

Armatura LLC

MPE ASSESSMENT REPORT

Report Type:

FCC MPE assessment report

Model:

OmniAC20

REPORT NUMBER:

230402194SHA-006

ISSUE DATE:

July 5, 2023

DOCUMENT CONTROL NUMBER:

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Applicant: Armatura LLC
190 Bluegrass Valley Parkway Alpharetta, GA 30005

Manufacturer: Armatura LLC
190 Bluegrass Valley Parkway Alpharetta, GA 30005

FCC ID: 2A5UQ-OMNIAC20W

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
KDB447498 D01 General RF Exposure Guidance v06 FCC Part2.1091, FCC Part2.1093 FCC Part1.1307(b)

PREPARED BY: **REVIEWED BY:**



Project Engineer
Damon Ding

Reviewer
Erick Liu

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Revision History

Report No.	Version	Description	Issued Date
230402194SHA-006	Rev. 01	Initial issue of report	July 5, 2023

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Access Control Terminal
Type/Model:	OmniAC20
Description of EUT:	Smart Access Control Terminal
Rating:	Powered from adapter DC12V, 3.0A
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Software Version:	Not provided
Hardware Version:	Not provided
Sample received date:	March 8, 2023
Date of test:	April 03, 2023 to June 07, 2023

1.2 Technical Specification

For 2.4 GHz ISM Band of Wi-Fi

Frequency band:	2400MHz ~ 2483.5MHz
Frequency Range:	2412MHz ~ 2462MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	IEEE 802.11b: 11 IEEE 802.11g: 11 IEEE 802.11n-HT20: 11 IEEE 802.11n-HT40: 9
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Channel Separation:	5 MHz
Antenna Information:	FPCB antenna: 3.2 dBi

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For 5 GHz U-NII Bands of Wi-Fi

Frequency Range:	5150 MHz to 5250 MHz (U-NII-1) 5250 MHz to 5350 MHz (U-NII-2A) 5470 MHz to 5725 MHz (U-NII-2C) 5 725 MHz to 5 850 MHz (U-NII-3)
Support Standards:	IEEE 802.11a/n
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a/n-HT20: 20 MHz IEEE 802.11n-HT40: 40 MHz
Channel Number:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40 5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40 5470 MHz to 5725 MHz: 12 for IEEE 802.11a/n-HT20 6 for IEEE 802.11n-HT40 5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40
Data Rate:	IEEE 802.11a: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Channel Separation:	IEEE 802.11a/n-HT20: 20 MHz IEEE 802.11n-HT40: 40 MHz
Antenna Information:	FPCB antenna 5150-5350MHz3.7dBi 5470-5725MHz4.6dBi 5725-5850MHz4.2dBi

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For RFID 13.56 MHz

Frequency Range:	13.56 MHz ~ 13.56 MHz
Nominal Operating Frequency:	13.56 MHz
Max. Data Rates:	106 Kbps
Number of Channels:	1
Work in Modes:	<input type="checkbox"/> Card Emulation, <input type="checkbox"/> Peer-to-Peer, <input checked="" type="checkbox"/> Reader/Writer
NFC Type:	<input checked="" type="checkbox"/> NFC A Type, <input checked="" type="checkbox"/> NFC B Type, <input type="checkbox"/> NFC F Type, <input type="checkbox"/> NFC V Type
Modulation:	ASK
Antenna:	induction coil antenna

For RFID 125 kHz

Frequency Range:	119 kHz ~ 140 kHz
Nominal Operating Frequency:	125kHz
Number of Channels:	1
Modulation:	ASK
Antenna:	induction coil antenna

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1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

2 MPE Assessment

Test result: Pass

2.1 MPE Assessment Limit

Mobile device exposure for standalone operations:

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (uT)	Equivalent plane wave power density S_{eq} (W/m ²)
0-1 Hz	-	$3,2 \times 10^4$	4×10^4	-
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	-
8-25 Hz	10 000	$4\ 000/f$	$5\ 000/f$	-
0,025-0,8 kHz	$250/f$	$4/f$	$5/f$	-
0,8-3 kHz	$250/f$	5	6,25	-
3-150 kHz	87	5	6,25	-
0,15-1 MHz	87	$0,73/f$	$0,92/f$	-
1-10 MHz	$87/f^{1/2}$	$0,73/f$	$0,92/f$	-
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1,375 f^{1/2}$	$0,0037 f^{1/2}$	$0,0046 f^{1/2}$	$f/200$
2-300 GHz	61	0,16	0,20	10

Mobile device exposure for simultaneous transmission operations: **the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0**

MPE Ratios are Calculated as $[(MPE1/Limit) + (MPE2/Limit) + \dots] \leq 1.0$

2.2 Assessment Results

For 2.4GHz, 5GHz Wi-Fi

Power density (S) is calculated according to the formula:

$$S = P / (4\pi R^2)$$

Where S = power density in mW/cm²

P = Radiated transmit power in mW

G = numeric gain of transmit antenna

R = distance (cm)

As we can see from the test report 230402194SHA-002 and 230402194SHA-003:

MPE CALCULATION RESULTS:

2.4 GHz Wi-Fi:

Operating Mode	Freq.	Declared maximum conducted average output power	Tolerance	Antenna Gain	Calculated maximum EIRP		MPE Limit	MPE Value
	(MHz)				(dBm)	(dB)		
IEEE 802.11b	2412-2462	13	±1	3.2	17.2	52.481	1	0.1044
IEEE 802.11g	2412-2462	11	±1	3.2	15.2	33.113	1	0.0066
IEEE 802.11n20	2412-2462	9.5	±1	3.2	13.7	23.442	1	0.0047
IEEE 802.11n40	2422-2452	9.5	±1	3.2	13.7	23.442	1	0.0047

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5 GHz Wi-Fi:

Operating Mode	Freq.	Declared maximum conducted average output power	Tolerance	Ant. Gain	Calculated maximum EIRP		MPE Limit	MPE Value
	(MHz)				(dBm)	(dB)		
IEEE 802.11a	5180-5320	12	±1	3.7	16.7	46.774	1	0.0093
IEEE 802.11n20	5180-5320	12	±1	3.7	16.7	46.774	1	0.0093
IEEE 802.11n40	5190-5310	12	±1	3.7	16.7	46.774	1	0.0093
IEEE 802.11a	5500-5720	12	±1	4.6	17.6	57.544	1	0.0114
IEEE 802.11n20	5500-5720	12	±1	4.6	17.6	57.544	1	0.0114
IEEE 802.11n40	5510-5710	12	±1	4.6	17.6	57.544	1	0.0114
IEEE 802.11a	5745-5825	11	±1	4.2	16.2	41.687	1	0.0083
IEEE 802.11n20	5745-5825	11	±1	4.2	16.2	41.687	1	0.0083
IEEE 802.11n40	5755-5795	11	±1	4.2	16.2	41.687	1	0.0083

So the transmitter complies with the RF exposure requirements and the SAR is not required.

TEST REPORT**For NFC**

Tx frequency: 13.56 MHz Type of Modulation: ASK
Antenna Type: induction coil antenna (Gain: 0 dBi)
Nominal rated field strength: 50.54 dB μ V/m at 3m
Maximum allowed field strength of production tolerance: +/- 3dB

Based on the Maximum allowed field strength of production tolerance was 52.64dB μ V/m at 3m in frequency 13.56MHz, thus;

The EIRP = $[(FS * D)^2 * 1000 / 30] = 0.000034 \text{ mW}$

Thus;

Conducted power = Radiated Power (EIRP) – Antenna Gain

So;

Conducted Power = 0.000034mW.

The SAR Exclusion Threshold Level for 13.56MHz when the minimum test separation distance is < 50mm:

$$= [474 * (1 + \log_{10}(f(\text{MHz})))]/2$$

$$= 443\text{mW}$$

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing. So the transmitter complies with the RF exposure requirements and the SAR is not required.

TEST REPORT**For 125 kHz**

Tx frequency: 125 kHz Type of Modulation: ASK
Antenna Type: induction coil antenna (Gain: 0 dBi)
Nominal rated field strength: 45.62 dB μ V/m at 3m
Maximum allowed field strength of production tolerance: +/- 3dB

Based on the Maximum allowed field strength of production tolerance was 45.62dB μ V/m at 3m in frequency 125 kHz, thus;

The EIRP = $[(FS * D)^2 * 1000 / 30] = 0.000011mW$

Thus;

Conducted power = Radiated Power (EIRP) – Antenna Gain

So;

Conducted Power = 0.000011mW.

The SAR Exclusion Threshold Level for 125 kHz when the minimum test separation distance is < 50mm:

$$= [948 * (1 + \log_{10} f(\text{MHz}))] / 2$$

$$= 1850mW$$

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing. So the transmitter complies with the RF exposure requirements and the SAR is not required.

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For simultaneous transmission operations

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous Transmission Configurations				
Mode	2.4GHz Wi-Fi	5GHz Wi-Fi	125 kHz	13.56 MHz
2.4GHz Wi-Fi	Not support			
5GHz Wi-Fi	Not support	Not support		
125 kHz	Support	Support	Not support	
13.56 MHz	Support	Support	Not support	Not support

The sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0

MPE Ratios are Calculated as $[(MPE1/Limit) + (MPE2/Limit) + \dots] \leq 1.0$

Simultaneous Transmission Calculated							
Mode	MPE Ratios				Simultaneous Transmission Result	Limit	Result
	2.4GHz Wi-Fi	5GHz Wi-Fi	125 kHz	13.56 MHz			
2.4GHz Wi-Fi + 125 kHz	0.1044	--	7.67494E-08	--	0.1044	1	Pass
2.4GHz Wi-Fi + 13.56 MHz	0.1044	--	--	5.94595E-09	0.1044	1	Pass
5GHz Wi-Fi + 125 kHz	--	0.0114	7.67494E-08	--	0.0114	1	Pass
5GHz Wi-Fi + 13.56 MHz	--	0.0114	--	5.94595E-09	0.0114	1	Pass

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Appendix I

Definition below must be outlined in the User Manual:

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.

***** END *****