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Report No.: TMWK2201000247KR

FCC ID: 2AAWQ-CAPRICA5UXL-2

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RF Exposure Evaluation Report

FCC 47 CFR § 2.1091

for
Play-Fi Wireless Module

Model Name.: Caprica5UXL-2

Prepared for:
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Prepared by
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 14, 2023	Initial Issue	ALL	Doris Chu
01	October 6, 2023	See the following Note Rev. (01)	P.6, P.14	Doris Chu
02	October 20, 2023	See the following Note Rev. (02)	P.6	Doris Chu

Rev. (01)

1. Add serial number in section 3.1.
2. Modify U-NII-2C Frequency in section 5.

Rev. (02)

1. Modify serial number in section 3.1.



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1 Attestation of Test Results

Applicant Name	Phorus, Inc.
Model Name	Caprica5UXL-2
Applicable Standards	FCC 47 CFR § 2.1091 FCC 47 CFR § 1.1307 FCC 47 CFR § 1.1310 Published RF exposure KDB procedures
Receive EUT Date:	May 17, 2023
<p>Compliance Certification Services Inc. , tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement,not taking into account measurement instrumentation uncertainty.All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p>	
<p>Approved & Released By:</p> 	
<p>Sky Zhou Asst. Section Manager Compliance Certification Services Inc.</p>	



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2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1091, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D02 RF Exposure Reporting v01r02



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3 Device Under Test (DUT) Information

3.1 DUT Description

Product	Play-Fi Wireless Module
Trade Name	XPERI
Model No.	Caprica5UXL-2
Model Discrepancy	N/A
Hardware Version	PVT-V03
Software Version	BT: 508.4.0.007 WiFi: RTL8822CU_WiFi_linux_v5.14.0.3-2
Serial number	C14-0000-0001
Sample Stage	Identical prototype

3.2 Wireless Technologies

Frequency bands	<input checked="" type="checkbox"/> Bluetooth: 2402MHz-2480MHz <input checked="" type="checkbox"/> 802.11b/g/n HT20/: 2412MHz ~ 2462 MHz <input checked="" type="checkbox"/> 802.11n HT40/: 2422MHz ~ 2452MHz <input checked="" type="checkbox"/> 802.11a/n HT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5700MHz / 5745MHz ~ 5825MHz <input checked="" type="checkbox"/> 802.11ac VHT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5700MHz / 5745MHz ~ 5825MHz <input checked="" type="checkbox"/> 802.11n HT40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5670MHz / 5755MHz ~ 5795MHz <input checked="" type="checkbox"/> 802.11ac VHT 40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5670MHz / 5755MHz ~ 5795MHz <input checked="" type="checkbox"/> 802.11ac VHT80: 5210MHz / 5290MHz / 5530MHz ~ 5610MHz / 5775MHz <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure <input checked="" type="checkbox"/> General Population/Uncontrolled exposure

Antenna Specification

BT:

Dipole Antenna / Gain: 5 dBi
PIFA Antenna / Gain: 4.80 dBi

WIFI 2.4GHz:

Dipole Antenna / Gain: 5 dBi
Power Directional Gain: 8.01 dBi
PIFA Antenna / Gain: 4.80 dBi
Power Directional Gain: 7.81 dBi

WIFI 5GHz:

5150~5250
Dipole Antenna / Gain: 4 dBi
Power Directional Gain: 7.01 dBi
PIFA Antenna / Gain: 6.06 dBi
Power Directional Gain: 9.07 dBi
5250~5350:
Dipole Antenna / Gain: 4 dBi
Power Directional Gain: 7.01 dBi
PIFA Antenna / Gain: 6.06 dBi
Power Directional Gain: 9.07 dBi
5470~5725:
Dipole Antenna / Gain: 4 dBi
Power Directional Gain: 7.01 dBi
PIFA Antenna / Gain: 6.06 dBi
Power Directional Gain: 9.07 dBi
5725~5850
Dipole Antenna / Gain: 4 dBi
Power Directional Gain: 7.01 dBi
PIFA Antenna / Gain: 6.06 dBi
Power Directional Gain: 9.07 dBi

BT:	Antenna Gain :	5.00 dBi	(Numeric gain: 3.16)	Worst
2.4GHz:	Antenna Gain:	8.01 dBi	(Numeric gain: 6.32)	Worst
5GHz(U-NII-1):	Antenna Gain:	9.07 dBi	(Numeric gain: 8.07)	Worst
5GHz(U-NII-2A):	Antenna Gain:	9.07 dBi	(Numeric gain: 8.07)	Worst
5GHz(U-NII-2C):	Antenna Gain:	9.07 dBi	(Numeric gain: 8.07)	Worst
5GHz(U-NII-3):	Antenna Gain:	9.07 dBi	(Numeric gain: 8.07)	Worst

Maximum
tune up
power

BT	5.50 dBm	(3.548 mW)
BLE	4.50 dBm	(2.818 mW)

2.4GHz

IEEE 802.11b (Multiple)	17.00 dBm	(50.119 mW)
IEEE 802.11g (Multiple)	16.00 dBm	(39.811 mW)
IEEE 802.11n HT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11n HT 40 (MIMO)	15.00 dBm	(31.62 mW)

5GHz (U-NII-1)

IEEE 802.11a (Multiple)	16.00 dBm	(39.81 mW)
IEEE 802.11n HT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11n HT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 80 (MIMO)	13.00 dBm	(19.95 mW)

5GHz (U-NII-2A)

IEEE 802.11a (Multiple)	16.00 dBm	(39.81 mW)
IEEE 802.11n HT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11n HT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 80 (MIMO)	13.00 dBm	(19.95 mW)

5GHz (U-NII-2C)

IEEE 802.11a (Multiple)	16.00 dBm	(39.81 mW)
IEEE 802.11n HT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11n HT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 80 (MIMO)	13.00 dBm	(19.95 mW)

5GHz (U-NII-3)

IEEE 802.11a (Multiple)	16.00 dBm	(39.81 mW)
IEEE 802.11n HT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11n HT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 20 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 40 (MIMO)	15.00 dBm	(31.62 mW)
IEEE 802.11ac VHT 80 (MIMO)	13.00 dBm	(19.95 mW)

Notes:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- The tune up power referred the AVG power of the test report TMWK2201000243KR, TMWK2201000244KR, TMWK2201000245KR and TMWK2201000246KR for RF Exposure assessment purpose.

4 Maximum Permissible Exposure

4.1 Limits for Maximum Permissible Exposure (MPE)

Table 1 - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	* 100	6
3.0-30	1842/f	4.89/f	* 900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* 100	30
1.34-30	824/f	2.19/f	* 180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
<u>1,500-100,000</u>			1.0	30

4.2 MPE Calculation Method

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

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:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

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

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

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

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

If, Substituting the MPE safe distance using d = 20 cm into Equation 1:

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

4.3 MPE EXEMPTION

- (A) The available maximum time-averaged power is no more than 1 mW
- (B) The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

- (C) Using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.
Note: R is in meters, f is in MHz.	

4.4 Multiple RF sources

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$



5 MPE Exemption Option B

Bluetooth

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
BT	2480.00	0.2	5.5	5.00	10.50	8.35	6.839	3060	Complies
BLE	2480.00	0.2	4.5	5.00	9.50	7.35	5.433	3060	Complies

WIFI 2.4GHz (DTS)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11b (Multiple)	2462.00	0.2	17.0	8.01	25.01	22.86	193.197	3060	Complies
IEEE 802.11g (Multiple)	2462.00	0.2	16.0	8.01	24.01	21.86	153.462	3060	Complies
IEEE 802.11n HT 20 (MIMO)	2462.00	0.2	15.0	8.01	23.01	20.86	121.899	3060	Complies
IEEE 802.11n HT 40 (MIMO)	2452.00	0.2	15.0	8.01	23.01	20.86	121.899	3060	Complies

WIFI 5.2GHz (U-NII-1)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11a (Multiple)	5240.00	0.2	16.0	9.07	25.07	22.92	195.884	3060	Complies
IEEE 802.11n HT 20 (MIMO)	5240.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11n HT 40 (MIMO)	5230.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 20 (MIMO)	5240.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 40 (MIMO)	5230.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 80 (MIMO)	5210.00	0.2	13.0	9.07	22.07	19.92	98.175	3060	Complies

WIFI 5.3GHz (U-NII-2A)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11a (Multiple)	5320.00	0.2	16.0	9.07	25.07	22.92	195.884	3060	Complies
IEEE 802.11n HT 20 (MIMO)	5320.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11n HT 40 (MIMO)	5310.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 20 (MIMO)	5320.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 40 (MIMO)	5310.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 80 (MIMO)	5290.00	0.2	13.0	9.07	22.07	19.92	98.175	3060	Complies

WIFI 5.5GHz (U-NII-2C)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11a (Multiple)	5700.00	0.2	16.0	9.07	25.07	22.92	195.884	3060	Complies
IEEE 802.11n HT 20 (MIMO)	5700.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11n HT 40 (MIMO)	5670.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 20 (MIMO)	5700.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 40 (MIMO)	5670.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 80 (MIMO)	5610.00	0.2	13.0	9.07	22.07	19.92	98.175	3060	Complies

WIFI 5.8GHz (U-NII-3)

Mode	Frequency (MHz)	R(m)	Max Tune-up power (dBm)	G(dBi)	Max Tune-up EIRP (dBm)	Max Tune-up ERP (dBm)	Max Tune-up ERP (mW)	ERP Threshold (mW)	MPE Exemption
IEEE 802.11a (Multiple)	5825.00	0.2	16.0	9.07	25.07	22.92	195.884	3060	Complies
IEEE 802.11n HT 20 (MIMO)	5825.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11n HT 40 (MIMO)	5795.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 20 (MIMO)	5825.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 40 (MIMO)	5795.00	0.2	15.0	9.07	24.07	21.92	155.597	3060	Complies
IEEE 802.11ac VHT 80 (MIMO)	5775.00	0.2	13.0	9.07	22.07	19.92	98.175	3060	Complies

6 Simultaneous Transmission Exempt

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation),

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
	1	DTS	+	BT
	2	U-NII	+	BT

6.1 Sum of the WIFI 2.4GHz & WIFI 5GHz+ Bluetooth

WiFi 2.4GHz + Bluetooth

Mode	Frequency (MHz)	Max Tune-up ERP(mW)	ERP Threshold(mW)	simultaneous Transmission	simultaneous Transmission Limit
WiFi 2.4GHz	2462.00	193.197	3060	0.065	≤1
Bluetooth	2480.00	6.839	3060		

WiFi 5GHz + Bluetooth

Mode	Frequency (MHz)	Max Tune-up ERP(mW)	ERP Threshold(mW)	simultaneous Transmission	simultaneous Transmission Limit
WiFi 5GHz	5825.00	195.884	3060	0.066	≤1
Bluetooth	2480.00	6.839	3060		



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7 Facilities

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan.

--End of Test Report--