

Smart Wires, Inc.

RF Exposure Exhibit

SCOPE OF WORK

EMC TESTING – SmartBypass™ Model: SmartBypass 2000-63

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**RF Exposure Exhibit
(Fixed Devices)****Report Number: 103948971MPK-001B****Project Number: G103948971****Report Issue Date: January 17, 2020****Testing performed on the
SmartBypass™****Model Number: SmartBypass 2000-63****FCC ID: QPS01008****IC ID: 22326-01008**

to

47CFR 2.1091**RSS-102 Issue 5**

for

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Report No. 103948971MPK-001B	
Equipment Under Test:	SmartBypass™
Trade Name:	Smart Wires, Inc.
Model(s) Tested:	SmartBypass 2000-63
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Applicable Regulation:	47CFR 2.1091 RSS-102 Issue 5

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1.0 RF Exposure Summary

Test	Reference FCC	Reference Industry Canada	Result
Radio frequency Radiation Exposure Evaluation	47 CFR§2.1093	RSS-102 Issue 5	Complies

2.0 RF Exposure Limits

In this document, we evaluate the RF Exposure to human body due the intentional transmission from the transmitter (EUT). The limits for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and RSS-102 are followed.

2.1 FCC Limits

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
0.3 – 3.0	614	1.63	*100	6
3.0 – 30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300 - 1500	...	...	F/300	6
1500 - 100,000	...	...	5	6
(B)Limits For General Population / Uncontrolled Exposure				
0.3 – 1.34	614	1.63	*100	30
1.34 – 30	824/f	2.19/f	*180/f ²	30
30 – 300	27.5	0.073	0.2	30
300 - 1500	...	...	F/1500	30
1500 - 100,000	...	...	1.0	30

F = Frequency in MHz

* = plane wave equivalent density

2.2 Industry Canada Limits

According to RSS-102, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range	Electric Field	Magnetic Field	Power Density	Reference Period
(MHz)	(V/m rms)	(A/m rms)	(W/m ²)	(minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. * Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

3.0 Test Results (Fixed Configuration)

3.1 Classification

Radio is installed inside a fixed host device. The antenna of the product, under normal use condition, is at least 20 cm away from the body of the user and accessible to the end user. Warning statement to the user for keeping at least 20 cm or more separation distance with the antenna should be included in user's manual.

3.2 EIRP calculations

The SmartBypass™, Model: SmartBypass 2000-63 consists of two radios: FHSS in the 900 MHz and 2.4 GHz Unlicensed Bands.

3.3 Maximum RF Power

Frequency Range (MHz)	RF Output (dBm)	Antenna Gain ¹ (dBi)	Note
902.4 – 926.944	22.46	1.15	Conducted power measurements were taken from Report # 103948971MPK-001.
2436.0 – 2463.921747	16.40	4.42	Conducted power measurements were taken from Report # 103948971MPK-002.

¹As declared by the manufacturer.

3.4 RF Exposure Calculation

3.4.1 RF Exposure calculation for 900 MHz and 2.4 GHz FHSS Radio

Calculations for this report are based on highest power measured for each band.

Frequency Range (MHz)	EIRP (dBm)	EIRP (mW)	Power Density (W/m ²) @20 cm	RSS Limit (W/m ²)	MPE Ratio	Sum of MPE Ratios
902.4 – 926.944	23.61	229.6149	0.4568	2.7890	0.1638	0.2083
2436.0 – 2463.921747	20.82	120.7814	0.2403	5.4020	0.0445	

Frequency Range (MHz)	EIRP (dBm)	EIRP (mW)	Power Density (mW/cm ²) @20 cm	FCC Limit (mW/cm ²)	MPE Ratio	Sum of MPE Ratios
902.4 – 926.944	23.61	229.6149	0.0457	0.601	0.0760	0.1000
2436.0 – 2463.921747	20.82	120.7814	0.0240	1	0.0240	

Note: Antenna gains below 0 are considered as 0dBi.

The summation of the MPE ratio is less than 1, therefore, the EUT complies for the MPE requirement of simultaneous transmission.

Appendix A: Power Density Calculation

The Power Density can be calculated using the formula

$$S = \text{EIRP} / 4\pi D^2$$

Where: S is Power Density in mW/cm²

D is the distance from the antenna in cm.

4.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
01/ G103948971	AS	KV	January 17, 2020	Original document