 263	5-1565	email	fozzy@sens	orswitch.com
Type of Equip	ment	L	ighting Control System	Model Number	er	Radio	Bridge		
Standar	ds		Description	S	Severity L	evel or I	Limit	Criteria	Test Result
FCC Part 15			Radio Frequency Devices -Part C	See cal	led out bas	ic stand	ards below	See Below	Complies
FCC Part 15.247 (a) (2)			Spectrum Bandwith of a Direct Sequence Spread Spectrum System	500kHz on a 6dB Bandwith, 2.405 GHz - 2.480 GHz			Limit	Complies	
FCC Part 15.247	C Part 15.247 (b) (3) Maximum Output Power 1 Watt (30dBm)			Limit	Complies				
FCC Part 15.247 and 1.1310	7 (b)(5)		RF Human Exposure Limit	Limit 1.0 (mW/cm2)			Limit	Complies	
FCC Part 15.247 15.205, 15.209	CC Part 15.247 (c), 5.205, 15.209		Radiated Spurious Emissions	-20dBo	e, 15.205 (a	1), 15.20	9 (a)	Limit	Complies
FCC Part 15.247	7 (d)		Transmitter Power Density	8 dBm/3kHz			Limit	Complies	
FCC Part 15.207			Conducted Emissions	15.207	15.207 (a)			Limit	Complies
FCC Part 15.215 (b) Frequency Stability		Frequency Stability	Containment of 20dB,				Limit	Complies	
FCC Part 15.215 RSS-210	5 (c)		20dB Bandwith	20dB Contained within the Frequency Band		Within Limit	Complies		





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2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at 12 Commerce Road, Newtown CT is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No US5112). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code: 200111-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Industry Canada

Registration No.: 3466D-1. The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2003.

2.2 Measurement Uncertainty

General

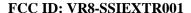
The estimated combined standard uncertainty for conducted immunity measurements is ± 1.4 dB.

The estimated combined standard uncertainty for radiated emissions measurements is \pm 1.6 dB.

The estimated combined standard uncertainty for conducted emissions measurements is \pm 1.2dB.

2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.





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3 Product Information

3.1 Product Description

The radio bridge is only one component that is part of a new lighting control system being designed by Sensor Switch, Inc. The name for the newly designed system is called 'nLight'. nLight will typically consist of the following components: SensorView software, at least one gateway, at least one bridge (or two radio bridges), devices for switching lighting loads (nPP-16, nWSD, nCMR, ...), devices for detecting occupancy, light levels (nCM, nWV, nCM-ADC, ...) and devices for user control (nPOD, nPOD-D, ...). SensorView software is a browser based application which will allow clients to customize their buildings lighting needs. The software will have the ability to change device parameters, load profiles, update device firmware, respond to load shedding, and many more selectable options. The gateway provides a method of translating Ethernet packets from SensorView to RS-485 where all nLight devices can communicate. The bridge (or radio bridges) contains eight RS-485 ports. Each port typically represents a lighting zone to which devices can be connected. For example, a private office will typically require one nCMR and one nPOD. An open office area could potentially use five nPP-16 and seven nCM-PDT depending on the overall size and lighting load.

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

3.3 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report





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Figure 1 – Photo of EUT (Transmitter)

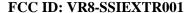
The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.



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Figure 2 – Photo of EUT (Receiver)





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4 Emissions

4.1 Spectrum Bandwidth

This test measures the spectrum bandwidth of the intentional radiator signal generated by the EUT.

4.1.1 Over View of Test

Results	Complies (as tested	l per this	Date	11/07/2	007				
Standard	FCC Part 15.247 (a) (2)								
Product Model	Radio Bridge			Serial#	Protoyp	be			
Configuration	See test plan for deta	ails							
Test Set-up	Tested @ 3m on O.	Tested @ 3m on O.A.T.S. placed on turn-table, see test plans for details							
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Humidity	45%	Pressure	998mbar		
Frequency Range	2.405 GHz - 2.480 C	GHz @ 31	n						
Perf. Criteria	500kHz. (Below Lir	Hz. (Below Limit) Perf. Verificatio			Reading	gs Under L	imit		
Mod. to EUT	None		Test Perf	ormed By	Dieter l	Baldamus			

4.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.





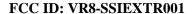
Repor	t No.: 307625324.001	Page 12 of 68
4.1.5 NOTES:	Summary of Final Data Spectrum Bandwidth Low Frequency	
MAI - 1	68:31 NDV 07, 2007 1 R: SENSOR SWITCH MODEL: RADIO BRIDGE RKER A ACTV DET: PEAK .65 MHz MEAS DET: PEAK QP AVG MKRA -1.65 MHz .66 dB	
LDG REF 10 dB/ #ATN 50 dB	F 13.0 dBm PREAMP DN	
MA SB — SC FC ACORR		
	9.40443 GHz SPAN 10.00 MHz F BW 100 kHz	
9124 Bicon 3146 Log Per 3106 Horn	ANTENNA/COUPLER: ☐ 3109 Bicon ☐ CBL6140 X-Wing ☐ NNB-4/63 ☐ 3115 Horn ☐ JB3 Bilog ☐ NNB-4/20 ☐ CBL6112B Bilog ☐ NSLK 8126 LISN ☐ MDS-21 (0X LISN
MEAS TYPE: Radiated Press Radiated Fina Conducted Disturbance P Other	I	echoic Room



Report No.:		07625324.001	Page 13 of 68		
			, age 10 s. ss		
NOTES:	S	pectrum Bandwidth Middle Frequency			
(%) 14:34:41 MFR: SE MARKER -1.80 M 02 dB	Δ	: RAD]O BR]DGE ACTV DET: PEAk MEAS DET: PEAk MKR⊿			
LDG REF 13.1 10 dB/ AIN 50 dB	2 dBm		PREAMP DN		
MA SB SC FC CORR		M/M			
CENTER 2,4605 #]f BW			20.00 MHz 20.0 msec		
ANTENNA/COUPLER: □ 9124 Bicon □ 3109 Bicon □ CBL6140 X-Wing □ NNB-4/63TL LISN □ 3146 Log Per □ 3115 Horn □ JB3 Bilog □ NNB-4/200X LISN □ 3106 Horn □ CBL6112B Bilog □ NSLK 8126 LISN □ MDS-21 Clamp					
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other	POLARIZATION: Vertical Horizontal Line Neutral NA	DISTANCE: 	LOCATION: ☐ OATS ☐ Semi-Anechoic ☐ Shielded Room ☐ Factory Floor ☐ Other		



		i resissif riigirii	
Report No.:		307625324.001	Page 14 of 68
NOTES:			
		Spectrum Bandwidth High Frequency	
<u>@</u> 14:50:24	NOV 07, 2007		
		OCTU DET. DEO	I/
MARKER 2.48135	GHz	ACTV DET: PEA: MEAS DET: PEA:	K OP ANG
63.46 di	3μV	MKR a	!.Կ8135 GHz 83.Կ8 dBաV
			ου, το αρμν
LDG REF 122	.0 dBμV		
10 dB/			et 62 62
AIN 40 dB		\u00e4	s, s,
שט שר		when the same	
0 0			e e
6 N N		* * * * * * * * * * * * * * * * * * *	s s
MA SB	m/V	1	1
SC FC CORR		V	MM
A 1440	V		V
CENTER 2.4800	10 GHz		1 10.00 MHz
#]f BW :	100 kHz	W 100 kHz SWP	'20.0 msec
	ANITI	ENNA/COUPLER:	_
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN
3146 Log Per 3106 Horn	3115 Horn CBL6112B Bilog	JB3 Bilog NSLK 8126 LISN	NNB-4/200X LISN MDS-21 Clamp
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
Radiated Prescan	Vertical	3 Meter	OATS
Radiated Final Conducted	Horizontal Line	10 Meter Meter	Semi-Anechoic Shielded Room
Disturbance Power	Neutral	NA Neter	Factory Floor
Other	_		Other





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4.1.6 Tabulated Test Data

Radiated Emissions	Measure	ments				
Standard:	47 CFR 15	.247 (a) (2)			Date:	11/7/2007
Device Tested:	Sensor Sw	itch - Radio Brid	dge		File:	07110701- 6dB Bandwith.xls
				Minimum		
				Limit □□		
				(Average		
				+		
				Correction		
	Freq	6dB Bandwith	Minimum Limit	Factors -		
Meas #	(MHz)	(MHz)	(MHz)	Limit)	Result	Comment
Channel 1 (2410GHz)	2404.43	1.6500	0.5000	-1.15	Complied	
Channel 8 (2450GHz)	2444.60	1.8500	0.5000	-1.35	Complied	
Channel 15 (2480GHz)	2480.50	1.8000	0.5000	-1.30	Complied	
Tested by:	Dieter Balo	lamus				
TUV Rheinland of North A	merica, Inc.	12 Commerce	Road Newt	own, CT 06	6470 Tel:(203) 4	426-0888 Fax: (203) 426-4009

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.

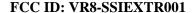


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4.1.7 Photos



Figure 3 - Radiated Emissions Test Setup (Semi-Anechoic Chamber 2)





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4.2 Maximum Output Power

This test measures the radiated electromagnetic levels of the intentional radiator generated by the EUT through the antenna port.

4.2.1 Over View of Test

Results	Complies (as tested	per this re	eport)			Date	07/0/2007	7	
Standard	FCC Part 15.247 (a)	FCC Part 15.247 (a) (2)							
Product Model	Radio Bridge			Sei	rial#	Protoy	pe		
Configuration	See test plan for deta	See test plan for details							
Test Set-up	Tested in shielded ro	Tested in shielded room EUT placed on table see test plans for details						for details	
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Hı	ımidity	45%	Pressure	998mbar	
Frequency Range	2.405GHz - 2.480GH	Hz @ 3m							
Perf. Criteria	1 Watt (30dBm) (Bellow Limit)	Perf. Verification		1	Readings Under Limit for L1 and L2				
Mod. to EUT	None	Test Per	formed I	3y	Dieter E	Baldamu	IS		

4.2.2 Test Procedure

Radiated emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.2.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.





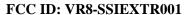
Report No.		307625324.001	Page 18 of 68	
4.2.5 Sum	nmary of Final Data	ı		
NOTES:		Duty Cycle Measu	rement	
∰ 15:12:0	6 NDV 07, 2007			
MARKER 10.675 -2.15	msec	ACTV DE MEAS DE	T: PEAK QP MKR⊿ 10.675	
LOG REF 13	.0 dBm		PREA.	MP DN
AB/	muy	hul.	Mound	ed)
VA SB SC FC CORR				
CENTER 2.44		1	SPAN	MW 9 Ø Hz
#]f BW	100 kHz	JG BW 100 kHz	#SWP 15.0) msec
9124 Bicon 3146 Log Per 3106 Horn	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bilog	ANTENNA/COUPLER CBL6140 X-Wing JB3 Bilog NSLK 8126 LISN	<u>:</u>	NNB-4/63TL LISN NNB-4/200X LISN MDS-21 Clamp
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power	POLARIZATION: Vertical Horizontal Line Neutral	DISTANCE:		LOCATION: ☐ OATS ☐ Semi-Anechoic ☐ Shielded Room ☐ Factory Floor
Other	□ NA			Other



Re	3070	625324.00)1		Page 19	9 of 68					
NOTES:	Duty Cycle Measurement										
<u>(</u>	5:12:40 N()V Ø7, 2001	7		F140 PMH (5, 10)	2000					
1	MARKER ∆ 2.0250 ms -1.75 dB	ec			DET: PE. DET: PE. MKR⊿	AK QP A 2.0250					
10	REF 13.0	dBm		[8]	8	PREAM	P DN				
dB∕ AJN 50 dB _.	Mun	, J	*			Many	M				
VA SB SC FC CORR-											
CENTER	MM√ ₹ 2.444550 #]F BW 10		AUG BW 10		M∧/M/\/ #Sh	SPAN IP 15.0					
			ANTENNA				7				
3146 Log I	9124 Bicon				.6140 X-Wing Bilog K 8126 LISN		NNB-4/63TL LISN NNB-4/200X LISN MDS-21 Clamp				
MEAS TYP Radiated F Radiated F Conducted Disturbance Other	Prescan Final l ce Power	POLARIZA' Vertical Horizontal Line Neutral NA	ΓΙΟΝ:	DISTA 3 M 10 N NA			OCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other				



	, research to the second secon					
Report No.:	30	7625324.001	Page 20 of 68			
NOTES:						
NOTES.	Max	ximum Output Power Low Frequency				
<u> </u>						
<i>ርኤ</i> መ 14:24:49 .	NDV 07. 2007					
ტე 14:24:49 MFR: SEN	SOR SWITCH MODEL:	RADIO BRIDGE				
MARKER 2.40446	GH-	ACTV DET: PEAK MEAS DET: PEAK	որ ոսց			
3.77 dBm			0448 GHz			
			3.77 dBm			
LDG REF 13.0	l dBm	PI	REAMP ON			
dB/			85			
ATN 50 dB						
× 1						
		The second second				
MA SB SC FC						
CORR						
8 8						
	5 00	CDON 4	0 00 MU			
CENTER 2.4054 #]F BW 1			0.00 MHz 500 msec			
9124 Bicon	ANTENN 3109 Bicon	A/COUPLER: CBL6140 X-Wing	NNB-4/63TL LISN			
3146 Log Per	3115 Horn	JB3 Bilog	NNB-4/200X LISN			
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp			
MEAS TYPE: Radiated Prescan	POLARIZATION: Vertical	DISTANCE:	LOCATION:			
Radiated Final	Horizontal	10 Meter	Semi-Anechoic			
Conducted Disturbance Power	Line Neutral	Meter NA	Shielded Room Factory Floor			
Other	□ NA		Other			





R	eport No.:			625324.00					Page 21 of 68
NOTES:				mum Ou iddle Fr					
(36) 1	5:06:35 N	DV 07, 2007							
	MARKER 2.44446 GHz 2.66 dBm ACTV DET: PEAK MEAS DET: PEAK QP AVG MKR 2.44446 GHz 2.66 dBm								
LDG	REF 13.0	dBm					PREAL	MP DN	
10 dB/ ATN 50 dB				_					
				8					
MA SB SC FC				93					
CORP	1			88			S.	15	
CENTE	R 2.44455 #]F BW 1.		IG BW 3	MHz				MHz msec	
			ANTENNA	/COLID	(FD.				
9124 Bico 3146 Log 3106 Hor	Per	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bild		CBI JB3	6140 X- Bilog K 8126 I	_		=	3TL LISN 00X LISN Clamp
	Prescan Final	POLARIZATION Vertical Horizontal Line Neutral NA	<u>ON:</u>	DISTA 3 M 10 N NA				LOCATIO OATS Semi-An Shielded Factory Other	echoic Room





			Precis	ely Right.			
R	eport No.:		30762	5324.001			Page 22 of 68
NOTES:	NOTES: Maximum Output Power High Frequency						
MFR: 29:56 NDV 07, 2007 MFR: SENSOR SWITCH MODEL: RADIO BRIDGE MARKER ACTV DET: PEAK 2.48050 GHz MEAS DET: PEAK OP AVG 2.75 dBm MKR 2.48050 GHz 2.75 dBm							
LDG 10 dB/ ATN 50 dB	REF 13.0	dBm			P.	REAMP DN	
MA SB SC FC CORF	- warman						
CENTE	LENTER 2.46050 GHz SPAN 20.00 MHz #]F BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec						
		Δ1	NTENNA/(COUPLER	<u> </u>		
9124 Bico 3146 Log 3106 Hor	Per	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bilog	[]	CBL6140	X-Wing	=	3TL LISN 00X LISN Clamp
MEAS TY Radiated Radiated Conducte Disturbat	Prescan Final ed nce Power	POLARIZATIO Vertical Horizontal Line Neutral NA		DISTANCE 3 Meter 10 MeterMete	_	LOCATIO OATS Semi-An Shielded Factory Other	echoic Room





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4.2.6 Tabulated Test Data

Radiated Emission	ns Measu	rements								
Standard:	47 CFR 15.	.247(b) (3)		Pres	can/Final:	Final			Date:	11/7/2007
Device Tested:	Sensor Swi	tch - Radio E	Bridge		Distance:	0m, Direct	Measureme	nt	File:	07110707 Max Power.xls
Meas #	Freq (MHz)	Measured Peak (dBm)	Cable Correction	Duty Ovele	Antenna Gain	Corrected Measured Average (dBm)	Peak Limit 1 Watt (30dBm)	Peak (dB) □	e.i.r.p. Peak	Comment
ivieas #	(IVITZ)	(ubiii)	Factor	Duty Cycle	Gain	(ubiii)	(300DIII)	(ub) 🗆	Power (dBm)	Comment
Channel 1 (2.405GHz)	2404.48	3.60	1.00	-5.51	2.14	1.23	30.00	-28.77	Complied	
Channel 8 (2.444GHz)	2445.48	2.73	1.00	-5.51	2.14	0.36	30.00	-29.64	Complied	
Channel 15 (2.480GHz)	2480.24	2.86	1.00	-5.51	2.14	0.49	30.00	-29.51	Complied	
Tested by:	Dieter Bald	amus								
TUV Rheinland of North	America, In	c. 12 Comr	nerce Road	Newtown	, CT 0647	Tel:(20	3) 426-0888	Fax: (203)	426-4009	

Average Values were calculated based on the duty cycle of the transmission frequency Measured Duty Cycle is 2.025ms + 0.787ms in 10ms

Duty Cycle = Tx ON/(TxON+TxOFF)

Duty Cycle 28.12% in dB -5.509847

Average Value = Peak Value (in dBm) - Duty Cycle Duty Cycle = 10log (0.2812) = -5.50985

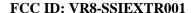
Corrected Measured Peak (dBm) = Measured Peak + Correction Factor+ Duty Cycle+ Antenna Gain



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Figure 4 – Maximum Output Power (Semi-Anechoic Chamber 2)





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4.3 RF Human Exposure Limits

This test evaluates the potential for the EUT currents to be injected into the public supply system and cause distortion on the AC power lines.

4.3.1 Test Over View

Results	Complies (as tested	l per this	report)		Date	08/10/2	207
Standard	FCC Part 15.247 (b)(5)	and 1.1310	l				
Product Model	Radio Bridge			Serial#	Protoy	ре	
Configuration	See test plan for deta	ails					
Test Set-up	Tested in shielded ro	oom	EUT p	laced on tabl	e		
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Humidity	45%	Pressure	998mbar
Frequency Range	2.405GHz - 2.480G	Hz @ 3n	1				
Perf. Criteria	1.0 (mW/cm2) (Bellow Perf. Verification Limit)			Readings under Limit			
Mod to EUT	None		Test Perf	ormed By	Dieter	Baldamus	

4.3.2 Test Procedure

The maximum input power was measured. Then the minimum distance to the radiator was calculated based on the following formula:

 $S=PG/4\Pi r^2 = EIRP/4\Pi r^2$ where:

P: Power Input to the antenna in mW

EIRP: Equivalent (effective) isotropic radiated power.

S: power density mW/cm² (1.0 according to the maximum permissible exposure limits (MPE) stated in the FCC standard.

G: Numeric Gain of antenna relative to isotropic radiator

r: Distance to centre of radiation in cm

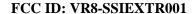
 $r = \sqrt{PG/4\Pi S}$

4.3.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.3.4 Final Test

The distance of the antenna is greater than the calculated in r. Therefore the FCC radio frequency exposure limits are not exceeded.





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4.3.5 Tabulated Test Data

Radiated Emission	ns Measu	rements							
Standard:	47 CFR 15	.247(b) (5) and	1.1310				Date:	11/7/2007	
Device Tested:	Sensro Swi	tch - Radio Bri	dge				File:	07110707 R	F Exposure
Meas#	Freq (MHz)	Measured Peak (dBm)	Cable Correction Factor	Duty Cycle	Total Average EIRP (dBm)	Total Average EIRP (mW)	S Max Exposure Limit (mW2/cm)	Safety Distance (cm)	Comment
Channel 4 (2440CHe)	0404.40	2.00	1.00	F F4	0.04	0.04	1.00	0.054	Marrian Cofety Dietor of
Channel 1 (2410GHz)	2404.48	3.60	1.00	-5.51	-0.91	0.81	1.00	0.254	Maximum Safety Distance
Channel 8 (2450GHz)	2445.48	2.73	1.00	-5.51	-1.78	0.66	1.00	0.230	
Channel 15 (2480GHz)	2480.24	2.86	1.00	-5.51	-1.65	0.68	1.00	0.233	
Tested by:	Dieter Bald	amus							
TUV Rheinland of North	America, In	c. 12 Comme	rce Road	Newtown, 0	CT 06470	Tel:(203)	426-0888 F	ax: (203) 420	6-4009

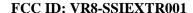
Average Values were calculated based on the duty cycle of the transmission frequency Measured Duty Cycle is 2.025 ms + 0.787 ms in 10ms

Duty Cycle = Tx ON/(TxON+TxOFF)

Duty Cycle = 28.12% in dB = -5.509847

Total Average EIRP = Measured Peak (in dBm) + Cable Correction Factor - Duty Cycle

Safety Distance = vE/(4*¶*S) = vTotal Average EIRP/(4*3.1416*Max Exposure Limit)





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4.4 Radiated Spurious Emissions

This test measures the radiated electromagnetic levels of the intentional and unintentional radiator generated by the EUT.

4.4.1 Test Over View

Results	Complies (as teste	d per this r	eport)		Date	10/09/200	7
Standard	FCC Part 15.247 (c),	15.205, 15.20	9				
Product Model	Radio Bridge			Serial#	Protoy	pe	
Configuration	See test plan for de	tails					
Test Set-up	Tested in shielded	room EUT	placed or	n table			
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Humidity	45%	Pressure	998mbar
Frequency Range	2.405GHz - 2.480	GHz @ 3m					
Perf. Criteria	-20dBc, 15.205 (a)	-20dBc, 15.205 (a), 15.209 (a) Perf. Verification			Readin	ngs under Li	mit
Mod to EUT	None		Test Pe	rformed By	Dieter	Baldamus	

4.4.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.4.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.4.4 Final Test

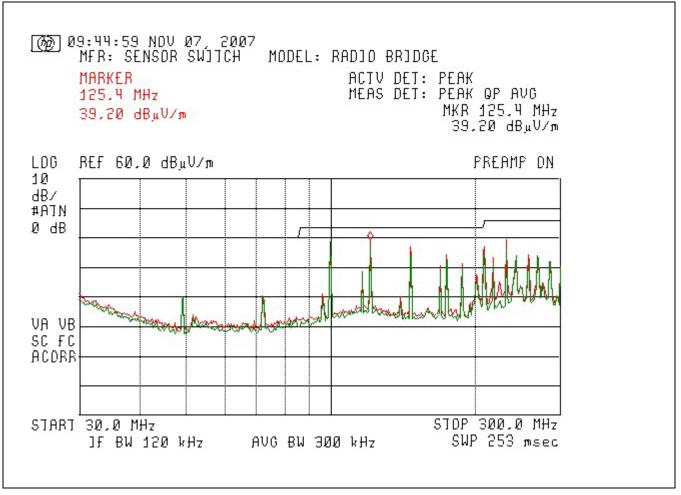
The Voltage Fluctuations & Flicker of the EUT were below the limits specified in the standard. The EUT complies with 24dmax requirements for manual switching.



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4.4.5 Summary of Final Data

NOTES:	
	Radiated Emissions Prescan



	ANTENNA/COUPLER:					
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN			
3146 Log Per	☐ 3115 Horn	JB3 Bilog	NNB-4/200X LISN			
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp			
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:			
Radiated Prescan	Vertical Vertical	3 Meter	OATS			
Radiated Final	Morizontal	10 Meter	Semi-Anechoic			
Conducted	Line	Meter	Shielded Room			
Disturbance Power			Factory Floor			
Other	□ NA		Other			



Report No.:		25324.001	Page 29 of 68
			· ·
NOTES:	Radiated Spurious	Emissions Prescan	
(№) 09:49:11 NOV MFR: SENSO MARKER 301.2 MHz 50.52 dBµV	R SW]TCH MODEL: F	RADIO BRIDGE ACTV DET: PEAK MEAS DET: PEAK OP MKR 301. 50.52 (.2 MHz
LOG REF 60.0 d 10 dB/ #AIN 0 dB	BuV/m	PREA	MP DN
VA VB SC FC ACDRR			
START 300.0 MHz Jf BW 120	kHz AVG BW 300	STOP 1.000 3 kHz SWP 650	
	_	COUPLER:	
9124 Bicon 3146 Log Per 3106 Horn	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bilog	☐ CBL6140 X-Wing ☐ JB3 Bilog ☐ NSLK 8126 LISN	☐ NNB-4/63TL LISN ☐ NNB-4/200X LISN ☐ MDS-21 Clamp
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other_	POLARIZATION: Vertical Horizontal Line Neutral NA	DISTANCE: 3 Meter 10 Meter Meter NA	LOCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other





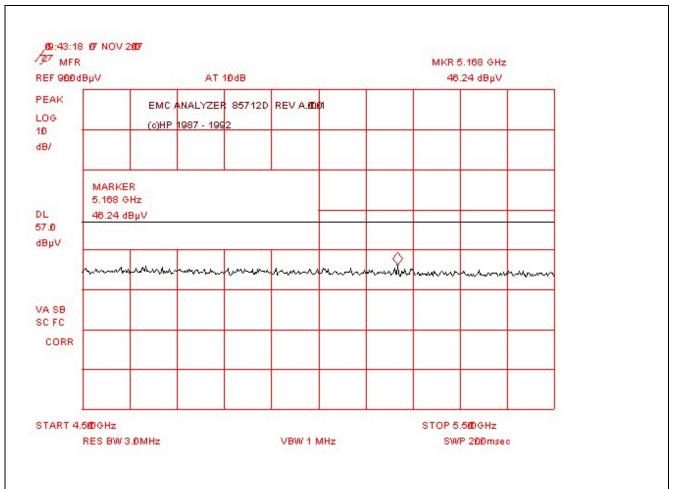
Report No.:	307625324.001	Page 30 of 68
NOTES:	Radiated Spurious Emissions Prescan	
@ 09:55:54 ND MFR: SENSO MARKER 1.076 GHz 35.60 dBµl		
LDG REF 60.0 c 10 dB/ #ATN 0 dB	B _U V/m	PREAMP DN
VA VB SC FC ACORR		
START 1.000 GHz]f BW 1.0		P 2.000 GHz P 20.0 msec
	ANTENNA/COUPLER:	
9124 Bicon 3146 Log Per 3106 Horn	3109 Bicon	NNB-4/63TL LISN NNB-4/200X LISN MDS-21 Clamp
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other	POLARIZATION:	LOCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other



			Pre	cisely Right.				
Report No.:			3076	Page 31				
OTES: Radiated Spurious Emissions Prescan								
89 :36:23 67 NO 77 MFR REF 900 dBpV	V 2007	AT 10dB			MKR 2.2217 G 46.29 dB			
PEAK	EMC		DE) (A energy		10.20 0	<u> </u>		
LOG	1000	ANALYZER 85712D 1987 - 1992	KEV A.MUI					
10 dB/	(c)nr	1807 - 1882						
		2	2 2					
MARI								
DL 46.29	7 GHz dΒμV							
57.0 dΒμV					SRQ 140			
обру		5 - 5 -		A Commission and a second	-			
المان ال	have adolesced	was in the contract of the contract	e astaladas prospetiones.	Aphilipson to explandation	AND THE RESIDENCE OF THE PARTY	accommence with		
MAVB								
SC FC								
CORR								
						-		
START 2.0000 GHz					STOP 2.4650 GH:	7		
	V3.0MHz		VBW 1 MHz	z	SWP 200			
9124 Bicon		3109 Bicon	NTENNA		<u>R:</u> 40 X-Wing	NNB-4/63TL LISN		
3146 Log Per		3115 Horn		JB3 Bilog		NNB-4/200X LISN		
3106 Horn		CBL6112B Bil	og		8126 LISN	MDS-21 Clamp		
EAS TYPE: POLARIZATION:		ON:	DISTAN		LOCATION:			
Radiated Prescan		Vertical			er	OATS		
Radiated Final Conducted		Horizontal Line		10 Meter Meter		Semi-Anechoic Shielded Room		
Conauctea Disturbance Pow	er	Neutral		\bigcup_{NA}^{NA}	10101	Factory Floor		
Other		NA NA				Other		



Poport No.	207525224 004	Dog 22 of 69
Report No.:	307625324.001	Page 32 of 68
NOTES:		
	Radiated Spurious Emissions Prescan	



ANTENNA/COUPLER:								
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN					
3146 Log Per	⊠ 3115 Horn	☐ JB3 Bilog	NNB-4/200X LISN					
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp					
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:					
Radiated Prescan	Vertical	3 Meter	OATS					
Radiated Final	Morizontal	10 Meter	Semi-Anechoic					
Conducted	Line	Meter	Shielded Room					
Disturbance Power	Neutral Neutral	│	Factory Floor					
Other	□ NA		Other					



CC ID. VI	K0-881EA I KI	,W1	Pred	isely Right.				
Report No.:			3076	25324.001		Page 33 of 68		
OTES:		Radiated	d Spurious	Emissions 1	Prescan			
99:45:48 /97 MFR REF 900dB	67 NOV2 667 ЭµV	AT 10dB	10 /10	164	MKR 7.915 52.27 dl			
PEAK LOG 10 dB/		ANALYZER 85712D 1987 - 1992	REV A.MOM					
DL 57.0	MARKER 7.915 GHz 52.27 dBµV							
	+ may receive the	Harris Commission Commission	<u> Anna an an an</u>	"The industry the	and the second second second second	printing of the second		
VA VB SC FC CORR								
START 5.6	79 GHz RES BW 3.0MHz		VBW 1 MHz		STOP 10000 6H; SWP 86.			
] 0124 P:			NTENNA/	COUPLER			CATEL A MONI	
9124 Bicon 3146 Log P 3106 Horn	Per	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bild	og	JB3 Bilo NSLK 81		NNB-4/2	63TL LISN 200X LISN 1 Clamp	
EAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other		POLARIZATIO Vertical Horizontal Line Neutral NA	ON:	DISTANCE: 3 Meter 10 Meter Meter NA		LOCATION OATS Semi-An Shielder Factory Other	nechoic l Room	



			Pred	isely Right.					
Rep	oort No.:		307625324.001			Page 34 of			
OTES: Radiated Spurious Emissions Prescan									
09:48:59 /V MFR REF 900dB	67 NOV 2 667 µV	#AT ØdB			MKR 18938 GHz 41.99 dBpV				
PEAK LOG 10 dB/	EMC	ANALYZER 85712D 1987 - 1992	REV A.MO						
DL 57.0 dBµV	MARKER 10938 GHz 41.99 dBµV								
VA MB SC FC CORR	ore of the second control of the second cont	R. Alexander Company	the section of the se	Lhan morabhain	فيتعيب مسترد علائمة المعارض المسترد ال	Land Andrews			
START 100	D GHz				STOP 13.000 GHz				
#RE	ES BW 1.0MHz		VBW 300kHz		SWP 600mse	c			
9124 Bicon 3146 Log Po 3106 Horn		☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bild	og	COUPLER: CBL6140 JB3 Bilog NSLK 812	X-Wing 26 LISN	☐ NNB-4/63TL LISN ☐ NNB-4/200X LISN ☐ MDS-21 Clamp			
EAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other		POLARIZATION Vertical Horizontal Line Neutral NA	<u>ON:</u>	DISTANCE: 3 Meter 10 Meter Meter NA		LOCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other			



cc ib. v	Ko-SSIEAIK		Pred	isely Right.		
Report No.:			3076	25324.001	Page 35 of	
OTES:		Radiate	d Spurious	Emissions	Prescan	
99:51:22 /g/ MFR REF 900d		#AT ØdB	D //D	50	MKR 17.290 43.32 d	
PEAK	EMC	ANALYZER 85712D	REV A.000			
LOG 10	(c)HF	1987 - 1992				
dB/						
DL 57.0	MARKER 17.290 GHz 43.32 dBμV					
dΒμV	manustra Museral	ic discovered and the contradition	الدورا ووساد استألاه	and the second section	and the made and the con-	whenever
VA MB SC FC						
CORR						
START 13	8.000 GHz RES BW 1.0MHz		VBW 300kHz		STOP 19.000 GF SWP 12	
		Δ	NTENNA/	COUPLE	R:	
9124 Bico		3109 Bicon	. , 2 231 11 1/2/	CBL61	40 X-Wing	NNB-4/63TL LISN
3146 Log		3115 Horn CBL6112B Bile	0 g	JB3 Bil	og 3126 LISN	NNB-4/200X LISN MDS-21 Clamp
EAS TYI		POLARIZATIO		DISTAN		LOCATION:
Radiated Prescan		Vertical	<u>- · · · · -</u>	3 Meter		OATS
Radiated Final		Horizontal			er	Semi-Anechoic
Conducte		Line		=	eter	Shielded Room
Disturbance Power Other		Neutral NA		□ NA		Factory Floor Other



recib. v.	KO-SSILATK	JU1	Pred	cisely Right.			
Re	Report No.:			25324.001		Page 36 of 68	
NOTES:		Radiate	d Spurious	Emissions l	Prescan		
89:53:13 FF MFR REF 9000de	67 NOV 2 867 3µV	#AT ØdB	a (a		MKR 19.3422 (43.55 d		
PEAK LOG 10 dB/		ANALYZER 85712D 1987 - 1992	REVA.MON				
DL 57.0	STOP 19.4786 GHz						
dBμV MA.VB	and the second subsequently and the second s	ulusinessalt disserviced		electrical on American	. Sironnana	makennine	
SC FC CORR							
START 19. #R	.0000 GHz ES BW 1.0MHz		VBW 300kHz		TOP 19.4786 G SWP 200		
		<u>A</u>	NTENNA	COUPLER	•		
9124 Bicon 3146 Log F 3106 Horn	Per	☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bild	og	CBL6140 JB3 Bilog NSLK 81	g	NNB-4/2	63TL LISN 200X LISN 1 Clamp
Radiated F Radiated F Conducted	Radiated Prescan Radiated Final Conducted Disturbance Power		ON:	DISTANCE: 3 Meter 10 Meter Meter NA		LOCATION OATS Semi-An Shielder Factory Other	nechoic d Room

FCC ID: VR8-SSIEXTR001



CC ID. VRo-	SILA I KUUI	Precisely Rig	ht.	
Report	No.:	307625324.0	01	Page 37 of 6
OTES:	Ra	diated Spurious Emissi	ons Prescan	
,14:43: 68 67 Ni <i>Гуг</i> мгг REF 1 60: 0dBµV	0V 2 007 #AT 20°d	В	MKR 7.334 0 GHz 67. 20 dΒμV	
PEAK LOG 10 dB/	EMC ANALYZER 8 (c)HP 1987 - 1992	5712D REV A.8001		
7.33	RKER 140 G Hz 0 d B µ V			A A 4045
VA SB SC FC CORR				
CENTER 7.3413 RES E	GHz W 1.0MHz	VBW 380kHz	SPAN 1000MHz SWP 200msec	
9124 Bicon 3146 Log Per 3106 Horn	☐ 3109 Bic	rn 🔲 JB3	LER: L6140 X-Wing Bilog LK 8126 LISN	NNB-4/63TL LISN NNB-4/200X LISN MDS-21 Clamp
EAS TYPE: Radiated Presca Radiated Final Conducted Disturbance Po Other	Horizon	∑ 3 M	Ieter [Meter [_Meter [OCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other



Repo	ort No.:		30762532	4.001		Page 38
ΓES:		Radiated	l Spurious Emi	ssions Prescan		
14:48:21 @ /g/ REF .ØdBm	7 NOV 2 207	AT 1DdB		MKR 7.3	37 0	
PEAK LOG 10 dB/		ANALYZER 85712D 1987 - 1992	REV A. 00 01			
7	MARKER 7.337ØGHz 31.93 dBm					
MA SB SC FC ~~ CORR		of the state of th		Mundhin	Manuel Manuellande	
CENTER 7.3: #RES	360 GHz S BW 3.0MHz		VBW 1 MHz	SPAN 18 SWI	DDMHz P 200msec	
			NTENNA/COU			
124 Bicon 146 Log Pe 106 Horn	r	 ☐ 3109 Bicon ☐ 3115 Horn ☐ CBL6112B Bild 		CBL6140 X-Wing JB3 Bilog NSLK 8126 LISN	☐ NNB-4/63T ☐ NNB-4/200 ☐ MDS-21 Cl	X LISN
AS TYPE Radiated Pro Radiated Fire Conducted	escan	POLARIZATION Vertical Horizontal Line		STANCE: 3 Meter 10 Meter Meter	LOCATION OATS Semi-Anecl	hoic



Re	eport No.:			307	625324.001			Page 39
ES:		Ra	diated	l Spurious	s Emission	ns Prescan		
,14:50:49 27 EF 107.0	67 NOV 2007	AT 10:	18				825 GHz 92 dBµV	
EAK OG 0	E	MC ANALYZER 8		REV A.8001	-		2 450	
	MARKER 9.7825 GHz 5092 dBµV							
A SB C FC CORR	ander man	or the second	Angen	A.	www.ww	~~~	who and how will	
).7820GHz RES BW 1.0MHz			VBW 300kH	z	SPAN 28	DDMHz P 200msec	
124 Bicon	n	3109 Bio		NTENNA		ER: 5140 X-Wing	□ NNR.4/	63TL LISN
146 Log 1 106 Horr	Per 1	3115 Ho	rn 2B Bilo		☐ JB3 F	Bilog K 8126 LISN	NNB-4/ MDS-2	200X LISN 1 Clamp
AS TYF adiated I adiated I onducted	Prescan Final	POLARIZ Vertical Horizon Line		<u>DN:</u>	DISTAN	ter		ON: nechoic d Room



FCC ID: VR8-S	SIEXIK	W1		P	recisely	Right.				
Report I	No.:			30	762532	4.001				Page 40 of 68
NOTES:		F	Radiated	d Spurio	us Emi	ssions P	rescan			
14:55:52 0 7 NO <i>Уут</i> REF 137.0dBµV	0V 2 107	AT 4	Ючв	D 55		9 2		2138 GHz .48 dBµV		
PEAK LOG 10 dB/	1000	ANALYZER 1987 - 199		REV A. 800						
19.000000	KER 38 GHz 3 dBµV									
VA SB SC FC CORR	person the grant age of the second	Ndyma og Nazaria	والدر معمولها	n	Am	hadahaan ee	non beautiful and the second	المرسم	pubrah	
CENTER 7.21400 RES B\	9Hz W 1.8MHz			VBW/380k	Hz		SPAN 1 SW	0 00MHz /P 2 0 0mse	c	
9124 Bicon 3146 Log Per 3106 Horn		☐ 3109 E ☑ 3115 F ☐ CBL6	Bicon	NTENN.		JPLER: CBL6140 JB3 Bilog NSLK 812			NNB-4/	63TL LISN 200X LISN 11 Clamp
MEAS TYPE: Radiated Presca Radiated Final Conducted Disturbance Pov	n	POLAR Vertic Horizo Line Neutra	<mark>al</mark> ontal	ON:		STANCI 3 Meter 10 Meter Meter			LOCATI OATS Semi-A Shielde Factory Other	nechoic d Room



FCC ID: VR8-SSIEXTR001

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Tabulated Test Data

Standard:	47 CFR 15	.247 (c)			Date:	7/26/2007
Device Tested:		itch - Radio	Bridge			07110704 S.E. Conducted
ocvice resieu.	OCHOOL OW	Tradio	Dilago		T IIC.	or Horo- C.E. Conducted
				Margin H		
				(Average		
				+		
		RF Peak		Correction		
	Freq	Level	-20dBc	Factors -		
Meas #	(GHz)	(dBµV)	Limit (dBm)	Limit)	Result	Comment
Lower Channel	(- /	(- - /	, ,	,		
1	2.4046	109.82				
2	2.4000	64.60	89.82	-25.22	Complied	at bandedge
3	4.8091	68.31	89.82	-21.51	Complied	2nd Harmonic
4	7.2140	81.48	89.82	-8.34	Complied	3rd Harmonic
5	9.7825	56.86	89.82	-32.96	Complied	4th Harmonic
Middle Channel						
6	2.4445	109.17				
7	4.8910	63.45	89.17	-25.72	Complied	2nd Harmonic
8	7.3369	75.07	89.17	-14.10	Complied	3rd Harmonic
9	9.7825	50.10	89.17	-39.07	Complied	4th Harmonic
High Channel						
10	2.4805	109.27			Complied	
11	2.4835	64.39	89.27	-24.88	Complied	at bandedge
12	4.9593	51.94	89.27	-37.33	Complied	2nd Harmonic
13	7.4414	71.54	89.27	-17.73	Complied	3rd Harmonic
14	9.9186	47.09	89.27	-42.18	Complied	4th Harmonic
ested by:	Dieter Bald	amus				

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.



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4.4.6 Photos

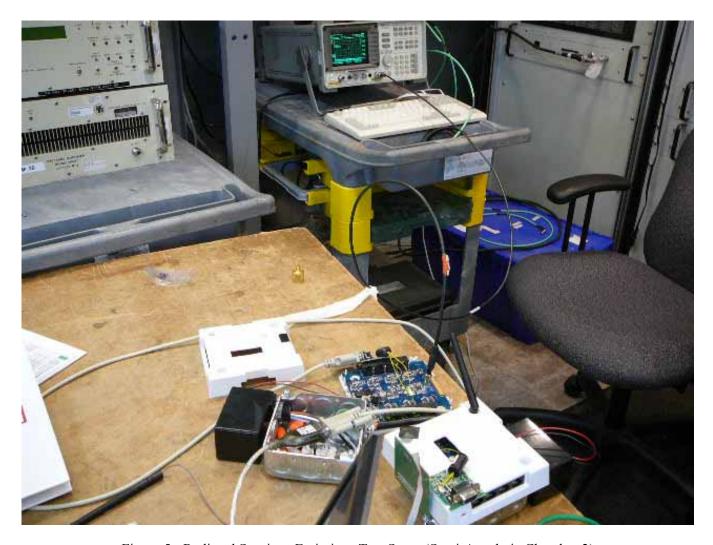


Figure 5 - Radiated Spurious Emissions Test Setup (Semi-Anechoic Chamber 2)

FCC ID: VR8-SSIEXTR001



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Figure 6 - Radiated Spurious Emissions Test Setup (Radiated Prescan- Semi Anechoic Chamber)

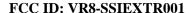
FCC ID: VR8-SSIEXTR001



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Figure 7 - Radiated Spurious Emissions Test Setup (Radiated Final Test - OATS)





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4.5 Transmitter Power Density Spectrum

This test is to evaluate

4.5.1 Test Over View

Results	Complies (as tested per this report)					Date	e	07/0/20	007	
Standard	FCC Part 15.215 (b)	FCC Part 15.215 (b)								
Product Model	Radio Bridge	Radio Bridge Serial# Protoype								
Configuration	See test plan for de	See test plan for details								
Test Set-up	Tested in 3m chamber EUT placed on table See test plan for details									
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Н	umidity	45%	Pre	essure	998mbar	
Frequency Range	2.405GHz - 2.480	GHz @ 3	m							
Perf. Criteria	8dBm in a 3kHz BW Perf. Verification			Readi	ngs t	ınder Li	mit			
Mod to EUT	None		Test P	erfo	rmed By	Dieter	Dieter Baldamus			

4.5.2 Test Procedure

The Radiated Power Density was performed using a 1 second interval over a 3kHz bandwidth within each band.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS

4.5.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Immunity test.

4.5.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

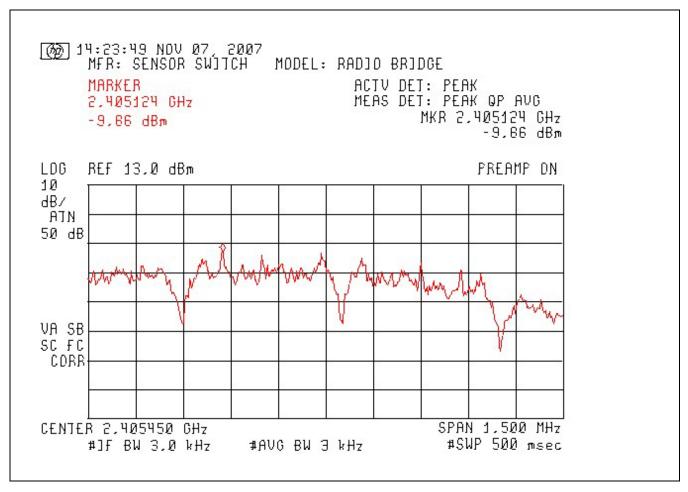
4.5.5 Test Results



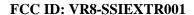
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Report No	301 023324.00 I	1 446 40 01 00

4.5.6 Summary of Final Data

NOTES:
Transmitter Power Density Measurement

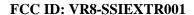


ANTENNA/COUPLER:										
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN							
3146 Log Per	⊠ 3115 Horn	☐ JB3 Bilog	NNB-4/200X LISN							
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp							
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:							
Radiated Prescan	Vertical	3 Meter	OATS							
Radiated Final	Horizontal	10 Meter	Semi-Anechoic							
Conducted	Line	Meter	Shielded Room							
Disturbance Power	Neutral	□ NA	Factory Floor							
Other	□ NA		Other							





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NOTES: Transmitter Power Density Measurement										
(ആള് 15:07:36 NOV J	07, 2007									
MARKER 2.444501 GHz -10.12 dBm	ACTV DET: PEAK MEAS DET: PEAK QP AVG MKR 2,444501 GHz -10,12 dBm									
LDG REF 13.0 dBm 10 dB/ ATN 50 dB	PREAMP DN									
	What have have been a second to the second t									
CENTER 2.444550 G #JF BW 3.0 k										
9124 Bicon 3146 Log Per 3106 Horn	3115 Horn JB3 Bilog NNB-4	4/63TL LISN 4/200X LISN 21 Clamp								
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other	Horizontal									





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NOTES: Transmitter Power Density Measurement										
MARKER 2.479494 GH -9.25 dBm LOG REF 15.0 dE 10 dB/ ATN	ACTV DET: PEAK MEAS DET: PEAK QP AVG MKR 2,479494 GHz -9,25 dBm									
VA SB SC FC CDRR	the town of the think of the th									
CENTER 2.480000 #JF BW 3.0										
ANTENNA/COUPLER: ☐ 9124 Bicon ☐ 3109 Bicon ☐ CBL6140 X-Wing ☐ NNB-4/63TL LISN ☐ 3146 Log Per ☐ 3115 Horn ☐ JB3 Bilog ☐ NNB-4/200X LISN ☐ 3106 Horn ☐ CBL6112B Bilog ☐ NSLK 8126 LISN ☐ MDS-21 Clamp										
Radiated Prescan	POLARIZATION:									



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4.5.7 Photos

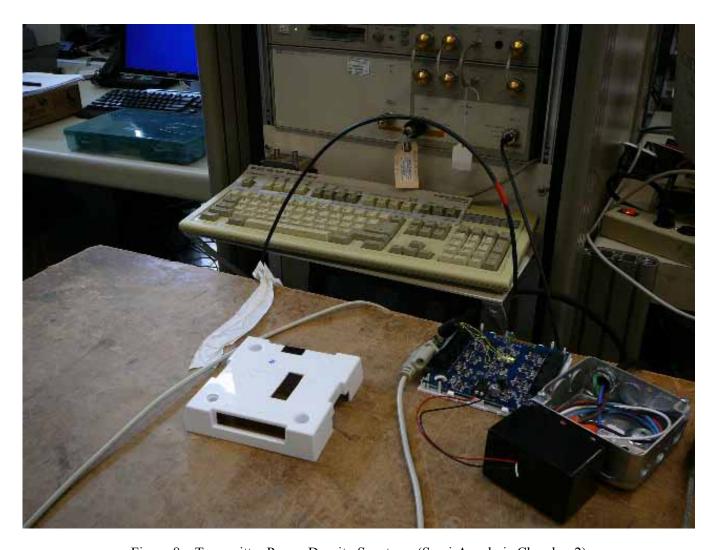
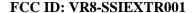


Figure 8 – Transmitter Power Density Spectrum (Semi-Anechoic Chamber 2)





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4.6 Conducted Emissions

This test measures the electromagnet levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other near by electronic equipment.

4.6.1 Test Over View

Results	Complies (as tested per this report)						07/0/2007	7		
Standard	FCC Part 15.207	FCC Part 15.207								
Product Model	Radio Bridge	Radio Bridge Serial# Protoype								
Configuration	See test plan for detail	See test plan for details								
Test Set-up	Tested in shielded roo	Tested in shielded room EUT placed on table								
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Hun	nidity	45%	Pressure	998mbar		
Frequency Range	120V/60Hz, 0150-30N	МНz								
Perf. Criteria	FCC Part 15.207 (a)	Perf. V	Perf. Verification Readings Under Limit for L1 and L2							
Mod. to EUT	None	Test P	erformed	l By	Dieter	Baldaı	nus			

4.6.2 Test Procedure

Conducted and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 0.15 to 30 MHz was investigated for conducted emissions.

Conducted Emissions measurements were performed in the shielded room using procedures specified in the test plan and standard.

4.6.3 Deviations

There were no deviations from the test methodology listed in the test plan for the conducted emission test.

4.6.4 Final Test

All final conducted emissions measurements were below (in compliance) the limits.



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4.6.5 Final Graph

NOTES:	
	Conducted Emissions @ 120V/60Hz

[ﮔﮭ査] 16:09:46 NOV 07, 2007 MFR: SENSOR SWITCH MODEL: RADIO BRIDGE [XIL [XIN ACTV DET: PEAK MARKER MEAS DET: PEAK OP AVG 4.19 MHz MKR 4,19 MHz 56,76 dB_uV 56.78 dBuV LDG REF 60.0 dBuV 10 dB/ NTA 10 dB VA VB SC FC ACORR START 150 kHz STOP 30.00 MHz SWP 2.49 sec #]f BW 9.0 kHz AVG BW 30 kHz

ANTENNA/COUPLER:									
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN						
3146 Log Per	☐ 3115 Horn	JB3 Bilog	NNB-4/200X LISN						
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp						
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power Other	POLARIZATION: Vertical Horizontal Line Neutral NA	DISTANCE: 3 Meter 10 Meter Meter NA	LOCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other						



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4.6.6 Final Tabulated Data at 120V/60Hz

Standard:	EN55022:1	998, Class B/F	CC Part 15	.107 (a)						Date:	11/9/2007	
Device Tested:	Sensor Swi	tch - Radio Bri	dge	. ,						File: .xls	07110902 CE120	V.xls
/oltage:	120V/60Hz											
Signal Num	Freq	Peak Amp	QP Amp	Avg Amp	QP Limit	Avg Limit	Conductor	QP U	QP Result	Avg∪	Average Result	Mode
	MHz	dBuV	dBuV	dBuV	dBuV	dBuV		dB		dB		
1	0.1633	43.45	36.71	23.77	65.29	55.29	Line	-28.58	Complied	-31.52	Complied	
2	0.2858	37.09	31.35	4.51	60.64	50.64	Line	-29.29	Complied	-46.13	Complied	
3	0.5039	17.19	9.77	2.53	56.00	46.00	Line	-46.23	Complied	-43.47	Complied	
4	25.0133	44.17	43.75	43.28	60.00	50.00	Line	-16.25	Complied	-6.72	Complied	
5	0.1615	40.73	33.93	23.61	65.39	55.39	Neutral	-31.46	Complied	-31.78	Complied	
6	0.2720	33.87	26.69	8.77	61.06	51.06	Neutral	-34.37	Complied	-42.29	Complied	
7	13.8424	13.28	8.74	2.33	60.00	50.00	Neutral	-51.26	Complied	-47.67	Complied	
8	17.8317	13.95	9.02	2.75	60.00	50.00	Neutral	-50.98	Complied	-47.25	Complied	
9	25.0134	43.54	43.16	42.71	60.00	50.00	Neutral	-16.84	Complied	-7.29	Complied	
ested by:	Dieter Bald	amus										

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4.6.7 Photos

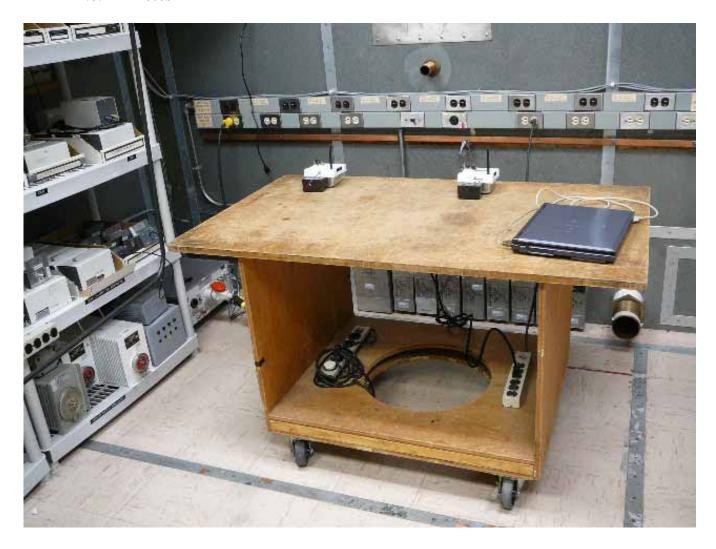
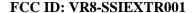


Figure 9 – Conducted Emissions Test Setup





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4.7 Frequency Stability

This test is to evaluate the performance of the EUT when subjected to temperature and voltage changes

4.7.1 Test Over View

Results	Complies (as tested per this report)				Date	10/09/200)7		
Standard	FCC Part 15.215								
Product Model	Radio Bridge Serial#				Protog	уре			
Configuration	See test plan for de	See test plan for details							
Test Set-up	Tested in shielded	Tested in shielded room. See test plans for details							
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Humidity	45%	Pressure	998mbar		
Frequency Range	2.405 GHZ – 2.480	GHz	Temperature Range		0°C – 70°C				
Perf. Criteria	Containment of 20dB of frequency range		Perf. Verification		Readings under Limit				
Mod to EUT	See section 5.5		Test Perf	ormed By	Dieter Baldamus				

4.7.2 Test Procedure

EUT was place in a temperature chamber. Frequency and output power level were measured at room temperature. Temperature in the chamber was increased to 70°C and maintained till the EUT reached that temperature. Frequency and level was measured again. EUT was placed into a humidity chamber and temperature was set to 0 °C. Temperature was maintained till the EUT reached that temperature. Frequency and level were measured again.

4.7.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Surge Immunity test.

4.7.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.



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4.7.5 Summary of Final Test Results

Standard:	FCC Part 15.225 e)			Date:	11/9/2007	
Device Tested:	Radio Bridge			File:	07100812 Freq. Stability.xls	
Customer:	Sensor Switch					
Temperature	Start-up (GHz)	2min (GHz)	5min (GHz)	10min (GHz)	Permitted Band Edge in MHz (+/-0.01%)	Results
Low						
0℃	2.4045	2.4045	2.4048	2.4049	2.4000GHz-2.4835GHz	Complied
22°C	2.4048	2.4050	2.4049	2.4050	2.4000GHz-2.4835GHz	Complied
70°C	2.4049	2.4050	2.4049	2.4050	2.4000GHz-2.4835GHz	Complied
Middle						-
0℃	2.4445	2.4445	2.4445	2.4446	2.4000GHz-2.4835GHz	Complied
22°C	2.4445	2.4445	2.4446	2.4446	2.4000GHz-2.4835GHz	Complied
70°C	2.4446	2.4446	2.4446	2.4446	2.4000GHz-2.4835GHz	Complied
High						-
0°C	2.4805	2.4805	2.4805	2.4805	2.4000GHz-2.4835GHz	Complied
22°C	2.4805	2.4805	2.4805	2.4805	2.4000GHz-2.4835GHz	Complied
70°C	2.4805	2.4805	2.4805	2.4805	2.4000GHz-2.4835GHz	Complied
Tested by:	Dieter Baldamus					

FCC TempStab.xlt Revised 24APR08

Frequency S	tability Test - Volt	tage Variations				
Standard:	FCC Part 15.225 e)			Date:	6/11/2008	
Device Tested:	DSVII+Turbo			File:	08061101 FreqVar.xls	
Customer:	Datastrip					
Temperature	Start-up (GHz)	2min (GHz)	5min (GHz)	10min (GHz)	Permitted Band Edge in MHz (+/-0.01%)	Results
Low						
102 V(85%)	2.4047	2.4047	2.4048	2.4048	2.4000GHz-2.4835GHz	Complied
120V (100%)	2.4048	2.4047	2.4048	2.4048	2.4000GHz-2.4835GHz	Complied
138V (115%)	2.4047	2.4047	2.4047	2.4047	2.4000GHz-2.4835GHz	Complied
Middle						
102 V(85%)	2.4445	2.4445	2.4445	2.4445	2.4000GHz-2.4835GHz	Complied
120V (100%)	2.4444	2.4444	2.4444	2.4444	2.4000GHz-2.4835GHz	Complied
138V (115%)	2.4445	2.4445	2.4445	2.4445	2.4000GHz-2.4835GHz	Complied
High						
102 V(85%)	2.4806	2.4805	2.4804	2.4805	2.4000GHz-2.4835GHz	Complied
120V (100%)	2.4805	2.4805	2.4805	2.4805	2.4000GHz-2.4835GHz	Complied
138V (115%)	2.4806	2.4805	2.4806	2.4805	2.4000GHz-2.4835GHz	Complied
ested by:	Dieter Baldamus					
UV Rheinland	of North America, Inc	c. 12 Commerce Ro	ad Newtown, C	T 06470 Tel:(203) 426-0888 Fax: (203) 426-4009	

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4.7.6 Photos



Figure 10 – Frequency Stability Test Setup – Temperature Chamber at +50°C

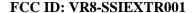
FCC ID: VR8-SSIEXTR001



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Figure 11 –Frequency Stability Test Setup – Humidity Chamber at 0°C





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4.8 Band Edge Measurement

This test evaluates the potential for the EUT to cause voltage fluctuation and flicker impressed on the public AC low-voltage system.

4.8.1 Test Over View

Results	Complies (as teste	Complies (as tested per this report)				05/13/200	8		
Standard	FCC Part 215 c)/RS	FCC Part 215 c)/RSS-210							
Product Model	Radio Bridge Serial#				Protoy	pe			
Configuration	See test plan for de	See test plan for details							
Test Set-up	Tested in OATS I	Tested in OATS EUT placed on table See test plan for details							
EUT Powered By	AC/DC Adapter & Batteries	Temp	22° C	Humidity	45%	Pressure	1001mbar		
Perf. Criteria	6dB and 99% Band	l Edge	Perf. Verification		Readings within Limit				
Mod to EUT			Test Performed By		Error! Reference source not found.				

4.8.2 Test Procedure

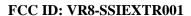
Radiated field strength emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Testing was performed at a distance of 10 meters on the OATS Deviations. Reading were made at 6dB and 99% of the fundamental signal.

4.8.3 Deviations

There were no deviations from the test methodology listed in the test plan for the band edge measurement test.

4.8.4 Final Test

The Band Edge Measurements were within the limits specified in the standard.





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4.8.5 Tabulated Test Data

Radiated Em	issions Me	asuremen	ts					
Standard:	47 CFR FC	47 CFR FCC Part 15.215 c)/RSS-210			PRESCAN or FINAL: Final			5/13/2008
Device Tested:	Sensor Swi	tch - Radio Bı	idge		Distance:	10m	File Name:	0805301Bandedge.xls
Mode:	Normal Ope	eration						
Mount:	Table Top							
Modifications:	NA							
			Measured Leve	el				
					99%			
					Measured			
			-20dB High	+20dB High	Bandwith			
Meas #	TX Band	Peak	End (MHz)	End (MHz)	(MHz)	Band (MHz)	Result	Comment
RBW = 9kHz VB\	N=30kHz							
1	2404.48	3.60	2403.53	2405.31	1.7800	2400-2483.5	Complied	
2	2445.48	2.73	2444.52	2446.33	1.8100	2400-2483.6	Complied	
3	2480.24	2.86	2479.49	2481.36	1.8700	2400-2483.7	Complied	
Tested by:	Dieter Balda	amus						
TUV Rheinland of			ommerce Roa	d Newtown	, CT 06470	Tel:(203) 426	6-0888 Fax: (2	203) 426-4009



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4.8.6 Photos

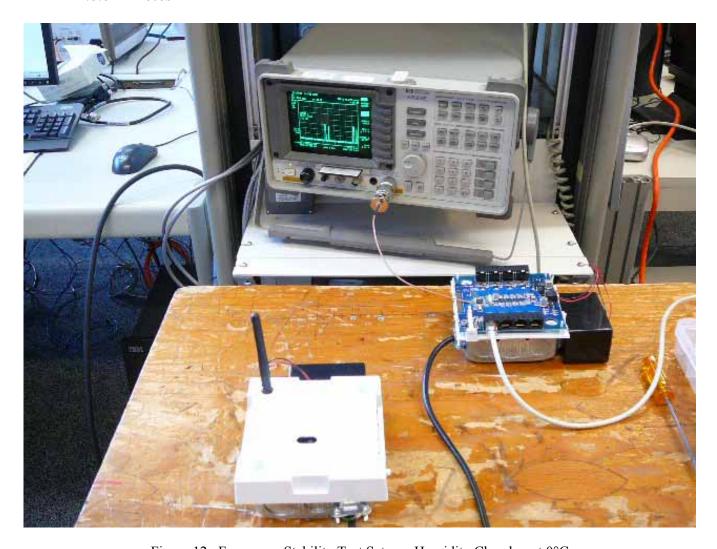
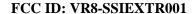


Figure 12 – Frequency Stability Test Setup – Humidity Chamber at 0°C





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Appendix A

5 Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

5.1 General Information

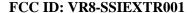
Client	Sensor Switch, Inc.
Address	900 Northrop Road
Address	Wallingford, CT 06492
Contact Person	William J Fassbender
Telephone	(203) 265-2842
Fax	(203) 265-1565
email	fozzy@sensorswitch.com

5.2 Model(s) Name

Radio Bridge		

5.3 Type of Product

Lighting Control System		





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5.4 Equipment Under Test (EUT) Description

The EUT is a wireless foot pedal used for various applications in the industrial environment. The wireless system eliminates the nuisance of wires under foot while invisible waves fill a room with 360° of signal. The EUT consist of a wireless foot pedal transmitter and a receiver; one (the transmitter) used with batteries and one (the receiver) used with an AC/DC adapter. The receiver also sends a signal every second to control de antenna output power of the transmitter.

5.5 Modifications

Software Change to comply with the frequency stability test.

5.6 Product Environment

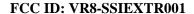
Residential	Hospital
Light Industrial	Small Clinic
Industrial	Doctor's office
Other	

5.7 Countries

\boxtimes	USA
	Taiwan
	Japan
	Europe

^{*}Check all that apply

^{*}Check all that apply

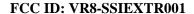




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5.8 Applicable Documents

Standard	Description
FCC Part 15	Rado Frquency Devices -Part C
FCC Part 15.247 (a) (2) RSS-210	Spectrum Bandwith of a Direct Sequence Spread Spectrum System
FCC Part 15.247 (b)	Maximum Output Power
FCC Part 1.1310	RF Human Exposure Limit
FCC Part 15.247 (c), 15.205, 15.209	Radiated Spurious Emissions
FCC Part 15.247 (d)	Transmitter Power Density of a Direct Sequence Spread Spectrum System
FCC Part 15.207	Conducted Emissions
FCC Part 15.215 (b)	Frequency Stability
FCC part 15.215 e), RSS-210	Band Edge Measurement





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5.9 General Product Information

Size (T	ransmitter)	Н	5cm	W	15cm	L	15cm
Weight	(Transmitter)	0.5		Fork-	Lift Needed	No	
Notes	None						

5.10 EUT Powered Information

5.10.1 Power Type

AC./DC Block)

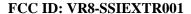
5.10.2 Power Information

Name	Type	Vol	tage	Frequency	Current	Notes
		min	max			
24VDC AC/DC Adapter	Class 1	120VAC	120VAC	60Hz	500mA	
Notes						

5.11 EUT Modes Of operation

The EUT footswitch transmitter has 2 modes of operation. Switch ON or Switch OFF. Both modes were in operation during the test. The receiver was constantly on receiving signals from the footswitch transmitter.

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5.12 EUT Configurations

Configuration	Description
Configuration 1	Transmitter was on all the time
Note: all configurations are the same except as	noted above

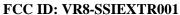
5.13 EUT Clock/Oscillator Frequencies

Less than 108MHz	FCC – scan up to 1GHz
Less than 500MHz	FCC – scan up to 2GHz
Less than 1000MHz	FCC – scan up to 5GHz
Greater then 1000MHz	FCC – scan up to 5 th Harmonic or 40GHz (2.4GHz)

5.14 Electrical Support Equipment

Type	Manufacture	Model	Connected To
NA	NA	NA	NA

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Item		7	Notes		
NA	NA		Total		
5.16 EUT Equip	oment/Cabling Inf	ormation			
EUT Port	Connected To	Location		Cable Type	
			Length	Shielded	Bea
15-24VDC Input	AC/ DC Terminal Block	Tx/ Rx	1.5m	No	No
5.17 EUT Door	rs				
None None					
None For ser	rs vice personnel only or will wear ESD st				



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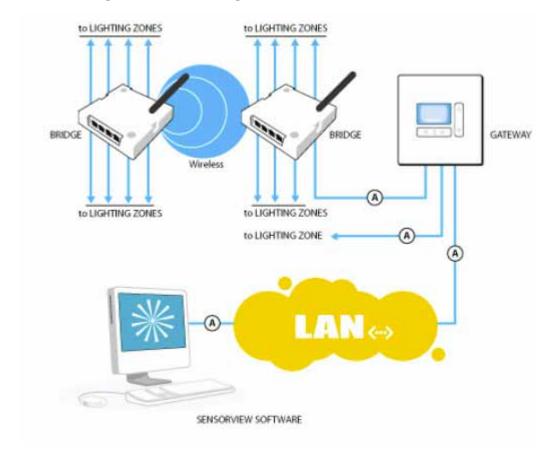
5.19 EUT Test Program

None

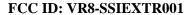
5.20 Monitoring of EUT during Testing

During the test a LED in the receiver indicates that the switch of the transmitter is ON. If the LED is off the foot switch is OFF as well.

5.21 EUT Configuration Block Diagram



The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.





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5.22 Constructional Data Form

TUV Rheinland		Please submit in duplicate								
D-51101 Köln 91		Gen-Ausw-Nr.	Aktenzeichen:				Anlage-Nr.			
			3	30762324.001 Sensor Switch -	Radio Brio	lge	1 of 1			
Am Grauen Stein/										
Konstantin-Wille	-Str. 1			EMC/EMV						
EMC/EMV Constructional Data Form										
Item Listing No. & Location in EUT	Component / Sub-Assembly			Part No. & Description	on	Freq.; Rated ERP/Atten.				
1.0	Enclosure			Plastic		NA				
2.0	Antenna			AN -A2		2.14dBi				
TUV Rheinland Prüfstelle für Gerätesicherheit		rheit	Applicant							
Köln, den:			Ort/place: Datum/date:							
(report copy not signed)		(report copy not signed)								
TUV Rheinland Prüfstelle für Gerätesicherheit		(Stempel und Unterschrift des Antragstellers/ stamp and signature of applicant)								

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