

Smart Wires, Inc.

RF Exposure Exhibit

SCOPE OF WORK

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

REPORT NUMBER

104988398MPK-010

ISSUE DATE

May 25, 2022

REVISED DATE

September 9, 2022

PAGES

10

DOCUMENT CONTROL NUMBER

Non-Specific Radio Report Shell Rev. December 2017 MPK

© 2017 INTERTEK



RF Exposure Exhibit (Mobile Devices)

Report Number: 104988398MPK-010
Project Number: G104988398

Issue Date: September 9, 2022

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.

Tested by:

Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Client:

Smart Wires, Inc.
1035 Swabia Court, Suite 130
Durham, NC 27703 USA

Report prepared by:



Kenneth Roque / EMC Project Engineer

Report reviewed by:



Anderson Soungpanya / EMC Team Lead

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. This report must not be used to claim product endorsement by A2LA, NIST nor any other agency of the U.S. Government.

Report No. 104988398MPK-010	
Equipment Under Test:	SmartValve™
Model(s) Tested:	SmartValve 10-1800 v1.04
Applicant:	Smart Wires, Inc.
Contact:	Karamjit Singh
Address:	Smart Wires, Inc. 1035 Swabia Court, Suite 130 Durham, NC 27703
Country:	United States of America
Tel. Number:	(919) 294-3998
Email:	karamjit.singh@smartwires.com
Applicable Regulation:	47CFR 2.1091 RSS-102 Issue 5

We attest to the accuracy of this report:



Kenneth Roque
EMC Project Engineer



Anderson Soungpanya
EMC Team Lead

TABLE OF CONTENTS

<i>Smart Wires, Inc.</i>	1
1.0 RF Exposure Summary	5
2.0 RF Exposure Limits	5
3.0 Test Results (Mobile Configuration)	7
Appendix A: Power Density Calculation	9
4.0 Document History	10

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 (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (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.