RF Test Report

Applicant	:	Kaonbroadband CO., LTD
Product Name	:	WiFi6E XGS-PON Gateway
Trade Name	:	KAON
Model Number	:	PG2494
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Received Date	:	Apr. 08, 2022
Test Period	:	Jun. 09, 2022
Issued Date	:	Aug. 05, 2022

Issued by

A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330
Frequency Range : 9 kHz to 40 GHz
Test Firm MRA designation number: TW0010

Note:
1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
2.This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issued Date	Revisions	Revised By
00	Jul. 29, 2022	Initial Issue	Nicole Chu
01	Aug. 05, 2022	Update report information (P.1) Update 4.2 chapter (P.12)	Nicole Chu

Verification of Compliance

Applicant	:	Kaonbroadband CO., LTD
Product Name	:	WiFi6E XGS-PON Gateway
Trade Name	:	KAON
Model Number	:	PG2494
FCC ID	:	2AXCW-PG2494
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. 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.

Approved By : Kai Yu Yang

(Kai Yu Yang)

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1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark
15.207	AC Power Conducted Emission	NA	-----
15.247(d)	Transmitter Radiated Emissions	NA	-----
15.247(b)(3)	Max. Output Power	PASS	-----
15.247(a)(2)	6 dB RF Bandwidth	NA	-----
15.247(e)	Maximum Power Spectral Density	NA	-----
15.247(d)	Out of Band Conducted Spurious Emission	NA	-----
15.203	Antenna Requirement	PASS	-----

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 15.247 Meas Guidance v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
KDB 662911 D01 v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conducted Emission	150 kHz ~ 30 MHz	2.7 dB
Radiated Emission	9 kHz ~ 30 MHz	2.2 dB
	30 MHz ~ 1000 MHz	5.1 dB
	1000 MHz ~ 18000 MHz	5.2 dB
	18000 MHz ~ 26500 MHz	4.6 dB
	26500 MHz ~ 40000 MHz	4.6 dB
Conducted Output Power	1.1 dB	
RF Bandwidth	4.7 %	
Power Spectral Density	1.1 dB	

2 EUT Description

Applicant	Kaonbroadband CO., LTD 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea				
Product Name	WiFi6E XGS-PON Gateway				
Trade Name	KAON				
Model Number	PG2494				
Models different description	All models are electrically identical, different model names are for marketing purpose.				
FCC ID	2AXCW-PG2494				
Operate Freq. Band	Frequency Range (MHz)		Modulation	Channel Bandwidth	Data Rate 400 GI (ns)
IEEE 802.11b	2412 ~ 2462		DSSS	20 MHz	Up to 11 Mbps
IEEE 802.11g	2412 ~ 2462		OFDM	20 MHz	Up to 54 Mbps
IEEE 802.11n 2.4 GHz 20 MHz	2412 ~ 2462		OFDM	20 MHz	Up to 288.8 Mbps
IEEE 802.11n 2.4 GHz 40 MHz	2422 ~ 2452		OFDM	40 MHz	Up to 600 Mbps
IEEE 802.11n 2.4 GHz 20 MHz	2412 ~ 2462		OFDM (256QAM)	20 MHz	Up to 346.8 Mbps
IEEE 802.11n 2.4 GHz 40 MHz	2422 ~ 2452		OFDM (256QAM)	40 MHz	Up to 800 Mbps
IEEE 802.11ax 2.4 GHz 20 MHz	2412 ~ 2462		OFDMA	20 MHz	MCS11
IEEE 802.11ax 2.4 GHz 40 MHz	2422 ~ 2452		OFDMA	40 MHz	MCS11
Antenna information	ANT	Model Number	Type		Max. Gain (dBi)
	ANT-0	SW25DEC100P	Internal PCB Antenna		1.9
	ANT-1/2/3	SW25DEC200P	Internal PCB Antenna		1.9
	Directional Gain				4.63
Antenna Delivery	See section 3.1				
Operate Temp. Range	0 ~ +40 ℃				
EUT Power Rating	DC 12 V, 3.33 A				

EUT Modify Description：

Modify Description: Add IEEE 802.11ax Partial RU via software and there is no hardware changes or modifications.
FCC ID: 2AXCW-PG2494

Frequency Band	Max. RF Output Power (W)
IEEE 802.11ax_HE20:	0.149
IEEE 802.11ax_HE40:	0.049

3 Test Methodology

3.1. Mode of Operation

In the test report use EUT model: PG2494 to operate testing.
Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: IEEE 802.11ax 2.4 GHz 20 MHz Continuous TX Mode
Mode 2: IEEE 802.11ax 2.4 GHz 40 MHz Continuous TX Mode

Software used to control the EUT for staying in continuous transmitting mode was programmed.
After verification, all tests were carried out with the worst case test modes.
Note 1: Investigation has been done on all the possible configurations for searching the worst cases (IEEE 802.11ax test results Full RU Covers Partina RU).

Test Mode	ANT-0	ANT-1	ANT-2	ANT-3	ANT-0+1+2+3
Mode 1	V	V	V	V	V
Mode 2	V	V	V	V	V

Test Mode	Antenna Delivery	Data Rate (Mbps)	Test Channel
Mode 1	4TX (CDD / Beamforming on)	19.5	1, 6, 11
Mode 2	4TX (CDD / Beamforming on)	40.5	3, 6, 9

3.2. EUT Test Step

1.	Setup the EUT shown on “Configuration of Test System Details”.
2.	Turn on the power of all equipment.
3.	Turn on TX function.
4.	EUT run test program.

3.3. Test Instruments

For Conducted
Test Period: Jun. 09, 2022
Testing Engineer: Brian Lin

Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☒	Power Sensor	Anritsu	MA2411B	1126022	Sep. 03, 2021	1 year
☒	Power Meter	Anritsu	ML2495A	1135009	Sep. 03, 2021	1 year
☐	Power Sensor	Agilent	N1921A	MY45241957	Dec. 06, 2021	1 year
☐	Power Meter	Agilent	N1911A	MY45101619	Dec. 06, 2021	1 year
☐	Spectrum Analyzer (10 Hz~26.5 GHz)	Keysight	N9010B	MY59071418	Mar. 16, 2022	1 year
☒	Spectrum Analyzer (9 kHz~26.5 GHz)	Agilent	N9010A	MY48030518	Jul. 23, 2021	1 year
☐	Spectrum Analyzer (20 Hz~26.5 GHz)	Agilent	N9020A	US47520902	Sep. 09, 2021	1 year
☐	Spectrum Analyzer (3 Hz~50 GHz)	Agilent	N9030A	MY53120541	Jan. 05, 2022	1 year
☐	Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	Mar. 30, 2021	1 year
☐	Signal Generator	Keysight	N5182B	MY53052569	Apr. 20, 2021	1 year
☐	Signal Generator	Keysight	N5182BX07	MY59360221	Apr. 20, 2021	1 year
☐	Bluetooth Tester	R&S	CBT	100350	Mar. 17, 2021	2 years
☐	Wireless Connectivity Tester	R&S	CMW270	102208	Jun. 02, 2021	1 year
☐	Power Supply	KEITHLEY	2303	4045290	Jan. 19, 2022	1 year
☐	RF Communication Test Set	HP	8920A	3344A03297	Aug. 10, 2021	1 year

Note: N.C.R. = No Calibration Request.

3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	20-30
Humidity (%RH)	25-75	45-75

4 Measurement Procedure

4.1. Maximum Conducted Output Power Measurement

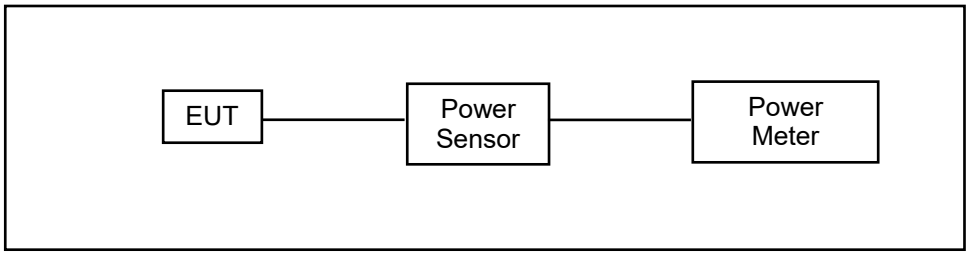
■ **Limit**

For systems using digital modulation in the 2400-2483.5 MHz, the limit for maximum output power is 30 dBm.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IEEE 802.11b / IEEE 802.11g / IEEE 802.11n 2.4 GHz 20 MHz / IEEE 802.11n 2.4 GHz 40 MHz /
IEEE 802.11ax 2.4 GHz 20 MHz / IEEE 802.11ax 2.4 GHz 40 MHz

■ **Test Setup**



■ **Test Procedure**

The testing follows the Measurement Procedure of ANSI C63.10:2013 section 11.9.2.3.2 Method AVGPM.
The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor.

4.2. Antenna Measurement

■ **Limit**

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■ **Antenna Description**

See section 2 – antenna information.

■ **Directional Gain Calculated**

Directional Gain = 10*log{[10^(G1/10)+10^(G2/10)+⋯+10^(Gn/10)]/NANT}

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11ax_HE20:	1.9
IEEE 802.11ax_HE40:	1.9

Beamforming on

Directional Gain = GANT + Array Gain

Array Gain is the actual measurement.

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11ax_HE20:	4.63
IEEE 802.11ax_HE40:	4.63

5 Test Results

5.1. Conducted Test Results

Maximum Conducted Output Power Measurement

Test Mode	Frequency (MHz)	RF Power setting in Test Software				Test Software Version
		ANT-0	ANT-1	ANT-2	ANT-3	
Mode 1	2412	19.0	19.0	19.0	19.0	Putty
	2437	23.0	23.0	23.0	23.0	
	2462	18.0	18.0	18.0	18.0	
Mode 2	2422	15.0	15.0	15.0	15.0	
	2437	17.0	17.0	17.0	17.0	
	2452	15.0	15.0	15.0	15.0	

Test Mode	Frequency (MHz)	Data Rate	RU	RU Number	Average Output Power										Limit
					Measurement Results										
					ANT-0		ANT-1		ANT-2		ANT-3		ANT-0+1+2+3		
					dBm	W	dBm	W	dBm	W	dBm	W	dBm	W	dBm
Mode 1	2412	MCS0	26	1	12.02	0.01	12.21	0.01	11.49	0.01	11.89	0.01	17.93	0.06	≤ 30.00
	2437		26	1	15.66	0.03	16.03	0.04	15.35	0.03	15.77	0.03	21.73	0.14	≤ 30.00
	2462		26	9	10.88	0.01	10.74	0.01	10.16	0.01	10.47	0.01	16.59	0.04	≤ 30.00
Mode 2	2422	MCS0	26	1	7.86	0.00	9.05	0.00	8.05	0.00	8.41	0.00	14.39	0.02	≤ 30.00
	2437		26	1	10.88	0.01	11.16	0.01	10.68	0.01	10.67	0.01	16.87	0.04	≤ 30.00
	2452		26	18	7.45	0.00	8.86	0.00	7.45	0.00	7.82	0.00	13.96	0.02	≤ 30.00

Note: The relevant measured result has the offset with cable loss already.

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