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47 C.F.R. Part 1, Subpart I, Section 1.1310

47 C.F.R. Part 2, Subpart J, Section 2.1091

RF EXPOSURE REPORT

For

DOCSIS 3.1 wifi Gateway

Model: CODA-4782

Data Applies To: CODA-4682, CODA-4580, CODA-4582

Trade Name: Hitron

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	10/21/2016	Initial Issue	All Page	Gloria Chang

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1. Limit

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

2. EUT Specification

Product Name	DOCSIS 3.1 wifi Gateway
Model Number	CODA-4782
Data Applies To	CODA-4682, CODA-4580, CODA-4582
Identify Number	T160919S01
Received Date	September 02, 2016
Frequency band (Operating)	802.11b/g/gn HT20 Mode: 2412MHz ~ 2462MHz 802.11gn HT40 Mode: 2422MHz ~ 2452MHz 802.11a, 802.11ac VHT20 Mode: 5180 MHz ~ 5240 MHz / 5745 MHz ~ 5825 MHz 802.11ac VHT40 Mode: 5190 MHz ~ 5230 MHz / 5755 MHz ~ 5795 MHz 802.11ac VHT80 Mode: 5210 MHz / 5775 MHz 802.11ac VHT160 Mode: 5210 MHz + 5775 MHz
Device category	Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna Specification	WiFi 2.4GHz Antenna, Dipole Antenna × 3 : Ant. 1 / Chain 2, Antenna Gain : 3.69dBi Ant. 2 / Chain 0, Antenna Gain : 3.23dBi Ant. 3 / Chain 1, Antenna Gain : 4.28dBi WiFi 5GHz Antenna, Dipole Antenna × 4 : Ant. 4 / Chain 2, Antenna Gain : 4.51dBi Ant. 5 / Chain 1, Antenna Gain : 6.10dBi Ant. 6 / Chain 0, Antenna Gain : 4.94dBi Ant. 7 / Chain 3, Antenna Gain : 4.83dBi For Beamforming Directional Gain : 11.14dBi

Maximum average output power	IEEE 802.11b Mode: 23.22 dBm IEEE 802.11g Mode: 24.31 dBm IEEE 802.11gn HT20 MCS0 Mode: 25.16 dBm IEEE 802.11gn HT40 MCS0 Mode: 20.87 dBm For Non-beamforming : UNII Band 1: IEEE 802.11a Mode: 22.71 dBm IEEE 802.11ac VHT20 NSS1/MCS0 Mode: 22.76 dBm IEEE 802.11ac VHT40 NSS1/MCS0 Mode: 26.38 dBm IEEE 802.11ac VHT80 NSS1/MCS0 Mode: 20.67 dBm UNII Band 3: IEEE 802.11a Mode: 25.27 dBm IEEE 802.11ac VHT20 NSS1/MCS0 Mode: 25.33 dBm IEEE 802.11ac VHT40 NSS1/MCS0 Mode: 26.04 dBm IEEE 802.11ac VHT80 NSS1/MCS0 Mode: 25.66 dBm UNII Band 1 + Band 3: IEEE 802.11ac VHT160 NSS1/MCS0 Mode: 18.17 dBm / 18.40 dBm For Beamforming : UNII Band 1: IEEE 802.11a Mode: 22.07 dBm IEEE 802.11ac VHT20 NSS1/MCS0 Mode: 22.63 dBm IEEE 802.11ac VHT40 NSS1/MCS0 Mode: 23.61 dBm IEEE 802.11ac VHT80 NSS1/MCS0 Mode: 18.97 dBm UNII Band 3: IEEE 802.11a Mode: 24.11 dBm IEEE 802.11ac VHT20 NSS1/MCS0 Mode: 24.45 dBm IEEE 802.11ac VHT40 NSS1/MCS0 Mode: 24.41 dBm IEEE 802.11ac VHT80 NSS1/MCS0 Mode: 24.21 dBm UNII Band 1 + Band 3: IEEE 802.11ac VHT160 NSS1/MCS0 Mode: 15.54 dBm / 22.46 dBm
Evaluation applied	MPE Evaluation*

Remark:

1. For more details, please refer to the User's manual of the EUT.
2. This submittal(s) (test report) is intended for FCC ID: 2AHKM-CODA4782 filing.
3. The model CODA-4782 was considered the main model for testing.

3. Test Results

No non-compliance noted.

Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \textbf{Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

4. Maximum Permissible Exposure

Substituting the MPE safe distance using $d = 21$ cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

Mode	Frequency (MHz)	Power (dBm)	Ant. Gain (dBi)	Distance (cm)	Power density (mW/cm ²)	Limit (mW/cm ²)
IEEE 802.11b	2437	23.22	4.28	21	0.1015	1
IEEE 802.11g	2437	24.31	4.28	21	0.1304	1
IEEE 802.11gn HT20 MCS0	2437	25.16	4.28	21	0.1586	1
IEEE 802.11gn HT40 MCS0	2437	20.87	4.28	21	0.0591	1
For Non-beamforming :						
UNII Band 1:						
IEEE 802.11a	5240	22.71	6.10	21	0.1372	1
IEEE 802.11ac VHT20 NSS1/MCS0	5240	22.76	6.10	21	0.1388	1
IEEE 802.11ac VHT40 NSS1/MCS0	5230	26.38	6.10	21	0.3194	1
IEEE 802.11ac VHT80 NSS1/MCS0	5210	20.67	6.10	21	0.0858	1
UNII Band 3:						
IEEE 802.11a	5745	25.27	6.10	21	0.2474	1
IEEE 802.11ac VHT20 NSS1/MCS0	5825	25.33	6.10	21	0.2508	1
IEEE 802.11ac VHT40 NSS1/MCS0	5755	26.04	6.10	21	0.2954	1
IEEE 802.11ac VHT80 NSS1/MCS0	5775	25.66	6.10	21	0.2706	1
UNII Band 1 + Band 3:						
IEEE 802.11ac VHT160 NSS1/MCS0	5210	18.17	6.10	21	0.0482	1
IEEE 802.11ac VHT160 NSS1/MCS0	5775	18.40	6.10	21	0.0509	1

For Beamforming :						
UNII Band 1:						
IEEE 802.11a	5180	22.07	11.14	21	0.3779	1
IEEE 802.11ac VHT20 NSS1/MCS0	5200	22.63	11.14	21	0.4299	1
IEEE 802.11ac VHT40 NSS1/MCS0	5230	23.61	11.14	21	0.5387	1
IEEE 802.11ac VHT80 NSS1/MCS0	5210	18.97	11.14	21	0.1851	1
UNII Band 3:						
IEEE 802.11a	5785	24.11	11.14	21	0.6044	1
IEEE 802.11ac VHT20 NSS1/MCS0	5785	24.45	11.14	21	0.6536	1
IEEE 802.11ac VHT40 NSS1/MCS0	5755	24.41	11.14	21	0.6477	1
IEEE 802.11ac VHT80 NSS1/MCS0	5775	24.21	11.14	21	0.6185	1
UNII Band 1 + Band 3:						
IEEE 802.11ac VHT160 NSS1/MCS0	5210	15.54	11.14	21	0.0840	1
IEEE 802.11ac VHT160 NSS1/MCS0	5775	22.46	11.14	21	0.4134	1

Simultaneously MPE

Simultaneously MPE = MPE 1 / Limit 1 + MPE 2 / Limit2 +

WiFi 2.4GHz + 5GHz Mode

Simultaneously MPE = (0.1586 / 1) + (0.6536 / 1) = **0.8122 mW/cm²**