RF EXPOSURE EVALUATION REPORT

FCC ID	**: LHJ-WT50NA01**
Equipment	**: WT50NA01**
Brand Name	**: WT50NA01**
Model Name	**: WT50NA01**
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 in accordance with 47 CFR Part 2.1091 for the device and pass the limit.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Jones Tsai

Approved by: Jones Tsai / Manager

SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory

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History of this test report

Report No.	Version	Description	Issued Date
FA862137	Rev. 01	Initial issue of report	Aug. 21, 2018
FA862137	Rev. 02	Updated section 1 and section 4	Aug. 31, 2018

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	WT50NA01
Brand Name	WT50NA01
Model Name	WT50NA01
FCC ID	LHJ-WT50NA01
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 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 66: 1710 MHz ~ 1780 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK
HW Version	P0
SW Version	GEN_PACK-1
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: Eric Huang

Report Producer: Wan Liu

2. Maximum RF average output power among production units

Mode	Burst average power(dBm)	
	GSM 850	GSM 1900
GPRS (GMSK, 1 Tx slot)	35.00	32.00
GPRS (GMSK, 2 Tx slots)	35.00	32.00
GPRS (GMSK, 3 Tx slots)	33.00	30.50
GPRS (GMSK, 4 Tx slots)	33.00	30.50
EDGE (8PSK, 1 Tx slot)	27.00	27.00
EDGE (8PSK, 2 Tx slots)	27.00	26.50
EDGE (8PSK, 3 Tx slots)	26.50	26.50
EDGE (8PSK, 4 Tx slots)	26.50	26.00

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
	Band 66	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	Frequency (MHz)	Antenna Gain (dBi)	Maximum Burst Power (dBm)	Maximum Burst ERP (dBm)	Maximum Burst ERP (W)	Maximum Burst EIRP (dBm)	Maximum Burst EIRP (W)	RSE Power Limit (W)	Maximum Source Base-Time Average Power (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)
GPRS 850 (1 Tx slot)	824	1.00	35.00	33.850	2.427	36.000	3.981	7.000	501.187	0.100	0.549
GPRS 850 (2 Tx slots)	824	1.00	35.00	33.850	2.427	36.000	3.981	7.000	995.268	0.198	0.549
GPRS 850 (3 Tx slots)	824	1.00	33.00	31.850	1.531	34.000	1.531	7.000	941.890	0.187	0.549
GPRS 850 (4 Tx slots)	824	1.00	33.00	31.850	1.531	34.000	1.531	7.000	1258.925	0.251	0.549
EGPRS 850 (1 Tx slot)	824	1.00	27.00	25.850	0.385	28.000	0.385	7.000	79.433	0.016	0.549
EGPRS 850 (2 Tx slots)	824	1.00	27.00	25.850	0.385	28.000	0.631	7.000	157.739	0.031	0.549
EGPRS 850 (3 Tx slots)	824	1.00	26.50	25.350	0.343	27.500	0.562	7.000	210.878	0.042	0.549
EGPRS 850 (4 Tx slots)	824	1.00	26.50	25.350	0.343	27.500	0.562	7.000	281.171	0.056	0.549
GPRS 1900 (1 Tx slot)	1850	1.00	32.00	30.850	1.216	33.000	1.995	2.000	251.189	0.050	1.000
GPRS 1900 (2 Tx slots)	1850	1.00	32.00	30.850	1.216	33.000	1.995	2.000	498.816	0.099	1.000
GPRS 1900 (3 Tx slots)	1850	1.00	30.50	29.350	0.861	31.500	1.413	2.000	529.663	0.105	1.000
GPRS 1900 (4 Tx slots)	1850	1.00	30.50	29.350	0.861	31.500	1.413	2.000	707.946	0.141	1.000
EGPRS 1900 (1 Tx slot)	1850	1.00	27.00	25.850	0.385	28.000	0.631	2.000	79.433	0.016	1.000
EGPRS 1900 (2 Tx slots)	1850	1.00	26.50	25.350	0.343	27.500	0.562	2.000	140.585	0.028	1.000
EGPRS 1900 (3 Tx slots)	1850	1.00	26.50	25.350	0.343	27.500	0.562	2.000	210.878	0.042	1.000
EGPRS 1900 (4 Tx slots)	1850	1.00	26.00	24.850	0.305	27.000	0.501	2.000	250.594	0.050	1.000
WCDMA Band 2	1850	1.00	25.00	23.850	0.243	26.000	0.398	2.000	398.107	0.079	1.000
WCDMA Band 4	1710	5.00	25.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000
WCDMA Band 5	826	1.00	25.00	23.850	0.243	26.000	0.398	7.000	398.107	0.079	0.551
LTE Band 2	1850	1.00	25.00	23.850	0.243	26.000	0.398	2.000	398.107	0.079	1.000
LTE Band 4	1710	5.00	25.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000
LTE Band 5	824	1.00	25.00	23.850	0.243	26.000	0.398	7.000	398.107	0.079	0.549
LTE Band 7	2500	9.00	25.00	31.850	1.531	34.000	2.512	3.000	2511.886	0.500	1.000
LTE Band 12	699	5.00	25.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.466
LTE Band 13	777	5.00	25.00	27.850	0.610	30.000	1.000	3.000	1000.000	0.199	0.518
LTE Band 66	1710	5.00	25.00	27.850	0.610	30.000	1.000	1.000	1000.000	0.199	1.000

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

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 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.

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Burst Power (dBm)	Maximum Burst EIRP (dBm)	Maximum Burst EIRP (W)	Maximum Source Base-Time Average Power (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
GPRS 850 (1 Tx slot)	824	-2.00	35.00	33.0	2.00	251.19	0.050	0.549	0.091
GPRS 850 (2 Tx slots)	824	-2.00	35.00	33.0	2.00	498.82	0.099	0.549	0.181
GPRS 850 (3 Tx slots)	824	-2.00	33.00	31.0	1.26	472.06	0.094	0.549	0.171
GPRS 850 (4 Tx slots)	824	-2.00	33.00	31.0	1.26	630.96	0.126	0.549	0.229
EGPRS 850 (1 Tx slot)	824	-2.00	27.00	25.0	0.32	39.81	0.008	0.549	0.014
EGPRS 850 (2 Tx slots)	824	-2.00	27.00	25.0	0.32	79.06	0.016	0.549	0.029
EGPRS 850 (3 Tx slots)	824	-2.00	26.50	24.5	0.28	105.69	0.021	0.549	0.038
EGPRS 850 (4 Tx slots)	824	-2.00	26.50	24.5	0.28	140.92	0.028	0.549	0.051
GPRS 1900 (1 Tx slot)	1850	1.00	32.00	33.0	2.00	251.19	0.050	1.000	0.050
GPRS 1900 (2 Tx slots)	1850	1.00	32.00	33.0	2.00	498.82	0.099	1.000	0.099
GPRS 1900 (3 Tx slots)	1850	1.00	30.50	31.5	1.41	529.66	0.105	1.000	0.105
GPRS 1900 (4 Tx slots)	1850	1.00	30.50	31.5	1.41	707.95	0.141	1.000	0.141
EGPRS 1900 (1 Tx slot)	1850	1.00	27.00	28.0	0.63	79.43	0.016	1.000	0.016
EGPRS 1900 (2 Tx slots)	1850	1.00	26.50	27.5	0.56	140.59	0.028	1.000	0.028
EGPRS 1900 (3 Tx slots)	1850	1.00	26.50	27.5	0.56	210.88	0.042	1.000	0.042
EGPRS 1900 (4 Tx slots)	1850	1.00	26.00	27.0	0.50	250.59	0.050	1.000	0.050
WCDMA Band 2	1850	1.00	25.00	26.0	0.40	398.11	0.079	1.000	0.079
WCDMA Band 4	1710	5.00	25.00	30.0	1.00	1000.00	0.199	1.000	0.199
WCDMA Band 5	826	-2.00	25.00	23.0	0.20	199.53	0.040	0.551	0.072
LTE Band 2	1850	1.00	25.00	26.0	0.40	398.11	0.079	1.000	0.079
LTE Band 4	1710	5.00	25.00	30.0	1.00	1000.00	0.199	1.000	0.199
LTE Band 5	824	-2.00	25.00	23.0	0.20	199.53	0.040	0.549	0.072
LTE Band 7	2500	6.00	25.00	31.0	1.26	1258.93	0.251	1.000	0.251
LTE Band 12	699	2.50	25.00	27.5	0.56	562.34	0.112	0.466	0.240
LTE Band 13	777	2.50	25.00	27.5	0.56	562.34	0.112	0.518	0.216
LTE Band 66	1710	5.00	25.00	30.0	1.00	1000.00	0.199	1.000	0.199
WLAN2.4GHz Band	2412	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
WLAN5GHz Band	5180	5.0	26.0	31.0	1.26	1258.93	0.251	1.000	0.251
Bluetooth	2402	5.0	15.0	20.0	0.10	100.00	0.020	1.000	0.020

<Collocated analysis>

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	0.521

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:

Using the maximum power (including tune-up tolerances), the power density was calculated. Since device is not provided with antennas, the maximum antenna gain was calculated that still complieance the limits at a 20cm distance.

Based on 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	Frequency (MHz)	Maximum Conducted Power (dBm)	Stanalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
WT50NA01	GSM	GSM850	824.2~848.8	35	1.00	-2.00
		GSM1900	1850.2~1909.8	32	1.00	1.00
	WCDMA	Band II	1852.4~1907.6	25	1.00	1.00
		Band IV	1712.4~1752.6	25	5.00	5.00
		Band V	826.4~846.6	25	1.00	-2.00
	LTE	Band 2	1850.7~1909.3	25	1.00	1.00
		Band 4	1710.7~1754.3	25	5.00	5.00
		Band 5	824.7~848.3	25	1.00	-2.00
		Band 7	2502.5~2567.5	25	9.00	6.00
		Band 12	699.7~715.3	25	5.00	2.50
		Band 13	779.5~784.5	25	5.00	2.50
		Band 66	1710.7~1779.3	25	5.00	5.00