

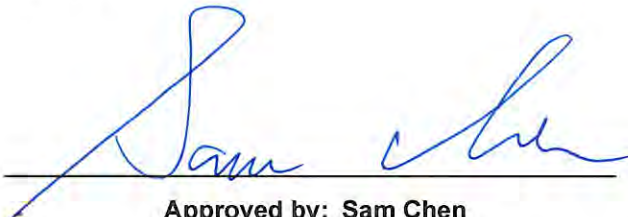


RADIO EXPOSURE TEST REPORT

FCC ID : 2ABLKU6HE
Equipment : GigaPro™ GPR2032H
Brand Name : Calix
Model Name : GPR2032H
Applicant : Calix Inc.
1035 N. McDowell Blvd. Petaluma, CA94954 U.S.A.
Manufacturer : Calix Inc.
1035 N. McDowell Blvd. Petaluma, CA94954 U.S.A.
Standard : 47 CFR Part 2.1091

The product was received on Mar. 04, 2022, and testing was started from Mar. 08, 2022 and completed on Dec 22, 2023. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
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Table of Contents

History of this test report.....3

Summary of Test Result.....4

1 General Description5

1.1 EUT General Information5

1.2 Antenna Information5

1.3 Table for EUT supports functions.....6

1.4 Table for Permissive Change7

1.5 Accessories7

1.6 Applicable Standards7

1.7 Testing Location7

2 Maximum Permissible Exposure8

2.1 Limit of Maximum Permissible Exposure8

2.2 MPE Calculation Method.....8

2.3 MPE Exemption.....9

2.4 Calculated Result and Limit.....10

Photographs of EUT v01



History of this test report

Report No.	Version	Description	Issued Date
FA230414-02	01	Initial issue of report	Jul. 17, 2024



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Vicky Huang



1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM,) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5700 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
6GHz WLAN	5925-6425 6525-6875	5955-6415 6535-6855	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

1.2 Antenna Information

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz						
1	2	2	-	Galtronics	60-2891-03-2	PCB antenna	I-PEX	Note1	WLAN Ant.
2	1	1	-	Galtronics	60-2914-03-1	PCB antenna	I-PEX		
3	-	-	1	Hong Bo	290-50254	PCB Antenna	I-PEX		
4	-	-	2	Hong Bo	290-50255	PCB Antenna	I-PEX		

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Gain (dBic)	Remark
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz						
5	-	-	-	u-blox	SAM-M8Q	Ceramic Patch Antenna	N/A	3	GPS Ant.



Note 1:

<Antenna Gain>

Ant.	Port			Antenna Gain (dBi)						
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	WLAN 2.4GHz	WLAN 5GHz				WLAN 6GHz	
					UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 7
1	2	2	-	5.62	1.36	2.03	2.64	1.84	-	-
2	1	1	-	4.97	2.22	2.77	4.1	3.65	-	-
3	-	-	1	-	-	-	-	-	5.2	5.6
4	-	-	2	-	-	-	-	-	7.5	5.8

< Directional Gain>

Item	Directional Gain (dBi)				
	WLAN 2.4GHz	WLAN 5GHz			
		UNII 1	UNII 2A	UNII 2C	UNII 3
2T1S	6.88	4.15	4.15	5.81	5.74

Note 2: The above information (except 2.4GHz/5GHz gain) was declared by manufacturer.

For 2.4GHz/5GHz: The directional gain is measured which follows the procedure of KDB 662911 D03.

<WLAN 2.4GHz function>

For IEEE 802.11b/g/n/VHT/ax (2TX/2RX):

Pot 1, Port 2 can be used as transmitting/receiving antenna.

Pot 1, Port 2 could transmit/receive simultaneously.

<WLAN 5GHz function>

For IEEE 802.11a/n/ac/ax mode (2TX/2RX)

Pot 1, Port 2 can be used as transmitting/receiving antenna.

Pot 1, Port 2 could transmit/receive simultaneously.

<WLAN 6GHz function>

For IEEE 802.11ax mode (2TX/2RX)

Pot 1, Port 2 can be used as transmitting/receiving antenna.

Pot 1, Port 2 could transmit/receive simultaneously.

1.3 Table for EUT supports functions

Function	Support Band
AP	2.4GHz / 5GHz UNII 1~UNII 3 / 6GHz UNII 5, UNII 7
Extender	2.4GHz / 5GHz UNII 1~UNII 3

Note: The above information was declared by manufacturer.



1.4 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA230414

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Changing the Firmware Version to "22.4.500" from "13725.5.5". 2. Changing the design for the digital board. 3. Changing equipment name to "GigaPro™ GPR2032H" from "GigaPro GPR2032H"	It does not affect the test results.
4. Adding 6GHz UNII 5 and UNII 7 (5925~6425 MHz, 6525~6875MHz) for this device. 5. Updating the MPE distance to "52cm" from "51cm".	MPE

1.5 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter	AMIGO	AMS157-1203000F2	Input: 100-240V~50/60Hz, 1A Output: 12V, 3.0A
Others			
Power cord*1: Non-shielded, 1.5m			
Grounding wire*1: Non-shielded, 0.35m			
I/O Cover*1			

1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

1.7 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
Test site Designation No. TW3787 with FCC.	
Conformity Assessment Body Identifier (CABID) TW3787 with ISED.	



2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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
300-1500	-	-	f/300	<6
1500-100,000	-	-	5	<6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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
300-1500	-	-	f/1500	<30
1500-100,000	-	-	1.0	<30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 52 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

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



2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

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

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);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

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	19.2R ² .
Note: R is in meters, f is in MHz.	



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)	Option	TL EIRP (dBm)	TL Ratio
2.4G;G1D	5.62	29.92	35.54	0.45	35.99	52	0.11689	1.00000	C	39.302	0.4665
5.2G;D1D	4.15	25.78	29.93	0.50	30.43	52	0.03249	1.00000	C	39.302	0.1297
5.3G;D1D	4.15	23.93	28.08	0.50	28.58	52	0.02122	1.00000	C	39.302	0.0847
5.6G;D1D	5.81	23.96	29.77	0.22	29.99	52	0.02936	1.00000	C	39.302	0.1172
5.8G;D1D	5.74	29.84	35.58	0.41	35.99	52	0.11689	1.00000	C	39.302	0.4665
6.2G;D1D	-	-	24.09	0.50	24.59	52	0.00847	1.00000	C	39.302	0.0338
6.7G;D1D	-	-	24.77	0.50	25.27	52	0.00990	1.00000	C	39.302	0.0395

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)	Option	TL EIRP (dBm)	TL Ratio
2.4G;G1D	5.62	29.92	35.54	0.45	35.99	52	0.11689	1.00000	C	39.302	0.4665
5.8G;D1D	5.74	29.84	35.58	0.41	35.99	52	0.11689	1.00000	C	39.302	0.4665
6.7G;D1D	-	-	24.77	0.50	25.27	52	0.00990	1.00000	C	39.302	0.0395
Sum TL Ratio_C	0.9725										
Ratio Limit	1										

Note: The above antenna gain was declared by manufacturer.

—————THE END—————