



ANSI/IEEE Std. C95.1-1992

in accordance with the requirements of
FCC Report and Order: ET Docket 93-62, and OET Bulletin 65 Supplement C



FCC TEST REPORT

For

Mobile Computer

Trade Name: CIPHERLAB

Model: CP60G

Issued to

Cipherlab Co., Ltd.
12F, 333 Dunhua S. Rd., Sec.2,
Taipei, Taiwan R.O.C.

Issued by

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
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1 Certificate of Compliance (SAR Evaluation)

Applicant Cipherlab Co., Ltd.
 12F, 333 Dunhua S. Rd., Sec.2,Taipei, Taiwan R.O.C.

Equipment Under Test: Mobile Computer

Trade Name: Cipherlab

Model Number: CP60G

Date of Test: March 25 ~ April 1 , 2013

Device Category: PORTABLE DEVICES

Exposure Category: GENERAL POPULATION/UNCONTROLLED EXPOSURE

APPLICABLE STANDARDS	
STANDARD	
FCC	<ul style="list-style-type: none"> ● FCC OET 65 Supplement C ● IEEE 1528 2003 ● KDB 447498 D01 General RF Exposure Guidance v05 ● KDB 648474 D01 SAR Handsets Multi Xmitter and Ant v01r05 ● KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01 ● KDB 941225 D01 SAR Test for 3G Devices 3G-SAR ● KDB 248227 D01 SAR measurement for 802 11 a b g v01r02
Deviation from Applicable Standard	
1.6 W/Kg	
TEST RESULT	
PASS	

The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in EN62311: 2008. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Tested by:

Alex Wu
 Section Manager
 Compliance Certification Services Inc.

Scott Hsu
 SAR Engineer
 Compliance Certification Services Inc.



2 EUT Description

Product	Mobile Computer		
Trade Name	Cipherlab		
Model Number	CP60G		
Transmitters	GSM & UMTS	Ericsson Model: C5621	
	Wi-Fi & Bluetooth	Intel WiFi+BT Model: 62205ANSFF	
Modulation Technique	802.11a: Orthogonal Frequency Division Multiplexing (OFDM)		
	802.11b: Direct Sequence Spread Spectrum(DSSS)		
	802.11g: Orthogonal Frequency Division Multiplexing (OFDM)		
	802.11n: Orthogonal Frequency Division Multiplexing (OFDM)		
Antenna Specification	WWAN	Brand name	CIPHERLAB
		Parts Number	A10467
		WWAN antenna: FPC	
	WLAN	Brand name	CIPHERLAB
		Parts Number	KV00CP6000W19
		WLAN antenna: FPC	
Maximum Output Power	Band	Avg. Pwr.	Time Avg. Pwr.
	GPRS 850	32.7 dBm	26.7 dBm
	EGPRS 850	27.4 dBm	24.4 dBm
	GPRS 1900	29.6 dBm	23.6 dBm
	EGPRS 1900	26.0 dBm	23.0 dBm
	WCDMA Band II	23.6 dBm	
	HSDPA Band II	23.5 dBm	
	HSUPA Band II	23.4 dBm	
	WCDMA Band IV	23.4 dBm	
	HSDPA Band IV	23.4 dBm	
	HSUPA Band IV	23.3 dBm	
	WCDMA Band V	23.9 dBm	
	HSDPA Band V	23.8 dBm	
	HSUPA Band V	23.8 dBm	
	802.11b	11.0 dBm	
	802.11g	12.4 dBm	
	802.11n HT20	9.7 dBm	
	802.11a 5.2GHz	12.0 dBm	
	802.11a 5.3GHz	11.8 dBm	
	802.11a 5.5GHz	8.9 dBm	
802.11a 5.8GHz	11.9 dBm		
802.11n HT20	13.4 dBm		
FCC Rule Parts	Frequency Range	Highest Reported 1-g SAR	
22H	824 - 849 MHz	0.755 W/kg (Rear)	
24E	1850 - 1910 MHz	0.532 W/kg (Rear)	
15.247	2412 - 2462 MHz	0.122 W/kg (Rear)	
	5725 - 5850 MHz	0.423 W/kg (Rear)	
15.407	5150 - 5250 MHz	0.506 W/kg (Rear)	
	5250 - 5350 MHz	0.515 W/kg (Rear)	
	5500 - 5700 MHz	0.308 W/kg (Rear)	
Rechargeable Li-polymer Battery-alternate	Sample1 Brand: CIPHERLAB Model: BA-0063A6 Rating: 3.7V 3600mAh , 13.32Wh		
	Sample2 Brand: CIPHERLAB Model: BA-0064A4 Rating: 3.7V 4400mAh , 16.28Wh		

Remark: The sample selected for test was prototype that approximated to production product and was provided by manufacturer.



3 Requirements for Compliance Testing Defined

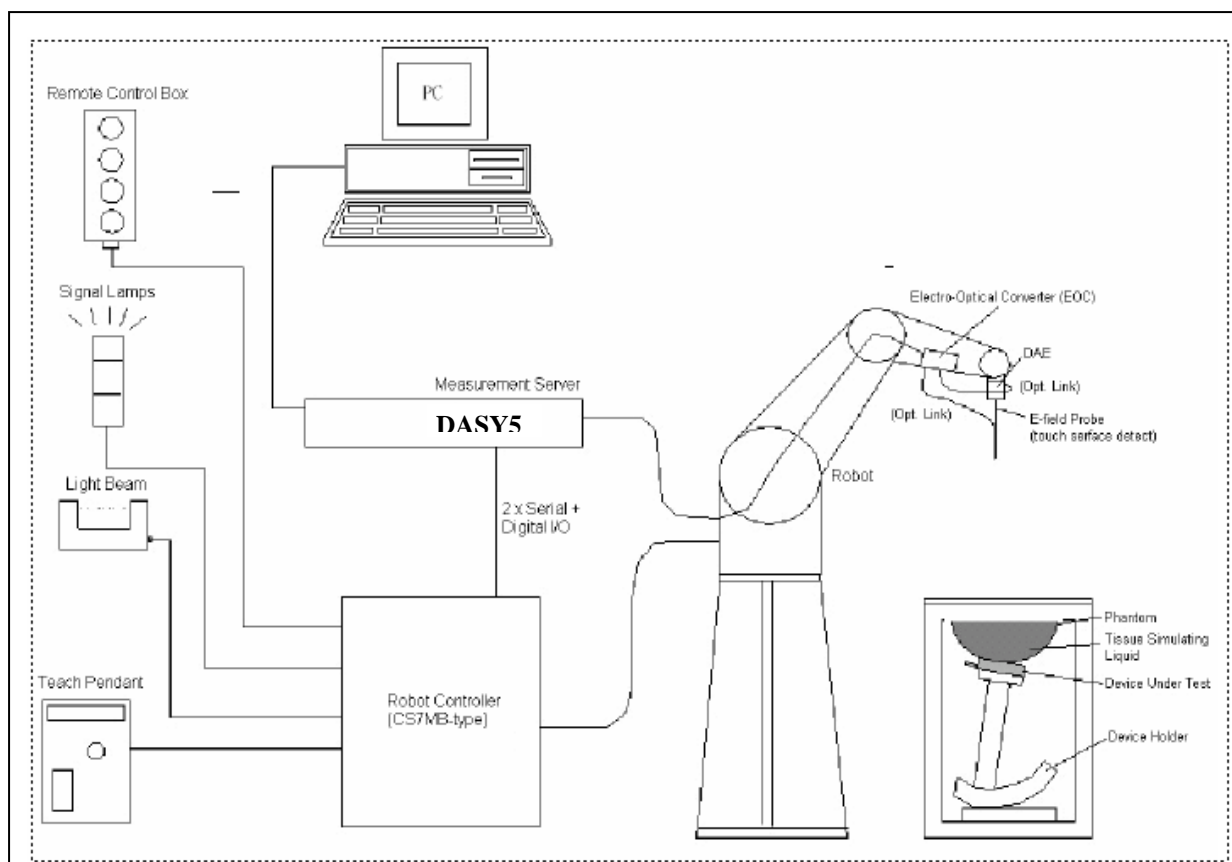
3.1 Requirements for Compliance Testing Defined by the FCC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1]. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992 [6]. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

4 Dosimetric Assessment System

These measurements were performed with the automated near-field scanning system DASY4/DAST5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m) which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe EX3DV4-SN: 3665 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than $\pm 10\%$. The spherical isotropy was evaluated with the procedure and found to be better than ± 0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE 1528 2003.

4.1 Measurement System Diagram



The DASY4/DASY5 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 Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4/DAST5 software.
- Remote control 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 validating the proper functioning of the system.



4.2 System Components

DASY4/DASY5 Measurement Server



The DASY4/DASY5 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4/DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.



The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200M Ω ; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements

- Construction:** Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
- Calibration:** Basic Broad Band Calibration in air: 10-3000 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800
CF-Calibration for other liquids and frequencies upon request.
- Frequency:** 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
- Directivity:** ± 0.3 dB in HSL (rotation around probe axis)
 ± 0.5 dB in HSL (rotation normal to probe axis)
- Dynamic Range:** 10 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
(noise: typically < 1 μ W/g)





Dimensions: Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 2.5 mm (Body: 12 mm)
Distance from probe tip to dipole centers: 1 mm

Application: High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Interior of probe



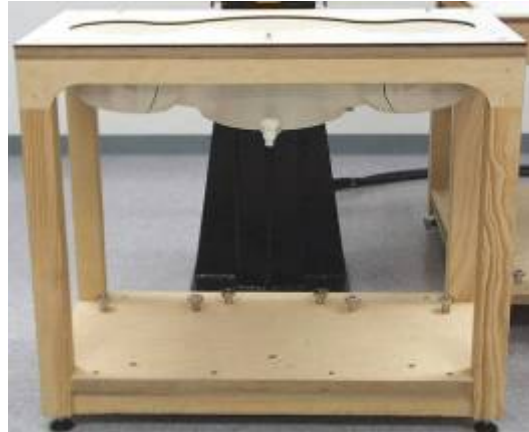
SAM Phantom (V4.0)

Construction: The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. 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 manually teaching three points with the robot.

Shell Thickness: 2 ± 0.2 mm

Filling Volume: Approx. 25 liters

Dimensions: Height: 810mm; Length: 1000mm; Width: 500mm



SAM Phantom (ELI4)

Construction: Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 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 supported by software version DASY4/DASY5 and higher and is compatible with all SPEAG dosimetric probes and dipoles

Shell Thickness: 2.0 ± 0.2 mm (sagging: <1%)

Filling Volume: Approx. 25 liters

Dimensions: Major ellipse axis: 600 mm

Minor axis: 400 mm 500mm





Device Holder for SAM Twin Phantom

Construction: In combination with the Twin SAM Phantom V4.0 or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).



System Validation Kits for SAM Phantom (V4.0)

Construction: Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 850, 1800, 1900, 2450, 5200, 5300, 5500, 5800 MHz

Return loss: > 20 dB at specified validation position

Power capability: > 100 W (f < 1GHz); > 40 W (f > 1GHz)

Dimensions:
D835V2: dipole length: 161 mm; overall height: 340 mm
D1800V2: dipole length: 72.5 mm; overall height: 300 mm
D1900V2: dipole length: 67.7 mm; overall height: 300 mm
D2450V2: dipole length: 51.5 mm; overall height: 290 mm
D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm



System Validation Kits for ELI4 phantom

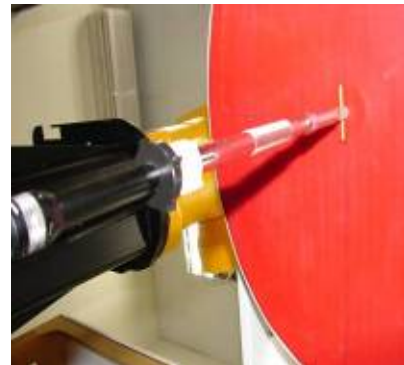
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D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm





5 Evaluation Procedures

Data Evaluation

The DASY4/DASY5 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

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

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with	V_i	= Compensated signal of channel i	(i = x, y, z)
	U_i	= Input signal of channel i	(i = x, y, z)
	cf	= Crest factor of exciting field	(DASY parameter)
	dcp_i	= Diode compression point	(DASY parameter)

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

E-field probes:
$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes:
$$H_i = \sqrt{V_i} \cdot \frac{a_{i10} + a_{i11}f + a_{i12}f^2}{f}$$

with	V_i	= Compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i	(i = x, y, z)
		$\mu V/(V/m)^2$ for E0field Probes	
	$ConvF$	= Sensitivity enhancement in solution	
	aij	= Sensor sensitivity factors for H-field probes	
	f	= Carrier frequency (GHz)	
	E_i	= Electric field strength of channel i in V/m	
	H_i	= Magnetic field strength of channel i in A/m	



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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

- with SAR = local specific absorption rate in W/kg
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

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

- with P_{pwe} = Equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m



SAR Measurement Procedures

The procedure for assessing the peak spatial-average SAR value consists of the following steps:

- **Power Reference Measurement**

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure 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.

- **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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4/DASY5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, the grid resolution has to be less than 15 mm by 15 mm at frequency ≤ 2 GHz; the grid resolution has to be less than 12mm by 12 mm at frequency between 2GHz to 4GHz; grid resolution has to be less than 10 mm by 10 mm at frequency between 4GHz to 6GHz. according to KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01).

- **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 default zoom scan measures points in accordance with the frequency can be divided into three parts. (1)The zoom scan volume was set to 5x5x7 points at frequency ≤ 2 GHz. (2) The zoom scan volume was set to 7x7x7 points at frequency between 2GHz to 4GHz (3) The zoom scan volume was set to 7x7x12 points at frequency between 4GHz to 6GHz. The measures points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly.

- **Power Drift Measurement**

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY4/DASY5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.



Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1528 2003 standard. It can be conducted for 1 g and 10 g.

The DASY4/DASY5 system allows evaluations that combine measured data and robot positions, such as:

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

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

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7(7x7x12 for 5GHz) measurement points with 5mm resolution amounting to 343(588 for 5GHz) measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

Boundary Effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b \exp\left(-\frac{z}{a}\right) \cos\left(\pi \frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probes ($a \ll \lambda$), the cos-term can be omitted. Factors S_b (parameter Alpha in the DASY4/DASY5 software) and a (parameter Delta in the DASY4/DASY5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30° to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY4/DASY5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.



6 Measurement Uncertainty

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

Uncertainty Component	Uncertainty	Prob.	Div.	C_i (10g)	Std. Unc.(1-g)	V_i or V_{eff}
Measurement System						
Probe Calibration ($k=1$)	6.00	Normal	1	1	6.00	∞
Probe Isotropy	7.60	Rectangular	$\sqrt{3}$	0.7	3.07	∞
Boundary Effect	0.65	Rectangular	$\sqrt{3}$	1	0.38	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.71	∞
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.58	∞
Readout Electronics	0.30	Normal	1	1	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1.50	∞
RF Ambient Conditions	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner Mechanical Tolerance	0.40	Rectangular	$\sqrt{3}$	1	0.23	∞
Probe Positioning with respect to Phantom Shell	2.90	Rectangular	$\sqrt{3}$	1	1.67	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	2.00	Rectangular	$\sqrt{3}$	1	1.15	∞
Test sample Related						
Test sample Positioning	3.70	Normal	1	1	3.7	89
Device Holder Uncertainty	3.40	Normal	1	1	3.4	5
Output Power Variation - SAR drift measurement	5.00	Rectangular	$\sqrt{3}$	1	2.89	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	7.50	Rectangular	$\sqrt{3}$	1	4.33	∞
Liquid Conductivity - deviation from target values	4.14	Rectangular	$\sqrt{3}$	0.64	1.53	∞
Liquid Conductivity - measurement uncertainty	-4.68	Normal	1	0.64	-3.00	39
Liquid Permittivity - deviation from target values	3.92	Rectangular	$\sqrt{3}$	0.6	1.36	∞
Liquid Permittivity - measurement uncertainty	-3.71	Normal	1	0.6	-2.23	39
		RSS			11.68	611
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =		$k=2$				23.36%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =		$k=2$				1.82dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

Uncertainty Component	Uncertainty	Prob.	Div.	C_i (10g)	Std. Unc.(1-g)	V_i or V_{eff}
Measurement System						
Probe Calibration ($k=1$)	6.55	Normal	1	1	6.55	∞
Probe Isotropy	7.60	Rectangular	$\sqrt{3}$	0.7	3.07	∞
Boundary Effect	2.00	Rectangular	$\sqrt{3}$	1	1.15	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.71	∞
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.58	∞
Readout Electronics	0.30	Normal	1	1	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1.50	∞
RF Ambient Conditions	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner Mechanical Tolerance	0.80	Rectangular	$\sqrt{3}$	1	0.46	∞
Probe Positioning with respect to Phantom Shell	6.70	Rectangular	$\sqrt{3}$	1	3.87	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	4.00	Rectangular	$\sqrt{3}$	1	2.31	∞
Test sample Related						
Test sample Positioning	3.70	Normal	1	1	3.7	89
Device Holder Uncertainty	3.40	Normal	1	1	3.4	5
Output Power Variation - SAR drift measurement	5.00	Rectangular	$\sqrt{3}$	1	2.89	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	7.90	Rectangular	$\sqrt{3}$	1	4.56	∞
Liquid Conductivity - deviation from target values	5.00	Rectangular	$\sqrt{3}$	0.64	1.85	∞
Liquid Conductivity - measurement uncertainty	-2.97	Normal	1	0.64	-1.90	39
Liquid Permittivity - deviation from target values	5.00	Rectangular	$\sqrt{3}$	0.6	1.73	∞
Liquid Permittivity - measurement uncertainty	-1.47	Normal	1	0.6	-0.88	39
		RSS			12.48	611
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =		$k=2$				24.95%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =		$k=2$				1.93dB



7 Exposure Limit

(A). Limits for Occupational/Controlled Exposure (W/kg)

<u>Whole-Body</u>	<u>Partial-Body</u>	<u>Hands, Wrists, Feet and Ankles</u>
0.4	8.0	2.0

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

<u>Whole-Body</u>	<u>Partial-Body</u>	<u>Hands, Wrists, Feet and Ankles</u>
0.08	1.6	4.0

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

Population/Uncontrolled Environments:

are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Occupational/Controlled Environments:

are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

NOTE
GENERAL POPULATION/UNCONTROLLED EXPOSURE
PARTIAL BODY LIMIT
1.6 W/kg



8 Tissue Dielectric Properties

8.1 Test Liquid Confirmation

Simulating Liquids Parameter Check

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values

The relative permittivity and conductivity of the tissue material should be within $\pm 5\%$ of the values given in the table below. 5% may not be easily achieved at certain frequencies. Under such circumstances, 10% tolerance may be used until more precise tissue recipes are available

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 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 P1528

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
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00



8.2 Typical Composition of Ingredients for Liquid Tissue Phantoms

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

alt: 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

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

Ingredients	(% by weight)
Water	50-65
Mineral oil	10-30
Emulsifiers	8-25
Sodium and Salt	0-1.5



8.3 Simulating Liquids Parameter Check Results

Date	Band	Freq(MHz)	Measured			Standard		Δ		Limit
			e' (εr)	e''	σ	e' (εr)	σ	e' (εr)	σ	±5
2013/3/25	Body 900	824.2	53.50	20.55	0.94	55.24	0.97	-3.15%	-2.90%	±5
		836.6	53.43	20.52	0.95	55.20	0.97	-3.19%	-1.80%	±5
		848.8	53.32	20.47	0.97	55.16	0.99	-3.33%	-2.08%	±5
2013/3/26	Body 1800	1710.2	53.15	15.32	1.46	53.54	1.46	-0.72%	-0.52%	±5
		1747.6	53.00	15.37	1.49	53.44	1.49	-0.83%	0.36%	±5
		1784.8	52.88	15.48	1.54	53.34	1.51	-0.86%	1.69%	±5
2013/3/26	Body 1900	1850.2	51.50	14.10	1.45	53.30	1.52	-3.38%	-4.68%	±5
		1880	51.36	14.22	1.49	53.30	1.52	-3.65%	-2.26%	±5
		1909.8	51.32	14.31	1.52	53.30	1.52	-3.71%	-0.12%	±5
2013/3/27	Body 2450	2412	51.17	14.31	1.92	52.75	1.91	-2.99%	0.20%	±5
		2437	51.10	14.44	1.96	52.72	1.94	-3.07%	0.93%	±5
		2442	51.09	14.46	1.96	52.71	1.94	-3.07%	1.01%	±5
		2462	51.07	14.55	1.99	52.68	1.97	-3.06%	1.16%	±5
		2472	51.06	14.58	2.00	52.67	1.98	-3.07%	1.06%	±5
2013/3/28	Body 5000	5180	48.59	17.83	5.13	49.07	5.25	-0.98%	-2.35%	±5
		5200	48.52	17.85	5.16	49.04	5.28	-1.07%	-2.25%	±5
		5500	48.10	18.10	5.53	48.64	5.62	-1.10%	-1.67%	±5
		5800	47.53	18.20	5.86	48.23	5.97	-1.45%	-1.80%	±5
		5825	47.49	18.26	5.91	48.20	6.00	-1.47%	-1.53%	±5
2013/3/29	Body 5000	5180	48.78	17.71	5.10	49.07	5.25	-0.58%	-2.97%	±5
		5200	48.73	17.76	5.13	49.04	5.28	-0.64%	-2.78%	±5
		5500	48.34	17.98	5.49	48.64	5.62	-0.62%	-2.33%	±5
		5800	47.82	18.12	5.84	48.23	5.97	-0.86%	-2.19%	±5
		5825	47.77	18.17	5.88	48.20	6.00	-0.88%	-2.00%	±5
2013/3/30	Body 5000	5180	48.60	17.72	5.10	49.07	5.25	-0.96%	-2.94%	±5
		5200	48.55	17.75	5.13	49.04	5.28	-1.01%	-2.82%	±5
		5500	48.10	17.94	5.48	48.64	5.62	-1.11%	-2.54%	±5
		5800	47.58	18.05	5.82	48.23	5.97	-1.36%	-2.58%	±5
		5825	47.53	18.09	5.86	48.20	6.00	-1.39%	-2.41%	±5
2013/4/1	Body 5000	5180	49.34	18.26	5.26	49.07	5.25	0.56%	0.05%	±5
		5200	49.31	18.32	5.29	49.04	5.28	0.54%	0.32%	±5
		5500	48.81	18.53	5.66	48.64	5.62	0.35%	0.69%	±5
		5800	48.28	18.81	6.06	48.23	5.97	0.09%	1.50%	±5
		5825	48.26	18.84	6.10	48.20	6.00	0.13%	1.59%	±5



9 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. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

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/DASY5 system with an E-field probe EX3DV4 SN:3665 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 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration (dx=dy= 5 mm, dz= 5 mm).
- Distance between probe sensors and phantom surface was set to 3.0 mm.
- The dipole input power (forward power) was 100 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for System Performance Check

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D835V2	4d092	06/22/2012	835	1g	9.42	9.71
				10g	6.15	6.41
D1800V2	2d062	02/12/2013	1800	1g	38.7	38.5
				10g	20.3	20.3
D1900V2	5d056	02/13/2013	1900	1g	40.1	40.4
				10g	21	21.5
D2450V2	728	11/20/2012	2450	1g	53.1	51.3
				10g	24.9	24
D5GHzV2	1004	11/16/2012	5200	1g	77.8	71.8
				10g	22.1	20.1
D5GHzV2	1004	11/16/2012	5300	1g	83.9	75.4
				10g	24	21.2
D5GHzV2	1004	11/16/2012	5600	1g	83.3	78.8
				10g	23.6	21.8
D5GHzV2	1004	11/16/2012	5800	1g	79.8	73.5
				10g	22.7	20.4



9.1 System Performance Check Results

Date	System Dipole			Parameters	Target	Measured	Deviation[%]	Limited[%]
	Type	Serial No.	Liquid					
2013/03/25	D835V2	4d092	Body	1g SAR:	9.71	10.10	4.02	± 5
				10g SAR:	6.41	6.63	3.43	± 5
2013/03/26	D1800V2	2d062	Body	1g SAR:	38.50	37.90	-1.56	± 5
				10g SAR:	20.30	19.80	-2.46	± 5
2013/03/26	D1900V2	5d056	Body	1g SAR:	38.30	37.60	-1.83	± 5
				10g SAR:	20.20	19.90	-1.49	± 5
2013/03/27	D2450V2	728	Body	1g SAR:	51.30	50.80	-0.97	± 5
				10g SAR:	24.00	23.40	-2.50	± 5
2013/03/28	D5GHZV2 (5.2GHz)	1004	Body	1g SAR:	71.80	71.10	-0.97	± 5
				10g SAR:	20.10	20.50	1.99	± 5
2013/03/28	D5GHZV2 (5.3GHz)	1004	Body	1g SAR:	75.40	76.10	0.93	± 5
				10g SAR:	21.20	21.50	1.42	± 5
2013/03/29	D5GHZV2 (5.6GHz)	1004	Body	1g SAR:	78.80	78.40	-0.51	± 5
				10g SAR:	21.80	22.10	1.38	± 5
2013/03/30	D5GHZV2 (5.8GHz)	1004	Body	1g SAR:	73.50	74.90	1.90	± 5
				10g SAR:	20.40	21.10	3.43	± 5
2013/04/01	D5GHZV2 (5.8GHz)	1004	Body	1g SAR:	73.50	72.00	-2.04	± 5
				10g SAR:	20.40	20.40	0.00	± 5



10 Device Under Test

10.1 Simultaneous Transmission

No.	Conditions	Head	Body	Hotspot
1	GSM850 GPRS + WiFi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	GSM1900 GPRS + WiFi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	WCDMA(UMTS) Band V + WiFi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	WCDMA(UMTS) Band IV + WiFi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	WCDMA(UMTS) Band II + WiFi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	GSM850 GPRS + BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	GSM1900 GPRS + BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	WCDMA(UMTS) Band V + BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	WCDMA(UMTS) Band IV + BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10	WCDMA(UMTS) Band II + BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	WiFi 2.4GHz Bands+ BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12	WiFi 5GHz Bands+ BT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note(s):

1. As the tablet has been assessed in accordance with KDB 447498, which has more conservative measurement distances than KDB 941225, further assessment in accordance with KDB 941225 is judged unnecessary. This is also in accordance with FCC training provided in October 2012 (TCBC Workshop) which indicates that hotspot mode KDB procedures are not intended for larger tablets.
2. WiFi 2.4GHz band and BT can simultaneous transmit.



11 Summary of Test Configurations

11.1 Body Test Exclusion Thresholds

The following SAR test exclusion Thresholds based on KDB 447498 D01 General RF Exposure Guidance v05) 4.3.1)

Band	Test Configurations	Antenna-to-edge/surface	Power Target (dBm)	Power Tolerance (dBm)	Calculate Power (mW)	Test Exclusion Power Threshold(mW)	SAR Required
GPRS850	Rear	4.77 mm	32	±1	1995.2	16	Yes
GPRS1900	Rear	4.77 mm	29	±1	1000	10	Yes
WCDMA Band II	Rear	4.77 mm	23	±1	251	10	Yes
WCDMA Band IV	Rear	4.77 mm	23	±1	251	11	Yes
WCDMA Band V	Rear	4.77 mm	23	±1	251	15	Yes
WiFi 2.4GHz	Rear	3.41 mm	11	±2	19	7	Yes
WiFi 5GHz	Rear	3.41 mm	11.5	±2	22	4	Yes
Bluetooth	Rear	3.21 mm	1	±2	1.9	6	No

11.2 Body Exposure Conditions for WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Front	17.7 mm	Yes	
Rear	4.77 mm	Yes	

11.3 Body Exposure Conditions for WiFi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Front	18 mm	Yes	
Rear	3.41 mm	Yes	



12 RF Output Power Measurement

12.1 GSM850

GMSK (GPRS) - Coding Scheme: CS1

Target Power:32 dBm

Tune-up Tolerance: -1.0dB / +1.0dB GMSK (GPRS) Mode

Band	Slot	Ch No.	Freq. (MHz)	Avg burst pwr (dBm)	Time Avg. Pwr
GPRS850	1	128	824.2	32.5	23.5
		190	836.6	32.5	23.5
		251	848.8	32.7	23.7
	2	128	824.2	32.5	26.5
		190	836.6	32.5	26.5
		251	848.8	32.7	26.7

8PSK (EGPRS) - Coding Scheme: MCS5

Target Power:27 dBm

Tune-up Tolerance: -1.0dB / +1.0dB 8PSK (EGPRS) Mode

Band	Slot	Ch No.	Freq. (MHz)	Avg burst pwr (dBm)	Time Avg. Pwr
EGPRS850	1	128	824.2	27.2	18.2
		190	836.6	27.3	18.3
		251	848.8	27.4	18.4
	2	128	824.2	27.2	21.2
		190	836.6	27.3	21.3
		251	848.8	27.4	21.4
	3	128	824.2	27.2	22.9
		190	836.6	27.3	23.0
		251	848.8	27.4	23.1
	4	128	824.2	27.2	24.2
		190	836.6	27.3	24.3
		251	848.8	27.4	24.4



12.2 GSM1900

GMSK(GPRS) - Coding Scheme: CS1

Target Power:29 dBm

Tune-up Tolerance: -1.0dB / +1.0dB GMSK (GPRS) Mode

Band	Slot	Ch No.	Freq. (MHz)	Avg burst pwr (dBm)	Time Avg. Pwr
GPRS1900	1	512	824.2	29.5	20.5
		661	836.6	29.5	20.5
		810	848.8	29.6	20.6
	2	512	824.2	29.5	23.5
		661	836.6	29.5	23.5
		810	848.8	29.6	23.6

8PSK (EGPRS) - Coding Scheme: MCS5

Target Power:26 dBm

Tune-up Tolerance: -1.0dB / +1.0dB 8PSK (EGPRS) Mode

Band	Slot	Ch No.	Freq. (MHz)	Avg burst pwr (dBm)	Time Avg. Pwr
EGPRS1900	1	512	824.2	26.0	17.0
		661	836.6	25.9	16.9
		810	848.8	26.0	17.0
	2	512	824.2	26.0	20.0
		661	836.6	25.9	19.9
		810	848.8	26.0	20.0
	3	512	824.2	25.9	21.6
		661	836.6	25.9	21.6
		810	848.8	26.0	21.7
	4	512	824.2	25.9	22.9
		661	836.6	25.9	22.9
		810	848.8	26.0	23.0



12.3 WCDMA Band II

Target Power:23 dBm

Tune-up Tolerance: -1.0dB / +1.0dB

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control	Algorithm2
	β_c/β_d	8/15

Band	Mode	Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
WCDMA Band II	Rel99	9262	1852.4	23.6
	RMC	9400	1880	23.2
	12.2kbps	9538	107.6	23.1



HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Sub-test	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	8/15	4/15
	β_{hs}	4/15	24/15	30/15	30/15
CM (dB)	0	1	1.5	1.5	
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSDPA II	1	9262/9662	1852.4	23.5
		9400/9800	1880.0	23.3
		9538/9983	1907.6	23.2
	2	9262/9662	1852.4	23.5
		9400/9800	1880.0	23.4
		9538/9983	1907.6	23.2
	3	9262/9662	1852.4	23.0
		9400/9800	1880.0	22.8
		9538/9983	1907.6	22.8
	4	9262/9662	1852.4	22.9
		9400/9800	1880.0	22.8
		9538/9983	1907.6	22.7



HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Sub-test	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	D_{ACK}	8				
	D_{NAK}	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max Data Rate Kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E_TFCI PO 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	E_TFCI 11 E_TFCI PO 4	E_TFCI 11 E_TFCI PO 4 E_TFCI 92 E_TFCI PO 18	E_TFCI PO 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSUPA II	1	9262/9662	1852.4	23.4
		9400/9800	1880.0	23.4
		9538/9983	1907.6	23.3
	2	9262/9662	1852.4	21.6
		9400/9800	1880.0	21.6
		9538/9983	1907.6	21.6
	3	9262/9662	1852.4	22.6
		9400/9800	1880.0	22.4
		9538/9983	1907.6	22.3
	4	9262/9662	1852.4	21.6
		9400/9800	1880.0	21.5
		9538/9983	1907.6	21.2
	5	9262/9662	1852.4	23.4
		9400/9800	1880.0	23.4
		9538/9983	1907.6	23.3



12.4 WCDMA Band IV

Target Power:23 dBm

Tune-up Tolerance: -1.0dB / +1.0dB

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control	Algorithm2
	β_c/β_d	8/15

Band	Mode	Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
WCDMA Band IV	Rel99	1312	1712.4	23.4
	RMC	1413	1732.6	23.3
	12.2kbps	1513	1752.6	23.4



HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Sub-test	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	8/15	4/15
	β_{hs}	4/15	24/15	30/15	30/15
CM (dB)	0	1	1.5	1.5	
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSDPA IV	1	1312/1537	1712.4	23.4
		1413/1675	1732.6	23.2
		1513/1738	1752.6	23.4
	2	1312/1537	1712.4	23.3
		1413/1675	1732.6	23.2
		1513/1738	1752.6	23.4
	3	1312/1537	1712.4	22.8
		1413/1675	1732.6	22.8
		1513/1738	1752.6	22.9
	4	1312/1537	1712.4	22.8
		1413/1675	1732.6	22.6
		1513/1738	1752.6	22.9



HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Sub-test	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	D_{ACK}	8				
	D_{NAK}	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max Data Rate Kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E_TFCI 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	E_TFCI 11 E_TFCI PO 4	E_TFCI 11 E_TFCI PO 4 E_TFCI 92 E_TFCI PO 18	E_TFCI 11 E_TFCI PO 4 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	E_TFCI 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSUPA IV	1	1312/1537	1712.4	23.3
		1413/1675	1732.6	23.2
		1513/1738	1752.6	23.3
	2	1312/1537	1712.4	21.3
		1413/1675	1732.6	21.2
		1513/1738	1752.6	21.2
	3	1312/1537	1712.4	22.2
		1413/1675	1732.6	22.1
		1513/1738	1752.6	22.2
	4	1312/1537	1712.4	21.5
		1413/1675	1732.6	21.3
		1513/1738	1752.6	21.4
	5	1312/1537	1712.4	23.4
		1413/1675	1732.6	23.3
		1513/1738	1752.6	23.3



12.5 WCDMA Band V

Target Power:23 dBm

Tune-up Tolerance: -1.0dB / +1.0dB

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control	Algorithm2
	β_c/β_d	8/15

Band	Mode	Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
WCDMA Band V	Rel99	4132	826.4	23.9
	RMC	4182	836.4	23.7
	12.2kbps	4233	846.4	23.7



HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Sub-test	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	8/15	4/15
	β_{hs}	4/15	24/15	30/15	30/15
CM (dB)	0	1	1.5	1.5	
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSDPA V	1	4132/4357	826.4	23.8
		4182/4407	836.6	23.7
		4233/4458	846.6	23.7
	2	4132/4357	826.4	23.8
		4182/4407	836.6	23.7
		4233/4458	846.6	23.6
	3	4132/4357	826.4	23.5
		4182/4407	836.6	23.2
		4233/4458	846.6	23.2
	4	4132/4357	826.4	23.3
		4182/4407	836.6	23.3
		4233/4458	846.6	23.2



HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121.A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Sub-test	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	D_{ACK}	8				
	D_{NAK}	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max Data Rate Kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E_TFCI 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	E_TFCI 11	E_TFCI 11 E_TFCI PO 4 E_TFCI 92 E_TFCI PO 18	E_TFCI 11 E_TFCI PO 4 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27	E_TFCI 4 E_TFCI 67 E_TFCI PO 18 E_TFCI 71 E_TFCI PO 23 E_TFCI 75 E_TFCI PO 26 E_TFCI 81 E_TFCI PO 27

Band	Data Rate or Sub-test	UL/DL Ch No.	Freq. (MHz)	Avg. Pwr (dBm)
HSUPA V	1	4132/4357	826.4	23.8
		4182/4407	836.6	23.8
		4233/4458	846.6	23.6
	2	4132/4357	826.4	21.9
		4182/4407	836.6	21.8
		4233/4458	846.6	21.8
	3	4132/4357	826.4	22.9
		4182/4407	836.6	22.7
		4233/4458	846.6	22.7
	4	4132/4357	826.4	22.0
		4182/4407	836.6	21.8
		4233/4458	846.6	21.8
5	4132/4357	826.4	23.8	
	4182/4407	836.6	23.6	
	4233/4458	846.6	23.4	



12.6 WiFi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band (GHz)	Freq. (MHz)	Ch #	Default Test Channels	
				802.11b	802.11g
802.11 b/g	2.4	2412	1 [#]	✓	▽
		2437	6	✓	▽
		2462	11 [#]	✓	▽

Notes

✓ = "default test channels"

▽ = possible 802.11g channels with maximum average output ¼ dB the "default test channels"

[#] = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

The indicated Wi-Fi target powers in the following table are absolute maximums.

Output power table

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)			Tune-up Tolerance (dBm)	Maximum Tune-up Pwr (dBm)	Avg. Pwr (dBm)		
					Main	Aux	Total			Main	Aux	Total
2.4	802.11b	1	1	2412	9.0			±2.0	11.0	10.1		
			6	2437	9.0			±2.0	11.0	10.4		
			11	2462	9.0			±2.0	11.0	11.0		
	802.11g	6	1	2412	10.5			±2.0	12.5	11.5		
			6	2437	10.5			±2.0	12.5	11.8		
			11	2462	10.5			±2.0	12.5	12.4		
	802.11n HT20	MCS0	1	2412	8.0			±2.0	10.0	8.8		
			6	2437	8.0			±2.0	10.0	9.3		
			11	2462	8.0			±2.0	10.0	9.7		



12.7 WiFi (5 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band (GHz)	Freq. (MHz)	Ch #	Default Test Channels			
				§15.247		UNII	
802.11a	UNII	5180	36			✓	
		5200	40				*
		5220	44				*
		5240	48			✓	
		5260	52			✓	
		5280	56				*
		5300	60				*
		5320	64			✓	
		5500	100				*
		5520	104			✓	
		5540	108				*
		5560	112				*
		5580	116			✓	
		5600	120				*
		5620	124			✓	
		5640	128				*
	5660	132				*	
	5680	136			✓		
	5700	140				*	
		UNII or §15.247	5745	149	✓		✓
	5765		153		*		*
	5785		157	✓			*
	5805		161		*	✓	
	§15.247	5825	165	✓			

Notes
 ✓ = "default test channels"
 * = possible 802.11a channels with maximum average output > the "default test channels"

The indicated Wi-Fi target powers in the following table are absolute maximums.



WiFi 5.2GHz Band:

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)			Tune-up Tolerance (dBm)	Maximum Tune-up Pwr (dBm)	Avg. Pwr (dBm)		
					Main	Aux	Total			Main	Aux	Total
5.2	802.11a	6	36	5180	10.0			± 2.0	12.0	12.0		
			40	5200	10.0			± 2.0	12.0	12.0		
			44	5220	10.0			± 2.0	12.0	11.7		
			48	5240	10.0			± 2.0	12.0	12.0		
	802.11n (HT20)	MCS0	36	5180	9.0			± 2.0	11.0	11.0		
			40	5200	9.0			± 2.0	11.0	11.0		
			44	5220	9.0			± 2.0	11.0	10.7		
			48	5240	9.0			± 2.0	11.0	11.0		

WiFi 5.3GHz Band:

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)			Tune-up Tolerance (dBm)	Maximum Tune-up Pwr (dBm)	Avg. Pwr (dBm)		
					Main	Aux	Total			Main	Aux	Total
5.3	802.11a	6	52	5260	10.0			± 2.0	12.0	11.5		
			56	5280	10.0			± 2.0	12.0	10.6		
			60	5300	10.0			± 2.0	12.0	11.8		
			64	5320	10.0			± 2.0	12.0	11.8		
	802.11n (HT20)	MCS8	52	5260	9.0			± 2.0	11.0	11.0		
			56	5280	9.0			± 2.0	11.0	10.6		
			60	5300	9.0			± 2.0	11.0	11.0		
			64	5320	9.0			± 2.0	11.0	10.8		

WiFi 5.5GHz Band:

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)			Tune-up Tolerance (dBm)	Maximum Tune-up Pwr (dBm)	Avg. Pwr (dBm)		
					Main	Aux	Total			Main	Aux	Total
5.5	802.11a	6	100	5500	7.0			± 2.0	9.0	8.5		
			104	5520	7.0			± 2.0	9.0	8.9		
			108	5540	7.0			± 2.0	9.0	8.9		
			112	5560	7.0			± 2.0	9.0	8.9		
			116	5580	7.0			± 2.0	9.0	8.7		
			132	5660	7.0			± 2.0	9.0	8.9		
			136	5680	7.0			± 2.0	9.0	8.9		
	802.11n (HT20)	MCS8	140	5700	7.0			± 2.0	9.0	7.0		
			100	5500	6.0			± 2.0	8.0	8.0		
			104	5520	6.0			± 2.0	8.0	8.0		
			108	5540	6.0			± 2.0	8.0	7.9		
			112	5560	6.0			± 2.0	8.0	7.5		
			116	5580	6.0			± 2.0	8.0	7.0		
			132	5660	6.0			± 2.0	8.0	7.5		
			136	5680	6.0			± 2.0	8.0	7.5		
			140	5700	6.0			± 2.0	8.0	7.3		



WiFi 5.8GHz Band:

Band (GHz)	Mode	Data rate (Mbps)	Ch #	Freq. (MHz)	Target Pwr (dBm)			Tune-up Tolerance (dBm)	Maximum Tune-up Pwr (dBm)	Avg. Pwr (dBm)		
					Main	Aux	Total			Main	Aux	Total
5.8	802.11a	6	149	5745	10.0			± 2.0	12.0	11.9		
			153	5765	10.0			± 2.0	12.0	11.9		
			157	5785	10.0			± 2.0	12.0	11.8		
			161	5805	10.0			± 2.0	12.0	11.9		
			165	5825	10.0			± 2.0	12.0	11.6		
	802.11n (HT20)	MCS8	149	5745	11.5			± 2.0	13.5	13.4		
			153	5765	11.5			± 2.0	13.5	13.4		
			157	5785	11.5			± 2.0	13.5	13.4		
			161	5805	11.5			± 2.0	13.5	13.4		
			165	5825	11.5			± 2.0	13.5	13.4		

12.8 Bluetooth

Target Power: -1 dBm

Tune-up Tolerance: - 2dBm / + 2dBm

Output power table

Band	Mode	Ch #	Freq. (MHz)	Avg pwr (dBm)
Bluetooth	DH5	0	2402	-0.4
		39	2441	0.5
		78	2480	1.0
	3DH5	0	2402	-2.9
		39	2441	-2.0
		78	2480	-1.6



12.9 EUT Tune-up Procedures and Test Mode

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

- The client supplied a special driver to program the EUT, allowing it to continually transmit the specified maximum power and change the channel frequency.
- The output power(dBm) we measured before SAR test in different channel



13 SAR Measurements Results

GPRS850:

Band	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
				Tune up limit	Measured			
GPRS850 (2 Slot)	Front	128	10					1
		190	10					1
		251	10	33.0	32.7	0.358	0.384	
	Rear	128	10					1
		190	10					1
		251	10	33.0	32.7	0.705	0.755	
		251	10	33.0	32.7	0.518	0.555	2

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.

GPRS1900:

Band	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
				Tune up limit	Measured			
GPR1900 (2 Slot)	Front	512	10					1
		661	10					1
		810	10	30.0	29.6	0.112	0.123	
	Rear	512	10					1
		661	10					1
		810	10	30.0	29.6	0.334	0.366	
		810	10	30.0	29.6	0.156	0.171	2

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.

WCDMA Band II:

Band	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
				Tune up limit	Measured			
WCDMA Band II	Front	9262	10	24.0	23.6	0.131	0.144	
		9400	10					1
		9538	10					1
	Rear	9262	10	24.0	23.6	0.485	0.532	
		9262	10	24.0	23.6	0.305	0.334	2
		9400	10					1
		9538	10					1

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.



WCDMA Band IV:

Band	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
				Tune up limit	Measured			
WCDMA Band IV	Front	1312	10	24.0	23.4	0.148	0.170	
		1413	10					1
		1513	10					1
	Rear	1312	10	24.0	23.4	0.341	0.392	
		1312	10	24.0	23.4	0.195	0.224	2
		1413	10					1
		1513	10					1

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.

WCDMA Band V:

Band	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
				Tune up limit	Measured			
WCDMA Band V	Front	4132	10	24.0	23.9	0.249	0.255	
		4182	10					1
		4233	10					1
	Rear	4132	10	24.0	23.9	0.422	0.432	
		4132	10	24.0	23.9	0.285	0.292	2
		4182	10					1
		4233	10					1

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.

Wi-Fi (2.4GHz Band):

Band	Mode	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
					Tune up limit	Measured			
2.4GHz	802.11b	Front	1	10					1
			6	10					1
			11	10	11.0	11.0	0.099	0.099	
		Rear	1	10					1
			6	10					1
			11	10	11.0	11.0	0.122	0.122	
			11	10	11.0	11.0	0.051	0.051	2
	802.11g	Front	1	10					1
			6	10					1
			11	10	12.5	12.4	0.077	0.079	
		Rear	1	10					1
			6	10					1
11			10	12.5	12.4	0.097	0.097		

Note(s):

1. 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. ≤ 0.8 W/kg and transmission band ≤ 100 MHz (Per KDB 447498 D01 v05 section 4.3.3)
2. Test is Using Battery Sample 2.

**Wi-Fi (5.2GHz Band):**

Band	Mode	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
					Tune up limit	Measured			
5.2GHz	802.11a	Front	36	0	12.0	12.0	0.108	0.108	
			48	0	12.0	12.0	0.080	0.080	
		Rear	36	0	12.0	12.0	0.399	0.399	
			48	0	12.0	12.0	0.506	0.506	
			48	0	12.0	12.0	0.389	0.389	1

Wi-Fi (5.3GHz Band):

Band	Mode	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
					Tune up limit	Measured			
5.3GHz	802.11a	Front	52	0	12.0	11.5	0.109	0.122	
			64	0	12.0	11.8	0.122	0.128	
		Rear	52	0	12.0	11.5	0.459	0.515	
			52	0	12.0	11.5	0.443	0.497	1
			64	0	12.0	11.8	0.385	0.403	

Wi-Fi (5.5GHz Band):

Band	Mode	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
					Tune up limit	Measured			
5.5GHz	802.11a	Front	104	10	9.0	8.9	0.027	0.028	
			112	10	9.0	8.9	0.035	0.036	
			136	10	9.0	8.9	0.049	0.050	
		Rear	104	10	9.0	8.9	0.224	0.229	
			112	10	9.0	8.9	0.216	0.221	
			136	10	9.0	8.9	0.301	0.308	
			136	10	9.0	8.9	0.141	0.144	1

Wi-Fi (5.8GHz Band):

Band	Mode	Test Position	Channel	Dist. (mm)	Power (dBm)		Measure d1g SAR (W/kg)	Reported SAR(W/kg)	Note
					Tune up limit	Measured			
5.8GHz	802.11a	Front	149	10	12.0	11.9	0.050	0.051	
			161	10	12.0	11.9	0.135	0.138	
			165	10	12.0	11.6	0.027	0.030	
		Rear	149	10	12.0	11.9	0.142	0.145	
			161	10	12.0	11.9	0.358	0.366	
			165	10	12.0	11.6	0.285	0.312	
	802.11n HT20	Front	149	10	13.5	13.4	0.163	0.167	
			157	10	13.5	13.4	0.252	0.258	
			165	10	13.5	13.4	0.271	0.277	
		Rear	149	10	13.5	13.4	0.244	0.250	
			157	10	13.5	13.4	0.273	0.279	
			165	10	13.5	13.4	0.413	0.423	
165	10	13.5	13.4	0.282	0.289	1			

Note(s):

1. Test is Using Battery Sample 2.



Bluetooth:

Band	Mode	Freq. (MHz)	Power (dBm)		Estimated 1g SAR (W/kg)	Note
			Tune up limit	Measured		
Bluetooth	DH5	2402				
		2440				
		2480	1.0	1.0	0.082	

Note(s):

1. When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following KDB 447498 D01 v05 section 4.3.2

Maximum power of channel, including tune-up tolerance (mW)=1.25mW

Minimum test separation distance (mm) = 3.21 mm

Estimated SAR= $(1.25\text{mW}/3.21\text{mm})[(2.440\text{GHz}^{0.5})/7.5]=0.026\text{mW/g}$



13.1 Summary of Highest SAR Values

Results for highest Body SAR values for each frequency band and mode

Technology/Band	Test configuration	Mode	Highest Measured 1g-SAR (W/kg)
GSM850	Rear	GPRS 2 slot	0.755
GSM1900	Rear	GPRS 2 slot	0.366
W-CDMA (UMTS) Band II	Rear	Rel 99 RMC 12.2kbps	0.532
WCDMA (UMTS) band IV	Rear	Rel 99 RMC 12.2kbps	0.392
WCDMA (UMTS) band V	Rear	Rel 99 RMC 12.2kbps	0.432
WiFi 2.4 GHz	Rear	802.11b 1Mbps	0.122
WiFi 5.2 GHz	Rear	802.11a 6Mbps	0.506
WiFi 5.3 GHz	Rear	802.11a 6Mbps	0.515
WiFi 5.5 GHz	Rear	802.11a 6Mbps	0.308
WiFi 5.8 GHz	Rear	802.11n HT20 MCS0	0.423



14 Simultaneous Transmission SAR Analysis

14.1 Sum of the 1g SAR for Body Exposure Condition

Sum of the SAR with Scaled Values

Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	WiFi 2.4 GHz Band	∑ 1-g SAR (W/kg)
Front	0.384					0.099	0.483
		0.123				0.099	0.222
			0.144			0.099	0.243
				0.170		0.099	0.269
					0.255	0.099	0.354
Rear	0.755					0.122	0.877
		0.366				0.122	0.488
			0.532			0.122	0.654
				0.392		0.122	0.514
					0.432	0.122	0.554

Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	WiFi 5.2 GHz Band	∑ 1-g SAR (W/kg)
Front	0.384					0.108	0.492
		0.123				0.108	0.231
			0.144			0.108	0.252
				0.170		0.108	0.278
					0.255	0.108	0.363
Rear	0.755					0.506	1.261
		0.366				0.506	0.872
			0.532			0.506	1.038
				0.392		0.506	0.898
					0.432	0.506	0.938

Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	WiFi 5.3 GHz Band	∑ 1-g SAR (W/kg)
Front	0.384					0.128	0.512
		0.123				0.128	0.251
			0.144			0.128	0.272
				0.170		0.128	0.298
					0.255	0.128	0.383
Rear	0.755					0.515	1.270
		0.366				0.515	0.881
			0.532			0.515	1.047
				0.392		0.515	0.907
					0.432	0.515	0.947



Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	WiFi 5.5 GHz Band	∑ 1-g SAR (W/kg)
Front	0.384					0.050	0.434
		0.123				0.050	0.173
			0.144			0.050	0.194
				0.170		0.050	0.220
Rear	0.755				0.255	0.050	0.305
		0.366				0.308	1.063
			0.532			0.308	0.674
				0.392		0.308	0.840
				0.432	0.308	0.700	
					0.308	0.740	

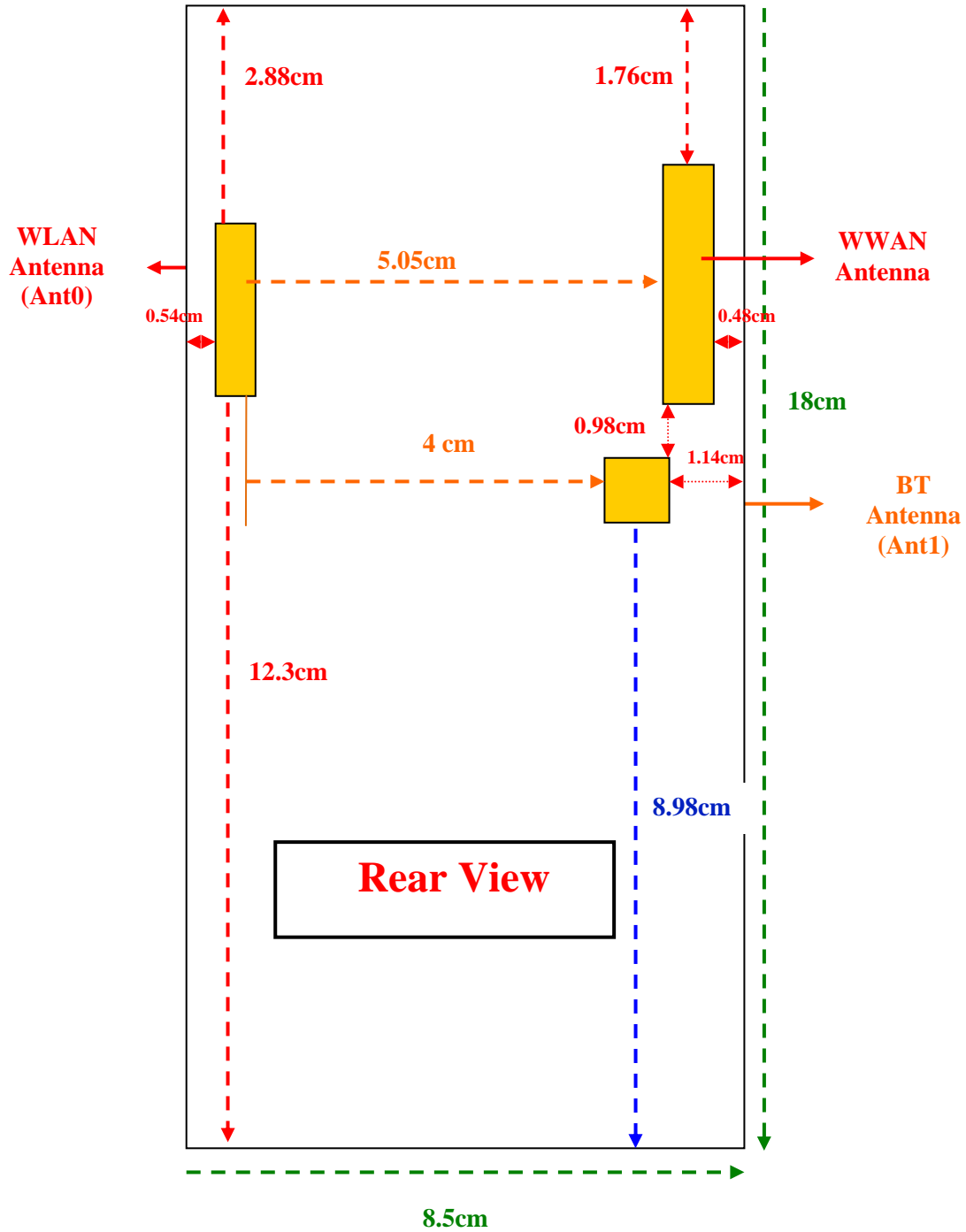
Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	WiFi 5.8 GHz Band	∑ 1-g SAR (W/kg)
Front	0.384					0.277	0.661
		0.123				0.277	0.400
			0.144			0.277	0.421
				0.170		0.277	0.447
Rear	0.755				0.255	0.277	0.532
		0.366				0.423	1.178
			0.532			0.423	0.789
				0.392		0.423	0.955
				0.432	0.423	0.815	
					0.423	0.855	

Test Position	GPRS850	GPRS1900	WCDMA Band II	WCDMA Band IV	WCDMA Band V	Bluetooth	∑ 1-g SAR (W/kg)
Front	0.384					0.082	0.466
		0.123				0.082	0.205
			0.144			0.082	0.226
				0.170		0.082	0.252
Rear	0.755				0.255	0.082	0.337
		0.366				0.082	0.837
			0.532			0.082	0.448
				0.392		0.082	0.614
				0.432	0.082	0.474	
					0.082	0.514	

Test Position	WiFi 2.4GHz Band	WiFi 5.2GHz Band	WiFi 5.3GHz Band	WiFi 5.5GHz Band	WiFi 5.8GHz Band	Bluetooth	∑ 1-g SAR (W/kg)
Front	0.099					0.082	0.181
		0.108				0.082	0.190
			0.128			0.082	0.210
				0.050		0.082	0.132
Rear	0.122				0.277	0.082	0.359
		0.506				0.082	0.204
			0.515			0.082	0.588
				0.308		0.082	0.597
				0.432	0.082	0.390	
					0.082	0.514	



15 Antenna Locations & Separation Distances





16 Equipment List & Calibration Status

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Cycle(year)	Calibration Due
S-Parameter Network Analyzer	Agilent	E8358A	US40260243	1	07/03/2013
Electronic Probe kit	Hewlett Packard	85070D	N/A	N/A	N/A
Power Meter	Anritsu	ML2495A	1012009	1	04/26/2013
Power Sensor	Anritsu	MA2411B	917072	1	04/26/2013
Spectrum Analyzer	Agilent	E4446A	US42510252	1	12/09/2013
Wireless Communication Test Set	Agilent	E5515C 8960	MY48363204	1	09/12/2013
Data Acquisition Electronics (DAE)	SPEAG	DAE3	360	1	01/29/2014
Dosimetric E-Field Probe	SPEAG	EX3DV4	3665	1	4/27/2013
835 MHz System Validation Dipole	SPEAG	D835V2	4d092	1	06/21/2013
1800 MHz System Validation Dipole	SPEAG	D1800V2	2d062	1	02/11/2014
1900 MHz System Validation Dipole	SPEAG	D1900V2	5d056	1	02/12/2014
2450 MHz System Validation Dipole	SPEAG	D2450V2	728	1	11/19/2013
5GHz System Validation Dipole	SPEAG	D5GHzV2	1004	1	11/15/2013
Robot	Staubli	RX60L	F02/5T69A1/A/01	N/A	N/A
Amplifier	Mini-Circuit	ZVE-8G	665500309	N/A	N/A
Amplifier	Mini-Circuit	ZHL-1724HLN	D072602#2	N/A	N/A
DC Power generator	ABM	8301HD	N/A	N/A	N/A
Probe Alignment Unit	SPEAG	LB (V2)	348	N/A	N/A
SAM Twin Phantom V4.0	SPEAG	N/A	N/A	N/A	N/A



17 Facilities

All measurement facilities used to collect the measurement data are located at

- No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
- No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
- No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

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19 Attachments

Exhibit	Content
1	System performance check plots
2	SAR test plots for GPRS850
3	SAR test plots for GPRS1900
4	SAR test plots for WCDMA Band II
5	SAR test plots for WCDMA Band IV
6	SAR test plots for WCDMA Band V
7	SAR test plots for 2.4GHz
8	SAR test plots for 5.2GHz
9	SAR test plots for 5.3GHz
10	SAR test plots for 5.5GHz
11	SAR test plots for 5.8GHz
12	SAR_DAE3_sn360_20130130
13	SAR_Probe_EX3DV4_sn3665_20120427
14	SAR_Dipole_D835V2_sn4d092_20120622
15	SAR_Dipole_D1800V2_sn2d062_20130212
16	SAR_Dipole_D1900V2_5d056_20130213
17	SAR_Dipole_D2450v2_sn728_20121120
18	SAR_Dipole_D5GHz_sn1004_20121116
19	T130321W01-SF PHOTOS

END OF REPORT