FCC SAR Test Report

FCC ID: M82-DLM8110WL

Project No.	:	1603230
Equipment	:	Computer
Model Name	:	DLT-M8110; DLT-M8110XXXXXXXXXXXXXX;DLM8110XXXXXXXXXXXXXX
Applicant	:	Advantech Co., Ltd.
Address	:	No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.

Date of Receipt	:	Mar. 9 , 2016
Date of Test	:	Apr. 29 , 2016
Issued Date	:	Jul. 06 , 2016
Tested by	:	BTL Inc.

Jerome Chang

PREPARED BY : (Jerome Chang/ Technical Engineer)

Herbort Liu

APPROVED BY : (Herbort Liu/ Technical Manager)

B T L I N C .

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ilac-MRA TAF Testing Laboratory 0659

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**), or National Institute of Standards and Technology (**NIST**) .

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO Guide17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

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

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCC-SAR-1603230	Original Issue.	Jul. 06 , 2016

1. GENERAL SUMMARY

Equipment	Computer
Model Name	DLT-M8110; DLT-M8110XXXXXXXXXXXXXX;DLM8110XXXXXXXXXXXXXX (where X may be any alphanumeric character , blank or “-”.)
Brand Name	ADVANTECH
Manufacturer	Advantech Co., Ltd.
Address	No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.
Standard(s)	**FCC 47CFR §2.1093** Radio frequency Radiation Exposure Evaluation: Portable Devices **ANSI Std C95.1-1992** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991) **IEEE Std 1528-2013** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques **KDB447498 D01** General RF Exposure Guidance v06 **KDB616217 D04** SAR for laptop and tablets v01r02 **KDB248227 D01** 802. 11 Wi-Fi SAR v02r02 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** RF Exposure Reporting v01r02 **KDB690783 D01** SAR Listings on Grants v01r03

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC-SAR-1603230) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan.

2.2 MEASUREMENT UNCERTAINTY

Note: Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

3. GENERAL INFORMATION

3.1 STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) found during testing for Advantech DLT-M8110 is as below Table.

Equipment Class	Mode	Highest Body (0mm) SAR-1g(W/kg)
DTS	2.4G WLAN	0.34
U-NII	5G WLAN	0.31

Note:

The device is in compliance with Specific Absorption Rate（SAR）for general population/ uncontraolled exposure limits according to the FCC rule §2.1093, the ANSI/IEEE C95.1:1992, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

3.2 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td colspan="6">Computer</td></tr>
<tr><td>Model Name</td><td colspan="6">DLT-M8110</td></tr>
<tr><td>HW Version</td><td colspan="6">V1.12</td></tr>
<tr><td>SW Version</td><td colspan="6">V0.10</td></tr>
<tr><td>Modulation</td><td colspan="6">WiFi(DSSS/OFDM),BT(GFSK/ π /4-DQPSK/8-DPSK)</td></tr>
<tr><td rowspan="8">Operation Frequency Range(s)</td><td colspan="2">Band</td><td colspan="2">TX (MHz)</td><td colspan="2">RX (MHz)</td></tr>
<tr><td colspan="2">Bluetooth</td><td colspan="4">2400 ~2483.5</td></tr>
<tr><td colspan="2">2.4G WiFi</td><td colspan="4">2412~2462</td></tr>
<tr><td colspan="6">1-6-11 (2.4G WIFI 802.11b/g/n)</td></tr>
<tr><td colspan="6">3-6 -9 (2.4G WIFI 802.11n HT40)</td></tr>
<tr><td>5G WIFI</td><td colspan="2">Band 1</td><td colspan="2">Band 2</td><td>Band 3</td></tr>
<tr><td>a/n20</td><td colspan="2">36-40-44-48</td><td colspan="2">52-56-60-64</td><td>100-104-108-112
-116-132-136-140</td></tr>
<tr><td>n40</td><td colspan="2">38-46</td><td colspan="2">54-62</td><td>102-110-118-134</td></tr>
<tr><td rowspan="2">Antenna Gain</td><td colspan="6">BT/2.4G WiFi: Ant 1= 4.77dBi / Ant 2=4.96dBi</td></tr>
<tr><td colspan="6">5G WiFi: Ant 1=6.05dBi / Ant 2=4.53dBi</td></tr>
</table>

3.3 LABORATORY ENVIRONMENT

<table>
<tr><td>Temperature</td><td>Min. = 18ºC, Max. = 25ºC</td></tr>
<tr><td>Relative humidity</td><td>Min. = 30%, Max. = 70%</td></tr>
<tr><td>Ground system resistance</td><td>< 0.5Ω</td></tr>
<tr><td colspan="2">Ambient noise is checked and found very low and in compliance with requirement of standards.
Reflection of surrounding objects is minimized and in compliance with requirement of standards.</td></tr>
</table>

3.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	E-field Probe	Speag	EX3DV4	7369	Aug. 18, 2015	1 Year
2	Data Acquisition Electronics	Speag	DAE4	1486	Aug. 27, 2015	1 Year
3	System Validation Dipole	Speag	D2450V2	973	Aug. 14, 2015	3 Year
4	System Validation Dipole	Speag	D5GHzV2	1221	Aug. 11, 2015	3 Year
5	Oval Flat Phantom	Speag	Oval Flat Phantom ELI 5.0	1240	N/A	N/A
6	Power Amplifier	Mini-Circuits	ZVE-2W-272+	N650001538	N/A	Note 1
7	Power Amplifier	Mini-Circuits	ZVE-8G+	N628801631	N/A	Note 1
8	ENA Network Analyzer	Keysight	E5071C	MY46524658	Dec. 17, 2015	1 Year
9	EXG Vector Signal Generator	Keysight	N5172B	MY53051229	Dec. 10, 2015	1 Year
10	Power Meter	Anritsu	ML2495A	1128008	Aug. 16, 2015	1 Year
11	Power Sensor	Anritsu	MA2411B	1126001	Aug. 16, 2015	1 Year
12	Spectrum Analyzer	Keysight	N9000A	MY54230551	Nov. 09, 2015	1 Year
13	Dielectric Assessment Kit	Speag	DAK-3.5	1226	Dec. 09, 2015	1 Year
14	Low pass filter	Mini-Circuits	SLP-2950+	M108294	N/A	N/A
15	Attenuator	Worken	WFA0602-10	Att-10-01	N/A	Note 1
16	Attenuator	Worken	WFA0602-10	Att-10-02	N/A	Note 1
17	Attenuator	Worken	WFA0602-3	Att-03-01	N/A	Note 1
18	Dual directional coupler	Woken	0110A05601O-10	DOM5CIW3E2	N/A	Note 1

Note: 1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

Remark: ” N/A” denotes no model name, serial No. or calibration specified.

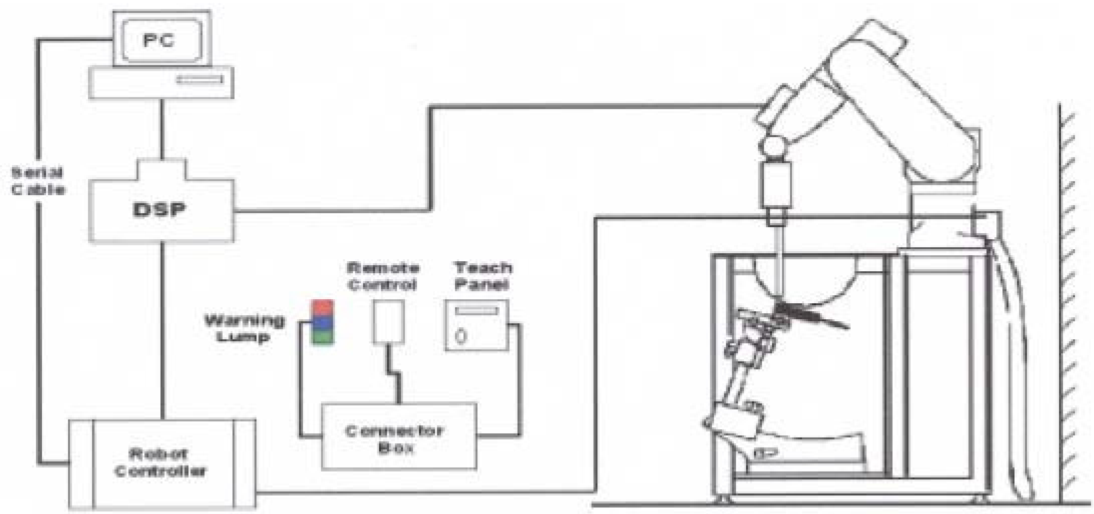
4.SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1SAR MEASUREMENT SET-UP

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

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. TheDASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.1.1Test Setup Layout

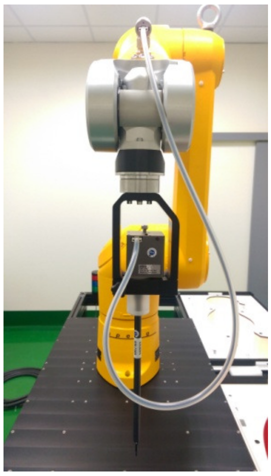


4.2DASY5E-FIELDPROBESYSTEM

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

4.2.1EX3DV4 PROBE SPECIFICATION

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



EX3DV4 E-field Probe

4.2.2E-FIELD PROBE CALIBRATION

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

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

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

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

4.2.3OTHER TEST EQUIPMENT

4.2.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4and SAM v6.0Phantoms.
Material: POM, Acrylic glass, Foam

4.2.3.2 Phantom

Model	ELI4 Phantom	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Shell Thickness	2±0.1 mm	
Filling Volume	Approx. 30 liters	
Dimensions	Length: 600 mm ; Width: 190mm Height: adjustable feet	
Aailable	Special	

4.2.4SCANNING PROCEDURE

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

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

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

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement.

Standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz)，12 mm in x- and y- dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

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

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

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

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

4.2.5SPATIAL PEAK SAR EVALUATION

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

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

Extrapolation

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

Interpolation

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

Volume Averaging

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

Advanced Extrapolation

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

4.2.6DATA STORAGE AND EVALUATION

4.2.5.1Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

4.4.2 Data Evaluation by SEMCAD

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

Probe parameters:	Sensitivity	Normi, 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	
	Density	

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

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

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

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

With
V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
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: $E_i = (V_i \,/\, Norm_i \cdot ConvF \;)^{1/2}$

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

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

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

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

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

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

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

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

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

With SAR = local specific absorption rate in mW/g

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

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

= equivalent tissue density in g/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 to be a free space field.

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

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

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

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

5. SYSTEM VERIFICATION PROCEDURE

5.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 5% of the target values.

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

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Body 750	0.2	-	0.2	0.8	48.8	-	50.0	-
Body 835	0.2	-	0.2	0.9	48.5	-	50.2	-
Body 1750	-	31.0	-	0.2	-	-	68.8	-
Body 1900	-	29.5	-	0.3	-	-	70.2	-
Body 2450	-	31.4	-	0.1	-	-	68.5	-
Body 2600	-	31.8	-	0.1	-	-	68.1	-
Body 5G	-	-	-	-	-	10.7	78.6	10.7

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

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Date
Body	2450	21.3	1.973	53.183	1.95	52.7	1.18	0.92	Apr. 29, 2016
Body	5200	21.5	5.347	47.581	5.30	49.0	0.89	-2.90	Apr. 29, 2016
Body	5300	21.5	5.481	47.409	5.42	48.9	1.13	-3.05	Apr. 29, 2016
Body	5600	21.5	5.912	46.863	5.77	48.5	2.46	-3.38	Apr. 29, 2016

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

5.2 SYSTEM CHECK

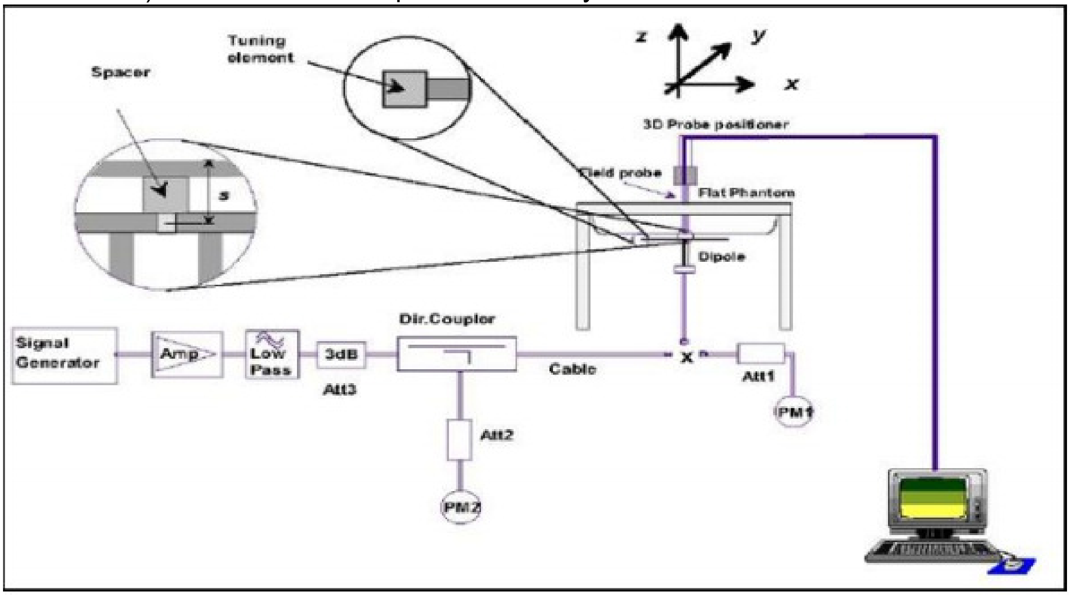
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands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

System Check	Date	Frequency (MHz)	Targeted SAR (W/kg)	Measured SAR (W/kg)	normalized SAR (W/kg)	Deviation (%)	Dipole S/N
Body	Apr. 29, 2016	2450	51.70	12.20	48.80	-5.61	Body
Body	Apr. 29, 2016	5200	74.70	7.18	71.80	-3.88	Body
Body	Apr. 29, 2016	5300	75.80	7.29	72.90	-3.83	Body
Body	Apr. 29, 2016	5600	80.60	7.54	75.40	-6.45	Body

5.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW(below 5GHz) or 100mW(above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

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



6.SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

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

6.2SAR MEASUREMENT UNCERTAINTY

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 WIFI 2.4G TEST CONFIGURATION

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

Mode	802.11b	802.11g	802.11a	802.11n (20M/40M)
Duty cycle	100%			
Crest factor	1			

For the 802.11b SAR tests, a communication link is set up with the test mode software for WiFi mode test. The Absolute Radio Frequency Channel Number(ARFCN) is allocated to 1 ,6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate.

✧ **802.11b DSSS SAR Test Requirements**

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

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

✧ **2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements**

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

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

7.2 TEST POSITION OF PORTABLE DEVICES

7.2.1 Test Position Requirements

The SAR Exclusion Threshold in KDB 447498 D01can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned adjacent the phantom and the edge containing the antenna positioned perpendicular to the phantom.

7.2.2 SAR test reduction and exclusion guidance

(1)The SAR exclusion threshold for distances<50mm is defined by the following equation:

$$\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \sqrt{\text{Frequency (GHz)}} \leq 3.0$$

The test exclusions are applicable only when the minimum test separation distance is ≤50mm and for transmission frequencies between 100MHz and 6GHz. When the minimum test separation distance is<5mm, a distance of 5mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

(2)The SAR exclusion threshold for distances>50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:

a) at 100 MHz to1500 MHz

$$\text{[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm)} \cdot \text{(f}_{\text{(MHz)}}\text{/150)] mW}$$

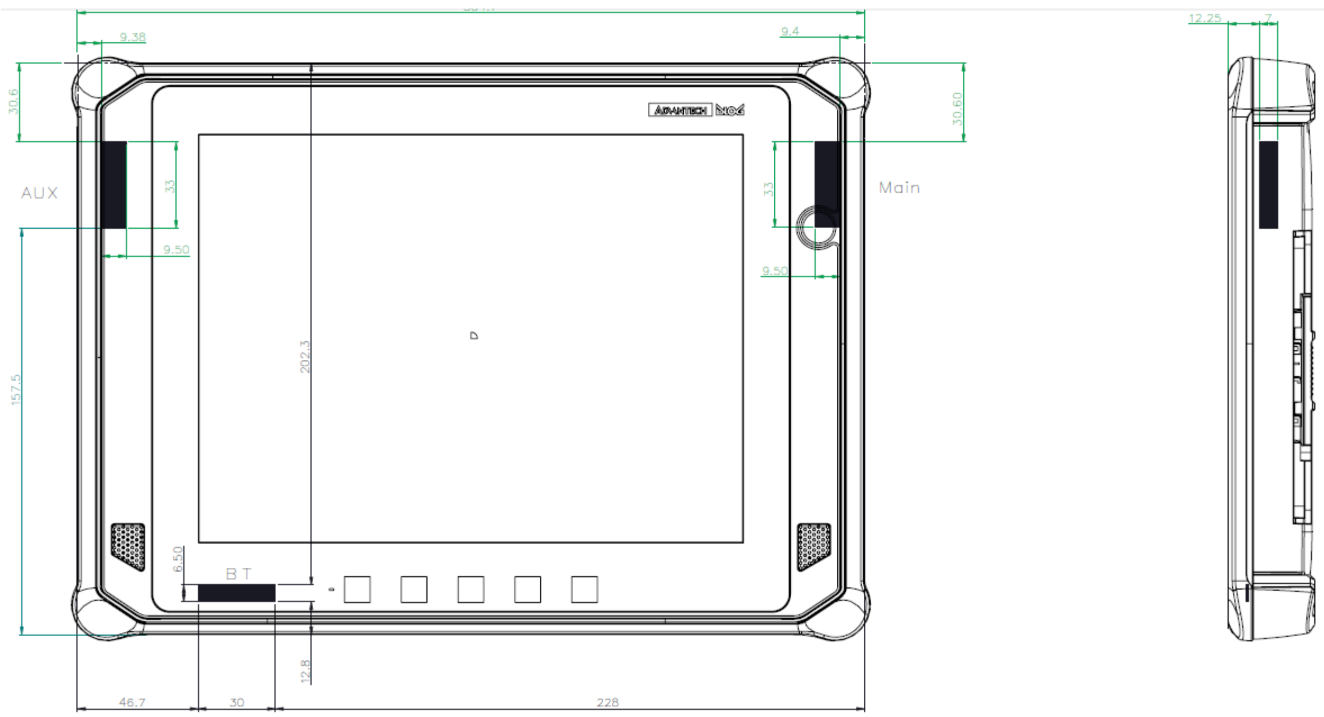
b) at >1500MHz and ≤6GHz

$$\text{[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm)} \cdot \text{10] mW}$$

Antenna -to -edge distance(mm)

Antenna	Rear Face	Right Side	Left Side	Top Side	Bottom Side
WiFi Ant 1	13.25	9.38	285.79	30.59	159.93
WiFi Ant 2	13.25	285.79	9.38	20.59	159.93
BT Ant	13.25	228	46.7	202.3	12.8

The location of the WiFi antenna inside EUT is as below.



The distance <50mm for WiFi Ant 1+2(MIMO Tx)

Band	Frequency	Turn-UP(dBm)	Turn-UP(mW)	Position	Rear Face	Right Side	Left Side	Top Side
				Antenna -to -edge distance(mm)	**13.25**	**9.38**	**9.38**	**30.59**
2.4G	2462	20	100	Exclusion considerations	11.84	16.73	16.73	5.13
				Test requirements(Yes/No)	Yes	Yes	Yes	Yes
5G Band 1	5240	12	15.85	Exclusion considerations	2.74	3.87	3.87	1.19
				Test requirements(Yes/No)	No	Yes	Yes	No
5G Band 2	5320	16.5	44.67	Exclusion considerations	7.78	10.98	10.98	3.37
				Test requirements(Yes/No)	Yes	Yes	Yes	Yes
5G Band 3	5700	16	39.81	Exclusion considerations	7.17	10.13	10.13	3.11
				Test requirements(Yes/No)	Yes	Yes	Yes	Yes

The distance >50mm for WiFi Ant 1+2(MIMO Tx)

Band	Frequency	Turn-UP(dBm)	Turn-UP(mW)	Position	Bottom Side
				Antenna -to -edge distance(mm)	159.93
2.4G	2462	20	100	Exclusion considerations(mW)	1194.9
				Test requirements(Yes/No)	No
5G Band 1	5240	12	15.85	Exclusion considerations(mW)	1164.83
				Test requirements(Yes/No)	No
5G Band 2	5320	16.5	44.67	Exclusion considerations(mW)	1164.33
				Test requirements(Yes/No)	No
5G Band 3	5700	16	39.81	Exclusion considerations(mW)	1162.13
				Test requirements(Yes/No)	No

The distance <50mm for BT Ant

Band	Frequency	Turn-UP(dBm)	Turn-UP(mW)	Position	Rear Face	Left Side	Bottom Side
				Antenna -to -edge distance(mm)	**13.25**	**46.7**	**12.8**
BT	2480	3	2	Exclusion considerations	0.24	0.07	0.25
				Test requirements(Yes/No)	No	No	No

The distance >50mm for BT Ant

Band	Frequency	Turn-UP(dBm)	Turn-UP(mW)	Position	Right Side	Top Side
				Antenna -to -edge distance(mm)	228	202.3
BT	2480	3	2	Exclusion considerations(mW)	1875.25	1618.25
				Test requirements(Yes/No)	No	No

8. POWER TEST RESULT

8.1 CONDUCTED POWER MEASUREMENTS OF BT

BT MHz	Tune Up	Average Conducted Power (dBm)			Test required
		DH5	2DH5	3DH5	
CH0	3	1.72	2.01	2	No
CH39	3	1.97	2.26	2.24	No
CH78	3	1.99	2.26	2.25	No

BT MHz	Tune Up	Average Conducted Power (dBm)			Test required
		CH0	CH19	CH39	
BT (4.0)	3	2.42	2.42	2.43	No

Note:
1) The conducted power of BT is measured with RMS detector.

8.2 CONDUCTED POWER MEASUREMENTS OF WIFI 2.4G

Mode	802.11b			Test required
Channel	1	6	11	
Frequency	2412	2437	2462	
1M	**19.76**	19.62	19.62	Yes
Tune-up	20.0	20.0	20.0	

Mode	802.11g					Test required
Channel	1	2	6	10	11	
Frequency	2412	2417	2437	2457	2462	
6M	15.88	19.11	**19.74**	19.02	15.90	No
Tune-up	16.0	20.0	20.0	20.0	16.0	

Mode	802.11n HT20					Test required
Channel	1	2	6	10	11	
Frequency	2412	2417	2437	2457	2462	
MCS0	16.15	17.10	**17.26**	17.18	15.13	No
Tune-up	16.5	17.5	17.5	17.5	16.5	

Mode	802.11n HT40					Test required
Channel	3	4	6	8	9	
Frequency	2422	2427	2437	2447	2452	
MCS0	15.31	16.66	**16.76**	16.60	13.91	No
Tune-up	15.5	17	17	17	15.5	

Note:

1) The Max conducted power of WiFi is measured with RMS detector.

2) Per KDB248227, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes(802.11b)was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes(802.11g/n)to DSSS modes(802.11b)specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

8.3 CONDUCTED POWER MEASUREMENTS OF WIFI 5G BAND 1

Mode	802.11a					Test required
Channel	Tune-up	36	40	44	48	
Frequency		5180	5200	5220	5240	
6M	10.00	**9.66**	9.33	9.16	9.20	No
Power Setting	x	100%	100%	100%	100%	

Mode	802.11n HT20					Test required
Channel	Tune-up	36	40	44	48	
Frequency		5180	5200	5220	5240	
MCS0	10	9.64	**9.98**	9.39	9.29	No
Power Setting	x	100%	100%	100%	100%	

Mode	802.11n HT40			Test required
Channel	Tune-up	38	46	
Frequency		5190	5230	
MCS0	12	**11.91**	11.56	Yes
Power Setting	x	100%	100%	

Note:

1) The Max conducted power of WiFi is measured with RMS detector.

8.4 CONDUCTED POWER MEASUREMENTS OF WIFI 5G BAND 2

Mode	802.11a					Test required
Channel	Tune-up	52	56	60	64	
Frequency		5260	5280	5300	5320	
6M	16.00	15.86	15.85	**15.99**	14.01	No
Power Setting	x	100%	100%	100%	100%	

Mode	802.11n HT20					Test required
Channel	Tune-up	52	56	60	64	
Frequency		5260	5280	5300	5320	
MCS0	16.5	16.01	**16.28**	16.10	14.48	Yes
Power Setting	x	100%	100%	100%	100%	

Mode	802.11n HT40			Test required
Channel	Tune-up	54	62	
Frequency		5270	5310	
MCS0	15.5	**15.45**	11.69	No
Power Setting	x	100%	100%	

Note:

1) The Max conducted power of WiFi is measured with RMS detector.

8.5 CONDUCTED POWER MEASUREMENTS OF WIFI 5G BAND 3

Mode	802.11a									Test required
Channel	Tune-up	100	104	108	112	116	132	136	140	
Frequency		5500	5520	5540	5560	5580	5660	5680	5700	
6M	15.5	14.93	14.80	14.69	14.93	15.20	**15.30**	15.21	15.25	No
Power Setting	x	100%	100%	100%	100%	100%	100%	100%	100%	

Mode	802.11n HT20									Test required
Channel	Tune-up	100	104	108	112	116	132	136	140	
Frequency		5500	5520	5540	5560	5580	5660	5680	5700	
MCS0	16	14.90	15.05	15.07	15.04	15.24	15.45	**15.58**	15.34	Yes
Power Setting	x	100%	100%	100%	100%	100%	100%	100%	100%	

Mode	802.11n HT40			Test required
Channel	Tune-up	102	134	
Frequency		5510	5670	
MCS0	15	14.55	**14.90**	No
Power Setting	x	100%	100%	

Note:

1) The Max conducted power of WiFi is measured with RMS detector.

9. SAR TEST RESULTS

General Notes:

1) Per KDB447498 D01v06, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:≤0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is≤100 MHz. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01v01r04,for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/Kg; if the deviation among the repeated measurement is ≤20%,and the measured SAR <1.45W/Kg, only one repeated measurement is required.
4) Per KDB865664 D02v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

WLAN Notes:

1) For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated(peak)SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2) Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHZ WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1 for more information.
3) Per KDB248227D01, the highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.

9.1 STAND-ALONE SAR TEST EXCLUSION

Per FCC KDB 447498D01v06, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance,mm)][√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Standalone SAR test exclusion for BT

Mode	Position	P_{max} (dBm)*	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
BT	Body	2	3	5	2.48	0.5	3	Yes

Note:

1)* - maximum possible output power declared by manufacturer

2) Held to ear configurations are not applicable to Bluetooth for this device.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] •

[√ f(GHz)/x] W/kg for test separation distances⩽50 mm,where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

According to KDB 447498 D01,when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standslone SAR was estimated according to following formula to result in substantially conservative SAR values of⩽0.4W/Kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(mW)}}{\text{Min. Test Separation Distance}_{(mm)}} \times \frac{\sqrt{f_{(GHz)}}}{7.5}$$

BT Estimated SAR calculation

Mode	P_{max} (dBm) *	P_{max} (mW)	Distance (mm)	f (GHz)	X	Estimated SAR (W/Kg)*
BT	3	2	5	2.48	7.5	0.066

Note: * - maximum possible output power declared by manufacturer

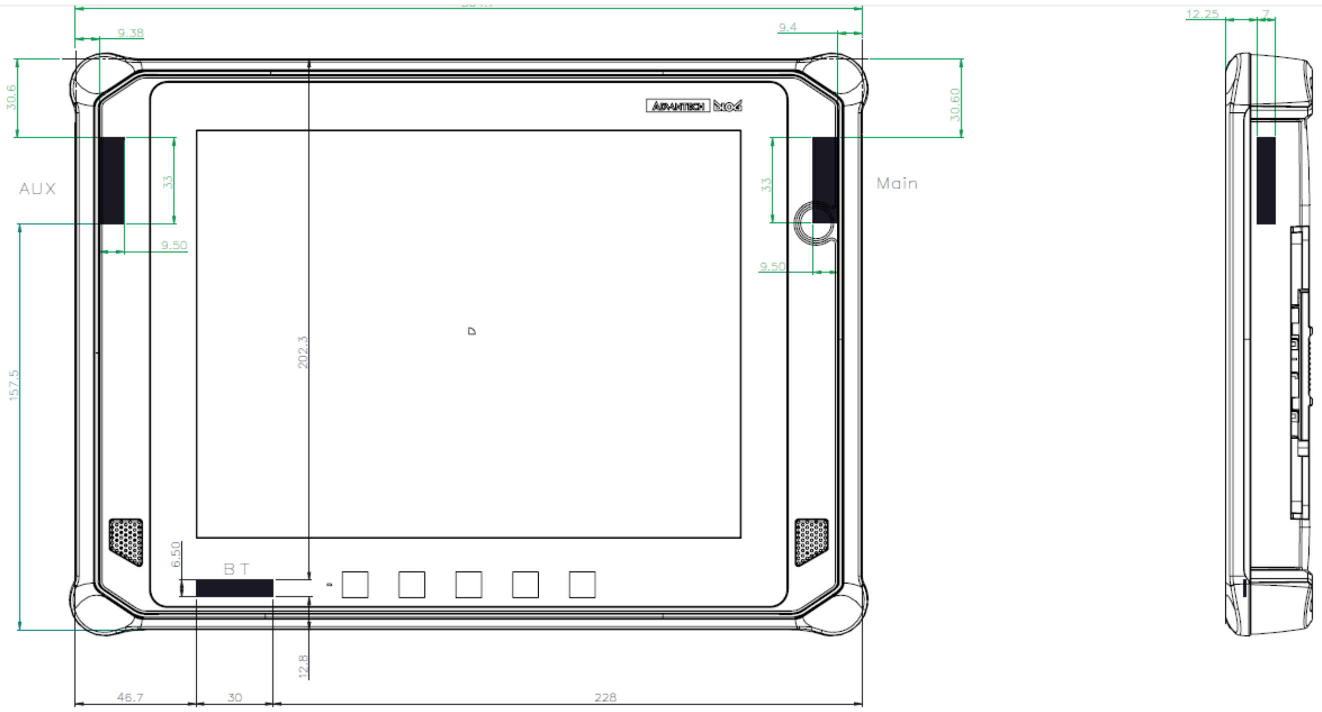
9.2 SAR MEASUREMENT RESULT OF BODY

Test No.	Band	Mode	CH	Test Position	Separation Distance (cm)	Ant	Battery	Tune up (dBm)	Measured (dBm)	Drift (dB)	SAR Value (W/kg) 1-g	Reported SAR
T01	802.11b	-	1	Rear Face	0	1 + 2	1	20	19.76	0.02	0.19	0.201
T02	802.11b	-	1	Left Side	0	1 + 2	1	20	19.76	-0.11	0.343	**0.362**
T03	802.11b	-	1	Right Side	0	1 + 2	1	20	19.76	0.07	0.334	0.353
T04	802.11b	-	1	Top Side	0	1 + 2	1	20	19.76	-0.06	0.117	0.124
T05	802.11b	-	1	Left Side	0	1 + 2	2	20	19.76	-0.01	0.34	0.359
T06	802.11n	HT40	38	Rear Face	0	1 + 2	1	12	11.91	0.14	0.0341	0.035
T07	802.11n	HT40	38	Left Side	0	1 + 2	1	12	11.91	0.09	0.068	**0.069**
T08	802.11n	HT40	38	Right Side	0	1 + 2	1	12	11.91	0.08	0.0258	0.026
T09	802.11n	HT40	38	Top Side	0	1 + 2	1	12	11.91	0.03	0.0127	0.013
T10	802.11n	HT40	38	Left Side	0	1 + 2	2	12	11.91	-0.02	0.0576	0.059
T11	802.11n	HT20	56	Rear Face	0	1 + 2	1	16.5	16.28	0.1	0.235	0.247
T12	802.11n	HT20	56	Left Side	0	1 + 2	1	16.5	16.28	0.13	0.253	**0.266**
T13	802.11n	HT20	56	Right Side	0	1 + 2	1	16.5	16.28	-0.05	0.0782	0.082
T14	802.11n	HT20	56	Top Side	0	1 + 2	1	16.5	16.28	-0.06	0.0376	0.040
T15	802.11n	HT20	56	Left Side	0	1 + 2	2	16.5	16.28	0.08	0.247	0.260
T16	802.11n	HT20	136	Rear Face	0	1 + 2	1	16	15.58	0.07	0.263	0.290
T17	802.11n	HT20	136	Left Side	0	1 + 2	1	16	15.58	-0.05	0.277	**0.305**
T18	802.11n	HT20	136	Right Side	0	1 + 2	1	16	15.58	-0.12	0.0247	0.027
T19	802.11n	HT20	136	Top Side	0	1 + 2	1	16	15.58	0.07	0.0494	0.054
T20	802.11n	HT20	136	Rear Face	0	1 + 2	2	16	15.58	0.06	0.0137	0.015

Note: The adjusted Body SAR is 0.362 x (100/100) = 0.362 mW/g, the OFDM is not required for 2.4G.

10. MULTIPLE TRANSMITTER INFORMATION

The location of the antennas inside mobile phone is shown as below picture:



11. SIMULTANEOUS TRANSMISSION CONDITIONS

WiFi 2.4G / WiFi 5G / BT transmit simultaneously.

Co-Location	WiFi 2.4G	WiFi 5G	BT
WiFi 2.4G		No	Yes
WiFi 5G	No		Yes
BT	Yes	Yes	

About BT and 2.4G / 5G antenna

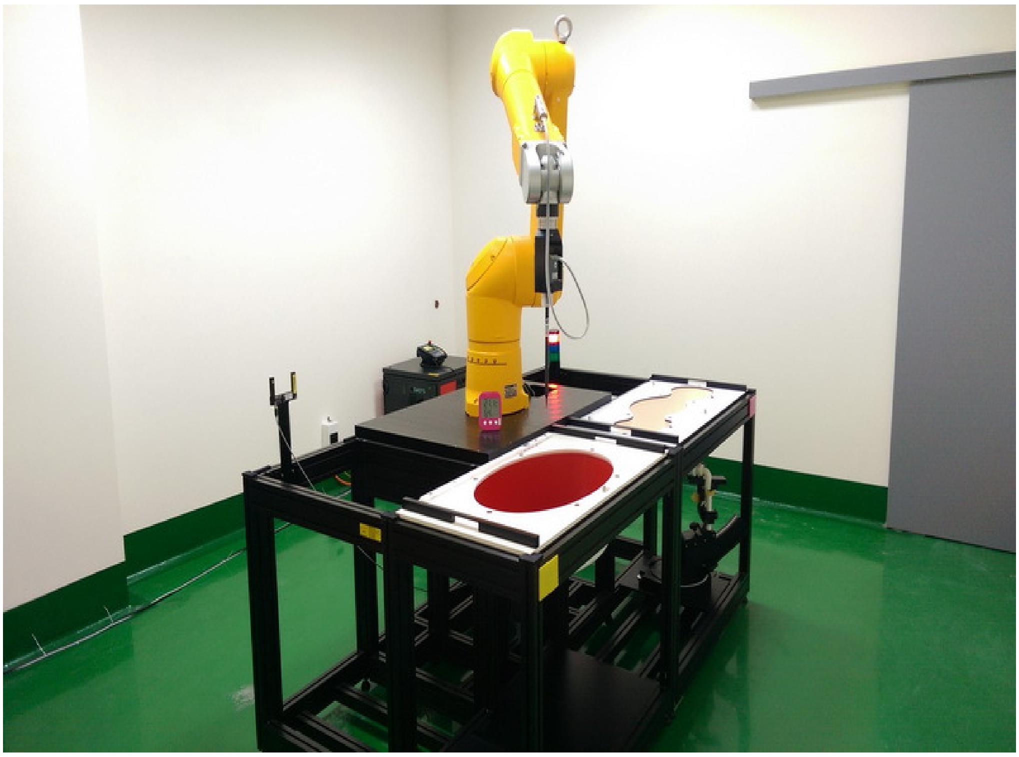
Test Position / Reported SAR_{1g}	Body				
	Rear	Left	Right	Top	Bottom
2.4G WiFi	0.201	0.362	0.353	0.124	-
5G WiFi	0.290	0.305	0.082	0.054	-
BT	0.066	0.066	0.066	0.066	-
MAX∑SAR1g	0.356	0.428	0.419	0.19	-

MAX. $\sum SAR_{1g}$=0.428 W/Kg$<$1.6 W/Kg, so the SAR to peak location separation ratio do not considered.

APPENDIX

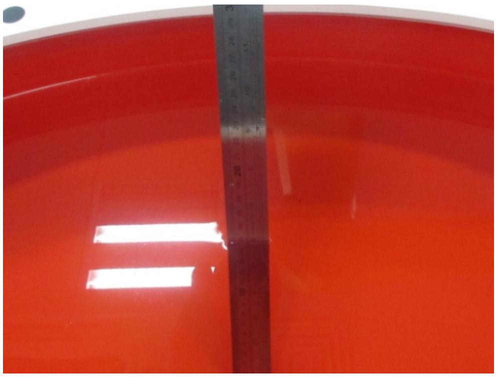
1. Test Layout

Specific Absorption Rate Test Layout

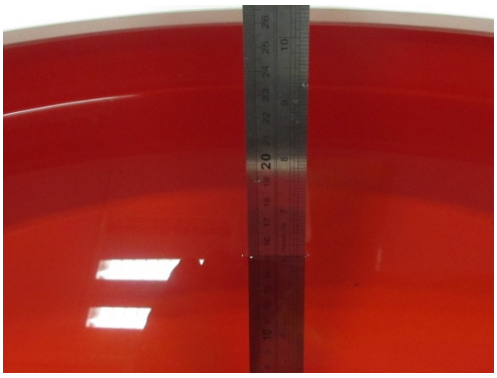


Liquid depth in the flat Phantom (≥15cm depth)

Body(2400MHz~2500MHz)



Body(5GHz~6GHz)



Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination are shown as follows.

Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

Appendix D. Photographs of the Test Set-Up

Photo 1: Rear Face_0mm_Battery 1	Photo 2: Left Side_0mm_Battery 1

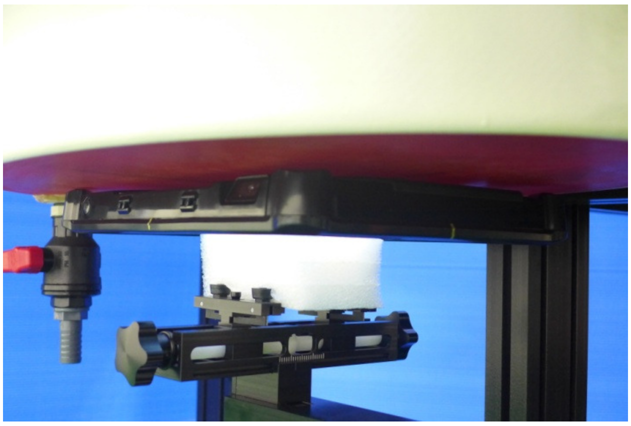
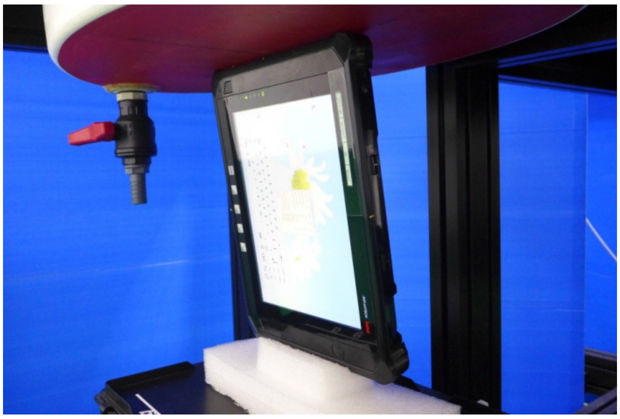

	

Photo 3: Right Side_0mm_Battery 1	Photo 4: Top Side_0mm_Battery 1

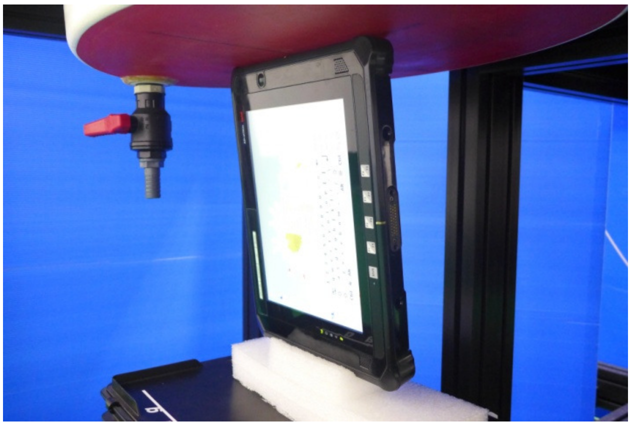
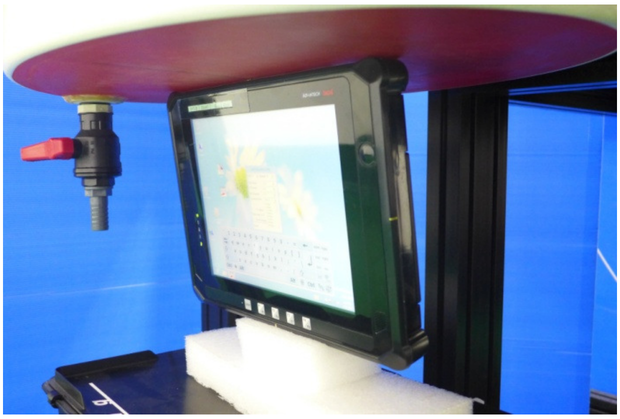

	

Photo 2: Left Side_0mm_Battery 2