FCC SAR Report

Report No.	:	**SESF1606083**
Client/Manufacturer	:	**Realtek Semiconductor Corp.**
Address	:	**No.2,Innovation Rode II, Hsinchu Science Park, Hsinchu 300,Taiwan**
Product	:	**802.11a/b/g/n/ac RTL8821AE Combo module**
Brand	:	**REALTEK**
Model	:	**RTL8821AE**
FCC ID	:	**TX2-RTL8821AE**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:2005 / IEEE 1528-2013 / KDB 865664 D01 v01r04 / KDB 248227 D01 v02r02 / KDB 447498 D01 v06 / KDB 616217 D04 v01r02**
Test Date	:	**March 07th, 2016~ March 10th, 2016**

Statement of Compliance:

The SAR values measured for the test sample are below the maximum recommended level of 1.6W/kg averaged over any 1g tissue according to FCC Knowledge Data Base/ FCC 47CFR Part 2 (2.1093) / IEEE Std.1528-2013.

The test result only corresponds to the tested sample. It is not permitted to copy this report, in part or in full, without the permission of the test laboratory.

The testing described in this report has been carried out to the best of our knowledge and ability, and our responsibility is limited to the exercise of reasonable care. This certification is not intended to believe the sellers from their legal and/or contractual obligations.

Prepared By: Leo Chen

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Approved By: Miro Chueh

Miro Chueh

Testing Laboratory
2877

Release Version

Report No.	Issue Date	Description
SESF1606083	2016-07-05	Initial release

Contents

1. Summary of Maximum SAR Value

Equipment Class	Highest Reported SAR_{1-g}(W/kg)
DTS	1.147
U-NII	1.189
DSS	0.12
Highest Simultaneous SAR	
DTS+DSS	1.157
UNII+DSS	1.199

2. Description of Equipment under Test

Product Name	802.11a/b/g/n/ac RTL8821AE Combo module
Model No.	RTL8821AE
Brand Name	REALTEK
Product Type	WLAN (1TX, 1RX)
Antenna Type	PIFA
Antenna Peak Gain	Speed: 2400- 2500MHz: 1.46dBi, 5150- 5850MHz: 2.82dBi
	HongLin: 2400- 2500MHz: 0.87dBi, 5150- 5850MHz: 0.58dBi
Bus Interface	Portable
Device Category	Uncontrolled
RF Exposure Environment	802.11a/b/g/n/ac RTL8821AE Combo module
Wi-Fi	
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz
MODULATION TECHNOLOGY	DSSS,OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n : up to 150Mbps 802.11ac: up to 433.3Mbps
OPERATING FREQUENCY	**For 15.407** 5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.50 ~ 5.58GHz & 5.66GHz ~ 5.72GHz, 5.745 ~ 5.825GHz
	For 15.247 2.412 ~ 2.462GHz
NUMBER OF CHANNEL	**For 15.407** 25 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 12 for 802.11n (HT40), 802.11ac (VHT40) 6 for 802.11ac (VHT80)
	For 15.247 (2.4GHz) 11 for 802.11b/g, 802.11n (HT20), VHT20 7 for 802.11n (HT40), VHT40

Bluetooth	
MODULATION TYPE	GFSK, π/4-DQPSK, 8DPSK for FHSS 16QAM, QPSK, BPSK for OFDM GFSK for DTS
MODULATION TECHNOLOGY	FHSS, OFDM, DTS
DATE RATE	Up to 3Mbps for BT-EDR mode Up to 24Mbps for BT-HS mode Up to 1Mbps for BT-LE mode
FREQUENCY RANGE	BT-EDR, BT-LE mode: 2402MHz ~ 2480MHz BT-HS mode: 2412MHz ~ 2462MHz
NUMBER OF CHANNEL	BT-EDR mode: 79 BT-HS mode: 11 BT-LE mode: 40

Additional Information

1. Antenna information

Ant Type	Manufacturer	Part Number
1	Speed Wireless Technical Co., LTD.	Main：DC33001F300 Aux：DC33001F310
2	HongLin Electronics Co., Ltd	Main：DC33001F000 Aux：DC33001F010

2. Antenna function type

For diversity type: (Both of those two antenna connectors can be used.)

<For 2.4GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 2.4GHz WLAN and Bluetooth, but only one of them will be used at the same time.

<For 5GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 5GHz WLAN and Bluetooth, and both them can transmit and receive signal simultaneously. But only one antenna can be used as transmitting/receiving functions at the same time.

For fixed type: (Chain 1 is designated for 2.4 GHz WLAN function, Chain 2 is designated for 5GHz WLAN and Bluetooth functions.)

3. General Information

Host Details,

Host Manufacture	Host Type	Host Model
Lenovo	Notebook Computer	Lenovo YOGA 710-11IKB

Our Lab,

Test Site	Cerpass Technology (Suzhou) Co.,Ltd
Test Site Location	No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China

4. Basic restrictions and Standards

4.1. Test Standards

1. IEEE 1528-2013
2. FCC KDB Publication 447498 D01 General RF Exposure Guidance v06
3. FCC KDB Publication 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
4. FCC KDB Publication 616217 D04 SAR for laptop and tablets v01r02
5. FCC KDB Publication 248227 D01 802.11 Wi-Fi SAR v02r02

4.2. Environment Condition

Item	Target	Measured
Ambient Temperature(℃)	18~25	21.5±2
Temperature of Simulant(℃)	20~22	21±2
Relative Humidity(%RH)	30~70	52

4.3. RF Exposure Limits

Human Exposure	Basic restrictions for electric, magnetic and electromagnetic fields. (Unit in mW/g or W/kg)
Spatial Peak SAR[1](Head and Body)	1.60
Spatial Average SAR[2](Whole Body)	0.08
Spatial Peak SAR[3](Arms and Legs)	4.00

Notes:

1. The Spatial Peak value of the SAR averaged over any 1gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

2. The Spatial Average value of the SAR averaged over the whole body.

3. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over appropriate averaging time.

5. DASY5 Measurement System

DASY5 Measurement System

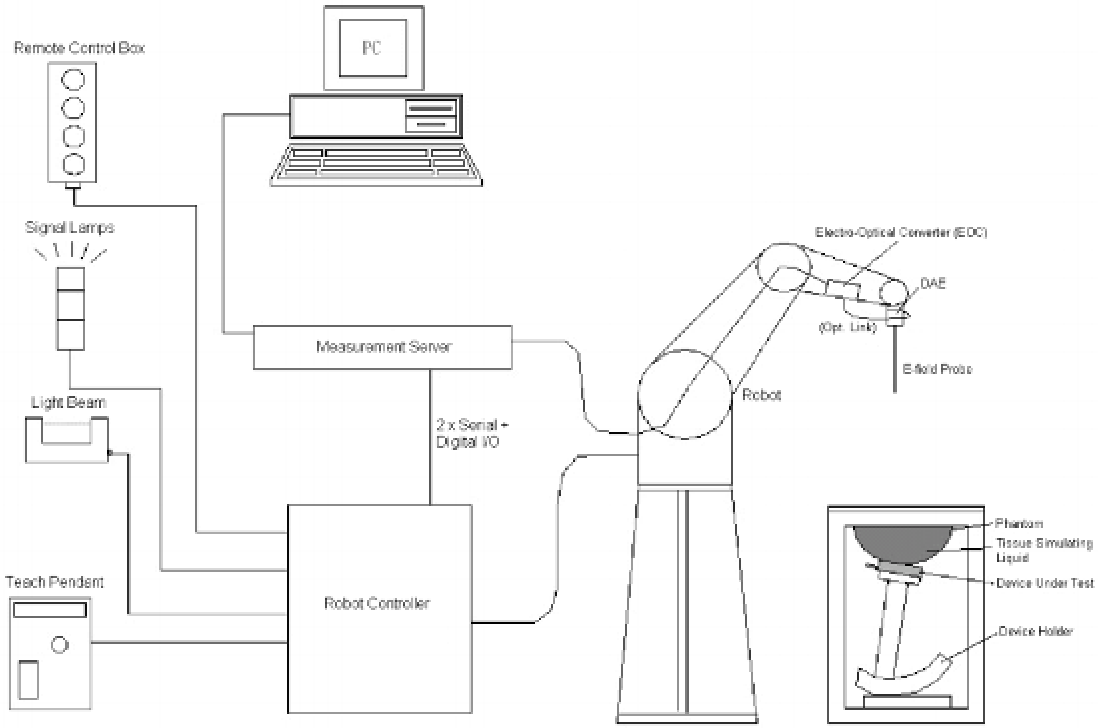


Figure 2.1 SPEAG DASY5 System Configurations

The DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

■ A standard high precision 6-axis robot with controller, a teach pendant and software

■ A data acquisition electronic(DAE)attached to the robot arm extension

■ A dosimetric probe equipped with an optical surface detector system

■ The electro-optical converter(ECO)performs the conversion between optical and electrical signals

■ A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

■ A probe alignment unit which improves the accuracy of the probe positioning

■ A computer operating Windows 7

■ DASY5 software

■ Remove control with teach pendant additional circuitry for robot safety such as warming lamps, etc.

■ The SAM twin phantom

■ A device holder

■ Tissue simulating liquid

■ Dipole for evaluating the proper functioning of the system

5.1. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY5 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}}\cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}}\frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

5.2. DASY5 E-Field Probe

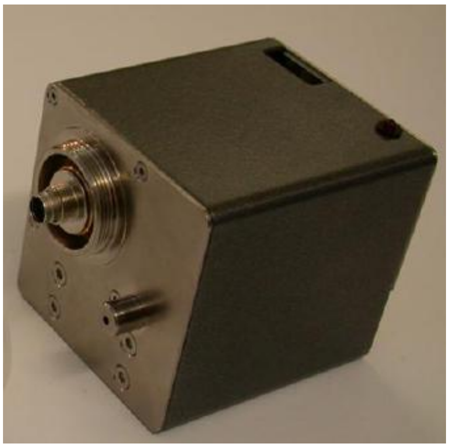
The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO 17025. The calibration data are in Appendix D.

Model	EX3DV4
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (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: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

5.3. Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit.
Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.
The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



5.4. Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.
The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

5.5. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

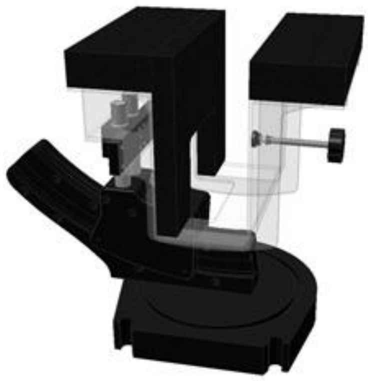
5.6. Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.	

5.7. SAM Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas: ■ Left head ■ Right head ■ Flat phantom	
The ELI4 Phantom also is a fiberglass shell phantom with 2mm shell thickness. It has 30 liters filling volume, and with a dimension of 600mm for major ellipse axis, 400mm for minor axis. It is intended for compliance testing of handheld and body-mounted wireless devices in frequency range of 30 MHz to 6GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.	
The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.	

5.8. Device Holder

The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).Thus the device needs no repositioning when changing the angles. The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon r = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	
The laptop extension is lightweight and made of POM, acrylic glass and foam. It fits easily on upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.	

5.9. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Stäubli Robot TX60L	Stäubli	TX60L	5P6VA1/A/01	only once
Robot Controller	Stäubli	CS8C	5P6VA1/C/01	only once
Dipole Validation Kits	Speag	D2450V2	914	2017.05.18
Dipole Validation Kits	Speag	D5GHzV2	1156	2017.05.21
SAM ELI Phantom	Speag	SAM	1211	N/A
Laptop Holder	Speag	SM LH1 001CD	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1379	2016.05.19
E-Field Probe	Speag	EX3DV4	3927	2016.05.26
SAR Software	Speag	DASY5	V5.2 Build 162	N/A
Power Amplifier	Mini-Circuit	ZVA-183W-S+	MN136701248	2016.09.02
Directional Coupler	Agilent	772D	MY52180104	2016.09.02
Spectrum Analyzer	R&S	FSP40	100324	2017.03.26
Vector Network	Agilent	E5071C	MY4631693	2017.03.26
Signal Generator	R&S	SML	103287	2017.03.26
Power Meter	R&S	BLWA0830-160/100/40D	76659	2017.03.26
AUG Power Sensor	R&S	NRP-Z91	100384	2017.03.26

6. The SAR Measurement Procedure

6.1. System Performance Check

6.1.1 Purpose

1. To verify the simulating liquids are valid for testing.
2. To verify the performance of testing system is valid for testing.

6.1.2 Tissue Dielectric Parameters for Head and Body Phantoms

Target Frequency	Head		Body	
(MHz)	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
850	41.5	0.92	55.2	0.99
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
5200	36.0	4.66	**49.0**	**5.30**
5300	35.87	4.76	48.88	5.42
5600	35.5	5.07	**48.5**	**5.77**
5800	35.3	5.27	**48.2**	**6.00**

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

6.1.3 Tissue Calibration Result

■ The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Diel -ectric Assessment Kit and Agilent Vector Network Analyzer E5071C.

Tissue parameter for body							
Fre. <MHz>	Permittivity	Conductivity	Target Permittivity	Target Conductivity	Delta Permittivity%	Delta Conductivity%	Tissue Temperature℃
07-03-2016							
2450	52.43	1.98	52.70	1.95	-0.01	0.02	21.0
2437	52.52	1.96	52.70	1.93	0.00	0.02	21.0
2462	52.39	1.99	52.69	1.97	-0.01	0.01	21.0
08-03-2016							
5200	49.18	5.32	49.00	5.30	0.00	0.00	21.0
5180	49.20	5.29	49.03	5.28	0.00	0.00	21.0
09-03-2016							
5600	48.53	5.78	48.50	5.77	0.00	0.00	21.0
5580	48.61	5.77	48.54	5.75	0.00	0.00	21.0
5680	48.34	5.85	48.37	5.85	0.00	0.00	21.0
10-03-2016							
5800	48.45	5.97	48.20	6.00	0.01	-0.01	21.0
5785	48.49	5.95	48.24	5.97	0.01	0.00	21.0

Conclusion: Since the Delta Permittivity% and Delta Conductivity% are both within ±5% limit of target values, the tissue parameters comply with the standard requirement.

Refer to KDB 865664 D01 v01r04, The depth of body tissue-equivalent liquid in a phantom must be ≥ 15.0 cm with ≤ ± 0.5 cm variation for SAR measurements ≤ 3 GHz and ≥ 10.0 cm with ≤ ± 0.5 cm variation for measurements > 3 GHz.

6.1.4 System Performance Check Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and the system performance check. They are read-only document files and destined as fully defined but unmeasured masks, so the finished system performance check must be saved under a different name. The system performance check document requires the SAM Twin Phantom or ELI4 Phantom, so the phantom must be properly installed in your system. (User defined measurement procedures can be created by opening a new document or editing an existing document file). Before you start the system performance check, you need only to tell the system with which components (probe, medium, and device) you are performing the system performance check; the system will take care of all parameters.

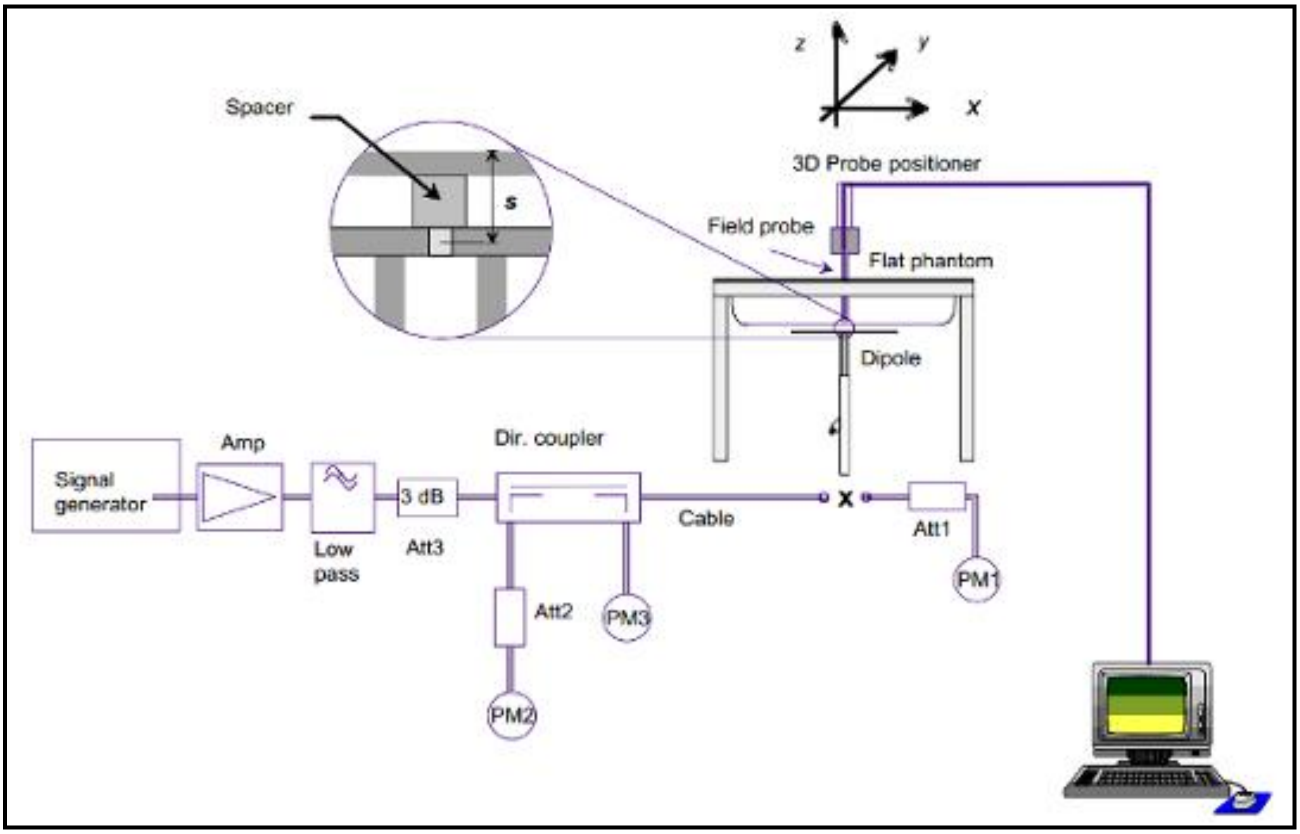
■ **The Power Reference Measurement and Power Drift Measurement** jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the Dipole output power. If it is too high (above ±0.2 dB), the system performance check should be repeated;

■ **The Surface Check** job 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). In that case it is better to abort the system performance check and stir the liquid;

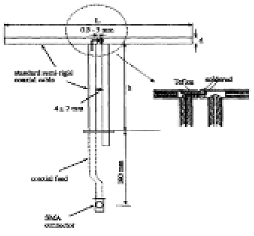
■ **The Area Scan** job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable;

■ **The Zoom Scan** job measures the field in a volume around the peak SAR value assessed in the previous Area Scan job (for more information see the application note on SAR evaluation). If the system performance check gives reasonable results. The dipole input power(forward power) was 250mW, 1 g and 10 g spatial average SAR values normalized to 1W dipole input power give reference data for comparisons and it's equal to 10x(dipole forward power). The next sections analyze the expected uncertainties of these values, as well as additional checks for further information or troubleshooting.

6.1.5 System Performance Check Setup



6.1.6 Validation Dipoles

The dipoles use is based on the IEEE Std.1528-2013 and FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 standard, and is complied with mechanical and electrical specifications in line with the requirements of both EN62209-1 and EN62209-2. The table below provides details for the mechanical and electrical specifications for the dipoles.	

6.1.7 Result of System Performance Check: Valid Result

System Performance Check at 2450MHz, 5200MHz, 5600MHz and 5800MHz for Body.

Validation Dipole: D2450V2-SN 914

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
2450 MHz	Reference result ± 10% window	52.5 47.25 to 57.75	24.6 22.14 to 27.06	21.0
	07-03-2016	52	23.4	

Validation Dipole: D5GHzV2-SN1156

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5200MHz	Reference result ± 10% window	75.0 67.5 to 82.5	21.0 18.9 to 23.1	21.0
	08-03-2016	79	22	
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5600MHz	Reference result ± 10% window	79.5 71.55 to 87.45	22.0 19.8 to 24.2	21.0
	09-03-2016	83.4	23.2	
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5800MHz	Reference result ± 10% window	76.6 68.94 to 84.26	21.1 18.99 to 23.21	21.0
	10-03-2016	81.4	22.6	

Note: All SAR values are normalized to 1W forward power.

6.2. Test Requirements

6.2.1 Test Procedures

Step 1 Setup a Connection

First, engineer should record the conducted power before the test. Then establish a call in handset at the maximum power level with a base station simulator via air interface, or make the EUT estimate by itself in testing band. Place the EUT to the specific test location. After the testing, must export SAR test data by SEMCAD. Then writing down the conducted power of the EUT into the report, also the SAR values tested.

Step 2 Power Reference Measurements

To measure the local E-field value at a fixed location which value will be taken as a reference value for calculating a possible power drift.

Step 3 Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01v01r04

	≤ 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 angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 4 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 Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 v01r04

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

Step 5 Power Drift Measurements

Repetition of the E-field measurement at the fixed location mentioned in Step 1 to make sure the two results differ by less than ± 0.2 dB.

6.2.2 Test Channel

Per KDB248227 D01 v02r02, channel selection procedures below apply to both the initial test configu -ration and subsequent test configureation(s):

1) The largest channel bandwidth configuration is selected among the multiple configurations in a freq -uency band with the same specified maximum output power.

2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is sele -cted.

3) If multiple configurations have the same specified maximum output power, largest channel band -width and lowest order modulation, the lowest data rate configuration among these configurations is seleced.

4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

5) The same procedures also apply to subsequent highest output power channel(s) selection.

a> The channel closest to mid-band frequency is selected for SAR measurement.

b> For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

7. Wi-Fi/Bluetooth SAR Exclusion and Results

7.1. Maximum Tune-up Conducted Average Power

< RTL8821AE _WIFI 1x1Tx_ Single Chain Power> (Unit: dBm)

Ch.	Freq(MHz)	11b	11g	HT20	HT40
1	2412	17	16	14	--
3	2422	--	--	--	14
6	2437	17	17	17	17
9	2452	--	--	--	14
11	2462	17	16	14	--

Ch.	Freq(MHz)	11a	HT20	VHT20
36	5180	17	17	17
40	5200	17	17	17
48	5240	17	17	17
52	5260	14.5	14.5	14.5
56	5280	14.5	14.5	14.5
64	5320	14.5	14.5	14.5
100	5500	14.5	14.5	14.5
112	5560	14.5	14.5	14.5
140	5700	14.5	14.5	14.5
149	5745	14.5	14.5	14.5
157	5785	14.5	14.5	14.5
165	5825	14.5	14.5	14.5

Ch.	Freq(MHz)	HT40	VHT40
38	5190	14	14
46	5230	16.5	16.5
54	5270	14	14
62	5310	14	14
102	5510	14	14
110	5550	14	14
134	5670	14	14
151	5755	14	14
159	5795	14	14

Ch.	Freq(MHz)	VHT80
42	5210	11
58	5290	11
106	5530	11
155	5775	14

< RTL8821AE _Bluetooth > (Unit: dBm)

Max. Bluetooth Power	8.5

7.2. Measured Conducted Average Power

< RTL8821AE _ Main> (Unit: dBm)

Configurations	Mode		
	Channel / Frequency (MHz)		
2.4GHz WLAN Average Power	802.11b		
	1/2412	6/2437	11/2462
	16.89	16.93	16.86
	802.11g		
	1/2412	6/2437	11/2462
	15.87	16.73	15.94
	802.11n(HT20)		
	1/2412	6/2437	11/2462
	13.92	16.77	13.97
	802.11n(HT40)		
	3/2422	6/2437	9/2452
	13.86	16.77	13.91

< RTL8821AE _ Aux> (Unit: dBm)

Configurations	Mode		
	Channel / Frequency (MHz)		
2.4GHz WLAN Average Power	802.11b		
	1/2412	6/2437	11/2462
	16.76	16.89	16.86
	802.11g		
	1/2412	6/2437	11/2462
	15.81	16.75	15.91
	802.11n(HT20)		
	1/2412	6/2437	11/2462
	13.89	16.81	13.91
	802.11n(HT40)		
	3/2422	6/2437	9/2452
	13.89	16.74	13.93

< RTL8821AE _ Main> (Unit: dBm)

<table>
<tr><td rowspan="2">Configurations</td><td colspan="12">Mode</td></tr>
<tr><td colspan="12">Channel / Frequency (MHz)</td></tr>
<tr><td rowspan="12">5.2GHz WLAN Average Power</td><td colspan="12">802.11a</td></tr>
<tr><td colspan="3">36/5180</td><td colspan="3">40/5200</td><td colspan="3">44/5220</td><td colspan="3">48/5240</td></tr>
<tr><td colspan="3">16.91</td><td colspan="3">16.79</td><td colspan="3">16.85</td><td colspan="3">16.87</td></tr>
<tr><td colspan="12">802.11n(HT20)</td></tr>
<tr><td colspan="3">36/5180</td><td colspan="3">40/5200</td><td colspan="3">44/5220</td><td colspan="3">48/5240</td></tr>
<tr><td colspan="3">16.74</td><td colspan="3">16.78</td><td colspan="3">16.77</td><td colspan="3">16.96</td></tr>
<tr><td colspan="12">802.11n(HT40)</td></tr>
<tr><td colspan="6">38/5190</td><td colspan="6">46/5230</td></tr>
<tr><td colspan="6">13.86</td><td colspan="6">16.51</td></tr>
<tr><td colspan="12">802.11ac(VHT80)</td></tr>
<tr><td colspan="12">42/5210</td></tr>
<tr><td colspan="12">10.81</td></tr>
<tr><td rowspan="12">5.3GHz WLAN Average Power</td><td colspan="12">802.11a</td></tr>
<tr><td colspan="3">52/5260</td><td colspan="3">56/5280</td><td colspan="3">60/5300</td><td colspan="3">64/5320</td></tr>
<tr><td colspan="3">14.35</td><td colspan="3">14.32</td><td colspan="3">14.39</td><td colspan="3">14.41</td></tr>
<tr><td colspan="12">802.11n(HT20)</td></tr>
<tr><td colspan="3">52/5260</td><td colspan="3">56/5280</td><td colspan="3">60/5300</td><td colspan="3">64/5320</td></tr>
<tr><td colspan="3">14.46</td><td colspan="3">14.39</td><td colspan="3">14.47</td><td colspan="3">14.37</td></tr>
<tr><td colspan="12">802.11n(HT40)</td></tr>
<tr><td colspan="6">54/5270</td><td colspan="6">62/5310</td></tr>
<tr><td colspan="6">13.91</td><td colspan="6">13.87</td></tr>
<tr><td colspan="12">802.11ac(VHT80)</td></tr>
<tr><td colspan="12">58/5290</td></tr>
<tr><td colspan="12">10.82</td></tr>
<tr><td rowspan="12">5.6GHz WLAN Average Power</td><td colspan="12">802.11a</td></tr>
<tr><td colspan="2">100/5500</td><td colspan="2">104/5520</td><td colspan="2">116/5580</td><td colspan="2">132/5660</td><td colspan="2">136/5680</td><td colspan="2">140/5700</td></tr>
<tr><td colspan="2">14.43</td><td colspan="2">14.42</td><td colspan="2">14.49</td><td colspan="2">14.41</td><td colspan="2">14.47</td><td colspan="2">14.39</td></tr>
<tr><td colspan="12">802.11n(HT20)</td></tr>
<tr><td colspan="2">100/5500</td><td colspan="2">104/5520</td><td colspan="2">116/5580</td><td colspan="2">132/5660</td><td colspan="2">136/5680</td><td colspan="2">140/5700</td></tr>
<tr><td colspan="2">14.31</td><td colspan="2">14.35</td><td colspan="2">14.36</td><td colspan="2">14.33</td><td colspan="2">14.36</td><td colspan="2">14.21</td></tr>
<tr><td colspan="12">802.11n(HT40)</td></tr>
<tr><td colspan="4">102/5510</td><td colspan="4">110/5550</td><td colspan="4">134/5670</td></tr>
<tr><td colspan="4">13.89</td><td colspan="4">13.79</td><td colspan="4">13.82</td></tr>
<tr><td colspan="12">802.11ac(VHT80)</td></tr>
<tr><td colspan="12">106/5530</td></tr>
<tr><td colspan="12">10.91</td></tr>
</table>

<table>
<tr><td rowspan="2">Configurations</td><td colspan="5">Mode</td></tr>
<tr><td colspan="5">Channel / Frequency (MHz)</td></tr>
<tr><td rowspan="12">5.8GHz WLAN Average Power</td><td colspan="5">802.11a</td></tr>
<tr><td>149/5745</td><td>153/5765</td><td>157/5785</td><td>161/5805</td><td>165/5825</td></tr>
<tr><td>14.37</td><td>14.36</td><td>14.49</td><td>14.33</td><td>14.42</td></tr>
<tr><td colspan="5">802.11n(HT20)</td></tr>
<tr><td>149/5745</td><td>153/5765</td><td>157/5785</td><td>161/5805</td><td>165/5825</td></tr>
<tr><td>14.42</td><td>14.33</td><td>14.39</td><td>14.31</td><td>14.32</td></tr>
<tr><td colspan="5">802.11n(HT40)</td></tr>
<tr><td colspan="2">151/5755</td><td colspan="3">159/5795</td></tr>
<tr><td colspan="2">13.89</td><td colspan="3">13.81</td></tr>
<tr><td colspan="5">802.11ac(VHT80)</td></tr>
<tr><td colspan="5">155/5775</td></tr>
<tr><td colspan="5">13.82</td></tr>
</table>

< RTL8821AE _ Aux> (Unit: dBm)

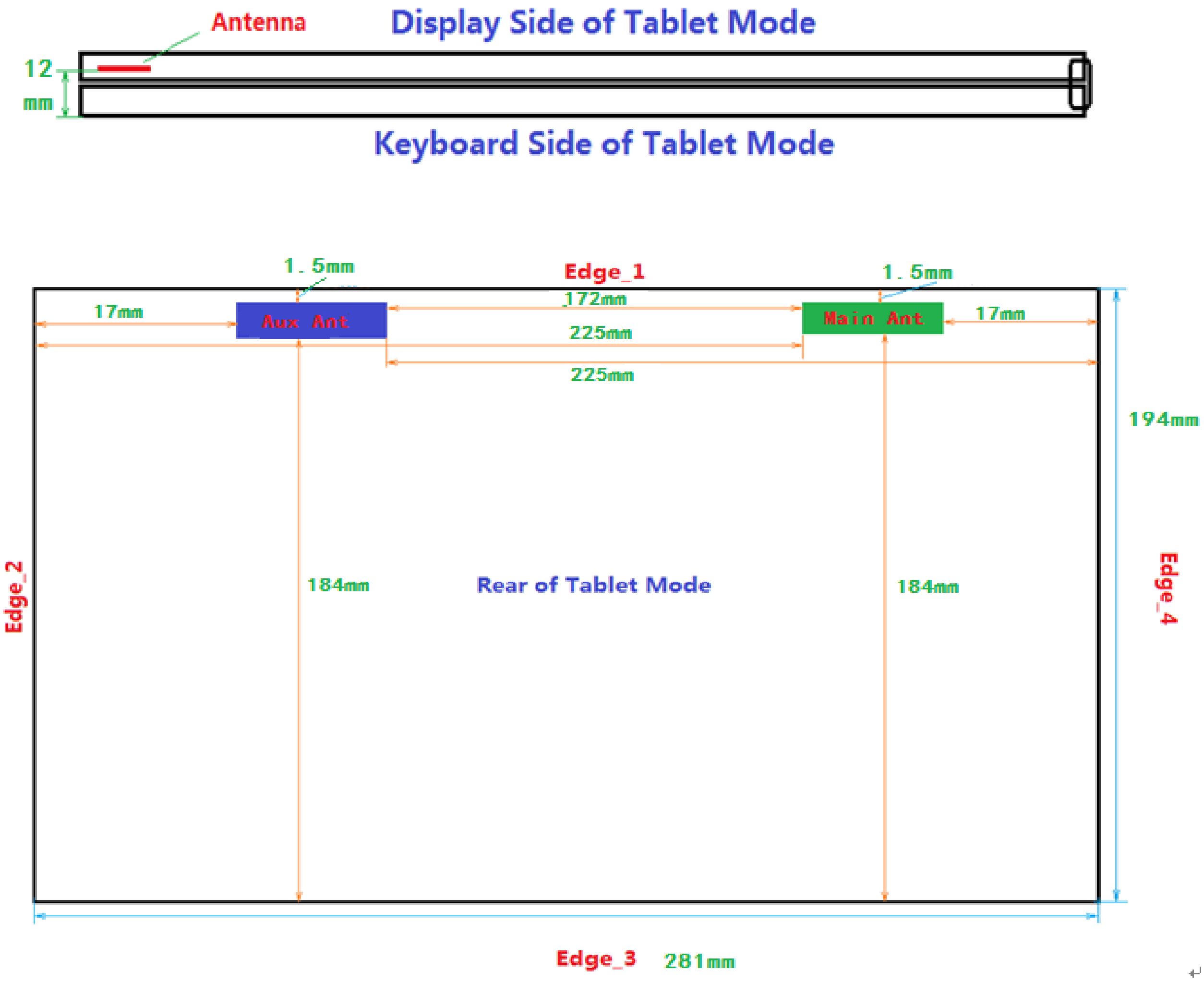
<table>
<tr><td rowspan="2">Configurations</td><td colspan="4">Mode</td></tr>
<tr><td colspan="4">Channel / Frequency (MHz)</td></tr>
<tr><td rowspan="12">5.2GHz WLAN Average Power</td><td colspan="4">802.11a</td></tr>
<tr><td>36/5180</td><td>40/5200</td><td>44/5220</td><td>48/5240</td></tr>
<tr><td>16.87</td><td>16.81</td><td>16.82</td><td>16.93</td></tr>
<tr><td colspan="4">802.11n(HT20)</td></tr>
<tr><td>36/5180</td><td>40/5200</td><td>44/5220</td><td>48/5240</td></tr>
<tr><td>16.79</td><td>16.73</td><td>16.79</td><td>16.91</td></tr>
<tr><td colspan="4">802.11n(HT40)</td></tr>
<tr><td colspan="2">38/5190</td><td colspan="2">46/5230</td></tr>
<tr><td colspan="2">13.85</td><td colspan="2">16.40</td></tr>
<tr><td colspan="4">802.11ac(VHT80)</td></tr>
<tr><td colspan="4">42/5210</td></tr>
<tr><td colspan="4">10.89</td></tr>
<tr><td rowspan="12">5.3GHz WLAN Average Power</td><td colspan="4">802.11a</td></tr>
<tr><td>52/5260</td><td>56/5280</td><td>60/5300</td><td>64/5320</td></tr>
<tr><td>14.33</td><td>14.37</td><td>14.41</td><td>14.45</td></tr>
<tr><td colspan="4">802.11n(HT20)</td></tr>
<tr><td>52/5260</td><td>56/5280</td><td>60/5300</td><td>64/5320</td></tr>
<tr><td>14.45</td><td>14.38</td><td>14.44</td><td>14.33</td></tr>
<tr><td colspan="4">802.11n(HT40)</td></tr>
<tr><td colspan="2">54/5270</td><td colspan="2">62/5310</td></tr>
<tr><td colspan="2">13.93</td><td colspan="2">13.91</td></tr>
<tr><td colspan="4">802.11ac(VHT80)</td></tr>
<tr><td colspan="4">58/5290</td></tr>
<tr><td colspan="4">10.91</td></tr>
</table>

Configurations	Mode / Channel / Frequency (MHz)					
5.6GHz WLAN Average Power	802.11a					
	100/5500	104/5520	116/5580	132/5660	136/5680	140/5700
	14.41	14.42	14.45	14.32	14.33	14.31
	802.11n(HT20)					
	100/5500	104/5520	116/5580	132/5660	136/5680	140/5700
	14.34	14.33	14.37	14.34	14.36	14.29
	802.11n(HT40)					
	102/5510	110/5550	134/5670			
	13.87	13.83	13.81			
	802.11ac(VHT80)					
	106/5530					
	10.97					
5.8GHz WLAN Average Power	802.11a					
	149/5745	153/5765	157/5785	161/5805	165/5825	
	14.38	14.35	14.48	14.31	14.41	
	802.11n(HT20)					
	149/5745	153/5765	157/5785	161/5805	165/5825	
	14.44	14.32	14.42	14.36	14.31	
	802.11n(HT40)					
	151/5755	159/5795				
	13.91	13.84				
	802.11ac(VHT80)					
	155/5775					
	13.87					

< RTL8821AE _Bluetooth > (Unit: dBm)

Max. Bluetooth Power	
2441MHz GFSK	8.5

7.3. Antenna Location



Antenna	Antenna Distance to Edges(mm)				
	Back	Edge_1	Edge_2	Edge_3	Edge_4
Main(Tx1)	12	1.5	225	184	17
Aux(Tx2)	12	1.5	17	184	225

7.4. SAR exclusion

7.4.1 Laptop Mode

Because the antenna-to-user separation distance in laptop mode is 210 mm, SAR is not required.

7.4.2 Tablet mode

Per FCC KDB 447498 D01v06 for 100MHz~6GHz:

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

$$\frac{Max\ Power\ of\ Channel(mW)}{Test\ Separation\ Distance(mm)} \times \sqrt{Frequency(GHz)} \leq 3.0$$

1.5mm Antenna-to-user distance

Test Mode	Frq.(MHz)	Antenna-to-user distance (mm)	Thresholds (mW)	Max. Tune-up Power(dBm)	Max. Tune-up Power(mW)	SAR Test(Y/N
Bluetooth	2441	1.5	3	8.5	7.1	Y
802.11b	2437	1.5	3	17.0	50.1	Y
802.11g	2437	1.5	3	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	2437	1.5	3	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	2437	1.5	3	17.0	50.1	Y
802.11a	5220	1.5	2	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	5220	1.5	2	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	5230	1.5	2	16.5	44.7	Y
802.11ac(VHT80)	5210	1.5	2	11.0	12.6	Y
802.11a	5300	1.5	2	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5300	1.5	2	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5270	1.5	2	14.0	25.1	Y
802.11ac(VHT80)	5290	1.5	2	11.0	12.6	Y
802.11a	5540	1.5	2	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5540	1.5	2	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5550	1.5	2	14.0	25.1	Y
802.11ac(VHT80)	5530	1.5	2	11.0	12.6	Y
802.11a	5785	1.5	2	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5785	1.5	2	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5795	1.5	2	14.0	25.1	Y
802.11ac(VHT80)	5775	1.5	2	14.0	25.1	Y

12mm Antenna-to-user distance

Test Mode	Frq.(MHz)	Antenna-to-user distance (mm)	Thresholds (mW)	Max. Tune-up Power(dBm)	Max. Tune-up Power(mW)	SAR Test(Y/N
Bluetooth	2441	12	23	8.5	7.1	N
802.11b	2437	12	23	17.0	50.1	Y
802.11g	2437	12	23	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	2437	12	23	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	2437	12	23	17.0	50.1	Y
802.11a	5220	12	16	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	5220	12	16	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	5230	12	16	16.5	44.7	Y
802.11ac(VHT80)	5210	12	16	11.0	12.6	N
802.11a	5300	12	16	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5300	12	16	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5270	12	16	14.0	25.1	Y
802.11ac(VHT80)	5290	12	16	11.0	12.6	N
802.11a	5540	12	15	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5540	12	15	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5550	12	15	14.0	25.1	Y
802.11ac(VHT80)	5610	12	15	11.0	12.6	N
802.11a	5785	12	15	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5785	12	15	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5795	12	15	14.0	25.1	Y
802.11ac(VHT80)	5775	12	15	14.0	25.1	Y

17mm Antenna-to-user distance

Test Mode	Frq.(MHz)	Antenna-to-user distance (mm)	Thresholds (mW)	Max. Tune-up Power(dBm)	Max. Tune-up Power(mW)	SAR Test(Y/N
Bluetooth	2441	17	33	8.5	7.1	N
802.11b	2437	17	33	17.0	50.1	Y
802.11g	2437	17	33	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	2437	17	33	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	2437	17	33	17.0	50.1	Y
802.11a	5220	17	22	17.0	50.1	Y
802.11n/ac(HT20/VHT20)	5220	17	22	17.0	50.1	Y
802.11n/ac(HT40/VHT40)	5230	17	22	16.5	44.7	Y
802.11ac(VHT80)	5210	17	22	11.0	12.6	N
802.11a	5300	17	22	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5300	17	22	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5270	17	22	14.0	25.1	Y
802.11ac(VHT80)	5290	17	22	11.0	12.6	N
802.11a	5540	17	22	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5540	17	22	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5550	17	22	14.0	25.1	Y
802.11ac(VHT80)	5610	17	22	11.0	12.6	N
802.11a	5785	17	21	14.5	28.2	Y
802.11n/ac(HT20/VHT20)	5785	17	21	14.5	28.2	Y
802.11n/ac(HT40/VHT40)	5795	17	21	14.0	25.1	Y
802.11ac(VHT80)	5775	17	21	14.0	25.1	Y

2) At test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

a. [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50mm)·(f (MHz)/150)] mW, at 100 MHz to 1500 MHz

b. [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

184mm Antenna-to-user distance

Test Mode	Frq.(MHz)	Antenna-to-user distance (mm)	Thresholds (mW)	Max. Tune-up Power(dBm)	Max. Tune-up Power(mW)	SAR Test(Y/N
Bluetooth	2441	184	1436	8.5	7.1	N
802.11b	2437	184	1436	17.0	50.1	N
802.11g	2437	184	1436	17.0	50.1	N
802.11n/ac(HT20/VHT20)	2437	184	1436	17.0	50.1	N
802.11n/ac(HT40/VHT40)	2437	184	1436	17.0	50.1	N
802.11a	5220	184	1406	17.0	50.1	N
802.11n/ac(HT20/VHT20)	5220	184	1406	17.0	50.1	N
802.11n/ac(HT40/VHT40)	5230	184	1406	16.5	44.7	N
802.11ac(VHT80)	5210	184	1406	11.0	12.6	N
802.11a	5300	184	1405	14.5	28.2	N
802.11n/ac(HT20/VHT20)	5300	184	1405	14.5	28.2	N
802.11n/ac(HT40/VHT40)	5270	184	1405	14.0	25.1	N
802.11ac(VHT80)	5290	184	1405	11.0	12.6	N
802.11a	5540	184	1404	14.5	28.2	N
802.11n/ac(HT20/VHT20)	5540	184	1404	14.5	28.2	N
802.11n/ac(HT40/VHT40)	5550	184	1404	14.0	25.1	N
802.11ac(VHT80)	5610	184	1403	11.0	12.6	N
802.11a	5785	184	1402	14.5	28.2	N
802.11n/ac(HT20/VHT20)	5785	184	1402	14.5	28.2	N
802.11n/ac(HT40/VHT40)	5795	184	1402	14.0	25.1	N
802.11ac(VHT80)	5775	184	1402	14.0	25.1	N

Note: The exclusion calculation tables for antenna-to-user separation distances greater than 200 mm are unnecessary since these are mobile RF exposure conditions.

7.5. Required Edges for SAR Testing

Frequency	Test Mode	Main Antenna					Aux Antenna				
		Back	Edge1	Edge2	Edge	Edge4	Bac	Edge	Edge	Edge	Edge
2.4G	BT(GFSK)	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO
	802.11b	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11g	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT20)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT40)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
5.2G	802.11a	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT20)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT40)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11ac(VHT8	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
5.6G	802.11a	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT20)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT40)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11ac(VHT8	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
5.8G	802.11a	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT20)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11n(HT40)	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
	802.11ac(VHT8	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO

Note: According to KDB 248227 D01 v02r02, SAR configuration may be reduced.

7.6. Estimated SAR

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v06, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is≤1.6W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2 2, the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$Estimated\ SAR = \frac{\sqrt{f(GHz)}}{7.5} * \frac{(Max\ Power\ of\ channel,\ mW)}{Min.\ Separation,\ mm}$$

Where: Test separation distances ≤ 50mm.

WIFI/ Bluetooth

Test Position	Test Mode	Frq.(MHz)	Test Separations	Max. Tune-up Power(dBm)	Max. Tune-up Power(mW)	Estimated SAR(W/kg)
Back	Bluetooth GFSK	2441	12	8.5	7.1	0.12

Note: An estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR for test separate on distances >50mm per 447498 D01v06.

7.7. SAR Test Results Summary

■ Tablet Mode- DTS_WLAN 2.4GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	1	main	802.11b	CCK	Edge_1	0	6	2437	17.0	16.93	1.00	0.14	0.422	0.424
	1	main	802.11b	CCK	Back	0	6	2437	17.0	16.93	1.00	0.04	0.105	0.105
	1	main	802.11b	CCK	Edge_4	0	6	2437	17.0	16.93	1.00	0.11	0.0073	0.007
	2	main	802.11b	CCK	Edge_1	0	11	2462	17.0	16.86	1.01	0.09	1.1	1.109
	2	main	802.11b	CCK	Edge_1	0	6	2437	17.0	16.93	1.00	-0.11	0.99	0.994
	2	main	802.11b	CCK	Back	0	11	2462	17.0	16.86	1.01	0.02	0.125	0.126
	2	main	802.11b	CCK	Edge_4	0	11	2462	17.0	16.86	1.01	0.11	0.013	0.013

Note:

1. **Per KDB248227 D01 v02r02 section 5.2.1 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. **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, 802.11g/n OFDM SAR is not required, per KDB248227 D01 v02r02 section 5.2.2 2).**

■ Tablet Mode- DTS_WLAN 2.4GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	1	aux	802.11b	CCK	Edge_1	0	6	2437	17.0	16.89	1.01	0.14	0.455	0.458
	1	aux	802.11b	CCK	Back	0	6	2437	17.0	16.89	1.01	0.04	0.125	0.126
	1	aux	802.11b	CCK	Edge_2	0	6	2437	17.0	16.89	1.01	0.11	0.0079	0.008
01	2	aux	802.11b	CCK	Edge_1	0	6	2437	17.0	16.89	1.01	0.13	1.14	**1.147**
	2	aux	802.11b	CCK	Edge_1	0	11	2462	17.0	16.86	1.01	-0.11	1.03	1.039
	2	aux	802.11b	CCK	Back	0	6	2437	17.0	16.89	1.01	0.02	0.137	0.138
	2	aux	802.11b	CCK	Edge_2	0	6	2437	17.0	16.89	1.01	0.11	0.016	0.016

Note:

1. **Per KDB248227 D01 v02r02 section 5.2.1 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. **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, 802.11g/n OFDM SAR is not required, per KDB248227 D01 v02r02 section 5.2.2 2).**

■ **Tablet Mode- U-NII-2A _WLAN 5.2GHz**

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	main	802.11a	OFDM	Edge_1	0	36	5180	17.0	16.91	1.01	0.00	1.05	1.056
	1	main	802.11a	OFDM	Edge_1	0	48	5240	17.0	16.87	1.01	0.00	0.977	0.985
	1	main	802.11a	OFDM	Back	0	36	5180	17.0	16.91	1.01	0.00	0.103	0.104
	1	main	802.11a	OFDM	Edge_4	0	36	5180	17.0	16.91	1.01	0.00	0.011	0.011
Initial Test configuration of Honglin Main Antenna														
	2	main	802.11a	OFDM	Edge_1	0	36	5180	17.0	16.91	1.01	0.00	0.513	0.52
	2	main	802.11a	OFDM	Back	0	36	5180	17.0	16.91	1.01	0.00	0.0803	0.081
	2	main	802.11a	OFDM	Edge_4	0	36	5180	17.0	16.91	1.01	0.00	0.0051	0.005

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

■ **Tablet Mode- U-NII-2A _WLAN 5.2GHz**

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Aux Antenna														
02	1	aux	802.11a	OFDM	Edge_1	0	36	5180	17.0	16.87	1.01	0.00	1.18	**1.189**
	1	aux	802.11a	OFDM	Edge_1	0	48	5240	17.0	16.93	1.00	0.00	1.03	1.034
	1	aux	802.11a	OFDM	Back	0	36	5180	17.0	16.87	1.01	0.00	0.115	0.116
	1	aux	802.11a	OFDM	Edge_2	0	36	5180	17.0	16.87	1.01	0.00	0.0153	0.015
Initial Test configuration of Honglin Aux Antenna														
	2	aux	802.11a	OFDM	Edge_1	0	36	5180	17.0	16.87	1.01	0.00	0.726	0.73
	2	aux	802.11a	OFDM	Back	0	36	5180	17.0	16.87	1.01	0.00	0.0811	0.082
	2	aux	802.11a	OFDM	Edge_2	0	36	5180	17.0	16.87	1.01	0.00	0.0054	0.005

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

■ Tablet Mode- U-NII-2C_ WLAN 5.6GHz

Blow 5.65GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	main	802.11a	OFDM	Edge_1	0	116	5580	14.5	14.49	1.00	0.00	0.479	0.479
	1	main	802.11a	OFDM	Back	0	116	5580	14.5	14.49	1.00	0.00	0.0421	0.042
	1	main	802.11a	OFDM	Edge_4	0	116	5580	14.5	14.49	1.00	0.00	0.0053	0.005
Initial Test configuration of Honglin Main Antenna														
	2	main	802.11a	OFDM	Edge_1	0	116	5580	14.5	14.49	1.00	0.00	0.411	0.41
	2	main	802.11a	OFDM	Back	0	116	5580	14.5	14.49	1.00	0.00	0.0203	0.020
	2	main	802.11a	OFDM	Edge_4	0	116	5580	14.5	14.49	1.00	0.00	0.0031	0.003

Above 5.65GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	main	802.11a	OFDM	Edge_1	0	136	5680	14.5	14.47	1.00	0.00	0.613	0.614
	1	main	802.11a	OFDM	Back	0	136	5680	14.5	14.47	1.00	0.00	0.091	0.091
	1	main	802.11a	OFDM	Edge_4	0	136	5680	14.5	14.47	1.00	0.00	0.0061	0.006
Initial Test configuration of Honglin Main Antenna														
	2	main	802.11a	OFDM	Edge_1	0	136	5680	14.5	14.47	1.00	0.00	0.492	0.493
	2	main	802.11a	OFDM	Back	0	136	5680	14.5	14.47	1.00	0.00	0.062	0.062
	2	main	802.11a	OFDM	Edge_4	0	136	5680	14.5	14.47	1.00	0.00	0.0039	0.004

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

Blow 5.65GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Aux Antenna														
03	1	aux	802.11a	OFDM	Edge_1	0	116	5580	14.5	14.45	1.00	0.00	0.677	**0.679**
	1	aux	802.11a	OFDM	Back	0	116	5580	14.5	14.45	1.00	0.00	0.0516	0.052
	1	aux	802.11a	OFDM	Edge_2	0	116	5580	14.5	14.45	1.00	0.00	0.0072	0.007
Initial Test configuration of Honglin Aux Antenna														
	2	aux	802.11a	OFDM	Edge_1	0	116	5580	14.5	14.45	1.00	0.00	0.443	0.44
	2	aux	802.11a	OFDM	Back	0	116	5580	14.5	14.45	1.00	0.00	0.0231	0.023
	2	aux	802.11a	OFDM	Edge_2	0	116	5580	14.5	14.45	1.00	0.00	0.0035	0.004

Above 5.65GHz

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Aux Antenna														
	1	aux	802.11a	OFDM	Edge_1	0	136	5680	14.5	14.33	1.01	0.00	0.631	0.638
	1	aux	802.11a	OFDM	Back	0	136	5680	14.5	14.33	1.01	0.00	0.096	0.097
	1	aux	802.11a	OFDM	Edge_2	0	136	5680	14.5	14.33	1.01	0.00	0.0068	0.007
Initial Test configuration of Honglin Aux Antenna														
	2	aux	802.11a	OFDM	Edge_1	0	136	5680	14.5	14.33	1.01	0.00	0.527	0.533
	2	aux	802.11a	OFDM	Back	0	136	5680	14.5	14.33	1.01	0.00	0.071	0.072
	2	aux	802.11a	OFDM	Edge_2	0	136	5680	14.5	14.33	1.01	0.00	0.0042	0.004

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

■ **Tablet Mode- U-NII-3_ WLAN 5.8GHz**

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	main	802.11a	OFDM	Edge_1	0	157	5785	14.5	14.49	1.00	0.00	0.643	**0.643**
	1	main	802.11a	OFDM	Back	0	157	5785	14.5	14.49	1.00	0.00	0.029	0.029
	1	main	802.11a	OFDM	Edge_4	0	157	5785	14.5	14.49	1.00	0.00	0.0081	0.008
Initial Test configuration of Honglin Main Antenna														
	2	main	802.11a	OFDM	Edge_1	0	157	5785	14.5	14.49	1.00	0.00	0.426	0.426
	2	main	802.11a	OFDM	Back	0	157	5785	14.5	14.49	1.00	0.00	0.0134	0.013
	2	main	802.11a	OFDM	Edge_4	0	157	5785	14.5	14.49	1.00	0.00	0.0031	0.003

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Aux Antenna														
04	1	aux	802.11a	OFDM	Edge_1	0	157	5785	14.5	14.48	1.00	0.00	0.695	**0.696**
	1	aux	802.11a	OFDM	Back	0	157	5785	14.5	14.48	1.00	0.00	0.0325	0.033
	1	aux	802.11a	OFDM	Edge_2	0	157	5785	14.5	14.48	1.00	0.00	0.0086	0.009
Initial Test configuration of Honglin Aux Antenna														
	2	aux	802.11a	OFDM	Edge_1	0	157	5785	14.5	14.48	1.00	0.00	0.432	0.433
	2	aux	802.11a	OFDM	Back	0	157	5785	14.5	14.48	1.00	0.00	0.0185	0.019
	2	aux	802.11a	OFDM	Edge_2	0	157	5785	14.5	14.48	1.00	0.00	0.0039	0.004

Note:

1. **Per KDB248227 D01 v02r02 section 5.3.3 initial test configuration procedures, when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg.**

■ Tablet Mode- Bluetooth

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	main	Bluetooth	GFSK	Edge_1	0	39	2441	8.5	8.50	1.00	0.00	0.0019	<0.01
Initial Test configuration of Honglin Main Antenna														
	2	main	Bluetooth	GFSK	Edge_1	0	39	2441	8.5	8.50	1.00	0.00	0.0023	<0.01

Plot No.	Ant Type	Ant Port	Band	Mode	Test Position	Dist. mm	Ch.	Fre.	Max. Tune-up Power(dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift(dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
Initial Test configuration of Speed Main Antenna														
	1	aux	Bluetooth	GFSK	Edge_1	0	39	2441	8.5	8.50	1.00	0.00	0.0021	<0.01
Initial Test configuration of Honglin Main Antenna														
	2	aux	Bluetooth	GFSK	Edge_1	0	39	2441	8.5	8.50	1.00	0.00	0.0033	<0.01

8. Simultaneous Transmission Analysis

8.1. Max. Simultaneous SAR

■ **WLAN+ Bluetooth (Speed Ant）**

No.	Configurations	Test Position	WLAN SAR(W/kg)	BT SAR(W/kg)	∑ SAR(W/kg)
1	WLAN(DTS) + BT(DSS)	Body-Back	0.126	0.12	0.246
		Body-Edge_1	0.458	0.01	0.468
		Body-Edge_2	0.008	0.4	0.408
		Body-Edge_3	0.4	0.4	0.8
		Body-Edge_4	0.007	0.4	0.407
2	WLAN(UNII) + BT(DSS)	Body-Back	0.116	0.12	0.236
		Body-Edge_1	1.189	0.01	1.199
		Body-Edge_2	0.015	0.4	0.415
		Body-Edge_3	0.4	0.4	0.8
		Body-Edge_4	0.011	0.4	0.411

■ **WLAN+ Bluetooth (Honglin Ant)**

No.	Configurations	Test Position	WLAN SAR(W/kg)	BT SAR(W/kg)	∑ SAR(W/kg)
1	WLAN(DTS) + BT(DSS)	Body-Back	0.138	0.12	0.258
		Body-Edge_1	1.147	0.01	1.157
		Body-Edge_2	0.016	0.4	0.416
		Body-Edge_3	0.4	0.4	0.8
		Body-Edge_4	0.013	0.4	0.413
2	WLAN(UNII) + BT(DSS)	Body-Back	0.082	0.12	0.202
		Body-Edge_1	0.73	0.01	0.74
		Body-Edge_2	0.005	0.4	0.405
		Body-Edge_3	0.4	0.4	0.8
		Body-Edge_4	0.005	0.4	0.405

Note:

1. An estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR for test separate on distances >50mm per 447498 D01v06.

8.2. Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06.

9. Measurement Uncertainty

Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std.Unc. (1g)	Std. nc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max.SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Power Scalingp	±0%	R	$\sqrt{3}$	0	0	±0%	±0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)DAK	±2.5%	R	$\sqrt{3}$	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.)DAK	±2.5%	R	$\sqrt{3}$	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. –ConductivityBB	±3.4%	R	$\sqrt{3}$	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. – PermittivityBB	±0.4%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%	∞
Combined Std. Uncertainty						±11.2%	±11.1%	361
Expanded STD Uncertainty(k=2)						**±22.3%**	**±22.2%**	

DASY5 Uncertainty Budget, according to IEEE 1528/2011 and IEC 62209-1/2011(0.3-3GHz)

Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std.Unc. (1g)	Std. nc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±6.55%	N	1	0	0			
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Modulation Response[m]	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%	∞
Max.SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Power Scaling[p]	±0%	R	$\sqrt{3}$	0	0	±0%	±0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.6%	R	$\sqrt{3}$	1	1	±3.8%	±3.8%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)[DAK]	±2.5%	R	$\sqrt{3}$	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.)[DAK]	±2.5%	R	$\sqrt{3}$	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. –Conductivity[BB]	±3.4%	R	$\sqrt{3}$	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. – Permittivity[BB]	±0.4%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%	∞
Combined Std. Uncertainty						±12.3%	±12.2%	748
Expanded STD Uncertainty(Coverage factor=2)						**±24.6%**	**±24.5%**	

DASY5 Uncertainty Budget, according to IEEE 1528/2011 and IEC 62209-1/2011(3-6GHz)

--END--

APPENDIX A. SAR System Verification Data

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

Date/Time: 07/03/2016

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D2450 Body

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.98 S/m; εr = 52.43; ρ = 1000 kg/m3

Phantom section: Flat Section ; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

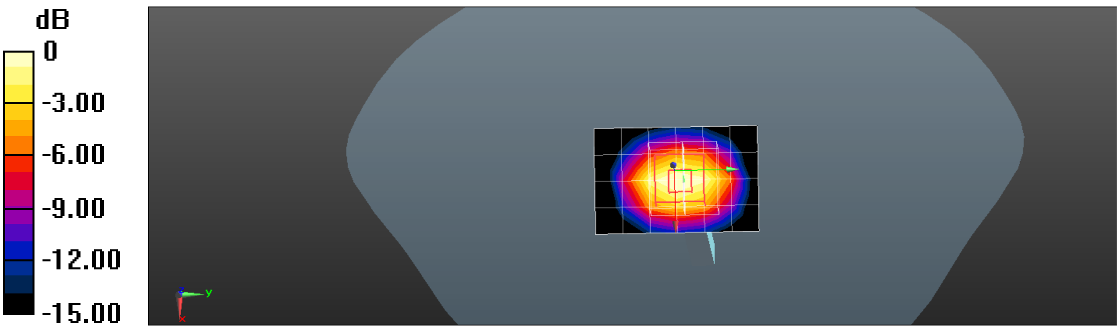
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(7.54, 7.54, 7.54); Calibrated: 2015/5/27;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/SystemPerformanceCheck-D2450 Body/Area Scan (5x7x1): Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 17.0 W/kg

Configuration/SystemPerformanceCheck-D2450 Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 89.74 V/m; Power Drift = -0.02 dB, Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 5.85 W/kg Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

Date/Time: 08/03/2016

Test Laboratory: Cerpass Lab

Dipole Calibration for Body Tissue Pin=100mW, dist=10mm, f=5200 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2

Communication System: CW; Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 5.31 S/m; εr = 49.19; ρ = 1000 kg/m3

Phantom section: Flat Section ; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

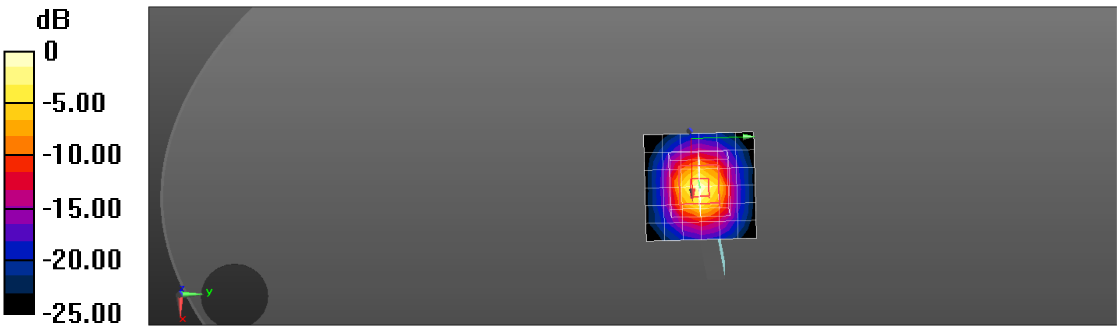
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.6, 4.6, 4.6); Calibrated: 2015/5/27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 19.8 W/kg

Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Reference Value = 41.35 V/m; Power Drift = -0.00 dB, Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 7.9 W/kg; SAR(10 g) = 2.2 W/kg Maximum value of SAR (measured) = 20.2 W/kg



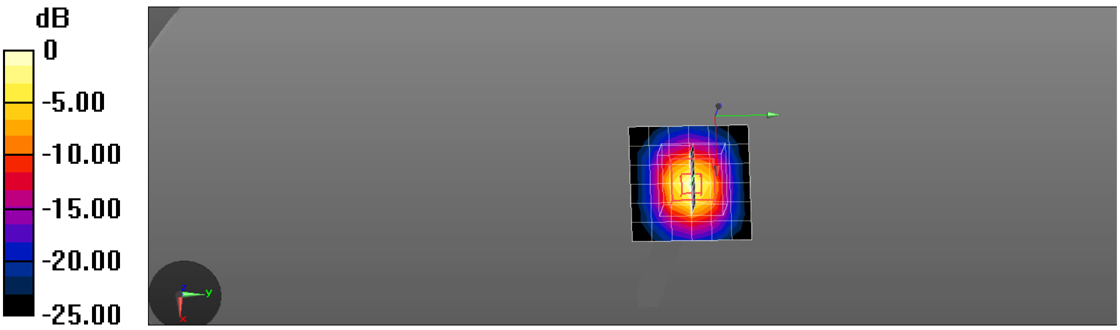
0 dB = 20.2 W/kg = 13.05 dBW/kg

Date/Time: 09/03/2016

Test Laboratory: Cerpass Lab
Dipole Calibration for Body Tissue Pin=100mW, dist=10mm, f=5600 MHz
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2
Communication System: CW; Frequency: 5600 MHz
Medium parameters used: f = 5600 MHz; σ = 5.79 S/m; εr = 48.56; ρ = 1000 kg/m3
Phantom section: Flat Section ; Meas. Ambient Temp (celsius) -22℃; Input power-250mW
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.03, 4.03, 4.03); Calibrated: 2015/5/27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 21.4 W/kg
Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Reference Value = 41.80 V/m; Power Drift = -0.08 dB, Peak SAR (extrapolated) = 39.2 W/kg
SAR(1 g) = 8.34 W/kg; SAR(10 g) = 2.32 W/kg Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

Date/Time: 10/03/2016

Test Laboratory: Cerpass Lab

Dipole Calibration for Body Tissue Pin=100mW, dist=10mm, f=5800 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2

Communication System: CW; Frequency: 5800 MHz

Medium parameters used: f = 5800 MHz; σ = 5.97 S/m; εr = 48.45; ρ = 1000 kg/m3

Phantom section: Flat Section ; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

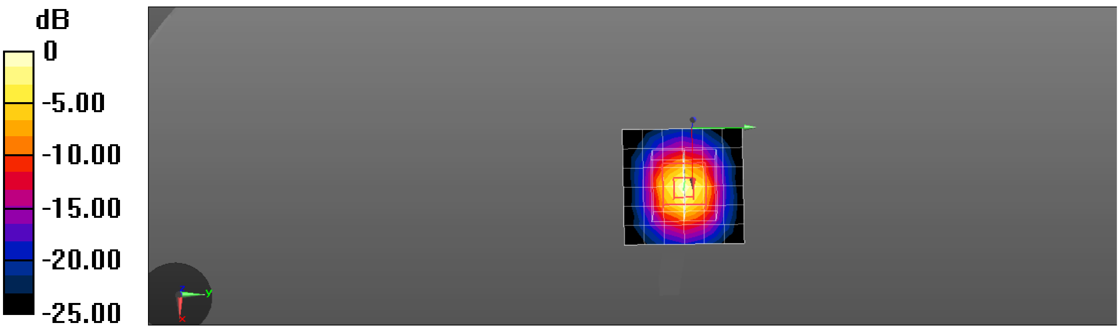
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.16, 4.16, 4.16); Calibrated: 2015/5/27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 21.0 W/kg

Configuration/Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm, Reference Value = 39.76 V/m; Power Drift = -0.07 dB, Peak SAR (extrapolated) = 38.0 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.26 W/kg Maximum value of SAR (measured) = 22.0 W/kg



0 dB = 22.0 W/kg = 13.42 dBW/kg

APPENDIX B. SAR measurement Data

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

Plot1 **Date/Time: 07/03/2016**

Test Laboratory: Cerpass Lab

DUT: Yoga 710-11IKB; Type:RTL8821AE

Procedure Name: 802.11b 2437MHz Edge-1 Aux

Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.96 S/m; εr = 52.52; ρ = 1000 kg/m3

Phantom section: Flat Section ; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

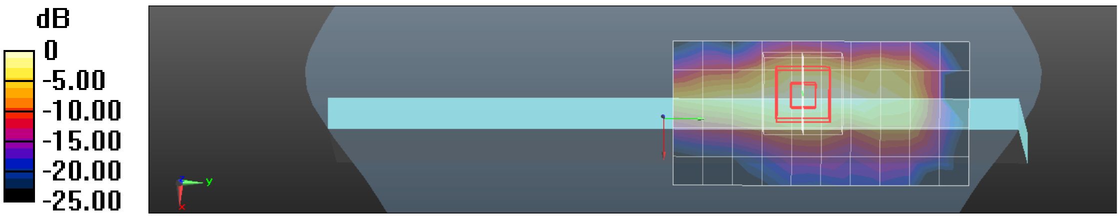
DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(7.54, 7.54, 7.54); Calibrated: 2015/5/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD
- Measurement SW: DASY52, Version 52.8 (8);

Configuration/802.11b 2437MHz Edge-1 Main/Area Scan (6x11x1): Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 1.63 W/kg

Configuration/802.11b 2437MHz Edge-1 Main/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 5.719 V/m; Power Drift = 0.13 dB, Peak SAR (extrapolated) = 2.20 W/kg

SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.545 W/kg Maximum value of SAR (measured) = 1.65 W/kg



0 dB = 1.65 W/kg = 2.17 dBW/kg

Plot2 **Date/Time: 08/03/2016**

Test Laboratory: Cerpass Lab

DUT: Yoga 710-11IKB; Type:RTL8821AE

Procedure Name: 802.11a 5180MHz tablet edge-Aux

Communication System Band: 802.11a (20MHz); Frequency: 5180 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5180 MHz; σ = 5.29 S/m; εr = 49.20; ρ = 1000 kg/m3

Phantom section: Flat Section ; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

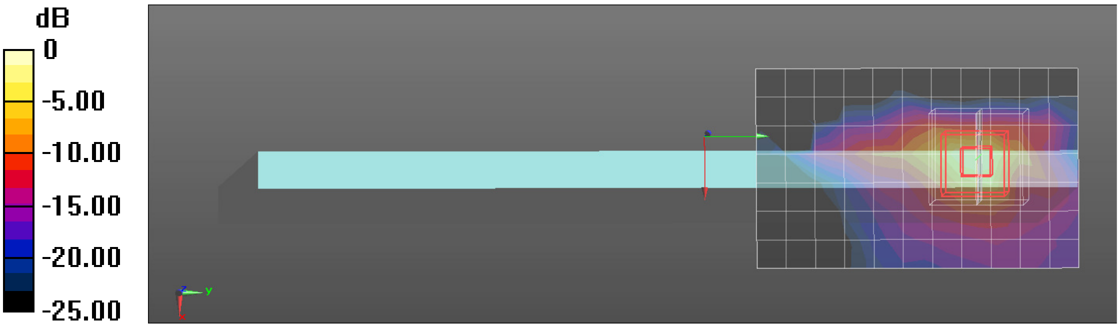
DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.6, 4.6, 4.6); Calibrated: 2015/5/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

Configuration/802.11a 5180MHz tablet edge-Aux/Area Scan (8x12x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 2.07 W/kg

Configuration/802.11a 5180MHz tablet edge-Aux/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm, Reference Value = 0.7200 V/m; Power Drift = 0.00 dB, Peak SAR (extrapolated) = 5.92 W/kg

SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.319 W/kg Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Plot3 **Date/Time: 09/03/2016**

Test Laboratory: Cerpass Lab

DUT: Yoga 710-11IKB; Type:RTL8821AE

Procedure Name: 802.11a 5580MHz tablet edge-Aux

Communication System Band: 802.11a (20MHz); Frequency: 5580 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5580 MHz; σ = 5.77 S/m; εr = 48.61; ρ = 1000 kg/m3

Phantom section: Flat Section ; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

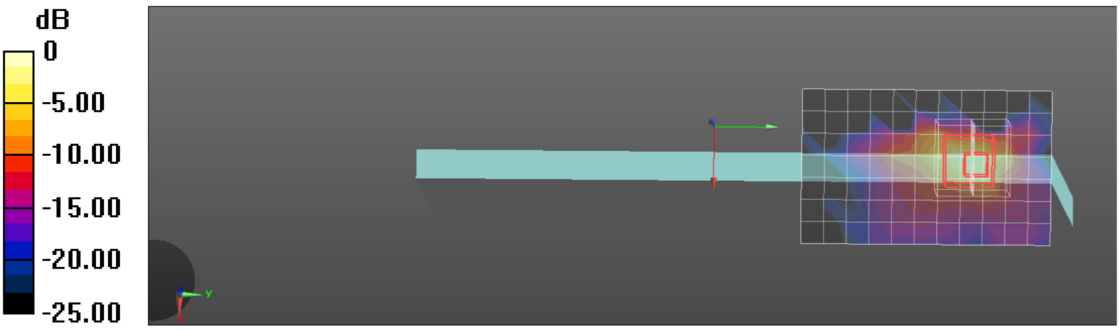
DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.03, 4.03, 4.03); Calibrated: 2015/5/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

Configuration/802.11a 5580MHz tablet edge-Aux/Area Scan (8x12x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 1.18 W/kg

Configuration/802.11a 5580MHz tablet edge-Aux/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm, Reference Value = 0 V/m; Power Drift = 0.00 dB, Peak SAR (extrapolated) = 3.45 W/kg

SAR(1 g) = 0.677 W/kg; SAR(10 g) = 0.180 W/kg Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

Plot4 **Date/Time: 10/03/2016**

Test Laboratory: Cerpass Lab

DUT: Yoga 710-11IKB; Type:RTL8821AE

Procedure Name: 802.11a 5785MHz tablet edge-Aux

Communication System Band: 802.11a (20MHz); Frequency: 5785 MHz; Duty Cycle: 1:1

Medium parameters used: f = 5785 MHz; σ = 5.95 S/m; εr = 48.49; ρ = 1000 kg/m3

Phantom section: Flat Section ; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

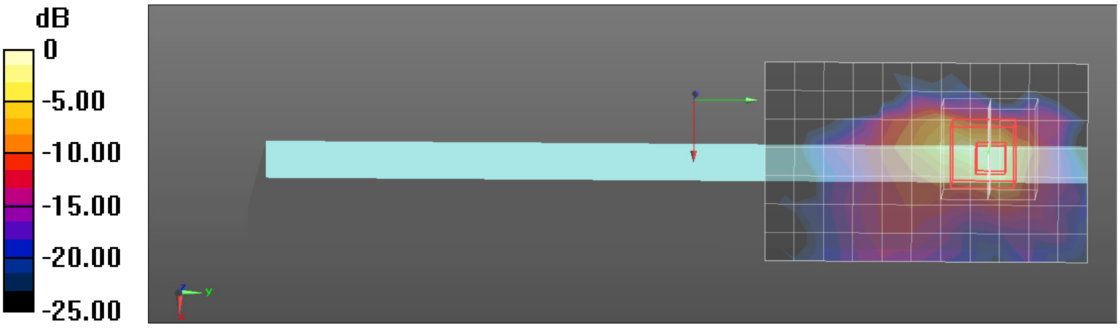
DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(4.16, 4.16, 4.16); Calibrated: 2015/5/27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2015/5/20
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

Configuration/802.11a 5785MHz tablet edge-Aux/Area Scan (8x12x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 1.18 W/kg

Configuration/802.11a 5785MHz tablet edge-Aux/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm, Reference Value = 0 V/m; Power Drift = 0.00 dB, Peak SAR (extrapolated) = 4.15 W/kg

SAR(1 g) = 0.695 W/kg; SAR(10 g) = 0.180 W/kg Maximum value of SAR (measured) = 1.69 W/kg



0 dB = 1.69 W/kg = 2.28 dBW/kg

APPENDIX C. Calibration Data for Probe, Dipole and DAE

Please refer to attached files.

APPENDIX D. Photographs of EUT and Setup

Please refer to attached files.