FCC SAR Test Report

FCC ID: QISBG2-U03

Project No.	:	1707C204
Equipment	:	HUAWEI MediaPad T3 7
Model Name	:	BG2-U03
Applicant	:	Huawei Technologies Co.,Ltd.
Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen China

Date of Receipt	:	Jul. 24, 2017
Date of Test	:	Jul. 24, 2017 ~ Aug. 11, 2017
Issued Date	:	Aug. 14, 2017
Tested by	:	BTL Inc.

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Testing Laboratory 2640

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 the standards traceable to National Measurement Laboratory (**NML**), or National Institute of Standards and Technology (**NIST**) .

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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.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCC SAR-1-1707C204	Original Issue.	Aug. 14, 2017

1. GENERAL SUMMARY

Equipment	HUAWEI MediaPad T3 7
Model Name	HUAWEI
Brand Name	BG2-U03
Model difference	N/A
Manufacturer	Huawei Technologies Co.,Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen China
Standard(s)	**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) **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 **KDB616217 D04** SAR for laptop and tablets v01r02 **KDB941225 D01** 3G SAR Procedures v03r01 **KDB941225 D06** Hotspot Mode V02r01 **KDB447498 D01** General RF Exposure Guidance v06 **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 **KDB648474 D04** Handset SAR v01r03

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-1-1707C204) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-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. 523792

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 STATEMENT OF COMPLIANCE

Equipment Class	Mode	Highest Head SAR-1g (W/kg)	Highest Body SAR-1g(W/kg)
PCE	GSM850	0.37	1.03
	GSM1900	0.05	0.89
	UMTS Band 2	0.11	1.04
	UMTS Band 5	0.30	0.64
DTS	2.4G WLAN	0.88	0.90
DSS	BT	-	0.40
Note：The highest reported SAR for head, body-worn accessory and simultaneous transmission exposure conditions are 0.88/kg, 1.04/kg and 1.54 W/kg respectively.			

Note:

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/IEEE C95.1:1992, 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.

3.1.1 GENERAL DESCRIPTION OF EUT

Equipment	HUAWEI MediaPad T3 7		
Model Name	BG2-U03		
S/N	#1 DYTKR17623000024 #2 DYTKR17623000004 #3 DYTKR1762300009		
IMEI Code	#1 865542030014612 #2 865542030014414 #3 865542030014463		
HW Version	Baggio2_U03A		
SW Version	BG2-U03C331B015		
Modulation	GSM(GMSK/8PSK), UMTS(QPSK), WiFi(DSSS/OFDM),BT(GFSK/π/4-DQPSK/8-DPSK)		
Operation Frequency Range(s)	Band	TX (MHz)	RX (MHz)
	GSM850	824~849	869~894
	GSM1900	1850~1910	1930~1990
	UMTS Band 2	1850~1910	1930~1990
	UMTS Band 5	824~849	869~894
	Bluetooth	2400 ~2483.5	
	WIFI	2412 ~2462	
GPRS/EDGE Multislot Class(12)	Max Number of Timeslots in Uplink:	4	
	Max Number of Timeslots in Downlink:	4	
	Max Total Timeslot:	5	
GSM Device class	Class B		
HSDPA UE Category	14		
HSUPA UE Category	6		
Power Class:	4,tested with power level 5(GSM850)		
	1,tested with power level 0(GSM1900)		
	3, tested with power control “all 1”(UMTS Band 2/5)		
Test Channels (low-mid-high):	128-190-251 (GSM850)		
	512-661-810 (GSM1900)		
	9262-9400-9538(UMTS Band 2)		
	4132-4182-4233 (UMTS Band 5)		
	1-6 -11 (2.4G WIFI 802.11b/g/n HT20)		
	0-39-78(BT)		

Other Information	
Battery	Huawei Technologies Co., Ltd. 1) Battery Model: HB3G1 a) Harbin Coslight Power Co., Ltd b) SCUD (FUJIAN) Electronics Co., Ltd 2) Battery Model: HB4269B6EAW a) Sunwoda Electronic Co., LTD Rated capacity: 4000mAh Nominal Voltage: ⎓+3.7V Charging Voltage: ⎓+4.2V
With Earphone(Yes/No)	No

3.2 LABORATORY ENVIRONMENT

Temperature	Min. = 18ºC, Max. = 25ºC
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.	

3.3 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1390	Sep. 22, 2016	1 Year
2	E-field Probe	Speag	EX3DV4	7383	Dec. 27, 2016	1 Year
3	Electro Optical Converter	Speag	ECO90	1151	N/A	N/A
4	System Validation Dipole	Speag	D835V2	4d160	Sep. 30, 2015	3 Years
5	System Validation Dipole	Speag	D1900V2	5d179	Sep. 29, 2015	3 Years
6	System Validation Dipole	Speag	D2450V2	919	Sep. 28, 2015	3 Years
7	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1784	N/A	N/A
8	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1896	N/A	N/A
9	8960 Series 10 Wireless Com Te st set	Agilent	E5515E	MY52112163	Sep. 04, 2016	1 Year
10	CMW500-Wideband Radio Communication Tester	RS	CMW500	152372	Mar. 26, 2017	1 Year
11	Power Amplifier	Mini-Circuits	ZHL-42W+	QA1333003	N/A	N/A
12	ENA Network Analyzer	Agilent	E5071C	MY46102965	Mar. 26, 2017	1 Year
13	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Sep. 04, 2016	1 Year
14	P-series power meter	Agilent	N1911A	MY45100473	Sep. 04, 2016	1 Year
15	wideband power sensor	Agilent	N1921A	MY51100041	Sep. 04, 2016	1 Year
16	power Meter	Anritsu	ML2495A	1128009	Mar. 26, 2017	1 Year
17	Pulse Power Sensor	Anritsu	MA 2411B	1027500	Mar. 26, 2017	1 Year
18	Dielectric Assessment Kit	Speag	DAK-3.5	1226	N/A	N/A
19	Dual directional coupler	Woken	TS-PCC0M-05	107090019	Mar. 09, 2017	1 Year

Remark: 1. ” N/A” denotes no model name, serial No. or calibration specified.

2.* These test equipments have been recalibrated between the test periods. All these test equipments were within the valid period when the tests were performed.

3.

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 5 Ω from the previous measurement.

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

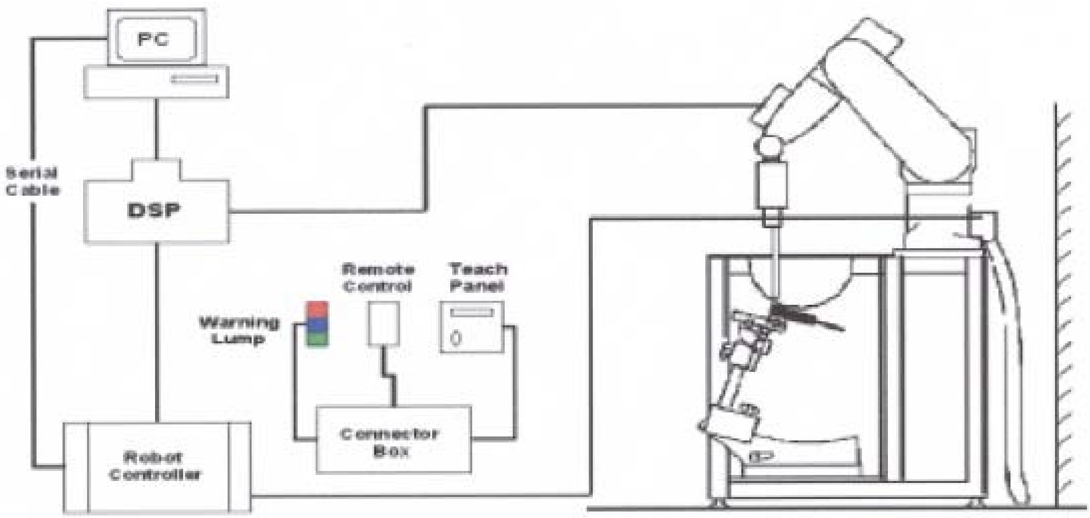
4. SAR MEASUREMENTS SYSTEM CONFIGURATION

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. TheDASY5 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
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 DASY5E-FIELDPROBESYSTEM

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

4.2.1 EX3DV4 PROBE SPECIFICATION

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 µW/g to > 100 mW/g Linearity:± 0.2dB
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

EX3DV4 E-field Probe

4.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. 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 bellow 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.

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

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, ELI4and SAM v6.0Phantoms.
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	
Aailable	Special	

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length:1000mm; Width: 500mm Height: adjustable feet	
Aailable	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) 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. ± 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 ± 0.1mm). 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 ± 30°.)

- 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(≤2GHz)，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: Δx_{zoom}, $\Delta y_{zoom} \leq$ 2GHz -≤8mm, 2-4GHz -≤5 mm and 4-6 GHz-≤4mm; $\Delta z_{zoom} \leq$3GHz -≤5 mm, 3-4 GHz-≤4mm and 4-6GHz-≤2mm 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 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 (Δx_{area}, Δy_{area})	Maximun Zoom Scan spatial resolution (Δx_{Zoom}, Δy_{Zoom})	Maximun Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			$\Delta z_{Zoom}(n)$	$\Delta z_{Zoom}(1)$*	$\Delta z_{Zoom}(n>1)$*	
≤2GHz	≤15mm	≤8mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
3-4GHz	≤12mm	≤5mm	≤4mm	≤3mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥22mm

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, Computermathematik, 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, Computermathematik, 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 compansate 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 ".DAE4". 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.

4.2.6.2 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:

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

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

aij = 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):

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

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

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/cm^3

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.

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

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 of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 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 835	0.2	-	0.2	1.5	57.0	-	41.1	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2450	-	45.0	-	0.1	-	-	54.9	-

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Body 835	0.2	-	0.2	0.9	48.5	-	50.2	-
Body 1900	-	29.5	-	0.3	-	-	70.2	-
Body 2450	-	31.4	-	0.1	-	-	68.5	-

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. (℃)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Date
Head	835	22.5	0.906	42.892	0.90	41.5	0.67	3.35	Jul. 27, 2017
Head	1900	22.5	1.404	39.600	1.40	40.0	0.29	-1.00	Jul. 27, 2017
Head	2450	22.9	1.871	37.990	1.80	39.2	3.94	-3.09	Aug. 05, 2017
Body	835	22.3	0.980	54.320	0.97	55.2	0.98	-1.59	Jul. 28, 2017
Body	1900	22.8	1.557	53.519	1.52	53.3	2.43	0.41	Aug. 01, 2017
Body	2450	22.7	1.999	51.710	1.95	52.7	2.51	-1.88	Jul. 31, 2017
Body	2450	22.9	1.966	51.442	1.95	52.7	0.82	-2.39	Aug. 05, 2017

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

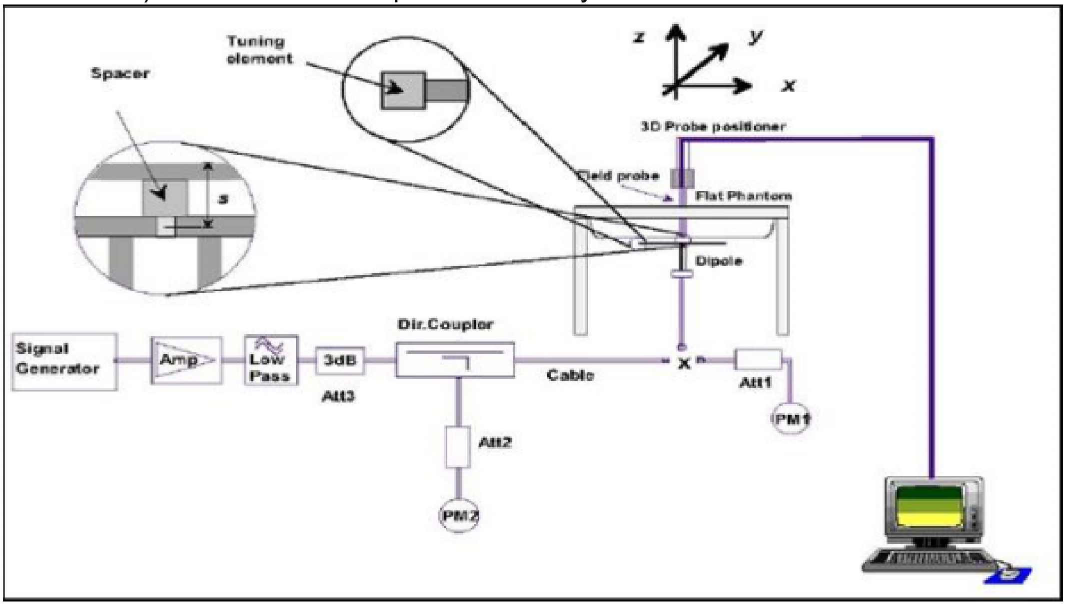
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands 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	Jul. 27, 2017	835	9.50	2.41	9.64	1.47	4d160
Head	Jul. 27, 2017	1900	39.70	9.62	38.48	-3.07	5d179
Head	Aug. 05, 2017	2450	52.00	13.10	52.40	0.77	919
Body	Jul. 28, 2017	835	9.52	2.37	9.48	-0.42	4d160
Body	Aug. 01, 2017	1900	39.60	9.87	39.48	-0.30	5d179
Body	Jul. 31, 2017	2450	51.10	12.60	50.40	-1.37	919
Body	Aug. 05, 2017	2450	51.10	12.30	49.20	-3.72	919

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 5GHz) or 100mW(above 5GHz). 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.



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 9.1.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 SAR TEST CONFIGURATION

7.1.1 GSM Test Configuration

SAR tests for GSM850 and GSM1900, a communication link is set up with a base station by air link. Using 8960 Series the power lever is set to “5”and “0” in SAR of GSM850 and GSM1900. The tests in the band of GSM850 and GSM1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

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

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot.

The allowed power reduction in the multi-slot configuration is as following:

Number of timeslots in uplink assignment		Reduction of maximum output power (dB)
Band	Time Slots	GPRS (GMSK)
GSM850	1 TX slot	0
	2 TX slots	2
	3 TX slots	4
	4 TX slots	5
GSM1900	1 TX slot	0
	2 TX slots	3
	3 TX slots	4
	4 TX slots	5

7.1.2 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 applying the required inner loop power control procedure 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 Head exposure configurations in voice mode is measured using a 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise SAR is measured on the maximum output channel in 12.2 kbps AMR with 3.4kbps SRB(signaling radio bearer) using the exposure configuration that results in the highest SAR in12.2kbps RMC for that RF channel.

(2).Body SAR Measurements
SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. SAR for other spreading codes and multiple DPDCHn, when supported by the EUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC.

3. HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements"" procedures of 3G device. In addition, body SAR is also measured for HSDPA when the maximum average outputs of each RF channel with HSDPA active is at ¼ dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA. 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 △ACK, △NACK, △CQI = 8. The variation of the β_c / β_d ratio causes a power reduction at sub-tests 2 - 4.

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

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

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 ≤¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the primary mode and the adjusted SAR is ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

Per KDB941225 D01v03r01, 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 UMTS Release 6 HSUPA

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

Note 1: ΔACK, ΔNACK and ΔCQI = 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 Speading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	22996	?
	4	4	10		20000	?

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

5. DC-HSDPA

In DC-HSDPA implementation of this device, the uplink parameters are the same as HSDPA. No additional channels and modulations (16 QAM, and 64 QAM) are supported in uplink. The difference is only in the downlink parameters, where two carriers are supported. HSDPA settings were used on uplink.

For Rel. 8 DC-HSDPA apply the four subtests from HSDPA Release 5 except use fixed reference channel H-Set 12 for DC-HSDPA. And we can apply the same SAR test exclusion criteria used for Rel. 6 HSPA for Rel. 7 HSPA+ and Rel. 8 DC-HSDPA. That is, if the HSPA, HSPA+, or the DC-HSDPA maximum output is not more than 0.25 dB higher than WCDMA, SAR measurement for those modes is not required.
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.

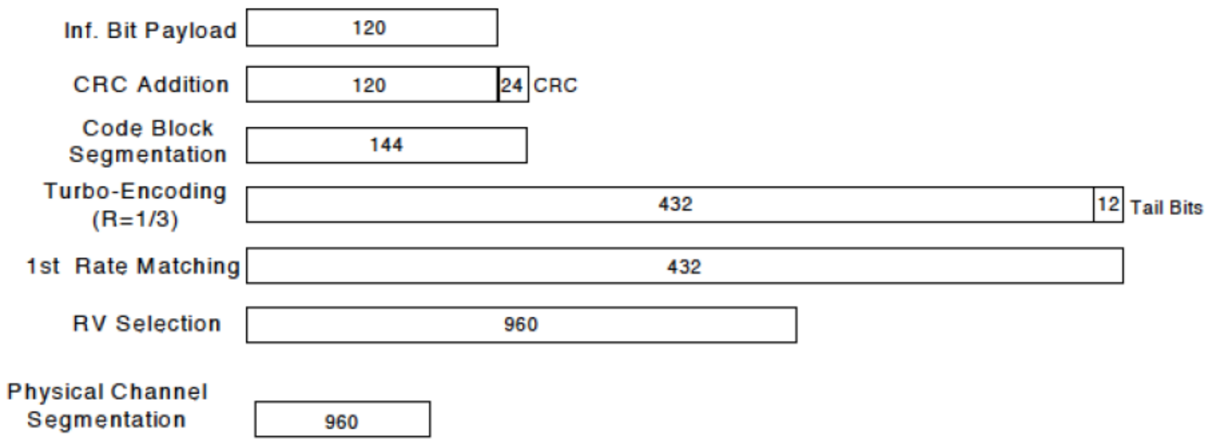


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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

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

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$
Note 2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. 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 $\beta_d = 15/15$

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.

7.1.4 WiFi Test Configuration

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

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

7.1.4.1 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.

7.1.4.3 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.

7.1.4.4 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, SARis 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.

7.1 SAR SENSOR WORKING

When the sensor is active, the active distance as below:

Ant	Test Position	Active distance（mm）
Main Ant	Rear Face	17
	Bottom Side	16
2.4G WiFi Ant	Rear Face	6
	Right Side	5

The SAR power reduce as below:

Band	Mode	Reduce power (dB)
GSM850	Voice & GPRS 1TX	6.5
	GPRS 2-4TX	8.5
GSM1900	Voice & GPRS 1TX	6.5
	GPRS 2-4TX	7.5
UMTS Band 2	WCDMA	11.5
	HSDPA	10.5
	HSUPA SUBTEST-1	9.5
	HSUPA SUBTEST-2	7.5
	HSUPA SUBTEST-3	8.5
	HSUPA SUBTEST-4	7.5
	HSUPA SUBTEST-5	9
UMTS Band 5	WCDMA	8
	HSDPA	8.5
	HSUPA SUBTEST-1	6.5
	HSUPA SUBTEST-2	4.5
	HSUPA SUBTEST-3	5
	HSUPA SUBTEST-4	5
	HSUPA SUBTEST-5	5
2.4G WiFi	802.11b	7

Note: To ensure all production units are compliant, the smallest separation distance determined by the sensor triggering and sensor coverage for normal and tilt positions for all usage conditions, minus 1 mm, must be used as the test separation distance for additional SAR testing with sensor off.

7.2 POWER REDUCTION BY PROXIMITY SENSOR

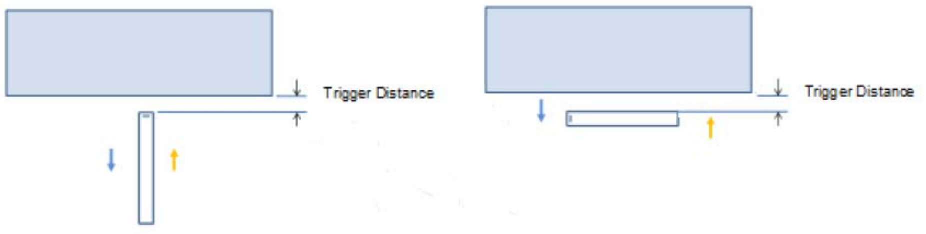
7.3.1 Proximity Sensor Triggering Distance

The bottom of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The measurement was then repeated for the Rear surface.

The DUT featured a sound indicator on its player that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



Proximity Sensor Trigger Distance Assessment
KDB 616219 §6.2, Edge 1

Proximity Sensor Trigger Distance Assessment
KDB 616219 §6.2, Rear

LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point

Proximity Sensor Triggering Distance Measurement Results

Mode		Distance (mm)										
		Rear Face										
		Sensor on						Sensor off				
		12	13	14	15	16	17	18	19	20	21	22
GSM 850	GSM	26.03	26.03	26.03	26.03	26.03	26.03	33	33	33	33	33
	GPRS 1TX	26.03	26.03	26.03	26.03	26.03	26.03	33	33	33	33	33
	GPRS 2TX	22.1	22.1	22.1	22.1	22.1	22.1	31.03	31.03	31.03	31.03	31.03
	GPRS 3TX	20.11	20.11	20.11	20.11	20.11	20.11	29.24	29.24	29.24	29.24	29.24
	GPRS 4TX	18.18	18.18	18.18	18.18	18.18	18.18	27.22	27.22	27.22	27.22	27.22
GSM 1900	GSM	22.82	22.82	22.82	22.82	22.82	22.82	29.65	29.65	29.65	29.65	29.65
	GPRS 1TX	22.82	22.82	22.82	22.82	22.82	22.82	29.65	29.65	29.65	29.65	29.65
	GPRS 2TX	19.84	19.84	19.84	19.84	19.84	19.84	27.35	27.35	27.35	27.35	27.35
	GPRS 3TX	17.79	17.79	17.79	17.79	17.79	17.79	25.76	25.76	25.76	25.76	25.76
	GPRS 4TX	15.96	15.96	15.96	15.96	15.96	15.96	23.7	23.7	23.7	23.7	23.7
UMTS B2	WCDMA	10.21	10.21	10.21	10.21	10.21	10.21	22.39	22.39	22.39	22.39	22.39
	HSDPA	10.17	10.17	10.17	10.17	10.17	10.17	21.52	21.52	21.52	21.52	21.52
	HSUPA SUBTEST-1	11.14	11.14	11.14	11.14	11.14	11.14	20.86	20.86	20.86	20.86	20.86
	HSUPA SUBTEST-2	11.34	11.34	11.34	11.34	11.34	11.34	18.98	18.98	18.98	18.98	18.98
	HSUPA SUBTEST-3	11.4	11.4	11.4	11.4	11.4	11.4	20.32	20.32	20.32	20.32	20.32
	HSUPA SUBTEST-4	11.79	11.79	11.79	11.79	11.79	11.79	19.76	19.76	19.76	19.76	19.76
	HSUPA SUBTEST-5	12.13	12.13	12.13	12.13	12.13	12.13	20.65	20.65	20.65	20.65	20.65

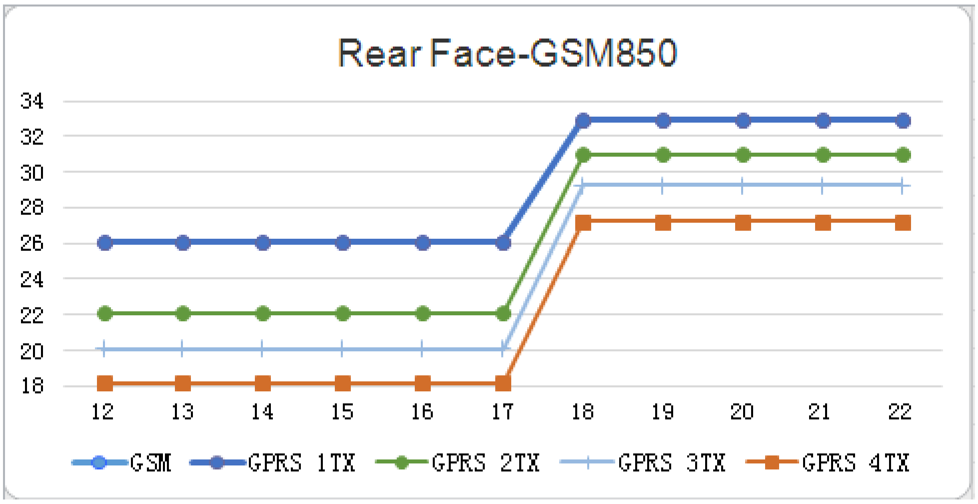
UMTS B5	WCDMA	14.79	14.79	14.79	14.79	14.79	14.79	22.94	22.94	22.94	22.94	22.94
	HSDPA	14.68	14.68	14.68	14.68	14.68	14.68	22.75	22.75	22.75	22.75	22.75
	HSUPA SUBTEST-1	14.54	14.54	14.54	14.54	14.54	14.54	20.46	20.46	20.46	20.46	20.46
	HSUPA SUBTEST-2	14.74	14.74	14.74	14.74	14.74	14.74	18.67	18.67	18.67	18.67	18.67
	HSUPA SUBTEST-3	15.47	15.47	15.47	15.47	15.47	15.47	19.91	19.91	19.91	19.91	19.91
	HSUPA SUBTEST-4	14.33	14.33	14.33	14.33	14.33	14.33	19.43	19.43	19.43	19.43	19.43
	HSUPA SUBTEST-5	16.49	16.49	16.49	16.49	16.49	16.49	20.41	20.41	20.41	20.41	20.41

Mode		Distance (mm)										
		Bottom Side										
		Sensor on						Sensor off				
		11	12	13	14	15	16	17	18	19	20	21
GSM 850	GSM	26.03	26.03	26.03	26.03	26.03	26.03	33	33	33	33	33
	GPRS 1TX	26.03	26.03	26.03	26.03	26.03	26.03	33	33	33	33	33
	GPRS 2TX	22.1	22.1	22.1	22.1	22.1	22.1	31.03	31.03	31.03	31.03	31.03
	GPRS 3TX	20.11	20.11	20.11	20.11	20.11	20.11	29.24	29.24	29.24	29.24	29.24
	GPRS 4TX	18.18	18.18	18.18	18.18	18.18	18.18	27.22	27.22	27.22	27.22	27.22
GSM 1900	GSM	22.82	22.82	22.82	22.82	22.82	22.82	29.65	29.65	29.65	29.65	29.65
	GPRS 1TX	22.82	22.82	22.82	22.82	22.82	22.82	29.65	29.65	29.65	29.65	29.65
	GPRS 2TX	19.84	19.84	19.84	19.84	19.84	19.84	27.35	27.35	27.35	27.35	27.35
	GPRS 3TX	17.79	17.79	17.79	17.79	17.79	17.79	25.76	25.76	25.76	25.76	25.76
	GPRS 4TX	15.96	15.96	15.96	15.96	15.96	15.96	23.7	23.7	23.7	23.7	23.7
UMTS B2	WCDMA	10.21	10.21	10.21	10.21	10.21	10.21	22.39	22.39	22.39	22.39	22.39
	HSDPA	10.17	10.17	10.17	10.17	10.17	10.17	21.52	21.52	21.52	21.52	21.52
	HSUPA SUBTEST-1	11.14	11.14	11.14	11.14	11.14	11.14	20.86	20.86	20.86	20.86	20.86
	HSUPA SUBTEST-2	11.34	11.34	11.34	11.34	11.34	11.34	18.98	18.98	18.98	18.98	18.98
	HSUPA SUBTEST-3	11.4	11.4	11.4	11.4	11.4	11.4	20.32	20.32	20.32	20.32	20.32
	HSUPA SUBTEST-4	11.79	11.79	11.79	11.79	11.79	11.79	19.76	19.76	19.76	19.76	19.76
	HSUPA SUBTEST-5	12.13	12.13	12.13	12.13	12.13	12.13	20.65	20.65	20.65	20.65	20.65

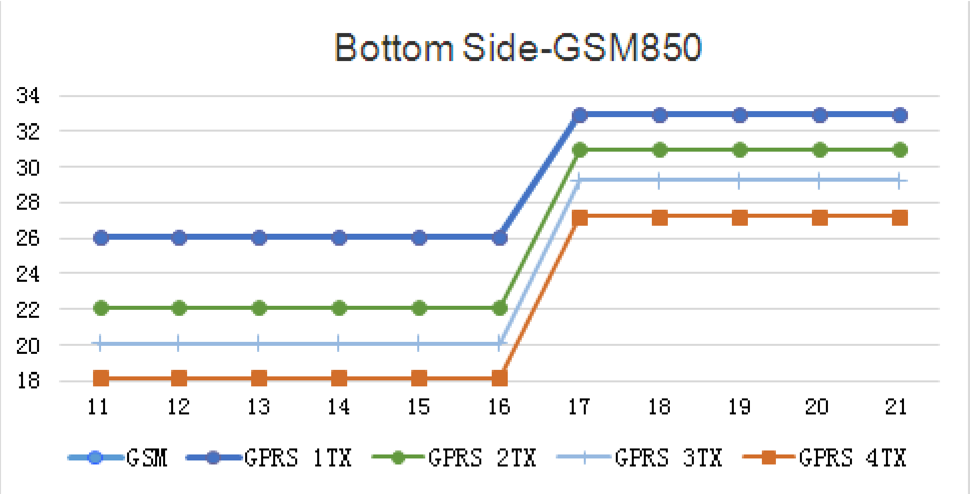
UMTS B5	WCDMA	14.79	14.79	14.79	14.79	14.79	14.79	22.94	22.94	22.94	22.94	22.94
	HSDPA	14.68	14.68	14.68	14.68	14.68	14.68	22.75	22.75	22.75	22.75	22.75
	HSUPA SUBTEST-1	14.54	14.54	14.54	14.54	14.54	14.54	20.46	20.46	20.46	20.46	20.46
	HSUPA SUBTEST-2	14.74	14.74	14.74	14.74	14.74	14.74	18.67	18.67	18.67	18.67	18.67
	HSUPA SUBTEST-3	15.47	15.47	15.47	15.47	15.47	15.47	19.91	19.91	19.91	19.91	19.91
	HSUPA SUBTEST-4	14.33	14.33	14.33	14.33	14.33	14.33	19.43	19.43	19.43	19.43	19.43
	HSUPA SUBTEST-5	16.49	16.49	16.49	16.49	16.49	16.49	20.41	20.41	20.41	20.41	20.41

Mode		Distance (mm)										
		Rear Face										
		Sensor on						Sensor off				
		1	2	3	4	5	6	7	8	9	10	11
WiFi 2.4G	802.11b	10.85	10.85	10.85	10.85	10.85	10.85	17.52	17.52	17.52	17.52	17.52

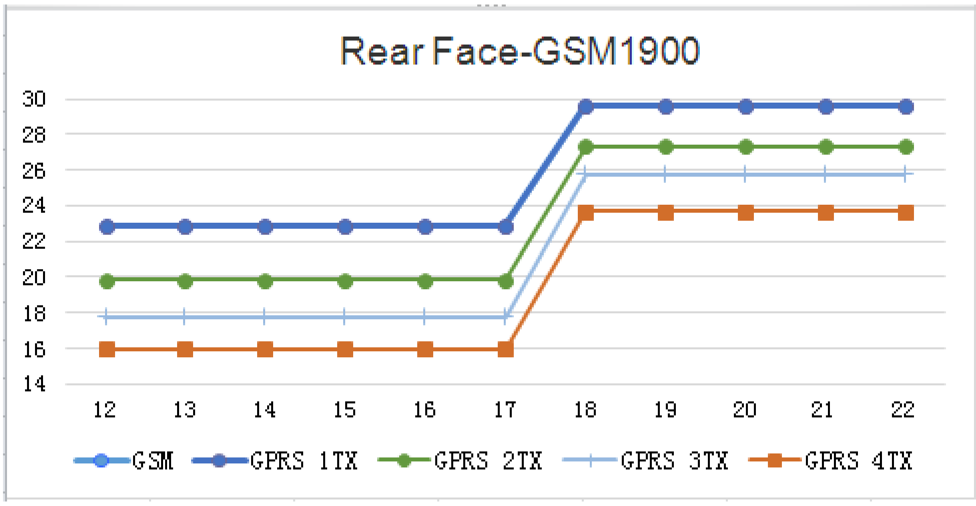
Mode		Distance (mm)										
		Right Side										
		Sensor on						Sensor off				
		0	1	2	3	4	5	6	7	8	9	10
WiFi 2.4G	802.11b	10.85	10.85	10.85	10.85	10.85	10.85	17.52	17.52	17.52	17.52	17.52

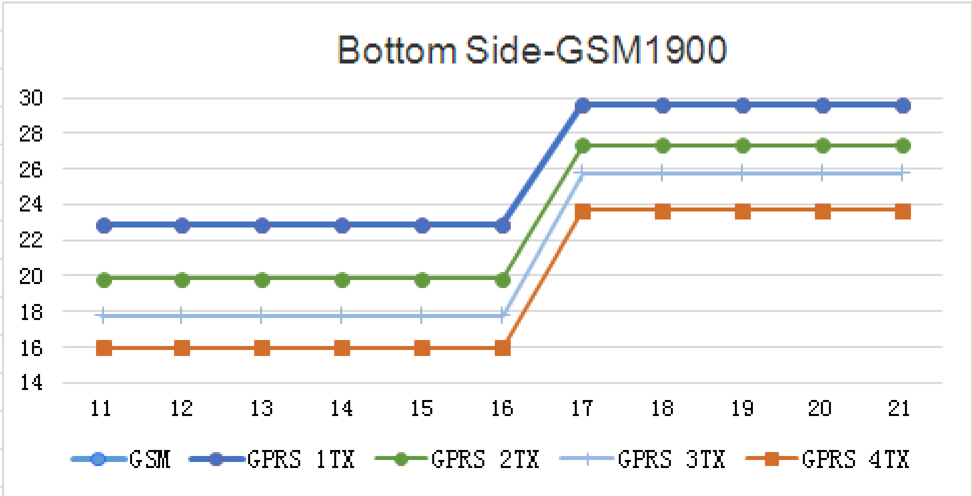


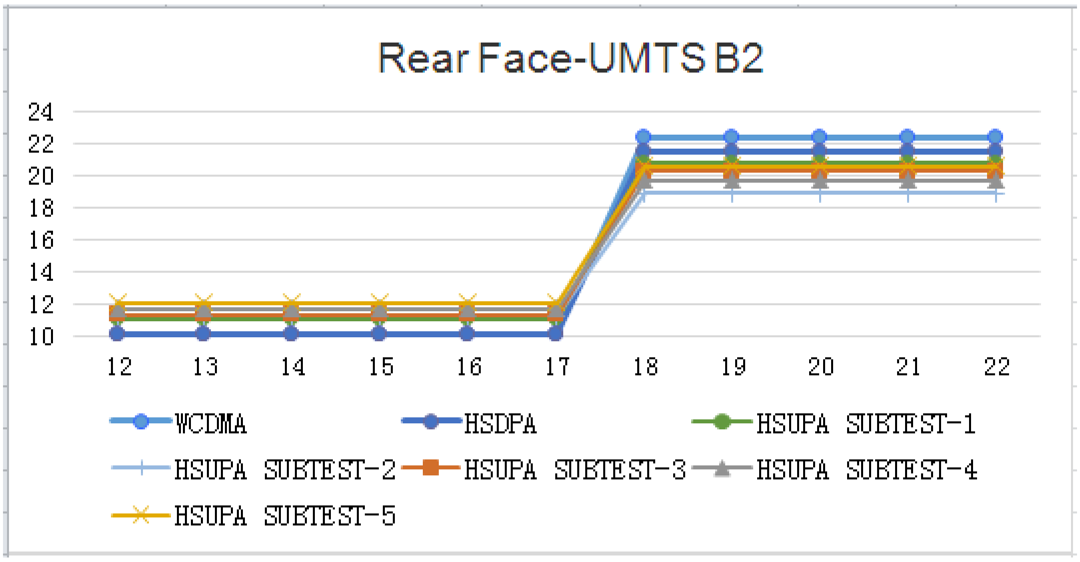
Rear Face-GSM850
34
32
30
28
26
24
22
20
18
12
13
14
15
16
17
18
19
20
21
22
GSM
GPRS 1TX
GPRS 2TX
GPRS 3TX
GPRS 4TX



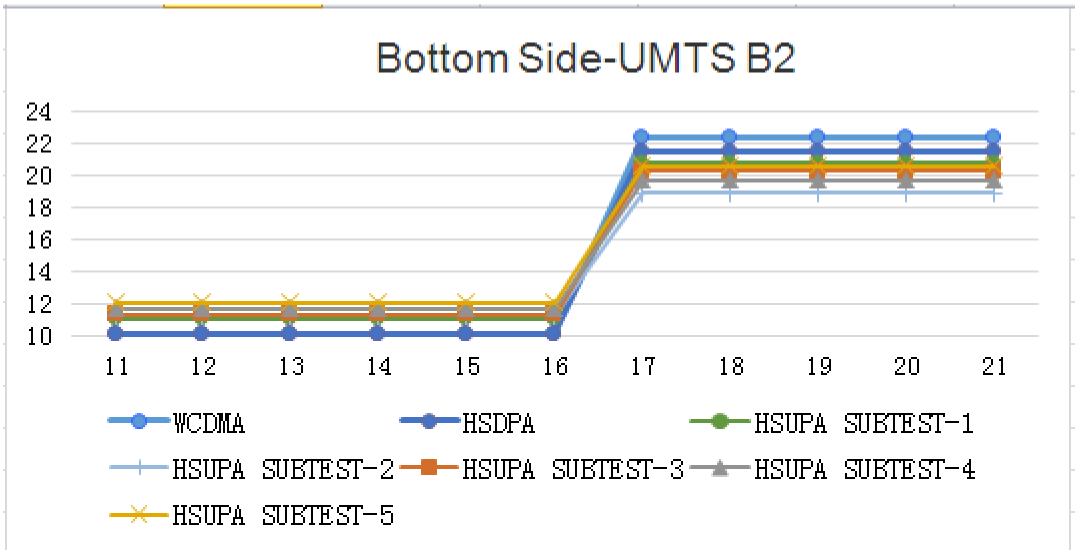
Bottom Side-GSM850
34
32
30
28
26
24
22
20
18
11
12
13
14
15
16
17
18
19
20
21
GSM
GPRS 1TX
GPRS 2TX
GPRS 3TX
GPRS 4TX


Rear Face-GSM1900
30
28
26
24
22
20
18
16
14
12
13
14
15
16
17
18
19
20
21
22
GSM
GPRS 1TX
GPRS 2TX
GPRS 3TX
GPRS 4TX

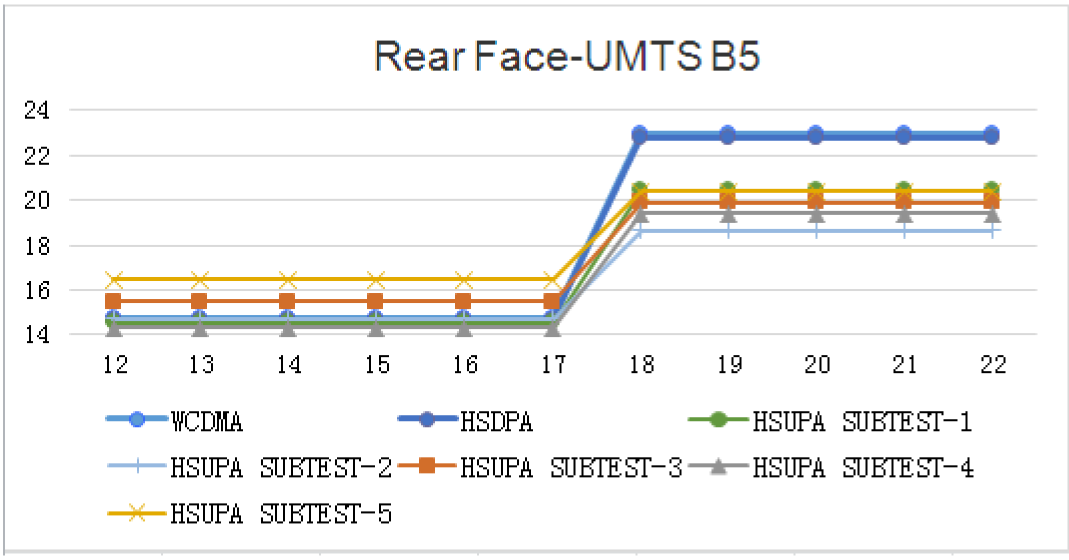

Bottom Side-GSM1900
30
28
26
24
22
20
18
16
14
11
12
13
14
15
16
17
18
19
20
21
GSM
GPRS 1TX
GPRS 2TX
GPRS 3TX
GPRS 4TX

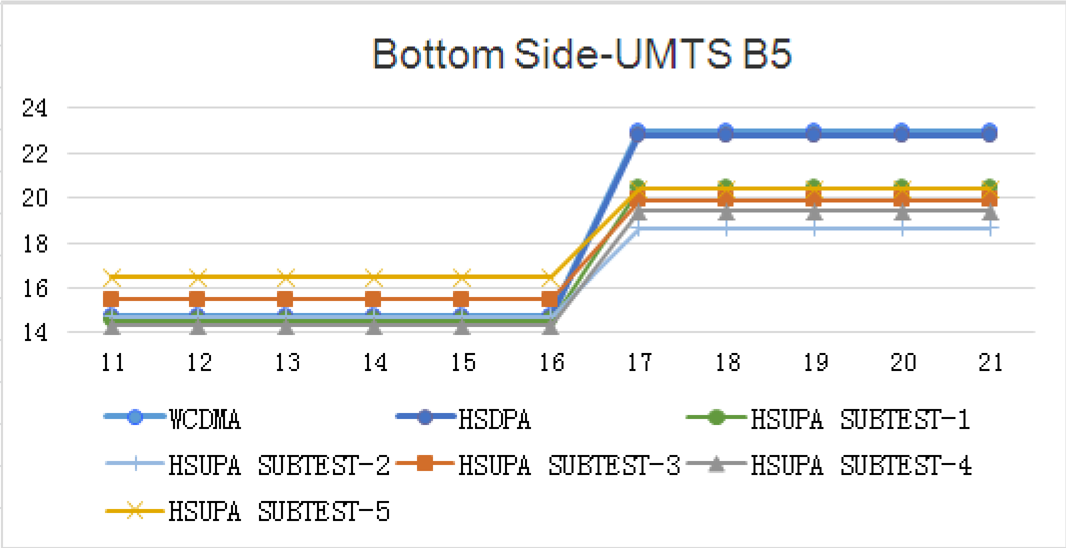


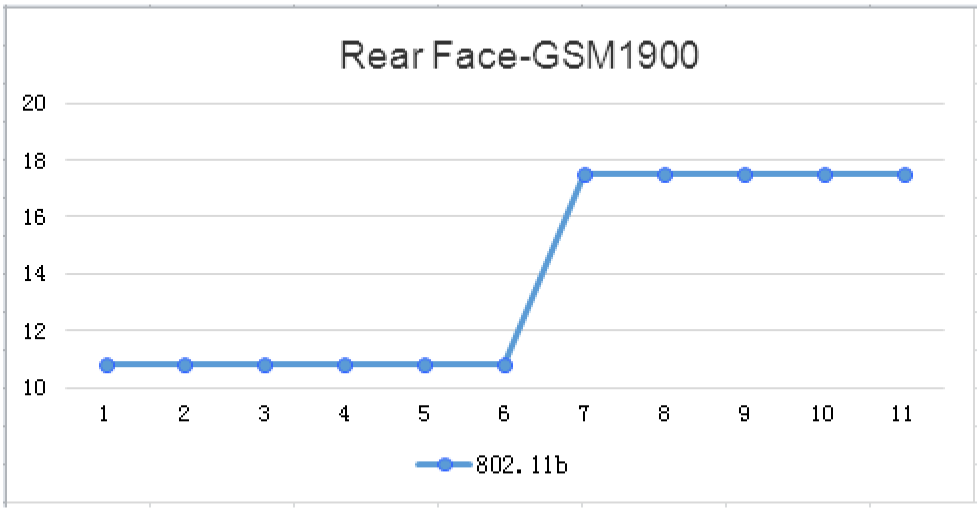
Rear Face-UMTS B2
24
22
20
18
16
14
12
10
12
13
14
15
16
17
18
19
20
21
22
WCDMA
HSDPA
HSUPA SUBTEST-1
HSUPA SUBTEST-2
HSUPA SUBTEST-3
HSUPA SUBTEST-4
HSUPA SUBTEST-5

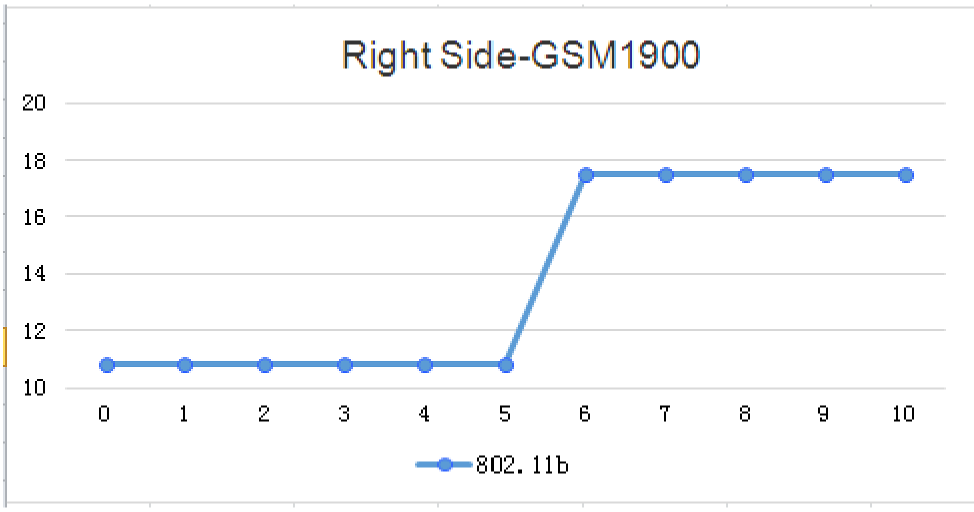


Bottom Side-UMTS B2
24
22
20
18
16
14
12
10
11
12
13
14
15
16
17
18
19
20
21
WCDMA
HSDPA
HSUPA SUBTEST-1
HSUPA SUBTEST-2
HSUPA SUBTEST-3
HSUPA SUBTEST-4
HSUPA SUBTEST-5


Rear Face-UMTS B5
24
22
20
18
16
14
12
13
14
15
16
17
18
19
20
21
22
WCDMA
HSDPA
HSUPA SUBTEST-1
HSUPA SUBTEST-2
HSUPA SUBTEST-3
HSUPA SUBTEST-4
HSUPA SUBTEST-5


Bottom Side-UMTS B5
24
22
20
18
16
14
11
12
13
14
15
16
17
18
19
20
21
WCDMA
HSDPA
HSUPA SUBTEST-1
HSUPA SUBTEST-2
HSUPA SUBTEST-3
HSUPA SUBTEST-4
HSUPA SUBTEST-5


Rear Face-GSM1900
20
18
16
14
12
10
1
2
3
4
5
6
7
8
9
10
11
802. 11b


Right Side-GSM1900
20
18
16
14
12
10
0
1
2
3
4
5
6
7
8
9
10
802. 11b

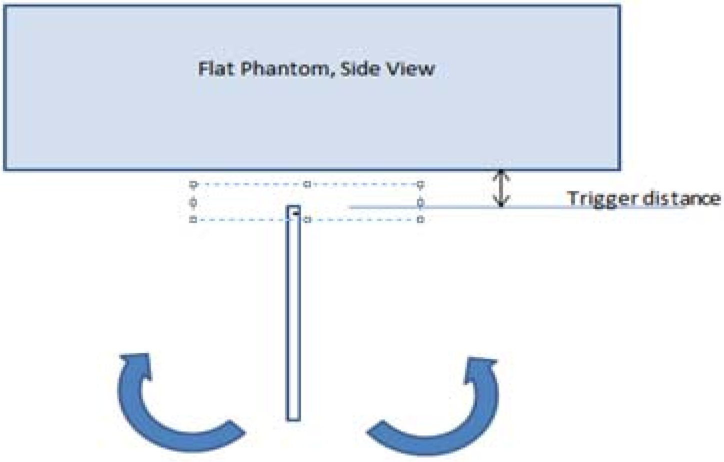
7.3.2. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

7.3.3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1 for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (bottom)

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Bottom

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2			Minimum distance at which power reduction was maintained over +/-45°			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
	Rear	Right	Bottom	Rear	Right	Bottom											
GSM 850	17mm	-	16mm	17mm	-	16mm	on	on	on	on	on	on	on	on	on	on	on
GSM 1900	17mm	-	16mm	17mm	-	16mm	on	on	on	on	on	on	on	on	on	on	on
UMTS B2	17mm	-	16mm	17mm	-	16mm	on	on	on	on	on	on	on	on	on	on	on
UMTS B5	17mm	-	16mm	17mm	-	16mm	on	on	on	on	on	on	on	on	on	on	on
2.4G WIFI	6mm	5mm	-	6mm	5mm	-	on	on	on	on	on	on	on	on	on	on	on

7.2 TEST POSITION

7.2.1 Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

7.2.2 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 are generally not necessary. The SAR Exclusion Threshold in KDB 447498 D01can 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:

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

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:

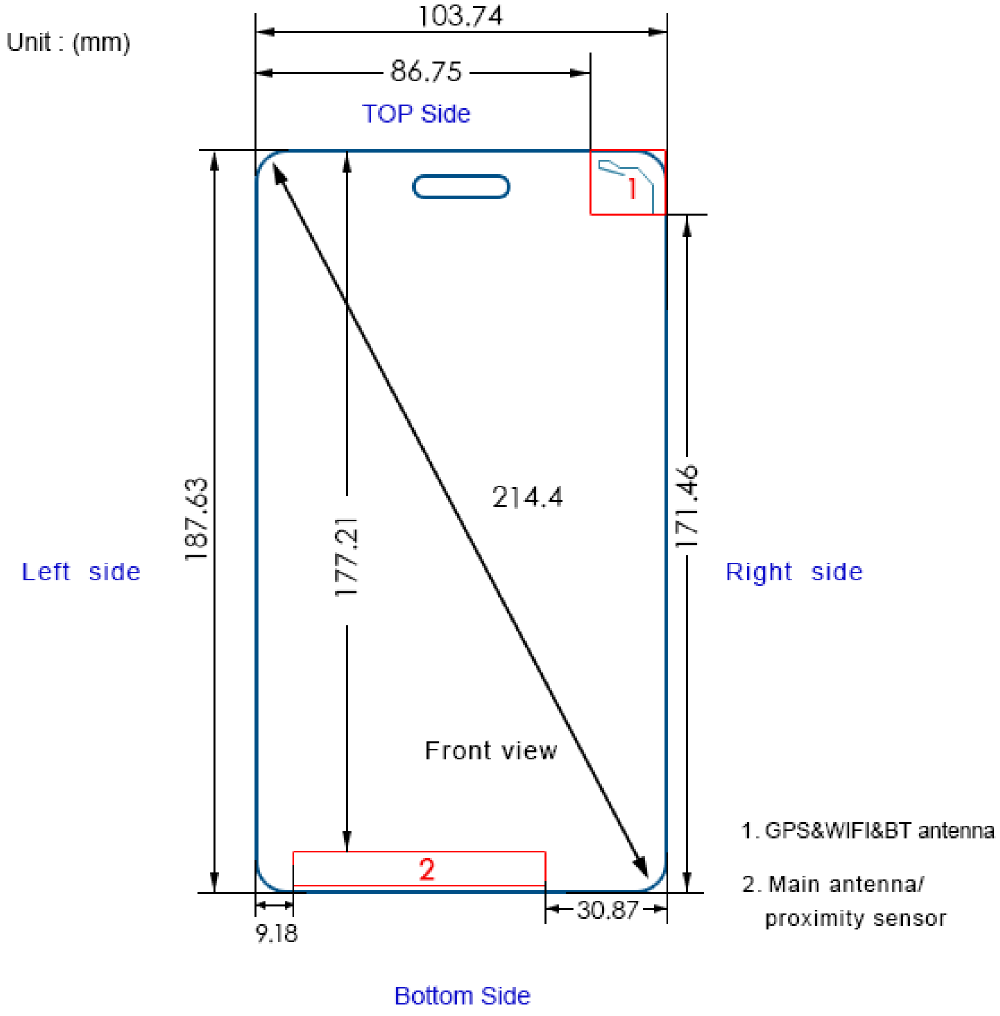
a) at 100 MHz to1500 MHz

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

b) at >1500MHz and ≤6GHz

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

The location of the antenna inside EUT is as below.



The distance <50mm (sensor off)

Mode	Position	Pmax (dBm) *	Pmax (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	Test Requirement (Yes/No)
BT	Rear/ Top	8.5	7.07	5	2.480	2.23	3	No
	Right	8.5	7.07	5	2.480	2.23	3	No
2.4GWiFi	Rear/ Top	18.5	70.79	5	2.462	22.22	3	Yes
	Right	18.5	70.79	5	2.462	22.22	3	Yes
GSM850	Rear/ Bottom	31.5	1412.54	5	0.8488	260.28	3	Yes
	Left	31.5	1412.54	9.18	0.8488	141.76	3	Yes
	Right	31.5	1412.54	30.87	0.8488	42.16	3	Yes
GSM1900	Rear/ Bottom	28.5	707.95	5	1.9098	195.67	3	Yes
	Left	28.5	707.95	9.18	1.9098	106.57	3	Yes
	Right	28.5	707.95	30.87	1.9098	31.69	3	Yes
UMTS Band 2	Rear/ Bottom	23.5	223.87	5	1.9076	61.84	3	Yes
	Left	23.5	223.87	9.18	1.9076	33.68	3	Yes
	Right	23.5	223.87	30.87	1.9076	10.02	3	Yes
UMTS Band 5	Rear/ Bottom	24	251.19	5	0.8466	46.22	3	Yes
	Left	24	251.19	9.18	0.8466	25.18	3	Yes
	Right	24	251.19	30.87	0.8466	7.49	3	Yes

The distance <50mm (sensor on)

Mode	Position	Pmax (dBm)*	Pmax (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	Test Requirement (Yes/No)
2.4G WiFi	Rear/ Right	11.5	14.13	5	2.462	4.43	3	Yes
GSM850	Rear/ Bottom	27	501.19	5	0.8488	92.35	3	Yes
GSM1900	Rear/ Bottom	24	251.19	5	1.9098	69.43	3	Yes
UMTS Band 2	Rear/ Bottom	13.5	22.39	5	1.9076	6.18	3	Yes
UMTS Band 5	Rear/ Bottom	17	50.19	5	0.8466	9.22	3	Yes

The distance >50mm

Mode	Position	f (GHz)	Power allowed at numeric Threshold at 50mm	Distance (mm)	P_{max} (dBm)*	P_{max} (mW)	SAR Exclusion Result (mW)	Test Requirement (Yes/No)
BT	Left	2.480	95.25	187.63	8.5	7.07	1471.55	No
	Bottom	2.480	95.25	171.46	8.5	7.07	1309.85	No
2.4GWiFi	Left	2.462	95.60	187.63	18.5	70.79	1471.90	No
	Bottom	2.462	95.60	171.46	18.5	70.79	1310.20	No
GSM850	Top	0.8488	162.81	177.21	31.5	1412.54	815.44	Yes
GSM1900	Top	1.9098	108.54	177.21	28.5	707.95	1380.64	No
UMTS Band 2	Top	1.9076	108.60	177.21	23.5	223.87	1380.70	No
UMTS Band 5	Top	0.8466	163.02	177.21	24	251.19	813.57	No

8. POWER TEST RESULT

8.1 CONDUCTED POWER MEASUREMENTS OF GSM850

GSM850 (sensor off)		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			128CH	190CH	251CH		128CH	190CH	251CH
			824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		33.50	32.96	33.00	33.05	24.31	23.77	23.81	23.86
GPRS (GMSK)	1 Tx Slot	33.50	32.96	33.00	33.05	24.31	23.77	23.81	23.86
	2 Tx Slots	31.50	30.99	31.03	31.00	25.37	24.86	24.90	24.87
	3 Tx Slots	29.50	29.21	29.24	29.26	25.08	24.79	24.82	24.84
	4 Tx Slots	27.50	27.16	27.22	27.17	24.32	23.98	24.04	23.99

GSM850 (sensor on)		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			128CH	190CH	251CH		128CH	190CH	251CH
			824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		27.00	26.04	26.03	26.05	17.81	16.85	16.84	16.86
GPRS (GMSK)	1 Tx Slot	27.00	26.04	26.03	26.05	17.81	16.85	16.84	16.86
	2 Tx Slots	23.00	22.11	22.10	22.12	16.87	15.98	15.97	15.99
	3 Tx Slots	21.00	20.10	20.11	20.12	16.58	15.68	15.69	15.70
	4 Tx Slots	19.00	18.16	18.18	18.21	15.82	14.98	15.00	15.03

Note:
1) The conducted power of GSM850 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01, the bolded GPRS 2Tx mode was selected for SAR testing according to the highest frame –averaged output power table.

8.2 CONDUCTED POWER MEASUREMENTS OF GSM1900

GSM1900 (sensor off)		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			512CH	661CH	810CH		512CH	661CH	810CH
			1850.2MHz	1880MHz	1909.8MHz		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)		30.50	29.70	29.65	29.62	21.31	20.51	20.46	20.43
GPRS (GMSK)	1 Tx Slot	30.50	29.70	29.65	29.62	21.31	20.51	20.46	20.43
	2 Tx Slots	28.50	27.42	27.35	27.34	22.37	21.29	21.22	21.21
	3 Tx Slots	26.50	25.82	25.76	25.76	22.08	21.40	21.34	21.34
	4 Tx Slots	24.50	23.77	23.70	23.70	21.32	20.59	20.52	20.52

GSM1900 (sensor on)		Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
			512CH	661CH	810CH		512CH	661CH	810CH
			1850.2MHz	1880MHz	1909.8MHz		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)		24.00	22.88	22.82	22.81	14.81	13.69	13.63	13.62
GPRS (GMSK)	1 Tx Slot	24.00	22.88	22.82	22.81	14.81	13.69	13.63	13.62
	2 Tx Slots	21.00	19.92	19.84	19.85	14.87	13.79	13.71	13.72
	3 Tx Slots	19.00	17.85	17.79	17.78	14.58	13.43	13.37	13.36
	4 Tx Slots	17.00	16.03	15.96	15.98	13.82	12.85	12.78	12.80

Note:
1) The conducted power of GSM1900 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01, the bolded GPRS 4Tx mode was selected for SAR testing according to the highest frame –averaged output power table.

8.3 CONDUCTED POWER MEASUREMENTS OF UMTS1900 Band 2

UMTS1900 Band 2 (sensor off)		Tune-up	SAR Conducted Power (dBm)		
			9262CH	9400CH	9538CH
			1852.4	1880	1907.6
WCDMA	12.2kbps RMC	23.50	22.44	22.39	22.41
	64kbps RMC	23.50	22.47	22.36	22.39
	144kbps RMC	23.50	22.48	22.38	22.34
	384kbps RMC	23.50	22.53	22.47	22.47
HSDPA	Subtest 1	22.50	21.51	21.52	21.48
	Subtest 2	22.50	21.48	21.52	21.51
	Subtest 3	22.50	21.56	21.52	21.56
	Subtest 4	22.50	21.47	21.53	21.50
HSUPA	Subtest 1	22.50	20.81	20.86	20.91
	Subtest 2	20.50	18.95	18.98	19.06
	Subtest 3	21.50	20.22	20.32	20.34
	Subtest 4	20.50	19.68	19.76	19.81
	Subtest 5	22.50	20.61	20.65	20.72

UMTS1900 Band 2 (sensor on)		Tune-up	SAR Conducted Power (dBm)		
			9262CH	9400CH	9538CH
			1852.4	1880	1907.6
WCDMA	12.2kbps RMC	12.00	10.09	10.21	10.14
	64kbps RMC	12.00	10.07	10.21	10.22
	144kbps RMC	12.00	10.07	10.22	10.09
	384kbps RMC	12.00	10.05	10.24	10.16
HSDPA	Subtest 1	12.00	10.06	10.17	10.13
	Subtest 2	12.00	10.06	10.23	10.28
	Subtest 3	11.00	10.03	9.56	9.43
	Subtest 4	12.00	10.04	10.21	10.36
HSUPA	Subtest 1	13.00	11.64	11.14	11.18
	Subtest 2	13.00	11.26	11.34	11.26
	Subtest 3	13.00	11.18	11.40	11.22
	Subtest 4	13.00	11.68	11.79	11.71
	Subtest 5	13.50	12.15	12.13	12.18

Note:
1) The conducted power of UMTS Band 2 is measured with RMS detector.
2)Note: Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

8.4 CONDUCTED POWER MEASUREMENTS OF UMTS850 Band 5

UMTS 850 Band 5) (sensor off)		Tune-up	SAR Conducted Power (dBm)		
			4132CH	4182CH	4233CH
			826.4	836.4	846.6
WCDMA	12.2kbps RMC	24.00	22.97	22.94	22.91
	64kbps RMC	24.00	22.95	22.92	22.90
	144kbps RMC	24.00	22.96	22.96	22.92
	384kbps RMC	24.00	23.01	22.99	22.90
HSDPA	Subtest 1	24.00	22.61	22.75	22.63
	Subtest 2	24.00	22.60	22.72	22.67
	Subtest 3	24.00	22.57	22.66	22.68
	Subtest 4	24.00	22.60	22.73	22.68
HSUPA	Subtest 1	22.00	20.42	20.46	20.45
	Subtest 2	20.00	18.63	18.67	18.62
	Subtest 3	21.00	19.86	19.91	19.87
	Subtest 4	21.00	19.41	19.43	19.39
	Subtest 5	22.00	20.38	20.41	20.32

UMTS 850 Band 5) (sensor on)		Tune-up	SAR Conducted Power (dBm)		
			4132CH	4182CH	4233CH
			826.4	836.4	846.6
WCDMA	12.2kbps RMC	16.00	14.78	14.79	14.56
	64kbps RMC	16.00	14.60	14.74	14.45
	144kbps RMC	16.00	14.63	14.74	14.48
	384kbps RMC	16.00	14.61	14.81	14.52
HSDPA	Subtest 1	15.50	14.64	14.68	14.51
	Subtest 2	15.50	14.58	14.66	14.54
	Subtest 3	15.50	14.65	14.92	14.63
	Subtest 4	15.50	14.68	14.85	14.58
HSUPA	Subtest 1	15.50	14.33	14.54	14.17
	Subtest 2	15.50	14.68	14.74	14.55
	Subtest 3	16.00	14.41	15.47	15.12
	Subtest 4	16.00	15.08	14.33	14.92
	Subtest 5	17.00	16.36	16.49	16.11

Note:
1) The conducted power of UMTS Band 5 is measured with RMS detector.
2) Note: Per KDB941225 D01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

8.5 CONDUCTED POWER MEASUREMENTS OF WiFi 2.4G

	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Power Setting	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
FCC 2.4G (sensor off)	802.11b	1	2412	1	14.00	15.50	13.96	Yes
		6	2437		16.00	18.50	17.52	Yes
		11	2462		14.00	15.50	13.83	No
	802.11g	1	2412	6	-	12.50	Not Required	No
		6	2437		-	16.50	Not Required	No
		11	2462		-	12.50	Not Required	No
	802.11n HT20	1	2412	6.5	-	11	Not Required	No
		6	2437		-	16	Not Required	No
		11	2462		-	11	Not Required	No

	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Power Setting	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
FCC 2.4G (sensor on)	802.11b	1	2412	1	10.00	11.50	10.84	No
		6	2437		10.00	11.50	10.85	Yes
		11	2462		10.00	11.50	10.27	No
	802.11g	1	2412	6	-	11.00	Not Required	No
		6	2437		-	11.00	Not Required	No
		11	2462		-	11.00	Not Required	No
	802.11n HT20	1	2412	6.5	-	10.5	Not Required	No
		6	2437		-	10.5	Not Required	No
		11	2462		-	10.5	Not Required	No

Note:

1) The Average conducted power of WiFi is measured with RMS detector.

2) Per KDB248227, 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.

8.13 Conducted power measurements of BT

BT	Tune Up	Average Conducted Power (dBm)		
		DH5	2DH5	3DH5
DH5	8.50	7.73	7.27	6.95
2DH5	8.50	7.13	7.61	7.71
3DH5	8.50	7.62	7.58	7.27

BT	Tune Up	Average Conducted Power (dBm)		
		CH0	CH19	CH39
BLE	8.50	7.51	7.99	7.16

Note:
1) The conducted power of BT is measured with RMS detector.

9 .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 > ½ 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 ≥0.8W/Kg; if the deviation among the repeated measurement is ≤ 20%,and the measured SAR <1.45W/Kg, only one repeated measurement is required.
4) Per KDB648474 D04v01r03, SAR is evaluated without a headset connected to the device. When the standalone reported Body SAR is ≤1.2 W/kg, no additional SAR evaluations using a headset are required.
5) Per KDB865664 D02v01r02, 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.

GSM Notes:

1) Per KDB648474 D04v01r03, Body accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for Body SAR.
2) Per KDB941225 D01v03r01, SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

WCDMA Notes:

Per KDB941225 D01v03r01, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

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.

9.1 SAR MEASUREMENT RESULT

9.1.1 SAR MEASUREMENT RESULT OF HEAD

1. Head SAR test results of GSM&UMTS

Test No.	Band	Mode	CH	Test Position	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	SAR Value (W/kg)10-g	Reported SAR1-g
T01	GSM 850	GSM	190	Right Cheek	33.5	33	0.02	0.197	0.161	0.221
T02	GSM 850	GSM	190	Right Tilted	33.5	33	-0.05	0.170	0.142	0.191
T03	GSM 850	GSM	190	Left Cheek	33.5	33	0.01	0.305	0.243	0.342
T04	GSM 850	GSM	190	Left Tilted	33.5	33	0.07	0.174	0.147	0.195
T05	GSM 850	GSM	190	Left Cheek	33.5	33	-0.03	0.326	0.260	0.366
T06	GSM 850	GSM	190	Left Cheek	33.5	33	0.01	0.277	0.215	0.311
T11	GSM 1900	GSM	661	Right Cheek	30.5	29.65	0.04	0.038	0.024	0.047
T12	GSM 1900	GSM	661	Right Tilted	30.5	29.65	-0.02	0.021	0.013	0.026
T13	GSM 1900	GSM	661	Left Cheek	30.5	29.65	0.04	0.026	0.016	0.032
T14	GSM 1900	GSM	661	Left Tilted	30.5	29.65	0	0.021	0.012	0.026
T15	GSM 1900	GSM	661	Right Cheek	30.5	29.65	-0.04	0.034	0.023	0.041
T16	GSM 1900	GSM	661	Right Cheek	30.5	29.65	0.04	0.037	0.023	0.045
T21	UMTS B2	RMC12.2K	9400	Right Cheek	23.5	22.39	0.02	0.086	0.053	0.111
T22	UMTS B2	RMC12.2K	9400	Right Tilted	23.5	22.39	0.07	0.028	0.018	0.036
T23	UMTS B2	RMC12.2K	9400	Left Cheek	23.5	22.39	0.02	0.039	0.025	0.050
T24	UMTS B2	RMC12.2K	9400	Left Tilted	23.5	22.39	0.04	0.029	0.017	0.037
T25	UMTS B2	RMC12.2K	9400	Right Cheek	23.5	22.39	0.07	0.076	0.046	0.098
T26	UMTS B2	RMC12.2K	9400	Right Cheek	23.5	22.39	0.08	0.081	0.048	0.105
T31	UMTS B5	RMC12.2K	4182	Right Cheek	24	22.94	-0.01	0.161	0.129	0.206
T32	UMTS B5	RMC12.2K	4182	Right Tilted	24	22.94	-0.03	0.133	0.112	0.170
T33	UMTS B5	RMC12.2K	4182	Left Cheek	24	22.94	0.06	0.217	0.172	0.277
T34	UMTS B5	RMC12.2K	4182	Left Tilted	24	22.94	0.07	0.162	0.138	0.207
T35	UMTS B5	RMC12.2K	4182	Left Cheek	24	22.94	-0.04	0.233	0.187	0.297
T36	UMTS B5	RMC12.2K	4182	Left Cheek	24	22.94	-0.02	0.171	0.135	0.218

2. Head SAR test results of WiFi

Test No.	Band	CH	Test Position	Data Rate	Power Setting	Tune up	Measured	Drift(dB)	SAR Value (W/kg)1-g	SAR Value (W/kg)10-g	Reported SAR 1-g
T151	802.11b	6	Right Cheek	1	16	18.5	17.52	0.01	0.147	0.078	0.184
T152	802.11b	6	Right Tilted	1	16	18.5	17.52	0.02	0.112	0.06	0.140
T153	802.11b	6	Left Cheek	1	16	18.5	17.52	-0.08	0.668	0.331	0.837
T154	802.11b	6	Left Tilted	1	16	18.5	17.52	0.01	0.345	0.177	0.432
T155	802.11b	6	Left Cheek	1	16	18.5	17.52	0.15	0.688	0.364	0.862
T156	802.11b	6	Left Cheek	1	16	18.5	17.52	0.13	0.701	0.361	0.878
T157	802.11b	1	Left Cheek	1	14	14.5	13.96	0.08	0.425	0.221	0.481

Note:

1) Per KDB248227, 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) Per KDB248227D01, the highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.

9.1.2 SAR MEASUREMENT RESULT OF BODY

1. Body SAR test results of GSM&UMTS

Test No.	Band	Mode	CH	Test Position	Separation Distance (cm)	Sensor (on/off)	Battery	Tune-up	Measured	Drift (dB)	SAR Value (W/kg)1-g	SAR Value (W/kg)10-g	Reported SAR 1-g
T41	GSM 850	GPRS2TX	190	Rear Face	1.6	off	1	31.5	31.03	-0.03	0.521	0.327	0.581
T42	GSM 850	GPRS2TX	190	Bottom Side	1.5	off	1	31.5	31.03	0.02	0.288	0.165	0.321
T43	GSM 850	GPRS2TX	190	Rear Face	1.6	off	2	31.5	31.03	-0.03	0.519	0.325	0.578
T44	GSM 850	GPRS2TX	190	Rear Face	1.6	off	3	31.5	31.03	0.07	0.501	0.311	0.558
T51	GSM 850	GPRS1TX	190	Rear Face	0	on	1	27	26.03	0.02	0.405	0.242	0.506
T52	GSM 850	GPRS2TX	190	Left Side	0	-	1	31.5	31.03	0.04	0.922	0.586	1.027
T53	GSM 850	GPRS2TX	190	Right Side	0	-	1	31.5	31.03	0.05	0.377	0.254	0.420
T54	GSM 850	GPRS2TX	190	Top Side	0	-	1	31.5	31.03	-0.01	0.075	0.052	0.084
T55	GSM 850	GPRS1TX	190	Bottom Side	0	on	1	27	26.03	0.04	0.346	0.176	0.433
T56	GSM 850	GPRS2TX	128	Left Side	0	-	1	31.5	30.99	0.04	0.79	0.505	0.888
T57	GSM 850	GPRS2TX	251	Left Side	0	-	1	31.5	31	0.03	0.664	0.425	0.745
T58	GSM 850	GPRS2TX	190	Left Side	0	-	2	31.5	31.03	-0.032	0.781	0.491	0.870
T59	GSM 850	GPRS2TX	190	Left Side	0	-	3	31.5	31.03	0	0.889	0.513	0.991
T60	GSM 850	GPRS2TX	190	Left Side (1st repeated)	0	-	1	31.5	31.03	0.04	0.912	0.586	1.016
T61	GSM 1900	GPRS2TX	661	Rear Face	1.6	off	1	28.5	27.35	0.06	0.396	0.233	0.516
T62	GSM 1900	GPRS2TX	661	Bottom Side	1.5	off	1	28.5	27.35	0.03	0.109	0.064	0.142
T63	GSM 1900	GPRS2TX	661	Rear Face	1.6	off	2	28.5	27.35	0.01	0.341	0.201	0.444
T64	GSM 1900	GPRS2TX	661	Rear Face	1.6	off	3	28.5	27.35	-0.04	0.418	0.247	0.545
T71	GSM 1900	GPRS2TX	661	Rear Face	0	on	1	21	19.84	0	0.536	0.25	0.700
T72	GSM 1900	GPRS2TX	661	Left Side	0	-	1	28.5	27.35	-0.02	0.132	0.069	0.172
T73	GSM 1900	GPRS2TX	661	Right Side	0	-	1	28.5	27.35	0.06	0.213	0.106	0.278
T74	GSM 1900	GPRS2TX	661	Bottom Side	0	on	1	21	19.84	0.09	0.58	0.273	0.758
T75	GSM 1900	GPRS2TX	661	Bottom Side	0	on	2	21	19.84	0.02	0.556	0.263	0.726
T76	GSM 1900	GPRS2TX	661	Bottom Side	0	on	3	21	19.84	0.01	0.678	0.319	0.886
T77	GSM 1900	GPRS2TX	512	Bottom Side	0	on	3	21	19.84	0.01	0.641	0.309	0.837
T78	GSM 1900	GPRS2TX	885	Bottom Side	0	on	3	21	19.84	-0.05	0.555	0.302	0.725
T81	UMTS B2	RMC12.2K	9400	Rear Face	1.6	off	1	23.5	22.39	0.02	0.703	0.416	0.908
T82	UMTS B2	RMC12.2K	9400	Bottom Side	1.5	off	1	23.5	22.39	0.05	0.314	0.191	0.405
T83	UMTS B2	RMC12.2K	9262	Rear Face	1.6	off	1	23.5	22.39	0.02	0.683	0.364	0.882
T84	UMTS B2	RMC12.2K	9538	Rear Face	1.6	off	1	23.5	22.39	-0.03	0.632	0.34	0.816
T85	UMTS B2	RMC12.2K	9400	Rear Face	1.6	off	2	23.5	22.39	0.08	0.808	0.475	1.043
T86	UMTS B2	RMC12.2K	9400	Rear Face	1.6	off	3	23.5	22.39	0.07	0.723	0.427	0.934
T87	UMTS B2	RMC12.2K	9400	Rear Face (1st repeated)	1.6	off	2	23.5	22.39	0.08	0.803	0.475	1.037
T91	UMTS B2	HSUPA Subtest-5	9400	Rear Face	0	on	1	13.5	12.13	0.09	0.45	0.209	0.617

T92	UMTS B2	RMC12.2K	9400	Left Side	0	-	1	23.5	22.39	0.03	0.26	0.133	0.336
T93	UMTS B2	RMC12.2K	9400	Right Side	0	-	1	23.5	22.39	0.07	0.414	0.221	0.535
T94	UMTS B2	HSUPA Subtest-5	9400	Bottom Side	0	on	1	13.5	12.13	0.03	0.457	0.214	0.626
T95	UMTS B2	HSUPA Subtest-5	9400	Bottom Side	0	on	2	13.5	12.13	0	0.436	0.188	0.598
T96	UMTS B2	HSUPA Subtest-5	9400	Bottom Side	0	on	3	13.5	12.13	0	0.442	0.193	0.606
T101	UMTS B5	RMC12.2K	4182	Rear Face	1.6	off	1	24	22.94	0.02	0.335	0.211	0.428
T102	UMTS B5	RMC12.2K	4182	Bottom Side	1.5	off	1	24	22.94	-0.03	0.182	0.116	0.232
T103	UMTS B5	RMC12.2K	4182	Rear Face	1.6	off	2	24	22.94	0	0.462	0.289	0.590
T104	UMTS B5	RMC12.2K	4182	Rear Face	1.6	off	3	24	22.94	-0.05	0.393	0.244	0.502
T121	UMTS B5	HSUPA Subtest-5	4182	Rear Face	0	on	1	17	16.49	0.12	0.57	0.286	0.641
T122	UMTS B5	RMC12.2K	4182	Left Side	0	-	1	24	22.94	0.03	0.205	0.121	0.262
T123	UMTS B5	RMC12.2K	4182	Right Side	0	-	1	24	22.94	-0.06	0.064	0.037	0.082
T124	UMTS B5	HSUPA Subtest-5	4182	Bottom Side	0	on	1	17	16.49	0.03	0.292	0.132	0.328
T125	UMTS B5	HSUPA Subtest-5	4182	Rear Face	0	on	2	17	16.49	0.02	0.537	0.242	0.604
T126	UMTS B5	HSUPA Subtest-5	4182	Rear Face	0	on	3	17	16.49	-0.03	0.553	0.256	0.622

2. Body SAR test results of WIFI

Test No.	Band	CH	Test Position	Separation Distance (cm)	Earphone	Sensor (on/off)	Battery	Data Rate	Power Setting	Tune-up	Measured	Drift (dB)	SAR Value (W/kg)1-g	SAR Value (W/kg)10-g	Reported SAR 1-g
T131	802.11b	6	Rear Face	0.5	v	off	1	1	16	18.5	17.52	-0.02	0.618	0.319	0.774
T132	802.11b	6	Right Side	0.4	v	off	1	1	16	18.5	17.52	0.04	0.429	0.123	0.538
T133	802.11b	6	Rear Face	0.5	v	off	2	1	16	18.5	17.52	0.02	0.582	0.313	0.729
T134	802.11b	6	Rear Face	0.5	v	off	3	1	16	18.5	17.52	0.05	0.692	0.325	**0.867**
T135	802.11b	1	Rear Face	0.5	v	off	3	1	14	14.50	13.96	0.07	0.318	0.147	0.360
T141	802.11b	6	Rear Face	0	-	on	1	1	10	11.5	10.85	0	0.771	0.308	**0.895**
T142	802.11b	6	Right Side	0	-	on	1	1	10	11.5	10.85	0.02	0.528	0.192	0.613
T143	802.11b	6	Top Side	0	-	-	1	1	10	18.5	17.52	0.07	0.231	0.118	0.289
T144	802.11b	1	Rear Face	0	-	on	1	1	10	11.5	10.84	0	0.442	0.173	**0.515**
T145	802.11b	6	Rear Face	0	-	on	2	1	10	11.5	10.85	0.09	0.636	0.249	0.739
T146	802.11b	6	Rear Face	0	-	on	3	1	10	11.5	10.85	0	0.687	0.276	0.798

Note:

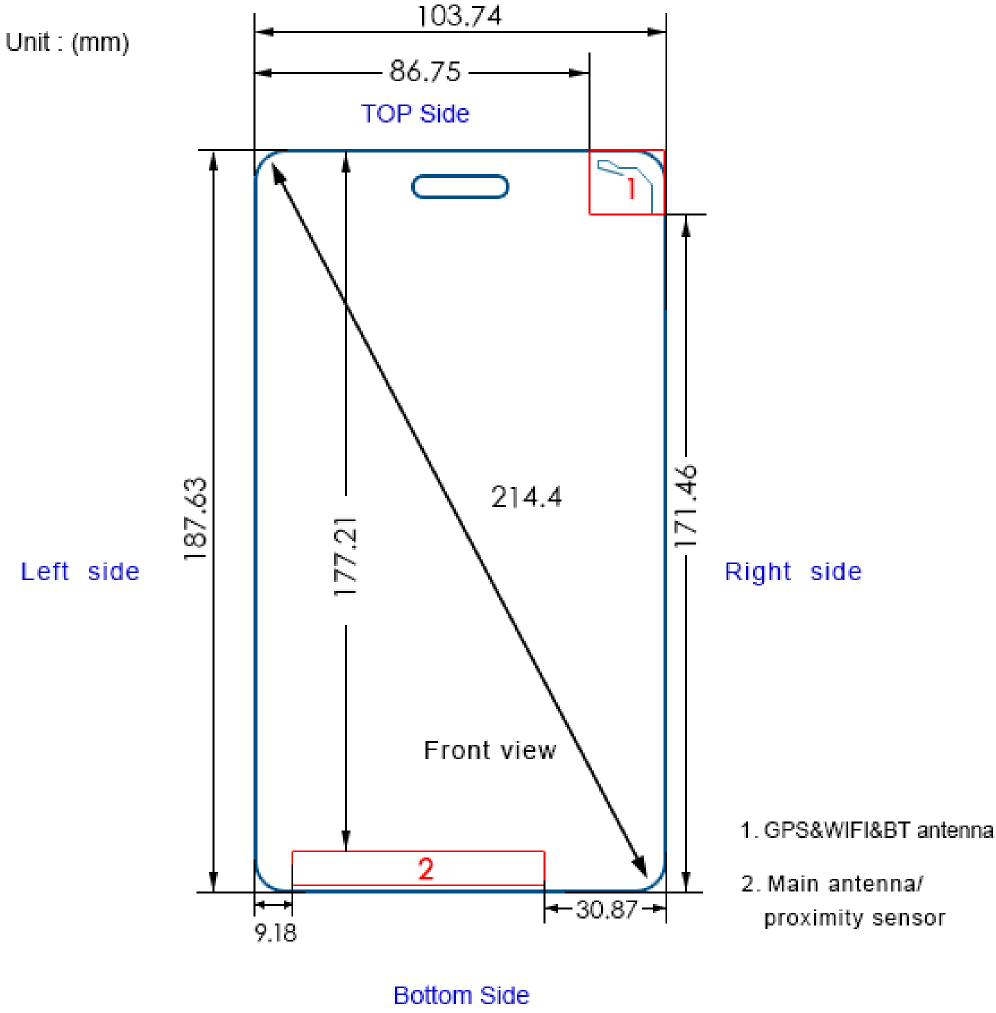
1) Per KDB248227, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes(802.11b)was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes(802.11g/n)to DSSS modes(802.11b)specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

2) Per KDB248227D01, the highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.

10. 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:



11. ESTIMATED SAR CALCULATION

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] •

[√ f(GHz)/x] W/kg for test separation distances≤50 mm,where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

According to KDB 447498 D01,when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standslone SAR was estimated according to following formula to result in substantially conservative SAR values of≤0.4W/Kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(mW)}}{\text{Min. Test Separation Distance}_{(mm)}} \times \frac{\sqrt{f_{(GHz)}}}{7.5}$$

Estimated SAR calculation

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR(W/Kg)*
2.4G WiFi	Left	-	-	86.75	-	-	0.400
	Bottom	-	-	171.46	-	-	0.400
GSM 1900	Top	-	-	177.21	-	-	0.400
UMTS B2/5	Top	-	-	177.21	-	-	0.400

12. SIMULTANEOUS TRANSMISSION

Per KDB 447498D01 v06, 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	Head	Body
1	GSM (Voice)+ WiFi 2.4G	Yes	Yes
2	GPRS(DATA)+ WiFi 2.4G	N/A	Yes
3	GSM(Voice)+BT	N/A	Yes
4	GPRS(DATA)+BT	N/A	Yes
5	UMTS(Voice)+ WiFi 2.4G	Yes	Yes
6	UMTS(DATA)+ WiFi 2.4G	N/A	Yes
7	UMTS(Voice)+BT	Yes	Yes
8	UMTS(DATA)+BT	N/A	Yes

Note:
i) Wi-Fi and Bluetooth share the same antenna and can’t transmit simultaneously.
ii) 2G&3G share the same antenna and can’t transmit simultaneously.
iii) The device does not support DTM function.
iv) Held to ear configurations are not applicable to BT and therefore were not considered for simultaneous transmission.

13. SAR SUMMATION SCENARIO

About BT/2.4G WiFi and GSM/UMTS/LTE antenna

Reported SAR_{1g} \ Test Position	Head			
	Right Cheek	Right Tilted	Left Cheek	Left Tilted
GSM850	0.221	0.191	0.366	0.195
GSM1900	0.047	0.026	0.032	0.026
UMTS B2	0.111	0.036	0.050	0.037
UMTS B5	0.206	0.170	0.297	0.207
BT	-	-	-	-
WiFi 2.4G	0.185	0.140	0.878	0.432
MAX∑SAR1g	0.406	0.331	1.244	0.639

Reported SAR_{1g} \ Test Position	Sensor on			Sensor off				
	Rear	Bottom	Right	Rear	Left	Right	Top	Bottom
GSM850	0.506	0.433	0.420	0.581	1.027	0.420	0.084	0.321
GSM1900	0.700	0.886	0.278	0.545	0.172	0.278	0.400	0.142
UMTS B2	0.617	0.626	0.535	1.043	0.336	0.535	0.400	0.405
UMTS B5	0.641	0.328	0.082	0.590	0.262	0.082	0.400	0.232
BT	0.297	0.297	0.297	0.297	0.400	0.297	0.297	0.400
WiFi 2.4G	0.895	0.400	0.613	0.867	0.400	0.538	0.289	0.400
MAX∑SAR1g	1.596	1.286	1.148	1.910	1.427	1.072	0.697	0.805

Reported SAR1g / Test Position	GSM850	GSM1900	UMTS B2	UMTS B5	2.4G WiFi	MAX $\sum SAR_{1g}$
Rear (Sensor on)	0.506	/	/	/	0.895	1.401
	/	0.700	/	/	0.895	1.596
	/	/	0.617	/	0.895	1.512
	/	/	/	0.641	0.895	1.536

Reported SAR1g / Test Position	GSM850	GSM1900	UMTS B2	UMTS B5	2.4G WiFi	MAX $\sum SAR_{1g}$
Rear (Sensor off)	0.581	/	/	/	0.867	1.448
	/	0.545	/	/	0.867	1.412
	/	/	1.043	/	0.867	1.910
	/	/	/	0.590	0.867	1.457

Note:
1) MAX. $\sum SAR_{1g}$ <1.6 W/Kg, the SAR to peak location separation ratio should not be considered, otherwise, see section 13.1 for more information.
2) The highest simultaneous SAR value=1.596 W/Kg, per KDB690783 D01
3) Since the sum of MAX SAR 1.596W/Kg is very close to 1.6W/Kg, we also evaluate the SAR to peak location separation ratio.

13.1 SIMULTANEOUS TRANSMISSION CONLCUSION

According to KDB447498 D01v06, When the sum of SAR is larger than limit, SAR test exclusion is determined by the SAR to peak location separation ratio(SPLSR).When the SAR to peak location ratio for each pair of antennas is ≤0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10.
When SAR is measured for both antennas in the pair the peak location separation distance is computed by the following formula:

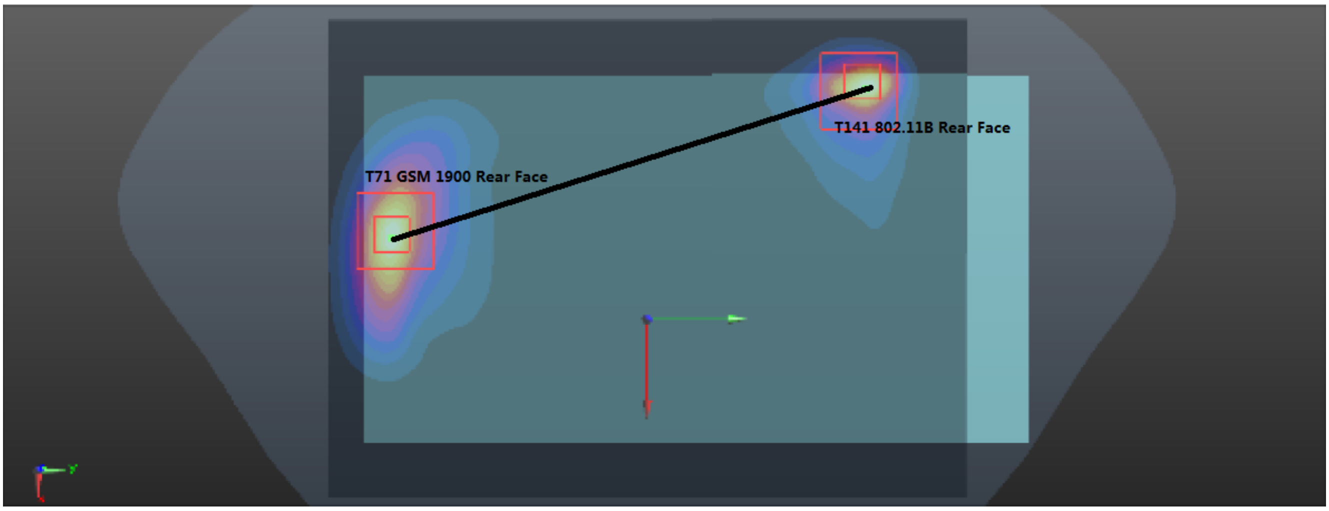
$$\text{Distance}_{Tx1\text{-}Tx2} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$\text{SPLS Ratio} = (SAR_1 + SAR_2)^{1.5}/R_i$$

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location should be translated onto the test device to determine the peak location separation for the antenna pair. The ERP location on the phantom is aligned with the ERP location on the handset, with 6mm separation in the z coordinate due to the ear spacer. A measured peak location can be translated onto the handset, with respect to the ERP location, by ignoring the 6 mm offset in the z coordinate. The assumed peak location of the antenna with estimated SAR can also be determined with respect to the ERP location on the handset. The peak location separation distance is estimated by the x and y coordinated of the peaks, referenced to the ERP location. While flat phantoms are not expected to have these issues, the same peak translation approach should be applied to determine peak location separation.

1) The sum of aggregate 1g SAR was above 1.6 W/Kg for Rear Face configuration with GSM1900 and 2.4GWiFi.

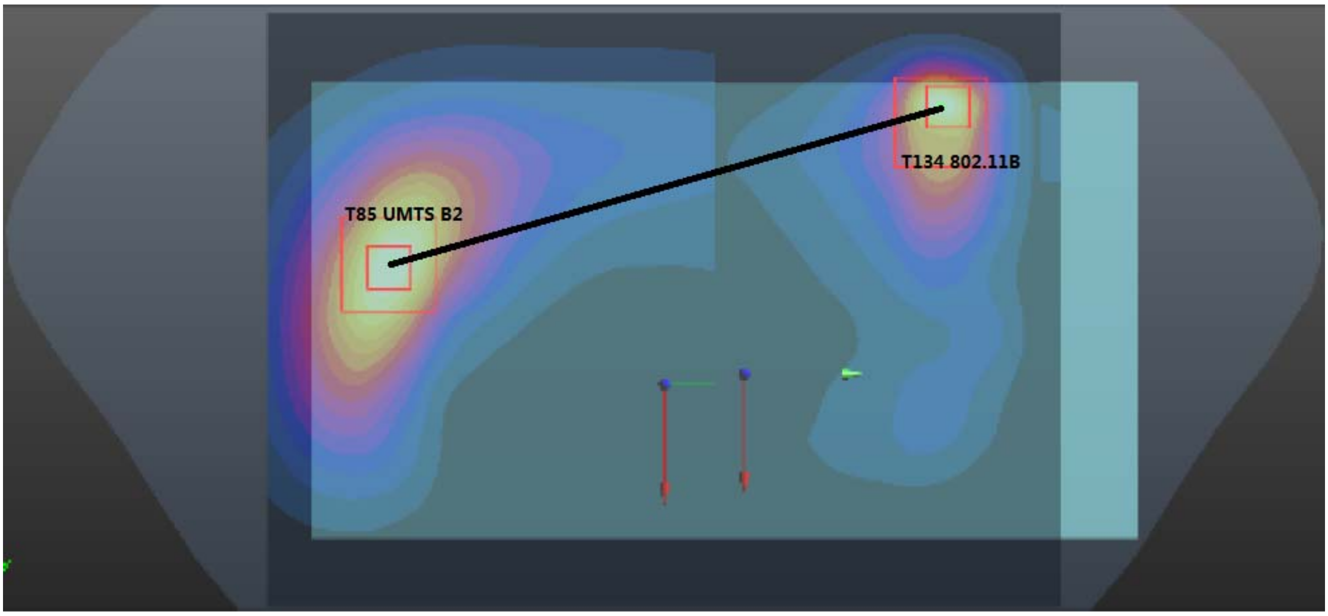
The Peak SAR location is as below:



Mode	Reported SAR_{1g}	Peak SAR_{1g}	X	Y	Z	D(mm)	SPLSR	Ratio Limit	Simultaneous SAR
	mW/g	mW/g	m	m	m				
GSM1900	0.700	0.625	-0.023	-0.072	-0.203	131.4	0.015	0.04	No
2.4GWiFi	0.895	0.828	-0.065	0.0525	-0.203				

2) The sum of aggregate 1g SAR was above 1.6 W/Kg for Rear Face configuration with UMTS B2 and 2.4GWiFi.

The Peak SAR location is as below:

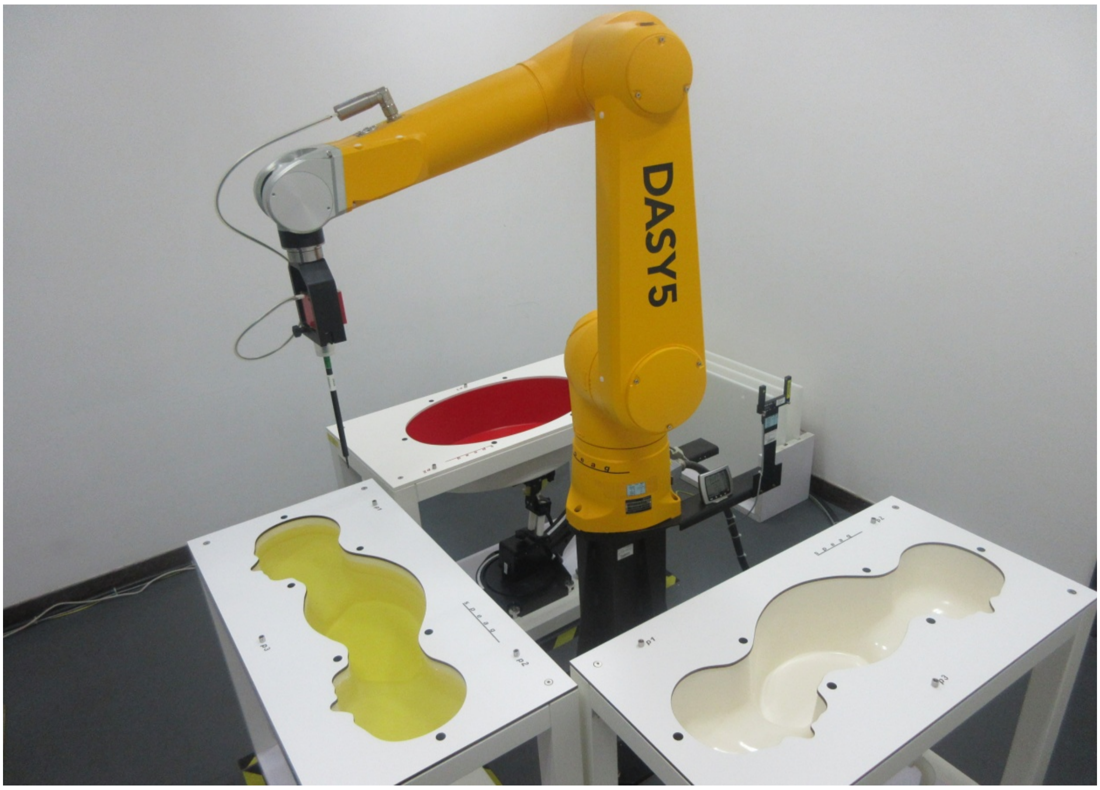


Mode	Reported SAR_{1g} mW/g	Peak SAR_{1g} mW/g	X m	Y m	Z m	D(mm)	SPLSR	Ratio Limit	Simultaneous SAR
UMTS B2	1.043	0.888	-0.0275	-0.0615	-0.203	121.4	0.022	0.04	No
2.4GWiFi	0.867	0.796	-0.073	0.051	-0.203				

APPENDIX

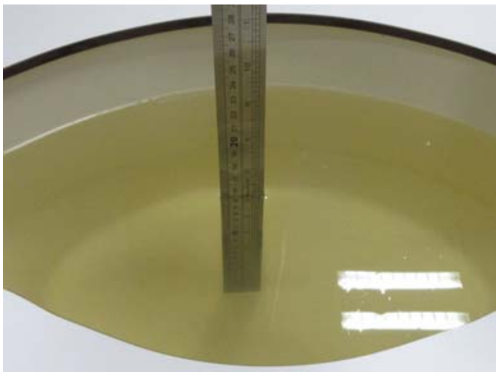
1. Test Layout

Specific Absorption Rate Test Layout



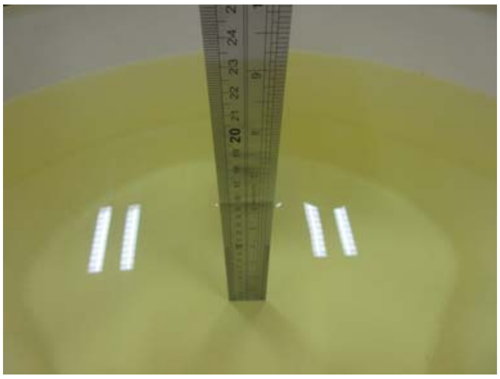
Liquid depth in the flat Phantom (≥15cm depth)

Body(835MHz) 15.5cm

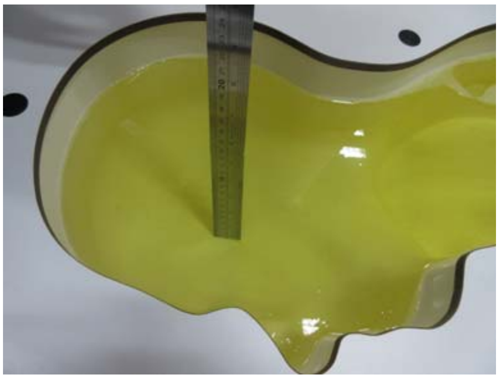


Head(835MHz) 15.9cm

Body(1900MHz~2600 MHz) 15.5cm



Head (1900MHz~2600 MHz) 15.1cm



Appendix A. SAR Plots of System Verification

(Pls See Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See Appendix B.)

Appendix C. Calibration Certificate for Probe and Dipole

(Pls See Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See Appendix D.)

End