



RADIO EXPOSURE TEST REPORT

FCC ID : RSL-TQ2402GEN2

Equipment : IEEE802.11ax dual-radio 5G/2.4GHz 2x2+2x2 wireless AP

Brand Name : Allied Telesis

Model Name : AT-TQ2402 GEN2,AT-TQm2402 GEN2

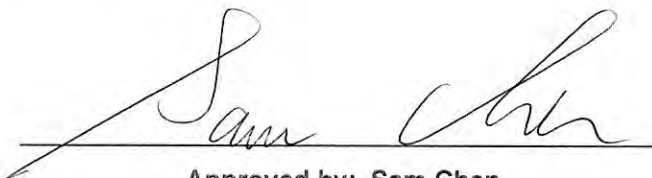
Applicant : Allied Telesis K.K.
2nd. TOC Bldg.7-21-11 Nishi-Gotanda, Shinagawa-ku
Tokyo 141-0031 Japan

Manufacturer : Allied Telesis K.K.
2nd. TOC Bldg.7-21-11 Nishi-Gotanda, Shinagawa-ku
Tokyo 141-0031 Japan

Standard : 47 CFR Part 2.1091

The product was received on May 08, 2023, and testing was started from May 11, 2023 and completed on May 16, 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 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

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Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 EUT General Information	5
1.2 Antenna Information	6
1.3 Table for Multiple Listing	7
1.4 Accessories	7
1.5 Applicable Standards	7
2 Maximum Permissible Exposure	8
2.1 Limit of Maximum Permissible Exposure	8
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

TEL : 886-3-656-9065
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Report Template No.: CB-A1_1 Ver1.1

Page Number : 3 of 10
Issued Date : Jul. 11, 2023
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: Viola 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 5725-5850	5180-5240 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)



1.2 Antenna Information

Ant.	2.4GHz	5GHz	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	2	-	WNC	95XEAK15.GAD	PIFA Antenna	I-PEX	Note 1
2	1	-	WNC	95XEAK15.GAE	PIFA Antenna	I-PEX	
3	-	1	WNC	95XEAK15.GAF	PIFA Antenna	I-PEX	
4	-	2	WNC	95XEAK15.GAG	PIFA Antenna	I-PEX	

Note 1:

Ant.	Gain (dBi)				
	2.4GHz	5GHz UNII 1	5GHz UNII 2A	5GHz UNII 2C	5GHz UNII 3
1	1.93	-	-	-	-
2	3.37	-	-	-	-
3	-	4.55	5.10	5.14	5.38
4	-	4.16	4.93	4.69	5.43

Note 2: The above information was declared by manufacturer.

Note 3: The DFS band wasn't enabled for this application.

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ;$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2))^2 / N_{ANT}] \Rightarrow 10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}]$$

Where ;

$$2.4G \ G1 = 1.93 \text{ dBi} ; G2 = 3.37 \text{ dBi} ; DG = 5.69 \text{ dBi}$$

$$5G \text{ UNII-1} \ G1 = 4.55 \text{ dBi} ; G2 = 4.16 \text{ dBi} ; DG = 7.37 \text{ dBi}$$

$$5G \text{ UNII-2A} \ G1 = 5.1 \text{ dBi} ; G2 = 4.93 \text{ dBi} ; DG = 8.03 \text{ dBi}$$

$$5G \text{ UNII-2C} \ G1 = 5.14 \text{ dBi} ; G2 = 4.69 \text{ dBi} ; DG = 7.93 \text{ dBi}$$

$$5G \text{ UNII-3} \ G1 = 5.38 \text{ dBi} ; G2 = 5.43 \text{ dBi} ; DG = 8.42 \text{ dBi}$$

**For 2.4GHz function:****For IEEE 802.11b/g/n/VHT/ax (2TX/2RX)**

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

Port 1 and Port 2 could transmit/receive simultaneously.

For 5GHz function:**For IEEE 802.11a/n/ac/ax (2TX/2RX)**

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

Port 1 and Port 2 could transmit/receive simultaneously.

1.3 Table for Multiple Listing

Model Name	Description
AT-TQ2402 GEN2	All the models are identical, the difference model for difference brand served as marketing strategy.
AT-TQm2402 GEN2	

Note 1: From the above models, model: AT-TQ2402 GEN2 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.4 Accessories

Accessories
Mounting Bracket*1
Normal Screw*2 (For pre-fit the Mounting Bracket)*2
Special Screw*4

1.5 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



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 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
2.4G;D1D	5.69	25.50	31.19	0.50	31.69	1.475706	20	0.29358	1.00000
5.2G;D1D	7.37	23.81	31.18	0.50	31.68	1.472312	20	0.29291	1.00000
5.8G;D1D	8.42	23.58	32.00	0.50	32.50	1.778279	20	0.35378	1.00000

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

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm ²)	Limit (mW/cm ²)	Option	TL EIRP (dBm)	TL Ratio
5.8G;D1D	8.42	23.58	32.00	0.50	32.50	20	0.35378	1.00000	B	37.006	0.3544
2.4G;D1D	5.69	25.50	31.19	0.50	31.69	20	0.29358	1.00000	B	37.006	0.2941
Sum TL Ratio_B	0.6485										
Ratio Limit	1										

Note: The above antenna gain was declared by manufacturer.

—THE END—