



FCC SAR Test Report

FCC ID: 2AN9R-M610L

Project No. : 2410C002
Equipment : LTE Module
Brand Name : Fibocom
Test Model : FM101-GL
Series Model : N/A
Date of Receipt : Oct. 09, 2024
Date of Test : Oct. 11, 2024 ~ Dec. 22, 2024
Issued Date : Jan. 20, 2025
Report Version : R00
Test Sample : Engineering Sample No.: SSL2024100967.
Standard(s) : Please refer to page 2.
Applicant : Fujian Centerm Information Co., Ltd.
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Manufacturer : Fibocom Wireless Inc.
Address : 1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

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

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Standard(s) : **IEEE Std C95.1:2019** IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 kHz to 300 GHz

IEC/IEEE 62209-1528:2020 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

The following reference test guidance is not within the scope of accreditation of A2LA:

KDB447498 D04 Interim General RF Exposure Guidance v01
KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
KDB865664 D02 SAR Reporting v01r02
KDB248227 D01 802.11 Wi-Fi SAR v02r02
KDB941225 D05 SAR for LTE Devices v02r05
KDB941225 D06 Hot Spot SAR v02r01

Declaration

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

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by **BTL**. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government.

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BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.

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

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

Limitation

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

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

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCC SAR-1-2410C002	R00	Original Report.	Jan. 20, 2025	Valid

1. GENERAL INFORMATION

1.1 STATEMENT OF COMPLIANCE

Mode	Highest Reported Body-worn SAR-1g (W/kg)
LTE B2	0.906
LTE B4	0.973
LTE B5	0.887
LTE B7	0.932
LTE B12	1.035
LTE B13	1.135
LTE B14	1.067
LTE B17	0.986
LTE B25	0.941
LTE B26	1.033
LTE B30	0.978
LTE B38	0.995
LTE B41	0.998
LTE B66	0.995
LTE B71	0.988
2.4G WLAN	0.221
5.2G WLAN	0.493
5.3G WLAN	0.491
5.6G WLAN	0.617
5.8G WLAN	0.615
Bluetooth	0.002

Note:

1) The device is in compliance with Specific Absorption Rate (SAR) for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020.

1.2 LABORATORY ENVIRONMENT

Temperature	Min. = 20°C, Max. = 24°C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards.	
Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

1.3 GENERAL DESCRIPTION OF EUT

Equipment	LTE Module	
Brand Name	Fibocom	
Test Model	FM101-GL	
Series Model	N/A	
Model Difference(s)	N/A	
Modulation	LTE(QPSK/16QAM), WiFi(DSSS/OFDM/OFDMA), BT(GFSK/ π /4-DQPSK/8-DPSK)	
Operation Frequency Range(s)	Band	TX (MHz)
	LTE B2	1850~1910
	LTE B4	1710~1755
	LTE B5	824~849
	LTE B7	2500~2570
	LTE B12	699~716
	LTE B13	777~787
	LTE B14	788~798
	LTE B17	704~716
	LTE B25	1850~1915
	LTE B26	814~849
	LTE B30	2305~2315
	LTE B38	2570~2620
	LTE B41	2500~2690
	LTE B66	1710~1780
	LTE B71	663~698
	Bluetooth	2400~2483.5
	2.4G WLAN	2400~2483.5
	5.2G WLAN	5150~5250
	5.3G WLAN	5250~5350
	5.6G WLAN	5470~5725
	5.8G WLAN	5725~5850
Power Class	3, tested with power control "all Max" (LTE B2/4/5/7/12/13/14/17/25/26/30/38/41/66/71)	
Test Channels (low-mid-high)	18700-18900-19100 (LTE B2 BW=20MHz)	
	20050-20175-20300 (LTE B4 BW=20MHz)	
	20450-20525-20600 (LTE B5 BW=10MHz)	
	20850-21100-21350 (LTE B7 BW=20MHz)	
	23060-23095-23130 (LTE B12 BW=10MHz)	
	23230 (LTE B13 BW=10MHz)	
	23330 (LTE B14 BW=10MHz)	
	23780-23790-23800 (LTE B17 BW=10MHz)	
	26140-26365-26590 (LTE B25 BW=20MHz)	
	26765-26865-26965 (LTE B26 BW=15MHz)	
	27710 (LTE B30 BW=10MHz)	
	37850-38000-38150 (LTE B38 BW=20MHz)	
	39750-40620-41490 (LTE B41 BW=20MHz)	
	132072-132322-132572 (LTE B66 BW=20MHz)	
	133222-133322-133372 (LTE B71 BW=20MHz)	

Test Channels (low-mid-high)	0-39-78 (BT)					
	0-19-39 (BLE)					
	1-6-11 (2.4G WiFi 802.11b/g/n HT20/ax HE20)					
	3-6-9 (2.4G WiFi 802.11n HT40/ax HE40)					
	5G WiFi	5.2G	5.3G	5.6G	5.8G	
	802.11a/n HT20/ ac VHT20/ ax HE20	36-40-44-48	52-56-60-64	100-104-108- 112-116-120- 124-128-132- 136-140	149-153-157- 161-165	
	802.11n HT40/ ac VHT40/ ax HE40	38-46	54-62	102-110-118- 126-134	142-151-159	
802.11ac VHT80/ ax HE80	42	58	106-122	138-155		
802.11ac VHT160/ ax HE160	/	50	114	/		
Antenna Information For LTE	Brand		Ant. Part number	Type	Band	Gain (dBi)
			81EAB415.G01	PIFA	LTE Band 2	0.55
					LTE Band 4	0.88
					LTE Band 5	-0.95
					LTE Band 7	2.95
					LTE Band 12	-0.34
					LTE Band 13	-0.30
					LTE Band 14	-0.51
					LTE Band 17	-0.34
					LTE Band 25	0.74
					LTE Band 26	-0.51
					LTE Band 30	0.74
					LTE Band 38	2.99
					LTE Band 41	2.99
					LTE Band 66	0.88
LTE Band 71	-0.34					
Antenna Information For WiFi	Ant.	Manufacturer	Ant. Part number	Type	Frequency Range (MHz)	Gain (dBi)
	Main Ant	Wistron NeWeb Corp.	DQ6615GAY00 (81EAA615.GAY)	PIFA	2400-2483.5	1.35
					5150-5250	2.34
					5250-5350	2.34
					5470-5725	2.52
					5725-5850	1.69
	Aux Ant	Wistron NeWeb Corp.	DQ6615GAY00 (81EAA615.GAY)	PIFA	2400-2483.5	1.16
					5150-5250	1.58
					5250-5350	1.58
					5470-5725	2.37
5725-5850					2.37	
Other Information						
Battery Information	Model Name		QTA-CB1			
	Power Rating		DC 7.7V, 5781mAh			
	Manufacturer		Zhuhai CosMX Power JinWan Subsidiary Co., Ltd.			

Note:

1. Implementation in the following platform

Model name: Centerm Chromebook M610, Centerm Enterprise Chromebook M610, Chromebook M610, M610, M610 Plus, M***, M61***, M*****, OM***, OM***** (“*” may be alphanumeric characters, blank or other characters, which represent Operating system or user serial number. such changes do not concern those factors (such as hardware and the external structure) which might impact the security or electromagnetic compatibility of the device.)

Product name: 1) Notebook Computer
2) Chromebook
3) Thin Client
4) Portable cloud computer
5) Notebook PC

Brand name: N/A

Model Difference(s): The specific model differences are: the appearance color of the product is not the same, the sales area is different, and the others are the same, which does not affect EMC and safety.

Hardware Version: V1.0

Firmware Version: Chrome OS 64bit

2. The WWAN SAR value is for FM101-GL Module Card (FCC ID: 2AN9R-M610L).
And the WLAN SAR value is for AX201NGW Module Card (FCC ID: 2AN9R-M610).

3. The antenna gain is provided by the manufacturer.

1.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1390	Nov. 14, 2024	1 Year
2	Data Acquisition Electronics	Speag	DAE4	1717	Apr. 18, 2024	1 Year
3	E-field Probe	Speag	EX3DV4	3809	Dec. 18, 2023	1 Year
4	E-field Probe	Speag	EX3DV4	7693	Nov. 20, 2024	1 Year
5	System Validation Dipole	Speag	D750V3	1095	Sep. 16, 2024	3 Years
6	System Validation Dipole	Speag	D835V2	4d160	Apr. 25, 2024	3 Years
7	System Validation Dipole	Speag	D1750V2	1101	Apr. 25, 2024	3 Years
8	System Validation Dipole	Speag	D1900V2	5d179	Apr. 25, 2024	3 Years
9	System Validation Dipole	Speag	D2300V2	1033	Sep. 13, 2024	3 Years
10	System Validation Dipole	Speag	D2450V2	919	Apr. 22, 2024	3 Years
11	System Validation Dipole	Speag	D2600V2	1067	Apr. 22, 2024	3 Years
12	System Validation Dipole	Speag	D5GHzV2	1160	Apr. 25, 2024	3 Years
13	ELI Phantom	Speag	ELI Phantom V5.0	1222	N/A	N/A
14	Radio Communication Analyzer	Anritsu	MT8821C	6261915479	Jun. 29, 2024	1 Year
15	Wideband Radio Communication Tester	R&S	CMW500	165848	Jan. 20, 2024	1 Year
16	Power Amplifier	Mini-Circuits	ZHL-42W+	QA1333003	Jun. 29, 2024	1 Year
17	Power Amplifier	Mini-Circuits	ZVE-8G+	520701341	Jan. 20, 2024	1 Year
18	DC Source meter	Iteck	IT6154	006104126768201001	Jun. 29, 2024	1 Year
19	Vector Network Analyzer	Agilent	E5071C	MY46102965	Jan. 20, 2024	1 Year
20	Signal Generator	Keysight	N5173B	MY59101420	Jan. 20, 2024	1 Year
21	Smart Power Sensor	R&S	NRP18S	101333	Jun. 01, 2024	1 Year
22	Smart Power Sensor	R&S	NRP-Z21	102209	Jan. 20, 2024	1 Year
23	3.5mm Economy Calibration Kit	Agilent	85052D	MY43252246	Nov. 04, 2024	1 Year
24	Dielectric Assessment Kit	Speag	DAK-3.5	1226	Jan. 24, 2022	3 Years
25	Directional Coupler	Woken	TS-PCC0M-05	0107090019	Jan. 20, 2024	1 Year
26	Coupler	Woken	0110A05601O-10	COM5BNW1A2	Jan. 20, 2024	1 Year

Remark:

1. "N/A" denotes no model name, serial No. or calibration specified.

2.

1) Per KDB865664 D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;

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

c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement;

d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.

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

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is SAR room at the location of Room 108, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People's Republic of China.

BTL's Registration Number for FCC: 747969.

BTL's Designation Number for FCC: CN1377.

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Budget for Frequency range of 300 MHz to 3 GHz

Symbol	Input quantity X_i (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)
Measurement system errors								
CF	Probe calibration(±%)	12.0	N	2	1	1	6.0	6.0
CF_{drift}	Probe calibration drift(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
LIN	Probe linearity and detection limit(±%)	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
BBS	Broadband signal(±%)	3.0	R	$\sqrt{3}$	1	1	1.7	1.7
ISO	Probe isotropy(±%)	7.6	R	$\sqrt{3}$	1	1	4.4	4.4
DAE	Other probe and data acquisition errors(±%)	0.7	N	1	1	1	0.7	0.7
AMB	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8
Δ_{xyz}	Probe positioning errors(±mm)	0.006	N	1	0.14	0.14	0.08	0.08
DAT	Data processing errors(±%)	1.2	N	1	1	1	1.2	1.2
Phantom and device (DUT or validation antenna) errors								
LIQ(σ)	Conductivity (meas.)(±%)	2.5	N	1	0.78	0.71	2.0	1.8
LIQ(T_c)	Conductivity (temp.)(±%)	3.3	R	$\sqrt{3}$	0.78	0.71	1.5	1.4
EPS	Phantom Permittivity(±%)	14	R	$\sqrt{3}$	0	0	0.0	0.0
DIS	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0
D_{xyz}	Device Positioning(±%)	0.6	N	1	1	1	0.6	0.6
H	Device Holder(±%)	2	N	1	1	1	2.0	2.0
MOD	DUT Modulationm(±%)	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
TAS	Time-average SAR(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
RF_{drift}	DUT drift(±%)	1.5	N	1	1	1	1.5	1.5
VAL	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0
P_{in}	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0
Corrections to the SAR result								
C(ϵ', σ)	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6
C(R)	SAR scaling(±%)	0	R	$\sqrt{3}$	1	1	0.0	0.0
u(ΔSAR)	Combined uncertainty						10.3	10.2
	Coverage Factor for 95%						k=2	k=2
U	Expanded uncertainty					U =	20.7	20.5
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.								

Uncertainty Budget for Frequency range of 3 GHz to 6 GHz

Symbol	Input quantity X_i (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)
Measurement system errors								
CF	Probe calibration(±%)	14.0	N	2	1	1	7.0	7.0
CF_{drift}	Probe calibration drift(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
LIN	Probe linearity and detection limit(±%)	4.7	R	$\sqrt{3}$	1	1	2.7	2.7
BBS	Broadband signal(±%)	2.6	R	$\sqrt{3}$	1	1	1.5	1.5
ISO	Probe isotropy(±%)	7.6	R	$\sqrt{3}$	1	1	4.4	4.4
DAE	Other probe and data acquisition errors(±%)	1.2	N	1	1	1	1.2	1.2
AMB	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8
Δ_{xyz}	Probe positioning errors(±mm)	0.005	N	1	0.29	0.29	0.15	0.15
DAT	Data processing errors(±%)	2.3	N	1	1	1	2.3	2.3
Phantom and device (DUT or validation antenna) errors								
LIQ(σ)	Conductivity (meas.)(±%)	2.5	N	1	0.78	0.71	2.0	1.8
LIQ(T_c)	Conductivity (temp.)(±%)	3.4	R	$\sqrt{3}$	0.78	0.71	1.5	1.4
EPS	Phantom Permittivity(±%)	14	R	$\sqrt{3}$	0.25	0.25	2.0	2.0
DIS	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0
D_{xyz}	Device Positioning(±%)	0.5	N	1	1	1	0.5	0.5
H	Device Holder(±%)	1.9	N	1	1	1	1.9	1.9
MOD	DUT Modulationm(±%)	2.4	R	$\sqrt{3}$	1	1	1.4	1.4
TAS	Time-average SAR(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0
RF_{drift}	DUT drift(±%)	0.8	N	1	1	1	0.8	0.8
VAL	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0
P_{in}	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0
Corrections to the SAR result								
C(ϵ', σ)	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6
C(R)	SAR scaling(±%)	0	R	$\sqrt{3}$	1	1	0.0	0.0
u(ΔSAR)	Combined uncertainty						11.2	11.1
	Coverage Factor for 95%						k=2	k=2
U	Expanded uncertainty					U =	22.5	22.3
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.								

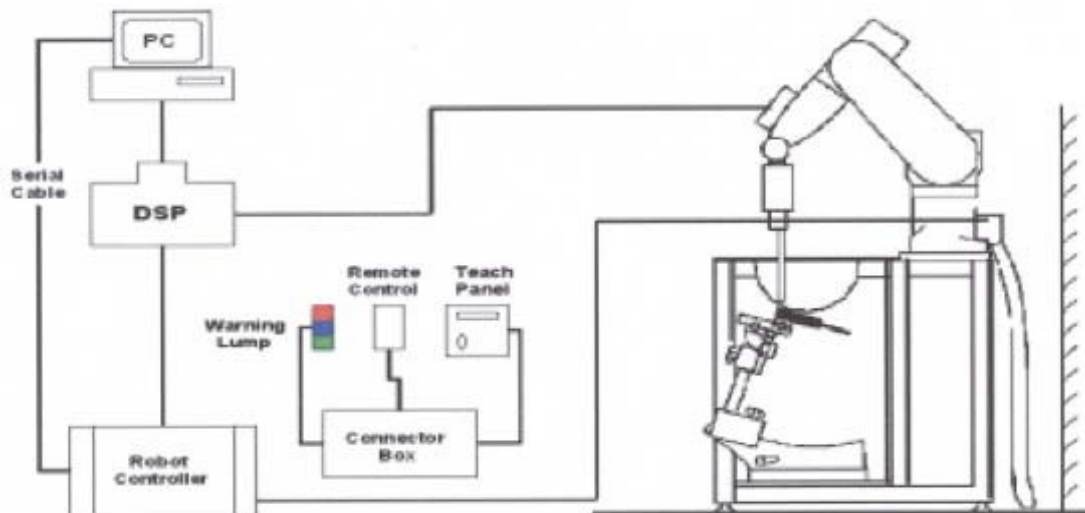
3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SET-UP

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

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

3.1.1 TEST SETUP LAYOUT



3.2 DASY5 E-FIELD PROBE SYSTEM

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

3.2.1 PROBE SPECIFICATION

EX3DV4

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



E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

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

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

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

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

3.2.3 OTHER TEST EQUIPMENT

3.2.3.1. Device Holder for Transmitters

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

Material: POM, Acrylic glass, Foam

3.2.3.2 Phantom

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

3.2.4 SCANNING PROCEDURE

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

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

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

- Area Scan

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

- Zoom Scan

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

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

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

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

3.2.5 SPATIAL PEAK SAR EVALUATION

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

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

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

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

3.2.6 DATA STORAGE AND EVALUATION

3.2.6.1 Data Storage

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

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

3.2.7 DATA EVALUATION BY SEMCAD

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

Probe parameters:	Sensitivity	Normi, ai0, ai1, ai2
	Conversion factor	ConvFi
	Diode compression point	Dcpj
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

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

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

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

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

With	V_i = compensated signal of channel i	(i = x, y, z)
	U_i = input signal of channel i	(i = x, y, z)
	cf = crest factor of exciting field	(DASY parameter)
	dcpj = diode compression point	(DASY parameter)

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

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

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

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

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

ConvF = sensitivity enhancement in solution

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

f = carrier frequency [GHz]

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

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

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

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

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

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

With SAR = local specific absorption rate in mW/g

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

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

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

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

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

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

4. SYSTEM VERIFICATION PROCEDURE

4.1 TISSUE VERIFICATION

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

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

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 750	0.2	-	0.2	1.5	56.0	-	42.1	-
Head 835	0.2	-	0.2	1.5	57.0	-	41.1	-
Head 1750	-	47.0	-	0.4	-	-	52.6	-
Head 1900	-	44.5	-	0.2	-	-	55.3	-
Head 2300	-	44.9	-	0.1	-	-	55.0	-
Head 2450	-	45.0	-	0.1	-	-	54.9	-
Head 2600	-	45.1	-	0.1	-	-	54.8	-
Head 5G	-	-	-	-	-	17.2	65.5	17.3

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

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Targeted Conductivity (σ)	Targeted Permittivity (ϵ_r)	Deviation Conductivity (σ) (%)	Deviation Permittivity (ϵ_r) (%)	Date
Head	750	22.0	0.898	42.987	0.89	41.9	0.90	2.59	Dec. 21, 2024
Head	835	22.0	0.926	42.311	0.90	41.5	2.89	1.95	Dec. 21, 2024
Head	1750	22.7	1.345	39.590	1.37	40.1	-1.82	-1.27	Dec. 20, 2024
Head	1900	22.7	1.336	41.001	1.40	40.0	-4.57	2.50	Dec. 20, 2024
Head	2300	22.3	1.657	40.491	1.67	39.5	-0.78	2.51	Dec. 22, 2024
Head	2450	22.1	1.786	39.691	1.80	39.2	-0.78	1.25	Nov. 09, 2024
Head	2600	22.3	1.994	39.420	1.96	39.0	1.73	1.08	Dec. 22, 2024
Head	5250	22.4	4.719	35.442	4.71	36.0	0.19	-1.41	Nov. 11, 2024
Head	5600	22.4	5.106	34.743	5.07	35.5	0.71	-2.13	Nov. 11, 2024
Head	5750	22.4	5.296	34.340	5.22	35.4	1.46	-2.86	Nov. 11, 2024

Note:

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

4.2 SYSTEM CHECK

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

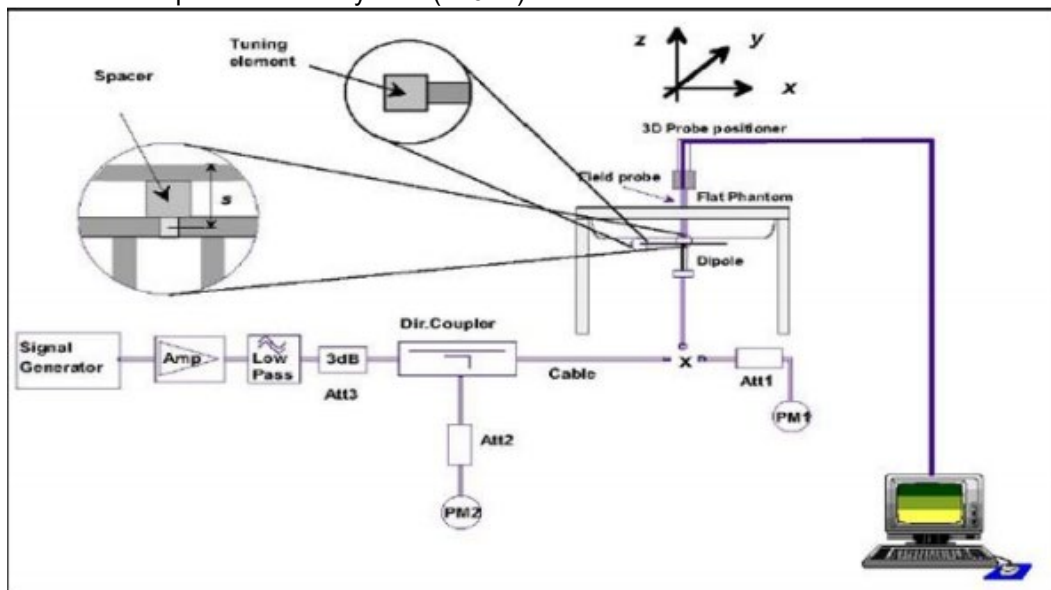
System Check	Date	Frequency (MHz)	Targeted SAR 1g (W/kg)	Measured SAR 1g (W/kg)	normalized SAR 1g (W/kg)	Deviation 1g (%)	Dipole S/N
Head	Dec. 21, 2024	750	8.59	2.10	8.40	-2.21	1132
Head	Dec. 21, 2024	835	9.52	2.48	9.92	4.20	4d160
Head	Dec. 20, 2024	1750	36.40	9.14	36.56	0.44	1101
Head	Dec. 20, 2024	1900	39.60	9.57	38.28	-3.33	5d179
Head	Dec. 22, 2024	2300	49.10	12.30	49.20	0.20	1092
Head	Nov. 09, 2024	2450	52.10	12.90	51.60	-0.96	919
Head	Dec. 22, 2024	2600	56.90	13.60	54.40	-4.39	1067
Head	Nov. 11, 2024	5250	78.00	7.83	78.30	0.38	1160
Head	Nov. 11, 2024	5600	80.60	8.09	80.90	0.37	1160
Head	Nov. 11, 2024	5750	76.50	7.35	73.50	-3.92	1160

4.3 SYSTEM CHECK PROCEDURE

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

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

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



5. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

5.1 SAR MEASUREMENT VARIABILITY

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

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

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

The detailed repeated measurement results are shown in Section 7.2.

6. OPERATIONAL CONDITIONS DURING TEST

6.1 GENERAL DESCRIPTION OF TEST PROCEDURES

Connection to the EUT is established via air interface with Anritsu MT8821C & R&S CMW500, and the EUT is set to maximum output power by Anritsu MT8821C & R&S CMW500. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

6.2 SAR TEST CONFIGURATION

6.2.1 LTE TEST CONFIGURATION

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

1. Spectrum Plots for RB configurations

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

2. MPR

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

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

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

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

3. A-MPR

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

4. LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test requirements

i) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

ii) QPSK with 50% RB allocation

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

iii) QPSK with 100% RB allocation

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

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

B) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

LTE (TDD) Test Configuration

According to KDB 941225 D05 SAR for LTE Devices V02r05, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

TDD LTE B38/41/71 supports 3GPP TS 36 for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

TDD LTE B38/41/71 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Figure 4.2-1: Frame structure type 2

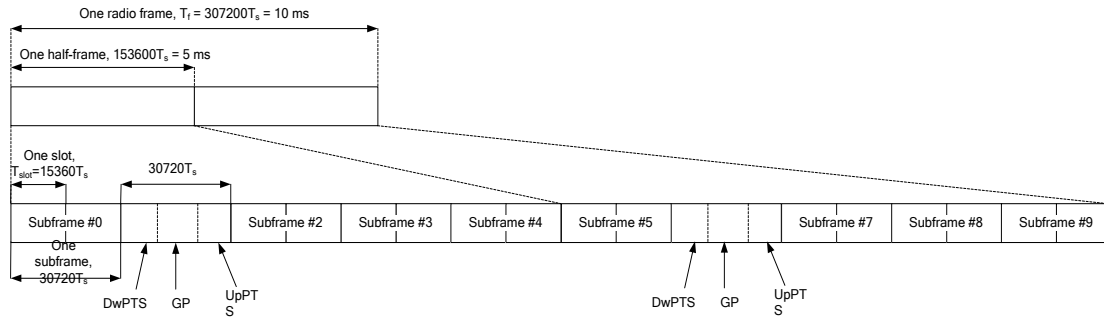


Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

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:

$$\text{Duty cycle} = (30720Ts \cdot \text{Ups} + \text{Uplink Component} \cdot \text{Specials}) / (307200Ts)$$

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

$$\text{Uplink Component} = \text{UpPTS}$$

In conclusion, for the TDD LTE B38/41/71, Duty Cycle can be calculated with formula as below. All these sets are ok when we test, or we can set as below.

$$\text{Duty cycle} = [(30720Ts \cdot \text{Ups}) + \text{UpPTS} \cdot \text{Specials}] / (307200Ts)$$

And we can get different Duty cycles under different configurations:

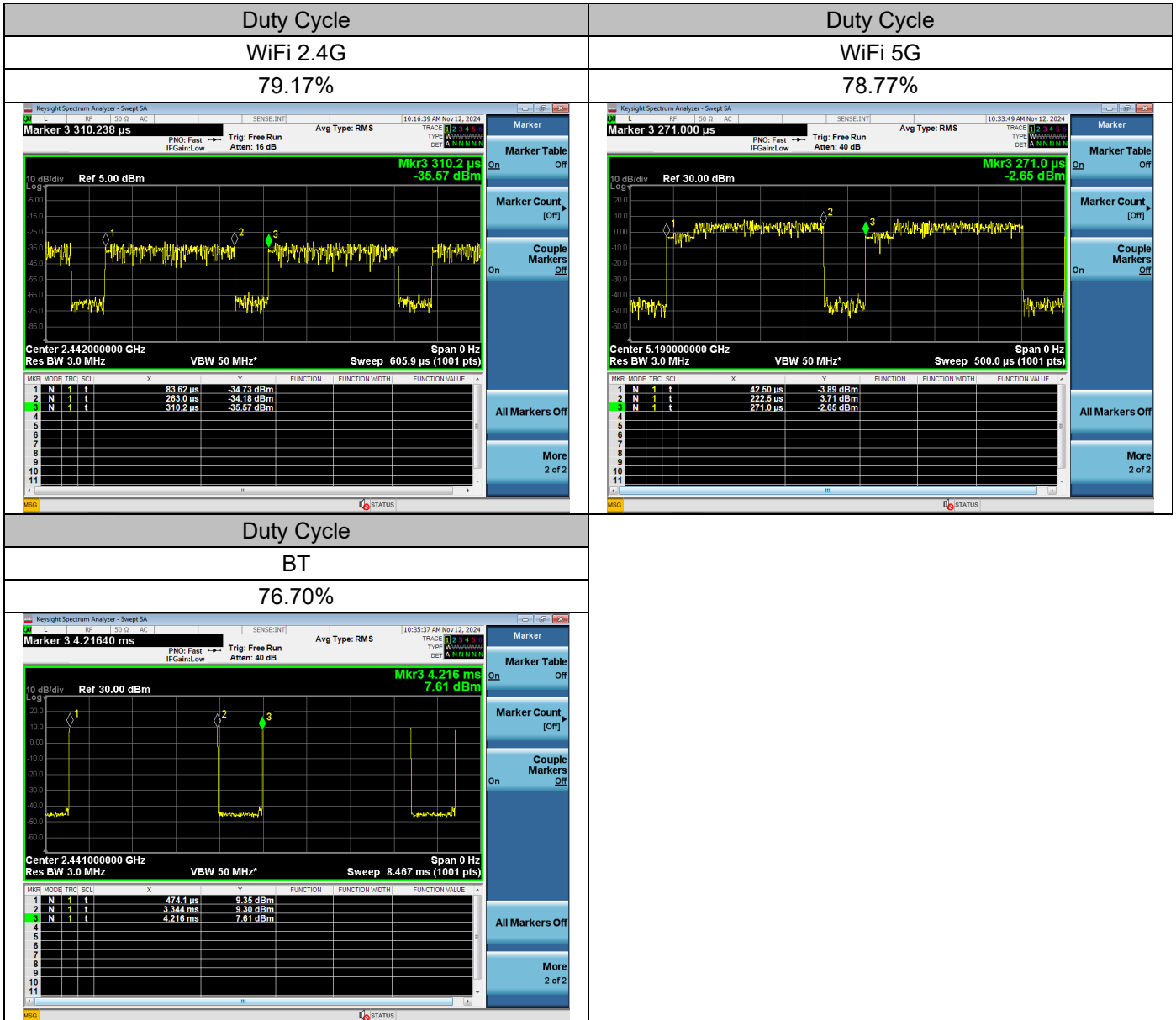
Uplink-downlink configuration	Subframe number			Configuration of special subframe							
				Normal cyclic prefix in downlink				Extended cyclic prefix in downlink			
				Normal cyclic prefix in uplink		Extended cyclic prefix in uplink		Normal cyclic prefix in uplink		Extended cyclic prefix in uplink	
	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 4-7
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.

6.2.2 WIFI TEST CONFIGURATION

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

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



6.1.4.1 2.4G SAR Test Requirements

802.11b DSSS SAR Test Requirements

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

- 1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.

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

SAR Test Requirements for OFDM configurations

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

6.1.4.2 5G SAR Test Requirements

✧ U-NII-1 and U-NII-2A Band

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR. When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

✧ U-NII-2C, U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification.

Unless band gap channels are permanently disabled, they must be considered for SAR testing.

To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels.¹¹ When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

6.1.4.3 OFDM transmission mode and SAR test channel selection

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

6.1.4.4 Initial test configuration procedure

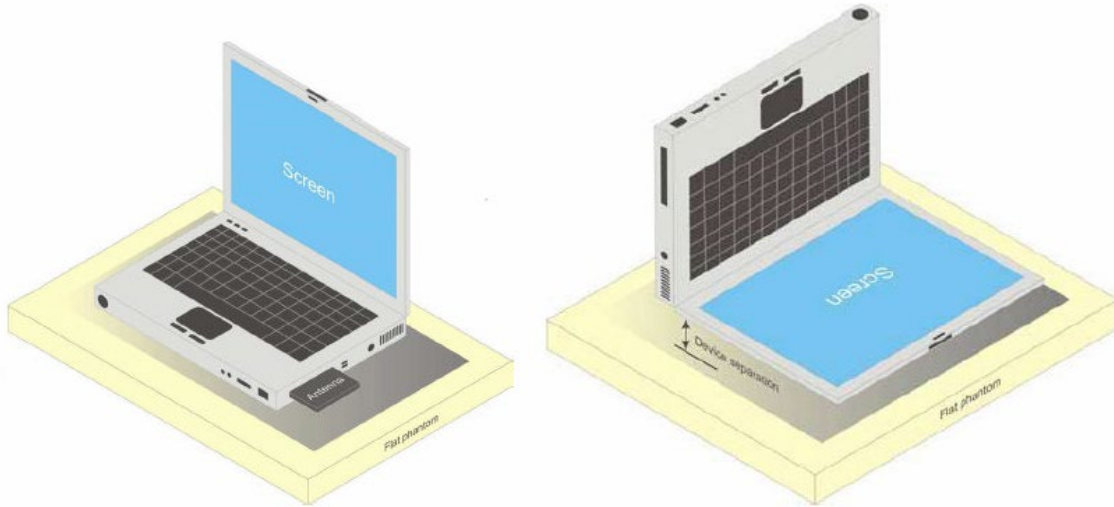
For OFDM, in both 2.4GHz and 5GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output powers is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurement.

6.3 TEST POSITION

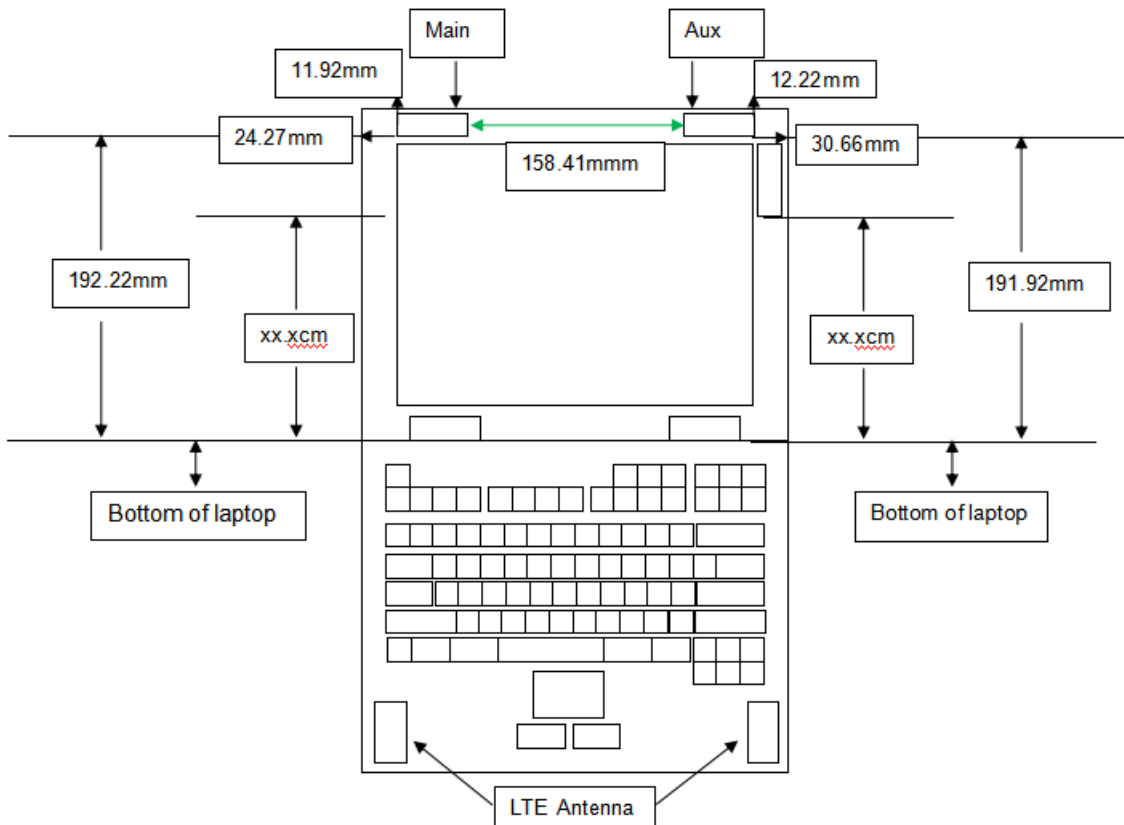
6.3.1 NOTEBOOK MODE

This DUT was tested in 2 different positions. They are back of keyboard and back of screen as illustrated below:



a) Portable computer with back of keyboard and back of screen.

The location of the antenna inside EUT is as below:



The SAR measurement positions of each band are as below:

Antenna	Back of Keyboard	Back of Screen
Main Ant	Yes	Yes
Aux Ant	Yes	Yes

6.4 POWER REDUCTION BY PROXIMITY SENSING

A proximity sensor for power reduction is implemented in this device to address RF exposure compliance when the cellular antenna is positioned close to the user's body. The sensor's mechanical structure is designed to fit within the enclosure design used in this device and also extended around the edge and top of the antenna element in order to optimize sensitivity in these orientations. This design combines the antenna printed directly on a plastic part and proximity sensor FPC (Flexible Printed Circuit) bonded together into one piece. According to KDB 616217 D04 SAR for laptop and tablets v01r02)

6.4.1 PROCEDURES FOR DETERMINING PROXIMITY SENSOR TRIGGERING DISTANCES

The following procedures should be applied to determine proximity sensor triggering distances for the back surface and individual edges of a tablet. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing, as required by the procedures. Unless there is built-in test software that reports the triggering conditions and enables the power levels to be confirmed separately, monitoring of conducted power during the triggering tests typically requires internal access to the antenna ports inside the tablet, which may interfere with the triggering tests.

1. The relevant transmitter should be set to operate at its normal maximum output power.
2. The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue-equivalent medium, and positioned at least 20 mm further than the distance that triggers power reduction.
3. It should be ensured that the cables required for power measurements are not interfering with the proximity sensor. Cable losses should be properly compensated to report the measured power results.
4. The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.
5. The back surface or edge is then moved back (further away) from the phantom by at least 5 mm or until maximum output power is returned to the normal maximum level.
6. The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom. If 1 mm resolution is not suitable for the sensor triggering sensitivity, a KDB inquiry should be submitted to determine alternative test configurations.
7. If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.
8. The process is then reversed by moving the tablet away from the phantom according to steps 4) to 7), to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.
9. The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated in the SAR report.
10. If the sensor design and implementation allow additional variations for triggering distance tolerances, multiple samples should be tested to determine the most conservative distance required for SAR evaluation.
11. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

6.4.2 PROCEDURES FOR DETERMINING ANTENNA AND PROXIMITY SENSOR COVERAGE

The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. The following are used to determine if additional SAR measurements may be necessary due to sensor and antenna offset. 25 These procedures do not apply and are not required for configurations where the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

1. The back surface or edge of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset. For the back surface, if the direction of maximum offset is not aligned with the tablet coordinates (physical edges) the tablet test position would not be aligned with the phantom coordinates (orientations). Each applicable tablet edge should be positioned perpendicularly to the phantom to determine sensor coverage. For antennas and/or sensors located near the corner of a tablet, both adjacent edges must be considered.
2. The similar sequence of steps applied to determine sensor triggering distance in section 6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.
3. After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.
4. The process is then repeated from the opposite direction, starting at the other end of the maximum antenna and sensor offset, by rotating the tablet 180° along the vertical axis.
5. The triggering points should be documented graphically, with the antenna and sensor clearly identified, along with all relevant dimensions.

If the subsequently measured peak SAR location for the antenna is not between the triggering points, established by the sensor coverage tests from opposite ends of the antenna and sensor, additional SAR tests may be required for conditions where only part of the back surface or edge of a tablet corresponding to the antenna is in proximity to the user and the sensor may not be triggering as desired. A KDB inquiry must be submitted by the test lab to determine if additional tests are required and the proper test configurations to use for testing. This may include situations where the sensor coverage region is too small for the antenna, the sensor is located too far away from the antenna, the sensor location is insufficient to cover multiple antennas or the antenna is at the corner of a tablet etc.

6.4.3 PROXIMITY SENSOR STATUS TABLE OF TRIGGER DISTANCE

As per the KDB 616217 D04 SAR for laptop and tablets v01r02, section 6.2, the following procedure is used to determine the triggering distances.

Proximity Sensor Status Table when DUT is moving towards the phantom

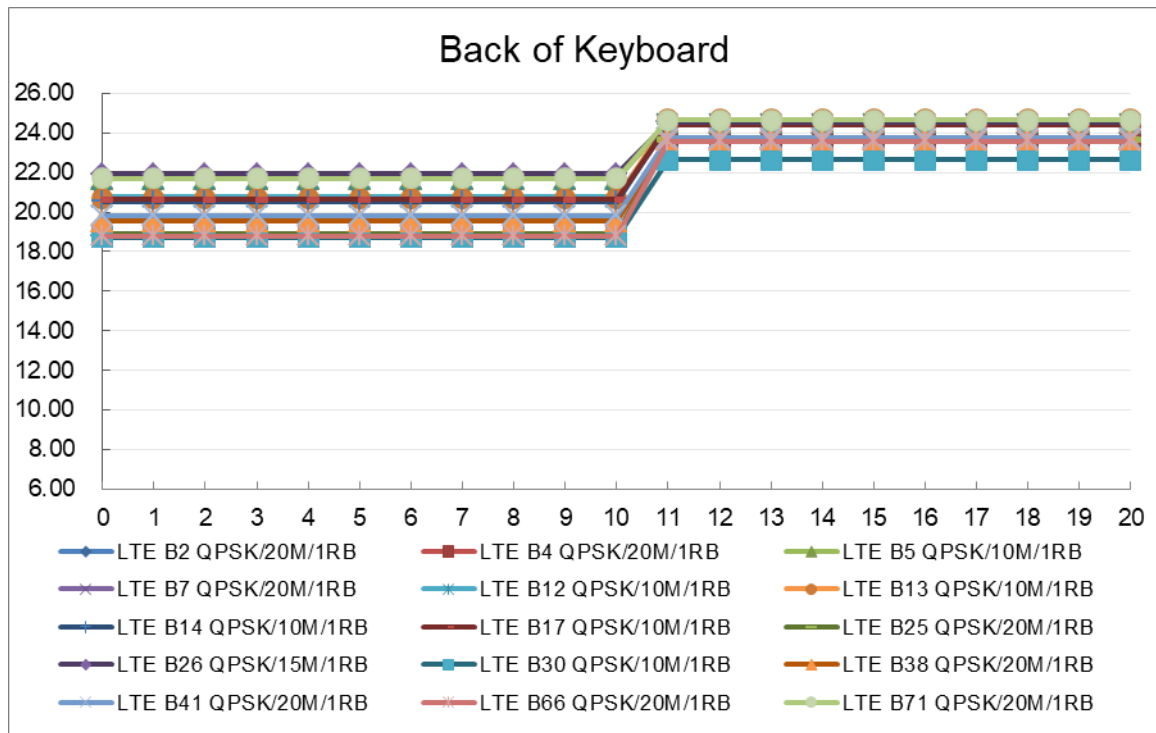
Distance to the DUT (mm)	Proximity Sensor Status - Bottom
0	ON
1	ON
2	ON
3	ON
4	ON
5	ON
6	ON
7	ON
8	ON
9	ON
10	ON
11	OFF
12	OFF
13	OFF
14	OFF
15	OFF
16	OFF
17	OFF
18	OFF
19	OFF
20	OFF

6.4.4 POWER REDUCTION PER AIR-INTERFACE

The following graphs show the power level and the distance from the DUT to the flat phantom for the Rear, Edge1 and Bottom Mode Surface.

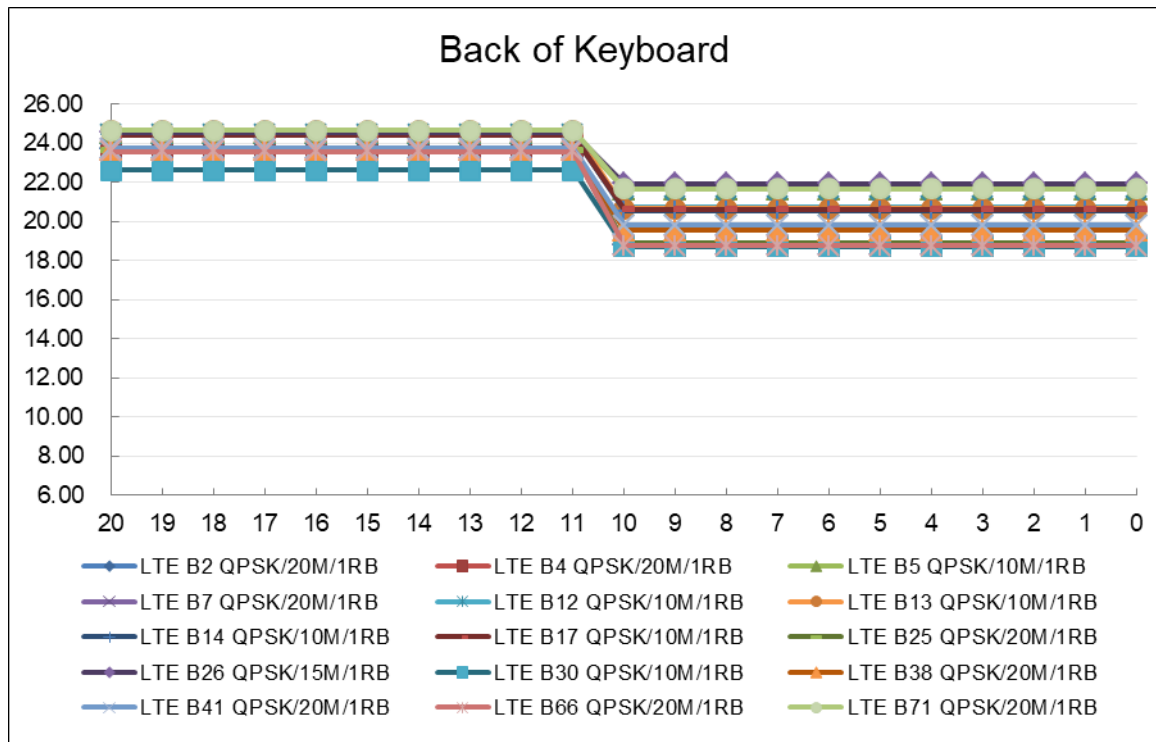
1) Back of Keyboard (moving away from the phantom)

mode		distance(mm)																				
		Back of Keyboard																				
		Sensor on											Sensor off									
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LTE B2	QPSK/20M/1RB	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74
LTE B4	QPSK/20M/1RB	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57
LTE B5	QPSK/10M/1RB	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51
LTE B7	QPSK/20M/1RB	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70
LTE B12	QPSK/10M/1RB	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42
LTE B13	QPSK/10M/1RB	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67
LTE B14	QPSK/10M/1RB	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45
LTE B17	QPSK/10M/1RB	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39
LTE B25	QPSK/20M/1RB	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65
LTE B26	QPSK/15M/1RB	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56
LTE B30	QPSK/10M/1RB	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63
LTE B38	QPSK/20M/1RB	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68
LTE B41	QPSK/20M/1RB	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74
LTE B66	QPSK/20M/1RB	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58
LTE B71	QPSK/20M/1RB	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65



2) Back of Keyboard (moving toward from the phantom)

mode		distance(mm)																				
		Back of Keyboard																				
		Sensor off										Sensor on										
		20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
LTE B2	QPSK/20M/1RB	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78	18.78
LTE B4	QPSK/20M/1RB	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57	23.57	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75
LTE B5	QPSK/10M/1RB	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66
LTE B7	QPSK/20M/1RB	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82	18.82
LTE B12	QPSK/10M/1RB	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42	24.42	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76	20.76
LTE B13	QPSK/10M/1RB	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67	24.67	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65
LTE B14	QPSK/10M/1RB	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45	24.45	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53	20.53
LTE B17	QPSK/10M/1RB	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39	24.39	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63
LTE B25	QPSK/20M/1RB	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65	23.65	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91	18.91
LTE B26	QPSK/15M/1RB	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56	24.56	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93
LTE B30	QPSK/10M/1RB	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63	22.63	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71	18.71
LTE B38	QPSK/20M/1RB	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68	23.68	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54	19.54
LTE B41	QPSK/20M/1RB	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	23.74	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82	19.82
LTE B66	QPSK/20M/1RB	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	23.58	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77	18.77
LTE B71	QPSK/20M/1RB	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65	24.65	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69



7. TEST RESULT

7.1 CONDUCTED POWER RESULTS

The conducted power measurement results please refer to Appendix E.

7.2 SAR TEST RESULTS

General Notes:

- 1) Per KDB447498 D04, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
- 2) Per KDB447498 D04, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz. When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel must be used.
- 3) Per KDB865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR < 1.45 W/kg, only one repeated measurement is required.
- 4) Per KDB941225 D06, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
- 5) Per KDB648474 D04, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤ 1.2 W/kg, no additional SAR evaluations using a headset are required.
- 6) 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.

LTE notes:

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

WLAN Notes:

- 1) For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
- 2) Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHz WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.5 for more information.
- 3) Justification for test configurations for WLAN per KDB Publication 248227 for 5GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2W/kg. See Section 7.1.5 for more information.

7.2.1 SAR MEASUREMENT RESULT OF BODY-WORN

1. Body-worn SAR test results of LTE

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (mm)	Sensor sate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
L01	LTE B2	QPSK20M	18700	1	50	Back of Screen	25	on	19	18.78	0	<0.001	<0.001	<0.001
L02	LTE B2	QPSK20M	18700	1	50	Back of Keyboard	0	on	19	18.78	-0.06	0.826	0.478	0.869
L03	LTE B2	QPSK20M	18900	1	50	Back of Keyboard	0	on	19	18.73	-0.16	0.769	0.445	0.818
L04	LTE B2	QPSK20M	19100	1	50	Back of Keyboard	0	on	19	18.71	-0.07	0.749	0.436	0.801
L05	LTE B2	QPSK20M	18700	50	25	Back of Keyboard	0	on	19	18.64	0.03	0.834	0.483	0.906
L06	LTE B2	QPSK20M	19100	100	0	Back of Keyboard	0	on	19	18.59	-0.18	0.749	0.435	0.823
L07	LTE B2	QPSK20M	18700	1	50	Back of Keyboard	9	off	24	23.74	-0.16	0.714	0.443	0.758
L08	LTE B2	QPSK20M	18700	50	0	Back of Keyboard	9	off	23	22.61	-0.18	0.568	0.351	0.621
L09	LTE B2	QPSK20M	18700	50	25	Back of Keyboard (Repeated)	0	on	19	18.64	0.01	0.809	0.465	0.879
L10	LTE B4	QPSK20M	20175	1	50	Back of Screen	25	on	19	18.75	0	<0.001	<0.001	<0.001
L11	LTE B4	QPSK20M	20175	1	50	Back of Keyboard	0	on	19	18.75	0	0.841	0.479	0.891
L12	LTE B4	QPSK20M	20050	1	50	Back of Keyboard	0	on	19	18.67	-0.13	0.763	0.432	0.823
L13	LTE B4	QPSK20M	20300	1	50	Back of Keyboard	0	on	19	18.67	-0.05	0.835	0.474	0.901
L14	LTE B4	QPSK20M	20175	50	25	Back of Keyboard	0	on	19	18.58	0.19	0.852	0.483	0.939
L15	LTE B4	QPSK20M	20300	100	0	Back of Keyboard	0	on	19	18.6	0	0.887	0.503	0.973
L16	LTE B4	QPSK20M	20175	1	50	Back of Keyboard	9	off	24	23.57	-0.18	0.651	0.392	0.719
L17	LTE B4	QPSK20M	20175	50	25	Back of Keyboard	9	off	23	22.57	0	0.528	0.318	0.583
L18	LTE B4	QPSK20M	20300	100	0	Back of Keyboard (Repeated)	0	on	19	18.6	0.01	0.868	0.497	0.952
L19	LTE B5	QPSK10M	20600	1	0	Back of Screen	25	on	22	21.66	0	<0.001	<0.001	<0.001
L20	LTE B5	QPSK10M	20600	1	0	Back of Keyboard	0	on	22	21.66	-0.16	0.709	0.44	0.767
L21	LTE B5	QPSK10M	20450	1	0	Back of Keyboard	0	on	22	21.33	0.07	0.76	0.468	0.887
L22	LTE B5	QPSK10M	20525	1	0	Back of Keyboard	0	on	22	21.62	0.02	0.724	0.446	0.790
L23	LTE B5	QPSK10M	20525	25	12	Back of Keyboard	0	on	22	21.35	0.08	0.719	0.443	0.835
L24	LTE B5	QPSK10M	20600	50	0	Back of Keyboard	0	on	22	21.15	-0.13	0.677	0.419	0.823
L25	LTE B5	QPSK10M	20600	1	0	Back of Keyboard	9	off	25	24.51	0.04	0.544	0.344	0.609
L26	LTE B5	QPSK10M	20525	25	12	Back of Keyboard	9	off	24	23.52	0.19	0.443	0.28	0.495
L27	LTE B5	QPSK10M	20450	1	0	Back of Keyboard (Repeated)	0	on	22	21.33	0	0.751	0.462	0.876
L28	LTE B7	QPKS20M	21350	1	50	Back of Screen	25	on	19	18.82	-0.03	<0.001	<0.001	<0.001
L29	LTE B7	QPKS20M	21350	1	50	Back of Keyboard	0	on	19	18.82	0	0.755	0.415	0.787
L30	LTE B7	QPKS20M	20850	1	50	Back of Keyboard	0	on	19	18.8	-0.03	0.736	0.412	0.771
L31	LTE B7	QPKS20M	21100	1	50	Back of Keyboard	0	on	19	18.76	0.06	0.731	0.414	0.773
L32	LTE B7	QPKS20M	21100	50	25	Back of Keyboard	0	on	19	18.46	0.03	0.823	0.438	0.932
L33	LTE B7	QPKS20M	21100	100	0	Back of Keyboard	0	on	19	18.44	0.06	0.763	0.417	0.868
L34	LTE B7	QPKS20M	21350	1	50	Back of Keyboard	9	off	24	23.7	-0.05	0.604	0.331	0.647
L35	LTE B7	QPKS20M	21100	50	25	Back of Keyboard	9	off	23	22.7	0.12	0.465	0.255	0.498
L36	LTE B7	QPKS20M	21100	50	25	Back of Keyboard (Repeated)	0	on	19	18.46	0.03	0.809	0.43	0.916

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (mm)	Sensor sate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
L37	LTE B12	QPSK10M	23130	1	24	Back of Screen	25	on	21	20.76	-0.02	<0.001	<0.001	<0.001
L38	LTE B12	QPSK10M	23130	1	24	Back of Keyboard	0	on	21	20.76	0.1	0.925	0.561	0.978
L39	LTE B12	QPSK10M	23060	1	24	Back of Keyboard	0	on	21	20.7	-0.05	0.966	0.591	1.035
L40	LTE B12	QPSK10M	23095	1	24	Back of Keyboard	0	on	21	20.66	-0.11	0.948	0.585	1.025
L41	LTE B12	QPSK10M	23060	25	12	Back of Keyboard	0	on	21	20.37	0.19	0.863	0.537	0.998
L42	LTE B12	QPSK10M	23060	50	0	Back of Keyboard	0	on	21	20.31	-0.06	0.85	0.533	0.996
L43	LTE B12	QPSK10M	23130	1	24	Back of Keyboard	9	off	25	24.42	-0.08	0.811	0.526	0.927
L44	LTE B12	QPSK10M	23060	25	12	Back of Keyboard	9	off	24	23.45	0.02	0.641	0.416	0.728
L45	LTE B12	QPSK10M	23060	1	24	Back of Keyboard (Repeated)	0	on	21	20.7	-0.01	0.937	0.582	1.004
L46	LTE B13	QPSK10M	23230	1	0	Back of Screen	25	on	21	20.65	-0.02	<0.001	<0.001	<0.001
L47	LTE B13	QPSK10M	23230	1	0	Back of Keyboard	0	on	21	20.65	-0.1	0.988	0.6	1.071
L48	LTE B13	QPSK10M	23230	25	0	Back of Keyboard	0	on	21	20.42	0.01	0.993	0.607	1.135
L49	LTE B13	QPSK10M	23230	50	0	Back of Keyboard	0	on	21	20.41	0.1	0.954	0.587	1.093
L50	LTE B13	QPSK10M	23230	1	0	Back of Keyboard	9	off	25	24.67	-0.01	0.881	0.565	0.951
L51	LTE B13	QPSK10M	23230	25	0	Back of Keyboard	9	off	24	23.53	0.08	0.851	0.544	0.948
L52	LTE B13	QPSK10M	23230	25	0	Back of Keyboard (Repeated)	0	on	21	20.42	-0.01	0.985	0.597	1.126
L53	LTE B14	QPSK10M	23330	1	0	Back of Screen	25	on	21	20.53	-0.12	<0.001	<0.001	<0.001
L54	LTE B14	QPSK10M	23330	1	0	Back of Keyboard	0	on	21	20.53	0.01	0.898	0.553	1.001
L55	LTE B14	QPSK10M	23330	25	0	Back of Keyboard	0	on	21	20.39	0.16	0.927	0.57	1.067
L56	LTE B14	QPSK10M	23330	50	0	Back of Keyboard	0	on	21	20.32	-0.04	0.883	0.542	1.033
L57	LTE B14	QPSK10M	23330	1	0	Back of Keyboard	9	off	25	24.45	0.18	0.731	0.467	0.830
L58	LTE B14	QPSK10M	23330	25	0	Back of Keyboard	9	off	24	23.43	-0.08	0.603	0.385	0.688
L59	LTE B14	QPSK10M	23330	25	0	Back of Keyboard (Repeated)	0	on	21	20.39	0.05	0.911	0.563	1.048
L60	LTE B17	QPSK10M	23790	1	24	Back of Screen	25	on	21	20.63	0.02	<0.001	<0.001	<0.001
L61	LTE B17	QPSK10M	23790	1	24	Back of Keyboard	0	on	21	20.63	0.03	0.807	0.491	0.879
L62	LTE B17	QPSK10M	23780	1	24	Back of Keyboard	0	on	21	20.56	0.04	0.805	0.49	0.891
L63	LTE B17	QPSK10M	23800	1	24	Back of Keyboard	0	on	21	20.55	0.14	0.798	0.486	0.885
L64	LTE B17	QPSK10M	23790	25	25	Back of Keyboard	0	on	21	20.28	0.1	0.815	0.495	0.962
L65	LTE B17	QPSK10M	23780	50	0	Back of Keyboard	0	on	21	20.19	-0.05	0.818	0.498	0.986
L66	LTE B17	QPSK10M	23800	1	24	Back of Keyboard	9	off	25	24.39	-0.01	0.651	0.416	0.749
L67	LTE B17	QPSK10M	23790	25	25	Back of Keyboard	9	off	24	23.43	0.19	0.516	0.33	0.588
L68	LTE B17	QPSK10M	23780	50	0	Back of Keyboard (Repeated)	0	on	21	20.19	0	0.802	0.49	0.966
L69	LTE B25	QPSK20M	26365	1	0	Back of Screen	25	on	19	18.91	0	<0.001	<0.001	<0.001
L70	LTE B25	QPSK20M	26365	1	0	Back of Keyboard	0	on	19	18.91	0.09	0.784	0.395	0.800
L71	LTE B25	QPSK20M	26590	1	0	Back of Keyboard	0	on	19	18.82	0.18	0.799	0.407	0.833
L72	LTE B25	QPSK20M	26140	1	0	Back of Keyboard	0	on	19	18.63	-0.14	0.746	0.385	0.812
L73	LTE B25	QPSK20M	26140	50	25	Back of Keyboard	0	on	19	18.42	0.02	0.823	0.475	0.941
L74	LTE B25	QPSK20M	26365	100	0	Back of Keyboard	0	on	19	18.38	-0.15	0.771	0.39	0.889
L75	LTE B25	QPSK20M	26365	1	0	Back of Keyboard	9	off	24	23.65	-0.16	0.668	0.377	0.724
L76	LTE B25	QPSK20M	26140	52	25	Back of Keyboard	9	off	23	22.8	-0.15	0.552	0.336	0.578
L77	LTE B25	QPSK20M	26140	50	25	Back of Keyboard (Repeated)	0	on	19	18.42	0.08	0.815	0.463	0.931

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (mm)	Sensor sate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
L78	LTE B26	QPSK15M	26965	1	37	Back of Screen	25	on	22	21.93	-0.04	<0.001	<0.001	<0.001
L79	LTE B26	QPSK15M	26965	1	37	Back of Keyboard	0	on	22	21.93	0.16	0.829	0.511	0.842
L80	LTE B26	QPSK15M	26765	1	37	Back of Keyboard	0	on	22	21.75	-0.07	0.856	0.527	0.907
L81	LTE B26	QPSK15M	26865	1	37	Back of Keyboard	0	on	22	21.85	0.01	0.842	0.517	0.872
L82	LTE B26	QPSK15M	26765	36	39	Back of Keyboard	0	on	22	21.27	0	0.873	0.538	1.033
L83	LTE B26	QPSK15M	26765	75	0	Back of Keyboard	0	on	22	21.22	-0.17	0.856	0.526	1.024
L84	LTE B26	QPSK15M	26965	1	37	Back of Keyboard	9	off	25	24.56	0.14	0.613	0.423	0.678
L85	LTE B26	QPSK15M	26765	36	39	Back of Keyboard	9	off	24	23.65	0.16	0.509	0.351	0.552
L86	LTE B26	QPSK15M	26765	36	39	Back of Keyboard (Repeated)	0	on	22	21.27	0.05	0.866	0.529	1.025
L87	LTE B30	QPSK10M	27710	1	49	Back of Screen	25	on	19	18.71	-0.16	<0.001	<0.001	<0.001
L88	LTE B30	QPSK10M	27710	1	49	Back of Keyboard	0	on	19	18.71	-0.01	0.816	0.414	0.872
L89	LTE B30	QPSK10M	27710	25	25	Back of Keyboard	0	on	19	18.34	0	0.84	0.422	0.978
L90	LTE B30	QPSK10M	27710	50	0	Back of Keyboard	0	on	19	18.3	-0.01	0.825	0.415	0.969
L91	LTE B30	QPSK10M	27710	1	49	Back of Keyboard	9	off	23	22.63	0.15	0.561	0.296	0.611
L92	LTE B30	QPSK10M	27710	25	25	Back of Keyboard	9	off	22	21.62	0.15	0.457	0.241	0.499
L93	LTE B30	QPSK10M	27710	25	25	Back of Keyboard (Repeated)	0	on	19	18.34	0.02	0.829	0.417	0.965
L94	LTE B38	QPSK20M	37850	1	0	Back of Screen	25	on	20	19.54	0.14	<0.001	<0.001	<0.001
L95	LTE B38	QPSK20M	37850	1	0	Back of Keyboard	0	on	20	19.54	-0.08	0.844	0.442	0.938
L96	LTE B38	QPSK20M	38000	1	0	Back of Keyboard	0	on	20	19.5	0.08	0.836	0.435	0.938
L97	LTE B38	QPSK20M	38150	1	0	Back of Keyboard	0	on	20	19.52	-0.11	0.852	0.44	0.952
L98	LTE B38	QPSK20M	37850	50	0	Back of Keyboard	0	on	20	19.38	-0.17	0.844	0.443	0.974
L99	LTE B38	QPSK20M	38150	100	0	Back of Keyboard	0	on	20	19.39	0.01	0.865	0.45	0.995
L100	LTE B38	QPSK20M	37850	1	0	Back of Keyboard	9	off	24	23.68	-0.07	0.681	0.373	0.733
L101	LTE B38	QPSK20M	37850	50	0	Back of Keyboard	9	off	23	22.62	-0.16	0.548	0.299	0.598
L102	LTE B38	QPSK20M	38150	100	0	Back of Keyboard (Repeated)	0	on	20	19.39	0	0.858	0.442	0.987
L103	LTE B41	QPSK20M	41490	1	0	Back of Screen	25	on	20	19.82	-0.01	<0.001	<0.001	<0.001
L104	LTE B41	QPSK20M	41490	1	0	Back of Keyboard	0	on	20	19.82	-0.04	0.926	0.473	0.965
L105	LTE B41	QPSK20M	39750	1	0	Back of Keyboard	0	on	20	19.77	0	0.737	0.392	0.777
L106	LTE B41	QPSK20M	40620	1	0	Back of Keyboard	0	on	20	19.63	-0.14	0.795	0.408	0.866
L107	LTE B41	QPSK20M	41490	50	25	Back of Keyboard	0	on	20	19.76	0.08	0.888	0.459	0.938
L108	LTE B41	QPSK20M	41490	100	0	Back of Keyboard	0	on	20	19.75	0.05	0.942	0.48	0.998
L109	LTE B41	QPSK20M	41490	1	0	Back of Keyboard	9	off	24	23.74	0.12	0.806	0.427	0.856
L110	LTE B41	QPSK20M	41490	50	50	Back of Keyboard	9	off	23	22.78	0.13	0.638	0.338	0.671
L111	LTE B41	QPSK20M	41490	100	0	Back of Keyboard (Repeated)	0	on	20	19.75	-0.01	0.925	0.471	0.980
L112	LTE B66	QPSK20M	132572	1	50	Back of Screen	25	on	19	18.77	0	<0.001	<0.001	<0.001
L113	LTE B66	QPSK20M	132572	1	50	Back of Keyboard	0	on	19	18.77	0.01	0.892	0.514	0.941
L114	LTE B66	QPSK20M	132072	1	50	Back of Keyboard	0	on	19	18.58	0.15	0.732	0.415	0.806
L115	LTE B66	QPSK20M	132322	1	50	Back of Keyboard	0	on	19	18.47	-0.02	0.875	0.494	0.989
L116	LTE B66	QPSK20M	132572	50	0	Back of Keyboard	0	on	19	18.59	0.1	0.875	0.498	0.962
L117	LTE B66	QPSK20M	132572	100	0	Back of Keyboard	0	on	19	18.57	0	0.901	0.51	0.995
L118	LTE B66	QPSK20M	132572	1	50	Back of Keyboard	9	off	24	23.58	-0.19	0.693	0.411	0.763
L119	LTE B66	QPSK20M	132572	50	0	Back of Keyboard	9	off	23	22.47	-0.19	0.538	0.318	0.608
L120	LTE B66	QPSK20M	132572	100	0	Back of Keyboard (Repeated)	0	on	19	18.57	0	0.875	0.496	0.966

Test No.	Band	Mode	Channel	RB	offset	Test Position	Separation Distance (mm)	Sensor sate	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
L121	LTE B71	QPSK20M	133222	1	0	Back of Screen	25	on	22	21.69	-0.09	<0.001	<0.001	<0.001
L122	LTE B71	QPSK20M	133222	1	0	Back of Keyboard	0	on	22	21.69	0	0.75	0.455	0.805
L123	LTE B71	QPSK20M	133322	1	0	Back of Keyboard	0	on	22	21.34	0.19	0.828	0.502	0.964
L124	LTE B71	QPSK20M	133372	1	0	Back of Keyboard	0	on	22	21.64	-0.18	0.89	0.539	0.967
L125	LTE B71	QPSK20M	133222	50	25	Back of Keyboard	0	on	22	21.57	0.02	0.895	0.542	0.988
L126	LTE B71	QPSK20M	133222	100	0	Back of Keyboard	0	on	22	21.46	-0.1	0.87	0.526	0.985
L127	LTE B71	QPSK20M	133222	1	0	Back of Keyboard	9	off	25	24.65	0.01	0.482	0.306	0.522
L128	LTE B71	QPSK20M	133222	50	25	Back of Keyboard	9	off	24	23.68	0.04	0.439	0.280	0.473
L129	LTE B71	QPSK20M	133222	50	25	Back of Keyboard (Repeated)	0	on	22	21.57	0	0.882	0.536	0.974

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

2. Body-worn SAR test results of WiFi 2.4G

Test No.	Band	Channel	Test Position	Separation Distance (mm)	Ant	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W01	802.11g	6	Back of Screen	25	AUX	6	79.17	21.00	19.55	-0.07	0.097	0.041	0.172
W02	802.11g	6	Back of Keyboard	0	AUX	6	79.17	21.00	19.55	0	0.001	0.001	0.002
W03	802.11g	1	Back of Screen	25	AUX	6	79.17	17.00	16.49	0.19	0.029	0.016	0.042
W04	802.11g	11	Back of Screen	25	AUX	6	79.17	17.50	17.02	0.01	0.035	0.021	0.050
W05	802.11g	6	Back of Screen	25	MAIN	6	79.17	21.00	19.32	-0.06	0.119	0.070	0.221
W06	802.11g	6	Back of Keyboard	0	MAIN	6	79.17	21.00	19.32	0	0.001	0.000	0.002
W07	802.11g	1	Back of Screen	25	MAIN	6	79.17	17.00	16.64	0.06	0.032	0.019	0.043
W08	802.11g	11	Back of Screen	25	MAIN	6	79.17	17.50	16.54	-0.15	0.079	0.046	0.125
W09	802.11n HT40	6	Back of Screen	25	MIMO	HT8	79.17	21.00	20.56	-0.02	0.087	0.051	0.121
W10	802.11n HT40	6	Back of Keyboard	0	MIMO	HT8	79.17	21.00	20.56	0	<0.001	<0.001	<0.001
W11	802.11n HT40	3	Back of Screen	25	MIMO	HT8	79.17	19.50	18.55	0.08	0.054	0.032	0.084
W12	802.11n HT40	9	Back of Screen	25	MIMO	HT8	79.17	19.00	18.69	-0.04	0.049	0.029	0.067

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

3. Body-worn SAR test results of BT

Test No.	Band	Channel	Test Position	Separation Distance (mm)	Ant	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
B01	BT DH5	78	Back of Screen	25	AUX	DH5	76.70	10.00	9.81	-0.02	0.0010	0.0003	0.001
B02	BT DH5	78	Back of Keyboard	0	AUX	DH5	76.70	10.00	9.81	0	0.0012	0.0001	0.002
B03	BT DH5	0	Back of Keyboard	0	AUX	DH5	76.70	10.00	8.70	0	0.0014	0.0001	0.002
B04	BT DH5	39	Back of Keyboard	0	AUX	DH5	76.70	10.00	9.27	0	0.0014	0.0003	0.002

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

4. Body-worn SAR test results of WiFi 5G

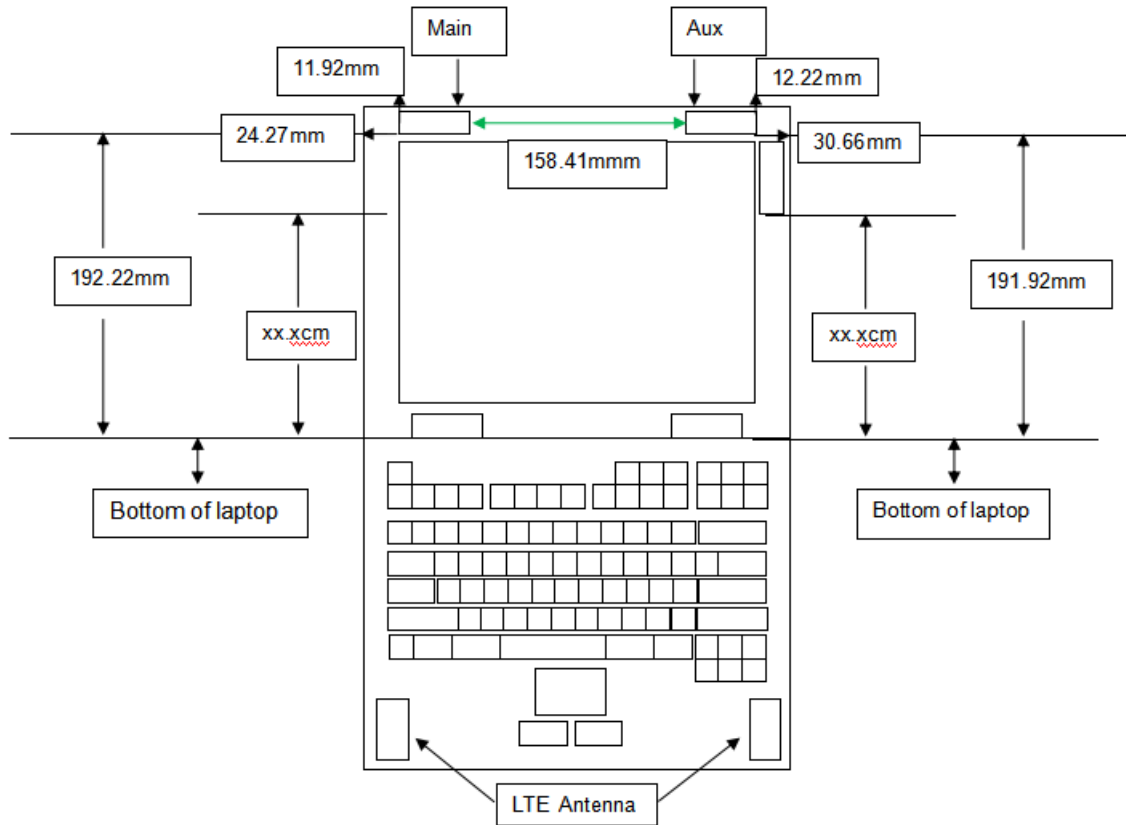
Test No.	Band	Channel	Test Position	Separation Distance (mm)	Ant	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W13	802.11n HT40	46	Back of Screen	25	AUX	HT0	78.77	18.50	18.04	0	0.231	0.107	0.326
W14	802.11n HT40	46	Back of Keyboard	0	AUX	HT0	78.77	18.50	18.04	0	0.0044	0.0019	0.006
W15	802.11n HT40	38	Back of Screen	25	AUX	HT0	78.77	18.00	17.91	-0.02	0.275	0.126	0.356
W16	802.11n HT40	46	Back of Screen	25	MAIN	HT0	78.77	18.50	17.90	0.08	0.321	0.147	0.468
W17	802.11n HT40	46	Back of Keyboard	0	MAIN	HT0	78.77	18.50	17.90	0	0.0051	0.004	0.007
W18	802.11n HT40	38	Back of Screen	25	MAIN	HT0	78.77	18.50	17.87	0	0.336	0.153	0.493
W19	802.11n HT20	48	Back of Screen	25	MIMO	HT8	78.77	21.00	20.60	-0.03	0.292	0.136	0.406
W20	802.11n HT20	48	Back of Keyboard	0	MIMO	HT8	78.77	21.00	20.60	0	0.0046	0.0026	0.006
W21	802.11n HT20	40	Back of Screen	25	MIMO	HT8	78.77	20.50	20.06	0	0.311	0.141	0.437
W22	802.11n HT20	44	Back of Screen	25	MIMO	HT8	78.77	20.50	20.12	0	0.289	0.133	0.400
W23	802.11n HT20	60	Back of Screen	25	AUX	HT0	78.77	18.50	17.77	0	0.287	0.128	0.431
W24	802.11n HT20	60	Back of Keyboard	0	AUX	HT0	78.77	18.50	17.77	0	<0.001	<0.001	<0.001
W25	802.11n HT20	52	Back of Screen	25	AUX	HT0	78.77	18.50	17.70	0	0.207	0.0938	0.316
W26	802.11n HT20	56	Back of Screen	25	AUX	HT0	78.77	18.50	17.62	-0.08	0.24	0.11	0.373
W27	802.11n HT20	52	Back of Screen	25	MAIN	HT0	78.77	18.50	17.76	-0.02	0.318	0.143	0.479
W28	802.11n HT20	52	Back of Keyboard	0	MAIN	HT0	78.77	18.50	17.76	0	<0.001	<0.001	<0.001
W29	802.11n HT20	56	Back of Screen	25	MAIN	HT0	78.77	18.50	17.62	0	0.307	0.144	0.477
W30	802.11n HT20	60	Back of Screen	25	MAIN	HT0	78.77	18.50	17.57	-0.04	0.309	0.143	0.486
W31	802.11n HT20	60	Back of Screen	25	MIMO	HT8	78.77	21.00	20.40	0	0.337	0.158	0.491
W32	802.11n HT20	60	Back of Keyboard	0	MIMO	HT8	78.77	21.00	20.40	0	<0.001	<0.001	<0.001
W33	802.11n HT20	52	Back of Screen	25	MIMO	HT8	78.77	21.00	20.33	-0.05	0.305	0.144	0.452
W34	802.11n HT20	56	Back of Screen	25	MIMO	HT8	78.77	21.00	20.31	0	0.298	0.133	0.443
W35	802.11n HT40	110	Back of Screen	25	AUX	HT0	78.77	18.50	18.02	0	0.254	0.11	0.360
W36	802.11n HT40	110	Back of Keyboard	0	AUX	HT0	78.77	18.50	18.02	0	<0.001	<0.001	<0.001
W37	802.11n HT40	118	Back of Screen	25	AUX	HT0	78.77	18.50	17.94	-0.05	0.255	0.116	0.368
W38	802.11n HT40	134	Back of Screen	25	AUX	HT0	78.77	18.50	17.92	0.17	0.391	0.181	0.567
W39	802.11n HT40	134	Back of Screen	25	MAIN	HT0	78.77	18.50	18.12	0.07	0.439	0.191	0.608
W40	802.11n HT40	134	Back of Keyboard	0	MAIN	HT0	78.77	18.50	18.12	0	<0.001	<0.001	<0.001
W41	802.11n HT40	110	Back of Screen	25	MAIN	HT0	78.77	18.50	18.07	0	0.424	0.186	0.594
W42	802.11n HT40	118	Back of Screen	25	MAIN	HT0	78.77	18.50	18.05	-0.02	0.438	0.194	0.617
W43	802.11n HT20	112	Back of Screen	25	MIMO	HT8	78.77	21.50	21.25	0.02	0.442	0.206	0.594
W44	802.11n HT20	112	Back of Keyboard	0	MIMO	HT8	78.77	21.50	21.25	0	<0.001	<0.001	<0.001
W45	802.11n HT20	116	Back of Screen	25	MIMO	HT8	78.77	21.50	21.22	0.06	0.453	0.208	0.613
W46	802.11n HT20	108	Back of Screen	25	MIMO	HT8	78.77	21.50	21.09	-0.01	0.437	0.197	0.610
W47	802.11n HT40	151	Back of Screen	25	AUX	HT0	78.77	18.50	17.89	0	0.319	0.142	0.466
W48	802.11n HT40	151	Back of Keyboard	0	AUX	HT0	78.77	18.50	17.89	0	<0.001	<0.001	<0.001
W49	802.11n HT40	142	Back of Screen	25	AUX	HT0	78.77	18.50	17.87	0.06	0.307	0.138	0.451
W50	802.11n HT40	159	Back of Screen	25	AUX	HT0	78.77	18.50	17.73	-0.08	0.356	0.159	0.540
W51	802.11n HT40	142	Back of Screen	25	MAIN	HT0	78.77	18.50	18.11	0	0.426	0.189	0.592
W52	802.11n HT40	142	Back of Keyboard	0	MAIN	HT0	78.77	18.50	18.11	0	<0.001	<0.001	<0.001
W53	802.11n HT40	151	Back of Screen	25	MAIN	HT0	78.77	18.50	18.08	0	0.426	0.189	0.596
W54	802.11n HT40	159	Back of Screen	25	MAIN	HT0	78.77	18.50	18.02	0	0.434	0.192	0.615
W55	802.11n HT40	142	Back of Screen	25	MIMO	HT8	78.77	21.00	20.77	-0.05	0.438	0.193	0.586
W56	802.11n HT40	142	Back of Keyboard	0	MIMO	HT8	78.77	21.00	20.77	0	<0.001	<0.001	<0.001
W57	802.11n HT40	151	Back of Screen	25	MIMO	HT8	78.77	21.00	20.68	0	0.422	0.187	0.577
W58	802.11n HT40	159	Back of Screen	25	MIMO	HT8	78.77	21.00	20.67	-0.06	0.445	0.197	0.610

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

7.3 MULTIPLE TRANSMITTER EVALUATION

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

The location of the antenna inside EUT is as below:



7.3.1 SIMULTANEOUS TRANSMISSION CONDITIONS

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

The Simultaneous Transmission Possibilities of this device are as below:

NO.	Simultaneous Tx Combination	Body-worn
1	LTE Ant+WIFI 2.4G Main Ant	Yes
2	LTE Ant+WIFI 5.2G Main Ant	Yes
3	LTE Ant+WIFI 5.3G Main Ant	Yes
4	LTE Ant+WIFI 5.6G Main Ant	Yes
5	LTE Ant+WIFI 5.8G Main Ant	Yes
6	LTE Ant+WIFI 2.4G Aux Ant	Yes
7	LTE Ant+WIFI 5.2G Aux Ant	Yes
8	LTE Ant+WIFI 5.3G Aux Ant	Yes
9	LTE Ant+WIFI 5.6G Aux Ant	Yes
10	LTE Ant+WIFI 5.8G Aux Ant	Yes
11	LTE Ant+BT Aux Ant	Yes
12	LTE Ant+WIFI 2.4G MIMO	Yes
13	LTE Ant+WIFI 5G MIMO	Yes

Note: Only the Aux Ant supports BT function.

7.3.2 SAR SUMMATION SCENARIO

1. About LTE and WIFI (Main) antenna

Test Position SAR _{1g} (W/Kg)	Back of Screen	Back of Keyboard
LTE B2	<0.001	0.906
LTE B4	<0.001	0.973
LTE B5	<0.001	0.887
LTE B7	<0.001	0.932
LTE B12	<0.001	1.035
LTE B13	<0.001	1.135
LTE B14	<0.001	1.067
LTE B17	<0.001	0.986
LTE B25	<0.001	0.941
LTE B26	<0.001	1.033
LTE B30	<0.001	0.978
LTE B38	<0.001	0.995
LTE B41	<0.001	0.998
LTE B66	<0.001	0.995
LTE B71	<0.001	0.988
WiFi 2.4G	0.221	0.002
WiFi 5.2G	0.493	0.007
WiFi 5.3G	0.486	<0.001
WiFi 5.6G	0.617	<0.001
WiFi 5.8G	0.615	<0.001
MAX $\sum$ SAR _{1g}	0.617	1.142

Note: MAX. $\sum$ SAR_{1g} = 1.142 W/Kg < 1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

2. About LTE and WIFI/BT (Aux) antenna

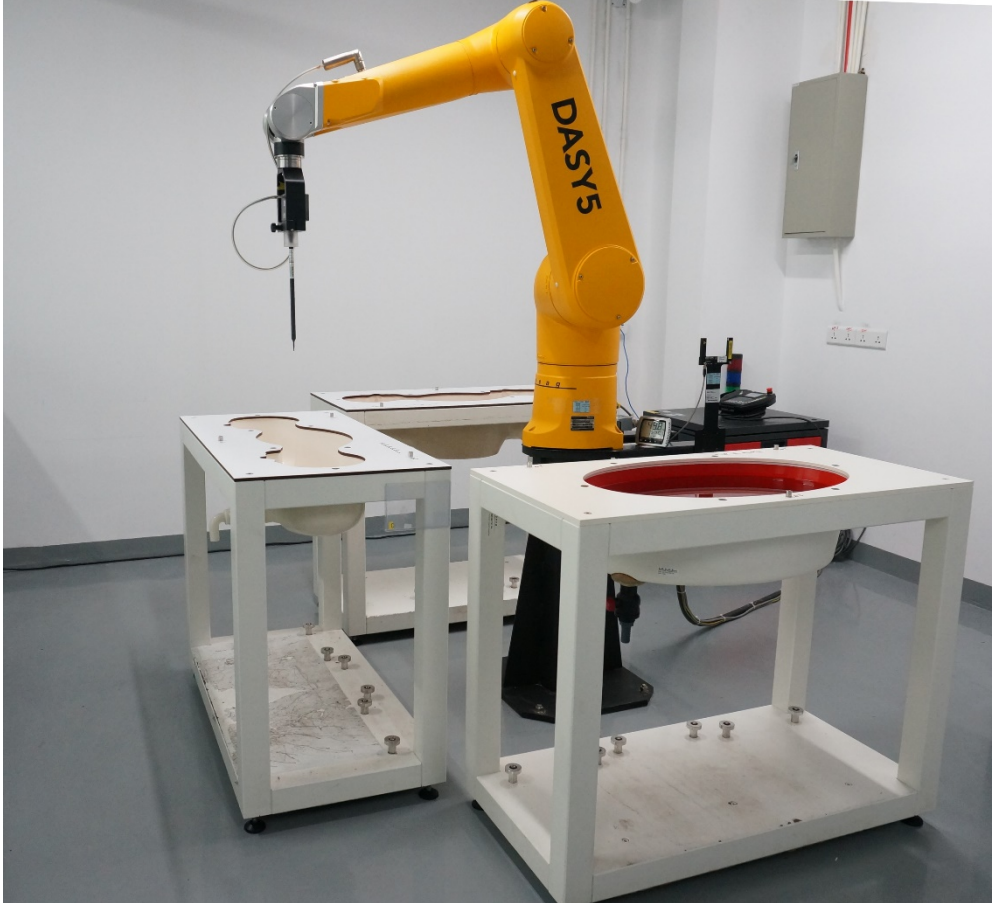
Test Position SAR _{1g} (W/Kg)	Back of Screen	Back of Keyboard
LTE B2	<0.001	0.906
LTE B4	<0.001	0.973
LTE B5	<0.001	0.887
LTE B7	<0.001	0.932
LTE B12	<0.001	1.035
LTE B13	<0.001	1.135
LTE B14	<0.001	1.067
LTE B17	<0.001	0.986
LTE B25	<0.001	0.941
LTE B26	<0.001	1.033
LTE B30	<0.001	0.978
LTE B38	<0.001	0.995
LTE B41	<0.001	0.998
LTE B66	<0.001	0.995
LTE B71	<0.001	0.988
WiFi 2.4G	0.172	0.002
WiFi 5.2G	0.356	0.006
WiFi 5.3G	0.431	<0.001
WiFi 5.6G	0.567	<0.001
WiFi 5.8G	0.540	<0.001
BT	0.001	0.002
MAX $\sum$ SAR _{1g}	0.567	1.141

Note: MAX. $\sum$ SAR_{1g} = 1.141 W/Kg <1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

3. About LTE and WIFI/BT (MIMO) antenna

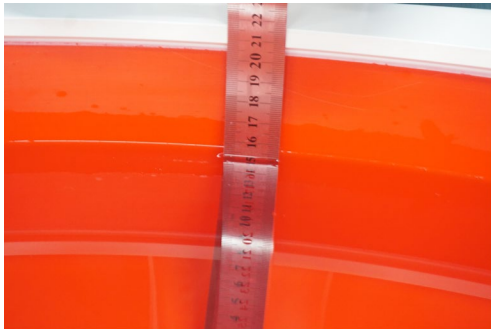
Test Position SAR _{1g} (W/Kg)	Back of Screen	Back of Keyboard
LTE B2	<0.001	0.906
LTE B4	<0.001	0.973
LTE B5	<0.001	0.887
LTE B7	<0.001	0.932
LTE B12	<0.001	1.035
LTE B13	<0.001	1.135
LTE B14	<0.001	1.067
LTE B17	<0.001	0.986
LTE B25	<0.001	0.941
LTE B26	<0.001	1.033
LTE B30	<0.001	0.978
LTE B38	<0.001	0.995
LTE B41	<0.001	0.998
LTE B66	<0.001	0.995
LTE B71	<0.001	0.988
WiFi 2.4G	0.121	<0.001
WiFi 5.2G	0.437	0.006
WiFi 5.3G	0.491	<0.001
WiFi 5.6G	0.613	<0.001
WiFi 5.8G	0.610	<0.001
MAX $\sum$ SAR _{1g}	0.613	1.141

Note: MAX. $\sum$ SAR_{1g} = 1.141 W/Kg <1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

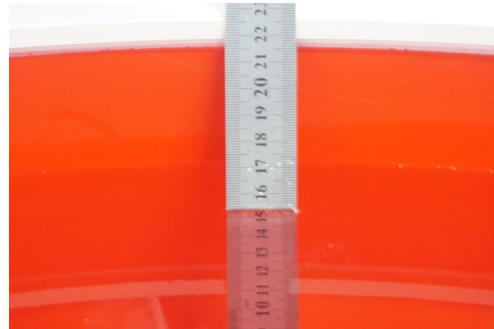
APPENDIX**1. TEST LAYOUT****Specific Absorption Rate Test Layout**

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

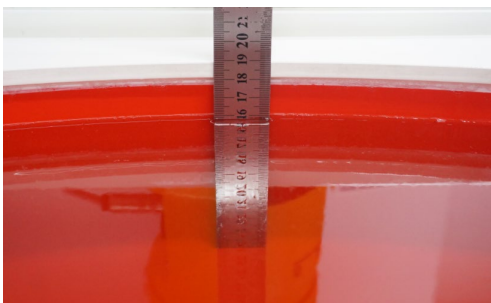
Body_695MHz-925MHz_15.3cm



Body_1700MHz-1900MHz_15.4cm



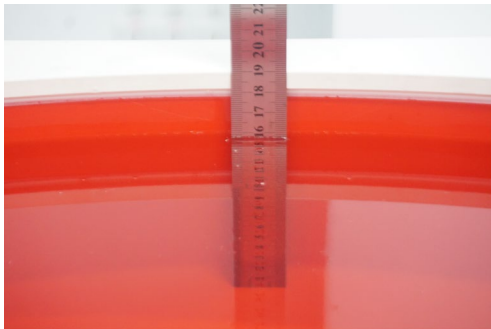
Body_1900MHz-2300MHz_15.9cm



Body_2300MHz-2700MHz_15.1cm



Body_3300MHz-4200MHz_15.8cm



Body_4500MHz-6000MHz_15.5cm



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-2410C002_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-2410C002_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-2410C002_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-2410C002_Appendix D.)

Appendix E. Conducted power measurement result

(Pls See BTL-FCC SAR-1-2410C002_Appendix E.)