

RF EXPOSURE EVALUATION REPORT

FCC ID : GKRRMLV1
Equipment : 5G LGA Module
Brand Name : COMPAL
Model Name : RML-N1v
Applicant : Compal Electronics, Inc.
No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei, (114) Taiwan
Manufacturer : Compal Electronics, Inc.
No.581 & 581-1, Ruiguang Rd., Neihu District, Taipei, (114) Taiwan
Standard : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part2.1091 and it complies with applicable limit.

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.

The results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full



Approved by: Cona Huang / Deputy Manager



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History of this test report

Report No.	Version	Description	Issued Date
FA210421-02	Rev. 01	Initial issue of report	May 01, 2022
FA210421-02	Rev. 02	Remove n48	Jul. 13, 2022



1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	5G LGA Module
Brand Name	COMPAL
Model Name	RML-N1v
FCC ID	GKRRMLV1
Wireless Technology and Frequency Range	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n77: 3700 MHz ~ 3980 MHz
Mode	LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Reviewed by: Jason Wang

Report Producer: Daisy Peng

2. Maximum RF average output power among production units

Radio Tech	Band Number	Maximum Transmit Power Level (dBm)
		Default
LTE	B2	25.00
LTE	B5	25.00
LTE	B12	25.00
LTE	B13	25.00
LTE	B48	25.00
LTE	B66	25.00
FR1	n2	25.00
FR1	n5	25.00
FR1	n66	25.00
FR1	n77	28.00



3. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Table with 5 columns: Frequency range (MHz), Electric field strength (V/m), Magnetic field strength (A/m), Power density (mW/cm²), Averaging time (minutes). It is divided into two sections: (A) Limits for Occupational/Controlled Exposures and (B) Limits for General Population/Uncontrolled Exposure.

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:

S = PG / (4πR²)

Where:

- S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna



4. Radio Frequency Radiation Exposure Evaluation

4.1. Standalone Power Density Calculation

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 2	7.50	25.00	32.5	1.78	1778.28	0.354	1.000	0.354
LTE Band 5	5.00	25.00	30.0	1.00	1000.00	0.199	0.549	0.362
LTE Band 12	5.50	25.00	30.5	1.12	1122.02	0.223	0.466	0.479
LTE Band 13	5.50	25.00	30.5	1.12	1122.02	0.223	0.518	0.431
LTE Band 48	-2.00	25.00	23.0	0.20	199.53	0.040	1.000	0.040
LTE Band 66	4.50	25.00	29.5	0.89	891.25	0.177	1.000	0.177
FR1 Band n2	7.50	25.00	32.5	1.78	1778.28	0.354	1.000	0.354
FR1 Band n5	5.00	25.00	30.0	1.00	1000.00	0.199	0.549	0.362
FR1 Band n66	4.50	25.00	29.5	0.89	891.25	0.177	1.000	0.177
FR1 Band n77	2.00	28.00	30.0	1.00	1000.00	0.199	1.000	0.199

<EN-DC Simtaneous Transmission analysis>

EN-DC		Σ (Power Density / Limit) of LTE + 5G NR
LTE Power Density / Limit	5G NR Power Density / Limit	
0.479	0.362	0.841

General Note:

- The device support 5G FR1 NSA mode, consider colocation analysis to selected worst case LTE and 5G NR power density / limit to summation to show compliance
- Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for LTE + 5G NR.
- Considering the collocation with the four transmitters of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant



4.2. EN-DC active and transmit with WLAN/BT

Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN is less than or equal to 21dBm and for Bluetooth is less than or equal to 15dBm.
2. A maximum antenna gain of 5 dBi for WLAN/BT has been assumed for all collocated antennas.

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 2	7.5	25.00	32.5	1.78	1778.28	0.354	1.000	0.354
LTE Band 5	5.0	25.00	30.0	1.00	1000.00	0.199	0.549	0.362
LTE Band 12	5.0	25.00	30.0	1.00	1000.00	0.199	0.466	0.427
LTE Band 13	5.5	25.00	30.5	1.12	1122.02	0.223	0.518	0.431
LTE Band 48	-2.0	25.00	23.0	0.20	199.53	0.040	1.000	0.040
LTE Band 66	4.5	25.00	29.5	0.89	891.25	0.177	1.000	0.177
FR1 Band n2	7.5	25.00	32.5	1.78	1778.28	0.354	1.000	0.354
FR1 Band n5	5.0	25.00	30.0	1.00	1000.00	0.199	0.549	0.362
FR1 Band n66	4.5	25.00	29.5	0.89	891.25	0.177	1.000	0.177
FR1 Band n77	2.0	28.00	30.0	1.00	1000.00	0.199	1.000	0.199
WLAN2.4GHz Band	5.0	21.0	26.0	0.40	398.11	0.079	1.000	0.079
WLAN5GHz Band	5.0	21.0	26.0	0.40	398.11	0.079	1.000	0.079
Bluetooth	5.0	15.0	20.0	0.10	100.00	0.020	1.000	0.020

EN-DC		WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of LTE +5G NR+WLAN+Bluetooth
LTE Power Density / Limit	5G NR Power Density / Limit			
0.431	0.362	0.079	0.020	0.892

Note:

4. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for LTE + NR + WLAN + Bluetooth.
5. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 4 collocated transmitters is compliant



Conclusion:

Based on FCC 47 CFR §1.1307, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

Device	Technology	Band	Maximum Conducted Power (dBm)	Stanalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
RML-N1v	LTE	Band 2	25.00	7.5	7.5
		Band 5	25.00	5.0	5.0
		Band 12	25.00	5.5	5.0
		Band 13	25.00	5.5	5.5
		Band 48	25.00	-2	-2
		Band 66	25.00	4.5	4.5
	FR1	n2	25.00	7.5	7.5
		n5	25.00	5.0	5.0
		n66	25.00	4.5	4.5
		n77	28.00	2.0	2.0