



MPE TEST REPORT

Applicant	Compal Electronics, Inc.
FCC ID	GKREXCN1
Product	4G LCC Module
Brand	COMPAL
Model	EXC-N1
Report No.	R2209A0845-M1V2
Issue Date	October 20, 2022

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Version	Revision description	Issue Date
Rev.0	Initial issue of report.	September 28, 2022
Rev.1	Update information.	October 19, 2022
Rev.2	Update description.	October 20, 2022
Note: This revised report (Report No. R2209A0845-M1V2) supersedes and replaces the previously issued report (Report No. R2209A0845-M1V1). Please discard or destroy the previously issued report and dispose of it accordingly.		

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	Building 3, No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Description of Equipment under Test

Client Information

Applicant	Compal Electronics, Inc.
Applicant address	No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei, (114) Taiwan
Manufacturer	Compal Electronics, Inc.
Manufacturer address	No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei, (114) Taiwan

General Technologies

Model	EXC-N1
IMEI	863879041726491
Hardware Version	EXC-N1_MB_V1.01
Software Version	EXC-N1_4.71.5_EQ101
Date of Testing:	September 4, 2019 ~ September 24, 2019

Note:

1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.
2. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.
3. All test values duplicated from the report (Report No.: R2208A0783-M1).

3 Maximum Tune up and antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by

$$\text{Numeric gain (G)} = 10^{(\text{antenna gain}/10)}$$

Band		Maximum Tune up (dBm)	Division Factors (dB)	Time-Averaged Tune up Power (dBm)
GSM 850	GSM	34.00	-9.03	24.97
	GPRS	1 Txslot	-9.03	19.47
		2 Txslots	-6.02	22.48
		3 Txslots	-4.26	23.94
		4 Txslots	-3.01	23.99
GSM 1900	GSM	30.50	-9.03	21.47
	GPRS	1 Txslot	-9.03	17.47
		2 Txslots	-6.02	20.48
		3 Txslots	-4.26	22.24
		4 Txslots	-3.01	22.99

Note:

Division Factors

To average the power, the division factor is as follows:

1Txslot = 1 transmit time slot out of 8 time slots

=> conducted power divided by (8/1) => -9.03 dB

2Txslots = 2 transmit time slots out of 8 time slots

=> conducted power divided by (8/2) => -6.02 dB

3Txslots = 3 transmit time slots out of 8 time slots

=> conducted power divided by (8/3) => -4.26 dB

4Txslots = 4 transmit time slots out of 8 time slots

=> conducted power divided by (8/4) => -3.01 dB



Band	Maximum Tune up	
	(dBm)	(mW)
GSM 850	24.97	314.051
GSM 1900	22.99	199.067
WCDMA II	24.50	281.838
WCDMA IV	24.50	281.838
WCDMA V	24.50	281.838
LTE Band 2	24.50	281.838
LTE Band 4	24.50	281.838
LTE Band 5	24.50	281.838
LTE Band 7	24.50	281.838
LTE Band 12	24.50	281.838
LTE Band 13	24.50	281.838
LTE Band 17	24.50	281.838
LTE Band 25	24.50	281.838
LTE Band 26	24.50	281.838
LTE Band 41	24.50	281.838
LTE Band 66	24.50	281.838

4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following

TABLE 1 – LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3-30	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				
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

f = frequency in MHz

* = Plane-wave equivalent power density

Note1. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



The maximum permissible exposure for 300~1500 MHz is $f/1500$, for 1500~100,000MHz is 1.0. So

Band	The maximum permissible exposure (mW/cm ²)
GSM850	0.549
GSM1900	1.000
WCDMA II	1.000
WCDMA IV	1.000
WCDMA V	0.549
LTE Band 2	1.000
LTE Band 4	1.000
LTE Band 5	0.549
LTE Band 7	1.000
LTE Band 12	0.466
LTE Band 13	0.518
LTE Band 17	0.469
LTE Band 25	1.000
LTE Band 26	0.543
LTE Band 41	1.000
LTE Band 66	1.000

RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

$$S = PG / 4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna (20 cm = limit for MPE)

Band	Maximum Tune up (dBm)	EIRP limit (dBm)	Margin1 (dB)	Power density Limit		Margin2 (dB)	Final Margin (dB)	Gain (dBi)
				(mW/cm ²)	(dBm)			
GSM850	24.97	40.60	15.630	0.549	34.408	9.438	9.438	9.438
GSM1900	22.99	33.00	10.010	1.000	37.013	14.023	10.010	10.010
WCDMA II	24.50	33.00	8.500	1.000	37.013	12.513	8.500	8.500
WCDMA IV	24.50	30.00	5.500	1.000	37.013	12.513	5.500	5.500
WCDMA V	24.50	40.60	16.100	0.549	34.408	9.908	9.908	9.908
LTE Band 2	24.50	33.00	8.500	1.000	37.013	12.513	8.500	8.500
LTE Band 4	24.50	30.00	5.500	1.000	37.013	12.513	5.500	5.500
LTE Band 5	24.50	40.60	16.100	0.549	34.408	9.908	9.908	9.908
LTE Band 7	24.50	33.00	8.500	1.000	37.013	12.513	8.500	8.500
LTE Band 12	24.50	36.92	12.420	0.466	33.697	9.197	9.197	9.197
LTE Band 13	24.50	36.92	12.420	0.518	34.156	9.656	9.656	9.656
LTE Band 17	24.50	36.92	12.420	0.469	33.724	9.224	9.224	9.224
LTE Band 25	24.50	33.00	8.500	1.000	37.013	12.513	8.500	8.500
LTE Band 26	24.50	40.60	16.100	0.543	34.361	9.861	9.861	9.861
LTE Band 41	24.50	33.00	8.500	1.000	37.013	12.513	8.500	8.500
LTE Band 66	24.50	30.00	5.500	1.000	37.013	12.513	5.500	5.500

Note: 1. The Maximum allowed antenna gain per Band should be less than or equal to the **Final Margin** which is the allowable maximum gain value to comply with limits for maximum permissible exposure (MPE).
 2. The Final Margin is determined and selected to the worst-case of Margin1 and Margin2.
 3. Margin1=EIRP Limit (dBm)-Maximum Conducted Power (dBm). EIRP limit reference standard part 22/ part 24 /part 27 for each band, EIRP = ERP + 2.15 (dB).
 4. Margin2=Power density Limit (dBm)-Maximum Conducted Power (dBm). Power density Limit (dBm): The max. obtained by MPE with 20cm.



IMPORTANT NOTE: To comply with the FCC RF exposure compliance requirements, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. No change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

Band	PG (mW)	Test Result (mW/cm ²)	Limit Value (mW/cm ²)	Conclusion
GSM850	2759.307	0.549	0.549	Pass
GSM1900	1995.262	0.397	1.000	Pass
WCDMA II	1995.262	0.397	1.000	Pass
WCDMA IV	1000.000	0.199	1.000	Pass
WCDMA V	2759.307	0.549	0.549	Pass
LTE Band 2	1995.262	0.397	1.000	Pass
LTE Band 4	1000.000	0.199	1.000	Pass
LTE Band 5	2759.307	0.549	0.549	Pass
LTE Band 7	1995.262	0.397	1.000	Pass
LTE Band 12	2342.610	0.466	0.466	Pass
LTE Band 13	2603.754	0.518	0.518	Pass
LTE Band 17	2357.219	0.469	0.469	Pass
LTE Band 25	1995.262	0.397	1.000	Pass
LTE Band 26	2729.606	0.543	0.543	Pass
LTE Band 41	1995.262	0.397	1.000	Pass
LTE Band 66	1000.000	0.199	1.000	Pass
Note: R = 20cm π= 3.1416				

Note: For transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

*****END OF REPORT *****



ANNEX A: The EUT Appearance and Change declaration letter

The EUT Appearance and Change declaration letter are submitted separately.