

Smart Wires, Inc.

RF Exposure Exhibit

SCOPE OF WORK

EMC TESTING – SmartValve™ Model: SmartValve 10-1800 v1.04

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RF Exposure Exhibit (Mobile Devices)

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**Testing performed on the
SmartValve™
Model Number: SmartValve 10-1800 v1.04**

FCC ID: QPS01010

IC: 22326-01010

to

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

for

Smart Wires, Inc.

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Report No. 104988398MPK-010	
Equipment Under Test:	SmartValve™
Model(s) Tested:	SmartValve 10-1800 v1.04
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Applicable Regulation:	47CFR 2.1091 RSS-102 Issue 5

We attest to the accuracy of this report:



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1.0 RF Exposure Summary

Test	Reference FCC	Reference Industry Canada	Result
Radio frequency Radiation Exposure Evaluation	47 CFR§2.1091	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/ f	-	6**
1.1-10	87/ f ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ f ^{0.25}	0.1540/ f ^{0.25}	8.944/ f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/ f ^{1.2}
Note: f is frequency in MHz. * Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

3.0 Test Results (Mobile Configuration)

3.1 Classification

Radio is installed inside a mobile 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 SmartValve™ Model: SmartValve 10-1800 v1.04 consists of two radios: 900 MHz, and 2.4 GHz.

For RF exposure compliance refer to reports below:

Radio	FCC ID	Report Number
900 MHz	QPS01010	104988398MPK-007
2.4 GHz		104988398MPK-008

3.3 Maximum RF Power

Frequency Range (MHz)	RF Output (dBm)	Antenna Gain ¹ (dBi)	Note
902.400 – 926.944	23.25	5.2	Conducted power measurements were taken from Report #104988398MPK-007.
2436.000000 – 2463.921747	11.56	5.0	Conducted power measurements were taken from Report #104988398MPK-008.

¹As declared by the manufacturer.

3.4 RF Exposure Calculation

3.4.1 RF Exposure Calculation for 900 MHz, and 2.4 GHz

Frequency Range (MHz)	EIRP ¹ (dBm)	EIRP ¹ (mW)	Power Density (mW/cm ²) @20 cm	FCC Limit (mW/cm ²)
902.400 – 926.944	28.45	699.8420	0.1393	0.6016
2436.000000 – 2463.921747	16.56	45.2898	0.0090	1.0000

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

Frequency Range (MHz)	EIRP ¹ (dBm)	EIRP ¹ (mW)	Power Density (W/m ²) @20 cm	RSS Limit (W/m ²)
902.400 – 926.944	28.45	699.8420	1.3930	2.7407
2436.000000 – 2463.921747	16.56	45.2898	0.0901	5.4024

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

3.5 Worst Case RF Exposure Calculation – 900MHz & 2.4 GHz(Simultaneous Transmission)

Frequency Range (MHz)	EIRP ¹ (dBm)	EIRP ¹ (mW)	Power Density (mW/cm ²) @20 cm	FCC Limit (mW/cm ²)	MPE Ratio	Sum of MPE Ratios
902.400 – 926.944	28.45	699.8420	0.1393	0.6016	0.2315	0.2406
2436.000000 – 2463.921747	16.56	45.2898	0.0090	1.0000	0.0090	

Frequency Range (MHz)	EIRP ¹ (dBm)	EIRP ¹ (mW)	Power Density (W/m ²) @20 cm	RSS Limit (W/m ²)	MPE Ratio	Sum of MPE Ratios
902.400 – 926.944	28.45	699.8420	1.3930	2.7407	0.5083	0.5250
2436.000000 – 2463.921747	16.56	45.2898	0.0901	5.4024	0.0167	

Calculations for this report are based on highest power measured.

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
1.0 / G104988398	KR	AS	May 25, 2022	Original Document
1.1 / G104988398	KR	AS	September 9, 2022	Corrected antenna gain and RF exposure calculation.