



RADIO EXPOSURE TEST REPORT

FCC ID : RRKEM060KALPHA
Equipment : LTE Module
Brand Name : ALPHA
Model Name : EM060K-GL-ALPHA
Applicant : Alpha Networks Inc.
No.8, Li-shing 7th Rd., Science-based Industrial
Park, Hsinchu, Taiwan 300
Manufacturer : Alpha Networks Inc.
No.8, Li-shing 7th Rd., Science-based Industrial
Park, Hsinchu, Taiwan 300
Standard : 47 CFR Part 2.1091

The product was received on Mar. 29, 2023, and testing was started from Apr. 22, 2023 and completed on Nov. 30, 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.)



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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: Sandy Chuang



1 General Description

1.1 EUT General Information

Items	Description
Downlink (MHz)	WCDMA Band 2: 1930~1990 WCDMA Band 4: 2110~2155 WCDMA Band 5: 869~894 LTE Band 2: 1930~1990 LTE Band 4: 2110~2155 LTE Band 5: 869~894 LTE Band 7: 2620~2690 LTE Band 12: 729~746 LTE Band 13: 746~756 LTE Band 14: 758~768 LTE Band 17: 734~746 LTE Band 25: 1930~1995 LTE Band 26: 859~894 LTE Band 30: 2350~2360 LTE Band 38: 2570~2620 LTE Band 41: 2496~2690 LTE Band 48: 3550~3700 LTE Band 66: 2110~2200 LTE Band 71: 617~652
Uplink (MHz)	WCDMA Band 2: 1850~1910 WCDMA Band 4: 1710~1755 WCDMA Band 5: 824~849 LTE Band 2: 1850~1910 LTE Band 4: 1710~1755 LTE Band 5: 824~849 LTE Band 7: 2500~2570 LTE Band 12: 699~716 LTE Band 13: 777~787 LTE Band 14: 788~798 LTE Band 17: 704~716 LTE Band 25: 1850~1915 LTE Band 26: 814~849 LTE Band 30: 2305~2315 LTE Band 38: 2570~2620 LTE Band 41: 2496~2690 LTE Band 48: 3550~3700



	LTE Band 66: 1710~1780 LTE Band 71: 663~698
Bandwidth (MHz)	WCDMA Band 2: 5 WCDMA Band 4: 5 WCDMA Band 5: 5 LTE Band 2: 1.4 / 3 / 5 / 10 / 15 / 20 LTE Band 4: 1.4 / 3 / 5 / 10 / 15 / 20 LTE Band 5: 1.4 / 3 / 5 / 10 LTE Band 7: 5 / 10 / 15 / 20 LTE Band 12: 1.4 / 3 / 5 / 10 LTE Band 13: 5 / 10 LTE Band 14: 5 / 10 LTE Band 17: 5 / 10 LTE Band 25: 1.4 / 3 / 5 / 10 / 15 / 20 LTE Band 26: 1.4 / 3 / 5 / 10 / 15 LTE Band 30: 5 / 10 LTE Band 38: 5 / 10 / 15 / 20 LTE Band 41: 5 / 10 / 15 / 20 LTE Band 48: 5 / 10 / 15 / 20 LTE Band 66: 1.4 / 3 / 5 / 10 / 15 / 20 LTE Band 71: 5 / 10 / 15 / 20
Type of Modulation	WCDMA: BPSK / QPSK / 16 QAM HSDPA: BPSK / QPSK / 16 QAM HSUPA: BPSK / QPSK / 16 QAM LTE: QPSK/16QAM/64QAM



1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1/2	PSA	RFDPA161500SMMB805	Dipole	SMA	Note 1
2	1/2	Ventev	M3030050O20006	Dipole	N-Female	
3	1/2	PTY	XPOL-2-5G-US	Patch	N-Female	

Note 1:

WCDMA WWAN antenna Gain							
Ant. \ Band	Band 2	Band 4	Band 5	Cable Loss	WCDMA Net Gain (dBi)		
					Band 2	Band 4	Band 5
1	5	5	3	-	5	5	3
2	5	5	3	2.5	2.5	2.5	0.5
3	10	10	9	2.5	7.5	7.5	6.5

LTE WWAN antenna Gain																		
Ant. \ Band	Band 2	Band 4	Band 5	Band 7	Band 12	Band 13	Band 14	Band 17	Band 25	Band 26	Band 30	Band 38	Band 41	Band 48	Band 66	Band 71	Cable Loss	
1	5	5	3	5	3	3	3	3	5	3	5	5	5	5	5	5	3	-
2	5	5	3	5	3	3	3	3	5	3	5	5	5	5	5	5	3	2.5
3	10	10	9	10	9	9	9	9	10	9	10	10	10	11	10	9	2.5	
Ant. \ Band	Band 2	Band 4	Band 5	Band 7	Band 12	Band 13	Band 14	Band 17	Band 25	Band 26	Band 30	Band 38	Band 41	Band 48	Band 66	Band 71		
1	5	5	3	5	3	3	3	3	5	3	5	5	5	5	5	3		
2	2.5	2.5	0.5	2.5	0.5	0.5	0.5	0.5	2.5	0.5	2.5	2.5	2.5	2.5	2.5	0.5		
3	7.5	7.5	6.5	7.5	6.5	6.5	6.5	6.5	7.5	6.5	7.5	7.5	7.5	8.5	7.5	6.5		

Note 2: The above information was declared by manufacturer.

Note 3: For RF Conducted Test: Only the highest gain antenna "Ant. 3" was selected to perform the test and recorded in this report.

Note 4: Both Port 1 and Port 2 could be used as receiving antennas.

Only Port 1 antenna can transmit RF signal.



1.3 Accessories

1. Fixed Bracket *1 (for ant. 2 use)
2. Wall Bracket *1 (for ant. 3 use)
3. Cradlepoint to External Antenna Cable*1: Shielded, 6.2m (for ant. 2 and ant. 3 use)

1.4 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

1.5 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 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, <= 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^2 .
1.34-30	3,450 R^2/f^2 .
30-300	3.83 R^2 .
300-1,500	0.0128 R^2f .
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)
WCDMA Band 2	7.50	21.05	28.55	0.50	29.05	0.80353	20	0.15985	1.00000
WCDMA Band 4	7.50	21.18	28.68	0.50	29.18	0.82794	20	0.16471	1.00000
WCDMA Band 5	6.50	22.49	28.99	0.50	29.49	0.88920	20	0.17690	0.55093
LTE Band 2	7.50	22.72	30.22	0.50	30.72	1.18032	20	0.23481	1.00000
LTE Band 4	7.50	22.45	29.95	0.04	29.99	0.99770	20	0.19848	1.00000
LTE Band 5	6.50	22.24	28.74	0.50	29.24	0.83946	20	0.16700	0.55767
LTE Band 7	7.50	22.77	30.27	0.50	30.77	1.19399	20	0.23753	1.00000
LTE Band 12	6.50	22.24	28.74	0.50	29.24	0.83946	20	0.16700	0.47400
LTE Band 13	6.50	22.08	28.58	0.50	29.08	0.80910	20	0.16096	0.52133
LTE Band 14	6.50	23.02	29.52	0.50	30.02	1.00462	20	0.19986	0.52700
LTE Band 17	6.50	22.19	28.69	0.50	29.19	0.82985	20	0.16509	0.47267
LTE Band 25	7.50	23.38	30.88	0.50	31.38	1.37404	20	0.27335	1.00000
LTE Band 26 (Part 22H)	6.50	22.60	29.10	0.50	29.60	0.91201	20	0.18143	0.55267
LTE Band 26 (Part 90S)	6.50	23.07	29.57	0.50	30.07	1.01625	20	0.20217	0.54767
LTE Band 30	7.50	8.08	15.58	0.50	16.08	0.04055	20	0.00807	1.00000
LTE Band 38	7.50	23.29	30.79	0.50	31.29	1.34586	20	0.26774	1.00000
LTE Band 41	7.50	23.31	30.81	0.50	31.31	1.35207	20	0.26898	1.00000
LTE Band 48	8.50	10.19	18.69	0.50	19.19	0.08299	20	0.01651	1.00000
LTE Band 66	7.50	22.03	29.53	0.46	29.99	0.99770	20	0.19848	1.00000
LTE Band 71	6.50	22.61	29.11	0.50	29.61	0.91411	20	0.18185	0.45200



MPE Exemption Option B							
Mode	Frequency (MHz)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
WCDMA Band 2	1852.4	0.2	29.05	26.90	0.490	3.060	Complies
WCDMA Band 4	1752.6		29.18	27.03	0.505	3.060	Complies
WCDMA Band 5	826.4		29.49	27.34	0.542	1.686	Complies
LTE Band 2	1880		30.72	28.57	0.719	3.060	Complies
LTE Band 4	1750		29.99	27.84	0.608	3.060	Complies
LTE Band 5	836.5		29.24	27.09	0.512	1.706	Complies
LTE Band 7	2535		30.77	28.62	0.728	3.060	Complies
LTE Band 12	711		29.24	27.09	0.512	1.450	Complies
LTE Band 13	784.5		29.08	26.93	0.493	1.600	Complies
LTE Band 14	790.5		30.02	27.87	0.612	1.613	Complies
LTE Band 17	709		29.19	27.04	0.506	1.446	Complies
LTE Band 25	1852.5		31.38	29.23	0.838	3.060	Complies
LTE Band 26 (Part 22H)	829		29.60	27.45	0.556	1.691	Complies
LTE Band 26 (Part 90S)	821.5		30.07	27.92	0.619	1.676	Complies
LTE Band 30	2310		16.08	13.93	0.02	3.060	Complies
LTE Band 38	2610		31.29	29.14	0.82	3.060	Complies
LTE Band 41	2682.5		31.31	29.16	0.824	3.060	Complies
LTE Band 48	3625		19.19	17.04	0.051	3.060	Complies
LTE Band 66	1745		29.99	27.84	0.608	3.060	Complies
LTE Band 71	678	29.61	27.46	0.557	1.383	Complies	

—THE END—