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RF Exposure Report

FCC Part 2.1091

EUT Name: FB40-ND1

EUT Model: FB40-ND1

Prepared for:

Continental Automotive
21440 West Lake Cook Road
Deer Park, Illinois 60010
USA

Prepared by:

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Report/Issue Date: November 16, 2018

Report Number: 31854560.001

Job Number: 159900

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Statement of Compliance

Manufacturer: Continental Automotive
21440 West Lake Cook Road
Deer Park, Illinois 60010

Name of Equipment: FB40-ND1
Model No. FB40-ND1
Application of Regulations: FCC Part 2.1091

Guidance Documents:

FCC Part 2.1091

Test Methods:

FCC Part 1.1310, KDB 447498 D01

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Josie Sabado November 16, 2018

Test Engineer

Date

Isaac Aguilar November 16, 2018

Laboratory Signatory

Date



Test Cert. # 31331.02

1 Product Specifications

1.1 Product Description

Embedded communication device for automotive.

1.2 Product Specifications

EUT Specifications	
Exposure Type	<input checked="" type="checkbox"/> General Population / Uncontrolled <input type="checkbox"/> Occupational / Controlled
Multiple Antenna Feeds:	<input type="checkbox"/> Yes, <input checked="" type="checkbox"/> No

1.3 Air Interfaces

Air Interface	Supported Capabilities	Modulation	Maximum Duty Cycle	Band	Frequency Range (MHz)	Maximum Output Power Including Tolerance (dBm)	Categorically Excluded according to FCC 1.1307 (b)(1)
GSM/ (E)GPRS	<ul style="list-style-type: none"> • Device Class B • MS Class 12 • Power Class 4/1 	<ul style="list-style-type: none"> • GMSK • 8PSK 	50%	GSM 850	824 – 849	33	Yes
				PCS 1900	1850 - 1910	30	Yes
WCDMA	<ul style="list-style-type: none"> • Rel. 99 UMTS • Rel. 5 HSDPA, Cat. 24 • Rel. 6 HSUPA • Power Class 3 	<ul style="list-style-type: none"> • QPSK • 16QAM 	100%	FDD II	1850 – 1910	25	Yes
				FDD IV	1710 – 1755	25	Yes
				FDD V	824 – 149	25	Yes
LTE - FDD	<ul style="list-style-type: none"> • Rel. 10 • UE Category 3 • MPR Supported • Power Class 3 	<ul style="list-style-type: none"> • QPSK • 16QAM 	100%	Band 2	1850 – 1910	25	Yes
				Band 4	1710 - 1755	25	Yes
				Band 5	824 – 849	25	Yes
				Band 7	2500 – 2570	25	Yes
				Band 12	699 – 716	25	Yes
WLAN: 802.11 b/g/n	<ul style="list-style-type: none"> • b/g mode • n mode, HT20 	<ul style="list-style-type: none"> • BPSK • QPSK • 16QAM • 64QAM 	100%	N/A	2400 – 2483.5	18.5	Yes
WLAN: 802.11 a/n/ac	<ul style="list-style-type: none"> • a mode • n mode, HT20 • n mode, HT40 • ac mode, VHT20 • ac mode, VHT40 • ac mode, VHT80 	<ul style="list-style-type: none"> • QPSK • 16QAM • 64QAM • 256 QAM 	100%	UNII-1	5150 – 5250	15	Yes
				UNII-3	5725 – 5825	15	Yes

2 RF Exposure Evaluation

2.1 Purpose

This report will demonstrate the compliance of RF exposure to the human body of the FB40-ND1 according to FCC rule part 2.1091. All transmitters, regardless if it is categorically excluded, are assessed to ensure the product can operate in manners that meet or exceed the minimum test separation distance as required by KDB 447498.

2.2 Maximum Permissible Exposure Limit

The Maximum Permissible Exposure (MPE) limits for general population/uncontrolled exposure is as follows:

Frequency Range (MHz)	E-field strength (V/m)	H-field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
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
300-1,500	-	-	f/1500	30
1,500-100,000	-	-	1.0	30

* = Plane-wave equivalent power density

2.3 Assessment Methods

The power density is calculated according to the following equation

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

Where

S = Power Density (mW/cm²)

EIRP = Effective Isotropic Radiated Power (mW)

R = Minimum distance between the human body and antenna (cm)

2.4 Assessment Calculation

The maximum output power and antenna gain is declared by the manufacturer and used in this assessment. The minimum RF exposure distance during normal operation is 25 cm.

Stand Alone Analysis

Frequency Band	Max. Conducted Power (mW)	Duty Cycle	Time-Avg. Power (mW)	Numeric Antenna Gain	EIRP (mW)	Power Density (mW/cm ²)	Power Density Limit (mW/cm ²)	Percentage of Limit
GSM 850	1995.26	50%	997.63	1.26	1255.94	0.160	0.55	29.1%
GSM 1900	1000.00	50%	500.00	3.16	1581.14	0.201	1.00	20.1%
WCDMA Band II	316.23	100%	316.23	3.16	1000.00	0.127	1.00	12.7%
WCDMA Band IV	316.23	100%	316.23	3.16	1000.00	0.127	1.00	12.7%
WCDMA Band V	316.23	100%	316.23	1.26	398.11	0.051	0.55	9.2%
LTE Band 2	316.23	100%	316.23	3.16	1000.00	0.127	1.00	12.7%
LTE Band 4	316.23	100%	316.23	3.16	1000.00	0.127	1.00	12.7%
LTE Band 5	316.23	100%	316.23	1.26	398.11	0.051	0.55	9.2%
LTE Band 7	316.23	100%	316.23	3.16	1000.00	0.127	1.00	12.7%
LTE Band 12	316.23	100%	316.23	3.16	1000.00	0.127	0.47	27.3%
802.11b/g/n	70.79	100%	70.79	2.04	144.54	0.018	1.00	1.8%
802.11a/n/ac UNII-1	31.62	100%	31.62	1.17	37.15	0.005	1.00	0.5%
802.11a/n/ac UNII-3	31.62	100%	31.62	1.55	48.98	0.006	1.00	0.6%

Simultaneous Transmission Analysis

For each simultaneous transmission configuration, the sum of the percentages to the limit of each radio should not exceed 100%.

Only the worst-case cellular band is used for this assessment.

Simultaneous Transmission Configuration	Percentage of Limit	Sum of Percentages
Cellular (GSM 850) 802.11 b/g/n	29.1% 1.8%	30.9%
Cellular (GSM 850) 802.11 a/n/ac (UNII-1)	29.1% 0.5%	29.6%
Cellular (GSM 850) 802.11 a/n/ac (UNII-3)	29.1% 0.6%	29.7%

2.5 Conclusion

The EUT was found to be compliant to the requirements of FCC part 1.1310 and part 2.1091 with a minimum distance of 25 cm.

3 Revision History

The latest revision replaces all previous versions

Revision No.	Date	Reason for change	Author
0	October 23, 2018	Original	JS
1	October 29, 2018	Updated simultaneous transmission analysis	JS
2	November 16, 2018	Updated simultaneous transmission analysis	JS