JQA File No. : KL80130099
Issue Date : June 19, 2013

TEST REPORT (SAR EVALUATION)

Applicant	:	Sharp Corporation, Communication Systems Division
Address	:	2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
Products	:	Tablet
Model No.	:	SH-08E
Serial No.	:	004401114855147
FCC ID	:	APYHRO00191
Test Standard	:	FCC/OET Bulletin 65 Supplement C (Edition 01-01)
Test Results	:	**Passed**
Date of Test	:	June 7 ~ 17, 2013

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ilac-MRA VLAC Lab Accreditation VLAC-001-2

- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan, National Institute of Information and Communications Technology (NICT) of Japan , and Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
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- VLAC does not approve, certify or warrant the product by this test report.

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1 Description of the Device Under Test (DUT)

1.	Manufacturer	:	Sharp Corporation, Communication Systems Division 2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2.	Products	:	Tablet
3.	Model No.	:	SH-08E
4.	Serial No.	:	004401114855147
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	May, 2013
7.	Transmitting Frequency	:	826.4 MHz – 846.6 MHz (WCDMA Band V) 824.2 MHz – 848.8 MHz (GSM 850) 1850.2 MHz – 1909.8 MHz (PCS 1900) 2402 MHz – 2480 MHz (Bluetooth) 2412 MHz – 2462 MHz (WLAN 802.11b/g/n) 5150 MHz – 5250 MHz (WLAN 802.11a/n/ac, W52) 5250 MHz – 5350 MHz (WLAN 802.11a/n/ac, W53) 5470 MHz – 5725 MHz (WLAN 802.11a/n/ac, W56)
8.	Battery Option	:	Lithium-ion Battery Pack UBATIA227AFN3 (4200mAh)
9.	Power Rating	:	4.0VDC
10.	EUT Grounding	:	None
11.	Device Category	:	Portable Device (§2.1093)
12.	Exposure Category	:	General Population/Uncontrolled Exposure
13.	FCC Rule Part(s)	:	24(E), 15.247, 15.407
14.	EUT Authorization	:	Certification
15.	Received Date of DUT	:	June 7, 2013

2 Summary of Test Results

Applied Standard : FCC/OET Bulletin 65 Supplement C (Edition 01-01)
Evaluating Compliance with FCC Guidelines for Human Exposure to Radio-frequency Electromagnetic Fields
Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions

Band	Test Configuration	**Reported 1 g SAR (W/kg)**	Limit (W/kg)
WCDMA Band V	Rear	**0.70**	**1.6**
GSM 850	Rear	**0.51**	
PCS 1900	Rear	**0.62**	
WLAN 2.4 GHz	Rear	**0.48**	
WLAN 5.2 GHz	Rear	**0.75**	
WLAN 5.3 GHz	Rear	**0.54**	
WLAN 5.6 GHz	Rear	**0.85**	
Simultaneous transmission condition		**1.55**	

The test results are **passed** for exposure limits specified in ANSI/IEEE Std. C95.1–1991.

In the approval of test results,
- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

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3 Test Procedure

The tests documented in this report were performed in accordance with FCC/OET Bulletin 65 Supplement C (Edition 01-01), IEEE Std.1528–2003 and the following KDB Procedures.

248227 D01 SAR meas for 802 11 a b g v01r02
447498 D01 General RF Exposure Guidance v05r01
616217 D04 SAR for laptop and tablets v01r01
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01
865664 D02 RF Exposure Reporting v01r01
941225 D01 SAR test for 3G devices v02
941225 D02 HSPA and 1x Advanced v02r02
941225 D03 SAR Test Reduction GSM GPRS EDGE v01

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

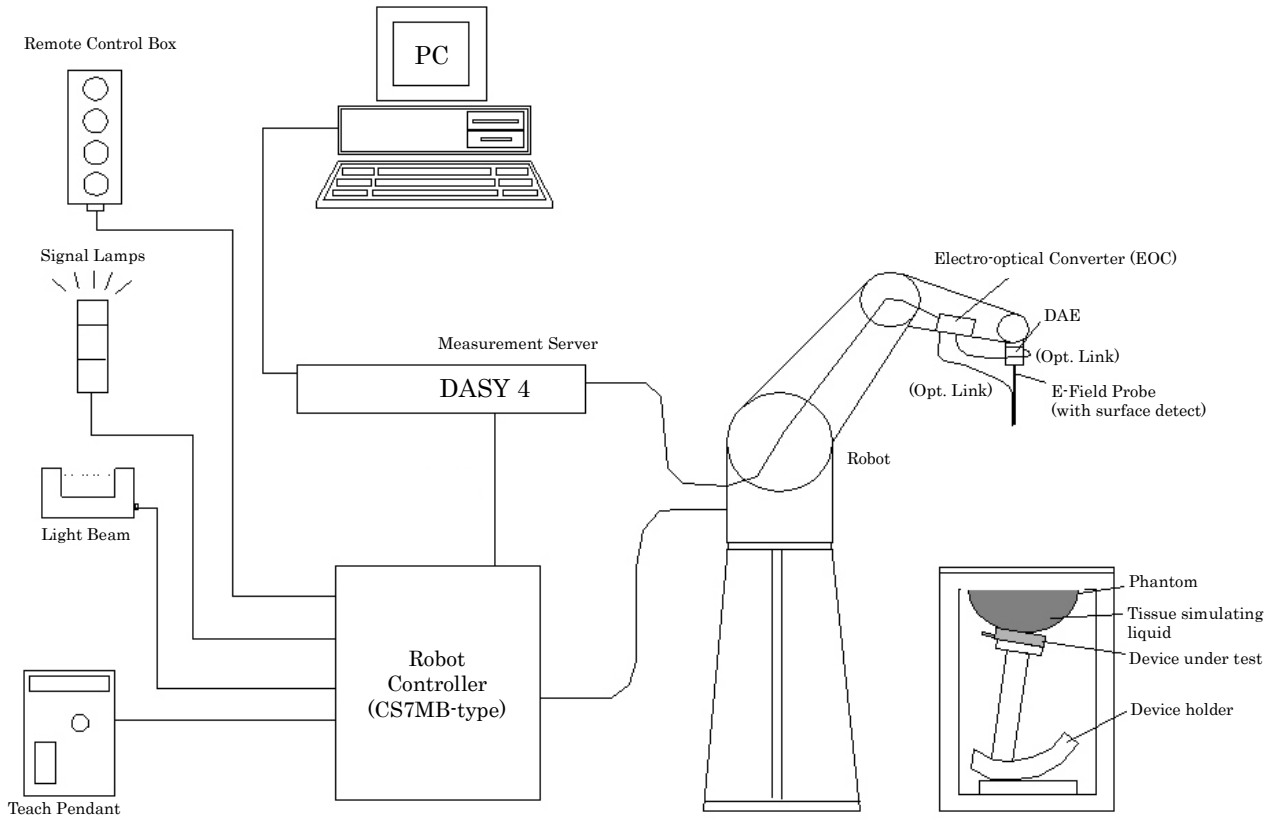
JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No.	:	VLAC-001-2 (Expiry date : March 30, 2014)
VCCI Registration No.	:	A-0002 (Expiry date : March 30, 2014)
BSMI Registration No.	:	SL2-IS-E-6006, SL2-IN-E-6006, SL2-A1-E-6006 (Expiry date : September 14, 2013)
IC Registration No.	:	2079E-3, 2079E-4 (Expiry date : July 20, 2014)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI. (Expiry date : February 22, 2016)

6 Measurement System Diagram

These measurements are performed using the DASY4 automated dosimetric assessment system (manufactured by Schmid & Partner Engineering AG (SPEAG) in Zürich, Switzerland). It consists of high precision robotics system, cell controller system, DASY4 measurement server, personal computer with DASY4 software, data acquisition electronic (DAE) circuit, the Electro-optical converter (EOC), near-field probe, and the twin SAM phantom containing the equivalent tissue. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).
The Robot is connected to the cell controller to allow software manipulation of the robot. The DAE is connected to the EOC. The DAE performs the signal amplification, signal multiplexing, A/D conversion, offset measurements, mechanical surface detection, collision detection, etc. The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server.



7 System Components

7.1 Probe Specification ET3DV6

Construction : Symmetrical design with triangular core
Built-in optical fiber for surface detection system
Built-in shielding against static changes
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration : In air form 10 MHz to 2.3 GHz
In head tissue simulating liquid (HSL) and muscle tissue simulating liquid
835 MHz (accuracy ± 12.0%; k=2)
900 MHz (accuracy ± 12.0%; k=2)
1450 MHz (accuracy ± 12.0%; k=2)
1750 MHz (accuracy ± 12.0%; k=2)
1900 MHz (accuracy ± 12.0%; k=2)
1950 MHz (accuracy ± 12.0%; k=2)

Frequency : 10 MHz to 2.3 GHz
Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)

Directivity : ± 0.2 dB in HSL (rotation around probe axis)
± 0.4 dB in HSL (rotation normal to probe axis)

Dynamic Range : 5 μW/g to >100 mW/g; Linearity: ± 0.2 dB

Surface Detection : ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

Dimensions : Overall length 337 mm
Tip length 16 mm
Body diameter 12 mm
Tip diameter 6.8 mm
Distance from probe tip to dipole centers 2.7 mm

7.2 Probe Specification EX3DV4

Construction : Symmetrical design with triangular core
Built-in shielding against static changes
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration : In air form 10 MHz to 6 GHz
In head tissue simulating liquid (HSL) and muscle tissue simulating liquid
2450 MHz (accuracy ± 12.0%; k=2)
2600 MHz (accuracy ± 12.0%; k=2)
5200 MHz (accuracy ± 13.1%; k=2)
5300 MHz (accuracy ± 13.1%; k=2)
5500 MHz (accuracy ± 13.1%; k=2)
5600 MHz (accuracy ± 13.1%; k=2)
5800 MHz (accuracy ± 13.1%; k=2)

Frequency : 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 6 GHz)

Directivity : ± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range : 10 μW/g to >100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μW/g)

Dimensions : Overall length 337 mm
Tip length 20 mm
Body diameter 12 mm
Tip diameter 2.5 mm
Distance from probe tip to dipole centers 1 mm

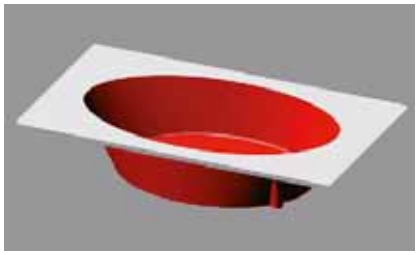
7.3 Twin SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Shell Thickness : 2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume : Volume Approx. 25 liters
Dimensions : 810 × 1000 × 500 mm (H × L × W)

7.4 ELI4 Flat 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 with the IEC 62209-2 standard and all known tissue simulating 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.

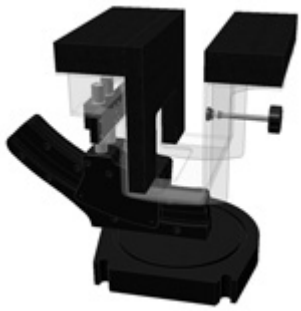


Shell Thickness : 2 ± 0.2 mm (sagging: <1%)
Filling Volume : Volume Approx. 30 liters
Dimensions : Major ellipse axis : 600 mm
Minor axis : 400 mm

7.5 Mounting Device for Transmitters

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat point).

7.6 Laptop Extensions Kit for Mounting Device



Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (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.

7.7 Typical Composition of Ingredients for Liquid Tissue

Ingredients (% by weight)	Frequency (MHz)					
	835		1900		2450	
	Head	Body	Head	Body	Head	Body
Water	41.45	52.40	54.90	40.40	62.70	73.20
Salt (NaCl)	1.45	1.40	0.18	0.50	0.50	0.04
Sugar	56.00	45.00	0.00	58.00	0.00	0.00
HEC	1.00	1.00	0.00	1.00	0.00	0.00
Bactericide	0.10	0.10	0.00	0.10	0.00	0.00
Triton X-100	0.00	0.00	0.00	0.00	36.80	0.00
DGBE	0.00	0.00	44.92	0.00	0.00	26.70

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-tetramethylbuthyl)phenyl]ether

The composition of ingredients is according to FCC/OET Bulletin 65 Supplement C.

8 Measurement Process

Step 1 : Power Reference Measurement

The power reference job measures the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method. The minimum distance of probe sensors to surface set to 4 mm for an ET3DV6 probe, or 2 mm for EX3DV4 probe. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

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 DASY software can find the maximum locations 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. If only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maxima within 2 dB of the maximum SAR value 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 points specified in standards within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure.

Step 4 : 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.

Step 5 : Power Drift Measurement

The power drift measurement measures the field at the same location as the most recent power reference measurement job 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. The power reference measurement and power drift measurement are for monitoring the power drift of the device under test in the batch process.

9 Measurement Uncertainties

9.1 300 MHz to 3 GHz

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %)		v_i
						1g	10g	
Measurement System								
Probe calibration	6.0	N	1	1	1	6.0	6.0	∞
Axial isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary effect	1.0	R	√3	1	1	0.6	0.6	∞
Linearity	4.7	R	√3	1	1	2.7	2.7	∞
System detection limits	1.0	R	√3	1	1	0.6	0.6	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0.8	R	√3	1	1	0.5	0.5	∞
Integration time	2.6	R	√3	1	1	1.5	1.5	∞
RF ambient conditions – noise	3.0	R	√3	1	1	1.7	1.7	∞
RF ambient conditions – reflections	3.0	R	√3	1	1	1.7	1.7	∞
Probe positioner mechanical tolerance	0.4	R	√3	1	1	0.2	0.2	∞
Probe positioning with respect to phantom shell	2.9	R	√3	1	1	1.7	1.7	∞
Extrapolation, interpolation and integration algorithms for max. SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Test Sample Related								
Test sample positioning	3.4	N	1	1	1	3.4	3.4	23
Device holder uncertainty	2.9	N	1	1	1	2.9	2.9	5
Output power variation – SAR drift measurement	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters								
Phantom uncertainty	4.0	R	√3	1	1	2.3	2.3	∞
Liquid conductivity – deviation from target	5.0	R	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – measurement uncertainty	3.2	N	1	0.64	0.43	2.0	1.4	5
Liquid Permittivity – deviation from target	5.0	R	√3	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – measurement uncertainty	3.0	N	1	0.6	0.49	1.8	1.5	5
Combined Standard Uncertainty		RSS				11.0	10.8	
Expanded Uncertainty (95% Confidence Interval)		k=2				**22.1**	**21.5**	

NOTES
1. Tol. : tolerance in influence quantity
2. Prob. Dist. : probability distributions
3. N, R : normal, rectanglar
4. Div. : divisor used to obtain standard uncertainty
5. c_i : sensitivity coefficient
6. Std. Unc. : standard uncertainty
7. Measurement uncertainties are according to IEEE Std. 1528 and IEC 62209-1.

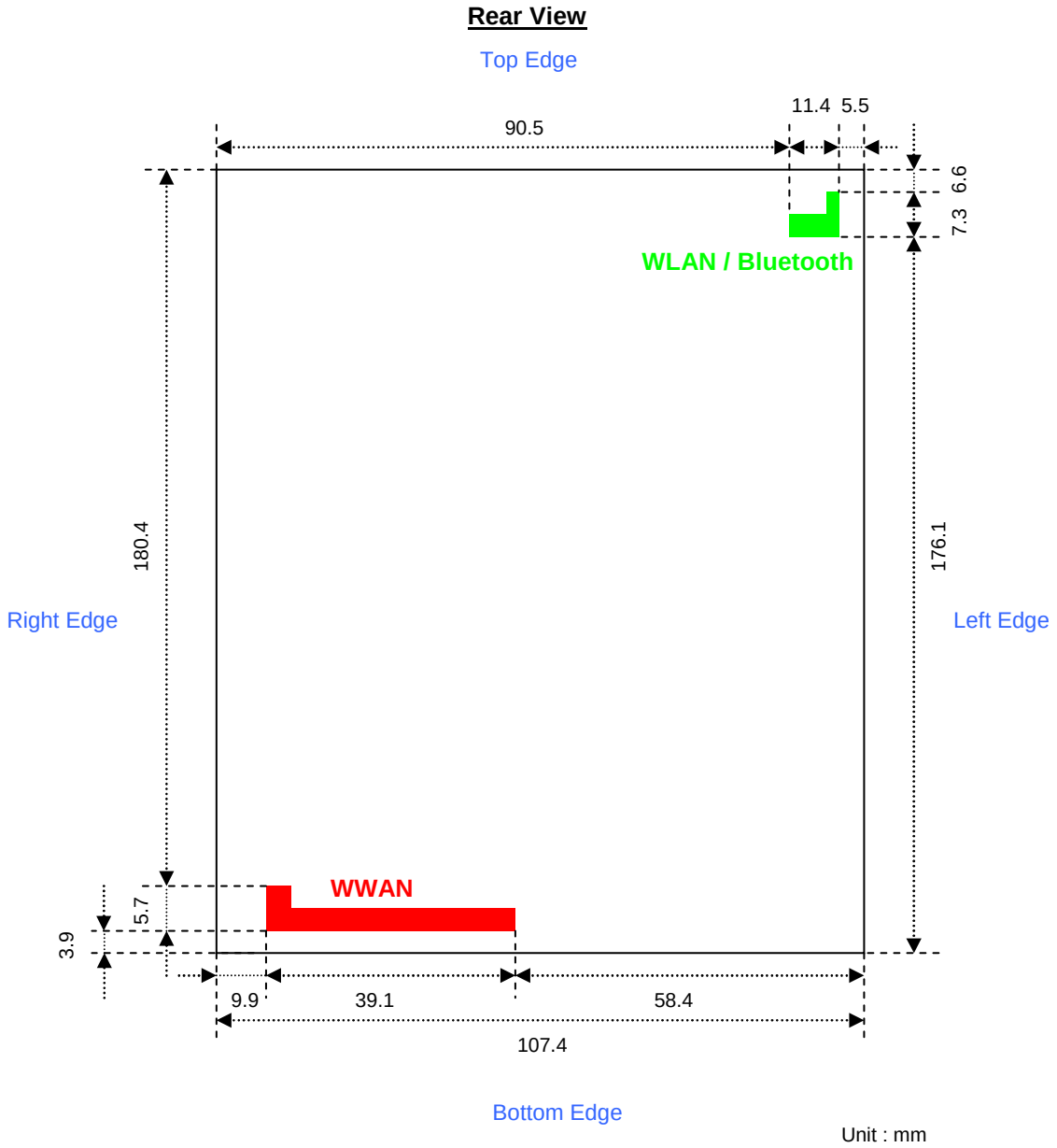
9.2 3 GHz to 6 GHz

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %)		v_i
						1g	10g	
Measurement System								
Probe calibration	6.6	N	1	1	1	6.6	6.6	∞
Axial isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary effect	2.0	R	√3	1	1	1.2	1.2	∞
Linearity	4.7	R	√3	1	1	2.7	2.7	∞
System detection limits	1.0	R	√3	1	1	0.6	0.6	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0.8	R	√3	1	1	0.5	0.5	∞
Integration time	2.6	R	√3	1	1	1.5	1.5	∞
RF ambient conditions – noise	3.0	R	√3	1	1	1.7	1.7	∞
RF ambient conditions – reflections	3.0	R	√3	1	1	1.7	1.7	∞
Probe positioner mechanical tolerance	0.8	R	√3	1	1	0.5	0.5	∞
Probe positioning with respect to phantom shell	9.9	R	√3	1	1	5.7	5.7	∞
Extrapolation, interpolation and integration algorithms for max. SAR evaluation	4.0	R	√3	1	1	2.3	2.3	∞
Test Sample Related								
Test sample positioning	3.4	N	1	1	1	3.4	3.4	23
Device holder uncertainty	2.9	N	1	1	1	2.9	2.9	5
Output power variation – SAR drift measurement	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters								
Phantom uncertainty	4.0	R	√3	1	1	2.3	2.3	∞
Liquid conductivity – deviation from target	5.0	R	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – measurement uncertainty	3.2	N	1	0.64	0.43	2.0	1.4	5
Liquid Permittivity – deviation from target	5.0	R	√3	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – measurement uncertainty	3.0	N	1	0.6	0.49	1.8	1.5	5
Combined Standard Uncertainty		RSS				12.8	12.6	
Expanded Uncertainty (95% Confidence Interval)		k=2				**25.7**	**25.2**	

NOTES
1. Tol. : tolerance in influence quantity
2. Prob. Dist. : probability distributions
3. N, R : normal, rectanglar
4. Div. : divisor used to obtain standard uncertainty
5. c_i : sensitivity coefficient
6. Std. Unc. : standard uncertainty
7. Measurement uncertainties are according to IEEE Std. 1528 and IEC 62209-1.

10 Test Arrangement

10.1 Antenna Location and Separation Distances



10.2 Exposure Conditions

Refer to section 10.1 "Antenna Location and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge/surface(s) distances.

10.2.1 Test Configuration for WWAN

Test Position	Antenna-to-edge/surface	SAR Required	Note
Front	--	NO	SAR is not required as this is not a typical use scenario.
Rear	< 5 mm	YES	
Top	180.4 mm	NO	Refer to section 13.7 for SAR exclusion justification
Bottom	3.9 mm	YES	
Left	58.4 mm	NO	Refer to section 13.7 for SAR exclusion justification
Right	9.9 mm	YES	

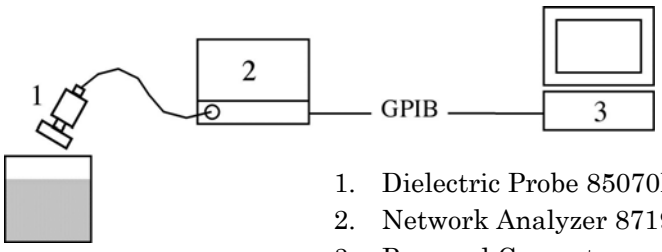
10.2.2 Test Configuration for WLAN

Test Position	Antenna-to-edge/surface	SAR Required	Note
Front	--	NO	SAR is not required as this is not a typical use scenario.
Rear	< 5 mm	YES	
Top	6.6 mm	YES	
Bottom	170.3 mm	NO	Refer to section 13.7 for SAR exclusion justification
Left	5.5 mm	YES	
Right	90.5 mm	NO	Refer to section 13.7 for SAR exclusion justification

11 Tissue Verification

11.1 Tissue Verification Measurement Condition

The tissue dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use, or earlier if dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
The temperature of the tissue-equivalent medium used during measurement must be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
It is verified by using the dielectric probe and the network analyzer.



1. Dielectric Probe 85070D
2. Network Analyzer 8719ET
3. Personal Computer

11.2 Tissue Dielectric Properties

The tissue dielectric properties are specified in FCC/OET Bulletin 65 Supplement C.

Target Frequency [MHz]	Head		Body	
	Permittivity (ε_r)	Conductivity (σ)	Permittivity (ε_r)	Conductivity (σ)
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

For tissue dielectric properties at other frequencies within the range, a linear interpolation method shall be used.

11.3 Tissue Verification Results

Tissue dielectric parameters are measured at the low, middle and high frequency of each operating frequency range of the test device.

Date	Liquid	Frequency [MHz]	Parameters	Target	Measured	Deviation [%]	Limit [%]
6/7/2013	Body	1850	Permittivity (ε_r)	53.3	53.22	-0.15	± 5
			Conductivity (σ)	1.52	1.467	-3.49	± 5
		1880	Permittivity (ε_r)	53.3	53.10	-0.38	± 5
			Conductivity (σ)	1.52	1.499	-1.38	± 5
		1900	Permittivity (ε_r)	53.3	53.03	-0.51	± 5
			Conductivity (σ)	1.52	1.521	+0.07	± 5
		1910	Permittivity (ε_r)	53.3	52.98	-0.60	± 5
			Conductivity (σ)	1.52	1.530	+0.66	± 5
6/10/2013	Body	820	Permittivity (ε_r)	55.3	55.04	-0.47	± 5
			Conductivity (σ)	0.97	0.958	-1.24	± 5
		835	Permittivity (ε_r)	55.2	54.98	-0.40	± 5
			Conductivity (σ)	0.97	0.973	+0.31	± 5
		850	Permittivity (ε_r)	55.2	54.90	-0.54	± 5
			Conductivity (σ)	0.99	0.988	-0.20	± 5
6/14/2013	Body	2410	Permittivity (ε_r)	52.8	51.81	-1.87	± 5
			Conductivity (σ)	1.91	1.905	-0.26	± 5
		2435	Permittivity (ε_r)	52.7	51.72	-1.86	± 5
			Conductivity (σ)	1.94	1.939	-0.05	± 5
		2450	Permittivity (ε_r)	52.7	51.67	-1.95	± 5
			Conductivity (σ)	1.95	1.960	+0.51	± 5
		2465	Permittivity (ε_r)	52.7	51.63	-2.03	± 5
			Conductivity (σ)	1.97	1.978	+0.41	± 5

Tissue Verification Results (continued)

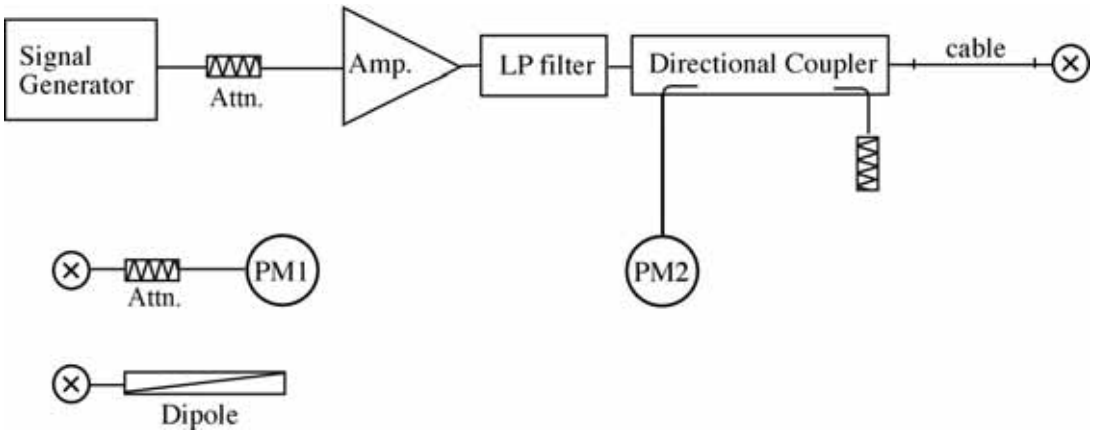
Date	Liquid	Frequency [MHz]	Parameters	Target	Measured	Deviation [%]	Limit [%]
6/17/2013	Body	5180	Permittivity (ε_r)	49.0	47.90	-2.24	± 5
			Conductivity (σ)	5.28	5.366	+1.63	± 5
		5200	Permittivity (ε_r)	49.0	47.85	-2.35	± 5
			Conductivity (σ)	5.30	5.392	+1.74	± 5
		5240	Permittivity (ε_r)	49.0	47.78	-2.49	± 5
			Conductivity (σ)	5.35	5.448	+1.83	± 5
6/17/2013	Body	5260	Permittivity (ε_r)	48.9	47.73	-2.39	± 5
			Conductivity (σ)	5.37	5.477	+1.99	± 5
		5300	Permittivity (ε_r)	48.9	47.64	-2.58	± 5
			Conductivity (σ)	5.42	5.528	+1.99	± 5
		5320	Permittivity (ε_r)	48.9	47.59	-2.68	± 5
			Conductivity (σ)	5.44	5.556	+2.13	± 5
6/17/2013	Body	5500	Permittivity (ε_r)	48.6	47.26	-2.76	± 5
			Conductivity (σ)	5.65	5.799	+2.64	± 5
		5520	Permittivity (ε_r)	48.6	47.24	-2.80	± 5
			Conductivity (σ)	5.67	5.825	+2.73	± 5
		5560	Permittivity (ε_r)	48.5	47.16	-2.76	± 5
			Conductivity (σ)	5.72	5.879	+2.78	± 5
		5600	Permittivity (ε_r)	48.5	47.06	-2.97	± 5
			Conductivity (σ)	5.77	5.935	+2.86	± 5
		5640	Permittivity (ε_r)	48.4	47.00	-2.89	± 5
			Conductivity (σ)	5.81	5.994	+3.17	± 5
		5680	Permittivity (ε_r)	48.4	46.94	-3.02	± 5
			Conductivity (σ)	5.86	6.047	+3.19	± 5
		5700	Permittivity (ε_r)	48.3	46.90	-2.90	± 5
			Conductivity (σ)	5.88	6.078	+3.37	± 5

12 System Validation

12.1 System Validation Measurement Condition

The power meter PM1 (including Attenuator) measures the forward power at the location of the validation dipole connector. The signal generator is adjusted for 250 mW at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

The dipole antenna is matched to be used near flat phantom filled with tissue simulating solution. A specific distance holder is used in the positioning of the antenna to ensure correct spacing between the phantom and the dipole.



12.2 Target SAR Values for System Validation

The target SAR values can be obtained from the calibration certificate of system validation dipoles.

System Dipole		Cal. Date	Frequency [MHz]	Target SAR Values [W/kg]		
Type	Serial			1g/10g	Head	Body
D835V2	4d081	8/8/2012	835	1g	9.35	9.46
				10g	6.12	6.25
D1900V2	5d112	8/14/2012	1900	1g	39.6	40.5
				10g	20.9	21.5
D2450V2	714	11/7/2012	2450	1g	53.1	50.5
				10g	24.7	23.5
D5GHzV2	1111	9/18/2012	5200	1g	77.7	75.3
				10g	22.3	21.0
			5500	1g	82.4	79.1
				10g	23.4	22.0
			5800	1g	76.0	74.4
				10g	21.7	20.6

12.3 System Validation Results

The SAR measured with a system validation dipole, using the required tissue-equivalent medium at the test frequency, must be within 10 % of the manufacturer calibrated dipole SAR target.

Date	System Dipole		Liquid	Measured SAR [W/kg] (Normalized to 1 W)		Target	Deviation [%]	Limit [%]
	Type	Serial						
6/7/2013	D1900V2	5d112	Body	1 g	38.88	40.5	-4.00	± 10
				10 g	20.92	21.5	-2.70	± 10
6/10/2013	D835V2	4d081	Body	1 g	9.44	9.46	-0.21	± 10
				10 g	6.24	6.25	-0.16	± 10
6/14/2013	D2450V2	714	Body	1 g	53.60	50.5	+6.14	± 10
				10 g	25.32	23.5	+7.74	± 10
6/17/2013	D5GHzV2 (5.2GHz)	1111	Body	1 g	77.60	75.3	+3.05	± 10
				10 g	22.00	21.0	+4.76	± 10
6/17/2013	D5GHzV2 (5.5GHz)	1111	Body	1 g	81.20	79.1	+2.65	± 10
				10 g	22.92	22.0	+4.18	± 10

13 RF Output Power Measurements

13.1 WCDMA Band V

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification.

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Anritsu, MT8820C" was used to program the DUT.

3GPP Release 99 WCDMA Settings

Settings	Release 99	
Loopback Mode	Mode 1	OFF
Channel Coding	12.2k / 64k / 144k / 384kbps RMC	Voice AMR
TPC Bit Pattern	All 1	
Power Tolerance (dB)	+1.7/-3.7	

3GPP Release 5 HSDPA Settings

Settings	Release 5 HSDPA			
Sub-test	1	2	3	4
Loopback Mode	Mode 1			
Channel Coding	Fixed Reference Channel (QPSK)			
TPC Algorithm	2			
TPC Bit Pattern	All 1			
Beta C	2	11	15	15
Beta D	15	15	8	4
MPR (dB)	0	0	0.5	0.5
Power Tolerance (dB)	+1.7/-3.7	+1.7/-3.7	+2.7/-3.7	+3.7/-3.7

3GPP Release 6 HSPA Settings

Settings	Release 6 HSPA				
Sub-test	1	2	3	4	5
Loopback Mode	Mode 1				
Channel Coding	E-DCH RF Test with TTI 10ms (QPSK)				
TPC Algorithm	2				1
TPC Bit Pattern	Inner Loop Power Control				All 1
Beta C	10	6	15	2	15
Beta D	15	15	9	15	0
Absolute Grant Value	20	12	15	17	12
MPR (dB)	0	2	1	2	0
Power Tolerance (dB)	+1.7/-6.7	+3.7/-5.2	+2.7/-5.2	+3.7/-5.2	+1.7/-3.7

Conducted power measurement results

Mode		Conducted Average Power (dBm)		
		4132 ch (826.4 MHz)	4182 ch (836.4 MHz)	4233 ch (846.6 MHz)
12.2 kbps RMC		18.44	18.45	18.40
64 kbps RMC		18.47	18.48	18.42
144 kbps RMC		18.42	18.45	18.42
384 kbps RMC		18.40	18.48	18.42
Voice AMR		18.42	18.45	18.44
R5 HSDPA	Sub-test 1	18.42	18.40	18.35
	Sub-test 2	18.40	18.40	18.40
	Sub-test 3	18.02	18.02	17.94
	Sub-test 4	18.02	18.02	17.92
R6 HSPA	Sub-test 1	17.69	17.67	17.62
	Sub-test 2	16.45	16.53	16.55
	Sub-test 3	17.26	17.25	17.09
	Sub-test 4	16.67	16.68	16.71
	Sub-test 5	18.42	18.45	18.40

Note(s):

1. KDB 941225 D01 – SAR in voice and data modes is measured using a 12.2 kbps RMC. SAR in voice AMR configurations and for other spreading codes are not required when the maximum average output of each channel is less than ¼ dB higher than that measured in 12.2 kbps RMC.
2. KDB 941225 D01 – Body SAR for HSPA (HSDPA/HSUPA) is not required when the maximum average output with HSPA active is less than ¼ dB higher than that measured without HSPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit.
3. KDB 941225 D01 – Head SAR for HSPA (VoIP applicable) is not required when the maximum average output with HSPA active is less than ¼ dB higher than that measured without HSPA using 12.2 kbps RMC.
4. KDB 941225 D02 – The maximum power reduction (MPR) on the order of 0, 2, 1, 2, 0 dB are expected for the subtests specified in R6 HSPA. Conducted power measurement results are set within 24 dBm +/- expected power tolerance.

13.2 GSM 850

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Anritsu, MT8820C" was used to program the DUT.

GSM/GPRS Settings

Settings	Mode	Parameter
General Settings	Band Indicator	GSM 850
	Power Control Level	5 (33 dBm)
GPRS Specific Settings	Connection Type	Test Mode A
	Multi Slot Class	12 (4 down / 4 up / 5 sum)
	Coding Scheme	CS1 (GMSK)

Conducted power measurement results

Mode		Conducted Power (dBm)		
		128 ch (824.2 MHz)	189 ch (836.4 MHz)	251 ch (848.8 MHz)
GSM	Burst Avg.	26.32	26.38	26.40
	Frame Avg.	17.29	17.35	17.37
GPRS (1 slot)	Burst Avg.	26.32	26.38	26.40
	Frame Avg.	17.29	17.35	17.37
GPRS (2 slot)	Burst Avg.	23.33	23.38	23.40
	Frame Avg.	17.31	17.36	17.38
GPRS (3 slot)	Burst Avg.	21.52	21.39	21.51
	Frame Avg.	17.26	17.13	17.25
GPRS (4 slot)	Burst Avg.	20.39	20.40	**20.42**
	Frame Avg.	17.38	17.39	**17.41**

Note(s):
KDB 941225 D03 – The worst-case configuration for SAR testing is determined to be as follows.
1. Body : GPRS mode with 4 time slots, based on the output power above
2. Head : Same mode as Body SAR testing (VoIP applicable using GPRS multi-slot)

13.3 PCS 1900

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester was used to program the DUT.

GSM/GPRS Settings

Settings	Mode	Parameter
General Settings	Band Indicator	PCS 1900
	Power Control Level	0 (30 dBm)
GPRS Specific Settings	Connection Type	Test Mode A
	Multi Slot Class	12 (4 down / 4 up / 5 sum)
	Coding Scheme	CS1 (GMSK)

Conducted power measurement results

Mode		Conducted Power (dBm)		
		512 ch (1850.2 MHz)	661 ch (1880.0 MHz)	810 ch (1909.8 MHz)
GSM	Burst Avg.	25.85	25.77	25.74
	Frame Avg.	16.82	16.74	16.71
GPRS (1 slot)	Burst Avg.	25.85	25.77	25.74
	Frame Avg.	16.82	16.74	16.71
GPRS (2 slot)	Burst Avg.	22.90	22.77	22.81
	Frame Avg.	16.88	16.75	16.79
GPRS (3 slot)	Burst Avg.	20.87	20.90	20.90
	Frame Avg.	16.61	16.64	16.64
GPRS (4 slot)	Burst Avg.	**19.89**	19.87	19.85
	Frame Avg.	**16.88**	16.86	16.84

Note(s):
KDB 941225 D03 – The worst-case configuration for SAR testing is determined to be as follows.
1. Body : GPRS mode with 4 time slots, based on the output power above
2. Head : Same mode as Body SAR testing (VoIP applicable using GPRS multi-slot)

13.4 WLAN 2.4 GHz

To setup the desire channel frequency and the maximum output power, RF test mode prepared by the manufacturer was used to program the DUT.

Conducted power measurement results

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
2.4 GHz	802.11b	1	2412	12.32
		6	2437	12.65
		11	2462	12.32
	802.11g	1	2412	11.73
		6	2437	12.17
		11	2462	11.86
	802.11n [HT20]	1	2412	11.67
		6	2437	12.23
		11	2462	11.76

Note(s):
KDB 248227 D01 – SAR is not required for 802.11g/n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11b channels.

13.5 WLAN 5 GHz

To setup the desire channel frequency and the maximum output power, RF test mode prepared by the manufacturer was used to program the DUT.

Conducted power measurement results (W52)

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
5.2 GHz	802.11a	36	5180	11.54
		40	5200	11.46
		44	5220	11.52
		48	5240	11.50
	802.11n [HT20]	36	5180	11.39
		44	5220	11.45
		48	5240	11.46
	802.11n [HT40]	38	5190	11.32
		46	5230	11.40
	802.11ac [VHT80]	42	5210	10.71

Conducted power measurement results (W53)

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
5.3 GHz	802.11a	52	5260	11.89
		56	5280	12.03
		60	5300	11.87
		64	5320	11.95
	802.11n [HT20]	52	5260	11.85
		60	5300	11.98
		64	5320	11.87
	802.11n [HT40]	54	5270	11.25
		62	5310	11.09
	802.11ac [VHT80]	58	5290	10.69

Conducted power measurement results (W56)

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
5.6 GHz	802.11a	100	5500	11.39
		104	5520	11.23
		108	5540	11.28
		112	5560	11.19
		116	5580	11.06
		120	5600	Not supported
		124	5620	Not supported
		128	5640	Not supported
		132	5660	10.80
		136	5680	10.90
		140	5700	10.93
	802.11n [HT20]	100	5500	11.25
		116	5580	11.08
		140	5700	10.83
	802.11n [HT40]	102	5510	11.32
		110	5550	11.11
		134	5670	10.88
	802.11ac [VHT80]	106	5530	11.34

Note(s):
KDB 248227 D01 – SAR is not required for 802.11n/ac channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11a channels.

13.6 Bluetooth

For the Bluetooth operation, the client supplied a special driving program to program the DUT to continually transmit the specified maximum power.

Modulation type : Frequency Hopping Spread Spectrum (FHSS)
Transmitting Frequency : 2402 MHz (0 ch) – 2480 MHz (78 ch)
RF Output Power : Max. 4.0 dBm (Class 2)

13.7 Standalone SAR Test Exclusion Considerations (KDB 447498 D01)

The 1 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*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0, where

- $f_{(GHz)}$ 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.
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

SAR exclusion calculations for antenna ≤ 50 mm from the user

Band	Frequency (MHz)	Max. Power (dBm)	Max. Power (mW)	Test Position	Distance (mm)	Threshold	Test Exclusion
WCDMA Band V	846.6	18.90	78	Rear	< 5	14.4	NO
				Bottom	< 5	14.4	NO
				Right	10	7.2	NO
GSM 850	848.8	18.39	69	Rear	< 5	12.7	NO
				Bottom	< 5	12.7	NO
				Right	10	6.4	NO
PCS 1900	1909.8	17.89	62	Rear	< 5	17.1	NO
				Bottom	< 5	17.1	NO
				Right	10	8.6	NO
WLAN 2.4 GHz	2462	14.00	25	Rear	< 5	7.8	NO
				Top	7	5.6	NO
				Left	6	6.5	NO
WLAN 5 GHz	5700	13.00	20	Rear	< 5	9.5	NO
				Top	7	6.8	NO
				Left	6	8.0	NO
Bluetooth	2480	4.00	3	Rear	< 5	0.9	YES
				Top	7	0.7	YES
				Left	6	0.8	YES

At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following;
[(Power allowed at numeric threshold for 50 mm) + (*test separation distance* – 50 mm) · ($f_{(MHz)}$/150)] mW, at 100 MHz to 1500 MHz
[(Power allowed at numeric threshold for 50 mm) + (*test separation distance* – 50 mm) · 10] mW, at > 1500 MHz and ≤ 6 GHz

SAR exclusion calculations for antenna > 50 mm from the user

Band	Frequency (MHz)	Max. Power (dBm)	Max. Power (mW)	Test Position	Distance (mm)	Threshold (mW)	Test Exclusion
WCDMA Band V	846.6	18.90	78	Top	180	897	YES
				Left	58	208	YES
GSM 850	848.8	18.39	69	Top	180	898	YES
				Left	58	208	YES
PCS 1900	1909.8	17.89	62	Top	180	1409	YES
				Left	58	189	YES
WLAN 2.4 GHz	2462	14.00	25	Bottom	170	1296	YES
				Right	91	506	YES
WLAN 5 GHz	5700	13.00	20	Bottom	170	1263	YES
				Right	91	473	YES
Bluetooth	2480	4.00	3	Bottom	170	1295	YES
				Right	91	505	YES

Standalone SAR test exclusion was based upon the following criteria (KDB 616217 D04);

- The *test separation distance* used to determine SAR test exclusion for the back (bottom) surface and tablet edges that contain an antenna is determined from the outer housing of the tablet.
- The *test separation distance* for SAR test exclusion of adjacent edges is determined by the closest distance between the antenna and outer housing on the adjacent edge of the device.

14 SAR Measurements

14.1 WCDMA Band V

R99 12.2kbps RMC – Duty Cycle 100%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	4132	826.4					1
	4182	836.4	18.9	18.45	0.630	0.699	
	4233	846.6					1
Bottom	4132	826.4					1
	4182	836.4	18.9	18.45	0.294	**0.326**	
	4233	846.6					1
Right	4132	826.4					1
	4182	836.4	18.9	18.45	0.377	**0.418**	
	4233	846.6					1

NOTE(S) :

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.2 GSM 850

GPRS 4 slot (CS1) – Duty Cycle 48.0%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	128	824.2					1
	189	836.4	21.4	20.40	0.407	0.512	
	251	848.8					1
Bottom	128	824.2					1
	189	836.4	21.4	20.40	0.208	**0.262**	
	251	848.8					1
Right	128	824.2					1
	189	836.4	21.4	20.40	0.217	**0.273**	
	251	848.8					1

NOTE(S) :

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.3 PCS 1900

GPRS 4 slot (CS1) – Duty Cycle 48.0%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	512	1850.2					1
	661	1880.0	20.9	19.87	0.487	0.617	
	810	1909.8					1
Bottom	512	1850.2					1
	661	1880.0	20.9	19.87	0.314	0.398	
	810	1909.8					1
Right	512	1850.2					1
	661	1880.0	20.9	19.87	0.358	0.454	
	810	1909.8					1

NOTE(S) :

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.4 WLAN 2.4 GHz

802.11b (1 Mbps) – Duty Cycle 100%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	1	2412					1
	6	2437	14.0	12.65	0.354	0.483	
	11	2462					1
Top	1	2412					1
	6	2437	14.0	12.65	0.099	0.135	
	11	2462					1
Left	1	2412					1
	6	2437	14.0	12.65	0.229	0.312	
	11	2462					1

NOTE(S) :

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.5 WLAN 5.2 GHz

802.11a (6 Mbps) – Duty Cycle 100%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	36	5180	13.0	11.54	0.534	0.747	
	48	5240					1
Top	36	5180	13.0	11.54	0.363	0.508	
	48	5240					1
Left	36	5180	13.0	11.54	0.106	0.148	
	48	5240					1

NOTE(S) :
1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.6 WLAN 5.3 GHz

802.11a (6 Mbps) – Duty Cycle 100%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	56	5280	13.0	12.03	0.431	0.539	
	64	5320					1
Top	56	5280	13.0	12.03	0.347	0.434	
	64	5320					1
Left	56	5280	13.0	12.03	0.114	0.143	
	64	5320					1

NOTE(S) :
1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.7 WLAN 5.6 GHz

802.11a (6 Mbps) – Duty Cycle 100%							
Test Position	Ch#	Frequency [MHz]	Power [dBm]		1 g SAR [W/kg]		Note
			Tune-up Limit	Measured	Measured	Scaled	
Rear	100	5500	13.0	11.39	0.458	**0.664**	
	116	5580	13.0	11.06	0.542	**0.847**	
	124	5620					2
	136	5680	13.0	10.90	0.521	**0.845**	
Top	100	5500	13.0	11.39	0.403	**0.584**	
	116	5580	13.0	11.06	0.415	**0.649**	
	124	5620					2
	136	5680	13.0	10.90	0.393	**0.637**	
Left	100	5500	13.0	11.39	0.140	**0.203**	
	116	5580					1
	124	5620					2
	136	5680					1

NOTE(S) :

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz
2. KDB 443999 D01 – Transmissions in the 5600 to 5650 MHz band are disabled.

14.8 Simultaneous Transmission SAR Analysis (KDB 447498 D01)

14.8.1 Simultaneous Transmission

WWAN can transmit simultaneously with WLAN/Bluetooth.
WLAN in 2.4 GHz and 5 GHz bands cannot transmit simultaneously with Bluetooth.

No.	Conditions
1	WCDMA Band V + WLAN 2.4 GHz
2	GSM 850 + WLAN 2.4 GHz
3	PCS 1900 + WLAN 2.4 GHz
4	WCDMA Band V + WLAN 5 GHz
5	GSM 850 + WLAN 5 GHz
6	PCS 1900 + WLAN 5 GHz
7	WCDMA Band V + Bluetooth
8	GSM 850 + Bluetooth
9	PCS 1900 + Bluetooth

The device is capable of personal hotspot mode with WLAN in 2.4 GHz band.
However, the 5 GHz bands do not support hotspot mode.

14.8.2 Antenna Separation Distances

WWAN to WLAN/Bluetooth : 175 mm

14.8.3 Standalone SAR Estimation

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$ / 7.5] W/kg for 1 g SAR, *test separation distances* ≤ 50 mm, or
0.4 W/kg for 1 g SAR, *test separation distances* > 50 mm
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

Band	Frequency (MHz)	Max. Power		Test Position	Distance (mm)	Estimated SAR (W/kg)
		(dBm)	(mW)			
WCDMA Band V	846.6	18.90	78	Top	180	0.400
				Left	58	0.400
GSM 850	848.8	18.39	69	Top	180	0.400
				Left	58	0.400
PCS 1900	1909.8	17.89	62	Top	180	0.400
				Left	58	0.400
WLAN 2.4 GHz	2462	14.00	25	Bottom	170	0.400
				Right	91	0.400
WLAN 5 GHz	5700	13.00	20	Bottom	170	0.400
				Right	91	0.400
Bluetooth	2480	4.00	3	Rear	< 5	0.126
				Top	7	0.090
				Bottom	170	0.400
				Left	6	0.105
				Right	91	0.400

14.8.4 Sum of the SAR for WWAN + WLAN 2.4 GHz

Sum of the SAR with Measured Values

Test Position	Highest 1 g SAR (W/kg)			Σ 1 g SAR (W/kg)
	WWAN		WLAN 2.4 GHz	
Rear	WCDMA Band V	0.699	0.483	1.182
	GSM 850	0.512	0.483	0.995
	PCS1900	0.617	0.483	1.100
Top	WCDMA Band V	0.400	0.135	0.535
	GSM 850	0.400	0.135	0.535
	PCS1900	0.400	0.135	0.535
Bottom	WCDMA Band V	0.326	0.400	0.726
	GSM 850	0.262	0.400	0.662
	PCS1900	0.398	0.400	0.798
Left	WCDMA Band V	0.400	0.312	0.712
	GSM 850	0.400	0.312	0.712
	PCS1900	0.400	0.312	0.712
Right	WCDMA Band V	0.418	0.400	0.818
	GSM 850	0.273	0.400	0.673
	PCS1900	0.454	0.400	0.854

SAR to Peak Location Separation Ratio (SPLSR)

As the sum of the 1 g SAR is < 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1 g SAR is < 1.6 W/kg.

14.8.5 Sum of the SAR for WWAN + WLAN 5.2 GHz

Sum of the SAR with Measured Values

Test Position	Highest 1 g SAR (W/kg)			Σ 1 g SAR (W/kg)
	WWAN		WLAN 5.2 GHz	
Rear	WCDMA Band V	0.699	0.747	1.446
	GSM 850	0.512	0.747	1.259
	PCS1900	0.617	0.747	1.364
Top	WCDMA Band V	0.400	0.508	0.908
	GSM 850	0.400	0.508	0.908
	PCS1900	0.400	0.508	0.908
Bottom	WCDMA Band V	0.326	0.400	0.726
	GSM 850	0.262	0.400	0.662
	PCS1900	0.398	0.400	0.798
Left	WCDMA Band V	0.400	0.148	0.548
	GSM 850	0.400	0.148	0.548
	PCS1900	0.400	0.148	0.548
Right	WCDMA Band V	0.418	0.400	0.818
	GSM 850	0.273	0.400	0.673
	PCS1900	0.454	0.400	0.854

SAR to Peak Location Separation Ratio (SPLSR)

As the sum of the 1 g SAR is < 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1 g SAR is < 1.6 W/kg.

14.8.6 Sum of the SAR for WWAN + WLAN 5.3 GHz

Sum of the SAR with Measured Values

Test Position	Highest 1 g SAR (W/kg)			Σ 1 g SAR (W/kg)
	WWAN		WLAN 5.3 GHz	
Rear	WCDMA Band V	0.699	0.539	1.238
	GSM 850	0.512	0.539	1.051
	PCS1900	0.617	0.539	1.156
Top	WCDMA Band V	0.400	0.434	0.834
	GSM 850	0.400	0.434	0.834
	PCS1900	0.400	0.434	0.834
Bottom	WCDMA Band V	0.326	0.400	0.726
	GSM 850	0.262	0.400	0.662
	PCS1900	0.398	0.400	0.798
Left	WCDMA Band V	0.400	0.143	0.543
	GSM 850	0.400	0.143	0.543
	PCS1900	0.400	0.143	0.543
Right	WCDMA Band V	0.418	0.400	0.818
	GSM 850	0.273	0.400	0.673
	PCS1900	0.454	0.400	0.854

SAR to Peak Location Separation Ratio (SPLSR)

As the sum of the 1 g SAR is < 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1 g SAR is < 1.6 W/kg.

14.8.7 Sum of the SAR for WWAN + WLAN 5.6 GHz

Sum of the SAR with Measured Values

Test Position	Highest 1 g SAR (W/kg)			Σ 1 g SAR (W/kg)
	WWAN		WLAN 5.6 GHz	
Rear	WCDMA Band V	0.699	0.847	1.546
	GSM 850	0.512	0.847	1.359
	PCS1900	0.617	0.847	1.464
Top	WCDMA Band V	0.400	0.649	1.049
	GSM 850	0.400	0.649	1.049
	PCS1900	0.400	0.649	1.049
Bottom	WCDMA Band V	0.326	0.400	0.726
	GSM 850	0.262	0.400	0.662
	PCS1900	0.398	0.400	0.798
Left	WCDMA Band V	0.400	0.203	0.603
	GSM 850	0.400	0.203	0.603
	PCS1900	0.400	0.203	0.603
Right	WCDMA Band V	0.418	0.400	0.818
	GSM 850	0.273	0.400	0.673
	PCS1900	0.454	0.400	0.854

SAR to Peak Location Separation Ratio (SPLSR)

As the sum of the 1 g SAR is < 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1 g SAR is < 1.6 W/kg.

14.8.8 Sum of the SAR for WWAN + Bluetooth

Sum of the SAR with Measured Values

Test Position	Highest 1 g SAR (W/kg)			Σ 1 g SAR (W/kg)
	WWAN		Bluetooth	
Rear	WCDMA Band V	0.699	0.126	**0.825**
	GSM 850	0.512	0.126	**0.638**
	PCS1900	0.617	0.126	**0.743**
Top	WCDMA Band V	0.400	0.090	**
	GSM 850	0.400	0.090	**
	PCS1900	0.400	0.090	**
Bottom	WCDMA Band V	0.326	0.400	**0.726**
	GSM 850	0.262	0.400	**0.662**
	PCS1900	0.398	0.400	**0.798**
Left	WCDMA Band V	0.400	0.105	**
	GSM 850	0.400	0.105	**
	PCS1900	0.400	0.105	**
Right	WCDMA Band V	0.418	0.400	**0.818**
	GSM 850	0.273	0.400	**0.673**
	PCS1900	0.454	0.400	**0.854**

** As there were only estimated values, it was not assessed as it is inherently compliant.

SAR to Peak Location Separation Ratio (SPLSR)

As the sum of the 1 g SAR is < 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1 g SAR is < 1.6 W/kg.

16 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
E-Field Probe	ET3DV6	SPEAG	S-2	2012/8	1 Year
E-Field Probe	EX3DV4	SPEAG	S-17	2012/9	1 Year
DAE	DAE4	SPEAG	S-3	2012/11	1 Year
Robot	RX60L	SPEAG	S-7	------	N/A
Probe Alignment Unit	LB1RX60L	SPEAG	S-13	------	N/A
Network Analyzer	8719ET	Agilent	B-53	2012/9	1 Year
Dielectric Probe Kit	85070D	Agilent	B-54	------	N/A
835MHz Dipole	D835V2	SPEAG	S-23	2012/8	1 Year
1900MHz Dipole	D1900V2	SPEAG	S-25	2012/8	1 Year
2450MHz Dipole	D2450V2	SPEAG	S-6	2012/11	1 Year
5GHz Dipole	D5GHzV2	SPEAG	S-31	2012/9	1 Year
Signal Generator	MG3681A	Anritsu	B-3	2012/9	1 Year
Signal Generator	MG3710A	Anritsu	B-41	2012/9	1 Year
RF Power Amplifier	CGA020M602-2633R	R&K	A-51	------	N/A
Directional Coupler	4226-20	narda	D-87	------	N/A
Low Pass Filter	LSM1000-4BA	LARK	D-90	2012/11	1 Year
Low Pass Filter	LSM2200-4BA	LARK	D-91	2012/11	1 Year
Low Pass Filter	LSM2700-3BA	LARK	D-92	2012/11	1 Year
Radio Communication Analyzer	MT8820C	Anritsu	B-5	2013/2	1 Year
Power Meter	E4417A	Agilent	B-51	2012/6	1 Year
Power Sensor	E9323A	Agilent	B-59	2012/6	1 Year
Power Meter	N1911A	Agilent	B-63	2012/7	1 Year
Power Sensor	N1921A	Agilent	B-64	2012/7	1 Year
Attenuator	54A-10	Weinschel	D-28	2012/9	1 Year
Attenuator	2-20	Weinschel	D-36	2012/9	1 Year

17 Appendix

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