FCC SAR TEST REPORT

Test File No : F690501-RF-SAR000494

Equipment Under Test	Telematics
Model Name	TM16FNROBM0
Applicant	LG Electronics USA, Inc.
Address of Applicant	111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632
FCC ID	BEJTM16FNROBM0
Exposure Category	General Population/Uncontrolled Exposure
Standards	FCC 47 CFR Part 2 (2.1093) IEEE 1528, 2013
Receipt No.	GPRI2405000563SR
Date of Receipt	2024-05-27
Date of Test(s)	2024-07-24 ~2024-08-19
Date of Issue	2024-08-28
Test Result	Refer to the Page 07

In the configuration tested, the EUT complied with the standards specified above.

This test report does not assure KOLAS accreditation.

Remarks:

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Report prepared by /
Jayden Jung
Test Engineer

Approved by /
Minhyuk Han
Technical Manager

Revision history

Revision	Date of issue	Revisions	Revised By
-	Aug 28, 2024	Initial issue	

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1 Testing Laboratory

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2 Details of Applicant

Applicant	LG Electronics USA, Inc.
Address	111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632
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3 Details of Manufacturer

Applicant	LG Electronics Inc.
Address	128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea, 07336

4 Description of EUT(s)

EUT Type	Telematics
Model Name	TM16FNROBM0
Software Version	IN25XA03
Hardware Version	Rev.D
Serial Number	004400152020000

Mode of Operation	GSM850 / GSM1900 / WCDMA II / WCDMA IV / WCDMA V / LTE Band 2 / LTE Band 4 / LTE Band 5 / LTE Band 7 / LTE Band 12 / LTE Band 17 / LTE Band 18 / LTE Band 19 / LTE Band 25 / LTE Band 26 / LTE Band 38 / LTE Band 41 / 5G NR n7 / 5G NR n41 / 5G NR n77 / 5G NR n78
Tx Frequency Range	GSM 850 : 824.0 ~ 850.0 MHz GSM 1900 : 1850.0 ~ 1910.0 MHz WCDMA II : 1850.0 ~ 1910.0 MHz WCDMA IV : 1710.0 ~ 1755.0 MHz WCDMA V : 824.0 ~ 849.0 MHz LTE Band 2 : 1850.0 ~ 1910.0 MHz LTE Band 4 : 1710.0 ~ 1755.0 MHz LTE Band 5 : 824.0 ~ 849.0 MHz LTE Band 7 : 2500.0 ~ 2570.0 MHz LTE Band 12 : 699.0 ~ 716.0 MHz LTE Badn 17 : 704.0 ~ 716.0 MHz LTE Badn 18 : 815.0 ~ 830.0 MHz LTE Badn 19 : 860.0 ~ 875.0 MHz LTE Band 25 : 1850 ~ 1915.0 MHz LTE Band 26 : 814.0 ~ 849.0 MHz LTE Band 38 : 2572.0 ~ 2618.0 MHz LTE Band 41 : 2496.0 ~ 2690.0 MHz 5G NR n7 : 2500.0 ~ 2570.0 MHz 5G NR n41 : 2496.0 ~ 2690.0 MHz 5G NR n77 DoD : 3450.0 ~ 3550.0 MHz 5G NR n77 : 3700.0 ~ 3980.0 MHz 5G NR n78 DoD : 3450.0 ~ 3550.0 MHz 5G NR n78 : 3700.0 ~ 3800.0 MHz

5 The Highest Reported SAR Values

Equipment Class	Band	Highest Reported SAR 1g (W/kg)
PCE	GSM 850 Ant1	0.034
PCE	GSM 850 Ant3	0.022
PCE	GPRS 850 Ant1	0.062
PCE	GPRS 850 Ant3	0.051
PCE	GSM 1900 Ant1	0.064
PCE	GSM 1900 Ant3	0.057
PCE	GPRS 1900 Ant1	0.101
PCE	GPRS 1900 Ant3	0.095
PCE	WCDMA II Ant1	**0.208**
PCE	WCDMA II Ant3	0.087
PCE	WCDMA IV Ant1	0.166
PCE	WCDMA IV Ant3	0.166
PCE	WCDMA V Ant1	0.052
PCE	WCDMA V Ant3	0.042
PCE	LTE Band 4 Ant1	0.143
PCE	LTE Band 4 Ant3	0.120
PCE	LTE Band 7 Ant1	0.049
PCE	LTE Band 7 Ant3	0.029
PCE	LTE Band 12 Ant1	0.025
PCE	LTE Band 12 Ant3	0.016
PCE	LTE Band 25 Ant1	0.178
PCE	LTE Band 25 Ant3	0.067
PCE	LTE Band 26 Ant1	0.047
PCE	LTE Band 26 Ant3	0.039
PCE	LTE Band 41 Ant1	0.018
PCE	LTE Band 41 Ant3	0.029
PCE	5G NR n7 Ant1	0.047
PCE	5G NR n7 Ant3	0.052
PCE	5G NR n41 Ant1	0.036
PCE	5G NR n41 Ant3	0.059
PCE	5G NR n77 Ant1	0.082
PCE	5G NR n77 Ant2	0.069
PCE	5G NR n77 Ant3	0.061
PCE	5G NR n77 DoD Ant1	0.050
PCE	5G NR n77 DoD Ant2	0.018
PCE	5G NR n77 DoD Ant3	0.027
Simultaneous SAR per KDB 690783 D01v01r03 :		0.100

6 Test Methodology

ANSI/IEEE C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

Test tests documented in this report were performed in accordance with IEEE Standard 1528-2013 and the following published KDB procedures.

In additions;

☒	**KDB 865664 D01v01r04**	**SAR Measurement Requirements for 100 MHz to 6 GHz**
☒	**KDB 865664 D02v01r02**	**RF Exposure Compliance Reporting and Documentation Considerations**
☐	KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
☒	**KDB 447498 D04v01**	**Interim General RF Exposure Guidance**
☐	KDB 447498 D02v02r01	SAR Measurement Procedures for USB Dongle Transmitters
☐	KDB 248227 D01v02r02	SAR Guidance For IEEE 802.11 (Wi-Fi) Transmitters
☐	KDB 615223 D01v01r01	802.16e/WiMax SAR Measurement Guidance
☐	KDB 616217 D04v01r02	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
☐	KDB 643646 D01v01r03	SAR Test Considerations for Occupational PTT Radios
☐	KDB 648474 D03v01r04	Evaluation and Approval Considerations for Handsets with Specific Wireless Charging Battery Covers
☐	KDB 648474 D04v01r03	SAR Evaluation Considerations for Wireless Handsets
☐	KDB 680106 D01v03r01	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications
☒	**KDB 941225 D01v03r01**	**3G SAR Measurement Procedures**
☒	**KDB 941225 D05v02r05**	**SAR Evaluation Considerations for LTE Devices**
☐	KDB 941225 D06v02r01	SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities
☐	KDB 941225 D07v01r02	SAR Evaluation Procedures for UMPC Mini-Tablet Devices

7 Testing Environment

Ambient temperature	: 18°C ~ 25°C
Relative humidity	: 30% ~ 70%
Liquid temperature of during the test	: <± 2°C
Ambient noise & Reflection	: < 0.012 W/kg

8 Specific Absorption Rate (SAR)

8.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled

8.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

8.3 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 ㎑ to 300 ㎓," ANSI/IEEE C95.3–2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified

in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 ㎑ to 6 ㎓. Portable devices that transmit at frequencies above 6 ㎓ are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 ㎓ should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Partial Peak SAR (Partial)	1.60 mW/g	8.00 mW/g
Partial Average SAR (Whole Body)	0.08 mW/g	0.40 mW/g
Partial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

1. The spatial Peak value of the SAR averaged over any 1g gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

9 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. 1. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli TX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimeter probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- Data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

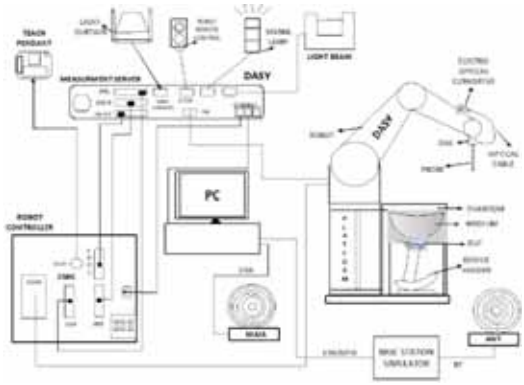


Fig a. The microwave circuit arrangement used for SAR system verification

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows.
- DASY software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Verification dipole kits allowing to validate the proper functioning of the system.

10 System Components

10.1 Probe

Construction	:	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	:	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835 and HSL1900. Additional CF-Calibration for other liquids and frequencies upon request.
Frequency	:	10 ㎒ to 6 ㎓; Linearity: ± 0.2 ㏈ (30 ㎒ to 6 ㎓)
Directivity	:	± 0.3 ㏈ in HSL (rotation around probe axis) ± 0.5 ㏈ in tissue material (rotation normal to probe axis)
Dynamic Range	:	10μW/g to > 100 m W/g; Linearity: ± 0.2 ㏈(noise: typically < 1 μW/g)
Dimensions	:	Overall length: 337 ㎜ (Tip length: 20 ㎜) Tip diameter: 2.5 ㎜ (Body diameter: 12 ㎜) Distance from probe tip to dipole centers: 1 ㎜
Application	:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 ㎓ with precision of better 30%

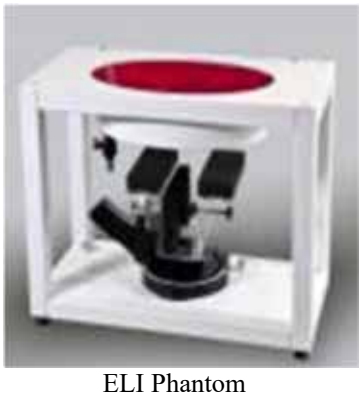

EX3DV4 E-Field Probe

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX C” for the Calibration Certification Report.

10.2 ELI Phantom

Construction	:	Phantom for compliance testing of handheld and bodymounted wireless devices in the frequency range of 30 ㎒ to 6 ㎓. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure
Shell Thickness	:	2.0 ㎜ ± 0.1 ㎜
Dimensions	:	Major axis : 600 ㎜ Minor axis : 400 ㎜


ELI Phantom

10.3 Device Holder

Construction: : In combination with the Twin SAM PhantomV4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Device Holder

11 SAR Measurement Procedures

11.1 Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4 ㎜. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2 and 3: Area Scan & Zoom Scan Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1 g and 10 g.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. SAR drift shall be kept within ± 5 % and if it without ± 5 %, SAR retest according to measurement procedure step 1~4.

< Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04 >

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	½·δ·ln(2) mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

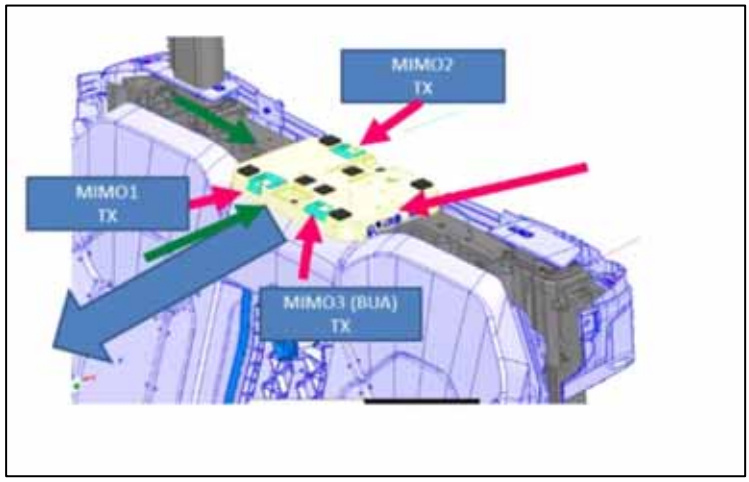
* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

12 Definition of Reference※

12.1 Other consumer electronic devices

The exposure conditions of transmitters and modules incorporated in certain consumer electronic devices, such as printers, cameras, and camcorders may vary according to the installation and operating configurations required by the host products. Details of the transmitter and antenna configurations, antenna to user test separation distance, device operating configurations, etc., are required to determine SAR test exclusion or SAR measurement requirements for each host product. When SAR tests are required, a KDB inquiry is recommended to confirm the test setup. Unless the transmitter is used in a specific/dedicated host device, the standalone and simultaneous transmission SAR procedures for transmitters and modules should be applied. These must be fully explained in the permissive change documentation or equipment approval filing, whichever is applicable.

“ Intended use distance” specified by the manufacturer: When there is no regulatory requirement, the intended use condition or distance specified by the manufacturer shall be used. This information shall be acquired from the user documentation accompanying the DUT. This device is mounted on the vehicle, and the physical distance from the device is 45mm. By manufacturer declaration, the test distance is 45mm. Testing of all six faces of the DUT might not be required; justification shall be provided when omitting testing of some faces. The SAR was tested only in two positions, the Front and Right Edge



- The data marked ※ in this report was provided by the customer and may affect the validity of the test results.

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

13 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig 1. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 750 / 835 / 1750 / 1900 / 2600 / 3500 / 3900 ㎒. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1. (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was in the range (22 ± 2) ° C, the relative humidity was in the range (55 ± 5) % R.H and the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz)in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

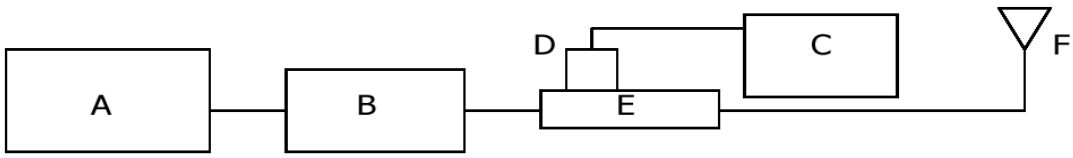


Fig 1. The microwave circuit arrangement used for SAR system verification

A. Signal Generator
B. RF Amplifier
C. Power Meter
D. Power Sensor
E. Dual Directional Coupler
F. Reference dipole Antenna

Photo of the dipole Antenna

SAR System Verification

Dipole Validation Kits		Probe S/N	Freq. (MHz)	Input Power (W)	Target SAR values (W/Kg)	1 W normalized Measured SAR (W/Kg)	SAR Deviation (%)	Date	Temperature (°C)	
Model	S/N				1g	1g	1g		Ambient	Liquid
D750V3	1085	3986	750	0.10	8.49	8.67	2.12	2024-07-29	21.9	21.6
D750V3	1085	3986	750	0.10	8.49	8.30	-2.24	2024-08-01	21.8	21.5
D835V2	490	3986	835	0.10	9.64	9.27	-3.84	2024-07-26	22.0	21.8
D835V2	490	3986	835	0.10	9.64	9.88	2.49	2024-07-30	21.8	21.7
D835V2	490	3986	835	0.10	9.64	9.22	-4.36	2024-07-31	21.9	21.7
D835V2	490	3986	835	0.10	9.64	9.87	2.39	2024-08-01	21.8	21.5
D1750V2	1116	3986	1750	0.10	35.50	36.20	1.97	2024-07-24	21.9	21.7
D1750V2	1116	3986	1750	0.10	35.50	38.20	7.61	2024-07-25	21.7	21.5
D1750V2	1116	3986	1750	0.10	35.50	38.30	7.89	2024-08-02	21.9	21.6
D1900V2	5d033	3986	1900	0.10	40.60	38.10	-6.16	2024-07-24	21.9	21.7
D1900V2	5d033	3986	1900	0.10	40.60	38.00	-6.40	2024-07-29	21.9	21.6
D1900V2	5d033	3986	1900	0.10	40.60	40.60	0.00	2024-07-30	21.8	21.7
D1900V2	5d033	3986	1900	0.10	40.60	39.20	-3.45	2024-07-31	21.9	21.7
D1900V2	5d033	3986	1900	0.10	40.60	39.90	-1.72	2024-08-01	21.8	21.5
D2600V2	1038	3986	2600	0.10	55.70	55.40	-0.54	2024-07-25	21.7	21.5
D2600V2	1038	3986	2600	0.10	55.70	53.40	-4.13	2024-07-26	22.0	21.8
D2600V2	1038	3986	2600	0.10	55.70	55.70	0.00	2024-08-05	22.2	21.9
D2600V2	1038	3986	2600	0.10	55.70	54.10	-2.87	2024-08-06	22.4	21.8
D2600V2	1038	3986	2600	0.10	55.70	56.70	1.80	2024-08-07	22.4	21.7
D2600V2	1038	3986	2600	0.10	55.70	56.50	1.44	2024-08-08	22.3	22.0
D3500V2	1058	3986	3500	0.10	65.30	62.60	-4.13	2024-08-16	21.9	21.8
D3500V2	1058	3986	3500	0.10	65.30	62.60	-4.13	2024-08-19	21.8	21.5
D3900V2	1036	3986	3900	0.10	68.00	66.80	-1.76	2024-08-08	22.3	22.0
D3900V2	1036	3986	3900	0.10	68.00	69.70	2.50	2024-08-09	22.1	21.8
D3900V2	1036	3986	3900	0.10	68.00	64.60	-5.00	2024-08-14	22.2	21.8

Table 1 Results system verification

14 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Speag Model DAK-3.5 in conjunction with Keysight E5063A Network Analyzer by using a procedure.

Freq. (MHz)	Target Value		Measure Value		Deviation (%)		Date	Liquid Temperature (°C)
	Permitivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)		
750*	41.90	0.89	41.152	0.887	-1.79	-0.34	2024-07-29	21.6
707.50	41.90	0.89	41.457	0.870	-1.06	-2.25		
750*	41.90	0.89	41.084	0.898	-1.95	0.90	2024-08-01	21.5
707.50	41.90	0.89	41.427	0.879	-1.13	-1.24		
835*	41.50	0.90	40.739	0.908	-1.83	0.89	2024-07-26	21.8
831.50	41.50	0.90	40.767	0.907	-1.77	0.78		
836.60	41.50	0.90	40.723	0.908	-1.87	0.89		
835*	41.50	0.90	40.570	0.907	-2.24	0.78	2024-07-30	21.7
836.60	41.50	0.90	40.556	0.907	-2.27	0.78		
835*	41.50	0.90	40.870	0.904	-1.52	0.44	2024-07-31	21.7
831.50	41.50	0.90	40.893	0.903	-1.46	0.33		
836.60	41.50	0.90	40.855	0.905	-1.55	0.56		
835*	41.50	0.90	40.001	0.925	-3.61	2.78	2024-08-01	21.5
831.50	41.50	0.90	40.020	0.924	-3.57	2.67		
836.60	41.50	0.90	39.990	0.925	-3.64	2.78		
1750*	40.07	1.37	40.559	1.360	1.22	-0.73	2024-07-24	21.7
1732.50	40.07	1.37	40.565	1.347	1.24	-1.68		
1750*	40.07	1.37	40.284	1.400	0.53	2.19	2024-07-25	21.5
1732.50	40.07	1.37	40.311	1.385	0.60	1.09		
1732.60	40.07	1.37	40.311	1.385	0.60	1.09		
1750*	40.07	1.37	39.463	1.418	-1.51	3.50	2024-08-02	21.6
1732.50	40.07	1.37	39.484	1.414	-1.46	3.21		
1732.60	40.07	1.37	39.484	1.414	-1.46	3.21		
1900*	40.00	1.40	40.413	1.445	1.03	3.21	2024-07-24	21.7
1882.50	40.00	1.40	40.392	1.438	0.98	2.71		
1900*	40.00	1.40	40.413	1.445	1.03	3.21	2024-07-29	21.6
1880.00	40.00	1.40	38.851	1.448	-2.87	3.43		
1900*	40.00	1.40	38.723	1.460	-3.19	4.29	2024-07-30	21.7
1880.00	40.00	1.40	38.706	1.450	-3.23	3.57		
1900*	40.00	1.40	38.491	1.450	-3.77	3.57	2024-07-31	21.7
1880.00	40.00	1.40	38.454	1.440	-3.87	2.86		
1900*	40.00	1.40	38.862	1.456	-2.85	4.00	2024-08-01	21.5
1880.00	40.00	1.40	38.802	1.447	-3.00	3.36		
1882.50	40.00	1.40	38.812	1.449	-2.97	3.50		
2600*	39.00	1.96	38.792	1.971	-0.53	0.56	2024-07-25	21.5
2535.00	39.00	1.96	38.897	1.912	-0.26	-2.45		
2593.00	39.00	1.96	38.800	1.962	-0.51	0.10		
2600*	39.00	1.96	38.236	1.968	-1.96	0.41	2024-07-26	21.8
2535.00	39.00	1.96	38.303	1.909	-1.79	-2.60		
2593.00	39.00	1.96	38.239	1.960	-1.95	0.00		
2600*	39.00	1.96	38.009	1.965	-2.54	0.26	2024-08-05	21.9
2535.00	39.00	1.96	38.125	1.904	-2.24	-2.86		
2593.00	39.00	1.96	38.017	1.956	-2.52	-0.20		
2600*	39.00	1.96	38.969	1.953	-0.08	-0.36	2024-08-06	21.8
2535.00	39.00	1.96	39.099	1.898	0.25	-3.16		
2600*	39.00	1.96	40.149	1.997	2.95	1.89	2024-08-07	21.7
2592.99	39.00	1.96	40.158	1.988	2.97	1.43		
2600*	39.00	1.96	39.482	1.964	1.24	0.20	2024-08-08	22.0
2592.99	39.00	1.96	39.497	1.955	1.27	-0.26		

Freq. (MHz)	Target Value		Measure Value		Deviation (%)		Date	Liquid Temperature (°C)
	Permitivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)	Permittivity	Conductivity (S/m)		
3500*	37.90	2.91	38.284	2.896	1.01	-0.48	2024-08-16	21.8
3500.01	37.90	2.91	38.284	2.896	1.01	-0.48		
3500*	37.90	2.91	39.540	2.818	4.33	-3.16	2024-08-19	21.5
3500.01	37.90	2.91	39.540	2.818	4.33	-3.16		
3900*	37.50	3.33	38.673	3.266	3.13	-1.92	2024-08-08	22.0
3840.00	37.50	3.33	38.806	3.212	3.48	-3.54		
3900*	37.50	3.33	38.704	3.259	3.21	-2.13	2024-08-09	21.8
3840.00	37.50	3.33	38.842	3.206	3.58	-3.72		
3900*	37.50	3.33	38.082	3.279	1.55	-1.53	2024-08-14	21.8
3840.00	37.50	3.33	38.485	3.204	2.63	-3.78		

Note: The data marked (*) in this table was Permittivity/Conductivity results of Verification

The brain mixtures consist of a viscous gel using hydroxethlcellullose(HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation. The dielectric properties of the liquid material required to fill the phantom shell shall be target. For 3.4 to 10.0 GHz, the tests were done with using stimulating liquid made by SPEAG.

Frequency (㎒)	**450**	**835**	**900**	**1800-2000**	**2450**	**2600**
Tissue Type	**Body**					
Ingredient (% by weight)						
Water	38.91	40.29	40.29	55.24	45.0	45.0
Salt (NaCl)	3.79	1.38	1.38	0.31	0	0
Sugar	56.93	57.90	57.90	0	0	0
HEC	0.25	0.24	0.24	0	0	0
Bactericide	0.12	0.18	0.18	0	0	0
Triton X-100	0	0	0	0	0	0
DGBE	0	0	0	44.45	55.0	55.0
Tissue parameter target by IEEE 1528-2013						
Dielectric Constant	43.5	41.5	41.5	40.0	39.2	39.0
Conductivity (S/m)	0.87	0.90	0.97	1.40	1.80	1.96
Salt: 99+% Pure Sodium Chloride Water: De-ionized, 16 M + resistivity				Sucrose: 98+% Pure Sucrose HEC: Hydroxyethyl Cellulose		
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]						

15 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20 % of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB publication 865664 D01V01r04:

750V3_Head (SN : 1085)				
750 MHz				
Measurement Date	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ
2024-02-28	-28.20	1.08	51.77	1.63

1750V3_Head (SN : 1116)				
1750 MHz				
Measurement Date	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ
2024-04-29	-33.07	-6.79	48.34	3.04

2600V2_Head (SN : 1038)				
2600 MHz				
Measurement Date	Return Loss (dB)	Δ%	Impedance (Ω)	ΔΩ
2024-04-23	-30.04	1.30	48.70	1.41

16 Instruments List

Test Platform	SPEAG DASY System				
Manufacture	SPEAG				
Description	SAR Test System				
Software Reference	DASY52: 52.10.4(1527) SEMCAD X: 14.6.14(7483)				
Equipment	**Type**	**Serial Number**	**Cal Date**	**Cal Interval**	**Cal Due**
Phantom	ELI Phantom	TP-1244	N/A	N/A	N/A
Verification Dipole	D750V3	1085	2023-03-21	Biennial	2025-03-21
Verification Dipole	D835V2	490	2024-06-07	Biennial	2026-06-07
Verification Dipole	D1750V2	1116	2023-07-12	Biennial	2025-07-12
Verification Dipole	D1900V2	5d033	2024-06-13	Biennial	2026-06-13
Verification Dipole	D2600V2	1038	2023-06-16	Biennial	2025-06-16
Verification Dipole	D3500V2	1058	2023-09-28	Biennial	2025-09-28
Verification Dipole	D3900V2	1036	2023-09-27	Biennial	2025-09-27
Calibration of Dielectric Parameter Probes	DAK-3.5	1107	2024-05-21	Annual	2025-05-21
DAE	DAE4	1507	2023-09-20	Annual	2024-09-20
E-Field Probe	EX3DV4	3986	2024-01-24	Annual	2025-01-24
Network Analyzer	E5063A	MY54706220	2024-01-10	Annual	2025-01-10
Power Meter	N1914A	MY56120017	2024-06-09	Annual	2025-06-09
Power Meter	E4416A	GB41291455	2024-06-29	Annual	2025-06-29
Power Sensor	E9300H	MY41495307	2024-04-17	Annual	2025-04-17
Power Sensor	E9300H	MY41495314	2024-04-17	Annual	2025-04-17
Power Sensor	N8481A	MY56120026	2023-12-01	Annual	2024-12-01
Power Sensor	N8481A	MY56120030	2024-02-19	Annual	2025-02-19
Vector Signal Generator	E4438C	MY44270498	2024-02-08	Annual	2025-02-08
Signal Generator	E4421B	MY43350132	2024-02-08	Annual	2025-02-08
Vector Signal Generator	E4438C	MY44270498	2024-02-08	Annual	2025-02-08
RF Amplifier	AMP2027	10008	2024-03-07	Annual	2025-03-07
Dual Directional Coupler	772D	MY52180226	2024-03-05	Annual	2025-03-05
Dual Directional Coupler	778D	MY52180497	2024-03-07	Annual	2025-03-07
LP Filter	LA-15N	LF02	2024-03-05	Annual	2025-03-05
LP Filter	LA-30N	LF03	2024-03-05	Annual	2025-03-05
LP Filter	LA-60N	LF04	2024-03-05	Annual	2025-03-05
Digital Thermometer	SDT25	19041500179	2023-09-01	Annual	2024-09-01
Hygro-Thermometer	303C	210609816	2024-01-30	Annual	2025-01-30
Communication Tester	MT8820C	6201074216	2023-11-27	Annual	2024-11-27
Communication Tester	MT8821C	6262044721	2023-12-07	Annual	2024-12-07
Radio Communication Test Station	MT8000A	6261906013	2023-09-20	Annual	2024-09-20
Wideband Radio Communication Tester	CMW500	144031	2024-02-19	Annual	2025-02-19
Spectrum Analyzer	FSP	100007	2023-12-01	Annual	2024-12-01
Attenuator	05AS102-K03	A1	2023-12-01	Annual	2024-12-01
Attenuator	05AS102-K20	A4	2023-12-01	Annual	2024-12-01
Attenuator	RFHB1210NC2	4	2024-04-17	Annual	2025-04-17

17 FCC Power Measurement Procedures

The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5 % occurred, the tests were repeated.

18 Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

19 5G NR FR1※

19.1 5G NR FR1 Test Application

This device supports 5G NR FR1 Band n7, n41 and n77 is declared by the manufacturer used to configuration for frequency, SCS, Bandwidth, Target power, and etc. The RB Configuration was evaluated all using reference to SCS / Bandwidth / Modulation supported by Section 6.1-1 of TS38.521-1.

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to MPR is 3GPP TS38.101-1 Section 6.2.2.

NR test was evaluated under Maximum power in NR single mode. In NR standalone mode, NR power states in the highest power, and the SAR measurement is determined by measuring LTE and 5G NR respectively.

5G NR Band	Mode	SCS (kHz)	Bandwidth (MHz)	Waveform	UL Modulation	RB Configuration	EN-DC (LTE Band)
n7	SA	15	5, 10, 15, 20	DFT-s-OFDM / CP OFDM	PI/2 BPSK QPSK 16QAM 64QAM 256QAM	Inner 1RB left Inner 1RB Right Inner Full Outer Full Edge 1RB Left Edge Full Left Edge 1RB Right Edge Full Right	-
n41	SA	30	20, 30, 40, 50, 60, 70, 80, 90, 100				-
n77	NSA/SA	30	20, 30, 40, 50, 60, 70, 80, 90, 100				41

- The data marked ※ in this report was provided by the customer and may affect the validity of the test results.

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

20 Maximum Output Power Specifications

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01

GSM Maximum Power

Band	Maximum/ Normal	Maximum Output Power (dBm)								
		GSM Voice	GPRS				EGPRS			
			1Tx	2Tx	3Tx	4Tx	1Tx	2Tx	3Tx	4Tx
GSM 850	**Maximum**	**34.50**	**34.50**	**34.50**			**29.00**	**29.00**		
	Normal	33.00	33.00	33.00			27.00	27.00		
GSM 1900	**Maximum**	**30.00**	**30.00**	**30.00**			**28.00**	**28.00**		
	Normal	29.00	29.00	29.00			26.00	26.00		

WCDMA Maximum Power

Mode	Maximum/Normal	Maximum / Normal Output Power (dBm)			
		3GPP WCDMA AMR / RMC	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
WCDMA II	**Maximum**	**25.00**	**25.00**	**25.00**	**25.00**
	Normal	24.00	24.00	24.00	24.00
WCDMA IV	**Maximum**	**25.00**	**25.00**	**25.00**	**25.00**
	Normal	24.00	24.00	24.00	24.00
WCDMA V	**Maximum**	**25.00**	**25.00**	**25.00**	**25.00**
	Normal	24.00	24.00	24.00	24.00

LTE Maximum Power

Mode	Maximum / Normal	Maximum / Normal Output Power (dBm)
LTE Band 2	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 4	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 5	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 7	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 12	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 17	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 18	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 19	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 25	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 26	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 38	**Maximum**	**25.00**
	Nominal	23.00
LTE Band 41	**Maximum**	**25.00**
	Nominal	23.00

5G NR Maximum Power

Mode	Maximum / Normal	Maximum / Normal Output Power (dBm)
5G NR n7	**Maximum**	**25.00**
	Normal	23.00
5G NR n41	**Maximum**	**25.00**
	Normal	23.00
5G NR n77	**Maximum**	**25.00**
	Normal	23.00
5G NR n77 DoD	**Maximum**	**25.00**
	Normal	23.00
5G NR n78	**Maximum**	**25.00**
	Normal	23.00
5G NR n78 DoD	**Maximum**	**25.00**
	Normal	23.00

21 RF Conducted Power Measurement

21.1 WCDMA

21.1.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

21.1.2 Output Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s".

21.1.3 Procedures Used to Establish RF Signal for SAR HSDPA Data Devices

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

Sub-Test 1 Setup for Release 5 HSDPA

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

21.1.4 SAR Measurements for Conditions for HSUPA Data Devices

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.1 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurement should be used to test for head exposure.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}[1]	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM[2] (dB)	MPR (dB)	AG[4] Index	E-TFCI
1	11/15[3]	15/15[3]	64	11/15[3]	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15[4]	15/15[4]	64	15/15[4]	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

21.2 LTE

21.2.1 SAR measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02r05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluation SAR. Anritsu MT8821C was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

21.2.2 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

21.2.3 MPR

MPR is permanently implemented for this device by the manufacture. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3.-1

21.2.4 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

21.2.5 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05V02r05

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
   i. The required channel and offset combination with the highest maximum output power is required for SAR.
   ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel
   iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.

b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.

c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.

d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Section 5.2.1, through 5.2.3 is less than or equal to 1/2 dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.

21.2.6 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05V02r04.

TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

21.2.7 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB 941225 D05Av01r02. The RRC connection is only handle by one cell, the primary component carrier(PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation and RB combinations in each frequency band. Per FCC KDB 941125 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

21.2.8 5G NR

According to October 2020 TCB Workshop Guidance, NR FR1 SAR evaluations are being generally based on adapting the existing LTE SAR procedures (FCC KDB 941225 D05V02r05). Therefore, NR SAR for the lower bandwidths was not required for testing based on the measured output power and the reported NR SAR for the highest bandwidth.

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS38.521-1 specification.

The allowed Maximum Power Reduction(MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS38.521-1.

The allowed A-MPR values specified Table 6.2.3.3.1-1 of 3GPP TS38.521-1 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01"

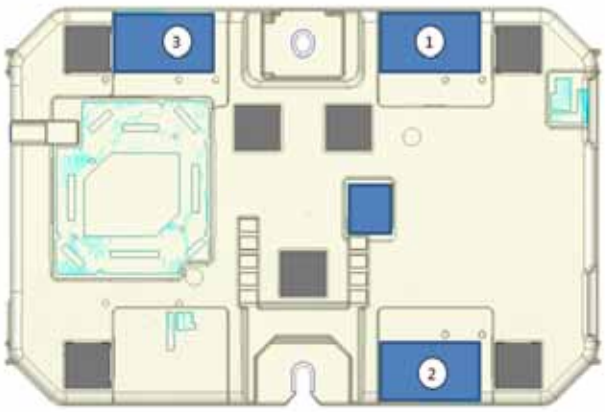
Uplink RB allocations were used to Table 6.1-1 of the 3GPP TS38.521-1.

22 RF Conducted Power

- Refer to Appendix E.

23 DUT Antenna Locations※

Rear View



No.	Antenna	TX	
1	MIMO1	O	2G, 3G, LTE NR below 3GHz
2	MIMO2	O	LTE, NR above 3GHz b42,b43, b48,n77,n78,n 79 only
3	MIMO3	O	2G, 3G, LTE NR below 3GHz

<The Distance information of Antenna to Edges of Car Telematics Modem>

- The data marked ※ in this report was provided by the customer and may affect the validity of the test results.

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

24 SAR Data Summary

24.1 SAR data

GSM 850 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.8			
				Liquid Temperature (°C)			21.7			
				Date			2024-07-30			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (mm)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GSM	836.60	190	N/A	45	33.72	0.028	34.50	1.197	**0.034**
Right Edge	GSM	836.60	190	N/A	45	33.72	0.023	34.50	1.197	0.028

GSM 850 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.8		21.9	
				Liquid Temperature (°C)			21.7		21.7	
				Date			2024-07-30		2024-07-31	
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (mm)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GSM	836.60	190	N/A	45	33.72	0.018	34.50	1.197	0.022
Right Edge	GSM	836.60	190	N/A	45	33.72	0.018	34.50	1.197	**0.022**

GPRS 850 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.8			
				Liquid Temperature (°C)			21.7			
				Date			2024-07-30			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (mm)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GPRS 2Tx	836.60	190	N/A	45	33.66	0.051	34.50	1.213	**0.062**
Right Edge	GPRS 2Tx	836.60	190	N/A	45	33.66	0.045	34.50	1.213	0.055

GPRS 850 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.8		21.9	
				Liquid Temperature (°C)			21.7		21.7	
				Date			2024-07-30		2024-07-31	
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (mm)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GPRS 2Tx	836.60	190	N/A	45	33.66	0.042	34.50	1.213	**0.051**
Right Edge	GPRS 2Tx	836.60	190	N/A	45	33.66	0.035	34.50	1.213	0.042

GSM 1900 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.8			
				Liquid Temperature (°C)			21.7			
				Date			2024-07-30			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (mm)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GSM	1880.00	661	N/A	45	29.65	0.021	30.00	1.009	0.023
Right Edge	GSM	1880.00	661	N/A	45	29.65	0.059	30.00	1.009	**0.064**

GSM 1900 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.8		21.9	
				Liquid Temperature (°C)			21.7		21.7	
				Date			2024-07-30		2024-07-31	
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GSM	1880.00	661	N/A	45	29.65	0.018	30.00	1.009	0.020
Right Edge	GSM	1880.00	661	N/A	45	29.65	0.053	30.00	1.009	**0.057**

GPRS 1900 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.8			
				Liquid Temperature (°C)			21.7			
				Date			2024-07-30			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GPRS 2Tx	1880.00	661	N/A	45	29.65	0.030	30.00	1.084	0.033
Right Edge	GPRS 2Tx	1880.00	661	N/A	45	29.65	0.093	30.00	1.084	**0.101**

GPRS 1900 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.8		21.9	
				Liquid Temperature (°C)			21.7		21.7	
				Date			2024-07-30		2024-07-31	
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	GPRS 2Tx	1880.00	661	N/A	45	29.65	0.039	30.00	1.084	0.042
Right Edge	GPRS 2Tx	1880.00	661	N/A	45	29.65	0.088	30.00	1.084	**0.095**

WCDMA 2 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.9			
				Liquid Temperature (°C)			21.6			
				Date			2024-07-29			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	RMC	1880.00	9400	N/A	45	23.75	0.063	25.00	1.334	0.084
Right Edge	RMC	1880.00	9400	N/A	45	23.75	0.156	25.00	1.334	**0.208**

WCDMA 2 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.8			
				Liquid Temperature (°C)			21.5			
				Date			2024-08-01			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	RMC	1880.00	9400	N/A	45	23.75	0.043	25.00	1.334	0.057
Right Edge	RMC	1880.00	9400	N/A	45	23.75	0.065	25.00	1.334	**0.087**

WCDMA 4 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			21.7			
				Liquid Temperature (°C)			21.5			
				Date			2024-07-25			
Position	**Mode**	**Freq (MHz)**	**Ch.**	**Sensor State (Grip)**	**Space (㎜)**	**Measure Power (dBm)**	**Measure 1g SAR (W/kg)**	**Tune-Up Limit (dBm)**	**Power Scaling Factor**	**Scaling 1g SAR (W/kg)**
Front	RMC	1732.60	1413	N/A	45	23.67	0.051	25.00	1.358	0.069
Right Edge	RMC	1732.60	1413	N/A	45	23.67	0.122	25.00	1.358	**0.166**

WCDMA 4 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.9			
				Liquid Temperature (°C)			21.6			
				Date			2024-08-02			
Position	Mode	Freq (MHz)	Ch.	Sensor State (Grip)	Space (㎜)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	RMC	1732.60	1413	N/A	45	23.67	0.048	25.00	1.358	0.065
Right Edge	RMC	1732.60	1413	N/A	45	23.67	0.122	25.00	1.358	**0.166**

WCDMA 5 Cellular Ant 1 Body SAR				Ambient Temperature (°C)			22.0			
				Liquid Temperature (°C)			21.8			
				Date			2024-07-26			
Position	Mode	Freq (MHz)	Ch.	Sensor State (Grip)	Space (㎜)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	RMC	836.60	4183	N/A	45	23.85	0.017	25.00	1.303	0.022
Right Edge	RMC	836.60	4183	N/A	45	23.85	0.040	25.00	1.303	**0.052**

WCDMA 5 Cellular Ant 3 Body SAR				Ambient Temperature (°C)			21.9		21.8	
				Liquid Temperature (°C)			21.7		21.5	
				Date			2024-07-31		2024-08-01	
Position	Mode	Freq (MHz)	Ch.	Sensor State (Grip)	Space (㎜)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	RMC	836.60	4183	N/A	45	23.85	0.032	25.00	1.303	**0.042**
Right Edge	RMC	836.60	4183	N/A	45	23.85	0.030	25.00	1.303	0.039

LTE Band 4 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			21.9		21.7	
							Liquid Temperature (°C)			21.7		21.5	
							Date			2024-07-24		2024-07-25	
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (㎜)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	1732.50	20175	1	0	N/A	45	23.17	0.086	25.00	1.524	0.131
Front	QPSK	20	1732.50	20175	50	25	N/A	45	22.19	0.062	24.00	1.517	0.094
Right Edge	QPSK	20	1732.50	20175	1	0	N/A	45	23.17	0.094	25.00	1.524	**0.143**
Right Edge	QPSK	20	1732.50	20175	50	25	N/A	45	22.19	0.077	24.00	1.517	0.117

LTE Band 4 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			21.9			
							Liquid Temperature (°C)			21.6			
							Date			2024-08-02			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (㎜)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	1732.50	20175	1	0	N/A	45	23.17	0.033	25.00	1.524	0.050
Front	QPSK	20	1732.50	20175	50	25	N/A	45	22.19	0.029	24.00	1.517	0.044
Right Edge	QPSK	20	1732.50	20175	1	0	N/A	45	23.17	0.079	25.00	1.524	**0.120**
Right Edge	QPSK	20	1732.50	20175	50	25	N/A	45	22.19	0.066	24.00	1.517	0.100

LTE Band 7 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			21.7			
							Liquid Temperature (°C)			21.5			
							Date			2024-07-25			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	2535.00	21100	1	0	N/A	45	23.18	0.012	25.00	1.521	0.018
Front	QPSK	20	2535.00	21100	50	0	N/A	45	22.23	0.012	24.00	1.503	0.018
Right Edge	QPSK	20	2535.00	21100	1	0	N/A	45	23.18	0.032	25.00	1.521	**0.049**
Right Edge	QPSK	20	2535.00	21100	50	0	N/A	45	22.23	0.032	24.00	1.503	0.048

LTE Band 7 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			22.2			
							Liquid Temperature (°C)			21.9			
							Date			2024-08-05			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	2535.00	21100	1	0	N/A	45	23.18	0.004	25.00	1.521	0.006
Front	QPSK	20	2535.00	21100	50	0	N/A	45	22.23	0.006	24.00	1.503	0.009
Right Edge	QPSK	20	2535.00	21100	1	0	N/A	45	23.18	0.019	25.00	1.521	**0.029**
Right Edge	QPSK	20	2535.00	21100	50	0	N/A	45	22.23	0.018	24.00	1.503	0.027

LTE Band 12 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			21.9			
							Liquid Temperature (°C)			21.6			
							Date			2024-07-29			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	10	707.50	23095	1	0	N/A	45	23.36	0.015	25.00	1.459	0.022
Front	QPSK	10	707.50	23095	25	0	N/A	45	22.39	0.012	24.00	1.449	0.017
Right Edge	QPSK	10	707.50	23095	1	0	N/A	45	23.36	0.017	25.00	1.459	**0.025**
Right Edge	QPSK	10	707.50	23095	25	0	N/A	45	22.39	0.013	24.00	1.449	0.019

LTE Band 12 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			21.8			
							Liquid Temperature (°C)			21.5			
							Date			2024-08-01			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	10	707.50	23095	1	0	N/A	45	23.36	0.011	25.00	1.459	**0.016**
Front	QPSK	10	707.50	23095	25	0	N/A	45	22.39	0.009	24.00	1.449	0.013
Right Edge	QPSK	10	707.50	23095	1	0	N/A	45	23.36	0.007	25.00	1.459	0.010
Right Edge	QPSK	10	707.50	23095	25	0	N/A	45	22.39	0.007	24.00	1.449	0.010

LTE Band 25 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			21.9			
							Liquid Temperature (°C)			21.7			
							Date			2024-07-24			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	1882.50	26365	1	0	N/A	45	23.35	0.086	25.00	1.462	0.126
Front	QPSK	20	1882.50	26365	50	0	N/A	45	22.12	0.067	24.00	1.542	0.103
Right Edge	QPSK	20	1882.50	26365	1	0	N/A	45	23.35	0.122	25.00	1.462	**0.178**
Right Edge	QPSK	20	1882.50	26365	50	0	N/A	45	22.12	0.098	24.00	1.542	0.151

LTE Band 25 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			21.8			
							Liquid Temperature (°C)			21.5			
							Date			2024-08-01			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	1882.50	26365	1	0	N/A	45	23.35	0.034	25.00	1.462	0.050
Front	QPSK	20	1882.50	26365	50	0	N/A	45	22.12	0.026	24.00	1.542	0.040
Right Edge	QPSK	20	1882.50	26365	1	0	N/A	45	23.35	0.046	25.00	1.462	**0.067**
Right Edge	QPSK	20	1882.50	26365	50	0	N/A	45	22.12	0.040	24.00	1.542	0.062

LTE Band 26 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			22.0			
							Liquid Temperature (°C)			21.8			
							Date			2024-07-26			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	15	831.50	26865	1	0	N/A	45	23.23	0.025	25.00	1.503	0.038
Front	QPSK	15	831.50	26865	36	0	N/A	45	22.14	0.019	24.00	1.535	0.029
Right Edge	QPSK	15	831.50	26865	1	0	N/A	45	23.23	0.031	25.00	1.503	**0.047**
Right Edge	QPSK	15	831.50	26865	36	0	N/A	45	22.14	0.024	24.00	1.535	0.037

LTE Band 26 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			21.9	21.8		
							Liquid Temperature (°C)			21.7	21.5		
							Date			2024-07-31	2024-08-01		
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	15	831.50	26865	1	0	N/A	45	23.23	0.026	25.00	1.503	**0.039**
Front	QPSK	15	831.50	26865	36	0	N/A	45	22.14	0.020	24.00	1.535	0.031
Right Edge	QPSK	15	831.50	26865	1	0	N/A	45	23.23	0.021	25.00	1.503	0.032
Right Edge	QPSK	15	831.50	26865	36	0	N/A	45	22.14	0.017	24.00	1.535	0.026

LTE Band 41 Cellular Ant 1 Body SAR							Ambient Temperature (°C)			21.7	22.0		
							Liquid Temperature (°C)			21.5	21.8		
							Date			2024-07-25	2024-07-26		
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	2593.00	40620	1	0	N/A	45	23.22	0.007	25.00	1.507	0.011
Front	QPSK	20	2593.00	40620	50	0	N/A	45	22.50	0.005	24.00	1.413	0.007
Right Edge	QPSK	20	2593.00	40620	1	0	N/A	45	23.22	0.012	25.00	1.507	**0.018**
Right Edge	QPSK	20	2593.00	40620	50	0	N/A	45	22.50	0.012	24.00	1.413	0.017

LTE Band 41 Cellular Ant 3 Body SAR							Ambient Temperature (°C)			22.2			
							Liquid Temperature (°C)			21.9			
							Date			2024-08-05			
Position	Mod.	BW (MHz)	Freq (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1g SAR (W/kg)
Front	QPSK	20	2593.00	40620	1	0	N/A	45	23.22	0.010	25.00	1.507	0.015
Front	QPSK	20	2593.00	40620	50	0	N/A	45	22.50	0.007	24.00	1.462	0.010
Right Edge	QPSK	20	2593.00	40620	1	0	N/A	45	23.22	0.019	25.00	1.507	**0.029**
Right Edge	QPSK	20	2593.00	40620	50	0	N/A	45	22.50	0.020	24.00	1.413	0.028

5G NR n7 Cellular Ant 1 Body SAR									Ambient Temperature (°C)			22.4			
									Liquid Temperature (°C)			21.8			
									Date			2024-08-06			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	15	20	2535.00	507000	1	1	N/A	45	23.24	0.015	25.00	1.500	0.023
Front	DFT-s-OFDM	QPSK	15	20	2535.00	507000	50	25	N/A	45	23.05	0.014	25.00	1.567	0.022
Right Edge	DFT-s-OFDM	QPSK	15	20	2535.00	507000	1	1	N/A	45	23.24	0.027	25.00	1.500	0.041
Right Edge	DFT-s-OFDM	QPSK	15	20	2535.00	507000	50	25	N/A	45	23.05	0.030	25.00	1.567	**0.047**

5G NR n7 Cellular Ant 3 Body SAR									Ambient Temperature (°C)			22.4			
									Liquid Temperature (°C)			21.8			
									Date			2024-08-06			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	15	20	2535.00	507000	1	1	N/A	45	23.24	0.007	25.00	1.500	0.011
Front	DFT-s-OFDM	QPSK	15	20	2535.00	507000	50	25	N/A	45	23.05	0.010	25.00	1.567	0.016
Right Edge	DFT-s-OFDM	QPSK	15	20	2535.00	507000	1	1	N/A	45	23.24	0.033	25.00	1.500	0.050
Right Edge	DFT-s-OFDM	QPSK	15	20	2535.00	507000	50	25	N/A	45	23.05	0.033	25.00	1.567	**0.052**

5G NR n41 Cellular Ant 1 Body SAR									Ambient Temperature (°C)			22.4			
									Liquid Temperature (°C)			21.7			
									Date			2024-08-07			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	2592.99	518598	1	1	N/A	45	23.22	0.017	25.00	1.507	0.026
Front	DFT-s-OFDM	QPSK	30	100	2592.99	518598	135	67	N/A	45	23.08	0.017	25.00	1.556	0.026
Right Edge	DFT-s-OFDM	QPSK	30	100	2592.99	518598	1	1	N/A	45	23.22	0.024	25.00	1.507	**0.036**
Right Edge	DFT-s-OFDM	QPSK	30	100	2592.99	518598	135	67	N/A	45	23.08	0.020	25.00	1.556	0.031

5G NR n41 Cellular Ant 3 Body SAR									Ambient Temperature (°C)			22.3			
									Liquid Temperature (°C)			22.0			
									Date			2024-08-08			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	2592.99	518598	1	1	N/A	45	23.22	0.006	25.00	1.507	0.009
Front	DFT-s-OFDM	QPSK	30	100	2592.99	518598	135	67	N/A	45	23.08	0.017	25.00	1.556	0.026
Right Edge	DFT-s-OFDM	QPSK	30	100	2592.99	518598	1	1	N/A	45	23.22	0.039	25.00	1.507	**0.059**
Right Edge	DFT-s-OFDM	QPSK	30	100	2592.99	518598	135	67	N/A	45	23.08	0.032	25.00	1.556	0.050

5G NR n77 Cellular Ant 1 Body SAR									Ambient Temperature (°C)			22.1			
									Liquid Temperature (°C)			21.8			
									Date			2024-08-09			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	23.35	0.013	25.00	1.462	0.019
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.27	0.019	25.00	1.489	0.028
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	23.35	0.017	25.00	1.462	0.025
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.27	0.055	25.00	1.489	**0.082**

5G NR n77 Cellular Ant 2 Body SAR									Ambient Temperature (°C)			22.3			
									Liquid Temperature (°C)			22.0			
									Date			2024-08-08			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	24.12	0.055	25.00	1.225	0.067
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.95	0.054	25.00	1.274	**0.069**
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	24.12	0.021	25.00	1.225	0.026
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.95	0.015	25.00	1.274	0.019

5G NR n77 Cellular Ant 3 Body SAR									Ambient Temperature (°C)			22.1		22.2	
									Liquid Temperature (°C)			21.8		21.8	
									Date			2024-08-09		2024-08-14	
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	23.35	0.019	25.00	1.462	0.028
Front	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.27	0.020	25.00	1.489	0.030
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	1	1	N/A	45	23.35	0.040	25.00	1.462	0.058
Right Edge	DFT-s-OFDM	QPSK	30	100	3840.00	656000	135	67	N/A	45	23.27	0.041	25.00	1.489	**0.061**

5G NR n77 DoD Cellular Ant 1 Body SAR									Ambient Temperature (°C)			21.8			
									Liquid Temperature (°C)			21.5			
									Date			2024-08-19			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.07	0.003	25.00	1.560	0.005
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.06	0.003	25.00	1.563	0.005
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.07	0.022	25.00	1.560	0.034
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.06	0.032	25.00	1.563	**0.050**

5G NR n77 DoD Cellular Ant 2 Body SAR									Ambient Temperature (°C)			21.9			
									Liquid Temperature (°C)			21.8			
									Date			2024-08-16			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.74	0.011	25.00	1.337	0.015
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.56	0.013	25.00	1.393	**0.018**
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.74	0.007	25.00	1.337	0.009
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.56	0.006	25.00	1.393	0.008

5G NR n77 DoD Cellular Ant 3 Body SAR									Ambient Temperature (°C)			21.9			
									Liquid Temperature (°C)			21.8			
									Date			2024-08-16			
Position	Waveform	Mod.	SCS (kHz)	BW (MHz)	Freq. (MHz)	Ch.	RB Size	RB Offset	Sensor State (Grip)	Space (mm)	Measure Power (dBm)	Measure 1 g SAR (W/kg)	Tune-Up Limit (dBm)	Power Scaling Factor	Scaling 1 g SAR (W/kg)
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.07	0.004	25.00	1.560	0.006
Front	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.06	0.006	25.00	1.563	0.009
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	1	1	N/A	45	23.07	0.017	25.00	1.560	0.027
Right Edge	DFT-s-OFDM	QPSK	30	100	3500.01	633334	135	67	N/A	45	23.06	0.017	25.00	1.563	**0.027**

24.2 General Notes

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 447498 D04v01.
2. Liquid tissue depth was at least 15 cm for all frequencies.
3. All modes of operation were investigated, and worst-case results are reported.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
7. The "N/A" means there is no SAR value or the SAR is too low to be measured.

GSM Notes

1. SAR results were scaled to the maximum allowed power to demonstrate compliance.
2. The GPRS multi-slot configuration with the highest frame averaged output power was evaluated for SAR.
3. The GPRS VoIP mode was tested by the worst case test.

WCDMA Notes:

1. WCDMA mode in Body SAR was tested under RMC 12.2 kbps with HSPA inactive per KDB Publication 941225 D01v03r01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D04v01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > 1/2 dB, instead of the middle channel, the highest output power channel must be used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r05. The general test procedures used for testing can be found in Section 5.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3-6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator.
4. This device supports LTE capabilities with overlapping transmission frequency rages. When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE bands share the same transmission path and signal characteristics, SAR was only assessed for the band with larger transmission frequency range.

5G NR Notes:

1. According to FCC guidance, SAR test for NR bands and LTE anchor Bands were performed separately due to limitations in SAR probe calibration factors. And, Due to test setup limitations, SAR testing for NR was performed using test mode software to establish the connection.
2. NR configurations of SAR test were determined according to Section 5.2 of KDB 941225 D05.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator.
4. According to FCC guidance, NR modulations and RB sizes/offsets were selected for testing such that configurations with the highest output power were evaluated for SAR tests.
5. This device supports 5G FR1 capabilities with overlapping transmission frequency ranges. When the supported frequency range of an NR band falls completely within an NR band with a larger transmission frequency range, both NR bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both NR bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.
6. 5G NR n41 and n77 is synchronized using maximum duty cycle of 100 %. SAR testing was performed using FTM mode with a 100 % duty cycle applied to match final duty cycle.

25 Simultaneous SAR Results

25.1 5G NR EN-DC

Configuration		Body	
		Front	Right Edge
LTE Band 41 Ant1	5G NR n77 Ant1	0.039	**0.100**
LTE Band 41 Ant1	5G NR n77 Ant2	0.080	0.044
LTE Band 41 Ant3	5G NR n77 Ant3	0.045	0.090
LTE Band 41 Ant1	5G NR n77 DoD Ant1	0.016	0.068
LTE Band 41 Ant1	5G NR n77 DoD Ant2	0.029	0.027
LTE Band 41 Ant3	5G NR n77 DoD Ant3	0.024	0.056

26 LTE Downlink Carrier Aggregation

- Refer to Appendix F

27 LTE Uplink Carrier Aggregation

This device supports LTE Carrier Aggregation in the uplink for LTE Band 7C. In the supported uplink Carrier Aggregation, additional uplink Carrier Aggregation band conducted power and SAR were evaluated for the worst-case SAR band in the Single Carrier.

27.1 Intra band ULCA

The configuration of the worst-case SAR result Band:

LTE Band 7C Ant1 / Right Edge / Test Distance, 45 mm

PCC						SCC						CA Total (dBm)	Single Carrier (dBm)
BW (MHz)	Uplink		Modulation	RB Size	RB Offset	Band width (MHz)	Uplink		Modulation	RB Size	RB Offset		
	Channel	Frequency (MHz)					Channel	Frequency (MHz)					
												Conducted Power	
												23.02	23.18
20	21100	2535.00	QPSK	1	0	20	20902	2512.20	QPSK	1	99	Measure 1g SAR	
												0.028	0.032
												Scaling 1g SAR	
												0.044	0.049

LTE Band 7C Ant3 / Right Edge / Test Distance, 45 mm

PCC						SCC						CA Total (dBm)	Single Carrier (dBm)
BW (MHz)	Uplink		Modulation	RB Size	RB Offset	Band width (MHz)	Uplink		Modulation	RB Size	RB Offset		
	Channel	Frequency (MHz)					Channel	Frequency (MHz)					
												Conducted Power	
												23.02	23.18
20	21100	2535.00	QPSK	1	0	20	20902	2512.20	QPSK	1	99	Measure 1g SAR	
												0.018	0.019
												Scaling 1g SAR	
												0.028	0.029

28 SAR Measurement Variability

28.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the power supply before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1. When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2. A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3. A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4. Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

29 Appendixes List

Appendix A	Appendix A Verification Plots
Appendix B	Appendix B Test Plots
Appendix C	Appendix C Photograph
Appendix D	Appendix D Probe, DAE and Dipole Calibration Certificates
Appendix E	Appendix E RF Conducted Power
Appendix F	Appendix F LTE Downlink Carrier Aggregation

-THE END-