FCC SAR Test Report

APPLICANT	**:**	**TCL Communication Ltd.**
EQUIPMENT	**:**	**GSM/LTE Mobile phone**
BRAND NAME	**:**	**TCL**
MODEL NAME	**:**	**T608G**
FCC ID	**:**	**2ACCJH170**
STANDARD	**:**	**FCC 47 CFR Part 2 (2.1093)**

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

Si Zhang

ilac-MRA

A2LA ACCREDITED
Cert #5145.01

Approved by: Si Zhang

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People's Republic of China

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA2O1305-01	Rev. 01	Initial issue of report.	Jan. 12, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **TCL Communication Ltd., GSM/LTE Mobile phone, T608G,** are as follows.

Original Project

Highest 1g SAR Summary

Equipment Class	Frequency Band		Head (Separation 0mm) 1g SAR (W/kg)	Hotspot (Separation 10mm) 1g SAR (W/kg)	Body-worn (Separation 15mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	LTE	Band 12	0.73	0.42	0.37	1.40
		Band 13	0.79	0.33	0.44	
		Band 5	0.92	0.36	0.33	
		Band 66/4	0.23	**0.93**	0.61	
		Band 2	0.27	0.82	0.47	
DTS	WLAN	2.4GHz WLAN	**1.17**	0.41	0.25	1.39
NII		5GHz WLAN	1.11	0.53	**1.39**	1.40
DSS	Bluetooth	2.4GHz Bluetooth	<0.10	<0.10	<0.10	0.95

Highest 10g SAR Summary

Equipment Class	Frequency Band		Product Specific 10g SAR (W/kg) (Separation 0mm)	Highest Simultaneous Transmission 10g SAR (W/kg)
License	LTE	Band 66/4	**3.48**	3.54
NII	WLAN	5GHz WLAN	3.35	3.54
Date of Testing:			2022/11/27 ~ 2022/12/29	

Remark:

1. This device supports both LTE B4 and B66. Since the supported frequency span for LTE B4 falls completely within the supports frequency span for LTE B66, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B66.
2. This is a variant report for T608G. For model change note, please refer to the T608G_Class II Permissive Change letter which is exhibited separately. According to the change, Added intra-band ULCA and DLCA Combination, measured conducted power of intra-band ULCA and DLCA Combination, and ULCA SAR verified the worse cases from the same band without CA, other bands only verified the worse cases from original test report (Sporton Report Number FA2O1305). Max SAR chose higher SAR between original applications and variant project.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-SZ	CN1256	421272

Applicant	
Company Name	TCL Communication Ltd.
Address	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong

Manufacturer	
Company Name	TCL Communication Ltd.
Address	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	GSM/LTE Mobile phone
Brand Name	TCL
Model Name	T608G
FCC ID	2ACCJH170
IMEI Code	016332000212455
Wireless Technology and Frequency Range	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 66: 1710 MHz ~ 1780 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	03
SW Version	6FS6
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. This device supports VoIP in LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering applications.
3. This device 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.3GHz / 5.5GHz supports WiFi Direct (GC only).
4. The device implements receiver detection/hotspot mode for SAR compliance at different exposure conditions (head, body-worn, hotspot, and extremity). It uses the receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for 4G and Wi-Fi antennas accordingly. And the device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to power table at appendix E.
5. For WLAN when transmit simultaneous with WWAN, power reduction will be activated to head, body-worn and Handheld.

4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>2ACCJH170</td></tr>
<tr><td>Equipment Name</td><td>GSM/LTE Mobile phone</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850 MHz ~ 1910 MHz
LTE Band 4: 1710 MHz ~ 1755 MHz
LTE Band 5: 824 MHz ~ 849 MHz
LTE Band 12: 699 MHz ~ 716 MHz
LTE Band 13: 777 MHz ~ 787 MHz
LTE Band 66: 1710 MHz ~ 1780 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 13: 5MHz, 10MHz
LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM / 64QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE Release Version</td><td>R11, Cat13</td></tr>
<tr><td>CA Support</td><td>Supported, Uplink and Downlink</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, when operating in receiver/hotspot detect mechanism, body -worn /hotspot/extremity will trigger reduced power for some bands applied to satisfy SAR compliance, the detail please referred to section 12.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Intra-Band and Inter-Band possible combinations and the detail power verification please referred to section 12.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>(1) This device supports LTE Carrier Aggregation (CA) in the uplink for LTE CA_5B/66B /66C with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance.
(2) This device supports maximum of 2 carriers in the downlink and 2 carriers in the uplink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.</td></tr>
</table>

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 66

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 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.

6.2 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:

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

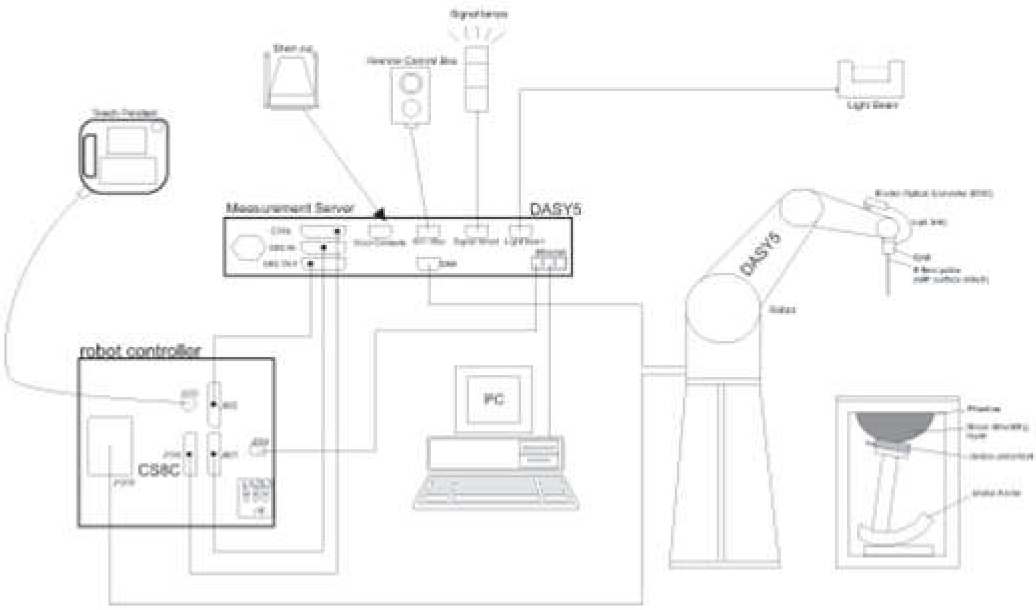
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A 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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted 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.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

7.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

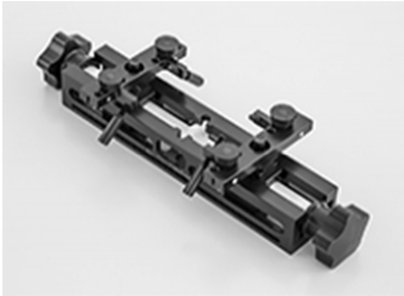
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 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.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>*reported*</u> SAR from the *area scan based 1-g SAR estimation* procedures of KDB 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.</td></tr>
</table>

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Dec. 15, 2021	Dec. 14, 2022
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 17, 2021	Dec. 16, 2022
SPEAG	1750MHz System Validation Kit	D1750V2	1090	Feb. 24, 2022	Feb. 23, 2023
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Oct. 19, 2021	Oct. 18, 2024
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Dec. 20, 2021	Dec. 19, 2022
SPEAG	2450MHz System Validation Kit	D2450V2	924	Sep. 02, 2020	Aug. 31, 2023
SPEAG	5000MHz System Validation Kit	D5GHzV2	1341	Dec. 13, 2021	Dec. 12, 2022
SPEAG	Data Acquisition Electronics	DAE4	1664	May 30, 2022	May 29, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	May 30, 2022	May 29, 2023
SPEAG	SAM Twin Phantom	QD 000 P40 CD	1671	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8821C	6272416863	Apr. 06, 2022	Apr. 05, 2023
Keysight	Network Analyzer	E5071C	MY46523671	Oct. 17, 2022	Oct. 16, 2023
Speag	Dielectric Assessment KIT	DAK-3.5	1071	Jan. 24, 2022	Jan. 23, 2023
Agilent	Signal Generator	N5181A	MY50145381	Dec. 28, 2021	Dec. 27, 2022
Agilent	Signal Generator	N5181A	MY50145381	Dec. 27, 2022	Dec. 26, 2023
Anritsu	Power Senor	MA2411B	1306099	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Meter	ML2495A	1349001	Oct. 17, 2022	Oct. 16, 2023
R&S	Power Sensor	NRP50S	101254	Apr. 07, 2022	Apr. 06, 2023
R&S	Power Sensor	NRP8S	109228	Apr. 07, 2022	Apr. 06, 2023
R&S	CBT BLUETOOTH TESTER	CBT	100963	Dec. 28, 2021	Dec. 27, 2022
R&S	Spectrum Analyzer	FSP7	100818	Jul. 07, 2022	Jul. 06, 2023
TES	Hygrometer	1310	200505600	Jul. 12, 2022	Jul. 11, 2023
Anymetre	Thermo-Hygrometer	JR593	2015030904	Jul. 12, 2022	Jul. 11, 2023
SPEAG	Device Holder	N/A	N/A	N/A	N/A
ARRA	Power Divider	A3200-2	N/A	Note 1	
ET Industries	Dual Directional Coupler	C-058-10	N/A	Note 1	
Weinschel	Attenuator 1	3M-10	N/A	Note 1	
Weinschel	Attenuator 2	3M-20	N/A	Note 1	
AR	Amplifier	5S1G4	0333096	Note 1	
Mini-Circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.2.

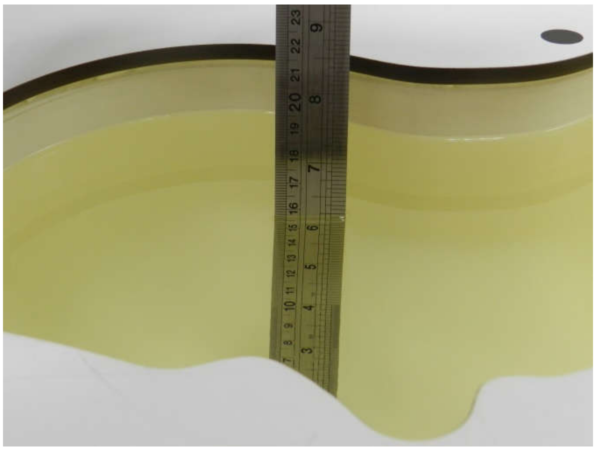


Fig 11.1 Photo of Liquid Height for Head SAR

Fig 11.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.5	0.879	40.711	0.89	41.90	-1.24	-2.84	±5	2022/11/27
835	Head	22.3	0.913	40.859	0.90	41.50	1.44	-1.54	±5	2022/11/28
1750	Head	22.6	1.377	41.359	1.37	40.10	0.51	3.14	±5	2022/11/28
1900	Head	22.2	1.435	38.464	1.40	40.00	2.50	-3.84	±5	2022/11/29
2450	Head	22.3	1.809	37.604	1.80	39.20	0.50	-4.07	±5	2022/11/29
5250	Head	22.3	4.638	37.088	4.71	35.95	-1.53	3.17	±5	2022/11/30
5600	Head	22.5	5.034	36.508	5.07	35.50	-0.71	2.84	±5	2022/11/30
5750	Head	22.3	5.152	35.850	5.22	35.35	-1.30	1.41	±5	2022/11/30
1750	Head	22.6	1.355	38.395	1.37	40.10	-1.09	-4.25	±5	2022/12/15
1750	Head	22.4	1.324	38.710	1.37	40.10	-3.36	-3.47	±5	2022/12/29

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

<1g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2022/11/27	750	Head	250	1099	3819	1664	2.100	8.540	8.4	-1.64
2022/11/28	835	Head	250	4d162	3819	1664	2.560	9.640	10.24	6.22
2022/11/28	1750	Head	250	1090	3819	1664	9.310	37.000	37.24	0.65
2022/11/29	1900	Head	250	5d182	3819	1664	10.300	39.600	41.2	4.04
2022/11/29	2450	Head	250	924	3819	1664	13.500	51.400	54	5.06
2022/11/30	5250	Head	100	1341	3819	1664	7.460	80.700	74.6	-7.56
2022/11/30	5600	Head	100	1341	3819	1664	8.600	84.500	86	1.78
2022/11/30	5750	Head	100	1341	3819	1664	7.870	80.600	78.7	-2.36
2022/12/15	1750	Head	250	1137	3819	1664	9.170	36.500	36.68	0.49
2022/12/29	1750	Head	250	1137	3819	1664	9.260	36.500	37.04	1.48

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2022/11/27	750	Head	250	1099	3819	1664	1.400	5.650	5.6	-0.88
2022/11/28	835	Head	250	4d162	3819	1664	1.690	6.260	6.76	7.99
2022/11/28	1750	Head	250	1090	3819	1664	5.080	19.500	20.32	4.21
2022/11/29	1900	Head	250	5d182	3819	1664	5.450	20.200	21.8	7.92
2022/11/29	2450	Head	250	924	3819	1664	6.390	24.000	25.56	6.50
2022/11/30	5250	Head	100	1341	3819	1664	2.180	23.100	21.8	-5.63
2022/11/30	5600	Head	100	1341	3819	1664	2.210	24.000	22.1	-7.92
2022/11/30	5750	Head	100	1341	3819	1664	2.140	22.700	21.4	-5.73
2022/12/15	1750	Head	250	1137	3819	1664	5.000	19.200	20	4.17
2022/12/29	1750	Head	250	1137	3819	1664	5.100	19.200	20.4	6.25

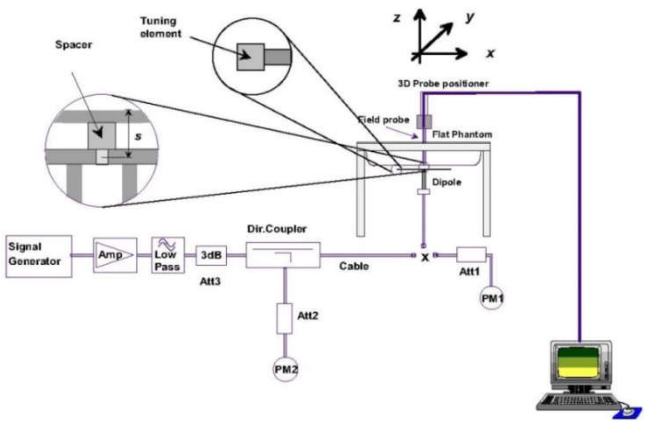


Fig 11.3.1 System Performance Check Setup

Fig 11.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 12.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 12.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 12.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 12.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

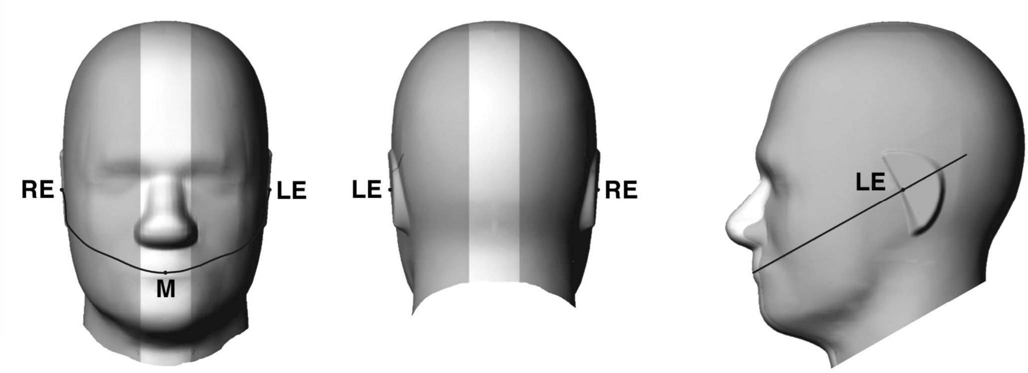


Fig 12.1.1 Front, back, and side views of SAM twin phantom

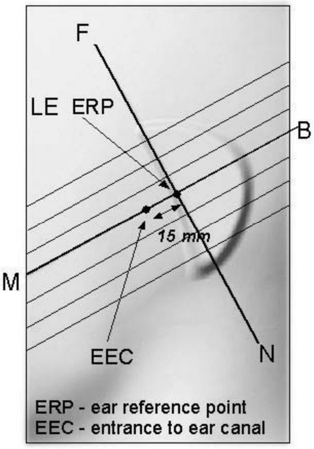


Fig 12.1.2 Close-up side view of phantom showing the ear region.

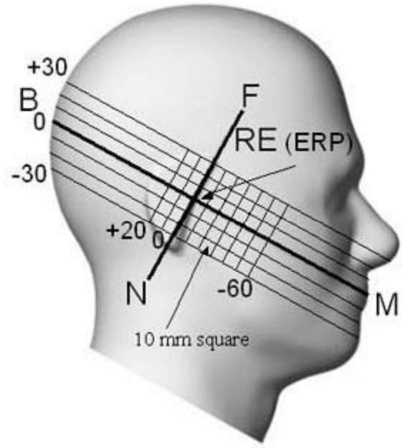


Fig 12.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 12.2.1 and Figure 12.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 12.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 12.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 12.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 12.2.3. The actual rotation angles should be documented in the test report.

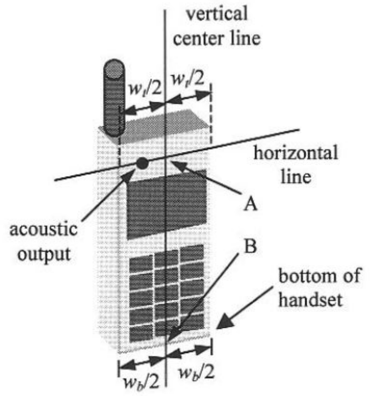


Fig 12.2.1 Handset vertical and horizontal reference lines—"fixed case

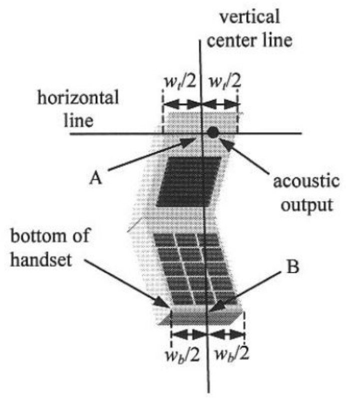


Fig 12.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

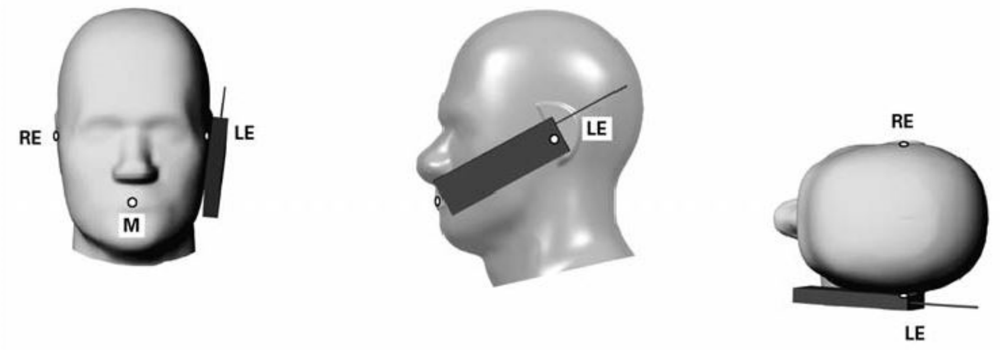


Fig 12.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 12.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

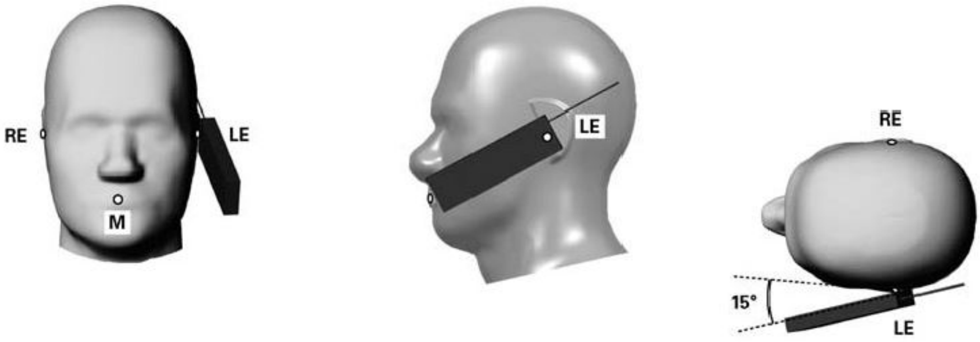


Fig 12.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 12.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

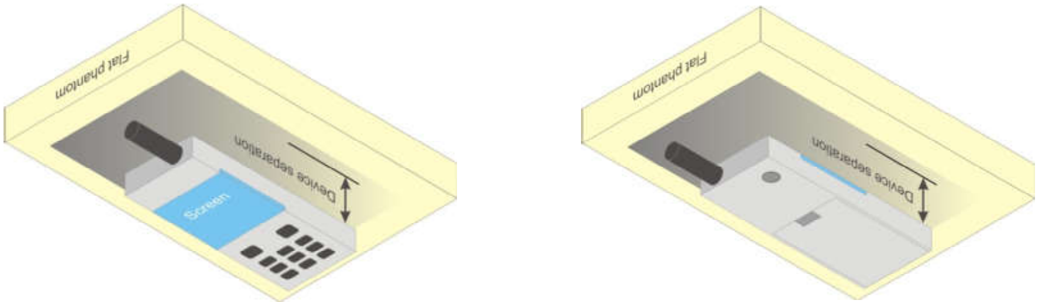


Fig 12.4 Body Worn Position

11.5 Product Specific 10g SAR Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

11.6 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

12. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<LTE Carrier Aggregation>

General Note:

1. This device supports Carrier Aggregation on downlink for inter and intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. In applying the existing power measurement procedures of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of frequency bands and CCs in each row need combination, and for this device that all the configurations were choose to power measurement.
3. All permutations exist. No restrictions on Pcell & Scell combinations.

2CC Downlink Carrier Aggregation	
Number	Combination
1	CA_13A-66A
2	CA_2A-13A
3	CA_2A-2A
4	CA_2A-4A
5	CA_2A-5A
6	CA_2A-66A
7	CA_4A-13A
8	CA_4A-4A
9	CA_4A-5A
10	CA_5A-5A
11	CA_66A-66A
12	CA_5A-66A
13	CA_5B
14	CA_66B
15	CA_66C

LTE Carrier Aggregation Conducted Power (Downlink)

i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

iii. The device supports downlink two carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.

iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

v. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.

vi. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.

vii. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \ \text{[MHz]}$$

LTE Carrier Aggregation Conducted Power (Uplink)

2CC Uplink Carrier Aggregation		
Number	Combination	Ant No.
1	CA_5B	Ant 1
2	CA_66B	Ant 0
3	CA_66C	Ant 0

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation for LTE B5/66 with a maximum of two component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.

ii. The device supports uplink carrier aggregation with a maximum of two component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre the 3GPP requirement.

iii. According Nov. 2017 TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

iv. Additional SAR measurement for LTE UL CA whit other DL CA combinations active were not required since the maximum output power for this configuration was not > 0.25dB higher than the maximum output power for UL CA active.

13. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

14. SAR Test Results

14.1 Head SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																				
01	LTE Band 12	10M	QPSK	1	25	-	Left Cheek	0mm	Ant 1	Receiver on	23095	707.5	24.17	25.00	1.211	-	-	0.02	0.578	**0.700**
02	LTE Band 13	10M	QPSK	1	25	-	Left Cheek	0mm	Ant 1	Receiver on	23230	782	24.06	25.00	1.242	-	-	0.05	0.477	**0.592**
835MHz																				
03	LTE Band 5	10M	QPSK	1	25	-	Left Cheek	0mm	Ant 1	Receiver on	20525	836.5	23.86	25.00	1.300	-	-	-0.04	0.709	**0.922**
	LTE Band 5B	10M	QPSK	1	0	-	Left Cheek	0mm	Ant 1	Receiver on	20476+20575	837.6+841.5	23.66	25.00	1.361	-	-	0.01	0.660	0.899
1750MHz																				
04	LTE Band 66	20M	QPSK	1	49	-	Left Cheek	0mm	Ant 0	Receiver on	132322	1745	24.48	25.50	1.265	-	-	0.06	0.175	**0.221**
	LTE Band 66B	15M	QPSK	1	37	-	Left Cheek	0mm	Ant 0	Receiver on	132597+132504	1772.5+1763.2	23.83	25.50	1.469	-	-	0.02	0.141	0.207
	LTE Band 66C	20M	QPSK	1	49	-	Left Cheek	0mm	Ant 0	Receiver on	132572+132374	1770+1750.2	23.85	25.50	1.462	-	-	-0.03	0.148	0.216
1900MHz																				
05	LTE Band 2	20M	QPSK	1	49	-	Left Cheek	0mm	Ant 0	Receiver on	18900	1880	24.50	25.50	1.259	-	-	0.02	0.146	**0.184**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
2450MHz																
06	Bluetooth	DH5 1Mbps	Right Cheek	0mm	Ant 2	Full	78	2480	7.40	8.50	1.288	76.83	1.302	0.15	0.025	**0.042**
07	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 2	Receiver on	1	2412	17.30	18.50	1.318	100	1.000	0.13	0.655	**0.863**
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 2	Receiver on	6	2437	17.60	18.50	1.230	100	1.000	0.02	0.601	0.739
5000-6000MHz																
08	WLAN5.3GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 3	Receiver on	58	5290	15.85	17.00	1.303	100	1.000	0.04	0.406	**0.529**
09	WLAN5.5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 3	Receiver on	138	5690	16.05	17.00	1.245	100	1.000	-0.03	0.541	**0.673**
10	WLAN5.8GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 3	Receiver on	155	5775	16.05	17.00	1.245	100	1.000	-0.03	0.589	**0.733**

14.2 Hotspot SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																				
11	LTE Band 12	10M	QPSK	1	25	-	Back	10mm	Ant 1	Hotspot on	23095	707.5	24.17	25.00	1.211	-	-	-0.17	0.344	**0.416**
12	LTE Band 13	10M	QPSK	1	25	-	Back	10mm	Ant 1	Hotspot on	23230	782	24.06	25.00	1.242	-	-	-0.07	0.257	**0.319**
835MHz																				
13	LTE Band 5	10M	QPSK	1	25	-	Back	10mm	Ant 1	Hotspot on	20525	836.5	23.86	25.00	1.300	-	-	0.02	0.291	**0.378**
	LTE Band 5B	10M	QPSK	1	0	-	Back	10mm	Ant 1	Hotspot on	20476+20575	837.6+841.5	23.66	25.00	1.361	-	-	-0.09	0.223	0.304
1750MHz																				
14	LTE Band 66	20M	QPSK	1	49	-	Bottom Side	10mm	Ant 0	Hotspot on	132572	1770	21.28	22.50	1.324	-	-	0.06	0.696	**0.922**
	LTE Band 66B	15M	QPSK	1	37	-	Bottom Side	10mm	Ant 0	Hotspot on	132597+132504	1772.5+1763.2	20.87	22.50	1.455	-	-	-0.05	0.530	0.771
	LTE Band 66C	20M	QPSK	1	49	-	Bottom Side	10mm	Ant 0	Hotspot on	132572+132374	1770+1750.2	20.85	22.50	1.462	-	-	-0.01	0.553	0.809
	LTE Band 66	20M	QPSK	1	49	-	Bottom Side	10mm	Ant 0	Hotspot on	132072	1720	21.27	22.50	1.327	-	-	0.01	0.601	0.798
	LTE Band 66	20M	QPSK	1	49	-	Bottom Side	10mm	Ant 0	Hotspot on	132322	1745	21.43	22.50	1.279	-	-	0.13	0.612	0.783
1900MHz																				
15	LTE Band 2	20M	QPSK	1	49	-	Bottom Side	10mm	Ant 0	Hotspot on	18700	1860	21.54	22.50	1.247	-	-	0.14	0.638	**0.796**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
2450MHz																
16	Bluetooth	DH5 1Mbps	Left Side	10mm	Ant 2	Full	78	2480	7.40	8.50	1.288	76.83	1.302	0.02	0.010	**0.016**
17	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	Ant 2	Hotspot on	6	2437	16.60	17.50	1.230	100	1.000	-0.01	0.213	**0.262**
5000-6000MHz																
18	WLAN5.2GHz	802.11ac-VHT80 MCS0	Right Side	10mm	Ant 3	Hotspot on	42	5210	12.33	13.50	1.309	100	1.000	0.02	0.171	**0.224**
19	WLAN5.8GHz	802.11ac-VHT80 MCS0	Back	10mm	Ant 3	Hotspot on	155	5775	12.58	13.50	1.236	100	1.000	0.01	0.426	**0.527**

14.3 Body Worn Accessory SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Headset	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																					
20	LTE Band 12	10M	QPSK	1	25	-	Back	15mm	Ant 1	-	Receiver off	23095	707.5	24.17	25.00	1.211	-	-	-0.02	0.305	**0.369**
21	LTE Band 13	10M	QPSK	1	25	-	Back	15mm	Ant 1	-	Receiver off	23230	782	24.06	25.00	1.242	-	-	0.05	0.302	**0.375**
835MHz																					
22	LTE Band 5	10M	QPSK	1	25	-	Back	15mm	Ant 1	-	Receiver off	20525	836.5	23.86	25.00	1.300	-	-	-0.04	0.203	**0.264**
	LTE Band 5B	10M	QPSK	1	0	-	Back	15mm	Ant 1	-	Receiver off	20476+20575	837.6+841.5	23.66	25.00	1.361	-	-	-0.01	0.178	0.242
1750MHz																					
23	LTE Band 66	20M	QPSK	1	49	-	Back	15mm	Ant 0	-	Receiver off	132322	1745	23.10	24.00	1.230	-	-	0.12	0.438	**0.539**
	LTE Band 66B	15M	QPSK	1	37	-	Back	15mm	Ant 0	-	Receiver off	132597+132504	1772.5+1763.2	22.40	24.00	1.445	-	-	0.05	0.352	0.509
	LTE Band 66C	20M	QPSK	1	49	-	Back	15mm	Ant 0	-	Receiver off	132572+132374	1770+1750.2	22.37	24.00	1.455	-	-	-0.05	0.360	0.524
1900MHz																					
24	LTE Band 2	20M	QPSK	1	49	-	Back	15mm	Ant 0	-	Receiver off	18900	1880	22.06	23.00	1.242	-	-	0.01	0.336	**0.417**

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Headset	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
2450MHz																	
25	Bluetooth	DH5 1Mbps	Back	15mm	Ant 2	-	Full	78	2480	7.40	8.50	1.288	76.83	1.302	0.17	0.006	**0.010**
26	WLAN2.4GHz	802.11b 1Mbps	Back	15mm	Ant 2	-	Receiver off	6	2437	18.50	19.50	1.259	100	1.000	0.16	0.155	**0.195**
5000-6000MHz																	
27	WLAN5.3GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	64	5320	17.99	19.00	1.262	100	1.000	-0.14	0.629	**0.794**
28	WLAN5.5GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	-0.05	1.000	**1.253**
	WLAN5.5GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	132	5660	17.97	19.00	1.268	100	1.000	0.02	0.770	0.976
	WLAN5.5GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	100	5500	17.51	19.00	1.409	100	1.000	0.09	0.861	1.213
	WLAN5.5GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	140	5700	15.87	17.00	1.297	100	1.000	-0.09	0.883	1.145
	WLAN5.5GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	144	5720	17.93	19.00	1.279	100	1.000	0.14	0.910	1.164
29	WLAN5.8GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	157	5785	17.87	19.00	1.297	100	1.000	0.02	0.987	**1.280**
	WLAN5.8GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	149	5745	18.01	19.00	1.256	100	1.000	0.09	0.810	1.017
	WLAN5.8GHz	802.11a 6Mbps	Back	15mm	Ant 3	-	Receiver off	165	5825	17.65	19.00	1.365	100	1.000	-0.01	0.893	1.219

14.4 Product Specific SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
1750MHz																		
30	LTE Band 66	20M	QPSK	50	0	-	Bottom Side	0mm	Ant 0	Receiver off	132572	1770	23.01	24.00	1.256	0.04	2.760	**3.467**
	LTE Band 66B	15M	QPSK	1	37	-	Bottom Side	0mm	Ant 0	Receiver off	132597+132504	1772.5+1763.2	22.40	24.00	1.445	0.18	2.020	2.920
	LTE Band 66C	20M	QPSK	1	49		Bottom Side	0mm	Ant 0	Receiver off	132572+132374	1770+1750.2	22.37	24.00	1.455	0.16	1.980	2.882
	LTE Band 66	20M	QPSK	50	0		Bottom Side	0mm	Ant 0	Receiver off	132322	1745	23.05	24.00	1.245	0.03	2.280	2.837
	LTE Band 66	20M	QPSK	50	0		Bottom Side	0mm	Ant 0	Receiver off	132072	1720	22.90	24.00	1.288	0.09	2.140	2.757

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
5000-6000MHz																
31	WLAN5.3GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	64	5320	17.99	19.00	1.262	100	1.000	-0.01	1.510	**1.905**
32	WLAN5.5GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	-0.06	2.470	**3.095**
	WLAN5.5GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	132	5660	17.97	19.00	1.268	100	1.000	0.01	1.790	2.269
	WLAN5.5GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	100	5500	17.51	19.00	1.409	100	1.000	-0.09	1.770	2.494
	WLAN5.5GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	140	5700	15.87	17.00	1.297	100	1.000	0.02	1.610	2.088
	WLAN5.5GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	144	5720	17.93	19.00	1.279	100	1.000	-0.03	1.980	2.533
33	WLAN5.8GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	149	5745	17.51	19.00	1.409	100	1.000	-0.13	2.010	**2.833**
	WLAN5.8GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	157	5785	17.37	19.00	1.455	100	1.000	0.11	1.770	2.576
	WLAN5.8GHz	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	165	5825	17.65	19.00	1.365	100	1.000	0.08	1.720	2.347

14.5 Repeated SAR Measurement

<1g>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	15mm	Ant 3	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	-0.05	1.000	1	1.253
2nd	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	15mm	Ant 3	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	0.08	0.992	1.008	1.243
1st	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	15mm	Ant 3	Receiver off	157	5785	17.87	19.00	1.297	100	1.000	0.02	0.987	1	1.280
2nd	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	15mm	Ant 3	Receiver off	157	5785	17.87	19.00	1.297	100	1.000	0.06	0.980	1.007	1.271

<10g>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	LTE Band 66	20M	QPSK	50	0	-	Bottom Side	0mm	Ant 0	Receiver off	132572	1770	23.01	24.00	1.256	-	-	0.04	2.760	1	3.467
2nd	LTE Band 66	20M	QPSK	50	0	-	Bottom Side	0mm	Ant 0	Receiver off	132572	1770	23.01	24.00	1.256	-	-	-0.09	2.710	1.018	3.404
1st	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	-0.06	2.470	1	3.095
2nd	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	116	5580	18.02	19.00	1.253	100	1.000	-0.02	2.420	1.021	3.033
1st	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	149	5745	17.51	19.00	1.409	100	1.000	-0.13	2.010	1	2.833
2nd	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	Ant 3	Receiver off	149	5745	17.51	19.00	1.409	100	1.000	0.09	2.000	1.005	2.819

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. The ratio is the difference in percentage between original and repeated *measured SAR*.
5. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

14.6 Summary of Maximum SAR for spot check data

General Note: In this variant report section 14.1 / 14.2 / 14.3 /14.4 that maximum SAR results are as follows.

Highest 1g SAR Summary					
Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 15mm)
			1g SAR (W/kg)		
Licensed	LTE	Band 12	0.70	0.42	0.37
		Band 13	0.59	0.32	0.38
		Band 5	**0.92**	0.38	0.26
		Band 66/4	0.22	**0.92**	0.54
		Band 2	0.18	0.80	0.42
DTS	WLAN	2.4GHz WLAN	0.86	0.26	0.20
NII		5GHz WLAN	0.73	0.53	**1.28**
DSS	Bluetooth	2.4GHz Bluetooth	<0.10	<0.10	<0.10

Highest 10g SAR Summary			
Equipment Class	Frequency Band		Product Specific 10g SAR (W/kg) (Separation 0mm)
License	LTE	Band 66/4	**3.47**
NII	WLAN	5GHz WLAN	3.10

Remark: This device supports both LTE B4 and B66. Since the supported frequency span for LTE B4 falls completely within the supports frequency span for LTE B66, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B66.

15. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product specific 10g SAR
1.	WWAN + WLAN2.4GHz	Yes	Yes	Yes	Yes
2.	WWAN + WLAN5GHz	Yes	Yes	Yes	Yes
3.	WWAN + Bluetooth	Yes	Yes	Yes	Yes

General Note:

1. For simultaneously transmission SAR analysis, WWAN/WLAN/BT SAR Chose higher SAR between original project and variant project for each exposure position to perform co-located SAR analysis.
2. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
3. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
4. This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering applications.
5. This device 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WLAN Direct (GC/GO), and 5.3GHz / 5.5GHz supports WLAN Direct (GC only).
6. The worst case 5 GHz WLAN SAR for each configuration was used for SAR summation.
7. WLAN 2.4GHz and Bluetooth share the same antenna so can’t transmit simultaneously.
8. According to the EUT characteristic, WLAN 5GHz and Bluetooth can’t transmit simultaneously.
9. The maximum SAR summation is calculated based on the same configuration and test position.
10. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
    i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/kg.
    ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
    iii) If SPLSR ≤ 0.04 for 1g SAR and SPLSR≤ 0.10 for 10g SAR, simultaneously transmission SAR measurement is not necessary.
    iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg and 10g SAR < 4.0W/kg.

15.1 Head Exposure Conditions

WWAN Band	Exposure Position	1	3	6	9	1+3	1+6	1+9
		WWAN	WLAN2.4GHz_ Simultaneous Ant 2	WLAN5GHz_ Simultaneous Ant 3	Bluetooth Ant 2	**Summed**	**Summed**	**Summed**
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	**1g SAR (W/kg)**	**1g SAR (W/kg)**	**1g SAR (W/kg)**
LTE Band 12 Ant 1	Right Cheek	0.582	0.597	0.124	0.066	1.18	0.71	0.65
	Right Tilted	0.444	0.335	0.121	0.035	0.78	0.57	0.48
	Left Cheek	0.730	0.237	0.389	0.030	0.97	1.12	0.76
	Left Tilted	0.557	0.241	0.250	0.027	0.80	0.81	0.58
LTE Band 13 Ant 1	Right Cheek	0.612	0.597	0.124	0.066	1.21	0.74	0.68
	Right Tilted	0.509	0.335	0.121	0.035	0.84	0.63	0.54
	Left Cheek	0.791	0.237	0.389	0.030	1.03	1.18	0.82
	Left Tilted	0.550	0.241	0.250	0.027	0.79	0.80	0.58
LTE Band 5 Ant 1	Right Cheek	0.789	0.597	0.124	0.066	**1.39**	0.91	0.86
	Right Tilted	0.591	0.335	0.121	0.035	0.93	0.71	0.63
	Left Cheek	0.922	0.237	0.389	0.030	1.16	1.31	**0.95**
	Left Tilted	0.549	0.241	0.250	0.027	0.79	0.80	0.58
LTE Band 66 Ant 0	Right Cheek	0.125	0.597	0.124	0.066	0.72	0.25	0.19
	Right Tilted	0.125	0.335	0.121	0.035	0.46	0.25	0.16
	Left Cheek	0.231	0.237	0.389	0.030	0.47	0.62	0.26
	Left Tilted	0.130	0.241	0.250	0.027	0.37	0.38	0.16
LTE Band 2 Ant 0	Right Cheek	0.161	0.597	0.124	0.066	0.76	0.29	0.23
	Right Tilted	0.193	0.335	0.121	0.035	0.53	0.31	0.23
	Left Cheek	0.267	0.237	0.389	0.030	0.50	0.66	0.30
	Left Tilted	0.145	0.241	0.250	0.027	0.39	0.40	0.17

15.2 Hotspot Exposure Conditions

WWAN Band	Exposure Position	1	3	6	9	1+3	1+6	1+9
		WWAN	WLAN2.4GHz Ant 2	WLAN5GHz Ant 3	Bluetooth Ant 2	**Summed**	**Summed**	**Summed**
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	**1g SAR (W/kg)**	**1g SAR (W/kg)**	**1g SAR (W/kg)**
LTE Band 12 Ant 1	Front	0.230	0.236	0.126	0.015	0.47	0.36	0.25
	Back	0.416	0.262	0.534	0.020	0.68	0.95	0.44
	Left side	0.292	0.407	0.098	0.026	0.70	0.39	0.32
	Right side	0.341		0.383		0.34	0.72	0.34
	Top side	0.349	0.241	0.162	0.017	0.59	0.51	0.37
	Bottom side							
LTE Band 13 Ant 1	Front	0.248	0.236	0.126	0.015	0.48	0.37	0.26
	Back	0.329	0.262	0.534	0.020	0.59	0.86	0.35
	Left side	0.232	0.407	0.098	0.026	0.64	0.33	0.26
	Right side	0.293		0.383		0.29	0.68	0.29
	Top side	0.184	0.241	0.162	0.017	0.43	0.35	0.20
	Bottom side							
LTE Band 5 Ant 1	Front	0.191	0.236	0.126	0.015	0.43	0.32	0.21
	Back	0.359	0.262	0.534	0.020	0.62	0.89	0.38
	Left side	0.169	0.407	0.098	0.026	0.58	0.27	0.20
	Right side	0.158		0.383		0.16	0.54	0.16
	Top side	0.170	0.241	0.162	0.017	0.41	0.33	0.19
	Bottom side							
LTE Band 66 Ant 0	Front	0.411	0.236	0.126	0.015	0.65	0.54	0.43
	Back	0.861	0.262	0.534	0.020	1.12	**1.40**	0.88
	Left side	0.150	0.407	0.098	0.026	0.56	0.25	0.18
	Right side	0.164		0.383		0.16	0.55	0.16
	Top side		0.241	0.162	0.017	0.24	0.16	0.02

	Bottom side	0.931				0.93	0.93	0.93
LTE Band 2 Ant 0	Front	0.341	0.236	0.126	0.015	0.58	0.47	0.36
	Back	0.650	0.262	0.534	0.020	0.91	1.18	0.67
	Left side	0.119	0.407	0.098	0.026	0.53	0.22	0.15
	Right side	0.195		0.383		0.20	0.58	0.20
	Top side		0.241	0.162	0.017	0.24	0.16	0.02
	Bottom side	0.819				0.82	0.82	0.82

15.3 Body-Worn Accessory Exposure Conditions

WWAN Band	Exposure Position	1	3	6	9	**1+3**	**1+6**	**1+9**
		WWAN	WLAN2.4GHz Ant 2	WLAN5GHz Ant 3	Bluetooth Ant 2	**Summed**	**Summed**	**Summed**
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	**1g SAR (W/kg)**	**1g SAR (W/kg)**	**1g SAR (W/kg)**
LTE Band 12 Ant 1	Front	0.270	0.123	0.065	0.007	0.39	0.34	0.28
	Back	0.370	0.140	0.375	0.011	0.51	0.75	0.38
LTE Band 13 Ant 1	Front	0.267	0.123	0.065	0.007	0.39	0.33	0.27
	Back	0.440	0.140	0.375	0.011	0.58	0.82	0.45
LTE Band 5 Ant 1	Front	0.200	0.123	0.065	0.007	0.32	0.27	0.21
	Back	0.329	0.140	0.375	0.011	0.47	0.70	0.34
LTE Band 66 Ant 0	Front	0.308	0.123	0.065	0.007	0.43	0.37	0.32
	Back	0.608	0.140	0.375	0.011	0.75	0.98	0.62
LTE Band 2 Ant 0	Front	0.209	0.123	0.065	0.007	0.33	0.27	0.22
	Back	0.470	0.140	0.375	0.011	0.61	0.85	0.48

15.4 Product Specific Exposure Conditions

Note: 1. For WLAN2.4GHz/Bluetooth Product specific 10g stand-alone SAR is not required for a transmitter or antenna, due to 1g hotspot SAR is <1.2W/kg.

WWAN Band	Exposure Position	1	6	1+6
		WWAN	WLAN5GHz_ Simultaneous Ant 3	Summed
		10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)
LTE Band 66 Ant 0	Front		0.202	0.20
	Back	2.997	0.545	3.54
	Left side			0.00
	Right side		0.883	0.88
	Top side		0.181	0.18
	Bottom side	3.479		3.48

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16. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

17. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[8] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

[9] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[10] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[11] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[12] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

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