



RF Exposure Evaluation Declaration

FCC ID: 2ABLK-U4X

Applicant: Calix Inc.

Application Type: Certification

Product: GigaSpire BLAST

Model No.: u4 GS2028E, u4-2 GS2028E-2,
u4m GM1028, u4m-2 GM1028-2

Brand Name: 

FCC Classification: Digital Transmission System (DTS)
Unlicensed National Information Infrastructure (NII)

Test Procedure(s): KDB 447498 D01v06

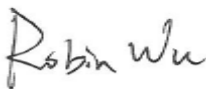
Test Date: August 21, 2020

Reviewed By:



Kevin Guo

Approved By:



Robin Wu



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2105RSU028-U5	Rev. 01	Initial report	05-21-2021	Valid

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1. General Information

1.1. Applicant

Calix Inc.

1035 N. McDowell Blvd Petaluma, CA94954 U.S.A

1.2. Manufacturer

Calix Inc.

1035 N. McDowell Blvd Petaluma, CA94954 U.S.A

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory	
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01 FCC: CN1166 VCCI: R-20025, G-20034, C-20020, T-20020	CNAS: L10551 ISED: CN0001
☐	Test Site – MRT Shenzhen Laboratory	
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02 FCC: CN1284	CNAS: L10551 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory	
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725 FCC: 291082, TW3261	ISED: TW3261

1.4. Product Information

Product Name	GigaSpire BLAST
Model No.	u4 GS2028E, u4-2 GS2028E-2, u4m GM1028, u4m-2 GM1028-2
Brand Name	
Wi-Fi Specification	802.11a/b/g/n/ac/ax/VHT
Serial No.	262007039756 (Radiated Emission & AC Line Conducted Emission) 262007039695 (Conducted)
Accessory	
Adapter #1	MODEL: F24L9-120200SPAU INPUT: 100-240V~50/60Hz 0.6A OUTPUT: 12V=2A
Adapter #2	Model No.: WY-24A12R Input Power: 100 - 240V ~ 50-60Hz, 0.6A Max Output Power: 12.0VDC 2.0A, 24.0W
Remark:	
1. Between the models, there are the same schematics design, same PCB layout and the same RF parameters except the difference as below (Section 1.5), and only u4 GS2028E with adapter #2 was selected for test in this report.	

1.5. Models Difference

Model name	Difference
u4 GS2028E, u4-2 GS2028E-2	2 LAN ports, 1 WAN port, 1 USB, 2.4G/5G Wi-Fi, external PSU
u4m GM1028, u4m-2 GM1028-2	1 WAN port, 2.4G/5G Wi-Fi, external PSU

1.6. Antenna Details

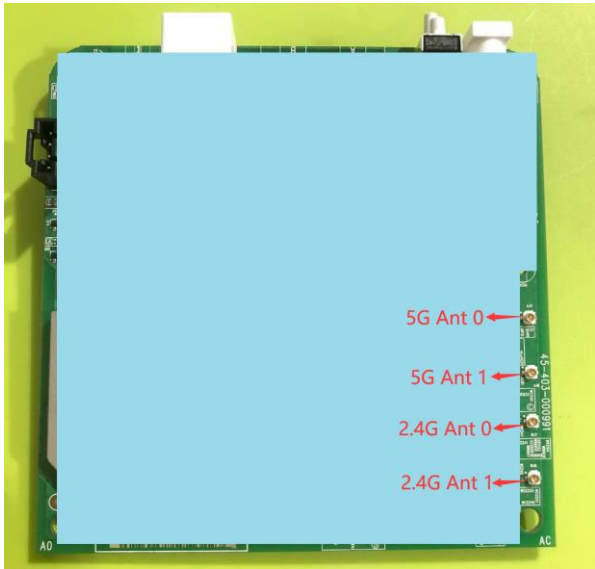
Model name	Manufacturer	Tx Port	Frequency Band (MHz)	Cable length (mm)
2.4G-2_PCB-LY70FC1	CHANGSHU HONGBO TELECOMMUNICATION TECHNOLOGY CO., LTD.	2.4G Ant 0	2412~2462	70
2.4G-1_PCB-LE160FC3		2.4G Ant 1	2412~2462	160
RFPCA252302IM5B301	WALSIN TECHNOLOGY CORPORATION	5G Ant 0	5150~5850	30
RFPCA252312IM5B301		5G Ant 1	5150~5850	125

Antenna Type	Frequency Band (MHz)	Tx Paths	Directional Gain (dBi)
			CDD & Beamforming
PCB Antenna	2412 ~ 2462	2	5.84
	5150 ~ 5350	2	5.81
	5470 ~ 5725	2	5.93
	5725 ~ 5850	2	5.95

Note 1: The EUT supports Cyclic Delay Diversity (CDD) and Beamforming technology, and the Beamforming mode support 802.11ac/ax, not include 802.11a/b/g. It transmits signals that are correlated, then Directional gain = $10 \log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently].

Note 2: All the messages as above are provided by manufacturer.

1.7. Antenna RF Port

Antenna RF Port				
Software Control Port	2.4GHz RF Port		5GHz RF Port	
	Ant 0	Ant 1	Ant 0	Ant 1
				

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	f/1500	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Result

Product	GigaSpire BLAST
Test Item	RF Exposure Evaluation

Antenna Gain: Refer to clause 1.6.

Test Mode	Frequency Band (MHz)	Maximum EIRP (dBm)	Safety Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
802.11b/g/n/ax/VHT	2412 ~ 2462	35.73	27	0.4084	1
802.11a/n/ac/ax	5180 ~ 5240	34.35	27	0.2972	1
	5260 ~ 5320				
	5500 ~ 5720				
	5745 ~ 5825				

Note: Based on the original report 2006RSU066-U3 to add U-NII-2a/-2c bands in this report.

Conclusion:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously.

The max Power Density at R (27 cm) = $0.4084\text{mW/cm}^2 + 0.2972\text{mW/cm}^2 = 0.7056\text{mW/cm}^2 < 1\text{mW/cm}^2$.

So the safety distance is 27cm for device installed without any other radio equipment.

_____ The End _____

Appendix A - EUT Photograph

Refer to “2105RSU028-UE” file.