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Test report No:
2630259R.705B

FCC TEST REPORT

Product Name	Insta360 Luna Pro
Trademark	Insta360
Model and /or type reference	CINSACHA
FCC ID	2AWWH-CINSACHA
Applicant´s name / address	Arashi Vision Inc. 11th Floor, Building 2, Jinlitong Financial Center, Bao'an District, 518000 Shenzhen, Guangdong, China
Test method requested, standard	47 CFR FCC Part 2 (Section 2.1093) IEEE Std 1528-2013 ANSI C95.1-2019
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao / Project Manager
Approved by (name / position & signature)	Frank He / Technical Manager
Date of issue	2026-04-15
Report Version	V1.0
Report template No	Template_FCC SAR-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Test Facility	A2LA (Certificate No. 3235.01) CNAS (Certificate No. L5313) FCC - Designation Number: CN1199 Test Firm Registration Number: 566524 ISED - CAB identifier: CN0040 IC#: 4075B
Date (receive sample)	Mar. 23, 2026
Date (start test)	Apr. 05, 2026
Date (finish test)	Apr. 14, 2026

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.
5. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, it is not necessary to account the uncertainty associated with the measurement result.

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2630259R.705B	V1.0	Initial issue of report.	2026-04-15

STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) found during testing for Insta360 Luna Pro, are as follows.

Frequency Band	Maximum Reported SAR 10g (W/kg)
	Limbs SAR (0mm)
Bluetooth	0.31
WLAN 2.4G	0.51
WLAN 5.2G&5.3G	0.76
WLAN 5.6G	**0.80**
WLAN 5.8G	0.57
Sum SAR	Maximum Simultaneous Transmission SAR 10g (W/kg)
	0.88
SAR Limited(W/kg)	4.00

Note: Based on the original DEKRA report 2610076R.705B, this product has changed the DDR model and removed the front ISP and I2C resistor of the secondary camera. The product has been changed from a dual-camera to a single-camera design, and the RF module and RF circuitry remain unchanged. Based on technical assessment, sampling inspections for SAR verification were conducted only under the most extreme conditions. For related test data, please refer to DEKRA report 2610076R.705B.

USED EQUIPMENT

SAR Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Next Cal. Date
Stäubli Robot TX60L	Stäubli	TX60L	F10/5C90A1/A/01	N/A
Controller	Stäubli	SP1	S-0034	N/A
Dipole Validation Kits	Speag	D2450V2	839	2028.03.17
Dipole Validation Kits	Speag	D5GHzV2	1078	2028.03.13
ELI Phantom	Speag	ELI	N/A	N/A
Device Holder	Speag	SD 000 H01 HA	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1220	2026.03.13
E-Field Probe	Speag	EX3DV4	7860	2026.04.06
Data Acquisition Electronic	Speag	DAE4	905	2026.06.25
E-Field Probe	Speag	EX3DV4	7351	2026.06.18
SAR Software	Speag	DASY6	V5.2 Build 162	N/A
Power Amplifier	MVE	MPC1018.50	C30002D	2026.05.16
Dual Directional Coupler	woken	0110A05A82Z-20	CMLC66W1A1	2026.05.16
Tissue fluid test probe	SPEAG	DAK 3.5	1308	N/A
Vector Network	Agilent	E5071C	MY46103316	2026.07.24
Signal Generator	R&S	SMBV100A	263697	2026.05.09
Power Meter	Keysight	N1912A	MY60300004	2026.05.16
Temperature/Humidity Meter	Rites	RTS-1909	THM-034	2026.04.29
Temperature/Humidity Meter	Rites	RTS-1909	THM-035	2026.04.29
Temperaturer	LKM	DTM3000	3777	2026.05.18

SAR Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Firmware Version	Software Version
SAR Software	Speag	DASY6	V5.2 Build 162	N/A	V16.2.4.2448
Power Amplifier	MVE	MPC1018.50	C30002D	A.14.03	N/A
Vector Network	Agilent	E5071C	MY46103316	A.11.31	N/A
Signal Generator	R&S	SMBV100A	263697	V4.15.125.49	N/A
Power Meter	Keysight	N1912A	MY60300004	A2.06.01	N/A

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95% .

Uncertainty for System Validation 4MHz – 300 MHz								
Error Description	Unc. ±%	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±13.3%	N	2	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±0.5%	R	$\sqrt{3}$	0.7	0.7	±0.2%	±0.2%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±0.6%	R	$\sqrt{3}$	1	1	±0.4%	±0.4%	∞
Modulation	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
Integration Time	±0.0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
RF Ambient Noise	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
RF Ambient Reflections	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Max. SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole Related								
Deviation from exp. dipole	±5.5%	R	$\sqrt{3}$	0	0	±0.0%	±0.0%	∞
Dipole axis to liquid distance	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole input power and SAR drift	±3.4%	R	$\sqrt{3}$	1	1	±2.0%	±2.0%	∞
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
SAR correction for deviations in conductivity and permittivity(target)	±5%	R	$\sqrt{3}$	1	0.84	±2.9%	±2.4%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Liquid conductivity - temperature uncertainty	±1.7%	R	$\sqrt{3}$	0.78	0.71	±0.8%	±0.7%	
Liquid permittivity - temperature uncertainty	±0.3%	R	$\sqrt{3}$	0.23	0.26	±0.0%	±0.0%	
Combined Std. Uncertainty						±10.6%	±10.4%	
Expanded Std. Uncertainty						±21.2%	±20.9%	

DASY6 SAR Uncertainty Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±5.5%	N	1	1	1	±5.5%	±5.5%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±10.6%	±10.5%	361
Expanded STD Uncertainty						±21.2%	±21.1%	

DASY6 SAR Uncertainty Measurement uncertainty for 3 GHz to 6 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±6.65%	N	1	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±12.0%	±12.0%	784
Expanded STD Uncertainty						±24.0%	±23.9%	

1 GENERAL INFORMATION

Product Name ..... :	Insta360 Luna Pro
Model No. ..... :	CINSACHA
Trademark..... :	Insta360
FCC ID..... :	2AWWH-CINSACHA
Hardware Version..... :	V10
Software Version..... :	V1.2.51
Manufacturer..... :	Arashi Vision Inc.
Manufacturer Address ..... :	11th Floor, Building 2, Jinlitong Financial Center, Bao'an District, 518000 Shenzhen, Guangdong, China
Power Supply..... :	3.85 Vdc, EUT is equipped with an adapter to power it via AC/DC.
SN ..... :	N/A
Wireless specifiction..... :	Wi-Fi
Wireless specifiction..... :	802.11b / g / n / ax
Operating frequency range(s) ..... :	2412~2462MHz
Type of Modulation..... :	DSSS / OFDM / OFDMA
Wireless specification..... :	802.11a / n / ac / ax
Operating frequency range(s) ..... :	U-NII-1: 5150 MHz to 5250 MHz
	U-NII-2A: 5250 MHz to 5350 MHz
	U-NII-2C: 5470 MHz to 5725 MHz
	U-NII-3: 5725 MHz to 5850 MHz
Modulation technology ..... :	OFDM / OFDMA
Wireless specifiction..... :	Bluetooth (BR/EDR)
Operating frequency range(s) ..... :	2402~2480MHz
Data Rate..... :	GFSK 1Mbps, Pi/4 DQPSK 2Mbps, 8DPSK 3Mbps
Wireless specification	Bluetooth (LE)
Operating frequency range(s)	2402~2480MHz
Wireless specification	LE 1Mbps, LE 2Mbps
Antenna type..... :	FPC
Remark: As above information is provided and confirmed by the applicant. DEKRA is not liable to the accuracy, suitability, reliability or/and integrity of the information.	

1.1 DUT Antenna Locations

Note: The DUT Antenna Locations please see appendix.

According to the distance between Wi-Fi antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing							
Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
WLAN Antenna	Product specific 10g SAR	Yes	Yes	Yes	Yes	Yes	Yes

Note:

1) When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

1.2 Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation

1) A fixed level power reduction is applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.
2) A fixed level power reduction is applied for some frequency bands when simultaneously transmitting with the other antennas in certain simultaneous transmission conditions. The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction
3) A fixed level power reduction is applied for some frequency bands when handset operate “held to the ear” condition, the power reduction triggered by audio receiver detection. The audio receiver detection is used to determine head or body scenario.
4) The proximity sensor is used to indicate when the device is held close to a user’s body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance(Refer to section 5.4 for detailed proximity Sensor information and validation data per KDB 616217).

The following tables summarize the key power reduction information. The detailed full power which is the Max. power the state can use and reduced tune-up specifications and conducted power measurement results are provided in Section 8 of this report.

Band	Antenna	Limbs SAR
Bluetooth	ANT1	13.00
Wi-Fi 2.4G	ANT1	18.00
	ANT2	18.00
	ANT1+2	20.00
Wi-Fi 5.2G	ANT1	14.50
	ANT2	14.50
	ANT1+2	17.50
Wi-Fi 5.3G	ANT1	14.50
	ANT2	14.50
	ANT1+2	17.50
Wi-Fi 5.6G	ANT1	14.50
	ANT2	14.50
	ANT1+2	17.50
Wi-Fi 5.8G	ANT1	14.50
	ANT2	14.50
	ANT1+2	17.50

1.3 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radio frequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
EN IEC/IEEE 62209-1528	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) (IEC/IEEE 62209-1528)
KDB 941225 D05	SAR for LTE Devices v02r05
KDB 941225 D05A	LTE Rel.10 KDB Inquiry Sheet v01r02
KDB 941225 D06	Hotspot Mode SAR v02r01
KDB 248227 D01	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB 648474 D04	Handset SAR v01r03
KDB447498 D01	General RF Exposure Guidance v06
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03
KDB 616217 D04	SAR for laptop and tablets v01r02

1.4 RF exposure limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimetres of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device; it is 1.6 W/kg as averaged over any 1 gram of tissue.

SAR Exposure Limit		
	General Population / Uncontrolled Exposure [1] (W/kg)	Occupational / Controlled Exposure [2] (W/kg)
Spatial Peak SAR [3] (head or Body)	1.60	8.00
Spatial Peak SAR [4] (Whole Body)	0.08	0.40
Spatial Peak SAR [5] (Hands / Feet / Ankle / Wrist)	4.00	20.00
Power Density Exposure Limit (1,500 - 100,000 MHz)		
	General Population / Uncontrolled Exposure (mW/cm^2) [6]	Occupational / Controlled Exposure (mW/cm^2)
Power Density (S)	1.0	5.0

Notes:
1. **General Population / Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.
2. **Occupational / 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).
3. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
4. The Spatial Average value of the SAR averaged over the whole body.
5. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
6. 1 mW/cm^2 = 10 W/m^2,

2 SAR MEASUREMENTS SYSTEM CONFIGURATION

SAR Definition

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.

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 (p).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 measurement can be related to the electrical field in the tissue by

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

Where:
σ= conductivity of the tissue (S/m)
p= mass density of the tissue (kg/m3)
E = RMS electric field strength (V/m)
SAR is expressed in units of Watts per kilogram (W/kg).

Power Tensity Definition

The power density for an electromagnetic field represents the rate of energy transfer per unit area. The local power density (i.e. Poynting vector) at a given spatial point is deduced from electromagnetic fields by the following formula:

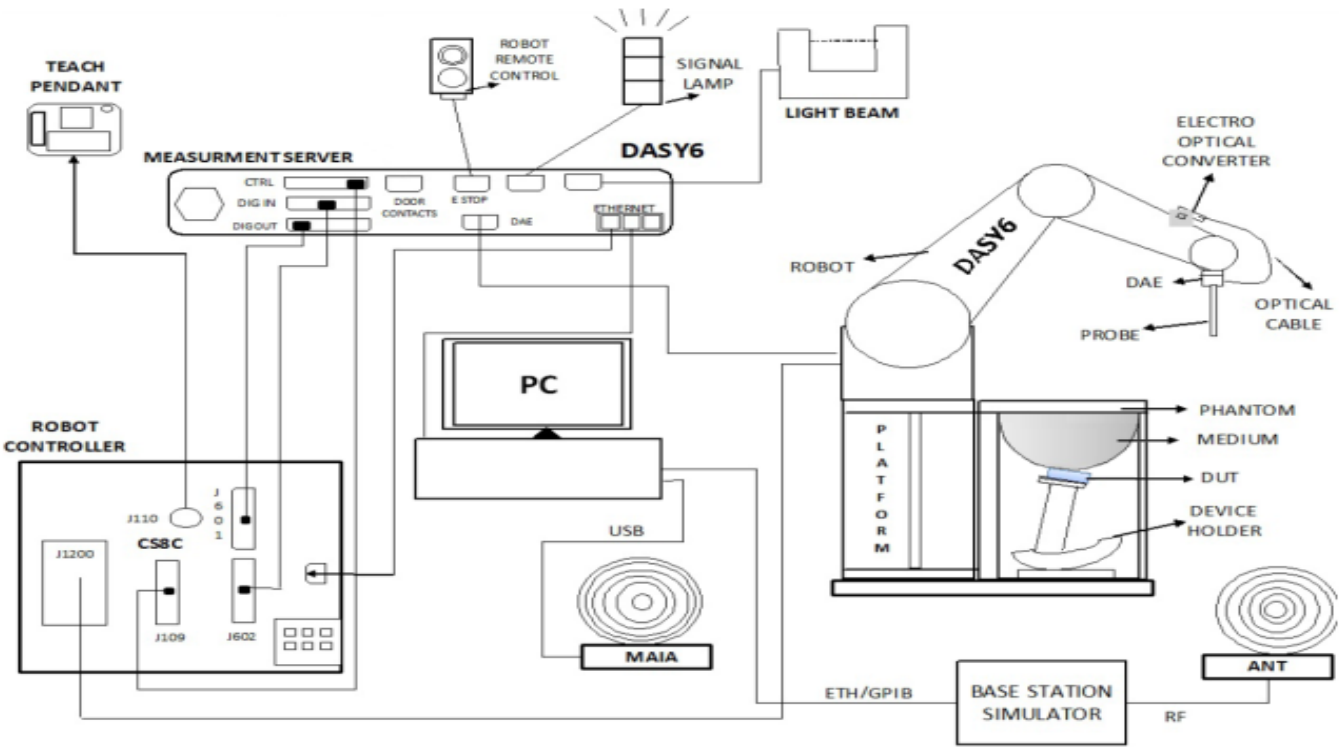
$$S = \frac{1}{2}\mathrm{Re}\{E \times H^*\} \cdot \vec{n}$$

Where: E is the complex electric field peak phasor and H is the complex conjugate magnetic field peak phasor.

The spatial-average power density distribution on the evaluation surface is determined per the IEC TR 63170. The spatial area, Ais specified by the applicable exposure limit or regulatory requirements. The circular shape was used.

$$S_{av} = \frac{1}{2A}\Re\left(\int E \times H^* \cdot \hat{n}dA\right)$$

2.1 DASY6 SAR System Description



The DASY6 system for performing compliance tests consists of the following items:
1. A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. 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.
3. 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.
4. The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
5. A computer running Windows 11 and the DASY6 software.
6. Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
7. The phantom, the device holder and other accessories according to the targeted measurement.

2.2 Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEC/IEEE 62209-1528 others.

2.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures points and step size follow as below. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution. The measure settings are referred in IEEE Std 1528-2013.

<table>
<tr><th colspan="3"></th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>½·δ·ln(2)±0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx Area , Δy Area</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3–4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></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="6">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2" rowspan="3">uniform grid: Δz Zoom (n)</td><td rowspan="3">≤ 5 mm</td><td>3–4 GHz: ≤ 4 mm</td></tr>
<tr><td>4–5 GHz: ≤ 3 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="3">graded grid</td><td rowspan="2">Δz Zoom (1): between 1st two points closest to phantom surface</td><td rowspan="2">≤ 4 mm</td><td>3–4 GHz: ≤ 3 mm</td></tr>
<tr><td>4–5 GHz: ≤ 2.5 mm
5–6 GHz: ≤ 2 mm</td></tr>
<tr><td>Δz Zoom (n>1): between subsequent points</td><td colspan="2">≤ 1.5·Δz Zoom (n-1)</td></tr>
<tr><td rowspan="3">Minimum zoom scan volume</td><td colspan="2" rowspan="3">x, y, z</td><td rowspan="3">≥30 mm</td><td>3–4 GHz: ≥ 28 mm</td></tr>
<tr><td>4–5 GHz: ≥ 25 mm</td></tr>
<tr><td>5–6 GHz: ≥ 22 mm</td></tr>
</table>

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * When zoom scan is required and the reported 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 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

2.4 Uncertainty of Inter-/Extrapolation and Averaging

To evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY6 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEC/IEEE 62209-1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}} \cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}} \frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

2.5 DASY6 E-Field Probe & EUmmWV Probe

The SAR measurement is conducted with the diametric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The diametric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEC/IEEE 62209-1528, etc.) under ISO 17025. The calibration data are in Appendix D.

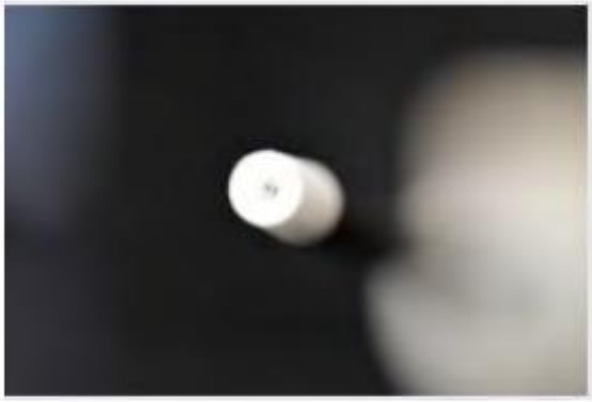
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz to 10 GHz Linearity: ± 0.2 dB (30 MHz to 10 GHz)
Directivity	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
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
Calibration	ISO/IEC 17025 calibration service available

EX3DV4 E-Field Probe

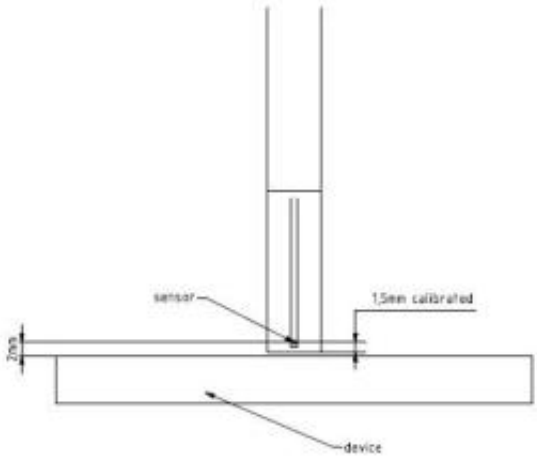
Probe setup on robot

The EUmmWV3 probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse. This probe concept also has the advantage that the sensor angle errors or distortions of the field by the substrate can be largely nullified by calibration. This is particularly important as, at these very high frequencies, field distortions by the substrate are dependent on the wavelength. It has two dipoles optimally arranged to obtain pseudo-vector information. It has minimum 3 measurements/point, 120° rotated around probe axis. Sensors (0.8 mm length) printed on glass substrate protected by high density foam. Low perturbation of the measured field. Requires positioner which can do accurate probe rotation.

Frequency Range	750 MHz - 110 GHz
Dynamic Range	< 20 V/m - 10'000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor < 1mm) Distance from probe tip to dipole centers: < 2 mm Sensor displacement to probe's calibration point: < 0.3 mm
Applications	Electric field measurements of 5G devices and other mm-wave transmitters operating above 10 GHz in <2 mm distance from device (free-space) Power density, magnetic field, and far-field analysis using total field reconstruction (cDASY6 5G or ICEy-mmW module required)
compatibility	cDASY6 + 5G-Module SW1.0 and higher



E-Field mm-Wave Probe



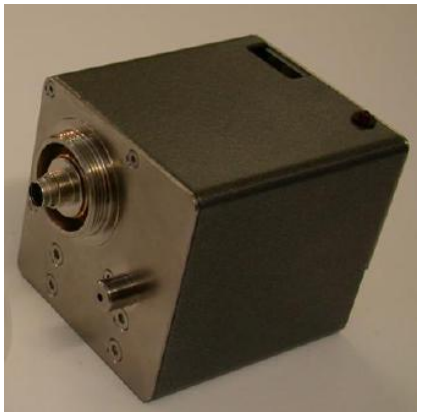
Sensor to DUT Surface

2.6 Boundary Detection Unit and Probe Mounting Device

The DASY probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.

2.7 DATA Acquisition Electronics (DAE) and Measurement Server

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 DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



The DASY6 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board

2.8 Robot

The DASY6 system uses the high precision robots TX60 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY6 system, the CS8C robot controller version from Stäubli is used. The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

2.9 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

2.10 Device Holder

The DASY6 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).
Thus the device needs no repositioning when changing the angles.
The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =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.

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.

The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =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.

2.11 SAM Phantom

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left head
- Right head
- 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

The SAM phantom is a fiberglass shell phantom with 2mm shell thickness. It has one measurement areas:

- ELI phantom

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

3 TISSUE SIMULATING LIQUID

3.1 The composition of the tissue simulating liquid

Simulate 10MHz~10000MHz liquid, manufactured by SPEAG

Table F.1 – Suggested recipes for achieving target dielectric properties, 30 MHz to 900 MHz

Frequency (MHz)	30	50		144		450		835	900	
Recipe source number	3	3	2	2	3	2	4	2	2	4
Ingredients (% by weight)										
De-ionized water	48,30	48,30	53,53	55,12	48,30	48,53	56	50,36	50,31	56
Tween 20			44,70	43,31		49,51		48,39	48,34	
Oxidized mineral oil							44			44
Diethylenglycol monohexylether										
Triton X-100										
Diacetin	50,00	50,00			50,00					
DGBE										
NaCl	1,60	1,60	1,77	1,57	1,60	1,96		1,25	1,35	
Additives and salt	0,10	0,10			0,10					
Measured temperature dependence										
Temp. (°C)			21	21		21	20	21	21	20
$\varepsilon_{\text{liquid temp. unc.}}$ (%)	0,8	0,1			0,1	0,1		0,04	0,04	
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,8	2,8			2,6	4,2		1,6	1,6	

Table F.2 – Suggested recipes for achieving target dielectric properties, 1 800 MHz to 10 000 MHz

Frequency (MHz)	1 800		2 450	4 000	5 000	5 200	5 800	6 000	8 000	10 000
Recipe source number	2	4	4	4	4	1	1	4	5	5
Ingredients (% by weight)										
De-ionized water	54,23	56	56	56	56	65,53	65,53	56	67,8	66,0
Tween	45,27								31,1	33,0
Oxidized mineral oil		44	44	44	44			44		
Diethylenglycol monohexylether						17,24	17,24			
Triton X-100						17,24	17,24			
Diacetin										
DGBE										
NaCl	0,50									
Additives and salt										
Measured temperature dependence										
Temp. (°C)	21	20	20	20	20	22	22	20	20	20
$\varepsilon_{\text{liquid temp. unc.}}$ (%)	0,4					1,7	1,8			
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,3					2,7	2,6			

NOTE 1 Multiple columns under a single frequency indicate optional recipes.

NOTE 2 Recipe source numbers: 1 verified by different labs, 2 Reference [59], 3 developed by IT'IS Foundation, 4 developed by IT'IS Foundation, 5 Reference [60].

NOTE 3 The values of $\varepsilon_{\text{liquid temp. unc.}}$ and $\sigma_{\text{liquid temp. unc.}}$ are liquid temperature uncertainties described in O.9.6, based on measurements of the applicable liquid recipes given above. These are not part of the original publications but have been subsequently developed by the project team.

NOTE 4 The recipes at 8 000 MHz and 10 000 MHz are sufficiently broadband that they cover the frequency range of 6 000 MHz to 10 000 MHz within a tolerance of ±10 % for permittivity and conductivity.

3.2 Measurement for Tissue Simulate Liquid

The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent E5071C Network Analyzer (600 KHz-10000 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22 ± 2 °C.

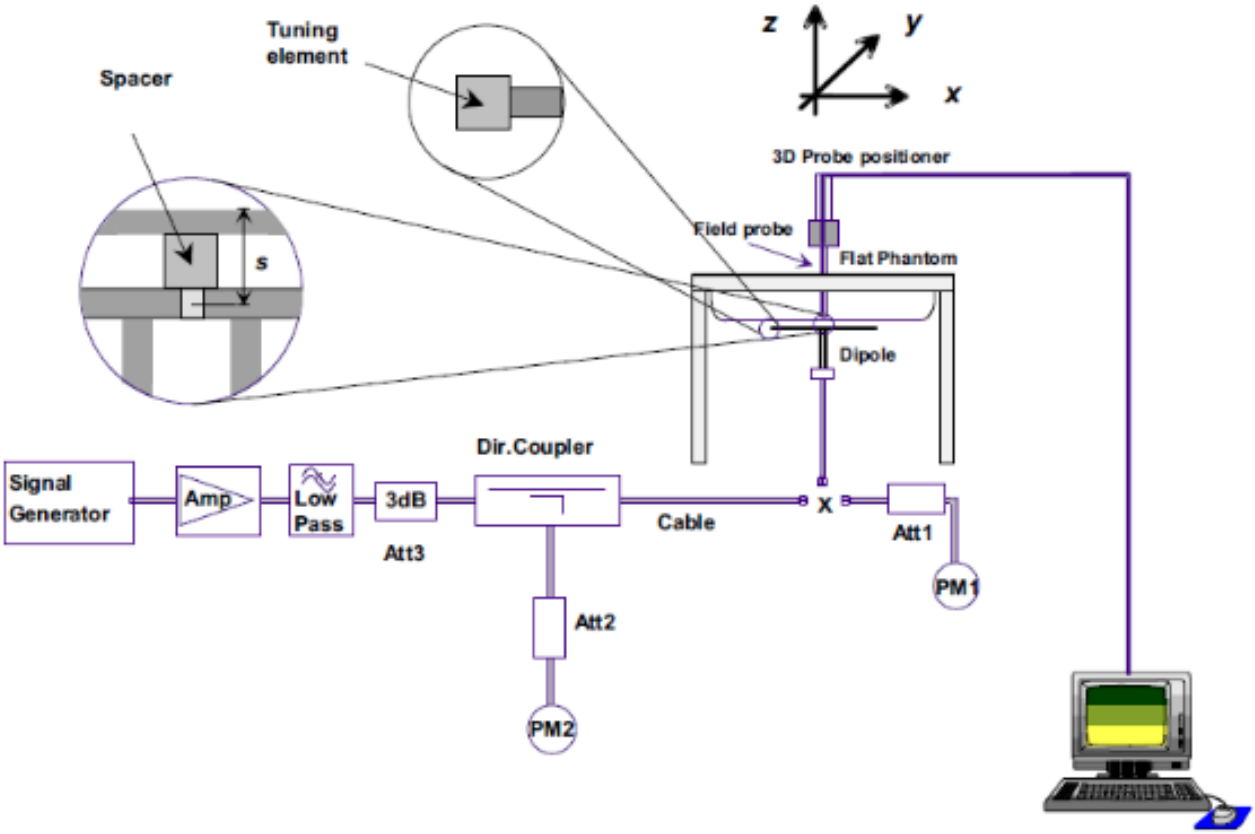
Tissue Type	Measured Frequency (MHz)	Target Tissue (±5%)		Measured Tissue		Liquid Temp.(℃)	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)		
2450 Head	2450	39.2 (37.24~41.16)	1.80 (1.71~1.89)	40.78	1.87	22.50	2026.02.01
5250 Head	5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	36.80	4.56	22.50	2026.02.03
5600 Head	5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	36.23	4.95	22.50	2026.02.05
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	35.99	5.13	22.50	2026.02.07

Tissue Type	Measured Frequency (MHz)	Target Tissue (±5%)		Measured Tissue		Liquid Temp.(℃)	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)		
2450 Head	2450	39.2 (37.24~41.16)	1.80 (1.71~1.89)	40.82	1.89	22.50	2026.04.13
5250 Head	5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	35.40	4.67	22.50	2026.04.13
5600 Head	5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	34.77	5.09	22.50	2026.04.15
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.47	5.26	22.50	2026.04.15

Tissue Verification									
CH	**Frequency (MHz)**	**Conductivity (σ)**	**Permittivity (ε_r)**	**Conductivity Target (σ)**	**Permittivity Target (ε_r)**	**Delta (σ) (%)**	**Delta (ε_r) (%)**	**Limit (%)**	**Date**
0	2402	1.84	40.93	1.76	39.29	4.55	4.15	±5	DSS
39	2441	1.87	40.84	1.79	39.22	4.47	4.18	±5	
78	2480	1.92	40.75	1.83	39.15	4.92	3.95	±5	
1	2412	1.85	40.90	1.77	39.27	4.52	4.07	±5	DTS
6	2437	1.87	40.85	1.79	39.22	4.47	4.21	±5	
11	2462	1.90	40.80	1.81	39.18	4.97	4.08	±5	
52	5260	4.69	35.39	4.72	35.94	-0.64	-1.42	±5	UNII-2A
56	5280	4.71	35.35	4.74	35.92	-0.63	-1.53	±5	
64	5320	4.76	35.28	4.78	35.87	-0.42	-1.73	±5	
100	5500	4.96	34.95	4.97	35.63	-0.20	-1.83	±5	UNII-3
116	5580	5.06	34.78	5.05	35.53	0.20	-2.03	±5	
140	5700	5.20	34.57	5.17	35.40	0.58	-2.34	±5	
149	5745	5.25	34.49	5.22	35.36	0.57	-2.57	±5	UNII-4
157	5785	5.30	34.41	5.26	35.32	0.76	-2.52	±5	
165	5825	5.35	34.35	5.30	35.28	0.94	-2.69	±5	

4 SYSTEM CHECK

The microwave circuit arrangement for system Check is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250Mw (below 3GHz) or 100Mw (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-1. The microwave circuit arrangement used for SAR system check

4.1 Justification for Extended Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;

b) System check with specific dipole is within 10% of calibrated value;

c) Return-loss is within 10% of calibrated measurement;

d) Impedance is within 5Ω from the previous measurement.

2) Network analyser probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4.2 Measurement for System Check

Validation Kit		Measured SAR 250mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp.(°C)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D2450V2	Head	13.30	6.26	53.20	25.04	52.80 (47.52~58.08)	24.60 (22.14~27.06)	22.50	2026.02.01
Validation Kit		**Measured SAR 100mW**		**Measured SAR 1W**		**Normalized to 1W Target (±10%)**		**Liquid Temp.(°C)**	**Measured Date**
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D5GHzV2 5.25GHz	Head	7.35	2.11	73.50	21.10	77.60 (69.84~85.36)	21.60 (19.44~23.76)	22.50	2026.02.03
D5GHzV2 5.6GHz	Head	8.43	2.40	84.30	24.00	81.30 (73.17~89.43)	22.60 (20.34~24.86)	22.50	2026.02.05
D5GHzV2 5.75GHz	Head	7.83	2.23	78.30	22.30	77.40 (69.66~85.14)	21.30 (19.17~23.43)	22.50	2026.02.07

Validation Kit		Measured SAR 250mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp.(°C)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D2450V2	Head	13.00	6.09	52.00	24.36	52.80 (47.52~58.08)	24.60 (22.14~27.06)	22.50	2026.04.13
Validation Kit		**Measured SAR 100mW**		**Measured SAR 1W**		**Normalized to 1W Target (±10%)**		**Liquid Temp.(°C)**	**Measured Date**
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D5GHzV2 5.25GHz	Head	7.60	2.19	76.00	21.90	77.60 (69.84~85.36)	21.60 (19.44~23.76)	22.50	2026.04.13
D5GHzV2 5.6GHz	Head	7.95	2.28	79.50	22.80	81.30 (73.17~89.43)	22.60 (20.34~24.86)	22.50	2026.04.15
D5GHzV2 5.75GHz	Head	7.50	2.15	75.00	21.50	77.40 (69.66~85.14)	21.30 (19.17~23.43)	22.50	2026.04.15

5 TEST CONFIGURATION

5.1 SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

5.2 Operation Configurations

5.2.1. GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMW500 the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

5.2.2. WCDMA Test Configuration

1）. Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1's" for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

2）. Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure

3）. Body SAR

SAR for body configurations is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4）. HSDPA / HSUPA / DC-HSDPA

According to KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA

a) HSDPA

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) are set according to values indicated in the following table The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	βc	Bd	βd(SF)	βc/βd	βhs	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: △ACK, △NACK and △CQI= 8 Ahs = βhs/βc=30/15 βhs=30/15*βc

Note2:For the HS-DPCCH power mask requirement test in clause 5.2C,5.7A,and the Error Vector Magnitude(EVM) with HS-DPCCH test in clause 5.13.1.A,and HSDPA EVM with phase discontinuity in clause 5.13.1AA, △ACK and △NACK= 8 (Ahs=30/15) with βhs=30/15*βc,and △CQI=

7 (Ahs=24/15) with βhs=24/15*βc. Note3: CM=1 forβc/βd =12/15, βhs/βc=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	MaximumH S-DSCH Transport BlockBits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

HSDPA UE category

b) <u>HSUPA</u>

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSUPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset" and „Release 5 HSUPA Data Device" sections of 3G device.

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

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference

Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Subtests for UMTS Release 6 HSUPA

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Speading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

HSUPA UE category

c) DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a Second serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0.

A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13.

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK.

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI's
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

settings of required H-Set 12 QPSK acc. to 3GPP 34.121

Note:

1. The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.
2. Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

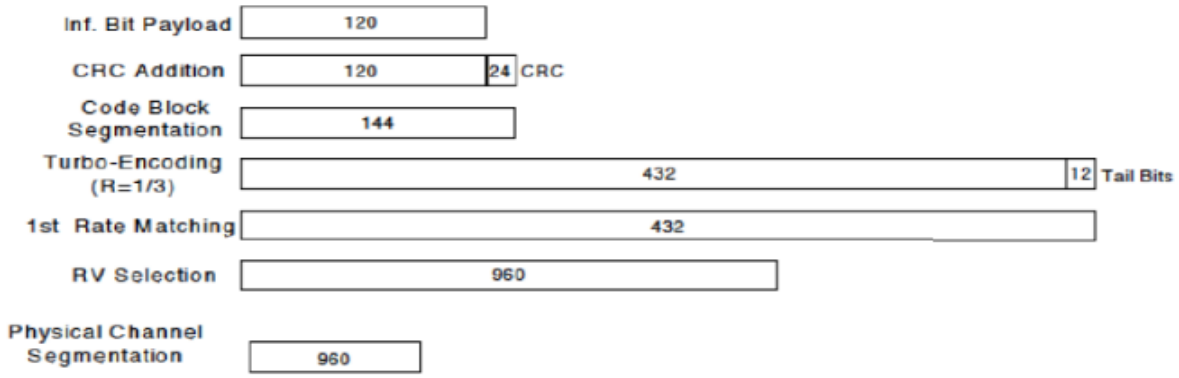


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$
Note 2: CM=1 for β_c/β_d= 12/15, β_{hs}/β_c = 24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15

Up commands are set continuously to set the UE to Max power.

Note:

1. The Dual Carriers transmission only applies to HSDPA physical channels
2. The Dual Carriers belong to the same Node and are on adjacent carriers.
3. The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4. The Dual Carriers operate in the same frequency band.
5. The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6. The device doesn’t support carrier aggregation for it just can operate in Release 8.

d) <u>HSPA+</u>

Per KDB941225D01, SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c *(Note3)*	β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} ***(2xSF2)*** *(Note 4)*	β_{ed} ***(2xSF4)*** *(Note 4)*	**CM *(dB)*** *(Note 2)*	**MPR *(dB)*** *(Note 2)*	***AG Index*** *(Note 4)*	***E-TFCI*** *(Note 5)*	***E-TFCI*** *(boost)*
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

5.2.3. LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The Anritsu MT8821C was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

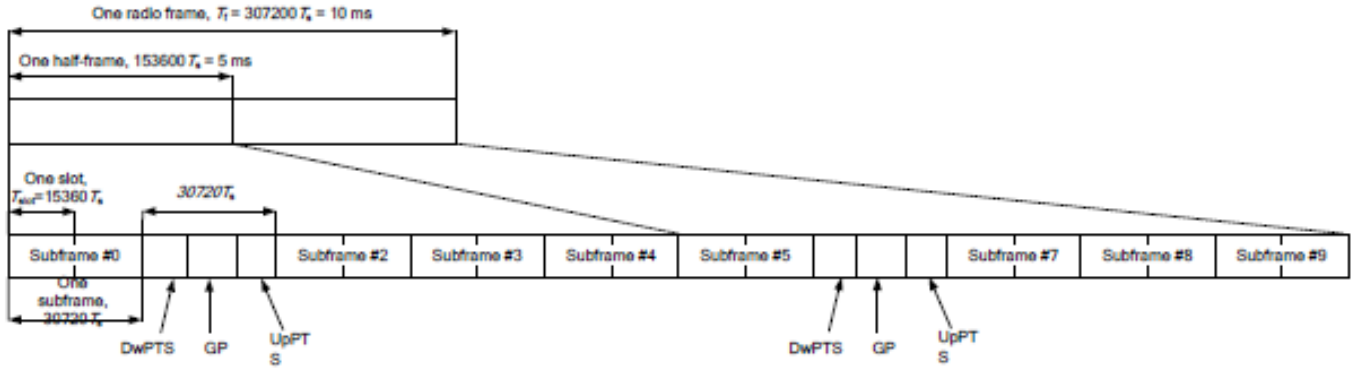
TDD LTE test consideration

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Frame structure type 2:



Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	6592.Ts	2192.Ts	2560.Ts	7680.Ts	2192.Ts	2560.Ts
1	19760.Ts			20480.Ts		
2	21952.Ts			23040.Ts		
3	24144.Ts			25600.Ts		
4	26336.Ts			7680.Ts	4384.Ts	5120.Ts
5	6592.Ts	4384.Ts	5120.Ts	20480.Ts		
6	19760.Ts			23040.Ts		
7	21952.Ts			25600.Ts		
8	24144.Ts			-	-	-
9	13168.Ts			-	-	-

Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle=[Extended cyclic prefix in uplink x (Ts) x # of S + # of U]/10ms

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

A) Spectrum Plots for RB Configurations

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

B) MPR

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

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{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

C) A-MPR

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

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle

and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2) QPSK with 50% RB allocation
The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.
3) QPSK with 100% RB allocation
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 in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4) Higher order modulations
For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, 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.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and 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.

LTE Downlink CA consideration

The device supports the carrier aggregation in the downlink. Uplink maximum output power is measured with downlink carrier aggregation active only for the channel with highest measured maximum output power when downlink carrier aggregation is inactive, 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 % dB higher than the maximum output power measured when downlink carrier aggregation inactive. The downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPPTS 36.521 or equivalent) and channel bandwidth (5.4.2A)requirements. The nominal channel spacing is determined by [BW1 + BW2 - 0.1*|BW1-BW2|/2 MHz where BW1 and BW2 are the channel bandwidths of the CC in a 2-CC aggregation configuration. The downlink PCC channel should be paired with the uplink channel according to normal configurations， as if there is no carrier aggregation.
The downlink SCC should be adjacent to the PCC and remain within the downlink transmission band for contiguous intra-band CA. For non-contiguous intra-band CA, the SCC should be selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band. For inter-band CA, the SCC should be near the middle of its transmission band. When downlink carrier aggregation is active uplink maximum output power remain 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, so SAR evaluation is not required for downlink carrier aggregation.

LTE intra-band UL CA(contiguous)

The device supports LTE intra-band contiguous UL CA. The maximum output power is measured for each UL Configuration for the required test channels. UL PCC configuration is determined by the required test channel. SCC and subsequent CCs are added alternatively to either side of the PCC or within the transmission band for channels at the ends of frequency band. SAR for UL CA is required in highest standalone head/body test position and frequency band combination. Since the maximum output for UL CA is<standalone LTE mode (without CA), PCC is configured according to the highest standalone SAR configuration tested, SCC and subsequent CCs are configured according to procedures used for power measurement and parameters (BW, RB etc.)similar to that used for the PCC.

5.2.4. NR Test Configuration

SAR tests for NR bands and LTE anchor bands were performed separately due to limitations in SAR probe calibration factor. Due to test setup limitation, SAR testing for NR was performed using factory test mode software to establish the connection.

5G NR Power/SAR procedure is similar with KDB 941225 D05.

A) For power measurement reduction of DFT-s-OFDM and CP-OFDM, CP-OFDM will not higher than DFT-OFDM based on 3GPP MPR table, so CP-OFDM QPSK power measurement is spot check for 1RB allocation/1 RB offset configuration to ensure the output power will not ½ dB higher than Pi/2 BPSK and QPSK.

B) For power measurement reduction Of DFT-S-OFDM, 16QAM/64QAM/256QAM will not higher than Pi/2 BPSK and QPSK based on 3GPP MPR table, so Pi/2 BPSK and QPSK are measured fully, and 16QAM is spot check 1RB allocation/1 RB offset configuration to ensure the output power will not % dB higher than Pi/2 BPSK and QPSK. Smaller bandwidth output power will also follow the largest bandwidth to ensure output power will not ½ dB higher than largest supported bandwidth.

C) SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.

D) 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.

E) 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. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

F) 16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configurations than 1.45W/kg, 16QAM/64QAM/256QAM SAR testing are not required.

G) Smaller bandwidth output power for each RB allocation configuration for this device will not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device.

5.2.5. Wi-Fi Test Configuration

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

1）. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
2）. When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
3）. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to *reported* SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the *reported* SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and

exposure configuration.

2）. When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

b) replace “initial test configuration” with “all tested higher output power configurations”

2.4 GHz WiFi SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

- **802.11b DSSS SAR Test Requirements**

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1）. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2）. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

- **2.4 GHz 802.11g/n OFDM&OFDMA SAR Test Exclusion Requirements**

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1）. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2）. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum

output power and the adjusted SAR is ≤ 1.2 W/kg.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

5 GHz WiFi SAR Procedures

- **U-NII-1 and U-NII-2A Bands**
  For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following：

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

- **U-NII-2C and U-NII-3 Bands**
  The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

  When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe

calibration frequency points requirements.

- **OFDM&OFDMA Transmission Mode SAR Test Configuration and Channel Selection Requirements**
  The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.
  1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
  2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
  3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
  4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
     a) The channel closest to mid-band frequency is selected for SAR measurement.
     b) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

6 GHz WiFi SAR Procedures

Initial Test Configuration: An initial test configuration is determinedfor OFDMA transmission modes according to the channel bandwidth, modulation anddata rate combination(s) with the highest maximum output power specified forproduction units in each standalone and aggregated frequency band. SAR ismeasured using the highest measured maximum output power channel. When thereported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement isrequired for the subsequent next highest measured output power channel(s) in theinitial test configuration until the reported SAR is s 1.2 W/kg or all required channelsare tested. Since the highest reported SAR for the initial test configuration is adjustecby the ratio of the subseguent test configuration to initial test configuration specifiedmaximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required forsubsequent test configuration.

- **Power Density Test Requirements**

Per October 2020 & April 2021 TCB Workshop interim proceduresand FCC guidance, start instead with a minimum of 5 test channels across the fullband, then adapt and apply conducted power and SAR test reduction procedures ofKDB Pub.248227 v02r02.WLAN 6GHz SAR is measured by using 6-7GHzparameters per IEC/EEE62209-1528:2020 and report also estimated absorbed PD(for reference purposes only, not specifically for compliance). For the highest SARtest configurations also measure incident PD (total) using mmW near-field probe andtotal-field/power-density reconstruction method.

1) Per equipmentmanufacturer guidance,power density wasmeasured at d=2mm with the grid step (0.0625λ)for determining compliance atd=2mm.

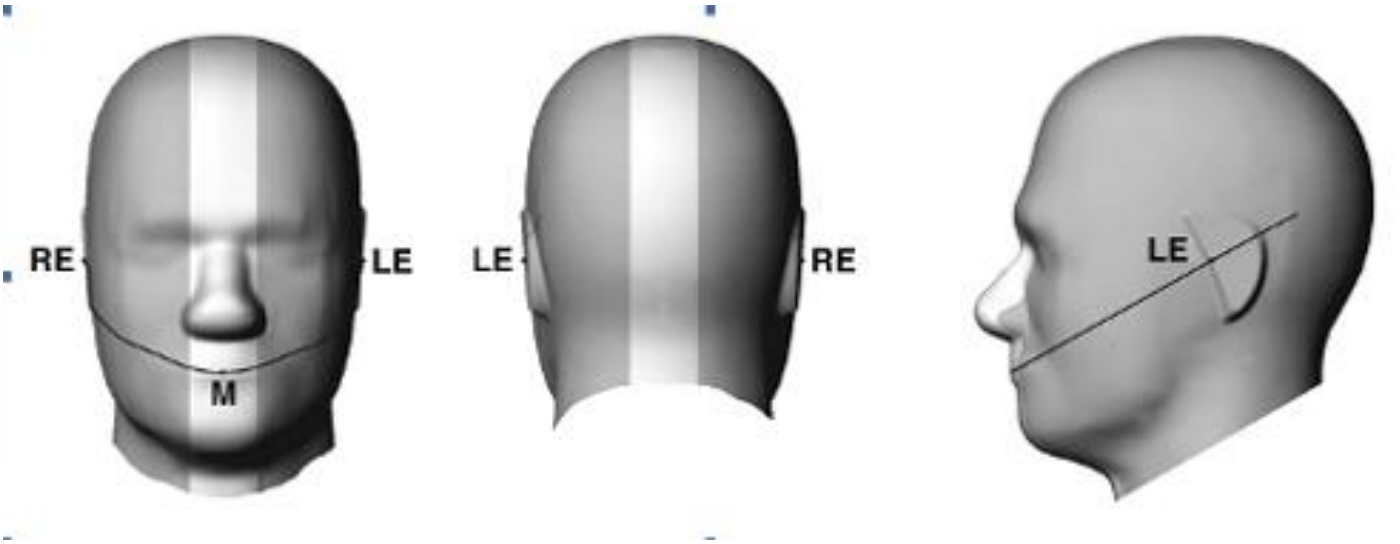
2) According to October 2020 TCB Workshop Interim procedurespower density results were scaled according to IEC 62479:2010 for the portion of themeasurement uncertainty> 30%. Total expanded uncertainty of 2.68 dB (85%) wasused to determine the psPD measurement scaling factor.

3) Per FCC guidance, for simultaneous transmission evaluation, usingSAR sum and SPLSR for simultaneous transmit exclusion analyses and evaluations

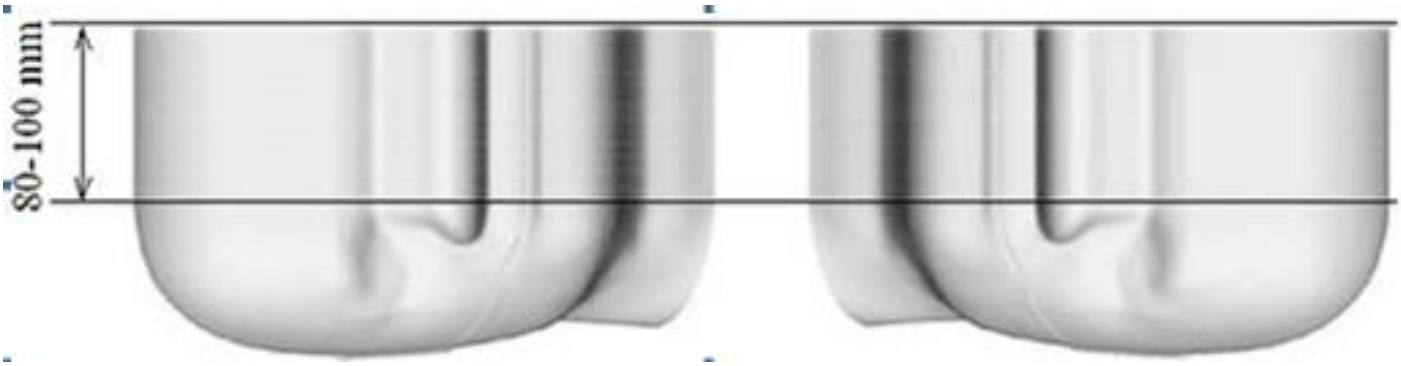
6 DESCRIPTION OF TEST POSITION

6.1 SAR Test Reduction Procedure

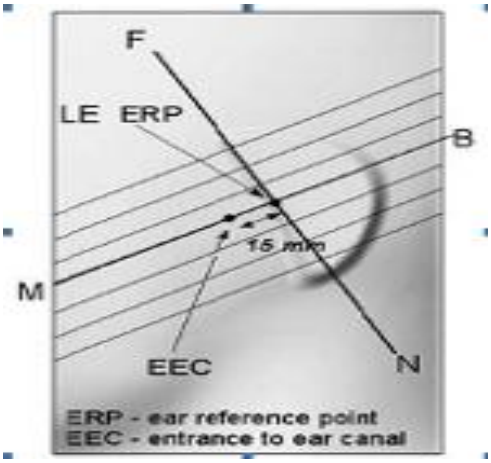
6.1.1. Head Test Position Conditions



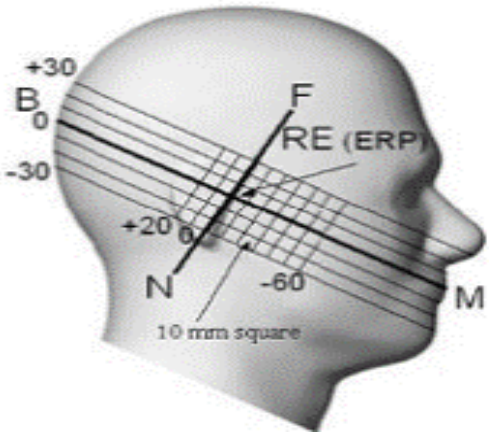
Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only-procedures in this recommended practice are intended primarily for the phantom setup.
Note: The centre strip including the nose region has a different thickness tolerance.



Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)



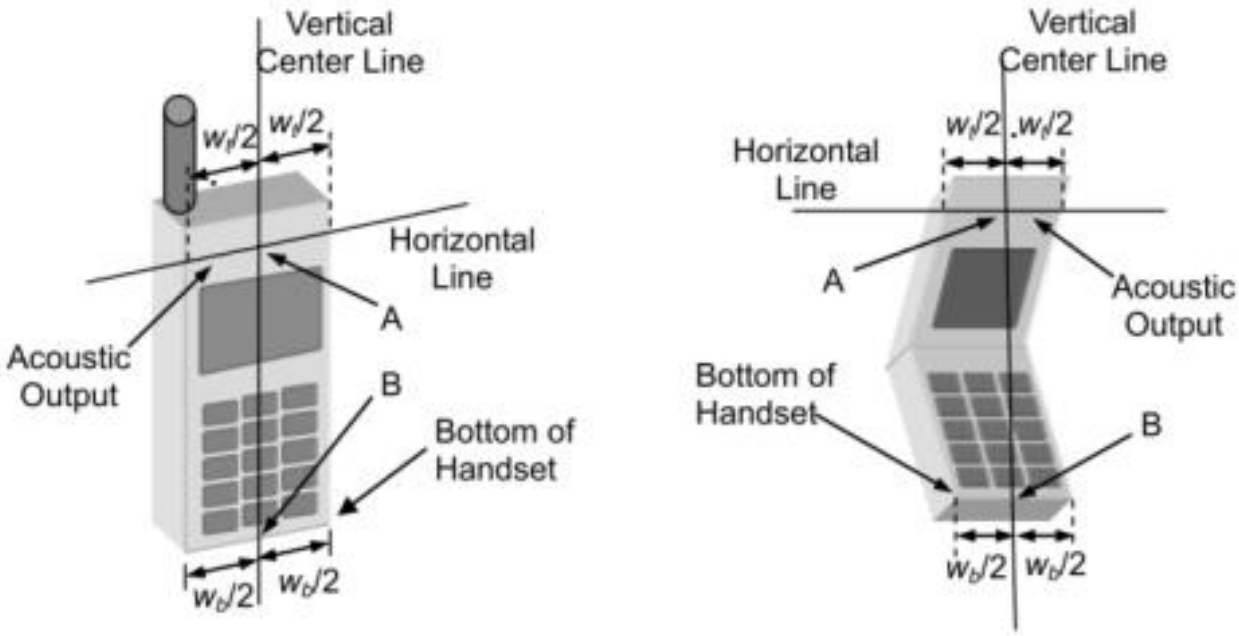
Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations



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

EUT constructions

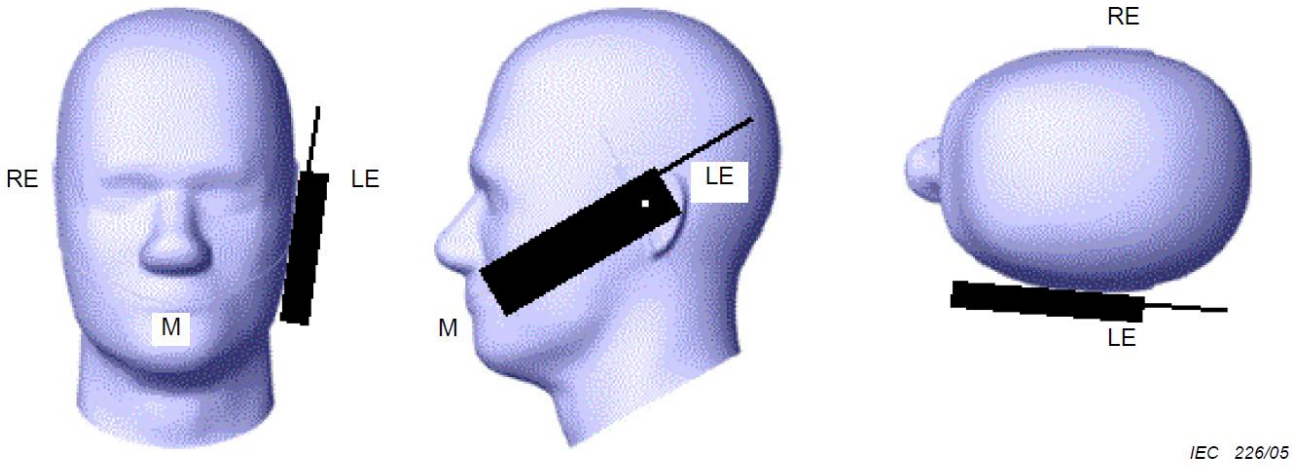
(a) The vertical center line passes through two points on the front side of the handset - the midpoint of the width w t of the handset at the level of the acoustic output, and the midpoint of the width w b of the bottom of the handset.
(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
(c) 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 center line is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.



Tilted Position

(a) To position the device in the “cheek” position described above.

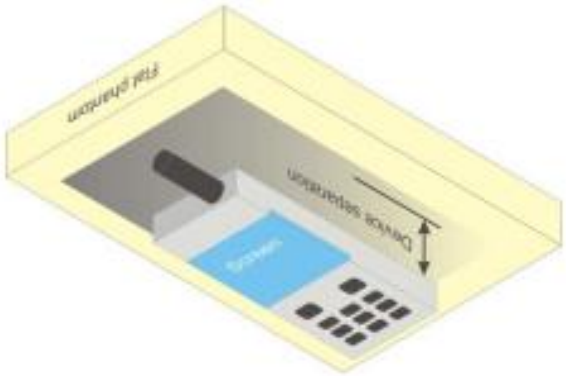
(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.

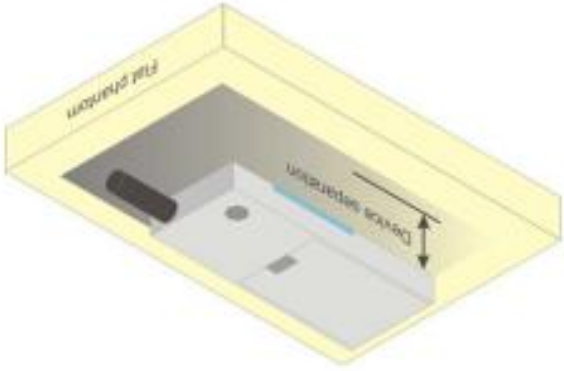
6.1.2. Body-worn Test Position Conditions

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 KDB 447498 are 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 the reported SAR for a body-worn accessory.

Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

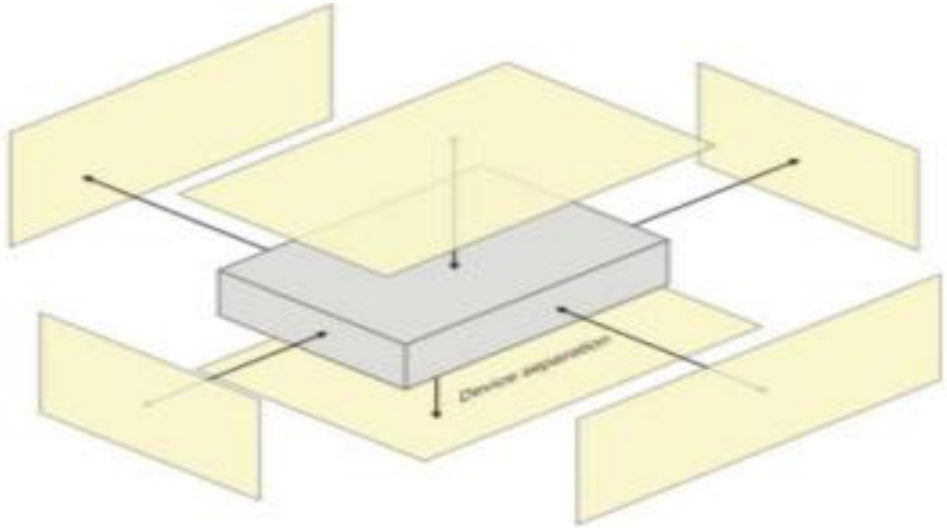
Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required. A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance <= 5 mm to support compliance.





6.1.3. Hotspot Mode Test Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).

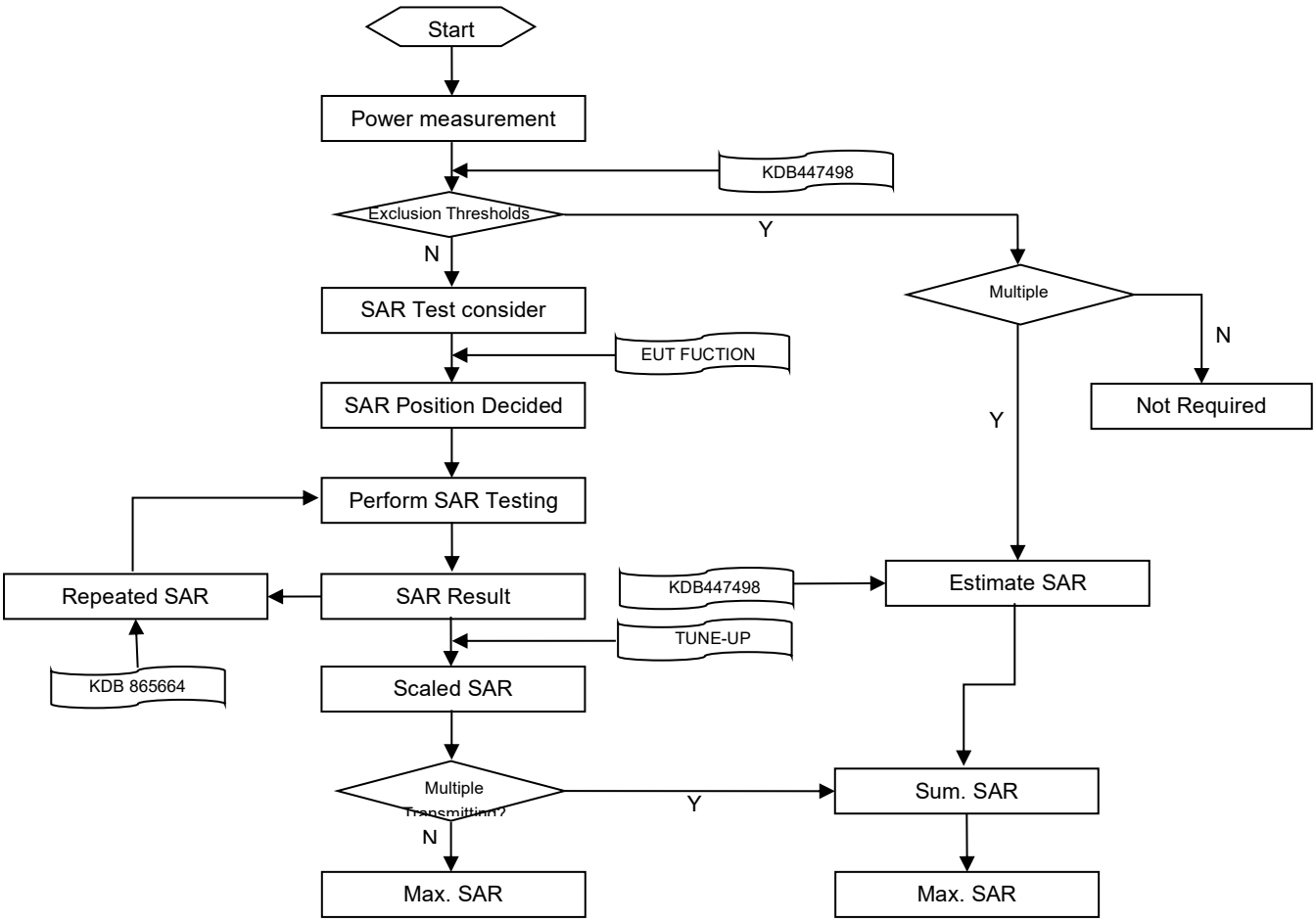


6.2 Product Specific 10g Exposure Consideration

According with FCC KDB 648474 D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modems and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance;

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. 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.

6.3 Measurement Process Diagram



7 TEST RESULT

7.1 Measurement of RF Conducted Power

	Mode	Channel	Frequency (MHz)	Average Power (dBm)			Tune-up	
				ANT 1	ANT 2	ANT 1+2	SISO	MIMO
2.4GHz WLAN	802.11b 1Mbps	1	2412	17.15	17.39	N/A	18.00	N/A
		6	2437	17.40	17.34		18.00	
		11	2462	17.32	17.26		18.00	
	802.11g 6Mbps	1	2412	17.48	17.17		18.00	
		6	2437	17.09	17.12		18.00	
		11	2462	17.35	17.10		18.00	
	802.11n-HT20 MCS0	1	2412	15.95	16.38	19.18	17.00	20.00
		6	2437	16.29	15.95	19.13	17.00	20.00
		11	2462	13.36	13.24	16.31	14.00	17.00
	802.11ax-HE20 MCS0	1	2412	14.14	14.21	17.19	15.00	18.00
		6	2437	16.16	16.25	**19.22**	17.00	20.00
		11	2462	13.33	13.25	16.30	14.00	17.00

	Mode	Channel	Frequency (MHz)	Average Power (dBm)			Tune-up	
				ANT 1	ANT 2	ANT 1+2	SISO	MIMO
5GHz WLAN	802.11a 6Mbps	36	5180	13.35	13.45	N/A	14.00	N/A
		40	5200	13.79	13.44		14.00	
		48	5240	13.33	13.45		14.00	
		52	5260	13.37	13.31		14.00	
		56	5280	13.29	13.23		14.00	
		64	5320	13.27	13.74		14.00	
		100	5500	13.55	13.79		14.00	
		116	5580	13.56	13.29		14.00	
		140	5700	13.55	13.33		14.00	
		149	5745	13.53	13.78		14.00	
		157	5785	13.37	13.54		14.00	
		165	5825	13.64	13.79		14.00	
	802.11n-HT20 MCS0	36	5180	13.26	13.24	16.26	14.00	17.00
		40	5200	13.72	13.33	16.54	14.00	17.00
		48	5240	13.78	13.68	16.74	14.00	17.00
		52	5260	13.63	13.66	16.66	14.00	17.00
		56	5280	13.43	13.63	16.54	14.00	17.00
		64	5320	13.52	13.33	16.44	14.00	17.00
		100	5500	13.59	13.70	16.66	14.00	17.00
		116	5580	13.26	13.47	16.38	14.00	17.00
		140	5700	13.68	13.41	16.56	14.00	17.00
		149	5745	13.44	13.23	16.35	14.00	17.00
		157	5785	13.72	13.53	16.64	14.00	17.00
		165	5825	13.33	13.71	16.53	14.00	17.00
	802.11n-HT40 MCS0	38	5190	12.49	12.77	15.64	13.50	16.50
		46	5230	13.73	13.22	16.49	14.00	17.00
		54	5270	13.25	13.45	16.36	14.00	17.00
		62	5310	13.37	13.02	16.21	13.50	16.50
		102	5510	13.01	12.84	15.94	13.50	16.50
		118	5590	13.40	13.49	16.46	14.00	17.00
		134	5670	13.66	13.62	16.65	14.00	17.00
		151	5755	13.51	13.20	16.37	14.00	17.00
		159	5795	13.25	13.67	16.48	14.00	17.00
	802.11ac-VHT20 MCS0	36	5180	13.24	13.66	16.47	14.00	17.00
		40	5200	13.49	13.46	16.49	14.00	17.00
		48	5240	13.62	13.69	16.67	14.00	17.00
		52	5260	13.20	13.52	16.37	14.00	17.00
		56	5280	13.60	13.26	16.44	14.00	17.00
		64	5320	13.78	13.42	16.61	14.00	17.00
		100	5500	13.72	13.38	16.56	14.00	17.00
		116	5580	13.21	13.47	16.35	14.00	17.00
		140	5700	13.68	13.72	16.71	14.00	17.00
		149	5745	13.66	13.42	16.55	14.00	17.00

		157	5785	13.43	13.40	16.43	14.00	17.00
		165	5825	13.42	13.62	16.53	14.00	17.00
	802.11ac-VHT40 MCS0	38	5190	12.25	12.64	15.46	13.50	16.50
		46	5230	13.37	13.59	16.49	14.00	17.00
		54	5270	13.76	13.43	16.61	14.00	17.00
		62	5310	12.88	12.77	15.84	13.50	16.50
		102	5510	12.82	12.56	15.70	13.50	16.50
		118	5590	13.43	13.49	16.47	14.00	17.00
		134	5670	13.28	13.38	16.34	14.00	17.00
		151	5755	13.51	13.75	16.64	14.00	17.00
		159	5795	13.48	13.57	16.54	14.00	17.00
	802.11ac-VHT80 MCS0	42	5210	11.01	11.29	14.16	12.00	15.00
		58	5290	12.18	12.34	15.27	13.00	16.00
		106	5530	13.20	13.33	16.28	14.00	17.00
		122	5610	13.03	13.25	16.15	14.00	17.00
		155	5775	12.91	13.19	16.06	14.00	17.00
	802.11ax-HE20 MCS0	36	5180	13.65	13.59	16.63	14.50	17.50
		40	5200	13.32	13.73	16.54	14.50	17.50
		48	5240	13.58	13.71	16.66	14.50	17.50
		52	5260	13.63	13.75	**16.70**	14.50	17.50
		56	5280	13.35	13.31	16.34	14.50	17.50
		64	5320	13.47	13.29	16.39	14.50	17.50
		100	5500	13.32	13.21	16.28	14.50	17.50
		116	5580	13.37	13.30	**16.35**	14.50	17.50
		140	5700	11.87	12.33	15.12	13.00	16.00
		149	5745	13.47	13.65	16.57	14.50	17.50
		157	5785	13.67	13.43	16.56	14.50	17.50
		165	5825	13.55	13.75	**16.66**	14.50	17.50
	802.11ax-HE40 MCS0	38	5190	12.02	12.05	15.05	12.50	15.50
		46	5230	13.51	13.58	16.56	14.00	17.00
		54	5270	13.66	13.45	16.57	14.00	17.00
		62	5310	11.49	11.02	14.27	12.50	15.50
		102	5510	11.88	11.78	14.84	13.00	16.00
		118	5590	13.74	13.56	16.66	14.00	17.00
		134	5670	13.29	13.42	16.37	14.00	17.00
		151	5755	13.45	13.22	16.35	14.00	17.00
		159	5795	13.27	13.69	16.50	14.00	17.00
	802.11ax-HE80 MCS0	42	5210	10.18	10.66	13.44	12.00	15.00
		58	5290	10.54	10.68	13.62	12.00	15.00
		106	5530	10.26	10.21	13.25	12.00	15.00
		122	5610	10.09	10.46	13.29	12.00	15.00
		155	5775	10.77	10.53	13.66	12.00	15.00

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up
Bluetooth	DH5	0	2402	11.25	13.00
		39	2441	**12.72**	13.00
		78	2480	11.71	13.00
	2DH5	0	2402	8.33	9.00
		39	2441	7.58	9.00
		78	2480	7.65	9.00
	3DH5	0	2402	8.51	9.00
		39	2441	8.01	9.00
		78	2480	7.98	9.00
	BLE 1M	0	2402	5.44	6.00
		19	2442	5.73	6.00
		39	2480	5.57	6.00
	BLE 2M	0	2402	5.39	6.00
		19	2442	5.85	6.00
		39	2480	5.72	6.00

7.2 Measurement of SAR Test Results

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
Bluetooth SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	DH5	39/2441	1.30	0.119	-0.11	12.72	13.00	1.067	0.165
Back side	DH5	39/2441	1.30	0.050	0.06	12.72	13.00	1.067	0.069
Left side	DH5	39/2441	1.30	0.029	0.02	12.72	13.00	1.067	0.040
Right side	DH5	39/2441	1.30	**0.224**	0.10	12.72	13.00	1.067	**0.311**
Top side	DH5	39/2441	1.30	0.019	0.06	12.72	13.00	1.067	0.026
Bottom side	DH5	39/2441	1.30	0.028	0.05	12.72	13.00	1.067	0.039
Right side	DH5	0/2402	1.30	0.130	-0.04	11.25	13.00	1.496	0.253
Right side	DH5	78/2480	1.30	0.156	0.07	11.71	13.00	1.346	0.273

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
WLAN 2.4G ANT1 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11b	6/2437	1.02	0.149	0.06	17.40	18.00	1.148	0.174
Back side	802.11b	6/2437	1.02	0.070	0.03	17.40	18.00	1.148	0.082
Left side	802.11b	6/2437	1.02	0.022	0.05	17.40	18.00	1.148	0.026
Right side	802.11b	6/2437	1.02	**0.436**	0.09	17.40	18.00	1.148	**0.511**
Top side	802.11b	6/2437	1.02	0.020	-0.07	17.40	18.00	1.148	0.024
Bottom side	802.11b	6/2437	1.02	0.031	0.04	17.40	18.00	1.148	0.036
Right side	802.11b	1/2412	1.02	0.379	-0.01	17.15	18.00	1.216	0.470
Right side	802.11b	11/2462	1.02	0.396	0.12	17.32	18.00	1.169	0.472
WLAN 2.4G ANT2 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11b	1/2412	1.02	0.132	-0.03	17.39	18.00	1.151	0.155
Back side	802.11b	1/2412	1.02	0.064	0.02	17.39	18.00	1.151	0.075
Left side	802.11b	1/2412	1.02	0.342	0.05	17.39	18.00	1.151	0.401
Right side	802.11b	1/2412	1.02	0.089	0.12	17.39	18.00	1.151	0.104
Top side	802.11b	1/2412	1.02	0.013	0.04	17.39	18.00	1.151	0.015
Bottom side	802.11b	1/2412	1.02	0.025	0.03	17.39	18.00	1.151	0.029
Left side	802.11b	6/2437	1.02	0.313	0.02	17.34	18.00	1.164	0.372
Left side	802.11b	11/2462	1.02	0.326	-0.02	17.26	18.00	1.186	0.394
WLAN 2.4G ANT1+2 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11ax20	6/2437	1.14	0.097	-0.03	19.22	20.00	1.197	0.132
Back side	802.11ax20	6/2437	1.14	0.042	0.07	19.22	20.00	1.197	0.057
Left side	802.11ax20	6/2437	1.14	0.232	0.08	19.22	20.00	1.197	0.317
Right side	802.11ax20	6/2437	1.14	0.358	0.02	19.22	20.00	1.197	0.488
Top side	802.11ax20	6/2437	1.14	0.007	0.04	19.22	20.00	1.197	0.010
Bottom side	802.11ax20	6/2437	1.14	0.011	-0.08	19.22	20.00	1.197	0.015
Right side	802.11ax20	1/2412	1.14	0.207	0.06	17.19	18.00	1.205	0.284
Right side	802.11ax20	11/2462	1.14	0.162	0.05	16.30	17.00	1.175	0.217

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
WLAN 5.3G ANT1+2 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11ax20	52/5260	1.14	0.126	0.08	16.70	17.50	1.202	0.173
Back side	802.11ax20	52/5260	1.14	0.016	0.07	16.70	17.50	1.202	0.022
Left side	802.11ax20	52/5260	1.14	**0.553**	0.04	16.70	17.50	1.202	**0.758**
Right side	802.11ax20	52/5260	1.14	0.254	0.03	16.70	17.50	1.202	0.348
Top side	802.11ax20	52/5260	1.14	0.000	0.00	16.70	17.50	1.202	0.000
Bottom side	802.11ax20	52/5260	1.14	0.027	-0.06	16.70	17.50	1.202	0.037
Left side	802.11ax20	56/5280	1.14	0.505	0.09	16.34	17.50	1.306	0.752
Left side	802.11ax20	64/5320	1.14	0.512	-0.04	16.39	17.50	1.291	0.754

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
WLAN 5.6G ANT1+2 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11ax20	116/5580	1.14	0.121	-0.07	16.35	17.50	1.303	0.180
Back side	802.11ax20	116/5580	1.14	0.019	0.01	16.35	17.50	1.303	0.028
Left side	802.11ax20	116/5580	1.14	**0.539**	0.05	16.35	17.50	1.303	**0.801**
Right side	802.11ax20	116/5580	1.14	0.264	0.08	16.35	17.50	1.303	0.392
Top side	802.11ax20	116/5580	1.14	0.000	0.00	16.35	17.50	1.303	0.000
Bottom side	802.11ax20	116/5580	1.14	0.024	0.02	16.35	17.50	1.303	0.035
Left side	802.11ax20	100/5500	1.14	0.511	0.06	16.28	17.50	1.324	0.771
Left side	802.11ax20	140/5700	1.14	0.201	-0.08	15.12	16.00	1.225	0.281

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
WLAN 5.8G ANT1+2 SAR Test Record Limbs SAR Test data(Separate 0mm)									
Front side	802.11ax20	165/5825	1.14	0.102	0.01	16.66	17.50	1.213	0.141
Back side	802.11ax20	165/5825	1.14	0.010	0.04	16.66	17.50	1.213	0.014
Left side	802.11ax20	165/5825	1.14	0.365	0.06	16.66	17.50	1.213	0.505
Right side	802.11ax20	165/5825	1.14	**0.409**	0.05	16.66	17.50	1.213	**0.566**
Top side	802.11ax20	165/5825	1.14	0.000	0.00	16.66	17.50	1.213	0.000
Bottom side	802.11ax20	165/5825	1.14	0.013	0.09	16.66	17.50	1.213	0.018
Right side	802.11ax20	149/5745	1.14	0.385	-0.02	16.57	17.50	1.239	0.544
Right side	802.11ax20	157/5785	1.14	0.391	0.07	16.56	17.50	1.242	0.553

SAR Test Note:

1. The Wi-Fi duty cycle is 95~100%, Wi-Fi SAR scaling need further consideration and the theoretical duty cycle is 100%, therefore the actual duty cycle will be scaled up to the theoretical value of Wi-Fi reported SAR calculation.
2. The ratio is the difference in percentage between original and repeated measured SAR.
3. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

Worse case spot check data:

Test position	Test mode	Test ch./Freq.	Duty Cycle factor	SAR (W/kg) 10-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 10-g(W/kg)
WLAN 5.6G Test data(Separate 0mm) Ant1+2									
Left side	802.11ax20	116/5580	1.14	**0.426**	**0.09**	16.35	17.50	1.303	**0.633**
Left side	802.11ax20	100/5500	1.14	0.403	-0.06	16.28	17.50	1.324	0.608
Left side	802.11ax20	140/5700	1.14	0.301	0.03	16.72	17.50	1.197	0.411

SAR Test Note:

1. The Wi-Fi duty cycle is 95~100%, Wi-Fi SAR scaling need further consideration and the theoretical duty cycle is 100%, therefore the actual duty cycle will be scaled up to the theoretical value of Wi-Fi reported SAR calculation.
2. The ratio is the difference in percentage between original and repeated measured SAR.
3. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

7.2.1. SAR Measurement Variability

Band	Mode	Test Position	Ch.	Freq. (MHz)	Antenna	Original 10g SAR (W/kg)	First 10g SAR (W/kg)	First Ratio (%)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Note:
According to KDB 865664 D01v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.
The following procedures are applied to determine if repeated measurements are required:

1. The original highest measured Reported SAR 10-g ≥ 2.0 W/kg repeated that measurement once.
2. Perform a second repeated measurement the ratio of the largest to the smallest SAR for the original and first repeated measurements is <3.0 W/kg, or when the original or repeated measurement ≥ 3.63 W/kg (~10% from the 10-g SAR limit).

7.3 Multiple Transmitter Evaluation

7.3.1. Simultaneous SAR SAR test evaluation

• **Simultaneous TX Combination**	Limbs SAR
Wi-Fi 2.4G + Bluetooth	Y
Wi-Fi 5G + Bluetooth	Y

7.3.2. Simultaneous Transmission SAR Summation Scenario

Limbs SAR (0mm)					
Exposure Position (0mm)	1	2	3	1+3	2+3
	2.4GHz WLAN	5GHz WLAN	Bluetooth	Scaled SAR	
	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)
Front side	0.17	0.18	0.17	0.34	0.35
Back side	0.08	0.03	0.07	0.15	0.1
Left side	0.40	0.80	0.04	0.44	0.84
Right side	0.51	0.57	0.31	0.82	**0.88**
Top side	0.02	0.00	0.03	0.05	0.03
Bottom side	0.04	0.04	0.04	0.08	0.08

8 SAR VALIDATION DATA

Note: The Validation Data can refer to Appendix.

9 SAR TEST DATA

Note: The SAR Test Data can refer to Appendix.

10 CALIBRATION CERTIFICATE

Note: The detailed calibration certificate can refer to Appendix.

11 TEST SETUP PHOTO

Note: The Test Setup Photo please see appendix.

The End