TEST REPORT

TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: EB-4058

FCC ID: UCE212051A

To: OET Bulletin 65 Supplement C: (2001-01)
IEEE 1528: 2003

Test Report Serial No:
RFI-SAR-RP87473JD03A V2.0

Version 2.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	 (APPROVED SIGNATORY)
Checked By: Richelieu Quoi	 (APPROVED SIGNATORY)
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1. Customer Information

Company Name:	Panasonic Mobile Comms Dev of Europe Ltd
Address:	Panasonic House, Willoughby Road, Bracknell, Berkshire, RG12 8FP, United Kingdom

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	NTT docomo
Model Name or Number:	EB-4058
Serial Number:	None Stated
IMEI Number:	3518-070500-19143
Hardware Version Number:	Rev E
Software Version Number:	ACPU: fujiko-ics-09-0316 CCPU: HY11-N5119_ALL_00.20.31
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	UCE212051A
Country of Manufacture:	Japan
Date of Receipt:	01 June 2012

This sample was used to perform WWAN and WLAN SAR evaluation measurements only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

Description:	Mobile Handset
Brand Name:	NTT docomo
Model Name or Number:	EB-4058
Serial Number:	None Stated
IMEI Number:	3518-070500-19150
Hardware Version Number:	Rev E
Software Version Number:	ACPU: fujiko-ics-09-0316 CCPU: HY11-N5119_ALL_00.20.31
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	UCE212051A
Country of Manufacture:	Japan
Date of Receipt:	01 June 2012

This sample was used to perform WWAN and WLAN conducted power measurements only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

2.2. Description of EUT

The equipment under test was a Dual-mode UMTS/GSM mobile handset operating in the GSM850, PCS1900, UMTS FDD V, Wi-Fi 2450 and *Bluetooth* bands. The EUT has GPRS class 12, UMTS FDD V HSPA, Wi-Fi802.11b/g/n, Wireless Personal Hotspot Mode, RFID and *Bluetooth* mode capabilities.

2.3. Modifications Incorporated in the EUT

EUT (IMEI: 3518-070500-19143) was used to perform WWAN and WLAN SAR evaluations only.

EUT (IMEI: 3518-070500-19150) was used for perform WWAN and WLAN conducted power measurements only.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Personal Hands-Free (PHF)
Brand Name:	Panasonic
Model Name or Number:	Type 02
Serial Number:	None Stated
Cable Length and Type:	~1.15m
Country of Manufacture:	None Stated
Connected to Port	3.5mm Jack

Description:	Battery
Brand Name:	NTT docomo
Model Name or Number:	P28
Serial Number:	None Stated
Cable Length and Type:	Not Applicable
Country of Manufacture:	None Stated
Connected to Port	3 pin contact

Description:	Memory Card
Brand Name:	None Stated (Generic)
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	Not Applicable
Country of Manufacture:	None Stated
Connected to Port	Dedicated Micro SD Slot

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10
Serial Number:	GB46311280
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10
Serial Number:	GB462000666
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

2.6. Additional Information Related to Testing

Equipment Category	GSM/GPRS/EDGE850, PCS/GPRS/EDGE1900, UMTS FDD V, WiFi802.11b/g/n, *Bluetooth*, RFID	
Type of Unit	Portable Transceiver	
Intended Operating Environment:	Within GSM, UMTS, Wi-Fi *Bluetooth* and RFID Coverage	
Transmitter Maximum Output Power Characteristics:	GSM850	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
	PCS1900	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
	UMTS Band V	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	WiFi802.11b/g/n	Communication Test Set was configured to allow the EUT to transmit at a maximum power of up to 14.1 dBm.
	Bluetooth	< 2 dBm
Transmitter Frequency Range:	GSM850	824 to 849 MHz
	PCS1900	1850 to 1910 MHz
	UMTS Band V	826 to 847 MHz
	WiFi802.11b/g/n	2412 to 2462 MHz

Additional Information Related to Testing (Continued)

Transmitter Frequency Allocation of EUT When Under Test:	**Channel Number**	**Channel Description**	**Frequency (MHz)**
	128	Low	824.2
	190	Middle	836.6
	251	High	848.8
	512	Low	1850.2
	661	Middle	1880.0
	810	High	1909.8
	4132	Low	826.4
	4183	Middle	836.6
	4233	High	846.6
	1	Low	2412.0
	6	Middle	2437.0
	11	High	2462.0
Modulation(s):	GMSK (GSM/ GPRS/EDGE.): 217 Hz 8PSK (EDGE): 217 Hz QPSK(UMTS / HSDPA/HSPA):0Hz DBPSK, CCK (Wi-Fi): 0 Hz		
Modulation Scheme (Crest Factor):	GSMK (GSM): 8.3 GMSK (GPRS/EDGE850): 2.67 8PSK (EDGE850): 2.67 GMSK (GPRS/EDGE1900): 2 8PSK (EDGE1900): 2 DBPSK, CCK (Wi-Fi): 1 QPSK(UMTS FDD / HSPA): 1		
Antenna Type:	Internal integral		
Antenna Length:	Unknown		
Number of Antenna Positions:	2 fixed (WWAN and WLAN/*Bluetooth*)		
Power Supply Requirement:	3.8V		
Battery Type(s):	Li-ion		

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.

3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, “Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields”, OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques,
Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with known precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

KDB 248227 D01 "SAR measurements for 802.11a/b/g v01r02”

KDB 447498 D01 “Mobile Portable RF Exposure v04”

KDB 450824 D01 ‘’SAR Prob Cal and Ver Meas v01r01’’

KDB 648474 D01 “SAR Handsets Multi Xmiter and Ant v01r05”

KDB 941225 D01 "SAR test for 3G v02"

KDB 941225 D03 “SAR Test Reduction GSM/GPRS/EDGE v01”

KDB 941225 D06 “Hot Spot SAR v01”

The version of DASY system used by RFI for SAR measurements is v4.7.

The SAR probe for the DASY v4.4 and higher has a validity of +/- 100 MHz from the spot frequency at which the system is calibrated.

The system validation performed at 900 MHz is valid for 800 MHz to 1000 MHz which covers the 850 MHz band. The probe calibration for SN: 3814 was performed at the spot frequencies of 750 MHz and 900 MHz.. The SAR software selects the conversion factor based on the following attributes; 1. The operating frequency 2. The measured permittivity imported to the software and 3. The measured conductivity imported to the software.

The 900 MHz system check is applicable for the 850 band as this is within 100 MHz of the of the 850 MHz spot frequency.

As per FCC KDB pub 450824 for SAR probe calibration; The following procedures are recommended for DUT measurements at 150 MHz to 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. Measurements exceeding 50 % of these intervals, in this case +/- 50 MHz, EUT frequency greater than or equal to 300 MHz, shall apply method 1 of the steps.
1) When the actual tissue dielectric parameters used for probe calibration are available the differences for relative permittivity and conductivity between probe calibration and routine measurements should each be less than or equal to 5 % while also satisfying the required +/- 5 % tolerances in target dielectric parameters.

The simulation liquid used satisfies both 835 MHz and 900 MHz target values for all channels in the GSM850 band. The SAR probe coverage and conversion factor has been calibrated to ensure this condition is met and the appropriate conversion factor is used in the frequency range for up to +/- 100 MHz.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

Test was performed as per KDB 248227 D01 "SAR measurements for 802.11a/b/g v01r02", KDB 447498 D01 "Mobile Portable RF Exposure v04", KDB 450824 D01 ''SAR Prob Cal and Ver Meas v01r01'', KDB 648474 D01 "SAR Handsets Multi Xmiter and Ant v01r05", KDB 941225 D01 "SAR test for 3G v02", KDB 941225 D03 "SAR Test Reduction GSM/GPRS/EDGE v01", KDB 941225 D06 "Hot Spot SAR v01", according to the handset procedures in IEEE Std 1528-2003 and OET Bulletin 65 Supplement C 01-01. The assessment for Personal Wireless Hotspot was also evaluated as per the FCC KDB 941225 D06 "Hot Spot SAR v01".

For technologies bands supporting personal hotspot mode, SAR was evaluated on all the Sides and surfaces within 25mm of the transmitting antenna (WWAN or WLAN) as per FCC KDB 941225 D06 "Hot Spot SAR v01".

Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg and the antenna-to-antenna distance was greater than 5 cm.

SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

GPRS class12, uplink setup of 1-uplink; 2-uplink, 3-uplink and 4-uplink were all evaluated to find the setting with the highest power reference point (unit v/m) as per the DASY4 system. 3-uplinks and 4-uplinks were found to give the highest power reference point measurement on the DASY4 system (unit v/m) for GSM850 and PCS1900 respectively. All settings were performed with the device in a fixed position Back facing phantom at 0mm separation to ensure there were no positioning errors. The following values were measured relative to the uplink settings:

GPRS Mode	GPRS850 Power (v/m)	GPRS1900 Power (v/m)
1 uplink	10.45	4.69
2 uplink	11.81	5.87
3 uplink	**12.31**	6.26
4 uplink	12.12	**6.38**

Note: Power reference point measurements are from the DASY4 system and used to check the device power drift although the units are v/m. For informational purpose to ensure the worst case uplink time slot is also verified by the DASY4 SAR system, this was use as per above comment at a fixed point.

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- GSM850 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
- GPRS850 – Data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5. Tested using 3 Uplink time slots with CS1 for GPRS.
- PCS1900 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
- GPRS1900 – Data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0. Tested using 4 Uplink time slots with CS1 for GPRS.

GSM85 – Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
0 … 2	39
3	37
4	35
5	**33**
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19 ... 31	5

PCS1900 – Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
22 … 29	Reserved
30	33
31	32
0	**30**
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0
16 … 21	Reserved

- UMTS FDD V Call allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- WiFi802.11b/g/n Data allocated mode using ‘FTM-BOX3.exe’ software to excise mode ‘b’, ‘g’ and ‘n’, with maximum power of up to 14.1 dBm for ‘b’ mode and 11.2 dBm for ‘g’ and 9.2 dBm for ‘n’ modes.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- Test performed with the EUT in a Standalone Battery Powered configuration.
- The applied configurations for body-worn orientations where the corresponding edge(s) is closest to the user with the most conservative exposure condition were all evaluated at 10 mm from the body as Personal Hotspot mode was supported. Therefore SAR test at 15 mm for configuration that overlapped with the Personal hotspot configuration were not evaluated.

Head Configuration

a) The handset was placed in a normal operating position with the centre of the ear-piece aligned with the ear canal on the phantom.

b) With the ear-piece touching the phantom the centre line of the handset was aligned with an imaginary plane (X and Y axis) consisting of three lines connecting both ears and the mouth.

c) For the cheek position the handset was gradually moved towards the cheek until any point of the mouth-piece or keypad touched the cheek.

d) For the tilted position the EUT was positioned as for the cheek position, and then the horizontal angle was increased by fifteen degrees (the phone keypad was moved away from the cheek by fifteen degrees).

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

Body Configuration

a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the ‘SAM’ phantom.

b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.

c) For the touch-safe position the EUT was gradually moved towards the flat section of the ‘SAM’ phantom until any point of the EUT touched the phantom.

d) For position(s) greater then 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

6. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-GSM 850 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 850 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 850 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GSM 850 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 1900 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 1900 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD V Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD V Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD V Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-Wi-Fi 2450 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-Wi-Fi 2450 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied

SAR Individual Transmitter Evaluation						
Device, mode	Frequency, (MHz)	Phantom Configuration	P_x (mW)	P_{REF} (mW)	single SAR, W/kg	Remarks
WWAN, GSM	850	Back	214	60/f	0.668	Routine Evaluation
WWAN, UMTS	850	Back	229	60/f	0.875	Routine Evaluation
WWAN, GSM	1900	Back	138	60/f	0.477	Routine Evaluation
WLAN, WiFi802.11b	2450	Touch Left	26	60/f	0.529	Routine Evaluation
BT, *Bluetooth*	2400	-	~ 2	12	:=0	{$P_{BT} \leq 2P_{REF}$} {$d_{WWAN, BT} >$ 5cm}

Note(s):

1. Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg.
2. *Bluetooth* transmitter thresholds output power "P_{Ref} = 12 mW as listed in KDB 648474.
3. Px: The indicated power measurements is the overall maximum average burst power per frequency band measured by RFI.
4. Single SAR value measured by RFI.
5. The "Antenna-to-Antenna distance and Antenna-to-User distance were provided by the customer.

SAR Simultaneous Transmitter Evaluation					
(x,y)	D(x,y) cm	L(x,y) cm	$SPLSR_{xy}$	Sim-Tx SAR	Remarks
($WWAN_{GSM/UMTS}$, BT)	>5	N/A	N/A	N/A	{no stand-alone SAR for BT}
($WWAN_{GSM/UMTS}$, Wi-Fi)	>5	N/A	N/A	N/A	{$\Sigma_{WWAN, WLAN} <$ 1.6 W/kg}

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

7.2. Test Results

For All SAR measurement in this report the SAR limit tested to is 1.6 W/kg

7.2.1.Specific Absorption Rate – GSM 850 Head Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.355
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	190	22.7	N/A	0.355	1, 2	GMSK
Tilt	Left	190	22.7	N/A	0.243	1, 2	GMSK
Touch	Right	190	22.7	N/A	0.348	1, 2	GMSK
Tilt	Right	190	22.7	N/A	0.242	1, 2	GMSK

Note(s):

1. Voice
2. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. As stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

7.2.2.Specific Absorption Rate – GPRS 850 Head Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.405
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	190	23.3	N/A	0.405	1, 2, 3	GMSK

Note(s):

1. Data - SAR measurements were performed using 3 uplink timeslots
2. Touch Left, is worst case configuration from GSM head is used on GPRS head.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

*KDB 941225 - SAR is not required for EDGE channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.3.Specific Absorption Rate - GPRS 850 Hotspot Mode Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.668
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	20.4 to 20.4

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	190	23.3	N/A	0.504	1, 2, 3	GMSK
Back of EUT Facing Phantom	Flat (SAM)	190	23.3	N/A	0.668	1, 2, 3	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	190	23.3	N/A	0.428	1, 2, 3	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	190	23.3	N/A	0.394	1, 2, 3	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	190	23.3	N/A	0.108	1, 2, 3	GMSK

Note(s):

1. Data - SAR measurements were performed using 3 uplink timeslots
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

*KDB 941225 - SAR is not required for EDGE channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.4.Specific Absorption Rate - GSM 850 Body-Worn Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.458
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	20.4 to 20.4

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	190	22.7	N/A	0.458	1, 2, 3	GMSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	190	22.7	N/A	0.415	1, 2, 3, 4	GMSK

Note(s):

1. Voice - Back of EUT, is worst case configuration from GPRS Hotspot Mode is used on GSM body-worn.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

7.2.5.Specific Absorption Rate - PCS 1900 Head Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.244
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	661	29.6	N/A	0.244	1, 2	GMSK
Tilt	Left	661	29.6	N/A	0.069	1, 2	GMSK
Touch	Right	661	29.6	N/A	0.243	1, 2	GMSK
Tilt	Right	661	29.6	N/A	0.090	1, 2	GMSK

Note(s):

1. Voice
2. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

7.2.6.Specific Absorption Rate - GPRS 1900 Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.312
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	661	21.4	N/A	0.312	1, 2, 3	GMSK

Note(s):

1. Data - SAR measurements were performed using 4 uplink timeslots
2. Touch Left, is worst case configuration from PCS head is used on GPRS head
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

*KDB 941225 - SAR is not required for EDGE channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.7.Specific Absorption Rate - GPRS 1900 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.477
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	21.5 to 21.5

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	661	21.4	N/A	0.418	1, 2, 3	GMSK
Back of EUT Facing Phantom	Flat (SAM)	661	21.4	N/A	0.477	1, 2, 3	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	661	21.4	N/A	0.075	1, 2, 3	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	661	21.4	N/A	0.188	1, 2, 3	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	661	21.4	N/A	0.423	1, 2, 3	GMSK

Note(s):

1. Data - SAR measurements were performed using 4 uplink timeslots
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

*KDB 941225 - SAR is not required for EDGE channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.8.Specific Absorption Rate - PCS 1900 Body-Worn Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.136
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	21.5 to 21.5

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	661	29.6	N/A	0.118	1, 2, 3	GMSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	661	29.6	N/A	0.136	1, 2, 3, 4	GMSK

Note(s):

1. Voice - Back of EUT, is worst case configuration from GPRS Hotspot Mode is used on PCS body-worn.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

7.2.9.Specific Absorption Rate - UMTS-FDD V Head Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.567
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	4183	23.6	N/A	0.567	1, 2	QPSK
Tilt	Left	4183	23.6	N/A	0.338	1, 2	QPSK
Touch	Right	4183	23.6	N/A	0.538	1, 2	QPSK
Tilt	Right	4183	23.6	N/A	0.379	1, 2	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

7.2.10.Specific Absorption Rate - UMTS-FDD V Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.875

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.3 to 22.3

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.658	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.864	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4132	23.7	N/A	0.865	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4233	23.6	N/A	0.875	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.572	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.583	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.128	1, 2	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

*KDB 941225 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding RMC channels.

7.2.11.Specific Absorption Rate - UMTS-FDD V Body-Worn Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.727

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.3 to 22.3

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	4183	23.6	N/A	0.694	1, 2, 3	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	4183	23.6	N/A	0.727	1, 2, 3, 4	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. Back of EUT, is worst case configuration from Hotspot mode used for Body Worn Configuration.
3. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

*KDB 941225 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding RMC channels.

7.2.12.Specific Absorption Rate - Wi-Fi 2450 Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.529
Environmental Conditions:	
Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	6	14.1	N/A	0.529	1	DBPSK
Tilt	Left	6	14.1	N/A	0.320	1	DBPSK
Touch	Right	6	14.1	N/A	0.184	1	DBPSK
Tilt	Right	6	14.1	N/A	0.169	1	DBPSK

Note(s):

1. WLAN 802.11b 1Mbps

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is equal to that measured on the corresponding 802.11b channels.

7.2.13.Specific Absorption Rate - Wi-Fi 2450 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.071
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	6	14.1	N/A	0.068	1, 2, 3	DBPSK
Back of EUT Facing Phantom	Flat (SAM)	6	14.1	N/A	0.071	1, 2, 3	DBPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	6	14.1	N/A	0.010	1, 2, 3	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	6	14.1	N/A	0.055	1, 2, 3	DBPSK
Top of EUT Facing Phantom	Flat (SAM)	6	14.1	N/A	0.055	1, 2, 3	DBPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	6	14.1	N/A	0.049	1, 2, 3, 4	DBPSK

Note(s):

1. WLAN 802.11b 1Mbps
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit. as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is equal to that measured on the corresponding 802.11b channels.

7.2.14.Conducted Average Power Measurement 2G: GSM850

Channel Number	Frequency (MHZ)	GSM Tx Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
128	824.2	**31.5**	22.5	Conducted, GMSK
190	836.6	31.7	22.7	Conducted, GMSK
251	848.8	31.6	22.6	Conducted, GMSK

GPRS850 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	31.5	28.7	27.4	25.8	Conducted, GMSK
190	836.6	31.7	29.1	27.6	26.2	Conducted, GMSK
251	848.8	31.6	29.1	27.6	26.1	Conducted, GMSK

GPRS850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	22.5	22.7	23.1	22.8	Conducted, GMSK
190	836.6	22.7	23.1	23.3	23.2	Conducted, GMSK
251	848.8	22.6	23.1	23.3	23.1	Conducted, GMSK

EDGE850 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	31.3	28.7	27.4	25.8	Conducted, GMSK
190	836.6	31.6	29.1	27.6	26.2	Conducted, GMSK
251	848.8	31.6	29.1	27.7	26.2	Conducted, GMSK

EDGE850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	22.3	22.7	23.1	22.8	Conducted, GMSK
190	836.6	22.6	23.1	23.3	23.2	Conducted, GMSK
251	848.8	22.6	23.1	23.4	23.2	Conducted, GMSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

EDGE (MCS9 ~ 8PSK)
EDGE850 - Measured Average Power Without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	23.1	20.5	18.6	17.6	Conducted, 8PSK
190	836.6	22.6	20.0	18.0	17.2	Conducted, 8PSK
251	848.8	22.1	19.6	17.6	16.7	Conducted, 8PSK

EDGE850 - Calculated Value With consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	14.1	14.5	14.3	14.6	Conducted, 8PSK
190	836.6	13.6	14.0	13.7	14.2	Conducted, 8PSK
251	848.8	13.1	13.6	13.3	13.7	Conducted, 8PSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

7.2.15.Conducted Average Power Measurement 2G:PCS1900

Channel Number	Frequency (MHZ)	GSM TX Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
512	1850.2	29.6	20.6	Conducted, GMSK
661	1880.0	29.6	20.6	Conducted, GMSK
810	1909.8	29.6	20.6	Conducted, GMSK

GPRS1900 - Measured Average Power Without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	29.6	27.5	25.7	24.3	Conducted, GMSK
661	1880.0	29.6	27.6	25.7	24.4	Conducted, GMSK
810	1909.8	29.6	27.6	25.6	24.3	Conducted, GMSK

GPRS1900 - Calculated Value With consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	20.6	21.5	21.4	21.1	Conducted, GMSK
661	1880.0	20.6	21.6	21.4	21.4	Conducted, GMSK
810	1909.8	20.6	21.6	21.3	21.3	Conducted, GMSK

EDGE1900 - Measured Average Power Without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	29.5	27.3	25.5	24.2	Conducted, GMSK
661	1880.0	29.6	27.6	25.7	24.4	Conducted, GMSK
810	1909.8	29.5	27.6	25.6	24.3	Conducted, GMSK

EGPR1900 - Calculated Value With consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	20.5	21.3	21.2	21.2	Conducted, GMSK
661	1880.0	20.6	21.6	21.4	21.4	Conducted, GMSK
810	1909.8	20.5	21.6	21.3	21.3	Conducted, GMSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

EDGE (MCS9 ~ 8PSK):
EDGE1900 - Measured Average Power Without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	25.7	23.1	21.3	19.9	Conducted, 8PSK
661	1880.0	25.8	23.2	21.5	20.0	Conducted, 8PSK
810	1909.8	25.8	23.2	21.5	20.0	Conducted, 8PSK

EDGE1900 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	16.7	17.1	17.0	16.9	Conducted, 8PSK
661	1880.0	16.8	17.2	17.2	17.0	Conducted, 8PSK
810	1909.8	16.8	17.2	17.2	17.0	Conducted, 8PSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

7.2.16.Conducted Average Power Measurement 3G

Modes		HSDPA				HSPA					WCDMA
Sets		1	2	3	4	1	2	3	4	5	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
UMTS FDD V (850 MHz)	4132 4357	23.1	22.8	22.3	22.2	22.9	22.9	22.3	23.1	22.3	23.7
	4183 4408	23.0	22.7	22.2	22.2	22.7	22.8	22.2	23.0	22.2	23.6
	4233 4458	22.6	22.3	21.7	21.6	22.2	22.5	21.7	22.4	21.8	23.6
ßc		2	12	15	15	11	6	15	2	15	
ßd		15	15	8	4	15	15	9	15	15	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8	8	8	8	8	
AGV		-	-	-	-	20	12	15	17	21	

The module power levels were measured in both HSPA and 3G RMC 12.2kbps modes and compared to ensure the correct mode of operation had been established.

The following tables taken from FCC 3G SAR procedures (KDB 941225 D01 SAR test for 3G devices v02) below were applied using an communications test set which supports 3G / HSDPA release 5 / HSPA release 6.

Sub-test Setup for Release 5 HSDPA

Sub-test	β_c	β_d	B_d *(SF)*	β_c/β_d	β_{hs} (1)	SM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ A_{hs} = β_{hs}/β_c = 30/15 ⇔ β_{hs} = 30/15 * β_c

Note 2: CM = 1 for β_c/β_d = 12/15, B_{hs}/β_c = 24/15

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15

Sub-test Setup for Release 6 HSPA

Sub-test	β_c	β_d	B_d *(SF)*	β_c/β_d	β_{hs} (1)	B_{oc}	B_{od}	B_{od} *(SF)*	B_{od} *(codes)*	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	31/15	B_{al1}: 47/15 B_{al2}: 47/15	4	1	2.0	1.0	15	92
4	2/15	15/15	64	2/15	2/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	24/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 $\Leftrightarrow$ A_{hs} = β_{hs}/β_c = 30/15 $\Leftrightarrow$ β_{hs} = 30/15 * β_c

Note 2: CM = 1 for β_c/β_d = 12/15, B_{hs}/β_c = 24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH AND E-DPCCH for the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Tavle 5.1g.

Note 6: B_{od} can not be set directly; it is set by Absolute Grant Value.

7.2.17.Conducted Average Power Measurement: WLAN 802.11b/g/n

802.11b/g

Channel Number	Frequency (MHz)	TX Power before Test (dBm)	Note
1	2412.0	13.8	**2.4GHz 802.11b** (1Mbps)
6	2437.0	14.1	
11	2462.0	12.9	
1	2412.0	12.9	**2.4GHz 802.11b** (11Mbps)
6	2437.0	13.3	
11	2462.0	12.2	
1	2412.0	10.9	**2.4GHz 802.11g** (6Mbps)
6	2437.0	11.2	
11	2462.0	10.0	
1	2412.0	8.9	**2.4GHz 802.11g** (54Mbps)
6	2437.0	9.2	
11	2462.0	8.0	

802.11n

Channel Number	Frequency (MHz)	TX Power before Test (dBm)	Note
1	2412.0	8.9	**2.4GHz 802.11n** (6.5Mbps)
6	2437.0	9.2	
11	2462.0	8.0	

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Specific Absorption Rate - GSM / GPRS / EDGE 850 / UMTS FDD V Head Configuration 1g	95%	19.94
Specific Absorption Rate - GSM / GPRS / EDGE 850 / UMTS FDD V Body Configuration 1g	95%	20.07
Specific Absorption Rate - PCS / GPRS / EDGE 1900 Head Configuration 1g	95%	20.72
Specific Absorption Rate - PCS / GPRS / EDGE 1900 Body Configuration 1g	95%	20.00
Specific Absorption Rate - Wi-Fi 2450 Head Configuration 1g	95%	19.47
Specific Absorption Rate - Wi-Fi 2450 Body Configuration 1g	95%	19.90

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

8.1. Specific Absorption Rate Uncertainty – GSM / GPRS / EDGE 850 / UMTS FDD V Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or
							+ u (%)	- u (%)	υ_{eff}
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.400	2.400	normal (k=1)	1.0000	1.0000	2.400	2.400	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6400	3.149	3.149	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.970	4.970	normal (k=1)	1.0000	0.6000	2.982	2.982	5
	Combined standard uncertainty			t-distribution			10.17	10.17	>250
	Expanded uncertainty			k = 1.96			19.94	19.94	>250

8.2. Specific Absorption Rate - GSM / GPRS / EDGE 850 / UMTS FDD V Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration /Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.900	2.900	normal (k=1)	1.0000	1.0000	2.900	2.900	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.690	4.690	normal (k=1)	1.0000	0.6400	3.002	3.002	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.860	4.860	normal (k=1)	1.0000	0.6000	2.916	2.916	5
	Combined standard uncertainty			t-distribution			10.24	10.24	>250
	Expanded uncertainty			k = 1.96			20.07	20.07	>250

8.3. Specific Absorption Rate - PCS / GPRS / EDGE1900 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with Regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	3.800	3.800	normal (k=1)	1.0000	1.0000	3.800	3.800	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.880	4.880	normal (k=1)	1.0000	0.6000	2.928	2.928	5
	Combined standard uncertainty			t-distribution			10.57	10.57	>200
	Expanded uncertainty			k = 1.96			20.72	20.72	>200

8.4. Specific Absorption Rate - PCS / GPRS / EDGE 1900 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.500	2.500	normal (k=1)	1.0000	1.0000	2.500	2.500	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.940	4.940	normal (k=1)	1.0000	0.6400	3.162	3.162	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.980	4.980	normal (k=1)	1.0000	0.6000	2.988	2.988	5
	Combined standard uncertainty			t-distribution			10.20	10.20	>250
	Expanded uncertainty			k = 1.96			20.00	20.00	>250

8.5. Specific Absorption Rate - Wi-Fi 2450 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.000	2.000	normal (k=1)	1.0000	1.0000	2.000	2.000	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.410	4.410	normal (k=1)	1.0000	0.6400	2.822	2.822	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.930	4.930	normal (k=1)	1.0000	0.6000	2.958	2.958	5
	Combined standard uncertainty			t-distribution			9.93	9.93	>300
	Expanded uncertainty			k = 1.96			19.47	19.47	>300

8.6. Specific Absorption Rate - Wi-Fi 2450 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.570	2.570	normal (k=1)	1.0000	1.0000	2.570	2.570	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6000	2.952	2.952	5
	Combined standard uncertainty			t-distribution			10.15	10.15	>250
	Expanded uncertainty			k = 1.96			19.90	19.90	>250

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A1184	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	394	26 Jan 2012	12
A2111	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	432	02 May 2012	12
A2077	Probe	Schmid & Partner Engineering AG	EX3 DV4	3814	22 Sep 2011	12
A2113	Probe	Schmid & Partner Engineering AG	ET3 DV6	1587	11 May 2012	12
A1235	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	124	09 Feb 2011	24
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	08 Feb 2011	24
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	08 Feb 2011	24
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 56)	002	Calibrated before use	-
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 56)	001	Calibrated before use	-
A2125	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 57)	TP-1031	Calibrated before use	-
A2124	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 57)	TP-1030	Calibrated before use	-

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	27 Sept 2011	12
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
GO591	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J8 6A1/C/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 14 Apr 2012	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1270	Digital Thermometer	RS	N/A	N/A	Internal Checked 13 May 2012	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-
S512	SAR Lab	RFI	Site 57	N/A	Calibrated before use	-

Note: All the assets were in calibration during the course of testing.

A.1.1. Calibration Certificates

This section contains the calibration certificates and data for the Probe(s) and Dipole(s) used, which are not included in the total number of pages for this report.

The following information is justification to why the listed dipoles calibration period has been extended. This address FCC KDB 450824 D02

Cal Date	Dipole Calibration History									
	Dipole SN: 124, Frequency 900 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
27-Jun-12	Lab Annual Check of dipole		-24.73	49.56	-7.4	Lab Annual Check of dipole		-21.92	48.18	-8.03
09-Feb-11	11.00	7.01	-21.60	48.90	-8.20	11.10	7.14	-20.20	46.10	-8.60
23-Aug-07	10.20	6.56	-21.20	48.60	-8.50	10.50	6.89	-20.20	45.40	-8.10
31-Aug-05	10.60	6.78	-24.70	49.10	-5.70	10.50	6.77	-18.90	44.90	-8.90
13-May-03	10.60	6.76	-24.00	50.30	-6.40	11.00	7.12	-20.60	46.20	-8.20
03-Aug-01	11.28	7.16	-25.40	50.80	-5.60	Dipole calibrated for Head only				
Standard Deviation	**0.42**	**0.23**	**1.77**	**0.85**	**1.25**	**0.32**	**0.18**	**1.08**	**1.25**	**0.37**
|Mean Value|	**10.74**	**6.85**	**23.61**			**10.78**	**6.98**	**20.36**		
Relative standard deviation %	**3.87%**	**3.41%**	**7.49%**			**2.97%**	**2.58%**	**5.31%**		

Cal Date	Dipole Calibration History									
	Dipole SN: 540, Frequency 1900 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
27-Jun-12	Lab Annual Check of dipole		-30.57	49.54	1.41	Lab Annual Check of dipole		-29.80	50.34	2.37
08-Feb-11	40.30	21.00	-27.60	50.50	4.20	40.70	21.60	-23.10	45.60	5.00
26-Jun-09	40.30	21.10	-30.00	48.50	2.70	40.90	21.50	-24.30	44.90	2.80
11-Jun-07	36.10	19.30	-25.40	51.90	5.10	38.00	20.70	-25.30	47.70	4.80
14-Jun-05	38.1	19.90	-25.40	51.90	5.20	39.10	20.70	-24.00	48.10	5.90
04-Jun-03	41.20	21.20	-28.50	50.30	3.80	Dipole calibrated for Head only				
Standard Deviation	**2.08**	**0.85**	**2.21**	**1.33**	**1.46**	**1.38**	**0.49**	**2.64**	**2.16**	**1.52**
|Mean Value|	**39.20**	**20.50**	**27.91**			**39.68**	**21.13**	**25.30**		
Relative standard deviation %	**5.30%**	**4.15%**	**7.93%**			**3.47%**	**2.33%**	**10.42%**		

Calibration Certificates (Continued)

Cal Date	Dipole Calibration History									
	Dipole SN: 725, Frequency 2450 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
02-July-12	Lab Annual Check of dipole		-20.37	47.27	8.65	Lab Annual Check of dipole		-21.04	48.52	8.72
08-Feb-11	52.90	24.70	-20.50	45.60	7.90	51.90	24.10	-20.20	49.50	9.70
08-Jan-09	52.10	24.30	-23.70	54.40	5.30	52.20	24.70	-23.40	49.00	6.70
17-Jan-07	53.30	24.80	-22.10	52.40	7.70	53.30	24.50	-21.80	47.80	7.70
04-Jan-05	54.5	24.70	-22.30	53.50	7.20	52.90	24.50	-22.20	48.50	7.50
17-Jan-03	54.70	24.50	-22.60	53.00	7.00	52.10	24.10	-21.70	49.00	8.10
Standard Deviation	**1.10**	**0.20**	**1.28**	**3.66**	**1.14**	**0.59**	**0.27**	**1.08**	**0.58**	**1.04**
|Mean Value|	**53.50**	**24.60**	**21.93**			**52.48**	**24.38**	**21.72**		
Relative standard deviation %	**2.05%**	**0.81%**	**5.85%**			**1.13%**	**1.10%**	**4.97%**		

Note:

1. SAR lab has more than one dipole, the 900 MHz calibration gap is 24 months from 2007 and a second dipole was use after this period.
2. The dipole history shows that the measured SAR relative standard deviation was all less than 10% for the calibration period. The return loss relative standard deviation was all less than 10 %. And the real and imaginary impedance standard deviation is within 5 **(Ω).**

27-SEPT-2011
Checked by R. Dinn

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Accreditation No.: SCS 108

Client RFI

Certificate No: EX3-3814_Sep11

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3814

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: September 22, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 22, 2011

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Schmid & Partner
Engineering AG
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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3814

Manufactured: September 2, 2011
Calibrated: September 22, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.52	0.51	0.44	± 10.1 %
DCP (mV)[B]	100.8	96.5	101.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	121.7	±2.7 %
			Y	0.00	0.00	1.00	115.0	
			Z	0.00	0.00	1.00	105.3	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	9.55	9.55	9.55	0.12	1.00	± 13.4 %
750	41.9	0.89	9.26	9.26	9.26	0.80	0.67	± 12.0 %
900	41.5	0.97	8.75	8.75	8.75	0.71	0.73	± 12.0 %
1750	40.1	1.37	8.13	8.13	8.13	0.80	0.62	± 12.0 %
1900	40.0	1.40	7.78	7.78	7.78	0.80	0.61	± 12.0 %
2450	39.2	1.80	7.02	7.02	7.02	0.80	0.60	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

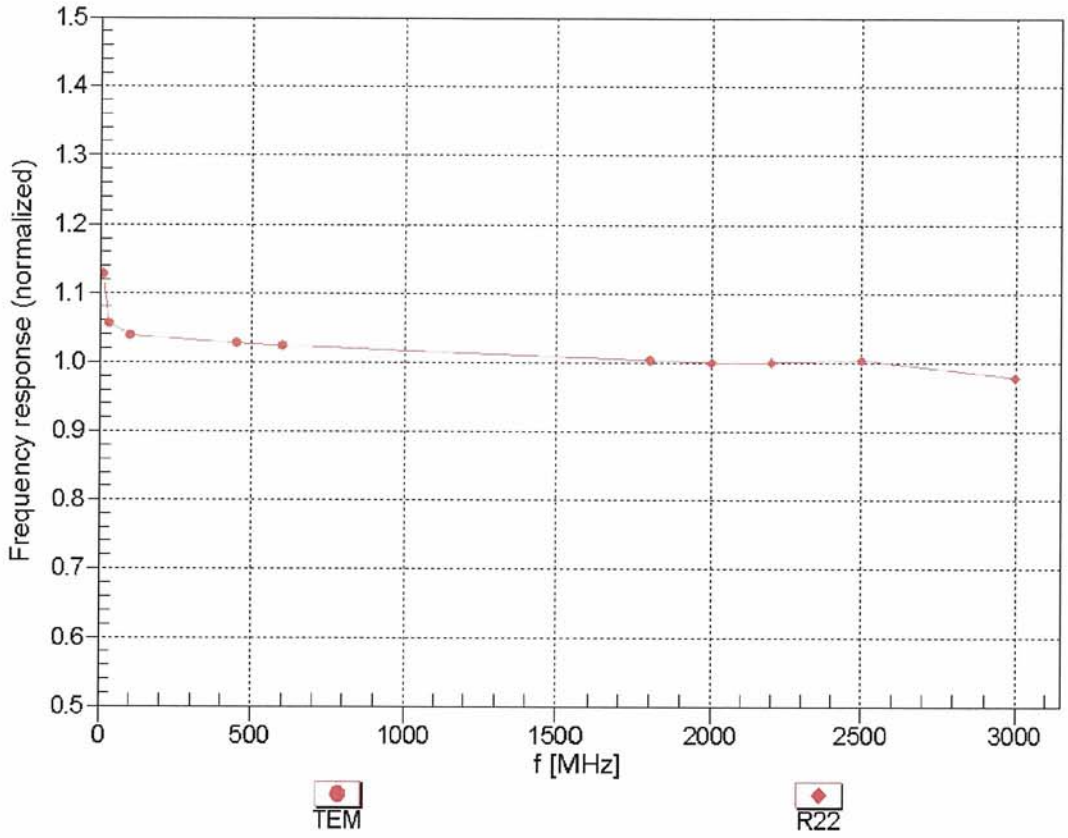
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	10.39	10.39	10.39	0.04	1.00	± 13.4 %
750	55.5	0.96	9.28	9.28	9.28	0.80	0.65	± 12.0 %
900	55.0	1.05	8.92	8.92	8.92	0.80	0.65	± 12.0 %
1750	53.4	1.49	7.58	7.58	7.58	0.80	0.67	± 12.0 %
1900	53.3	1.52	7.31	7.31	7.31	0.80	0.68	± 12.0 %
2150	53.1	1.66	7.38	7.38	7.38	0.80	0.65	± 12.0 %
2450	52.7	1.95	7.15	7.15	7.15	0.80	0.50	± 12.0 %
2600	52.5	2.16	7.02	7.02	7.02	0.80	0.50	± 12.0 %
3700	51.0	3.55	6.35	6.35	6.35	0.26	1.68	± 13.1 %
5200	49.0	5.30	4.19	4.19	4.19	0.60	1.95	± 13.1 %
5500	48.6	5.65	3.86	3.86	3.86	0.60	1.95	± 13.1 %
5800	48.2	6.00	3.94	3.94	3.94	0.60	1.95	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

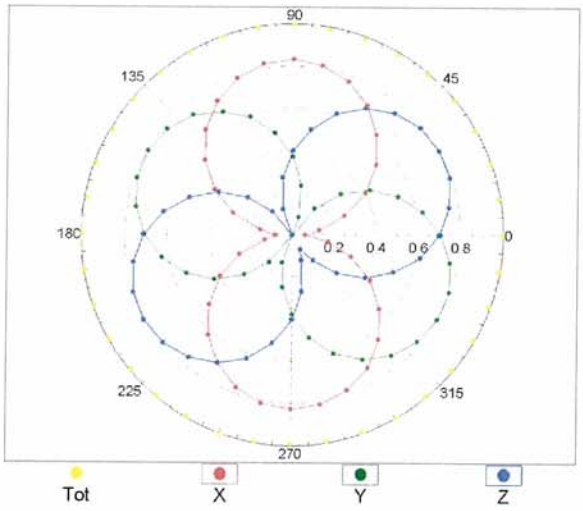
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



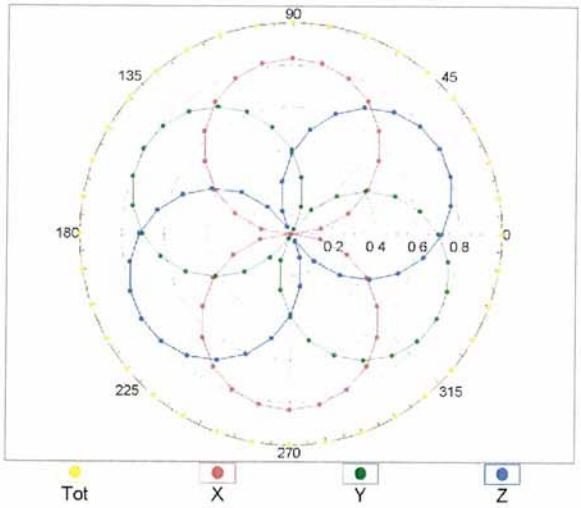
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

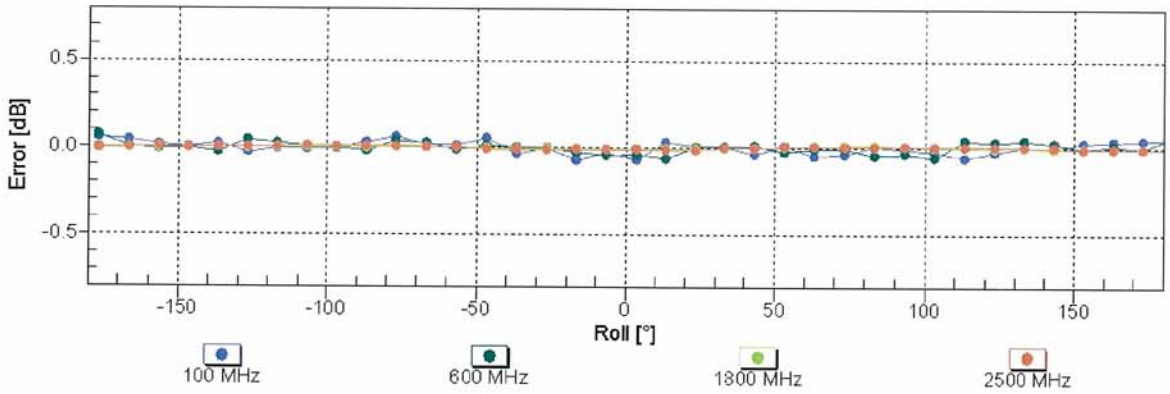
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



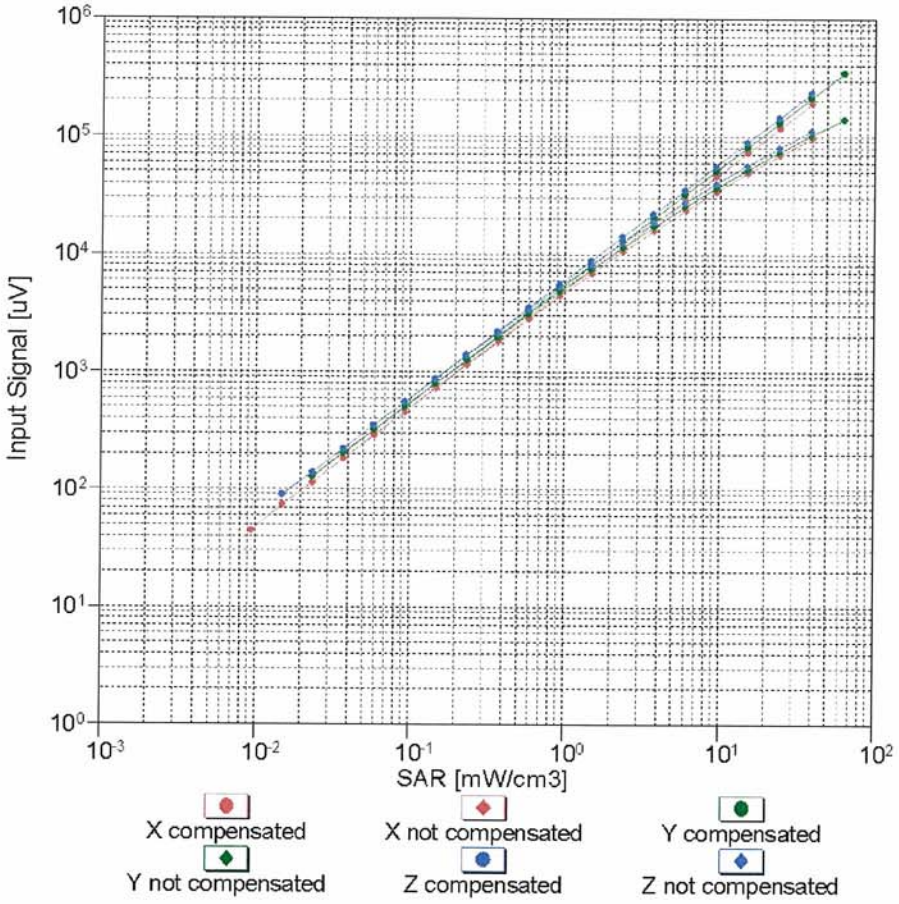
f=1800 MHz,R22

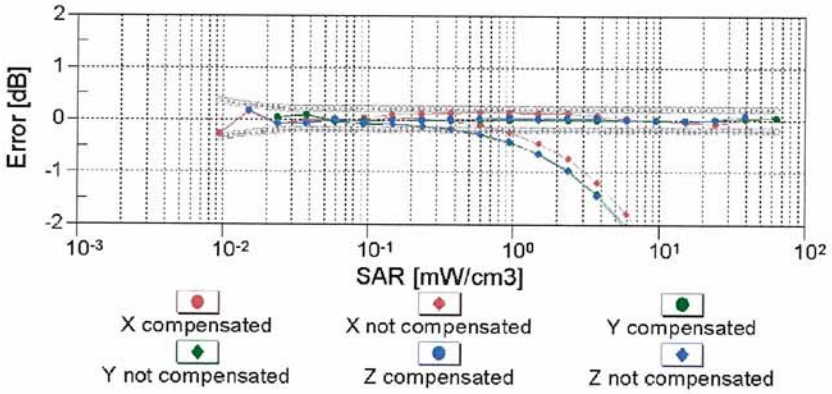




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

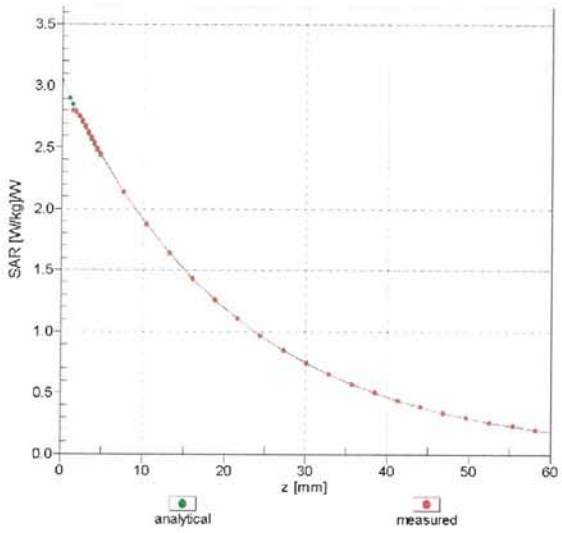




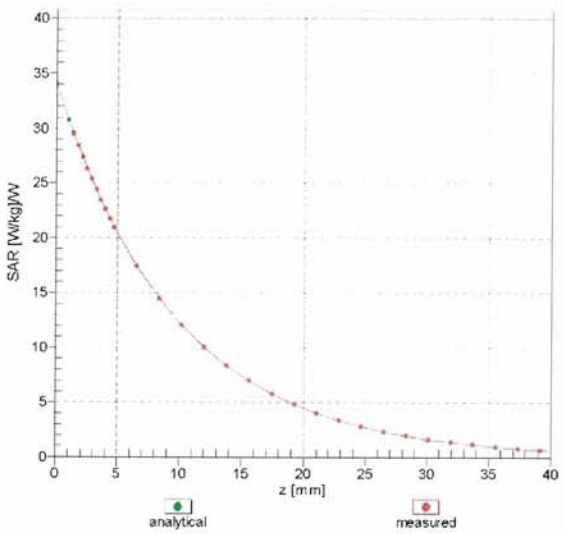
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 750 MHz,WGLS R9 (H_convF)

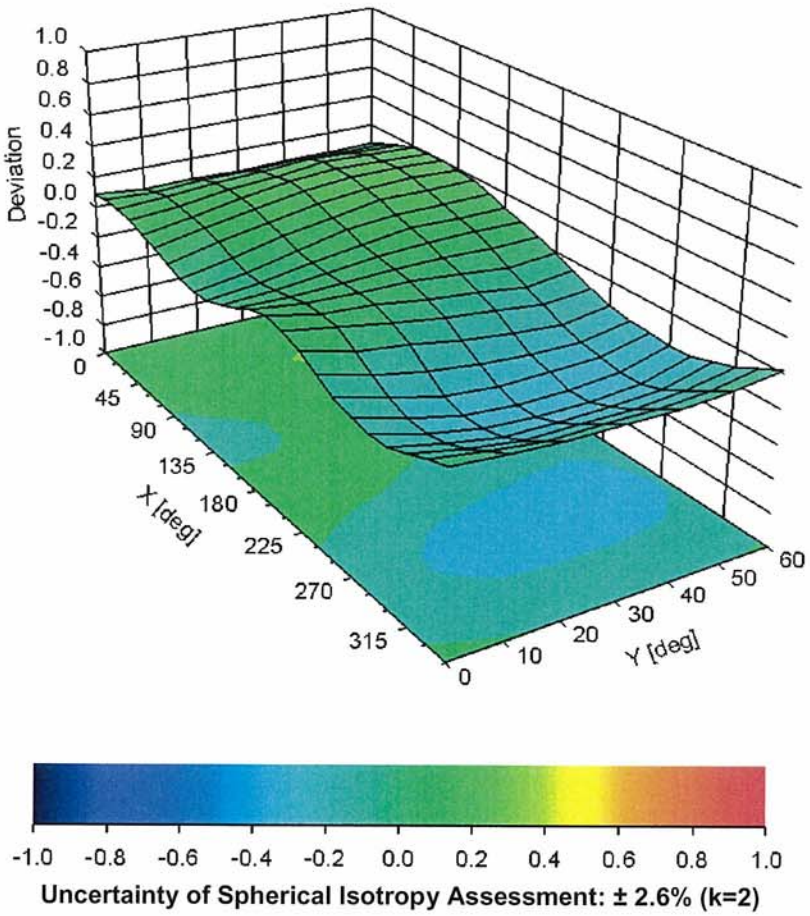


f = 2450 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm