VARIANT FCC RF Exposure Test Report

Report No.	:	**W7L-230201W001SA01**
Applicant	:	**Continental Automotive Systems, Inc.**
Address	:	**21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Product	:	**FE5NA0010, FE5NA0011**
FCC ID	:	**LHJ-FE5NA0010**
Brand	:	**Continental**
Model No.	:	**FE5NA0010, FE5NA0011**
Standards	:	**FCC Part 2 (Section 2.1091)** **KDB 447498 D01 General RF Exposure Guidance v06**
Sample Received Date	:	**Jan. 19, 2023**
Date of Testing	:	**Jan. 19, 2023 ~ Feb. 23, 2023**

CERTIFICATION: The above equipment have been tested by **BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO., LTD.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

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Release Control Record

Report No.	Reason for Change	Date Issued
W7L-220214W001SA01	Initial release	Jul. 30, 2022
W7L-230201W001SA01	Based on the original product changing the software version and add the MIMO function of Band n41, n77.	Feb. 23, 2023

1. Description of Equipment Under Test

EUT Type	FE5NA0010, FE5NA0011
FCC ID	LHJ-FE5NA0010
Brand Name	Continental
Model Name	FE5NA0010, FE5NA0011
Tx Frequency Bands (Unit: MHz)	WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band IV: 1712.4 ~ 1752.6 WCDMA Band V : 826.4 ~ 846.6 LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 14 : 790.5 MHz ~ 795.5 MHz LTE Band 66 : 1710.7 MHz ~ 1779.3 MHz LTE Band 71 : 665.5 MHz ~ 695.5 MHz LTE Band CA_5B: 825.6MHz ~ 847.4MHz LTE Band CA_7C: 2505.5MHz ~ 2564.7Hz LTE Band CA_66B: 1712.5MHz ~ 1777.5MHz LTE Band CA_66C: 1713.3MHz ~ 1776.7MHz NR Band n2(NSA):1852.5MHz ~ 1907.5MHz NR Band n5(NSA):826.5MHz ~ 846.5MHz NR Band n25(SA):1852.5MHz ~1912.5MHz NR Band n41/n41 HPUE(SA): 2506.02MHz ~ 2679.99MHz NR Band n66(SA): 1712.5MHz ~ 1777.5MHz NR Band n71(SA): 665.5MHz ~ 695.5MHz NR Band n77A/n77C-HPUE(SA): 3710MHz ~ 3970MHz
Uplink Modulations	WCDMA :QPSK LTE : QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFMA(π/2 BPSK,QPSK,16QAM,64QAM,256QAM); CP-OFMA(QPSK,16QAM,64QAM,256QAM)
Antenna Type	WWAN: Monopole antenna
EUT Stage	Production Unit

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. According to the information provided by the manufacturer, The difference between FE5NA0010, FE5NA0011 is as follows:

TA-code	L2/L5 GNSS	Band Difference
FE5NA0010	support	/
FE5NA0011	not support	BOM change: depopulated passive components from the GNSS RF front-end

3. This report only reflects the new MIMO MPE evaluation, other frequency bands please refer to the original report W7L-220214W001SA01.

2. MPE(Maximum Permissible Exposure) Assessment

2.1 Introduction

According to 47 CFR §2.1091, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitting antenna and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 cm separation requirement. The limits to be used for MPE evaluation are specified in §1.1310. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

2.2 RF Radiation Exposure Limits

According to 47 CFR §1.1310, the criteria listed in below table shall be used to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093.

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (min)
(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 – 100000	-	-	5	6
(B) Limits for General Population / Uncontrolled Exposures				
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 – 100000	-	-	1.0	30

Limits for maximum permissible exposure (MPE)

Notes:

1. f = frequency in MHz
2. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided they are made aware of the potential for exposure.
3. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

2.3 MPE Assessment Method

Calculations can be made to predict RF field strength and power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations below. This equation is generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

$$\text{Power Density (S)} = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where
S = Power Density, unit in mW/cm^2
P = Power input to the antenna, unit in mW
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Distance to the center of radiation of the antenna, unit in cm
EIRP = Effective isotropically radiated power

2.4 MPE Calculation for Standalone Operations

The manufacturer expects that the radiated component of this device will not close to the human body during normal usage and the warning statement was also stated in the user instruction. Since the transmitting antenna will be kept at least 20 cm away from the human body, the MPE level is calculated based on this condition and the result is listed in below table.

CALCULATION FOR MAXIMUM E.I.R.P

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit	Result (PASS / FAIL)
NR Band n41	1.69	22.5	262.42	0.052	1.000	0.059	Pass
NR Band n77A	1.5	22.5	251.19	0.050	1.000	0.050	Pass

CALCULATION MAX ANTENNA GAIN：

5G NR

Band	Frequency (dBi)	Antenna Gain (dBi)	Conducted Tune-up Peak Power(dBm)	Limit EIRP (dBm)	Limit EIRP (W)	Power Density at 20cm (mW/cm^2)	limit (mW/cm^2)	Result (PASS / FAIL)
NR Band n41	2506.02	10.5	22.5	33.01	2	0.397	1.000	Pass
NR Band n77A	3710	7.5	22.5	30	1	0.199	1.000	Pass

3. Information on the Testing Laboratories

We, BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO., LTD., were founded in 2015 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The road map of all our labs can be found in our web site also.

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