PERFORMANCE TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR22-SRZ0021-B Page (1) of (11)	eurofins | KCTL

1. Client

- Name : Kaonbroadband CO., LTD
- Address : 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2022-02-23

2. Use of Report : -

3. Name of Product / Model : WiFi6E XGS-PON Gateway / PG2494

4. Manufacturer / Country of Origin : Kaonbroadband CO., LTD / Korea

5. Date of Test : 2022-05-03 to 2022-05-09

6. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

7. Test method used : FCC Part 15 Subpart C (ANSI C63.10:2013)

8. Test Result : Refer to the test result in the test report

Affirmation	Tested by Name : Taekyong Nam (Signature)	Technical Manager Name : Heesu Ahn (Signature)

2022-08-09

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-08-04	Originally issued	-
2022-08-05	Updated	6
2022-08-09	Deleted the setup photo	9

Note. The report No. KR22-SRZ0021-A is superseded by the report No. KR22-SRZ0021-B.

CONTENTS

1. General information

Client	:	Kaonbroadband CO., LTD
Address	:	884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer	:	Kaonbroadband CO., LTD
Address	:	884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 CAB Identifier: KR0040, ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	WiFi6E XGS-PON Gateway
Model	:	PG2494
Modulation technique	:	WIFI(802.11a/b/g/n/ac/ax)
Number of channels	:	2 ㎓ band : 11 ch (20 ㎒), 7 ch (40 ㎒) 5 ㎓ band : 25 ch (20 ㎒), 12 ch (40 ㎒), 6 ch (80 ㎒) 6 ㎓ band : 24 ch (20 ㎒), 12 ch (40 ㎒), 6 ch (80 ㎒)
Power supply	:	DC 12 V, 3.33 A
Antenna type	:	PIFA Antenna
Antenna gain	:	2 ㎓ band : 1.90 ㏈i 5 ㎓ band : 2.00 ㏈i 6 ㎓ band : 2.70 ㏈i

Frequency range	:	2.4 ㎓ WALN	: 2 412 ㎒ ~ 2 462 ㎒	(802.11b/g/n/ax_20)
		2.4 ㎓ WALN	: 2 422 ㎒ ~ 2 452 ㎒	(802.11b/g/n/ax_40)
		UNII-1	: 5 180 ㎒ ~ 5 240 ㎒	(802.11a/n/ac/ax_20)
		UNII-1	: 5 190 ㎒ ~ 5 230 ㎒	(802.11n/ac/ax_40)
		UNII-1	: 5 210 ㎒	(802.11ac/ax_80)
		UNII-2A	: 5 260 ㎒ ~ 5 320 ㎒	(802.11a/n/ac/ax_20)
		UNII-2A	: 5 270 ㎒ ~ 5 310 ㎒	(802.11n/ac/ax_40)
		UNII-2A	: 5 290 ㎒	(802.11ac/ax_80)
		UNII-2C	: 5 500 ㎒ ~ 5 720 ㎒	(802.11a/n/ac/ax_20)
		UNII-2C	: 5 510 ㎒ ~ 5 710 ㎒	(802.11n/ac/ax_40)
		UNII-2C	: 5 530 ㎒ ~ 5 690 ㎒	(802.11ac/ax_80)
		UNII-3	: 5 745 ㎒ ~ 5 825 ㎒	(802.11a/n/ac/ax_20)
		UNII-3	: 5 755 ㎒ ~ 5 795 ㎒	(802.11n/ac/ax_40)
		UNII-3	: 5 775 ㎒	(802.11ac/ax_80)
		UNII-5	: 5 955 ㎒ ~ 6 415 ㎒	(802.11ax_20)
		UNII-5	: 5 965 ㎒ ~ 6 405 ㎒	(802.11ax_40)
		UNII-5	: 5 985 ㎒ ~ 6 385 ㎒	(802.11ax_80)

	UNII-6	: 6 435 ㎒ ~ 6 515 ㎒	(802.11ax_20)
	UNII-6	: 6 445 ㎒ ~ 6 525 ㎒	(802.11ax_40)
	UNII-6	: 6 465 ㎒	(802.11ax_80)
	UNII-7	: 6 535 ㎒ ~ 6 875 ㎒	(802.11ax_20)
	UNII-7	: 6 565 ㎒ ~ 6 845 ㎒	(802.11ax_40)
	UNII-7	: 6 545 ㎒ ~ 6 865 ㎒	(802.11ax_80)
	UNII-8	: 6 895 ㎒ ~ 7 115 ㎒	(802.11ax_20)
	UNII-8	: 6 885 ㎒ ~ 7 085 ㎒	(802.11ax_40)
	UNII-8	: 6 945 ㎒ ~ 7 025 ㎒	(802.11ax_80)
Software version	:	Ver. 2.0	
Hardware version	:	Ver. 1.0	
Test device serial No.	:	N/A	
Operation temperature	:	0 ℃ ~ 40 ℃	

3. Antenna System Description

- The QT62312 of highly integrated 802.11ax baseband chips that support up to 12 spatial streams in a single chip.
- The family can be configured for 4x4:4ss + 4x4:4ss + 4x4:4ss triple−band triple−concurrent (TBTC) solutions.
- The QT62312 is fully compliant with 802.11ax/ac/n/a/g/b standards.

Core to QUANTENNA's QT62312 system is the implementation of dynamic digital beamforming. The QT62312 can use the 8x8 MIMO array to provide up to 8.6Gbps of digitally beamformed data. Dynamic digital beamforming applies optimal complex weights to each transmit antenna to steer the energy of the antenna array in the independent spatial directions associated with the different data streams while simultaneously avoiding interference for up to 8 data streams. This optimal weighting requires channel estimation at the receiver, based on sounding packets, and feedback of the weights (or channel estimates) from the receiver to the transmitter. These estimates are then applied to the transmitter to optimize for the current channel.

Ant.	Ant. Type	Gain (dBi)		
		2.4 ㎓	5 ㎓	6 ㎓
		-	Band I	
1	PCB Antenna	1.90	2.00	-
2	PCB Antenna	1.90	2.00	-
3	PCB Antenna	1.90	2.00	-
4	PCB Antenna	1.90	2.00	-
5	PCB Antenna	-	-	2.70
6	PCB Antenna	-	-	2.70
7	PCB Antenna	-	-	2.70
8	PCB Antenna	-	-	2.70

Notes:

The 2.4G and 5G antenna gain above should refer to KMARU antenna report no.: Approval sheet SW25DEC100P, issued on 30-Mar-20 / SW25DEC200P, issued on 30-Mar-20

The 6G antenna gain above should refer to KMARU antenna report no.: Approval sheet W6EDEC150P-I37, issued on 24-Feb-22 / W6EDEC300P-I37, issued on 24-Feb-22

4. Summary of tests

FCC Part section(s)	Parameter	Test condition	Test results
15.247(b)	Beamforming Gain	Radiated	-
15.407(a)			

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 558074 D01 v05r02

5. Mode of Operation

Test Mode	ANT-1+2+3+4	ANT-1+2+3+4	ANT-5+6+7+8
Band	**2.4** GHz	**5** GHz	**6** GHz
Beamfroming mode	V	V	V

WLAN 2.4 GHz:

Test Mode	Antenna Delivery	BW	Test Channel
Beamfroming mode	4TX	20	7
		40	7

WLAN 5 GHz:

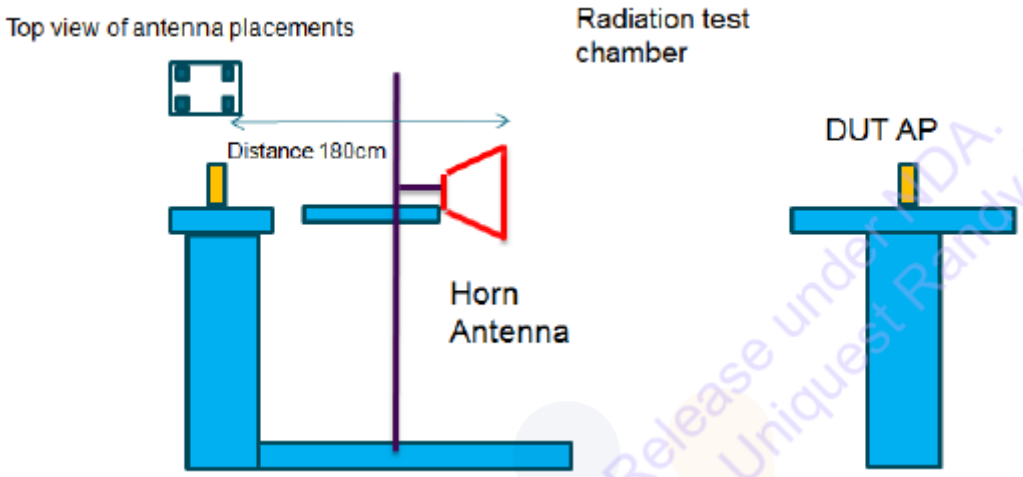
Test Mode	Antenna Delivery	BW	Band	Test Channel
Beamfroming mode	4TX	20	U-NII Band 1	40
			U-NII Band 2-A	60
			U-NII Band 2-C	120
			U-NII Band 3	157
Beamfroming mode	4TX	40	U-NII Band 1	38
			U-NII Band 2-A	62
			U-NII Band 2-C	118
			U-NII Band 3	159
Beamfroming mode	4TX	80	U-NII Band 1	42
			U-NII Band 2-A	58
			U-NII Band 2-C	122
			U-NII Band 3	155

WLAN 6 GHz:

Test Mode	Antenna Delivery	BW	Band	Test Channel
Beamfroming mode	4TX	20	U-NII Band 5	45
			U-NII Band 6	105
			U-NII Band 7	149
			U-NII Band 8	209
Beamfroming mode	4TX	40	U-NII Band 5	43
			U-NII Band 6	107
			U-NII Band 7	147
			U-NII Band 8	211
Beamfroming mode	4TX	80	U-NII Band 5	39
			U-NII Band 6	103
			U-NII Band 7	151
			U-NII Band 8	215

6. Measurement method
6.1. Beamforming Gain Measurement

Test setup



Test procedure

1) One DUT programmed to AP to measure BeamForming gain.
2) Two PCs with Iperf to pass traffic and issue commands to AP and STA through Ethenet cables.
3) Reduce the acknowledge singnal level so that ack singnal level is much lower than AP signal level at the horn antenna.
4) Place AP and STA as the test setup picture. Disable SCS (smart channel selection) and PPPC (per packet power control) , program the AP channel and wait for the association.
5) Issue commands to set MCS, Bandwidth, No. of streams, Power and Beamforming on/off

- DTS Divices:

The test is performed in accordance with ANSI C63.10:2013 section 11.9.2.2.2 & 11.9.2.2.4, Section 2.3 of KDB 412172 D01 Determining ERP and EIRP v01r01, Guidelines for Compliance Testing of Digital Transmission System (DTS) Devices.

1) The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a antenna tower.
3) The height of antenna is fixed 1.5 meter , Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) Beamforming Gain (dB) = Beamforming On EIRP (dBm) - Beamforming Off EIRP (dBm)

- U-NII Divices:

The test is performed in accordance with ANSI C63.10:2013 section 12.3.2.2 & 12.3.2.4, Section 2.3 of KDB 412172 D01 Determining ERP and EIRP v01r01, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices.
Accordance with ANSI C63.10:2013 section 12.1.2 use radiated compliance measurements.

1) The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a antenna tower.
3) The height of antenna is fixed 1.5 meter , Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) Beamforming Gain (dB) = Beamforming On EIRP (dBm) - Beamforming Off EIRP (dBm)

Test results

GHz	Ch	Freq	BW	Axis	Angle(°)	Beamforming		Beamforming Gain [dB]
						ON	OFF	
2.4	7	2442MHz	20MHz	H	89.7	-30.44	-33.17	**2.73**
5	40	5200MHz		V	128.8	-35.31	-37.46	**2.15**
	60	5300MHz			131.5	-35.51	-37.14	**1.63**
	120	5600MHz			138	-33.26	-35.44	**2.18**
	157	5785MHz			138.6	-32.20	-34.67	**2.47**
6	45	6175MHz		V	140	-36.17	-38.62	**2.45**
	105	6475MHz			148.1	-38.30	-40.97	**2.67**
	149	6695MHz			147.4	-37.24	-39.98	**2.74**
	209	6995MHz			150.7	-36.90	-39.35	**2.45**
2.4	7	2442MHz	40MHz	H	88.6	-27.59	-30.29	**2.70**
5	38	5190MHz		V	127.8	-35.80	-38.61	**2.81**
	62	5310MHz			130	-34.00	-36.06	**2.06**
	118	5590MHz			136.6	-33.18	-35.13	**1.95**
	159	5795MHz			137	-31.89	-34.38	**2.49**
6	43	6165MHz		V	139.6	-35.65	-37.84	**2.19**
	107	6485MHz			147.2	-37.85	-40.62	**2.77**
	147	6685MHz			148	-37.05	-39.62	**2.57**
	211	7005MHz			151.4	-37.00	-39.11	**2.11**
5	42	5210MHz	80MHz	V	130.5	-38.24	-40.94	**2.70**
	58	5290MHz			131.7	-37.75	-39.94	**2.19**
	122	5610MHz			138.7	-36.90	-39.11	**2.21**
	155	5775MHz			139.8	-35.70	-38.29	**2.59**
6	39	6145MHz		V	140.9	-39.22	-41.84	**2.62**
	103	6465MHz			149.1	-41.78	-43.94	**2.16**
	151	6705MHz			148.8	-40.60	-43.03	**2.43**
	215	7025MHz			150.2	-41.64	-43.74	**2.10**

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Horn Antenna	ETS.LINDGREN	3117	161225	23.05.04
Horn Antenna	ETS.LINDGREN	3117	00227509	22.09.27
Spectrum Analyzer	AGILENT	N9040B	MY57010132	22.12.31
Signal Generator	R&S	SMB100A	176206	23.01.19
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	N/A	-
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	N/A	
Compact Table	innco systems GmbH	CT1000	N/A	

End of test report