Prüfbericht - Produkte
Test Report - Products

Prüfbericht-Nr.: *Test report no.:*	CN24CB9V 001	**Auftrags-Nr.:** *Order no.*:	48244361	Seite 1 von 47 *Page 1 of 47*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2024-02-27	
Auftraggeber: *Client:*	HTC Corporation No. 88, Sec. 3, Zhongxing Rd. Xindian Dist., New Taipei City 231, Taiwan			
Prüfgegenstand: *Test item:*	Headset			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	2QD4100			
Auftrags-Inhalt: *Order content*:	Test Report for RF Exposure Evaluation			
Prüfgrundlage: *Test specification:*	FCC 47CFR Part 2(2.1093) IEC TR 63170 IEC/IEEE 63195-1 IEC/IEEE 62209-1528:2020			

Wareneingangsdatum: *Date of sample receipt:*	2024-03-13
Prüfmuster-Nr.: *Test sample no:*	A003674863-007
Prüfzeitraum: *Testing period:*	2024-03-20 - 2024-04-13
Ort der Prüfung: *Place of testing:*	EMC/RF Taipei Testing Site
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories
Prüfergebnis*: *Test result*:*	Pass

überprüft von: *compiled by:*	Morrison Huang	**genehmigt von:** authorized by:	Brenda Chen
Datum: *Date:* 2024-04-26		**Ausstellungsdatum:** *Issue date:* 2024-04-26	
Stellung / *Position:*	Morrison Huang Project Engineer	**Stellung** / *Position:*	Brenda Chen Senior Project Manager

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Anmerkungen
Remarks

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CONTENTS

HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2024-04-26

1. General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Operating Mode	Highest Head SAR_{1g} (0 cm Gap) (W/kg)	APD (W/m^2)	Reported PD PsPD (W/m^2)
2.4G WLAN	0.335	-	-
5G WLAN	0.530	-	-
6G WLAN	0.442	3.68	9.54
Bluetooth	0.013	-	-
SRD 2.4GHz	0.005	-	-
Highest Simultaneous Transmission SAR	Body SAR-1g (W/Kg)		
	1.547		

Note:

1. According to 47 CFR part 2.1093, the MPE limits specified in part 1.1310 apply to portable devices that transmit at frequencies above 6 GHz. The localized power density limit for general population exposure is 1.0 mW/cm² (equal to 10 W/m²) for frequency up to 100 GHz.
2. Per FCC guidance in Oct 2018 TCB workshop, the total exposure ratio calculated by taking ratio of maximum reported SAR divided by SAR limit and adding it to maximum measured power density divided by power density limit. Numerical sum of the ratios should be less than 1.
3. Per FCC interim guidance for near-field power density measurement, the power density was spatially averaged over a circular area of 4 cm².
4. 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, 4.0 W/kg for Product Specific 10g SAR).

1.2 Equipment Under Test (EUT) Information

1.2.1 General Information

EUT Type	Headset
Model Name	2QD4100
Trademark	VIVE
FCC ID	NM82QD4100
Antenna Type	WLAN & Bluetooth: Dipole Antenna SRD 2.4GHz: PIFA Antenna
Antenna Gain	WLAN 2.4GHz: 1.5 dBi (Ant 0) / 1.2 dBi (Ant 1) WLAN 5GHz Band 1: 2.42 dBi (Ant 0) / 2.27 dBi (Ant 1) WLAN 5GHz Band 2: 2.05 dBi (Ant 0) / 2.32 dBi (Ant 1) WLAN 5GHz Band 3: 0.52 dBi (Ant 0) / 2.8 dBi (Ant 1) WLAN 5GHz Band 4: 0.01 dBi (Ant 0) / 0.55 dBi (Ant 1) WLAN 6GHz: 1.26 dBi (Ant 0) / 0.13 dBi (Ant 1) SRD 2.4GHz: 2 dBi Bluetooth: 1.5 dBi
EUT Stage	Identical Prototype

1.2.2 Wireless Technologies

Tx Frequency Bands (Unit: MHz)	WLAN 2.4GHz: 2412 ~ 2472 WLAN 5GHz: 5150 ~ 5250, 5250 ~ 5350, 5470 ~ 5725, 5725 ~ 5850 WLAN 6GHz: 5925 ~ 7125 SRD 2.4GHz: 2402 ~ 2480 Bluetooth: 2402 ~ 2480
Uplink Modulations	802.11b: DSSS 802.11a/g/n/ac/ax: OFDM/OFDMA SRD 2.4GHz: GFSK Bluetooth: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F., No. 758, Sec. 4, Bade Rd., Songshan Dist., Taipei City 105 Taiwan (R.O.C.)

2.2 Test Facilities

Taipei Testing Laboratories

No. 458-18, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244 Taiwan (R.O.C.)

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.3 List of Test and Measurement Instruments

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
E-field probes	SPEAG	EX3DV4	7400	2023/4/28	1 Year
E-field probes	SPEAG	EX3DV4	3804	2023/5/19	1 Year
E-field probes	SPEAG	EUmmWV4	9599	2023/4/19	1 Year
Data Acquisition Electronics	SPEAG	DAE4	855	2023/4/25	1 Year
Data Acquisition Electronics	SPEAG	DAE4	917	2024/3/11	1 Year
System Validation Dipole	SPEAG	D2450V2	735	2023/12/7	1 Year
System Validation Dipole	SPEAG	D5GHzV2	1145	2024/2/21	1 Year
System Validation Dipole	SPEAG	D6.5GHzV2	1044	2023/4/18	1 Year
5G Verification Source	SPEAG	10GHz	2013	2023/4/26	1 Year
ENA	Agilent	E5080A	MY55200677	2024/1/17	1 Year
Power Meter	Anritsu	ML2495A	1901008	2024/3/12	1 Year
Power Sensor	Anritsu	MA2411B	1725269	2024/3/12	1 Year
Power Sensor	R&S	NRP33S	101622	2024/3/21	1 Year
			101623	2023/3/21	1 Year
Signal Analyzer	R&S	FSV40	101514	2023/5/18	1 Year
Signal Generator	R&S	SMB100A03	181248	2023/11/16	1 Year
Digital Thermometer	Testo	608-H1	45207430	2023/11/24	1 Year
Directional coupler	Fairview Microwave	FMCP1025-20	A000553136-001	N/A	N/A
Dielectric Assessment Kit	SPEAG	DAK-3.5	1292	N/A	N/A
Twin Sam Phantom	SPEAG	QD000P40CC	TP-1467	N/A	N/A
Power Amplifier	EMCI	EMC2830P	980352	N/A	N/A
Power Amplifier	mini-circuits	ZHL-42W	SN002101809	N/A	N/A

3. Measurement Uncertainty

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor(a)	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity
(b) κ is the coverage factor

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The uncertainty Budget is shown in the following tables.

PD Uncertainty Budget

cDASY6 Module mmWave Uncertainty Budget Evaluation Distances to the Antennas > λ/2π In Compliance with IEC/IEEE 63195-1					
Error Description	Uncertainty Value (±dB)	Probability	Divisor	(Ci)	Standard Uncertainty (±dB)
Uncertainty terms dep endent on the measurement system					
Probe Calibration	0.49	N	1	1	0.49
Probe correction	0.00	R	1.732	1	0.00
Frequency response (BW ≤ 1 GHz)	0.20	R	1.732	1	0.12
Sensor cross coupling	0.00	R	1.732	1	0.00
Isotropy	0.50	R	1.732	1	0.29
Linearity	0.20	R	1.732	1	0.12
Probe scattering	0.00	R	1.732	1	0.00
Probe positioning offset	0.30	R	1.732	1	0.17
Probe positioning repeatability	0.04	R	1.732	1	0.02
Sensor mechanical offset	0.00	R	1.732	1	0.00
Probe spatial resolution	0.00	R	1.732	1	0.00
Field impedance dependance	0.00	R	1.732	1	0.00
Amplitude and phase drift	0.00	R	1.732	1	0.00
Amplitude and phase noise	0.04	R	1.732	1	0.02
Measurement area truncation	0.00	R	1.732	1	0.00
Data acquisition	0.03	N	1	1	0.03
Sampling	0.00	R	1.732	1	0.00
Field reconstruction	1.99	R	1.732	1	1.15
Forward transformation	0.00	R	1.732	1	0.00
Power density scaling	0.00	R	1.732	1	0.00
Spatial averaging	0.10	R	1.732	1	0.06
System detection limit	0.04	R	1.732	1	0.02
Uncertainty terms dep endent on the DUT and environmental factors					
Probe coupling with DUT	0.00	R	1.732	1	0.0
Modulation response	0.40	R	1.732	1	0.2
Integration time	0.00	R	1.732	1	0.0
Response time	0.00	R	1.732	1	0.0
Device holder influence	0.10	R	1.732	1	0.1
DUT alignment	0.00	R	1.732	1	0.0
RF ambient conditions	0.04	R	1.732	1	0.0
Ambient reflections	0.04	R	1.732	1	0.0
Immunity / secondary reception	0.00	R	1.732	1	0.0
Drift of the DUT		R	1.732	1	
Combined Std. Uncertainty					1.33
Expanded STD Uncertainty (95%)					2.66

SAR Uncertainty Budget According to IEC/IEEE 62209-1528 (Frequency band: 4MHz - 10GHz range)								
Symbol	Input quantity *Xi* (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)
Measurement system errors								
CF	Probe calibration (±%)	18.6	N	2	1	1	9.3	9.3
***CF*drift**	Probe calibration drift (±%)	1.0	N	1	1	1	0.6	0.6
LIN	Probe linearity and detection limit (±%)	4.7	R	1.732	1	1	2.7	2.7
BBS	Broadband signal (±%)	3.0	N	1	1	1	1.7	1.7
ISO	Probe isotropy (±%)	7.6	R	2	1	1	4.4	4.4
DAE	Other probe and data acquisition errors (±%)	0.3	N	1.732	1	1	0.2	0.2
AMB	RF ambient and noise (±%)	1.8	N	1	1	1	1.8	1.8
∆xyz	Probe positioning errors (±mm)	0.20	N	1	0.33	0.33	0.07	0.07
DAT	Data processing errors (±%)	3.5	N	1	1	1	3.5	3.5
Phantom and device (DUT or validation antenna) errors								
***LIQ*(σ)**	Conductivity (meas.) DAK (±%)	2.5	N	1	0.78	0.71	2.0	1.8
***LIQ*(Tc)**	Conductivity (temp.) (±%)	5	R	1.732	0.78	0.71	2.3	2.0
EPS	Phantom Permittivity (±%)	14	R	1.732	0.5	0.5	4.0	4.0
DIS	Distance DUT – TSL (±%)	2	N	1	2	2	4.0	4.0
Dxyz	Device Positioning (±%)	2	N	1	1	1	2.0	2.0
H	Device Holder (±%)	3.4	N	1	1	1	3.4	3.4
MOD	DUT Modulationm (±%)	2.4	R	1.732	1	1	1.4	1.4
TAS	Time-average SAR (±%)	2.4	R	1.732	1	1	1.4	1.4
***RF*drift**	DUT drift (±%)	5	N	1	1	1	5.0	5.0
VAL	Val Antenna Unc. (±%)	0	N	1	1	1	0.0	0.0
***P*in**	Unc. Input Power (±%)	0	N	1	1	1	0.0	0.0
Corrections to the SAR result								
***C*(ε',σ)**	Deviation to Target (±%)	1.9	N	1	1	0.84	1.9	1.6
***C*(*R*)**	SAR scaling (±%)	0	R	√3	1	1	0.0	0.0
***u*(∆*SAR*)**	Combined uncertainty						14.9	14.8
	Coverage Factor for 95%						K=2	K=2
U	Expanded uncertainty					*U* =	±29.7	±29.6

4. Submitted Documents

4.1 Test Specification(s)

-ANSI/IEEE C95.1-1992
-IEEE 1528-2013
-IEC/IEEE 62209-1528:2020
-IEC 62479 (2010)
-KDB 447498 D01 General RF Exposure Guidance v06r04
-KDB 865664 D01 SAR Measurement 100 MHz to 6GHz V01r04
-KDB 865664 D02 SAR Reporting V01r02
-KDB 248227 D01 802.11 Wi-Fi SAR V02r02
-KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03

4.2 RF exposure limits (ICNIRP Guidelines)

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

Whole body average SAR	Localized SAR (head and trunk)	Localized SAR (limbs)
0.08	1.6	4.0

Note:
1. Localised SAR averaging mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure.
2. The limit applied in this test report is shown in **bold** letters

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.Peak Spatially Averaged Power Density was evaluated over a circular area of 4cm² per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

5. SAR Measurement System

5.1 Definition of Specific Absorption Rate (SAR)

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.

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:

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

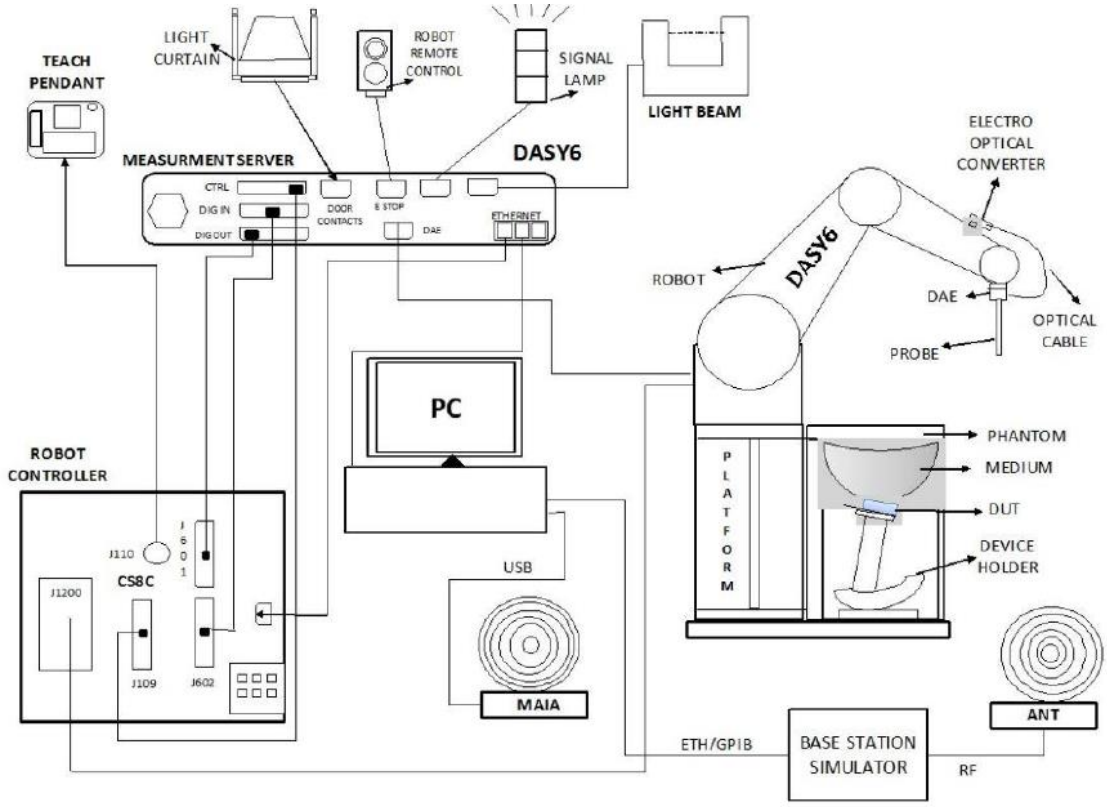
SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

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

5.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY6 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

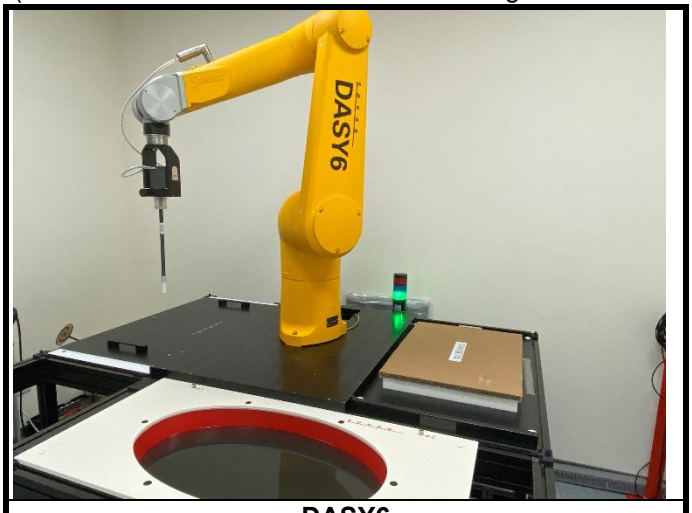


DASY SAR System Setup

5.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY6: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

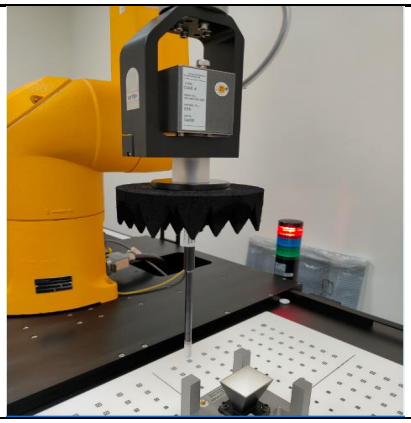


DASY6

5.2.2 mmWave System

The mmWave system uses the from SPEAG(Switzerland) . DASY6 Module mmWave is SPEAG's solution for power density (PD) compliance testing of transmitters operating in the mmWave frequency range 6GHz-110GHz. Incident PD exposure compliance testing of transmitters.

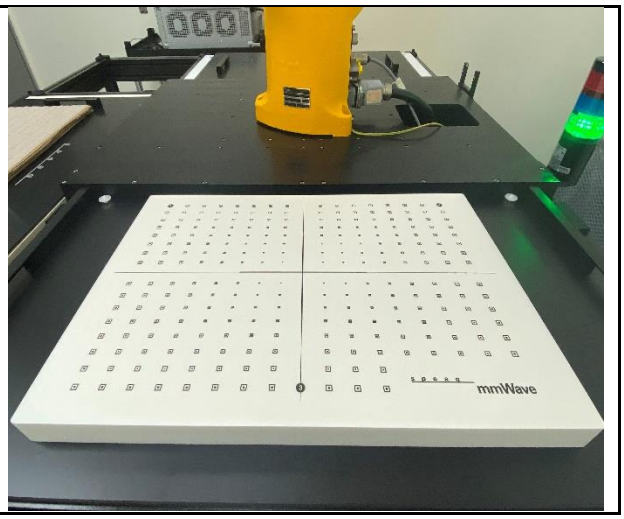
- The measures electric (E-) fields at distances as small as 2 mm from any transmitter.
- Approximates free-space conditions, allowing to evaluate not only the antenna side of the device but also the front (screen) side or any opposite-radiating side of wireless devices operating above 10 GHz without distorting the radio frequency (RF) field.



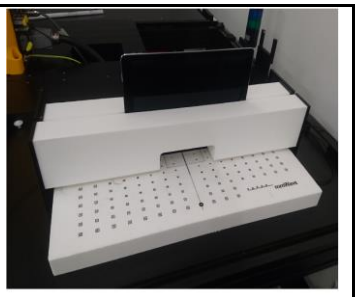
mmWave System

5.2.3 Phantom

Model	mmWave Phantom
Construction	Approximates free-space conditions, allowing to evaluate not only the antenna side of the device but also the front (screen) side or any opposite-radiating side of wireless devices operating above 10 GHz without distorting the radio frequency (RF) field.
Material	Rohacell plate
Shell Thickness	40 mm



5.2.4 Device Holder

Model	DUT Holder	
Construction	mmWave DUT Holder – Ensures accurate positioning of smartphones, tablets, and laptops	

5.2.5 Probes

Model	EUmmWVx / 5G Power Density Probe	
Construction	Two dipoles optimally arranged to obtain pseudo-vector information. Minimum three measurements/point, 120º rotated around probe axis. Sensors (0.8 mm length) printed on glass substrate protected by high density foam. Low perturbation of the measured field Requires positioner which can do accurate probe rotation	
Dimensional tolerance	Overall length: 320 mm (tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor <1mm) Distance from probe tip to dipole centers: <2 mm Sensor displacement to probe's calibration point: <0.3 mm	

Model	EX3DV4	
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (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	

5.2.6 Data Acquisition Electronics (DAE)

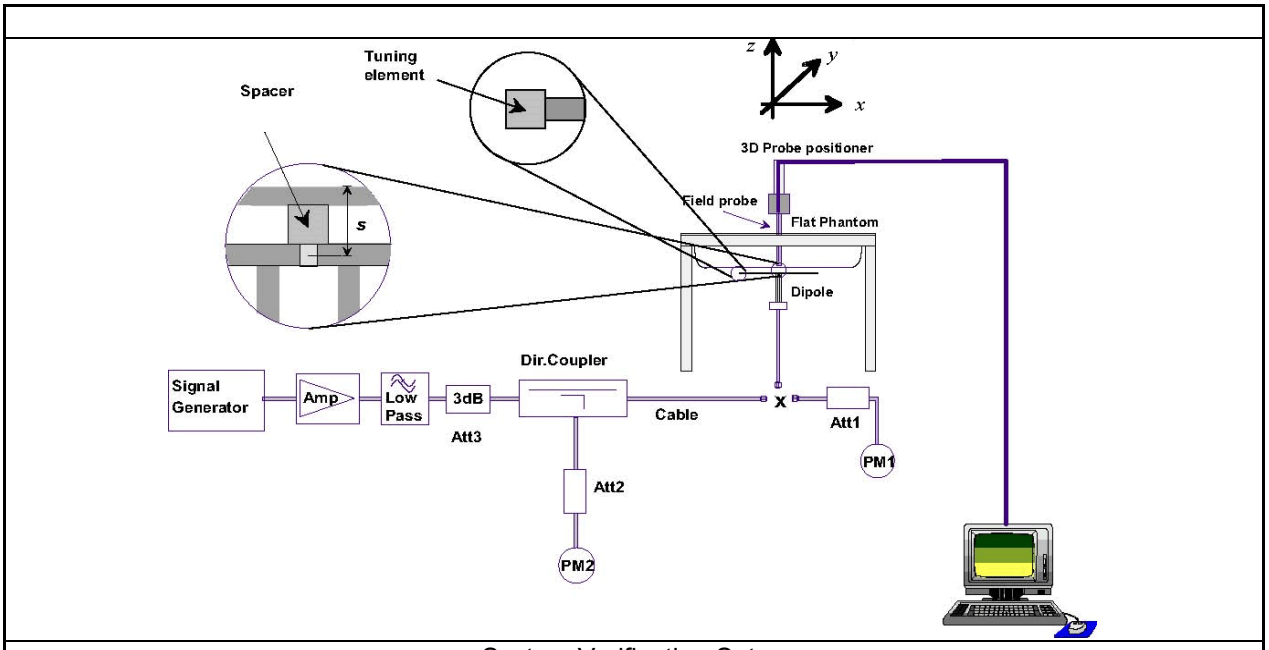
Model	DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
Input Offset Voltage	< 5µV (with auto zero)	
Input Bias Current	< 50 fA	
Dimensions	60 x 60 x 68 mm	

5.2.7 System Validation Dipoles

Model	D-Serial
Construction	Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.
Frequency	750 MHz to 6500 MHz
Return Loss	> 20 dB
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)

5.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



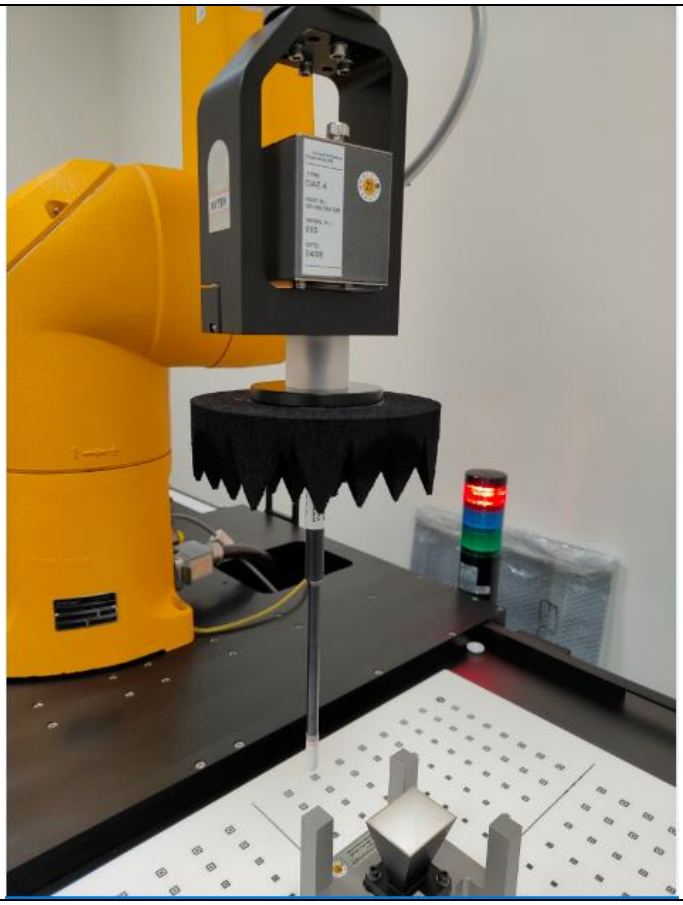
System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz, 154.8mW is used 6GHz to 10GHz) at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

5.4 PSD System Verification

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check. The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.



PD System Verification Setup

5.5 SAR Measurement Procedure

According to the SAR test standard, If an array system is used, the following procedure and requirements shall be applied:

a) Measure the electric field or magnetic field over the measurement region.
b) Apply the reconstruction algorithm to reconstruct the SAR distribution in the volume of interest.
c) Apply the averaging algorithm as described in 6.5 to determine the psSAR.
d) If a sequence of different configurations is evaluated without recharging the battery, then the first measurement shall be repeated at the end of each measurement and the relative difference between the first and last measurement shall be within the repeatability tolerance of the system but not larger than 5 %. If the SAR difference exceeds 5 % then the measurements shall be repeated with full charged battery or all SAR values shall be increased by the absolute percentage difference between the first and last measurement.

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

5.5.1 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 drift more than 5%, the SAR will be retested.

6. Test Set-up and Operation Modes

6.1 EUT Configuration and Setting

<Considerations Related to WLAN for Setup and Testing>
In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies.

This device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

6.2 Test Position Configuration

According to technical standards, the EUT is tested for SAR compliance in the configurations described in the following subsections.

6.2.1 Head Exposure Conditions

The EUT was tested for the surface of Rear Face. The separation distance between this EUT and phantom is 0mm for SAR testing and 2mm for PD testing.

6.2.2 Antenna Location

Diagram only - HMD Top View

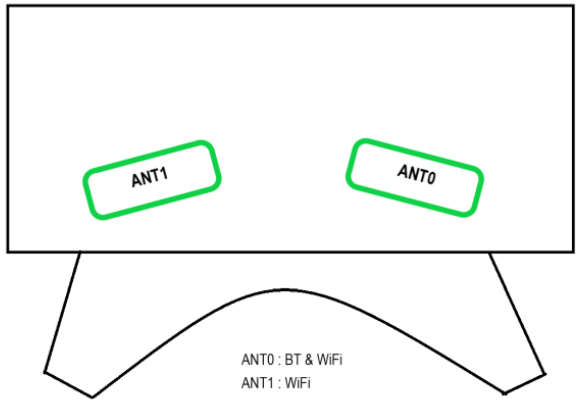
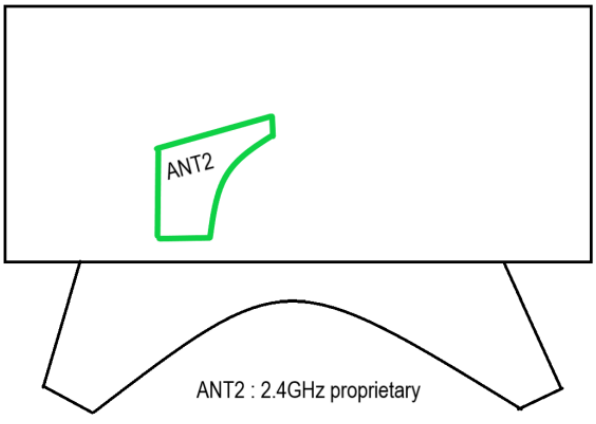


Diagram only - HMD Bottom View



6.2.3 Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Head
1	WLAN 2.4GHz MIMO	Yes
2	WLAN 5GHz MIMO	Yes
3	WLAN 6GHz MIMO	Yes
4	WLAN 2.4GHz Ant 1 + Bluetooth	Yes
5	WLAN 5GHz MIMO + Bluetooth	Yes
6	WLAN 6GHz MIMO + Bluetooth	Yes
7	WLAN 2.4GHz MIMO + SRD 2.4GHz	Yes
8	WLAN 5GHz MIMO + SRD 2.4GHz	Yes
9	WLAN 6GHz MIMO + SRD 2.4GHz	Yes
10	Bluetooth + SRD 2.4G	Yes

6.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Test Date	Tissue Type	Frequency (MHz)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
2024/3/20	Head	2450	1.855	40.418	1.8	39.2	3.06	3.11
2024/4/13	Head	5250	4.678	36.711	4.71	35.9	-0.68	2.26
2024/4/13	Head	5600	5.045	36.26	5.07	35.5	-0.49	2.14
2024/4/13	Head	5750	5.208	36.094	5.22	35.4	-0.23	1.96
2024/4/1	Head	6500	30.8	5.54	29.4	5.44	4.76	1.84

Note:

1. The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2°C.
2. Since the maximum deviation of dielectric properties of the tissue simulating liquid is within 5%, SAR correction is evaluated in the measurement uncertainty shown on section 3 of this report.

6.4 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	1W Target SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
2024/3/20	2450	13.20	52.8	53.4	-1.12	735	7400	855
2024/4/13	5250	7.52	75.2	79.2	-5.05	1145	7400	855
2024/4/13	5600	8.08	80.8	82.3	-1.82	1145	7400	855
2024/4/13	5750	7.54	75.4	78.6	-4.07	1145	7400	855
2024/4/1	6500	27.90	279	294	-5.10	1044	7400	855

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

6.5 PD System Verification Results

Test Date	Frequency (GHz)	5G Verification Source	Distance (mm)	Prad (mW)	Normalized 4cm² (W/m²)	Targeted 4cm² (W/m²)	Deviation (dB)	Probe S/N	DAE S/N
2024/3/25	10	10GHz-2013	10	132	153.67	173	-0.51	9599	855

6.6 Maximum Output Power

6.6.1 Measured Conducted Power Result

All Rate have been tested, the Worst average power (Unit: dBm) is shown as below.

<WLAN 2.4G>

2.4G WIFI_ANT 0					
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)	Max. Tune up
802.11b	1	2412	1	15.19	15.5
	7	2442		16.85	17
	13	2472		15.45	15.5
802.11g	1	2412	6	14.86	15
	7	2442		14.93	15
	13	2472		14.92	15
802.11n HT20	1	2412	MCS0	14.86	15
	7	2442		14.83	15
	13	2472		14.79	15
802.11n HT40	3	2422	MCS0	14.05	14.5
	7	2442		14.58	15
	11	2462		14.82	15
802.11ac VHT20	1	2412	NSS1 MCS0	14.88	15
	7	2442		14.83	15
	13	2472		14.87	15
802.11ac VHT40	3	2422	NSS1 MCS0	14.11	14.5
	7	2442		14.63	15
	11	2462		14.88	15
802.11ax HE20	1	2412	NSS1 MCS0	14.91	15
	7	2442		14.92	15
	13	2472		14.88	15
802.11ax HE40	3	2422	NSS1 MCS0	14.18	14.5
	7	2442		14.70	15
	11	2462		14.88	15

2.4G WIFI_ANT 1					
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Average Power (dBm)	Max. Tune up
802.11b	1	2412	1	15.10	15.5
	7	2442		16.48	16.5
	13	2472		15.38	15.5
802.11g	1	2412	6	14.75	15
	7	2442		14.62	15
	13	2472		14.91	15
802.11n HT20	1	2412	MCS0	14.73	15
	7	2442		14.55	15
	13	2472		14.70	15
802.11n HT40	3	2422	MCS0	14.02	14.5
	7	2442		14.63	15
	11	2462		14.79	15
802.11ac VHT20	1	2412	NSS1 MCS0	14.76	15
	7	2442		14.66	15
	13	2472		14.82	15
802.11ac VHT40	3	2422	NSS1 MCS0	14.10	14.5
	7	2442		14.67	15
	11	2462		14.79	15
802.11ax HE20	1	2412	NSS1 MCS0	14.85	15
	7	2442		14.71	15
	13	2472		14.89	15
802.11ax HE40	3	2422	NSS1 MCS0	14.16	14.5
	7	2442		14.74	15
	11	2462		14.92	15

2.4G WIFI_ANT 0+1					
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
802.11b	1	2412	1	17.88	18.5
	7	2442		19.35	19.8
	13	2472		18.14	18.5
802.11g	1	2412	6	17.87	18
	7	2442		17.84	18
	13	2472		17.96	18
802.11n HT20	1	2412	MCS0	17.85	18
	7	2442		17.75	18
	13	2472		17.83	18
802.11n HT40	3	2422	MCS0	17.10	17.5
	7	2442		17.47	18
	11	2462		17.84	18
802.11ac VHT20	1	2412	NSS1 MCS0	17.89	18
	7	2442		17.80	18
	13	2472		17.88	18
802.11ac VHT40	3	2422	NSS1 MCS0	17.17	17.5
	7	2442		17.52	18
	11	2462		17.90	18
802.11ax HE20	1	2412	NSS1 MCS0	17.96	18
	7	2442		17.87	18
	13	2472		17.95	18
802.11ax HE40	3	2422	NSS1 MCS0	17.25	17.5
	7	2442		17.59	18
	11	2462		17.97	18

<WLAN 5G>

5.2G WIFI_ANT 0						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.2G	802.11a	36	5180	6	16.07	16.50
		40	5200		16.09	16.50
		44	5220		15.96	16.00
		48	5240		15.22	15.50
	802.11n HT20	36	5180	MCS0	16.51	17.00
		40	5200		16.59	17.00
		44	5220		16.48	16.50
		48	5240		15.33	15.50
	802.11n HT40	38	5190	MCS0	16.41	16.50
		46	5230		16.56	17.00
	802.11ac VHT20	36	5180	NSS1 MCS0	16.74	17.00
		40	5200		16.49	16.50
		44	5220		16.55	17.00
		48	5240		15.38	15.50
	802.11ac VHT40	38	5190	NSS1 MCS0	16.48	16.50
		46	5230		16.53	17.00
	802.11ac VHT80	42	5210	NSS1 MCS0	16.55	17.00
	802.11ax HE20	36	5180	NSS1 MCS0	16.81	17.00
		40	5200		16.61	17.00
		44	5220		16.65	17.00
		48	5240		15.46	15.50
	802.11ax HE40	38	5190	NSS1 MCS0	16.41	16.50
		46	5230		16.52	17.00
	802.11ax HE80	42	5210	NSS1 MCS0	16.58	17.00

5.2G WIFI_ANT 1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.2G	802.11a	36	5180	6	15.83	16.00
		40	5200		16.04	16.50
		44	5220		16.02	16.50
		48	5240		15.19	15.50
	802.11n HT20	36	5180	MCS0	16.17	16.50
		40	5200		16.03	16.50
		44	5220		15.99	16.00
		48	5240		15.66	16.00
	802.11n HT40	38	5190	MCS0	16.72	17.00
		46	5230		15.90	16.00
	802.11ac VHT20	36	5180	NSS1 MCS0	16.15	16.50
		40	5200		16.17	16.50
		44	5220		16.02	16.50
		48	5240		15.82	16.00
	802.11ac VHT40	38	5190	NSS1 MCS0	16.76	17.00
		46	5230		16.06	16.50
	802.11ac VHT80	42	5210	NSS1 MCS0	16.23	16.50
	802.11ax HE20	36	5180	NSS1 MCS0	16.25	16.50
		40	5200		16.12	16.50
		44	5220		16.19	16.50
		48	5240		15.94	16.00
	802.11ax HE40	38	5190	NSS1 MCS0	16.80	17.00
		46	5230		16.07	16.50
	802.11ax HE80	42	5210	NSS1 MCS0	16.33	16.50

5.2G WIFI_ANT 0+1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.2G	802.11a	36	5180	6	19.06	19.50
		40	5200		19.21	19.50
		44	5220		19.09	19.50
		48	5240		18.32	18.50
	802.11n HT20	36	5180	MCS0	19.48	19.50
		40	5200		19.37	19.50
		44	5220		19.30	19.50
		48	5240		18.64	19.00
	802.11n HT40	38	5190	MCS0	19.71	20.00
		46	5230		19.36	19.50
	802.11ac VHT20	36	5180	NSS1 MCS0	19.52	20.00
		40	5200		19.43	19.50
		44	5220		19.44	19.50
		48	5240		18.69	19.00
	802.11ac VHT40	38	5190	NSS1 MCS0	19.73	20.00
		46	5230		19.43	19.50
	802.11ac VHT80	42	5210	NSS1 MCS0	19.50	20.00
	802.11ax HE20	36	5180	NSS1 MCS0	19.60	20.00
		40	5200		19.50	19.50
		44	5220		19.50	19.50
		48	5240		18.82	19.00
	802.11ax HE40	38	5190	NSS1 MCS0	19.77	20.00
		46	5230		19.49	19.50
	802.11ax HE80	42	5210	NSS1 MCS0	19.55	20.00

5.3G WIFI_ANT 0						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.3G	802.11a	52	5260	6	15.21	15.50
		56	5280		15.16	15.50
		60	5300		15.12	15.50
		64	5320		15.21	15.50
	802.11n HT20	52	5260	MCS0	16.60	17.00
		56	5280		16.52	17.00
		60	5300		16.52	17.00
		64	5320		16.69	17.00
	802.11n HT40	54	5270	MCS0	16.56	17.00
		62	5310		16.53	17.00
	802.11ac VHT20	52	5260	NSS1 MCS0	16.57	17.00
		56	5280		16.60	17.00
		60	5300		16.52	17.00
		64	5320		16.84	17.00
	802.11ac VHT40	54	5270	NSS1 MCS0	16.53	17.00
		62	5310		16.71	17.00
	802.11ac VHT80	58	5290	NSS1 MCS0	16.64	17.00
	802.11ac VHT160	50	5250	NSS1 MCS0	13.96	14.00
	802.11ax HE20	52	5260	NSS1 MCS0	16.78	17.00
		56	5280		16.57	17.00
		60	5300		16.71	17.00
		64	5320		16.77	17.00
	802.11ax HE40	54	5270	NSS1 MCS0	16.67	17.00
		62	5310		16.61	17.00
	802.11ax HE80	58	5290	NSS1 MCS0	16.63	17.00
	802.11ax HE160	50	5250	NSS1 MCS0	14.02	14.50

5.3G WIFI_ANT 1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.3G	802.11a	52	5260	6	14.92	15.00
		56	5280		14.83	15.00
		60	5300		15.31	15.50
		64	5320		15.26	15.50
	802.11n HT20	52	5260	MCS0	16.03	16.50
		56	5280		16.05	16.50
		60	5300		16.01	16.50
		64	5320		16.05	16.50
	802.11n HT40	54	5270	MCS0	16.09	16.50
		62	5310		16.18	16.50
	802.11ac VHT20	52	5260	NSS1 MCS0	16.06	16.50
		56	5280		16.09	16.50
		60	5300		16.02	16.50
		64	5320		16.11	16.50
	802.11ac VHT40	54	5270	NSS1 MCS0	16.01	16.50
		62	5310		16.40	16.50
	802.11ac VHT80	58	5290	NSS1 MCS0	16.11	16.50
	802.11ac VHT160	50	5250	NSS1 MCS0	13.90	14.00
	802.11ax HE20	52	5260	NSS1 MCS0	16.11	16.50
		56	5280		16.28	16.50
		60	5300		16.15	16.50
		64	5320		16.31	16.50
	802.11ax HE40	54	5270	NSS1 MCS0	16.18	16.50
		62	5310		16.44	16.50
	802.11ax HE80	58	5290	NSS1 MCS0	16.11	16.50
	802.11ax HE160	50	5250	NSS1 MCS0	13.85	14.00

5.3G WIFI_ANT 0+1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.3G	802.11a	52	5260	6	18.17	18.50
		56	5280		18.10	18.50
		60	5300		18.32	18.50
		64	5320		18.33	18.50
	802.11n HT20	52	5260	MCS0	19.42	19.50
		56	5280		19.39	19.50
		60	5300		19.40	19.50
		64	5320		19.53	20.00
	802.11n HT40	54	5270	MCS0	19.38	19.50
		62	5310		19.54	20.00
	802.11ac VHT20	52	5260	NSS1 MCS0	19.49	19.50
		56	5280		19.46	19.50
		60	5300		19.47	19.50
		64	5320		19.59	20.00
	802.11ac VHT40	54	5270	NSS1 MCS0	19.44	19.50
		62	5310		19.60	20.00
	802.11ac VHT80	58	5290	NSS1 MCS0	19.51	20.00
	802.11ac VHT160	50	5250	NSS1 MCS0	17.00	17.50
	802.11ax HE20	52	5260	NSS1 MCS0	19.56	20.00
		56	5280		19.53	20.00
		60	5300		19.54	20.00
		64	5320		19.65	20.00
	802.11ax HE40	54	5270	NSS1 MCS0	19.50	20.00
		62	5310		19.65	20.00
	802.11ax HE80	58	5290	NSS1 MCS0	19.57	20.00
	802.11ax HE160	50	5250	NSS1 MCS0	17.08	17.50

5.6G WIFI_ANT 0						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.6G	802.11a	100	5500	6	16.57	17.00
		116	5580		15.46	15.50
		124	5620		15.41	15.50
		132	5660		16.44	16.50
		144	5720		16.82	17.00
	802.11n HT20	100	5500	MCS0	16.36	16.50
		116	5580		16.42	16.50
		124	5620		16.15	16.50
		132	5660		16.33	16.50
		144	5720		16.76	17.00
	802.11n HT40	102	5510	MCS0	16.71	17.00
		110	5550		16.74	17.00
		126	5630		16.68	17.00
		134	5670		16.80	17.00
		142	5710		16.72	17.00
	802.11ac VHT20	100	5500	NSS1 MCS0	16.71	17.00
		116	5580		16.72	17.00
		124	5620		16.82	17.00
		132	5660		16.82	17.00
		144	5720		16.75	17.00
	802.11ac VHT40	102	5510	NSS1 MCS0	16.76	17.00
		110	5550		16.76	17.00
		126	5630		16.76	17.00
		134	5670		16.76	17.00
		142	5710		16.82	17.00
	802.11ac VHT80	106	5530	NSS1 MCS0	16.75	17.00
		122	5610		16.77	17.00
		138	5690		16.58	17.00
	802.11ac VHT160	114	5570	NSS1 MCS0	14.01	14.50
	802.11ax HE20	100	5500	NSS1 MCS0	16.84	17.00
		116	5580		16.77	17.00
		124	5620		16.72	17.00
		132	5660		16.93	17.00
		144	5720		16.78	17.00
	802.11ax HE40	102	5510	NSS1 MCS0	16.79	17.00
		110	5550		16.94	17.00
		126	5630		16.82	17.00
		134	5670		16.79	17.00
		142	5710		16.91	17.00
	802.11ax HE80	106	5530	NSS1 MCS0	16.87	17.00
		122	5610		16.92	17.00
		138	5690		16.66	17.00
	802.11ax HE160	114	5570	NSS1 MCS0	14.97	15.00

5.6G WIFI_ANT 1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.6G	802.11a	100	5500	6	16.83	17.00
		116	5580		15.74	16.00
		124	5620		15.61	16.00
		132	5660		15.56	16.00
		144	5720		16.44	16.50
	802.11n HT20	100	5500	MCS0	16.85	17.00
		116	5580		16.83	17.00
		124	5620		16.33	16.50
		132	5660		15.87	16.00
		144	5720		16.24	16.50
	802.11n HT40	102	5510	MCS0	16.66	17.00
		110	5550		16.74	17.00
		126	5630		16.30	16.50
		134	5670		16.30	16.50
		142	5710		16.19	16.50
	802.11ac VHT20	100	5500	NSS1 MCS0	16.63	17.00
		116	5580		16.82	17.00
		124	5620		16.61	17.00
		132	5660		16.27	16.50
		144	5720		16.31	16.50
	802.11ac VHT40	102	5510	NSS1 MCS0	16.74	17.00
		110	5550		16.82	17.00
		126	5630		16.41	16.50
		134	5670		16.40	16.50
		142	5710		16.43	16.50
	802.11ac VHT80	106	5530	NSS1 MCS0	16.74	17.00
		122	5610		16.72	17.00
		138	5690		15.92	16.00
	802.11ac VHT160	114	5570	NSS1 MCS0	14.15	14.50
	802.11ax HE20	100	5500	NSS1 MCS0	16.80	17.00
		116	5580		16.73	17.00
		124	5620		16.61	17.00
		132	5660		16.27	16.50
		144	5720		16.31	16.50
	802.11ax HE40	102	5510	NSS1 MCS0	16.69	17.00
		110	5550		16.83	17.00
		126	5630		16.43	16.50
		134	5670		16.30	16.50
		142	5710		16.35	16.50
	802.11ax HE80	106	5530	NSS1 MCS0	16.72	17.00
		122	5610		16.70	17.00
		138	5690		16.06	16.50
	802.11ax HE160	114	5570	NSS1 MCS0	15.25	15.50

5.6G WIFI_ANT 0+1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.6G	802.11a	100	5500	6	19.84	20.00
		116	5580		18.72	19.00
		124	5620		18.61	19.00
		132	5660		18.59	19.00
		144	5720		19.75	20.00
	802.11n HT20	100	5500	MCS0	19.74	20.00
		116	5580		19.76	20.00
		124	5620		19.35	19.50
		132	5660		19.25	19.50
		144	5720		19.57	20.00
	802.11n HT40	102	5510	MCS0	19.79	20.00
		110	5550		19.83	20.00
		126	5630		19.63	20.00
		134	5670		19.60	20.00
		142	5710		19.63	20.00
	802.11ac VHT20	100	5500	NSS1 MCS0	19.86	20.00
		116	5580		19.87	20.00
		124	5620		19.81	20.00
		132	5660		19.65	20.00
		144	5720		19.64	20.00
	802.11ac VHT40	102	5510	NSS1 MCS0	19.87	20.00
		110	5550		19.89	20.00
		126	5630		19.69	20.00
		134	5670		19.67	20.00
		142	5710		19.70	20.00
	802.11ac VHT80	106	5530	NSS1 MCS0	19.83	20.00
		122	5610		19.89	20.00
		138	5690		19.42	19.50
	802.11ac VHT160	114	5570	NSS1 MCS0	17.16	17.50
	802.11ax HE20	100	5500	NSS1 MCS0	19.92	20.00
		116	5580		19.94	20.00
		124	5620		19.87	20.00
		132	5660		19.72	20.00
		144	5720		19.69	20.00
	802.11ax HE40	102	5510	NSS1 MCS0	19.93	20.00
		110	5550		19.96	20.00
		126	5630		19.76	20.00
		134	5670		19.74	20.00
		142	5710		19.76	20.00
	802.11ax HE80	106	5530	NSS1 MCS0	19.90	20.00
		122	5610		19.95	20.00
		138	5690		19.48	19.50
	802.11ax HE160	114	5570	NSS1 MCS0	18.19	18.50

5.8G WIFI_ANT 0						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.8G	802.11a	149	5745	6	16.94	17.00
		157	5785		16.78	17.00
		165	5825		16.93	17.00
	802.11n HT20	149	5745	MCS0	16.81	17.00
		157	5785		16.74	17.00
		165	5825		16.60	17.00
	802.11n HT40	151	5755	MCS0	16.79	17.00
		159	5795		16.80	17.00
	802.11ac VHT20	149	5745	NSS1 MCS0	16.72	17.00
		157	5785		16.77	17.00
		165	5825		16.81	17.00
	802.11ac VHT40	151	5755	NSS1 MCS0	16.79	17.00
		159	5795		16.85	17.00
	802.11ac VHT80	155	5775	NSS1 MCS0	16.67	17.00
	802.11ax HE20	149	5745	NSS1 MCS0	16.91	17.00
		157	5785		16.86	17.00
		165	5825		16.78	17.00
	802.11ax HE40	151	5755	NSS1 MCS0	16.90	17.00
		159	5795		16.89	17.00
	802.11ax HE80	155	5775	NSS1 MCS0	16.80	17.00

5.8G WIFI_ANT 1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.8G	802.11a	149	5745	6	16.49	16.50
		157	5785		15.58	16.00
		165	5825		15.78	16.00
	802.11n HT20	149	5745	MCS0	16.22	16.50
		157	5785		15.54	16.00
		165	5825		15.81	16.00
	802.11n HT40	151	5755	MCS0	16.18	16.50
		159	5795		15.51	16.00
	802.11ac VHT20	149	5745	NSS1 MCS0	16.40	16.50
		157	5785		15.56	16.00
		165	5825		15.85	16.00
	802.11ac VHT40	151	5755	NSS1 MCS0	16.28	16.50
		159	5795		15.65	16.00
	802.11ac VHT80	155	5775	NSS1 MCS0	15.66	16.00
	802.11ax HE20	149	5745	NSS1 MCS0	16.41	16.50
		157	5785		15.64	16.00
		165	5825		15.90	16.00
	802.11ax HE40	151	5755	NSS1 MCS0	16.34	16.50
		159	5795		15.72	16.00
	802.11ax HE80	155	5775	NSS1 MCS0	15.85	16.00

5.8G WIFI_ANT 0+1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
5.8G	802.11a	149	5745	6	19.75	20.00
		157	5785		19.41	19.50
		165	5825		19.50	20.00
	802.11n HT20	149	5745	MCS0	19.60	20.00
		157	5785		19.25	19.50
		165	5825		19.36	19.50
	802.11n HT40	151	5755	MCS0	19.57	20.00
		159	5795		19.30	19.50
	802.11ac VHT20	149	5745	NSS1 MCS0	19.67	20.00
		157	5785		19.30	19.50
		165	5825		19.44	19.50
	802.11ac VHT40	151	5755	NSS1 MCS0	19.65	20.00
		159	5795		19.37	19.50
	802.11ac VHT80	155	5775	NSS1 MCS0	19.35	19.50
	802.11ax HE20	149	5745	NSS1 MCS0	19.74	20.00
		157	5785		19.37	19.50
		165	5825		19.50	20.00
	802.11ax HE40	151	5755	NSS1 MCS0	19.71	20.00
		159	5795		19.42	19.50
	802.11ax HE80	155	5775	NSS1 MCS0	19.42	19.50

6G WIFI_ANT 0						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
6G	802.11a	1	5955	6	2.63	3
		57	6235		3.08	3.5
		113	6515		2.99	3
		173	6815		3.57	4
		233	7115		4.18	4.5
	802.11ax HE20	1	5955	NSS1 MCS0	3.42	3.5
		57	6235		3.95	4
		113	6515		3.85	4
		173	6815		4.30	4.5
		233	7115		4.71	5
	802.11ax HE40	3	5965	NSS1 MCS0	6.76	7
		59	6245		6.68	7
		107	6485		6.67	7
		171	6805		7.52	8
		227	7085		8.08	8.5
	802.11ax HE80	7	5985	NSS1 MCS0	10.56	11
		71	6305		9.75	10
		119	6545		9.09	9.5
		167	6785		10.82	11
		215	7025		10.58	11
	802.11ax HE160	15	6025	NSS1 MCS0	13.15	13.5
		47	6185		12.35	12.5
		111	6505		12.22	12.5
		175	6825		13.60	14
		207	6985		13.42	13.5

6G WIFI_ANT 1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
6G	802.11a	1	5955	6	0.71	1
		57	6235		3.98	4
		113	6515		3.83	4
		173	6815		3.07	3.5
		233	7115		4.75	5
	802.11ax HE20	1	5955	NSS1 MCS0	1.44	1.5
		57	6235		4.99	5
		113	6515		4.21	4.5
		173	6815		3.59	4
		233	7115		5.54	6
	802.11ax HE40	3	5965	NSS1 MCS0	6.70	7
		59	6245		7.54	8
		107	6485		6.84	7
		171	6805		7.14	7.5
		227	7085		8.39	8.5
	802.11ax HE80	7	5985	NSS1 MCS0	9.86	10
		71	6305		10.32	10.5
		119	6545		9.47	9.5
		167	6785		10.80	11
		215	7025		11.03	11.5
	802.11ax HE160	15	6025	NSS1 MCS0	12.68	13
		47	6185		12.40	12.5
		111	6505		13.17	13.5
		175	6825		13.36	13.5
		207	6985		13.68	14

6G WIFI_ANT 0+1						
Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Total Average Power (dBm)	Max. Tune up
6G	802.11a	1	5955	6	4.80	5.00
		57	6235		6.58	7.00
		113	6515		6.44	6.50
		173	6815		6.35	6.50
		233	7115		7.50	7.50
	802.11ax HE20	1	5955	NSS1 MCS0	5.57	6.00
		57	6235		7.52	8.00
		113	6515		7.05	7.50
		173	6815		6.99	7.00
		233	7115		8.17	8.50
	802.11ax HE40	3	5965	NSS1 MCS0	9.78	10.00
		59	6245		10.17	10.50
		107	6485		9.78	10.00
		171	6805		10.36	10.50
		227	7085		11.27	11.50
	802.11ax HE80	7	5985	NSS1 MCS0	13.25	13.50
		71	6305		13.08	13.50
		119	6545		12.29	12.50
		167	6785		13.84	14.00
		215	7025		13.82	14.00
	802.11ax HE160	15	6025	NSS1 MCS0	15.96	16.00
		47	6185		15.39	15.50
		111	6505		15.73	16.00
		175	6825		16.52	17.00
		207	6985		16.60	17.00

<Bluetooth>

Bluetooth		Average Conducted Power (dBm)		
Channel	Frequency (MHz)	1DH5	2DH5	3DH5
CH 00	2402	6.78	5	5.02
CH 39	2441	7.99	6.27	6.32
CH 78	2480	6.29	4.56	4.59
Max. Tune-up		8.00	6.50	6.50

Bluetooth LE		Average Conducted Power (dBm)	
Channel	Frequency (MHz)	1Mbps	2Mbps
CH 00	2402	6.77	6.72
CH 19	2440	7.94	7.93
CH 39	2480	6.23	6.19
Max. Tune-up		8.00	8.00

<SRD 2.4GHz>

SRD 2.4GHz		Average Conducted Power (dBm)
Channel	Frequency (MHz)	
CH 00	2402	4.19
CH 19	2440	4.25
CH 39	2480	4.32
Max. Tune-up		4.50

6.7 SAR Testing Results

6.7.1 SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
(2) ≤ 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
(3) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.
(2) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2 W/kg.
(3) For WLAN 5 GHz, the initial test configuration was selected according to the transmission mode with the highest maximum output power. When the reported SAR of initial test configuration is > 0.8 W/kg, SAR is required for the subsequent highest measured output power channel until the reported SAR result is <= 1.2 W/kg or all required channels are measured. For other transmission modes, SAR is not required when the highest reported SAR for initial test configuration is adjusted by the ratio of subsequent test configuration to initial test configuration specified maximum output power and it is <= 1.2 W/kg.
(4) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

<PD Test Result>
Power Density General Notes:.

(1) The Probe Factor for SAR Testing were used 6.5GHz SAR Probe calibration factor.
For the SAR measurement test, five channels were selected according to the criteria of FCC KDB 248227. According to the notes of FCC Oct, 2020 TCBC Workshop Interim procedures, start instead with a minimum of 5 test channels across the full band.
(2) The absorbed power density (APD) using a 4cm² averaging area is reported based on SAR measurements.
(3) Per equipment manufacturer guidance, power density was measured at d=2 and d=λ/8 mm using the same grid size and grid step size for some frequencies, surfaces and each antennas. The integrated Power Density (iPD) was calculated based on these measurements. Since iPD ratio between the two distances is < 1dB, the grid step (0.05) was sufficient for determining compliance at d=2mm.
(4) Since there is no different PD limit on different exposure conditions, therefore the PD test was performed of a 2mm separation between sensor and EUT surface to cover all exposure conditions of phablet.
(5) According to FCC test guidance and equipment manufacturer guidance, power density results were scaled according to IEC62479:2010 for the portion of the measurement uncertainty > 30%. Total expanded uncertainty of 2.66 dB was used to determine the psPD measurement scaling factor.

6.7.2 SAR Results for Head Exposure Condition (Separation Distance is 0mm Gap)

Plot No.	Band	Mode	Test Position	Antenna	Ch.	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Reported SAR-1g (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 0	1	2412	15.19	15.50	1.074	1.019	0.07	0.297	0.325
	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 0	6	2437	16.85	17.00	1.035	1.019	-0.04	0.222	0.234
	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 0	11	2462	15.45	15.50	1.012	1.019	0.06	0.228	0.235
	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 1	1	2412	15.10	15.50	1.096	1.019	-0.1	0.257	0.287
5	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 1	6	2437	16.48	16.50	1.005	1.019	0.06	0.327	**0.335**
	WLAN2.4GHz	802.11b 1Mbps	Rear Face	Ant 1	11	2462	15.38	15.50	1.028	1.019	-0.07	0.297	0.311
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant0	58	5290	16.64	17.00	1.086	1.008	0.09	0.260	0.285
19	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant1	58	5290	16.11	16.50	1.094	1.008	0.11	0.378	**0.417**
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant0	106	5530	16.75	17.00	1.059	1.008	0.18	0.290	0.310
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant0	122	5610	16.77	17.00	1.054	1.008	0.15	0.331	0.352
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant0	138	5690	16.58	17.00	1.102	1.008	0.17	0.304	0.338
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant1	106	5530	16.74	17.00	1.062	1.008	-0.02	0.491	0.525
23	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant1	122	5610	16.72	17.00	1.067	1.008	-0.16	0.493	**0.530**
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant1	138	5690	15.92	16.00	1.019	1.008	-0.01	0.349	0.358
	WLAN5GHz	802.11ac-VHT80	Rear Face	Ant0	155	5775	16.67	17.00	1.079	1.008	-0.17	0.293	0.319
22	WLAN5GHz	802.11n-HT40	Rear Face	Ant1	151	5755	16.18	16.50	1.076	1.008	0.18	0.435	**0.472**
	WLAN5GHz	802.11n-HT40	Rear Face	Ant1	159	5795	15.51	16.00	1.119	1.008	0.05	0.387	0.437

Plot No.	Band	Test Position	Antenna	Ch.	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Reported SAR-1g (W/kg)
	Bluetooth	Rear Face	Ant0	0	2402	6.78	8.00	1.324	1.087	-0.15	0.00746	0.011
	Bluetooth	Rear Face	Ant0	39	2441	7.99	8.00	1.002	1.087	-0.15	0.00773	0.008
12	Bluetooth	Rear Face	Ant0	78	2480	6.29	8.00	1.483	1.087	-0.19	0.00798	**0.013**
	2.4G Proprietary	Rear Face	Ant2	0	2402	4.19	4.50	1.074	1.000	-0.14	0.00313	0.003
	2.4G Proprietary	Rear Face	Ant2	19	2440	4.25	4.50	1.059	1.000	-0.13	0.00238	0.003
9	2.4G Proprietary	Rear Face	Ant2	39	2480	4.32	4.50	1.042	1.000	0.13	0.00464	**0.005**

6.7.3 WLAN APD Results (Separation Distance is 0mm Gap)

Plot No.	Band	Mode	Test Position	Antenna	Ch.	Frequency (MHz)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Reported SAR-1g (W/kg)	Measured APD W/m^2 (4cm^2)
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	15	6025	13.15	13.50	1.083	1.008	-0.12	0.261	0.285	2.30
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	47	6185	12.35	12.50	1.035	1.008	-0.05	0.305	0.318	2.62
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	111	6505	12.22	12.50	1.068	1.008	-0.18	0.243	0.262	2.21
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	175	6825	13.60	14.00	1.096	1.008	-0.16	0.162	0.179	1.21
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	207	6985	13.42	13.50	1.019	1.008	-0.11	0.114	0.117	0.92
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	15	6025	12.68	13.00	1.077	1.008	0	0.329	0.357	2.92
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	47	6185	12.40	12.50	1.024	1.008	-0.05	0.256	0.264	2.44
2	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	111	6505	13.17	13.50	1.080	1.008	0.09	0.406	**0.442**	3.68
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	175	6825	13.36	13.50	1.033	1.008	0	0.199	0.207	1.75
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	207	6985	13.68	14.00	1.076	1.008	-0.05	0.198	0.215	1.39

6.7.4 WLAN PD Results (Separation Distance is 2mm Gap)

Plot No.	Band	Mode	Test Position	Antenna	Ch.	Freq. (MHZ)	Average Power (dBm)	Tune up Power (dBm)	Tune up Scaling Factor	Duty Cycle Scaling Factor	Grip Step (λ)	Scaling Factor for measurement uncertainty	Power Drift (dB)	Normal psPD (W/m^2)	Scaled Normal psPD (W/m^2)	Total psPD (W/m^2)	Scaled Total psPD (W/m^2)
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	15	6025	13.15	13.50	1.083	1.008	0.0625	1.5535	-0.15	2.04	3.46	2.22	3.77
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	47	6185	12.35	12.50	1.035	1.008	0.0625	1.5535	-0.19	3.05	4.94	4.75	7.70
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	111	6505	12.22	12.50	1.068	1.008	0.0625	1.5535	-0.03	2.89	4.83	3.84	6.42
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	175	6825	13.60	14.00	1.096	1.008	0.0625	1.5535	-0.09	2.48	4.26	3.11	5.34
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant0	207	6985	13.42	13.50	1.019	1.008	0.0625	1.5535	-0.01	1.50	2.39	2.89	4.61
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	15	6025	12.68	13.00	1.077	1.008	0.0625	1.5535	-0.09	2.06	3.47	3.39	5.72
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	47	6185	12.40	12.50	1.024	1.008	0.0625	1.5535	-0.13	3.02	4.84	4.00	6.41
1	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	111	6505	13.17	13.50	1.080	1.008	0.0625	1.5535	-0.08	3.35	5.66	5.64	9.54
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	175	6825	13.36	13.50	1.033	1.008	0.0625	1.5535	-0.13	1.93	3.12	2.64	4.27
	WLAN6GHz	802.11ax-HE160	Rear Face	Ant1	207	6985	13.68	14.00	1.076	1.008	0.0625	1.5535	-0.13	1.42	2.39	2.00	3.37

6.7.6 Simultaneous Multi-band Transmission Evaluation

Regarding the compliance of this device in simultaneous transmission modes, the simultaneous multi-band transmission was evaluated by summation method for each test condition at each frequency where simultaneous operation is intended. The maximum summed SAR value is as below.

Head	Reported 1g SAR (W/kg)								
Exposure Position	1	2	3	4	5	6	7	8	9
	2.4GHz WLAN Ant 0	2.4GHz WLAN Ant 1	5GHz WLAN Ant 0	5GHz WLAN Ant 1	6GHz WLAN Ant 0	6GHz WLAN Ant 1	Bluetooth Ant 0	SRD 2.4GHz Ant 2	PD 4cm^2 (W/m^2)
Rear Face	0.325	0.335	0.352	0.530	0.318	0.442	0.013	0.005	9.54

6.7.7 Total Exposure Ratio Analysis

According to the FCC guidance in Oct 2018 TCBC workshop and IEC TR 63170, the total exposure ratio calculated by taking ratio of maximum reported SAR divided by SAR limit and adding it to maximum measured power density divided by power density limit. Numerical sum of the ratios should be less than 1.

Head	Summed 1g SAR (W/kg)			SAR TER (TER < 1.0)			PD TER (TER < 1.0)
Exposure Position	2+3+4+7+8	1+2+3+4+8	5+6+7+8	2+3+4+7+8	1+2+3+4+8	5+6+7+8	7+8+9
Rear Face	1.235	1.547	0.778	0.772	0.981	0.486	0.965

Summary:
The SAR summation of maximum SAR of WLAN and Bluetooth and SRD for each position is under the SAR limitation (**1.6 W/kg for Head and body, 4.0 W/kg for Limbs, and 10 W/m^2 for PD**). Therefore, the simultaneous transmission condition is compliance with the SAR criterion.

7. Appendixes

Appendix A – SAR & PD Plots of System Verification

Appendix B – SAR & PD Plots of SAR Measurement

Appendix C – Calibration Certificate for Probe and Dipole

Appendix D – Photographs of the Test Set-Up

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