SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std. 1528-2013
RSS-102 Issue 5
IEC/IEEE 62209-1528:2020

For

Smart Mini Payment Terminal

FCC ID: : V5PA77GT
IC: 11689A-A77GT
Model: A77

Report Number: 4790087823-SAR-1
Issue Date: April 1, 2022

Prepared for

PAX Technology Limited
Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	4/1/2022	Initial Issue	

Note:

1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

2. The measurement result for the sample received is <Pass> according to < IEEE Std. 1528, RSS-102 ISSUE 5>when <Accuracy Method> decision rule is applied.

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1. Attestation of Test Results

Applicant Name	PAX Technology Limited			
Address	Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong			
Manufacturer	PAX Technology Limited			
Address	Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong			
EUT Name	Smart Mini Payment Terminal			
Model	A77			
Sample Status	Normal			
Sample Received Date	Jan 17, 2022			
Date of Tested	February 8,2022~March 11,2022			
Applicable Standards	FCC 47 CFR § 2.1093 IEEE Std. 1528-2013 KDB publication RSS-102 Issue 5 IEC/IEEE 62209-1528:2020			
SAR Limits (W/Kg)				
Exposure Category	Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4	
The Highest Reported SAR (W/kg)				
RF Exposure Conditions	**Equipment Class**			
	Cellular	**2.4GHz Wi-Fi**	**5GHz Wi-Fi**	**Bluetooth**
Body-worn (1-g)	1.059	0.202	0.543	0.043
Extremity(10-g)	1.86	0.415	0.531	0.078
Body-worn (1-g)	1.059			
Extremity(10-g)	2.391			
Test Results	Pass			
Prepared By: Burt Hu Burt Hu Engineering Project Handler	Reviewed By: Shawn Wen Laboratory Leader		Approved By: Stephen Guo Laboratory Manager	

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std.1528-2013, RSS-102 Issue 5 the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR
- 447498 D01 General RF Exposure Guidance
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D07 UMPC Mini Tablet v01r02
- 941225 D01 3G SAR Procedures

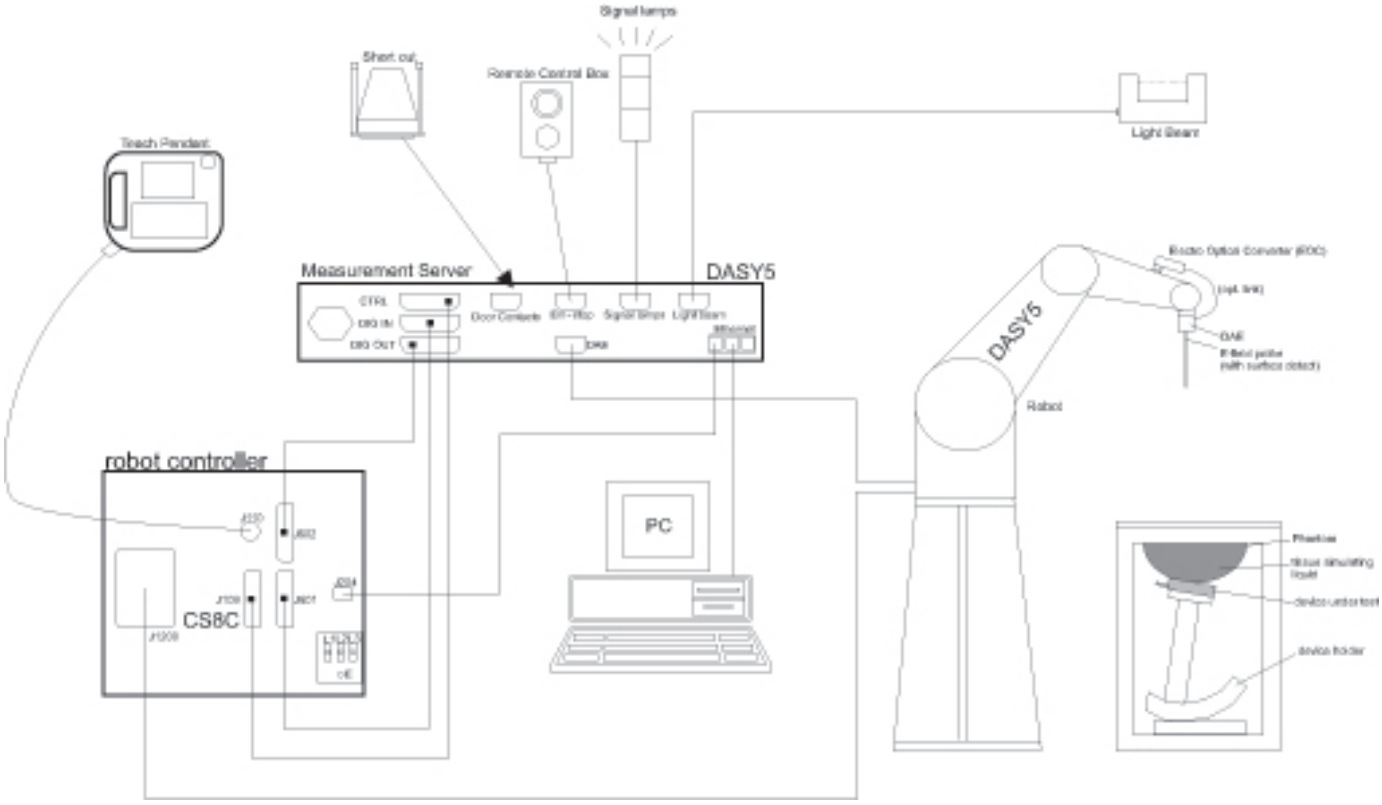
3. Facilities and Accreditation

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011
Description	All measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in Db) is specified in the standards for compliance testing. For example, a 2 Db range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 Db is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in Db from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be greater than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Name of equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
ENA Network Analyzer	Keysight	E5080A	MY55100583	2022.10.29
Dielectric Probe kit	SPEAG	SM DAK 040 SA	1155	NCR
DC power supply	Keysight	E36103A	MY55350020	2022.10.29
Signal Generator	Rohde & Schwarz	SME06	837633\001	2022.10.29
BI-Directional Coupler	WERLATONE	C8060-102	3423	2022.10.29
Peak and Average Power Sensor	Keysight	E9323A	MY55440013	2022.10.29
Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	2022.10.29
Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600-50-30P	1983561	NCR
Dosimetric E-Field Probe	SPEAG	EX3DV4	7589	2022.4.26
Data Acquisition Electronic	SPEAG	DAE4	1673	2022.5.5
Dipole Kit 750 MHz	SPEAG	D750V3	1153	2022.12.14
Dipole Kit 835 MHz	SPEAG	D835V2	4d206	2022.12.16
Dipole Kit 1800 MHz	SPEAG	D1800V2	2d212	2022.12.20
Dipole Kit 2450 MHz	SPEAG	D2450V2	977	2022.12.16
Dipole Kit 5 GHz	SPEAG	D5GHzV2	1231	2022.12.15
Software	SPEAG	DASY52	N/A	NCR
Twin Phantom	SPEAG	SAM V5.0	1805	NCR
ELI Phantom	SPEAG	ELI V5.0	1235	NCR
Thermometer	/	GX-138	150709653	2022.10.29
Thermometer	VICTOR	ITHX-SD-5	18470005	2022.10.29
Base station	R&S	CMW500	155522	2022.10.29

5. Measurement Uncertainty

5.1. Uncertainty budget list (30MHz to 3GHz).

Uncertainty component	Tol. (±%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	U_i, 1g (±%)	U_i, 10g (±%)
Measurement system							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	1.9	1.9
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	3.9	3.9
Boundary Effects	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
System Detection Limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Modulation Response^m	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5
RF Ambient Noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.2	0.2
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	$\sqrt{3}$	1	1	1.2	1.2
Test sample related							
Device Positioning	2.9	N	1	1	1	2.9	2.9
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	$\sqrt{3}$	1	1	2.9	2.9
Power Scaling	0	R	$\sqrt{3}$	1	1		
Phantom and set-up							
Phantom Uncertainty	6.1	R	$\sqrt{3}$	1	1	3.5	3.5
SAR correction	1.9	R	$\sqrt{3}$	1	0.84	1.1	0.9
Liquid Conductivity (mea.)	2.5	R	$\sqrt{3}$	0.78	0.71	1.1	1.0
Liquid Permittivity (mea.)	2.5	R	$\sqrt{3}$	0.26	0.26	0.4	0.4
Temp. unc. - Conductivity	3.4	R	$\sqrt{3}$	0.23	0.26	0.5	0.5
Temp. unc. - Permittivity	0.4	R	$\sqrt{3}$	0.78	0.71	0.2	0.2
Combined standard uncertainty						10.58	10.54
Expanded uncertainty (95% confidence interval) k=2						21.16	21.08

5.2. Uncertainty budget list (3GHz to 6GHz).

Uncertainty component	Tol. (±%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	U_i, 1g (±%)	U_i, 10g (±%)
Measurement system							
Probe Calibration	6.5	N	1	1	1	6.5	6.5
Axial Isotropy	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	1.9	1.9
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	3.9	3.9
Boundary Effects	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
System Detection Limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6
Modulation Response	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5
RF Ambient Noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.2	0.2
Probe Positioning	6.7	R	$\sqrt{3}$	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	$\sqrt{3}$	1	1	2.3	2.3
Test sample related							
Device Positioning	2.9	N	1	1	1	2.9	2.9
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	$\sqrt{3}$	1	1	2.9	2.9
Power Scaling	0	R	$\sqrt{3}$	1	1	0.0	0.0
Phantom and set-up							
Phantom Uncertainty	6.1	R	$\sqrt{3}$	1	1	3.5	3.5
SAR correction	1.9	R	$\sqrt{3}$	1	0.84	1.1	0.9
Liquid Conductivity (mea.)	2.5	R	$\sqrt{3}$	0.78	0.71	1.1	1.0
Liquid Permittivity (mea.)	2.5	R	$\sqrt{3}$	0.26	0.26	0.4	0.4
Temp. unc. - Conductivity	3.4	R	$\sqrt{3}$	0.23	0.26	0.5	0.5
Temp. unc. - Permittivity	0.4	R	$\sqrt{3}$	0.78	0.71	0.2	0.2
Combined standard uncertainty						11.59	11.55
Expanded uncertainty (95% confidence interval) k=2						23.18	23.11

6. Device Under Test (DUT) Information

6.1. DUT Description

EUT is an intelligent mini payment terminal with WCDMA/HSDPA/ HSUPA /LTE radio, IEEE 802.11a/ b/g/n/ac and Bluetooth wireless radio	
Dimension	Overall (Length x Width x Height): 158 mm x 74.8 mm x 17.8 mm
Accessory	None

6.2. Wireless Technology

Wireless technologies	Frequency bands	Operating mode
W-CDMA (UMTS)	Band II Band V Band IV	UMTS Rel. 99 (Data) HSDPA (Rel. 7) HSUPA (Rel. 5)
LTE	FDD B2 FDD B4 FDD B5 FDD B12 FDD B13 FDD B17	QPSK 16QAM ☒ Rel. 10 Does not support Carrier Aggregation (CA) ☐ Rel. 10 Carrier Aggregation (Downlink only) ☐ Rel. 11 Carrier Aggregation (2 Uplink and 2 Downlinks)
Wi-Fi	2.4GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40)
Wi-Fi	5GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)
BT	2.4GHz	V5.1
GPS	1.5GHz	L1/G1

6.3. Antenna Gain

Main Antenna		
Band	Antenna Type	MAX Antenna Gain(dBi)
WCDMA Band 2	PIFA	1.69
WCDMA Band 4	PIFA	0.75
WCDMA Band 5	PIFA	0.82
LTE B2	PIFA	1.69
LTE B4	PIFA	0.75
LTE B5	PIFA	0.82
LTE B12	PIFA	0.56
LTE B13	PIFA	0.56
LTE B17	PIFA	0.56
Wi-Fi/BT/GPS Antenna		
Band	Antenna Type	MAX Antenna Gain(dBi)
2.4GHz	PIFA	0.18
5GHz	PIFA	-0.75
Bluetooth	PIFA	0.18
GNSS	PIFA	0.98

7. Conducted Output Power Measurement and tune-up tolerance

Detailed conducted power and tune-up tolerance please refer to Appendix A.

8. Test Configuration

8.1. UMTS Test Configuration

1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures description in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s” for WCDMA/HSDPA or 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

Body SAR Measurements

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

3. HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements"" procedures of 3G device. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

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

HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The □c and □d gain factors for DPCCH and DPDCH

were set according to the values in the below table, □hs for HS-DPCCH is set automatically to the correct value when ΔACK, ΔNACK, ΔCQI = 8. The variation of the □c /□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 adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

As per KDB941225 D01v03, the 3G SAR test reduction procedure 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 HSDPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSDPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset" and „Release 5 HSDPA Data Device" sections of 3G device.

Subtests for WCDMA Release 6 HSUPA

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

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

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

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

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

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

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

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:

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

5. DC-HSDPA

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

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0
Levels for HSDPA connection setup

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

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

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

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

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

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

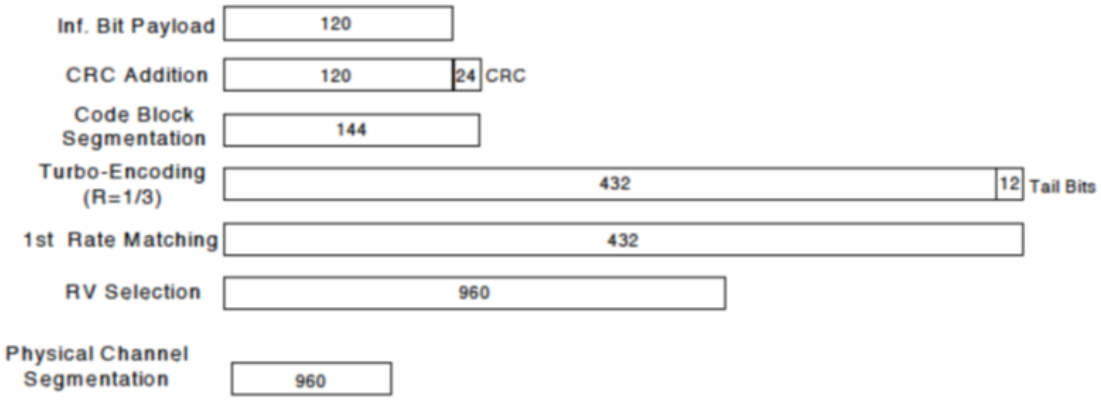


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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

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

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

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

Note:

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

The device doesn’t support carrier aggregation for it just can operate in Release 8.

8.2. LTE Test Configuration

Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

1) Spectrum Plots for RB configurations

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

2) MPR

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

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

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

3) A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS=01”on the base station simulator.

4) SAR test requirements

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the

remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

ii) QPSK with 50% RB allocation

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

iii) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in i) and ii) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Table 4.2-2: Uplink-downlink configurations

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

According to Figure 4.2-1, one radio frame is configured by 10 subframes, which consist of Uplink-subframe, Downlink-subframe and Special subframe. For TDD-LTE, the Duty Cycle should be calculated on Uplink-subframes and Special subframes, due to Special subframe containing both Uplink transmissions. So for one radio frame, Duty Cycle can be calculated with formula as below. The count of Uplink subframes are according to Table 4.2-2:

Duty cycle =(30720Ts*Ups+Uplink Component*Specials)/(307200Ts)

About the uplink component of Special subframes, we can figure out by Table 4.2-1:

Uplink Component=UpPTS

In conclusion, for the TDD LTE Band, Duty Cycle can be calculated with formula as below .all these sets are ok when we test, or we can set as below.

Duty cycle =[(30720Ts*Ups)+ UpPTS *Specials]/(307200Ts)

And we can get different Duty cycles under different configurations:

Uplink-downlink configuratin	Subframe number			Configuration of special subframe							
				Normal cyclic prefix in downlink				Extended cyclic prefix in downlink			
				Normal cyclic prefix in uplink		Extended cyclic prefix in uplink		Normal cyclic prefix in uplink		Extended cyclic prefix in uplink	
	D	S	U	configuration 0-4	configuration 5-9	configuration 0-4	configuration 5-9	configuration 0-3	configuration 4-7	configuration 0-3	configuration
0	2	2	6	61.43%	62.85%	61.67%	63.33%	61.43%	62.85%	61.67%	63.33%
1	4	2	4	41.43%	42.85%	41.67%	43.33%	41.43%	42.85%	41.67%	43.33%
2	6	2	2	21.43%	22.85%	21.67%	23.33%	21.43%	22.85%	21.67%	23.33%
3	6	1	3	30.71%	31.43%	30.83%	31.67%	30.71%	31.43%	30.83%	31.67%
4	7	1	2	20.71%	21.43%	20.83%	21.67%	20.71%	21.43%	20.83%	21.67%
5	8	1	1	10.71%	11.43%	10.83%	11.67%	10.71%	11.43%	10.83%	11.67%
6	3	2	5	51.43%	52.85%	51.67%	53.33%	51.43%	52.85%	51.67%	53.33%

For TDD LTE, SAR should be tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7 for Frame structure type 2.

For TDD LTE B40, SAR should be tested with the highest transmission duty factor (31.67%) using Uplink-downlink configuration 3 and Special subframe configuration 3 for Frame structure type 2.

Note:

The device supports both LTE Band 2 and LTE Band 25, Since the supported frequency span for LTE band 2 falls completely within the supported frequency span for LTE Band 25, both LTE bands have the same target power, and if both LTE Bands share the same transmission path, SAR was only assessed for LTE Band 25.

The device supports both LTE Band 4 and LTE Band 66, Since the supported frequency span for LTE band 4 falls completely within the supported frequency span for LTE Band 66, both LTE bands have the same target power, and if both LTE Bands share the same transmission path, SAR was only assessed for LTE Band 66.

8.3. Wi-Fi Test Configuration

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The test procedures in KDB 248227D01 are applied.

8.3.1. Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet, 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 position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

8.3.2. Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

8.3.3. Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.

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

8.3.4. 2.4GHz Wi-Fi SAR Test Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

A) 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 (section 3.1 of KDB 248227D01) 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.

B) 2.4GHz 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 (section 5.3 of KDB 248227D01). SAR is not required for the following 2.4 GHz OFDM conditions.

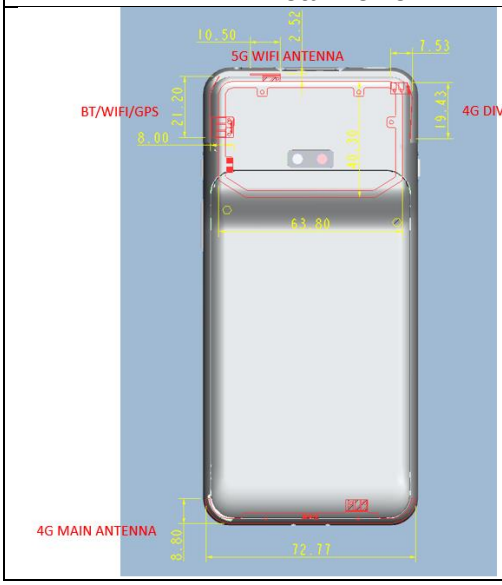
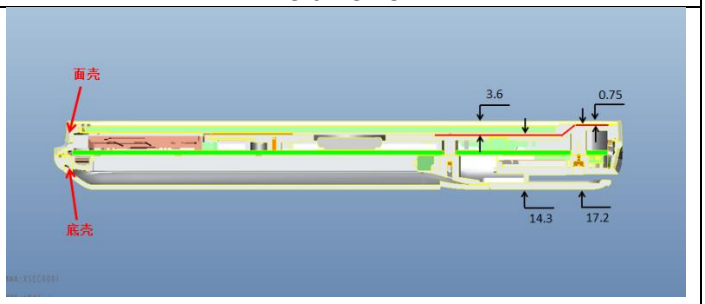
1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

C) SAR Test Requirements for OFDM configurations

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

9. RF Exposure Conditions

Refer to the diagram inside the device which attached below for the specific details of the antenna-to-edges distances. As per KDB 941225 D06, when the antenna to-edge-distance is greater than 2.5 cm, SAR evaluation is not required for the corresponding position.

Rear Review	Left Review
	

Note:
1) The EUT doesn't support operating next to the ear, so head SAR evaluation isn't considered.
2) The Main Antenna in the bottom of EUT, it supports LTE/WCDMA;
3) The Dvi antenna in the top left of EUT, it only supports RX for LTE/WCDMA;

	Test Position	antenna to-edge-distance	Test required
Main Ant	Front Edge	<25mm	Yes
	Back Edge	<25mm	Yes
	Left Edge	<25mm	Yes
	Right Edge	<25mm	Yes
	Top Edge	>25mm	No
	Bottom Edge	<25mm	Yes

	Test Position	antenna to-edge-distance	Test required
Wi-Fi/BT/GPS Ant	Front Edge	<25mm	Yes
	Back Edge	<25mm	Yes
	Left Edge	>25mm	No
	Right Edge	<25mm	Yes
	Top Edge	<25mm	Yes
	Bottom Edge	>25mm	No

5G Wi-Fi Ant	Test Position	antenna to-edge-distance	Test required
	Front Edge	<25mm	Yes
	Back Edge	<25mm	Yes
	Left Edge	>25mm	No
	Right Edge	<25mm	Yes
	Top Edge	<25mm	Yes
	Bottom Edge	>25mm	No

10. Dielectric Property Measurements & System Check

10.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013
Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

Liquid	Freq.	Liquid Parameters				Delta(%)		Limit (%)	Temp. (℃)	Test Date
		Measured		Target						
		ϵ_r	σ	ϵ_r	σ	ϵ_r	σ			
HBBL600~10000V6	700	42.73	0.88	42.20	0.89	1.26	-1.12	±5	21.8	2022.2.14
	707	42.62	0.91	42.16	0.89	1.09	2.25	±5		
	709	42.63	0.92	42.15	0.89	1.14	3.37	±5		
	720	42.69	0.87	42.10	0.89	1.40	-2.25	±5		
	750	42.52	0.88	41.94	0.89	1.38	-1.12	±5		
	782	42.35	0.89	41.78	0.90	1.36	-1.11	±5		
	805	42.35	0.92	41.66	0.90	1.66	2.22	±5	21.6	2022.2.12
	829	41.34	0.91	41.53	0.90	-0.46	1.11	±5		
	835	42.29	0.93	41.50	0.90	1.90	3.33	±5		
	855	42.30	0.91	41.50	0.92	1.93	-1.09	±5		
	875	42.33	0.91	41.50	0.94	2.00	-3.19	±5		
	835	41.32	0.93	41.50	0.90	-0.43	3.33	±5	22.1	2022.2.16
	846	41.35	0.94	41.50	0.91	-0.36	3.30	±5		
	875	41.44	0.97	41.50	0.94	-0.14	3.19	±5		
	1800	40.35	1.35	40.00	1.40	0.88	-3.57	±5	21.5	2022.2.8
	1850	40.33	1.38	40.00	1.40	0.82	-1.43	±5		
	1860	40.24	1.42	40.00	1.40	0.60	1.43	±5		
	1880	40.10	1.43	40.00	1.40	0.25	2.14	±5		
	1720	40.21	1.38	40.13	1.35	0.20	2.22	±5	20.4	2022.2.12
	1732	40.13	1.38	40.11	1.36	0.05	1.47	±5		
	1745	40.15	1.42	40.09	1.37	0.15	3.65	±5		
	1760	40.18	1.40	40.06	1.38	0.30	1.45	±5		
	1800	40.26	1.39	40.00	1.40	0.65	-0.71	±5		
	1700	40.09	1.39	40.16	1.34	-0.17	3.73	±5	21.8	2022.2.16
	1720	40.28	1.36	40.13	1.35	0.37	0.74	±5		
	1750	40.31	1.38	40.08	1.37	0.57	0.73	±5		
	1752	40.33	1.39	40.08	1.37	0.62	1.46	±5		
	1800	40.35	1.42	40.00	1.40	0.88	1.43	±5		
	1830	40.38	1.39	40.00	1.40	0.95	-0.71	±5		
	1852	40.41	1.42	40.00	1.40	1.02	1.43	±5		
	1860	40.45	1.44	40.00	1.40	1.13	2.86	±5		
	2412	39.95	1.75	39.27	1.77	1.73	-1.13	±5	21.3	2022.2.10
	2437	39.38	1.77	39.22	1.79	0.41	-1.12	±5		
	2450	39.48	1.84	39.20	1.80	0.71	2.22	±5		
	2462	39.59	1.85	39.22	1.79	0.94	3.35	±5		
	2402	39.32	1.77	39.29	1.76	0.08	0.57	±5	21.7	2022.3.11
	2441	39.35	1.78	39.22	1.79	0.33	-0.56	±5		
	2450	39.29	1.82	39.20	1.80	0.23	1.11	±5		

	2480	39.15	1.86	39.16	1.83	-0.03	1.64	±5		
	5200	36.62	4.83	35.99	4.66	1.75	3.65	±5	21.3	2022.2.10
	5250	36.28	4.81	35.93	4.71	0.97	2.12	±5		
	5260	36.73	4.78	35.92	4.72	2.26	1.27	±5		
	5300	36.18	4.83	35.87	4.76	0.86	1.47	±5		
	5500	36.15	4.89	35.64	4.96	1.43	-1.41	±5	20.9	2022.2.11
	5550	36.09	4.90	35.59	5.01	1.40	-2.20	±5		
	5600	36.50	4.92	35.53	5.07	2.73	-2.96	±5		
	5750	36.15	5.12	35.36	5.22	2.23	-1.92	±5	20.9	2022.2.11
	5800	36.08	5.16	35.30	5.27	2.21	-2.09	±5		
	5825	35.94	5.22	35.27	5.30	1.90	-1.51	±5		

10.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHZ) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, 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).
- For zoom scan, Δx_{zoom}, Δy_{zoom}≤ 2GHz - ≤8mm, 2-4GHz - ≤5 mm and 4-6 GHz-≤4mm; Δz_{zoom} ≤3GHz - ≤5 mm, 3-4 GHz- ≤4mm and 4-6GHz-≤2mm.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

T.S. Liquid		Measured Results		Target (Ref. value)	Delta (%)	Limit (%)	Temp. (℃)	Test Date
		Zoom Scan (W/Kg)	Normalize to 1W (W/Kg)					
Head 750	1-g	2.130	8.52	8.50	0.24	±10	20.9	2022.2.14
	10-g	1.400	5.60	5.61	-0.18	±10		
Head 750	1-g	2.140	8.56	8.50	0.71	±10	21.8	2022.2.15
	10-g	1.400	5.60	5.61	-0.18	±10		
Head 835	1-g	2.290	9.16	9.64	-4.98	±10	20.4	2022.2.12
	10-g	1.480	5.92	6.26	-5.43	±10		
Head 835	1-g	2.400	9.60	9.64	-0.41	±10	20.9	2022.2.14
	10-g	1.550	6.20	6.26	-0.96	±10		
Head 835	1-g	2.350	9.40	9.64	-2.49	±10	21.3	2022.2.16
	10-g	1.540	6.16	6.26	-1.60	±10		
Head 1800	1-g	8.950	35.80	38.70	-7.49	±10	21.5	2022.2.8
	10-g	4.650	18.60	19.90	-6.53	±10		
Head 1800	1-g	9.570	38.28	38.70	-1.09	±10	21.5	2022.2.12
	10-g	5.030	20.12	19.90	1.11	±10		
Head 1800	1-g	9.090	36.36	38.70	-6.05	±10	20.4	2022.2.16
	10-g	4.730	18.92	19.90	-4.92	±10		
Head 2450	1-g	12.900	51.60	53.20	-3.01	±10	21.3	2020.2.10
	10-g	5.960	23.84	24.20	-1.49	±10		
Head 2450	1-g	13.100	52.40	53.20	-1.50	±10	21.7	2020.3.11
	10-g	6.040	24.16	24.20	-0.17	±10		
Head 5250	1-g	8.320	83.20	77.90	6.80	±10	21.3	2020.2.10
	10-g	2.380	23.80	22.60	5.31	±10		
Head 5600	1-g	7.710	77.10	80.90	-4.70	±10	20.9	2022.2.11
	10-g	2.200	22.00	23.30	-5.58	±10		
Head 5750	1-g	7.780	77.80	78.30	-0.64	±10	20.9	2022.2.11
	10-g	2.210	22.10	22.40	-1.34	±10		

11. Measured and Reported (Scaled) SAR Results

General Notes:

1) As per KDB447498 D01, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.
2) As 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:
   ● ≤ 0.8W/kg for 1-g or 2.0W/kg for 10-g respectively, when the transmission band is ≤ 100MHz.
   ● ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
   ● ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.
   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) As 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) As per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for detailed SAR plots).
5) Additional SAR tests in simultaneous transmission fixed power reduction scenario are also tested in some frequency bands and required test positions for the SAR worst case, which are only used to ensure simultaneous transmission SAR test exclusion. The standalone SAR compliance still uses the SAR results tested at the maximum output power level.
6) As per KDB 648474 D04, Phones with built-in NFC functions do not require separate SAR testing and can generally be tested according to the SAR measurement procedures normally required for the phone. Influences of the hardware introduced by the built-in NFC functions are inherently considered through testing of the other transmitters that require SAR.

UMTS Notes:

1) As per KDB941225 D01, when the maximum output power and tune-up tolerance specified for production units in a Second 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 Second to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the Second mode.

LTE Notes:

1) The LTE test configurations are determined according to KDB941225 D05. The general test procedures used for SAR testing can be found in Section 8.3.
2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames(maximum TTI)

Wi-Fi Notes:

As per KDB248227 D01:

1) When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.
2) 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.

11.1. SAR Test Results of WCDMA Band 2.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
Back Surface	12.2kbps RMC	9262	23.5	23.06	0.298	0.09	0.330
Front Surface	12.2kbps RMC	9262	23.5	23.06	0.240	0.05	0.266
Left Edge	12.2kbps RMC	9262	23.5	23.06	0.298	0.03	0.330
Right Edge	12.2kbps RMC	9262	23.5	23.06	0.066	0.02	0.073
Bottom Edge	12.2kbps RMC	9262	23.5	23.06	0.764	0.19	**0.845**
Bottom Edge	12.2kbps RMC	9400	23.5	22.93	0.668	0.07	0.762
Bottom Edge	12.2kbps RMC	9538	23.5	23.05	0.693	0.20	0.769
Repeated for WCDMA B2							
Bottom Edge	12.2kbps RMC	9262	23.5	23.06	0.736	0.07	0.814

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	12.2kbps RMC	9262	23.5	23.06	1.220	0.10	**1.350**

11.2. SAR Test Results of WCDMA Band 4

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
Back Surface	12.2kbps RMC	1312	23.5	23.19	0.359	0.13	0.386
Front Surface	12.2kbps RMC	1312	23.5	23.19	0.312	0.19	0.335
Left Edge	12.2kbps RMC	1312	23.5	23.19	0.291	0.05	0.313
Right Edge	12.2kbps RMC	1312	23.5	23.19	0.083	0.01	0.089
Bottom Edge	12.2kbps RMC	1312	23.5	23.19	0.850	0.02	0.913
Bottom Edge	12.2kbps RMC	1413	23.5	22.88	0.811	0.20	0.935
Bottom Edge	12.2kbps RMC	1513	23.5	22.90	0.922	0.03	**1.059**
Repeated for WCDMA B4							
Bottom Edge	12.2kbps RMC	1513	23.5	22.90	0.912	0.03	1.047

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	12.2kbps RMC	1513	23.5	22.90	1.620	0.06	**1.860**

11.3. SAR Test Results of WCDMA Band 5

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
Back Surface	12.2kbps RMC	4233	24.0	23.92	0.227	0.00	0.231
Front Surface	12.2kbps RMC	4233	24.0	23.92	0.219	-0.19	0.223
Left Edge	12.2kbps RMC	4233	24.0	23.92	0.102	0.03	0.104
Right Edge	12.2kbps RMC	4233	24.0	23.92	0.269	0.04	0.274
Bottom Edge	12.2kbps RMC	4233	24.0	23.92	0.401	0.02	**0.408**
Bottom Edge	12.2kbps RMC	4132	24.0	23.92	0.367	0.03	0.374
Bottom Edge	12.2kbps RMC	4183	24.0	23.92	0.383	0.03	0.390

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	12.2kbps RMC	4233	24.0	23.92	0.662	0.09	**0.674**

11.4. SAR Test Results of LTE B2.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	20M QPSK 1RB#0	18700	23.0	22.56	0.288	0.09	0.319
Front Surface	20M QPSK 1RB#0	18700	23.0	22.56	0.214	0.08	0.237
Left Edge	20M QPSK 1RB#0	18700	23.0	22.56	0.258	0.20	0.286
Right Edge	20M QPSK 1RB#0	18700	23.0	22.56	0.063	0.13	0.069
Bottom Edge	20M QPSK 1RB#0	18700	23.0	22.56	0.652	0.02	**0.722**
50%RB							
Back Surface	20M QPSK 50RB#25	18900	22.0	21.54	0.205	0.06	0.228
Front Surface	20M QPSK 50RB#25	18900	22.0	21.54	0.155	0.10	0.172
Left Edge	20M QPSK 50RB#25	18900	22.0	21.54	0.177	0.01	0.197
Right Edge	20M QPSK 50RB#25	18900	22.0	21.54	0.041	0.15	0.045
Bottom Edge	20M QPSK 50RB#25	18900	22.0	21.54	0.458	0.02	0.509

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	20M QPSK 1RB#0	18700	23.0	22.56	1.120	0.06	**1.239**

11.5. SAR Test Results of LTE B4.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	20M QPSK 1RB#99	20300	22.5	22.39	0.301	-0.02	0.309
Front Surface	20M QPSK 1RB#99	20300	22.5	22.39	0.324	0.16	0.332
Left Edge	20M QPSK 1RB#99	20300	22.5	22.39	0.280	0.13	0.287
Right Edge	20M QPSK 1RB#99	20300	22.5	22.39	0.074	0.03	0.076
Bottom Edge	20M QPSK 1RB#99	20300	22.5	22.39	0.828	0.01	0.849
Bottom Edge	20M QPSK 1RB#49	20050	22.5	22.23	0.785	0.06	0.835
Bottom Edge	20M QPSK 1RB#49	20175	22.5	22.26	0.846	0.07	**0.894**
50%RB							
Back Surface	20M QPSK 50RB#0	20300	21.5	21.30	0.248	0.17	0.260
Front Surface	20M QPSK 50RB#0	20300	21.5	21.30	0.266	0.08	0.279
Left Edge	20M QPSK 50RB#0	20300	21.5	21.30	0.235	0.03	0.246
Right Edge	20M QPSK 50RB#0	20300	21.5	21.30	0.062	0.04	0.065
Bottom Edge	20M QPSK 50RB#0	20300	21.5	21.30	0.610	0.05	0.639
100%RB							
Back Surface	20M QPSK 100RB#0	20050	21.5	21.31	0.256	0.17	0.267
Front Surface	20M QPSK 100RB#0	20050	21.5	21.31	0.270	0.09	0.282
Left Edge	20M QPSK 100RB#0	20050	21.5	21.31	0.227	-0.02	0.237
Right Edge	20M QPSK 100RB#0	20050	21.5	21.31	0.054	0.06	0.057
Bottom Edge	20M QPSK 100RB#0	20050	21.5	21.31	0.627	0.08	0.655
Worst Case repeated							
Bottom Edge	20M QPSK 1RB#49	20175	22.5	22.26	0.814	-0.03	0.860

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	20M QPSK 1RB#49	20175	22.5	22.26	1.510	0.10	**1.596**

11.6. SAR Test Results of LTE B5.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	10M QPSK 1RB#24	20450	24.0	23.58	0.184	-0.20	0.203
Front Surface	10M QPSK 1RB#24	20450	24.0	23.58	0.215	0.08	0.237
Left Edge	10M QPSK 1RB#24	20450	24.0	23.58	0.099	0.04	0.109
Right Edge	10M QPSK 1RB#24	20450	24.0	23.58	0.254	0.08	0.280
Bottom Edge	10M QPSK 1RB#24	20450	24.0	23.58	0.323	0.17	**0.356**
50%RB							
Back Surface	10M QPSK 25RB#0	20525	22.5	22.18	0.160	-0.10	0.172
Front Surface	10M QPSK 25RB#0	20525	22.5	22.18	0.153	-0.15	0.165
Left Edge	10M QPSK 25RB#0	20525	22.5	22.18	0.079	0.14	0.085
Right Edge	10M QPSK 25RB#0	20525	22.5	22.18	0.196	0.09	0.211
Bottom Edge	10M QPSK 25RB#0	20525	22.5	22.18	0.280	0.08	0.301

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Bottom Edge	10M QPSK 1RB#24	20450	24.0	23.58	0.622	0.09	**0.685**

11.7. SAR Test Results of LTE B12.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	10M QPSK 1RB#24	23095	24.0	23.69	0.187	-0.05	0.201
Front Surface	10M QPSK 1RB#24	23095	24.0	23.69	0.153	0.14	0.164
Left Edge	10M QPSK 1RB#24	23095	24.0	23.69	0.118	0.15	0.127
Right Edge	10M QPSK 1RB#24	23095	24.0	23.69	0.227	-0.01	**0.244**
Bottom Edge	10M QPSK 1RB#24	23095	24.0	23.69	0.141	0.09	0.151
50%RB							
Back Surface	10M QPSK 25RB#12	23130	22.5	22.50	0.150	0.05	0.150
Front Surface	10M QPSK 25RB#12	23130	22.5	22.50	0.115	0.09	0.115
Left Edge	10M QPSK 25RB#12	23130	22.5	22.50	0.092	0.09	0.092
Right Edge	10M QPSK 25RB#12	23130	22.5	22.50	0.179	0.20	0.179
Bottom Edge	10M QPSK 25RB#12	23130	22.5	22.50	0.102	0.08	0.102

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Right Edge	10M QPSK 1RB#24	23095	24.0	23.69	0.237	0.18	**0.255**

11.8. SAR Test Results of LTE B13.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	10M QPSK 1RB#24	23230	24.0	23.72	0.168	-0.03	0.179
Front Surface	10M QPSK 1RB#24	23230	24.0	23.72	0.161	0.07	0.172
Left Edge	10M QPSK 1RB#24	23230	24.0	23.72	0.089	0.06	0.095
Right Edge	10M QPSK 1RB#24	23230	24.0	23.72	0.218	0.06	**0.233**
Bottom Edge	10M QPSK 1RB#24	23230	24.0	23.72	0.200	0.01	0.213
50%RB							
Back Surface	10M QPSK 25RB#12	23230	22.5	22.32	0.136	0.09	0.142
Front Surface	10M QPSK 25RB#12	23230	22.5	22.32	0.126	0.20	0.131
Left Edge	10M QPSK 25RB#12	23230	22.5	22.32	0.066	0.13	0.069
Right Edge	10M QPSK 25RB#12	23230	22.5	22.32	0.174	0.09	0.181
Bottom Edge	10M QPSK 25RB#12	23230	22.5	22.32	0.157	0.03	0.164

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Right Edge	10M QPSK 1RB#24	23230	24.0	23.72	0.176	0.15	**0.188**

11.9. SAR Test Results of LTE B17.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)		
1RB							
Back Surface	10M QPSK 1RB#24	23780	24.5	24.04	0.184	0.06	0.205
Front Surface	10M QPSK 1RB#24	23780	24.5	24.04	0.155	-0.09	0.172
Left Edge	10M QPSK 1RB#24	23780	24.5	24.04	0.120	0.17	0.133
Right Edge	10M QPSK 1RB#24	23780	24.5	24.04	0.232	0.18	**0.258**
Bottom Edge	10M QPSK 1RB#24	23780	24.5	24.04	0.127	0.08	0.141
50%RB							
Back Surface	10M QPSK 25RB#12	23780	23.0	22.66	0.153	0.01	0.165
Front Surface	10M QPSK 25RB#12	23780	23.0	22.66	0.119	0.06	0.129
Left Edge	10M QPSK 25RB#12	23780	23.0	22.66	0.092	0.08	0.099
Right Edge	10M QPSK 25RB#12	23780	23.0	22.66	0.180	0.12	0.195
Bottom Edge	10M QPSK 25RB#12	23780	23.0	22.66	0.102	0.06	0.110

Limb SAR base on worse case of body result							
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)		
Right Edge	10M QPSK 1RB#24	23780	24.5	24.04	0.194	0.01	**0.216**

11.10. SAR Test Results of 2.4GHz Wi-Fi.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
Back Surface	802.11b	2412	16.50	16.37	0.097	0.05	98.88	0.101
Front Surface	802.11b	2412	16.50	16.37	0.100	0.03	98.88	0.104
Right Edge	802.11b	2412	16.50	16.37	0.157	0.07	98.88	0.164
Top Edge	802.11b	2412	16.50	16.37	0.148	-0.01	98.88	0.154
Right Edge	802.11b	2437	16.50	15.93	0.115	0.15	98.88	0.133
Right Edge	802.11b	2462	16.50	15.99	0.178	0.10	98.88	**0.202**

Limb SAR base on worse case of body result								
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Power (dBm)	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
Right Edge	802.11b	2462	16.50	15.99	0.365	0.14	98.88	0.415

OFDM mode SAR evaluation exclusion analysis

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	16.5	44.67	0.202	\	\
802.11g	16.5	44.67	\	0.202	Excluded
802.11n20	14	25.12	\	0.114	Excluded
802.11n40	14.5	28.18	\	0.127	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

11.11. SAR Test Results of 5GHz Wi-Fi.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
5.2GHz								
Back Surface	802.11a	5260	16.5	16.10	0.137	0.00	98.55	0.152
Front Surface	802.11a	5260	16.5	16.10	0.211	0.00	98.55	**0.235**
Right Edge	802.11a	5260	16.5	16.10	0.041	0.00	98.55	0.046
Top Edge	802.11a	5260	16.5	16.10	0.109	0.05	98.55	0.121
5.6GHz								
Back Surface	802.11a	5500	16.5	16.47	0.219	0.00	98.55	0.224
Front Surface	802.11a	5500	16.5	16.47	0.531	0.04	98.55	**0.543**
Right Edge	802.11a	5500	16.5	16.47	0.119	0.07	98.55	0.122
Top Edge	802.11a	5500	16.5	16.47	0.241	0.09	98.55	0.246
5.8GHz								
Back Surface	802.11a	5825	17.0	16.67	0.224	0.00	98.55	0.245
Front Surface	802.11a	5825	17.0	16.67	0.264	0.00	98.55	**0.289**
Right Edge	802.11a	5825	17.0	16.67	0.072	0.08	98.55	0.079
Top Edge	802.11a	5825	17.0	16.67	0.242	0.04	98.55	0.265

Limb SAR base on worse case of body result								
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Power (dBm)	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
5.2GHz								
Front Surface	802.11a	5260	16.5	16.10	0.223	0.01	98.55	**0.248**
5.6GHz								
Front Surface	802.11a	5500	16.5	16.47	0.506	0.00	98.55	**0.517**
5.8GHz								
Front Surface	802.11a	5825	17.0	16.67	0.485	-0.03	98.55	**0.531**

Note:

1) When the reported SAR of the initial test configuration is ＞0.8W/kg, SAR measurement is required for subsequent nest highest measured output power channel(s) in the initial test configuration until reported SAR is ≤1.2 W/kg or all required channels are tested.

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-I band

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a-20	16.5	44.67	0.235	\	\
802.11n 20M	14.5	28.18	\	0.148	Excluded
802.11n 40M	15.5	35.48	\	0.187	Excluded
802.11ac 20M	14.5	28.18	\	0.148	Excluded
802.11ac 40M	15.5	35.48	\	0.187	Excluded
802.11ac 80M	14	25.12	\	0.132	Excluded

Note:

1) The 802.11ac40 mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes is not required.

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-2C band

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a-20	16.5	44.67	0.543	\	\
802.11n 20M	15	31.62	\	0.384	Excluded
802.11n 40M	16	39.81	\	0.484	Excluded
802.11ac 20M	15	31.62	\	0.384	Excluded
802.11ac 40M	16	39.81	\	0.484	Excluded
802.11ac 80M	15	31.62	\	0.384	Excluded

Note:

1) The 802.11ac80 mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes is not required.

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-3 band

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a-20	17	50.12	0.289	\	\
802.11n 20M	14.5	28.18	\	0.163	Excluded
802.11n 40M	14.5	28.18	\	0.163	Excluded
802.11ac 20M	14.5	28.18	\	0.163	Excluded
802.11ac 40M	14.5	28.18	\	0.163	Excluded
802.11ac 80M	14	25.12	\	0.145	Excluded

Note:

2) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes is not required.

11.12. SAR Test Results of Bluetooth.

Scenario and Distance (Body Worn 10mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
Back Surface	BT 3DH5	2480	9.00	8.70	0.007	0.04	77.15	0.010
Front Surface	BT 3DH5	2480	9.00	8.70	0.013	-0.06	77.15	0.017
Right Edge	BT 3DH5	2480	9.00	8.70	0.031	0.06	77.15	**0.043**
Top Edge	BT 3DH5	2480	9.00	8.70	0.019	-0.11	77.15	0.026
Right Edge	BT 3DH5	2402	9.00	8.19	0.020	-0.05	77.15	0.030
Right Edge	BT 3DH5	2441	9.00	7.98	0.020	-0.07	77.15	0.033

Limb SAR base on worse case of body result								
Scenario and Distance (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Power (dBm)	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
Right Edge	BT 3DH5	2480	9.00	8.70	0.057	-0.20	77.15	0.078

12. Simultaneous Transmission SAR Analysis

According to FCC OET KDB447498 D01, when the sum of 1g SAR for all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

12.1. Simultaneous Transmission combination.

NO.	Combination	Scenario	
		Body-worn	Extremity
1	UMTS+2.4GHz Wi-Fi	√	√
2	UMTS+5GHz Wi-Fi	√	√
3	UMTS+BT	√	√
4	LTE+2.4GHz Wi-Fi	√	√
5	LTE+5GHz Wi-Fi	√	√
6	LTE+BT	√	√

Note:
1) "√" indicates exist, "×" indicates inexistence.

12.2. Highest Reported SAR

WCDMA Highest Reported SAR (1-g) (W/kg) For Body worn				
Test Position	WCDMA Band II	WCDMA Band IV	WCDMA Band V	$WCDMA_{MAX}$
Back Surface	0.330	0.386	0.231	0.386
Front Surface	0.266	0.335	0.223	0.335
Left Edge	0.330	0.313	0.104	0.330
Right Edge	0.073	0.089	0.274	0.274
Top Edge	/	/	/	/
Bottom Edge	0.845	1.059	0.408	1.059
WCDMA Highest Reported SAR (10-g) (W/kg) for Limb				
Test Position	WCDMA Band II	WCDMA Band IV	WCDMA Band V	$WCDMA_{MAX}$
/	1.350	1.860	0.674	1.860

LTE Highest Reported SAR (1-g) (W/kg) For Body worn							
Test Position	LTE B2	LTE B4	LTE B5	LTE B12	LTE B13	LTE B17	LTE_{MAX}
Back Surface	0.319	0.309	0.203	0.201	0.179	0.205	0.319
Front Surface	0.237	0.332	0.237	0.164	0.172	0.172	0.332
Left Edge	0.286	0.287	0.109	0.127	0.095	0.133	0.286
Right Edge	0.069	0.076	0.280	0.244	0.233	0.258	0.280
Top Edge	/	/	/	/	/	/	/
Bottom Edge	0.722	0.894	0.356	0.151	0.213	0.141	0.894
LTE Highest Reported SAR (10-g) (W/kg) for Limb							
Test Position	LTE B2	LTE B4	LTE B5	LTE B12	LTE B13	LTE B17	LTE_{MAX}
/	1.239	1.596	0.685	0.255	0.188	0.216	1.596

2.4GHz Wi-Fi Highest Reported SAR (1-g) (W/kg) For Body worn	
Test Position	2.4GHz Wi-Fi
Back Surface	0.101
Front Surface	0.104
Left Edge	/
Right Edge	0.202
Top Edge	0.154
Bottom Edge	/
2.4GHz Wi-Fi Highest Reported SAR (10-g) (W/kg) for Limb	
Test Position	2.4GHz Wi-Fi
Right Edge	0.415

5GHz Wi-Fi Highest Reported SAR (1-g) (W/kg) For Body worn				
Test Position	UNII-1	UNII-2C	UNII-3	5GHz Wi-Fi$_{max}$
Back Surface	0.152	0.224	0.245	0.245
Front Surface	0.235	0.543	0.289	0.543
Left Edge	/	/	/	/
Right Edge	0.046	0.122	0.079	0.122
Top Edge	0.121	0.246	0.265	0.265
Bottom Edge	/	/	/	/
5GHz Wi-Fi Highest Reported SAR (10-g) (W/kg) for Limb				
Test Position	UNII-1	UNII-2C	UNII-3	5GHz Wi-Fi$_{max}$
Front Surface	0.248	0.517	0.531	0.531

BT Highest Reported SAR (1-g) (W/kg) For Body worn	
Test Position	BT
Back Surface	0.010
Front Surface	0.017
Left Edge	/
Right Edge	0.043
Top Edge	0.026
Bottom Edge	/
BT Highest Reported SAR (10-g) (W/kg) For Limb	
Test Position	BT
/	0.078

12.3. Simultaneous Transmission calculation.

Simultaneous Transmission Combination 1 For Body worn				
Test Position	$WCDMA_{MAX}$	2.4GHz Wi-Fi	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.386	0.101	0.487	1.6
Front Surface	0.335	0.104	0.439	
Left Edge	0.330	/	0.330	
Right Edge	0.274	0.202	0.476	
Top Edge	/	0.154	0.154	
Bottom Edge	1.059	/	1.059	

Simultaneous Transmission Combination 1 For Limb				
Test Position	$WCDMA_{MAX}$	2.4GHz Wi-Fi	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.86	0.415	2.275	4

Simultaneous Transmission Combination 2 For Body worn				
Test Position	$WCDMA_{MAX}$	5GHz $Wi\text{-}Fi_{max}$	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.386	0.245	0.631	1.6
Front Surface	0.335	0.543	0.878	
Left Edge	0.330	/	0.330	
Right Edge	0.274	0.122	0.396	
Top Edge	/	0.265	0.265	
Bottom Edge	1.059	/	1.059	

Simultaneous Transmission Combination 2 For Limb				
Test Position	$WCDMA_{MAX}$	5GHz Wi-Fi	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.86	0.531	2.391	4

Simultaneous Transmission Combination 3 Body worn				
Test Position	$WCDMA_{MAX}$	BT	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.386	0.010	0.396	1.6
Front Surface	0.335	0.017	0.352	
Left Edge	0.330	/	0.330	
Right Edge	0.274	0.043	0.317	
Top Edge	/	0.026	0.026	
Bottom Edge	1.059	/	1.059	

Simultaneous Transmission Combination 3 For Limb				
Test Position	$WCDMA_{MAX}$	BT	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.86	0.078	1.938	4

Simultaneous Transmission Combination 4 For Body worn				
Test Position	LTE_{MAX}	2.4GHz Wi-Fi	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.319	0.101	0.42	1.6
Front Surface	0.332	0.104	0.436	
Left Edge	0.286	/	0.286	
Right Edge	0.280	0.202	0.482	
Top Edge	/	0.154	0.154	
Bottom Edge	0.894	/	0.894	

Simultaneous Transmission Combination 4 For Limb				
Test Position	LTE_{MAX}	2.4GHz Wi-Fi	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.596	0.415	2.011	4

Simultaneous Transmission Combination 5 For Body worn				
Test Position	LTE_{MAX}	5GHz $Wi\text{-}Fi_{max}$	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.319	0.245	0.564	1.6
Front Surface	0.332	0.543	0.875	
Left Edge	0.286	/	0.286	
Right Edge	0.280	0.122	0.402	
Top Edge	/	0.265	0.265	
Bottom Edge	0.894	/	0.894	

Simultaneous Transmission Combination 5 For Limb				
Test Position	LTE_{MAX}	5Hz Wi-Fi	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.596	0.531	2.127	4

Simultaneous Transmission Combination 6 For Body worn				
Test Position	LTE_{MAX}	BT	∑SAR 1-g (W/kg)	Limit (W/kg)
Back Surface	0.319	0.010	0.329	1.6
Front Surface	0.332	0.017	0.349	
Left Edge	0.286	/	0.286	
Right Edge	0.280	0.043	0.323	
Top Edge	/	0.026	0.026	
Bottom Edge	0.894	/	0.894	

Simultaneous Transmission Combination 6 For Limb				
Test Position	LTE_{MAX}	BT	∑SAR 10-g (W/kg)	Limit (W/kg)
/	1.596	0.078	1.674	4

Note:
1) Because the maximum SUM 1-g SAR ≤ 1.6 W/Kg, so the SPLSR analysis is not required.
2) Because the maximum SUM 10-g SAR ≤ 4 W/Kg, so the SPLSR analysis is not required.

Appendixes

Refer to separated files for the following appendixes.

4790087823-SAR-1_APP A Conducted Power

4790087823-SAR-1_App B Photo

4790087823-SAR-1_App C System Check Plots

4790087823-SAR-1_App D Highest Test Plots

4790087823-SAR-1_App E Cal. Certificates

---------End of Report---------