



Engineering Test Report No. 2001916-09

Report Date	September 17, 2020
Manufacturer Name	Weber-Stephen Products LLC
Manufacturer Address	1415 S Roselle Rd Palatine, IL 60067
Product Name Brand/Model No.	76550
Assessment Dates	September 17, 2020
Specifications	FCC 47 CFR Part 2.1093 KDB, 447498 D01 OET Bulletin 65:1997 RSS-102 EN 62311 EN 62479 AS/NZS 2772.2 RSP 3
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	
Tested by	Javier Cardenas
Signature	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894

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1. Report Revision History

Revision	Date	Description
-	23 SEP 2020	Initial Release of Engineering Test Report No. 2001916-09

2. Introduction

The FCC, Innovation, Science and Economic Development Canada, European Union and Australia/New Zealand 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 Falcon Lite Wireless Monitoring Module, Model No. 76550 pursuant to the relevant requirements.

3. Subject of Investigation

This document presents the demonstration of RF Exposure compliance on a Falcon Lite Wireless Monitoring Module, (hereinafter referred to as the Equipment under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Description	Falcon Lite Wireless Monitoring Module
Model/Part No.	76550
S/N	S/N1
Radio Access Technology	WiFi 802.11b/g/n Bluetooth
Peak EIRP	WiFi 802.11b/g/n: 22.9dBm Bluetooth: 6.3dBm
Bands of Operation	2400-2483.5MHz
Maximum Declared Antenna Gain	5dBi

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 Polices 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

EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

EN 62479:2010 Assessment of the Compliance of Low Power Electronic and Electrical Equipment with the Basic Restrictions Related to Human Exposure to Electromagnetic Fields (10MHz-300GHz)

1999/519/EC Council Recommendation on the Limitation of Exposure of The General Public to Electromagnetic fields (0Hz-300GHz)

AS/NZS 2772.2: 2016 Principles and methods of measurement and computation-3 kHz to 300 GHz

RSP 3 Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz

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:

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

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

A minimum separation distance can be calculated using the following formulas

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

where 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

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

For sources with frequencies >30MHz

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

where 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.

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

Limits for Occupational/Controlled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)
0.3 - 3.0	614	1.63	*100
3.0 – 30	1842 / f	4.89 / f	*900 / f ²
30 – 300	61.4	0.163	1.0
300 – 1,500	—	—	f / 300
1,500 – 100,000	—	—	5
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.

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

Limits for Occupational/Controlled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)
1 – 10	—	1.6 / f	—
1.29 – 10	193 / f ^{0.5}	—	—
10 – 20	61.4	0.163	10
20 – 48	129.8 / f ^{0.25}	0.3444 / f ^{0.25}	44.72 / f ^{0.5}
48 – 100	49.33	0.1309	6.455
100 – 6000	15.60 f ^{0.25}	0.04138 f ^{0.25}	0.6455 f ^{0.5}
6000 – 15000	137	0.364	50
15000 – 150000	137	0.364	50
150000 – 300000	0.354 f ^{0.5}	9.40x10 ⁻⁴ f ^{0.5}	3.33x10 ⁻⁴ f
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			

7.3. As mandated by the European Union and outlined in EN 62311

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 the device output power is less than the low power exclusion level then the device is deemed to comply with the basic restrictions listed in the 1999/519/EC Council Recommendation.

Per the 1999/519/EC Council Recommendation, the measured field strength shall not exceed the levels below:

Reference Levels for Maximum Exposure			
Frequency Range	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)
0 – 1 Hz	—	3.2×10^4	—
1 – 8 Hz	10000	$3.2 \times 10^4 / f^2$	—
8 – 25 Hz	10000	$4000 / f$	—
0.025 – 0.8 kHz	$250 / f$	$4 / f$	—
0.8 – 3 kHz	$250 / f$	5	—
3 – 150 kHz	87	5	—
0.15 – 1 MHz	87	$0.73 / f$	—
1 – 10 MHz	$87 / f^{1/2}$	$0.73 / f$	—
10 – 400 MHz	28	0.073	2
400 – 2000 MHz	$1.375 f^{0.5}$	$0.0037 / f^{0.5}$	$f / 200$
2 – 300 GHz	61	0.16	10

f as indicated in the frequency range column

7.4. As mandated by Australia/New Zealand and outlined in AS/NZS 2772.2

As stated in Schedule 5 of RPS 3, S5.2.2, the evaluation of transmitting equipment for compliance with RPS 3 is not required where the nominal mean power output does not exceed 100mW. For devices exceeding 100mW, evaluation of transmitting equipment for compliance with this standard is not required where it can be demonstrated that in normal use the mean radiated power output does not exceed the alternative low-power exclusion levels as defined in IEC 62479 (2010).

The RF exposure levels are assessed either by 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 minimum separation distance must be measured or calculated such that the basic restrictions are met. The assessment is based on transmitter power levels, transmit frequency(s) and antenna parameters.

Per RPS 3, the calculated power density shall not exceed the levels below:

Limits for Occupational/Controlled Exposure			
Frequency Range	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)
100kHz – 1MHz	614	1.63 / f	-
1MHz – 10MHz	614 / f	1.63 / f	1000 / f ²
10MHz – 400MHz	61.4	0.163	10
400MHz – 2GHz	3.07 x f ^{0.5}	0.00814 / f ^{0.5}	f / 40
2GHz – 300GHz	137	0.364	50
Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m ²)
100kHz – 150kHz	86.8	4.86	-
150kHz – 1MHz	86.8	0.729 / f	-
1MHz – 10MHz	86.8 / f ^{0.5}	0.729 / f	-
10MHz – 400MHz	27.4	0.0729	2
400MHz – 2GHz	1.37 x f ^{0.5}	0.00364 x f ^{0.5}	f / 200
2GHz – 300GHz	61.4	0.163	10

f – Frequency in MHz

8. Assessment Results

8.1. Evaluation Relevant to the Requirements of the FCC

8.1.1. WiFi 802.11b/g/n Assessment

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

Radio Access Technology	f Transmit Frequency (MHz)	Maximum EIRP (mW)
802.11b/g/n	2412	195

Assessment Results Relevant to General/Uncontrolled Exposure Limits			
Radio Access Technology	f Transmit Frequency (MHz)	Calculated Power Density, S (mW/cm ²)	MPE Limit (mW/cm ²)
802.11b/g/n	2412	0.03879	1.00

8.1.2. Bluetooth Low Energy Assessment

Radio Access Technology	f Transmit Frequency (MHz)	Maximum EIRP (mW)
Bluetooth Low Energy	2412	4.3

Assessment Results Relevant to General/Uncontrolled Exposure Limits			
Radio Access Technology	f Transmit Frequency (MHz)	Calculated Power Density, S (mW/cm ²)	MPE Limit (mW/cm ²)
Bluetooth Low Energy	2412	0.00086	1.00

The power density at 0.2m meets the RF exposure requirements of the FCC.

8.2. Evaluation Relevant to the Requirements of ISED

8.2.1. WiFi 802.11b/g/n Assessment

Maximum EIRP (W)	EIRP Level for Routine RF Evaluation Exemption (W)
0.195	2.684

As stated in section 2.5.2 of RSS 102, the RF Evaluation exclusion EIRP value for 2412MHz is 2.684W. As originally measured and recorded, the maximum EIRP is 0.195W (22.9dBm). The EIRP of the device meets the compliance criteria of the Industry Canada RSS-102 specification.

8.2.2. Bluetooth Low Energy Assessment

Maximum EIRP (W)	EIRP Level for Routine RF Evaluation Exemption (W)
0.004	2.684

As stated in section 2.5.2 of RSS 102, the RF Evaluation exclusion EIRP value for 2412MHz is 2.684W. As originally measured and recorded, the maximum EIRP is 0.004W (6.3dBm). The EIRP of the device meets the compliance criteria of the Industry Canada RSS-102 specification.

8.3. Evaluation Relevant to the Requirements of the EU

8.3.1. WiFi 802.11b/g/n Assessment

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	5.00	1	3.16	0.066

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)
802.11b/g/n	2412	0.13211	10.00

The power density is below the limit at 0.2m. The EUT complies with the RF exposure requirements of the EN 62311 specification.

8.3.2. Bluetooth Low Energy Assessment

P Output Power (W)	Power Level for Routine RF Evaluation Exemption (W)
0.003	0.020

The low-power exclusion level for 2412MHz is 0.020W. As originally measured and recorded, the output power is 0.003W (5.288dBm). The device meets the compliance criteria of the EN 62311 specification.

8.4. Evaluation Relevant to the Requirements of Australia/New Zealand

8.4.1. WiFi 802.11b/g/n Assessment

Output Power (W)	Exemption Limit for RF Exposure Evaluation, (W)
0.066	0.100

As stated in Schedule 5 of RPS 3, S5.2.2, the evaluation of transmitting equipment for compliance with RPS 3 is not required where the nominal mean power output does not exceed 100mW.

8.4.2. Bluetooth Low Energy Assessment

Output Power (W)	Exemption Limit for RF Exposure Evaluation, (W)
0.003	0.100

As stated in Schedule 5 of RPS 3, S5.2.2, the evaluation of transmitting equipment for compliance with RPS 3 is not required where the nominal mean power output does not exceed 100mW.

Statement of Compliance

The Weber-Stephen Products LLC Falcon Lite Wireless Monitoring Module, Model 76550 is in compliance with the FCC, Innovation, Science and Economic Development Canada, European Union and Australia/New Zealand requirements for RF Exposure at a minimum separation distance of 0.20m.