MPE Calculations

Control4 Model: C4-THERM

FCC ID: R33C4THERM
IC ID: 7848A-C4THERM

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1.0 SCOPE:

This Report Demonstrates Evaluation and Compliance to the following standards:

1. **Code of Federal Regulations Title 47, Volume 1, Section 1.1310.**
2. **Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) - RSS-102 Issue 3**

2.0 REVISION LEVEL:

DATE	COMMENTS	REVISION
10/10/08	Created.	1.0
08/16/10	Added RSS-102 references	2.0

3.0 REFERANCE DOCUMENTS:

(A) Limits for Maximum Permissible Exposure (MPE). Code of Federal Regulations Title 47, Volume 1, Section 1.1310.
(B) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 67 Edition 97-01.
(C) Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) - RSS-102 Issue 3

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4.0 CALCULATIONS:

The following worst case emissions was calculated by using Method 2 below

Method 1: Based on a PPt (Peak Power Total) measurement of the total power into the antenna, worst case antenna gain and manufacturing variance.

Effective/Equivalent Isotropic Radiated Power [EIRP] dBm = Total power into the antenna [dBm] + antenna gain [dBi] + manufacturing variance/tolerance [dB]
To convert the values from dBm to mW
$mW = 10^{dBm/10}$

The EIRP was calculated to be 4.66 dBm (see calculation below). This is based on the worst case conducted output power as reported in UL test report 14U19506-E2 section 8.3, declared antenna gain and Control4 has declared that the maximum variation for the output power during manufacturing testing is ± 0.5 dB; therefore, +0.5 dB was added to the measured output power to calculate the MPE.

Total power into the antenna [dBm] =	**2.06**
antenna gain [dBi] =	**2.1**
Tune-up procedure variance[dB] =	**0.5**
EIRP (dBm) =	**4.66**
EIRP (mW) =	**2.92**
EIRP (W) =	**0.00292**

Method 2: Based on the radiated field strength measurement at 3 meters [at a calibrated OATS site, maximizing the antenna polarity and height]

After obtaining the EIRP, the Power density is calculated and compared against the FCC and IC limits.

S_{FCC} = Power density in *mW/cm^2* for FCC
$S_{FCC} = EIRP/4\pi \cdot R^2$
EIRP = Equivalent isotropically radiated power 2.92 *mW*
R = Distance to the center of radiation of the antenna *20 cm*
S_{FCC} = 0.000582 mW/cm^2

S_{FCC} Limit = 1.0 mW/cm^2

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S_{IC} = Power density in *W/m²* for IC
S_{IC} = EIRP/4π·R²
EIRP = Equivalent isotropically radiated power in watts 0.00292 *W*
R = Distance to the center of radiation of the antenna *0.2 m*
S_{IC} = 0.006 W/m²

S_{IC} Limit = 10 *W/m²* for IC

5.0 CONCLUSION:

1. **Based upon the limits for Maximum Permissible Exposure (MPE) given in Table 1 of reference document (A) as 1mW/cm², this device falls under the required limits.**
2. **Based upon the limits given in section 4.2 of the reference document (C) as 10W/m², this device falls under the required limits.**

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