RF EXPOSURE EVALUATION REPORT

FCC ID	:	**LHJ-FE5NA0D31**
Equipment	:	**FE5NA0D31**
Brand Name	:	**Continental**
Model Name	:	**FE5NA0D31**
Applicant	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Manufacturer	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
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
FA1N2419	Rev. 01	Initial issue of report	May 17, 2022

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	FE5NA0D31
Brand Name	Continental
Model Name	FE5NA0D31
FCC ID	LHJ-FE5NA0D31
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 LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz
Mode	GSM / GPRS: GMSK EDGE(MCS 0-4): GMSK/(MCS 5-9): 8PSK WCDMA: QPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA: QPSK (Uplink) LTE: QPSK / 16QAM / 64QAM 5G NR: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM
HW Version	P2
SW Version	MODEMSA515M_LE2.1_01.12.55
EUT Stage	Identical Prototype

Reviewed by: Jason Wang

Report Producer: Daisy Peng

2. Maximum RF average output power among production units

GSM850 TX Channel Frequency (MHz)	Tune-up Limit (dBm)
GPRS 1 Tx slot	33.50
GPRS 2 Tx slots	30.50
GPRS 3 Tx slots	29.00
GPRS 4 Tx slots	28.50
EDGE 1 Tx slot	27.50
EDGE 2 Tx slots	27.00
EDGE 3 Tx slots	27.00
EDGE 4 Tx slots	27.00

GSM1900 TX Channel Frequency (MHz)	Tune-up Limit (dBm)
GPRS 1 Tx slot	30.50
GPRS 2 Tx slots	27.50
GPRS 3 Tx slots	26.00
GPRS 4 Tx slots	24.50
EDGE 1 Tx slot	26.50
EDGE 2 Tx slots	26.00
EDGE 3 Tx slots	25.50
EDGE 4 Tx slots	24.50

Radio Tech	Band Number	Tune-up Limit (dBm)
WCDMA	B2	24.50
WCDMA	B4	24.50
WCDMA	B5	24.50
LTE	B2	24.00
LTE	B4	24.00
LTE	B5	24.00
LTE	B7	24.00
LTE	B12	24.00
LTE	B13	24.00
LTE	B14	24.00
LTE	B17	24.00
LTE	B25	24.00
LTE	B26	24.00
LTE	B66	24.00
LTE	B71	24.00
LTE	B41	24.00
LTE	B41 (HPUE)	27.00
FR1	n2	24.00
FR1	n5	24.00
FR1	n25	24.00
FR1	n66	24.00
FR1	n71	24.00
FR1	n41	24.00
FR1	n77	24.00
FR1	n77 (HPUE)	27.00

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.

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)	4.50	33.50	35.850	3.846	38.000	6.310	7.000	794.328	0.158	0.549
GPRS 850 (2 Tx slots)	4.50	30.50	32.850	1.928	35.000	3.162	7.000	790.569	0.157	0.549
GPRS 850 (3 Tx slots)	4.50	29.00	31.350	1.365	33.500	1.365	7.000	839.460	0.167	0.549
GPRS 850 (4 Tx slots)	4.50	28.50	30.850	1.216	33.000	1.216	7.000	1000.000	0.199	0.549
EGPRS 850 (1 Tx slot)	4.50	27.50	29.850	0.966	32.000	0.968	7.000	199.526	0.040	0.549
EGPRS 850 (2 Tx slots)	4.50	27.00	29.350	0.861	31.500	1.413	7.000	353.134	0.070	0.549
EGPRS 850 (3 Tx slots)	4.50	27.00	29.350	0.861	31.500	1.413	7.000	529.702	0.105	0.549
EGPRS 850 (4 Tx slots)	4.50	27.00	29.350	0.861	31.500	1.413	7.000	706.269	0.141	0.549
GPRS 1900 (1 Tx slot)	2.50	30.50	30.850	1.216	33.000	1.995	2.000	251.189	0.050	1.000
GPRS 1900 (2 Tx slots)	2.50	27.50	27.850	0.610	30.000	1.000	2.000	250.000	0.050	1.000
GPRS 1900 (3 Tx slots)	2.50	26.00	26.350	0.432	28.500	0.708	2.000	265.461	0.053	1.000
GPRS 1900 (4 Tx slots)	2.50	24.50	24.850	0.305	27.000	0.501	2.000	251.189	0.050	1.000
EGPRS 1900 (1 Tx slot)	2.50	26.50	26.850	0.484	29.000	0.794	2.000	100.000	0.020	1.000
EGPRS 1900 (2 Tx slots)	2.50	26.00	26.350	0.432	28.500	0.708	2.000	176.986	0.035	1.000
EGPRS 1900 (3 Tx slots)	2.50	25.50	25.850	0.385	28.000	0.631	2.000	236.609	0.047	1.000
EGPRS 1900 (4 Tx slots)	2.50	24.50	24.850	0.305	27.000	0.501	2.000	250.594	0.050	1.000
WCDMA Band 2	2.50	24.50	24.850	0.305	27.000	0.501	2.000	501.187	0.100	1.000
WCDMA Band 4	5.50	24.50	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000
WCDMA Band 5	4.50	24.50	26.850	0.484	29.000	0.794	7.000	794.328	0.158	0.549
LTE Band 2	2.50	24.00	24.350	0.272	26.500	0.447	2.000	446.684	0.089	1.000
LTE Band 4	5.50	24.00	27.350	0.543	29.500	0.891	1.000	891.251	0.177	1.000
LTE Band 5	4.50	24.00	26.350	0.432	28.500	0.708	7.000	707.946	0.141	0.549
LTE Band 7	6.00	24.00	27.850	0.610	30.000	1.000	2.000	1000.000	0.199	1.000
LTE Band 12	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.466
LTE Band 13	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.518
LTE Band 14	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.525
LTE Band 17	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.469
LTE Band 25	2.50	24.00	24.350	0.272	26.500	0.447	2.000	446.684	0.089	1.000
LTE Band 26	4.50	24.00	26.350	0.432	28.500	0.708	7.000	707.946	0.141	0.543
LTE Band 41	6.00	27.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
LTE Band 66	5.50	24.00	27.350	0.543	29.500	0.891	1.000	891.251	0.177	1.000
LTE Band 71	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.442
FR1 Band n2	2.50	24.00	24.350	0.272	26.500	0.447	2.000	446.684	0.089	1.000
FR1 Band n5	4.50	24.00	26.350	0.432	28.500	0.708	7.000	707.946	0.141	0.549
FR1 Band n25	2.50	24.00	24.350	0.272	26.500	0.447	2.000	446.684	0.089	1.000
FR1 Band n66	5.50	24.00	27.350	0.543	29.500	0.891	1.000	891.251	0.177	1.000
FR1 Band n71	6.00	24.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.442
FR1 Band n41	6.00	24.00	27.850	0.610	30.000	1.000	2.000	1000.000	0.199	1.000
FR1 Band n77	3.00	27.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000

4.2. Collocated Power Density Calculation

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
GPRS 850 (1 Tx slot)	2.0	33.50	35.5	3.55	446.68	0.089	0.549	0.162
GPRS 850 (2 Tx slots)	2.0	30.50	32.5	1.78	444.57	0.088	0.549	0.161
GPRS 850 (3 Tx slots)	2.0	29.00	31.0	1.26	472.06	0.094	0.549	0.171
GPRS 850 (4 Tx slots)	2.0	28.50	30.5	1.12	562.34	0.112	0.549	0.204
EGPRS 850 (1 Tx slot)	2.0	27.50	29.5	0.89	112.20	0.022	0.549	0.041
EGPRS 850 (2 Tx slots)	2.0	27.00	29.0	0.79	198.58	0.040	0.549	0.072
EGPRS 850 (3 Tx slots)	2.0	27.00	29.0	0.79	297.87	0.059	0.549	0.108
EGPRS 850 (4 Tx slots)	2.0	27.00	29.0	0.79	397.16	0.079	0.549	0.144
GPRS 1900 (1 Tx slot)	2.5	30.50	33.0	2.00	251.19	0.050	1.000	0.050
GPRS 1900 (2 Tx slots)	2.5	27.50	30.0	1.00	250.00	0.050	1.000	0.050
GPRS 1900 (3 Tx slots)	2.5	26.00	28.5	0.71	265.46	0.053	1.000	0.053
GPRS 1900 (4 Tx slots)	2.5	24.50	27.0	0.50	251.19	0.050	1.000	0.050
EGPRS 1900 (1 Tx slot)	2.5	26.50	29.0	0.79	100.00	0.020	1.000	0.020
EGPRS 1900 (2 Tx slots)	2.5	26.00	28.5	0.71	176.99	0.035	1.000	0.035
EGPRS 1900 (3 Tx slots)	2.5	25.50	28.0	0.63	236.61	0.047	1.000	0.047
EGPRS 1900 (4 Tx slots)	2.5	24.50	27.0	0.50	250.59	0.050	1.000	0.050
WCDMA Band 2	2.5	24.50	27.0	0.50	501.19	0.100	1.000	0.100
WCDMA Band 4	4.5	24.50	29.0	0.79	794.33	0.158	1.000	0.158
WCDMA Band 5	2.0	24.50	26.5	0.45	446.68	0.089	0.549	0.162
LTE Band 2	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
LTE Band 4	4.5	24.00	28.5	0.71	707.95	0.141	1.000	0.141
LTE Band 5	2.0	24.00	26.0	0.40	398.11	0.079	0.549	0.144
LTE Band 7	4.0	24.00	28.0	0.63	630.96	0.126	1.000	0.126
LTE Band 12	2.0	24.00	26.0	0.40	398.11	0.079	0.466	0.170
LTE Band 13	2.0	24.00	26.0	0.40	398.11	0.079	0.518	0.153
LTE Band 14	2.0	24.00	26.0	0.40	398.11	0.079	0.525	0.151
LTE Band 17	2.0	24.00	26.0	0.40	398.11	0.079	0.469	0.169
LTE Band 25	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
LTE Band 26	2.0	24.00	26.0	0.40	398.11	0.079	0.543	0.146
LTE Band 41	4.0	27.00	31.0	1.26	1258.93	0.251	1.000	0.251
LTE Band 66	4.5	24.00	28.5	0.71	707.95	0.141	1.000	0.141
LTE Band 71	2.0	24.00	26.0	0.40	398.11	0.079	0.442	0.179
FR1 Band n2	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
FR1 Band n5	2.0	24.00	26.0	0.40	398.11	0.079	0.549	0.144
FR1 Band n25	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
FR1 Band n41	4.0	24.00	28.0	0.63	630.96	0.126	1.000	0.126
FR1 Band n66	4.5	24.00	28.5	0.71	707.95	0.141	1.000	0.141
FR1 Band n71	2.0	24.00	26.0	0.40	398.11	0.079	0.442	0.179
FR1 Band n77	3.0	27.00	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

UMTS/LTE Power Density / Limit	5G NR Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of UMTS/LTE+5G NR WLAN+Bluetooth
0.251	0.199	0.079	0.020	0.549

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 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)
FE5NA0D31	GSM	GSM850	33.5	4.5	2.0
		GSM1900	30.5	2.5	2.5
	UMTS	WCDMA Band 2	24.5	2.5	2.5
		WCDMA Band 4	24.5	5.5	4.5
		WCDMA Band 5	24.5	4.5	2.0
	LTE	LTE Band 2	24.0	2.5	2.5
		LTE Band 4	24.0	5.5	4.5
		LTE Band 5	24.0	4.5	2.0
		LTE Band 7	24.0	6.0	4.0
		LTE Band 12	24.0	6.0	2.0
		LTE Band 13	24.0	6.0	2.0
		LTE Band 14	24.0	6.0	2.0
		LTE Band 17	24.0	6.0	2.0
		LTE Band 25	24.0	2.5	2.5
		LTE Band 26	24.0	4.5	2.0
		LTE Band 41	27.0	6.0	4.0
		LTE Band 66	24.0	5.5	4.5
		LTE Band 71	24.0	6.0	2.0
	5G NR	FR1 Band n2	24.0	2.5	2.5
		FR1 Band n5	24.0	4.5	2.0
		FR1 Band n25	24.0	2.5	2.5
		FR1 Band n66	24.0	5.5	4.5
		FR1 Band n71	24.0	6.0	2.0
		FR1 Band n41	24.0	6.0	4.0
		FR1 Band n77	27.0	3.0	3.0