10 Area Scan Based 1-g SAR

10.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

11 Conducted Output Power

11.1 Manufacturing tolerance

Table 11.1: GSM Speech

GSM 850			
Channel	Channel 251	Channel 190	Channel 128
Target (dBm)	32.3	32.3	32.3
Tune-up (dBm)	33.3	33.3	33.3
GSM 1900			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	29.3	29.3	29.3
Tune-up (dBm)	30.3	30.3	30.3

Table 11.2: GPRS and EGPRS

GSM 850 GPRS (GMSK)				
Channel		**251**	**190**	**128**
1 Txslot	Target (dBm)	32.3	32.3	32.3
	Tune-up (dBm)	33.3	33.3	33.3
2 Txslots	Target (dBm)	29	29	29
	Tune-up (dBm)	30	30	30
3Txslots	Target (dBm)	27.5	27.5	27.5
	Tune-up (dBm)	28.5	28.5	28.5
4 Txslots	Target (dBm)	26.5	26.5	26.5
	Tune-up (dBm)	27.5	27.5	27.5
GSM 850 EGPRS (GMSK)				
Channel		**251**	**190**	**128**
1 Txslot	Target (dBm)	32.3	32.3	32.3
	Tune-up (dBm)	33.3	33.3	33.3
2 Txslots	Target (dBm)	29	29	29
	Tune-up (dBm)	30	30	30
3Txslots	Target (dBm)	27.5	27.5	27.5
	Tune-up (dBm)	28.5	28.5	28.5
4 Txslots	Target (dBm)	26.5	26.5	26.5
	Tune-up (dBm)	27.5	27.5	27.5
GSM 1900 GPRS (GMSK)				
Channel		**810**	**661**	**512**
1 Txslot	Target (dBm)	29.3	29.3	29.3
	Tune-up (dBm)	30.3	30.3	30.3
2 Txslots	Target (dBm)	26	26	26
	Tune-up (dBm)	27	27	27
3Txslots	Target (dBm)	24	24	24
	Tune-up (dBm)	25	25	25
4 Txslots	Target (dBm)	23	23	23
	Tune-up (dBm)	24	24	24

GSM 1900 EGPRS (GMSK)				
Channel		**810**	**661**	**512**
1 Txslot	Target (dBm)	29.3	29.3	29.3
	Tune-up (dBm)	30.3	30.3	30.3
2 Txslots	Target (dBm)	26	26	26
	Tune-up (dBm)	27	27	27
3Txslots	Target (dBm)	24	24	24
	Tune-up (dBm)	25	25	25
4 Txslots	Target (dBm)	23	23	23
	Tune-up (dBm)	24	24	24

Table 11.3: WCDMA

WCDMA 850 CS			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	22	22	22
Tune-up (dBm)	23	23	23
HSUPA (sub-test 1~3)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	20	20	20
Tune-up (dBm)	20.5	20.5	20.5
HSUPA (sub-test 4)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	19.5	19.5	19.5
Tune-up (dBm)	20	20	20
HSUPA (sub-test 5)			
Channel	Channel 4233	Channel 4182	Channel 4132
Target (dBm)	22	22	22
Tune-up (dBm)	22.5	22.5	22.5
WCDMA 1900 CS			
Channel	Channel 9538	Channel 9400	Channel 9262
Target (dBm)	21.5	21.5	21.5
Tune-up (dBm)	22.5	22.5	22.5
HSUPA (sub-test 1~3)			
Channel	Channel 9538	Channel 9400	Channel 9262
Target (dBm)	20	20	20
Tune-up (dBm)	20.5	20.5	20.5
HSUPA (sub-test 4)			
Channel	Channel 9538	Channel 9400	Channel 9262
Target (dBm)	19.5	19.5	19.5
Tune-up (dBm)	20	20	20
HSUPA (sub-test 5)			
Channel	Channel 9538	Channel 9400	Channel 9262
Target (dBm)	22	22	22
Tune-up (dBm)	22.5	22.5	22.5

Table 11.4: Bluetooth

Mode	Target (dBm)	Tune-up (dBm)
Bluetooth	7.5	8.5

Table 11.5: WiFi

Mode	Target (dBm)	Tune-up (dBm)
802.11 b (2.4GHz) channel 1/6	18	19
802.11 b (2.4GHz) channel 11	14	15
802.11 b (2.4GHz) channel 12/13	8	9
802.11 g (2.4GHz) 6Mbps~24Mbps channel 1/6	15	16.5
802.11 g (2.4GHz) 36Mbps~54Mbps channel 1/6	13	14.5
802.11 g (2.4GHz) 6Mbps~18Mbps channel 11~13	7.5	9
802.11 g (2.4GHz) 24Mbps~48Mbps channel 11~13	6	7.5
802.11 g (2.4GHz) 54Mbps channel 11~13	5.5	7
802.11 n HT20 MCS0~MCS3 channel 1/6	13	14.5
802.11 n HT20 MCS4~MCS7 channel 1/6	11.5	13
802.11 n HT20 MCS0~MCS2 channel 11~13	5.5	7
802.11 n HT20 MCS3~MCS6 channel 11~13	4	5.5
802.11 n HT20 MCS7 channel 11~13	3.5	5
802.11 n HT40 MCS0 channel 3/6/9	7	9
802.11 n HT40 MCS1~MCS3 channel 3/6/9	9.5	11.5
802.11 n HT40 MCS4~MCS7 channel 3/6/9	7.5	9.5
802.11 n HT40 MCS0~MCS2 channel 12/13	6.5	8.5
802.11 n HT40 MCS3~MCS5 channel 12/13	5	7
802.11 n HT40 MCS6~MCS7 channel 12/13	4	6

11.2 GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11.6: The conducted power measurement results for GSM850/1900

GSM 850MHz	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	32.58	32.47	32.40
GSM 1900MHz	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	28.80	28.79	28.78

Table 11.7: The conducted power measurement results for GPRS and EGPRS

GSM 850	Measured Power (dBm)			calculation	Averaged Power (dBm)		
GPRS (GMSK)	**251**	**190**	**128**		**251**	**190**	**128**
1 Txslot	32.56	32.43	32.35	-9.03dB	23.53	23.40	23.32
2 Txslots	29.65	29.53	29.47	-6.02dB	**23.63**	**23.51**	**23.45**
3Txslots	27.74	27.60	27.52	-4.26dB	23.48	23.34	23.26
4 Txslots	26.00	25.85	25.78	-3.01dB	22.99	22.84	22.77
GSM 850	Measured Power (dBm)			calculation	Averaged Power (dBm)		
EGPRS (GMSK)	**251**	**190**	**128**		**251**	**190**	**128**
1 Txslot	32.58	32.47	32.40	-9.03dB	23.55	23.44	23.37
2 Txslots	29.68	29.55	29.51	-6.02dB	**23.66**	**23.53**	**23.49**
3Txslots	27.76	27.62	27.54	-4.26dB	23.50	23.36	23.28
4 Txslots	25.99	25.85	25.78	-3.01dB	22.98	22.84	22.77
PCS1900	Measured Power (dBm)			calculation	Averaged Power (dBm)		
GPRS (GMSK)	**810**	**661**	**512**		**810**	**661**	**512**
1 Txslot	28.80	28.80	28.78	-9.03dB	19.77	19.77	19.75
2 Txslots	26.50	26.47	26.45	-6.02dB	20.48	20.45	20.43
3Txslots	24.60	24.57	24.55	-4.26dB	20.34	20.31	20.29
4 Txslots	23.56	23.54	23.52	-3.01dB	**20.55**	**20.53**	**20.51**
PCS1900	Measured Power (dBm)			calculation	Averaged Power (dBm)		
EGPRS (GMSK)	**810**	**661**	**512**		**810**	**661**	**512**
1 Txslot	28.76	28.78	28.76	-9.03dB	19.73	19.75	19.73
2 Txslots	26.48	26.45	26.44	-6.02dB	20.46	20.43	20.42
3Txslots	24.59	24.57	24.54	-4.26dB	20.33	20.31	20.28
4 Txslots	23.58	23.55	23.51	-3.01dB	**20.57**	**20.54**	**20.50**

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 2Txslots for GSM850 and 4Txslots for PCS1900.

Note: According to the KDB941225 D03, "when SAR tests for EDGE or EGPRS mode is necessary, GMSK modulation should be used".

11.3 WCDMA Measurement result

Table 11.8: The conducted Power for WCDMA850/1900

Item	band	FDDV result		
	ARFCN	4233 (846.6MHz)	4182 (836.4MHz)	4132 (826.4MHz)
WCDMA	\	22.55	22.62	22.71
HSUPA	1	19.6	19.6	19.6
	2	19.6	19.6	19.6
	3	19.6	19.6	19.6
	4	19	19.1	19
	5	21.6	21.5	21.6
Item	band	FDDII result		
	ARFCN	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)
WCDMA	\	22.22	22.05	22.03
HSUPA	1	19.1	19.2	18.8
	2	19.2	19.2	18.8
	3	19.1	19.2	18.8
	4	18.5	18.6	18.3
	5	21	21.1	20.9

Note: HSUPA body SAR for WCDMA850/1900 are not required, because maximum average output power of each RF channel with HSUPA active is not 1/4 dB higher than that measured without HSUPA.

11.4 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Mode	Conducted Power (dBm)		
	Channel 0 (2402MHz)	Channel 39 (2441MHz)	Channel 78 (2480MHz)
Bluetooth	7.88	8.24	7.83

The average conducted power for Wi-Fi is as following:

802.11b（dBm）

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1	18.40	18.22	18.20	17.66
6	18.52	18.39	18.36	18.01
11	14.68	14.61	14.45	14.12
12	8.33	8.19	7.89	7.63
13	8.52	8.29	7.74	7.48

802.11g（dBm）

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1	15.98	15.82	15.66	15.16	14.83	14.33	13.60	13.45
6	16.27	15.87	15.70	15.39	15.06	14.31	13.83	13.69
11	8.63	8.42	8.29	7.84	7.40	6.90	6.38	6.21
12	8.04	7.77	7.56	7.22	6.87	6.07	5.58	5.44
13	8.08	7.82	7.46	7.10	6.74	6.23	5.79	5.61

802.11n（dBm）- HT20 (2.4G)

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1	14.23	13.54	13.20	12.87	12.26	11.91	11.74	11.56
6	14.28	13.85	13.25	13.19	12.55	11.95	11.77	11.60
11	6.59	6.06	5.69	5.49	4.82	4.39	4.18	4.00
12	5.95	5.51	5.17	4.76	4.13	3.63	3.62	3.43
13	5.96	5.55	5.21	4.90	4.31	3.88	3.71	3.54

802.11n（dBm）- HT40 (2.4G)

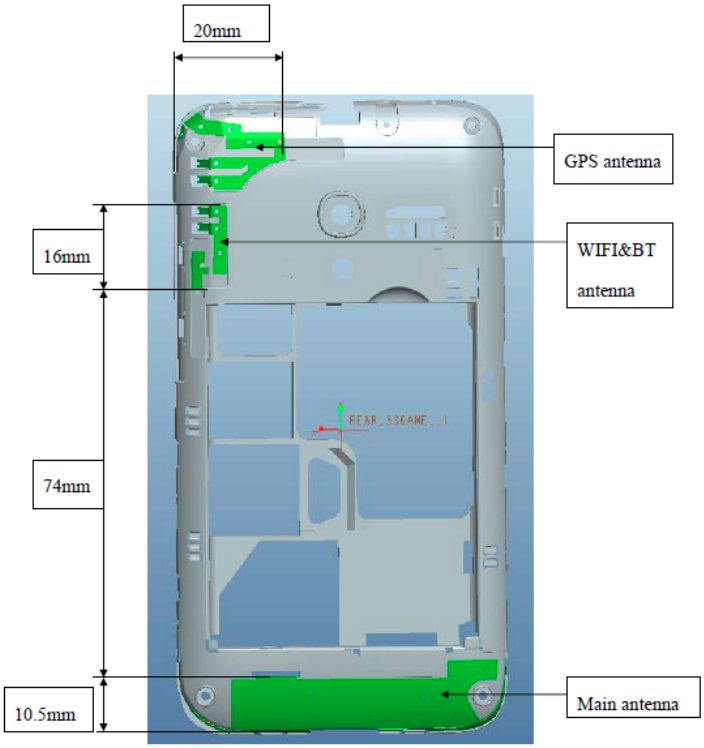
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
3	8.20	10.89	10.34	9.64	9.01	8.55	8.50	8.22
6	8.45	11.11	10.46	9.89	9.26	8.78	8.55	8.25
9	8.36	11.20	10.65	10.25	9.25	8.70	8.46	8.71
12	8.42	7.52	6.98	6.58	5.93	5.25	5.03	4.91
13	8.29	7.66	7.13	6.46	5.82	5.35	5.13	5.03

12 Simultaneous TX SAR Considerations

12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.
For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Table 12.1: Standalone SAR test exclusion considerations

Band/Mode	F(GHz)	Position	SAR test exclusion threshold (mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Head	9.60	8.24	6.67	Yes
		Body	19.20	8.24	6.67	Yes
2.4GHz WLAN 802.11 b	2.45	Head	9.58	18.52	71.12	No
		Body	19.17	18.52	71.12	No

13 Evaluation of Simultaneous

Table 13.1: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Left hand, Touch cheek	0.82	0.20	**1.02**
Highest reported SAR value for Body	Rear	1.14	0.22	**1.36**

Table 13.2: The sum of reported SAR values for main antenna and Bluetooth

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Left hand, Touch cheek	0.82	0.29	**1.11**
Highest reported SAR value for Body	Rear	1.14	0.15	**1.29**

BT* - Estimated SAR for Bluetooth (see the table 13.3)

Table 13.3: Estimated SAR for Bluetooth

Position	F (GHz)	Distance (mm)	Upper limit of power *		Estimated$_{1g}$ (W/kg)
			dBm	mW	
Head	2.441	5	8.5	7.08	0.29
Body	2.441	10	8.5	7.08	0.15

* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Conclusion:
According to the above tables, the sum of reported SAR values is < 1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.
The distance is 10mm and just applied to the condition of body worn accessory.
It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or > 1.2W/kg.
The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{Target}-P_{Measured})/10}$$

Where P_{Target} is the power of manufacturing upper limit;
$P_{Measured}$ is the measured power in chapter 11.

Table 14.1: Duty Cycle

Mode	Duty Cycle
Speech for GSM850/1900	1:8.3
GPRS&EGPRS for GSM850	1:4
GPRS&EGPRS for GSM1900	1:2
WCDMA & WiFi	1:1

14.1 SAR results for Fast SAR

Table 14.2: SAR Values (GSM 850 MHz Band - Head)

Ambient Temperature: 22.1 °C					Liquid Temperature: 21.6 °C						
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
848.8	251	Left	Touch	Fig.1	32.58	33.3	0.536	**0.63**	0.697	**0.82**	0.18
836.6	190	Left	Touch	/	32.47	33.3	0.416	**0.50**	0.607	**0.73**	0.08
824.2	128	Left	Touch	/	32.40	33.3	0.307	**0.38**	0.448	**0.55**	-0.05
848.8	251	Left	Tilt	/	32.58	33.3	0.281	**0.33**	0.407	**0.48**	0.11
836.6	190	Left	Tilt	/	32.47	33.3	0.249	**0.30**	0.360	**0.44**	0.01
824.2	128	Left	Tilt	/	32.40	33.3	0.191	**0.23**	0.276	**0.34**	0.02
848.8	251	Right	Touch	/	32.58	33.3	0.358	**0.42**	0.524	**0.62**	-0.02
836.6	190	Right	Touch	/	32.47	33.3	0.320	**0.39**	0.462	**0.56**	-0.05
824.2	128	Right	Touch	/	32.40	33.3	0.240	**0.30**	0.345	**0.42**	-0.18
848.8	251	Right	Tilt	/	32.58	33.3	0.282	**0.33**	0.399	**0.47**	-0.02
836.6	190	Right	Tilt	/	32.47	33.3	0.269	**0.33**	0.392	**0.47**	0.02
824.2	128	Right	Tilt	/	32.40	33.3	0.201	**0.25**	0.291	**0.36**	-0.01

Table 14.3: SAR Values (GSM 850 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
836.6	190	GPRS (2)	Front	/	29.53	30	0.407	**0.45**	0.578	**0.64**	-0.04
848.8	251	GPRS (2)	Rear	Fig.2	29.65	30	0.648	**0.70**	0.852	**0.92**	0.02
836.6	190	GPRS (2)	Rear	/	29.53	30	0.572	**0.64**	0.830	**0.92**	0.09
824.2	128	GPRS (2)	Rear	/	29.47	30	0.504	**0.57**	0.731	**0.83**	-0.03
836.6	190	GPRS (2)	Left	/	29.53	30	0.414	**0.46**	0.606	**0.68**	-0.01
836.6	190	GPRS (2)	Right	/	29.53	30	0.317	**0.35**	0.457	**0.51**	-0.04
836.6	190	GPRS (2)	Bottom	/	29.53	30	0.094	**0.10**	0.149	**0.17**	-0.18
848.8	251	EGPRS (2)	Rear	/	29.68	30	0.579	**0.62**	0.839	**0.90**	0.13
848.8	251	Speech	Rear Headset1	/	32.58	33.3	0.442	**0.52**	0.651	**0.77**	-0.18
848.8	251	Speech	Rear Headset2	/	32.58	33.3	0.446	**0.53**	0.657	**0.78**	-0.03

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The Headset1 is CCB0018A10C4, the Headset2 is CCB0018A10C1.

Table 14.4: SAR Values (GSM 1900 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	Left	Touch	Fig.3	28.80	30.3	0.219	**0.31**	0.362	**0.51**	0.07
1880	661	Left	Touch	/	28.79	30.3	0.194	**0.27**	0.334	**0.47**	0.00
1850.2	512	Left	Touch	/	28.78	30.3	0.187	**0.27**	0.321	**0.46**	-0.16
1909.8	810	Left	Tilt	/	28.80	30.3	0.081	**0.11**	0.145	**0.20**	0.02
1880	661	Left	Tilt	/	28.79	30.3	0.072	**0.10**	0.128	**0.18**	0.06
1850.2	512	Left	Tilt	/	28.78	30.3	0.068	**0.10**	0.121	**0.17**	0.06
1909.8	810	Right	Touch	/	28.80	30.3	0.180	**0.25**	0.294	**0.42**	0.04
1880	661	Right	Touch	/	28.79	30.3	0.154	**0.22**	0.257	**0.36**	0.11
1850.2	512	Right	Touch	/	28.78	30.3	0.140	**0.20**	0.233	**0.33**	0.13
1909.8	810	Right	Tilt	/	28.80	30.3	0.080	**0.11**	0.139	**0.20**	0.03
1880	661	Right	Tilt	/	28.79	30.3	0.071	**0.10**	0.122	**0.17**	-0.04
1850.2	512	Right	Tilt	/	28.78	30.3	0.071	**0.10**	0.125	**0.18**	0.02

Table 14.5: SAR Values (GSM 1900 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	GPRS (4)	Front	/	23.54	24	0.355	**0.39**	0.583	**0.65**	-0.01
1880	661	GPRS (4)	Front	/	23.56	24	0.386	**0.43**	0.629	**0.70**	-0.08
1850.2	512	GPRS (4)	Front	Fig.4	23.54	24	0.436	**0.48**	0.660	**0.73**	0.03
1880	661	GPRS (4)	Rear	/	23.52	24	0.365	**0.41**	0.627	**0.70**	-0.01
1880	661	GPRS (4)	Left	/	23.54	24	0.106	**0.12**	0.180	**0.20**	0.05
1880	661	GPRS (4)	Right	/	23.54	24	0.071	**0.08**	0.120	**0.13**	0.01
1880	661	GPRS (4)	Bottom	/	23.54	24	0.272	**0.30**	0.474	**0.53**	0.07
1850.2	512	EGPRS (4)	Front	/	23.51	24	0.405	**0.45**	0.656	**0.73**	0.02
1850.2	512	Speech	Front Headset1	/	28.78	30.3	0.231	**0.33**	0.411	**0.58**	0.18
1850.2	512	Speech	Front Headset2	/	28.78	30.3	0.219	**0.31**	0.386	**0.55**	0.06

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The Headset1 is CCB0018A10C4, the Headset2 is CCB0018A10C1.

Table 14.6: SAR Values (WCDMA 850 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
846.6	4233	Left	Touch	Fig.5	22.55	23	0.535	**0.59**	0.713	**0.79**	0.07
836.4	4182	Left	Touch	/	22.62	23	0.440	**0.48**	0.653	**0.71**	0.04
826.4	4132	Left	Touch	/	22.71	23	0.347	**0.37**	0.514	**0.55**	0.18
846.6	4233	Left	Tilt	/	22.55	23	0.277	**0.31**	0.403	**0.45**	0.07
836.4	4182	Left	Tilt	/	22.62	23	0.265	**0.29**	0.385	**0.42**	0.00
826.4	4132	Left	Tilt	/	22.71	23	0.208	**0.22**	0.301	**0.32**	0.01
846.6	4233	Right	Touch	/	22.55	23	0.330	**0.37**	0.477	**0.53**	0.02
836.4	4182	Right	Touch	/	22.62	23	0.329	**0.36**	0.474	**0.52**	0.04
826.4	4132	Right	Touch	/	22.71	23	0.274	**0.29**	0.396	**0.42**	0.12
846.6	4233	Right	Tilt	/	22.55	23	0.241	**0.27**	0.348	**0.39**	0.08
836.4	4182	Right	Tilt	/	22.62	23	0.247	**0.27**	0.359	**0.39**	0.04
826.4	4132	Right	Tilt	/	22.71	23	0.204	**0.22**	0.294	**0.31**	0.06

Table 14.7: SAR Values (WCDMA 850 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.4	4182	Front	/	22.62	23	0.461	**0.50**	0.657	**0.72**	-0.02
846.6	4233	Rear	Fig.6	22.55	23	0.680	**0.75**	0.867	**0.96**	0.02
836.4	4182	Rear	/	22.62	23	0.586	**0.64**	0.841	**0.92**	-0.02
826.4	4132	Rear	/	22.71	23	0.506	**0.54**	0.728	**0.78**	0.05
836.4	4182	Left	/	22.62	23	0.439	**0.48**	0.650	**0.71**	0.07
836.4	4182	Right	/	22.62	23	0.311	**0.34**	0.460	**0.50**	-0.01
836.4	4182	Bottom	/	22.62	23	0.083	**0.09**	0.133	**0.15**	0.08
846.6	4233	Rear Headset3	/	22.55	23	0.464	**0.51**	0.671	**0.74**	-0.07
846.6	4233	Rear Headset4	/	22.55	23	0.442	**0.49**	0.639	**0.71**	-0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The Headset1 is CCB0018A10C4, the Headset2 is CCB0018A10C1.

Table 14.8: SAR Values (WCDMA 1900 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1907.6	9538	Left	Touch	/	22.22	22.5	0.185	**0.20**	0.320	**0.34**	-0.02
1880	9400	Left	Touch	/	22.05	22.5	0.149	**0.17**	0.263	**0.29**	-0.00
1852.4	9262	Left	Touch	/	22.03	22.5	0.174	**0.19**	0.304	**0.34**	0.01
1907.6	9538	Left	Tilt	/	22.22	22.5	0.158	**0.17**	0.281	**0.30**	0.03
1880	9400	Left	Tilt	/	22.05	22.5	0.142	**0.16**	0.251	**0.28**	0.03
1852.4	9262	Left	Tilt	/	22.03	22.5	0.179	**0.20**	0.312	**0.35**	-0.03
1907.6	9538	Right	Touch	Fig.7	22.22	22.5	0.403	**0.43**	0.654	**0.70**	0.14
1880	9400	Right	Touch	/	22.05	22.5	0.317	**0.35**	0.530	**0.59**	0.16
1852.4	9262	Right	Touch	/	22.03	22.5	0.379	**0.42**	0.627	**0.70**	-0.06
1907.6	9538	Right	Tilt	/	22.22	22.5	0.188	**0.20**	0.317	**0.34**	-0.01
1880	9400	Right	Tilt	/	22.05	22.5	0.149	**0.17**	0.250	**0.28**	0.05
1852.4	9262	Right	Tilt	/	22.03	22.5	0.188	**0.21**	0.315	**0.35**	-0.01

Table 14.9: SAR Values (WCDMA 1900 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	9400	Front	/	22.05	22.5	0.445	**0.49**	0.741	**0.82**	0.03
1907.6	9538	Rear	/	22.22	22.5	0.507	**0.54**	0.864	**0.92**	0.12
1880	9400	Rear	/	22.05	22.5	0.518	**0.57**	0.834	**0.93**	0.01
1852.4	9262	Rear	Fig.8	22.03	22.5	0.640	**0.71**	1.02	**1.14**	0.03
1880	9400	Left	/	22.05	22.5	0.113	**0.13**	0.194	**0.22**	-0.07
1880	9400	Right	/	22.05	22.5	0.076	**0.08**	0.131	**0.15**	-0.07
1880	9400	Bottom	/	22.05	22.5	0.415	**0.46**	0.763	**0.85**	-0.05
1852.4	9262	Rear Headset3	/	22.03	22.5	0.381	**0.42**	0.630	**0.70**	0.05
1852.4	9262	Rear Headset4	/	22.03	22.5	0.324	**0.36**	0.521	**0.58**	0.09

Note1: The distance between the EUT and the phantom bottom is 10mm.

Note2: The Headset1 is CCB0018A10C4, the Headset2 is CCB0018A10C1.

Table 14.10: SAR Values (Wi-Fi 802.11b - Head)

Ambient Temperature: 22.2 °C Liquid Temperature: 21.7 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2437	6	Left	Touch	Fig.9	18.52	19	0.077	**0.09**	0.175	**0.20**	0.16
2437	6	Left	Tilt	/	18.52	19	0.015	**0.02**	0.028	**0.03**	-0.11
2437	6	Right	Touch	/	18.52	19	0.034	**0.04**	0.066	**0.07**	-0.18
2437	6	Right	Tilt	/	18.52	19	0.013	**0.01**	0.038	**0.04**	0.18

Table 14.11: SAR Values (Wi-Fi 802.11b - Body)

Ambient Temperature: 22.2 °C Liquid Temperature: 21.7 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2437	6	Front	/	18.52	19	0.016	**0.02**	0.030	**0.03**	-0.04
2437	6	Rear	Fig.10	18.52	19	0.089	**0.10**	0.199	**0.22**	0.17
2437	6	Right	/	18.52	19	0.041	**0.05**	0.083	**0.09**	-0.18
2437	6	Top	/	18.52	19	0.009	**0.01**	0.019	**0.02**	0.13

Note1: The distance between the EUT and the phantom bottom is 10mm.

14.2 SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

Table 14.12: SAR Values (GSM 850 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
848.8	251	Left	Touch	Fig.1	32.58	33.3	0.536	**0.63**	0.697	**0.82**	0.18

Table 14.13: SAR Values (GSM 850 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
848.8	251	GPRS (2)	Rear	Fig.2	29.65	30	0.648	**0.70**	0.852	**0.92**	0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.14: SAR Values (GSM 1900 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1909.8	810	Left	Touch	Fig.3	28.80	30.3	0.219	**0.31**	0.362	**0.51**	0.07

Table 14.15: SAR Values (GSM 1900 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Mode (number of timeslots)	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1850.2	512	GPRS (4)	Front	Fig.4	23.54	24	0.436	**0.48**	0.660	**0.73**	0.03

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.16: SAR Values (WCDMA 850 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
846.6	4233	Left	Touch	Fig.5	22.55	23	0.535	**0.59**	0.713	**0.79**	0.07

Table 14.17: SAR Values (WCDMA 850 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
846.6	4233	Rear	Fig.6	22.55	23	0.680	**0.75**	0.867	**0.96**	0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.18: SAR Values (WCDMA 1900 MHz Band - Head)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1907.6	9538	Right	Touch	Fig.7	22.22	22.5	0.403	**0.43**	0.654	**0.70**	0.14

Table 14.19: SAR Values (WCDMA 1900 MHz Band - Body)

Ambient Temperature: 22.1 °C Liquid Temperature: 21.6 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1852.4	9262	Rear	Fig.8	22.03	22.5	0.640	**0.71**	1.02	**1.14**	0.03

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.20: SAR Values (Wi-Fi 802.11b - Head)

Ambient Temperature: 22.2 °C Liquid Temperature: 21.7 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2437	6	Left	Touch	Fig.9	18.52	19	0.077	**0.09**	0.175	**0.20**	0.16

Table 14.21: SAR Values (Wi-Fi 802.11b - Body)

Ambient Temperature: 22.2 °C Liquid Temperature: 21.7 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2437	6	Rear	Fig.10	18.52	19	0.089	**0.10**	0.199	**0.22**	0.17

Note1: The distance between the EUT and the phantom bottom is 10mm.

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Table 15.1: SAR Measurement Variability for Body GSM 850 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
848.8	251	Rear	10	0.852	0.846	1.01	/

Table 15.2: SAR Measurement Variability for Body WCDMA 850 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
846.6	4233	Rear	10	0.867	0.861	1.01	/

Table 15.3: SAR Measurement Variability for Body WCDMA 1900 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1852.4	9262	Rear	10	1.02	1.01	1.01	/

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.25	9.12	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					18.5	18.2	

16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.5	N	1	1	1	6.5	6.5	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43

20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.8	10.7	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.6	21.4	

16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										