

TEST REPORT

of

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

FCC ID: YZP-GN1000

Equipment Under Test : Telematics Module
Model Name : LTD-GN1000
Variant Model Name(s) : -
Applicant : LG Innotek Co., Ltd.
Manufacturer : LG Innotek Co., Ltd.
Date of Receipt : 2024.01.25
Date of Test(s) : 2024.02.16 ~ 2023.06.25
Date of Issue : 2024.06.28

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

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Tested by:



Dave Kim

Technical
Manager:



Jinyoung Cho

SGS Korea Co., Ltd. Gunpo Laboratory



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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 Innotek Co., Ltd.
Address : 30, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07996
Contact Person : Inchang, Jeong
Phone No. : +82 10 2326-9972

1.3. Details of Manufacturer

Company : Same as applicant
Address : Same as applicant
Factory1 : PT. LG INNOTEK INDONESIA
Factory1 Adress : Bekasi International Industrial Estate, Blok C8 No. 12 & 12A, Desa Cibatu, Cikarang Selatan, Bekasi 17750, Jawa Barat - Indonesia
Factory2 : LG Innotek Co., Ltd.
Factory2 Adress : 26, Hanamsandan 5beon-ro, Gwangsan-gu, Gwangju, Republic of Korea, 62229

1.4. Description of EUT

Kind of Product	Telematics Module	
Model Name	LTD-GN1000	
Serial Number	Conducted: C1 Radiated: R1	
Power Supply	DC 4.00 V	
Rated Power	LTE Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 41, 66, 71: 23 dB m NR Band 2, 5, 7, 12, 13, 14, 25, 26, 41, 66, 71, 77, 78: 23 dB m	
Frequency Range	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 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1 850 MHz ~ 1 915 MHz LTE Band 26: 814 MHz ~ 824 MHz LTE Band 26: 824 MHz ~ 849 MHz LTE Band 41: 2 496 MHz ~ 2 690 MHz LTE Band 66: 1 710 MHz ~ 1 780 MHz LTE Band 71: 663 MHz ~ 698 MHz	NR Band 2: 1 850 MHz ~ 1 910 MHz NR Band 5: 824 MHz ~ 849 MHz NR Band 7: 2 500 MHz ~ 2 570 MHz NR Band 12: 699 MHz ~ 716 MHz NR Band 13: 777 MHz ~ 787 MHz NR Band 14: 788 MHz ~ 798 MHz NR Band 25: 1 850 MHz ~ 1 915 MHz NR Band 26: 814 MHz ~ 824 MHz NR Band 26: 824 MHz ~ 849 MHz NR Band 41: 2 496 MHz ~ 2 690 MHz NR Band 66: 1 710 MHz ~ 1 780 MHz NR Band 71: 663 MHz ~ 698 MHz NR Band 77: 3 450 MHz ~ 3 550 MHz NR Band 77: 3 700 MHz ~ 3 980 MHz NR Band 78: 3 450 MHz ~ 3 550 MHz NR Band 78: 3 700 MHz ~ 3 800 MHz
Modulation Technique	BPSK, QPSK, 16QAM, 64QAM, 256QAM	
Antenna Type	Dipole Antenna	
Antenna Gain*	Refer to the clause 1.5	
H/W Version	A.4	
S/W Version	01L_TCM	

1.5. Antenna Information

Ant. Type	Ant. No	Support Band	
		LTE	NR
Dipole Antenna	Ant.1	2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 41, 66, 71	2, 5, 7, 12, 13, 14, 25, 26, 41, 66, 71
	Ant.2		77, 78

Band	Operating Frequency (MHz)	Antenna Peak Gain (dB i)	
		Ant. 1	Ant. 2
LTE 25/2 NR 25/2	1 850 ~ 1 915	1.90	
LTE 66/4 NR 66	1 710 ~ 1 780	4.20	
LTE 26/5 NR 26/5	824 ~ 849	1.99	
LTE 26 NR 26	814 ~ 824	0.72	
LTE 7 NR 7	2 500 ~ 2 570	4.43	
LTE 12/17 NR 12	699 ~ 716	3.02	
LTE 13 NR 13	777 ~ 787	1.01	
LTE 14 NR 14	788 ~ 798	2.53	
LTE 71 NR 71	663 ~ 698	-0.17	
LTE 41 NR 41	2 496 ~ 2 690	4.43	
NR 77	3 450 ~ 3 550		4.69
	3 700 ~ 3 980		4.90
NR 78	3 450 ~ 3 550		4.69
	3 700 ~ 3 800		4.90

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 1		
Section	Test Item(s)	Result
1.1307(b)(3)	RF Exposure Evaluation	Complied

1.7. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL005203	2024.06.28	Initial

2. RF Exposure Evaluation

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

2.1. Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A).

The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

2.2. MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

**Table 1: THRESHOLDS FOR SINGLE RF SOURCES
 SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION**

RF Source Frequency			Minimum Distance			Threshold ERP
f_L (MHz)		f_H (MHz)	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1 920 R ²
1.34	-	30	35.6 m	-	1.6 m	3 450 R ² /f ²
30	-	300	1.6 m	-	159 mm	3.83 R ²
300	-	1 500	159 mm	-	31.8 mm	0.012 8 R ² f
1 500	-	100 000	31.8 mm	-	0.5 mm	19.2 R ²

Subscripts L and H are low and high; λ is wavelength.
 From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP 20 cm in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B. 1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

2.3. SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).

2.4. Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated_k term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

3. Test Result

3.1. SAR-based Exemption

Mode	Frequency Range (MHz)	Minimum Separation Distance (cm)	Maximum Average Target Power (dB m)	Maximum Tune up	Maximum Average Power		Worst Antenna Gain (dB i)	ERP (mW)		Limits P _{th} (mW)	Ratio ¹⁾	Result
				(dB)	(dB m)	(mW)		(dB m)	(mW)			
LTE Band 25/2	1 850 ~ 1 915	20	23.00	2.70	25.70	371.54	1.90	25.45	350.75	3 060.00	0.12	Pass
LTE Band 66/4	1 710 ~ 1 780	20	23.00	2.70	25.70	371.54	4.20	27.75	595.66	3 060.00	0.19	Pass
LTE Band 26/5 Part 22	824 ~ 849	20	23.00	2.70	25.70	371.54	1.99	25.54	358.10	1 680.96	0.22	Pass
LTE Band 26 Part 90	814 ~ 824	20	23.00	2.70	25.70	371.54	0.72	24.27	267.30	1 660.56	0.22	Pass
LTE Band 7	2 500 ~ 2 570	20	23.00	2.70	25.70	371.54	4.43	27.98	628.06	3 060.00	0.21	Pass
LTE Band 12/17	699 ~ 716	20	23.00	1.50	24.50	281.84	3.02	25.37	344.35	1 425.96	0.24	Pass
LTE Band 13	777 ~ 787	20	23.00	2.70	25.70	371.54	1.01	24.56	285.76	1 585.08	0.23	Pass
LTE Band 14	788 ~ 798	20	23.00	2.70	25.70	371.54	2.53	26.08	405.51	1 607.52	0.25	Pass
LTE Band 41	2 496 ~ 2 690	20	23.00	2.70	25.70	371.54	4.43	27.98	628.06	3 060.00	0.21	Pass
LTE Band 71	663 ~ 698	20	23.00	2.70	25.70	371.54	-0.17	23.38	217.77	1 352.52	0.27	Pass
5G NR Band 25/2	1 850 ~ 1 915	20	23.00	2.00	25.00	316.23	1.90	24.75	298.54	3 060.00	0.10	Pass
5G NR Band 26/5 Part 22	824 ~ 849	20	23.00	2.00	25.00	316.23	1.99	24.84	304.79	1 680.96	0.19	Pass
5G NR Band 26 Part 90	814 ~ 824	20	23.00	2.00	25.00	316.23	0.72	23.57	227.51	1 660.56	0.19	Pass
5G NR Band 7	2 500 ~ 2 570	20	23.00	2.00	25.00	316.23	4.43	27.28	534.56	3 060.00	0.17	Pass
5G NR Band 12	699 ~ 716	20	23.00	2.00	25.00	316.23	3.02	25.87	386.37	1 425.96	0.27	Pass
5G NR Band 13	777 ~ 787	20	23.00	2.00	25.00	316.23	1.01	23.86	243.22	1 585.08	0.20	Pass
5G NR Band 14	788 ~ 798	20	23.00	2.00	25.00	316.23	2.53	25.38	345.14	1 607.52	0.21	Pass
5G NR Band 41	2 496 ~ 2 690	20	23.00	2.00	25.00	316.23	4.43	27.28	534.56	3 060.00	0.17	Pass
5G NR Band 66	1 710 ~ 1 780	20	23.00	2.00	25.00	316.23	4.20	27.05	506.99	3 060.00	0.17	Pass
5G NR Band 71	663 ~ 698	20	23.00	2.00	25.00	316.23	-0.17	22.68	185.35	1 352.52	0.23	Pass
5G NR Band 77/78	3 450 ~ 3 550	20	23.00	2.00	25.00	316.23	4.69	27.54	567.54	3 060.00	0.19	Pass
5G NR Band 77/78	3 700 ~ 3 980	20	23.00	2.00	25.00	316.23	4.90	27.75	595.66	3 060.00	0.19	Pass

Note;

- 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).
- ERP (dB m) = Maximum average power (dB m) + Antenna gain (dB i) - 2.15 (dB)

1) A greater value between the ERP(dB m) and the Maximum average output power(dB m) is applied.

3.2. Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

Mode	Band	P_i/P_{th} Ratio Mode A	P_i/P_{th} Ratio Mode B	$\Sigma P_i/P_{th}$ Ratio Mode A+B	Result
LTE Inter band CA	2A-5A 2A-12A 2A-13A 2A-14A 2A-17A 2A-71A	0.12	0.27	0.39	Pass
	4A-5A 4A-12A 4A-13A 4A-17A 4A-71A	0.19	0.27	0.46	Pass
	5A-7A 5A-25A 5A-66A	0.22	0.21	0.43	Pass
	7A-12A	0.21	0.24	0.45	Pass
	12A-25A 12A-66A	0.24	0.19	0.43	Pass
	13A-66A	0.23	0.19	0.42	Pass
	14A-66A	0.25	0.19	0.44	Pass
	25A-26A	0.12	0.22	0.34	Pass
LTE Intra Band CA	5B	0.22	0.22	0.44	Pass
	7C	0.21	0.21	0.42	Pass
	12B	0.24	0.24	0.48	Pass
	41C	0.21	0.21	0.42	Pass
	66B, 66C	0.19	0.19	0.38	Pass
NR EN-DC	NR 2 LTE 5, 12, 13, 14, 71	0.10	0.27	0.37	Pass
	NR 5 LTE 2, 7, 66	0.19	0.21	0.40	Pass
	NR 66 LTE 5, 12, 13, 14, 71	0.17	0.27	0.44	Pass
	NR 71 LTE 2, 66	0.23	0.19	0.42	Pass
	NR 41 LTE 26	0.17	0.22	0.39	Pass
	NR 77 LTE 2, 5, 13, 41, 66	0.19	0.23	0.42	Pass
	NR 78 LTE 2, 5, 7, 12, 26, 41, 66	0.19	0.24	0.43	Pass

Mode	Band	P_i/P_{th} Ratio Mode A	P_i/P_{th} Ratio Mode B	$\Sigma P_i/P_{th}$ Ratio Mode A+B	Result
NR Inter band CA	n2A-n14A n2A-n77A	0.10	0.21	0.31	Pass
	n5A-n7A n5A-n66A n5A-n77A n5A-n78A	0.19	0.19	0.38	Pass
	n7A-n78A	0.17	0.19	0.36	Pass
	n14A-n66A n14A-n77A	0.21	0.19	0.40	Pass
	n26A-n66A	0.19	0.17	0.36	Pass
	n41A-n71A	0.17	0.23	0.40	Pass
	n66A-n71A n66A-n77A	0.17	0.23	0.40	Pass
	n71A-n77A	0.23	0.19	0.42	Pass

Note;

- Total power of simultaneous mode (Intra, CA, Inter CA, and EN-DC) not exceed single mode output power.
- In case of EN-DC mode, only one combination was reported as worst case.

Conclusion: No SAR is required.

- End of the Test Report -