

FCC SAR Test Report

FCC ID: 2AB7X-WISEPRO

Project No. : 1906H001
Equipment : WisePOS Pro
Test Model : WSP71
Series Model : WSP72, WSP73
Applicant : BBPOS International Limited
Address : Suite 1903-04, 19/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, N.T. HK

Date of Receipt : Jun. 27, 2019
Date of Test : Aug. 20, 2019 ~ Aug. 23, 2019
Issued Date : Sep. 10, 2019
Tested by : BTL Inc.

PREPARED BY : Rot Liang
(Rot Liang)

APPROVED BY : Herbert Liu
(Herbert Liu)

B T L I N C .

No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000



Certificate #5123.02

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents	Page
1 . GENERAL SUMMARY	6
2 . RF EMISSIONS MEASUREMENT	7
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
3 . GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 STATEMENT OF COMPLIANCE	10
3.3 LABORATORY ENVIRONMENT	10
3.4 MAIN TEST INSTRUMENTS	11
4 . SAR MEASUREMENTS SYSTEM CONFIGURATION	12
4.1 SAR MEASUREMENT SET-UP	12
4.1.1 TEST SETUP LAYOUT	12
4.2 DASY5 E-FIELD PROBE SYSTEM	13
4.2.1 PROBE SPECIFICATION	13
4.2.2 E-FIELD PROBE CALIBRATION	14
4.2.3 OTHER TEST EQUIPMENT	15
4.2.4 SCANNING PROCEDURE	16
4.2.5 SPATIAL PEAK SAR EVALUATION	17
4.2.6 DATA STORAGE AND EVALUATION	17
4.2.7 DATA EVALUATION BY SEMCAD	18
5 . SYSTEM VERIFICATION PROCEDURE	20
5.1 TISSUE VERIFICATION	20
5.2 SYSTEM CHECK	21
5.3 SYSTEM CHECK PROCEDURE	21
6 . SAR MEASUREMENT VARIABILITY AND UNCERTAINTY	22
6.1 SAR MEASUREMENT VARIABILITY	22
7 . OPERATIONAL CONDITIONS DURING TEST	23
7.1 SAR TEST CONFIGURATION	23
7.1.1 UMTS TEST CONFIGURATION	23
7.1.2 LTE TEST CONFIGURATION	28
7.1.3 WIFI TEST CONFIGURATION	30
7.2 TEST POSITION	32
7.2.1 BODY	32
8 . TEST RESULT	37
8.1 CONDUCTED POWER RESULTS	37
8.1.1 CONDUCTED POWER MEASUREMENTS OF UMTS	37
8.1.2 CONDUCTED POWER MEASUREMENTS OF LTE	39

Table of Contents	Page
8.1.3 CONDUCTED POWER MEASUREMENTS OF WIFI	48
8.1.4 CONDUCTED POWER MEASUREMENTS OF BT	52
8.2 SAR TEST RESULTS	53
8.2.1 SAR MEASUREMENT RESULT	54
9 . MULTIPLE TRANSMITTER EVALUATION	57
9.1 STAND-ALONE SAR TEST EXCLUSION	58
9.2 SIMULTANEOUS TRANSMISSION CONDITIONS	58
APPENDIX	59
1. TEST LAYOUT	59
Appendix A. SAR Plots of System Verification	
Appendix B. SAR Plots of SAR Measurement	
Appendix C. Calibration Certificate	
Appendix D. Photographs of the Test Set-Up	

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue	Sep. 10, 2019

1. GENERAL SUMMARY

Equipment	WisePOS Pro
Brand Name	7-ELEVEN
Test Model	WSP71
Series Model	WSP72, WSP73
Model difference(s)	WSP71: WisePOS Pro device only WSP72: WisePOS Pro device with hand strap WSP73: WisePOS Pro device with pistol grip
Manufacturer	BBPOS International Limited
Address	Suite 1903-04, 19/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, N.T. HK
Standard(s)	<p>ANSI Std C95.1-1992 Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz - 300 GHz.(IEEE Std C95.1-1991)</p> <p>IEEE Std 1528-2013 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques</p> <p>KDB941225 D01 3G SAR Procedures v03r01 KDB941225 D05 SAR for LTE Devices v02r05 KDB447498 D01 General RF Exposure Guidance v06 KDB648474 D04 Handset SAR v01r03 KDB248227 D01 802. 11 Wi-Fi SAR v02r02 KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04 KDB865664 D02 SAR Reporting v01r02 KDB690783 D01 SAR Listings on Grants v01r03 KDB616217 D04 SAR for laptop and tablets v01r02</p>

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC SAR-1-1906H001) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

2.2 MEASUREMENT UNCERTAINTY

Note: Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	WisePOS Pro	
Test Model	WSP71	
Series Model	WSP72, WSP73	
Test Sample	Engineering Sample No.: DG19081490	
IMEI	352788075018337	
S/N	7MDUS0100000117	
HW Version	7MD_V01	
SW Version	970ADGAAK2_BB_V009	
Modulation	UMTS(QPSK), LTE(QPSK/16QAM), WiFi(DSSS/OFDM), BT(GFSK/ π /4-DQPSK/8-DPSK)	
Operation Frequency Range(s)	Band	TX (MHz)
	UMTS B2	1850~1910
	UMTS B4	1710~1755
	UMTS B5	824~849
	LTE B2	1850~1910
	LTE B4	1710~1755
	LTE B5	824~849
	LTE B7	2500~2570
	LTE B12	699~716
	LTE B13	777~787
	LTE B17	704~716
	Bluetooth	2400~2483.5
	WIFI	2400~2483.5
		5150~5250
5250~5350		
5470~5725		
	5725~5850	
HSDPA UE Category	14	
HSUPA UE Category	6	
DC-HSDPA UE Category	24	
Power Class	3, tested with power control "all 1"(UMTS B2/4/5)	
	3, tested with power control "all Max" (LTE B2/4/5/7/12/13/17)	

	9262-9400-9538 (UMTS B2)				
	1312-1413-1513 (UMTS B4)				
	4132-4182-4233 (UMTS B5)				
	18700-18900-19100 (LTE B2 BW=20MHz)				
	20050-20175-20300 (LTE B4 BW=20MHz)				
	20450-20525-20600 (LTE B5 BW=10MHz)				
	20850-21100-21350 (LTE B7 BW=20MHz)				
	23060-23095-23130 (LTE B12 BW=10MHz)				
	23230 (LTE B13 BW=10MHz)				
	23780-23790-23800 (LTE B17 BW=10MHz)				
Test Channels (low-mid-high)	0-39-78 (BT)				
	0-19-39 (BLE)				
	1-6-10-11 (2.4G WIFI 802.11b)				
	1-2-5-6-7-10-11 (2.4G WIFI 802.11g/n HT20)				
	3-4-5-6-7-8-9 (2.4G WIFI 802.11n HT40)				
	Band	5.2G	5.3G	5.6G	5.8G
	802.11a/n HT20 /ac VHT20	36-40-44-48	52-56-60-64	100-104-108- 112-116-132- 136-140	149-153-157- 161-165
	802.11n HT40 /ac VHT40	38-46	54-62	102-110-118- 126-134	151-159
802.11ac VHT80	42	58	106-122	155	
Antenna Gain	Band	Main Antenna (dBi)		BT/WiFi Antenna (dBi)	
	UMTS B2	2.2		/	
	UMTS B4	2.2		/	
	UMTS B5	1.5		/	
	LTE B2	2.2		/	
	LTE B4	2.2		/	
	LTE B5	1.5		/	
	LTE B7	2.5		/	
	LTE B12	1.2		/	
	LTE B13	1.2		/	
	LTE B17	1.2		/	
	Bluetooth	/		3.2	
	2.4G WiFi	/		3.2	
5G WiFi	/		4.1		
Other Information					
Battery	Model Name	BPS01			
	Brand Name	TWS Technology			
	Power Rating	3.8 Vdc, 6400 mAh			
With Earphone(Yes/No)	No				

Note:

According to TCB workshop October, 2014 RF Exposure Procedures Update (Overlapping LTE Bands): SAR for LTE B17 (Frequency range: 704-716 MHz) is covered by LTE B12 (Frequency range: 699-716MHz) due to similar frequency range, same maximum tune up limit and same maximum channel bandwidth. Therefore, SAR test for LTE B17 is not required.

3.2 STATEMENT OF COMPLIANCE

Mode	Highest Reported Body SAR-1g (W/kg)
UMTS B2	0.40
UMTS B4	0.88
UMTS B5	0.31
LTE B2	0.51
LTE B4	0.73
LTE B5	0.25
LTE B7	0.25
LTE B12	0.51
LTE B13	0.30
2.4G WLAN	0.31
5.2G&5.3G WLAN	0.48
5.6G WLAN	0.75
5.8G WLAN	0.80
Bluetooth	<0.01

Note: The highest reported SAR for body and simultaneous transmission exposure conditions are 0.88W/kg, 1.17W/kg respectively.

Note:

1) The device is in compliance with Specific Absorption Rate(SAR)for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

3.3 LABORATORY ENVIRONMENT

Temperature	Min. = 18°C, Max. = 25°C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards.	
Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

3.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1390	May 25, 2019	1 Year
2	Data Acquisition Electronics	Speag	DAE3	420	Jun. 21, 2019	1 Year
3	E-field Probe	Speag	EX3DV4	3685	Mar. 25, 2019	1 Year
4	E-field Probe	Speag	ES3DV3	3121	Feb. 25, 2019	1 Year
5	System Validation Dipole	Speag	D750V3	1095	Jun. 05, 2018	3 Years
6	System Validation Dipole	Speag	D835V2	4d160	Jun. 05, 2018	3 Years
7	System Validation Dipole	Speag	D1750V2	1101	Jun. 07, 2018	3 Years
8	System Validation Dipole	Speag	D1900V2	5d179	Jun. 07, 2018	3 Years
9	System Validation Dipole	Speag	D2450V2	919	Jun. 11, 2018	3 Years
10	System Validation Dipole	Speag	D2600V2	1067	Jun. 11, 2018	3 Years
11	System Validation Dipole	Speag	D5GHzV2	1160	Jun. 20, 2018	3 Years
12	ELI4 Phantom	Speag	ELI4 Phantom V5.0	1222	N/A	N/A
13	8960 Series 10 Wireless Com Test set	Agilent	E5515E	MY52112163	Aug. 11, 2018	1 Year
14	CMW500-Wideband Radio Communication Tester	RS	CMW500	153883	Mar. 10, 2019	1 Year
15	Power Amplifier	Mini-Circuits	ZHL-42W+	QA1333003	Feb. 25, 2019	1 Year
16	Power Amplifier	Mini-Circuits	ZVE-8G+	520701341	Feb. 25, 2019	1 Year
17	DC Source	Iteck	OT6154	M00157	Oct. 12, 2018	1 Year
18	ENA Network Analyzer	Agilent	E5071C	MY46102965	Mar. 10, 2019	1 Year
19	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Aug. 11, 2018	1 Year
20	Signal Generator	Agilent	E4438C	MY4907131	Mar. 10, 2019	1 Year
21	P-series power meter	Agilent	N1911A	MY45100473	Aug. 11, 2018	1 Year
22	Wideband power sensor	Agilent	N1921A	MY51100041	Aug. 11, 2018	1 Year
23	Peak Power Analyzer	Keysight	8990B	MY51000506	Nov. 26, 2018	1 Year
24	Wideband Power Sensor	Keysight	N1923A	MY58310004	Nov. 26, 2018	1 Year
25	Dielectric Assessment Kit	Speag	DAK-3.5	1226	N/A	N/A
26	Dual directional coupler	Woken	TS-PCC0M-05	107090019	Mar. 10, 2019	1 Year
27	Coupler	Woken	0110A056010-10	COM5BNW1A2	Mar. 10, 2019	1 Year

Remark:

1. "N/A" denotes no model name, serial No. or calibration specified.
2.
 - 1) Per KDB865664 D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. 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) The most recent return-loss result , measured at least annually, deviates by no more than 20% from the previous measurement;
 - d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.
 - 2) Network analyzer probe calibration against air, distilled water and a short block performed before measuring liquid parameters.

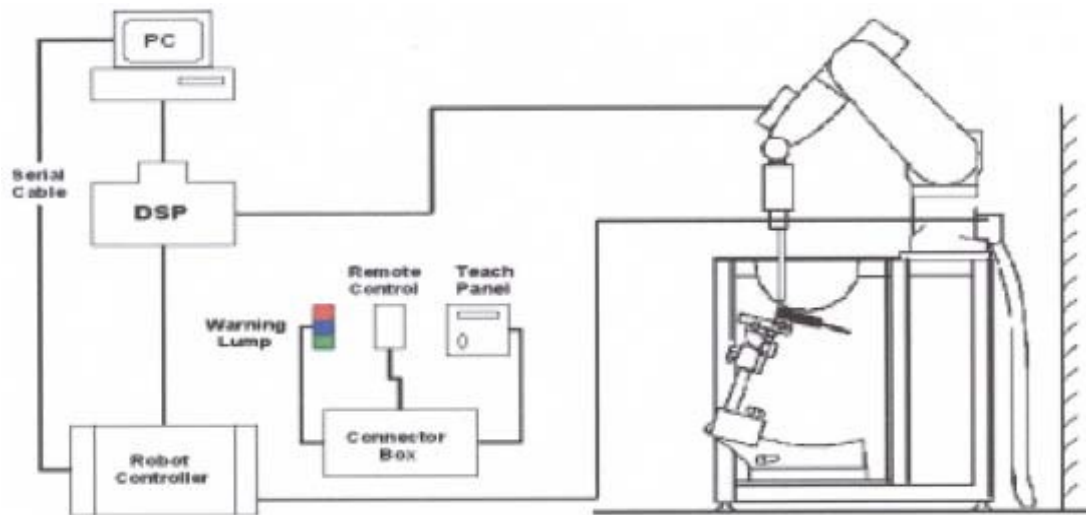
4. SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1 SAR MEASUREMENT SET-UP

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

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.1.1 TEST SETUP LAYOUT



4.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe EX3DV4 and ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

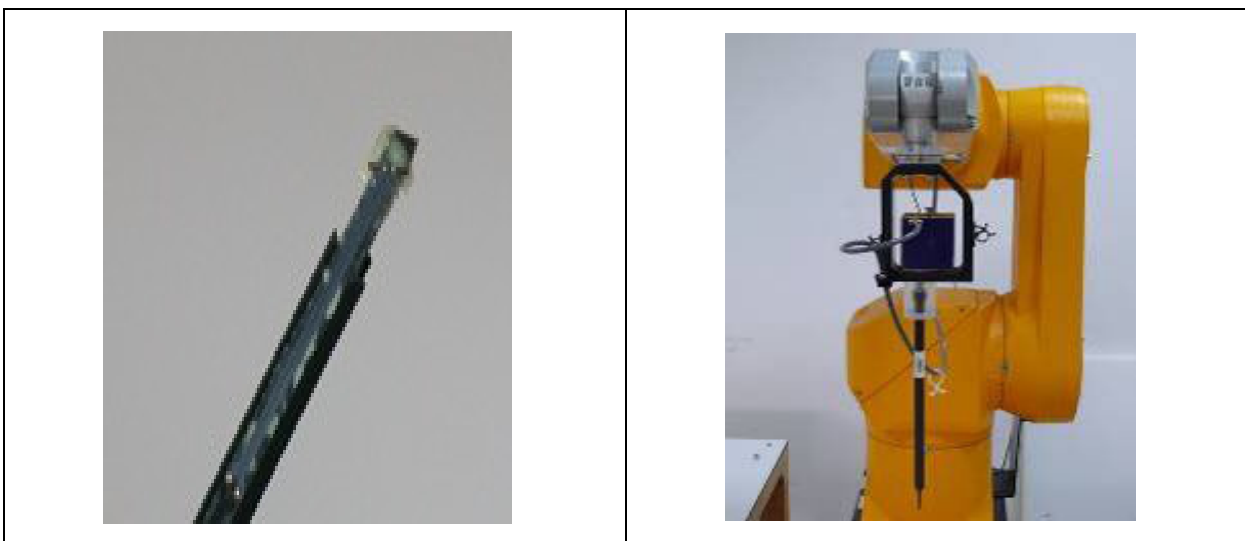
4.2.1 PROBE SPECIFICATION

EX3DV4

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm

ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 μ W/g to > 100 mW/g Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 4 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm



E-field Probe

4.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\text{SAR} = C \frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m³).


4.2.3 OTHER TEST EQUIPMENT

4.2.3.1 Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.

Material: POM, Acrylic glass, Foam

4.2.3.2 Phantom

Model	ELI4 Phantom	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Shell Thickness	2±0.1 mm	
Filling Volume	Approx. 30 liters	
Dimensions	Length: 600 mm ; Width: 190mm Height: adjustable feet	
Available	Special	

4.2.4 SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. $\pm 5\%$.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension ($\leq 2\text{GHz}$), 12 mm in x- and y- dimension (2-4 GHz) and 10mm in x- and y- dimension (4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution: $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}} \leq 2\text{GHz} - \leq 8\text{mm}$, 2-4GHz - $\leq 5\text{ mm}$ and 4-6 GHz - $\leq 4\text{mm}$; $\Delta z_{\text{zoom}} \leq 3\text{GHz} - \leq 5\text{ mm}$, 3-4 GHz - $\leq 4\text{mm}$ and 4-6GHz - $\leq 2\text{mm}$ where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

Frequency	Maximun Area Scan resolution ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximun Zoom Scan spatial resolution ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	Maximun Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	$\Delta z_{\text{zoom}}(n>1)^*$	
$\leq 2\text{GHz}$	$\leq 15\text{mm}$	$\leq 8\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 1.5 * \Delta z_{\text{zoom}}(n-1)$	$\geq 30\text{mm}$
2-3GHz	$\leq 12\text{mm}$	$\leq 5\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 1.5 * \Delta z_{\text{zoom}}(n-1)$	$\geq 30\text{mm}$
3-4GHz	$\leq 12\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 3\text{mm}$	$\leq 1.5 * \Delta z_{\text{zoom}}(n-1)$	$\geq 28\text{mm}$
4-5GHz	$\leq 10\text{mm}$	$\leq 4\text{mm}$	$\leq 3\text{mm}$	$\leq 2.5\text{mm}$	$\leq 1.5 * \Delta z_{\text{zoom}}(n-1)$	$\geq 25\text{mm}$
5-6GHz	$\leq 10\text{mm}$	$\leq 4\text{mm}$	$\leq 2\text{mm}$	$\leq 2\text{mm}$	$\leq 1.5 * \Delta z_{\text{zoom}}(n-1)$	$\geq 22\text{mm}$

4.2.5 SPATIAL PEAK SAR EVALUATION

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution) or 8 x 8 x 7 points (with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting “Graph Evaluated”.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computer mathematic, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computer mathematic, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

4.2.6 DATA STORAGE AND EVALUATION

4.2.6.1 Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “DAE”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

4.2.7 DATA EVALUATION BY SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	Sensitivity	Normi, a _{i0} , a _{i1} , a _{i2}
	Conversion factor	ConvF _i
	Diode compression point	Dcp _i
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multi meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With	V _i = compensated signal of channel i	(i = x, y, z)
	U _i = input signal of channel i	(i = x, y, z)
	cf = crest factor of exciting field	(DASY parameter)
	dcp _i = diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E-field probes: } E_i = (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2}$$

$$\text{H-field probes: } H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With V_i = compensated signal of channel i (i = x, y, z)

Norm_i = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)²] for E-field Probes

ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{\text{tot}} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$\text{SAR} = (E_{\text{tot}})^2 \cdot \sigma / (\rho \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{\text{pwe}} = E_{\text{tot}}^2 / 3770 \text{ or } P_{\text{pwe}} = H_{\text{tot}}^2 \cdot 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm²

E_{tot} = total field strength in V/m

H_{tot} = total magnetic field strength in A/m

5. SYSTEM VERIFICATION PROCEDURE

5.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

The following materials are used for producing the tissue-equivalent materials.

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 750	0.2	-	0.2	1.5	56.0	-	42.1	-
Head 835	0.2	-	0.2	1.5	57.0	-	41.1	-
Head 1750	-	47.0	-	0.4	-	-	52.6	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2450	-	45.0	-	0.1	-	-	54.9	-
Head 2600	-	45.1	-	0.1	-	-	54.8	-
Head 5G	-	-	-	-	-	17.2	65.5	17.3

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M + resistivity
 HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol] Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Targeted Conductivity (σ)	Targeted Permittivity (ϵ_r)	Deviation Conductivity (σ) (%)	Deviation Permittivity (ϵ_r) (%)	Date
Head	750	22.5	0.895	41.520	0.89	41.9	0.56	-0.91	Aug. 20, 2019
Head	835	22.3	0.934	42.910	0.90	41.5	3.78	3.40	Aug. 20, 2019
Head	1750	22.2	1.398	39.306	1.37	40.1	2.04	-1.98	Aug. 21, 2019
Head	1900	22.2	1.380	39.605	1.40	40.0	-1.43	-0.99	Aug. 21, 2019
Head	2450	22.4	1.874	38.301	1.80	39.2	4.11	-2.29	Aug. 22, 2019
Head	2450	22.5	1.860	38.910	1.80	39.2	3.33	-0.74	Aug. 23, 2019
Head	2600	22.2	2.048	37.722	1.96	39.0	4.49	-3.28	Aug. 21, 2019
Head	5200	22.1	4.854	36.274	4.66	36.0	4.16	0.76	Aug. 22, 2019
Head	5300	22.1	4.968	36.095	4.76	35.9	4.37	0.54	Aug. 22, 2019
Head	5500	22.1	5.189	35.738	4.96	35.6	4.62	0.39	Aug. 22, 2019
Head	5600	22.1	5.299	35.565	5.07	35.5	4.52	0.18	Aug. 22, 2019
Head	5800	22.1	5.520	35.217	5.27	35.3	4.74	-0.24	Aug. 22, 2019

Note:

- 1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
- 2) KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
- 3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

5.2 SYSTEM CHECK

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

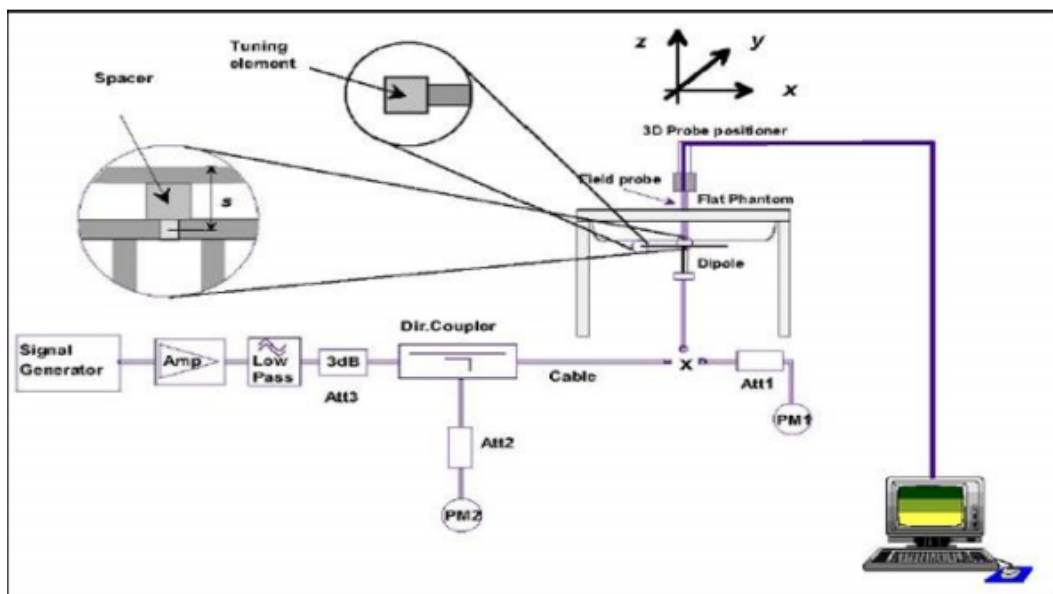
System Check	Date	Frequency (MHz)	Targeted SAR-1g (W/kg)	Measured SAR-1g (W/kg)	normalized SAR-1g (W/kg)	Deviation (%)	Dipole S/N
Head	Aug. 20, 2019	750	8.47	2.11	8.44	-0.35	1095
Head	Aug. 20, 2019	835	9.23	2.42	9.68	4.88	4d160
Head	Aug. 21, 2019	1750	37.00	9.20	36.80	-0.54	1101
Head	Aug. 21, 2019	1900	39.50	9.85	39.40	-0.25	5d179
Head	Aug. 22, 2019	2450	52.10	13.00	52.00	-0.19	919
Head	Aug. 23, 2019	2450	52.10	12.80	51.20	-1.73	919
Head	Aug. 21, 2019	2600	56.10	14.00	56.00	-0.18	1067
Head	Aug. 22, 2019	5200	75.30	7.75	77.50	2.92	1160
Head	Aug. 22, 2019	5300	76.80	7.85	78.50	2.21	1160
Head	Aug. 22, 2019	5500	80.80	8.44	84.40	4.46	1160
Head	Aug. 22, 2019	5600	78.60	7.80	78.00	-0.76	1160
Head	Aug. 22, 2019	5800	77.90	7.91	79.10	1.54	1160

5.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW (below 3GHz) or 100mW (3-6GHz). To adjust this power a power meter is used.

The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system ($\pm 10\%$).



6. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1 SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, 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. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 8.2.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 SAR TEST CONFIGURATION

7.1.1 UMTS TEST CONFIGURATION

1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures description in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Result for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA)

Should be tabulated in the SAR report .All configuration that are not supported by the DUT or cannot be measured due to technical or equipment limitation should be clearly identified.

2. WCDMA

(1).Head SAR Measurements

SAR for next to ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1s”. 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 with 3.4kbps SRB(signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

(2).Body SAR Measurements

SAR for body-worn accessory is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by handset with 12.2 kbps RMC as the primary mode.

3. HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 4 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.

Per KDB941225 D01, the 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures for the highest reported SAR body exposure configuration in 12.2 kbps RMC.

HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ 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 condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the below table, β_{hs} for HS-DPCCH is set automatically to the correct value when $\Delta ACK, \Delta NACK, \Delta CQI = 8$. The variation of the β_c / β_d ratio causes a power reduction at sub-tests 2 - 4.

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

Note 1: $\Delta ACK, \Delta NACK$ and $\Delta CQI = 8$ $A_{hs} = \beta_{hs} / \beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$
 Note 2: CM=1 for $\beta_c / \beta_d = 12/15$, $\beta_{hs} / \beta_c = 24/15$. For all other combinations of DPDCH, DPCCH 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 $\beta_c = 11/15$ and $\beta_d = 15/15$

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

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

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

HSDPA UE category

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum HS-DSCH Transport Block Bits/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

4. HSUPA

SAR for Body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ 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 $\leq 1.2W/kg$, SAR measurement is not required for the secondary mode.

Per KDB941225 D01, the 3G SAR test reduction procedures is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures for the highest reported body exposure SAR configuration in 12.2 kbps RMC.

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 HSDPA should be configured according to the values indicated below as well as other applicable procedures described in the “WCDMA Handset” and „Release 5 HSDPA Data Device” sections of 3G device.

Subtests for WCDMA Release 6 HSUPA

Sub-test [⊕]	β_c [⊕]	β_d [⊕]	β_d (SF) [⊕]	β_c/β_d [⊕]	$\beta_{hs}^{(1)}$ [⊕]	β_{ec} [⊕]	β_{ed} [⊕]	β_{ec} [⊕] (SF) [⊕]	β_{ed} [⊕] (code) [⊕]	CM ⁽²⁾ [⊕] (dB) [⊕]	MP R [⊕] (dB) [⊕]	AG ⁽⁴⁾ [⊕] Inde x [⊕]	E-TFC I [⊕]
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 [⊕]	$\beta_{ed1}:47/15$ [⊕] $\beta_{ed2}:47/15$ [⊕]	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: $\Delta ACK, \Delta NACK$ and $\Delta CQI = 8$ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

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.

HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Spreading 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).

5. 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 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

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.

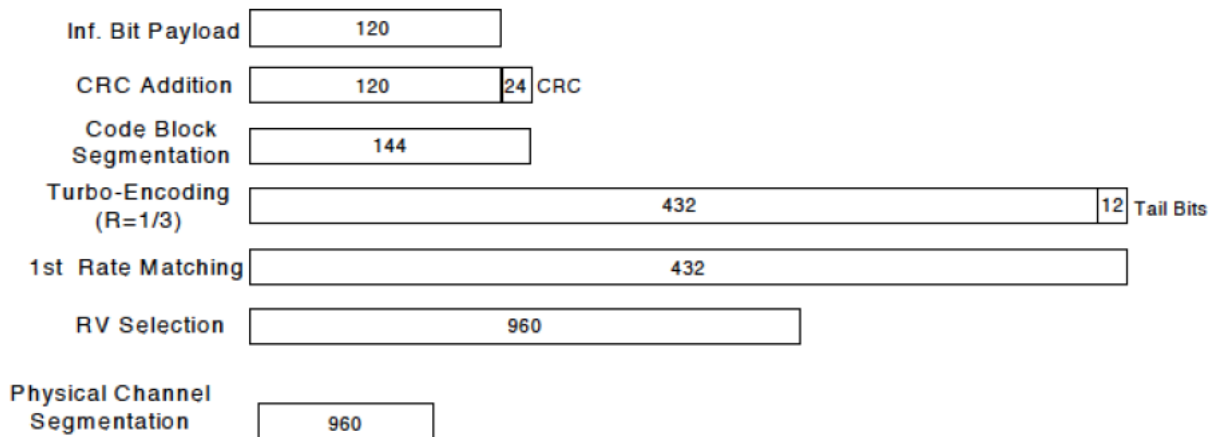


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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

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

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

Note 2: CM=1 for $\beta_c/\beta_d=12/15$, $\beta_{hs}/\beta_c=24/15$. 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.^o

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 $\beta_c=11/15$ and $\beta_d=15/15$ ^o

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.

7.1.2 LTE TEST CONFIGURATION

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices. The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all TTI frames(Maximum TTI)

1. Spectrum Plots for RB configurations

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

2. MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 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
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

3. A-MPR

A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS_01” on the base station simulator.

4. LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) 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.

ii) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in i) are applied to measure the SAR for QPSK with 50% RB allocation

iii) 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 i) and ii) 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.

iv) 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 $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) 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 $> \frac{1}{2}$ 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.

7.1.3 WIFI TEST CONFIGURATION

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal.

2.4G

Mode	802.11b	802.11g	802.11n HT20	802.11n HT40
Duty cycle	100%			
Crest factor	1			

5G

Mode	802.11a	802.11n HT20	802.11n HT40	802.11ac VHT20	802.11ac VHT40	802.11ac VHT80
Duty cycle	100%					
Crest factor	1					

For WiFi SAR testing, a communication link is set up with the test mode software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 are applied.

7.1.3.1 2.4G SAR Test Requirements

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 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. 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 configurations

When SAR measurement is required for 2.4 GHz 802.11g/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.

7.1.3.2 5G SAR Test Requirements

◇ U-NII-1 and U-NII-2A Band

For devices that operate in both U-NII-1 and U-NII-2A bands, 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. 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.

◇ U-NII-2C, 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, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, they must be considered for SAR testing. 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.¹¹ 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.

7.1.1.3 OFDM transmission mode and SAR test channel selection

For the 2.4GHz and 5GHz bands, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations (for example 802.11a, 802.11n and 802.11ac, or 802.11g and 802.11n, with the same channel bandwidth, modulation, and data rate, etc.), the lower order 802.11 mode (i.e. 802.11a then 802.11n and 802.11ac, or 802.11g then 802.11n) is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

7.1.3.4 Initial test configuration procedure

For OFDM, in both 2.4G and 5GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output powers is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output power will be the initial test configuration. When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurement.

7.2 TEST POSITION

7.2.1 BODY

The overall diagonal dimension of the display section of a tablet is 21.1cm>20cm, per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the Tablet touching the phantom. SAR evaluation for the front surface of tablet display screens is generally not necessary. The SAR Exclusion Threshold in KDB 447498 D01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned adjacent the phantom and the edge containing the antenna positioned perpendicular to the phantom.

SAR test reduction and exclusion guidance

(1)The SAR exclusion threshold for distances<50mm is defined by the following equation:

$$\frac{(\text{max. power of channel, including tune-up tolerance, mW})}{(\text{min. test separation distance, mm})} \sqrt{\text{Frequency (GHz)}} \leq 3.0$$

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

(2)The SAR exclusion threshold for distances>50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:

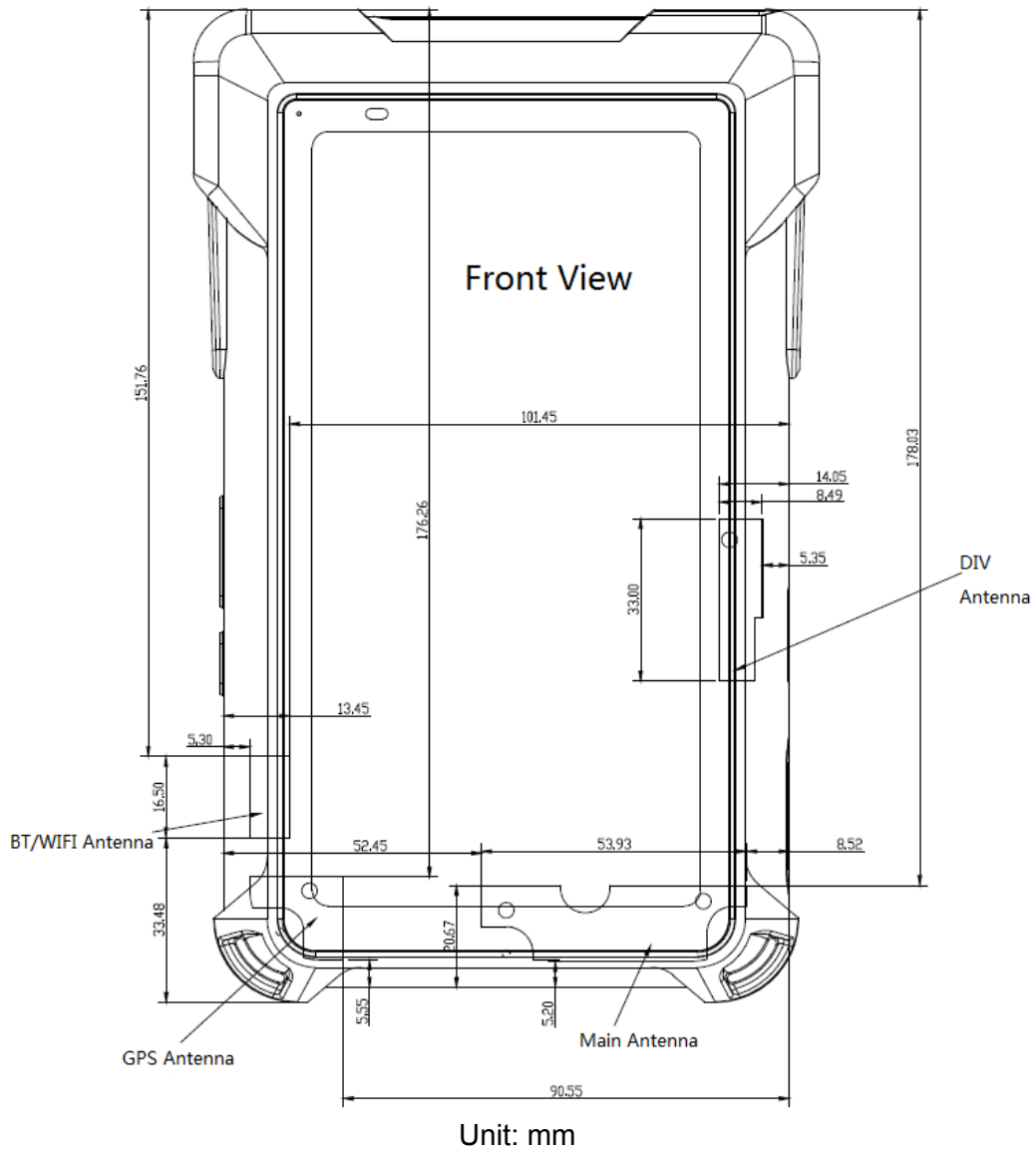
a) at 100 MHz to 1500 MHz

$$[\text{Power allowed at numeric Threshold at 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot (f_{\text{(MHz)}}/150)] \text{ mW}$$

b) at >1500MHz and ≤6GHz

$$[\text{Power allowed at numeric Threshold at 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot 10] \text{ mW}$$

The location of the antenna inside EUT is as below.



Note: The div antenna does not support TX function.

The distance <50mm

Mode	Position	Distance (mm)	Pmax (dBm)	Pmax (mW)	f (GHz)	Calculation Result	SAR Exclusion threshold	Test Requirement (Yes/No)
UMTS B2	Rear	5	22.5	177.83	1.9076	49.12	3	Yes
	Right	8.52	22.5	177.83	1.9076	28.83	3	Yes
	Bottom	5.2	22.5	177.83	1.9076	47.23	3	Yes
UMTS B4	Rear	5	22.5	177.83	1.7526	47.08	3	Yes
	Right	8.52	22.5	177.83	1.7526	27.63	3	Yes
	Bottom	5.2	22.5	177.83	1.7526	45.27	3	Yes
UMTS B5	Rear	5	22.5	177.83	0.8466	32.72	3	Yes
	Right	8.52	22.5	177.83	0.8466	19.20	3	Yes
	Bottom	5.2	22.5	177.83	0.8466	31.47	3	Yes
LTE B2	Rear	5	23	199.53	1.9	55.01	3	Yes
	Right	8.52	23	199.53	1.9	32.28	3	Yes
	Bottom	5.2	23	199.53	1.9	52.89	3	Yes
LTE B4	Rear	5	22.5	177.83	1.7450	46.98	3	Yes
	Right	8.52	22.5	177.83	1.7450	27.57	3	Yes
	Bottom	5.2	22.5	177.83	1.7450	45.17	3	Yes
LTE B5	Rear	5	22.5	177.83	0.8440	32.67	3	Yes
	Right	8.52	22.5	177.83	0.8440	19.17	3	Yes
	Bottom	5.2	22.5	177.83	0.8440	31.42	3	Yes
LTE B7	Rear	5	23	199.53	2.56	63.85	3	Yes
	Right	8.52	23	199.53	2.56	37.47	3	Yes
	Bottom	5.2	23	199.53	2.56	61.39	3	Yes
LTE B12	Rear	5	23	199.53	0.711	33.65	3	Yes
	Right	8.52	23	199.53	0.711	19.75	3	Yes
	Bottom	5.2	23	199.53	0.711	32.35	3	Yes
LTE B13	Rear	5	23	199.53	0.782	35.29	3	Yes
	Right	8.52	23	199.53	0.782	20.71	3	Yes
	Bottom	5.2	23	199.53	0.782	33.93	3	Yes
LTE B17	Rear	5	23	199.53	0.711	33.65	3	Yes
	Right	8.52	23	199.53	0.711	19.75	3	Yes
	Bottom	5.2	23	199.53	0.711	32.35	3	Yes

Mode	Position	Distance (mm)	Pmax (dBm)	Pmax (mW)	f (GHz)	Calculation Result	SAR Exclusion threshold	Test Requirement (Yes/No)
BT	Rear	5	9.5	8.91	2.48	2.81	3	No
	Left	5.3	9.5	8.91	2.48	2.65	3	No
	Bottom	33.48	9.5	8.91	2.48	0.42	3	No
2.4G WiFi	Rear	5	21	125.89	2.462	39.51	3	Yes
	Left	5.3	21	125.89	2.462	37.27	3	Yes
	Bottom	33.48	21	125.89	2.462	5.90	3	Yes
5.2G WiFi	Rear	5	17	50.12	5.24	22.95	3	Yes
	Left	5.3	17	50.12	5.24	21.65	3	Yes
	Bottom	33.48	17	50.12	5.24	3.43	3	Yes
5.3G WiFi	Rear	5	17	50.12	5.32	23.12	3	Yes
	Left	5.3	17	50.12	5.32	21.81	3	Yes
	Bottom	33.48	17	50.12	5.32	3.45	3	Yes
5.5G WiFi	Rear	5	17	50.12	5.7	23.93	3	Yes
	Left	5.3	17	50.12	5.7	22.58	3	Yes
	Bottom	33.48	17	50.12	5.7	3.57	3	Yes
5.8G WiFi	Rear	5	17	50.12	5.825	24.19	3	Yes
	Left	5.3	17	50.12	5.825	22.82	3	Yes
	Bottom	33.48	17	50.12	5.825	3.61	3	Yes

The distance >50mm

Mode	Position	Distance (mm)	Pmax (dBm)	Pmax (mW)	f (GHz)	Power allowed at numeric Threshold at 50mm	SAR Exclusion Result	Test Requirement (Yes/No)
UMTS B2	Left	52.45	22.5	177.83	1.9076	108.60	133.10	Yes
	Top	178.03	22.5	177.83	1.9076	108.60	1388.90	No
UMTS B4	Left	52.45	22.5	177.83	1.7526	113.31	137.81	Yes
	Top	178.03	22.5	177.83	1.7526	113.31	1393.61	No
UMTS B5	Left	52.45	22.5	177.83	0.8466	163.02	176.85	Yes
	Top	178.03	22.5	177.83	0.8466	163.02	885.63	No
LTE B2	Left	52.45	23	199.53	1.9	108.82	133.32	Yes
	Top	178.03	23	199.53	1.9	108.82	1389.12	No
LTE B4	Left	52.45	22.5	177.83	1.745	113.55	138.05	Yes
	Top	178.03	22.5	177.83	1.745	113.55	1393.85	No
LTE B5	Left	52.45	22.5	177.83	0.844	163.28	177.06	Yes
	Top	178.03	22.5	177.83	0.844	163.28	883.66	No
LTE B7	Left	52.45	23	199.53	2.56	93.75	118.25	Yes
	Top	178.03	23	199.53	2.56	93.75	1374.05	No
LTE B12	Left	52.45	23	199.53	0.711	177.89	189.51	Yes
	Top	178.03	23	199.53	0.711	177.89	784.75	No
LTE B13	Left	52.45	23	199.53	0.782	169.62	182.40	Yes
	Top	178.03	23	199.53	0.782	169.62	837.09	No
LTE B17	Left	52.45	23	199.53	0.711	177.89	189.51	Yes
	Top	178.03	23	199.53	0.711	177.89	784.75	No
BT	Right	101.45	9.5	8.91	2.48	95.25	609.75	No
	Top	151.76	9.5	8.91	2.48	95.25	1112.85	No
2.4G WiFi	Right	101.45	21	125.89	2.462	95.60	610.10	No
	Top	151.76	21	125.89	2.462	95.60	1113.20	No
5.2G WiFi	Left	101.45	17	50.12	5.24	65.53	580.03	No
	Right	151.76	17	50.12	5.24	65.53	1083.13	No
5.3G WiFi	Left	101.45	17	50.12	5.32	65.03	579.53	No
	Right	151.76	17	50.12	5.32	65.03	1082.63	No
5.5G WiFi	Left	101.45	17	50.12	5.7	62.83	577.33	No
	Bottom	151.76	17	50.12	5.7	62.83	1080.43	No
5.8G WiFi	Left	101.45	17	50.12	5.825	62.15	576.65	No
	Bottom	151.76	17	50.12	5.825	62.15	1079.75	No

8. TEST RESULT

8.1 CONDUCTED POWER RESULTS

8.1.1 CONDUCTED POWER MEASUREMENTS OF UMTS

Band	UMTS B2 Average Conducted Power(dBm)			
Tx Channel	Max.	9262	9400	9538
Frequency(MHz)	Tune-up	1852.4	1880	1907.6
RMC 12.2K	22.50	21.98	22.22	22.36
HSDPA Subtest-1	21.50	20.90	20.91	21.03
HSDPA Subtest-2	21.50	20.48	20.44	20.50
HSDPA Subtest-3	21.00	19.87	20.05	19.94
HSDPA Subtest-4	20.50	19.79	19.94	19.88
HSUPA Subtest-1	21.50	20.50	20.31	21.08
HSUPA Subtest-2	21.50	20.91	20.95	21.03
HSUPA Subtest-3	21.00	20.05	20.01	20.11
HSUPA Subtest-4	21.50	21.06	21.08	21.16
HSUPA Subtest-5	21.00	20.46	20.47	20.58

Band	UMTS B4 Average Conducted Power(dBm)			
Tx Channel	Max.	1312	1413	1513
Frequency(MHz)	Tune-up	1712.4	1732.6	1752.6
RMC 12.2K	22.50	21.59	21.40	21.37
HSDPA Subtest-1	21.50	20.55	20.30	20.48
HSDPA Subtest-2	21.50	20.04	19.81	19.70
HSDPA Subtest-3	21.00	19.41	19.47	19.50
HSDPA Subtest-4	20.50	19.44	18.83	19.35
HSUPA Subtest-1	21.50	20.42	20.29	20.49
HSUPA Subtest-2	21.50	20.64	20.40	20.54
HSUPA Subtest-3	21.00	19.58	19.58	19.40
HSUPA Subtest-4	21.50	20.64	20.52	20.62
HSUPA Subtest-5	21.00	20.09	20.07	20.25

Band	UMTS B5 Average Conducted Power(dBm)			
Tx Channel	Max.	4132	4182	4233
Frequency(MHz)	Tune-up	826.4	836.4	846.6
RMC 12.2K	22.50	21.75	21.74	21.85
HSDPA Subtest-1	21.50	20.70	20.70	20.89
HSDPA Subtest-2	21.50	20.05	20.14	20.10
HSDPA Subtest-3	21.00	19.70	19.66	19.74
HSDPA Subtest-4	20.50	19.57	19.81	19.87
HSUPA Subtest-1	21.50	20.61	20.67	20.95
HSUPA Subtest-2	21.50	20.79	20.76	21.01
HSUPA Subtest-3	21.00	19.71	19.70	19.92
HSUPA Subtest-4	21.50	20.77	20.78	20.94
HSUPA Subtest-5	21.00	20.71	20.72	20.77

Note: The tested channel results are marks in bold.

8.1.2 CONDUCTED POWER MEASUREMENTS OF LTE

1. Conducted power measurements of LTE B2

LTE B2/BW=1.4M		Average Conducted Power(dBm)				LTE B2/BW=3M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18607/1850.7	18900/1880	19193/1909.3				18615/1851.5	18900/1880	19185/1908.5
QPSK	1/0	23.00	21.99	22.03	22.05	QPSK	1/0	23.00	21.98	22.09	22.13
	1/2	23.00	22.09	22.14	22.18		1/7	23.00	22.08	22.24	22.25
	1/5	23.00	21.97	22.02	22.09		1/14	23.00	22.03	22.10	22.13
	3/0	23.00	22.04	22.13	22.15		8/0	22.00	21.00	21.04	21.13
	3/1	23.00	22.07	22.19	22.21		8/3	22.00	21.05	21.07	21.21
	3/3	23.00	22.08	22.15	22.21		8/7	22.00	20.98	21.02	21.15
	6/0	22.00	21.01	21.02	21.18		15/0	22.00	21.02	21.09	21.17
16QAM	1/0	22.00	21.02	21.14	21.44	16QAM	1/0	22.00	20.97	21.42	21.12
	1/2	22.00	21.05	21.23	21.50		1/7	22.00	21.03	21.60	21.23
	1/5	22.00	20.99	21.15	21.39		1/14	22.00	20.91	21.47	21.08
	3/0	22.00	21.23	21.21	21.33		8/0	21.00	20.15	20.19	20.14
	3/1	22.00	21.28	21.24	21.35		8/3	21.00	20.17	20.22	20.23
	3/3	22.00	21.23	21.19	21.40		8/7	21.00	20.10	20.16	20.16
	6/0	21.00	20.19	20.22	20.10		15/0	21.00	20.07	20.15	20.12
LTE B2/BW=5M		Average Conducted Power(dBm)				LTE B2/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18625/1852.5	18900/1880	19175/1907.5				18650/1855	18900/1880	19150/1905
QPSK	1/0	23.00	22.00	21.94	22.06	QPSK	1/0	23.00	21.96	22.02	22.15
	1/12	23.00	22.17	22.07	22.21		1/24	23.00	22.16	22.18	22.28
	1/24	23.00	22.03	21.95	22.10		1/49	23.00	21.92	21.98	22.15
	12/0	22.00	21.01	21.03	21.16		25/0	22.00	21.08	21.08	21.22
	12/6	22.00	21.06	21.11	21.19		25/12	22.00	21.01	21.09	21.14
	12/13	22.00	21.06	21.14	21.22		25/25	22.00	20.98	21.15	21.18
	25/0	22.00	21.01	21.07	21.14		50/0	22.00	21.04	21.15	21.23
16QAM	1/0	22.00	21.11	21.50	21.08	16QAM	1/0	22.00	20.93	21.42	21.06
	1/12	22.00	21.23	21.65	21.18		1/24	22.00	21.10	21.60	21.20
	1/24	22.00	21.13	21.46	21.11		1/49	22.00	20.87	21.38	21.06
	12/0	21.00	20.10	20.22	20.18		25/0	21.00	20.12	20.14	20.30
	12/6	21.00	20.14	20.30	20.22		25/12	21.00	20.04	20.21	20.29
	12/13	21.00	20.16	20.28	20.25		25/25	21.00	20.03	20.23	20.26
	25/0	21.00	20.03	20.19	20.10		50/0	21.00	20.07	20.23	20.26

LTE B2/BW=15M		Average Conducted Power(dBm)				LTE B2/BW=20M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			18675/1857.5	18900/1880	19125/1902.5				18700/1860	18900/1880	19100/1900
QPSK	1/0	23.00	22.00	22.03	22.14	QPSK	1/0	23.00	21.95	21.96	22.03
	1/37	23.00	22.00	22.13	22.21		1/50	23.00	22.14	21.97	22.27
	1/74	23.00	21.90	22.01	22.14		1/99	23.00	21.94	21.93	22.06
	36/0	22.00	21.12	21.14	21.34		50/0	22.00	21.10	21.05	21.32
	36/19	22.00	21.07	21.11	21.23		50/25	22.00	21.04	21.12	21.18
	36/39	22.00	21.00	21.16	21.20		50/50	22.00	20.94	21.19	21.35
	75/0	22.00	21.06	21.14	21.27		100/0	22.00	21.04	21.15	21.25
16QAM	1/0	22.00	21.33	21.48	20.99	16QAM	1/0	22.00	21.40	21.42	21.50
	1/37	22.00	21.38	21.54	21.06		1/50	22.00	21.58	20.01	21.76
	1/74	22.00	21.32	21.43	20.94		1/99	22.00	21.39	21.35	21.52
	36/0	21.00	20.11	20.21	20.28		50/0	21.00	20.13	20.10	20.37
	36/19	21.00	20.10	20.07	20.20		50/25	21.00	20.08	20.17	20.24
	36/39	21.00	20.04	20.11	20.16		50/50	21.00	20.01	20.20	20.10
	75/0	21.00	20.07	20.15	20.25		100/0	21.00	20.07	20.20	20.32

Note: The tested channel results are marks in bold.

2. Conducted power measurements of LTE B4

LTE B4/BW=1.4M		Average Conducted Power(dBm)				LTE B4/BW=3M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			19957/1710.7	20175/1732.5	20393/1754.3				19965/1711.5	20175/1732.5	20385/1753.5
QPSK	1/0	22.50	21.61	21.68	21.65	QPSK	1/0	22.50	21.68	21.74	21.70
	1/2	22.50	21.69	21.73	21.76		1/7	22.50	21.84	21.89	21.82
	1/5	22.50	21.60	21.63	21.67		1/14	22.50	21.73	21.73	21.66
	3/0	22.50	21.66	21.67	21.68		8/0	21.50	20.71	20.70	20.70
	3/1	22.50	21.70	21.72	21.72		8/3	21.50	20.75	20.75	20.74
	3/3	22.50	21.72	21.69	21.70		8/7	21.50	20.70	20.69	20.70
	6/0	21.50	20.73	20.68	20.70		15/0	21.50	20.71	20.68	20.69
16QAM	1/0	21.50	20.63	20.73	20.94	16QAM	1/0	21.50	20.60	21.05	20.69
	1/2	21.50	20.69	20.80	21.03		1/7	21.50	20.73	21.20	20.86
	1/5	21.50	20.61	20.71	20.94		1/14	21.50	20.59	21.06	20.62
	3/0	21.50	20.79	20.71	20.82		8/0	20.50	19.87	19.86	19.80
	3/1	21.50	20.84	20.73	20.84		8/3	20.50	19.90	19.88	19.84
	3/3	21.50	20.85	20.70	20.80		8/7	20.50	19.85	19.80	19.76
	6/0	20.50	19.89	19.86	19.63		15/0	20.50	19.75	19.79	19.71
LTE B4/BW=5M		Average Conducted Power(dBm)				LTE B4/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			19975/1712.5	20175/1732.5	20375/1752.5				20000/1715	20175/1732.5	20350/1750
QPSK	1/0	22.50	21.73	21.62	21.65	QPSK	1/0	22.50	21.71	21.68	21.66
	1/12	22.50	21.85	21.78	21.79		1/24	22.50	21.92	21.86	21.86
	1/24	22.50	21.72	21.62	21.63		1/49	22.50	21.72	21.66	21.64
	12/0	21.50	20.71	20.70	20.72		25/0	21.50	20.74	20.74	20.73
	12/6	21.50	20.74	20.76	20.75		25/12	21.50	20.75	20.74	20.69
	12/13	21.50	20.72	20.73	20.73		25/25	21.50	20.74	20.73	20.67
	25/0	21.50	20.69	20.70	20.68		50/0	21.50	20.74	20.76	20.71
16QAM	1/0	21.50	20.77	21.08	20.71	16QAM	1/0	21.50	21.00	20.70	20.59
	1/12	21.50	20.88	21.23	20.80		1/24	21.50	21.19	20.88	20.75
	1/24	21.50	20.76	21.07	20.66		1/49	21.50	21.01	20.65	20.52
	12/0	20.50	19.82	19.85	19.80		25/0	20.50	19.84	19.93	19.83
	12/6	20.50	19.85	19.91	19.84		25/12	20.50	19.85	19.91	19.78
	12/13	20.50	19.83	19.91	19.80		25/25	20.50	19.85	19.89	19.73
	25/0	20.50	19.77	19.83	19.69		50/0	20.50	19.83	19.85	19.77

LTE B4/BW=15M		Average Conducted Power(dBm)				LTE B4/BW=20M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20025/1717.5	20175/1732.5	20325/1747.5				20050/1720	20175/1732.5	20300/1745
QPSK	1/0	22.50	21.71	21.74	21.72	QPSK	1/0	22.50	21.63	21.66	21.65
	1/37	22.50	21.76	21.80	21.76		1/50	22.50	21.87	20.69	21.89
	1/74	22.50	21.62	21.67	21.69		1/99	22.50	21.89	21.71	21.91
	36/0	21.50	20.83	20.64	20.80		50/0	21.50	20.76	20.74	20.76
	36/19	21.50	20.80	20.80	20.79		50/25	21.50	20.74	20.75	20.74
	36/39	21.50	20.78	20.76	20.71		50/50	21.50	20.71	20.70	20.79
	75/0	21.50	20.78	20.77	20.78		100/0	21.50	20.77	20.75	20.71
16QAM	1/0	21.50	21.01	21.09	20.60	16QAM	1/0	21.50	21.08	21.03	20.95
	1/37	21.50	21.10	21.16	20.62		1/50	21.50	21.36	19.77	21.19
	1/74	21.50	21.00	21.03	20.49		1/99	21.50	21.09	20.99	20.89
	36/0	20.50	19.87	20.09	19.83		50/0	20.50	19.80	19.81	19.80
	36/19	20.50	19.86	19.77	19.80		50/25	20.50	19.84	19.83	19.77
	36/39	20.50	19.84	19.75	19.73		50/50	20.50	19.77	19.77	19.63
	75/0	20.50	19.84	19.80	19.78		100/0	20.50	19.84	19.79	19.78

Note: The tested channel results are marks in bold.

3. Conducted power measurements of LTE B5

LTE B5/BW=1.4M		Average Conducted Power(dBm)				LTE B5/BW=3M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20407/824.7	20525/836.5	20643/848.3				20415/825.5	20525/836.5	20635/847.5
QPSK	1/0	22.50	21.68	21.67	21.60	QPSK	1/0	22.50	21.79	21.72	21.56
	1/2	22.50	21.77	21.69	21.72		1/7	22.50	21.91	21.82	21.73
	1/5	22.50	21.66	21.63	21.61		1/14	22.50	21.76	21.66	21.60
	3/0	22.50	21.80	21.72	21.67		8/0	21.50	20.69	20.71	20.67
	3/1	22.50	21.81	21.75	21.75		8/3	21.50	20.73	20.70	20.67
	3/3	22.50	21.83	21.74	21.70		8/7	21.50	20.68	20.66	20.57
	6/0	21.50	20.72	20.66	20.66		15/0	21.50	20.70	20.69	20.66
16QAM	1/0	21.50	20.96	21.10	20.69	16QAM	1/0	21.50	21.24	20.84	20.70
	1/2	21.50	21.06	21.14	20.78		1/7	21.50	21.34	20.96	20.78
	1/5	21.50	20.91	21.10	20.70		1/14	21.50	21.16	20.78	20.62
	3/0	21.50	20.93	20.96	20.86		8/0	20.50	19.89	19.75	19.82
	3/1	21.50	20.91	20.99	20.93		8/3	20.50	19.92	19.77	19.82
	3/3	21.50	20.91	20.97	20.91		8/7	20.50	19.88	19.74	19.74
	6/0	20.50	19.96	19.66	19.89		15/0	20.50	19.77	19.68	19.73
LTE B5/BW=5M		Average Conducted Power(dBm)				LTE B5/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20425/826.5	20525/836.5	20625/846.5				20450/829	20525/836.5	20600/844
QPSK	1/0	22.50	21.71	21.64	21.62	QPSK	1/0	22.50	21.67	21.73	21.62
	1/12	22.50	21.79	21.70	21.72		1/24	22.50	21.64	21.77	21.73
	1/24	22.50	21.67	21.60	21.59		1/49	22.50	21.68	21.78	21.79
	12/0	21.50	20.65	20.72	20.68		25/0	21.50	20.66	20.69	20.72
	12/6	21.50	20.77	20.74	20.72		25/12	21.50	20.65	20.74	20.69
	12/13	21.50	20.75	20.73	20.65		25/25	21.50	20.70	20.75	20.77
	25/0	21.50	20.70	20.72	20.65		50/0	21.50	20.69	20.82	20.66
16QAM	1/0	21.50	20.97	21.18	20.74	16QAM	1/0	21.50	20.82	21.09	20.79
	1/12	21.50	21.00	21.26	20.82		1/24	21.50	20.88	21.27	20.87
	1/24	21.50	20.86	21.17	20.72		1/49	21.50	20.68	21.08	20.68
	12/0	20.50	19.75	19.89	19.72		25/0	20.50	19.73	19.86	19.81
	12/6	20.50	19.89	19.91	19.76		25/12	20.50	19.80	19.83	19.82
	12/13	20.50	19.88	19.87	19.68		25/25	20.50	19.75	19.81	19.70
	25/0	20.50	19.77	19.81	19.62		50/0	20.50	19.72	19.85	19.73

Note: The tested channel results are marks in bold.

4. Conducted power measurements of LTE B7

LTE B7/BW=5M		Average Conducted Power(dBm)				LTE B7/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20775/2502.5	21100/2535	21425/2567.5				20800/2505	21100/2535	21400/2565
QPSK	1/0	23.00	22.34	22.56	22.45	QPSK	1/0	23.00	22.37	22.57	22.51
	1/12	23.00	22.47	22.66	22.64		1/24	23.00	22.56	22.77	22.77
	1/24	23.00	22.32	22.53	22.53		1/49	23.00	22.42	22.49	22.58
	12/0	22.00	21.40	21.56	21.58		25/0	22.00	21.37	21.57	21.59
	12/6	22.00	21.45	21.58	21.64		25/12	22.00	21.42	21.57	21.61
	12/13	22.00	21.45	21.54	21.64		25/25	22.00	21.46	21.58	21.61
	25/0	22.00	21.39	21.54	21.57		50/0	22.00	21.40	21.58	21.59
16QAM	1/0	22.00	21.36	21.56	21.86	16QAM	1/0	22.00	21.26	21.80	21.46
	1/12	22.00	21.48	21.68	21.92		1/24	22.00	21.41	21.91	21.61
	1/24	22.00	21.34	21.55	21.90		1/49	22.00	21.28	21.75	21.42
	12/0	21.00	20.34	20.61	20.65		25/0	21.00	20.34	20.63	20.73
	12/6	21.00	20.43	20.63	20.72		25/12	21.00	20.42	20.63	20.73
	12/13	21.00	20.41	20.63	20.74		25/25	21.00	20.43	20.65	20.71
	25/0	21.00	20.31	20.56	20.67		50/0	21.00	20.37	20.64	20.66
LTE B7/BW=15M		Average Conducted Power(dBm)				LTE B7/BW=20M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			20825/2507.5	21100/2535	21375/2562.5				20850/2510	21100/2535	21350/2560
QPSK	1/0	23.00	22.36	22.54	22.47	QPSK	1/0	23.00	22.27	22.34	22.40
	1/37	23.00	22.48	22.65	22.65		1/50	23.00	22.50	22.65	22.68
	1/74	23.00	22.38	22.42	22.51		1/99	23.00	22.51	22.70	22.71
	36/0	22.00	21.40	21.64	21.72		50/0	22.00	21.30	21.55	21.61
	36/19	22.00	21.52	21.64	21.71		50/25	22.00	21.38	21.55	21.59
	36/39	22.00	21.51	21.66	21.70		50/50	22.00	21.33	21.59	21.62
	75/0	22.00	21.45	21.64	21.70		100/0	22.00	21.30	21.54	21.57
16QAM	1/0	22.00	21.59	21.73	21.34	16QAM	1/0	22.00	21.58	21.64	21.85
	1/37	22.00	21.69	21.85	21.45		1/50	22.00	21.89	21.92	21.93
	1/74	22.00	21.65	21.74	21.32		1/99	22.00	21.63	21.68	21.86
	36/0	21.00	20.38	20.52	20.61		50/0	21.00	20.31	20.52	20.60
	36/19	21.00	20.45	20.57	20.62		50/25	21.00	20.35	20.54	20.59
	36/39	21.00	20.44	20.54	20.65		50/50	21.00	20.29	20.56	20.57
	75/0	21.00	20.41	20.61	20.63		100/0	21.00	20.27	20.56	20.62

Note: The tested channel results are marks in bold.

5. Conducted power measurements of LTE B12

LTE B12/BW=1.4M		Average Conducted Power(dBm)				LTE B12/BW=3M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			23017/699.7	23095/707.5	23173/715.3				23025/700.5	23095/707.5	23165/714.5
QPSK	1/0	23.00	22.08	22.11	22.11	QPSK	1/0	23.00	22.12	22.20	22.14
	1/2	23.00	22.15	22.18	22.23		1/7	23.00	22.28	22.34	22.26
	1/5	23.00	22.07	22.11	22.14		1/14	23.00	22.14	22.22	22.13
	3/0	23.00	22.18	22.22	22.19		8/0	22.00	21.13	21.16	21.17
	3/1	23.00	22.24	22.27	22.26		8/3	22.00	21.22	21.22	21.21
	3/3	23.00	22.20	22.28	22.24		8/7	22.00	21.16	21.15	21.15
	6/0	22.00	21.14	21.17	21.16		15/0	22.00	21.21	21.23	21.16
16QAM	1/0	22.00	21.26	21.33	21.45	16QAM	1/0	22.00	21.23	21.63	21.21
	1/2	22.00	21.30	21.45	21.54		1/7	22.00	21.28	21.81	21.30
	1/5	22.00	21.23	21.36	21.48		1/14	22.00	21.12	21.70	21.16
	3/0	22.00	21.44	21.36	21.34		8/0	21.00	20.34	20.42	20.25
	3/1	22.00	21.53	21.38	21.36		8/3	21.00	20.37	20.46	20.28
	3/3	22.00	21.45	21.35	21.36		8/7	21.00	20.34	20.39	20.20
	6/0	21.00	20.40	20.43	20.10		15/0	21.00	20.26	20.35	20.15
LTE B12/BW=5M		Average Conducted Power(dBm)				LTE B12/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			23035/701.5	23095/707.5	23155/713.5				23060/704	23095/707.5	23130/711
QPSK	1/0	23.00	22.14	22.17	22.07	QPSK	1/0	23.00	22.05	22.18	22.10
	1/12	23.00	22.27	22.26	22.20		1/24	23.00	22.23	22.30	22.27
	1/24	23.00	22.14	22.15	22.10		1/49	23.00	22.27	22.31	22.34
	12/0	22.00	21.05	21.30	21.09		25/0	22.00	21.17	21.48	21.21
	12/6	22.00	21.23	21.30	21.21		25/12	22.00	21.21	21.33	21.29
	12/13	22.00	21.20	21.28	21.13		25/25	22.00	21.11	21.54	21.31
	25/0	22.00	21.11	21.34	21.07		50/0	22.00	21.17	21.54	21.26
16QAM	1/0	22.00	21.38	21.67	21.22	16QAM	1/0	22.00	21.60	21.17	21.18
	1/12	22.00	21.41	21.80	21.28		1/24	22.00	21.73	21.44	21.31
	1/24	22.00	21.29	21.70	21.17		1/49	22.00	21.65	21.20	21.04
	12/0	21.00	20.15	20.49	20.15		25/0	21.00	20.22	20.61	20.33
	12/6	21.00	20.33	20.52	20.27		25/12	21.00	20.32	20.50	20.38
	12/13	21.00	20.32	20.52	20.19		25/25	21.00	20.24	20.73	20.29
	25/0	21.00	20.18	20.47	20.06		50/0	21.00	20.26	20.62	20.27

Note: The tested channel results are marks in bold.

6. Conducted power measurements of LTE B13

LTE B13/BW=5M		Average Conducted Power(dBm)				LTE B13/BW=10M		Average Conducted Power(dBm)	
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)
			23205/779.5	23230/782	23255/784.5				23230/782
QPSK	1/0	23.00	22.23	22.22	22.07	QPSK	1/0	23.00	22.19
	1/12	23.00	22.31	22.29	22.23		1/24	23.00	22.17
	1/24	23.00	22.20	22.23	22.08		1/49	23.00	22.20
	12/0	22.00	21.32	21.28	21.23		25/0	22.00	21.32
	12/6	22.00	21.38	21.30	21.32		25/12	22.00	21.34
	12/13	22.00	21.41	21.32	21.27		25/25	22.00	21.35
	25/0	22.00	21.37	21.34	21.22		50/0	22.00	21.33
16QAM	1/0	22.00	21.41	21.77	21.34	16QAM	1/0	22.00	21.26
	1/12	22.00	21.53	21.87	21.44		1/24	22.00	21.44
	1/24	22.00	21.45	21.74	21.32		1/49	22.00	21.22
	12/0	21.00	20.49	20.50	20.31		25/0	21.00	20.48
	12/6	21.00	20.53	20.53	20.42		25/12	21.00	20.50
	12/13	21.00	20.56	20.55	20.38		25/25	21.00	20.45
	25/0	21.00	20.48	20.48	20.27		50/0	21.00	20.44

Note: The tested channel results are marks in bold.

7. Conducted power measurements of LTE B17

LTE B17/BW=5M		Average Conducted Power(dBm)				LTE B17/BW=10M		Average Conducted Power(dBm)			
Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)			Modulation	RB Size/Offset	Max. Tune-up	Channel/Frequency(MHz)		
			23755/706.5	23790/710	23825/713.5				23780/709	23790/710	23800/711
QPSK	1/0	23.00	22.08	22.13	22.07	QPSK	1/0	23.00	22.05	22.20	22.10
	1/12	23.00	22.24	22.27	22.18		1/24	23.00	22.24	22.29	22.19
	1/24	23.00	22.13	22.09	22.03		1/49	23.00	22.25	22.30	22.20
	12/0	22.00	21.32	21.13	21.05		25/0	22.00	21.35	21.32	21.20
	12/6	22.00	21.25	21.22	21.22		25/12	22.00	21.26	21.26	21.24
	12/13	22.00	21.20	21.30	21.12		25/25	22.00	21.53	21.34	21.20
	25/0	22.00	21.26	21.25	21.07		50/0	22.00	21.46	21.36	21.20
16QAM	1/0	22.00	21.14	21.34	21.60	16QAM	1/0	22.00	21.01	21.55	21.22
	1/12	22.00	21.38	21.42	21.66		1/24	22.00	21.37	21.70	21.39
	1/24	22.00	21.26	21.21	21.51		1/49	22.00	21.04	21.38	21.08
	12/0	21.00	20.34	20.26	20.20		25/0	21.00	20.45	20.40	20.34
	12/6	21.00	20.32	20.33	20.33		25/12	21.00	20.34	20.35	20.36
	12/13	21.00	20.27	20.41	20.22		25/25	21.00	20.57	20.43	20.32
	25/0	21.00	20.23	20.34	20.14		50/0	21.00	20.47	20.43	20.27

8.1.3 CONDUCTED POWER MEASUREMENTS OF WIFI

1. Conducted power measurement results of WiFi 2.4G

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
802.11b	1	2412	1	21.00	20.06
	6	2437		21.00	19.14
	10	2457		21.00	19.03
	11	2462		18.00	17.83
802.11g	1	2412	6	13.00	12.26
	2	2417		20.00	18.34
	5	2432		20.00	18.87
	6	2437		20.00	19.09
	7	2442		20.00	18.74
	10	2457		20.00	18.59
	11	2462		15.00	14.75
802.11n HT20	1	2412	6.5	12.00	11.32
	2	2417		20.00	18.23
	5	2432		20.00	18.77
	6	2437		20.00	19.05
	7	2442		20.00	18.95
	10	2457		20.00	18.89
	11	2462		11.00	10.22
802.11n HT40	3	2422	13.5	15.00	Not Required
	4	2427		16.00	Not Required
	5	2432		16.00	Not Required
	6	2437		16.00	Not Required
	7	2442		16.00	Not Required
	8	2447		16.00	Not Required
	9	2452		11.00	Not Required

Note:

- 1) The Average conducted power of 2.4G WiFi is measured with RMS detector.
- 2) The tested channel results are marks in bold.
- 3) Per KDB248227 D01, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes (802.11b) was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes (802.11g/n) to DSSS modes (802.11b) specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

2. Conducted power measurement results of WiFi 5G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.2G	802.11a	36	5180	6	17.00	16.16
		40	5200		17.00	16.56
		44	5220		17.00	16.46
		48	5240		17.00	16.78
	802.11n HT20	36	5180	MCS0	16.00	15.48
		40	5200		16.00	15.57
		44	5220		16.00	15.61
		48	5240		16.00	15.77
	802.11n HT40	38	5190	MCS0	12.00	11.83
		46	5230		16.00	15.84
	802.11ac VHT20	36	5180	MCS0	16.00	15.36
		40	5200		16.00	15.44
		44	5220		16.00	15.40
		48	5240		16.00	15.30
802.11ac VHT40	38	5190	MCS0	16.00	15.01	
	46	5230		16.00	14.25	
802.11ac VHT80	42	5210	MCS0	12.00	11.02	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.3G	802.11a	52	5260	6	17.00	16.82
		56	5280		17.00	16.81
		60	5300		17.00	16.83
		64	5320		17.00	16.57
	802.11n HT20	52	5260	MCS0	16.00	15.67
		56	5280		16.00	15.71
		60	5300		16.00	15.76
		64	5320		16.00	15.62
	802.11n HT40	54	5270	MCS0	12.00	11.79
		62	5310		11.00	10.68
	802.11ac VHT20	52	5260	MCS0	16.00	15.19
		56	5280		16.00	15.33
		60	5300		16.00	15.26
		64	5320		16.00	15.14
	802.11ac VHT40	54	5270	MCS0	12.00	11.23
		62	5310		16.00	14.62
802.11ac VHT80	58	5290	MCS0	10.00	9.55	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.6G	802.11a	100	5500	6	17.00	16.57
		104	5520		17.00	16.67
		108	5540		17.00	16.56
		112	5560		17.00	16.78
		116	5580		17.00	16.85
		132	5660		17.00	16.56
		136	5680		17.00	16.56
		140	5700		17.00	16.97
	802.11n HT20	100	5500	MCS0	16.00	15.68
		104	5520		16.00	15.67
		108	5540		16.00	15.76
		112	5560		16.00	15.79
		116	5580		16.00	15.86
		132	5660		16.00	15.83
		136	5680		16.00	15.88
		140	5700		16.00	15.85
	802.11n HT40	102	5510	MCS0	16.00	15.62
		110	5550		16.00	15.77
		118	5590		16.00	15.79
		126	5630		16.00	15.86
		134	5670		16.00	15.92
	802.11ac VHT20	100	5500	MCS0	16.00	15.46
		104	5520		16.00	15.66
		108	5540		16.00	15.67
		112	5560		16.00	15.78
		116	5580		16.00	15.39
		132	5660		16.00	15.23
		136	5680		16.00	15.34
		140	5700		16.00	15.39
	802.11ac VHT40	102	5510	MCS0	15.00	14.53
110		5550	15.00		14.77	
118		5590	15.00		14.67	
126		5630	15.00		14.72	
134		5670	15.00		14.84	
802.11ac VHT80	106	5530	MCS0	16.00	12.82	
	122	5610		16.00	14.56	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.8G	802.11a	149	5745	6	17.00	16.64
		153	5765		17.00	16.68
		157	5785		17.00	16.66
		161	5805		17.00	16.75
		165	5825		17.00	16.80
	802.11n HT20	149	5745	MCS0	16.00	15.58
		153	5765		16.00	15.65
		157	5785		16.00	15.57
		161	5805		16.00	15.79
		165	5825		16.00	15.71
	802.11n HT40	151	5755	MCS0	16.00	15.65
		159	5795		16.00	15.68
	802.11ac VHT20	149	5745	MCS0	16.00	15.25
		153	5765		16.00	15.43
		157	5785		16.00	15.27
		161	5805		16.00	15.56
		165	5825		16.00	15.18
	802.11ac VHT40	151	5755	MCS0	16.00	15.03
		159	5795		16.00	14.62
	802.11ac VHT80	155	5775	MCS0	16.00	15.26

Note:

- 1) The Average conducted power of 5G WiFi is measured with RMS detector.
- 2) The tested channel results are marks in bold.

8.1.4 CONDUCTED POWER MEASUREMENTS OF BT

BT	Average Conducted Power(dBm)			
	Max.	CH0	CH39	CH78
	Tune up	2402MHz	2441MHz	2480MHz
DH5	9.50	8.12	7.58	9.44
2DH5	9.00	7.38	7.03	8.91
3DH5	9.00	7.37	7.02	8.89

BT	Average Conducted Power(dBm)			
	Max.	CH0	CH19	CH39
	Tune up	2402MHz	2441MHz	2480MHz
BLE(1M)	6.00	4.76	4.68	5.31

Note:

- 1) The Average conducted power of BT is measured with RMS detector.
- 2) The conducted power of BT = 9.50dBm < 10dBm, but BT still tested.
- 3) The tested channel results are marks in bold.

8.2 SAR TEST RESULTS

General Notes:

- 1) Per KDB447498 D01, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
- 2) Per KDB447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz. When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel must be used.
- 3) Per KDB865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR < 1.45 W/kg, only one repeated measurement is required.
- 4) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

UMTS Notes:

Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ 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.

LTE notes:

- 1) The LTE test configurations are determined according to KDB941225 D05 SAR for LTE Devices. The general test procedures used for SAR testing can be found in Section 7.1.3.
- 2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames(maximum TTI)

WLAN Notes:

1. For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. 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. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHZ WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.4 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 for 5GHZ WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission mode was not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2W/kg. See Section 7.1.4 for more information.

8.2.1 SAR MEASUREMENT RESULT

1. SAR Measurement Result of UMTS

Test No.	Band	Mode	Channel	Test Position	Separation Distance (cm)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T15	UMTS B2	RMC12.2K	9400	Rear Face	0	22.5	22.22	0.03	0.328	0.173	0.350
T16	UMTS B2	RMC12.2K	9400	Left Side	0	22.5	22.22	0.04	0.039	0.025	0.042
T17	UMTS B2	RMC12.2K	9400	Right Side	0	22.5	22.22	0.09	0.083	0.048	0.089
T18	UMTS B2	RMC12.2K	9400	Bottom Side	0	22.5	22.22	0.01	0.247	0.149	0.263
T19	UMTS B2	RMC12.2K	9262	Rear Face	0	22.5	21.98	0.07	0.350	0.190	0.395
T20	UMTS B2	RMC12.2K	9538	Rear Face	0	22.5	22.36	-0.02	0.312	0.169	0.322
T22	UMTS B4	RMC12.2K	1413	Rear Face	0	22.5	21.4	-0.09	0.679	0.337	0.875
T23	UMTS B4	RMC12.2K	1413	Left Side	0	22.5	21.4	0.05	0.056	0.037	0.072
T24	UMTS B4	RMC12.2K	1413	Right Side	0	22.5	21.4	0.06	0.097	0.059	0.125
T25	UMTS B4	RMC12.2K	1413	Bottom Side	0	22.5	21.4	0	0.301	0.167	0.388
T26	UMTS B4	RMC12.2K	1312	Rear Face	0	22.5	21.59	0.01	0.659	0.327	0.813
T27	UMTS B4	RMC12.2K	1513	Rear Face	0	22.5	21.37	0.08	0.629	0.304	0.816
T29	UMTS B5	RMC12.2K	4182	Rear Face	0	22.5	21.74	0.05	0.161	0.117	0.192
T30	UMTS B5	RMC12.2K	4182	Left Side	0	22.5	21.74	0.09	0.055	0.034	0.066
T31	UMTS B5	RMC12.2K	4182	Right Side	0	22.5	21.74	0.08	0.204	0.138	0.243
T32	UMTS B5	RMC12.2K	4182	Bottom Side	0	22.5	21.74	0.17	0.259	0.123	0.309
T33	UMTS B5	RMC12.2K	4132	Bottom Side	0	22.5	21.75	-0.13	0.181	0.122	0.215
T34	UMTS B5	RMC12.2K	4233	Bottom Side	0	22.5	21.85	0.05	0.172	0.115	0.200

Note: The value with boldface is the maximum SAR Value of each test band.

2. SAR Measurement Result of LTE

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (cm)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T35	LTE B2	QPSK20M	19100	1	50	Rear Face	0	23	22.27	0.06	0.365	0.195	0.432
T36	LTE B2	QPSK20M	19100	1	50	Left Side	0	23	22.27	0.02	0.046	0.035	0.054
T37	LTE B2	QPSK20M	19100	1	50	Right Side	0	23	22.27	0.01	0.076	0.049	0.090
T38	LTE B2	QPSK20M	19100	1	50	Bottom Side	0	23	22.27	0.05	0.244	0.146	0.289
T39	LTE B2	QPSK20M	19100	50	50	Rear Face	0	22	21.35	0.1	0.333	0.175	0.387
T40	LTE B2	QPSK20M	19100	50	50	Left Side	0	22	21.35	-0.04	0.051	0.038	0.059
T41	LTE B2	QPSK20M	19100	50	50	Right Side	0	22	21.35	0.03	0.060	0.039	0.070
T42	LTE B2	QPSK20M	19100	50	50	Bottom Side	0	22	21.35	0.07	0.191	0.116	0.222
T43	LTE B2	QPSK20M	18700	1	50	Rear Face	0	23	22.14	-0.09	0.414	0.218	0.505
T44	LTE B2	QPSK20M	18900	1	50	Rear Face	0	23	21.97	0.04	0.391	0.205	0.496
T46	LTE B4	QPSK20M	20300	1	99	Rear Face	0	22.5	21.91	-0.06	0.633	0.324	0.725
T47	LTE B4	QPSK20M	20300	1	99	Left Side	0	22.5	21.91	0.05	0.093	0.057	0.107
T48	LTE B4	QPSK20M	20300	1	99	Right Side	0	22.5	21.91	0.03	0.112	0.069	0.128
T49	LTE B4	QPSK20M	20300	1	99	Bottom Side	0	22.5	21.91	0.05	0.382	0.218	0.438
T50	LTE B4	QPSK20M	20300	50	50	Rear Face	0	21.5	20.79	0.15	0.527	0.254	0.621
T51	LTE B4	QPSK20M	20300	50	50	Left Side	0	21.5	20.79	-0.02	0.087	0.062	0.102
T52	LTE B4	QPSK20M	20300	50	50	Right Side	0	21.5	20.79	0.06	0.082	0.052	0.097
T53	LTE B4	QPSK20M	20300	50	50	Bottom Side	0	21.5	20.79	0	0.268	0.151	0.316
T54	LTE B4	QPSK20M	20050	1	99	Rear Face	0	22.5	21.89	-0.06	0.596	0.300	0.686
T55	LTE B4	QPSK20M	20175	1	99	Rear Face	0	22.5	21.71	0.02	0.567	0.293	0.680

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (cm)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T57	LTE B5	QPSK10M	20600	1	49	Rear Face	0	22.5	21.79	0.02	0.211	0.129	0.248
T58	LTE B5	QPSK10M	20600	1	49	Left Side	0	22.5	21.79	0.07	0.046	0.030	0.054
T59	LTE B5	QPSK10M	20600	1	49	Right Side	0	22.5	21.79	-0.02	0.150	0.104	0.177
T60	LTE B5	QPSK10M	20600	1	49	Bottom Side	0	22.5	21.79	0.01	0.161	0.108	0.190
T61	LTE B5	QPSK10M	20600	25	25	Rear Face	0	21.5	20.77	0.09	0.172	0.104	0.203
T62	LTE B5	QPSK10M	20600	25	25	Left Side	0	21.5	20.77	0.17	0.049	0.034	0.058
T63	LTE B5	QPSK10M	20600	25	25	Right Side	0	21.5	20.77	0.03	0.115	0.081	0.136
T64	LTE B5	QPSK10M	20600	25	25	Bottom Side	0	21.5	20.77	0.04	0.124	0.083	0.147
T65	LTE B5	QPSK10M	20450	1	49	Rear Face	0	22.5	21.68	0.09	0.169	0.128	0.204
T66	LTE B5	QPSK10M	20525	1	49	Rear Face	0	22.5	21.78	0.06	0.174	0.133	0.205
T68	LTE B7	QPSK20M	21350	1	99	Rear Face	0	23	22.71	0.07	0.231	0.154	0.247
T69	LTE B7	QPSK20M	21350	1	99	Left Side	0	23	22.71	-0.08	0.139	0.082	0.149
T70	LTE B7	QPSK20M	21350	1	99	Right Side	0	23	22.71	0.09	0.120	0.109	0.128
T71	LTE B7	QPSK20M	21350	1	99	Bottom Side	0	23	22.71	0.08	0.141	0.112	0.151
T72	LTE B7	QPSK20M	21350	50	50	Rear Face	0	22	21.62	0.02	0.201	0.143	0.219
T73	LTE B7	QPSK20M	21350	50	50	Left Side	0	22	21.62	0.18	0.099	0.060	0.108
T74	LTE B7	QPSK20M	21350	50	50	Right Side	0	22	21.62	0.09	0.106	0.062	0.116
T75	LTE B7	QPSK20M	21350	50	50	Bottom Side	0	22	21.62	0.03	0.144	0.117	0.157
T76	LTE B7	QPSK20M	20850	1	99	Rear Face	0	23	22.51	0.04	0.173	0.117	0.194
T77	LTE B7	QPSK20M	21100	1	99	Rear Face	0	23	22.7	0.07	0.223	0.145	0.239
T79	LTE B12	QPSK10M	23130	1	49	Rear Face	0	23	22.34	0.05	0.361	0.248	0.420
T80	LTE B12	QPSK10M	23130	1	49	Left Side	0	23	22.34	-0.14	0.048	0.034	0.056
T81	LTE B12	QPSK10M	23130	1	49	Right Side	0	23	22.34	0.06	0.077	0.046	0.090
T82	LTE B12	QPSK10M	23130	1	49	Bottom Side	0	23	22.34	0.13	0.298	0.179	0.347
T83	LTE B12	QPSK10M	23130	25	25	Rear Face	0	22	21.31	0.01	0.305	0.199	0.358
T84	LTE B12	QPSK10M	23130	25	25	Left Side	0	22	21.31	0.04	0.046	0.032	0.053
T85	LTE B12	QPSK10M	23130	25	25	Right Side	0	22	21.31	0.07	0.069	0.041	0.081
T86	LTE B12	QPSK10M	23130	25	25	Bottom Side	0	22	21.31	0.09	0.221	0.147	0.259
T87	LTE B12	QPSK10M	23060	1	49	Rear Face	0	23	22.27	-0.1	0.427	0.243	0.505
T88	LTE B12	QPSK10M	23095	1	49	Rear Face	0	23	22.31	-0.17	0.337	0.227	0.395
T90	LTE B13	QPSK10M	23230	1	49	Rear Face	0	23	22.2	0.06	0.250	0.174	0.301
T91	LTE B13	QPSK10M	23230	1	49	Left Side	0	23	22.2	0.03	0.056	0.038	0.067
T92	LTE B13	QPSK10M	23230	1	49	Right Side	0	23	22.2	0.05	0.214	0.160	0.257
T93	LTE B13	QPSK10M	23230	1	49	Bottom Side	0	23	22.2	-0.18	0.229	0.163	0.275
T94	LTE B13	QPSK10M	23230	25	25	Rear Face	0	22	21.35	0.07	0.187	0.131	0.217
T95	LTE B13	QPSK10M	23230	25	25	Left Side	0	22	21.35	0.02	0.046	0.031	0.053
T96	LTE B13	QPSK10M	23230	25	25	Right Side	0	22	21.35	0.04	0.174	0.128	0.202
T97	LTE B13	QPSK10M	23230	25	25	Bottom Side	0	22	21.35	0.09	0.223	0.181	0.259

Note: The value with boldface is the maximum SAR Value of each test band.

3. SAR Measurement Result of 2.4G WiFi

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Data Rate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T100	802.11b	1	Rear Face	0	1	21	20.06	-0.05	0.112	0.103	0.139
T101	802.11b	1	Left Side	0	1	21	20.06	0.07	0.098	0.094	0.121
T102	802.11b	1	Bottom Side	0	1	21	20.06	0.02	0.148	0.107	0.184
T103	802.11b	11	Left Side	0	1	18	17.83	0.08	0.298	0.115	0.310
T104	802.11b	6	Left Side	0	1	21	19.14	0.03	0.104	0.101	0.160

Note: The value with boldface is the maximum SAR Value of each test band.

4. SAR Measurement Result of 5G WiFi

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Data Rate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T106	802.11a	60	Rear Face	0	6	17	16.83	0.03	0.172	0.131	0.179
T107	802.11a	60	Left Side	0	6	17	16.83	0	0.465	0.383	0.484
T108	802.11a	60	Right Side	0	6	17	16.83	0	<0.001	<0.001	<0.001
T109	802.11a	60	Top Side	0	6	17	16.83	0	<0.001	<0.001	<0.001
T110	802.11a	60	Bottom Side	0	6	17	16.83	0.16	0.297	0.142	0.309
T111	802.11a	52	Left Side	0	6	17	16.82	-0.05	0.415	0.335	0.433
T117	802.11a	64	Left Side	0	6	17	16.57	0.07	0.428	0.345	0.473
T112	802.11a	140	Rear Face	0	6	17	16.97	0.09	0.256	0.081	0.258
T113	802.11a	140	Left Side	0	6	17	16.97	0.06	0.748	0.522	0.754
T114	802.11a	140	Right Side	0	6	17	16.97	0	<0.001	<0.001	<0.001
T115	802.11a	140	Top Side	0	6	17	16.97	0	<0.001	<0.001	<0.001
T116	802.11a	140	Bottom Side	0	6	17	16.97	0.04	0.413	0.187	0.416
T130	802.11a	116	Left Side	0	6	17	16.85	0.07	0.726	0.511	0.752
T131	802.11a	100	Left Side	0	6	17	16.57	0.06	0.630	0.465	0.696
T118	802.11a	165	Rear Face	0	6	17	16.80	-0.02	0.280	0.183	0.293
T119	802.11a	165	Left Side	0	6	17	16.80	0.07	0.655	0.473	0.686
T123	802.11a	165	Right Side	0	6	17	16.80	0	<0.001	<0.001	<0.001
T129	802.11a	165	Top Side	0	6	17	16.80	0	<0.001	<0.001	<0.001
T120	802.11a	165	Bottom Side	0	6	17	16.80	0.02	0.445	0.208	0.466
T121	802.11a	161	Left Side	0	6	17	16.75	0.05	0.726	0.527	0.769
T122	802.11a	153	Left Side	0	6	17	16.64	0.04	0.740	0.534	0.804

Note: The value with boldface is the maximum SAR Value of each test band.

5. SAR Measurement Result of BT

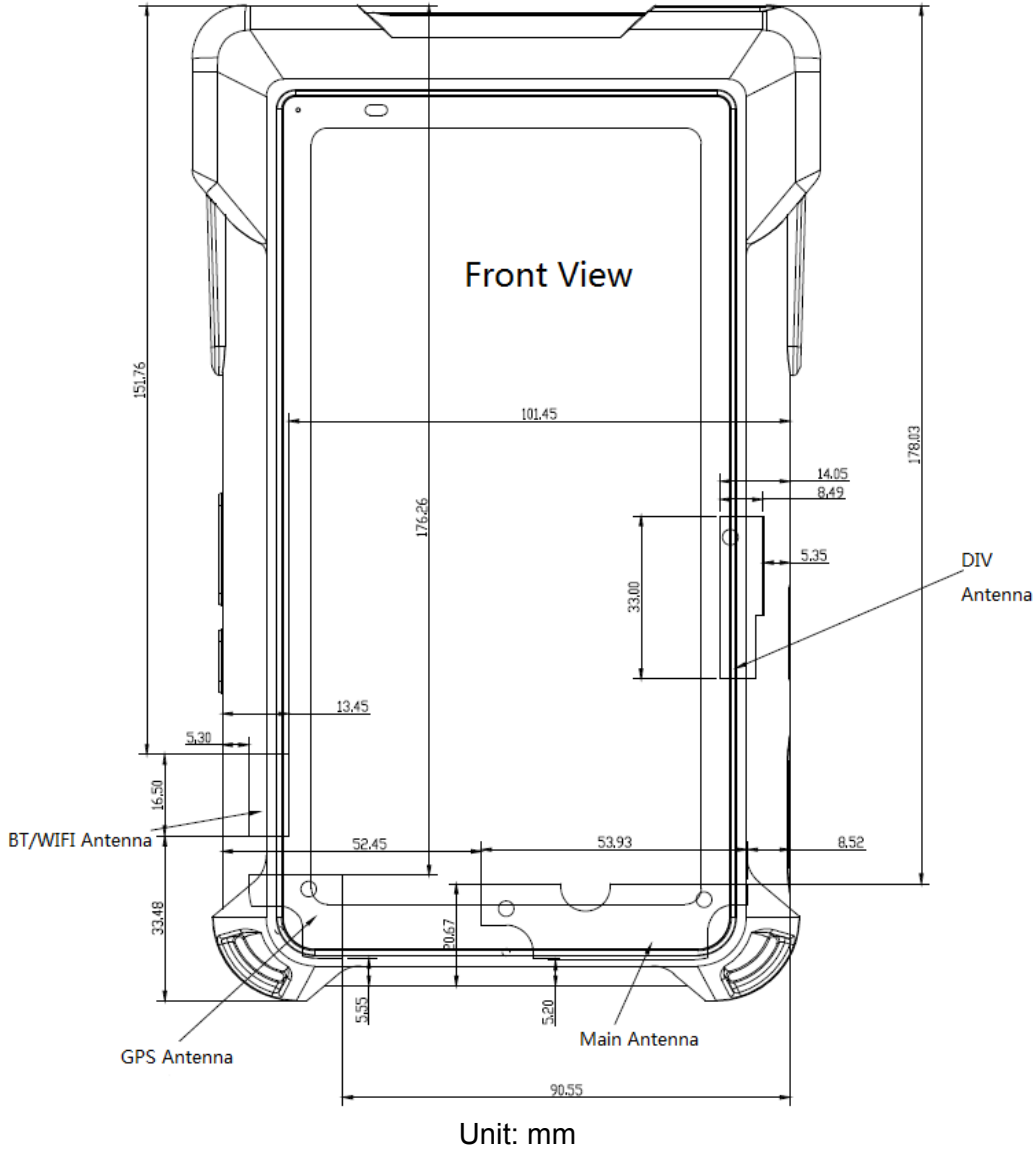
Test No.	Band	Channel	Test Position	Separation Distance (cm)	Data Rate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR
T124	BT DH5	78	Rear Face	0	1	9.5	9.44	0.04	0.003	0.002	0.003
T125	BT DH5	78	Left Side	0	1	9.5	9.44	0.08	0.004	0.002	0.004
T127	BT DH5	0	Left Side	0	1	9.5	8.12	0.09	0.001	<0.001	0.002
T128	BT DH5	39	Left Side	0	1	9.5	8.78	0.08	0.001	<0.001	0.001

Note: The value with boldface is the maximum SAR Value of each test band.

9. MULTIPLE TRANSMITTER EVALUATION

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v06.

The location of the antennas is shown as below picture:



Note: The div antenna does not support TX function.

9.1 STAND-ALONE SAR TEST EXCLUSION

Per FCC KDB 447498D01, SAR compliance for simultaneous transmission must be considered when the maximum duration of overlapping transmissions, including network hand-offs, is greater than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis.

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Body
1	UMTS+WiFi 2.4G	Yes
2	UMTS+WiFi 5.2G	Yes
3	UMTS+WiFi 5.6G	Yes
4	UMTS+WiFi 5.8G	Yes
5	UMTS+BT	Yes
6	LTE+WiFi 2.4G	Yes
7	LTE+WiFi 5.2G	Yes
8	LTE+WiFi 5.6G	Yes
9	LTE+WiFi 5.8G	Yes
10	LTE+BT	Yes

Note:

- 1) Wi-Fi and Bluetooth share the same antenna and can't transmit simultaneously.
- 2) 3G&4G share the same antenna and can't transmit simultaneously.

9.2 SIMULTANEOUS TRANSMISSION CONDITIONS

About UMTS/LTE and BT/WiFi transmit simultaneously

Band	Position	Front Face	Rear Face	Left Side	Right Side	Top Side	Bottom Side
UMTS B2		-	0.395	0.042	0.089	0.400	0.263
UMTS B4		-	0.875	0.072	0.125	0.400	0.388
UMTS B5		-	0.192	0.066	0.243	0.400	0.309
LTE B2		-	0.505	0.059	0.090	0.400	0.289
LTE B4		-	0.725	0.107	0.128	0.400	0.438
LTE B5		-	0.248	0.058	0.177	0.400	0.190
LTE B7		-	0.247	0.149	0.128	0.400	0.157
LTE B12		-	0.505	0.056	0.090	0.400	0.347
LTE B13		-	0.301	0.067	0.257	0.400	0.275
WiFi 2.4G		-	0.139	0.310	0.400	0.400	0.184
WiFi 5.2G		-	0.179	0.484	<0.001	<0.001	0.309
WiFi 5.6G		-	0.258	0.754	<0.001	<0.001	0.416
WiFi 5.8G		-	0.293	0.804	<0.001	<0.001	0.466
BT		-	0.003	0.004	0.400	0.400	0.374
MAX \sumSAR_{1g}		-	1.168	0.953	0.657	0.800	0.904

Note: $SAR_{MAX, total} = SAR_{UMTS B4} + SAR_{WiFi 5.8G} = 875W/Kg + 0.293W/Kg = 1.168W/Kg$.

Thus $SAR_{MAX, total} = 1.168W/Kg < 1.6W/Kg$, it is compliant with 1999/519/EC, so Simultaneous SAR are not required for UMTS/LTE and BT/WiFi antenna.

APPENDIX

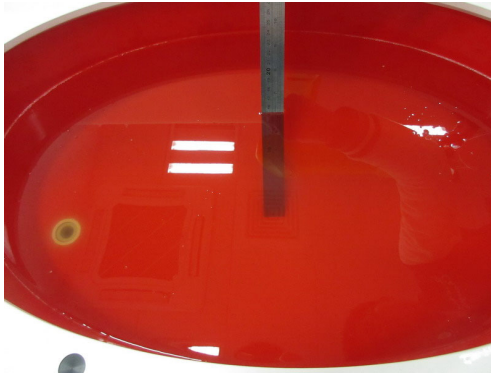
1. Test Layout

Specific Absorption Rate Test Layout

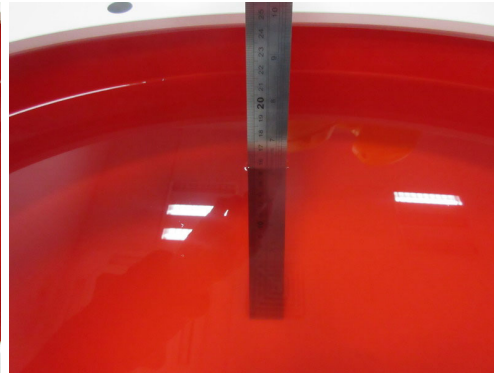


Liquid depth in the flat Phantom ($\geq 15\text{cm}$ depth)

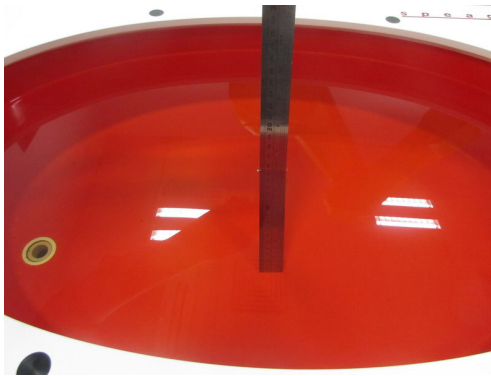
HSL750MHz_15.4cm



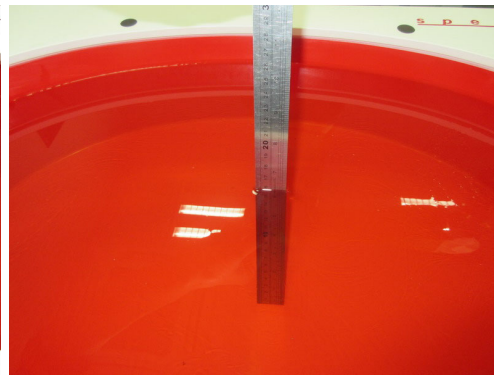
HSL835MHz-900MHz_15.6cm



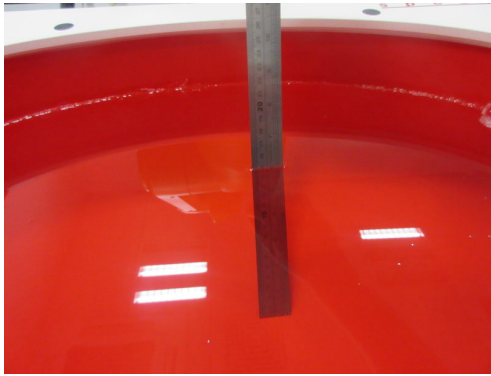
HSL1750MHz_15.8cm



HSL1900MHz-2600MHz_16cm



HSL5GHz_15.1cm



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-1906H001_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-1906H001_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-1906H001_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-1906H001_Appendix D.)

End of Test Report