N° 1-6736
Scope

CERTIFICATE #3478.01

TEST REPORT

EUT Description	**WWAN module installed in Convertible PC**
Brand Name	**HP**
Model Name	**HSN-I57C**
FCC / IC IDs	**B94HNI57CPT / 21374-L860GL16**
Date of Test Start/End	**2022-11-23 / 2022-11-25**
Features	**WWAN (LTE, UMTS), WLAN, BT** (see section 5)
Description	**Platform: HSN-I57C + Vendor 1 antenna**

Applicant	**HP Inc.**
Address	**1501 Page Mill Road, Palo Alto CA 94304 USA**
Contact Person	**Sam Lin**
Telephone / Email	**+886 2 3789 6331 / sam.lin2@hp.com**

Reference Standards	**FCC 47 CFR Part §2.1093** **RSS-102, issue 5** (see section 1)	
RF Exposure Environment	**Portable devices - General population/uncontrolled exposure**	
	SAR Result	SAR Limit
Maximum SAR Result & Limit	**0.76 W/kg (1g)**	**1.6 W/kg (1g)**
Min. test separation distance	**0mm to phantom, 6.50mm to antenna edge**	

Test Report identification	**221118-02.TR02**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** (see section 8)

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by	Reviewed by
Digitally signed by Edgar GARCIA Date: 2022.11.25 18:48:48 +01'00'	Digitally signed by Adel LOUNES Date: 2022.11.25 18:53:50 +01'00'
Edgar GARCIA (Test Engineer)	Adel LOUNES (Test Lead Engineer)

Intel Corporation S.A.S – WRF Lab
425 rue de Goa – Le Cargo B6 - 06600 Antibes, France
Tel. +33493001400 / Fax +33493001401

Table of Contents

1. Standards, reference documents and applicable test methods

FCC	1. FCC Title 47 CFR Part §2.1093 – Radiofrequency radiation exposure evaluation: portable devices. 2020-10-01 Edition 2. FCC OET KDB 447498 D04 Interim General RF Exposure Guidance v01– RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. 3. FCC OET KDB 616217 D04 v01r02 – SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers. 4. FCC OET KDB 865664 D01 v01r04 – SAR Measurement Requirements for 100 MHz to 6 GHz. 5. FCC OET KDB 865664 D02 v01r02 – RF Exposure Compliance Reporting and Documentation Considerations. 6. FCC OET KDB 941225 D05 v02r05 – SAR Evaluation Considerations for LTE Devices. 7. FCC OET KDB 941225 D01 v03r01 – 3G SAR Measurement Procedures. 8. IEEE Std 1528-2013 – IEEE Recommended Practice Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques… 9. TCB workshop November 2017; RF Exposure Procedures (LTE UL/DL Carrier Aggregation SAR) 10. TCB workshop October 2018; RF Exposure Procedures (LTE Inter-Band Uplink Carrier Aggregation –Interim Procedures) 11. TCB workshop November 2019; RF Exposure Policy Updates (5G NR FR1 NSA EN-DC UE SAR Evaluations) 12. TCB workshop November 2019; 5G NR/ EN-DC Compliance Test Configurations
ISED	13. ISED RSS 102, Issue 5 – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands 14. ISED RSS-102 Supplementary Procedures SPR-001 SAR testing requirements with regard to bystanders for laptop type computers with antennas built-In on display screen (Laptop Mode / Tablet Mode) 15. ISED Notice 2020-DRS2020 Applicability of IEC/IEEE62209-1528 and IEC 62209 -3 standard 16. ISED Notice 2016-DRS001 – Applicability of latest FCC RF Exposure KDB Procedures and Other Procedures. 17. ISED Notice 2012-DRS0529 – SAR correction for measured conductivity and relative permittivity based on IEC 62209-2 standard. 18. FCC OET KDB 447498 D01 V06 General RF Exposure Guidance v01– RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. 19. FCC OET KDB 616217 D04 v01r02 – SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers. 20. FCC OET KDB 865664 D01 v01r04 – SAR Measurement Requirements for 100 MHz to 6 GHz. 21. FCC OET KDB 865664 D02 v01r02 – RF Exposure Compliance Reporting and Documentation Considerations. 22. FCC OET KDB 941225 D05 v02r05 – SAR Evaluation Considerations for LTE Devices. 23. FCC OET KDB 941225 D01 v03r01 – 3G SAR Measurement Procedures. 24. IEC/IEEE 62209-1528:2020 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

2. General conditions, competences and guarantees

- ✓ Tests performed under FCC standards identified in section 1 are covered by A2LA accreditation.
- ✓ Tests performed under ISED standards identified in section 1 are covered by Cofrac accreditation.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 testing laboratory accredited by the French Committee for Accreditation (Cofrac) with the certificate number 1-6736.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED #1000Y.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	21.4ºC ± 0.7ºC
Humidity	34.3% ± 6.3%
Liquid Temperature	22.2ºC ± 0.5ºC

4. Test sample

Sample	Control #	Description	Model	Serial #	Date of receipt
#01	220815-02.S02	WWAN module installed in Convertible PC	HSN-I57C	C902NL009Y	2022-08-31

5. EUT Features

The herein information is provided by the customer
Intel WRF Lab declines any responsibility for the accuracy of the stated customer provided information, especially if it has any impact on the correctness of test results presented in this report.

Brand Name	HP
Model Name	HSN-I57C
Prototype / Production	Production
Host Identification	HSN-I57C
Exposure Conditions	Body worn

Supported radios

The module is a data only DUT supporting UMTS and LTE, with carrier aggregation. The applicable frequency bands and operating modes are identified in the following table.

WWAN:

Mode	Bands	Supported Tx Mode			
		WCDMA	HSDPA	HSUPA	DC-HSDPA
WCDMA / HSPA+	FDD II (1850.0 – 1910.0 MHz)	✓	✓	✓	✓
	FDD IV (1710.0 – 1755.0 MHz)	✓	✓	✓	✓
	FDD V (824.0 – 849.0 MHz)	✓	✓	✓	✓

FDD/TDD	Band	Modulation	Bandwidth					
			1.4	3	5	10	15	20
LTE FDD	Band 2 (1850.0 – 1910.0 MHz)	QPSK/16QAM	✓	✓	✓	✓	✓	✓
	Band 4 (1710.0 – 1755.0 MHz)	QPSK/16QAM	✓	✓	✓	✓	✓	✓
	Band 5 (824.0 – 849.0 MHz)	QPSK/16QAM	✓	✓	✓	✓		
	Band 7 (2500.0 – 2570.0 MHz)	QPSK/16QAM			✓	✓	✓	✓
	Band 12 (699.0 – 716.0 MHz)	QPSK/16QAM	✓	✓	✓	✓		
	Band 13 (777.0 – 787.0 MHz)	QPSK/16QAM			✓	✓		
	Band 14 (788.0 – 798.0 MHz)	QPSK/16QAM			✓	✓		
	Band 17 (704.0 – 716.0 MHz)	QPSK/16QAM			✓	✓		
	Band 25 (1850.0 – 1915.0 MHz)	QPSK/16QAM	✓	✓	✓	✓	✓	✓
	Band 26 (814.0 – 849.0 MHz)	QPSK/16QAM	✓	✓	✓	✓	✓	
	Band 30 (2305.0 – 2315.0 MHz)	QPSK/16QAM			✓	✓		
	Band 66 (1710.0 – 1780.0 MHz)	QPSK/16QAM	✓	✓	✓	✓	✓	✓
	Band 71 (663.0 – 698.0 MHz)	QPSK/16QAM			✓	✓	✓	✓
LTE TDD	Band 38 (2570.0 – 2620.0 MHz)	QPSK/16QAM			✓	✓	✓	✓
	Band 41 (2496.0 – 2690.0 MHz)	QPSK/16QAM			✓	✓	✓	✓
	Band 48 (3550.0 – 3700.0 MHz)	QPSK/16QAM			✓	✓	✓	✓

UL carrier aggregation LTE (Intra-band)
FDD Band 5B
FDD Band 7C
FDD Band 38C
FDD Band 41C
FDD Band 66B
FDD Band 66C

WLAN

Mode	UL Freq Range
802.11b/g/n/ax	2.4GHz (2400.0 – 2483.5 MHz)
802.11a/n/ac/ax	5.2GHz (5150.0 – 5250.0 MHz) 5.3GHz (5250.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5875.0 MHz)
802.11ax	6.0GHz (5925.0 – 7250.0 MHz)
Bluetooth & BLE v5.2	2.4GHz (2400.0 – 2483.5 MHz)

Antenna Information "information provided by the applicant"
The DUT has one WWAN TX antenna (Ant5 TX/RX): • WWAN (Ant5 TX/RX): **Vendor 1**, PIFA antenna. P/N : 6036B0327801 (81EABL15.G79) See Annex F for more details on antennas location.
Simultaneous Transmission Configurations
WWAN Ant5 Tx/Rx + WLAN2 2.4GHz + WLAN1 BT WWAN Ant5 Tx/Rx + WLAN2 2.4GHz + WLAN1 2.4GHz WWAN Ant5 Tx/Rx + WLAN2 5GHz + WLAN1 BT WWAN Ant5 Tx/Rx + WLAN2 5GHz + WLAN1 5GHz WWAN Ant5 Tx/Rx + WLAN2 5GHz + WLAN1 5GHz+ WLAN1 BT WWAN Ant5 Tx/Rx + WLAN2 6GHz + WLAN1 BT WWAN Ant5 Tx/Rx + WLAN2 6GHz + WLAN1 6GHz WWAN Ant5 Tx/Rx + WLAN2 6GHz + WLAN1 6GHz + WLAN1 BT WLAN transmitter is considered in this report just for the simultaneous transmission evaluation with the WWAN module (See section B.5.6)
Additional information

- 5.60-5.65 GHz band (TDWR) is supported by the device
- Band gap is supported by the device
- Two different power settings are implemented in the DUT:
  - Max power for Notebook mode
  - Reduced power for Tablet mode
- The DUT does not support VoLTE, so Head Exposure is not considered for LTE and WCDMA modes. Maximum Power Reduction (MPR) is implemented according to 3GPP, and it is a permanent feature, built-in by design:

Modulation	**Channel bandwidth / #RB**						**MPR (dB)**
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≥18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	>16	>18	≤ 3
256 QAM	≥1						≤ 5

A-MPR (additional MPR) was disabled during SAR testing

The following table indicates the power levels and tolerance for each mode:

Maximum Output power specification + Tune up tolerance

Mode	Technology	Bands	Class	Nominal (dBm)	Tolerance dB	Lower Tolerance (dBm)	Upper Tolerance (dBm)
Laptop	WCDMA/HSPA	FDD II (1850.0 – 1910.0 MHz)	3	23.5	±1	22.5	24.5
	WCDMA/HSPA	FDD IV (1710.0 – 1755.0 MHz)	3	23.5	±1	22.5	24.5
	WCDMA/HSPA	FDD V (824.0 – 849.0 MHz)	3	23.5	±1	22.5	24.5
	LTE	Band 2 (1850.0 – 1910.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 4 (1710.0 – 1755.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 5 (824.0 – 849.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 7 (2500.0 – 2570.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 12 (699.0 – 716.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 13 (777.0 – 787.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 14 (788.0 – 798.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 17 (704.0 – 716.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 25 (1850.0 – 1915.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 26 (814.0 – 849.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 30 (2305.0 – 2315.0 MHz)	3	22.0	±1	21.0	23.0
	LTE	Band 38 (2570.0 – 2620.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 41 (2496.0 – 2690.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 41 (2496.0 – 2690.0 MHz)	2	26.0	±1	25.0	27.0
	LTE	Band 48 (3550.0 – 3700.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 66 (1710.0 – 1780.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 71 (663.0 – 698.0 MHz)	3	23.0	±1	22.0	24.0
Tablet	WCDMA/HSPA	FDD II (1850.0 – 1910.0 MHz)	3	21.0	±1	20.0	22.0
	WCDMA/HSPA	FDD IV (1710.0 – 1755.0 MHz)	3	18.5	±1	17.5	19.5
	WCDMA/HSPA	FDD V (824.0 – 849.0 MHz)	3	22.5	±1	21.5	23.5
	LTE	Band 2 (1850.0 – 1910.0 MHz)	3	21.0	±1	20.0	22.0
	LTE	Band 4 (1710.0 – 1755.0 MHz)	3	18.5	±1	17.5	19.5
	LTE	Band 5 (824.0 – 849.0 MHz)	3	22.0	±1	21.0	23.0
	LTE	Band 7 (2500.0 – 2570.0 MHz)	3	19.0	±1	18.0	20.0
	LTE	Band 12 (699.0 – 716.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 13 (777.0 – 787.0 MHz)	3	22.5	±1	21.5	23.5
	LTE	Band 14 (788.0 – 798.0 MHz)	3	22.5	±1	21.5	23.5
	LTE	Band 17 (704.0 – 716.0 MHz)	3	23.0	±1	22.0	24.0
	LTE	Band 25 (1850.0 – 1915.0 MHz)	3	21.0	±1	20.0	22.0
	LTE	Band 26 (814.0 – 849.0 MHz)	3	22.5	±1	21.5	23.5
	LTE	Band 30 (2305.0 – 2315.0 MHz)	3	20.0	±1	19.0	21.0
	LTE	Band 38 (2570.0 – 2620.0 MHz)	3	19.0	±1	18.0	20.0
	LTE	Band 41 (2496.0 – 2690.0 MHz)	3	19.0	±1	18.0	20.0
	LTE	Band 41 (2496.0 – 2690.0 MHz)	2	19.0	±1	18.0	20.0
	LTE	Band 48 (3550.0 – 3700.0 MHz)	3	21.0	±1	20.0	22.0
	LTE	Band 66 (1710.0 – 1780.0 MHz)	3	18.5	±1	17.5	19.5
	LTE	Band 71 (663.0 – 698.0 MHz)	3	23.0	±1	22.0	24.0

6. Remarks and comments

a. Only the plots for the test positions with the highest measured SAR per band/mode are included in Annex C as required per FCC OET KDB 865664 D02, paragraph 2.3.h
b. This report includes only the test of band LTE 71. For all other cellular bands and configurations supported by the WWAN module, please refer to reports:

- 220815-03.TR01-FCC-IC_WWAN_SAR_HP_HSN-I57C_7560R_RTL8852CE_Rev01

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

Mode	Band (UL)	Highest Reported SAR (1g) (W/kg)	Verdict
LTE FDD	Band 71 (663.0 – 698.0 MHz)	0.76	Pass

8. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	E. Garcia	First Issue

Annex A. Test & System Description

A.1 SAR Definition

Specific Absorption rate is defined as the time derivative of the incremental energy (dW) absorbed by (dissipated in) and incremental mass (dm) contained in a volume element (dV) of a given density (ρ).

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

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

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

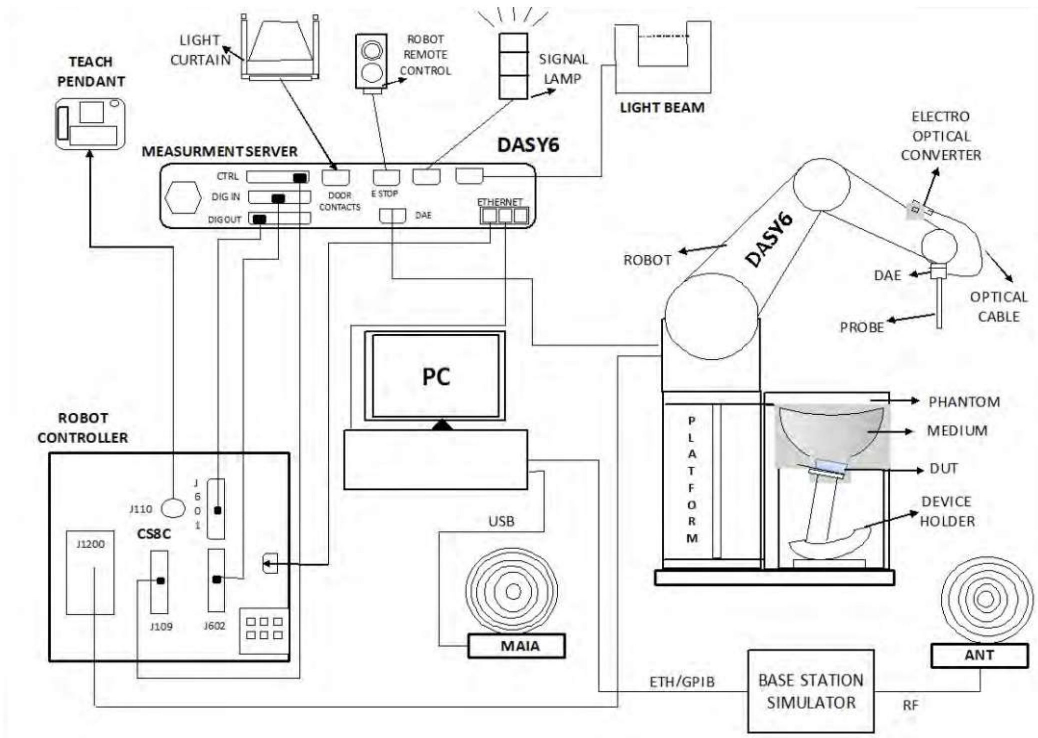
Where:

σ = Conductivity of the tissue (S/m)
ρ = Mass density of the tissue (kg/m3)
E = RMS electric field strength (V/m)

A.1.1 SPEAG SAR Measurement System

A.1.2 SAR Measurement Setup

The DASY6 system for performing compliance tests consists of the following items:



- ✓ A standard high precision 6-axis robot (Staübli TX/RX family) with controller, teach pendant and software. It includes an arm extension for accommodating the data acquisition electronics (DAE)
- ✓ An isotropic field probe optimized and calibrated for the targeted measurements.
- ✓ 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. 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 movements interrupts.
- ✓ The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- ✓ A computer running Win7 professional operating system and the DASY6 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.
- ✓ MAIA is a hardware interface (Antenna) used to evaluate the modulation and audio interference characteristics of RF signals.
- ✓ ANT is an ultra-wideband antenna for use with the base station simulators over 698 MHz to 6GHz.
- ✓ The base station simulator is an equipment used for SAR cellular tests in order to emulate the cellular signals characteristics and behavior between a regular base station and the equipment under test.
- ✓ Tissue simulating liquid.
- ✓ System Validation dipoles.
- ✓ Network emulator.

A.1.3 E-Field Measurement Probe

The probe is constructed using three orthogonal dipole sensors arranged on an interlocking, triangular prism core. The probe has built-in shielding against static charges and is contained within a PEEK cylindrical enclosure material at the tip.

The probe's characteristics are:

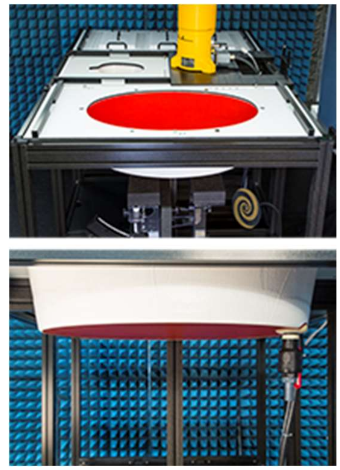
Frequency Range	30MHz – 6GHz
Length	337 mm
Probe tip external diameter	2.5 mm
Typical distance between dipoles and the probe tip	1 mm
Axial Isotropy (in human-equivalent liquids)	±0.3 dB
Hemispherical Isotropy (in human-equivalent liquids)	±0.5 dB
Linearity	±0.2 dB
Maximum operating SAR	100 W/kg
Lower SAR detection threshold	0.001 W/kg

A.1.4 Flat Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. 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.

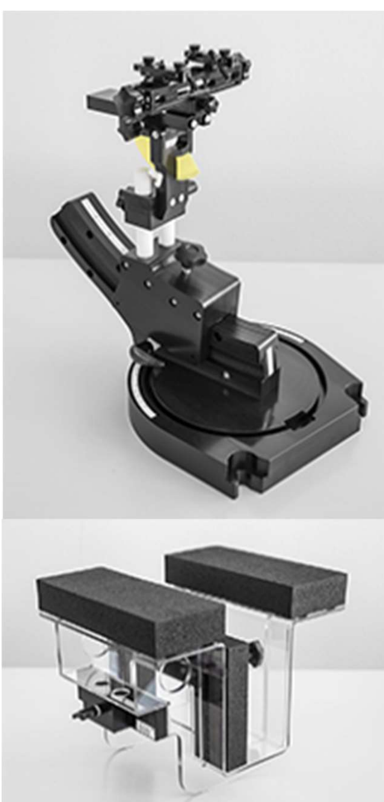
The phantom’s characteristics are:

Material	Vinylester, glass fiber reinforced (VE-GF)
Shell thickness	2 mm ± 0.2 mm
Filling volume	30 Liters approx.
Dimensions	Major axis: 600mm / Minor axis: 400mm



A.1.5 Device Positioner

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of 0.5 mm would produce a SAR uncertainty of 20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.



The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

A simple but effective and easy-to-use extension for the Mounting Device; facilitates testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.); lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI and other Flat Phantoms.

A.1.6 Data Evaluation

Power Reference measurement

The robot measures the E field in a specified reference position that can be either the selected section's grid reference point or a user point in this section at 4mm of the inner surface of the phantom, 2mm for frequencies above 3GHz.

Area Scan

Measurement procedures for evaluating SAR from wireless handsets typically start with a coarse measurement grid to determine the approximate location of the local peak SAR values. This is known as the area-scan procedure. The SAR distribution is scanned along the inside surface of one side of the phantom head, at least for an area larger than the projection of the handset and antenna. The distance between the measured points and phantom surface should be less than 8 mm, and should remain constant (with variation less than ± 1 mm) during the entire scan in order to determine the locations of the local peak SAR with sufficient accuracy. The angle between the probe axis and the surface normal line is recommended but not required to be less than 30°. If this angle is larger than 30° and the closest point on the probe-tip housing to the phantom surface is closer than a probe diameter, the boundary effect may become larger and polarization dependent. This additional uncertainty needs to be analyzed and accounted for. To achieve this, modified test procedures and additional uncertainty analyses not described in this recommended practice may be required. The measurement and interpolation point spacing should be chosen such as to allow identification of the local peak locations to within one-half of the linear dimension of a side of the zoom-scan volume. Because a local peak having specific amplitude and steep gradients may produce a lower peak spatial-average SAR compared to peaks with slightly lower amplitude and less steep gradients, it is necessary to evaluate these other peaks as well. However, since the spatial gradients of local SAR peaks are a function of the wavelength inside the tissue-equivalent liquid and the incident magnetic field strength, it is not necessary to evaluate local peaks that are less than 2 dB or more below the global maximum peak. Two-dimensional spline algorithms (Brishoual et al. 2001; Press et al., 1996) are typically used to determine the peaks and gradients within the scanned area. If a peak is found at a distance from the scan border of less than one-half the edge dimension of the desired 1 g or 10 g cube, the measurement area should be enlarged if possible.

Zoom Scan

To evaluate the peak spatial-average SAR values for 1 g or 10 g cubes, fine resolution volume scans, called zoom scans, are performed at the peak SAR locations identified during the area scan. The minimum zoom scan volume size should extend at least 1.5 times the edge dimension of a 1 g cube in all directions from the center of the scan volume, for both 1 g and 10 g peak spatial-average SAR evaluations. Along the phantom curved surfaces, the front face of the volume facing the tissue/liquid interface conforms to the curved boundary, to ensure that all SAR peaks are captured. The back face should be equally distorted to maintain the correct averaging mass. The flatness and orientation of the four side faces are unchanged from that of a cube whose orientation is within ± 30° of the line normal to the phantom at the center of the cube face next to the phantom surface. The peak local SAR locations that were determined in the area scan (interpolated values) should be used for the centers of the zoom scans. If a scan volume cannot be centered due to proximity of a phantom shape feature, the probe should be tilted to allow scan volume enlargement. If probe tilt is not feasible, the zoom-scan origin may be shifted, but not by more than half of the 1 g or 10 g cube edge dimension.

After the zoom-scan measurement, extrapolations from the closest measured points to the surface, for example along lines parallel to the zoom-scan centerline, and interpolations to a finer resolution between all measured and extrapolated points are performed. Extrapolation algorithm considerations are described in 6.5.3, and 3-D spline methods (Brishoual et al., 2001; Kreyszig, 1983; Press et al., 1996) can be used for interpolation. The peak spatial-average SAR is finally determined by a numerical averaging of the local SAR values in the interpolation grid, using for example a trapezoidal algorithm for the integration (averaging).

In some areas of the phantom, such as the jaw and upper head regions, the angle of the probe with respect to the line normal to the surface may be relatively large, e.g., greater than ± 30º, which could increase the boundary effect error to a larger level. In these cases, during the zoom scan a change in the orientation of the probe, the phantom, or both is recommended but not required for the duration of the zoom scan, so that the angle between the probe axis and the line normal to the surface is within 30º for all measurement points.

Power Drift measurement

The robot re-measures the E-Field in the same reference location measured at the Power Reference. The drift measurement gives the field difference in dB from the first to the last reference reading. This allows a user to monitor the power drift of the device under test that must remain within a maximum variation of ±5%.

Post-processing

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1528 and IEC 62209-1/2 standards. It can be conducted for 1g and 10g.

The software allows evaluations that combine measured data and robot positions, such as:

- ✓ Maximum search
- ✓ Extrapolation
- ✓ Boundary correction
- ✓ Peak search for averaged SAR

Interpolation between the measured points is performed when the resolution of the grid is not fine enough to compute the average SAR over a given mass.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

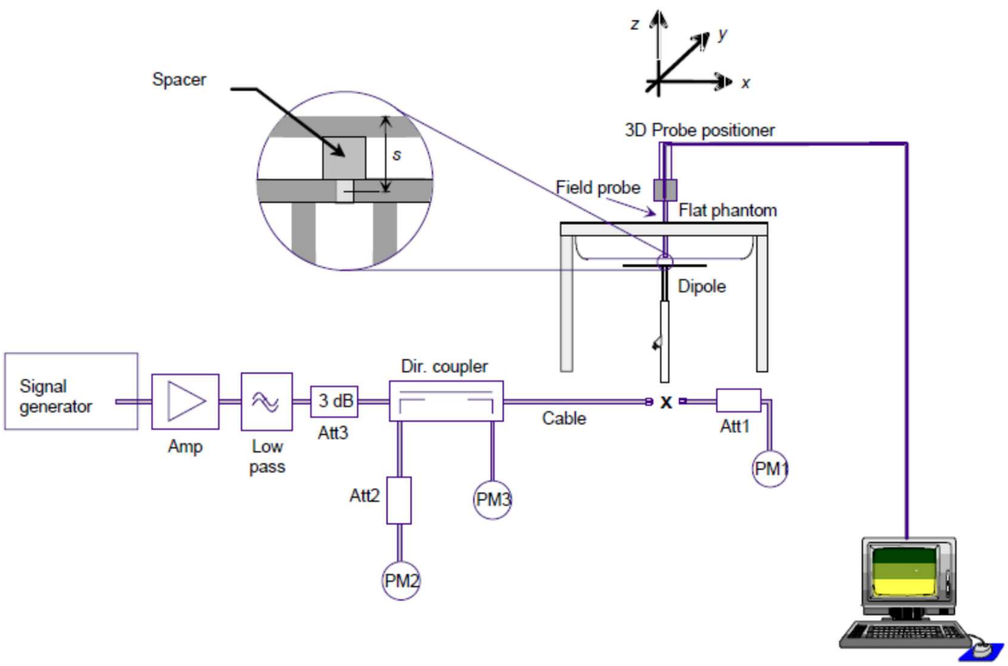
A.1.7 System and Liquid Check

A.1.8 System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results.

The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

In the simplified setup for system check, the EUT is replaced by a calibrated dipole and the power source is replaced by a controlled continuous wave generated by a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the phantom at the correct distance.



The equipment setup is shown below:

- ✓ Signal Generator
- ✓ Amplifier
- ✓ Directional coupler
- ✓ Power meter
- ✓ Calibrated dipole

First, the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the connector (x) to the system check source. The signal generator is adjusted for the desired forward power at the connector as read by power meter PM1 after attenuation Att1 and also as coupled through Att2 to PM2. After connecting the cable to the source, the signal generator is readjusted for the same reading at power meter PM2.

SAR results are normalized to a forward power of 1W to compare the values with the calibration reports results as described at IEEE 1528 and IEC 62209 standards.

A.1.9 Liquid Check

The dielectric parameters check is done prior to the use of the tissue simulating liquid. The verification is made by comparing the relative permittivity and conductivity to the values recommended by the applicable standards.

The liquid verification was performed using the following test setup:

- ✓ VNA (Vector Network Analyzer)
- ✓ Open-Short-Load calibration kit
- ✓ RF Cable
- ✓ Open-Ended Coaxial probe
- ✓ DAK software tool
- ✓ SAR Liquid
- ✓ De-ionized water
- ✓ Thermometer

These are the target dielectric properties of the tissue-equivalent liquid material as defined in FCC OET KDB 865664 D01.

Frequency	Body SAR	
(MHz)	ε_r (F/m)	σ (S/m)
150	61.9	0.80
300	58.2	0.92
450	56.7	0.94
835	55.2	0.97
900	55.0	1.05
1450	54.0	1.30
1800-2000	53.3	1.52
2450	52.7	1.95
3000	52.0	2.73
5800	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

The measurement system implement a SAR error compensation algorithm as documented in IEEE Std 1528-2013 (equivalent to draft standard IEEE P1528-2011) to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters (applied to only scale up the measured SAR, and not downward) so, according to FCC OET KDB 865664 D01, the tolerance for ε_r and σ may be relaxed to ± 10%.

A.1.10 Test Equipment List

SAR System #5

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
489-000	6-Axis Robot	TX260L Speag	F/22/0038104/A/001	STAÜBLI	NA	NA
489-001	Robot Controller	CSE9spe-TX2-60	F/22/0038104/C/001	STAÜBLI	NA	NA
489-004	Measurement Server	DASY8 MS	10079	SPEAG	NA	NA
489-009	Electro Optical Converter	EOC8-60	1033	SPEAG	NA	NA
489-005	Light Beam Unit	LB-85	2068	Di-soric	NA	NA
004-002	Oval Flat Phantom	ELI V8.0	2124	SPEAG	NA	NA
489-010	Measurement Software	DASY8 v16.0	9-457E974A_D8	SPEAG	NA	NA
489-007	Data Acquisition Electronics	DAE	1706	SPEAG	2022-07-11	2023-07-11
003-007	Dosimetric E-Field probe	EX3DV4	7465	SPEAG	2022-07-18	2023-07-18
003-009	Laptop Holder	N/A	N/A	SPEAG	NA	NA

A.1.11 Shared Instrumentation

ID #	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
123-000	USB Power Sensor	NRP-Z81	102278	R&S	2021-04-13	2023-04-13
124-000	USB Power Sensor	NRP-Z81	102279	R&S	2021-04-13	2023-04-13
099-000	Liquid measurement SW	DAK-3.5 V2.6.0.5	9-2687B491	SPEAG	NA	NA
369-000	Dielectric Probe Kit	DAK-3.5	1309	SPEAG	2021-03-10	2023-03-10
077-000	Coupler	CD0.5-8-20-30	1251-002	Amd-group	2022-08-26	2023-01-26
078-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2022-08-26	2023-01-26
079-000	RF Cable	ST-18/SMAm/SMAm/48	-	Huber & Suhner	2022-08-26	2023-01-26
126-000	Vector Signal Generator	ESG E4438C	MY45092885	Agilent	2021-05-27	2023-05-27
327-000	Temp & Humidity Logger	RA32E-TH1-RAS	RA32-F0DED9	AVTECH	2021-03-09	2023-03-09
089-000	Vector Reflectometer R140	PLANAR R140	0190616	R&S	2021-09-02	2023-09-02
071-000	750 MHz System Validation Dipole	D750V3	1136	SPEAG	2021-01-21	2023-01-21
327-000	Temperature & Humidity Logger	RA32E-TH1-RAS	RA32-F0DED9	AVTECH	2021-03-09	2023-03-09

A.1.12 Tissue Simulant Liquid

TSL	Manufacturer / Model	Freq Range (MHz)	Main Ingredients
Body WideBand	SPEAG MBBL600-6000V6 Batch 191014-02	600-6000	Ethanediol, Sodium petroleum sulfonate, Hexylene Glycol / 2-Methyl-pentane-2.4-diol, Alkoxylated alcohol

A.1.13 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

SPEAG DASY6 Uncertainty Budget According to IEC/IEEE 62209-1528 (4 MHz - 6 GHz) including IEEE 1528-2013 and IEC 62209-1/2016, IEC 62209-2/2010								
Symbol	Error Description	Uncert. Value	Prob Dist.	Div.	(ci) 1g	(ci) 10g	Std Unc. (1g)	Std Unc. (10g)
Measurement System Errors								
CF	*Probe Calibration*	±14.0 %	N	2	1	1	±7.0 %	±7.0 %
CF_{drift}	Probe Calibration Drift	±1.0 %	N	1	1	1	±1.0 %	±1.0 %
LIN	Probe Linearity	±4.7 %	R	√3	1	1	±2.7 %	±2.7 %
BBS	Broadband Signal	±3.0 %	N	2	1	1	±1.5 %	±1.5 %
ISO	*Axial Isotropy*	±4.7 %	R	√3	0.5	0.5	±1.4 %	±1.4 %
ISO	Hemispherical Isotropy	±9.6 %	R	√3	0.5	0.5	±2.8 %	±2.8 %
DAE	Data Acquisition	±0.3 %	N	1	1	1	±0.3 %	±0.3 %
AMB	RF Ambient	±1.8 %	N	1	1	1	±1.8 %	±1.8 %
Δ_{sys}	Probe Positioning	±0.2 %	N	1	0.33	0.33	±0.1 %	±0.1 %
DAT	Data Processing	±2.3 %	N	1	1	1	±2.3 %	±2.3 %
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.)$_{DAK}$	±2.5 %	N	1	0.78	0.71	±2.0 %	±1.8 %
LIQ(T_σ)	Conductivity (temp.)$_{BB}$	±3.4 %	R	√3	0.78	0.71	±1.5 %	±1.4 %
EPS	Phantom Permittivity	±14.0 %	R	√3	0.25	0.25	±2.0 %	±2.0 %
DAS	Distance DUT - TSL	±2.0 %	N	1	2	2	±4.0 %	±4.0 %
H	Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %
MOD	DUT Modulation$_m$	±2.4 %	R	√3	1	1	±1.4 %	±1.4 %
TAS	Time-average SAR	±2.6 %	R	√3	1	1	±1.5 %	±1.5 %
RF_{drift}	DUT drift	±5.0 %	N	1	1	1	±2.9 %	±2.9 %
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9 %	N	1	1	0.84	±1.9 %	±1.6 %
Combined Std. Uncertainty							±11.5 %	±11.4 %
Expanded STD Uncertainty							**±23.1 %**	**±22.9 %**

A.1.14 RF Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR Part 2.1093 on the limitation of exposure of the general population / uncontrolled exposure for portable devices.

Exposure Type	General Population / Uncontrolled Environment
Peak spatial-average SAR (averaged over any 1 gram of tissue)	1.6 W/kg
Whole body average SAR	0.08 W/kg
Peak spatial-average SAR (extremities)(averaged over any 10 grams of tissue)	4.0 W/kg

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
SAR measurement	E. Garcia
Conducted measurement	F. Heurtematte

B.1 Test Conditions

B.1.1 Test SAR Test positions relative to the phantom

The device under test was a Convertible PC, **HSN-I57C**. The device was operated utilizing proprietary software, and each channel was measured using a communication tester to determine the maximum average power.

The device has 2 power settings:
Laptop mode
Tablet mode

See section 5 for details about power values for the configuration
See Annex 0 for information about the platform antenna configuration

Laptop mode

As described below on section B.1.3, Laptop position does not require SAR testing.

Notebook	WWAN Ant 5 TX/RX
Position	Laptop

Tablet mode

According to FCC OET KDB 616217 D04, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Test Exclusion Threshold in FCC OET KDB 447498 can be applied to determine SAR test exclusion for adjacent edge configurations. (See section 5 for power specifications)

The reduced power values shown on section 5 and the closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

Considering the antenna location diagrams in Annex F and the test exclusions described before, the surfaces/edges to be measured for each antenna are:

Tablet	WWAN Ant 5 TX/RX
Position	Top Edge Back Face Right Edge

See B.1.3.1 for a more detailed list of the applied reductions.

See F.2 Test position section for more information on the tested positions.

B.1.2 Evaluation Exclusion and Test Reductions

B.1.2.1 SAR evaluation exclusion

FCC:

The SAR Test Exclusion Threshold in FCC OET KDB 447498 can be applied to determine SAR test exclusion for adjacent edge configurations. For 100MHz to 6GHz and test separation distances ≤50mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following formula:

$$[(\text{max. power of channel, including tune} - \text{up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot \left[\sqrt{f_{(GHz)}}\right] \leq 3.0\ for\ 1g\ SAR, and \leq 7.5\ for\ 10g\ extremity\ SAR \quad (1)$$

Where:

f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The values 3.0 and 7.5 are referred to as numeric thresholds

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

For test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined using the following formulas:

$$\langle(Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ (1)) + (test\ separation\ distance - 50\ mm) \cdot (f_{MHz}/150)\rangle mW, for\ 100MHz\ to\ 1500MHz \quad (2)$$

$$\langle(Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ (1)) + (test\ separation\ distance - 50\ mm) \cdot 10)\rangle mW, for\ 1500MHz\ and\ \leq 6GHz \quad (3)$$

Test Exclusion

Antenna	Band Name	Output power				Back Face	Top Edge	Left Edge	Right Edge	Bottom Edge	Laptop
		Notebook		Tablet							
		dBm	mW	dBm	mW						
	LTE 71	24.0	251.2	24.0	251.2	<50	<50	>50	<50	>50	>50

Back Face	Top Edge	Left Edge	Right Edge	Bottom Edge	Laptop
T	T	R	T	R	R

T: Tested position
R: Reduced
See Annex *F* for a more detailed explanation of the separation distance related to the platform.

In order to evaluate SAR test exclusion for Laptop and tablet user positions in which the separation distance passes the 50mm limit, equations (2) and (3) are used with the corresponding frequencies for each band, the user distances for the two positions and with the power values described on Section 5. The table below shows all cellular bands evaluated in this report grouped by frequency band, separation distances and the corresponding Power threshold in mW for each combination (distance and frequency)

Bands	Frequency	Separation distance to the body on mm										
		60	70	80	90	100	110	160	170	190	200	Threshold values in mW
LTE 71	750	223	273	323	373	423	473	723	773	873	923	

The highest output power for all bands in tablet mode is 251.2mW which is smaller than all the values of the table, SAR is not required for the tablet top edge (>200mm) and left edge (>160mm) positions

ISED:

According to RSS-102 section 2.5.1, SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table below:

SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance					
Frequency	Exemption Limits (mW)				
(MHz)	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW
Frequency	Exemption Limits (mW)				
(MHz)	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

B.1.2.2 General SAR test reduction

According to FCC OET KDB 447498, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

WWAN SAR Test reduction

Transmission Mode	SAR test exclusion/reduction
HSDPA	According to FCC OET KDB 941225 D01, SAR evaluation is not required when the maximum average output power is < ¼ dB higher than the measured on the corresponding channels without HSDPA, using 12.2kbps RMC, and the maximum SAR for 12.2kbps RMC is < 1.2 W/kg.
HSUPA	According to FCC OET KDB 941225 D01, SAR evaluation is not required when the maximum average output power is < ¼ dB higher than the measured on the corresponding channels without HSUPA, using 12.2kbps RMC, and the maximum SAR for 12.2kbps RMC is < 1.2 W/kg.
DC+HSDPA	According to FCC OET KDB 941225 D01, SAR evaluation is not required when the maximum average output power is < ¼ dB higher than the measured on the corresponding channels without DC+HSDPA, using 12.2kbps RMC, and the maximum SAR for 12.2kbps RMC is < 1.2 W/kg.
LTE	According to FCC OET KDB 941225 D05, testing of 100% RB allocation, higher order modulations or lower BW is not required when these conditions are met: For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. For each modulation besides QPSK, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg. For lower BW, only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M, and L channels may not fully apply

B.2 Conducted Power Measurements Tablet Mode

B.2.2 LTE

B.2.2.1 LTE band 71 FDD

Band	BW	Channel #	Freq (MHz)	% RB Allocation	RB Position	QPSK			16 QAM		
						Factory Upper Tolerance (dBm)	MPR	Measured Output Power (dBm)	Factory Upper Tolerance (dBm)	MPR	Measured Output Power (dBm)
LTE71	20 MHz	133222	673	1RB Low	1 Pos 0	24.00	0	23.63	24.00	1	22.30
				1RB Mid	1 Pos 50	24.00	0	23.26	24.00	1	22.99
				1RB High	1 Pos 99	24.00	0	23.81	24.00	1	22.65
				50% RB Low	50 Pos 0	24.00	1	22.49	24.00	2	21.45
				50% RB Mid	50 Pos 24	24.00	1	22.50	24.00	2	21.48
				50% RB High	50 Pos 50	24.00	1	20.85	24.00	2	21.38
				100% RB	100 Pos 0	24.00	1	22.44	24.00	2	21.43
		133297	680.5	1RB Low	1 Pos 0	24.00	0	23.68	24.00	1	22.95
				1RB Mid	1 Pos 50	24.00	0	23.22	24.00	1	22.56
				1RB High	1 Pos 99	24.00	0	23.14	24.00	1	22.47
				50% RB Low	50 Pos 0	24.00	1	22.43	24.00	2	21.44
				50% RB Mid	50 Pos 24	24.00	1	22.27	24.00	2	21.31
				50% RB High	50 Pos 50	24.00	1	22.19	24.00	2	21.22
				100% RB	100 Pos 0	24.00	1	22.50	24.00	2	21.50
		133372	688	1RB Low	1 Pos 0	24.00	0	23.21	24.00	1	22.62
				1RB Mid	1 Pos 50	24.00	0	23.16	24.00	1	22.60
				1RB High	1 Pos 99	24.00	0	23.40	24.00	1	22.83
				50% RB Low	50 Pos 0	24.00	1	22.27	24.00	2	21.24
				50% RB Mid	50 Pos 24	24.00	1	22.08	24.00	2	21.12
				50% RB High	50 Pos 50	24.00	1	22.00	24.00	2	21.04
				100% RB	100 Pos 0	24.00	1	22.06	24.00	2	21.09
	15 MHz	133197	670.5	1RB Low	1 Pos 0	24.00	0	23.04	24.00	1	22.20
				1RB Mid	1 Pos 38	24.00	0	23.49	24.00	1	22.82
				1RB High	1 Pos 74	24.00	0	23.72	24.00	1	22.57
				50% RB Low	38 Pos 0	24.00	1	22.11	24.00	2	21.31
				50% RB Mid	38 Pos 19	24.00	1	22.45	24.00	2	21.55
				50% RB High	38 Pos 39	24.00	1	22.54	24.00	2	21.48
				100% RB	75 Pos 0	24.00	1	22.53	24.00	2	21.50
		133297	680.5	1RB Low	1 Pos 0	24.00	0	22.98	24.00	1	22.98
				1RB Mid	1 Pos 38	24.00	0	23.57	24.00	1	22.61
				1RB High	1 Pos 74	24.00	0	23.31	24.00	1	22.52
				50% RB Low	38 Pos 0	24.00	1	22.29	24.00	2	21.34
				50% RB Mid	38 Pos 19	24.00	1	22.55	24.00	2	21.25
				50% RB High	38 Pos 39	24.00	1	22.50	24.00	2	21.17
				100% RB	75 Pos 0	24.00	1	22.50	24.00	2	21.39
		133397	690.5	1RB Low	1 Pos 0	24.00	0	23.45	24.00	1	22.54
				1RB Mid	1 Pos 38	24.00	0	23.22	24.00	1	22.44
				1RB High	1 Pos 74	24.00	0	23.28	24.00	1	22.76
				50% RB Low	38 Pos 0	24.00	1	22.25	24.00	2	21.22
				50% RB Mid	38 Pos 19	24.00	1	22.20	24.00	2	21.08
				50% RB High	38 Pos 39	24.00	1	22.24	24.00	2	20.96
				100% RB	75 Pos 0	24.00	1	22.22	24.00	2	21.04
	10 MHz	133172	668	1RB Low	1 Pos 0	24.00	0	23.60	24.00	1	22.25
				1RB Mid	1 Pos 24	24.00	0	23.24	24.00	1	22.80
				1RB High	1 Pos 49	24.00	0	23.17	24.00	1	22.98
				50% RB Low	25 Pos 0	24.00	1	22.29	24.00	2	21.10
				50% RB Mid	25 Pos 12	24.00	1	22.23	24.00	2	21.44
				50% RB High	25 Pos 24	24.00	1	22.18	24.00	2	21.54
				100% RB	50 Pos 0	24.00	1	22.36	24.00	2	21.51
		133297	680.5	1RB Low	1 Pos 0	24.00	0	23.24	24.00	1	22.73
				1RB Mid	1 Pos 24	24.00	0	23.08	24.00	1	22.65
				1RB High	1 Pos 49	24.00	0	23.48	24.00	1	22.68
				50% RB Low	25 Pos 0	24.00	1	22.21	24.00	2	21.27
				50% RB Mid	25 Pos 12	24.00	1	22.10	24.00	2	21.24
				50% RB High	25 Pos 24	24.00	1	21.96	24.00	2	21.28
				100% RB	50 Pos 0	24.00	1	22.02	24.00	2	21.31
		133422	693	1RB Low	1 Pos 0	24.00	0	23.20	24.00	1	22.50
				1RB Mid	1 Pos 24	24.00	0	23.02	24.00	1	22.34
				1RB High	1 Pos 49	24.00	0	23.53	24.00	1	22.86
				50% RB Low	25 Pos 0	24.00	1	22.06	24.00	2	21.09
				50% RB Mid	25 Pos 12	24.00	1	21.99	24.00	2	21.01
				50% RB High	25 Pos 24	24.00	1	22.07	24.00	2	21.10
				100% RB	50 Pos 0	24.00	1	21.95	24.00	2	21.01

Band	BW	Channel #	Freq (MHz)	% RB Allocation	RB Position	QPSK Factory Upper Tolerance (dBm)	QPSK MPR	QPSK Measured Output Power (dBm)	16 QAM Factory Upper Tolerance (dBm)	16 QAM MPR	16 QAM Measured Output Power (dBm)
LTE71	5.0 MHz	133147	665.5	1RB Low	1 Pos 0	24.00	0	23.53	24.00	1	22.18
				1RB Mid	1 Pos 12	24.00	0	23.60	24.00	1	22.30
				1RB High	1 Pos 24	24.00	0	23.91	24.00	1	22.64
				50% RB Low	12 Pos 0	24.00	1	21.78	24.00	2	20.77
				50% RB Mid	12 Pos 6	24.00	1	21.89	24.00	2	20.90
				50% RB High	12 Pos 11	24.00	1	22.03	24.00	2	21.03
				100% RB	25 Pos 0	24.00	1	21.97	24.00	2	20.92
		133297	680.5	1RB Low	1 Pos 0	24.00	0	23.76	24.00	1	22.65
				1RB Mid	1 Pos 12	24.00	0	23.74	24.00	1	22.63
				1RB High	1 Pos 24	24.00	0	23.75	24.00	1	22.69
				50% RB Low	12 Pos 0	24.00	1	20.64	24.00	2	21.08
				50% RB Mid	12 Pos 6	24.00	1	22.12	24.00	2	21.09
				50% RB High	12 Pos 11	24.00	1	22.15	24.00	2	21.12
				100% RB	25 Pos 0	24.00	1	22.12	24.00	2	21.12
		133447	695.5	1RB Low	1 Pos 0	24.00	0	22.90	24.00	1	22.24
				1RB Mid	1 Pos 12	24.00	0	23.09	24.00	1	22.42
				1RB High	1 Pos 24	24.00	0	23.41	24.00	1	22.73
				50% RB Low	12 Pos 0	24.00	1	21.78	24.00	2	20.81
				50% RB Mid	12 Pos 6	24.00	1	21.95	24.00	2	20.95
				50% RB High	12 Pos 11	24.00	1	22.14	24.00	2	21.14
				100% RB	25 Pos 0	24.00	1	22.06	24.00	2	21.02

B.3 Tissue Parameters Measurement

Body TSL

Body TSL	Target TSL		Measured TSL		Deviation %		Date
Freq (MHz)	ε'(F/m)	σ(S/m)	ε'(F/m)	σ(S/m)	Deviation ε'	Deviation σ	
750	55.53	0.96	56.14	0.93	1.1	-3.12	2022-11-24

See Annex D for more details.

B.4 System Check Measurements

Body Measurements

Frequency (MHz)	Forwarded power (mW)	Average	Target SAR (W/Kg)	Measured SAR (W/Kg)	Deviation to target (%)	Deviation to target limit	Date
750	50	1g	8.46	8.47	0.09	±10%	2022-11-24
		10g	5.59	5.65	0.99		

See Annex C for more details.

B.5 SAR Tablet Test Results

B.5.1 LTE

B.5.1.1 LTE Band 71 FDD

Band	Mod.	BW (MHz)	Channel Number	Freq (MHz)	Position	% RB Allocation	Scaling Factor (dB)	Measured SAR 1g (W/Kg)	Reported SAR 1g (W/Kg)	Plot #
Band 71	QPSK	20	133297	680.5	Back Face	1RB Mid	0.78	0.56	0.67	
						50RB Mid	0.73	0.52	0.62	
					Right Edge	1RB Mid	0.78	0.04	0.05	
						50RB Mid	0.73	0.04	0.05	
					Top Edge	1RB Mid	0.78	0.63	0.76	1
						50RB Mid	0.73	0.58	0.69	

B.5.2 SAR Measurement Variability

According to FCC OET KDB 865664, SAR Measurement variability is assessed when the maximum initial measured SAR is ≥0.8 W/kg for a certain band/mode.
As all measured SAR results are below 0.8W/kg, therefore SAR variability is not required

B.5.3 Simultaneous Transmission SAR Evaluation

Given that LTE band 71 SAR test results are lower than the highest values from report 220815-03.TR01-FCC-IC_WWAN_SAR_HP_HSN-I57C_7560R_RTL8852CE_Rev01, no simultaneous evaluation is required in this report.

Annex C. Test System Plots

1. LTE Band 71, QPSK - 20MHz, CH133297, Top Edge

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	S/N	DUT Type
HSN-I57C	205.0 x 295.0 x 20.0	C902NL009Y	Convertible PC

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	EDGE TOP, 0.00	Band2, UTRA/FDD	WCDMA, 10011-CAB	680.5, 133297	10.01	0.912	56.3

Hardware Setup

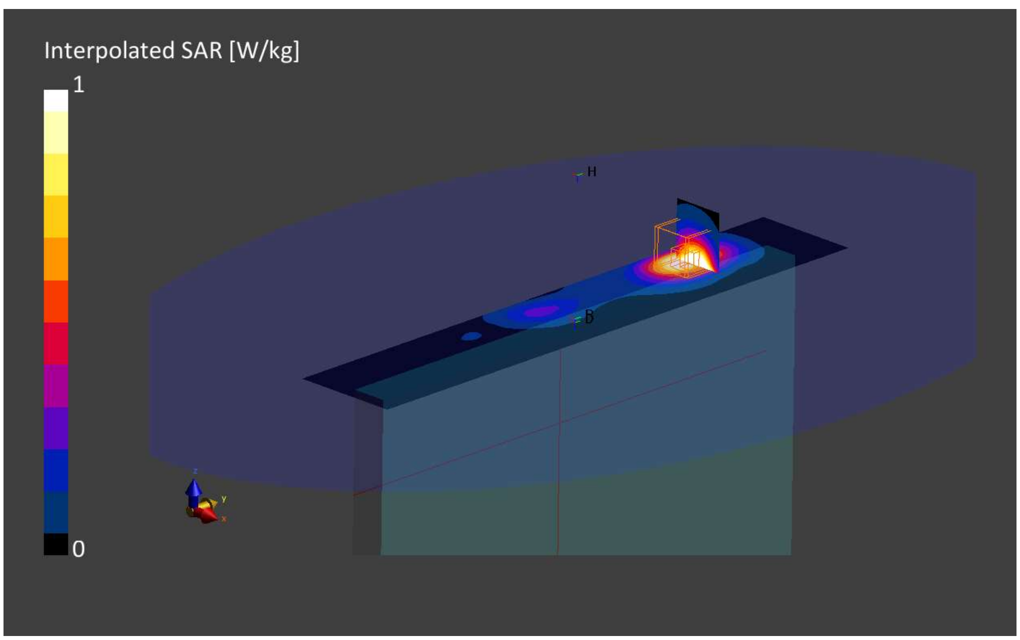
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	MBBL-600-6000, 2022-Nov-24	EX3DV4 - SN7465, 2022-07-18	DAE4ip Sn1706, 2022-07-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	60.0 x 330.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-11-24, 10:41	2022-11-24, 10:56
psSAR1g [W/Kg]	0.751	0.634
psSAR10g [W/Kg]	0.491	0.359
Power Drift [dB]	-0.03	0.04
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only
M2/M1 [%]		81.0
Dist 3dB Peak [mm]		9.6



2. System Check Body Liquid 750MHz

Device under Test Properties

Model, Manufacturer	Dimensions [mm]	S/N	DUT Type
Dipole 750MHz, SPEAG	50.0 x 10.0 x 8.0	1136	Validation Dipole

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, MSL	,		, 0--	750.0, 0	10.01	0.935	56.1

Hardware Setup

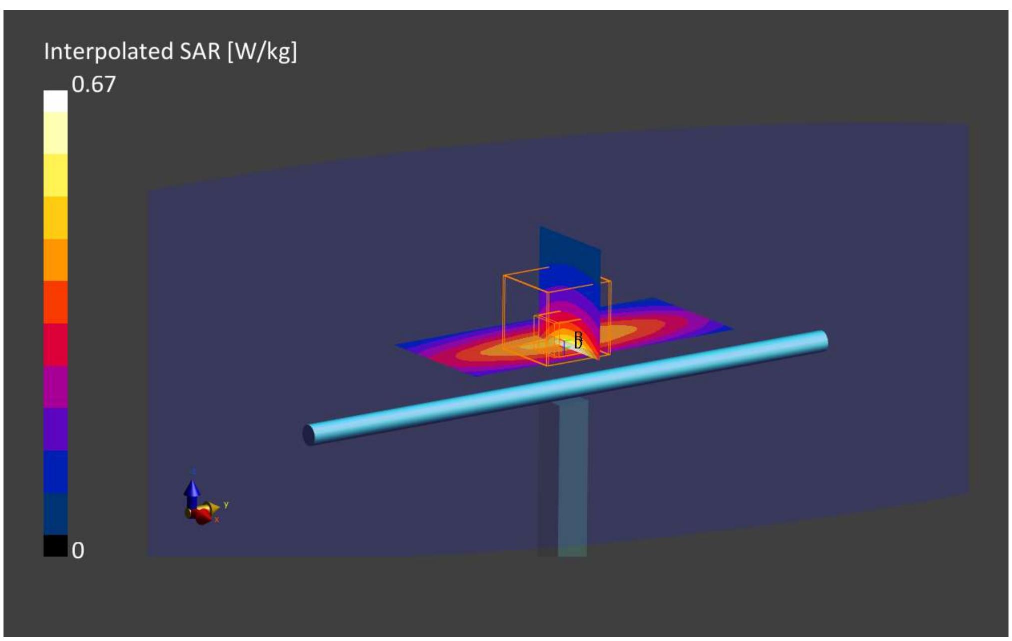
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
ELI V8.0 (20deg probe tilt)	600-6000, 2022-Nov-24	EX3DV4 - SN7465, 2022-07-18	DAE4ip Sn1706, 2022-07-11

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	40.0 x 90.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	Yes	Yes
Grading Ratio	1.5	1.5
MAIA	Confirmed by MAIA	Confirmed by MAIA
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2022-11-24, 11:31	2022-11-24, 11:37
psSAR1g [W/Kg]	0.410	0.422
psSAR10g [W/Kg]	0.274	0.281
Power Drift [dB]	-0.02	-0.20
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	Positive Only	Positive Only
M2/M1 [%]		84.8
Dist 3dB Peak [mm]		16.7



Annex D. TSL Dielectric Parameters

D.1 Body 600MHz-900MHz

Freq. (MHz)	Target		2022-11-24 Measured	
	ε'(F/m)	σ(S/m)	ε'_1(F/m)	σ_1(S/m)
600	56.12	0.95	56.62	0.89
650	55.92	0.96	56.43	0.9
700	55.73	0.96	56.27	0.92
750	55.53	0.96	56.14	0.94
800	55.34	0.97	56.03	0.95
850	55.15	0.99	55.93	0.97
900	55.0	1.05	55.85	0.99

Permittivity	Conductivity