

# TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: BEJTN1R23NR


Equipment Under Test : Telematics  
Model Name : TN1R23NR  
Variant Model Name(s) : Refer to the page 4  
Applicant : LG Electronics USA  
Manufacturer : LG Electronics Inc.  
Date of Receipt : 2022.11.04  
Date of Test(s) : 2022.11.04 ~ 2023.01.20  
Date of Issue : 2023.01.20

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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We are responsible for all the information of this test report except for the data(※) provided by the customer.

Tested by:

  
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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
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- Designation number: KR0150

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### 1.2. Details of Applicant

Applicant : LG Electronics USA

Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States,  
07632

Contact Person : Cho, Hee-jae

Phone No. : +1 201 470 2696

### 1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

### 1.4. Description of EUT

<b>Kind of Product</b>		Telematics
<b>Model Name</b>		TN1R23NR
<b>Variant Model Name</b>		TN1R23NE
<b>Serial Number</b>		352162110229030
<b>Power Supply</b>		DC 12.5 V
<b>Rated Power</b>	<b>SIM 1</b>	GSM 850: 33 dBm GSM 1 900: 30 dBm WCDMA II, IV, V: 24 dBm LTE Band 2, 4, 5, 7, 12, 17, 26: 23 dBm LTE Band 41: 26 dBm NR Band 41: 23 dBm
	<b>SIM 2</b>	GSM 850: 33 dBm GSM 1 900: 30 dBm LTE Band 2, 4, 5, 7, 26: 23 dBm LTE Band 41: 26 dBm NR Band 41: 23 dBm
<b>Frequency Range</b>		GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz WCDMA II: 1 850 MHz ~ 1 910 MHz WCDMA IV: 1 710 MHz ~ 1 755 MHz WCDMA V: 824 MHz ~ 849 MHz LTE Band 2: 1 850 MHz ~ 1 910 MHz LTE Band 4: 1 710 MHz ~ 1 755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2 500 MHz ~ 2 570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 26(Part 90): 814 MHz ~ 824 MHz LTE Band 26(Part 22): 824 MHz ~ 849 MHz LTE Band 41: 2 496 MHz ~ 2 690 MHz NR Band 41: 2 496 MHz ~ 2 690 MHz
<b>Modulation Technique</b>		QPSK, 16QAM, GSMK, 8PSK, BPSK, QPSK, 16QAM, 64QAM, 256QAM
<b>Antenna Type</b>	<b>SIM 1</b>	External antenna
	<b>SIM 2</b>	External antenna
<b>Antenna Gain*</b>	<b>SIM 1</b>	699 MHz ~ 716 MHz: 0.1 dB i 704 MHz ~ 716 MHz: 0.1 dB i 814 MHz ~ 824 MHz: 3 dB i 824 MHz ~ 849 MHz: 3 dB i 1 710 MHz ~ 1 755 MHz: 4.1 dB i 1 850 MHz ~ 1 910 MHz: 3.5 dB i 2 500 MHz ~ 2 570 MHz: 4.1 dB i 2 496 MHz ~ 2 690 MHz: 4.1 dB i
	<b>SIM 2</b>	814 MHz ~ 824 MHz: 5 dB i 824 MHz ~ 849 MHz: 5 dB i 1 710 MHz ~ 1 755 MHz: 5 dB i 1 850 MHz ~ 1 910 MHz: 5 dB i 2 500 MHz ~ 2 570 MHz: 5 dB i 2 496 MHz ~ 2 690 MHz: 5 dB i
<b>H/W Version</b>		Rev.D1
<b>S/W Version</b>		v004.144.010

### 1.5. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003738	2023.01.20	Initial

### 1.6. Information of Variant Model

Model Name		Differences Hardware Part	Description
Basic Model	TN1R23NR	Reference	Fully mounted on hardware.
Variant Model	TN1R23NE	Remove Band 21 related parts	Not support LTE Band 21
		Remove QPM5679AQ, QDM5679AQ	Not support 5G NR n79

### - Supported Cellular Band

MODEL	Mode	SIM 1	SIM 2
TN1R23NR	GSM	GSM850, PCS1900	GSM850, PCS1900
	WCDMA	B2, B4, B5	N/A
	LTE	B2, B4, B5, B7, B12(B17), B26, B41	B2, B4, B5, B7, B26, B41
	5G Sub6_SA	n41	n41
	5G Sub6_NSA	n41	N/A
TN1R23NE	GSM	N/A	N/A
	WCDMA	B2, B4, B5	N/A
	LTE	B2, B4, B5, B7, B12(B17)	B7
	5G Sub6_SA	N/A	N/A
	5G Sub6_NSA	N/A	N/A

\*Operating bands are different by software.

## 2. RF Exposure Evaluation

### 2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	≤ 6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	<6
30-300	61.4	0.163	1.0	<6
300-1 500	-	-	f/300	<6
1 500-100 000	-	-	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 <sup>2</sup> )	<30
30-300	27.5	0.073	0.2	<30
<b><u>300-1 500</u></b>	-	-	<b><u>f/1500</u></b>	<b><u>&lt;30</u></b>
<b><u>1 500-100 000</u></b>	-	-	<b><u>1.0</u></b>	<b><u>&lt;30</u></b>

#### 2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where  $P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

R = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

**2.1.2. Test Result of RF Exposure Evaluation**

Test Item : RF Exposure Evaluation Data  
 Test Mode : Normal Operation

**2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance**

**SIM 1**

**GSM 850**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
824 ~ 849	33	1	34	3	25	0.249 270	0.549 333

**GSM 1 900**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 850 ~ 1 910	30	1	31	3.5	25	0.140 175	1

**WCDMA - Band II**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 850 ~ 1 910	24	1.7	25.7	3.5	0.165 474	1

**WCDMA IV**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 710 ~ 1 755	24	1.7	25.7	4.1	0.189 990	1

**WCDMA - Band V**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
824 ~ 849	24	1.7	25.7	3	0.147 479	0.549 333

**LTE Band 2**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 850 ~ 1 910	23	2.7	25.7	3.5	0.165 474	1

**LTE Band 4**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 710 ~ 1 755	23	2.7	25.7	4.1	0.189 990	1

**LTE Band 7**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 500 ~2 570	23	2.7	25.7	4.1	0.189 990	1

**LTE Band 12/17**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
699 ~ 716	23	2.7	25.7	0.1	0.075 636	0.466

**LTE Band 26/5\_Part 22**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
824 ~ 849	23	2.7	25.7	3	0.147 479	0.549 333

**LTE Band 26\_Part 90**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
814 ~ 824	23	2.7	25.7	3	0.147 479	0.542 667



**LTE Band 41**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 496 ~ 2 690	26	2	28	4.1	0.322 649	1

**5G NR Band 41**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 496 ~ 2 690	23	2.7	25.7	4.1	0.189 990	1

**SIM 2**
**GSM 850**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
824 ~ 849	33	1	34	5	25	0.274 352	0.549 333

**GSM 1 900**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 850 ~ 1 910	30	1	31	5	25	0.137 502	1

**LTE Band 2**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 850 ~ 1 910	23	2.7	25.7	5	0.162 318	1

**LTE Band 4**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
1 710 ~ 1 755	23	2.7	25.7	5	0.162 318	1

**LTE Band 7**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 500 ~2 570	23	2.7	25.7	5	0.162 318	1

**LTE Band 26/5\_Part 22**
**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
824 ~ 849	23	2.7	25.7	5	0.162 318	0.549 333

**LTE Band 26\_Part 90**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
814 ~ 824	23	2.7	25.7	5	0.162 318	0.542 667

**LTE Band 41**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 496 ~ 2 690	26	2	28	5	0.275 656	1

**5G NR Band 41**

**- Maximum tune up tolerance**

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Antenna Gain (dB i)	Power Density at 24 cm (mW/cm <sup>2</sup> )	Limits (mW/cm <sup>2</sup> )
2 496 ~ 2 690	23	2.7	25.7	5	0.162 318	1

**Note;**

- The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm distance for the antenna of SIM 1 and 24 cm distance for the antenna of SIM 2 between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dB i and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.
- According to KDB 447498 D01 RF Exposure Guidance 4.1.
- Maximum average target power is the manufacturer's declared rated power.
- Maximum average output power = Maximum average target power (dB m) + Maximum tune up (dB).

**Simultaneous transmission of RF Exposure test exclusion for worst case configuration.**

SIM 1: the ratio is 0.249 270 / 0.549 333  
 SIM 2: the ratio is 0.274 352 / 0.549 333

Confirm the sum result of individual MPEs ratio is ≤ 1.0;  
 SIM 1 + SIM 2: (0.249 270 / 0.549 333) + (0.274 352 / 0.549 333) = 0.953 196 ≤ 1.0

**- End of the Test Report -**