

Appendix 5. Simulated Tissues

The body mixture consists of water, Polysorbate (Tween 20) and salt. Visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

Ingredient (% by weight)	Frequency 750/835/850/900 MHz	
	Head	Body
De-Ionized Water	52.87	71.30
Polysorbate 20	46.10	28.00
Salt	1.03	0.70

Ingredient (% by weight)	Frequency 1800/1900 MHz	
	Head	Body
De-Ionized Water	55.40	71.50
Polysorbate 20	44.22	28.00
Salt	0.38	0.50

Ingredient (% by weight)	Frequency 2450/2600 MHz	
	Head	Body
De-Ionized Water	55.75 ⁽¹⁾	71.70
Polysorbate 20	45.25 ⁽¹⁾	28.00
Salt	0.00	0.30

Stimulating Liquid for 3700 MHz to 5800 MHz are supplied and manufactured by SPEAG

Ingredient (% by weight)	Frequency
	3700 - 5800 MHz Head / Body
De-Ionized Water	~78.00
Mineral Oil	~11.00
Emulsifiers	~9.00
Additives and Salt	~2.00

Note(s):

- As per the recipe provided by National Physical Laboratory, the 2450 MHz Head Fluid recipe is mixed to the total percentage of weight is by 101.0 %.

Appendix 6. System Check and Dielectric Parameters

Dielectric Property Measurements: The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

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

System Performance Check: Prior to the assessment, the system was verified in the flat region of the phantom, 750 MHz, 900 MHz, 1800 MHz, 1900 MHz, 2450 MHz, 2600 MHz and 5.0 GHz dipoles were used. A forward power of 250 mW was applied to the 750 MHz, 900 MHz, 1800 MHz, 1900 MHz, 2450 MHz, 2600 MHz dipoles and 100 mW was applied to 5.0 GHz dipole and the system was verified to a tolerance of $\pm 5\%$ for the 900MHz, 1800MHz, 1900MHz, 2450 MHz, 2600 MHz and 5.0 GHz dipoles.

The applicable verification normalised to 1 Watt.

The applicable verification requirements to 1 Watt.

System Check 750 Head								
Date: 05/06/2014								
Validation Dipole and Serial Number: D750V3; SN: 1011								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	24.0 °C	23.9 °C	ϵ_r	41.96	42.02	0.14	5.00
				σ	0.89	0.88	-1.17	5.00
				1g SAR	8.48	8.48	0.00	5.00
				10g SAR	5.57	5.64	1.26	5.00
Date: 09/06/2014								
Validation Dipole and Serial Number: D750V3; SN: 1011								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	24.0 °C	23.9 °C	ϵ_r	41.96	42.02	0.14	5.00
				σ	0.89	0.88	-1.17	5.00
				1g SAR	8.48	8.40	-0.94	5.00
				10g SAR	5.57	5.57	-0.18	5.00
System Check 750 Body								
Date: 06/06/2014								
Validation Dipole and Serial Number: D750V3; SN: 1011								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	750	24.0 °C	22.8 °C	ϵ_r	55.55	54.10	-2.61	5.00
				σ	0.96	0.93	-3.54	5.00
				1g SAR	8.84	8.84	0.00	5.00
				10g SAR	5.84	5.92	1.37	5.00
Date: 09/06/2014								
Validation Dipole and Serial Number: D750V3; SN: 1011								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	750	24.0 °C	24.0 °C	ϵ_r	55.55	53.30	-3.09	5.00
				σ	1.05	1.05	-0.10	5.00
				1g SAR	8.84	8.48	-4.07	5.00
				10g SAR	5.84	5.68	-2.74	5.00

System Check 900 Head								
Date: 02/06/2014 Validation Dipole and Serial Number: D900V2 SN: 035								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0°C	22.0°C	ϵ_r	41.50	41.62	0.29	5.00
				σ	0.97	0.98	0.98	5.00
				1g SAR	10.50	10.68	1.71	5.00
				10g SAR	6.69	6.92	3.44	5.00
Date: 05/06/2014 Validation Dipole and Serial Number: D900V2 SN: 035								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0°C	22.0°C	ϵ_r	41.50	41.62	0.29	5.00
				σ	0.97	0.98	0.98	5.00
				1g SAR	10.50	10.16	-3.24	5.00
				10g SAR	6.69	6.56	-1.94	5.00
Date: 05/06/2014 Validation Dipole and Serial Number: D900V2 SN: 035								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0°C	22.0°C	ϵ_r	41.50	40.61	-2.14	5.00
				σ	0.97	0.97	0.36	5.00
				1g SAR	10.50	10.56	0.57	5.00
				10g SAR	6.69	6.88	2.84	5.00
Date: 16/06/2014 Validation Dipole and Serial Number: D900V2 SN: 035								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0°C	22.0°C	ϵ_r	41.50	39.84	-4.00	5.00
				σ	0.97	0.97	0.05	5.00
				1g SAR	10.50	10.24	-2.48	5.00
				10g SAR	6.69	6.60	-1.35	5.00

System Check 900 Body

Date: 02/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.5°C	22.0°C	ϵ_r	55.00	54.02	-1.78	5.00
				σ	1.05	1.03	-2.00	5.00
				1g SAR	10.40	10.40	0.00	5.00
				10g SAR	6.73	6.76	0.45	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	ϵ_r	55.00	53.30	-3.09	5.00
				σ	1.05	1.02	-2.71	5.00
				1g SAR	10.40	9.96	-4.23	5.00
				10g SAR	6.73	6.48	-3.71	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	ϵ_r	55.00	52.91	-3.80	5.00
				σ	1.05	1.05	-2.95	5.00
				1g SAR	10.40	10.24	-1.54	5.00
				10g SAR	6.73	6.76	0.45	5.00

Date: 16/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	ϵ_r	55.00	52.94	-3.75	5.00
				σ	1.05	1.05	3.48	5.00
				1g SAR	10.40	10.32	-0.77	5.00
				10g SAR	6.73	6.76	0.45	5.00

System Check 900 Body (Continued):

Date: 16/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	ϵ_r	55.00	54.13	-1.58	5.00
				σ	1.05	1.09	3.48	5.00
				1g SAR	10.40	10.24	-1.54	5.00
				10g SAR	6.73	6.56	-2.53	5.00

Date: 19/06/2014

Validation Dipole and Serial Number: D900V2 SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	ϵ_r	55.00	53.08	-3.49	5.00
				σ	1.05	1.06	0.52	5.00
				1g SAR	10.40	10.12	-2.69	5.00
				10g SAR	6.73	6.48	-3.71	5.00

System Check 1800 Head

Date: 02/06/2014

Validation Dipole and Serial Number: D1800V2; SN: 2d009

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	23.0 °C	22.9 °C	ϵ_r	40.00	39.68	-0.80	5.00
				σ	1.40	1.43	2.00	5.00
				1g SAR	37.30	36.80	-1.34	5.00
				10g SAR	19.70	19.88	0.91	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D1800V2; SN: 2d009

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	23.0 °C	22.9 °C	ϵ_r	40.00	39.60	-1.00	5.00
				σ	1.40	1.43	2.43	5.00
				1g SAR	37.30	36.28	-2.73	5.00
				10g SAR	19.70	19.76	0.30	5.00

System Check 1800 Body

Date: 02/06/2014

Validation Dipole and Serial Number: D1800V2;SN: 2d009

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	23.0 °C	24.0 °C	ϵ_r	51.92	53.30	-2.59	5.00
				σ	1.52	1.58	3.68	5.00
				1g SAR	36.50	35.60	-2.47	5.00
				10g SAR	19.50	19.52	0.10	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D1800V2;SN: 2d009

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	23.0 °C	24.0 °C	ϵ_r	53.30	51.87	-2.68	5.00
				σ	1.52	1.56	2.30	5.00
				1g SAR	36.50	37.84	3.67	5.00
				10g SAR	19.50	20.32	4.21	5.00

System Check 1900 Head

Date: 02/06/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	22.5 °C	22.0 °C	ϵ_r	40.00	40.23	0.57	5.00
				σ	1.40	1.43	1.86	5.00
				1g SAR	39.80	40.00	0.50	5.00
				10g SAR	20.70	20.76	0.29	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D1900V2: SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	22.5 °C	22.0 °C	ϵ_r	40.00	41.69	4.22	5.00
				σ	1.40	1.40	0.35	5.00
				1g SAR	39.80	39.12	-1.71	5.00
				10g SAR	20.70	20.08	-3.00	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D1900V2: SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	22.5 °C	22.0 °C	ϵ_r	40.00	41.75	4.38	5.00
				σ	1.40	1.38	-1.31	5.00
				1g SAR	39.80	39.16	-1.61	5.00
				10g SAR	20.70	20.12	-2.80	5.00

Date: 30/06/2014

Validation Dipole and Serial Number: D1900V2: SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	22.5 °C	22.0 °C	ϵ_r	40.00	39.68	-0.80	5.00
				σ	1.40	1.34	-4.32	5.00
				1g SAR	39.80	39.36	-1.11	5.00
				10g SAR	20.70	20.44	-1.26	5.00

System Check 1900 Body

Date: 02/06/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	22.8 °C	ϵ_r	53.30	52.30	-1.88	5.00
				σ	1.52	1.55	1.88	5.00
				1g SAR	40.20	41.20	2.49	5.00
				10g SAR	21.10	21.80	3.32	5.00

Date: 05/06/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	22.8 °C	ϵ_r	53.30	51.71	-2.98	5.00
				σ	1.52	1.54	1.04	5.00
				1g SAR	40.20	40.80	1.49	5.00
				10g SAR	21.10	21.20	0.47	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	22.8 °C	ϵ_r	53.30	50.86	-4.58	5.00
				σ	1.52	1.50	-1.25	5.00
				1g SAR	40.20	39.16	-2.59	5.00
				10g SAR	21.10	20.12	-4.64	5.00

Date: 19/06/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	22.8 °C	ϵ_r	53.30	53.51	0.39	5.00
				σ	1.52	1.51	-0.35	5.00
				1g SAR	40.20	39.16	-2.59	5.00
				10g SAR	21.10	20.60	-2.37	5.00

System Check 2450 Head

Date: 04/06/2014

Validation Dipole and Serial Number: D2450V2: SN:725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	24.0	22.7 °C	ϵ_r	39.20	39.92	1.84	5.00
				σ	1.80	1.87	3.75	5.00
				1g SAR	54.0	52.60	2.66	5.00
				10g SAR	24.40	24.96	2.30	5.00

Date: 17/06/2014

Validation Dipole and Serial Number: D2450V2: SN:725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	24.0	22.7 °C	ϵ_r	39.20	37.77	-3.65	5.00
				σ	1.80	1.77	-1.92	5.00
				1g SAR	53.40	52.80	-1.12	5.00
				10g SAR	24.7	24.72	0.08	5.00

System Check 2450 Body

Date: 02/06/2014

Validation Dipole and Serial Number: D24402: SN: 701

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	24.0	24.0	ϵ_r	52.70	52.78	0.15	5.00
				σ	1.95	1.99	2.12	5.00
				1g SAR	50.80	51.40	-1.17	5.00
				10g SAR	23.90	23.16	-3.10	5.00

Date: 17/06/2014

Validation Dipole and Serial Number: D24402: SN: 701

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	24.0	24.0	ϵ_r	52.70	52.20	-0.95	5.00
				σ	1.95	2.03	4.35	5.00
				1g SAR	51.40	53.60	4.28	5.00
				10g SAR	23.90	23.88	-0.08	5.00

System Check 2600 Head

Date: 06/06/2014

Validation Dipole and Serial Number: D2600V2: SN:1046

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2600	24.0	22.7 °C	ϵ_r	39.00	39.33	0.85	5.00
				σ	1.96	2.04	3.91	5.00
				1g SAR	57.60	58.80	2.08	5.00
				10g SAR	25.80	25.76	-0.16	5.00

System Check 2600 Body

Date: 05/06/2014

Validation Dipole and Serial Number: D2600V2: SN: 1046

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2600	23.4 °C	22.5 °C	ϵ_r	52.50	53.03	1.01	5.00
				σ	2.16	2.20	1.91	5.00
				1g SAR	56.80	55.60	-2.11	5.00
				10g SAR	25.20	24.12	-4.29	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D2600V2: SN: 1046

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2600	23.4 °C	22.5 °C	ϵ_r	52.50	53.67	2.23	5.00
				σ	2.16	2.20	1.98	5.00
				1g SAR	56.80	55.60	-2.11	5.00
				10g SAR	25.20	24.12	-4.29	5.00

System Check 5200 Head

Date 02/06/2014

Validation dipole and Serial Number: D5GHZV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5200	24.0°C	23.5°C	ϵ_r	36.00	35.34	-1.83	5.00
				σ	4.66	4.54	-2.61	5.00
				1g SAR	77.40	76.50	-1.16	5.00
				10g SAR	22.30	22.10	-0.90	5.00

System Check 5500 Head

Date 02/06/2014

Validation dipole and Serial Number: D5GHZV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5500	23.5°C	24.0°C	ϵ_r	35.60	35.01	-1.66	5.00
				σ	4.96	4.83	-2.67	5.00
				1g SAR	84.80	84.20	-0.71	5.00
				10g SAR	24.1	23.90	-0.83	5.00

System Check 5800 Head

Date 02/06/2014

Validation dipole and Serial Number: D5GHZV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5800	24.0°C	23.5°C	ϵ_r	35.30	34.64	-1.87	5.00
				σ	5.27	5.12	-2.91	5.00
				1g SAR	76.90	77.20	0.39	5.00
				10g SAR	22.00	22.00	0.00	5.00

System Check 5200 Body

Date: 05/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5200	23.0°C	23.0°C	ϵ_r	49.01	49.25	0.49	5.00
				σ	5.30	5.33	0.57	5.00
				1g SAR	73.10	70.30	-3.83	5.00
				10g SAR	20.40	19.90	-2.45	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5200	23.0°C	23.0°C	ϵ_r	49.01	48.11	-1.84	5.00
				σ	5.30	5.14	-2.98	5.00
				1g SAR	73.10	72.20	-1.23	5.00
				10g SAR	20.40	20.30	-0.49	5.00

System Check 5500 Body

Date: 05/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5500	23.0°C	23.0°C	ϵ_r	48.60	48.42	-0.37	5.00
				σ	5.65	5.74	1.62	5.00
				1g SAR	79.00	75.70	-4.18	5.00
				10g SAR	21.9	21.10	-3.65	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5500	23.0°C	23.0°C	ϵ_r	48.60	47.09	-3.11	5.00
				σ	5.65	5.59	-1.14	5.00
				1g SAR	79.00	81	2.53	5.00
				10g SAR	21.9	22.80	4.11	5.00

System Check 5800 Body

Date: 05/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5800	23.0°C	23.0°C	ϵ_r	48.20	47.68	-1.08	5.00
				σ	6.00	6.05	0.91	5.00
				1g SAR	73.20	71.20	-2.73	5.00
				10g SAR	20.20	19.80	-1.98	5.00

Date: 09/06/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5800	23.0°C	23.0°C	ϵ_r	48.20	46.36	-3.82	5.00
				σ	6.00	6.02	0.26	5.00
				1g SAR	73.20	71.60	-2.19	5.00
				10g SAR	20.20	19.70	-2.48	5.00

Appendix 7. measurement Uncertainty Table

Measurement uncertainty tables for technologies tested.

A.7.1. Uncertainty -GSM 850 / UMTS FDD 5 / LTE Band 5 / LTE Band 13 / LTE Band 17 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		u _i or u _{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	2.510	2.510	normal (k=1)	1.0000	1.0000	2.510	2.510	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)	2.950	2.950	normal (k=1)	1.0000	0.6400	1.888	1.888	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.840	2.840	normal (k=1)	1.0000	0.6000	1.704	1.704	5
	Combined standard uncertainty			t-distribution			9.58	9.58	>500
	Expanded uncertainty			k = 1.96			18.77	18.77	>500

**A.7.2. Uncertainty Rate-GSM / GPRS / EDGE 850 / UMTS FDD 5 / LTE Band 5 / LTE Band 13 / LTE Band 17
Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		U _i or U _{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	2.510	2.510	normal (k=1)	1.0000	1.0000	2.510	2.510	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)	2.000	2.000	normal (k=1)	1.0000	0.6400	1.280	1.280	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	1.560	1.560	normal (k=1)	1.0000	0.6000	0.936	0.936	5
	Combined standard uncertainty			t-distribution			9.37	9.37	>500
	Expanded uncertainty			k = 1.96			18.36	18.36	>500

A.7.3. Uncertainty – UMTS FDD 4 / LTE Band 4 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	2.440	2.440	normal (k=1)	1.0000	1.0000	2.440	2.440	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)	2.120	2.120	normal (k=1)	1.0000	0.6400	1.357	1.357	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.270	2.270	normal (k=1)	1.0000	0.6000	1.362	1.362	5
	Combined standard uncertainty			t-distribution			9.41	9.41	>500
	Expanded uncertainty			k = 1.96			18.45	18.45	>500

A.7.4. Uncertainty -UMTS FDD 4 / LTE Band 4 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	2.460	2.460	normal (k=1)	1.0000	1.0000	2.460	2.460	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)	2.210	2.210	normal (k=1)	1.0000	0.6400	1.414	1.414	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.150	2.150	normal (k=1)	1.0000	0.6000	1.290	1.290	5
	Combined standard uncertainty			t-distribution			9.42	9.42	>500
	Expanded uncertainty			k = 1.96			18.45	18.45	>500

A.7.5. Uncertainty -PCS 1900 / UMTS FDD 2 / LTE Band 2 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	2.490	2.490	normal (k=1)	1.0000	1.0000	2.490	2.490	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)	3.560	3.560	normal (k=1)	1.0000	0.6400	2.278	2.278	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.620	2.620	normal (k=1)	1.0000	0.6000	1.572	1.572	5
	Combined standard uncertainty			t-distribution			9.63	9.63	>500
	Expanded uncertainty			k = 1.96			18.88	18.88	>500

A.7.6. Uncertainty -PCS / GPRS / EDGE 1900 / UMTS FDD 2 / LTE Band 2 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	1.860	1.860	normal (k=1)	1.0000	1.0000	1.860	1.860	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)	2.610	2.610	normal (k=1)	1.0000	0.6400	1.670	1.670	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.140	2.140	normal (k=1)	1.0000	0.6000	1.284	1.284	5
	Combined standard uncertainty			t-distribution			9.32	9.32	>500
	Expanded uncertainty			k = 1.96			18.26	18.26	>500

A.7.7. Uncertainty –LTE Band 7 / Wi-Fi 2450 MHz Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	2.180	2.180	normal (k=1)	1.0000	1.0000	2.180	2.180	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)	1.840	1.840	normal (k=1)	1.0000	0.6400	1.178	1.178	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.030	2.030	normal (k=1)	1.0000	0.6000	1.218	1.218	5
	Combined standard uncertainty			t-distribution			9.25	9.25	>500
	Expanded uncertainty			k = 1.96			18.13	18.13	>500

A.7.8. Uncertainty –LTE Band 7 / Wi-Fi 2450 MHz Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{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	2.440	2.440	normal (k=1)	1.0000	1.0000	2.440	2.440	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)	2.260	2.260	normal (k=1)	1.0000	0.6400	1.446	1.446	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	2.150	2.150	normal (k=1)	1.0000	0.6000	1.290	1.290	5
	Combined standard uncertainty			t-distribution			9.36	9.36	>500
	Expanded uncertainty			k = 1.96			18.35	18.35	>500

A.7.9. Uncertainty -Wi-Fi 5GHz Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
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	2.380	2.380	normal (k=1)	1.0000	1.0000	2.380	2.380	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)	6.220	6.220	normal (k=1)	1.0000	0.6400	3.981	3.981	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	5.580	5.580	normal (k=1)	1.0000	0.6000	3.348	3.348	5
	Combined standard uncertainty			t-distribution			10.84	10.84	>150
	Expanded uncertainty			k = 1.96			21.25	21.25	>150

A.7.10. Uncertainty -Wi-Fi 5GHz Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty		v _i or v _{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
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	1.960	1.960	normal (k=1)	1.0000	1.0000	1.960	1.960	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)	4.370	4.370	normal (k=1)	1.0000	0.6400	2.797	2.797	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.270	4.270	normal (k=1)	1.0000	0.6000	2.562	2.562	5
	Combined standard uncertainty			t-distribution			10.15	10.15	>450
	Expanded uncertainty			k = 1.96			19.90	19.90	>450

Appendix 8. 3G Test set-up

3G (12.K RMC / HSDPA / HSUPA) setup

To switch from 2G to 3G, on the system config screen choose Format Switch and select WCDMA. The Call Setup Screen as shown in figure 1 pops up.

Call Setup Screen									
Call Control	Active Cell Operating Mode							Call Params	
Operating Mode	UE Information IMSI: IMEI(SU): (---) Power Class:							Cell Power	
Active Cell								-35.00	
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCCH TX Power: -11.55 dBm							dBm/3.84 MHz	
								Channel Type	
	Call Processing Status Current Service Type: None RIM Status: None GMM State: None Current DPCH Offset: 0 chips							12.2k RMC	
Originate Call								Paging Service	
	HSUPA Information Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----							RB Test Mode	
Paging Parameters ▾								HSPA Parameters	
	HSDPA Information Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----							34.121 Preset Call Configs ▾	
Handovers								Channel (UARFCN) Params	
	Active Cell Idle							Sys Type: UTRA FDD	
Clear UE Info									
1 of 5	IntRef							1 of 3	

Figure 1: 3G Call Setup Screen

For a 12.2k RMC call follow the steps below.

8.1. Steps for 12.2k RMC

1. Ensure that the Operating Mode of the cell is off before setting up the instrument.
2. On the Call Setup Screen, under Call Parameters, press the button against Cell Power. The Cell Power value is set to about -35dBm to account for all the losses and ensure sufficient signal strength to the EUT.
3. The Channel Type is selected to 12.2k RMC. Press button against Channel (VARFCN) Params select the correct Downlink Channel for the required UMTS FDD Band.
4. On the Call Setup Screen, under Call Parameters, press the button against HSPA Parameters. Under HSDPA Parameters on page 1, press HSDPA Uplink parameters and set the Delta ACK, Delta NACK, Delta CQI values to 8. Under HSDPA Params itself, press HSDPA RB Test Mode Setup button and then the HSDPA RB Test Mode Settings and change HS-DSCH Data Pattern to All Ones.

Call Setup Screen																
Call Control	Active Cell Operating Mode							HSDPA Parms								
	UE Information IMSI: IMEI(SV): (---) Power Class:							HSDPA RB Test Mode Setup								
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm															
	HSDPA Uplink Parameters							UE Category Parameters ▾								
	<table border="1"> <thead> <tr> <th>Value</th> </tr> </thead> <tbody> <tr> <td>DeltaACK</td> </tr> <tr> <td>DeltaNACK</td> </tr> <tr> <td>DeltaCQI</td> </tr> <tr> <td>Ack-Nack Repetition Factor</td> </tr> <tr> <td>CQI Feedback Cycle (k)</td> </tr> <tr> <td>CQI Repetition Factor</td> </tr> </tbody> </table>							Value	DeltaACK	DeltaNACK	DeltaCQI	Ack-Nack Repetition Factor	CQI Feedback Cycle (k)	CQI Repetition Factor	MAC-(e)hs Parameters ▾	
	Value															
	DeltaACK															
	DeltaNACK															
	DeltaCQI															
	Ack-Nack Repetition Factor															
	CQI Feedback Cycle (k)															
CQI Repetition Factor																
							HSDPA Uplink Parameters ▾									
							Return									
Close Menu																
			Active Cell				Sys Type: UTRA FDD									
			Idle													
			IntRef													
							1 of 2									

Figure 2: HSDPA Parameters

5. On the Call Setup Screen, under Call Parameters, on page 2, check if the DL DTCH Data is set to All Ones. On page 3, ensure that the Receiver is set to Manual. On page 3 itself, under UL CL Power Ctrl Parameters, UL CL Power Ctrl Mode is set to All Up Bits.

Call Setup Screen										
Call Control	Active Cell Operating Mode							Call Parms		
Operating Mode								DL DTCH Data		
Active Cell								All Ones		
	UE Information IMSI: IMEI(SV): (---) Power Class:							RLC Reestablish		
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm									
	Originate Call								Auto	
	Paging Parameters ▾	Call Processing Status Current Service Type: None RAI Status: None GMM State: None Current DPCH Offset: 0 chips							Call Limit State	
Handovers								Off		
Clear UE Info	HSUPA Information Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----							Call Drop Timer		
	HSDPA Information Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----							On		
								SRB Parameters ▾		
			Active Cell				Sys Type: UTRA FDD			
			Idle							
			IntRef							
							2 of 3			
1 of 5										

Figure 3: DL DTCH Data Parms

Call Setup Screen																									
Call Control	Active Cell Operating Mode							Call Parm																	
	UE Information IMSI: IMEI(SV): Power Class:							UE Target Power -5 dBm																	
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm							UL CL Power Ctrl Parameters																	
	UL CL Power Ctrl Parameters <table border="1"> <thead> <tr> <th>UL CL Power Ctrl Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>UL CL Power Ctrl Algorithm</td> <td>All Up bits</td> </tr> <tr> <td>UL CL Power Ctrl Stepsize</td> <td>Two</td> </tr> <tr> <td></td> <td>1 dB</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>							UL CL Power Ctrl Mode	Value	UL CL Power Ctrl Algorithm	All Up bits	UL CL Power Ctrl Stepsize	Two		1 dB									Send Step Up TPC Bit Pattern	
	UL CL Power Ctrl Mode	Value																							
	UL CL Power Ctrl Algorithm	All Up bits																							
	UL CL Power Ctrl Stepsize	Two																							
		1 dB																							
							Send Step Down TPC Bit Pattern																		
							Receiver Control																		
Close Menu																									
Active Cell Idle							Sys Type: UTRA FDD																		
IntRef							3 of 3																		

Figure 4: UL CL Power Ctrl Parameters

6. On the Call Setup Screen, under Call Control, page 2, Cell Parameters, it is ensured that PS Domain information is kept as Absent for RMC.

Call Setup Screen																											
Call Control	Active Cell Operating Mode							Call Parm																			
	UE Information IMSI: IMEI(SV): Power Class:							Cell Power -35.00 dBm/3.84 MHz																			
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm							Channel Type 12.2k RMC																			
	Cell Parameters <table border="1"> <thead> <tr> <th>Cell Parameters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>BCCH Update Page</td> <td>Inhibit</td> </tr> <tr> <td>PS Domain Information</td> <td>Absent</td> </tr> <tr> <td>MCC (Mobile Country Code)</td> <td>1</td> </tr> <tr> <td>MNC (Mobile Network Code)</td> <td>1</td> </tr> <tr> <td>MNC (Mobile Network Code) Length</td> <td>Auto</td> </tr> <tr> <td>LAC (Local Area Code)</td> <td>1</td> </tr> <tr> <td>RAC (Routing Area Code)</td> <td>1</td> </tr> <tr> <td>Cell Identity</td> <td>1</td> </tr> </tbody> </table>							Cell Parameters	Value	BCCH Update Page	Inhibit	PS Domain Information	Absent	MCC (Mobile Country Code)	1	MNC (Mobile Network Code)	1	MNC (Mobile Network Code) Length	Auto	LAC (Local Area Code)	1	RAC (Routing Area Code)	1	Cell Identity	1	Paging Service RB Test Mode	
	Cell Parameters	Value																									
	BCCH Update Page	Inhibit																									
	PS Domain Information	Absent																									
	MCC (Mobile Country Code)	1																									
	MNC (Mobile Network Code)	1																									
	MNC (Mobile Network Code) Length	Auto																									
LAC (Local Area Code)	1																										
RAC (Routing Area Code)	1																										
Cell Identity	1																										
							HSPA Parameters																				
							34,121 Preset Call Configs																				
							Channel (UARFCN) Parm																				
Close Menu																											
Active Cell Idle							Sys Type: UTRA FDD																				
IntRef							1 of 3																				

Figure 5: Cell Parameters

7. On the same page under Uplink Parameters the maximum Uplink Transmit Power is made 24dBm. Uplink DPCH Bc/Bd Control Settings are kept at Auto for RMC. These vary according for HSDPA and HSUPA as per the values given in KDB 941225 D01 SAR test for 3G devices v02.

Call Setup Screen									
Call Control	Active Cell Operating Mode						Call Parm		
Additional Screens	UE Information IMSI: IMEI(SV): (--) Power Class:						Cell Power		
							-35.00		
Cell Parameters	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm						dBm/3.84 MHz		
							Channel Type		
Generator Info	Uplink Parameters						12.2k RNC		
							Paging Service		
Uplink Parameters	Value PRACH Preambles 64 PRACH Ramping Cycles(MAX) 2 Available Subchannels (Bit Mask) 000000000001 Uplink DPCH Scrambling Code 0 Uplink DPCH Bc/Bd Control Auto Manual Uplink DPCH Bc 8 Manual Uplink DPCH Bd 15 Maximum Uplink Transmit Power Level 24 dBm						RB Test Mode		
							HSPA Parameters		
UE Rep Meas	Sys Type: UTRA FDD						34,121 Preset Call Configs		
							Channel (UARFCN) Parm		
Close Menu	Active Cell Idle IntRef						1 of 3		
2 of 5									

Figure 6: Uplink Parameters

8. On page 3 under Call Control, for the RB Test Mode setup, Asymmetric RMC CN Domain is ensured to be in CS Domain for RMC call.

Call Setup Screen									
Call Control	Active Cell Operating Mode						Call Parm		
	UE Information IMSI: IMEI(SV): (--) Power Class:						Cell Power		
							-35.00		
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm						dBm/3.84 MHz		
							Channel Type		
	RB Test Mode Settings						12.2k RNC		
							Paging Service		
Voice Call	Value Uplink DTCH RMC CRC Presence Present Uplink Dummy DCCH Data Off UE Loopback Type Type 1 Asymmetric RMC Loopback Messaging Close/Open Asymmetric RMC CN Domain CS Domain						RB Test Mode		
							HSPA Parameters		
Close Menu							34,121 Preset Call Configs		
							Channel (UARFCN) Parm		
	Active Cell Idle IntRef						1 of 3		
3 of 5									

Figure 7: RB Test Mode Settings

9. After the test set has been set up, change the cell Operating Mode to Active Cell and originate a call.

8.2. Steps for 12.2k RMC + HSDPA/HSUPA

1. Most of the steps to be followed are as in the case of 12.2k RMC however, some of the settings need to be changed. The Channel Type is changed to 12.2k RMC+HSDPA or 12.2k RMC+HSUPA as required.
2. For HSDPA and HSUPA, the settings remain same as the case for RMC but the PS Domain is made Present for Cell Parameters (Figure 5) and RB Test Mode Setup (Figure 7).
3. The following tables taken from FCC 3G SAR procedures (KDB 941225 D01 SAR test for 3G devices v02) below were applied to the Agilent 8960 series 10 wireless communications test set which supports 3G / HSDPA release 5 / HSUPA release 6.

Sub-test 1 Setup for Release 5 HSDPA

Sub-test	β_c	β_d	B_d (SF)	$\beta_{cl} \beta_d$	$\beta_{hs}^{(1)}$	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 $\Delta_{CQI} = 8 \Rightarrow A_{HS} = \beta_{HS}/\beta_c = 30/15 \Rightarrow \beta_{HS} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_{cl} \beta_d = 12/15$, $B_{HS}/\beta_c = 24/15$

Note 3: For subtest 2 the $\beta_{cl} \beta_d$ 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 $\beta_c = 11/15$ and $\beta_d = 15/15$

Sub-test 5 Setup for Release 6 HSUPA

Sub-test	β_c	β_d	B_d (SF)	$\beta_{cl} \beta_d$	$\beta_{hs}^{(1)}$	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	$B_{d1}: 47/15$ $B_{d2}: 47/15$	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 $\Delta_{CQI} = 8 \Rightarrow A_{HS} = \beta_{HS}/\beta_c = 30/15 \Rightarrow \beta_{HS} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_{cl} \beta_d = 12/15$, $B_{HS}/\beta_c = 24/15$. 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 $\beta_{cl} \beta_d$ 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 $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the $\beta_{cl} \beta_d$ 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 $\beta_c = 14/15$ and $\beta_d = 15/15$.

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

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

Call Setup Screen									
Call Control	Active Cell Operating Mode							Serving Grant	
Operating Mode	UE Information INSI: INEI(SU): (---) Power Class: UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm Call Processing Status Current Service Type: Mono RM Status: Abs Single Shot AG GMM State: Index 18: (95/15)^2 Current DPCCH Index 19: (106/15)^2 Index 20: (119/15)^2 Index 21: (134/15)^2 Index 22: (150/15)^2 Index 23: (168/15)^2 HSUPA Information Rep EDCH Cat/Power Class: 1 Last received Throughput: 0 kbps Acks Transmitted: 0							AG Mode	
Active Cell								Single Shot	
								Single Shot AG	
								21: (134/15)^2	
Originate Call								Send Single Shot Absolute Grant	
								RB Setup AG	
Paging Parameters								33: 4(134/15)^2	
Handovers								AG Pattern Parameters	
Clear UE Info								Return	
	Active Cell Idle Sys Type: UTRA FDD								
1 of 5	IntRef							1 of 2	

Call Setup Screen									
Call Control	Active Cell Operating Mode							Call Parms	
Additional Screens	UE Information INSI: INEI(SU): (---) Power Class: UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -22.58 dBm Uplink Parameters PRACH Preambles: 64 PRACH Ramping Cycles(NMAX): 2 Available Subchannels (Bit Mask): 000000000001 Uplink DPCCH Scrambling Code: 0 Uplink DPCCH Bc/Bd Control: Manual Manual Uplink DPCCH Bc: 2 Manual Uplink DPCCH Bd: 15 Maximum Uplink Transmit Power Level: 24 dBm							Cell Power	
Cell Parameters								-35.00 dBm/3.84 MHz	
Generator Info								Channel Type	
								12.2k + HSDPA	
								Paging Service	
								RB Test Mode	
Uplink Parameters								HSPA Parameters	
UE Rep Params								34.121 Preset Call Configs	
Close Menu								Channel (UARFCN) Params	
	Cell Off Sys Type: UTRA FDD								
2 of 5	IntRef							1 of 3	

4. For HSUPA the Serving Grant Parameter needs to be set. On the Call Setup Screen, under Call Parameters, press the button against HSPA Parameters. On the new screen that pops up, press HSUPA and Serving Grant. The Serving Grant is set according to the table for HSPA in the KDB (AG Index). The correct AG is chosen from the Single Shot AG. Consecutively, the RG Setup AG is set as per the ratio set on Single Shot AG.

Call Setup Screen									
Call Control	Active Cell Operating Mode							Serving Grant	
Operating Mode	UE Information INSI: INEI(SV): (---) Power Class:							AG Mode	
Active Cell								Single Shot	
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm							Single Shot AG	
								31: 6(168/15)^2	
Originate Call	Call Processing Status Current Service Type: None MM Status: None GMM State: None Current DPCH Offset: 0 chips							Send Single Shot Absolute Grant	
Paging Parameters	HSUPA Information Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----							RB Setup AG	
								37: 6(168/15)^2	
Handovers	HSDPA Information Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----							AG Pattern Parameters	
Clear UE Info	Active Cell Idle							Return	
1 of 5	Sys Type: UTRA FDD IntRef							1 of 2	

Figure 8: Serving Grant Example

Appendix 9. CAT24 Test set-up

A.9.1. Establish a DC-HSDPA RB Test Mode Connection with DL 42Mbps

RB (radio bearer) test mode is a special, defined-channel configuration designed to simplify the testing environment. Since W-CDMA is an incredibly flexible system, defined radio bearers, called RMCs (reference measurement channels) simplify which configurations need to be tested for RF performance.

RB test mode provides the ability to set up a standalone channel configuration originating from the 8960 via call-processing. The direction of the call setup is always from the 8960 to the UE. This is the typical RF test that is used throughout the lifecycle of a device's design process. Using RB test mode is attractive to device manufacturers because it does not require extra software to control the UE. In this type of call connection, the radio bearer (within the 8960) essentially controls the UE during test.

A.9.1.1 Configure 8960

1. Press **Operating Mode (F1)**, select **Cell Off** operating mode.

Call Setup Screen									
Call Control	Active Cell Operating Mode						Call Params		
Operating Mode	UE Information						Cell Power		
Cell Off	IMSI:		Power Class:		Detected PRACH Sig: ----		-75.00		
	INEI(SV):		(--)				dBm/3.84 MHz		
	Called Party Number:						Channel Type		
	UE Expected Open Loop Transmit Power						12.2k RNC		
	Init PRACH TX Pow: -22.70 dBm		Init DPCCH TX Pow: -11.55 dBm				Paging Service		
Originate Call	Current Service Type						RB Test Mode		
	None								
Paging Parameters	Call Processing Status						HSPA Parameters		
	RRC State:		Operating Mode		Over State: Off				
	MM Status:		Active Cell		Mode State: Off				
	GMM State:		FDD Test		Offset: 0 chips				
Handovers	HSUPA In CH						34.121 Preset Call Configs		
	UE Rep E-DCH		Cell Off		DSCH Cat: 14				
	Last Happy Bit				Ratio: ---- %				
	Throughput:				---- kbps				
Clear UE Info	ACKs Transmitted:				Transmitted: ----		Channel (UARFCN) Params		
	Background		Cell Off		Sys Type: UTRA FDD				
					Logging: No Conn				
1 of 5			IntRef		Offset		1 of 3		

2. Set the **Channel type** to **12.2k + HSDPA**.

3. Set the downlink channel code. In order to achieve the 42 Mbps maximum downlink throughput, you have to set up 15 HS-PDSCHs which will possibly cause a code collision.

To easily configure the downlink 15 HS-PDSCH for a maximum throughput, use the code preset to configure the code channels for both the serving cell and the secondary serving cell.

Select **Call Control 2 of 6 -> Generator Info (F3) -> Downlink Channel Configs (F4) -> DL Chan code Preset Configs (F5)**, choose **34.121 Tables E.6.2.3,4 (HSDPA 15 HS-PDSCHs)**.

Set the **Conn S-CCPCH Cfg** to **Off** to avoid the code collision.

To see the channel code allocation for the serving cell and the secondary serving cell, select **Additional Gen Info Screens (F1) -> DC-HSDPA DL Code Chan Info (F4)**.

Call Setup Screen											
Screen Ctrl	DC-HSDPA DL Code Channel Information								Call Parms		
DL Code Channel Info Screen	Serving Cell Primary Scrambling Code: 0								Cell Power		
	Secondary Serving Cell Primary Scrambling Code: 2								-75.00		
Generated Power Info Screen	Channel	Serving Cell DL Chan Info				Sec Cell DL Chan Info				dBm/3.84 MHz	
	Channel	Level (dB)	Current	Desired	OVSF	Chan Code	Level (dB)	Current	Desired	OVSF	Chan Code
OCNS Info Screen	CPICH:	Off	-3.30	256	0	Off	Off	256	0	Channel Type	
	P-CCPCH/SCH:	Off	-5.30	256	1	Off	Off	256	1	12.2k + HSDPA	
DC-HSDPA DL Code Chan Info	S-CCPCH:	Off	-10.30	64	2	Off	Off	256	2	Paging Service	
	PICH:	Off	-8.30	256	2	Off	Off	256	2	RB Test Mode	
Return	AICH:	Off	-9.90	256	3					HSPA Parameters	
	(F-)DPCH:	Off	Off	128	7					34.121 Preset Call Configs	
Return	E-AGCH:	Off	Off	256	42					Channel (UARFCN) Parms	
	E-HICH:	Off	Off	128	22					1 of 3	
Return	E-RGCH:	Off	Off	128	22						
	HS-SCCH 1:	Off	Off	128	2	Off	Off	128	2		
Return	HS-SCCH 2:	Off	Off	128	3	Off	Off	128	3		
	HS-SCCH 3:										
Return	HS-SCCH 4:										
	HS-PDSCHs:	Off	Off	16	1-15	Off	Off	16	1-15		
Return	Comp OCNS:	Off	Off	128	WCDMA	Off	Off	128	HSDPA		
Return	Cell Off								Sys Type: UTRA FDD		
	DBUS-INT								Logging: No Conn		
Return	IntRef								Offset		
Return											

4. Configure DC-HSDPA parameters to achieve the Maximum Downlink Data Rate:

First of all, you must know the maximum data rate of the device under test according to its category and the key factors to achieve the maximum data rate. In this lab, you use a category 24 device whose maximum data rate is 42 Mbps when DC-HSDPA is configured.

a) Set up the HSDPA RB Test Mode Parameters

Path: Call Parms 1 of 3 -> HSPA Parameters (F10) -> HSDPA Parameters (F10) -> HSDPA RB Test Mode Setup (F8) -> HSDPA RB Test Mode Settings (F8).

- RB Test HS-DSCH Configuration Type = User Defined
- RB Test User Defined HS-DSCH MAC entity = MAC-ehs (Note 1)
- RB Test User Defined HARQ Processes = 6 (Note 2)
- RB Test User Defined UE IR Buffer Allocation = Implicit
- RB Test User Defined DC-HSDPA State = On
- RB Test Mode DC-HSDPA DPCH Loopback State = On

Note 1: DC-HSDPA requires MAC-ehs. You must set the MAC entity to MAC-ehs before setting the DC-HSDPA state)

Note 2: To restrict the amount of soft memory that can be allocated to a single HARQ process (and thus limit the amount of data that has to be transferred across the UE's internal data buses) the specifications require that when setting up a DC-HSDPA call with the implicit HARQ memory partitioning the network must configure 6, 7, or 8 HARQ processes per cell. For the explicit HARQ memory partitioning case, the number of HARQ processes can be 1 through 8, but the memory size for each HARQ process cannot be greater than the number of soft channel bits for an implicit memory partitioning with 6 processes per HS-DSCH channel.

b) Set up the Serving Cell Parameters

Path: F10

- RB Test User Defined 64QAM State =On
- RB Test User Defined Active HS-PDSCHs =15
- RB Test User Def Transport Block Size Index =62
- RB Test User Defined Modulation Type =64QAM
- RB Test User Defined Inter-TTI Interval =1

c) Set up the Secondary Serving Cell Parameters

Path: **F11**

- **RB Test User Def Secondary Cell 64QAM State =On**
- **RBTM User Def Sec Cell Active HS-PDSCHs = 15**
- **RBTM User Def Sec Cell TB Size Index = 62**
- **RBTM User Def Sec Cell Modulation Type =64QAM**
- **RBTM User Def Sec Cell Inter-TTI Interval = 1**

d) Set the **Secondary Serving Cell Power (dBm/3.84 MHz)** to **-25 dBm/3.84 MHz**

Path: Return (**F12**) -> HSDPA Parms 2 of 2 -> Secondary Serv Cell Parms (**F10**)

e) Set the **Cell power** to **-25 dBm/3.84 MHz**

Path: **CALL SETUP** -> **F7**

f) Set the HSDPA Conn DL Channel Levels

Path: **CALL SETUP** -> Call Control 2 of 6 -> Generator Info (**F3**) ->Downlink Channel Levels (**F3**) -> Connected DL Channel Levels (**F3**) -> **F3**

- **HSDPA Cell 1 Connected CPICH Level = -8**
- **HSDPA Cell 1 Connected P-CCPCH/SCH Level = -20**
- **HSDPA Cell 1 Connected PICH Level = off**
- **HSDPA Cell 1 Connected DPCH Level = -30**
- **HSDPA Cell 1 Connected HS-PDSCH Level (Sum) = -1 dBm**
- **HSDPA Cell 1 Connected HS-SCCH 1 to 4 Level = -20,-20,off,off**
- **Secondary Cell HSDPA Conn CPICH Level = -8**
- **Secondary Cell HSDPA Conn PCCPCH/SCH Level = -20**
- **Secondary Cell HSDPA Conn PICH Level = off**
- **Secondary Cell HSDPA Conn HS-PDSCHs Lvl (Sum) = -1 dBm**
- **Secondary Cell HSDPA Conn HS-SCCH 1 to 4 Level = -20,-20,off,off**

5. Set the **Operating Mode (F1)** to **Active Cell**.

A.9.1.2. Power on the UE and Set up the Connection

Power on the device, and then wait for it to camp on 8960. You should be able to see the following screen.

Call Setup Screen									
Call Control		Active Cell Operating Mode						Call Params	
Operating Mode		UE Information						Cell Power	
Active Cell		IMSI: 001012345678901		Power Class: 4		Detected PRACH Sig: 0		-25.00 dBm/3.84 MHz	
		IMEI(SV): 352358040214948 (--)						Channel Type	
		Called Party Number:						12.2k + HSDPA	
		UE Expected Open Loop Transmit Power						Paging Service	
		Init PRACH TX Pou: -60.00 dBm		Init DPCH TX Pou: -11.55 dBm				RB Test Mode	
Originate Call		Current Service Type							
		None							
Paging Parameters		Call Processing Status						HSPA Parameters	
		RRC State: Idle		Soft Handover State: Off		Compressed Mode State: Off			
		MM Status: None		Cur DPCH Offset: 0 chips					
		GMM State: Attached							
Handovers		HSUPA Information			HSDPA Information			34,121 Preset Call Configs	
		Rep EDCH Cat/Ext: 6/Unrep			Cur UE HS-DSCH Cat: 24				
		Last Happy Bit: None			Block Error Ratio: ---- %				
		Throughput: ---- kbps			Throughput: ---- kbps				
Clear UE Info		ACKs Transmitted: ----			Blocks Transmitted: ----			Channel (UARFCN) Params	
		Active Cell		Sys Type: UTRA FDD					
		Idle		Logging: No Conn					
1 of 6		DBUS-INT		IntRef		Offset		1 of 3	

The UE reports HSDPA categories to 8960, which represents its maximum data rate capability. DC-HSDPA requires UE categories 21 to 24.

The GMM state must be **Attached**, otherwise you cannot establish a HSDPA connection.

2. Originate the Connection

a) Now, Originate an RB Test call with DC-HSDPA by pressing „F3” from the main Call Setup screen.

b) After a connection is set up, you will be able to see the throughput from the HSDPA Information window. Press the **Measurement Reset** key to reset the calculation.

Call Setup Screen									
Call Control		Active Cell Operating Mode						Call Params	
Operating Mode		UE Information						Cell Power	
Active Cell		IMSI: 001012345678901		Power Class: 4		Detected PRACH Sig: 0		-25.00 dBm/3.84 MHz	
		IMEI(SV): 352358040214948 (--)						Channel Type	
		Called Party Number:						12.2k + HSDPA	
		UE Expected Open Loop Transmit Power						Paging Service	
		Init PRACH TX Pou: -60.00 dBm		Init DPCH TX Pou: -11.55 dBm				RB Test Mode	
End Call		Current Service Type							
		RB Test Mode - HSDPA							
Paging Parameters		Call Processing Status						HSPA Parameters	
		RRC State: CELL_DCH		Soft Handover State: Off		Compressed Mode State: Off			
		MM Status: None		Cur DPCH Offset: 0 chips					
		GMM State: Attached							
Handovers		HSUPA Information			HSDPA Information			34,121 Preset Call Configs	
		Rep EDCH Cat/Ext: 6/Unrep			Cur UE HS-DSCH Cat: 24				
		Last Happy Bit: None			Block Error Ratio: 0 %				
		Throughput: ---- kbps			Throughput: 42101 kbps				
Clear UE Info		ACKs Transmitted: ----			Blocks Transmitted: 115500			Channel (UARFCN) Params	
		Active Cell		Sys Type: UTRA FDD					
		Connected		Logging: No Conn					
1 of 6		DBUS-INT		IntRef		Offset		1 of 3	

Now you can also check the connected DC-HSDPA downlink channel levels.

Path: CALL SETUP->Call Control 2 of 6 -> Generator Info (F3) -> Additional Gen Info Screens (F1) ->DC-HSDPA DL Code Chan Info (F4).

Call Setup Screen										
Screen Ctrl	DC-HSDPA DL Code Channel Information								Call Parns	
DL Code Channel Info Screen	Serving Cell Primary Scrambling Code: 0								Cell Power	
	Secondary Serving Cell Primary Scrambling Code: 2								-25.00	
Generated Power Info Screen	Channel	Serving Cell DL Chan Info				Sec Cell DL Chan Info				dBm/3.84 MHz
	Channel	Level (dB)		Chan		Level (dB)		Chan		Channel Type
OCNS Info Screen	CPICH:	-8.00	-8.00	256	0	-8.00	-8.00	256	0	12.2k + HSDPA
	P-CCPCH/SCH:	-20.00	-20.00	256	1	-20.00	-20.00	256	1	Paging Service
DC-HSDPA DL Code Chan Info	S-CCPCH:	Off	Off	64	2					RB Test Mode
	PICH:	Off	Off	256	2	Off	Off	256	2	
Return	AICH:									
	(F-)DPCH:	-30.00	-30.00	128	7					HSPA Parameters
	E-AGCH:	Off	Off	256	42					
	E-HICH:	Off	Off	128	22					
	E-RGCH:	Off	Off	128	22					
	HS-SCCH 1:	-20.00	-20.00	128	2	-20.00	-20.00	128	2	34.121 Preset Call Configs
	HS-SCCH 2:	-20.00	-20.00	128	3	-20.00	-20.00	128	3	
	HS-SCCH 3:									
	HS-SCCH 4:									
	HS-PDSCHs:	-1.00	-1.00	16	1-15	-1.00	-1.00	16	1-15	Channel (UARFCH) Parns
	Comp OCNS:	-17.31	-17.31	128	HSDPA	-17.65	-17.65	128	HSDPA	
	Active Cell Connected				Sys Type: UTRA FDD					
					Logging: No Conn					
	DBUS-INT		IntRef	Offset					1 of 3	

A.9.2. Activate/ Deactivate the Secondary Serving Cell

Once a DC-HSDPA connection is established, 8960 can control the UE to start or stop monitoring the secondary serving cell using HS-SCCH orders. The HS-SCCH orders can be sent on either the serving or secondary serving cell.

A.9.2.1 Deactivate the Secondary Serving Cell

1. Setup the Deactivate Secondary Cell Parameter

Path: CALL SETUP->Call Control 6 of 6 -> HS-SCCH Order (F3) -> Deactivate Secondary Cell (F2)

In this lab you set it to deactivate the secondary serving cell from the serving cell.

- Deactivate Secondary Cell HS-SCCH Order From = Serving Cell

Press **Send Deactivate Secondary Cell (F5)**

Press Measurement Reset key and see the throughput has dropped to 21 Mbps or so, like the figure below:

Call Setup Screen						
Call Control	Active Cell Operating Mode					Call Parm
Operating Mode	UE Information INSI: 001012345678901 Power Class: 4 INEI(SU):352358040214948(--) Detected PRACH Sig: 0 Called Party Number:					Cell Power
Active Cell	UE Expected Open Loop Transmit Power Init PRACH TX Pou: -60.00 dBm Init DPCCH TX Pou: -11.55 dBm					-25.00
						dBm/3.84 MHz
						Channel Type
						12.2k + HSDPA
						Paging Service
End Call	Current Service Type					RB Test Mode
	RB Test Mode - HSDPA					
	Call Processing Status					
Paging Parameters	RRC State: CELL_DCH		Soft Handover State: Off		HSPA Parameters	
	MM Status: None		Compressed Mode State: Off			
	GMM State: Attached		Cur DPCCH Offset: 0 chips			
Handovers	HSUPA Information		HSDPA Information		34.121 Preset Call Configs	
	Rep EDCH Cat/Ext: 6/Unrep		Cur UE HS-DSCH Cat: 24			
	Last Happy Bit: None		Block Error Ratio: 0 %			
	Throughput: ---- kbps		Throughput: 21088 kbps			
Clear UE Info	ACKs Transmitted: ----		Blocks Transmitted: 35000		Channel (UARFCN) Parm	
			Active Cell		Sys Type: UTRA FDD	
			Connected		Logging: No Conn	
1 of 6	DBUS-INT	IntRef	Offset			1 of 3

You can see more on the DC-HSDPA Information screen.

Path: CALL SETUP->Call Control 2 of 6 -> Additional Screens (F1) -> HSDPA Information (F4) -> DC-HSDPA Information (F4).

Call Setup Screen																																																										
Screen Ctrl	DC-HSDPA Information					Call Parm																																																				
Channel (UARFCN) Info	Secondary Serving Cell Status Current Secondary Serving Cell Status: Configured-Inactive					Cell Power																																																				
						-25.00																																																				
						dBm/3.84 MHz																																																				
HSPA Information	DC-HSDPA Information					Channel Type																																																				
	<table border="1"> <thead> <tr> <th></th> <th>Summary</th> <th>Serving Cell</th> <th>Secondary Serving Cell</th> </tr> </thead> <tbody> <tr> <td>Block Error Ratio:</td> <td>0 %</td> <td>0 %</td> <td>---- %</td> </tr> <tr> <td>Throughput (kbps):</td> <td>21082</td> <td>21082</td> <td>0</td> </tr> <tr> <td>Blocks Transmitted:</td> <td>66000</td> <td>66000</td> <td>0</td> </tr> <tr> <td>ACKs Received:</td> <td>65958</td> <td>65958</td> <td>0</td> </tr> <tr> <td>NACKs Received:</td> <td>42</td> <td>42</td> <td>0</td> </tr> <tr> <td>statDTXs Received:</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Count of Rep CQI Lim:</td> <td>----</td> <td>----</td> <td>----</td> </tr> <tr> <td>Last Received CQI:</td> <td></td> <td>30</td> <td>30</td> </tr> <tr> <td>Max Allowed CQI:</td> <td></td> <td>----</td> <td>----</td> </tr> <tr> <td>Test Mode User Def TBS:</td> <td></td> <td>42192</td> <td>42192</td> </tr> <tr> <td>PS Data User Def TBS:</td> <td></td> <td>7298</td> <td>7298</td> </tr> <tr> <td>Last Sig Meas Pur Offs (dB):</td> <td></td> <td>6.0</td> <td>6.0</td> </tr> </tbody> </table>						Summary	Serving Cell	Secondary Serving Cell	Block Error Ratio:	0 %	0 %	---- %	Throughput (kbps):	21082	21082	0	Blocks Transmitted:	66000	66000	0	ACKs Received:	65958	65958	0	NACKs Received:	42	42	0	statDTXs Received:	0	0	0	Count of Rep CQI Lim:	----	----	----	Last Received CQI:		30	30	Max Allowed CQI:		----	----	Test Mode User Def TBS:		42192	42192	PS Data User Def TBS:		7298	7298	Last Sig Meas Pur Offs (dB):		6.0	6.0	Paging Service
	Summary	Serving Cell	Secondary Serving Cell																																																							
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HSDPA Information						HSPA Parameters																																																				
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Return						Channel (UARFCN) Parm																																																				
			Active Cell		Sys Type: UTRA FDD																																																					
			Connected		Logging: No Conn																																																					
1 of 2	DBUS-INT	IntRef	Offset			1 of 3																																																				

A.9.2.2 Re-activate the Secondary Serving Cell

Now you can activate the secondary serving cell by pressing back to the HS-SCCH Order menu.

Path: CALL SETUP->Call Control 6 of 6 -> HS-SCCH Order (F3)

Press **Send Activate Secondary Cell (F1)**.

Press the Measurement Reset key and see the throughput has increased to 42 Mbps. When you look at the DC-HSDPA Information screen, you can see the secondary serving cell is set up again.

Call Setup Screen																																																												
Screen Ctrl	DC-HSDPA Information						Call Params																																																					
Channel (UARFCN) Info	Secondary Serving Cell Status						Cell Power																																																					
	Current Secondary Serving Cell Status: Configured-Active						-25.00 dBm/3.84 MHz																																																					
HSPA Information	DC-HSDPA Information						Channel Type																																																					
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	Summary	Serving Cell	Secondary Serving Cell																																																									
Block Error Ratio:	0 %	0 %	0 %																																																									
Throughput (kbps):	41996	21064	20941																																																									
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ACKs Received:	10949	5991	5956																																																									
NACKs Received:	51	9	44																																																									
statDTXs Received:	0	0	0																																																									
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Max Allowed CQI:		----	----																																																									
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Clear UE Info							34.121 Preset Call Configs ▾																																																					
Return							Channel (UARFCN) Params																																																					
	Active Cell				Sys Type: UTRA FDD																																																							
	Connected				Logging: No Conn																																																							
1 of 2		DBUS-INT		IntRef	Offset				1 of 3																																																			

When DC-HSDPA is active, the HBLER measurement can also be used to perform receiver testing. 3GPP TS 34.121-1 sections 6.3C and 6.3D are supported and can be set up and tested as described in an appendix in another document, DC-HSDPA User Guide.