FCC SAR Test Report

APPLICANT	:	DELL Inc.
EQUIPMENT	:	Tablet PC
BRAND NAME	:	Dell
MODEL NAME	:	T01C; T01C003
TYPE NAME	:	T01C003
FCC ID	:	E2K-T01C003
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2003

We, SPORTON INTERNATIONAL (KUNSHAN) INC. would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC. the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory 2627

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Table of Contents

1. Statement of Compliance 4
2. Administration Data 5
3. Guidance Standard 5
4. Equipment Under Test (EUT) 6
4.1 General Information 6
4.2 Maximum Tune-up Limit 7
5. RF Exposure Limits 8
5.1 Uncontrolled Environment 8
5.2 Controlled Environment 8
6. Specific Absorption Rate (SAR) 9
6.1 Introduction 9
6.2 SAR Definition 9
7. System Description and Setup 10
8. Measurement Procedures 11
8.1 Spatial Peak SAR Evaluation 11
8.2 Power Reference Measurement 12
8.3 Area Scan 12
8.4 Zoom Scan 13
8.5 Volume Scan Procedures 13
8.6 Power Drift Monitoring 13
9. Test Equipment List 14
10. System Verification 15
10.1 Tissue Verification 15
10.2 System Performance Check Results 16
11. RF Exposure Positions 17
11.1 SAR Testing for Tablet 17
12. Conducted RF Output Power (Unit: dBm) 18
13. Bluetooth Exclusions Applied 23
14. Antenna Location 24
15. SAR Test Results 26
15.1 Body SAR 26
15.2 Repeated SAR Measurement 28
16. Simultaneous Transmission Analysis 29
17. Uncertainty Assessment 30
18. References 33
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA422417	Rev. 01	Initial issue of report	May 27, 2014

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **DELL Inc., Tablet PC, T01C; T01C003**, are as follows.

Equipment Class	Frequency Band	Operating Mode	Highest SAR Summary Body 1g SAR (W/kg) (0cm Gap)
DTS	WLAN 2.4GHz Band	Data	0.85
	WLAN 5.8GHz Band	Data	**1.41**
NII	WLAN 5.2GHz Band	Data	1.47
	WLAN 5.3GHz Band	Data	**1.48**
	WLAN 5.5GHz Band	Data	1.47
DSS	Bluetooth	Data	
Date of Testing:		04/21/2014 ~ 05/06/2014	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958

Applicant	
Company Name	DELL Inc.
Address	One Dell Way, Round Rock, Texas 78682, United States

Manufacturer	
Company Name	DELL Inc.
Address	One Dell Way, Round Rock, Texas 78682, United States

3. Guidance Standard

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 644545 D01 Guidance for IEEE 802 11ac v01r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r01

4. Equipment Under Test (EUT)

4.1 General Information

Product Feature & Specification	
Equipment Name	Tablet PC
Brand Name	Dell
Model Name	T01C; T01C003
Type Name	T01C003
FCC ID	E2K-T01C003
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	・802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 ・Bluetooth v3.0+EDR, Bluetooth v4.0 LE
HW Version	P708-B1-BOT
SW Version	YTP802A110830
EUT Stage	Identical Prototype
Remark: 1. Voice call is not supported. 2. WLAN operation in 5600 MHz ~ 5650 MHz is notched.	

4.2 Maximum Tune-up Limit

Band	Average Power (dBm)							
	IEEE 802.11							
	11a	11b	11g	11n-HT20	11n-HT40	ac-VHT20	ac-VHT40	ac-VHT80
WLAN 2.4GHz Band		14.5	13	11	11.5			
WLAN 5.3GHz Band	12			12.5	13	12	12.5	13
WLAN 5.8GHz Band	13			12.5	12.5	12	12	12

Band	Average Power (dBm)					
WLAN 5.2GHz Band	IEEE 802.11					
Channel	11a	11n-HT20	11n-HT40	ac-VHT20	ac-VHT40	ac-VHT80
CH 36	12	12.5		13		
CH 38			11		13.5	
CH 40	12	12.5		13		
CH 42						13.5
CH 44	12.5	12.5		13		
CH 46			13.5		13.5	
CH 48	13.5	12.5		13		

Band	Average Power (dBm)					
WLAN 5.5GHz Band	IEEE 802.11					
Channel	11a	11n-HT20	11n-HT40	ac-VHT20	ac-VHT40	ac-VHT80
CH 100	12.5	10.5		11		
CH 102			7.5		7.5	
CH 104	12.5	10.5		11		
CH 106						11
CH 108	12.5	10.5		11		
CH 110			11		11	
CH 112	12.5	10.5		11		
CH 116	12.5	10.5		11		
CH 134			11		11	
CH 136	12.5	10.5		11		
CH 138						11
CH 140	12.5	10.5		7		

Mode / Band	Bluetooth	
	Bluetooth v3.0 + EDR	Bluetooth v4.0 LE
2.4GHz Bluetooth	3	1.5

5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

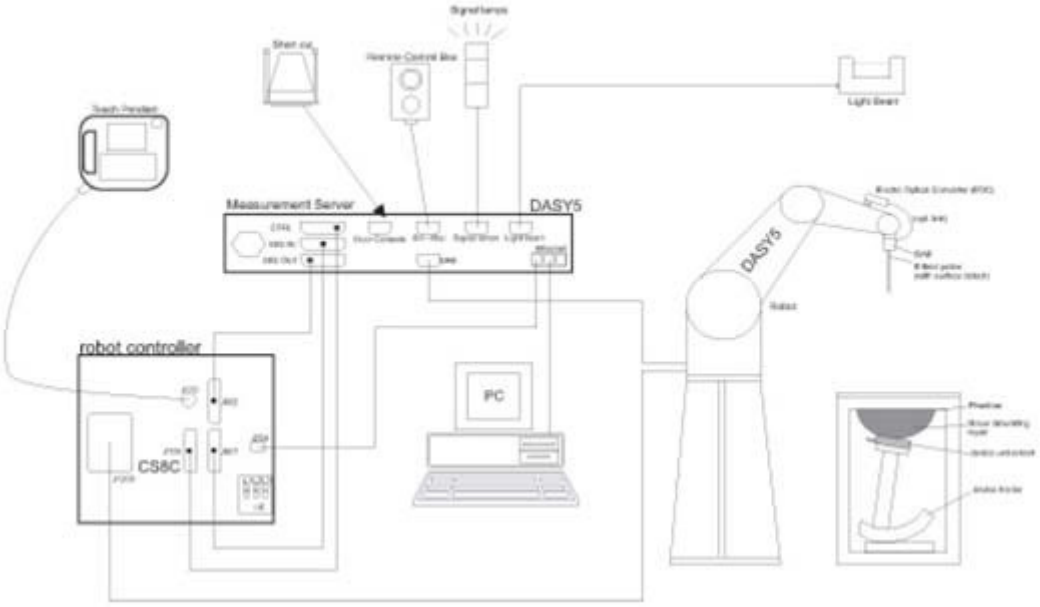
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(b) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

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

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

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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 Power Reference Measurement

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

8.3 Area Scan

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

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	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.	

8.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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 *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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.

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	736	Aug. 23, 2013	Aug. 22, 2014
SPEAG	5000MHz System Validation Kit	D5000V2	1006	Sep. 23, 2013	Sep. 22, 2014
SPEAG	Data Acquisition Electronics	DAE4	1210	Jun. 19, 2013	Jun. 18, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	Jun. 20, 2013	Jun. 19, 2014
SPEAG	ELI4 Phantom	QD OVA 001 BB	1079	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	May 24, 2013	May 23, 2014
Agilent	Dielectric Probe Kit	85070E	MY44300475	NCR	NCR
Agilent	Signal Generator	E4438C	MY49070755	Oct. 08, 2013	Oct. 07, 2014
Anritsu	Power Senor	MA2411B	0917070	Feb. 27, 2014	Feb. 26, 2015
Anritsu	Power Meter	ML2495A	1005002	Feb. 27, 2014	Feb. 26, 2015
ARRA	Power Divider	A3200-2	N/A	NA	NA
R&S	Spectrum Analyzer	FSP30	101399	May 23, 2013	May 22, 2014
Agilent	Dual Directional Coupler	778D	50422	*CBT	
Woken	Attenuator	WK0602-XX	N/A	*CBT	
PE	Attenuator	PE7005-10	N/A	*CBT	
PE	Attenuator	PE7005- 3	N/A	*CBT	
AR	Power Amplifier	5S1G4M2	0328767	*CBT	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	*CBT	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	*CBT	

General Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. *CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing an amplifier, coupler and attenuator were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurement.

10. System Verification

10.1 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
2450	68.6	0	0	0	0	31.4	1.95	52.7

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	Body	22.7	1.941	50.933	1.95	52.7	-0.46	-3.35	±5	2014/4/21
5200	Body	22.8	5.264	48.303	5.30	49.0	-0.68	-1.42	±5	2014/5/6
5300	Body	22.8	5.404	48.094	5.42	48.9	-0.30	-1.65	±5	2014/5/6
5600	Body	22.9	5.834	47.448	5.77	48.5	1.11	-2.17	±5	2014/5/6
5800	Body	22.8	6.096	46.929	6.00	48.2	1.60	-2.64	±5	2014/5/6

10.2 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2014/4/21	2450	Body	250	736	3857	1210	12.70	51.3	50.8	-0.97
2014/5/6	5200	Body	100	1006	3857	1210	7.30	71.5	73.0	2.10
2014/5/6	5300	Body	100	1006	3857	1210	7.19	75.2	71.9	-4.39
2014/5/6	5600	Body	100	1006	3857	1210	7.56	77.8	75.6	-2.83
2014/5/6	5800	Body	100	1006	3857	1210	7.27	72.3	72.7	0.55

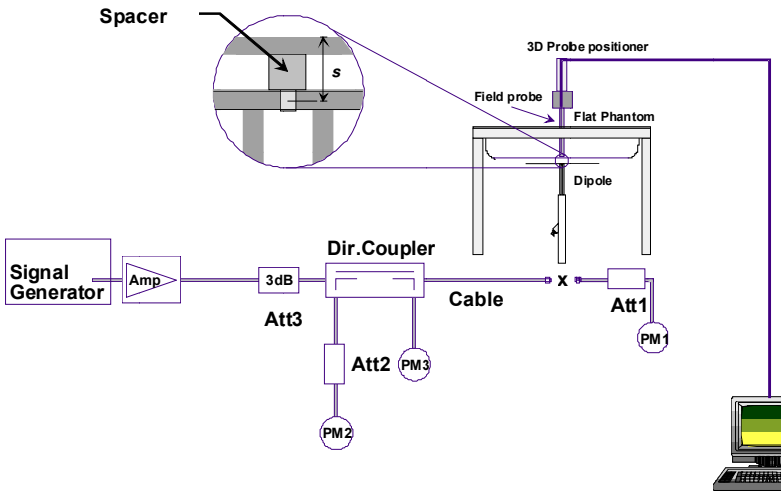


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v05r02 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

12. Conducted RF Output Power (Unit: dBm)

<WLAN Conducted Power>

General Note:

1. For IEEE802.11a/b/g SAR testing, highest average RF output power channel for the lowest data rate for 802.11b and 802.11a were selected for SAR evaluation. 802.11g were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.
2. For IEEE802.11n/ac, SAR testing can be conducted on channel with the highest output power when taking into consideration tune-up tolerance for same test configuration that was identified during SAR evaluations for IEEE802.11a/b/g (as applicable) provided bandwidth and test position are the same.
3. For IEEE802.11n/ac with multiple channel BW configurations, highest channel BW configuration with highest output power limit shall be tested.
4. Testing of lower BW configurations is not required when the maximum average output of the default test channels in each lower BW configuration is less than 1/4dB higher than the default test channel in the highest BW configuration.

<2.4GHz WLAN>

WLAN 2.4GHz 802.11b Average Power (dBm)					
Power vs. Channel			Power vs. Data Rate		
Channel	Frequency (MHz)	Data Rate 1Mbps	2Mbps	5.5Mbps	11Mbps
CH 1	2412	13.53	14.02	14.10	14.08
CH 6	2437	13.76			
CH 11	2462	**14.11**			

WLAN 2.4GHz 802.11g Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate 6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 1	2412	12.11	12.42	12.40	12.33	12.34	12.32	12.39	12.36
CH 6	2437	12.19							
CH 11	2462	**12.45**							

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 1	2412	10.46	10.69	10.71	10.61	10.74	10.77	10.66	10.67
CH 6	2437	10.60							
CH 11	2462	**10.78**							

WLAN 2.4GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 3	2422	10.97	11.19	11.21	11.14	11.20	11.14	11.05	11.06
CH 6	2437	11.06							
CH 9	2452	**11.23**							

<5GHz WLAN>

WLAN 5GHz 802.11a Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate 6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 36	5180	11.64	12.32	12.15	12.11	12.09	11.86	11.94	11.53
CH 40	5200	11.56							
CH 44	5220	11.84							
CH 48	5240	**12.96**							
CH 52	5260	11.72	11.78	11.72	11.66	11.66	11.71	11.81	11.59
CH 56	5280	11.71							
CH 60	5300	11.62							
CH 64	5320	**11.82**							
CH 100	5500	**12.34**	12.27	12.33	12.16	12.01	12.17	12.14	11.99
CH 104	5520	11.97							
CH 108	5540	12.18							
CH 112	5560	12.12							
CH 116	5580	12.31							
CH 136	5680	11.79							
CH 140	5700	11.92							
CH 149	5745	**12.38**	12.11	11.94	11.96	11.90	11.88	11.99	11.38
CH 153	5765	12.31							
CH 157	5785	12.31							
CH 161	5805	12.30							
CH 165	5825	12.37							

WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 36	5180	12.02	12.01	12.09	11.99	12.20	12.16	12.19	11.71
CH 40	5200	11.95							
CH 44	5220	12.05							
CH 48	5240	**12.29**							
CH 52	5260	11.99	11.90	11.88	11.80	11.98	12.01	11.91	11.43
CH 56	5280	11.92							
CH 60	5300	11.94							
CH 64	5320	**12.05**							
CH 100	5500	**10.29**	10.11	10.08	10.19	10.10	10.23	10.18	10.28
CH 104	5520	9.93							
CH 108	5540	10.13							
CH 112	5560	9.95							
CH 116	5580	10.03							
CH 136	5680	9.96							
CH 140	5700	6.58							
CH 149	5745	12.12	12.34	12.32	12.29	12.35	12.36	12.08	12.26
CH 153	5765	12.25							
CH 157	5785	**12.38**							
CH 161	5805	12.35							
CH 165	5825	12.37							

WLAN 5GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 38	5190	10.78	12.54	12.72	12.52	12.73	12.90	12.81	12.82
CH 46	5230	**13.16**							
CH 54	5270	12.36	12.45	12.46	12.32	12.39	12.47	12.54	12.54
CH 62	5310	**12.61**							
CH 102	5510	7.06	10.76	10.70	10.72	10.75	10.67	10.73	10.71
CH 110	5550	10.44							
CH 114	5570	10.62							
CH 134	5670	**10.82**							
CH 151	5755	11.77	12.04	12.05	11.98	12.14	12.21	12.11	11.67
CH 159	5795	**12.29**							

WLAN 5GHz 802.11ac-VHT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
CH 36	5180	12.29	12.16	12.21	12.28	12.35	12.43	12.34	12.24	12.29
CH 40	5200	12.05								
CH 44	5220	12.19								
CH 48	5240	**12.46**								
CH 52	5260	11.72	11.64	11.72	11.59	11.64	11.71	11.60	11.44	11.52
CH 56	5280	**11.78**								
CH 60	5300	11.68								
CH 64	5320	11.71								
CH 100	5500	**10.40**	10.22	10.32	10.34	10.22	10.24	10.13	10.05	10.11
CH 104	5520	10.32								
CH 108	5540	10.26								
CH 112	5560	10.15								
CH 116	5580	10.29								
CH 136	5680	10.00								
CH 140	5700	6.65								
CH 149	5745	**11.42**	11.27	11.14	10.90	11.06	11.12	11.18	11.16	11.14
CH 153	5765	11.19								
CH 157	5785	11.38								
CH 161	5805	11.35								
CH 165	5825	11.40								

WLAN 5GHz 802.11ac-VHT40 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index / MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 38	5190	12.84	12.65	12.86	12.73	12.75	12.96	12.93	12.85	12.95	12.83
CH 46	5230	**13.16**									
CH 54	5270	11.91	11.92	11.96	11.49	11.72	11.81	11.77	11.67	11.74	11.56
CH 62	5310	**12.03**									
CH 102	5510	6.83	9.79	9.66	9.64	9.71	9.62	9.62	9.83	9.82	9.61
CH 110	5550	10.03									
CH 114	5570	10.11									
CH 134	5670	**10.15**									
CH 151	5755	11.64	11.49	11.66	11.25	11.63	11.65	11.56	11.47	11.64	11.64
CH 159	5795	**11.77**									

WLAN 5GHz 802.11ac-VHT80 Average Power (dBm)										
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index / MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 42	5210	**13.29**	12.46	12.73	12.55	12.89	12.84	12.67	12.74	12.67	12.64
CH 58	5290	**12.55**	12.55	12.40	12.12	12.48	12.40	12.40	12.51	12.31	12.55
CH 106	5530	**10.45**	10.37	10.42	10.43	10.41	10.44	10.26	10.36	10.30	10.42
CH 138	5690	10.31									
CH 155	5775	**11.83**	11.56	11.81	11.41	11.66	11.64	11.21	11.01	10.49	10.35

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0 LE
2.4GHz Bluetooth	3	1.5

Note:

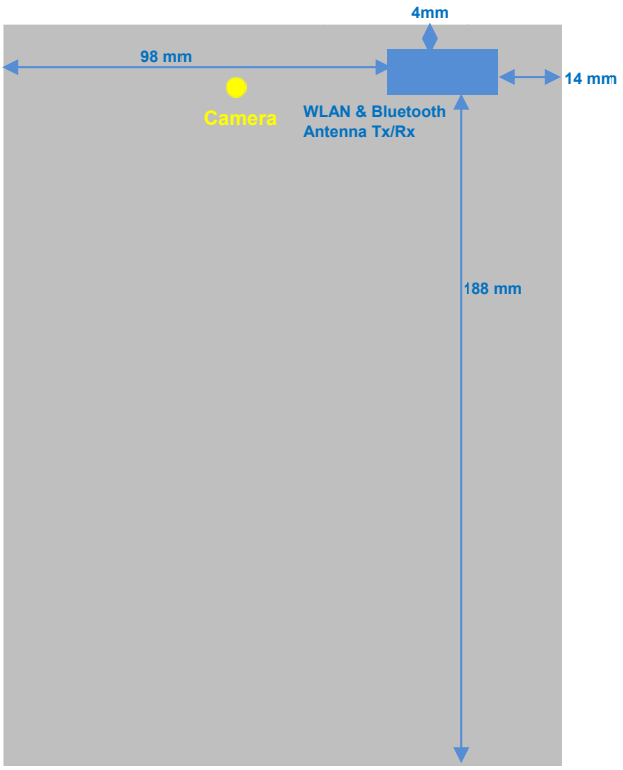
1. Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
3	0	2.48	0.63

Note: Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.63 which is <= 3, SAR testing is not required.

14. Antenna Location

Edge1



Edge2

Edge4

Edge3

Back View

Diagonal: 215mm

General Note:

1. Above the table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v05r02, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v05r02, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
   - For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare. This formula is [3.0] / [√f(GHz)] ·[(*min. test separation distance, mm*)] = exclusion threshold of mW.
6. Per KDB 447498 D01v05r02, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

SAR test exclusion table distance is ≤ 50mm

Exposure Position	Wireless Interface	WLAN2.4GHz	WLAN5.2GHz	WLAN5.3GHz	WLAN5.5GHz	WLAN5.8GHz
	Calculated Frequency (MHz)	2462	5240	5320	5700	5825
	Tune-up Maximum power (dBm)	14.5	13.5	13	12.5	13
Bottom Face	Antenna to user (mm)	0	0	0	0	0
	SAR exclusion threshold	9	7	10	10	10
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge1	Antenna to user (mm)	4	4	4	4	4
	SAR exclusion threshold	9	7	10	10	10
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge4	Antenna to user (mm)	14	14	14	14	14
	SAR exclusion threshold	3	2	3	3	3
	SAR testing required?	**No**	**No**	**No**	**No**	**No**

SAR test exclusion table distance is > 50mm

Exposure Position	Wireless Interface	WLAN2.4GHz	WLAN5.2GHz	WLAN5.3GHz	WLAN5.5GHz	WLAN5.8GHz
	Calculated Frequency (MHz)	2462	5240	5320	5700	5825
	Tune-up Maximum power (dBm)	14.5	13.5	13	12.5	13
	Tune-up Maximum rated power (mW)	28	22	20	18	20
Edge2	Antenna to user (mm)	98	98	98	98	98
	SAR exclusion threshold (mW)	576	546	545	543	542
	SAR testing required?	**No**	**No**	**No**	**No**	**No**
Edge3	Antenna to user (mm)	188	188	188	188	188
	SAR exclusion threshold (mW)	1476	1446	1445	1443	1442
	SAR testing required?	**No**	**No**	**No**	**No**	**No**

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

15.1 Body SAR

<DTS WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN 2.4GHz	802.11b	Bottom Face	0	11	2462	1M	14.11	14.5	1.094	-	-	0.05	0.634	0.694
#01	**WLAN 2.4GHz**	**802.11b**	**Edge1**	**0**	**11**	**2462**	**1M**	**14.11**	**14.5**	**1.094**	-	-	**0.11**	**0.779**	**0.852**
	WLAN 2.4GHz	802.11b	Edge1	0	1	2412	1M	13.53	14.5	1.250	-	-	0.06	0.502	0.628
	WLAN 2.4GHz	802.11b	Edge1	0	6	2437	1M	13.76	14.5	1.186	-	-	-0.02	0.640	0.759
	WLAN 2.4GHz	802.11n_HT40	Edge1	0	9	2452	MCS0	11.23	11.5	1.064	86.89	1.151	0.05	0.278	0.341
	WLAN 5.8GHz	802.11a	Bottom Face	0	149	5745	6M	12.38	13	1.153	93.96	1.064	0.05	0.358	0.439
	WLAN 5.8GHz	802.11a	Edge1	0	149	5745	6M	12.38	13	1.153	93.96	1.064	-0.04	1.110	1.362
	WLAN 5.8GHz	802.11a	Edge1	0	157	5785	6M	12.31	13	1.172	93.96	1.064	0.14	1.010	1.260
	WLAN 5.8GHz	802.11a	Edge1	0	165	5825	6M	12.37	13	1.156	93.96	1.064	0.05	1.050	1.292
	WLAN 5.8GHz	802.11n _HT40	Edge1	0	159	5795	MCS0	12.29	12.5	1.050	86.53	1.156	0.06	1.160	1.407
#02	**WLAN 5.8GHz**	**802.11n _HT40**	**Edge1**	**0**	**151**	**5755**	**MCS0**	**11.77**	**12.5**	**1.183**	**86.53**	**1.156**	**0.03**	**1.030**	**1.409**
	WLAN 5.8GHz	802.11ac _VTH80	Edge1	0	155	5775	MCS0	11.83	12	1.040	76.96	1.299	0.12	0.988	1.335

<UNII WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN 5.2GHz	802.11a	Bottom Face	0	48	5240	6M	12.96	13.5	1.132	93.96	1.064	0.05	0.374	0.451
	WLAN 5.2GHz	802.11a	Edge1	0	48	5240	6M	12.96	13.5	1.132	93.96	1.064	0.04	1.150	1.386
	WLAN 5.2GHz	802.11a	Edge1	0	36	5180	6M	11.64	12	1.086	93.96	1.064	-0.04	1.080	1.248
	WLAN 5.2GHz	802.11n _HT40	Edge1	0	46	5230	MCS0	13.16	13.5	1.081	86.53	1.156	-0.04	1.150	1.438
	WLAN 5.2GHz	802.11n _HT40	Edge1	0	38	5190	MCS0	10.78	11	1.052	86.53	1.156	0.11	0.880	1.070
#03	**WLAN 5.2GHz**	**802.11ac _VTH80**	**Edge1**	**0**	**42**	**5210**	**MCS0**	**13.29**	**13.5**	**1.050**	**76.96**	**1.299**	**-0.12**	**1.080**	**1.472**
	WLAN 5.3GHz	802.11a	Bottom Face	0	64	5320	6M	11.82	12	1.042	93.96	1.064	-0.04	0.421	0.467
	WLAN 5.3GHz	802.11a	Edge1	0	64	5320	6M	11.82	12	1.042	93.96	1.064	0.06	1.110	1.231
	WLAN 5.3GHz	802.11a	Edge1	0	52	5260	6M	11.72	12	1.067	93.96	1.064	0.04	1.090	1.237
#04	**WLAN 5.3GHz**	**802.11n _HT40**	**Edge1**	**0**	**62**	**5310**	**MCS0**	**12.61**	**13**	**1.094**	**86.53**	**1.156**	**0.08**	**1.170**	**1.480**
	WLAN 5.3GHz	802.11n _HT40	Edge1	0	54	5270	MCS0	12.36	13	1.159	86.53	1.156	0.07	1.100	1.474
	WLAN 5.3GHz	802.11ac _VTH80	Edge1	0	58	5290	MCS0	12.55	13	1.109	76.96	1.299	0.11	0.937	1.350
	WLAN 5.5GHz	802.11a	Bottom Face	0	100	5500	6M	12.34	12.5	1.038	93.96	1.064	0.06	0.692	0.764
	WLAN 5.5GHz	802.11a	Edge1	0	100	5500	6M	12.34	12.5	1.038	93.96	1.064	0.07	1.290	1.424
	WLAN 5.5GHz	802.11a	Bottom Face	0	116	5580	6M	12.31	12.5	1.045	93.96	1.064	0.08	0.568	0.631
	WLAN 5.5GHz	802.11a	Bottom Face	0	140	5700	6M	11.92	12.5	1.143	93.96	1.064	0.06	0.400	0.486
#05	**WLAN 5.5GHz**	**802.11a**	**Edge1**	**0**	**116**	**5580**	**6M**	**12.31**	**12.5**	**1.045**	**93.96**	**1.064**	**0.02**	**1.320**	**1.467**
	WLAN 5.5GHz	802.11a	Edge1	0	140	5700	6M	11.92	12.5	1.143	93.96	1.064	-0.08	1.080	1.313
	WLAN 5.5GHz	802.11n _HT40	Edge1	0	102	5510	MCS0	7.06	7.5	1.107	86.53	1.156	0.04	0.478	0.611
	WLAN 5.5GHz	802.11n _HT40	Edge1	0	110	5550	MCS0	10.44	11	1.138	86.53	1.156	0.01	0.994	1.307
	WLAN 5.5GHz	802.11n _HT40	Edge1	0	134	5670	MCS0	10.82	11	1.042	86.53	1.156	0.1	0.954	1.149
	WLAN 5.5GHz	802.11ac _VTH80	Edge1	0	106	5530	MCS0	10.45	11	1.135	76.96	1.299	0.02	0.852	1.256
	WLAN 5.5GHz	802.11ac _VTH80	Edge1	0	138	5690	MCS0	10.31	11	1.172	76.96	1.299	0.18	0.806	1.227

15.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN 5.2GHz	802.11a	Edge1	0	48	5240	6M	12.96	13.5	1.132	93.96	1.064	0.04	1.150	1	1.386
2nd	WLAN 5.2GHz	802.11a	Edge1	0	48	5240	6M	12.96	13.5	1.132	93.96	1.064	0.07	1.120	1.027	1.349
1st	WLAN 5.3GHz	802.11n _HT40	Edge1	0	62	5310	MCS0	12.61	13	1.094	86.53	1.156	0.08	1.170	1	1.480
2nd	WLAN 5.3GHz	802.11n _HT40	Edge1	0	62	5310	MCS0	12.61	13	1.094	86.53	1.156	0.10	1.110	1.054	1.404
1st	WLAN 5.5GHz	802.11a	Edge1	0	116	5580	6M	12.31	12.5	1.045	93.96	1.064	0.02	1.320	1	1.467
2nd	WLAN 5.5GHz	802.11a	Edge1	0	116	5580	6M	12.31	12.5	1.045	93.96	1.064	0.04	1.300	1.015	1.445
1st	WLAN 5.8GHz	802.11n _HT40	Edge1	0	159	5795	MCS0	12.29	12.5	1.050	86.53	1.156	0.06	1.160	1	1.407
2nd	WLAN 5.8GHz	802.11n _HT40	Edge1	0	159	5795	MCS0	12.29	12.5	1.050	86.53	1.156	0.01	1.080	1.074	1.310

General Note:

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations
1.	None

General Note:

1. WLAN2.4GHz and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. The Reported SAR summation is calculated based on the same configuration and test position.

Test Engineer： Fulu Hu

17. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[a]	1/k[b]	1/√3	1/√6	1/√2

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

(b) κ is the coverage factor

Table 17.1. Standard Uncertainty for Assumed Distribution

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

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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 22.0 %**	**± 21.5 %**

Table 17.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	1	± 5.7 %	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 12.8 %	± 12.6 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 25.6 %**	**± 25.2 %**

Table 17.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

18. References

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

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

[3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] SPEAG DASY System Handbook

[5] FCC KDB 447498 D01 v05r02, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Feb 2014

[6] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[7] FCC KDB 644545 D01 v01r02, "Guidance for IEEE 802.11ac and Pre-ac Device Emission Testing", October, 2013.

[8] FCC KDB 616217 D04 v01r01, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, May 2013

[9] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014.

[10] FCC KDB 865664 D02 v01r01, “RF Exposure Compliance Reporting and Documentation Considerations” May 2013.