

**Engineering Test Report No. 2002573-04**

Report Date	May 28, 2020
Manufacturer Name	Weber-Stephen Products LLC
Manufacturer Address	1415 S Roselle Rd Palatine, IL 60067
Product Name Brand/Model No.	Falcon
Assessment Dates	May 28, 2020
Specifications	FCC 47 CFR Part 2.1093 KDB, 447498 D01 OET Bulletin 65:1997 RSS-102
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1. Report Revision History

Revision	Date	Description
–	29 May 2020	Initial Release of Engineering Test Report No. 2002573-04

2. Introduction

The FCC and Innovation, Science and Economic Development Canada publish standards regarding the evaluation of the RF Exposure hazard of radio communications devices. An evaluation has been performed on the Weber-Stephen Products LLC Weber Connect Controller, Model No. Falcon pursuant to the relevant requirements.

3. Subject of Investigation

This document presents the demonstration of RF Exposure compliance on a Weber Connect Controller, (hereinafter referred to as the Equipment under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Description	Weber Connect Controller
Model/Part No.	Falcon
Radio Access Technology	802.11b/g/n Bluetooth
Output Power	802.11b/g/n: 20dBm Bluetooth: 6dBm
Bands of Operation	2400-2483.5MHz
Antenna Gain	3dBi

4. Standards and Requirements

The tests were performed to selected portions of, and in accordance with the following specification(s).

47 CFR Parts 1.1310, 2.1091 and 2.1093 Code of Federal Regulations, Title 47, Telecommunications

KDB 447498 D01 – “RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices, General RF Exposure Guidance v06”

OET Bulletin 65 Edition 97-01:1997 – “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”

ANSI/IEEE C95.1:1992 – “Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,”

RSS-102, Issue 5 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

5. Sample Calculations

The far field power density can be calculated using the following formula:

$$S = \frac{PG}{4\pi R^2} \quad (1)$$

where P is the transmit output power (mW), G is the maximum antenna gain relative to an isotropic antenna (linear) and R is the evaluation distance (cm).

In cases where multiple antennas are utilized for a single signal, the following formula is applied to calculate the maximum antenna gain:

$$Gain (dBi) = G + 10 \log N \quad (2)$$

where N is the number of antennas, G is the gain of a single antenna.

A minimum separation distance, D, can be calculated using the following formulas

$$D = \sqrt{\frac{PG}{4\pi(\text{Power Density Limit})}} \quad (3)$$

where D is the separation distance, P is the transmit output power (mW) and G is the maximum antenna gain relative to an isotropic antenna (linear).

For sources with frequencies <30MHz

$$D = R \left(10^{\frac{(FS_{Limit} - FS_R)}{40}} \right)^{-1} \quad (4)$$

For sources with frequencies >30MHz

$$D = R \left(10^{\frac{(FS_{Limit} - FS_R)}{20}} \right)^{-1} \quad (5)$$

where D is the separation distance, R is the measurement distance, FS_{Limit} is the field strength limit and FS_R is the measured field strength at distance R.

6. Photographs of EUT





7. Limits and Requirements

7.1. As mandated by the FCC

The first step is to determine if the product is categorically exempt from RF exposure evaluation based on the criteria listed in 1.1307(b)(1)

The next step is to evaluate RF exposure either by measurement or by calculating the power density at distance of 0.2m, as specified by ANSI/IEEE C95.1-1992. If it is determined that the resulting power density does not meet the basic restrictions, a separation distance must be measured or calculated such that the basic restrictions are met.

In environments where the possibility of simultaneous exposure to fields on different frequencies exists, the exposure shall be considered to be additive. The fraction of the recommended limit incurred within each frequency should be determined, and the sum of all fractional contributions should not exceed 1.0. The following formula shall apply:

$$\sum_{i=1}^n \frac{S_1}{S_{L,1}} + \frac{S_2}{S_{L,2}} + \frac{S_3}{S_{L,3}} + \dots \frac{S_n}{S_{L,n}} \leq 1 \quad (6)$$

where:

S is the measured/calculated power density;

S_L is the MPE limit.

Per 1.1310(e), the power density shall not exceed the levels below:

Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)
0.3 – 1.34	614	1.63	100
1.34 – 30	842 / f	2.19 / f	180 / f ²
30 – 300	27.5	0.073	0.2
300 – 1,500	—	—	f / 1500
1,500 – 100,000	—	—	1.0
f – Frequency in MHz * – Plane wave Equivalent Power Density			

7.2. As mandated by the Innovation, Science and Economic Development Canada

The RF exposure level is determined by either measurement or by calculating the power density at an evaluation distance of 0.2m, as specified by ANSI/IEEE C95.1-1992. If it is determined that the measured or calculated power density does not meet the basic restrictions, a separation distance must be measured or calculated such that the basic restrictions are met. If it is found that the product meets the low power exclusion level criteria listed in RSS 102 Section 2.5.2, no further RF exposure evaluation is required.

In environments where the possibility of simultaneous exposure to fields on different frequencies exists, the exposure shall be considered to be additive. The fraction of the recommended limit incurred within each frequency should be determined, and the sum of all fractional contributions should not exceed 1.0. The following formula(s) shall apply:

$$\sum_{i=1}^n \frac{S_{C,1}}{S_{L,1}} + \frac{S_{C,2}}{S_{L,2}} + \frac{S_{C,3}}{S_{L,3}} + \dots \frac{S_{C,n}}{S_{L,n}} \leq 1 \quad (7)$$

where:

S_C is the measured/calculated power density;

S_L is the RF exposure limit.

Per RSS 102 Section 4, the power density shall not exceed the levels below:

Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)
0.1 – 10	—	0.73 / f	—
1.1 – 10	87 / f ^{0.5}	—	—
10 – 20	27.46	0.0728	2
20 – 48	58.07 / f ^{0.25}	0.1540 / f ^{0.25}	8.944 / f ^{0.5}
48 – 300	22.06	0.05852	1.291
300 – 6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}
6000 – 15000	61.4	0.163	10
15000 – 150000	61.4	0.163	10
150000 – 300000	0.158 f ^{0.5}	4.21x10 ⁻⁴ f ^{0.5}	6.67x10 ⁻⁵ f
f – Frequency in MHz			

8. Assessment Results

8.1. Evaluation Relevant to the Requirements of the FCC

The power density will be calculated for the worst case with a 100% transmitter duty cycle.

Radio Access Technology	f Transmit Frequency (MHz)	Antenna Gain (dB)	Number of Antennas	G Maximum Antenna Gain (Linear)	P Output Power (mW)
802.11b/g/n	2412	3.00	1	2.00	3.98
Bluetooth	2402	3.00	1	2.00	100

Assessment Results Relevant to General/Uncontrolled Exposure Limits					
Radio Access Technology	f Transmit Frequency (MHz)	S Calculated Power Density (mW/cm ²)	S _L MPE Limit (mW/cm ²)	S:S _L Ratio	Sum of S:S _L Ratios
802.11b/g/n	2412	0.001580	1.00	0.00158	0.041274
Bluetooth	2402	0.039694	1.00	0.03969	

The sum of calculated power density to MPE limit ratios for all the transmitters is ≤ 1 therefore meeting the RF exposure requirements of the FCC.

8.2. Evaluation Relevant to the Requirements of ISSED

The power density will be calculated for the worst case with a 100% transmitter duty cycle.

Radio Access Technology	f Transmit Frequency (MHz)	Antenna Gain (dB)	Number of Antennas	G Maximum Antenna Gain (Linear)	P Output Power (W)
802.11b/g/n	2412	3.00	1	2.00	0.004
Bluetooth	2402	3.00	1	2.00	0.1

Assessment Results Relevant to General/Uncontrolled Exposure Limits					
Radio Access Technology	f Transmit Frequency (MHz)	S_C Calculated Power Density (W/m ²)	S_L Power Density Limit (W/m ²)	$S_C:S_L$ Ratio	Sum of $S_C:S_L$ Ratios
802.11b/g/n	2412	0.01588	5.366	0.00296	0.07714
Bluetooth	2402	0.39694	5.351	0.07418	

The sum of calculated power density to RF exposure limit ratios for all the transmitters is ≤ 1 . The EUT complies with the RF exposure requirements of the RSS-102 specification.

9. Statement of Compliance

The Weber-Stephen Products LLC Weber Connect Controller, Model Falcon is in compliance with the FCC and Innovation, Science and Economic Development Canada requirements for RF Exposure.