



RADIO EXPOSURE TEST REPORT

FCC ID : 2ABLK-GS5239XX

Equipment : GS7 XGS Tri Gateway, GS7 10GE Tri Gateway

Brand Name : Calix

Model Name : GS7 XGS GS5239XG, GS7 10GE GS5239E

Applicant : Calix Inc.
1 Santana West, 3155 Olsen Drive, Suite 450, San Jose,
California United States 95117

Standard : 47 CFR Part 2.1091

The product was received on Mar. 25, 2024, and testing was started from Apr. 12, 2024 and completed on May 23, 2024. 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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Photographs of EUT v01



History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
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Report Version : 01



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: **Sandy Chuang**

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, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
6GHz WLAN	5925-7125	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)

1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Alpha	290-20543	Dipole	I-PEX	Note 1
2	Alpha	290-20544	Dipole	I-PEX	
3	Alpha	290-20546	Dipole	I-PEX	
4	Alpha	290-20545	Dipole	I-PEX	
5	Alpha	290-20548	Dipole	I-PEX	
6	Alpha	290-20549	Omni	I-PEX	
7	Alpha	290-20547	Dipole	I-PEX	
8	Alpha	290-20550	Omni	I-PEX	

Note 1:

Ant.	Port		Antenna Gain (dBi)				
	WLAN 2.4GHz	WLAN 5GHz	WLAN 2.4GHz	WLAN 5GHz			
				UNII 1	UNII 2A	UNII 2C	UNII 3
1	1	3	2.61	4.07	4.41	3.66	3.30
2	2	4	3.15	3.95	3.69	3.56	3.77



Ant.	Port		Antenna Gain (dBi)				
	WLAN 2.4GHz	WLAN 5GHz	WLAN 2.4GHz	WLAN 5GHz			
				UNII 1	UNII 2A	UNII 2C	UNII 3
3	-	1	-	3.90	3.52	4.19	3.67
4	-	2	-	4.07	3.62	4.60	4.99

Ant.	Port		Antenna Gain (dBi)			
	WLAN 6GHz		WLAN 6GHz			
			UNII 5	UNII 6	UNII 7	UNII 8
5	1		4.57	4.18	3.89	3.82
6	2		3.78	4.25	4.39	4.07
7	3		5.99	4.05	4.08	4.55
8	4		4.64	4.51	4.33	3.64

Item	Directional gain (dBi)								
	WLAN 2.4GHz	WLAN 5GHz				WLAN 6GHz			
		UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
2T1S	4.09	-	-	-	-	-		-	-
2T2S	3.15	-	-	-	-	-		-	-
4T1S	-	6.88	7.19	7.73	7.39	7.14	7.44	6.67	5.98
4T2S	-	4.07	4.41	4.73	4.99	5.99	4.51	4.39	4.55
4T4S	-	4.07	4.41	4.60	4.99	5.99	4.51	4.39	4.55

Note 2: The above information (except antenna gain and directional gain) was declared by manufacturer.

Note 3: The antenna gain and directional gain are measured which follow the procedure of KDB 662911 D03.

Note 4: **For 2.4GHz function:**

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

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

Port 1~2 could transmit/receive simultaneously.

For 5GHz function:

For IEEE 802.11 a/n/ac/ax/be (4TX/4RX):

Port 1~4 can be used as transmitting/receiving antenna.

Port 1~4 could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11 ax/be (4TX/4RX):

Port 1~4 can be used as transmitting/receiving antenna.

Port 1~4 could transmit/receive simultaneously.

1.3 Table for Multiple Listing

The EUT has two equipment/model names, the difference is listed in the following table:

EUT	Equipment Name	Model Name	BOSA	10G PHY port	SLIC IC
1	GS7 XGS Tri Gateway	GS7 XGS GS5239XG	With	1 port	Brand : Intel Model : SLC220
2	GS7 10GE Tri Gateway	GS7 10GE GS5239E	Without	2 port	Brand : Microsemi Model : Le9632

Note1: After evaluation, the worst case scenario of EUT 1 was selected as representative mode for the test, and its data was recorded in this report.

Note2: The above information was declared by manufacturer.

1.4 Table for Components Source Information

Item	Main source	Second source
DDR	Brand name: Nanya Model name: NT5AD256M16E4-JR	Brand name: Nanya Model name: NT5AD512M16C4-JR

Note: The above information was declared by manufacturer.

1.5 Table for EUT Information

EUT	DDR	LED Rubber	Acetate Tape	Thermal pad	Bridge diode	Debug pin
1	Main source	Without	Without	Without	With	With
2						
3	Second source	With	With	With	Without	With
4						Without

Note: From the above, EUT 1 was selected to perform all test items.

1.6 Table for EUT supports functions

Function
AP Router
Bridge
Extender

Note: The above information was declared by manufacturer.



1.7 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA432203-01

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

Modifications	Performance Checking
1. Add the second source of DDR for EUT 3~4. 2. Add the thermal pad for EUT 3~4. 3. Remove bridge diode of digital board for EUT 3~4. 4. Add the LED rubber and acetate tape for EUT 3~4. 5. Remove debug pin of digital board for EUT 4. 6. Change the external photograph of EUT 2 (Model: GS7 10GE GS5239E) because the original external photograph of EUT 2 contains an error. 7. Change the external photograph of EUT 1 (Model: GS7 XGS GS5239XG) because the original external photograph of EUT 1 contains an error. 8. Add the MRU/Puncturing function in 5GHz/6GHz through SW change (software number to "OpenWrt SNAPSHOT r0-7a5117104 / LuCI luci/openwrt-24.10 branch 24.212.79282~65b8002" from "OpenWrt 19.07-SNAPSHOTr0-69aef30 / LuCI branch git-24.058.46099-69aef30"). 9. Change the applicant address to "1 Santana West, 3155 Olsen Drive, Suite 450, San Jose, California United States 95117" from "1035 N. McDowell Blvd. Petaluma, CA94954 U.S.A."	After evaluation, this test report was not affected.

Note: All test results are based on original test report.



1.8 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter 1	AMIGO	AMS340-1204500FU	INPUT: 100-240V~50/60Hz, 2.0A OUTPUT: 12V, 4.5A
Adapter 2	MOSO	V30-V4500R120-060K0-US	INPUT: 100-240V~50/60Hz, 1.5A max. OUTPUT: 12.0V, 4.5A
other			
Cradle*1			

1.9 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

1.10 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 47 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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, <= P_{th}.

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

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	$19.2 R^2$.
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)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	3.15	28.96	29.96	0.50	1111.732	47	C	4241.3	0.2622
5.2G;D1D	6.88	28.60	33.33	0.50	2415.461	47	C	4241.3	0.5697
5.3G;D1D	7.19	22.72	27.76	0.08	608.135	47	C	4241.3	0.1434
5.6G;D1D	7.73	21.82	27.40	0.44	608.135	47	C	4241.3	0.1434
5.8G;D1D	7.39	28.53	33.77	0.07	2421.029	47	C	4241.3	0.5710
6.2G;D1D	5.99	-	26.51	0.50	502.343	47	C	4241.3	0.1185
6.4G;D1D	4.51	-	24.50	0.50	316.228	47	C	4241.3	0.0746
6.7G;D1D	4.39	-	27.58	0.26	608.135	47	C	4241.3	0.1434
7.0G;D1D	4.55	-	24.93	0.50	349.140	47	C	4241.3	0.0823

Simultaneous Transmission Analysis Mode: EUT 1-WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	3.15	28.96	29.96	0.50	1111.732	47	C	4241.3	0.2622
5.8G;D1D	7.39	28.53	33.77	0.07	2421.029	47	C	4241.3	0.5710
6.7G;D1D	4.39	-	27.58	0.26	608.135	47	C	4241.3	0.1434
Sum TL Ratio_C	0.9766	-	-	-	-	-	-	-	-
Ratio Limit	1	-	-	-	-	-	-	-	-

————THE END————