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SAR CHAR REPORT

Applicant Name: **SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea	**Date of Issue: Nov. 29, 2023** **Test Report No.: HCT-SR-2311-FC005** **Test Site: HCT CO., LTD.**

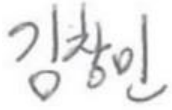
FCC ID: **A3LSMA256U**

Report Type:	**SAR Characterization**
Equipment Type:	**Mobile Phone**
Model Name:	**SM-A256U**
Additional Model Name:	**SM-A256U1/DS, SM-S256VL**

This device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in FCC KDB procedures and had been tested in accordance with the measurement procedures specified in FCC KDB procedures.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By



Chang-Min, Kim
Test Engineer
SAR Team
Certification Division

Reviewed By

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REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Nov. 29, 2023	Initial Release

This test results were applied only to the test methods required by the standard.

Table of Contents

1. Test Location

1.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Telephone	031-645-6300
Fax.	031-645-6401

1.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

2. DEVICE UNDER TEST

2.1 General Information of the DUT

Device Wireless specification overview		
Band & Mode	**Operating Mode**	**Tx Frequency**
GSM850	Voice / Data	824.2 ㎒ ~ 848.8 ㎒
GSM1900	Voice / Data	1 850.2 ㎒ ~ 1 909.8 ㎒
UMTS Band 5	Voice / Data	826.4 ㎒ ~ 846.6 ㎒
UMTS Band 4	Voice / Data	1 712.4 ㎒ ~ 1 752.6 ㎒
UMTS Band 2	Voice / Data	1 852.4 ㎒ ~ 1 907.6 ㎒
LTE Band 2 (PCS)	Voice / Data	1 850.7 ㎒ ~ 1 909.3 ㎒
LTE Band 4 (AWS)	Voice / Data	1 710.7 ㎒ ~ 1 754.3 ㎒
LTE Band 5 (Cell)	Voice / Data	824.7 ㎒ ~ 848.3 ㎒
LTE Band 7	Voice / Data	2 502.5 ㎒ ~ 2 567.5 ㎒
LTE Band 12	Voice / Data	699.7 ㎒ ~ 715.3 ㎒
LTE Band 13	Voice / Data	779.5 ㎒ ~ 784.5 ㎒
LTE Band 14	Voice / Data	790.5 ㎒ ~ 795.5 ㎒
LTE Band 25	Voice / Data	1 850.7 ㎒ ~ 1 914.3 ㎒
LTE Band 26	Voice / Data	814.7 ㎒ ~ 848.3 ㎒
LTE Band 30	Voice / Data	2 307.5 ㎒ ~ 2 312.5 ㎒
LTE TDD Band 38	Voice / Data	2 572.5 ㎒ ~ 2 617.5 ㎒
LTE TDD Band 41	Voice / Data	2 498.5 ㎒ ~ 2 687.5 ㎒
LTE TDD Band 48	Voice / Data	3 552.5 ㎒ ~ 3697.5 ㎒
LTE Band 66 (AWS)	Voice / Data	1 710.7 ㎒ ~ 1 779.3 ㎒
LTE Band 71	Voice / Data	665.5 ㎒ ~ 695.5 ㎒
NR Band n2	Voice / Data	1 852.5 ㎒ ~ 1 907.5 ㎒
NR Band n5	Voice / Data	826.5 ㎒ ~ 846.5 ㎒
NR Band n25	Voice / Data	1 852.5 ㎒ ~ 1 912.5 ㎒
NR Band n30	Voice / Data	2 307.5 ㎒ ~ 2 312.5 ㎒
NR Band n41	Voice / Data	2 506.02 ㎒ ~ 2 679.99 ㎒
NR Band n48	Voice / Data	3 555 ㎒ ~ 3 694.98 ㎒
NR Band n66	Voice / Data	1 712.5 ㎒ ~ 1 777.5 ㎒
NR Band n70	Voice / Data	1 695 ㎒ ~ 1 710 ㎒
NR Band n71	Voice / Data	665.5 ㎒ ~ 695.5 ㎒
NR Band n77	Voice / Data	3 705 ㎒ ~ 3 975 ㎒
NR Band n77 (DoD)	Voice / Data	3 455.04 ㎒ ~ 3 544.98 ㎒
U-NII-1	Voice / Data	5 180 ㎒ ~ 5 240 ㎒
U-NII-2A	Voice / Data	5 260 ㎒ ~ 5 320 ㎒
U-NII-2C	Voice / Data	5 500 ㎒ ~ 5 720 ㎒
U-NII-3	Voice / Data	5 745 ㎒ ~ 5 825 ㎒
2.4 ㎓ WLAN	Voice / Data	2 412 ㎒ ~ 2 472 ㎒
Bluetooth / LE 5.3	Data	2 402 ㎒ ~ 2 480 ㎒
NFC	Data	13.56 ㎒

2.2 Introduction of SAR compliance test with TAS algorithm

FCC RF exposure limit is based on time –averaged RF exposure. Both SAR regulatory specifications are defined over certain measurement duration allowing for time-averaging. The Samsung S.LSI proprietary TAS (Time Average SAR) algorithm has been designed to meet the compliance limits over the required duration, while still allowing dynamic control of transmit power to satisfy the performance of the system.

This test report shows SAR characterization of sub 6 GHz. The characterization is achieved by determination of Plimit.

This feature performs time averaging SAR algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time.
The WLAN/BT mode is not controlled by The Samsung S.LSI proprietary TAS (Time Average SAR) algorithm.

SAR Characterization confirms that Plimit in the 2G/3G/4G/5G communication mode declared by the manufacturer satisfies SAR_target.

The compliance test under the static transmission scenario and simultaneous transmission analysis are reported in SAR report for Sub 6GHz. The validation of The Samsung S.LSI proprietary TAS (Time Average SAR) algorithm and compliance under the time- varying transmission scenario for WWAN technologies are reported in TAS Validation report

Term	Description
Plimit	The Time-averaged RF power that corresponds to SAR_target.
Pmax	Maximum Tx power tha can be transmitted physically from RFIC for a given RAT.
SAR_target	Target SAR level used in TAS algorithm. This SAR value should be less than FCC limit and should be determined after accounting for all uncertainties and other design considerations.
SAR_FCC_Limit	SAR Limit specified by FCC 1.6 W/kg averaged over 1g , for head and body exposure, and 4W/kg averaged over 10g, for Phablet SAR.
SAR Characterization	Characterization of SAR value for Sub 6 technology..

Note :
This report is revised due to changes in the Plimit values of NR TDD Band n41 Power Class 3, 2, and NR TDD Band n48. More detail information is specified in the manufacturer’s technical documentation.

3. SAR MEASUREMENTS

3.1 SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right)$$

SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \sigma E^2 / \rho$$

Where:
σ = conductivity of the tissue-simulant material (S/m)
ρ = mass density of the tissue-simulant material (kg/㎥)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

3.2 SAR Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no more than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the DUT's head and body area and the horizontal grid resolution was depending on the FCC KDB 865664 D01v01r04 (see table 3-1) & IEEE 1528-2013.

2. Based on step, the area of the maximum absorption was determined by sophisticated interpolations routines implemented in DASY software. When an Area Scan has measured all reachable point. DASY system computes the field maximal found in the scanned are, within a range of the maximum. SAR at this fixed point was measured and used as a reference value.

3. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB 865664 D01v01r04 table 4-1 and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (reference from the DASY manual.)

   a. The data at the surface were extrapolated, since the center of the dipoles is no more than 2.7 mm away from the tip of the probe (it is different from the probe type) and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan. If the value changed by more than 5 %, the SAR evaluation and drift measurements were repeated.

Table 3-1

Frequency	Maximum Area Scan Resolution(mm) (Δxarea, Δyarea)	Maximum Zoom Scan Resolution (mm) (Δxzoom, Δyzoom)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			Δzzoom(n)	Δzzoom(1)*	Δzzoom(n>1)*	
≤2 GHz	≤15	≤8	≤5	≤4	≤1.5*Δzzoom(n-1)	≥30
2-3 GHz	≤12	≤5	≤5	≤4	≤1.5*Δzzoom(n-1)	≥30
3-4 GHz	≤12	≤5	≤4	≤3	≤1.5*Δzzoom(n-1)	≥28
4-5 GHz	≤10	≤4	≤3	≤2.5	≤1.5*Δzzoom(n-1)	≥25
5-6 GHz	≤10	≤4	≤2	≤2	≤1.5*Δzzoom(n-1)	≥22

Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

4. SAR CHACTERIZATION.

It should be confirmed that Plimit and SAR_target applied by OEM to device in SAR characterization satisfy within the uncertainty of device through SAR measurement.

4.1 Design target for TAS

SAR_target is determined by ensuring that it is less than FCC SAR limit after accounting for total device designed related uncertainties specified by the manufacturer.

SAR_target			
$SAR\_target < FCC\_SAR\_limit \times 10^{-Total\ Uncertainty/10}$			
1g SAR (W/kg)		**10g SAR (W/kg)**	
Total Uncertainty	1.0 dB	Total Uncertainty	1.0 dB
FCC_SAR_limit	1.6 W/kg	FCC_SAR_limit	4.0 W/kg
SAR_target	1.0 W/kg	SAR_target	2.5 W/kg

This device use differennt Radio SAR Index[RSI] to configure different Plimit based on certan exposure configurations for each 2G/3G/4G/5G wireless mode

Radio SAR Indicator (RSI)	Configuration
0	1.Body Worn SAR 2. Phablet SAR measured at Free Power 3. Phablet SAR measured at 16 ,4 and 12 mm spacing for back, front, bottom respectively 4. Phablet SAR measured at 0 mm for Top,Left and Right surfaces
1&2	Phablet SAR condition in which the grip sensor in the wireless mode is activated at 0 mm for back, front and bottom surfaces. Ear jack inseted mode.
3	Hotspot SAR conditions in wireless mode. at 10 mm
4	Head SAR conditions in wireless mode.

SAR test results corresponding to Pmax for each antenna/technology/band/RSI can be found in Appendix A. Plimit is calculated by linearly scaling with the measured SAR at the Pmax to correspond to the SAR_target.

Plim values in green indicate Plimit < Pmax			Plim values in grey indicate Plim > Pmax						
Plimit corresponding to 1 W/kg (1g) 2.5W/kg(10g) SAR_Design_target							Pmax	Pmax	
SAR Exposure Position			Body-worn/ Phablet(Free)	Head (RCV ON)	Hotspot (Hotspot on)	Phablet (Grip On) /Earjack	Maximum Tune-up Output Power (Burst Average Power) [dBm]	Maximum Tune-up Output Power (Frame Averaged Power) [dBm]	UL:DL Ratio
Averaging volume			1g/10g	1g	1g	10g			
seperation Distance			15 mm/ 16mm,4mm,12mm	0 mm	10 mm	0 mm			
Mode	Band	Antenna	RSI=0	RSI=4	RSI=3	RSI=1,2			
GSM/GPRS/EDGE	850	MAIN 1	27.4	29.4	20.7	20.7	29.0	24.7	37.5%
GSM/GPRS/EDGE	1900	MAIN 2	27.2	30.2	19.0	19.0	25.0	22.0	50.0%
UMTS	2	MAIN 2	26.8	28.0	20.5	20.5	24.0	24.0	100%
UMTS	4	MAIN 2	27.4	29.0	20.5	20.5	24.0	24.0	100%
UMTS	5	MAIN 1	29.6	29.9	24.9	27.2	24.5	24.5	100%
LTE FDD	2	MAIN 3	21.0	21.0	21.0	21.0	24.5	24.5	100%
LTE FDD	5	MAIN 1	28.5	29.5	26.7	28.6	24.5	24.5	100%
LTE FDD	7	MAIN 2	26.4	28.7	21.0	21.0	23.5	23.5	100%
LTE FDD	12	MAIN 1	30.7	32.8	31.3	28.4	24.5	24.5	100%
LTE FDD	13	MAIN 1	28.5	30.8	29.5	30.1	23.5	23.5	100%
LTE FDD	14	MAIN 1	29.7	31.0	28.1	30.6	23.5	23.5	100%
LTE FDD	25(2)	MAIN 2	28.0	30.2	21.5	21.5	24.0	24.0	100%
LTE FDD	26	MAIN 1	28.9	29.9	27.0	29.1	24.5	24.5	100%
LTE FDD	30	MAIN 2	28.5	30.0	21.0	21.0	23.0	23.0	100%
LTE TDD PC3	41(38)	MAIN 2	28.2	28.6	17.5	17.5	24.5	22.5	63.3%
LTE TDD PC3	41 ULCA	MAIN 2	27.8	28.5	17.5	17.5	23.5	21.5	63.3%
LTE TDD PC2	41	MAIN 2	27.7	28.9	17.9	17.9	26.0	22.4	43.3%
LTE TDD PC3	48	SUB 3	18.0	14.0	18.0	18.0	22.0	20.0	63.3%
LTE TDD PC3	48 ULCA	SUB 3	18.0	14.0	18.0	18.0	22.0	20.0	63.3%
LTE FDD	66(4)	MAIN 2	29.0	30.3	21.5	21.5	24.0	24.0	100%
LTE FDD	66(4)	MAIN 3	21.0	21.0	21.0	21.0	24.5	24.5	100%
LTE FDD	71	MAIN 1	30.9	32.3	28.4	28.9	23.5	23.5	100%
NR FDD	5	MAIN 1	28.7	29.8	26.3	28.1	24.5	24.5	100%
NR FDD	25(2)	MAIN 2	28.7	29.8	20.5	20.5	23.5	23.5	100%
NR FDD	30	MAIN 2	28.8	29.6	21.0	21.0	23.0	23.0	100%
NR TDD PC3	41	MAIN 2	25.6	26.8	17.0	17.0	23.0	23.0	100%
NR TDD PC2	41	MAIN 2	26.8	28.0	17.0	17.0	25.5	25.5	100%
NR TDD	48	SUB 3	17.0	13.5	17.0	17.0	17.0	17.0	100%
NR TDD SRS 1	48	MAIN 2	13.0	13.0	13.0	13.0	18.5	18.5	100%
NR TDD SRS 2	48	SUB 2	13.0	13.0	13.0	13.0	18.5	18.5	100%
NR TDD SRS 3	48	SUB 5	13.0	13.0	13.0	13.0	18.5	18.5	100%
NR FDD	66	MAIN 2	29.4	30.8	21.0	21.0	23.5	23.5	100%
NR FDD	70	MAIN 2	29.6	31.8	21.5	21.5	24.0	24.0	100%
NR FDD	71	MAIN 1	29.8	31.7	28.3	29.1	24.0	24.0	100%
NR TDD SRS 0 PC3	77	SUB 3	18.0	16.0	18.0	18.0	23.0	23.0	100%
NR TDD SRS 1	77	MAIN 2	13.5	13.5	13.5	13.5	21.5	21.5	100%
NR TDD SRS 2	77	SUB 2	12.5	12.5	12.5	12.5	20.5	20.5	100%
NR TDD SRS 3	77	SUB 5	12.5	12.5	12.5	12.5	20.0	20.0	100%
NR TDD SRS 0 PC2	77	SUB 3	18.0	16.0	18.0	18.0	25.5	25.5	100%
NR TDD SRS 1	77	MAIN 2	13.5	13.5	13.5	13.5	21.5	21.5	100%
NR TDD SRS 2	77	SUB 2	12.5	12.5	12.5	12.5	20.5	20.5	100%
NR TDD SRS 3	77	SUB 5	12.5	12.5	12.5	12.5	20.0	20.0	100%
NR TDD SRS 0 PC3	77 DoD	SUB 3	18.0	16.0	18.0	18.0	23.0	23.0	100%
NR TDD SRS 1	77 DoD	MAIN 2	13.5	13.5	13.5	13.5	21.5	21.5	100%
NR TDD SRS 2	77 DoD	SUB 2	12.5	12.5	12.5	12.5	20.5	20.5	100%
NR TDD SRS 3	77 DoD	SUB 5	12.5	12.5	12.5	12.5	20.0	20.0	100%
NR TDD SRS 0 PC2	77 DoD	SUB 3	18.0	16.0	18.0	18.0	25.5	25.5	100%
NR TDD SRS 1	77 DoD	MAIN 2	13.5	13.5	13.5	13.5	21.5	21.5	100%
NR TDD SRS 2	77 DoD	SUB 2	12.5	12.5	12.5	12.5	20.5	20.5	100%
NR TDD SRS 3	77 DoD	SUB 5	12.5	12.5	12.5	12.5	20.0	20.0	100%

Note :
1. Radio SAR indicator (RSI) in the table above means the SAR test configuration of each mobile communication technology.
2. WLAN/BT mode are not controlled by The Samsung S.LSI proprietary TAS (Time Average SAR) algorithm.
2. Plimit and Tune up output power Pmax above table correspond to average power level accounting for duty cycle in the case of TDD Modulation schemes (LTE TDD)
3. Maximum tune up output Power Pmax is used to configure DUT during RF tune up procedure. The maximum allowed output power is equal to Tune up power +1 dB device design uncertainty.
4. Compared with the Plimit (Tune up Powers) declared in each RSI by the manufacturer and the Plimit (calculation) calculated by the SAR measurement of each RSI, the lower power is applied to the DUT as the Plimit at each RSI configurations.
5. when Hotspot Mode (RSI=3), Grip sensor (RSI=2) and Ear-jack mode(RSI=1) are triggered at the same time, RSI =4(RCV) takes higher priority. The Priority for power reduction was given in the order of hotspot(RSI=3), ear-jack.(RSI=1), and grip (RSI=2).

5. SAR Test Equipment

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
SPEAG	ELI Phantom	-	N/A	N/A	N/A
HP	SAR System Control PC	-	N/A	N/A	N/A
Staubli	CS9spe-TX2-60	F/21/0029002/C/001	N/A	N/A	N/A
Staubli	CS9spe-TX2-60	F/21/0029145/C/001	N/A	N/A	N/A
Staubli	TX2-60 Lspeag	F/21/0029002/A/001	N/A	N/A	N/A
Staubli	TX2-60 Lspeag	F/21/0029145/A/001	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D21144507C	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D21144507C	N/A	N/A	N/A
TESTO	608-H1/Thermometer	83239085	10/24/2023	Annual	10/24/2024
TESTO	608-H1/Thermometer	83348028	03/27/2023	Annual	03/27/2024
SPEAG	DAE4	648	04/25/2023	Annual	04/25/2024
SPEAG	DAE4	1417	03/01/2023	Annual	03/01/2024
SPEAG	E-Field Probe EX3DV4	3797	01/24/2023	Annual	01/24/2024
SPEAG	E-Field Probe EX3DV4	3968	09/27/2023	Annual	09/27/2024
SPEAG	Dipole D2600V2	1106	05/24/2023	Annual	05/24/2024
SPEAG	Dipole D3500V2	1040	01/22/2023	Annual	01/22/2024
Agilent	Power Meter E4419B	MY41291386	09/21/2023	Annual	09/21/2024
Agilent	Power Meter N1911A	MY45101406	05/26/2023	Annual	05/26/2024
Agilent	Power Sensor 8481A	SG1091286	09/21/2023	Annual	09/21/2024
Agilent	Power Sensor 8481A	MY41090675	09/21/2023	Annual	09/21/2024
Agilent	Power Sensor N1921A	MY55220026	07/28/2023	Annual	07/28/2024
SPEAG	DAKS 3.5	1038	01/25/2023	Annual	01/25/2024
SPEAG	DAKS_VNA R140	0141013	02/13/2023	Annual	02/13/2024
Agilent	11636B/Power Divider	58698	01/26/2023	Annual	01/26/2024
OSI	Power Divider	#1	05/26/2023	Annual	05/26/2024
OSI	Power Divider	#2	05/26/2023	Annual	05/26/2024
OSI	Power Divider	#3	05/26/2023	Annual	05/26/2024
OSI	Power Divider	#4	05/26/2023	Annual	05/26/2024
OSI	Power Divider	#5	05/26/2023	Annual	05/26/2024
Agilent	SIGNAL GENERATOR N5182A	MY47070230	03/23/2023	Annual	03/23/2024
EMPOWER	RF Power Amplifier	1084	05/26/2023	Annual	05/26/2024
EMPOWER	RF Power Amplifier	1011	09/21/2023	Annual	09/21/2024
MICRO LAB	LP Filter / LA-30N	-	09/21/2023	Annual	09/21/2024
MICRO LAB	LP Filter / LA-60N	32011	09/21/2023	Annual	09/21/2024
HP	Attenuator (3dB) 333340A	02427	08/22/2023	Annual	08/22/2024
HP	Attenuator (20dB) 8493C	09271	08/22/2023	Annual	08/22/2024
Aeroflex/Weinschel	Fixed Coaxial Attenuator (30dB)	CE6106	11/15/2022	Annual	11/15/2023
Aeroflex/Weinschel	Fixed Coaxial Attenuator (30dB)	CE6106	11/15/2023	Annual	11/15/2024
Agilent	Directional Bridge 86205A	3140A04581	04/25/2023	Annual	04/25/2024
Agilent	MXA Signal Analyzer N9020A	MY50510407	06/07/2023	Annual	06/07/2024
Anritsu	Radio Communication Test Station MT8000A	6261987928	01/25/2023	Annual	01/25/2024
Anritsu	Radio Communication Test Station MT8000A	6261967108	04/25/2023	Annual	04/25/2024

6. Measurement Uncertainty

The measured SAR was <1.5 W/Kg for 1g SAR and <3.75 W/Kg For 10g SAR for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE1528-2013 was not required.

Appendix A: SAR Test Results for P limit CALCULATIONS.

Table A-1 RSI=4 – 5G Head SAR

For some bands/modes, a lower *PLimit* was selected as a more conservative evaluation.

MEASUREMENT RESULTS																
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Configurations		MPR	RB Size	RB offset	Duty Cycle	Meas. SAR(1g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)			(dB)				(W/kg)	(dBm)	(dBm)
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Left Cheek	DFT-s-OFDM QPSK	0	135	69	1:1	0.422	26.8	26.8
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Left Tilt	DFT-s-OFDM QPSK	0	135	69	1:1	0.160	31.0	
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Right Cheek	DFT-s-OFDM QPSK	0	135	69	1:1	0.310	28.1	
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Right Tilt	DFT-s-OFDM QPSK	0	135	69	1:1	0.263	28.9	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Left Cheek	DFT-s-OFDM QPSK	0	1	271	1:1	0.612	28.0	28.0
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Left Tilt	DFT-s-OFDM QPSK	0	1	271	1:1	0.288	31.3	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Right Cheek	DFT-s-OFDM QPSK	0	1	271	1:1	0.38	30.1	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Right Tilt	DFT-s-OFDM QPSK	0	1	271	1:1	0.486	29.0	
3 679.98	645332	NR Band n48	High	S3	40	14.42	Left Cheek	DFT-s-OFDM QPSK	0	50	56	1:1	0.113	23.9	18.2
3 679.98	645332	NR Band n48	High	S3	40	14.42	Left Tilt	DFT-s-OFDM QPSK	0	50	56	1:1	0.114	23.9	
3 679.98	645332	NR Band n48	High	S3	40	14.42	Right Cheek	DFT-s-OFDM QPSK	0	50	56	1:1	0.422	18.2	
3 679.98	645332	NR Band n48	High	S3	40	14.42	Right Tilt	DFT-s-OFDM QPSK	0	50	56	1:1	0.348	19.0	

Table A-2 RSI = 0 - NR Body-Worn SAR

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS																	
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Configurations		MPR	Spacing (mm)	RB Size	RB offset	Duty Cycle	Meas. SAR(1g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)			(dB)					(W/kg)	(dBm)	(dBm)
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Back	DFT-s-OFDM QPSK	0	15	135	69	1:1	0.464	26.4	26.4
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Front	DFT-s-OFDM QPSK	0	15	135	69	1:1	0.408	26.9	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Back	DFT-s-OFDM QPSK	0	15	1	271	1:1	0.635	27.8	27.8
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Front	DFT-s-OFDM QPSK	0	15	1	271	1:1	0.545	28.5	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Back	DFT-s-OFDM QPSK	0	15	1	53	1:1	0.137	26.6	26.6
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Front	DFT-s-OFDM QPSK	0	15	1	53	1:1	0.101	27.9	

Table A-3 RSI = 3 – 5G Hotspot SAR

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS																
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Configurations		MPR	Spacing (mm)	RB Size	RB offset	Duty Cycle	Meas. SAR(1g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)			(dB)					(W/kg)	(dBm)	(dBm)
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Back	DFT-s-OFDM QPSK	0	10	1	137	1:1	0.294	22.5	22.5
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Front	DFT-s-OFDM QPSK	0	10	1	137	1:1	0.215	23.8	
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Left	DFT-s-OFDM QPSK	0	10	1	137	1:1	0.123	26.3	
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Bottom	DFT-s-OFDM QPSK	0	10	1	137	1:1	0.265	22.9	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Back	DFT-s-OFDM QPSK	0	10	1	53	1:1	0.279	23.5	22.7
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Front	DFT-s-OFDM QPSK	0	10	1	53	1:1	0.222	24.5	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Left	DFT-s-OFDM QPSK	0	10	1	53	1:1	0.303	23.1	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Top	DFT-s-OFDM QPSK	0	10	1	53	1:1	0.337	22.7	

Table A-4 RSI = 1, 2 – 2/3G Phablet SAR (Grip Sensor not activated)

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS											
Frequency		Mode		Ant.	Frame Averaged Conducted Power	Test Position	Spacing (mm)	Duty Cycle	Meas. SAR (10g)	Plimit	Minimum Plimit
MHz	Ch.				(dBm)				(W/kg)	(dBm)	(dBm)
893.8	251	GSM 850	GPRS 3Tx	M1	24.92	Front	4	1:2.77	0.397	32.9	32.9
1 960.0	661	GSM 1900	GPRS 4Tx	M2	22.20	Front	4	1:2.07	0.798	27.2	27.2
1 880.0	9400	UMTS Band 2	RMC	M2	23.06	Front	4	1:1	1.050	26.8	26.8
1 732.4	1412	UMTS Band 4	RMC	M2	23.03	Front	4	1:1	0.905	27.4	27.4

Table A-5 RSI = 1, 2 – 4G Phablet SAR (Grip Sensor not activated)

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS															
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Position	MPR	Spacing (mm)	RB Size	RB offset	Duty Cycle	Meas. SAR (10g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)		(dB)					(W/kg)	(dBm)	(dBm)
2 535.0	21100	LTE Band 7	Mid	M2	20	23.19	Front	0	4	1	0	1:1	1.160	26.5	26.5
1 882.5	26365	LTE Band 25	Mid	M2	20	24.05	Front	0	4	1	49	1:1	0.998	28.0	28.0
2 310.0	27710	LTE Band 30	Mid	M2	10	23.06	Front	0	4	1	0	1:1	0.716	28.5	28.5
2 636.5	41055	LTE Band 41 (PC3)	High	M2	20	22.91	Front	0	4	1	0	1:1.58	0.525	29.7	29.7
2 593.0	40620	LTE Band 41 ULCA (PC3)	Mid	M2	20	21.52	Front	0	4	1	0	1:1.58	0.396	29.5	29.5
2 680.0	41490	LTE Band 41 (PC2)	High	M2	20	22.72	Front	0	4	1	0	1:2.31	0.726	28.1	28.1
1 770	132572	LTE Band 66	High	M2	20	24.19	Front	0	4	1	49	1:1	0.776	29.3	29.3

Table A-6 RSI = 1, 2 – 5G Phablet SAR (Grip Sensor not activated)

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS																	
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Configurations		MPR	Spacing (mm)	RB Size	RB offset	Duty Cycle	Meas. SAR (10g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)			(dB)					(W/kg)	(dBm)	(dBm)
1 882.5	376500	NR Band n25	Mid	M2	40	23.63	Front	DFT-s-OFDM QPSK	0	4	1	108	1:1	0.716	29.1	29.1
2 310.0	462000	NR Band n30	Mid	M2	10	22.84	Front	DFT-s-OFDM QPSK	0	4	1	26	1:1	0.637	28.8	28.8
1 745.0	349000	NR Band n66	Mid	M2	40	23.58	Front	DFT-s-OFDM QPSK	0	4	1	108	1:1	0.615	29.7	29.7
1 702.5	340500	NR Band n70	Mid	M2	15	23.54	Front	DFT-s-OFDM QPSK	0	4	36	22	1:1	0.616	29.6	29.6
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Back	DFT-s-OFDM QPSK	0	16	1	137	1:1	0.208	33.8	25.6
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Front	DFT-s-OFDM QPSK	0	4	1	137	1:1	1.010	27.0	
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Left	DFT-s-OFDM QPSK	0	0	1	137	1:1	1.390	25.6	
2 592.99	518598	NR Band n41(PC3)	Mid	M2	100	23.05	Bottom	DFT-s-OFDM QPSK	0	12	1	137	1:1	0.381	31.2	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Back	DFT-s-OFDM QPSK	0	16	1	271	1:1	0.251	35.8	26.8
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Front	DFT-s-OFDM QPSK	0	4	1	271	1:1	1.230	28.9	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Left	DFT-s-OFDM QPSK	0	0	1	271	1:1	2.030	26.8	
2 592.99	518598	NR Band n41(PC2)	Mid	M2	100	25.85	Bottom	DFT-s-OFDM QPSK	0	12	1	271	1:1	0.537	32.5	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Back	DFT-s-OFDM QPSK	0	0	1	53	1:1	1.160	21.3	21.3
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Front	DFT-s-OFDM QPSK	0	0	1	53	1:1	0.524	24.7	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Left	DFT-s-OFDM QPSK	0	0	1	53	1:1	0.738	23.2	
3 570.0	638000	NR Band n48	Low	S3	40	17.94	Top	DFT-s-OFDM QPSK	0	0	1	53	1:1	0.319	26.9	

Table A-7 RSI = 1(Ear-jack is inserted) **& 2**(Grip Sensor is on) **– 5G Phablet SAR**

For some bands/modes, a lower P_{Limit} was selected as a more conservative evaluation.

MEASUREMENT RESULTS																	
Frequency		Mode		Ant.	Band width	Frame Averaged Conducted Power	Test Configurations		MPR	Spacing (mm)	RB Size	RB offset	Duty Cycle	Meas. SAR (10g)	Plimit	Minimum Plimit
MHz	Ch.				(MHz)	(dBm)			(dB)					(W/kg)	(dBm)	(dBm)
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Back	DFT-s-OFDM QPSK	0	0	1	137	1:1	0.917	21.5	21.5
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Front	DFT-s-OFDM QPSK	0	0	1	137	1:1	0.838	21.9	
2 592.99	518598	NR Band n41(PC2,3)	Mid	M2	100	17.16	Bottom	DFT-s-OFDM QPSK	0	0	1	137	1:1	0.673	22.9	