BEC INCORPORATED

MAXIMUM PERMISSABLE EXPOSURE (MPE) REPORT

TEST STANDARDS:
U.S. Title 47 Chapter 1 Subchapter A Part 2 Subpart J

Peacock Technology
Model I-QUBE

FCC ID: WWP-I-QUBE

REPORT BEC-2300-02

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Testing Cert #2957.01

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The BEC Decision Rule: Measurement Uncertainty is not applied to any testing measurements or test results provided to the customer by BEC Incorporated at this time.

Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	02/23/2024
1	Corrected the Table on Page 8 to calculate the Power Density at 20 cm clearer to compare against the 1.1310 Exposure Limits	04/16/2024	04/16/2024

1.0 Administrative Information

1.1 General Information Table

Project Number	BEC-2290
Manufacturer	Peacock Technology
Model Number	I-QUBE
EUT Description	Cow Wireless Sensor
Sample Type	Unmodified Sample (Radiated Emissions Test Samples)
Sample Numbers	2290-03
Serial Numbers	90040065
Sample Type	Modified with SMA connector on transmitter output port (Antenna Conducted Test Sample)
Sample Number	2290-02
Serial Number	No Serial Number on the Antenna Conducted Sample
FCC ID	WWP-I-QUBE
Frequency of Operation	902 MHz – 928 MHz
Tune Up Tolerance	+/- 0.90 dB
RF Module Manufacturer	Texas Instruments
RF Module Model	CC1310 MCU
Modulation	WB-DSSS
FCC Classification	Digital Transmission System (DTS)
Date Samples Received	06/05/2023
EUT Firmware Version	CC1310 F/W: 3.012
Sample Types and Condition Received	Production Units Suitable for Test
Applicable FCC Rules	47 CFR Part 2.1091, OET Bulletin 65

1.2 Maximum Permissible Exposure Calculation

§1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

(b)(1) *Requirements.* (i) With respect to the limits on human exposure to RF provided in §1.1310 of this chapter, applicants to the Commission for the grant or modification of construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations for radiofrequency sources must either:

(A) Determine that they qualify for an exemption pursuant to §1.1307(b)(3);

(B) Prepare an evaluation of the human exposure to RF radiation pursuant to §1.1310 and include in the application a statement confirming compliance with the limits in §1.1310; or

(C) Prepare an Environmental Assessment if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in §1.1310

§1.1310 Radiofrequency radiation exposure limits.

(2) At operating frequencies less than or equal to 6 GHz, the limits for maximum permissible exposure (MPE), derived from whole-body Specific Absorption Rate (SAR) limits and listed in Table 1 of paragraph (e) of this section, may be used instead of whole-body SAR limits as set forth in paragraph (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b), except for portable devices as defined in §2.1093 as these evaluations shall be performed according to the SAR provisions in §2.1093 of this chapter.

(4) Both the MPE limits listed in Table 1 of paragraph (e) of this section and the SAR limits as set forth in paragraph (a) through (c) of this section and in §2.1093 of this chapter are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over the specified averaging time in Table 1 is less than the limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the FCC's *OET Bulletin 65,* "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," and in supplements to *Bulletin 65,* all available at the FCC's Internet Web site: *http://www.fcc.gov/oet/rfsafety*.

§2.1091 Radiofrequency radiation exposure evaluation: fixed RF source devices.

(b) For purposes of this section, the definitions in §1.1307(b)(2) of this chapter shall apply. A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location while transmitting. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal desktop computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.

The Peacock Technology Model I-QUBE is subject to the limits of Section 1.1310, Table 1 "Limits for Maximum Permissible Exposure (MPE)" Section (ii) "Limits for General Population / Uncontrolled Exposure are applicable.

The use of OET Bulletin 65 was used to calculate the Power Density based upon EIRP levels of the device measured and reported by this laboratory during testing for compliance to 47 CFR Part 15C.

From: OET Bulletin 65 Edition 97-02, page 19.

$$S = \frac{PG}{4\pi R^2} \qquad (3)$$

where: S = Power Density (in appropriate units, e.g., mW/cm^2)
P = Power input to the antenna (in appropriate units, e.g., mW)
G = Power Gain of the antenna in the direction of interest to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

or:
$$S = \frac{EIRP}{4\pi R^2} \qquad (4)$$

where: EIRP = equivalent (or effective) isotropically radiated power (mw)

1.3 Maximum Permissible Exposure (MPE)

Antenna power is the highest measured level among the low, middle and high frequencies of the transmitter contained in each model identified above. The measurements below were taken from a test sample of the Peacock Technology Model I-QUBE. The maximum radiated field strength level of the fundamental transmit frequencies were converted from dBµV/m to dBm. The table below identifies the transmitter output level to achieve the EIRP level. The tune up tolerance of +/- 0.90 dBm was added to the Antenna Conducted Maximum Output Power for the transmitter measurements. The Power Density is then calculated using Formula (4) of OET Bulletin 65.

Antenna Conducted Maximum Output Power Measurement (02/14/2024):

Channel	Modulation	Frequency (GHz)	Measured Level (dBm)	Cable # 962 Loss (dB)	Tune Up Tolerance (+/- 0.90 dB)	Maximum Conducted Output Power Total With Tune Up Tolerance + 0.90 dB		Limit		Margin		Result
						dBm	Watts	dBm	Watts	dBm	Watts	
0	O-QPSK	903.244	12.24	0.21	0.90	13.35	0.0216	30.00	1.000	-16.65	-0.978	PASS
18		914.440	12.41	0.21	0.90	13.52	0.0225	30.00	1.000	-16.48	-0.978	PASS
37		926.258	12.43	0.21	0.90	13.54	0.0226	30.00	1.000	-16.46	-0.977	PASS

Power Density Calculation

Formula (4) above: S or Power Density = $\frac{EIRP}{4\pi R^2}$

Tx Signal Type	Frequency	Maximum Output Power Peak P(dBm) with Tune Up Tolerance (+ 0.9 dBm)	Converted Power Input P(mW)	G=Power Gain (numeric)	S=Power Density @ 20 cm	1.1310 Radio Frequency Radiation Exposure Limit	Margin
	MHz	dBm	mW		mW/cm^2	mW/cm^2	
DTS	903.220	13.35	21.627	1.710	0.0074	0.602	-0.5948
DTS	914.440	13.52	22.491	1.710	0.0077	0.610	-0.6020
DTS	926.258	13.54	22.594	1.710	0.0077	0.618	-0.6098

Results: The highest calculated Power Density, 0.0077 mW/cm^2, is based upon the EIRP measurements for the Peacock Technology Model I-QUBE. This level complies with the limit Table 1(ii) of 47 CFR Part 1.1310 at a separation distance of 20 cm.