SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C

FOR

802.11A/B/G/N PCIEXPRESS MINICARD

MODEL: AR5BXB72

FCC ID: PPD-AR5BXB72-L

REPORT NUMBER: 06U10667-1B

(Collocation with BT and WWANs)

ISSUE DATE: NOVEMBER 8, 2006

Prepared for

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Prepared by

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LAB CODE:200065-0

Revision History
Revision History

Rev.	Issued date	Revisions	Revised By
--	October 24, 2006	Initial issue. Base on CCS SAR Reports: 06U10634 (WLAN - AR5BXB72-L), 06U10630 (WWAN - MC8755), 06U10631 (WWAN - MC8765) and 06U10632 (WWAN - MC5720)	HS
B	November 8, 2006	Correct some typo	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: October 12, 13, 16, 17 and 23, 2006

APPLICANT: ADDRESS:	ATHEROS COMMUNICATIONS, INC 5480 GREAT AMERICA PARKWAY SANTA CLARA, CA 95054, USA
FCC ID: MODEL:	PPD-AR5BXB72-L AR5BXB72
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

802.11a/b/g/n PCIExpress Minicard is installed in Lenovo ThinkPad X60Tablet along with WWAN MC5720 FCC ID: N7N-MC5720, WWAN MC8755 FCC ID: N7NMC8755, and WWAN MC8765 FCC ID: N7NMC8765.

Test Sample is a:	Production unit		
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11agn		
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	The Highest Collocation SAR Values [1g_mW/g]
FCC 15.247	2412-2462	0.361	0.558
	5745 - 5825	0.678	0.861
FCC 15.401	5180 - 5320	0.233	0.609

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01).

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Hsin Fu Shih
Senior Engineer
Compliance Certification Services

Tested By:

Ninous Davoudi
EMC Engineer
Compliance Certification Services

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EQUIPMENT UNDER TEST (EUT) DESCRIPTION

802.11a/b/g/n PCIExpress Minicard is installed in Lenovo ThinkPad X60Tablet along with WWAN MC5720 FCC ID: N7N-MC5720, WWAN MC8755 FCC ID: N7NMC8755, and WWAN MC8765 FCC ID: N7NMC8765.	
Normal operation:	Lap-held position, and underarm position
Accessory:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	100%
Host Device(s):	Lenovo ThinkPad X60Tablet
Antenna(s)	Antenna type: PIFA - Main - Wistron, PN 25.90354.001 - Auxiliary - Wistron, PN 25.90355.001
Power supply:	Power supplied through the laptop computer (host device).

1 FACILITIES AND ACCREDITATION

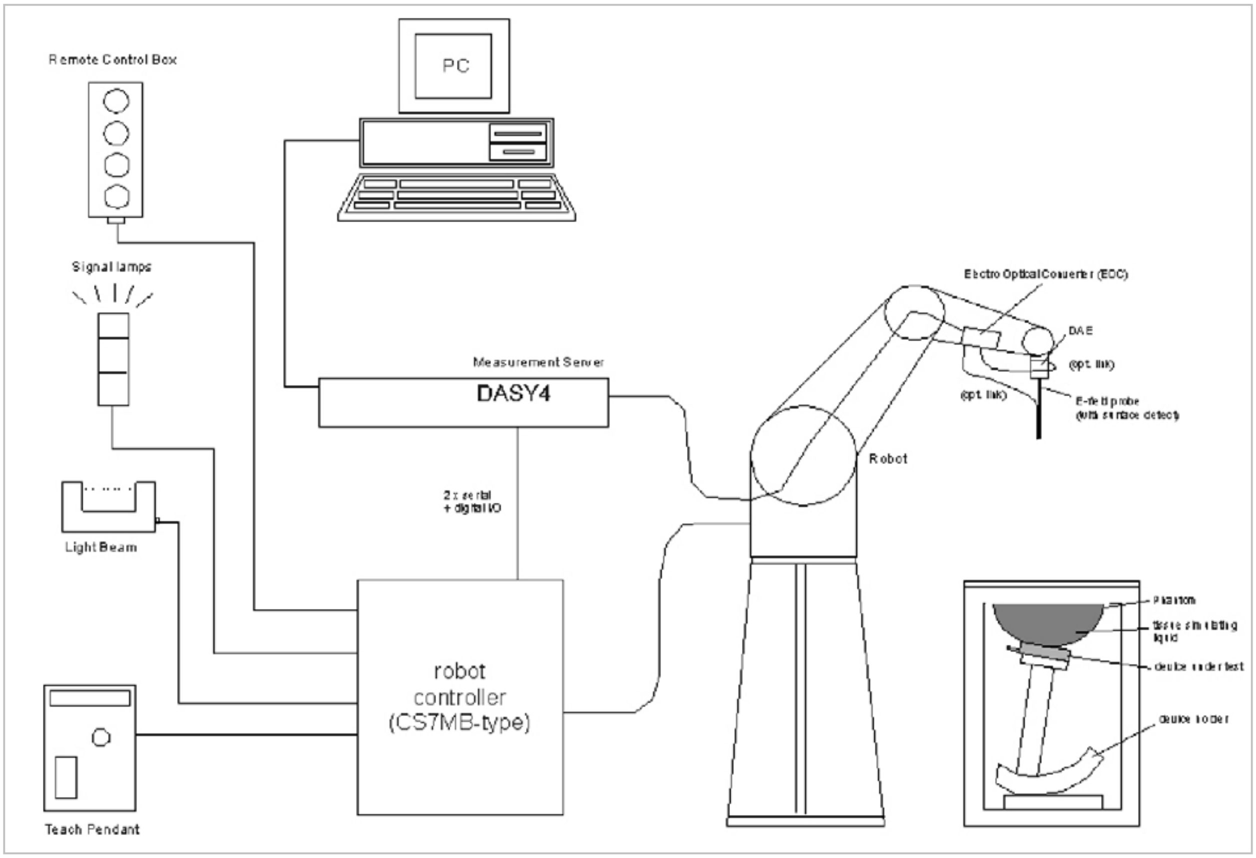
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

LAB CODE:200065-0

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

2 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- 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.
- 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 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

2.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATIG LIQUIDS

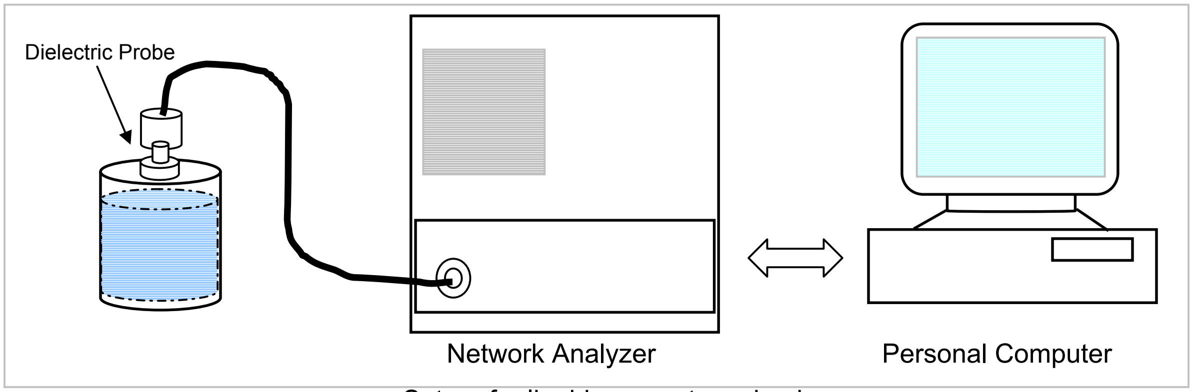
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz) 450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

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

3 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	**Head**		**Body**	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

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

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured suing a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired ±5% for the whole 5 to 5.8 GHz range.

f (MHz)	Head Tissue		Body Tissue		Reference
	rel. permitivity	conductivity	rel. permitivity	conductivity	
3000	38.5	2.40	52.0	2.73	Standard
5800	35.3	5.27	**48.2**	**6.00**	Standard
5000	36.2	1.45	49.3	5.07	Interpolated
5100	36.1	4.55	49.1	5.18	Interpolated
5200	36.0	4.66	**49.0**	**5.30**	Interpolated
5300	35.9	4.76	48.9	5.42	Interpolated
5400	35.8	4.86	48.7	5.53	Interpolated
5500	35.6	4.96	48.6	5.65	Interpolated
5600	35.5	5.07	48.5	5.77	Interpolated
5700	35.4	5.17	48.3	5.88	Interpolated

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

3.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	22	15	e'	52.3704	Relative Permittivity (ε_r):	52.3704	52.7	-0.63	± 5
			e"	15.0099	Conductivity (σ):	2.04580	1.95	4.91	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
October 12, 2006 07:31 PM

Frequency	e'	e"
2400000000.	52.5536	14.8109
2405000000.	52.5402	14.8226
2410000000.	52.5257	14.8512
2415000000.	52.5113	14.8645
2420000000.	52.4825	14.8962
2425000000.	52.4650	14.9214
2430000000.	52.4536	14.9391
2435000000.	52.4489	14.9676
2440000000.	52.4333	14.9604
2445000000.	52.3844	14.9807
2450000000.	**52.3704**	**15.0099**
2455000000.	52.3637	15.0416
2460000000.	52.3495	15.0641
2465000000.	52.3168	15.0721
2470000000.	52.2882	15.0828
2475000000.	52.2793	15.1143
2480000000.	52.2637	15.1316
2485000000.	52.2459	15.1557
2490000000.	52.2313	15.1760
2495000000.	52.2187	15.2093
2500000000.	52.1966	15.2204

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	22	15	e'	51.6202	Relative Permittivity (ε_r):	51.6202	52.7	-2.05	± 5
			e"	15.0102	Conductivity (σ):	2.04584	1.95	4.91	± 5

Liquid Check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
October 23, 2006 02:32 PM

Frequency	e'	e"
2400000000.	51.8123	14.8300
2410000000.	51.7725	14.8431
2420000000.	51.7203	14.8723
2430000000.	51.6840	14.9162
2440000000.	51.6527	14.9659
2450000000.	**51.6202**	**15.0102**
2460000000.	51.5789	15.0552
2470000000.	51.5586	15.1007
2480000000.	51.5117	15.1507
2490000000.	51.4800	15.2083
2500000000.	51.4339	15.2210

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where f = target $f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	23	15	e'	50.8077	Relative Permittivity (ε_r):	50.8077	49.0	3.69	± 10
			e"	18.8712	Conductivity (σ):	5.45911	5.30	3.00	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
October 13, 2006 03:21 PM

Frequency	e'	e"
4600000000.	52.0293	17.8917
4650000000.	51.9039	17.9832
4700000000.	51.8416	18.0827
4750000000.	51.6994	18.1638
4800000000.	51.6327	18.2585
4850000000.	51.5042	18.3140
4900000000.	51.4216	18.4145
4950000000.	51.3260	18.5109
5000000000.	51.1885	18.5630
5050000000.	51.0987	18.6673
5100000000.	50.9752	18.7086
5150000000.	50.8902	18.8238
5200000000.	**50.8077**	**18.8712**
5250000000.	50.6781	18.9647
5300000000.	50.5977	19.0161
5350000000.	50.5019	19.0948
5400000000.	50.4060	19.1606
5450000000.	50.2993	19.2522
5500000000.	50.1899	19.3034
5550000000.	50.1217	19.3968
5600000000.	50.0055	19.4251
5650000000.	49.9111	19.5407
5700000000.	49.8590	19.5559
5750000000.	49.7171	19.6536
5800000000.	49.6601	19.7069
5850000000.	49.4992	19.7610
5900000000.	49.4388	19.8677
5950000000.	49.3396	19.8895
6000000000.	49.2313	19.9939

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = target\ f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 42% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	23	15	e'	49.7798	Relative Permittivity (ε_r):	49.7798	49.0	1.59	± 10
			e"	18.6660	Conductivity (σ):	5.39975	5.30	1.88	± 5
5800	23	15	e'	48.7195	Relative Permittivity (ε_r):	48.7195	48.2	1.08	± 10
			e"	19.4350	Conductivity (σ):	6.27092	6.00	4.52	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg C
October 16, 2006 06:01 AM

Frequency	e'	e"
4600000000.	50.9985	17.7329
4650000000.	50.9414	17.8455
4700000000.	50.8367	17.8837
4750000000.	50.7252	17.9998
4800000000.	50.6467	18.0696
4850000000.	50.5135	18.1610
4900000000.	50.4341	18.2250
4950000000.	50.2582	18.2759
5000000000.	50.2374	18.3932
5050000000.	50.1144	18.4260
5100000000.	49.9989	18.5609
5150000000.	49.9270	18.5697
5200000000.	**49.7798**	**18.6660**
5250000000.	49.7293	18.7008
5300000000.	49.5880	18.7862
5350000000.	49.5437	18.8432
5400000000.	49.4064	18.8885
5450000000.	49.3122	18.9825
5500000000.	49.2303	19.0065
5550000000.	49.1326	19.1258
5600000000.	49.0693	19.1516
5650000000.	48.9187	19.2374
5700000000.	48.8933	19.2782
5750000000.	48.7583	19.3394
5800000000.	**48.7195**	**19.4350**
5850000000.	48.5649	19.4409
5900000000.	48.5262	19.5678
5950000000.	48.3839	19.5718
6000000000.	48.3229	19.7154

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	23	15	e'	50.5382	Relative Permittivity (ε_r):	50.5382	48.2	4.85	± 10
			e"	19.3106	Conductivity (σ):	6.23079	6.00	3.85	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
October 17, 2006 07:03 AM

Frequency	e'	e"
4600000000.	52.5350	17.6608
4650000000.	52.6257	17.6950
4700000000.	52.4032	17.8001
4750000000.	52.4972	17.8547
4800000000.	52.2859	17.9205
4850000000.	52.2966	18.0831
4900000000.	52.1649	18.1340
4950000000.	52.0306	18.1913
5000000000.	52.0580	18.2926
5050000000.	51.8993	18.3552
5100000000.	51.9079	18.4650
5150000000.	51.7282	18.5431
5200000000.	51.5867	18.6047
5250000000.	51.5639	18.6160
5300000000.	51.3846	18.6867
5350000000.	51.3840	18.7353
5400000000.	51.2458	18.8378
5450000000.	51.1716	18.8712
5500000000.	51.0797	18.9752
5550000000.	50.9356	18.8651
5600000000.	50.9359	19.0708
5650000000.	50.8392	18.9565
5700000000.	50.6471	19.2558
5750000000.	50.7304	19.1652
5800000000.	**50.5382**	**19.3106**
5850000000.	50.6901	19.3923
5900000000.	50.5285	19.4344
5950000000.	50.4399	19.6425
6000000000.	50.3943	19.6043

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2\pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

4 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
  For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration(dx=dy=4.3mm; dz=3mm)
- Distance between probe sensors and phantom surface was set to 4 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	**51.2**	**23.7**	97.6

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

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using finite-difference time-domain FDTD method (feed point-impedance set to 50 ohms) and the mechanical dimensions of the D5GHzV2 dipole (manufactured by SPEAG).

f (MHz)	Head Tissue		Body Tissue		
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}	SAR_{Peak}
5000	72.9	20.7	68.1	19.2	260.3
5100	74.6	21.1	78.8	19.6	272.3
5200	76.5	21.6	**71.8**	**20.1**	284.7
5800	78.0	21.9	**74.1**	**20.5**	324.7

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

4.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 706

Date: October 12, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	22	15	1g	13.20	52.8	51.2	3.12	± 10
			10g	6.03	24.12	23.7	1.77	± 10

Date: October 23, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	22	15	1g	13.10	52.4	51.2	2.34	± 10
			10g	6	24	23.7	1.27	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: October 13, 2006

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	23	15	1g	18.00	72	71.8	0.28	± 10
			10g	5.07	20.28	20.1	0.90	± 10

Date: October 16, 2006

Room Ambient Temperature = 24°C; Relative humidity = 42% Measured by: Sunny Shih

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	23	15	1g	17.80	71.2	71.8	-0.84	± 10
			10g	5.01	20.04	20.1	-0.30	± 10

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	23	15	1g	17.70	70.8	74.1	-4.45	± 10
			10g	4.94	19.76	20.5	-3.61	± 10

Date: October 17, 2006

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Sunny Shih

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	22	15	1g	17.60	70.4	74.1	-4.99	± 10
			10g	4.9	19.6	20.5	-4.39	± 10

5 SAR MEASURMENT PROCEDURE

A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

For 5 GHz band - The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 10 mm x 10 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

For 5 GHz band - Around this point, a volume of X=Y=Z=30 mm is assessed by measuring 8 x 8 x 8 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

(i) The data at the surface are extrapolated, since the centre of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

(ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

5.1 DASY4 SAR MEASURMENT PROCEDURE

Step 1: 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. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: 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 DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 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.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

For 5 GHz band – Same as above except the Zoom Scan measures 8 x 8 x 8 points.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

6 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following procedures had been used to prepare the EUT for the SAR test.

The client provided a special driver and program, Art, which enable a user to control the frequency and output power of the module.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Mode Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Total (dBm)
802.11b Mode				
Low	2412	17.1	16.9	20.0
Middle	2437	20.4	20.9	23.7
High	2462	17.4	17.6	20.5
802.11g Mode				
Low	2412	15.2	15.1	18.1
Middle	2437	20.3	20.7	23.5
High	2462	13.8	14.2	17.0
802.11n HT20 Mode				
Low	2412	15.1	15.1	18.1
Middle	2437	20.4	20.6	23.5
High	2462	12.5	12.8	15.7
802.11n HT40 Mode				
Low	2422	12.0	12.2	15.1
Middle	2437	18.6	18.6	21.6
High	2452	10.3	10.3	13.3

The cable assembly insertion loss of 11. dB (including 10 dB pad and 1.0 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Mode Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Total (dBm)
802.11a Mode				
Low	5180	8.68	8.5	11.6
Middle	5260	14.21	14.8	17.5
High	5320	14.01	15.0	17.6
802.11n HT20 Mode				
Low	5180	10.0	11.0	13.5
Middle	5260	15.9	18.1	20.1
High	5320	16.9	17.0	19.9
802.11n HT40 Mode				
Low	5190	12.3	13.7	16.1
Middle	5260	16.4	18.5	20.6
High	5310	14.2	14.6	17.4

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Mode Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Total (dBm)
802.11a Mode				
Low	5745	16.90	16.65	19.8
Middle	5785	16.85	16.74	19.8
High	5825	17.01	16.90	20.0
802.11n HT20 Mode				
Low	5745	16.79	16.40	19.6
Middle	5785	16.75	16.30	19.5
High	5825	16.86	16.25	19.6
802.11n HT40 Mode				
Low	5755	16.35	16.95	19.7
Middle	5785	16.26	16.89	19.6
High	5815	16.25	16.85	19.6

7 SAR MEASURMENT RESULTS

Following positions are skipped.

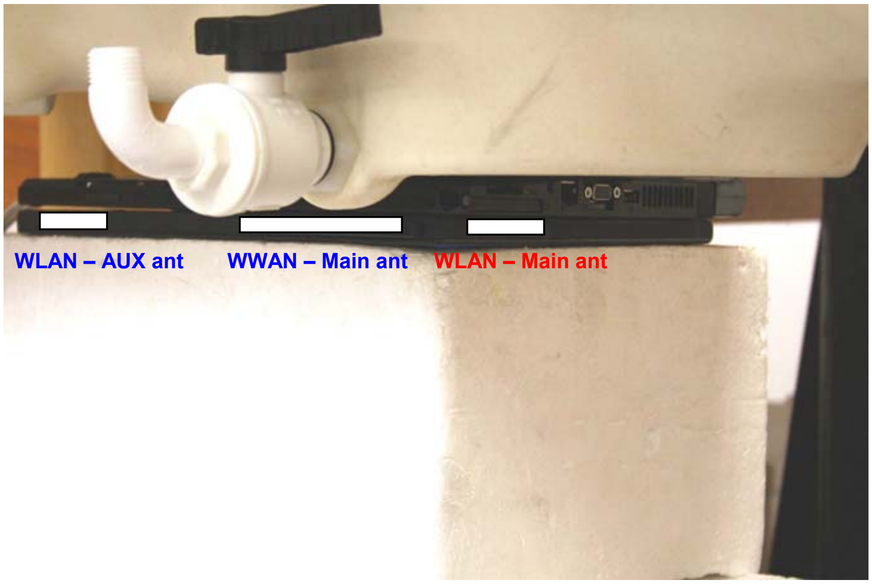
SECONDARY PORTRAIT
This position is skipped since the WLAN Main Antenna is disabled at this configuration.

PRIMARY LANDSCAPE

This position is skipped since SAR values are too low.

7.1 2.4GHZ BAND

7.1.1 LAP-HELD POSITION (MAIN ANTENNA)

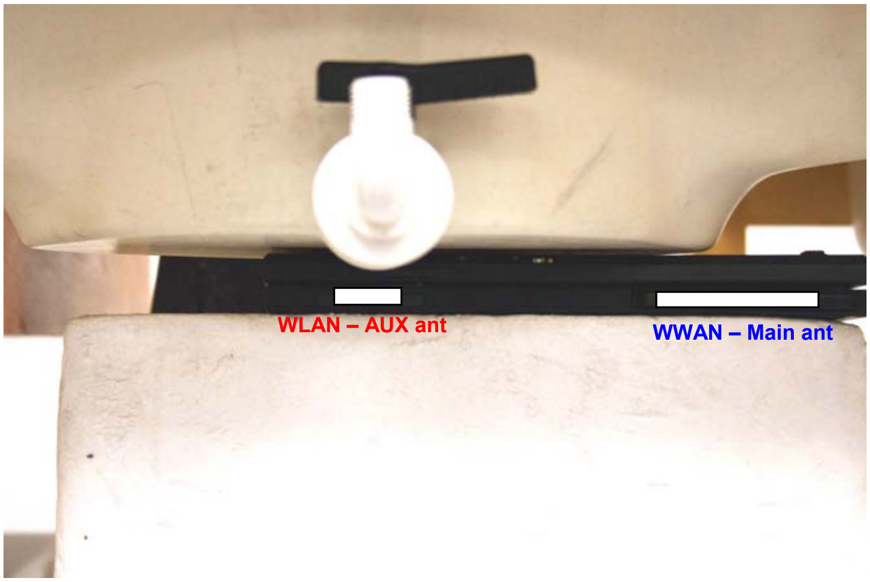


802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.115	0.000	0.115
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.098	-0.074	0.100
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.098	0.000	0.098
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2422 2437 2452	0.073	-0.061	0.074

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.1.2 LAP-HELD POSITION (AUX ANTENNA)



802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.122	0.000	0.122
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.109	0.000	0.109
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.111	0.000	0.111
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2422 2437 2452	0.075	0.000	0.075

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.1.3 EDGE POSITION – SECONDARY LANDSCAPE

802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.024	0.000	0.024
11	2462			
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.020	-0.132	0.021
11	2462			
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.020	-0.176	0.021
11	2462			
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2422			
6	2437	0.011	0.000	0.011
11	2452			

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) WLAN AUX Antenna is disabled at this position.

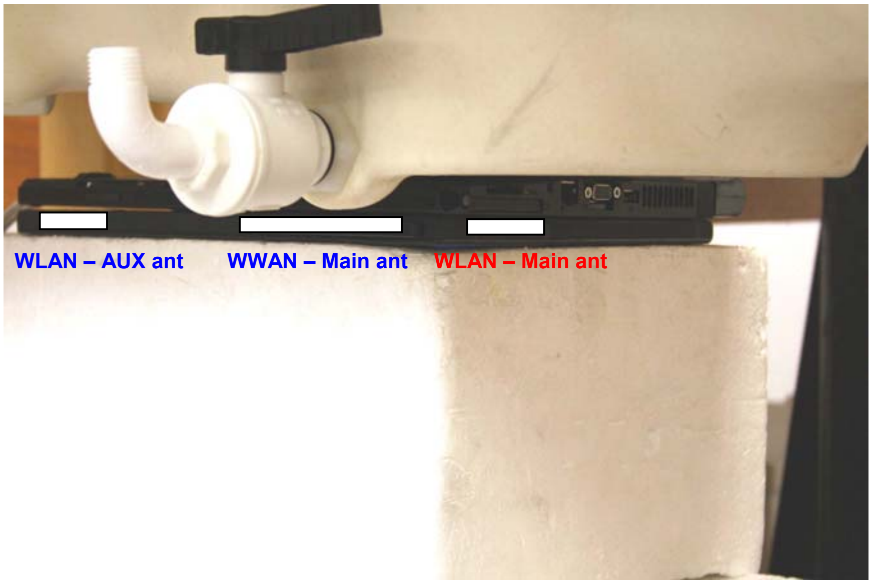
7.1.4 LCD EDGE POSITION – PRIMARY PORTRAIT

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
802.11b (1Mbps)				
1	2412			
6	**2437**	**0.355**	**-0.071**	**0.361**
11	2462			
6 [4]	2437	0.327	-0.146	0.338
802.11g (6Mbps)				
1	2412			
6	2437	0.293	-0.137	0.302
11	2462			
802.11n HT20 (6.5Mbps)				
1	2412			
6	2437	0.327	-0.124	0.336
11	2462			
802.11n HT40 (13.5Mbps)				
1	2422			
6	2437	0.246	0.000	0.246
11	2452			

Notes:
1. The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2. The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3. Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4. Collocation with Bluetooth module only.

7.2 5.2GHZ BAND

7.2.1 LAP-HELD POSITION (MAIN ANTENNA)



802.11a

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.064	-0.119	0.066

802.11n HT20

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.264	0.000	0.264

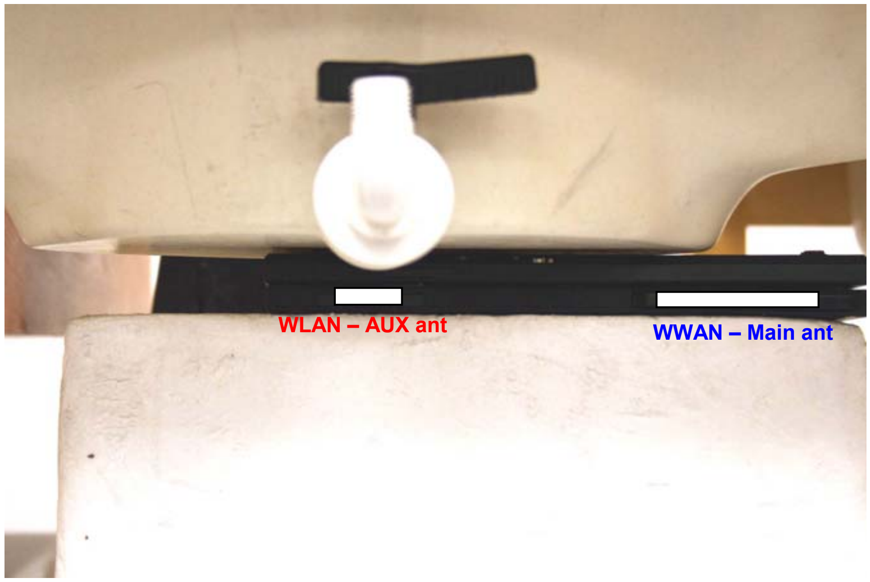
802.11n HT40

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38 52 62	5190 5260 5310	0.155	0.000	0.155

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.2.2 LAP-HELD POSITION (AUX ANTENNA)



802.11a

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.022	0.000	0.022

802.11n HT20

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.061	-0.119	0.063

802.11n HT40

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38 52 62	5190 5260 5310	0.069	-0.180	0.072

Notes:

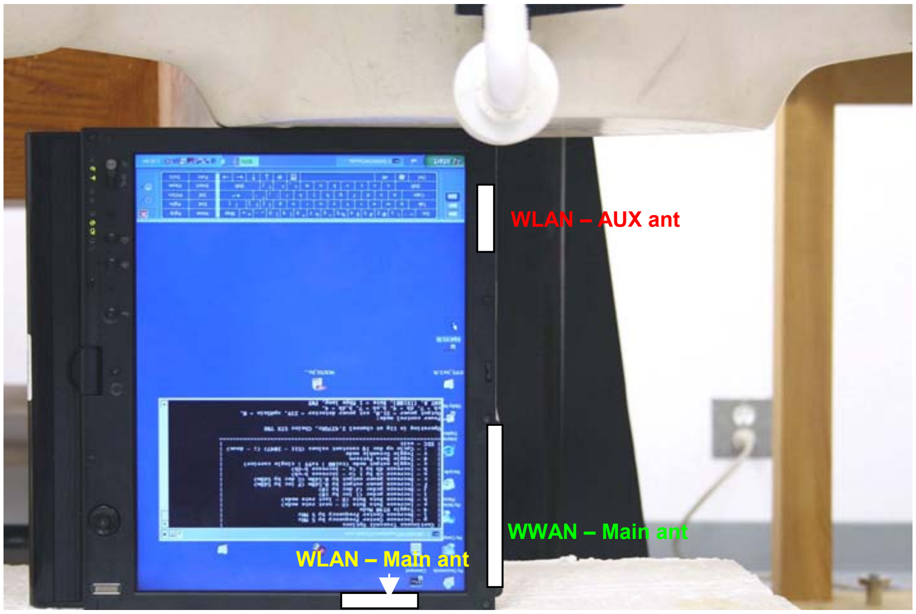
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.2.3 EDGE POSITION – SECONDARY LANDSCAPE

802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.016	0.000	0.016
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.027	0.000	0.027
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38 52 62	5190 5260 5310	0.040	-0.171	0.042

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) WLAN AUX Antenna is disabled at this position.

7.2.4 EDGE POSITION – PRIMARY PORTRAIT



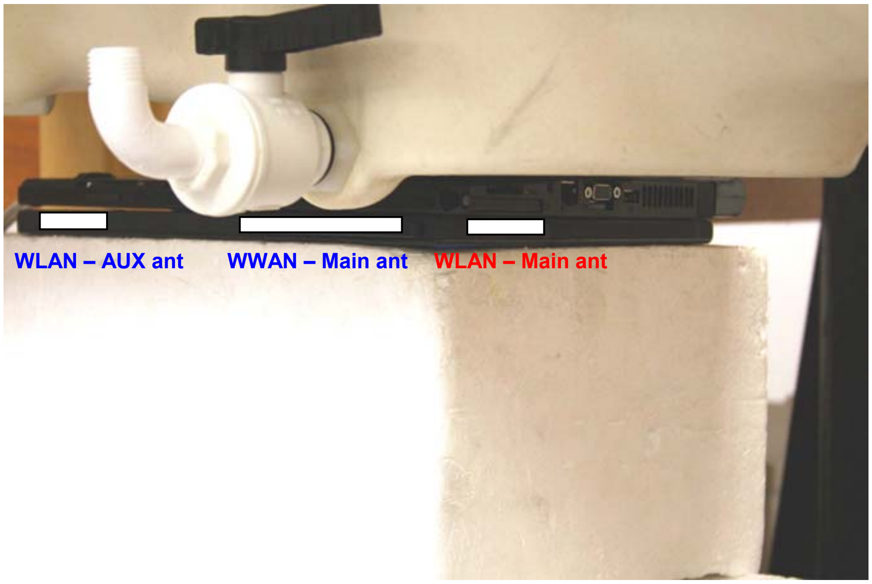
802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36	5180			
52	5260	0.148	0.000	0.148
64	5320			
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36	5180			
52	**5260**	**0.677**	**-0.008**	**0.678**
64	5320			
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38	5190			
52	5260	0.615	0.000	0.615
62	5310			

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.3 5.8GHZ BAND

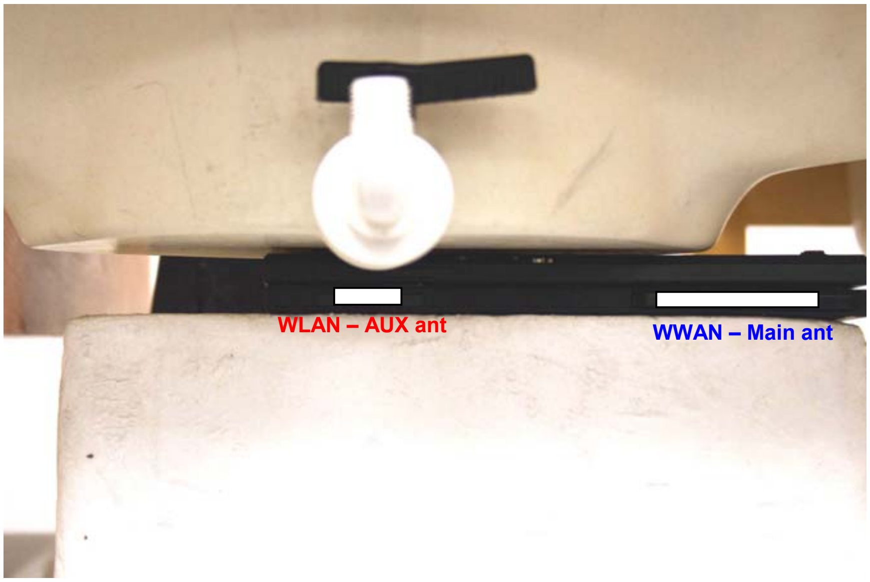
7.3.1 LAP-HELD POSITION (MAIN ANTENNA)



Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
802.11a				
149	5745			
157	5785	0.091	0.000	0.091
165	5825			
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149	5745			
157	5785	0.084	0.000	0.084
165	5825			
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.168	-0.133	0.173
157	5785	0.090	-0.192	0.094
163	5815	0.083	-0.099	0.084

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.3.2 LAP-HELD POSITION (AUX ANTENNA)



802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.038	0.000	0.038
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.037	0.000	0.037
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.038	0.000	0.038
157	5785	0.043	-0.170	0.045
163	5815	0.048	-0.158	0.050

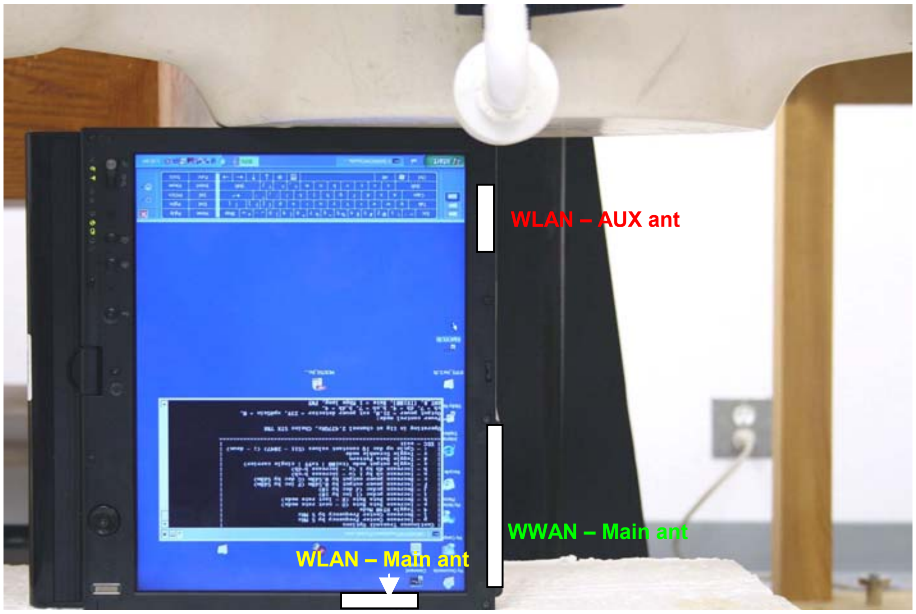
Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

7.3.3 EDGE POSITION – SECONDARY LANDSCAPE (Position 4)

802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149	5745	0.068	-0.150	0.070
157	5785	0.068	0.000	0.068
165	5825	0.030	0.000	0.030
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149	5745			
157	5785	0.042	-0.149	0.043
165	5825			
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755			
157	5785	0.039	0.000	0.039
163	5815			

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) WLAN AUX Antenna is disabled at this position.

7.3.4 EDGE POSITION – PRIMARY PORTRAIT



802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.178	0.000	0.178
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.153	0.000	0.153
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.160	-0.155	0.166
157	5785	0.189	0.000	0.189
163	**5815**	**0.233**	**0.000**	**0.233**

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

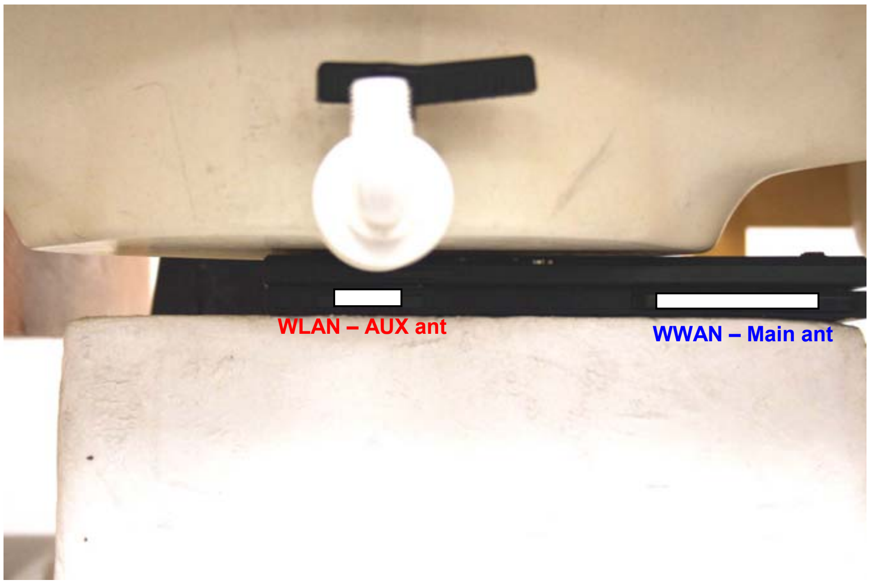
8 COLLOCATION EVALUATION RESULTS

Each antenna is test independently, one at a time; and total SAR is evaluated with sum of the SAR values from each antenna and frequency.

8.1 2.4GHZ BAND

8.1.1 LAP-HELD POSITION (AUX ANTENNA)

The highest reported SAR value at this configuration is: 0.122 W/kg (802.11b mode, channel 6, 2437 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.



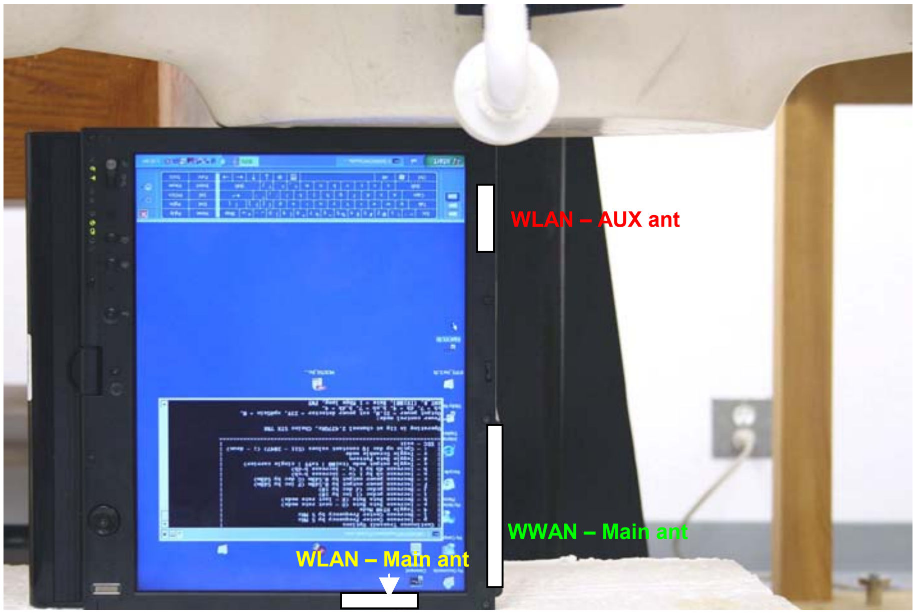
Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	2.4GHz	2437	0.122	0.000	0.122	N/A
MC5720	Cell	848.31	0.081	0.000	0.081	0.203
	PCS	**1851.25**	**0.427**	**-0.087**	**0.436**	**0.558**
MC8755	Cell	837.00	0.139	-0.089	0.142	0.264
	PCS	1850.20	0.182	-0.287	0.194	0.316
MC8765	Cell	837.00	0.118	-0.131	0.122	0.244
	PCS	1852.40	0.345	-0.157	0.358	0.480

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

8.1.2 LCD EDGE POSITION – PRIMARY PORTRAIT

The highest reported SAR value at this configuration is: 0.361 W/kg (802.11b mode, channel 6, 2437 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.



Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	2.4GHz	2437	0.355	-0.071	0.361	N/A
MC5720	Cell	836.52	0.066	0.000	0.066	0.427
	PCS	1880.00	0.045	-0.119	0.046	0.407
MC8755	Cell	837.00	0.082	0.000	0.082	0.443
	PCS	1880.00	0.056	0.000	0.056	0.417
MC8765	Cell	837.00	0.183	0.000	0.183	0.544
	PCS	1880.00	0.032	0.000	0.032	0.393

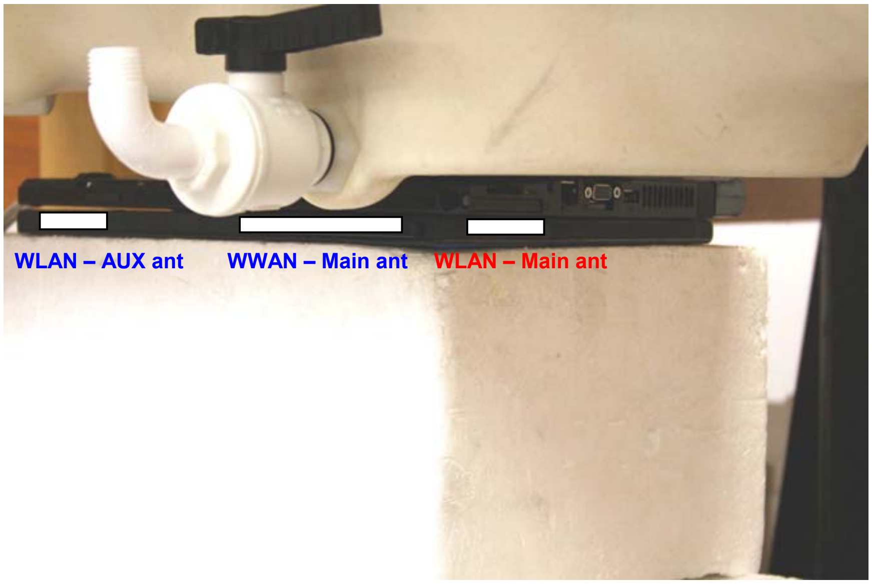
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

8.2 5.2GHZ BAND

8.2.1 LAP-HELD POSITION (MAIN ANTENNA)

The highest reported SAR value at this configuration is: 0.264W/kg (802.11n HT20 mode, channel 52, 5260 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.

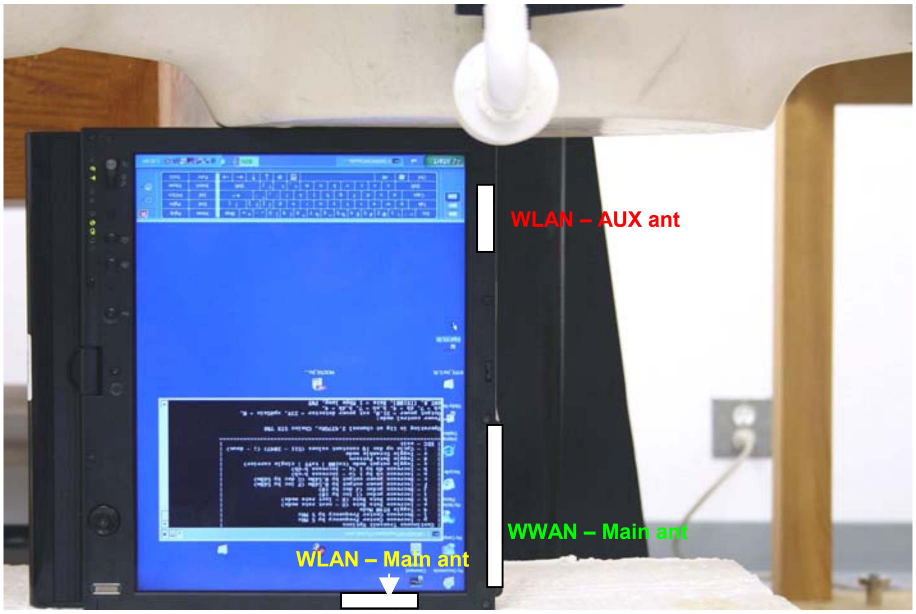


Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	5.2GHz	5260	0.264	0.000	0.264	N/A
MC5720	Cell	848.31	0.081	0.000	0.081	0.345
	PCS	1851.25	0.427	-0.087	0.436	0.700
MC8755	Cell	837.00	0.139	-0.089	0.142	0.406
	PCS	1850.20	0.182	-0.287	0.194	0.458
MC8765	Cell	837.00	0.118	-0.131	0.122	0.386
	PCS	1852.40	0.345	-0.157	0.358	0.622

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

8.2.2 LCD EDGE POSITION – PRIMARY PORTRAIT

The highest reported SAR value at this configuration is: 0.678 W/kg (802.11n HT20 mode, channel 52, 5260 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.



Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	5.2GHz	5260	0.677	-0.008	0.678	N/A
MC5720	Cell	836.52	0.066	0.000	0.066	0.744
	PCS	1880.00	0.045	-0.119	0.046	0.724
MC8755	Cell	837.00	0.082	0.000	0.082	0.760
	PCS	1880.00	0.056	0.000	0.056	0.734
MC8765	**Cell**	**837.00**	**0.183**	**0.000**	**0.183**	**0.861**
	PCS	1880.00	0.032	0.000	0.032	0.710

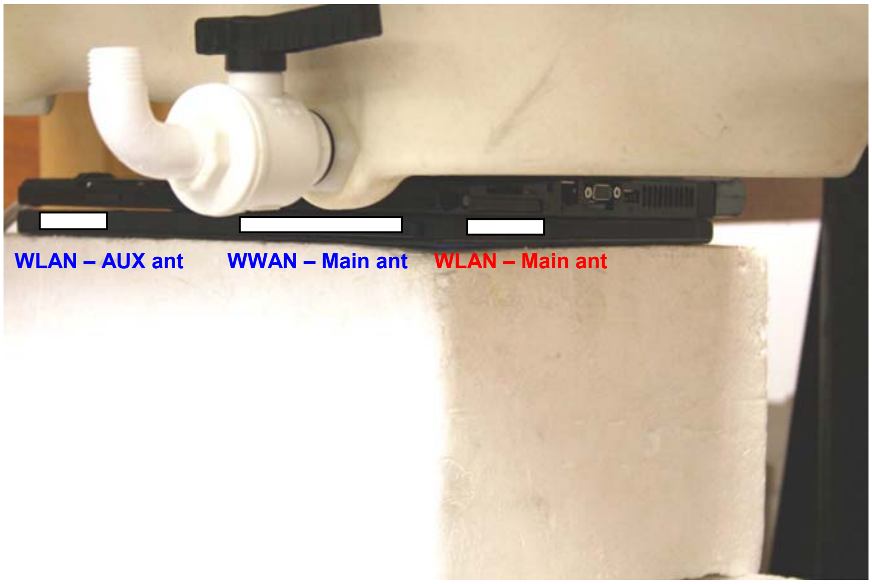
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

8.3 5.8GHZ BAND

8.3.1 LAP-HELD POSITION (MAIN ANTENNA)

The highest reported SAR value at this configuration is: 0.173 W/kg (802.11n HT40 mode, channel 151, 5755 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.

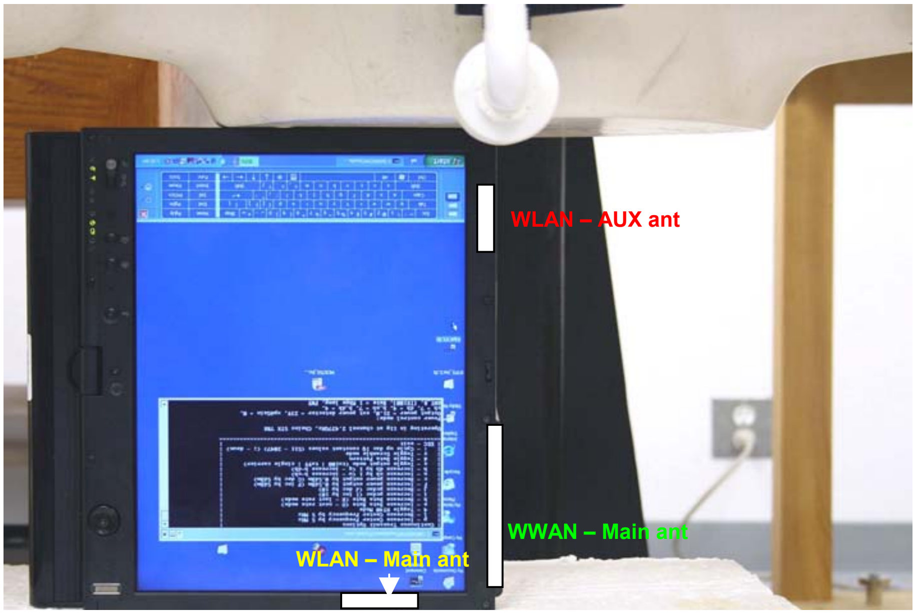


Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	5.8GHZ	5755	0.168	-0.133	0.173	N/A
MC5720	Cell	848.31	0.081	0.000	0.081	0.254
	PCS	**1851.25**	**0.427**	**-0.087**	**0.436**	**0.609**
MC8755	Cell	837.00	0.139	-0.089	0.142	0.315
	PCS	1850.20	0.182	-0.287	0.194	0.368
MC8765	Cell	837.00	0.118	-0.131	0.122	0.295
	PCS	1852.40	0.345	-0.157	0.358	0.531

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

8.3.2 LCD EDGE POSITION – PRIMARY PORTRAIT

The highest reported SAR value at this configuration is: 0.233 W/kg (802.11n HT40 mode, channel 163, 5815 MHz), please see CCS SAR Report 06U10634-4B for WLAN and 06U10630-3B (MC8755), 06U10631-3B (MC8765), and 06U106632-4B (MC5720) for WWANs.



Module	Band	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)	Total SAR 1g (mW/g)
WLAN	5.8GHz	5815	0.233	0.000	0.233	N/A
MC5720	Cell	836.52	0.066	0.000	0.066	0.299
	PCS	1880.00	0.045	-0.119	0.046	0.279
MC8755	Cell	837.00	0.082	0.000	0.082	0.315
	PCS	1880.00	0.056	0.000	0.056	0.289
MC8765	Cell	837.00	0.183	0.000	0.183	0.416
	PCS	1880.00	0.032	0.000	0.032	0.265

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) **Total SAR is evaluated with sum of the SAR values from each band frequency.**

9 MEASURMENT UNCERTAINTY

9.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

9.2 MEASURMENT UNCERTAINTY 3 GHz – 6 GHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.66	10.73
Expanded Uncertainty (95% Confidence Interval)	K=2					23.32	21.46

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

10 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2/9/07
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	EX3DV4	3552	5/30/07
Thermometer	ERTCO	639-1S	1718	1/11/07
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE4	558	1/20/07
System Validation Dipole	SPEAG	D2450V2	706	4/27/08
System Validation Dipole	SPEAG	D5GHzV2	1003	11/22/07
Power Meter	Giga-tronics	8651A	8651404	12/27/06
Power Sensor	Giga-tronics	80701A	1834588	12/27/07
Amplifier	Mini-Circuits	ZVE-8G	0360	N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	3/21/07
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test
Simulating Liquid	SPEAG	M5200-5800	N/A	Within 24 hrs of first test

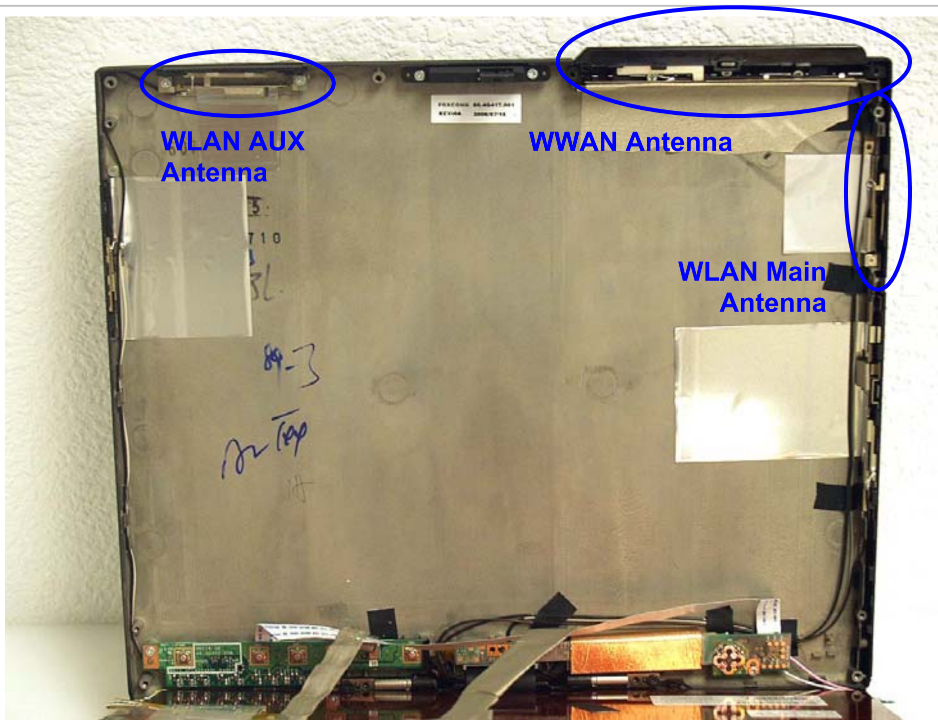
11 PHOTOS

DUT

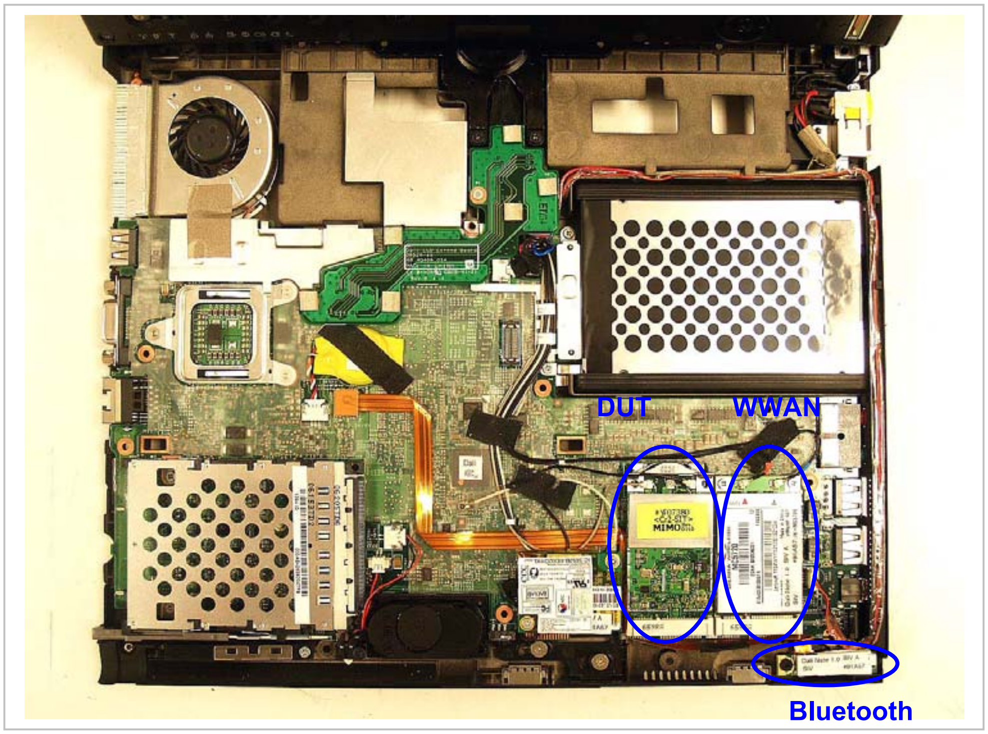
Host laptop – Normal Mode

Host laptop – Tablet Mode

Antenna Location



DUT Location



12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	12
2-1	SAR Test Plots – 2.4GHz	18
2-2	SAR Test Plots – 5.2GHz	13
2-3	SAR Test Plots – 5.8GHz	21
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D2450 SN:706	9
5	Certificate of System Validation Dipole - D5GHzV2 SN:1003	10
6	Material Specification Data Sheet of Body Simulating Liquid (5GHz)	3

END OF REPORT