Total Quality. Assured.

RF Exposure Exhibit

EUT Name:	SMARTBYPASS 2000
FCC ID:	QPS01006
Rule Part:	CFR 47 Part 15.247
Report Issue Date:	February 1, 2019

Prepared For:	***Prepared by:***
Smart Wires, Inc. 3292 Whipple Rd. Union City, CA 94587 USA Tel: (510) 952-2668	Intertek Testing Service NA, Inc. 1365 Adams Court Menlo Park, CA 94025 USA Tel: (650) 463-2900

1 Test Methodology

In this document, we evaluate the RF Exposure to human body due the intentional transmission from the transmitter (EUT). The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

1.1 RF Exposure Limit

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				
300 - 1500	…	…	F/300	6
1500 - 100,000	…	…	5	6
(B) Limits For General Population / Uncontrolled Exposure				
300 - 1500	…	…	F/1500	6
1500 - 100,000	…	…	1.0	30

F = Frequency in MHz

1.2 EUT Operating Condition

As instructed by the manufacturer, the EUT's power setting was set to 11 dBm on the low, middle and high frequencies/channels.

1.2.1 Classification

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

1.3 Test Results

1.3.1 Technical Product Description

Information presented below from Test Report 103758643MPK-002; Page 6:

Applicant	Smart Wires, Inc.
Model No.	SmartBypass 2000
FCC Identifier	QPS01006
Type of Transmission	Frequency Hopping Spread Spectrum
Rated RF Output	15.08 dBm
Antenna(s) & Gain	Internal Antenna, Gain: 4.0 dBi
Frequency Range	2436.000000 – 2461.493774 MHz
Number of Channel(s)	64
Modulation Type	2-FSK
Applicant Name &	Smart Wires, Inc. 3292 Whipple Rd. Union City, CA 94587 USA

1.3.2 Calculating the Power Density at 20cm

EUT Frequency Range	Mode	Max Power Output		Peak Antenna Gain		EIRP	
		dBm	mW	dBi	Numerical	dBi	mW
2436.000000 – 2461.493774 MHz	FHSS	15.08	32.21	4.0	2.51	19.08	80.91

<u>Calculating the Power Density (Pd) at 20cm</u>

Using the Friss transmission formula to solve for Power Density (Pd):

Pd = (Pout*G) / (4*π*R^2)

Pout = 32.21 mW

G = 2.51 Numerical Value

π ≈ 3.1416

R = 20 cm

The highest EIRP (Pout*G) power measured power is 19.08 dBm or 80.91 mW.

Pd = 80.91 / 5024

Pd = 0.016 mW/cm^2 or 0.160 W/m^2

The device <u>COMPLIES</u> with requirements of Power density limit of 1.0 mW/ cm^2 at 20cm.

1.3.3 Sample Calculation

The Friss transmission formula: Pd = (Pout*G) / (4*π*R^2)

Where;

Pd = Power density in mW/cm^2
Pout = Output power to antenna in mW
G = Gain of antenna in linear scale
π ≈ 3.1416
R = Distance between observation point and center of the radiator in cm

Ref.: David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).