



Engineering Test Report No. 2101580-02	
Report Date	January 4, 2022
Manufacturer Name	Astronics
Manufacturer Address	One Corporate Drive, Suite 110 Lake Zurich, IL 60047
Product Name Brand/Model No.	Focus Pro
Date Received	June 1, 2021
Assessment Date	January 4, 2022
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
-	6 JAN 2022	Initial Release of Engineering Test Report No. 2101580-02

## 2. Introduction

The FCC, 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 Astronics Resideo Thermostat, Model No. Focus Pro pursuant to the relevant requirements.

## 3. Subject of Investigation

This document presents the demonstration of RF exposure compliance on a Resideo Thermostat, (hereinafter referred to as the Equipment under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Product Description	Resideo Thermostat
Model/Part No.	Focus Pro
Serial No.	1378317 (Used for EIRP, high band edge, and spurious radiated emissions tests) 1378290 (Used for antenna conducted tests only)
Device Type	Digitally Modulated Transmission Device
Band of Operation	2412 – 2462MHz
Software/Firmware Version	XTR_CFPro_1.1
Conducted Output Power	22.47dBm (176.6mW)
EIRP	24.7dBm (295.1mW)
Antenna Type	Pulse Larsen Antennas, M/N: W3300, Chip Antenna
Manufacturer Supplied* Antenna Gain (dBi)	1.3dBi
6dB Bandwidth	17.72MHz
Occupied Bandwidth (99% CBW)	17.67MHz
Size of EUT	3 9/16" x 5 13/16" x 1 1/2"

\*- Antenna gain is supplied by the manufacturer and Elite is not responsible for the accuracy of the antenna gain.

## 4. Standards and Requirements

The tests were performed to selected portions of, and in accordance with the following specifications.

- 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)

## 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

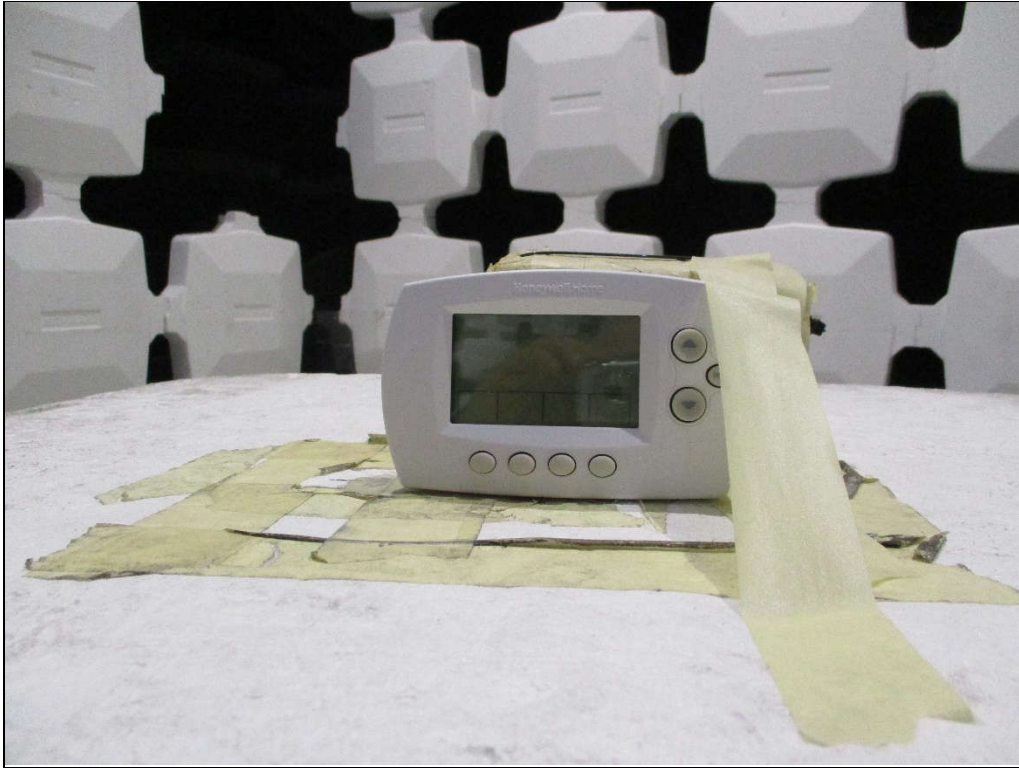
$$\text{Separation Distance} = R \left( 10^{\frac{(FS_{\text{Limit}} - FS_R)}{40}} \right)^{-1} \quad (4)$$

For sources with frequencies >30MHz

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

where R is the measurement distance,  $FS_{\text{Limit}}$  is the field strength limit and  $FS_R$  is the measured field strength at distance R.

6. Photograph of EUT



## 7. Limits and Requirements

### 7.1. Requirements 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 <sup>2</sup> )
0.3 - 3.0	614	1.63	*100
3.0 – 30	1842 / f	4.89 / f	*900 / f <sup>2</sup>
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 <sup>2</sup> )
0.3 – 1.34	614	1.63	*100
1.34 – 30	842 / f	2.19 / f	*180 / f <sup>2</sup>
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. Requirements mandated by 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 <sup>2</sup> )
0.003 – 10	170	180	—
0.1 – 10	—	1.6 / f	—
1.29 – 10	193 / f <sup>0.5</sup>	—	—
10 – 20	61.4	0.163	10
20 – 48	129.8 / f <sup>0.25</sup>	0.3444 / f <sup>0.25</sup>	44.72 / f <sup>0.5</sup>
48 – 100	49.33	0.1309	6.455
100 – 6000	15.60 f <sup>0.25</sup>	0.04138 f <sup>0.25</sup>	0.6455 f <sup>0.5</sup>
6000 – 15000	137	0.364	50
15000 – 150000	137	0.364	50
150000 – 300000	0.354 f <sup>0.5</sup>	9.40x10 <sup>-4</sup> f <sup>0.5</sup>	3.33x10 <sup>-4</sup> f
Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m <sup>2</sup> )
0.003 – 10	83	90	—
0.1 – 10	—	0.73 / f	—
1.1 – 10	87 / f <sup>0.5</sup>	—	—
10 – 20	27.46	0.0728	2
20 – 48	58.07 / f <sup>0.25</sup>	0.1540 / f <sup>0.25</sup>	8.944 / f <sup>0.5</sup>
48 – 300	22.06	0.05852	1.291
300 – 6000	3.142 f <sup>0.3417</sup>	0.008335 f <sup>0.3417</sup>	0.02619 f <sup>0.6834</sup>
6000 – 15000	61.4	0.163	10
15000 – 150000	61.4	0.163	10
150000 – 300000	0.158 f <sup>0.5</sup>	4.21x10 <sup>-4</sup> f <sup>0.5</sup>	6.67x10 <sup>-5</sup> f

f – Frequency in MHz



## 8. Assessment Results

### 8.1. RF Exposure Evaluation Relevant to the Requirements of the FCC

Radio Access Technology	$f$ Transmit Frequency (MHz)	EIRP (dBm)	ERP/EIRP (mW)
802.11n	2412	24.7	295.1209227

Assessment Results Relevant to General/Uncontrolled Exposure Limits			
Radio Access Technology	$f$ Transmit Frequency (MHz)	$S_c$ Calculated Power Density (mW/cm <sup>2</sup> )	$S_L$ Power Density Limit (mW/cm <sup>2</sup> )
802.11n	2412	0.058712442	1.00

Assessment Results Relevant to Occupational/Controlled Exposure Limits			
Radio Access Technology	$f$ Transmit Frequency (MHz)	$S_c$ Calculated Power Density (mW/cm <sup>2</sup> )	$S_L$ Power Density Limit (mW/cm <sup>2</sup> )
802.11n	2412	0.058712442	5.00

## 8.2. RF Exposure Evaluation Relevant to the Requirements of ISED

Radio Access Technology	$f$ Transmit Frequency (MHz)	EIRP (dBm)	EIRP (W)	EIRP Exemption Threshold (W)	Exempt/Not Exempt
802.11n	2412	24.7	0.295120923	3	Exempt

## 9. Statement of Compliance

The Astronics Resideo Thermostat, Model Focus Pro is in compliance with the FCC, Innovation, Science and Economic Development Canada requirements for RF Exposure.