



RF EXPOSURE EVALUATION REPORT

FCC ID : LHJ-FE5RW0D31
Equipment : FE5RW0D31
Brand Name : Continental
Model Name : FE5RW0D31
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
FA1N2419-01	Rev. 01	Initial issue of report	May 26, 2022



1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	FE5RW0D31
Brand Name	Continental
Model Name	FE5RW0D31
FCC ID	LHJ-FE5RW0D31
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 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 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz 5G NR n77: 3700 MHz ~ 3980 MHz
Mode	GSM/GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFDM/CP-OFDM, 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	27.50
EDGE 1 Tx slot	27.50
EDGE 2 Tx slots	25.50
EDGE 3 Tx slots	24.50
EDGE 4 Tx slots	23.50

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	24.50
EDGE 3 Tx slots	23.50
EDGE 4 Tx slots	22.50

Radio Tech	Band Number	Tune-up Limit (dBm)
WCDMA	B5	24.50
LTE	B2	24.00
LTE	B4	24.00
LTE	B5	24.00
LTE	B7	24.00
LTE	B25	24.00
LTE	B26	24.00
LTE	B38	24.00
LTE	B41 (HPUE)	27.00
FR1	n77 (HPUE)	24.00



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/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

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	27.50	29.850	0.966	32.000	0.966	7.000	794.328	0.158	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	25.50	27.850	0.610	30.000	1.000	7.000	250.000	0.050	0.549
EGPRS 850 (3 Tx slots)	4.50	24.50	26.850	0.484	29.000	0.794	7.000	297.873	0.059	0.549
EGPRS 850 (4 Tx slots)	4.50	23.50	25.850	0.385	28.000	0.631	7.000	315.479	0.063	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	24.50	24.850	0.305	27.000	0.501	2.000	125.297	0.025	1.000
EGPRS 1900 (3 Tx slots)	2.50	23.50	23.850	0.243	26.000	0.398	2.000	149.290	0.030	1.000
EGPRS 1900 (4 Tx slots)	2.50	22.50	22.850	0.193	25.000	0.316	2.000	158.114	0.031	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 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 38	6.00	24.00	27.850	0.610	30.000	1.000	2.000	1000.000	0.199	1.000
LTE Band 41 (HPUE)	6.00	27.00	30.850	1.216	33.000	1.995	2.000	1995.262	0.397	1.000
FR1 Band n77(HPUE)	6.00	24.00	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)	4.5	33.50	38.0	6.31	794.33	0.158	0.549	0.288
GPRS 850 (2 Tx slots)	4.5	30.50	35.0	3.16	790.57	0.157	0.549	0.286
GPRS 850 (3 Tx slots)	4.5	29.00	33.5	2.24	839.46	0.167	0.549	0.304
GPRS 850 (4 Tx slots)	4.5	27.50	32.0	1.58	794.33	0.158	0.549	0.288
EGPRS 850 (1 Tx slot)	4.5	27.50	32.0	1.58	199.53	0.040	0.549	0.072
EGPRS 850 (2 Tx slots)	4.5	25.50	30.0	1.00	250.00	0.050	0.549	0.091
EGPRS 850 (3 Tx slots)	4.5	24.50	29.0	0.79	297.87	0.059	0.549	0.108
EGPRS 850 (4 Tx slots)	4.5	23.50	28.0	0.63	315.48	0.063	0.549	0.114
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	24.50	27.0	0.50	125.30	0.025	1.000	0.025
EGPRS 1900 (3 Tx slots)	2.5	23.50	26.0	0.40	149.29	0.030	1.000	0.030
EGPRS 1900 (4 Tx slots)	2.5	22.50	25.0	0.32	158.11	0.031	1.000	0.031
WCDMA Band 5	4.5	24.50	29.0	0.79	794.33	0.158	0.549	0.288
LTE Band 2	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
LTE Band 4	5.5	24.00	29.5	0.89	891.25	0.177	1.000	0.177
LTE Band 5	4.5	24.00	28.5	0.71	707.95	0.141	0.549	0.257
LTE Band 7	6.0	24.00	30.0	1.00	1000.00	0.199	1.000	0.199
LTE Band 25	2.5	24.00	26.5	0.45	446.68	0.089	1.000	0.089
LTE Band 26	4.5	24.00	28.5	0.71	707.95	0.141	0.543	0.260
LTE Band 38	6.0	24.00	30.0	1.00	1000.00	0.199	1.000	0.199
LTE Band 41 (HPUE)	6.0	27.00	33.0	2.00	1995.26	0.397	1.000	0.397
FR1 Band n77 (HPUE)	6.0	24.00	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
0.397	0.199	0.079	0.020	0.695

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)	Standalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
FE5RW0D31	GSM	GSM850	33.5	4.5	4.5
		GSM1900	30.5	2.5	2.5
	UMTS	WCDMA Band 5	24.5	4.5	4.5
	LTE	LTE Band 2	24.0	2.5	2.5
		LTE Band 4	24.0	5.5	5.5
		LTE Band 5	24.0	4.5	4.5
		LTE Band 7	24.0	6.0	6.0
		LTE Band 25	24.0	2.5	2.5
		LTE Band 26	24.0	4.5	4.5
		LTE Band 38	24.0	6.0	6.0
	LTE Band 41(HPUE)	27.0	6.0	6.0	
5G NR	FR1 Band n77(HPUE)	24.0	6.0	6.0	