

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 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 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 and 5.0 GHz dipoles.

The applicable verification normalised to 1 Watt.

System Check 750 Head Date: 29/05/2014 Validation Dipole and Serial Number: D750V3; SN: 1011								
Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	23.0 °C	24.0 °C	ϵ_r	41.96	41.21	-1.79	5.00
				σ	0.89	0.87	-2.72	5.00
				1g SAR	8.48	8.36	-1.42	5.00
				10g SAR	5.57	5.56	-0.18	5.00

System Check 750 Body Date: 29/05/2014 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	24.0 °C	ϵ_r	55.55	53.07	-4.47	5.00
				σ	0.96	0.95	-1.16	5.00
				1g SAR	8.84	8.76	-0.90	5.00
				10g SAR	5.84	5.92	1.37	5.00

System Check 900 Head

Date: 27/05/2014

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	21.2°C	ϵ_r	41.50	41.73	0.55	5.00
				σ	0.97	1.00	2.73	5.00
				1g SAR	10.50	10.20	-2.86	5.00
				10g SAR	6.69	6.52	-2.54	5.00

System Check 900 Body

Date: 27/05/2014

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	22.2°C	ϵ_r	55.00	55.04	0.07	5.00
				σ	1.05	1.03	-2.38	5.00
				1g SAR	10.40	10.0	-3.85	5.00
				10g SAR	6.73	6.60	-1.93	5.00

System Check 1800 Head

Date: 27/05/2014

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

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	24.0 °C	23.0 °C	ϵ_r	40.00	40.07	0.18	5.00
				σ	1.40	1.38	-1.50	5.00
				1g SAR	37.30	36.36	-2.52	5.00
				10g SAR	19.70	19.52	-0.91	5.00

System Check 1800 Body

Date: 27/05/2014

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

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0 °C	25.0 °C	ϵ_r	53.30	51.68	-3.04	5.00
				σ	1.52	1.59	4.47	5.00
				1g SAR	36.50	36.36	-0.38	5.00
				10g SAR	19.50	19.52	-0.10	5.00

System Check 1900 Head

Date: 27/05/2014

Validation Dipole and Serial Number: D1900V2: SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	22.3 °C	24.0 °C	ϵ_r	40.00	40.91	2.27	5.00
				σ	1.40	1.46	4.35	5.00
				1g SAR	39.80	39.04	-1.91	5.00
				10g SAR	20.70	19.96	-3.57	5.00

System Check 1900 Body

Date: 27/05/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0 °C	23.5 °C	ϵ_r	53.30	51.65	-3.10	5.00
				σ	1.52	1.558	2.36	5.00
				1g SAR	40.20	39.88	-.08	5.00
				10g SAR	21.10	20.96	-0.66	5.00

Date: 29/05/2014

Validation Dipole and Serial Number: D1900V2: SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.2°C	21.2°C	ϵ_r	53.30	53.31	0.02	5.00
				σ	1.52	1.56	2.71	5.00
				1g SAR	40.20	41.60	3.48	5.00
				10g SAR	21.10	21.92	3.89	5.00

System Check 2450 Head

Date: 30/05/2014

Validation Dipole and Serial Number: D2440V2: SN: 701

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	24.0°C	24.0 °C	ϵ_r	39.20	38.06	-2.91	5.00
				σ	1.80	1.82	1.10	5.00
				1g SAR	53.40	51.20	-4.12	5.00
				10g SAR	24.70	23.52	-4.78	5.00

System Check 2450 Body

Date: 02/06/2014

Validation Dipole and Serial Number: D2440V2: SN: 701

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	24.0°C	24.0°C	ϵ_r	52.70	52.78	0.15	5.00
				σ	1.95	1.99	2.12	5.00
				1g SAR	51.40	50.80	-1.17	5.00
				10g SAR	23.90	23.10	-3.10	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	22.8°C	ϵ_r	36.00	34.24	-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	22.3	22.10	3.59	5.00

Date: 08/07/2014

Validation Dipole and Serial Number: D5GHZV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5200	23.0°C	22.0°C	ϵ_r	35.99	35.25	-2.06	5.00
				σ	4.66	4.73	1.55	5.00
				1g SAR	77.40	76.50	-1.16	5.00
				10g SAR	22.3	22.00	-1.35	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	24.0°C	23.5°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	24.10	23.50	2.55	5.00

Date 06/07/2014

Validation dipole and Serial Number: D5GHZV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5500	23.0°C	22.0°C	ϵ_r	35.60	34.82	-2.19	5.00
				σ	4.96	5.07	2.20	5.00
				1g SAR	84.80	83.10	-2.00	5.00
				10g SAR	24.1	23.60	-2.07	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

Date 08/07/2014

Validation dipole and Serial Number: D5GHzV2 SN: 1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	5800	23.0°C	22.0°C	ϵ_r	35.30	34.37	-2.63	5.00
				σ	5.27	5.42	2.78	5.00
				1g SAR	76.90	79.40	3.25	5.00
				10g SAR	22.00	22.70	3.18	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	24.0°C	22.8°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	24.0°C	22.8.0°C	ϵ_r	49.01	48.11	-1.84	5.00
				σ	5.30	5.14	-2.98	5.00
				1g SAR	73.10	72.2	-1.23	5.00
				10g SAR	20.40	20.30	-0.49	5.00

Date: 08/07/2014

Validation Dipole and Serial Number: D5GHzV2 SN:1016

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5200	24.0°C	24.0°C	ϵ_r	49.01	48.44	-1.16	5.00
				σ	5.30	5.29	-0.14	5.00
				1g SAR	73.10	71.50	-2.19	5.00
				10g SAR	20.40	20.50	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	24.0°C	23.5.0°C	ϵ_r	48.60	48.42	-0.37	5.00
				σ	5.65	5.74	1.62	5.00
				1g SAR	79.0	75.7	-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	24.0°C	23.5.0°C	ϵ_r	48.60	47.09	-3.11	5.00
				σ	5.65	5.59	-1.14	5.00
				1g SAR	79.0	81.0	2.53	5.00
				10g SAR	21.9	22.8	4.11	5.00

Date: 08/07/2014**Validation Dipole and Serial Number: D5GHzV2 SN:1016**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5500	24.0°C	24.0°C	ϵ_r	48.60	47.65	-1.95	5.00
				σ	5.65	5.81	2.81	5.00
				1g SAR	79.00	78.50	-0.63	5.00
				10g SAR	21.9	22.20	1.37	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	24.0°C	23.5°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	24.0°C	23.5°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

Date: 08/07/2014**Validation Dipole and Serial Number: D5GHzV2 SN:1016**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	5800	24.0°C	24.0°C	ϵ_r	48.20	47.20	-2.07	5.00
				σ	6.00	6.29	4.83	5.00
				1g SAR	73.20	74.90	2.32	5.00
				10g SAR	20.20	20.60	1.98	5.00

APPENDIX 7. MEASUREMENT UNCERTAINTY TABLE

Measurement uncertainty tables for technologies tested.

A.7.3. Uncertainty -GSM 850 / UMTS FDD 5 / LTE Band 12 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	2.510	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.7.4. Uncertainty Rate-GSM / GPRS / EDGE 850 / UMTS FDD 5 / LTE Band 12 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	2.510	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.7.5. Uncertainty - 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.7.6. 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.7.7. 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.7.8. 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.7.9. Uncertainty -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.7.10. Uncertainty -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.7.11. 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.7.12. Uncertainty -Wi-Fi 5GHz 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	6.550	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(SV): Power Class:						Cell Power		
Active Cell							-35.00		
							dBm/3.84 MHz		
							Channel Type		
							12.2k RMC		
							Paging Service		
Originate Call	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm						RB Test Mode		
Paging Parameters	Call Processing Status Current Service Type: None MM Status: None GMM State: None Current DPCCH Offset: 0 chips						HSPA Parameters		
Handovers	HSUPA Information Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----						HSDPA Information Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----		
							34.121 Preset Call Configs		
Clear UE Info							Channel (UARFCN) Params		
	Active Cell						Sys Type: UTRA FDD		
	Idle								
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:															
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm							HSDPA RB Test Mode Setup								
	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	UE Information IMSI: IMEI(SV): (---) Power Class:							All Ones		
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm							RLC Reestablish		
								Auto		
Originate Call	Call Processing Status Current Service Type: None RIN Status: None GMIN State: None Current DPCCH Offset: 0 chips							Call Limit State		
Paging Parameters ▾								Off		
Handovers	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		
Clear UE Info								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 Params	
Close Menu	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 DPCCH TX Power: -11.55 dBm						UL CL Power Ctrl Parameters		
	UL CL Power Ctrl Parameters						Value		
	UL CL Power Ctrl Mode						All Up bits		
	UL CL Power Ctrl Algorithm						Two		
	UL CL Power Ctrl Stepsize						1 dB		
							Send Step Up TPC Bit Pattern		
							Send Step Down TPC Bit Pattern		
							Receiver Control		
							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 Params	
Additional Screens	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 DPCCH TX Power: -11.55 dBm						Channel Type 12.2k RMC		
Cell Parameters	Cell Parameters						Value		
	PS Domain Information						Absent		
Generator Info	Uplink Parameters						HSPA Parameters		
	UE Rep Params						34.121 Preset Call Configs		
Close Menu	Cell Identity						1		
	Channel (UARFCN) Params						1 of 3		
Active Cell Idle						Sys Type: UTRA FDD			
2 of 5						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 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						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	Uplink Parameters 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						34,121 Preset Call Configs		
							Channel (UARFCN) Parm		
Close Menu	Active Cell Idle Sys Type: UTRA FDD						1 of 3		
							1 of 3		
2 of 5	IntRef						1 of 3		

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 Uplink DTCH RNC CRC Presence: Present Uplink Dummy DCCH Data: Off UE Loopback Type: Type 1 Asymmetric RNC Loopback Messaging: Close/Open Asymmetric RNC CN Domain: CS Domain						12.2k RNC		
							Paging Service		
Voice Call	Value Uplink DTCH RNC CRC Presence: Present Uplink Dummy DCCH Data: Off UE Loopback Type: Type 1 Asymmetric RNC Loopback Messaging: Close/Open Asymmetric RNC CN Domain: CS Domain						RB Test Mode		
							HSPA Parameters		
Close Menu	Uplink Parameters 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						34,121 Preset Call Configs		
							Channel (UARFCN) Parm		
	Active Cell Idle Sys Type: UTRA FDD						1 of 3		
							1 of 3		
3 of 5	IntRef						1 of 3		

Figure 7: RB Test Mode Settings

- 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

- 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.
- 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).
- 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)	β_c/β_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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

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

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

Sub-test 5 Setup for Release 6 HSUPA

Sub-test	β_c	β_d	B_d (SF)	β_c/β_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	$B_{al1}: 47/15$ $B_{al2}: 47/15$	4	1	2.0	1.0	15	92
4	2/15	15/15	64	2/15	2/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	24/15	24/15	134/15	4	1	1.0	0.0	21	81

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

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $B_{hs}/\beta_c = 24/15$. 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 β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ 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 MM 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/B: --- Last received: --- Throughput: --- kbps Acks Transmitted: ---							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 Params	
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(MMAX): 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 Meas								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 IMSI: IMEI(SV): (---) Power Class:							AG Node																																									
Active Cell								Single Shot																																									
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm							Single Shot AG 31: $6(168/15)^2$																																									
Originate Call								Send Single Shot Absolute Grant																																									
	Call Processing Status Current Service Type: None MM Status: None GMM State: None Current DPCH Offset: 0 chips							RB Setup AG 37: $6(168/15)^2$																																									
Paging Parameters ▾																																																	
	<table border="1"> <thead> <tr> <th colspan="4">HSUPA Information</th> <th colspan="4">HSDPA Information</th> </tr> </thead> <tbody> <tr> <td colspan="4">Rep EDCH Cat/Ext: Unrep/Unrep</td> <td colspan="4">Cur UE HS-DSCH Cat: ----</td> </tr> <tr> <td colspan="4">Last received E-TFCI: ----</td> <td colspan="4">Block Error Ratio: ---- %</td> </tr> <tr> <td colspan="4">Throughput: ---- kbps</td> <td colspan="4">Throughput: ---- kbps</td> </tr> <tr> <td colspan="4">Acks Transmitted: ----</td> <td colspan="4">Blocks Transmitted: ----</td> </tr> </tbody> </table>							HSUPA Information				HSDPA Information				Rep EDCH Cat/Ext: Unrep/Unrep				Cur UE HS-DSCH Cat: ----				Last received E-TFCI: ----				Block Error Ratio: ---- %				Throughput: ---- kbps				Throughput: ---- kbps				Acks Transmitted: ----				Blocks Transmitted: ----				AG Pattern Parameters ▾	
HSUPA Information								HSDPA Information																																									
Rep EDCH Cat/Ext: Unrep/Unrep				Cur UE HS-DSCH Cat: ----																																													
Last received E-TFCI: ----				Block Error Ratio: ---- %																																													
Throughput: ---- kbps				Throughput: ---- kbps																																													
Acks Transmitted: ----				Blocks Transmitted: ----																																													
Handovers								Return																																									
Clear UE Info																																																	
				Active Cell Idle			Sys Type: UTRA FDD																																										
1 of 5				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 Parms
Operating Mode	UE Information INSI: Power Class: IMEI(SV): Detected PRACH Sig: Called Party Number: UE Expected Open Loop Transmit Power Init PRACH TX Pou: -22.70 dBm Init DPCCCH TX Pou: -11.55 dBm Current Service Type None				Cell Power
Cell Off					-75.00
					dBm/3.84 MHz
					Channel Type
					12.2k RMC
Originate Call					Paging Service
					RB Test Mode
Paging Parameters	Call Processing Status Operating Mode RRC State: MM Status: GMN Status: Over State: Off Node State: Off Offset: 0 chips				HSPA Parameters
Handovers	HSUPA In CH UE Rep E-DCH Last Happy Bit Throughput: ACKs Transmitted: Cell Off Information DSCH Cat: 14 Ratio: ---- % ---- kbps Transmitted: ----				34.121 Preset Call Configs
Clear UE Info					Channel (UARFCN) Parms
	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 Parm		
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	QVSF	Chan Code	Level (dB) Current	Desired	QVSF	Chan Code	Channel Type	
OCNS Info Screen	CPICH:	Off	-3.30	256	0	Off	Off	256	0	12.2k + HSDPA	
	P-CCPCH/SCH:	Off	-5.30	256	1	Off	Off	256	1	Paging Service	
DC-HSDPA DL Code Chan Info	S-CCPCH:	Off	-10.30	64	2					RB Test Mode	
	PICH:	Off	-8.30	256	2	Off	Off	256	2		
Return	AICH:	Off	-9.90	256	3						
	(F-)DPCH:	Off	Off	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:	Off	Off	128	2	Off	Off	128	2	34.121 Preset Call Configs	
	HS-SCCH 2:	Off	Off	128	3	Off	Off	128	3		
	HS-SCCH 3:										
	HS-SCCH 4:										
	HS-PDSCHs:	Off	Off	16	1-15	Off	Off	16	1-15	Channel (UARFCN) Parm	
	Comp OCNS:	Off	Off	128	WCDMA	Off	Off	128	HSDPA		
	Cell Off								Sys Type: UTRA FDD		
									Logging: No Conn		
	DBUS-INT				IntRef	Offset				1 of 3	

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 Parm 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 IMEI(SV):352358040214948(--)				Power Class: 4 Detected PRACH Sig: 0		-25.00 dBm/3.84 MHz	
		Called Party Number:						Channel Type	
		UE Expected Open Loop Transmit Power						12.2k + HSDPA	
		Init PRACH TX Pou: -60.00 dBm				Init DPCCH TX Pou: -11.55 dBm		Paging Service	
Originate Call		Current Service Type						RB Test Mode	
		None							
Paging Parameters ▾		Call Processing Status						HSPA Parameters	
		RRC State: Idle		Soft Handover State: Off					
		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: ---- %			
		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 IMEI(SV):352358040214948(--)				Power Class: 4 Detected PRACH Sig: 0		-25.00 dBm/3.84 MHz	
		Called Party Number:						Channel Type	
		UE Expected Open Loop Transmit Power						12.2k + HSDPA	
		Init PRACH TX Pou: -60.00 dBm				Init DPCCH TX Pou: -11.55 dBm		Paging Service	
End Call		Current Service Type						RB Test Mode	
		RB Test Mode - HSDPA							
Paging Parameters ▾		Call Processing Status						HSPA Parameters	
		RRC State: CELL_DCH		Soft Handover State: Off					
		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: 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 (UARFCN) 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							Cell Power	
Active Cell	INSI: 001012345678901 Power Class: 4 INEI(SU):352358040214948(--) Detected PRACH Sig: 0 Called Party Number:							-25.00 dBm/3.84 MHz	
	UE Expected Open Loop Transmit Power							Channel Type	
	Init PRACH TX Pou: -60.00 dBm Init DPCH TX Pou: -11.55 dBm							12.2k + HSDPA	
End Call	Current Service Type							Paging Service	
	RB Test Mode - HSDPA							RB Test Mode	
Paging Parameters	Call Processing Status							HSPA Parameters	
	RRC State: CELL_DCH Soft Handover State: Off MM Status: None Compressed Mode State: Off GMM State: Attached Cur DPCH Offset: 0 chips							34.121 Preset Call Configs	
Handovers	HSDPA Information Rep EDCH Cat/Ext: 6/Unrep Last Happy Bit: None Throughput: ---- kbps ACKs Transmitted: ----							Channel (UARFCH) Parm	
	HSDPA Information Cur UE HS-DSCH Cat: 24 Block Error Ratio: 0 % Throughput: 21088 kbps Blocks Transmitted: 35000								
Clear UE Info	Active Cell Connected Sys Type: UTRA FDD 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 (UARFCH) Info	Secondary Serving Cell Status							Cell Power	
	Current Secondary Serving Cell Status: Configured-Inactive							-25.00	
HSPA Information	DC-HSDPA Information							Channel Type	
				Summary	Serving Cell	Secondary Serving Cell	12.2k + HSDPA		
E-TFCI Recording Information	Block Error Ratio:			0 %	0 %	---- %	Paging Service		
	Throughput (kbps):			21082	21082	0	RB Test Mode		
	Blocks Transmitted:			66000	66000	0			
	ACKs Received:			65958	65958	0			
	NACKs Received:			42	42	0			
HSDPA Information	statDTXs Received:			0	0	0	HSPA Parameters		
	Count of Rep CQI Lim:			----	----	----			
	Last Received CQI:				30	30			
Clear UE Info	Max Allowed CQI:				----	----	34.121 Preset Call Configs		
	Test Mode User Def TBS:				42192	42192			
	PS Data User Def TBS:				7298	7298			
	Last Sig Meas Pur Offs (dB):				6.0	6.0			
Return								Channel (UARFCH) 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 Parms	
Channel (UARFCN) Info	Secondary Serving Cell Status							Cell Power	
	Current Secondary Serving Cell Status: Configured-Active							-25.00	
HSPA Information	DC-HSDPA Information							dBm/3.84 MHz	
								Channel Type	
E-TFCI Recording Information								12.2k + HSDPA	
								Paging Service	
HSDPA Information								RB Test Mode	
Clear UE Info								HSPA Parameters	
Return								34.121 Preset Call Configs	
1 of 2								Channel (UARFCN) Parms	
		Active Cell				Sys Type: UTRA FDD			
		Connected				Logging: No Conn			
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.