FCC SAR TEST REPORT

APPLICANT	:	**Lenovo(Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Portable Tablet Computer**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**TB370FU**
FCC ID	:	**O57TB370FU**
STANDARD	:	**FCC 47 CFR PART 2 (2.1093)**

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ilac-MRA

ACCREDITED
Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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History of this test report

Report No.	Version	Description	Issued Date
FA332406	Rev. 01	Initial issue of report	May 16, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Lenovo(Shanghai) Electronics Technology Co., Ltd., Portable Tablet Computer, TB370FU,** are as follows.

Highest Standalone 1g SAR Summary				
Equipment Class	Frequency Band		Body (Separation 0mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
DTS	WLAN	2.4GHz WLAN	1.11	1.36
NII		5GHz WLAN	**1.19**	1.36
DSS	Bluetooth	Bluetooth	<0.10	1.30
Date of Testing:		2023/4/11 ~ 2023/4/18		

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR07-KS	CN1257	314309

Applicant	
Company Name	Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address	Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong, China

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

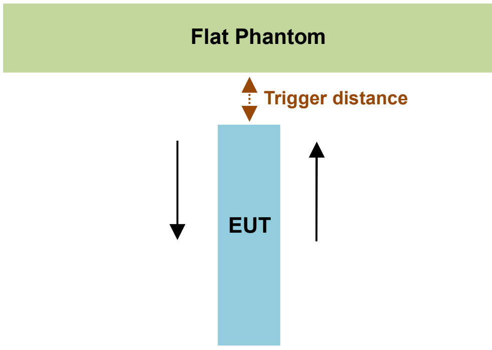
Product Feature & Specification	
Equipment Name	Portable Tablet Computer
Brand Name	Lenovo
Model Name	TB370FU
FCC ID	O57TB370FU
SN	Sample 1: HA1S4XC8 Sample 2: HA1SSPVL
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 WLAN 5GHz 802.11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE
HW Version	Lenovo Tablet TB370FU
SW Version	TB370FU_RF01 230325
EUT Stage	Identical Prototype

Remark:
1. This device does not support voice function.
2. The device implements Proximity sensors mechanism for the power management for SAR compliance at different exposure conditions (body). The device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to appendix E. power table.
3. This device will be equipped with keyboard, and its working modes are laptop and tablet, for the tablet mode test is more conservatively, so no need to evaluate laptop mode separately.
4. The pen can't be attached to the tablet, it has a metallic and do not contain any electronic circuitry, has no effect on RF exposure, so the pen is not tested.
5. There are two samples. The different between them refer to the TB370FU_Operational Description of Product Equality Declaration which is exhibit separately. According to the difference, we choose sample 1 to full test and sample 2 to verify the worst case of sample 1.

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency 5825MHz and lowest 2412MHz frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensor placed coincident with antenna elements at the Bottom Face of the device are utilized to determine when the device comes in proximity of the user's body at the Bottom Face side of the device. There is no need to do sensor coverage testing for the proximity sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the proximity sensor entirely covers the antenna.
3. When the sensor is active, all WLAN bands reduced power will be active.
4. The sensors used to detect the proximity of the user's body at the Bottom Face side for Ant1 of the device use a detection threshold distance. The data shown in the sections below shows the distance(s).



<Ant1 Frequency Bands>

Proximity Sensor Triggering Distance (mm)		
Position	Bottom Face	
	Moving towards	Moving away
Minimum	16	20

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

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. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.
Illustrated in the internal photo exhibit, although the senor is spatially offset, there is no trigger condition where the antenna is next to the user but the sensor is laterally further away, therefore proximity sensor coverage testing is not required.
This procedure is not required because antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

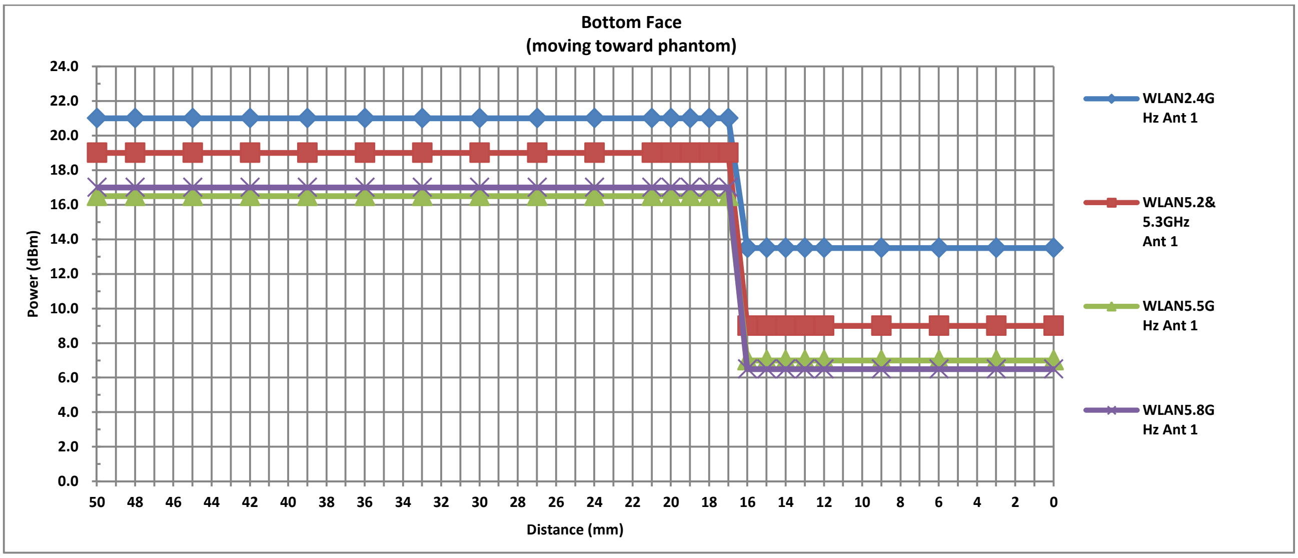
Proximity sensor power reduction

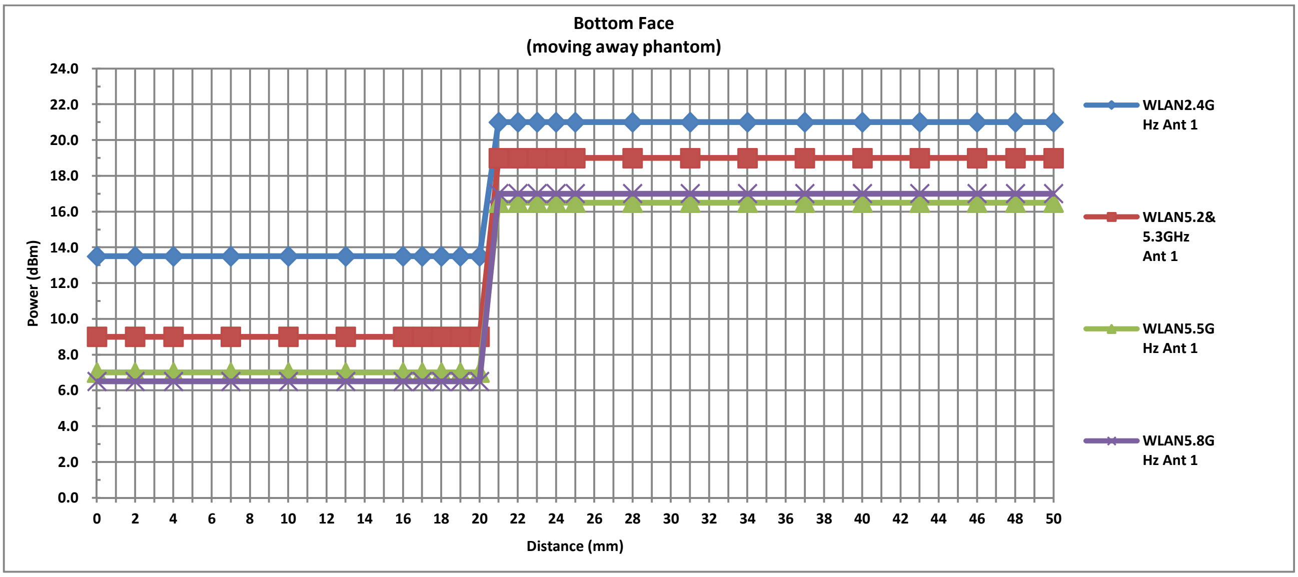
Exposure Position / wireless mode for ANT1	Bottom Face[1]	Edge 1	Edge 2	Edge 3	Edge 4
WLAN 2.4GHz	7.50 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.2&5.3GHz	10.00 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.5GHz	9.50 dB	0 dB	0 dB	0 dB	0 dB
WLAN 5.8GHz	10.50 dB	0 dB	0 dB	0 dB	0 dB

Remark:
1. [1]: Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   For ANT1:
   - Bottom Face: 15 mm

Power Measurement during Sensor Trigger distance testing

Band/Mode for ANT1	Measured power reduction (dBm)		Reduction Levels
	w/o power back-off	w/ power back-off	(dB)
WLAN 2.4GHz	21.00	13.50	7.50
WLAN 5.2&5.3GHz	19.00	9.00	10.00
WLAN 5.5GHz	16.50	7.00	9.50
WLAN 5.8GHz	17.00	6.50	10.50





6. RF Exposure Limits

6.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

6.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

7. Specific Absorption Rate (SAR)

7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

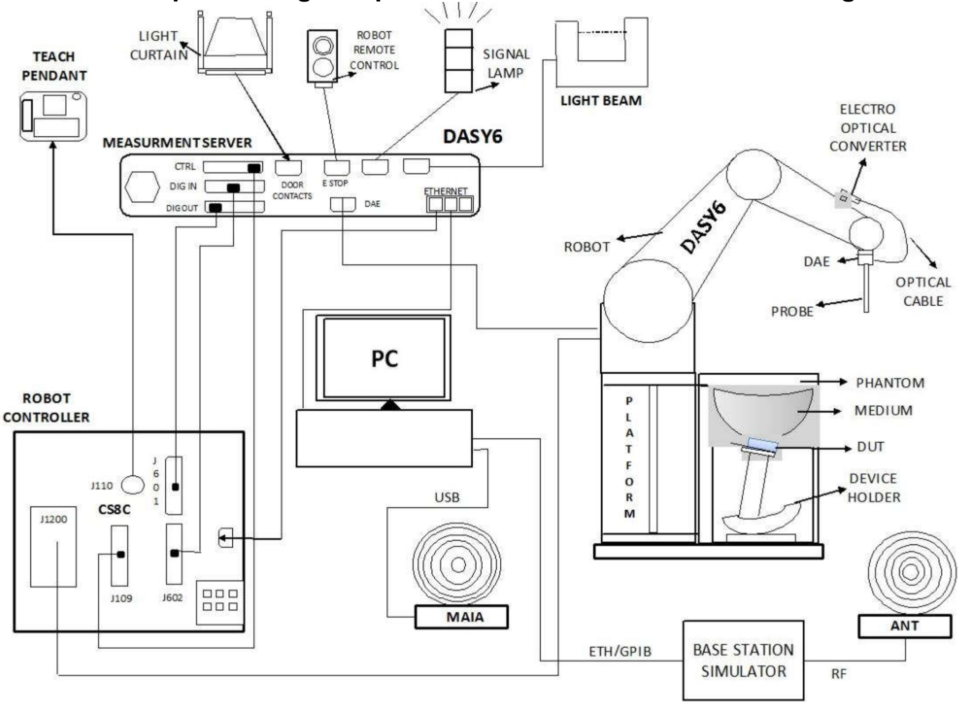
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

8. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Windows 10 and the DASY6 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.

8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 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 – >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	

8.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists 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 and 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

8.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

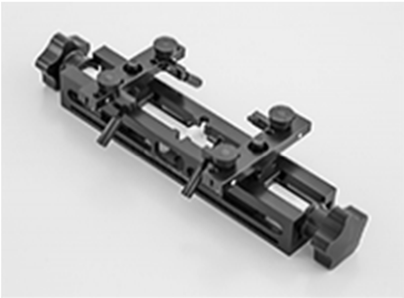
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

8.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Power Reference Measurement

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

9.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

9.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>*reported*</u> SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	1040	2020/5/6	2023/5/4
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2022/9/23	2023/9/22
SPEAG	Data Acquisition Electronics	DAE4	1691	2022/12/12	2023/12/11
SPEAG	Dosimetric E-Field Probe	EX3DV4	7734	2022/6/17	2023/6/16
SPEAG	ELI Phantom	ELI V8.0	TP-2135	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46104587	2022/5/24	2023/5/23
SPEAG	Dielectric Probe Kit	DAK-3.5	1144	2022/8/15	2023/8/14
Anritsu	Vector Signal Generator	MG3710A	6201682672	2023/1/5	2024/1/4
Rohde & Schwarz	Power Meter	NRVD	102081	2022/7/14	2023/7/13
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2022/7/14	2023/7/13
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2022/7/14	2023/7/13
R&S	BLUETOOTH TESTER	CBT	101246	2022/5/24	2023/5/23
Rohde & Schwarz	Spectrum Analyzer	FSV7	101631	2022/10/12	2023/10/11
TES	DIGITAC THERMOMETER	1310	220305411	2023/1/8	2024/1/7
Testo	Thermo-Hygrometer	608-H1	1241332126	2022/7/20	2023/7/19
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

11. System Verification

11.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.2.

Fig 11.2 Photo of Liquid Height for Body SAR

11.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
2450	55.0	0	0	0	0	45.0	1.80	39.2

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	Head	22.6	1.860	38.500	1.80	39.20	3.33	-1.79	±5	2023/4/11
5250	Head	22.9	4.600	36.400	4.71	35.90	-2.34	1.39	±5	2023/4/13
5600	Head	22.9	4.990	35.800	5.07	35.50	-1.58	0.85	±5	2023/4/15
5750	Head	22.9	5.170	35.600	5.22	35.40	-0.96	0.56	±5	2023/4/18

11.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2023/4/11	2450	Head	50	1040	7734	1691	2.440	51.80	48.8	-5.79
2023/4/13	5250	Head	50	1113	7734	1691	3.840	81.50	76.8	-5.77
2023/4/15	5600	Head	50	1113	7734	1691	3.930	82.60	78.6	-4.84
2023/4/18	5750	Head	50	1113	7734	1691	3.860	80.80	77.2	-4.46

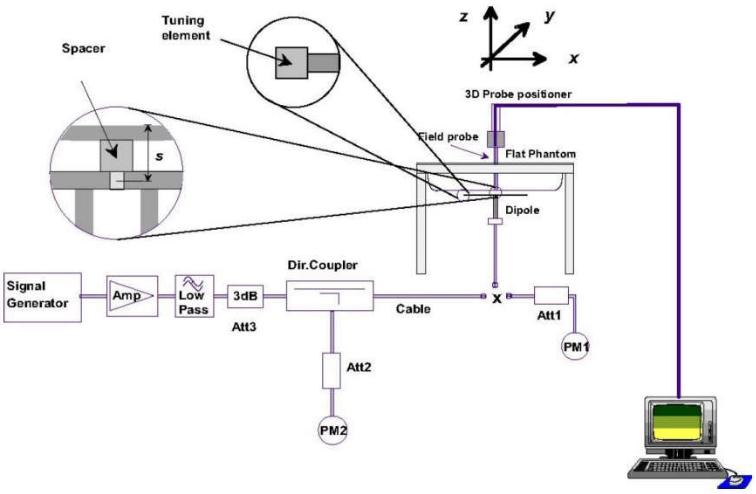


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

13. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

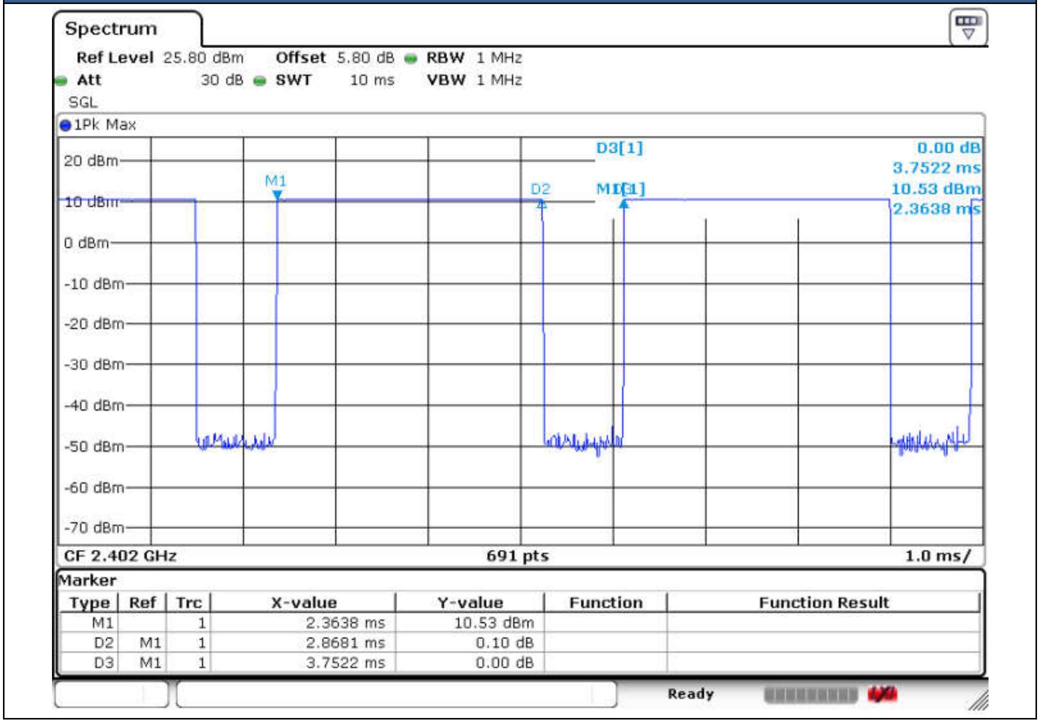
1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration. Additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
6. For each antenna, transmit power in SISO operation is larger than or equal to the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode. So WLAN SAR testing was performed on SISO antenna, MIMO SAR base on standalone SAR summed together as MIMO SAR.

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 76.44% as following figure, according to Oct. 2016 TCB workshop for Bluetooth SAR scaling need further consideration and the duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the value of Bluetooth reported SAR calculation.

Bluetooth time-domain plot



14. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

<SAR test exclusion table>

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1] + (test separation distance – 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1] + (test separation distance – 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Exposure Position	Wireless Interface	BT ANT 2	2.4GHz WLAN ANT 1	2.4GHz WLAN ANT 2	5GHz WLAN ANT 1	5GHz WLAN ANT 2
	Calculated Frequency (MHz)	2480	2462	2462	5825	5825
	Maximum power (dBm)	12.0	21.0	21.0	19.00	19.00
	Maximum rated power(mW)	15.85	125.89	125.89	79.43	79.43
Bottom Face	Separation distance(mm)	5.0	5.0	5.0	5.00	5.00
	exclusion threshold	5.0	39.5	39.5	38.3	38.3
	Testing required?	Yes	Yes	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.00	9.06	5.00	9.06	5.00
	exclusion threshold	5.0	21.8	39.5	21.2	38.3
	Testing required?	Yes	Yes	Yes	Yes	Yes
Edge 2	Separation distance(mm)	60.94	241.33	60.94	241.33	60.94
	exclusion threshold	205.0	2009.0	205.0	1975.0	172.0
	Testing required?	No	No	No	No	No
Edge 3	Separation distance(mm)	183.47	163.72	183.47	163.72	183.47
	exclusion threshold	1430.0	1233.0	1430.0	1199.0	1397.0
	Testing required?	No	No	No	No	No
Edge 4	Separation distance(mm)	191.02	21.77	191.02	21.77	191.02
	exclusion threshold	1505.0	9.1	1506.0	8.8	1472.0
	Testing required?	No	Yes	No	Yes	No

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN/BT signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For SAR testing of Bluetooth signal with 83.3% theoretical duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle) *83.3%".
   d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, 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
   · ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   · ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. The device implements Proximity sensors mechanism for the power management for SAR compliance at different exposure conditions (body). The device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to appendix E. power table.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required 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.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.
6. For each antenna, transmit power in SISO operation is larger than or equal to the power in MIMO operation, RF exposure compliance of MIMO mode can be deduced from the compliance simultaneous transmission of antennas operating in SISO mode. So WLAN SAR testing was performed on SISO antenna, MIMO SAR base on standalone SAR summed together as MIMO SAR.

15.1 Body SAR

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	6	2437	1	12.27	13.50	1.327	100	1.000	-0.02	0.836	**1.110**
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	1	2412	1	12.16	13.50	1.361	100	1.000	0.09	0.683	0.930
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	11	2462	1	11.91	13.50	1.442	100	1.000	0.01	0.620	0.894
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 1	Full	6	2437	1	18.61	20.00	1.377	100	1.000	0.03	0.124	0.171
	WLAN2.4GHz	802.11b 1Mbps	Edge 4	0mm	Ant 1	Full	6	2437	1	18.61	20.00	1.377	100	1.000	0.05	0.001	0.001
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	15mm	Ant 1	Full	6	2437	1	18.61	20.00	1.377	100	1.000	0.01	0.179	0.247
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	6	2437	2	12.27	13.50	1.327	100	1.000	0.06	0.670	0.889
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 2	Full	6	2437	1	18.01	20.00	1.581	100	1.000	0.01	0.030	0.047
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 2	Full	6	2437	1	18.01	20.00	1.581	100	1.000	0.06	0.412	0.651
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 2	Full	1	2412	1	16.91	18.50	1.442	100	1.000	0.02	0.123	0.177
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 2	Full	11	2462	1	15.77	17.00	1.327	100	1.000	0.04	0.092	0.122
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 2	Full	6	2437	2	18.01	20.00	1.581	100	1.000	0.03	0.336	0.531
	Bluetooth	1Mbps	Bottom Face	0mm	Ant 2	Full	0	2402	1	11.66	12.00	1.081	76.44	1.090	0.03	0.009	0.011
02	Bluetooth	1Mbps	Edge 1	0mm	Ant 2	Full	0	2402	1	11.66	12.00	1.081	76.44	1.090	-0.05	0.059	**0.070**
	Bluetooth	1Mbps	Edge 1	0mm	Ant 2	Full	39	2441	1	10.98	12.00	1.265	76.44	1.090	0.01	0.034	0.047
	Bluetooth	1Mbps	Edge 1	0mm	Ant 2	Full	78	2480	1	10.79	12.00	1.321	76.44	1.090	0.02	0.030	0.043
	Bluetooth	1Mbps	Edge 1	0mm	Ant 2	Full	0	2402	2	11.66	12.00	1.081	76.44	1.090	0.04	0.040	0.047
	WLAN5.3GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	58	5290	1	7.34	9.00	1.466	88.89	1.125	0.03	0.679	1.119
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 1	Full	54	5270	1	17.05	19.00	1.567	93.7	1.067	0.11	0.251	0.420
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 1	Full	62	5310	1	10.85	12.50	1.462	93.7	1.067	0.03	0.070	0.109
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	54	5270	1	17.05	19.00	1.567	93.7	1.067	0.02	0.081	0.135
	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	15mm	Ant 1	Full	54	5270	1	17.05	19.00	1.567	93.7	1.067	-0.04	0.366	0.612
	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	15mm	Ant 1	Full	62	5310	1	10.85	12.50	1.462	93.7	1.067	0.02	0.086	0.134
	WLAN5.3GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	58	5290	2	7.34	9.00	1.466	88.89	1.125	0.03	0.434	0.716
	WLAN5.3GHz	802.11n-HT40 MCS0	Bottom Face	0mm	Ant 2	Full	54	5270	1	17.94	19.00	1.276	93.7	1.067	0.01	0.074	0.101
03	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full	54	5270	1	17.94	19.00	1.276	93.7	1.067	-0.04	0.833	**1.135**
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full	62	5310	1	11.86	12.50	1.159	93.7	1.067	0.02	0.210	0.260
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full	54	5270	2	17.94	19.00	1.276	93.7	1.067	0.04	0.712	0.970
04	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	122	5610	1	6.12	7.00	1.225	88.89	1.125	-0.01	0.759	**1.046**
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	106	5530	1	6.08	7.00	1.236	88.89	1.125	-0.03	0.731	1.016
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	138	5690	1	5.44	7.00	1.432	88.89	1.125	0.02	0.610	0.983
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 1	Full	122	5610	1	15.21	16.50	1.346	88.89	1.125	0.01	0.196	0.297
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 4	0mm	Ant 1	Full	122	5610	1	15.21	16.50	1.346	88.89	1.125	0.05	0.069	0.104
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	15mm	Ant 1	Full	122	5610	1	15.21	16.50	1.346	88.89	1.125	0.06	0.338	0.512
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	122	5610	2	6.12	7.00	1.225	88.89	1.125	0.01	0.632	0.871
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 2	Full	138	5690	1	14.90	16.50	1.445	88.89	1.125	0.04	0.107	0.174
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	138	5690	1	14.90	16.50	1.445	88.89	1.125	0.03	0.589	0.958
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	122	5610	1	14.64	16.50	1.535	88.89	1.125	0.04	0.600	1.036
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	106	5530	1	11.26	13.00	1.493	88.89	1.125	0.01	0.289	0.485
	WLAN5.5GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	122	5610	2	14.64	16.50	1.535	88.89	1.125	0.04	0.588	1.015
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	155	5775	1	5.23	6.50	1.340	88.89	1.125	0.03	0.723	1.090
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 1	Full	155	5775	1	15.38	17.00	1.452	88.89	1.125	0.13	0.150	0.245
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Edge 4	0mm	Ant 1	Full	155	5775	1	15.38	17.00	1.452	88.89	1.125	0.01	0.077	0.126
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	15mm	Ant 1	Full	155	5775	1	15.38	17.00	1.452	88.89	1.125	0.06	0.220	0.359
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 1	Reduced	155	5775	2	5.23	6.50	1.340	88.89	1.125	0.01	0.653	0.984
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Bottom Face	0mm	Ant 2	Full	155	5775	1	15.33	17.00	1.469	88.89	1.125	0.04	0.021	0.035
05	WLAN5.8GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	155	5775	1	15.33	17.00	1.469	88.89	1.125	0.05	0.720	**1.190**
	WLAN5.8GHz	802.11ac-VHT80 MCS0	Edge 1	0mm	Ant 2	Full	155	5775	2	15.33	17.00	1.469	88.89	1.125	0.03	0.701	1.158

15.2 Repeated SAR Measurement

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Sample	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	6	2437	1	12.27	13.50	1.327	100	1.000	-0.02	0.836	1	1.110
2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	Ant 1	Reduced	6	2437	1	12.27	13.50	1.327	100	1.000	0.01	0.822	1.017	1.091
1st	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full	54	5270	1	17.94	19.00	1.276	93.7	1.067	-0.04	0.833	1	1.135
2nd	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full	54	5270	1	17.94	19.00	1.276	93.7	1.067	0.03	0.821	1.015	1.118

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Tablet
		Body
1.	5GHz WLAN + Bluetooth	Yes
2.	2.4GHz WLAN + 5GHz WLAN	Yes

General Note:

1. This device does not support voice function.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. WLAN2.4GHz and Bluetooth share the same antenna, and they cannot transmit simultaneously each other.
4. According to the EUT character, WLAN 5GHz and Bluetooth can transmit simultaneously.
5. According to the EUT character, WLAN 2.4GHz and WLAN 5GHz can transmit simultaneously.
6. The worst case 5 GHz WLAN SAR for each configuration was used for SAR summation.
7. When stand-alone SAR is not required for a transmitter or antenna, its SAR is considered zero in the SAR summing process to assess Multi-band transmission SAR compliance.
8. The reported SAR summation is calculated based on the same configuration and test position.
9. For distance SAR and non-distance SAR always chose higher SAR to do co-located analysis.
10. All licensed modes share the same antenna part and cannot transmit simultaneously.
11. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
    i) Scalar SAR summation < 1.6W/kg.
    ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
    iii) If SPLSR ≤ 0.04 for 1g SAR, simultaneously transmission SAR measurement is not necessary.
    iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg.
    v) The SPLSR calculated results please refer to section 16.2.

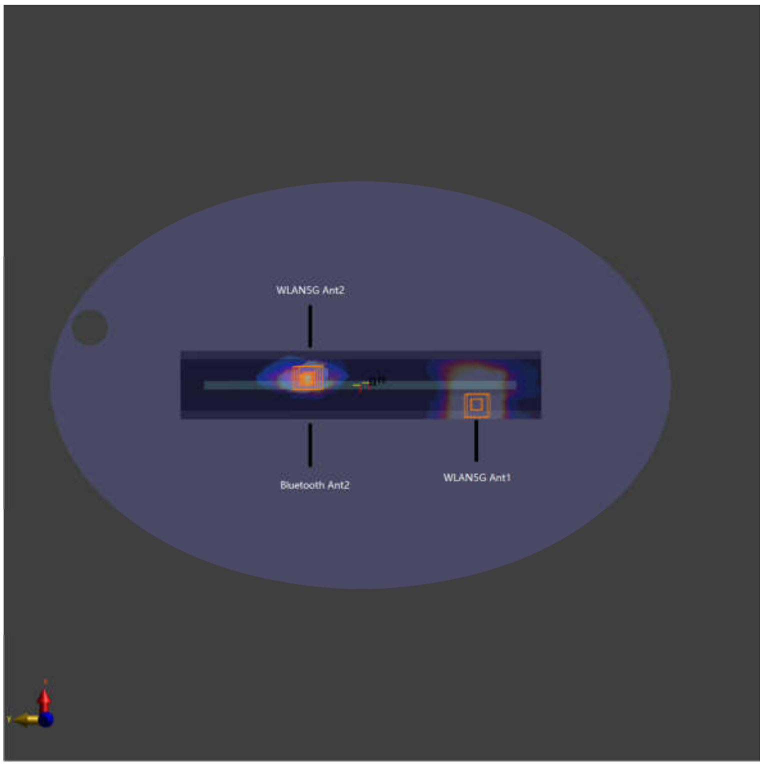
16.1 Body Exposure Conditions

Exposure Position	1	2	3	4	5	1+2	1+4	2+3	3+4+5	SPLSR
	WLAN2.4GHz Ant 1	WLAN2.4GHz Ant 2	WLAN5GHz Ant 1	WLAN5GHz Ant 2	Bluetooth Ant 2	Summed	Summed	Summed	Summed	
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	
Bottom Face	1.110	0.047	1.119	0.174	0.011	1.16	1.28	1.17	1.30	
Edge 1	0.171	0.651	0.420	1.190	0.070	0.82	1.36	1.07	1.68	1
Edge 4	0.001		0.135			0.00	0.00	0.14	0.14	

16.2 SPLSR Evaluation and Analysis

General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of [(x1−x2)2 + (y1−y2)2 + (z1−z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm). If SPLSR ≤ 0.04 for 1g SAR, simultaneously transmission SAR measurement is not necessary.
3. Per April 2022 TCB Workshop Notes, WLAN 5GHz / BT antenna 2 was summed algebraically with the WLAN Antenna 1 separately for the purposes of hybrid SPLSR combination.
4. Per April 2022 TCB Workshop, instead of doing a small volume scan over a co-located antenna pair, used summing the SAR values of the co-located pair and using that value in SPLSR calculation. In the calculation used the minimum distance between the spatially separated antenna and the closest antenna of the co-located antenna pair to be conservative.



WLAN5GHz+Bluetooth_Edge 1 0mm

	Band	Position	SAR (W/kg)	Summed SAR (W/kg)	Gap (mm)	SAR peak location (mm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 1	WLAN5GHz Ant 1	Edge 1	0.42	0.420	0mm	-37.6	-29.9	-207	96.6	1.68	0.02	Not required
	WLAN5GHz Ant 2		1.19	1.260	0mm	7.8	49.9	-177				
	Bluetooth Ant 2		0.07		0mm							
	WLAN5GHz Ant 1	Edge 1	0.42	0.420	0mm	-37.6	-29.9	-207	95.5	1.68	0.02	Not required
	WLAN5GHz Ant 2		1.19	1.260	0mm							
	Bluetooth Ant 2		0.07		0mm	4.9	50.2	-177				

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17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

18. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[8] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

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