FIC SAR Test Report

FCC ID: SIB-SNB02-NV7A

IC: 6719D-SNB02NV7A

Project No. : 1403C085
Equipment : nabi Tablet
Model Name SNB02-NV7A
Applicant : Foxconn International Inc.
Address : No.2,Ziyou St.,Tucheng Dist., New Taipei City 236,Taiwan

Tested by: Neutron Engineering Inc. EMC Laboratory
Date of Receipt: Mar. 13, 2014
Date of Test: Mar. 13, 2014 ~ Mar. 26, 2014
Date of Issue: Mar. 27, 2014

Testing Engineer : (Super Jiang)

Technical Manager : (Leo Hung)

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
NEI-FIC-SAR-1403C085	Original Issue.	Mar. 27, 2014

1. GENERAL SUMMARY

Equipment	nabi Tablet
Model Name	SNB02-NV7A
Brand Name	nabi
Model Difference	A model for multiple appearance, only differ in the color.
Manufacturer	FUHU INC
Address	909 N SEPULVEDA BLVD STE 540 EL SEGUNDO, CA 90245-2733
Factory	Hongfujin precision industry(wuhan) Co.,Ltd.
Address	1#, 2nd GUANG GU ROAD, DONGHU NEW TECHNOLOGY DEVELOPMENT DISTRICT, WUHAN CITY, HUBEI PROVINCE, CHINA
Standard(s)	**RSS-102 Issue 4 March 2010:** Radio frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands) **FCC 47CFR §2.1093** Radio frequency Radiation Exposure Evaluation: Portable Devices **ANSI C95.1, 1999** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.(IEEE Std C95.1-1999) **IEEE 1528 2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques **KDB 616217 D04 SAR for laptop and tablets v01r01:** SAR Evaluation Considerations for Laptop, Notebook, Notebook and Tablets Computers **KDB 248227 D01 v01r02 SAR meas for 802 11 a b g v01r02:** SAR Measurement Procedures for 802.11a/b/g Transmitters **KDB 447498 D02 General RF Exposure Guidance v05r01**: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies. **KDB 865664 D01 SAR measurement 100 MHz to 6GHz v01r01:** SAR Measurement Requirements for 100MHz to 6GHz

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FIC-SAR-1403C085) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3,Jinshagang 1st Road, ShiXia, Dalang Town, Dong Guan, China.523792

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Component	Uncertainty Value	Probability Distribution	Divisor	C_i (1g)	Standard Uncertainty ±1%	V_i or V_{eff}
Measurement System						
Probe Calibration (*k*=1)	5.9	Normal	1	1	5.9	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
Boundary Effect	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	2.7	∞
System Detection Limit	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
Readout Electronics	0.3	Normal	1	1	0.3	∞
Response Time	0.8	Rectangular	$\sqrt{3}$	1	0.5	∞
Integration Time	2.6	Rectangular	$\sqrt{3}$	1	1.5	∞
RF Ambient Conditions-Noise	3.0	Rectangular	$\sqrt{3}$	1	1.7	∞
RF Ambient Reflections	3.0	Rectangular	$\sqrt{3}$	1	1.7	∞
Probe Positioner Mechanical Tolerance	0.4	Rectangular	$\sqrt{3}$	1	0.2	∞
Probe Positioning with respect to Phantom Shell	2.9	Rectangular	$\sqrt{3}$	1	1.7	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
Test Sample Related						
Test sample Positioning	2.9	Normal	1	1	2.9	145
Device Holder Uncertainty	3.6	Normal	1	1	3.6	5
Output Power Variation - SAR drift measurement	5.0	Rectangular	$\sqrt{3}$	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty (shape and thickness tolerances)	4.0	Rectangular	$\sqrt{3}$	1	2.3	∞
Liquid Conductivity - deviation from target values	5.0	Rectangular	$\sqrt{3}$	0.64	1.8	∞
Liquid Conductivity - measurement uncertainty	2.5	Normal	1	0.64	1.6	∞
Liquid Permittivity - deviation from target values	5.0	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Permittivity - measurement uncertainty	2.5	Normal	1	0.6	1.5	∞
Combined standard uncertainty		RSS	-	-	10.9	387
Expanded uncertainty		*k*=2	-	-	21.9	-

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Operation Frequency	2412MHz~2462 MHz 5150MHz~5250MHz 5250MHz~5350MHz 5745 MHz~5825MHz
Modulation Technology	802.11a:OFDM 802.11b:DSSS 802.11g:OFDM 802.11n:OFDM
Bit Rate of Transmitter	802.11a (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b (DSSS, CCK) 1, 2, 5.5, 11 Mbps 802.11g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (OFDM, MCS 0-7) 6.5, 7.2, 13.0, 14.4, 19.5, 21.7, 26.0, 28.9, 39.0, 43.3, 52.0, 57.8, 58.5, 65.0, 72.2 up to 150 Mbps
Number Of Channel	Please refer to note 1 (Page 9)
Antenna Type	Please refer to note 2 (Page 10)

Note:

1. Check List:

802.11b / g / n 20MHz / n 40MHz							
CH 01 – CH 11 for 802.11b, 802.11g, 802.11n(20MHz) CH 03 – CH 09 for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

802.11a / 802.11n 20MHz				802.11n 40MHz			
Band 1		Band 2		Band 1		Band 2	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	52	5260	38	5190	54	5270
40	5200	56	5280	46	5230	62	5310
44	5220	60	5300				
48	5240	64	5320				

802.11a / 802.11n 20MHz					
Band 4					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	**5745**	153	5765	**157**	**5785**
161	5805	**165**	**5825**		

802.11n 40MHz			
Band 4			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	**5755**	**159**	**5795**

2. Table for Filed Antenna:

Group 1

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	Cortec	NB0309-N2S	PIFA	N/A	1.70	2.4G WIFI
1	Cortec	NB0309-N2S	PIFA	N/A	2.05	Band 1&2
1	Cortec	NB0309-N2S	PIFA	N/A	0.52	Band 4

Group 2

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	晶鈦	AH-JT-0214N0304	PIFA	N/A	2.88	2.4G WIFI
1	晶鈦	AH-JT-0214N0304	PIFA	N/A	0.97	Band 1&2
1	晶鈦	AH-JT-0214N0304	PIFA	N/A	0.90	Band 4

Note: Group 1 and Group 2 are same type antenna, Group 2 is recorded as the worst case since which gain is higher than Group 1 in 2.4G WIFI and Band 4, Group 1 is recorded as the worst case since which gain is higher than Group 2 in Band 1&2.

3.2 THE MAXIMUM SAR_{1G} VALUES

Body SAR Configuration

Test Mode	Frequency (MHz)	Test Position	Separation Distance	Test Result SAR_{1g} (W/kg)	Limit SAR_{1g} (W/kg)
802.11a	5280	Test Position 2	5mm	1.500	1.6

Note:
(1) Equipment Under Test (EUT) has a WIFI antenna that can be used for TX/RX. During SAR test of the EUT, SAR is only tested for 802.11b. SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.
(2) KDB 248227 - SAR is not required for 802.11a HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

3.3 LABORATORY ENVIRONMENT

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

3.4 MAIN TEST INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Data Acquisition Electronics	Speag	DAE4	1390	Sep. 10, 2014
2	E-field Probe	Speag	EX3DV4	3932	Sep. 16, 2014
3	Electro Optical Converter	Speag	ECO90	1151	N/A
4	ELI4 Phantom	Speag	ELI4 Phantom V5.0	1222	N/A
5	System Validation Dipole	Speag	D2450V2	919	Sep. 05, 2014
6	Power Amplifier	Speag	ZHL-42W	N/A	N/A
7	Power Amplifier	Speag	ZVE-8G	N/A	N/A
8	ENA Network Analyzer	Agilent	E5071C	MY46102965	Apr. 25, 2014
9	Dielectric Probe Kit	Agilent	85070E	2593	N/A
10	P-series power meter	Agilent	N1911A	MY45100473	Apr. 25, 2014
11	wideband power sensor	Agilent	N1921A	MY51100041	Apr. 25, 2014
12	power Meter	ANRITSU	ML2495A	1128009	May. 24, 2014
13	Pulse Power Sensor	ANRITSU	MA 2411B	1027500	May. 24, 2014
14	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Nov. 09, 2014

Remark: ” N/A” denotes no model name, serial No. or calibration specified.
All calibration period of equipment list is one year.

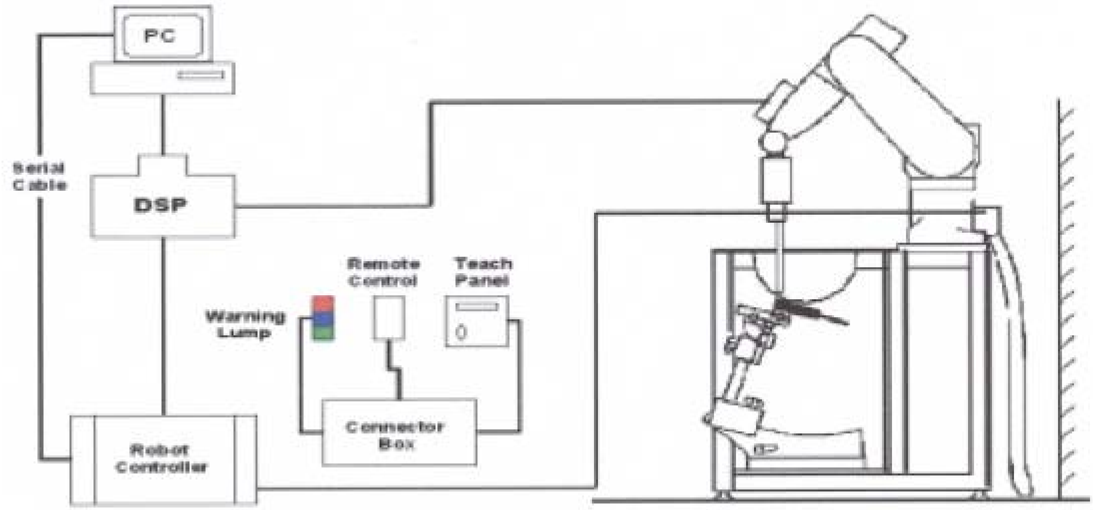
4. SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1 SAR MEASUREMENT SET-UP

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

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

4.1.1 Test Setup Layout



4.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

4.2.1 ES3DV3 PROBE SPECIFICATION

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 μW/g to > 100 mW/g Linearity: ± 0.2dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

EX3DV4 E-field Probe

4.2.2 E-FIELD PROBE CALIBRATION

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

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

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

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

4.2.3 OTHER TEST EQUIPMENT

4.2.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

4.2.3.2 Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible all known tissuesimulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 30 liters
Dimensions	190 X 600 X 0 mm (H x L x W)
Aailable	Special

ELI4 Phantom

4.2.4 SCANNING PROCEDURE

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

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

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

- Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 10 mm x 10 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

4.2.5 DATA STORAGE AND EVALUATION

4.2.5.1 Data Storage

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

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

4.4.2 Data Evaluation by SEMCAD

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

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

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

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

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

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

With
V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

E-field probes: $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

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

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

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

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

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

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

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

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

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

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

With SAR = local specific absorption rate in mW/g

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

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

= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

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

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

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

5. TISSUE-EQUIVALENT LIQUID

5.1 TISSUE-EQUIVALENT LIQUID INGREDIENTS

The liquid is consisted of water, salt and Glycol. The liquid has previously been proven to be suited for worst-case. The Table 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed

Composition of the Tissue Equivalent Matter

MIXTURE%	FREQUENCY 2450MHz
Water	62.7
Glycol	36.8
Salt	0.5
Dielectric Parameters Target Value	f=2450MHz ε=39.20 σ=1.80

Simulating Liquids for 5GHz, Manufactured by SPEAG

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

5.2 TISSUE-EQUIVALENT LIQUID PROPERTIES

Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Description	Dielectric Parameters		Temp ℃
		εr	σ(s/m)	
2450	Target value ±5% within	52.70 50.07-55.34	1.95 1.85-2.048	22.0
	Measurement value 2014-03-19	52.02	1.99	20.8
5200	Target value ±5% within	49.00 46.55~51.45	5.30 5.04~5.57	22.0
	Measurement value 2014-03-20	49.40	5.38	21.2
5300	Target value ±5% within	48.90 46.46~51.35	5.42 5.15~6.69	22.0
	Measurement value 2014-03-20	49.20	5.52	21.2
5800	Target value ±5% within	48.20 45.79~50.61	6.00 5.70~6.30	22.0
	Measurement value 2014-03-20	48.30	6.22	21.2

6. SYSTEM CHECK

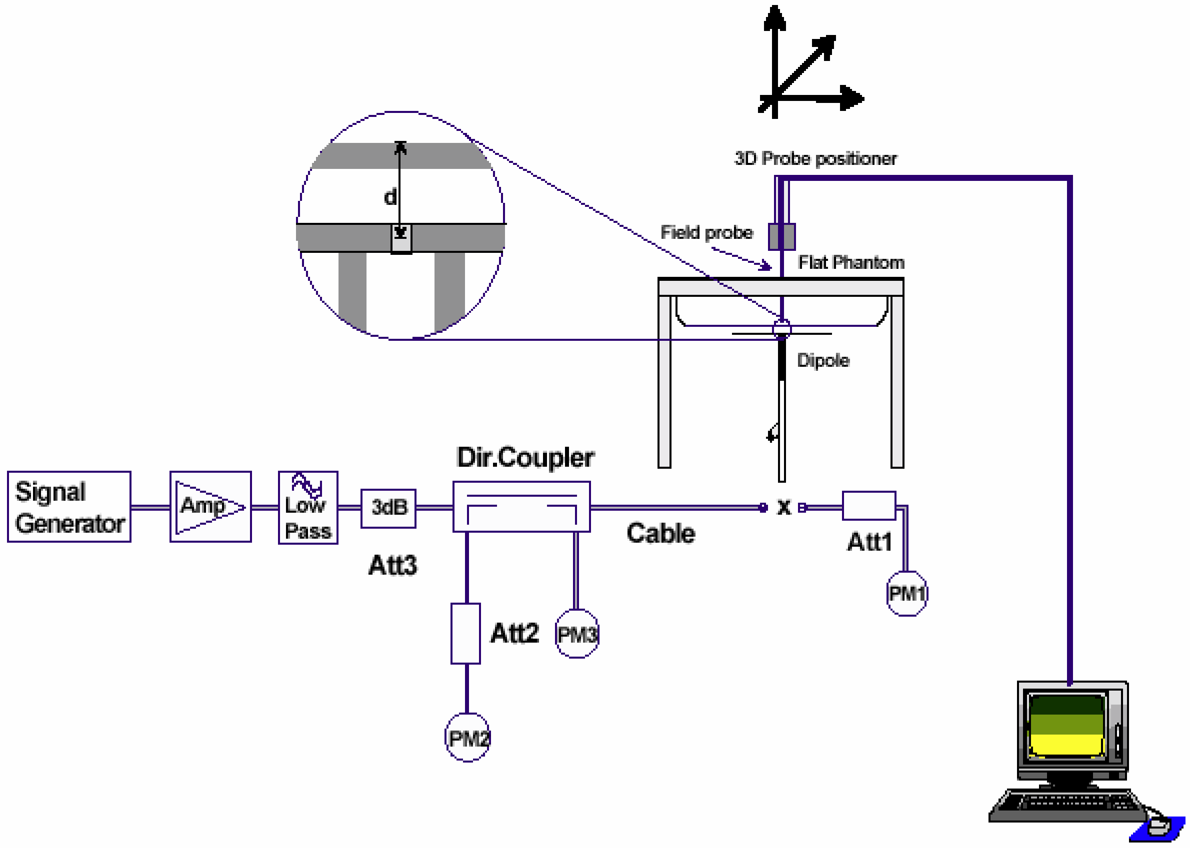
6.1 DESCRIPTION OF SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

System Check Set-up



6.2 DESCRIPTION OF SYSTEM CHECK

System Check in Tissue Simulating Liquid

Frequency (MHz)	Test Date	Dielectric Parameters		Temp	250mW Measured SAR_{1g}	1W Normalized SAR_{1g}	1W Target SAR_{1g} (±10% deviation)
		εr	σ(s/m)	(℃)	(W/kg)		
2450	2014-03-19	52.02	1.99	20.80	13.10	52.40	49.30 (44.37~54.23)

Frequency (MHz)	Test Date	Dielectric Parameters		Temp	100mW Measured SAR_{1g}	1W Normalized SAR_{1g}	1W Target SAR_{1g} (±10% deviation)
		εr	σ(s/m)	(℃)	(W/kg)		
5200	2014-03-20	49.40	5.38	21.20	7.21	72.10	74.00 (66.60~81.40)
5300	2014-03-20	49.20	5.52	21.20	7.35	73.50	75.7 (68.13~83.27)
5800	2014-03-20	48.30	6.22	21.20	6..98	69.80	72.50 (65.25~79.75)

Note: 1. The graph results see Appendix 2.
2. Target Value derives from the calibration certificate

7. OPERATIONAL CONDITIONS DURING TEST

7.1 General Description of Test Procedures

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

For the 802.11b/g/n SAR tests, a communication link is set up with the test mode software for WIFI mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. Testing at higher data rates is not required when the maximum average output power is less than 0.25dB higher than those measured at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band.802.11b/g modes are tested on channels1,6,11; however, if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

KDB 248227 - SAR is not required for 802.11a HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

7.2 Test Position

For each channel, the EUT is tested at the following 4 test positions:

Test Position 1: The front side of the EUT towards the bottom of the flat phantom distance 0mm. (APPENDIX 8)

Test Position 2: The back side of the EUT towards the bottom of the flat phantom distance 0mm. (APPENDIX 8)

Test Position 3: The top side of the EUT towards the bottom of the flat phantom distance 0mm. (APPENDIX 8)

Test Position 4: The right side of the EUT towards the bottom of the flat phantom distance 0mm.

(APPENDIX 8)

8. TEST RESULT

8.1 CONDUCTED POWER RESULTS

Test Mode	Data Rate (Mbps)	Test Results (dBm)		
		Conducted AV		
		2412MHz	2437MHz	2462MHz
802.11b	1	14.77	14.59	14.78
	2	14.61	14.52	14.65
	5.5	14.53	14.38	14.58
	11	14.41	14.22	14.47

Test Mode	Data Rate (Mbps)	Test Results (dBm)		
		Conducted AV		
		2412MHz	2437MHz	2462MHz
802.11g	6	12.66	13.92	13.79
	9	12.61	13.67	13.65
	12	12.55	13.54	13.52
	18	12.51	13.56	13.47
	24	12.49	13.53	13.41
	36	12.42	13.51	13.39
	48	12.35	13.46	13.35
	54	12.28	13.43	13.27

Test Mode	Data Rate (Mbps)	Test Results (dBm)		
		Conducted AV		
		2412MHz	2437MHz	2462MHz
802.11n HT20	MCS0	11.81	12.75	12.98
	MCS1	11.72	12.71	12.87
	MCS2	11.73	12.64	12.82
	MCS3	11.68	12.63	12.75
	MCS4	11.69	12.61	12.72
	MCS5	11.62	12.57	12.68
	MCS6	11.64	12.55	12.79
	MCS7	11.58	12.53	12.75
	MCS8	11.59	12.51	12.67
	MCS9	11.53	12.46	12.61
	MCS10	11.54	12.43	12.58
	MCS11	11.52	12.41	12.56
	MCS12	11.49	12.38	12.49
	MCS13	11.42	12.37	12.45
	MCS14	11.38	12.31	12.30
	MCS15	11.35	12.25	12.31

Test Mode	Data Rate (Mbps)	Test Results (dBm)		
		Conducted AV		
		2422MHz	2437MHz	2452MHz
802.11n HT40	MCS0	10.85	11.61	11.72
	MCS1	10.82	11.54	11.65
	MCS2	10.77	11.49	11.62
	MCS3	10.75	11.42	11.57
	MCS4	10.71	11.38	11.55
	MCS5	10.64	11.35	11.51
	MCS6	10.62	11.33	11.49
	MCS7	10.58	11.28	11.47
	MCS8	10.51	11.24	11.44
	MCS9	10.46	11.22	11.35
	MCS10	10.41	11.16	11.31
	MCS11	10.35	11.13	11.28
	MCS12	10.32	11.11	11.22
	MCS13	10.28	11.09	11.15
	MCS14	10.22	11.05	11.11
	MCS15	10.16	11.02	11.07

Test Mode	Data Rate (Mbps)	Test Results (dBm)							
		Conducted AV							
		5180	5200	5220	5240	5260	5280	5300	5320
802.11a	6	13.90	13.95	13.65	13.47	13.45	13.69	13.5	13.22
	9	13.86	13.91	13.58	13.45	13.42	13.61	13.46	13.17
	12	13.81	13.88	13.55	13.42	13.39	13.58	13.43	13.12
	18	13.75	13.85	13.46	13.39	13.31	13.49	13.36	13.08
	24	13.71	13.82	13.42	13.32	13.27	13.45	13.32	13.02
	36	13.67	13.79	13.35	13.31	13.22	13.37	13.29	12.88
	48	13.64	13.75	13.31	13.28	13.19	13.34	13.25	12.82
	54	13.58	13.73	13.29	13.21	13.12	13.23	13.18	12.77

Test Mode	Data Rate (Mbps)	Test Results (dBm)			
		Conducted AV			
		5745	5765	5785	5825
802.11a	6	13.78	13.74	13.93	13.82
	9	13.74	13.71	13.87	13.77
	12	13.66	13.70	13.74	13.65
	18	13.57	13.67	13.72	13.56
	24	13.56	13.65	13.69	13.53
	36	13.52	13.62	13.68	13.51
	48	13.51	13.59	13.62	13.49
	54	13.43	13.57	13.54	13.45

Test Mode	Data Rate (Mbps)	Test Results (dBm)							
		Conducted AV							
		5180	5200	5220	5240	5260	5280	5300	5320
802.11n HT20	MCS0	12.59	12.71	12.66	12.89	12.83	12.53	12.61	12.67
	MCS1	12.52	12.66	12.59	12.81	12.79	12.44	12.56	12.61
	MCS2	12.48	12.65	12.55	12.78	12.74	12.41	12.53	12.57
	MCS3	12.46	12.62	12.52	12.75	12.72	12.38	12.51	12.55
	MCS4	12.44	12.56	12.48	12.69	12.69	12.35	12.45	12.49
	MCS5	12.41	12.52	12.47	12.62	12.67	12.31	12.43	12.46
	MCS6	12.36	12.47	12.43	12.61	12.62	12.26	12.41	12.42
	MCS7	12.35	12.42	12.41	12.55	12.61	12.22	12.38	12.39
	MCS8	12.32	12.37	12.38	12.53	12.55	12.21	12.36	12.35
	MCS9	12.28	12.34	12.35	12.5	12.52	12.16	12.32	12.31
	MCS10	12.24	12.33	12.34	12.47	12.48	12.14	12.3	12.28
	MCS11	12.18	12.28	12.32	12.41	12.44	12.11	12.28	12.22
	MCS12	12.17	12.24	12.27	12.38	12.41	12.08	12.24	12.21
	MCS13	12.14	12.19	12.25	12.35	12.34	12.02	12.21	12.19
	MCS14	12.12	12.12	12.21	12.46	12.31	11.97	12.15	12.13
	MCS15	12.05	12.06	12.12	12.34	12.28	11.89	12.12	12.11