FCC

SAR EVALUATION REPORT

For

FCC ID：2AVE6TG5

Model : TG5

Report Type：Original Report	**Product Name**：Tractive CAT mini
Report Number: **RXZ230110032SA01**	
Report Date: **2023-02-20**	

Prepared By: **Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)**
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,
New Taipei City 22183, Taiwan, R.O.C.
Tel: **+886 (2)2647 6898**
Fax: **+886 (2)2647 6895**
www.bacl.com.tw

Facilities: **The test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on**
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Statement of Compliance

Applicant (Certification Holder)	Tractive GmbH	
	Poststrasse 4 ,4061Pasching, Austria	
Brand (Trade) Name	N/A	
Product (Equipment) Name	Tractive CAT mini	
Model Name	TG5	
Serial Model Name	N/A	
Serial Number	RXZ230110032-01	
Test Date	2023/02/07 ~ 2023/02/16	

Measurement Procedures and Standards Used:

☒ IEC/IEEE 62209-1528:2020

SAR baseline test guidance includes the following-IEC/IEEE 62209-1528:2020 – secs 6.1, 7.4.2.

☒ IEEE 1528-2013

☒ FCC 47 CFR part 2.1093

☒ KDB 447498 D04 Interim General RF Exposure Guidance v01

☒ KDB 648474 D04 Handset SAR v01r03

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

☒ KDB 941225 D05 SAR for LTE Devices v02r05

☒ KDB 248227 D01 802.11 Wi-Fi SAR v02r02

The measurement results in this report were performed at Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

Report Issued Date: 2023-02-20

Project Engineer: Anson Lu

Reviewed By: Rory Cheng

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ230110032	RXZ230110032SA01	2023.02.20	Original Report	Anson Lu

TABLE OF CONTENTS

EUT RESULTS

Attestation of Test Results for Body SAR			
Frequency Band	Max. SAR Level(s) Reported(1g / W/kg)		Limit(W/kg)
	Position	Maxi. SAR(W/kg)	
GPRS 850	Body SAR	0.69	1.6
GPRS1900	Body SAR	1.41	
CAT M1 Band 2	Body SAR	0.50	
CAT M1 Band 4	Body SAR	0.13	
CAT M1 Band 5	Body SAR	0.12	
CAT M1 Band 12	Body SAR	0.09	
CAT M1 Band 13	Body SAR	0.04	
WiFi 2.4GHz	Body SAR	0.46	
Simultaneous	Body SAR	1.54	

Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in FCC 47 CFR part 2.1093 has been tested in accordance with the measurement procedures specified in IEC/IEEE 62209-1528-2020 RF exposure KDB procedures.
The results and statements contained in this report pertain only to the device(s) evaluated.

EUT DESCRIPTION

Technical Specification

Applicant	Tractive GmbH
Exposure Category	Population / Uncontrolled
Antenna Type(s)	FPC Antenna for GPRS and LTE Chip Antenna for WiFi and Bluetooth
Modulation Type	GPRS: GMSK LTE: QPSK, 16QAM 2.4G Wi-Fi: DSSS BLE: GFSK
Frequency Band	GPRS 850: 824.2 ~ 848.8 MHz(TX) GPRS 1900: 1850.2 ~ 1909.8 MHz(TX) LTE Band 2: 1850 ~ 1910 MHz(TX) LTE Band 4: 1710 ~ 1755 MHz(TX) LTE Band 5: 824 ~ 849 MHz(TX) LTE Band 12: 699 ~ 716 MHz(TX) LTE Band 13: 777 ~ 787 MHz(TX) 2.4G Wi-Fi: 2412 ~ 2462 MHz(802.11b) BLE: 2402 ~ 2480 MHz
Conducted RF Power (Avg/Tune-Up)	GPRS 850 : 21.5 dBm GPRS 1900 : 17.5 dBm LTE Band 2 : 20.5 dBm LTE Band 4 : 22.5 dBm LTE Band 5 : 22.5 dBm LTE Band 12 : 22.5 dBm LTE Band 13 : 23.0 dBm Bluetooth LE(1M): -6.5 dBm Wi-Fi 2.4GHz: 6.5 dBm
Power Source	DC 3.8V from battery and DC 5V from external power supply
Normal Operation	Body-worn

Note:

1) *All measurement and test data in this report was gathered from production sample serial number：RXZ230110032-01 (Assigned by BACL, (New Taipei Laboratory)). The EUT supplied by the applicant was received on 2023/02/07.*

REFERENCE, STANDARDS, AND GUIDELINES

FCC：

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

SAR Limits

FCC Limit

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	**1.60**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	**4.0**	20.0

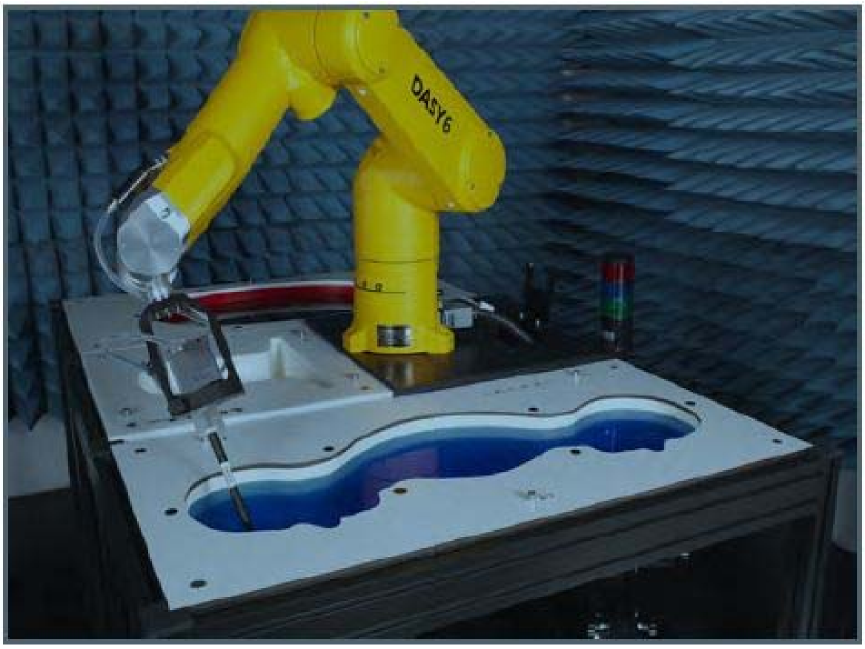
Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that maybe incurred by people who are aware of the potential for exposure (i.e. as a result of employmentor occupation).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2.0 W/kg (CE) applied to the EUT.

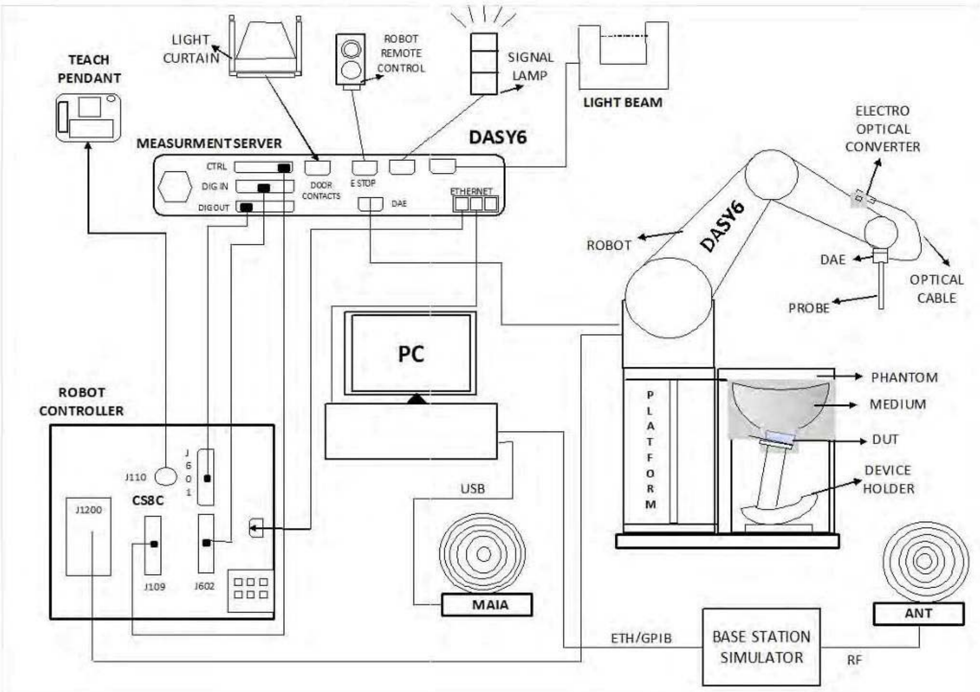
DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid& Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



DASY6 System Description

The DASY6 system for performing compliance tests consists of the following items:



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

DASY6 Measurement Server

The DASY6 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program- controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

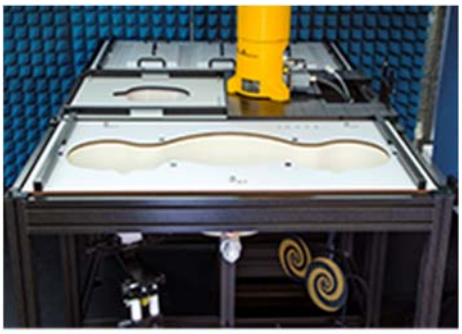
The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

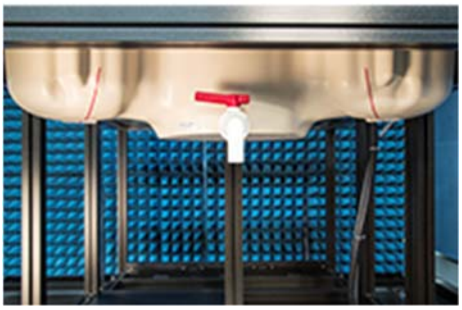
The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

SAM Twin Phantom





The SAM Twin Phantom (shown in front of DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three measurement areas: 1) Left Head, 2) Right Head, and 3) Flat Section. For larger devices, the use of the ELI-Phantom (shown behind DASY6) is required. For devices such as glasses with a wireless link, the Face Down Phantom is the most suitable (between the SAM Twin and ELI phantoms).

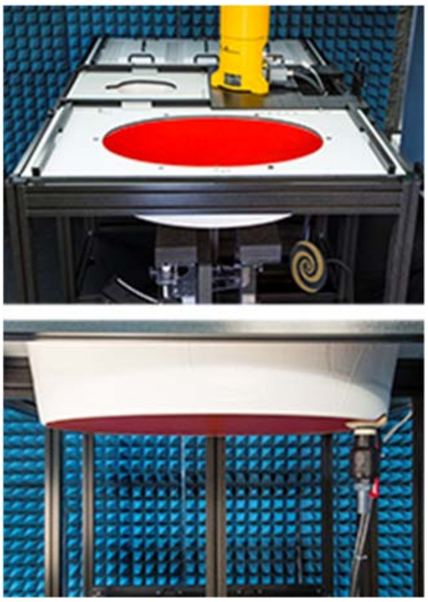
When the phantom is mounted inside allocated slot of the DASY6 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY6 platform is used to mount the

Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.
In addition to our standard broadband liquids, the phantom can be used with the following tissue simulating liquids:

Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.
DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

Do not use other organic solvents without previously testing the solvent resistivity of the phantom. Approximately 25 liters of liquid is required to fill the SAM Twin phantom.

ELI Phantom
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI is fully compatible with the latest draft of the standard IEC 62209-2 and the use of all known tissue simulating liquids. ELI has been optimized for performance and can be integrated into a SPEAG standard phantom table. A cover is provided to prevent evaporation of water and changes in liquid parameters. 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 can be used with the following tissue simulating liquids:

- Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.

- DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

- Do not use other organic solvents without previously testing the solvent resistivity of the phantom.

Approximately 25 liters of liquid is required to fill the ELI phantom

Robots
The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from StaubliSA (France). The TX robot family - the successor of the well-known RX robot family - continues to offer the features important for DASY6 applications:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchrony motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

The robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is provided

Area Scans
Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 15mm^2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)
The averaging zoom scan volume utilized in the DASY6 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

Recommended Tissue Dielectric Parameters for Head and Body

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEC/IEEE 62209-1528

Recommended Tissue Dielectric Parameters for Head liquid

Table 2 – Dielectric properties of the tissue-equivalent medium

Frequency(MHz)	permittivity,(ε'r)	Conductivity, σ(S/m)
4	*55,0*	*0,75*
13	*55,0*	*0,75*
30	55,0	0,75
150	52,3	0,76
300	45,3	0,87
450	43,5	0,87
750	*41,9*	*0,89*
835	41,5	0,90
900	41,5	0,97
1450	40,5	1,20
1800	40,0	1,40
1900	40,0	1,40
1950	40,0	1,40
2000	40,0	1,40
2100	*39,8*	*1,49*
2450	39,2	1,80
2600	*39,0*	*1,96*
3000	38,5	2,40
3500	*37,9*	*2,91*
4000	*37,4*	*3,43*
4500	*36,8*	*3,94*
5000	*36,2*	*4,45*
5200	*36,0*	*4,66*
5400	*35,8*	*4,86*
5600	*35,5*	*5,07*
5800	35,3	5,27
6000	*35,1*	*5,48*
6500	*34,5*	*6,07*
7000	*33,9*	*6,65*

7500	*33,3*	*7,24*
8000	*32,7*	*7,84*
8500	*32,1*	*8,46*
9000	*31,6*	*9,08*
9500	*31,0*	*9,71*
10000	*30,4*	*10,40*

NOTE For convenience, permittivity and conductivity values are linearly interpolated for frequencies that are not a part of the original data from Drossos et al. [2]. They are shown in italics in Table 2. The italicized values are linearly interpolated (below 5800 MHz) or extrapolated (above 5800 MHz) from the non-italicized values that are immediately above and below these values.

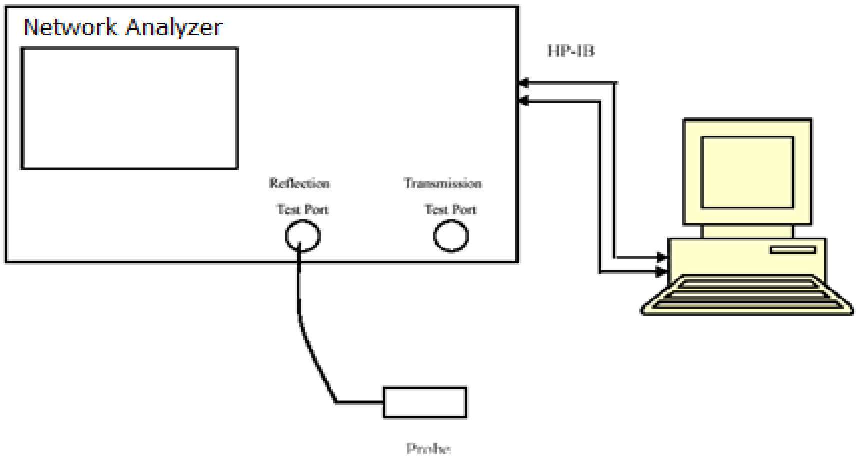
EQUIPMENT LIST AND CALIBRATION

Equipment's List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
Robot	TX90	5N26A1	N.C.R	N.C.R
DASY5 Test Software	DASY5.2	N/A	N.C.R	N.C.R
DASY6 Measurement Server	DASY 6.0	1588	N/A	N/A
Data Acquisition Electronics	DAE	1561	2022/12/15	2023/12/14
E-Field Probe	EX3DV4	7520	2022/12/12	2023/12/11
Dipole, 750 MHz	D750V3	1079	2020/11/06	2023/11/05
Dipole, 835 MHz	D835V2	454	2020/11/18	2023/11/17
Dipole, 1800 MHz	D1800V2	2d207	2020/11/9	2023/11/8
Dipole, 1900 MHz	D1900V2	5d207	2020/11/11	2023/11/10
Dipole, 2450 MHz	D2450V2	1068	2021/10/11	2024/10/10
Twin SAM	Twin SAM V5.0	1368	N/A	N/A
Twin ELI	Twin ELI V8.0	2088	N/A	N/A
Simulated Tissue 0.6G~6GHz Head	TS-6GHz-H	N/A	Each Time/	
Wideband Radio Communication Tester	CMW-500	149170	2022/04/29	2023/04/28
Wideband Radio Communication Tester	CMW290	101741	2022/07/14	2023/07/13
Mounting Device	N/A	SD 000 H01 KA	N/A	N/A
Network Analyzer	E5063A	MY54402093	2022/12/20	2023/12/19
Dielectric probe kit	85070B	50207	N/A	N/A
MXG Signal Generator	N5183A	MY50140407	2022/12/29	2023/12/28
EPM Series Power Meter	E4419B	GB43312279	2023/1/4	2024/1/3
Avg Power Sensor	E9304A H18	MZ54110016	2023/1/4	2024/1/3
Power Amplifier	ZVE-8G+	365701647	2023/1/11	2024/1/10
Power Amplifier	ZHL-42W+	329401642	2023/1/11	2024/1/10
Temperature and Humidity Recoder	HTC-1	005	2022/10/25	2023/10/24
Directional Coupler	488Z	810	N.C.R	N.C.R
Attenuator	20dB, 100W	1453	N.C.R	N.C.R

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target Value		Delta (%)		Tolerance (%)
			Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	εr	
2023/02/07	835	HSL	0.935	41.936	0.90	41.50	3.89	1.05	±5
	824.2	HSL	0.932	42.026	0.90	41.55	3.56	1.15	±5
	829	HSL	0.933	41.99	0.90	41.53	3.67	1.11	±5

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target Value		Delta (%)		Tolerance (%)
			Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	εr	
2023/02/08	750	HSL	0.911	42.164	0.89	41.90	2.36	0.63	±5
	782	HSL	0.924	42.145	0.89	41.75	3.82	0.95	±5
	707.5	HSL	0.895	42.433	0.89	42.13	0.56	0.72	±5

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target Value		Delta (%)		Tolerance (%)
			Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	εr	
2023/02/10	1900	HSL	1.387	38.76	1.40	40.00	-0.93	-3.10	±5
	1855	HSL	1.361	38.853	1.40	40.00	-2.79	-2.87	±5
	1850.2	HSL	1.359	38.866	1.40	40.00	-2.93	-2.84	±5
	1880	HSL	1.375	38.805	1.40	40.00	-1.79	-2.99	±5
	1909.8	HSL	1.396	38.751	1.40	40.00	-0.29	-3.12	±5

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target Value		Delta (%)		Tolerance (%)
			Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	εr	
2023/02/14	1800	HSL	1.331	38.573	1.40	40.00	-4.93	-3.57	±5
	1715	HSL	1.293	39.03	1.35	40.12	-4.22	-2.72	±5

Test Date	Frequency (MHz)	Liquid Type	Liquid parameter		Target Value		Delta (%)		Tolerance (%)
			Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	εr	
2023/02/16	2450	HSL	1.8	39.726	1.80	39.20	0.00	1.34	±5
	2462	HSL	1.804	39.721	1.79	39.22	0.78	1.28	±5

System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

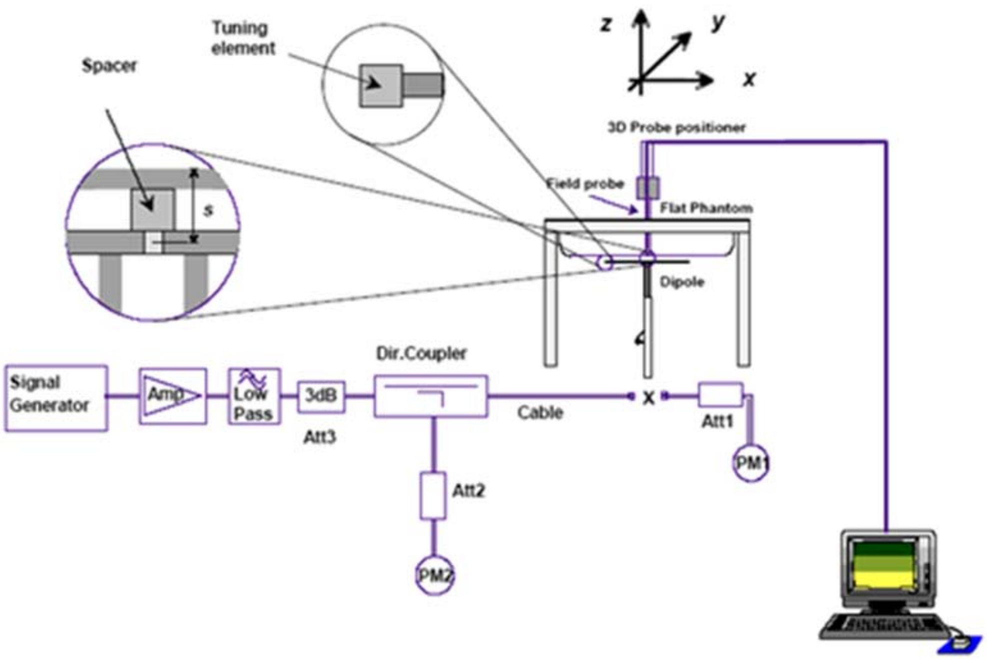
The spacing distances in the **System Verification Setup Block Diagram** is given by the following:

a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;

b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;

c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 MHz.

System Verification Setup Block Diagram



System Accuracy Check Results

System Check for 1g SAR

Test Date	Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)	Target Value (W/kg)	Normalized to 1W (W/kg)	Delta (%)	Tolerance (%)
2023/02/07	835	HSL	250	2.49	9.38	9.96	6.18	±10
2023/02/08	750	HSL	250	2.2	8.25	8.8	6.67	±10
2023/02/10	1900	HSL	250	10.1	40.1	40.4	0.75	±10
2023/02/14	1800	HSL	250	9.21	38.9	36.84	-5.30	±10
2023/02/16	2450	HSL	250	13.5	54.2	54	-0.37	±10

Note:

1) Below 5GHz, The power inputted to dipole is 0.25Watt; the SAR values are normalized to 1 Watt forward power by multiplying 4 times.

SAR SYSTEM VALIDATION DATA

Test Laboratory:BACL.SAR TestingLab

System Check_835MHz_D835V2

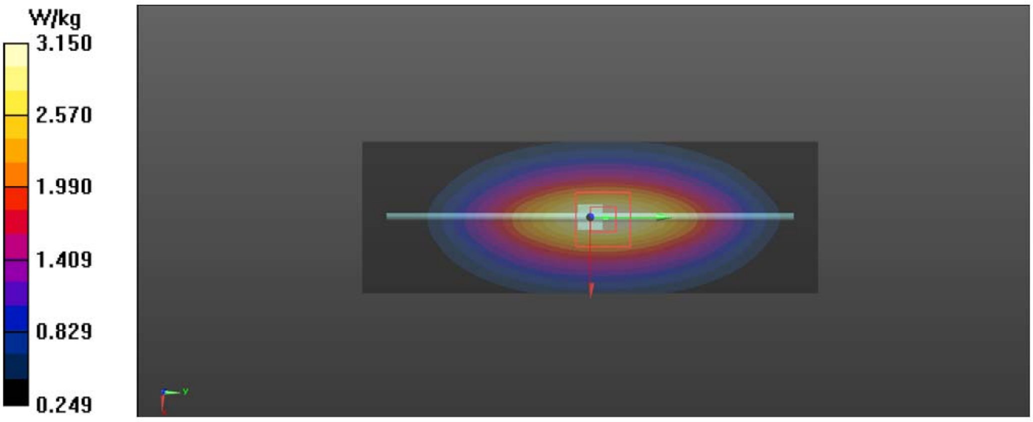
DUT: D835V2

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 Medium parameters used: f = 835 MHz; σ = 0.935 S/m; ε_r = 41.936; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.48, 9.48, 9.48) @ 835 MHz; Calibrated: 12/12/2022
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/15/2022
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.15 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.84 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.76 W/kg
SAR(1 g) = 2.49 W/kg; SAR(10 g) = 1.62 W/kg
Smallest distance from peaks to all points 3 dB below = 16.7 mm
Ratio of SAR at M2 to SAR at M1 = 66.2%
Maximum value of SAR (measured) = 3.15 W/kg



Test Laboratory:BACL.SAR TestingLab

System Check_750MHz_D750V3

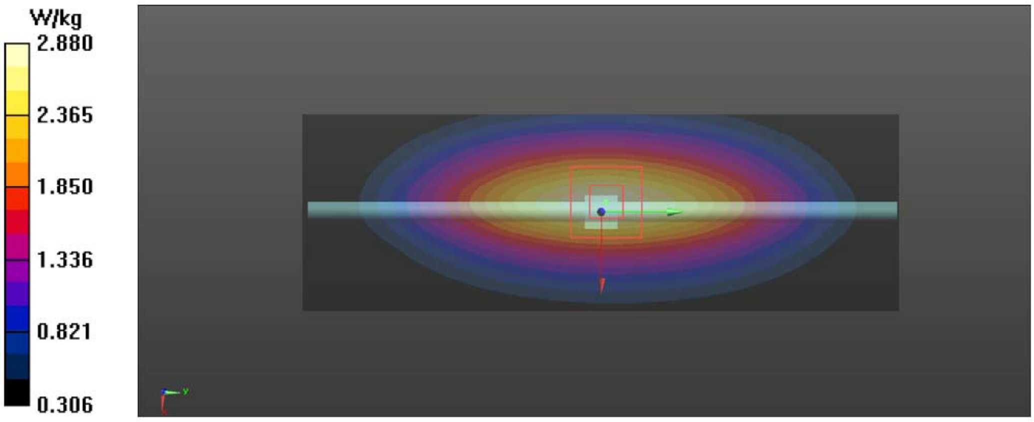
DUT: D750V3

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium: HSL 750 Medium parameters used: f = 750 MHz; σ = 0.911 S/m; ε_r = 42.164; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.72, 9.72, 9.72) @ 750 MHz; Calibrated: 12/12/2022
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/15/2022
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.86 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.82 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.24 W/kg
SAR(1 g) = 2.2 W/kg; SAR(10 g) = 1.45 W/kg
Smallest distance from peaks to all points 3 dB below = 17.6 mm
Ratio of SAR at M2 to SAR at M1 = 68.7%
Maximum value of SAR (measured) = 2.88 W/kg



Test Laboratory:BACL.SAR TestingLab

System Check_1900MHz_D1900V2

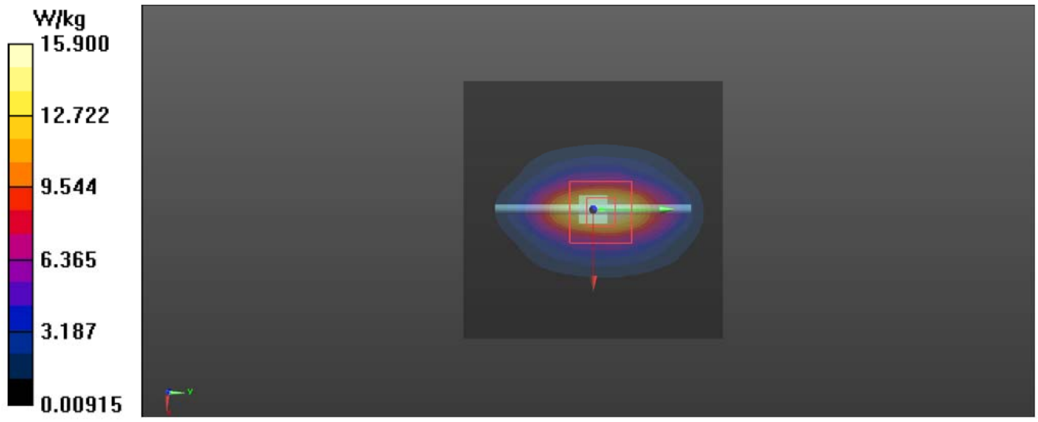
DUT: D1900V2

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL 1900 Medium parameters used: f = 1900 MHz; σ = 1.387 S/m; ε_r = 38.76; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(8.26, 8.26, 8.26) @ 1900 MHz; Calibrated: 12/12/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/15/2022
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 15.9 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 110.0 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 19.0 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.23 W/kg
Smallest distance from peaks to all points 3 dB below = 10.1 mm
Ratio of SAR at M2 to SAR at M1 = 53.3%
Maximum value of SAR (measured) = 15.5 W/kg



Test Laboratory:BACL.SAR TestingLab

System Check_1800MHz_D1800V2

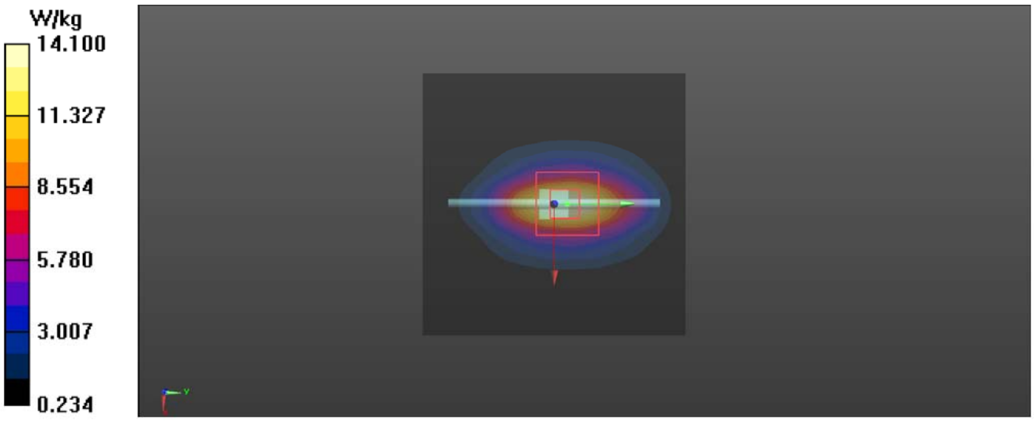
DUT: D1800V2

Communication System: UID 0, CW (0); Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: HSL1800 Medium parameters used: f = 1800 MHz; σ = 1.331 S/m; ε_r = 38.573; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(8.51, 8.51, 8.51) @ 1800 MHz; Calibrated: 12/12/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/15/2022
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.7 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 107.2 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.21 W/kg; SAR(10 g) = 4.85 W/kg
Smallest distance from peaks to all points 3 dB below = 10.1 mm
Ratio of SAR at M2 to SAR at M1 = 54.4%
Maximum value of SAR (measured) = 14.1 W/kg



Test Laboratory:BACL.SAR TestingLab

System Check_2450MHz_D2450V2

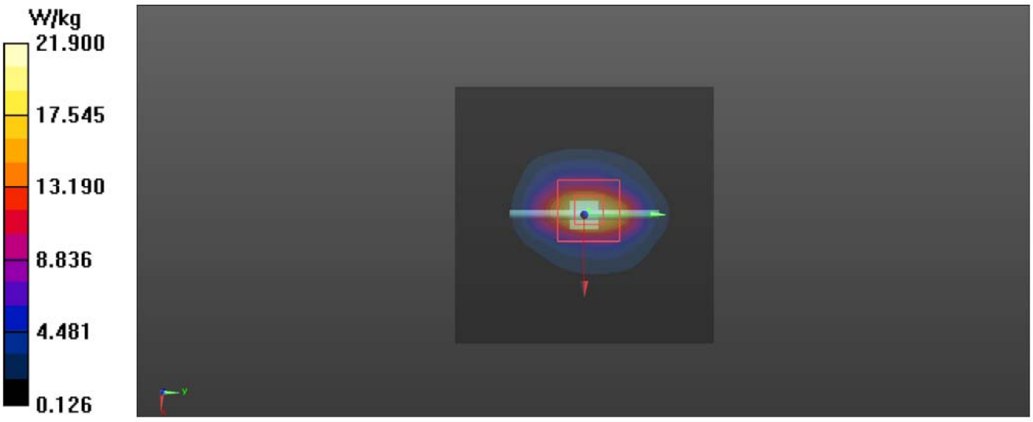
DUT: D2450V2-1068

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL 2450 Medium parameters used: f = 2450 MHz; σ = 1.8 S/m; ε_r = 39.726; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(7.49, 7.49, 7.49) @ 2450 MHz; Calibrated: 12/12/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 12/15/2022
- Phantom: ELI-Righr-ELI V8.0 (20deg probe tilt); Type: QD OVA 004 Ax; Serial: 2088
- Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 22.0 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 115.3 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.37 W/kg
Smallest distance from peaks to all points 3 dB below = 8.6 mm
Ratio of SAR at M2 to SAR at M1 = 50.9%
Maximum value of SAR (measured) = 21.9 W/kg

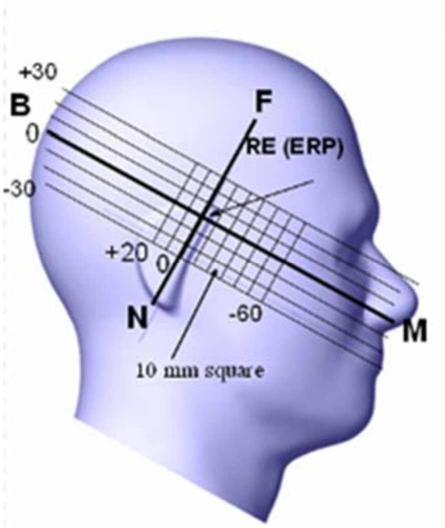


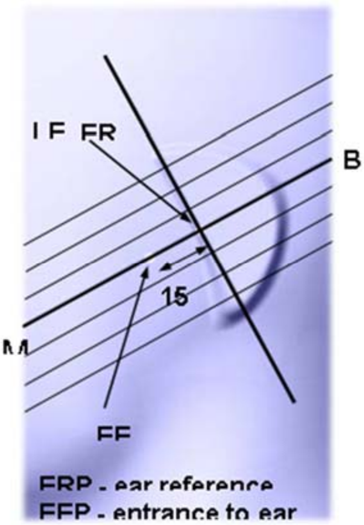
EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device hould be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:





Cheek/Touch Position

The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

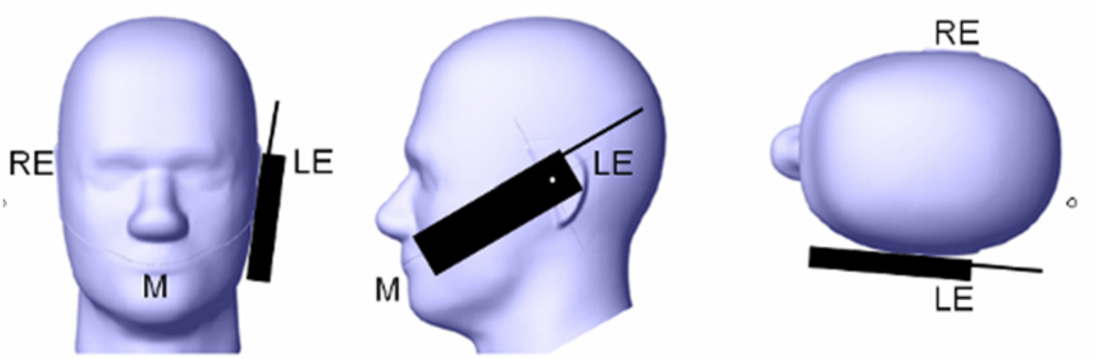
This test position is established:

When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.

(or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

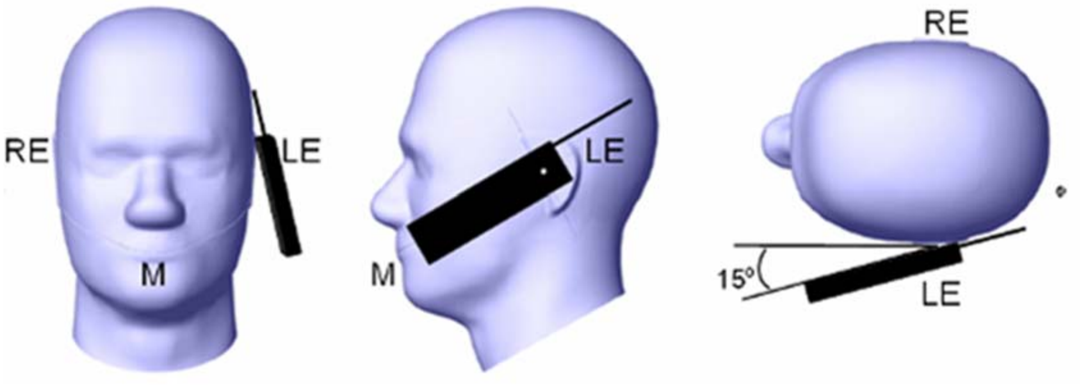
With the handset aligned in the "Cheek/Touch Position":

1) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15o Position



Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

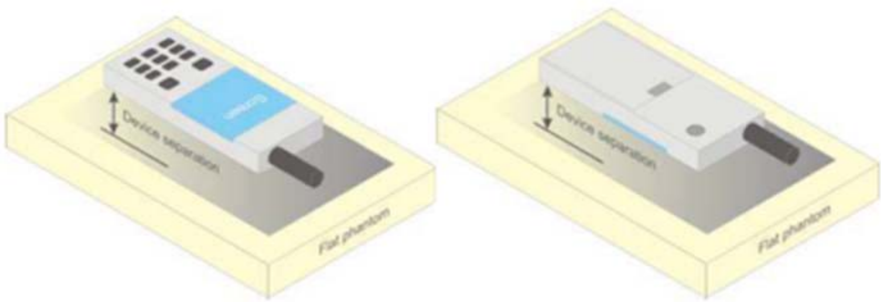


Figure 5 – Test positions for body-worn devices

Test Distance for SAR Evaluation

During SAR testing use type I to test six sides (or faces) first, and perform the test with type II for the worst position. Use 0mm spacing to test all faces (edges) Worst position use another EUT to test. For Back test , use 12mm pitch to perform test. If type I SAR higher than 0mm SAR , perform TYPE II 12mm test. For Bottom test , use 6mm pitch to perform test. If type I SAR higher than 0mm SAR , perform TYPE II 6mm test.

For this case the EUT(Equipment Under Test) in Back position, the test distance is 12mm between phantom and EUT, in Bottom position, the test distance is 6mm between phantom and EUT.

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or radiating structures of the EUT, the horizontal grid spacing was 15 mm x 15 mm, and the SAR distribution was determined by integrated grid of 1.5mm x 1.5mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

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

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

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

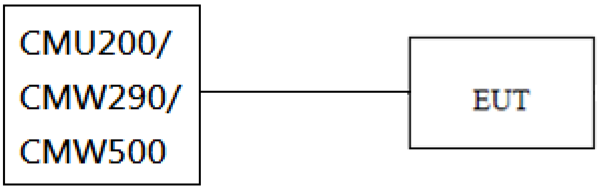
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

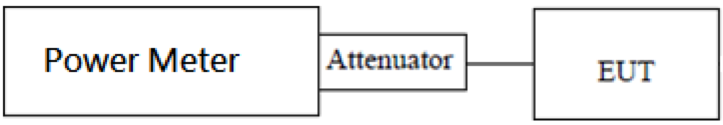
The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



GPRS & LTE



WiFi 2.4G/BLE

GPRS

Function: Menu select > GSM Mobile Station > GPRS 850/1900
Press Connection control to choose the different menus
Press RESET > choose all the reset all settings
Connection Press Signal Off to turn off the signal and change settings
Network Support > GSM + GPRS or GSM + EGSM
Main Service > Packet Data
Service selection > Test Mode A – Auto Slot Config. off
MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850
> 30 dBm for GPRS 1900
> 27 dBm for EGPRS 850
> 26 dBm for EGPRS 1900
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset > + 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stabe)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off
P0 > 4 dB
Slot Config>Unchanged (if already set under MS signal)
TCH > choose desired test channel
Hopping > Off

Main Timeslot > 3
Network Coding Scheme > CS4 (GPRS) and MCS5 (EGPRS)
Bit Stream >2E9-1 PSR Bit Stream
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection Press Signal on to turn on the signal and change settings

LTE

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table6.2.2-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table6.2.3-1.

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

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

For UE Power Class 1 and 3 the specific requirements and identified sub-clauses are specified in Table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4.-1 to 6.2.4-15 are in addition to the allowed MPR requirements specified in sub-clause

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	N/A
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	
NS_11	6.6.2.2.1	23	1.4, 3, 5, 10, 15, 20	Table 6.2.4-5	
NS_12	6.6.3.3.5	26	1.4, 3, 5	Table 6.2.4-6	
NS_13	6.6.3.3.6	26	5	Table 6.2.4-7	
NS_14	6.6.3.3.7	26	10, 15	Table 6.2.4-8	
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15	Table 6.2.4-9 Table 6.2.4-10	
NS_16	6.6.3.3.9	27	3, 5, 10	Table 6.2.4-11, Table 6.2.4-12, Table 6.2.4-13	
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
			10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table 6.2.4-14	
NS_20	6.2.2 6.6.2.2.1 6.6.3.2	23	5, 10, 15, 20	Table 6.2.4-15	
...					
NS_32	-	-	-	-	-

Channel List

GPRS

Mode	Channel		Frequency(MHz)
GPRS 850	Low	128	824.2
	Middle	190	836.6
	High	251	848.8
GPRS 1900	Low	512	1850.2
	Middle	661	1880.0
	High	810	1909.8

LTE

Mode		Channel		Frequency(MHz)
Band	Bandwidth			
LTE Band 2	1.4M	Low	18607	1850.7
		Middle	18900	1880.0
		High	19193	1909.3
	3M	Low	18615	1851.5
		Middle	18900	1880.0
		High	19185	1908.5
	5M	Low	18625	1852.5
		Middle	18900	1880.0
		High	19175	1907.5
	10M	Low	18650	1855.0
		Middle	18900	1880.0
		High	19150	1905.0
LTE Band 4	1.4M	Low	19957	1710.7
		Middle	20175	1732.5
		High	20393	1754.3
	3M	Low	19965	1711.5
		Middle	20175	1732.5
		High	20385	1753.5
	5M	Low	19975	1712.5
		Middle	20175	1732.5
		High	20375	1752.5
	10M	Low	20000	1715.0
		Middle	20175	1732.5
		High	20350	1750.0
LTE Band 5	1.4M	Low	20407	824.7
		Middle	20525	836.5
		High	20643	848.3
	3M	Low	20415	825.5
		Middle	20525	836.5
		High	20635	847.5
	5M	Low	20425	826.5
		Middle	20525	836.5
		High	20625	846.5
	10M	Low	20450	829.0

		Middle	20525	836.5
		High	20600	844.0
LTE Band 12	1.4M	Low	23017	699.7
		Middle	23095	707.5
		High	23173	715.3
	3M	Low	23025	700.5
		Middle	23095	707.5
		High	23165	714.5
	5M	Low	23035	701.5
		Middle	23095	707.5
		High	23155	713.5
	10M	Low	23060	704.0
		Middle	23095	707.5
		High	23130	711.0
LTE Band 13	5M	Low	23205	779.5
		Middle	23230	782.0
		High	23255	784.5
	10M	Low	---	---
		Middle	23230	782.0
		High	---	---

Test Results

WWAN Antenna Full Power

GPRS:

Mode	Channel No.	Frequency (MHz)	RF Output Power (Avg / dBm)			
			1 slot	2 slots	3 slots	4 slots
GPRS 850	128	824.2	29.25	27.23	25.71	---
	190	836.6	29.10	27.07	25.39	---
	251	848.8	28.65	26.45	24.68	---
GPRS1900	512	1850.2	25.19	23.28	21.21	---
	661	1880	25.11	23.21	21.07	---
	810	1909.8	25.22	23.28	21.25	---

Number of Time slot	1	2	3	4
Duty Cycle	12.5%	25%	37.6%	50%
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB
Crest Factor	8	4	2.66	2

The time based average power for GPRS

Band	Channel No.	Frequency (MHz)	Time based Average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GPRS 850	128	824.2	20.25	21.23	21.46	---
	190	836.6	20.10	21.07	21.14	---
	251	848.8	19.65	20.45	20.43	---
GPRS1900	512	1850.2	16.19	17.28	16.96	---
	661	1880.0	16.11	17.21	16.82	---
	810	1909.8	16.22	17.28	17.00	---

LTE:

Full Power

LTE Band 2 part1:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	RB1#0	20.09	19.80	19.79
		RB1#3	20.10	19.81	19.82
		RB1#5	20.11	19.82	19.78
		RB3#0	19.11	18.92	18.82
		RB3#3	19.09	18.93	18.82
		RB6#0	18.01	17.81	17.64
	16-QAM	RB1#0	19.47	19.10	19.07
		RB1#3	19.46	19.11	19.06
		RB1#5	19.48	19.13	19.08
		RB3#0	18.49	18.10	18.05
		RB3#3	18.47	18.11	18.04
		RB6#0	17.49	17.12	17.06
3M	QPSK	RB1#0	19.99	19.80	19.77
		RB1#8	20.01	19.83	19.78
		RB1#14	20.02	19.84	19.79
		RB6#0	19.00	18.89	18.83
		RB6#9	19.02	18.89	18.85
		RB15#0	17.89	17.68	17.76
	16-QAM	RB1#0	19.36	19.19	19.13
		RB1#8	19.38	19.18	19.11
		RB1#14	19.36	19.22	19.16
		RB6#0	18.39	18.20	18.13
		RB6#9	18.42	18.21	18.12
		RB15#0	17.38	17.17	17.12

LTE Band 2 part2:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	RB1#0	20.12	19.88	19.82
		RB1#13	20.10	19.89	19.83
		RB1#24	20.09	19.90	19.82
		RB15#0	19.13	18.91	18.88
		RB15#10	19.15	18.93	18.86
		RB25#0	18.97	18.85	18.79
	16-QAM	RB1#0	19.51	19.19	19.12
		RB1#13	19.50	19.22	19.15
		RB1#24	19.53	19.17	19.11
		RB15#0	18.54	18.19	18.10
		RB15#10	18.53	18.22	18.13
		RB25#0	17.51	17.21	17.13
10M	QPSK	RB1#0	20.15	20.02	20.03
		RB1#25	20.13	20.00	20.01
		RB1#49	20.11	19.98	20.00
		RB25#0	20.07	19.88	19.91
		RB25#25	20.08	19.91	19.91
		RB50#0	18.99	18.84	18.89
	16-QAM	RB1#0	19.44	19.38	19.44
		RB1#25	19.45	19.40	19.45
		RB1#49	19.43	19.38	19.46
		RB25#0	18.45	18.40	18.46
		RB25#25	18.45	18.43	18.48
		RB50#0	17.45	17.37	17.47

LTE Band 4 part1:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	RB1#0	22.01	21.70	20.92
		RB1#3	22.03	21.71	20.93
		RB1#5	22.06	21.69	20.96
		RB3#0	20.96	20.65	19.69
		RB3#3	20.96	20.67	19.72
		RB6#0	19.85	19.51	18.62
	16-QAM	RB1#0	21.30	21.12	20.20
		RB1#3	21.28	21.10	20.21
		RB1#5	21.29	21.10	20.19
		RB3#0	20.30	20.12	19.19
		RB3#3	20.32	20.12	19.17
		RB6#0	19.32	19.11	18.20
3M	QPSK	RB1#0	22.08	21.88	21.36
		RB1#8	22.10	21.86	21.38
		RB1#14	22.08	21.89	21.37
		RB6#0	21.14	20.82	20.35
		RB6#9	21.17	20.82	20.38
		RB15#0	19.93	19.67	19.19
	16-QAM	RB1#0	21.43	21.28	20.68
		RB1#8	21.42	21.29	20.71
		RB1#14	21.44	21.29	20.68
		RB6#0	20.46	20.28	19.70
		RB6#9	20.45	20.30	19.73
		RB15#0	19.45	19.27	18.69

LTE Band 4 part2:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	RB1#0	22.10	21.85	21.07
		RB1#13	22.09	21.88	21.09
		RB1#24	22.09	21.90	21.07
		RB15#0	21.19	20.81	20.15
		RB15#10	21.22	20.83	20.15
		RB25#0	20.94	20.74	20.23
	16-QAM	RB1#0	21.46	21.20	20.37
		RB1#13	21.44	21.19	20.40
		RB1#24	21.49	21.21	20.39
		RB15#0	20.44	20.23	19.36
		RB15#10	20.45	20.23	19.37
		RB25#0	19.46	19.21	18.36
10M	QPSK	RB1#0	22.20	21.96	21.52
		RB1#25	22.18	21.95	21.50
		RB1#49	22.15	21.95	21.49
		RB25#0	22.01	21.88	21.33
		RB25#25	22.04	21.90	21.34
		RB50#0	20.88	20.72	20.24
	16-QAM	RB1#0	21.46	21.35	20.92
		RB1#25	21.46	21.36	20.90
		RB1#49	21.47	21.35	20.94
		RB25#0	20.47	20.34	19.95
		RB25#25	20.49	20.33	19.95
		RB50#0	19.46	19.33	18.93

LTE Band 5 part1:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	RB1#0	22.02	21.67	21.41
		RB1#3	22.03	21.70	21.44
		RB1#5	22.06	21.68	21.47
		RB3#0	20.98	20.66	20.34
		RB3#3	21.00	20.69	20.32
		RB6#0	19.71	19.49	19.20
	16-QAM	RB1#0	21.44	20.99	20.75
		RB1#3	21.47	21.02	20.76
		RB1#5	21.43	20.97	20.78
		RB3#0	20.47	19.99	19.78
		RB3#3	20.48	19.97	19.79
		RB6#0	19.44	18.98	18.78
3M	QPSK	RB1#0	22.00	21.63	21.37
		RB1#8	22.02	21.66	21.36
		RB1#14	22.04	21.65	21.38
		RB6#0	21.01	20.68	20.39
		RB6#9	20.99	20.68	20.42
		RB15#0	19.73	19.55	19.22
	16-QAM	RB1#0	21.34	21.01	20.72
		RB1#8	21.37	21.00	20.75
		RB1#14	21.35	21.01	20.74
		RB6#0	20.34	20.00	19.70
		RB6#9	20.32	20.00	19.70
		RB15#0	19.35	19.01	18.73

LTE Band 5 part2:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	RB1#0	21.99	21.79	21.64
		RB1#13	22.01	21.76	21.63
		RB1#24	22.04	21.78	21.64
		RB15#0	20.90	20.60	20.44
		RB15#10	20.88	20.61	20.42
		RB25#0	20.79	20.48	20.31
	16-QAM	RB1#0	21.36	21.10	21.07
		RB1#13	21.36	21.09	21.10
		RB1#24	21.34	21.11	21.07
		RB15#0	20.37	20.12	20.10
		RB15#10	20.35	20.10	20.09
		RB25#0	19.36	19.12	19.06
10M	QPSK	RB1#0	22.09	22.00	22.03
		RB1#25	22.07	21.98	22.00
		RB1#49	22.07	21.99	22.00
		RB25#0	21.85	21.66	21.43
		RB25#25	21.86	21.66	21.45
		RB50#0	20.78	20.58	20.30
	16-QAM	RB1#0	21.47	21.32	21.39
		RB1#25	21.46	21.32	21.42
		RB1#49	21.45	21.35	21.38
		RB25#0	20.45	20.31	20.42
		RB25#25	20.46	20.31	20.42
		RB50#0	19.48	19.35	19.41

LTE Band 12 part1:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4M	QPSK	RB1#0	21.52	21.77	21.97
		RB1#3	21.53	21.79	21.96
		RB1#5	21.55	21.82	21.97
		RB3#0	20.54	20.78	21.24
		RB3#3	20.54	20.79	21.25
		RB6#0	19.45	19.71	20.17
	16-QAM	RB1#0	20.85	21.06	21.39
		RB1#3	20.85	21.07	21.41
		RB1#5	20.84	21.05	21.42
		RB3#0	19.85	20.07	20.39
		RB3#3	19.83	20.06	20.41
		RB6#0	18.84	19.05	19.39
3M	QPSK	RB1#0	21.56	21.93	22.01
		RB1#8	21.55	21.91	22.00
		RB1#14	21.55	21.92	21.99
		RB6#0	20.64	20.94	21.44
		RB6#9	20.66	20.92	21.43
		RB15#0	19.54	19.77	20.28
	16-QAM	RB1#0	20.84	21.34	21.37
		RB1#8	20.84	21.37	21.35
		RB1#14	20.85	21.36	21.36
		RB6#0	19.84	20.37	20.39
		RB6#9	19.82	20.37	20.39
		RB15#0	18.83	19.37	19.35

LTE Band 12 part2:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	RB1#0	21.67	21.94	22.00
		RB1#13	21.69	21.93	22.00
		RB1#24	21.72	21.91	22.02
		RB15#0	20.74	20.97	21.24
		RB15#10	20.76	20.97	21.25
		RB25#0	20.64	20.88	21.14
	16-QAM	RB1#0	21.00	21.31	21.32
		RB1#13	21.03	21.29	21.31
		RB1#24	20.99	21.29	21.33
		RB15#0	20.03	20.34	20.32
		RB15#10	20.04	20.36	20.35
		RB25#0	19.02	19.29	19.31
10M	QPSK	RB1#0	21.92	22.05	22.02
		RB1#25	21.88	22.02	21.12
		RB1#49	21.90	21.99	21.15
		RB25#0	21.70	21.75	21.88
		RB25#25	21.72	21.75	21.91
		RB50#0	20.52	20.72	20.84
	16-QAM	RB1#0	21.22	21.28	20.44
		RB1#25	21.22	21.31	20.46
		RB1#49	21.25	21.27	20.42
		RB25#0	20.23	20.31	19.43
		RB25#25	20.21	20.29	19.43
		RB50#0	19.20	19.30	18.44

LTE Band 13 part1:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5M	QPSK	RB1#0	22.55	22.47	22.46
		RB1#13	22.52	22.45	22.43
		RB1#24	22.53	22.45	22.44
		RB15#0	21.54	21.42	21.34
		RB15#10	21.57	21.43	21.33
		RB25#0	21.44	21.16	21.21
	16-QAM	RB1#0	21.87	21.80	21.73
		RB1#13	21.88	21.82	21.72
		RB1#24	21.85	21.82	21.73
		RB15#0	20.87	20.81	20.73
		RB15#10	20.86	20.79	20.75
		RB25#0	19.88	19.82	19.73
10M	QPSK	RB1#0	---	22.58	---
		RB1#25	---	22.56	---
		RB1#49	---	22.56	---
		RB25#0	---	22.53	---
		RB25#25	---	22.53	---
		RB50#0	---	22.42	---
	16-QAM	RB1#0	---	21.97	---
		RB1#25	---	21.99	---
		RB1#49	---	21.99	---
		RB25#0	---	20.98	---
		RB25#25	---	20.97	---
		RB50#0	---	19.95	---

Bluetooth Power:

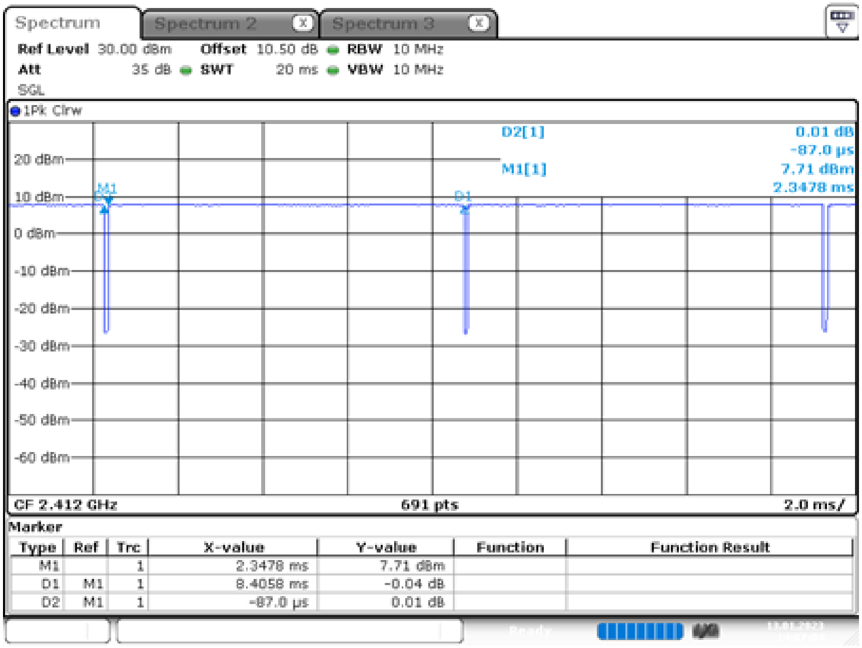
Mode	Channel	Freq.(MHz)	Conducted Power (Peak/dBm)	Conducted Power (Avg/dBm)
LE 1M	Low	2402	-5.83	-6.58
	Middle	2440	-5.91	-6.65
	High	2480	-6.12	-6.76

WiFi 2.4G Power:

Mode	Channel	Freq.(MHz)	Data Rate	Conducted Power (Peak/dBm)	Conducted Power (Avg/dBm)
802.11b	Low	2412	1Mbps	8.36	5.95
	Middle	2437		8.48	6.01
	High	2462		8.56	6.18

Duty Cycle:

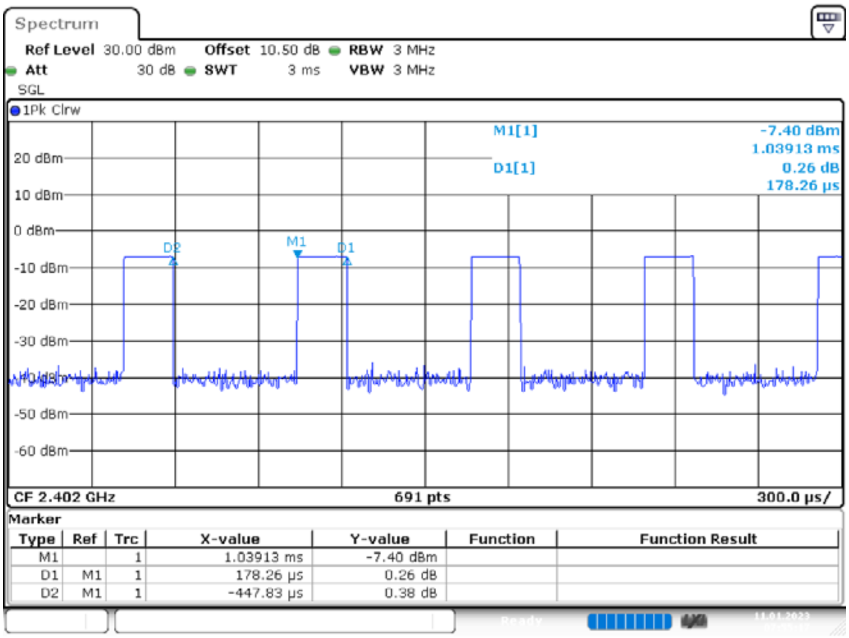
802.11b



Test Modes	Time-ON(ms)	Time-ON+OFF(ms)	Duty Cycle(%)
802.11b	8.41	8.49	98.976%

Note: Duty cycle greater than 95% can be regarded as 100%

BLE



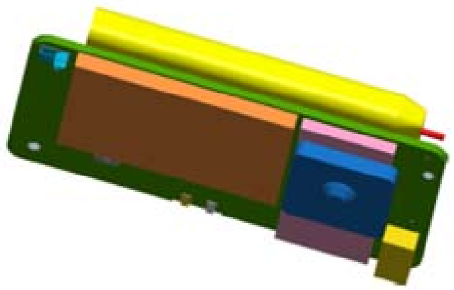
Test Modes	Time-ON(ms)	Time-ON+OFF(ms)	Duty Cycle(%)
BLE	0.18	0.63	28.435%

Maximum Target Output Power

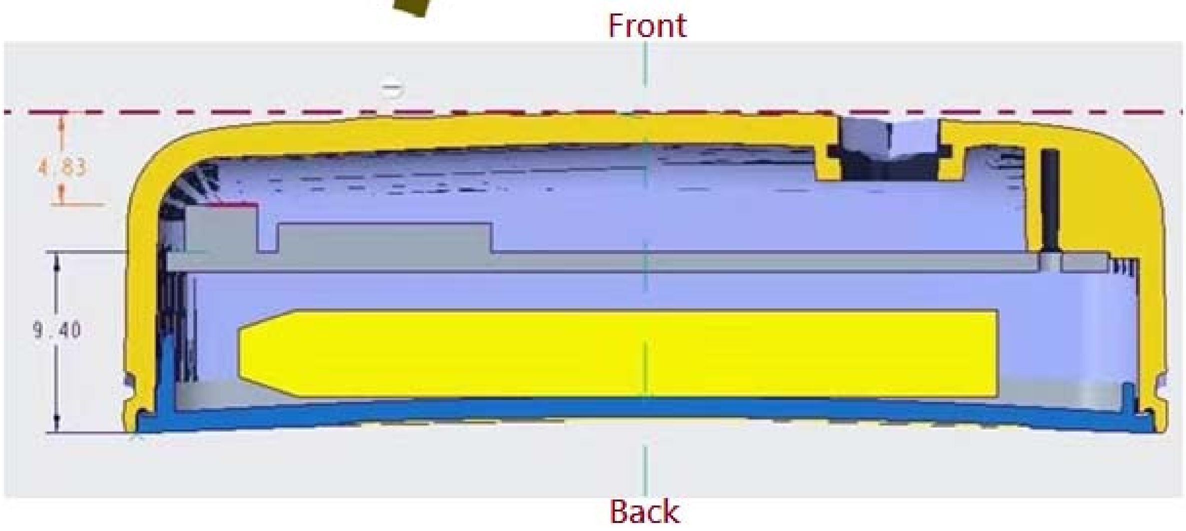
Max Target Power(Avg/dBm)			
Mode / Band	**Low Channel**	**Middle Channel**	**High Channel**
GPRS 850 3 TX Slot	21.5	21.5	21.5
GPRS 850 2 TX Slot	21.5	21.5	21.5
GPRS 850 1 TX Slot	20.5	20.5	20.5
GPRS 1900 3 TX Slot	17.0	17.0	17.0
GPRS 1900 2 TX Slot	17.5	17.5	17.5
GPRS 1900 1 TX Slot	16.5	16.5	16.5
CAT M1 Band 2	20.5	20.5	20.5
CAT M1 Band 4	22.5	22.5	22.5
CAT M1 Band 5	22.5	22.5	22.5
CAT M1 Band 12	22.5	22.5	22.5
CAT M1 Band 13	23.0	23.0	23.0
Bluetooth LE(1M)	-6.5	-6.5	-6.5
WiFi 2.4GHz_802.11b	6.5	6.5	6.5

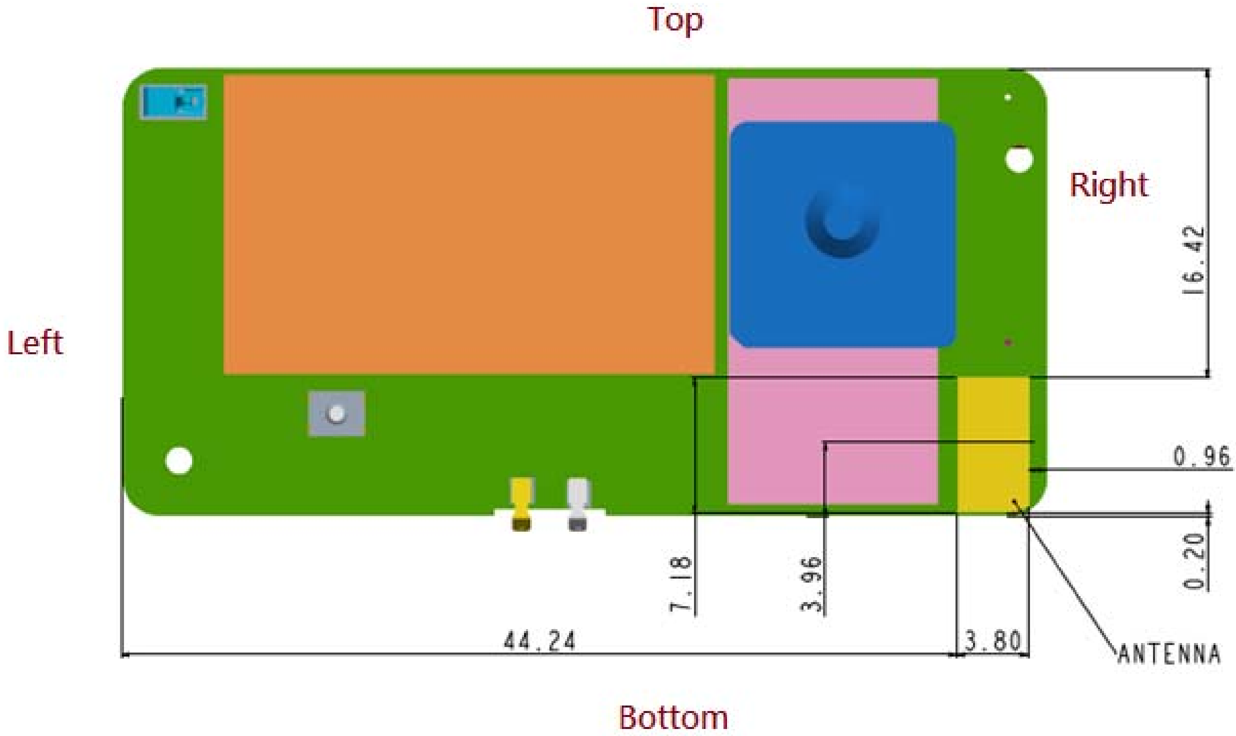
STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

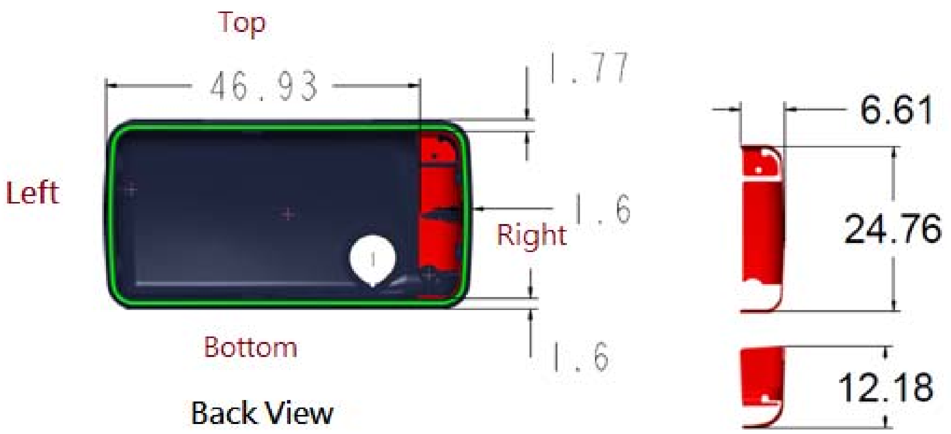
Antennas Location for Type I EUT:

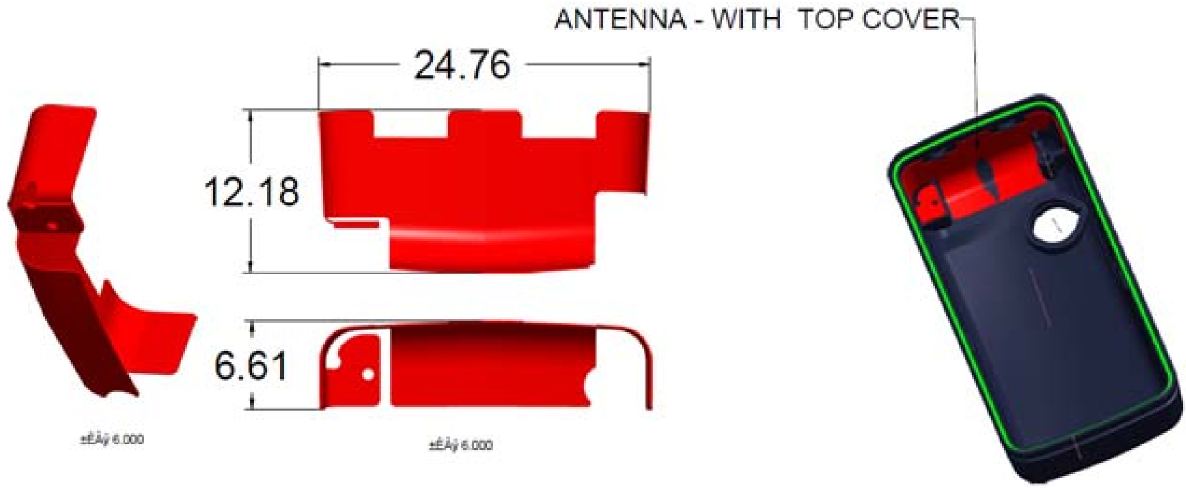


Front View









Antenna Distance To Edge for EUT(Front View):

Antenna	Antenna Distance To Edge(mm)					
	Front	Back	Left	Right	Top	Bottom
WWAN	<5	<5	<5	46.93	<5	<5
WiFi /BT	4.83	9.40	44.24	<5	16.42	<5

Note:

In normal use, only Back side close to the user body.

For FCC:

Band	Freq. (MHz)	Max. Avg. Power (dBm)	Ant. Gain (dBi)	Distances (mm)	Max. Avg. Power (mW)	ERP (dBm)	ERP (mW)
GPRS 850	824.2	21.5	-3.3	5	141.25	16.05	40.27
GPRS 1900	1850.2	17.5	0.9	5	56.23	16.25	42.17
CAT M1 Band2	1855	20.5	0.9	5	112.20	19.25	84.14
CAT M1 Band4	1715	22.5	0.9	5	177.83	21.25	133.35
CAT M1 Band5	829	22.5	-3.3	5	177.83	17.05	50.70
CAT M1 Band12	707.5	22.5	-3.3	5	177.83	17.05	50.70
CAT M1 Band13	782	23.0	-3.3	5	199.53	17.55	56.89
WLAN	2462	6.5	2.29	5	4.47	6.64	4.61
BLE	2402	-6.5	2.29	5	0.22	-6.36	0.23

Band	Freq. (MHz)	P_{th}(mW)	X	ERP 20cm(mW)	Result
GPRS 850	824.2	9.42	1.406	1681.368	not apply
GPRS 1900	1850.2	3.44	1.841	3060	not apply
CAT M1 Band2	1855	3.43	1.842	3060	not apply
CAT M1 Band4	1715	3.65	1.825	3060	not apply
CAT M1 Band5	829	9.34	1.409	1691.16	not apply
CAT M1 Band12	707.5	11.67	1.306	1443.3	not apply
CAT M1 Band13	782	10.14	1.371	1595.28	not apply
WLAN	2462	2.73	1.903	3060	not apply
BLE	2402	2.79	1.898	3060	exempt

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\,cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\,cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\,cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

Bluetooth LE mode SAR testing is not required.

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed diametric evaluation.

SAR Test Data

Environmental Conditions

Test Date	2023/02/07	2023/02/08	2023/02/10	2023/02/14
Freq. Band(MHz)	835	750	1900	1800
Temperature	24.1℃	20.5℃	20.5℃	19.5℃
Relative Humidity	58%	63%	62%	63%
Test Engineer	Anson Lu	Anson Lu	Anson Lu	Anson Lu

Test Date	2023/02/16
Freq. Band(MHz)	2450
Temperature	19.3℃
Relative Humidity	59%
Test Engineer	Anson Lu

In the SAR of testing, there are three sets of accessories(T1, T2, T3) for testing at WiFi and WWAN worst Band. The accessories picture as below:

T1 accessories:

T2 accessories:

T3 accessories:

WiFi 2.4GHz:

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	2462	802.11b	6.18	6.50	1.076	0.429	0.462	1.6	3T1
Body Back(0mm)	2462	802.11b	6.18	6.50	1.076	0.283	0.305	1.6	3T2
Body Back(0mm)	2462	802.11b	6.18	6.50	1.076	0.365	0.393	1.6	3T3

Note: 1) Max. meas. Power is using time based Avg power.

2) 3T1 is EUT with T1 accessories.

3) 3T2 is EUT with T2 accessories.

4) 3T3 is EUT with T3 accessories.

GPRS850：(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	824.2	GPRS(3TX)	21.46	21.50	1.009	0.683	0.689	1.6	11

Note: 1) Max. meas. Power is using time based Avg power.

GPRS1900：

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	1850.2	GPRS(2TX)	17.28	17.50	1.052	1.130	1.189	1.6	21
Body Back(0mm)	1880	GPRS(2TX)	17.21	17.50	1.069	1.160	1.240	1.6	22
Body Back(0mm)	1909.8	GPRS(2TX)	17.28	17.50	1.052	1.280	1.347	1.6	23T1-1
Body Back(0mm)	1909.8	GPRS(2TX)	17.28	17.50	1.052	1.320	1.389	1.6	23T1-2
Body Back(0mm)	1909.8	GPRS(2TX)	17.28	17.50	1.052	1.340	1.410	1.6	23T1-3
Body Back(0mm)	1909.8	GPRS(2TX)	17.28	17.50	1.052	1.170	1.231	1.6	23T2
Body Back(0mm)	1909.8	GPRS(2TX)	17.28	17.50	1.052	1.260	1.326	1.6	23T3

Note: 1) Max. meas. Power is using time based Avg power.

2) 23T1-1, 23T1-2, 23T1-3, is EUT with T1 accessories.

3) 23T2 is EUT with T2 accessories.

4) 23T3 is EUT with T3 accessories.

CAT-M1：Band2_10M BW_QPSK_0 Offset(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	1855	eFDD2 / 1RB	20.15	20.50	1.084	0.463	0.502	1.6	31
Body Back(0mm)	1855	eFDD2 / 50%RB	20.15	20.50	1.084	0.445	0.482	1.6	31-1

Note: 1) Max. meas. Power is using time based Avg power.

2) According GRPS SAR testing result, T1 accessories SAR is worst, therefore using T1 accessories to do CAT-M1 testing.

CAT-M1：Band4_10M BW_QPSK_0 Offset(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	1715	eFDD4 / 1RB	22.20	22.50	1.072	0.117	0.125	1.6	41
Body Back(0mm)	1715	eFDD4 / 50%RB	22.20	22.50	1.072	0.102	0.109	1.6	41-1

Note: 1) Max. meas. Power is using time based Avg power.

2) According GRPS SAR testing result, T1 accessories SAR is worst, therefore using T1 accessories to do CAT-M1 testing.

CAT-M1：Band5_10M BW_QPSK_0 Offset(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	829	eFDD5 / 1RB	22.09	22.50	1.099	0.107	0.118	1.6	51
Body Back(0mm)	829	eFDD5 / 50%RB	22.09	22.50	1.099	0.074	0.081	1.6	51-1

Note: 1) Max. meas. Power is using time based Avg power.

2) According GRPS SAR testing result, T1 accessories SAR is worst, therefore using T1 accessories to do CAT-M1 testing.

CAT-M1：Band12_10M BW_QPSK_0 Offset(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	707.5	eFDD12 / 1RB	22.05	22.50	1.109	0.077	0.085	1.6	62
Body Back(0mm)	707.5	eFDD12 / 50%RB	22.09	22.50	1.099	0.059	0.065	1.6	62-1

Note: 1) Max. meas. Power is using time based Avg power.

2) According GRPS SAR testing result, T1 accessories SAR is worst, therefore using T1 accessories to do CAT-M1 testing.

CAT-M1：Band13_10M BW_QPSK_1RB_0 Offset(with T1 accessories)

EUT Position	Freq. (MHz)	Test Mode	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)				
					Scaled Factor	Meas. SAR	Scaled SAR	Limit	Plot
Body Back(0mm)	782	eFDD13 / 1RB	22.58	23.00	1.102	0.035	0.039	1.6	72
Body Back(0mm)	782	eFDD13 / 50%RB	22.58	23.00	1.102	0.023	0.025	1.6	72-1

Note: 1) Max. meas. Power is using time based Avg power.

2) According GRPS SAR testing result, T1 accessories SAR is worst, therefore using T1 accessories to do CAT-M1 testing.

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05-SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > 0.5 dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05-For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
5. KDB941225D05- 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 are ≤ 0.8 W/kg.
6. KDB941225D05- 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 among RB offset the upper edge, middle and lower edge of each required test channel.
7. KDB941225D05- other channel bandwidths SAR test is required when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > 0.5 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.
8. Worst case SAR for 50% RB allocation is selected to be tested.
9. According KDB865664 D01 Repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with ≤ 20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination	**Simultaneous?**	**Hotspot**
WWAN(CAT M1) + WLAN(WiFi 2.4G)	√	×
WWAN(CAT M1) + WLAN(BLE)	√	×
WWAN(GPRS) + WLAN(WiFi 2.4G)	×	×
WWAN(GPRS) + WLAN(BLE)	√	×

Note: WWAN(GPRS) & WLAN not support simultaneous.

FCC Estimates SAR

Band	Freq (MHz)	Max. Avg. Power (dBm)	Ant Gain (dBi)	Distances (mm)	Max. Avg. Power (mW)	ERP (dBm)	ERP (mW)	P_{th} (mW)	Estimated SAR [W/kg]
BLE	2402	-6.58	2.29	5	0.22	-6.44	0.23	2.79	0.131

KDB 447498 D04

Estimated SAR is computed as SARest =1.6*P_{ant} / P_{th} [W/kg].

P_{ant} is maximum time-averaged power or effective radiated power (ERP)

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

Simultaneous Transmission Consideration Detail for Body mode

Transmitter Combination	Position	Maxi. SAR(W/kg)		∑SAR<1.6W/kg	Accessories
		SAR1(WWAN)	SAR2(WLAN)		
WWAN(CAT M1) + WLAN	Body Back(0mm)	0.502	0.462	0.964	T1

Note: WWAN & WLAN SAR value both are worst result.

Transmitter Combination	Position	Maxi. SAR(W/kg)		∑SAR<1.6W/kg	Accessories
		SAR1(WWAN)	SAR2(BLE)		
WWAN(CAT M1) + BLE	Body Back(0mm)	0.502	0.131	0.633	T1

Note: WWAN SAR value is worst result.

Transmitter Combination	Position	Maxi. SAR(W/kg)		∑SAR<1.6W/kg	Accessories
		SAR1(WWAN)	SAR2(BLE)		
WWAN(GPRS) + BLE	Body Back(0mm)	1.410	0.131	1.541	T1

Note: WWAN SAR value is worst result.

Conclusion:

1) Sum of SAR: **ΣSAR ≤ 1.6 W/kg** for 1g Body SAR.

APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement uncertainty evaluation for IEEE1528 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions– reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.3	23.9

APPENDIX B EUT TEST POSITION PHOTOS

Please Refer to the Attachment APPENDIX B EUT TEST POSITION PHOTOS

APPENDIX C SAR PLOTS OF SAR MEASUREMENT

Please Refer to the Attachment APPENDIX C SAR PLOTS OF SAR MEASUREMEN

APPENDIX D PROBE & DAE CALIBRATION CERTIFICATES

Please refer to the file document APPENDIX D PROBE & DAE CALIBRATION CERTIFICATES

APPENDIX E DIPOLE CALIBRATION CERTIFICATES

Please refer to the file document APPENDIX E DIPOLE CALIBRATION CERTIFICATES

******* END OF REPORT *******