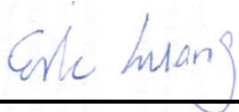


# FCC SAR Test Report

APPLICANT : Quanta Computer Inc.  
EQUIPMENT : Clover Mobile WiFi  
BRAND NAME : Clover  
MODEL NAME : C200  
FCC ID : HFS-C200  
STANDARD : FCC 47 CFR Part 2 (2.1093)  
ANSI/IEEE C95.1-1992  
IEEE 1528-2003

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in 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 INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Deputy Manager



Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

**No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan R.O.C.**



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**1. Statement of Compliance**

The maximum results of Specific Absorption Rate (SAR) found during testing for **Quanta Computer Inc., Clover Mobile WiFi, C200**, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary			
		Body 1g SAR (W/kg)	Extremity 10g SAR (W/kg)	Simultaneous Transmission 1g SAR (W/kg)	Simultaneous Transmission 10g SAR (W/kg)
DTS	2.4GHz WLAN	1.05	0.21	1.05	0.38
NII	5.2GHz WLAN	1.30	0.25	1.29	0.45
	5.3GHz WLAN	<b>1.29</b>	0.13		
	5.5GHz WLAN	1.27	0.12		
	5.8GHz WLAN	1.17	0.09		
DSS	Bluetooth	0.26	0.02	1.16	1.28
Date of Testing:		2014/11/18~2014/12/13			

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Body SAR, 4.0W/kg for Extremity SAR) 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 INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Quanta Computer Inc.
Address	No.188, Wen Hwa 2nd Rd., Kuei Shan Hsiang, Tao Yuan Shien, Taiwan, R.O.C.

Manufacturer	
Company Name	Quanta Computer Inc.
Address	No.188, Wen Hwa 2nd Rd., Kuei Shan Hsiang, Tao Yuan Shien, Taiwan, R.O.C.



### 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 616217 D04 SAR for laptop and tablets v01r01

### 4. Equipment Under Test (EUT)

#### 4.1 General Information

Product Feature & Specification	
Equipment Name	Clover Mobile WiFi
Brand Name	Clover
Model Name	C200
FCC ID	HFS-C200
IMEI Code	866274011678509
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 NFC : 13.56 MHz
Mode	• 802.11a/b/g/n HT20/HT40 • Bluetooth v2.1+EDR , Bluetooth v4.0-LE • NFC:ASK
EUT Stage	Identical Prototype
<b>Remark:</b>	
1. 802.11n-HT40 is not supported in 2.4GHz WLAN.	

#### 4.2 Maximum Tune-up Limit

Mode / Band	Average Power (dBm)			
	1Mbps	2Mbps	3Mbps	BT4.0-LE
Bluetooth	11.00	8.00	8.00	9.00

Band / Frequency (MHz)	IEEE 802.11 Average Power (dBm)						
	Main			Aux.			MIMO
	11b	11g	HT20	11b	11g	HT20	HT20
2.4GHz Band	16.00	16.00	15.00	16.00	15.00	15.00	17.50



Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)										
		Ant 0			Ant 1			Ant 0+1				
		11a	HT20	HT40	11a	HT20	HT40	HT20	HT40			
5.2GHz Band	5180	15.00	13.00	13.50	15.00	13.00	13.00	16.00	16.00			
	5190											
	5200				15.00							
	5210											
	5220				15.50							
	5230											
5.3GHz Band	5240	14.50	13.00	13.00	15.00	13.00	13.00	16.00	16.00			
	5260											
	5270											
	5280				15.50							
	5290											
	5300				15.00							
5.5GHz Band	5310	14.00	13.00	12.00		13.50	12.00	16.00				
	5320				15.00							
	5500								14.50		16.50	
	5510											16.50
	5520											
	5530											
	5540											
	5550											16.50
	5560											
	5580										15.00	
	5600										14.50	
	5610											
	5620											
	5630											16.00
	5640											
5660				14.00								
5670												
5680												
5690												
5700												
5.8GHz Band	5745	14.00	13.00	12.00	14.00	13.00	12.00	15.00	15.50			
	5755											
	5765							16.00				
	5775											
	5785							15.00				
	5795											
	5805							16.00				
	5825							15.00				



**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 ( $\rho$ ). The equation description is as below:

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

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

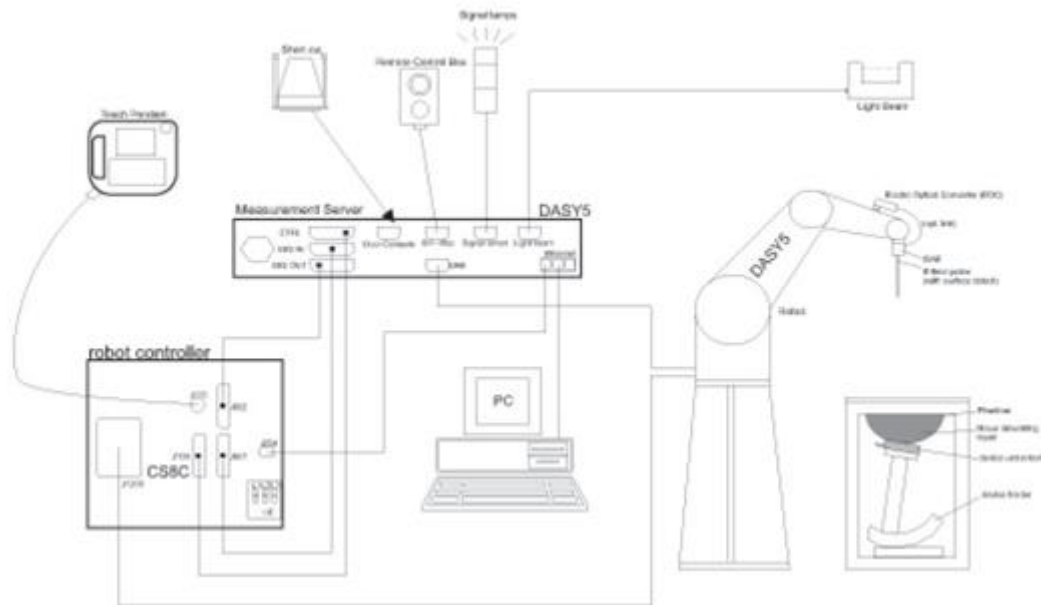
$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  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 WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) 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
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

### <SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and 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 from 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$	≤ 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: $\Delta x_{Zoom}, \Delta y_{Zoom}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ mm
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ 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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.				

**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 DASYS 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	869	Jun. 13, 2014	Jun. 12, 2015
SPEAG	2450MHz System Validation Kit	D2450V2	924	Nov. 19, 2014	Nov. 18, 2015
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Sep. 25, 2014	Sep. 24, 2015
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 21, 2014	Aug. 20, 2015
SPEAG	Data Acquisition Electronics	DAE4	1388	Sep. 24, 2014	Sep. 23, 2015
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 13, 2014	Nov. 12, 2015
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 26, 2014	Sep. 25, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3955	Nov. 21, 2014	Nov. 20, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3578	Jun. 24, 2014	Jun. 23, 2015
Wisewind	Thermometer	HTC-1	TM642	Oct. 21, 2014	Oct. 20, 2015
Wisewind	Thermometer	HTC-1	TM281	Oct. 21, 2014	Oct. 20, 2015
H.M.IRIS	Thermometer	TH-08	TM658	Oct. 21, 2014	Oct. 20, 2015
SPEAG	Device Holder	N/A	N/A	NCR	NCR
R&S	Signal Generator	SMU200A	102502	Jul. 07, 2014	Jul. 06, 2015
SPEAG	Dielectric Probe Kit	DAKS-3.5	0004	Mar. 04, 2014	Mar. 03, 2015
Agilent	ENA Network Analyzer	E5071C	MY46101588	May. 31, 2014	May. 30, 2015
Anritsu	Power Meter	ML2495A	1036004	Aug. 09, 2014	Aug. 08, 2015
Anritsu	Power Sensor	MA2411B	1027253	Aug. 11, 2014	Aug. 10, 2015
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 10, 2014	Jul. 09, 2015
Agilent	Dual Directional Coupler	778D	50422	Note1	
Woken	Attenuator 1	WK0602-XX	N/A	Note1	
PE	Attenuator 2	PE7005-10	N/A	Note1	
PE	Attenuator 3	PE7005- 3	N/A	Note1	
AR	Power Amplifier	5S1G4M2	0328767	Note1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note1	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	Note1	

**General Note:**

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



## 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 ( $\sigma$ )	Permittivity ( $\epsilon_r$ )
<b>For Head</b>								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
<b>For Body</b>								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

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%

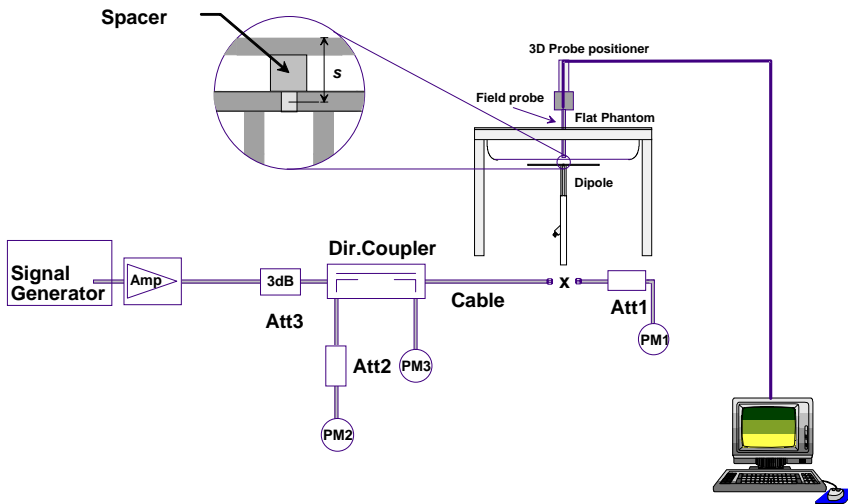
### <Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity ( $\sigma$ )	Permittivity ( $\epsilon_r$ )	Conductivity Target ( $\sigma$ )	Permittivity Target ( $\epsilon_r$ )	Delta ( $\sigma$ ) (%)	Delta ( $\epsilon_r$ ) (%)	Limit (%)	Date
2450	MSL	22.6	2.010	53.813	1.95	52.70	3.08	2.11	±5	2014/11/18
2450	MSL	22.6	2.034	55.021	1.95	52.70	4.31	4.40	±5	2014/12/13
5200	MSL	22.2	5.336	47.488	5.30	49.00	0.68	-3.09	±5	2014/12/11
5300	MSL	22.2	5.478	47.222	5.42	48.90	1.07	-3.43	±5	2014/12/11
5600	MSL	22.2	5.881	46.699	5.77	48.50	1.92	-3.71	±5	2014/12/11
5600	MSL	22.3	5.955	47.704	5.77	48.50	3.21	-1.64	±5	2014/12/12
5800	MSL	22.3	6.231	47.325	6.00	48.20	3.85	-1.82	±5	2014/12/12

**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 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2014/11/18	2450	MSL	250	D2450V2-869	ES3DV3 - SN3270	DAE4 Sn778	13.00	50.30	52.00	3.38	5.92	23.60	23.68	0.34
2014/12/13	2450	MSL	250	D2450V2-924	EX3DV4 - SN3955	DAE4 Sn1399	12.40	51.40	49.60	-3.50	5.70	23.80	22.80	-4.20
2014/12/11	5200	MSL	100	D5GHzV2-1006	EX3DV4 - SN3578	DAE4 Sn1388	7.94	77.50	79.40	2.45	2.12	21.60	21.20	-1.85
2014/12/11	5300	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	7.97	80.00	79.70	-0.37	2.13	22.30	21.30	-4.48
2014/12/11	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	8.39	85.20	83.90	-1.53	2.21	23.60	22.10	-6.36
2014/12/12	5600	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	8.50	85.20	85.00	-0.23	2.24	23.60	22.40	-5.08
2014/12/12	5800	MSL	100	D5GHzV2-1006	EX3DV4 - SN3955	DAE4 Sn1399	8.38	78.40	83.80	6.89	2.26	21.60	22.60	4.63



**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 WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
2. For IEEE802.11a/b/g SAR testing, highest average RF output power channel for the lowest data rate for 802.11a/b 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.
3. For IEEE802.11n, 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.
4. For IEEE802.11n with multiple channel BW configurations, highest channel BW configuration with highest output power limit shall be tested.
5. 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>**

**<Main Antenna>**

WLAN 2.4GHz 802.11b Average Power (dBm)					
Power vs. Channel			Power vs. Data Rate		
Channel	Frequency (MHz)	Data Rate	2Mbps	5.5Mbps	11Mbps
		1Mbps			
CH 1	2412	15.34	15.95	15.96	15.97
CH 6	2437	15.98			
CH 11	2462	15.85			

WLAN 2.4GHz 802.11g Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 1	2412	14.76	15.11	15.09	15.02	15.12	15.01	15.00	15.12
CH 6	2437	14.99							
CH 11	2462	15.13							

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 1	2412	13.75	14.03	14.07	14.02	14.05	14.10	14.09	14.02
CH 6	2437	13.81							
CH 11	2462	14.12							





<Aux. Antenna>

WLAN 2.4GHz 802.11b Average Power (dBm)					
Power vs. Channel			Power vs. Data Rate		
Channel	Frequency (MHz)	Data Rate	2Mbps	5.5Mbps	11Mbps
		1Mbps			
CH 1	2412	15.40	15.74	15.49	15.73
CH 6	2437	15.75			
CH 11	2462	15.59			

WLAN 2.4GHz 802.11g Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 1	2412	13.83	14.58	14.59	14.58	14.63	14.52	14.59	14.61
CH 6	2437	14.65							
CH 11	2462	12.71							

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 1	2412	13.59	13.52	13.54	13.67	13.62	13.67	13.67	13.61
CH 6	2437	13.60							
CH 11	2462	13.72							

<MIMO Antenna>

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 1	2412	16.73	16.86	16.67	16.79	16.97	16.95	17.06	17.08
CH 6	2437	17.07							
CH 11	2462	17.19							



<5GHz WLAN>

<Main Antenna>

WLAN 5GHz 802.11a Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	14.69	14.60	14.61	14.68	14.55	14.67	14.63	14.62
CH 40	5200	14.44							
CH 44	5220	14.50							
CH 48	5240	14.44							
CH 52	5260	14.38	14.38	14.31	14.38	14.34	14.40	14.42	14.42
CH 56	5280	14.15							
CH 60	5300	14.45							
CH 64	5320	14.44							
CH 100	5500	14.07							
CH 104	5520	14.03	14.06	14.01	14.04	14.04	14.00	14.03	13.92
CH 108	5540	14.00							
CH 112	5560	13.81							
CH 116	5580	13.73							
CH 120	5600	13.66							
CH 124	5620	13.45							
CH 128	5640	13.42							
CH 132	5660	13.21							
CH 136	5680	13.10							
CH 140	5700	12.96							
CH 149	5745	12.80	12.69	12.61	12.54	12.64	12.70	12.73	12.76
CH 153	5765	12.51							
CH 157	5785	12.64							
CH 161	5805	12.59							
CH 165	5825	12.79							



WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	12.78	12.89	12.89	12.90	12.88	12.87	12.92	12.89
CH 40	5200	12.67							
CH 44	5220	12.93							
CH 48	5240	12.68							
CH 52	5260	12.80	12.75	12.73	12.51	12.78	12.77	12.76	12.69
CH 56	5280	12.78							
CH 60	5300	12.75							
CH 64	5320	12.65							
CH 100	5500	12.94	12.88	12.92	12.91	12.86	12.91	12.92	12.89
CH 104	5520	12.89							
CH 108	5540	12.73							
CH 112	5560	12.02							
CH 116	5580	12.18							
CH 120	5600	12.11							
CH 124	5620	12.09							
CH 128	5640	12.17							
CH 132	5660	12.23							
CH 136	5680	11.77							
CH 140	5700	11.39							
CH 149	5745	11.62	11.54	11.59	11.60	11.56	11.57	11.50	11.58
CH 153	5765	11.58							
CH 157	5785	11.56							
CH 161	5805	11.57							
CH 165	5825	11.53							

WLAN 5GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 38	5190	13.25	12.96	13.06	12.88	12.90	13.19	13.12	13.14
CH 46	5230	13.04							
CH 54	5270	12.99	12.71	12.63	12.77	12.71	12.76	12.83	12.73
CH 62	5310	12.64							
CH 102	5510	11.81	11.67	11.73	11.77	11.74	11.78	11.79	11.63
CH 110	5550	11.41							
CH 126	5630	10.91							
CH 134	5670	10.31							
CH 151	5755	10.15	10.26	10.28	10.19	10.20	10.38	10.38	10.33
CH 159	5795	10.39							



<Aux. Antenna>

WLAN 5GHz 802.11a Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	14.59	14.81	14.59	14.34	14.58	14.66	14.63	14.65
CH 40	5200	14.45							
CH 44	5220	15.50							
CH 48	5240	14.54							
CH 52	5260	14.64	14.86	14.73	14.84	14.83	14.69	14.63	14.79
CH 56	5280	15.09							
CH 60	5300	14.98							
CH 64	5320	14.95							
CH 100	5500	14.38							
CH 104	5520	14.18	14.80	14.79	14.79	14.87	14.88	14.87	14.85
CH 108	5540	14.38							
CH 112	5560	14.50							
CH 116	5580	14.89							
CH 120	5600	14.00							
CH 124	5620	13.70							
CH 128	5640	13.91							
CH 132	5660	13.51							
CH 136	5680	13.11	13.36	13.33	13.16	13.35	13.35	13.33	13.35
CH 140	5700	13.71							
CH 149	5745	13.38							
CH 153	5765	12.79							
CH 157	5785	12.86							
CH 161	5805	12.55	13.03	13.03	13.03	13.03	13.03	13.03	13.03
CH 165	5825	13.03							



WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	12.29	12.65	12.63	12.53	12.66	12.66	12.62	12.67
CH 40	5200	12.51							
CH 44	5220	12.68							
CH 48	5240	12.65							
CH 52	5260	12.77	12.63	12.63	12.73	12.66	12.67	12.70	12.72
CH 56	5280	12.63							
CH 60	5300	12.67							
CH 64	5320	12.63							
CH 100	5500	13.34							
CH 104	5520	13.08	13.28	13.30	13.23	13.30	13.27	13.22	13.33
CH 108	5540	12.59							
CH 112	5560	12.55							
CH 116	5580	13.11							
CH 120	5600	13.09							
CH 124	5620	13.11							
CH 128	5640	12.55							
CH 132	5660	12.48							
CH 136	5680	12.60							
CH 140	5700	12.86							
CH 149	5745	12.77	11.95	12.04	12.21	12.14	12.11	12.16	12.50
CH 153	5765	12.68							
CH 157	5785	12.25							
CH 161	5805	12.33							
CH 165	5825	12.06							

WLAN 5GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 38	5190	12.68	12.65	12.61	12.54	12.55	12.61	12.66	12.60
CH 46	5230	12.65							
CH 54	5270	12.70							
CH 62	5310	12.61	12.24	12.40	12.43	12.57	12.30	12.50	12.51
CH 102	5510	11.26							
CH 110	5550	11.98							
CH 126	5630	11.15							
CH 134	5670	10.98	11.97	11.90	11.87	11.95	11.95	11.97	11.92
CH 151	5755	10.30							
CH 159	5795	10.08							
CH 151	5755	10.30	10.28	10.26	10.25	10.25	10.25	10.28	10.26
CH 159	5795	10.08							



<MIMO Antenna>

WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps							
CH 36	5180	15.61	15.81	15.80	15.79	15.82	15.78	15.80	15.82
CH 40	5200	15.58							
CH 44	5220	15.84							
CH 48	5240	15.53							
CH 52	5260	15.89	15.81	15.73	15.81	15.86	15.84	15.87	15.86
CH 56	5280	15.73							
CH 60	5300	15.65							
CH 64	5320	15.61							
CH 100	5500	16.35							
CH 104	5520	15.61	16.30	16.33	16.32	16.30	16.33	16.31	16.34
CH 108	5540	15.68							
CH 112	5560	15.65							
CH 116	5580	15.96							
CH 120	5600	15.55							
CH 124	5620	15.65							
CH 128	5640	15.58							
CH 132	5660	15.60							
CH 136	5680	15.49							
CH 140	5700	15.19							
CH 149	5745	14.79	14.57	14.65	14.62	14.75	14.74	14.74	14.76
CH 153	5765	15.60							
CH 157	5785	14.71							
CH 161	5805	15.52							
CH 165	5825	14.49							

WLAN 5GHz 802.11n-HT40 Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	MCS Index	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0							
CH 38	5190	15.67	15.54	15.51	15.48	15.64	15.60	15.66	15.62
CH 46	5230	15.57							
CH 54	5270	15.64							
CH 62	5310	15.74	15.41	15.56	15.54	15.70	15.66	15.63	15.57
CH 102	5510	15.41							
CH 110	5550	15.18							
CH 126	5630	14.31							
CH 134	5670	14.03	15.35	15.35	15.36	15.39	15.39	15.39	15.38
CH 151	5755	13.49							
CH 159	5795	13.50							
			13.49	13.48	13.49	13.47	13.48	13.48	13.46

**<2.4GHz Bluetooth>**

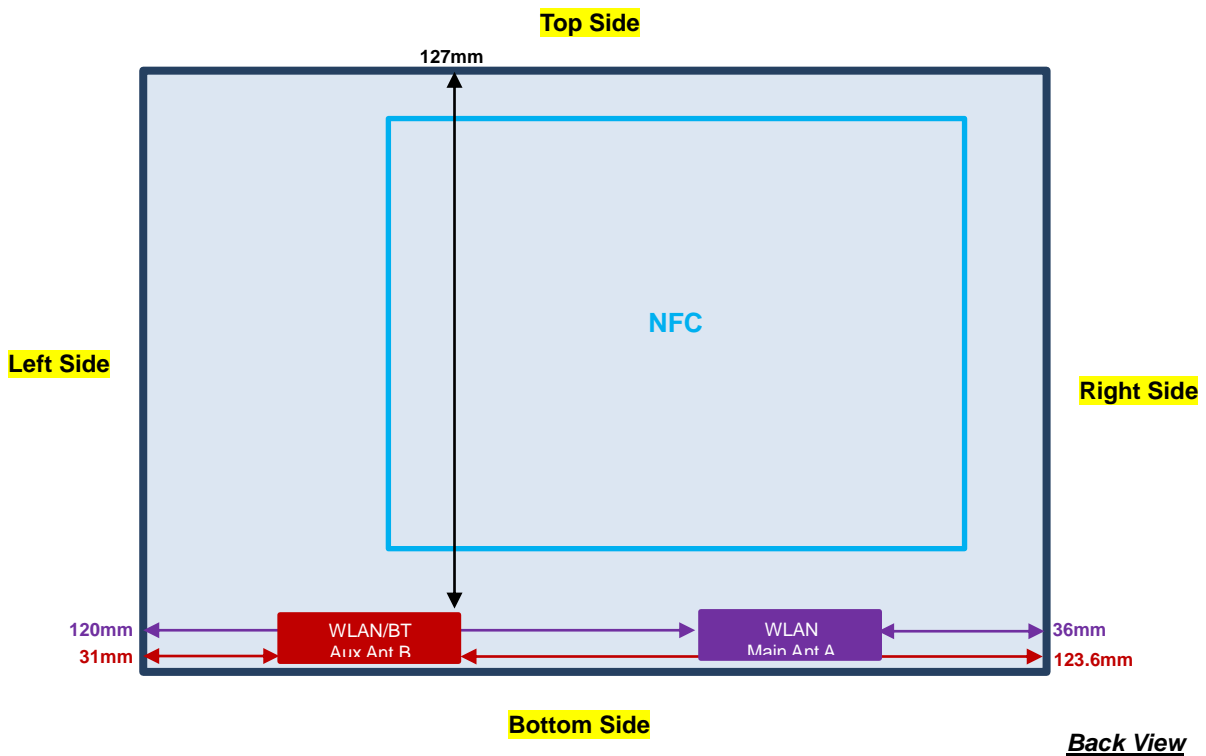
**General Note:**

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The duty factor is selected theoretical 83.3% perform Bluetooth SAR testing.

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
v3.0 with EDR	CH 00	2402	10.16	7.12	7.12
	CH 39	2441	9.67	6.45	6.46
	CH 78	2480	9.01	6.55	5.59

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0 with LE	CH 00	2402	7.26
	CH 19	2440	7.86
	CH 39	2480	8.20

**13. Antenna Location**





**<SAR test exclusion table>**

**General Note:**

1. The below 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
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

Exposure Position	Wireless Interface	802.11b Ant A	802.11b Ant B	802.11a Ant A	802.11a Ant B	Bluetooth Ant A
	Calculated Frequency	2462MHz	2462MHz	5825MHz	5825MHz	2480MHz
	Maximum power (dBm)	16	16	15.5	15.5	11
	Maximum rated power(mW)	40	40	35	35	13
Left Side	Separation distance(mm)	120.0	31.0	120.0	31.0	31.0
	exclusion threshold	796	2	762	3	2
	Testing required?	No	No	No	No	No
Right Side	Separation distance(mm)	36.0	123.6	36.0	123.6	123.6
	exclusion threshold	2	832	2	798	831
	Testing required?	No	No	No	No	No
Top Side	Separation distance(mm)	127.5	127.5	127.5	127.5	127.5
	exclusion threshold	871	871	837	837	870
	Testing required?	No	No	No	No	No
Bottom Side	Separation distance(mm)	5.0	5.0	5.0	5.0	5.0
	exclusion threshold	13	13	17	17	11
	Testing required?	Yes	Yes	Yes	Yes	Yes





## 14. 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
3. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

### 14.1 Body SAR

#### <WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	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)
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Main	6	2437	15.98	16.00	1.004	97.64	1.024	-0.02	0.610	0.627
	WLAN2.4GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	11	2462	14.12	15.00	1.225	86.61	1.155	-0.07	0.386	0.546
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Aux	6	2437	15.75	16.00	1.058	97.65	1.024	-0.02	0.685	0.742
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Aux	1	2412	15.40	16.00	1.147	97.65	1.024	-0.12	0.585	0.687
1	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Aux	11	2462	15.59	16.00	1.098	97.65	1.024	-0.04	0.931	1.047
	WLAN2.4GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	11	2462	13.72	15.00	1.341	86.61	1.155	-0.06	0.452	0.700
2	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	36	5180	14.69	15.00	1.074	87.34	1.145	0.01	1.060	1.304
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	44	5220	14.50	15.00	1.123	87.34	1.145	0.05	1.010	1.298
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	38	5190	13.25	13.50	1.059	75.81	1.319	0.09	0.343	0.479
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	44	5220	15.50	15.50	1.000	87.34	1.145	-0.1	0.807	0.924
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	36	5180	14.59	15.00	1.099	87.34	1.145	-0.03	0.805	1.013
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	38	5190	12.68	13.00	1.076	76.00	1.316	-0.04	0.223	0.316
3	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	60	5300	14.45	14.50	1.012	87.34	1.145	-0.15	1.110	1.286
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	52	5260	14.38	14.50	1.029	87.34	1.145	-0.11	1.030	1.213
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	54	5270	12.99	13.00	1.002	75.81	1.319	0.02	0.220	0.291
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	56	5280	15.09	15.50	1.099	87.34	1.145	-0.04	0.793	0.998
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	60	5300	14.98	15.00	1.005	87.34	1.145	0	0.756	0.870
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	54	5270	12.70	13.00	1.071	76.00	1.316	0.04	0.167	0.235



Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	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)
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	100	5500	14.00	14.00	1.000	87.34	1.145	0.03	0.948	1.085
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	112	5560	13.81	14.00	1.045	87.34	1.145	-0.04	1.060	1.268
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	120	5600	13.66	14.00	1.081	87.34	1.145	0.02	1.010	1.251
4	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	132	5660	13.21	14.00	1.199	87.34	1.145	0.04	1.010	1.387
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	100	5500	12.94	13.00	1.014	86.55	1.155	-0.02	0.898	1.052
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	116	5580	12.18	13.00	1.208	86.55	1.155	0.03	0.784	1.094
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	128	5640	12.17	13.00	1.211	86.55	1.155	-0.11	0.788	1.102
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	132	5660	12.23	13.00	1.194	86.55	1.155	-0.13	0.801	1.105
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	102	5510	11.81	12.00	1.045	75.81	1.319	-0.04	0.640	0.882
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	110	5550	11.41	12.00	1.146	75.81	1.319	0.1	0.583	0.881
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	126	5630	10.91	12.00	1.285	75.81	1.319	0.01	0.569	0.965
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	134	5670	10.31	12.00	1.476	75.81	1.319	0.06	0.498	0.969
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	116	5580	14.89	15.00	1.026	87.34	1.145	-0.15	0.965	1.133
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	100	5500	14.38	14.50	1.028	87.34	1.145	-0.18	1.060	1.248
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	120	5600	14.00	14.50	1.122	87.34	1.145	0.11	0.914	1.174
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	140	5700	13.71	14.00	1.069	87.34	1.145	-0.02	0.795	0.973
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	100	5500	13.34	13.50	1.038	86.55	1.155	-0.12	0.701	0.840
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	116	5580	13.11	13.50	1.094	86.55	1.155	0.04	0.684	0.864
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	124	5620	13.11	13.50	1.094	86.55	1.155	-0.03	0.663	0.838
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	140	5700	12.86	13.50	1.159	86.55	1.155	-0.01	0.641	0.858
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	110	5550	11.98	12.00	1.004	76.00	1.316	-0.09	0.451	0.596
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	102	5510	11.26	12.00	1.185	76.00	1.316	0.02	0.546	0.852
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	126	5630	11.15	12.00	1.216	76.00	1.316	-0.05	0.419	0.671
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	134	5670	10.98	12.00	1.265	76.00	1.316	0.03	0.466	0.776
5	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	149	5745	12.80	14.00	1.318	87.34	1.145	-0.01	0.775	1.170
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	157	5785	12.64	14.00	1.368	87.34	1.145	0.02	0.702	1.099
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	165	5825	12.79	14.00	1.321	87.34	1.145	0.01	0.647	0.979
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	149	5745	11.62	13.00	1.374	86.55	1.155	0.13	0.561	0.890
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	157	5785	11.56	13.00	1.393	86.55	1.155	-0.11	0.548	0.882
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Main	161	5805	11.57	13.00	1.390	86.55	1.155	-0.08	0.544	0.873
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	159	5795	10.39	12.00	1.449	75.81	1.319	0.02	0.334	0.638
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Main	151	5755	10.15	12.00	1.531	75.81	1.319	0.11	0.311	0.628
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	149	5745	13.38	14.00	1.153	87.34	1.145	-0.1	0.573	0.757
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	157	5785	12.86	14.00	1.300	87.34	1.145	0.02	0.555	0.826
	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Aux	165	5825	13.03	14.00	1.250	87.34	1.145	-0.11	0.502	0.719
	WLAN5GHz	802.11n-HT20 MCS0	Bottom Side	0cm	Aux	149	5745	12.77	13.00	1.054	86.55	1.155	-0.04	0.486	0.592
	WLAN5GHz	802.11n-HT40 MCS0	Bottom Side	0cm	Aux	151	5755	10.30	12.00	1.479	76.00	1.316	-0.02	0.252	0.491

<2.4GHz Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	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)
	Bluetooth	1Mbps	Bottom Side	0cm	Aux	0	2402	10.16	11.00	1.213	100.00	1.000	-0.12	0.155	0.188
	Bluetooth	1Mbps	Bottom Side	0cm	Aux	39	2441	9.67	11.00	1.358	100.00	1.000	0.09	0.161	0.219
6	Bluetooth	1Mbps	Bottom Side	0cm	Aux	78	2480	9.01	11.00	1.581	100.00	1.000	-0.14	0.161	0.255



14.2 Extremity SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	WLAN2.4GHZ	802.11b 1Mbps	Back of Bottom	0cm	Main	6	2437	15.98	16.00	1.004	97.64	1.024	-0.02	0.165	0.170
	WLAN2.4GHZ	802.11n-HT20 MCS0	Back of Bottom	0cm	Main	11	2462	14.12	15.00	1.225	86.61	1.155	0	0.117	0.165
	WLAN2.4GHZ	802.11b 1Mbps	Back of Bottom	0cm	Aux	6	2437	15.75	16.00	1.058	97.65	1.024	-0.02	0.179	0.194
7	WLAN2.4GHZ	802.11b 1Mbps	Back of Bottom	0cm	Aux	1	2412	15.40	16.00	1.147	97.65	1.024	-0.04	0.182	0.214
	WLAN2.4GHZ	802.11b 1Mbps	Back of Bottom	0cm	Aux	11	2462	15.59	16.00	1.098	97.65	1.024	0.03	0.180	0.202
	WLAN2.4GHZ	802.11n-HT20 MCS0	Back of Bottom	0cm	Aux	11	2462	13.72	15.00	1.341	86.61	1.155	0.01	0.109	0.169
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Main	36	5180	14.69	15.00	1.074	87.34	1.145	-0.05	0.166	0.204
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Main	38	5190	13.25	13.50	1.059	75.81	1.319	0.13	0.099	0.138
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	44	5220	15.50	15.50	1.000	87.34	1.145	-0.06	0.197	0.226
8	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	36	5180	14.59	15.00	1.099	87.34	1.145	0.01	0.199	0.250
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Aux	38	5190	12.68	13.00	1.076	76.00	1.316	0.08	0.098	0.139
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Main	60	5300	14.45	14.50	1.012	87.34	1.145	0.01	0.089	0.103
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Main	54	5270	12.99	13.00	1.002	75.81	1.319	0.01	0.016	0.021
9	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	56	5280	15.09	15.50	1.099	87.34	1.145	-0.07	0.105	0.132
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	60	5300	14.98	15.00	1.005	87.34	1.145	-0.01	0.096	0.110
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Aux	54	5270	12.70	13.00	1.071	76.00	1.316	0.08	0.016	0.023
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Main	100	5500	14.00	14.00	1.000	87.34	1.145	0.02	0.086	0.098
	WLAN5GHZ	802.11n-HT20 MSC0	Back of Bottom	0cm	Main	100	5500	12.94	13.00	1.014	86.55	1.155	-0.05	0.063	0.074
	WLAN5GHZ	802.11n-HT40 MSC0	Back of Bottom	0cm	Main	102	5510	11.81	12.00	1.045	75.81	1.319	-0.15	0.042	0.058
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	116	5580	14.89	15.00	1.026	87.34	1.145	0	0.093	0.109
10	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	100	5500	14.38	14.50	1.028	87.34	1.145	0.05	0.105	0.124
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	120	5600	14.00	14.50	1.122	87.34	1.145	0	0.086	0.110
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	140	5700	13.71	14.00	1.069	87.34	1.145	-0.06	0.076	0.093
	WLAN5GHZ	802.11n-HT20 MCS0	Back of Bottom	0cm	Aux	100	5500	13.34	13.50	1.038	86.55	1.155	0.12	0.066	0.079
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Aux	110	5550	11.98	12.00	1.004	76.00	1.316	0.05	0.054	0.071
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Main	149	5745	12.80	14.00	1.318	87.34	1.145	-0.07	0.033	0.050
	WLAN5GHZ	802.11n-HT20 MCS0	Back of Bottom	0cm	Main	149	5745	11.62	13.00	1.374	86.55	1.155	-0.05	0.026	0.041
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Main	159	5795	10.39	12.00	1.449	75.81	1.319	-0.15	0.016	0.031
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	149	5745	13.38	14.00	1.153	87.34	1.145	-0.12	0.065	0.086
11	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	157	5785	12.86	14.00	1.300	87.34	1.145	-0.08	0.059	0.088
	WLAN5GHZ	802.11a 6Mbps	Back of Bottom	0cm	Aux	165	5825	13.03	14.00	1.250	87.34	1.145	-0.05	0.058	0.083
	WLAN5GHZ	802.11n-HT20 MCS0	Back of Bottom	0cm	Aux	149	5745	12.77	13.00	1.054	86.55	1.155	0.12	0.051	0.062
	WLAN5GHZ	802.11n-HT40 MCS0	Back of Bottom	0cm	Aux	151	5755	10.30	12.00	1.479	76.00	1.316	0.18	0.018	0.035

<2.4GHz Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	Bluetooth	1Mbps	Back of Bottom	0cm	Aux	0	2402	10.16	11.00	1.213	100.00	1.000	0.05	0.012	0.015
	Bluetooth	1Mbps	Back of Bottom	0cm	Aux	39	2441	9.67	11.00	1.358	100.00	1.000	0.03	0.012	0.016
12	Bluetooth	1Mbps	Back of Bottom	0cm	Aux	78	2480	9.01	11.00	1.581	100.00	1.000	0.09	0.013	0.021



**14.3 Repeated SAR Measurement**

No.	Band	Mode	Test Position	Gap (cm)	Antenna	Ch.	Freq. (MHz)	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	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Aux	11	2462	15.59	16.00	1.098	97.65	1.024	-0.04	0.931	-	1.047
2nd	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0cm	Aux	11	2462	15.59	16.00	1.098	97.65	1.024	-0.07	0.917	1.02	1.031
1st	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	36	5180	14.69	15.00	1.074	87.34	1.145	0.01	1.060	-	1.304
2nd	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	36	5180	14.69	15.00	1.074	87.34	1.145	-0.08	1.020	1.04	1.254
1st	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	60	5300	14.45	14.50	1.012	87.34	1.145	-0.15	1.110	-	1.286
2nd	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	60	5300	14.45	14.50	1.012	87.34	1.145	-0.03	1.100	1.01	1.274
1st	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	112	5560	13.81	14.00	1.045	87.34	1.145	-0.04	1.060	-	1.268
2nd	WLAN5GHz	802.11a 6Mbps	Bottom Side	0cm	Main	112	5560	13.81	14.00	1.045	87.34	1.145	-0.14	1.040	1.02	1.244

**General Note:**

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured 1g SAR is  $\geq 0.8W/kg$ , and 10g SAR  $> 2.0W/kg$ .
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is  $\leq 1.2$  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.

**15. Simultaneous Transmission Analysis**

NO.	Simultaneous Transmission Configurations	Clover Mobile	
		Body	Extremity
1.	WLAN Main + WLAN Aux	Yes	Yes

**General Note:**

1. The WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. The WLAN RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode. Therefore transmit simultaneous calculation was choose worst case with SAR test results of each antenna in SISO mode perform evaluation.
3. The worst case WLAN SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
4. 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.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
  - i) Scalar SAR summation < 1.6W/kg and < 4.0W/kg.
  - ii)  $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$ , and the peak separation distance is determined from the square root of  $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$ , where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
  - iii) If  $SPLSR \leq 0.04$  and  $0.1$ , simultaneously transmission SAR measurement is not necessary.
  - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg and 4.0W/kg.
  - v) The SPLSR calculated results please refer to section 15.3.

**15.1 Body Exposure Conditions**

Band	Exposure Position	1	2	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
		WLAN Main Antenna	WLAN Aux Antenna			
		1g SAR (W/kg)	1g SAR (W/kg)			
2.4GHz WLAN	Bottom side	0.627	1.047	1.67	0.02	Case 1
5GHz WLAN	Bottom side	1.286	1.248	2.53	0.04	Case 2

**15.2 Extremity Exposure Conditions**

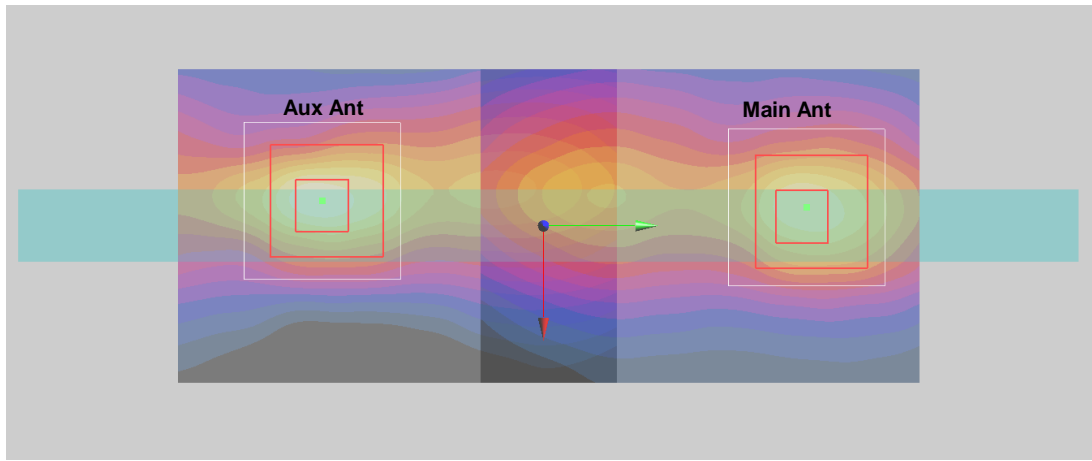
Band	Exposure Position	1	2	1+2 Summed 10g SAR (W/kg)	SPLSR	Case No
		WLAN Main Antenna	WLAN Aux Antenna			
		10g SAR (W/kg)	10g SAR (W/kg)			
2.4GHz WLAN	Back of Bottom	0.170	0.214	0.38		
5GHz WLAN	Back of Bottom	0.204	0.250	0.45		

15.3 SPLSR Evaluation and Analysis

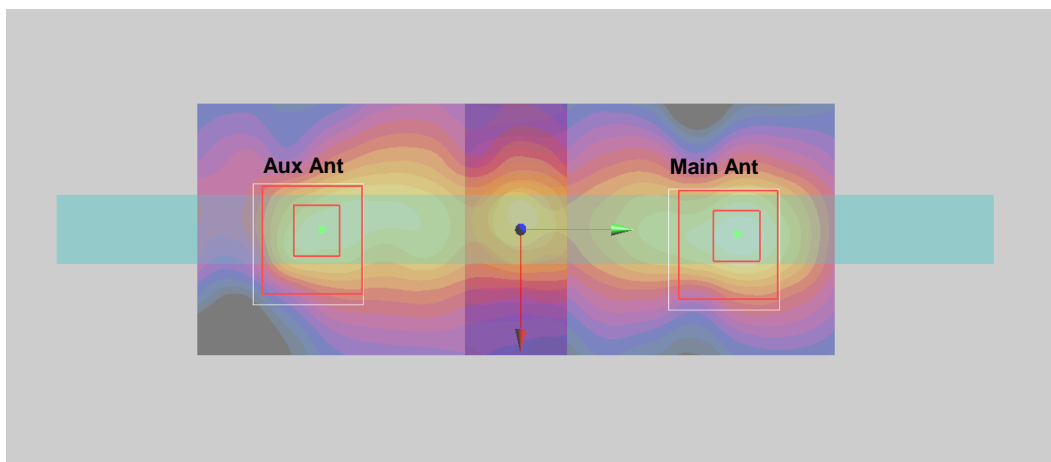
General Note:

- SPLSR =  $(SAR_1 + SAR_2)^{1.5} / (min. \text{ separation distance, mm})$ . If  $SPLSR \leq 0.04$ , simultaneously transmission SAR measurement is not necessary

Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	2.4GHz Main				X	Y	Z				
	2.4GHz Main	Bottom side	0.627	0cm	-0.0036	0.0504	-0.178	92.8	1.67	0.02	Not required
	2.4GHz Aux		1.047	0cm	-0.0048	-0.0424	-0.178				



Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	5GHz Main				X	Y	Z				
	5GHz Main	Bottom side	1.286	0	8.74E-11	0.048	-0.18	98.1	2.53	0.04	Not required
	5GHz Aux		1.248	0	-0.005	-0.05	-0.181				



Test Engineer : Angelo Chang, Frank Wu, Mood Huang, Tom Jiang, and Domo Hsiao

**16. Uncertainty Assessment**

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A 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.

<b>Uncertainty Distributions</b>	<b>Normal</b>	<b>Rectangular</b>	<b>Triangular</b>	<b>U-Shape</b>
Multi-plying Factor <sup>(a)</sup>	1/k <sup>(b)</sup>	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)  $\kappa$  is the coverage factor

**Table 16.1. 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)
<b>Measurement System</b>							
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 %
<b>Test Sample Related</b>							
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 %
<b>Phantom and Setup</b>							
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 %
<b>Combined Standard Uncertainty</b>						± 11.0 %	± 10.8 %
<b>Coverage Factor for 95 %</b>						K=2	
<b>Expanded Uncertainty</b>						± 22.0 %	± 21.5 %

Table 16.2. 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)
<b>Measurement System</b>							
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 %
<b>Test Sample Related</b>							
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 %
<b>Phantom and Setup</b>							
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 %
<b>Combined Standard Uncertainty</b>						± 12.8 %	± 12.6 %
<b>Coverage Factor for 95 %</b>						K=2	
<b>Expanded Uncertainty</b>						± 25.6 %	± 25.2 %

**Table 16.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz**



## **17. 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 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007
- [6] FCC KDB 447498 D01 v05r02, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Feb 2014
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- [8] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014.
- [9] FCC KDB 865664 D02 v01r01, "RF Exposure Compliance Reporting and Documentation Considerations" May 2013.