FCC TEST REPORT

For

BC-03

Trade Name: Getac

Model: Body Worn Camera

Issued to

Getac Technology Corp.

5F, Building A2, No.209, Sec.1, Nangang Rd., Nangang Dist., Taipei City 11568, Taiwan.

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd.,
Wugu Dist.,New Taipei City 24891,
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Issued Date: 2019/3/27

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		2019/3/25		Initial Issue	ALL	Stella Chang

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1 Certificate of Compliance (SAR Evaluation)

Applicant	Getac Technology Corp. 5F, Building A2, No.209, Sec.1, Nangang Rd., Nangang Dist., Taipei City 11568, Taiwan.
Equipment Under Test:	BC-03
Trade Name:	Getac
Model Number:	Body Worn Camera
Date of Test:	March 1, 2019
Device Category:	PORTABLE DEVICES
Exposure Category:	GENERAL POPULATION/UNCONTROLLED EXPOSURE

Applicable Standards	
FCC	● IEEE 1528 2013 ● KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 ● KDB 865664 D02 RF Exposure Reporting v01r02 ● KDB 447498 D01 General RF Exposure Guidance v06 ● KDB 616217 D04 SAR for laptop and tablets v01r02 ● KDB 248227 D01 SAR Meas for 802.11 v02r02
Limit	
1.6 W/kg	
Test Result	
Pass	

The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Alex Wu
Section Manager
Compliance Certification Services Inc.

Tested by:

Stella Chang
SAR Engineer
Compliance Certification Services Inc.

2 Description of Equipment Under Test

<table>
<tr><td>Product</td><td colspan="3">BC-03</td></tr>
<tr><td>Trade Name</td><td>Getac</td><td>Model Number</td><td>Body Worn Camera</td></tr>
<tr><td>RF Module</td><td>AMPAK</td><td>Model:</td><td>AP6255</td></tr>
<tr><td>Test Software</td><td>Tera tern</td><td>Version</td><td>4.80.0.0</td></tr>
<tr><td>Transmitters</td><td colspan="3">Wi-Fi & Bluetooth</td></tr>
<tr><td rowspan="6">Modulation Technique</td><td colspan="3">Bluetooth:GFSK for 1Mbps;π/4-DQPSK for 2Mbps;8DPSK for 3Mbps</td></tr>
<tr><td colspan="3">802.11a: Orthogonal Frequency Division Multiplexing (OFDM)</td></tr>
<tr><td colspan="3">802.11b: Direct Sequence Spread Spectrum(DSSS)</td></tr>
<tr><td colspan="3">802.11g: Orthogonal Frequency Division Multiplexing (OFDM)</td></tr>
<tr><td colspan="3">802.11n: Orthogonal Frequency Division Multiplexing (OFDM)</td></tr>
<tr><td colspan="3">802.11ac: Orthogonal Frequency Division Multiplexing (OFDM)</td></tr>
<tr><td rowspan="3">Antenna Specification</td><td>Brand name</td><td colspan="2">Getac</td></tr>
<tr><td>Parts Number</td><td colspan="2">BC-03</td></tr>
<tr><td>Type</td><td colspan="2">PIFA</td></tr>
<tr><td>Rechargeable Li-polymer Battery–alternate</td><td colspan="3">Brand：Getac
Model：BP151P3450P
Rating：3.6V/13Wh</td></tr>
</table>

Remark:

1.The sample selected for test was prototype that representative to production product and was provided by manufacturer

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2.1 Summary of Highest SAR Values

Results for highest reported SAR values for each frequency band and mode.

Technology/Band	Test configuration	Mode	Highest Reported 1g-SAR (W/kg)
Wi-Fi 2.4 GHz	Edge 3	802.11b	0.106
Wi-Fi 5.3 GHz(U-NII 2A)	Edge 2	802.11a	0.103
Wi-Fi 5.5 GHz(U-NII 2C)	Edge 1	802.11a	0.156
Wi-Fi 5.8 GHz(U-NII 3)	Edge 1	802.11a	0.113

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3 Requirements for Compliance Testing Defined

3.1 Requirements for Compliance Testing Defined by the FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1]. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 W/kg for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the FCC 47 CFR §2.1093 and IEEE Std 1528-2013.

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4 Dosimetric Assessment System

These measurements were performed with the automated near-field scanning system DASY4/DASY5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m) which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe EX3DV4-SN: 3770 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure and found to be better than ±0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE 1528 2013.

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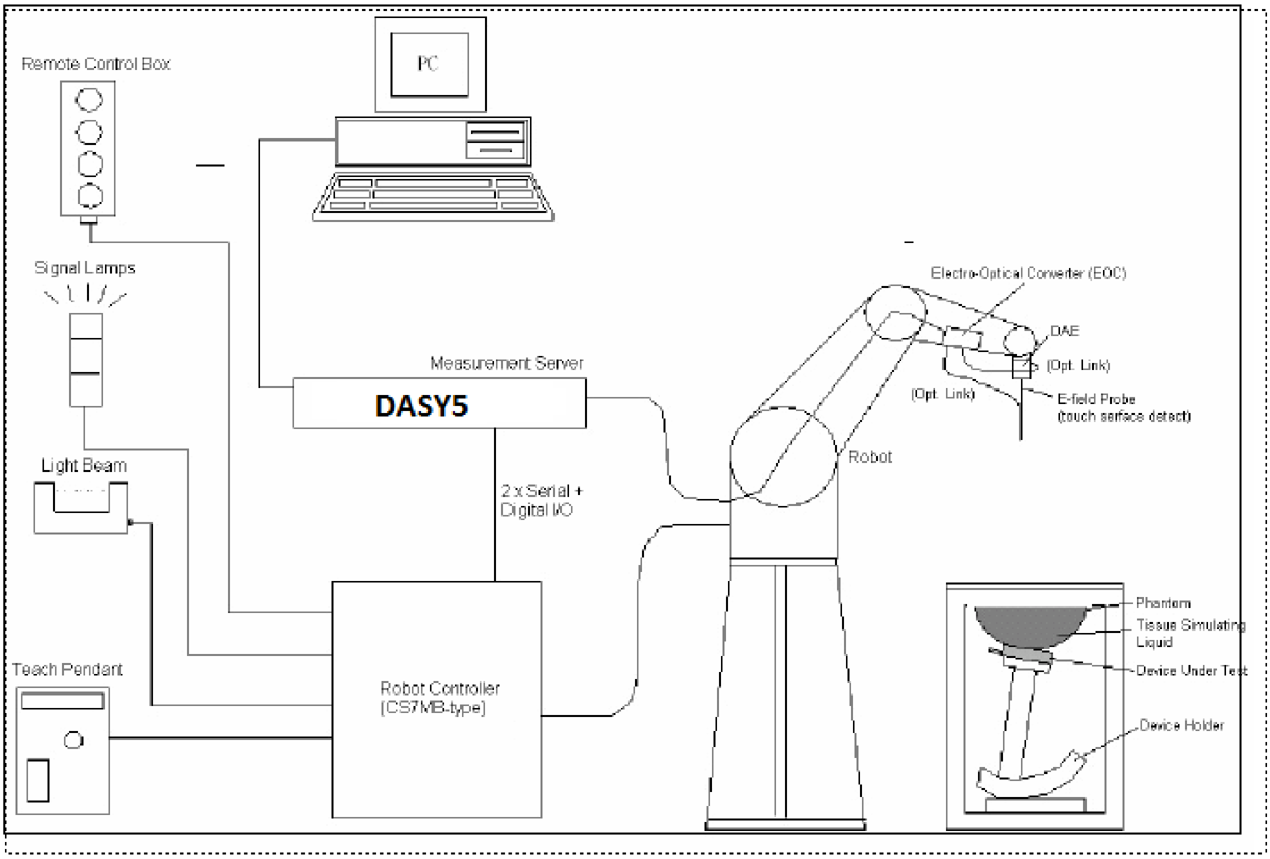
4.1 Measurement System Diagram



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

- A standard high precision 6-axis robot (St¨aubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- 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 between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7 or Windows XP.
- DASY5 software version: 52.8.8.1222.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.

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- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

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4.2 System Components

DASY4/DASY5 Measurement Server	
	The DASY4/DASY5 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4/DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board. The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
	The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

Data Acquisition Electronics (DAE)	
	The data acquisition electronics (DAE4) 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration: Basic Broad Band Calibration in air: 10-3000 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800
CF-Calibration for other liquids and frequencies upon request.

Frequency: 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Directivity: ± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in HSL (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: 330 mm (Tip: 20 mm)
Tip diameter: 2.5 mm (Body: 12 mm)
Distance from probe tip to dipole centers: 1 mm

Application: High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

SAM Phantom (V4.0)

Construction: The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 2013, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness: 2 ±0.2 mm

Filling Volume: Approx. 25 liters

Dimensions: Height: 810mm; Length: 1000mm; Width: 500mm

SAM Phantom (ELI4)

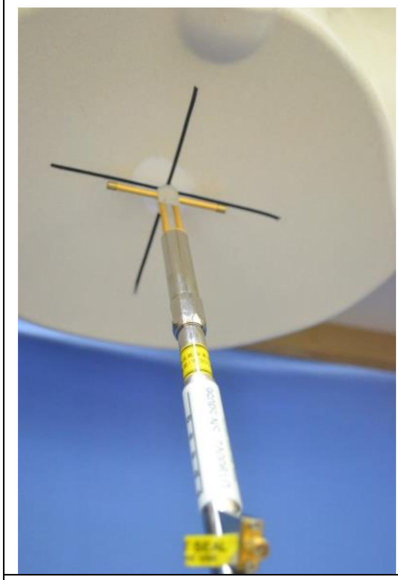
Construction: Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5 and higher and is compatible with all SPEAG dosimetric probes and dipoles

Shell Thickness: 2.0 ± 0.2 mm (sagging: <1%)

Filling Volume: Approx. 25 liters

Dimensions: Major ellipse axis: 600 mm
Minor axis: 400 mm 500mm

Device Holder for SAM Twin Phantom	
	**Construction:** In combination with the Twin SAM Phantom V4.0 or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

System Validation Kits for SAM Phantom (V4.0)		
	**Construction:**	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.
	Frequency:	2450, 5300, 5600, 5800 MHz
	Return loss:	> 20 dB at specified validation position
	Power capability:	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
	Dimensions:	D2450V2: dipole length: 51.5 mm; overall height: 290 mm D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm

System Validation Kits for ELI4 phantom

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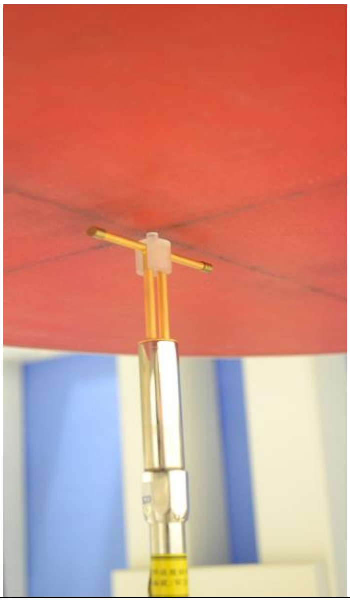	**Construction:**	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.
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5 Evaluation Procedures

Data Evaluation

The DASY4/DASY5 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with	V_i	= Compensated signal of channel i	(i = x, y, z)
	U_i	= Input signal of channel i	(i = x, y, z)
	cf	= Crest factor of exciting field	(DASY parameter)
	dcp_i	= Diode compression point	(DASY parameter)

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

E-field probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \bullet ConvF}}$$

H-field probes: $$H_i = \sqrt{Vi} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$$

with	V_i	= Compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i	(i = x, y, z)

μV/(V/m)[2] for E0field Probes

ConvF	= Sensitivity enhancement in solution
aij	= Sensor sensitivity factors for H-field probes
f	= Carrier frequency (GHz)
Ei	= Electric field strength of channel i in V/m
Hi	= Magnetic field strength of channel i in A/m

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in W/kg

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

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{377} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with P_{pwe} = Equivalent power density of a plane wave in mW/cm^2

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

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

6 SAR Measurement Procedures

6.1 Normal SAR Test Procedure

- **Power Reference Measurement**

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4/DASY5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, the grid resolution has to less than 15 mm by 15 mm at frequency ≤2GHz; the grid resolution has to less than 12mm by 12 mm at frequency between 2GHz to 4GHz; grid resolution has to less than 10 mm by 10 mm at frequency between 4GHz to 6GHz.

According to KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe abgle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}	≤ 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.	

- **Zoom Scan**

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures points in accordance with the frequency can be divided into three parts. (1)The zoom scan volume was set to 5x5x7 points at frequency ≤ 2GHz. (2) The zoom scan volume was set to 7x7x7 points at frequency between 2GHz to 4GHz (3) The zoom scan volume was set to 7x7x12 points at frequency between 4GHz to 6GHz. The measures points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly.

According to KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm</td><td>3 – 4 GHz: ≤ 5 mm
4 – 6 GHz: ≤ 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>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$:between 1st two points losest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Maximum zoom scan volume</td><td>x, y, z</td><td>≥ 30 mm</td><td colspan="2">3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
</table>

- **Power Drift Measurement**

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY4/DASY5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

7 Measurement Uncertainty

According to KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz section 2.8.2, SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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8 Device Under Test

8.1 Wireless Technologies

Wireless technologies	Tx Frequency Bands	Operating mode	Duty Cycle used for testing
Wi-Fi	2.4GHz Band	802.11b 802.11g 802.11n(HT20)	100%
	5GHz Band	802.11a 802.11n(HT20) 802.11n(HT40) 802.11ac(VHT80)	100%
Bluetooth	2.4GHz	2.1 4.0 LE	N/A

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8.2 Maximum Tune-up Power

Tolerance (dB):	1.5	RF Output Power (dBm)	
Band (GHz)	Mode	Target	Max. tune-up power
2.4	802.11b	16.00	17.50
	802.11g	15.00	16.50
	802.11n HT20	12.00	13.50
	802.11n HT40	14.00	15.50
Tolerance (dB):	1.5	RF Output Power (dBm)	
Band (GHz)	Mode	Target	Max. tune-up power
5.2 (UNII-1)	802.11a	8.00	9.50
	802.11n HT20	4.00	5.50
	802.11n HT40	4.00	5.50
	802.11ac VHT80	4.00	5.50
5.3 (UNII-2A)	802.11a	8.00	9.50
	802.11n HT20	4.00	5.50
	802.11n HT40	4.00	5.50
	802.11ac VHT80	4.00	5.50
5.5 (UNII-2C)	802.11a	10.00	11.50
	802.11n HT20	5.00	6.50
	802.11n HT40	6.00	7.50
	802.11ac VHT80	6.00	7.50
5.8 (UNII-3)	802.11a	10.00	11.50
	802.11n HT20	5.00	6.50
	802.11n HT40	6.00	7.50
	802.11ac VHT80	6.00	7.50

Mode	Max. tune-up power(dBm)
Bluetooth	6.0
Bluetooth LE	6.0

8.3 Simultaneous Transmission

RF Exposure Condition	Transmit Configurations
Wi-Fi + BT	2.4GHz(Chain 0) 2.4GHz(Chain 0 + Chain 1) 2.4GHz(Chain 0) + Bluetooth(Chain1) 5GHz(Chain 0) 5GHz(Chain 0 + Chain 1) 5GHz(Chain 0 + Chain1) + Bluetooth(Chain1) Bluetooth(Chain1)

Note(s):

1. For WLAN mode only used as transmitting/receiving on the Main Antenna.
2. WLAN and Bluetooth technology can transmit at same time.

9 Summary of SAR Test Exclusion Configurations

9.1 Standalone SAR Test Exclusion Calculations

Since the device is a Body Worn Camera whose antenna is already determined to not meet the minimum antenna to user separation distance for modular SAR, therefore testing is required by default.

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9.1.1 SAR Exclusion Calculation For Bluetooth

According to KDB 447498 v06 in section 4.3.1, if the calculated **threshold value is > 3** then SAR testing is required.

Antenna	Band	Frequency (MHz)	Output Power		Separation Distances(mm)					Calculated Threshold Value				
			dBm	mW	Bottom	Edge1	Edge2	Edge3	Edge4	Bottom	Edge1	Edge2	Edge3	Edge4
Wi-Fi Aux	Bluetooth	2402	6.0	4	20.0	6.3	10.3	61.5	52.3	0.3	1.0	0.6	0.1	0.1

Remark:

The above calculate the value of each side threshold value is < 3 so SAR testing not required.

9.1.2 SAR Required Test Configuration

For Wi-Fi and Bluetooth

Test Configurations	Bottom
Wi-Fi Main 2.4GHz	YES
Wi-Fi Main 5.2GHz	YES
Wi-Fi Main 5.3GHz	YES
Wi-Fi Main 5.5GHz	YES
Wi-Fi Main 5.8GHz	YES

Note(s):

1. Yes = SAR is required.
2. No = SAR is not required.

Test Configurations	Bottom
Wi-Fi Aux 2.4GHz	No
Wi-Fi Aux 5.2GHz	No
Wi-Fi Aux 5.3GHz	No
Wi-Fi Aux 5.5GHz	No
Wi-Fi Aux 5.8GHz	No
Bluetooth	No

Note(s):

1. Yes = SAR is required.
2. No = SAR is not required.

10 Exposure Limit

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	2.0

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

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

NOTE: **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 1 gram 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.

Population/Uncontrolled Environments:

are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Occupational/Controlled Environments:

are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

NOTE GENERAL POPULATION/UNCONTROLLED EXPOSURE PARTIAL BODY LIMIT 1.6 W/kg

11 Tissue Dielectric Properties

11.1 Test Liquid Confirmation

Simulating Liquids Parameter Check

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values

The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below 5% may not be easily achieved at certain frequencies.

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE 1528 2013 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528 2013 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE 1528 2013

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

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11.2 Typical Composition of Ingredients for Liquid Tissue Phantoms

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.

Ingredients (% by weight)	**Frequency (MHz)**									
	450		**835**		**915**		**1900**		**2450**	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

alt: 99^{+}% Pure Sodium Chloride Sugar: 98^{+}% Pure Sucrose
Water: De-ionized, 16 $M\Omega^{+}$ resistivity HEC: Hydroxy thyl Cellulose
DGBE: 99^{+}% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra-pure): Polyethylene glycol mono [4-(1, 1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

11.3 Simulating Liquids Parameter Check Results

Date	Band	Freq(MHz)	Measured		Standard		Δ		Limit(%)
			e' (εr)	σ	e' (εr)	σ	e' (εr)	σ	±5
2019/3/1	Body 2450	2450	53.70	1.98	52.70	1.96	1.89%	0.87%	±5
		2462	53.65	1.99	52.68	1.97	1.82%	1.17%	±5
2019/3/1	Body 5000	5300	48.90	5.34	48.90	5.42	0.00%	-1.46%	±5
		5320	48.85	5.38	48.86	5.44	-0.01%	-1.18%	±5
		5600	47.97	5.82	48.50	5.77	-1.10%	0.83%	±5
		5620	47.90	5.86	48.44	5.79	-1.11%	1.19%	±5
		5785	47.38	6.13	48.22	5.98	-1.73%	2.44%	±5
		5800	47.34	6.15	48.20	6.00	-1.79%	2.48%	±5

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12 System Performance Check

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4/DASY5 system with an E-field probe EX3DV4 SN: 3770 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration (dx=dy= 5 mm, dz= 5 mm).
- Distance between probe sensors and phantom surface was set to 3.0 mm.
- The dipole input power (forward power) was 100 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D2450V2	727	2018/04/24	2450	1g	52.1	50.8
				10g	24.3	23.8
D5GHzV2	1040	2019/01/30	5300	1g	82.2	76.4
				10g	23.6	21.4
D5GHzV2	1040	2019/01/30	5600	1g	85.3	81.5
				10g	24.5	22.7
D5GHzV2	1040	2019/01/30	5800	1g	80.6	77.3
				10g	23.0	21.3

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12.1 System Performance Check Results

Date	System Dipole			Parameters	Target[W/kg]	Measured [W/kg]	Deviation[%]	Limited[%]
	Type	Serial No.	Liquid					
2019/3/1	D2450V2	727	Body	1g SAR:	50.8	52.0	2.36	± 5
				10g SAR:	23.8	24.0	1.01	± 5
2019/3/1	D5GHzV2 (5.3GHz)	1040	Body	1g SAR:	76.4	75.0	-1.83	± 5
				10g SAR:	21.4	21.1	-1.40	± 5
2019/3/1	D5GHzV2 (5.6GHz)	1040	Body	1g SAR:	81.5	77.6	-4.79	± 5
				10g SAR:	22.7	21.6	-4.85	± 5
2019/3/1	D5GHzV2 (5.8GHz)	1040	Body	1g SAR:	77.3	75.4	-2.46	± 5
				10g SAR:	21.3	21.1	-0.94	± 5

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13 RF Output Power Measurement

According to KDB248227 D01 802.11 Wi-Fi SAR v02r02 section 4, the default power measurement procedures are:

1) Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.

2) Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.

a) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.

b) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.

3) For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

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13.1 Wi-Fi (2.4GHz Band)

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Avg. Pwr (dBm)			Maximum Tune-up Pwr (dBm)			SAR Test (Yes/No)	Note
					Main	Aux	MIMO	Main	Aux	MIMO		
2.4	802.11b	1	1	2412	16.40			17.50			Yes	
			6	2437	16.70			17.50				
			11	2462	17.10			17.50				
	802.11g	6	1	2412	No Required			16.50			No	1
			6	2437				16.50				
			11	2462				16.50				
	802.11n HT20	MCS0	1	2412	No Required			13.50			No	1
			6	2437				13.50				
			11	2462				13.50				

Note(s):

1. Output Power and SAR is not required for 802.11 g/n HT20/n HT40 channels 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.

13.2 Wi-Fi (5GHz Band)

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Avg. Pwr (dBm)			Maximum Tune-up Pwr (dBm)			SAR Test (Yes/No)	Note
					Main	Aux	MIMO	Main	Aux	MIMO		
5.2 (U-NII 1)	802.11a	6	36-48	5180-5240	Not Required			9.50			No	1
	802.11n (HT20)	MCS0	36-48	5180-5240				5.50			No	1
	802.11n (HT40)	MCS0	38-46	5190-5230				5.50			No	1
	802.11ac (VHT80)	VHT0	42	5210				5.50			No	1
5.3 (U-NII 2A)	802.11a	6	52	5260	7.18			9.50			Yes	
		6	56	5280	7.58			9.50			Yes	
		6	60	5300	7.86			9.50			Yes	
		6	64	5320	8.13			9.50			Yes	
	802.11n (HT20)	MCS0	52-64	5260-5320	Not Required			5.50			No	2
	802.11n (HT40)	MCS0	54-62	5270-5310				5.50			No	2
	802.11ac (VHT80)	VHT0	58	5290				5.50			No	2

Note(s):

1. When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
   2.1. ≤ 1.2 W/kg, SAR is not required for UNII band I.
   2.2. > 1.2 W/kg, both bands should be tested independently for SAR.
2. Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11a .

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Avg. Pwr (dBm)			Maximum Tune-up Pwr (dBm)			SAR Test (Yes/No)	Note
					Main	Aux	MIMO	Main	Aux	MIMO		
5.5 (U-NII-2C)	802.11a	6	100	5500	9.05			11.50			Yes	
	802.11a	6	104	5520	9.37			11.50			Yes	
	802.11a	6	108	5540	9.65			11.50			Yes	
	802.11a	6	112	5560	9.85			11.50			Yes	
	802.11a	6	116	5580	9.90			11.50			Yes	
	802.11a	6	120	5600	10.10			11.50			Yes	
	802.11a	6	124	5620	10.13			11.50			Yes	
	802.11a	6	128	5640	9.96			11.50			Yes	
	802.11a	6	132	5660	9.98			11.50			Yes	
	802.11a	6	136	5680	9.85			11.50			Yes	
	802.11a	6	140	5700	9.76			11.50			Yes	
	802.11n (HT20)	MCS0	100-144	5500-5720	Not Required			6.50			No	1
	802.11n (HT40)	MCS0	102-142	5510-5710				7.50			No	1
	802.11ac (VHT80)	VHT0	106-138	5530-5690				7.50			No	1

Note(s):

1. Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11n HT20/HT40/802.11ac and the measured SAR is ≤ 1.2 W/Kg.
2. Output Power and SAR measurement is not required for / 802.11n HT20/n HT40 /802.11ac channels when the specified maximum tune-up powers are less or same with 802.11 a.

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Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Avg. Pwr (dBm)			Maximum Tune-up Pwr (dBm)			SAR Test (Yes/No)	Note
					Main	Aux	MIMO	Main	Aux	MIMO		
5.8 (U-NII-3)	802.11a	6	149	5745	9.21			11.50			Yes	
		6	153	5765	9.25			11.50			Yes	
		6	157	5785	9.27			11.50			Yes	
		6	161	5805	9.22			11.50			Yes	
		6	165	5825	9.17			11.50			Yes	
	802.11n (HT20)	MCS0	149-165	5745-5825	Not Required			6.50			No	1
	802.11n (HT40)	MCS0	151-159	5755-5795				6.50			No	1
	802.11ac (VHT80)	VHT0	155	5775				6.50			No	1

Note(s):

1. Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11n HT20/HT40/802.11ac and the measured SAR is ≤ 1.2 W/Kg.
2. Output Power and SAR measurement is not required for / 802.11n HT20/n HT40 /802.11ac channels when the specified maximum tune-up powers are less or same with 802.11 a.

13.3 Bluetooth

Per exclusion calculations in Section 9, SAR testing for Bluetooth is not required.

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14 SAR Measurements Results

According to KDB248227D01 802.11 Wi-Fi SAR v02r02, the SAR test reduction procedures are:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for 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 wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test 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 reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position

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Wi-Fi (2.4GHz Band):

Band (GHz)	Mode	Dist. (mm)	Test Position	Ch#	Freq. (MHz)	Chain	Power (dBm) Tune up limit	Power (dBm) Meas.	Area Scan 1g SAR (W/kg)	Zoom Scan 1g SAR (W/kg)	Reported SAR (W/kg)	Note	Plot No.
2.4GHz	802.11b	5	Edge 1	11	2462	0	17.50	17.15	0.011	0.012	0.013		
		5	Edge 2	11	2462	0	17.50	17.15	0.085	0.091	0.092		
		5	Edge 3	11	2462	0	17.50	17.15	0.098	0.097	0.106		
		5	Edge 4	11	2462	0	17.50	17.15	0.008	0.0078	0.008		
		5	Rear	11	2462	0	17.50	17.15	0.058	0.057	0.062		

Note(s):

1. Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.

Wi-Fi (5 GHz Band):

Band (GHz)	Mode	Dist. (mm)	Test Position	Ch#	Freq. (MHz)	Chain	Power (dBm) Tune up limit	Power (dBm) Meas.	Area Scan 1g SAR (W/Kg)	Meas. 1g SAR (W/kg)	Reported SAR (W/kg)	Note	Plot No.
5.3 (U-NII-2A)	802.11a	5	Edge 1	64	5320	0	9.5	8.13	0.052	0.0630	0.086		
		5	Edge 2	64	5320	0	9.5	8.13	0.086	0.0750	0.103		
		5	Edge 3	64	5320	0	9.5	8.13	0.009	0.0150	0.021		
		5	Edge 4	64	5320	0	9.5	8.13	0.014	0.0150	0.021		
		5	Rear	64	5320	0	9.5	8.13	0.036	0.0360	0.049		
5.5 (U-NII-2C)	802.11a	5	Edge 1	124	5620	0	11.5	10.13	0.124	0.1140	0.156		
		5	Edge 2	124	5620	0	11.5	10.13	0.094	0.0950	0.130		
		5	Edge 3	124	5620	0	11.5	10.13	0.004	0.0053	0.007		
		5	Edge 4	124	5620	0	11.5	10.13	0.025	0.0047	0.006		
		5	Rear	124	5620	0	11.5	10.13	0.042	0.0420	0.058		
5.8 (U-NII-3)	802.11a	5	Edge 1	157	5785	0	11.5	9.27	0.077	0.0680	0.114		
		5	Edge 2	157	5785	0	11.5	9.27	0.055	0.0630	0.105		
		5	Edge 3	157	5785	0	11.5	9.27	0.008	0.0027	0.005		
		5	Edge 4	157	5785	0	11.5	9.27	0.014	0.0210	0.035		
		5	Rear	157	5785	0	11.5	9.27	0.039	0.0370	0.062		

Note(s):

1. Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.
2. Repeated measurements are required only when the measured SAR is ≥0.80 W/kg. If the measured SAR values are < 1.45 W/kg with ≤20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. (Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04)

15 Equipment List & Calibration Status

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Cycle(year)	Calibration Due
S-Parameter Network Analyzer	Agilent	E5071C	MY46107234	1	2019/10/17
Electronic Probe kit	Hewlett Packard	85070D	N/A	N/A	N/A
Power Meter	Agilent	4416	GB41291611	1	2019/08/28
Power Sensor	Agilent	8481H	MY41091956	1	2019/08/28
Data Acquisition Electronics (DAE)	SPEAG	DAE4	856	1	2019/04/20
Dosimetric E-Field Probe	SPEAG	EX3DV4	3770	1	2019/04/24
2450 MHz System Validation Dipole	SPEAG	D2450V2	727	1	2019/04/22
5GHz System Validation Dipole	SPEAG	D5GHzV2	1040	3	2019/06/27
Robot	Staubli	RX90L	F02/5T69A1/A/01	N/A	N/A
Amplifier	Mini-Circuit	ZVE-8G	665500309	N/A	N/A
Amplifier	Mini-Circuit	ZHL-1724HLN	D072602#2	N/A	N/A
Thermometer	Wisewind	0507	02	1	2020/01/29

Compliance Certification Services Inc. No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan 24891 / 新北市五股區五工六路 11 號
程智科技股份有限公司 t (886-2) 2299-9720 f (886-2) 2298-1882
www.ccsrf.com

16 Facilities

All measurement facilities used to collect the measurement data are located at

☐ No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang, Taoyuan Hsien, Taiwan, R.O.C.

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

17 Reference

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environ-mental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commision, O_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, ANSI/IEEE C95.1-2005: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 2006.

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-_eld probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120{124.

[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-_eld probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172{175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions onMicrowave Theory and Techniques, vol. 44, no. 10, pp. 1865{1873, Oct. 1996.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992..Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10

18 Attachments

Exhibit	Content
1	System Performance Check Plots
2	SAR Test Data Plots
3	SAR Equipment calibration report
4	T181222W01-SF PHOTOs

END OF REPORT