



# RADIO EXPOSURE TEST REPORT

**FCC ID** : RSL-TQ7403

**Equipment** : IEEE802.11ax tri-radio 2.4G/5G/6GHz 2x2+2x2+2x2+  
Bluetooth® Low Energy and ZigBee wireless AP

**Brand Name** : Allied Telesis

**Model Name** : AT-TQ7403

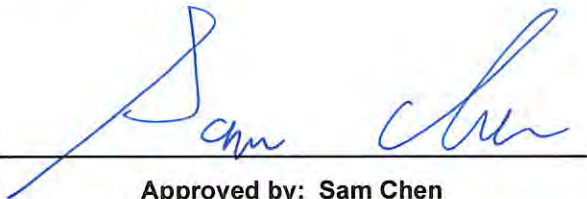
**Applicant** : Allied Telesis K.K.  
2nd. TOC Bldg.7-21-11 Nishi-Gotanda, Shinagawa-ku  
Tokyo 141-0031 Japan

**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 31, 2023, and testing was started from Jul. 25, 2023 and completed on Sep. 11, 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

**Sporton International Inc. Hsinchu Laboratory**  
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



## 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 Antennae Set 2 Configuration .....9  
1.4 Table for Radio Function .....9  
1.5 Accessories .....9  
1.6 Applicable Standards .....10  
1.7 Testing Location .....10  
**2 Maximum Permissible Exposure** .....11  
2.1 Limit of Maximum Permissible Exposure .....11  
2.2 MPE Calculation Method .....11  
2.3 MPE Exemption .....12  
2.4 Calculated Result and Limit.....13

**Photographs of EUT v01**





## 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)
6GHz WLAN	5925-7125	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	LE: GFSK
IEEE802.15.4	2400-2483.5	2405-2480	O-QPSK



## 1.2 Antenna Information

Set	Ant.	2.4GHz Port	5GHz Port	Brand	Model Name	Antenna Type	Connector	Remark	Gain (dBi)
1	1	2	2	WNC	08.22430.001	Dipole	RP-SMA PLUG	External	Note 1
	2	1	1	WNC	08.22430.001	Dipole	RP-SMA PLUG	External	
2	1	2	2	Angeei	EXD24140D01	Patch	N-Type	External	
	2	1	1	Angeei	EXD24140D01	Patch	N-Type	External	

Ant.	6GHz Port	Bluetooth / Zigbee	Brand	Model Name	Antenna Type	Connector	Remark	Gain (dBi)
3	2	1	WNC	95XEAK15.GAU	PIFA	I-PEX	Internal	Note 1
4	1	-	WNC	95XEAK15.GAT	PIFA	I-PEX	Internal	

Note1:

Antenna set 1:

Set	Ant.	2.4GHz Port	5GHz Port	Radio 1 (2.4GHz) and Radio 2 (5GHz)				
				Antenna Gain (dBi)				
				WLAN 2.4GHz	WLAN 5GHz			
					UNII 1	UNII 2A	UNII 2C	UNII 3
1	1	2	2	2.83	2.20	3.16	2.80	3.72
	2	1	1	2.51	2.88	3.85	3.56	3.85

Antenna set 2 with 2M antenna cable:

Set	Ant.	2.4GHz Port	Radio 1 (2.4GHz)				
			Antenna Gain (dBi)	Cable Loss of 2M N-type (dB)	Loss of SMA Connector (dB)	Cable loss of Internal EUT (dB)	Net Gain (dBi)
2	1	2	13	0.75	0.07	0.95	11.23
	2	1	13	0.75	0.07	0.68	11.50

Set	Ant.	5GHz Port	Radio 2 (5GHz)										
			Antenna Gain (dBi)	Cable Loss of 2M N-type (dB)	Loss of SMA Connector (dB)	Cable loss of Internal EUT (dB)				Net Gain (dBi)			
						UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 1	UNII 2A	UNII 2C	UNII 3
2	1	2	16	1.23	0.12	1.48	1.49	1.56	1.58	13.17	13.16	13.09	13.07
	2	1	16	1.23	0.12	1.10	1.17	1.34	1.23	13.55	13.48	13.31	13.42



**Antenna set 2 with 2M and 10M antenna cable:**

Set	Ant.	2.4GHz Port	Radio 1 (2.4GHz)					
			Antenna Gain (dBi)	Cable Loss of 2M N-type (dB)	Cable Loss of 10M N-type (dB)	Loss of SMA Connector (dB)	Cable loss of Internal EUT (dB)	Net Gain (dBi)
2	1	2	13	0.75	3.77	0.07	0.95	7.46
	2	1	13	0.75	3.77	0.07	0.68	7.73

Set	Ant.	5GHz Port	Radio 2 (5GHz)											
			Antenna Gain (dBi)	Cable Loss of 2M N-type (dB)	Cable Loss of 10M N-type (dB)	Loss of SMA Connector (dB)	Cable loss of Internal EUT (dB)				Net Gain (dBi)			
							UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 1	UNII 2A	UNII 2C	UNII 3
2	1	2	16	1.23	6.16	0.12	1.48	1.49	1.56	1.58	7.01	7.00	6.93	6.91
	2	1	16	1.23	6.16	0.12	1.10	1.17	1.34	1.23	7.39	7.32	7.15	7.26

**Antenna 3 and 4:**

Ant.	6GHz Port	Bluetooth / Zigbee	Radio 3 (6GHz) and Radio 4 (Bluetooth / Zigbee)				
			Antenna Gain (dBi)				
			UNII 5	UNII 6	UNII 7	UNII 8	Bluetooth / Zigbee
3	2	1	5.93	5.98	5.98	5.58	2.62
4	1	-	5.93	5.99	5.99	5.98	-

Note2: The above information was declared by manufacturer.

Note3: For antenna set 2: The gain of antenna set 2 with 2M antenna cable was higher than antenna set 2 with 10M antenna cable, thus antenna set 2 with 2M antenna cable was selected to test.

Note4: The EUT has two antenna sets for radio 1 and radio 2.

Note5: The DFS band isn't enabled at this time.



Note6: Directional gain information

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 $N_{ANT} \leq 4$	$DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{ANT}} \left[ \sum_{k=1}^{N_{ANT}} G_{j,k} \right]^2}{N_{ANT}} \right]$
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 ;

For Antenna set 1

2.4G G1= 2.83 dBi ; G2= 2.51 dBi ;DG= 5.68dBi

5G UNII-1 G1= 2.2 dBi ; G2= 2.88 dBi ;DG= 5.56dBi

5G UNII-2A G1= 3.16 dBi ; G2= 3.85 dBi ;DG= 6.52dBi

5G UNII-2C G1= 2.8 dBi ; G2= 3.56 dBi ;DG= 6.2dBi

5G UNII-3 G1= 3.72 dBi ; G2= 3.85 dBi ;DG= 6.8dBi

For Antenna set 2 (Cross-Polarized Antenna)

2.4G G1= 11.23 dBi ; G2= 11.5 dBi ;DG= 11.5dBi

5G UNII-1 G1= 13.17 dBi ; G2= 13.55 dBi ;DG= 13.55dBi

5G UNII-2A G1= 13.16 dBi ; G2= 13.48 dBi ;DG= 13.48dBi

5G UNII-2C G1= 13.09 dBi ; G2= 13.31 dBi ;DG= 13.31dBi

5G UNII-3 G1= 13.07 dBi ; G2= 13.42 dBi ;DG= 13.42dBi

For Antenna 3 and Antenna 4

6G UNII-4 G1= 5.93 dBi ; G2= 5.93 dBi ;DG= 8.94dBi

6G UNII-5 G1= 5.98 dBi ; G2= 5.99 dBi ;DG= 9dBi

6G UNII-6 G1= 5.98 dBi ; G2= 5.99 dBi ;DG= 9dBi

6G UNII-7 G1= 5.58 dBi ; G2= 5.98 dBi ;DG= 8.79dBi

**<For Radio 1 (2.4GHz Functions) and Radio 2 (5GHz Functions)>**

**For 2TX/2RX:**

Port 1 and Port 2 can be use as transmitting/receiving antenna

Port 1 and Port 2 could receive simultaneously.

**<For Radio 3 / 6GHz Functions>**

**For 2TX/2RX:**

Port 1 and Port 2 can be use as transmitting/receiving antenna

Port 1 and Port 2 could receive simultaneously.

**<For Radio 4 / Bluetooth / Zigbee Functions>**

**For 1TX/1RX:**

Only Port 1 can be use as transmitting/receiving antenna.



### 1.3 Table for Antennae Set 2 Configuration

Set	Configuration	Ant. of EUT	Radio 1 (2.4GHz) and Radio 2 (5GHz)			
			Antenna port of antenna set 2			
2	1	1	1	-	-	-
		2	2	-	-	-
	2	1	-	4	-	-
		2	-	3	-	-
	3	1	-	-	3	-
		2	-	-	4	-
	4	1	-	-	-	2
		2	-	-	-	1

### 1.4 Table for Radio Function

Radio	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth / Zigbee
1	V	-	-	-
2	-	V	-	-
3	-	-	V	-
4	-	-	-	V

Note: The above information was declared by manufacturer.

### 1.5 Accessories

Accessories
Mounting Bracket*1
SMA Connector*2 (Used for Patch Ant.)



### 1.6 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

### 1.7 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	*(100)	<6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	<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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	<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 53 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

**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, <= Pth.

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

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 <sup>2</sup> .
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup> .
30-300	3.83 R <sup>2</sup> .
300-1,500	0.0128 R <sup>2</sup> f.
1,500-100,000	19.2R <sup>2</sup> .

Note: R is in meters, f is in MHz.



### 2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For Radio 1

Antenna set 1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
2.4G;D1D	5.68	24.81	30.49	0.50	30.99	53	0.03558	1.00000	C	39.467	0.1420

Antenna set 2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
2.4G;G1D	11.50	24.47	35.97	0.02	35.99	53	0.11252	1.00000	C	39.467	0.4491

For Radio 2

Antenna set 1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
5.2G;D1D	5.56	24.57	30.13	0.50	30.63	53	0.03275	1.00000	C	39.467	0.1307
5.8G;D1D	6.80	25.27	32.07	0.50	32.57	53	0.05120	1.00000	C	39.467	0.2043

Antenna set 2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
5.2G;D1D	13.55	22.21	35.76	0.23	35.99	53	0.11252	1.00000	C	39.467	0.4491
5.8G;D1D	13.42	22.46	35.88	0.11	35.99	53	0.11252	1.00000	C	39.467	0.4491

For Radio 3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
6.2G;D1D	8.94	17.65	26.59	0.50	27.09	53	0.01450	1.00000	C	39.467	0.0578
6.4G;D1D	9.00	17.58	26.58	0.50	27.08	53	0.01446	1.00000	C	39.467	0.0577
6.7G;D1D	9.00	17.83	26.83	0.50	27.33	53	0.01532	1.00000	C	39.467	0.0611
7.0G;D1D	8.79	17.48	26.27	0.50	26.77	53	0.01347	1.00000	C	39.467	0.0537

For Radio 4

Bluetooth

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
2.4G;BT-LE	2.62	15.42	18.04	0.50	18.54	53	0.00202	1.00000	C	39.467	0.0081

Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm <sup>2</sup> )	S Limit (mW/cm <sup>2</sup> )	Option	TL EIRP (dBm)	TL Ratio
2.4G;G1D	2.62	15.46	18.08	0.50	18.58	53	0.00204	1.00000	C	39.467	0.0082



Simultaneous Transmission Analysis:

Mode 1: Radio 1 (2.4GHz) + Radio 2 (5GHz) with antenna set 1 + Radio 3 (6GHz) + Radio 4 (Bluetooth)

Table with 12 columns: Mode, DG (dBi), Power (dBm), EIRP (dBm), Tolerance (dB), Tune-up EIRP (dBm), Distance (cm), S (mW/cm²), Limit (mW/cm²), Option, TL EIRP (dBm), TL Ratio. Rows include 2.4G;D1D, 5.8G;D1D, 6.7G;D1D, 2.4G;BT-LE, Sum TL Ratio\_C, and Ratio Limit.

Mode 2: Radio 1 (2.4GHz) + Radio 2 (5GHz) with antenna set 1 + Radio 3 (6GHz) + Radio 4 (Zigbee)

Table with 12 columns: Mode, DG (dBi), Power (dBm), EIRP (dBm), Tolerance (dB), Tune-up EIRP (dBm), Distance (cm), S (mW/cm²), Limit (mW/cm²), Option, TL EIRP (dBm), TL Ratio. Rows include 2.4G;D1D, 5.8G;D1D, 6.7G;D1D, 2.4G;G1D, Sum TL Ratio\_C, and Ratio Limit.

Mode 3: Radio 1 (2.4GHz) + Radio 2 (5GHz) with antenna set 2 and 2M antenna cable + Radio 3 (6GHz) + Radio 4 (Bluetooth)

Table with 12 columns: Mode, DG (dBi), Power (dBm), EIRP (dBm), Tolerance (dB), Tune-up EIRP (dBm), Distance (cm), S (mW/cm²), Limit (mW/cm²), Option, TL EIRP (dBm), TL Ratio. Rows include 2.4G;G1D, 5.8G;D1D, 6.7G;D1D, 2.4G;BT-LE, Sum TL Ratio\_C, and Ratio Limit.

Mode 4: Radio 1 (2.4GHz) + Radio 2 (5GHz) with antenna set 2 and 2M antenna cable + Radio 3 (6GHz) + Radio 4 (Zigbee)

Table with 12 columns: Mode, DG (dBi), Power (dBm), EIRP (dBm), Tolerance (dB), Tune-up EIRP (dBm), Distance (cm), S (mW/cm²), Limit (mW/cm²), Option, TL EIRP (dBm), TL Ratio. Rows include 2.4G;G1D, 5.8G;D1D, 6.7G;D1D, 2.4G;G1D, Sum TL Ratio\_C, and Ratio Limit.

Note: The above antenna gain was declared by manufacturer.

—————THE END—————