RF EXPOSURE EVALUATION REPORT

FCC ID	:	**LHJ-BL28NA001**
Equipment	:	**Wireless Modem Module**
Brand Name	:	**BL28NA-001**
Model Name	:	**BL28NA-001**
Marketing Name	:	**BL28NA-001**
Applicant	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd.**
Manufacturer	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd.**
Standard	:	**47 CFR Part 2.1091**

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part 2.1091 and it complies with applicable limit.

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.

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.

Cona Huang

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FA062001	Rev. 01	Initial issue of report	Jul. 15, 2020

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Wireless Modem Module
Brand Name	BL28NA-001
Model Name	BL28NA-001
Marketing Name	BL28NA-001
FCC ID	LHJ-BL28NA001
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM
HW Version	BL28NA001
SW Version	n/a
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

Mode	Burst average power(dBm)	
	GSM 850	GSM 1900
GPRS (GMSK, 1 Tx slot)	35.5	32.5
GPRS (GMSK, 2 Tx slots)	34.0	31.0
GPRS (GMSK, 3 Tx slots)	32.0	29.0
GPRS (GMSK, 4 Tx slots)	31.0	28.0
EDGE (8PSK, 1 Tx slot)	27.5	26.5
EDGE (8PSK, 2 Tx slots)	25.5	24.5
EDGE (8PSK, 3 Tx slots)	24.5	23.5
EDGE (8PSK, 4 Tx slots)	23.5	22.5

Mode		Maximum Average power(dBm)
WCDMA	Band II	25
	Band IV	25
	Band V	25
LTE	Band 2	25
	Band 4	25
	Band 5	25
	Band 7	25
	Band 12	25
	Band 13	25

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.

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
3.0-30	1842/f	4.89/f	*(900/f2)	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/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

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:

$$S = \frac{PG}{4\pi R^2}$$

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 ERP (dBm)	Maximum ERP (W)	Maximum EIRP (dBm)	Maximum EIRP (W)	Maximum Output Power Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)
GPRS 850 (1 Tx slot)	3.00	35.50	36.350	4.315	38.500	7.079	7.000	891.251	0.177	0.549
GPRS 850 (2 Tx slots)	3.00	34.00	34.850	3.055	37.000	5.012	7.000	1252.968	0.249	0.549
GPRS 850 (3 Tx slots)	3.00	32.00	32.850	1.928	35.000	1.928	7.000	1185.769	0.236	0.549
GPRS 850 (4 Tx slots)	3.00	31.00	31.850	1.531	34.000	1.531	7.000	1258.925	0.251	0.549
EGPRS 850 (1 Tx slot)	3.00	27.50	28.350	0.684	30.500	0.685	7.000	141.254	0.028	0.549
EGPRS 850 (2 Tx slots)	3.00	25.50	26.350	0.432	28.500	0.708	7.000	176.986	0.035	0.549
EGPRS 850 (3 Tx slots)	3.00	24.50	25.350	0.343	27.500	0.562	7.000	210.878	0.042	0.549
EGPRS 850 (4 Tx slots)	3.00	23.50	24.350	0.272	26.500	0.447	7.000	223.342	0.044	0.549
GPRS 1900 (1 Tx slot)	0.50	32.50	30.850	1.216	33.000	1.995	2.000	251.189	0.050	1.000
GPRS 1900 (2 Tx slots)	0.50	31.00	29.350	0.861	31.500	1.413	2.000	353.134	0.070	1.000
GPRS 1900 (3 Tx slots)	0.50	29.00	27.350	0.543	29.500	0.891	2.000	334.195	0.067	1.000
GPRS 1900 (4 Tx slots)	0.50	28.00	26.350	0.432	28.500	0.708	2.000	354.813	0.071	1.000
EGPRS 1900 (1 Tx slot)	0.50	26.50	24.850	0.305	27.000	0.501	2.000	63.096	0.013	1.000
EGPRS 1900 (2 Tx slots)	0.50	24.50	22.850	0.193	25.000	0.316	2.000	79.057	0.016	1.000
EGPRS 1900 (3 Tx slots)	0.50	23.50	21.850	0.153	24.000	0.251	2.000	94.196	0.019	1.000
EGPRS 1900 (4 Tx slots)	0.50	22.50	20.850	0.122	23.000	0.200	2.000	99.763	0.020	1.000
WCDMA Band 2	0.50	25.00	23.350	0.216	25.500	0.355	2.000	354.813	0.071	1.000
WCDMA Band 4	5.00	25.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000
WCDMA Band 5	3.00	25.00	25.850	0.385	28.000	0.631	7.000	630.957	0.126	0.549
LTE Band 2	0.50	25.00	23.350	0.216	25.500	0.355	2.000	354.813	0.071	1.000
LTE Band 4	5.00	25.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000
LTE Band 5	3.00	25.00	25.850	0.385	28.000	0.631	7.000	630.957	0.126	0.549
LTE Band 7	8.00	25.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
LTE Band 12	5.00	25.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.466
LTE Band 13	5.00	25.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.518

4.2. Collocated 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
GPRS 850 (1 Tx slot)	0.00	35.50	35.5	3.55	446.68	0.089	0.549	0.162
GPRS 850 (2 Tx slots)	0.00	34.00	34.0	2.51	627.97	0.125	0.549	0.228
GPRS 850 (3 Tx slots)	0.00	32.00	32.0	1.58	594.29	0.118	0.549	0.215
GPRS 850 (4 Tx slots)	0.00	31.00	31.0	1.26	630.96	0.126	0.549	0.229
EGPRS 850 (1 Tx slot)	0.00	27.50	27.5	0.56	70.79	0.014	0.549	0.026
EGPRS 850 (2 Tx slots)	0.00	25.50	25.5	0.35	88.70	0.018	0.549	0.032
EGPRS 850 (3 Tx slots)	0.00	24.50	24.5	0.28	105.69	0.021	0.549	0.038
EGPRS 850 (4 Tx slots)	0.00	23.50	23.5	0.22	111.94	0.022	0.549	0.041
GPRS 1900 (1 Tx slot)	0.50	32.50	33.0	2.00	251.19	0.050	1.000	0.050
GPRS 1900 (2 Tx slots)	0.50	31.00	31.5	1.41	353.13	0.070	1.000	0.070
GPRS 1900 (3 Tx slots)	0.50	29.00	29.5	0.89	334.20	0.067	1.000	0.067
GPRS 1900 (4 Tx slots)	0.50	28.00	28.5	0.71	354.81	0.071	1.000	0.071
EGPRS 1900 (1 Tx slot)	0.50	26.50	27.0	0.50	63.10	0.013	1.000	0.013
EGPRS 1900 (2 Tx slots)	0.50	24.50	25.0	0.32	79.06	0.016	1.000	0.016
EGPRS 1900 (3 Tx slots)	0.50	23.50	24.0	0.25	94.20	0.019	1.000	0.019
EGPRS 1900 (4 Tx slots)	0.50	22.50	23.0	0.20	99.76	0.020	1.000	0.020
WCDMA Band 2	0.50	25.00	25.5	0.35	354.81	0.071	1.000	0.071
WCDMA Band 4	4.00	25.00	29.0	0.79	794.33	0.158	1.000	0.158
WCDMA Band 5	0.00	25.00	25.0	0.32	316.23	0.063	0.536	0.117
LTE Band 2	0.50	25.00	25.5	0.35	354.81	0.071	1.000	0.071
LTE Band 4	5.00	25.00	30.0	1.00	1000.00	0.199	1.000	0.199
LTE Band 5	0.00	25.00	25.0	0.32	316.23	0.063	0.549	0.115
LTE Band 7	6.00	25.00	31.0	1.26	1258.93	0.251	1.000	0.251
LTE Band 12	2.50	25.00	27.5	0.56	562.34	0.112	0.466	0.240
LTE Band 13	2.50	25.00	27.5	0.56	562.34	0.112	0.518	0.216
WLAN2.4GHz Band	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
WLAN5GHz Band	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
Bluetooth	5.0	15.0	20.0	0.10	100.00	0.020	1.000	0.020

Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN is less than or equal to 26dBm 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.

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WWAN+WLAN+Bluetooth
0.251	0.251	0.020	0.522

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth.
2. 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 3 collocated transmitters is compliant

Conclusion:

Based on FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091, 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)
BL28NA-001	GSM	GSM850	35.5	3.0	0.0
		GSM1900	32.5	0.5	0.5
	UMTS	2	25.0	0.5	0.5
		4	25.0	5.0	4.0
		5	25.0	3.0	0.0
	LTE	2	25.0	0.5	0.5
		4	25.0	5.0	5.0
		5	25.0	3.0	0.0
		7	25.0	8.0	6.0
		12	25.0	5.0	2.5
		13	25.0	5.0	2.5