

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 ± 2°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 ±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		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.7.5. 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		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	2.460	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		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	2.490	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		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	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		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	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		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	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		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	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 Parms	
Operating Mode		UE Information						Cell Power	
Active Cell		INSI: INEI(SU): (---) Power Class:						-35.00	
		UE Expected Open Loop Transmit Power						dBm/3.84 MHz	
		Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm						Channel Type	
Originate Call		Call Processing Status						12.2k RMC	
		Current Service Type: None MM Status: None MM State: None Current DPCH Offset: 0 chips						Paging Service	
Paging Parameters		HSDPA Information Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----						RB Test Mode	
		HSDPA Information Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----						HSPA Parameters	
Handovers		Active Cell Idle						34.121 Preset Call Configs	
		Sys Type: UTRA FDD						Channel (UARFCN) Parms	
Clear UE Info		IntRef							
1 of 5									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) Parms 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 Parms 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															
Close Menu	UE Information INSI: INEI(SU): (--) Power Class:		HSDPA RB Test Node Setup														
	UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm			UE Category Parameters ▾													
	<table border="1"> <thead> <tr> <th>HSDPA Uplink Parameters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>DeltaACK</td> <td>8</td> </tr> <tr> <td>DeltaNACK</td> <td>8</td> </tr> <tr> <td>DeltaCQI</td> <td>8</td> </tr> <tr> <td>Ack-Nack Repetition Factor</td> <td>1</td> </tr> <tr> <td>CQI Feedback Cycle (k)</td> <td>2 ms</td> </tr> <tr> <td>CQI Repetition Factor</td> <td>1</td> </tr> </tbody> </table>		HSDPA Uplink Parameters		Value	DeltaACK	8	DeltaNACK	8	DeltaCQI	8	Ack-Nack Repetition Factor	1	CQI Feedback Cycle (k)	2 ms	CQI Repetition Factor	1
	HSDPA Uplink Parameters	Value															
	DeltaACK	8															
	DeltaNACK	8															
	DeltaCQI	8															
	Ack-Nack Repetition Factor	1															
	CQI Feedback Cycle (k)	2 ms															
	CQI Repetition Factor	1															
		HSDPA Uplink Parameters ▾															
			Return														
Active Cell Idle		Sys Type: UTRA FDD															
IntRef		1 of 2															

Figure 2: HSDPA Parameters

- 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	UE Information INSI: INEI(SU): (--) Power Class:	DL DTCH Data	
Active Cell		All Ones	
Originate Call		UE Expected Open Loop Transmit Power Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm	RLC Reestablish
			Auto
Paging Parameters ▾		Call Processing Status Current Service Type: None RIN Status: None GMIN State: None Current DPCH Offset: 0 chips	Call Limit State
			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 Idle	Sys Type: UTRA FDD
1 of 5	IntRef	2 of 3	

Figure 3: DL DTCH Data Parms

Call Setup Screen									
Call Control		Active Cell Operating Mode						Call Parm	
Close Menu	UE Information IMSI: IMEI(SU): (--) 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			Value			Send Step Up TPC Bit Pattern		
	UL CL Power Ctrl Mode			All Up bits			Send Step Down TPC Bit Pattern		
	UL CL Power Ctrl Algorithm			Two			Receiver Control		
	UL CL Power Ctrl Step Size			1 dB					
		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	
Additional Screens	UE Information IMSI: IMEI(SU): (--) Power Class:						Cell Power -35.00 dBm/3.84 MHz		
	Cell Parameters	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	
Generator Info		Cell Parameters			Value			Paging Service RB Test Mode	
	Uplink Parameters	BCCH Update Page			Inhibit			HSPA Parameters	
UE Rep Info		PS Domain Information			Absent			34,121 Preset Call Configs	
	MCC (Mobile Country Code)			1					
	MNC (Mobile Network Code)			1					
	MNC (Mobile Network Code) Length			Auto					
Close Menu	LAC (Local Area Code)			1					
	RAC (Routing Area Code)			1					
	Cell Identity			1			Channel (UARFCH) Parm		
		Active Cell Idle			Sys Type: UTRA FDD				
2 of 5		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				Cell Power	
	INSI: INEI(SU): (--) Power Class:				-35.00	
Cell Parameters	UE Expected Open Loop Transmit Power				dBm/3.84 MHz	
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm				Channel Type	
Generator Info	Uplink Parameters				Paging Service	
	Value				RB Test Mode	
Uplink Parameters	PRACH Preambles			64	HSPA Parameters	
	PRACH Ramping Cycles(MMAX)			2	34,121 Preset Call Configs	
UE Rep Neas	Available Subchannels (Bit Mask)			000000000001	Channel (UARFCN) Parm	
	Uplink DPCCH Scrambling Code			0	1 of 3	
Close Menu	Uplink DPCCH Bc/Bd Control			Auto		
	Manual Uplink DPCCH Bc			8		
	Manual Uplink DPCCH Bd			15		
	Maximum Uplink Transmit Power Level			24 dBm		
	Active Cell Idle			Sys Type: UTRA FDD		
2 of 5			IntRef			

Figure 6: Uplink Parameters

- 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				Cell Power	
	INSI: INEI(SU): (--) Power Class:				-35.00	
	UE Expected Open Loop Transmit Power				dBm/3.84 MHz	
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm				Channel Type	
Voice Call	RB Test Mode Settings				Paging Service	
	Value				RB Test Mode	
	Uplink DTCH RMC CRC Presence			Present	HSPA Parameters	
	Uplink Dummy DCCH Data			Off	34,121 Preset Call Configs	
Close Menu	UE Loopback Type			Type 1	Channel (UARFCN) Parm	
	Asymmetric RMC Loopback Messaging			Close/Open	1 of 3	
	Asymmetric RMC CN Domain			CS Domain		
	Active Cell Idle			Sys Type: UTRA FDD		
3 of 5			IntRef			

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: $\Delta_{ACK}, \Delta_{NACK}$ 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: $\Delta_{ACK}, \Delta_{NACK}$ 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 5.1.g.

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				AG Node	
Active Cell	INSI: INEI(SU): (---) Power Class:				Single Shot	
	UE Expected Open Loop Transmit Power				Single Shot AG	
Originate Call	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm				21: (134/15)^2	
	Call Processing Status				Send Single Shot Absolute Grant	
Paging Parameters	Current Service Type: None MM Status: Abs Single Shot AG GMM State: Index 18: (95/15)^2 Current DPCCH: Index 19: (106/15)^2				RB Setup AG	
Handovers	HSUPA In: Index 20: (119/15)^2 Rep EDCH Cat/B: Index 21: (134/15)^2 Last received: Index 22: (150/15)^2 Throughput: Index 23: (168/15)^2 Acks Transmitted:				33: 4(134/15)^2	
Clear UE Info	DPCCH Cat: ---- Ratio: ---- % : ---- kbps nsmitted: ----				AG Pattern Parameters	
	Active Cell				Return	
	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				Cell Power	
Cell Parameters	INSI: INEI(SU): (---) Power Class:				-35.00	
Generator Info	UE Expected Open Loop Transmit Power				dBm/3.84 MHz	
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -22.58 dBm				Channel Type	
Uplink Parameters	Uplink Parameters				12.2k + HSDPA	
	Value				Paging Service	
	PRACH Preambles: 64				RB Test Node	
	PRACH Ramping Cycles(MAX): 2				HSPA Parameters	
	Available Subchannels (Bit Mask): 000000000001				34.121 Preset Call Configs	
UE Rep Params	Uplink DPCCH Scrambling Code: 0					
	Uplink DPCCH Bc/Bd Control: Manual					
	Manual Uplink DPCCH Bc: 2					
Close Menu	Manual Uplink DPCCH Bd: 15				Channel (UARFCN) Parms	
	Maximum Uplink Transmit Power Level: 24 dBm					
	Cell Off				Sys Type: UTRA FDD	
2 of 5	IntRef				1 of 3	

- 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							AG Node	
Active Cell	INSI: INEI(SV): (--) Power Class:							Single Shot	
	UE Expected Open Loop Transmit Power							Single Shot AG	
Originate Call	Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm							31: 6(168/15)^2	
	Call Processing Status							Send Single Shot Absolute Grant	
Paging Parameters ▾	Current Service Type: None IMI Status: None GMM State: None Current DPCH Offset: 0 chips							RB Setup AG	
								37: 6(168/15)^2	
Handovers	HSUPA Information			HSDPA Information				AG Pattern Parameters ▾	
	Rep EDCH Cat/Ext: Unrep/Unrep			Cur UE HS-DSCH Cat: ----					
	Last received E-TFCI: ----			Block Error Ratio: ---- %					
	Throughput: ---- kbps			Throughput: ---- kbps					
Clear UE Info	Acks Transmitted: ----			Blocks Transmitted: ----				Return	
	Active Cell			Sys Type: UTRA FDD					
	Idle								
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		Cell Power
Cell Off	INSI:	Power Class:	-75.00
	INEI(SV): (--)	Detected PRACH Sig: ----	dBm/3.84 MHz
	Called Party Number:		Channel Type
	UE Expected Open Loop Transmit Power		12.2k RMC
	Init PRACH TX Pou: -22.70 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:	Operating Mode	Over State: Off
	MM Status:	Active Cell	Node State: Off
	GMN State:	FDD Test	Offset: 0 chips
Handovers	HSUPA In CH		Information
	UE Rep E-DCH	Cell Off	DSCH Cat: 14
	Last Happy Bit		Ratio: ---- %
	Throughput:		---- kbps
Clear UE Info	ACKs Transmitt		Transmitted: ----
	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		
	Channel	Level (dB)		Chan	Level (dB)		Chan	dBm/3.84 MHz	
OCNS Info Screen	CPICH:	Off	-3.30	256	0	Off	Off	256	0
	P-CCPCH/SCH:	Off	-5.30	256	1	Off	Off	256	1
DC-HSDPA DL Code Chan Info	S-CCPCH:	Off	-10.30	64	2				
	PICH:	Off	-8.30	256	2	Off	Off	256	2
Return	AICH:	Off	-9.90	256	3				
	(F-)DPCH:	Off	Off	128	7				
Cell Off	E-AGCH:	Off	Off	256	42				
	E-HICH:	Off	Off	128	22				
Sys Type: UTRA FDD	E-RGCH:	Off	Off	128	22				
	HS-SCCH 1:	Off	Off	128	2	Off	Off	128	2
Logging: No Conn	HS-SCCH 2:	Off	Off	128	3	Off	Off	128	3
	HS-SCCH 3:								
1 of 3	HS-SCCH 4:								
	HS-PDSCHs:	Off	Off	16	1-15	Off	Off	16	1-15
DBUS-INT		IntRef		Offset		Channel (UARFCN) Parm			
Comp DCNS:		Off	Off	128	WCDMA	Off	Off	128	HSDPA

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 Parms	
Operating Mode	UE Information				Cell Power	
Active Cell	INSI: 001012345678901		Power Class: 4		-25.00	
	IMEI(SU):352358040214948(--)		Detected PRACH Sig: 0		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 DPCCCH TX Pou: -11.55 dBm		Paging Service	
Originate Call	Current Service Type				RB Test Mode	
	None					
	Call Processing Status				HSPA Parameters	
Paging Parameters	RRC State: Idle		Soft Handover State: Off			
	MM Status: None		Compressed Mode State: Off			
	GMM State: Attached		Cur DPCC 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) Parms	
	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 Parms	
Operating Mode	UE Information				Cell Power	
Active Cell	INSI: 001012345678901		Power Class: 4		-25.00	
	IMEI(SU):352358040214948(--)		Detected PRACH Sig: 0		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 DPCCCH TX Pou: -11.55 dBm		Paging Service	
End Call	Current Service Type				RB Test Mode	
	RB Test Mode - HSDPA					
	Call Processing Status				HSPA Parameters	
Paging Parameters	RRC State: CELL_DCH		Soft Handover State: Off			
	MM Status: None		Compressed Mode State: Off			
	GMM State: Attached		Cur DPCC 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) Parms	
	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 Parm	
	Serving Cell Primary Scrambling Code: 0								Cell Power	
DL Code Channel Info Screen	Secondary Serving Cell Primary Scrambling Code: 2								-25.00	
	Channel	Serving Cell DL Chan Info			Sec Cell DL Chan Info				dBm/3.84 MHz	
Generated Power Info Screen	Channel	Level (dB) Current	Desired	OVSF Code	Level (dB) Current	Desired	OVSF Code		Channel Type	
	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	
OCNS Info Screen	S-CCPCH:	Off	Off	64 2					RB Test Mode	
	PICH:	Off	Off	256 2	Off	Off	256 2			
	AICH:									
	(F-)DPCH:	-30.00	-30.00	128 7					HSPA Parameters	
DC-HSDPA DL Code Chan Info	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:									
Return	HS-PDSCHs:	-1.00	-1.00	16 1-15	-1.00	-1.00	16 1-15		Channel (UARFCH) Parm	
	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		-25.00	
	INEI(SU):352358040214948(--)		Detected PRACH Sig: 0		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 Node - HSDPA					
	Call Processing Status				HSPA Parameters	
Paging 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: 21088 kbps			
Clear UE Info	ACKs Transmitted: ----		Blocks Transmitted: 35000		Channel (UARFCH) Parm	
	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	
					dBm/3.84 MHz	
HSPA Information	DC-HSDPA Information				Channel Type	
					12.2k + HSDPA	
E-TFCI Recording Information	Summary		Serving Cell		Paging Service	
			Secondary Serving Cell		RB Test Mode	
	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		
HSDPA Information	statDTXs Received:	0	0	0	HSPA Parameters	
	Count of Rep CQI Lim:	----	----	----		
	Last Received CQI:		30	30		
	Max Allowed CQI:		----	----		
Clear UE Info	Test Node User Def TBS:		42192	42192	34.121 Preset Call Configs	
	PS Data User Def TBS:		7298	7298		
Return	Last Sig Meas Pur Offs (dB):		6.0	6.0	Channel (UARFCH) Parm	
	Active Cell Connected				Sys Type: UTRA FDD	
					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 Parm																																																				
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																																																				
	<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>0 %</td> </tr> <tr> <td>Throughput (kbps):</td> <td>41996</td> <td>21064</td> <td>20941</td> </tr> <tr> <td>Blocks Transmitted:</td> <td>11000</td> <td>6000</td> <td>6000</td> </tr> <tr> <td>ACKs Received:</td> <td>10949</td> <td>5991</td> <td>5956</td> </tr> <tr> <td>NACKs Received:</td> <td>51</td> <td>9</td> <td>44</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 Node 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 %	0 %	Throughput (kbps):	41996	21064	20941	Blocks Transmitted:	11000	6000	6000	ACKs Received:	10949	5991	5956	NACKs Received:	51	9	44	statDTXs Received:	0	0	0	Count of Rep CQI Lim:	----	----	----	Last Received CQI:		30	30	Max Allowed CQI:		----	----	Test Node User Def TBS:		42192	42192	PS Data User Def TBS:		7298	7298	Last Sig Meas Pur Offs (dB):		6.0	6.0	12.2k + HSDPA
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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.