

Appendix 5. System Check

Prior to the assessment, the system was verified in the flat region of the phantom, 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 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: 07/12/2012

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	22.9°C	ϵ_r	41.96	42.50	1.29	5.00
				σ	0.89	0.93	3.98	5.00
				1g SAR	8.48	8.48	0.00	5.00
				10g SAR	5.57	5.64	1.26	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
23780	Low	709.0	ϵ_r	42.74
			σ	0.90
23790	Middle	710.0	ϵ_r	42.73
			σ	0.90
23800	High	711.0	ϵ_r	42.72
			σ	0.91

System Check 750 Body

Date: 04/12/2012

Validation Dipole and Serial Number: D750V3; SN: 1011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	24.0°C	23.1°C	ϵ_r	55.55	54.86	-1.24	5.00
				σ	0.96	0.99	2.65	5.00
				1g SAR	8.84	8.96	1.36	5.00
				10g SAR	5.84	5.96	2.05	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters
23780	Low	709.0	ϵ_r 55.20
			σ 0.96
23790	Middle	710.0	ϵ_r 55.20
			σ 0.96
23800	High	711.0	ϵ_r 55.20
			σ 0.96

Date: 05/12/2012

Validation Dipole and Serial Number: D750V3; SN: 1011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	750	24.0°C	23.1°C	ϵ_r	55.55	54.86	-1.24	5.00
				σ	0.96	0.99	2.65	5.00
				1g SAR	8.84	8.80	-0.45	5.00
				10g SAR	5.84	5.84	0.00	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters
23780	Low	709.0	ϵ_r 55.20
			σ 0.96
23790	Middle	710.0	ϵ_r 55.20
			σ 0.96
23800	High	711.0	ϵ_r 55.20
			σ 0.96

System Check 850/900 Head

Date: 08/11/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	24.0°C	23.1°C	ϵ_r	41.50	40.61	-2.13	5.00
				σ	0.97	1.00	3.16	5.00
				1g SAR	10.50	10.40	-0.95	5.00
				10g SAR	6.74	6.76	0.30	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	ϵ_r	41.00
			σ	0.95
190	Middle	836.6	ϵ_r	40.90
			σ	0.96
251	High	848.8	ϵ_r	40.90
			σ	0.97

Date: 14/11/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	24.0°C	22.9°C	ϵ_r	41.50	41.00	-1.21	5.00
				σ	0.97	0.94	-3.53	5.00
				1g SAR	10.50	10.44	-0.57	5.00
				10g SAR	6.74	6.76	0.30	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	ϵ_r	41.40
			σ	0.88
190	Middle	836.6	ϵ_r	41.30
			σ	0.89
251	High	848.8	ϵ_r	41.20
			σ	0.90

System Check 850/900 Head (Continued)

Date: 19/11/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	24.0°C	22.5°C	ϵ_r	41.50	39.86	-3.94	5.00
				σ	0.97	0.97	0.27	5.00
				1g SAR	10.50	10.32	-1.71	5.00
				10g SAR	6.74	6.72	-0.30	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
4132	Low	826.4	ϵ_r	40.50
			σ	0.91
4183	Middle	836.6	ϵ_r	40.30
			σ	0.91
4233	High	846.6	ϵ_r	40.20
			σ	0.92

Date: 01/12/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	24.0°C	21.5°C	ϵ_r	41.50	40.45	-2.54	5.00
				σ	0.97	0.94	-2.81	5.00
				1g SAR	10.50	10.64	1.33	5.00
				10g SAR	6.74	6.88	2.08	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20450	Low	829.0	ϵ_r	41.66
			σ	0.90
20525	Middle	836.5	ϵ_r	40.81
			σ	0.91
20600	High	844.0	ϵ_r	41.56
			σ	0.91

System Check 850/900 Head (Continued)

Date: 03/12/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	24.0°C	21.8°C	ϵ_r	41.50	41.23	-0.66	5.00
				σ	0.97	0.95	-2.42	5.00
				1g SAR	10.50	10.76	2.48	5.00
				10g SAR	6.74	6.96	3.26	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20450	Low	829.0	ϵ_r	41.66
			σ	0.90
20525	Middle	836.5	ϵ_r	41.61
			σ	0.90
20600	High	844.0	ϵ_r	41.56
			σ	0.91
Channel Number	Channel Description	Frequency (MHz)	Parameters	
20407	Low	824.7	ϵ_r	41.68
			σ	0.89
20525	Middle	836.5	ϵ_r	41.61
			σ	0.90
20643	High	848.3	ϵ_r	41.53
			σ	0.91

System Check 850/900 Body

Date: 13/11/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0°C	22.9°C	ϵ_r	55.00	54.32	-1.24	5.00
				σ	1.05	1.04	-1.14	5.00
				1g SAR	10.80	10.64	-1.48	5.00
				10g SAR	6.96	6.96	0.00	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	ϵ_r	56.20
			σ	0.97
190	Middle	836.6	ϵ_r	56.20
			σ	0.97
251	High	848.8	ϵ_r	56.10
			σ	0.98

Date: 16/11/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0°C	23.0°C	ϵ_r	55.00	55.47	0.85	5.00
				σ	1.05	1.04	-1.42	5.00
				1g SAR	10.80	10.88	0.74	5.00
				10g SAR	6.96	7.12	2.30	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	ϵ_r	53.70
			σ	1.03
190	Middle	836.6	ϵ_r	1.04
			σ	53.70
251	High	848.8	ϵ_r	1.04
			σ	53.60

System Check 850/900 Body (Continued):

Date: 01/12/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0°C	22.2°C	ϵ_r	55.00	53.19	-3.29	5.00
				σ	1.05	1.01	-3.67	5.00
				1g SAR	10.80	11.16	3.33	5.00
				10g SAR	6.96	7.24	4.02	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
4132	Low	826.4	ϵ_r	53.50
			σ	0.97
4183	Middle	836.6	ϵ_r	53.50
			σ	0.98
4233	High	846.6	ϵ_r	53.40
			σ	0.98

Date: 04/12/20120

Validation Dipole and Serial Number: D900V2; SN: 035 (Site 58)

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0°C	23.1°C	ϵ_r	55.00	54.32	-1.23	5.00
				σ	1.05	1.01	-3.36	5.00
				1g SAR	10.80	10.36	-4.07	5.00
				10g SAR	6.96	6.72	-3.45	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
4132	Low	826.4	ϵ_r	53.50
			σ	0.98
4183	Middle	836.6	ϵ_r	54.70
			σ	0.96
4233	High	846.6	ϵ_r	54.50
			σ	0.98

System Check 850/900 Body (Continued):

Date: 04/12/2012

Validation Dipole and Serial Number: D900V2; SN: 035 (Site 57)

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	21.2°C	ϵ_r	55.00	55.67	1.21	5.00
				σ	1.05	1.02	-3.29	5.00
				1g SAR	10.80	10.52	-2.59	5.00
				10g SAR	6.96	6.92	-0.57	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20450	Low	829.0	ϵ_r	55.97
			σ	0.96
20525	Middle	836.5	ϵ_r	55.92
			σ	0.97
20600	High	844.0	ϵ_r	55.87
			σ	0.97
Channel Number	Channel Description	Frequency (MHz)	Parameters	
20407	Low	824.7	ϵ_r	56.00
			σ	0.96
20525	Middle	836.5	ϵ_r	55.93
			σ	0.97
20643	High	848.3	ϵ_r	55.84
			σ	0.98

Date: 05/12/2012

Validation Dipole and Serial Number: D900V2; SN: 035

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	21.2°C	ϵ_r	55.00	55.67	1.21	5.00
				σ	1.05	1.02	-3.29	5.00
				1g SAR	10.80	11.00	1.85	5.00
				10g SAR	6.96	7.20	3.45	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20407	Low	824.7	ϵ_r	56.00
			σ	0.96
20525	Middle	836.5	ϵ_r	55.93
			σ	0.97
20643	High	848.3	ϵ_r	55.84
			σ	0.98

System Check 850/900 Body (Continued):
Date: 08/02/2013
Validation Dipole and Serial Number: D900V2; SN: 035 (Site 57)

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0°C	21.0°C	ϵ_r	55.00	52.87	-3.87	5.00
				σ	1.05	1.05	-0.24	5.00
				1g SAR	10.80	10.56	2.22	5.00
				10g SAR	6.96	6.92	-0.57	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20450	Low	829.0	ϵ_r	53.19
			σ	1.01
20525	Middle	836.5	ϵ_r	53.15
			σ	1.01
20600	High	844.0	ϵ_r	53.12
			σ	1.02
Channel Number	Channel Description	Frequency (MHz)	Parameters	
20407	Low	824.7	ϵ_r	53.21
			σ	1.00
20525	Middle	836.5	ϵ_r	53.15
			σ	1.01
20643	High	848.3	ϵ_r	53.10
			σ	1.02

System Check 1800 Head

Date: 05/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	24.0°C	24.0°C	ϵ_r	40.00	40.28	0.69	5.00
				σ	1.40	1.44	3.06	5.00
				1g SAR	37.20	36.40	-2.15	5.00
				10g SAR	19.60	19.44	-0.82	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
1312	Low	1712.4	ϵ_r	40.60
			σ	1.36
1412	Middle	1732.4	ϵ_r	40.50
			σ	1.38
1513	High	1752.6	ϵ_r	40.40
			σ	1.40

Date: 13/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	24.0°C	21.5°C	ϵ_r	40.00	38.39	-4.02	5.00
				σ	1.40	1.40	0.02	5.00
				1g SAR	37.20	35.84	-3.66	5.00
				10g SAR	19.60	18.92	-3.47	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20050	Low	1720.0	ϵ_r	38.57
			σ	1.35
20175	Middle	1732.5	ϵ_r	38.50
			σ	1.36
20300	High	1745.0	ϵ_r	38.47
			σ	1.37

System Check 1800 Head (Continued):

Date: 14/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	24.0°C	21.5°C	ϵ_r	40.00	38.39	-4.02	5.00
				σ	1.40	1.40	0.02	5.00
				1g SAR	37.20	37.48	0.75	5.00
				10g SAR	19.60	20.28	3.47	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters
19957	Low	1710.7	ϵ_r 38.61
			σ 1.33
20175	Middle	1732.5	ϵ_r 38.52
			σ 1.36
20393	High	1754.3	ϵ_r 38.44
			σ 1.38

Date: 08/02/2013

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1800	24.0°C	22.4°C	ϵ_r	40.00	39.58	-1.05	5.00
				σ	1.40	1.37	-1.93	5.00
				1g SAR	37.20	37.32	1.40	5.00
				10g SAR	19.60	19.96	1.84	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters
20050	Low	1720.0	ϵ_r 40.15
			σ 1.28
20175	Middle	1732.5	ϵ_r 40.10
			σ 1.29
20300	High	1745.0	ϵ_r 40.06
			σ 1.30
Channel Number	Channel Description	Frequency (MHz)	Parameters
19957	Low	1710.7	ϵ_r 40.18
			σ 1.27
20175	Middle	1732.5	ϵ_r 40.10
			σ 1.29
20393	High	1754.3	ϵ_r 40.03
			σ 1.31

System Check 1800 Body

Date: 05/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	22.5°C	ϵ_r	53.30	54.68	2.59	5.00
				σ	1.52	1.52	0.00	5.00
				1g SAR	37.80	37.44	-0.95	5.00
				10g SAR	20.10	20.28	0.90	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
1312	Low	1712.4	ϵ_r	54.80
			σ	1.44
1412	Middle	1732.4	ϵ_r	54.80
			σ	1.46
1513	High	1752.6	ϵ_r	54.70
			σ	1.48

Date: 06/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	22.5°C	ϵ_r	53.30	54.68	2.59	5.00
				σ	1.52	1.52	0.00	5.00
				1g SAR	37.80	36.44	-3.60	5.00
				10g SAR	20.10	19.72	-1.89	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
1312	Low	1712.4	ϵ_r	54.80
			σ	1.44
1412	Middle	1732.4	ϵ_r	54.80
			σ	1.46
1513	High	1752.6	ϵ_r	54.70
			σ	1.48

System Check 1800 Body (Continued):

Date: 14/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	23.2°C	ϵ_r	53.30	53.57	0.51	5.00
				σ	1.52	1.54	1.25	5.00
				1g SAR	37.80	38.12	0.85	5.00
				10g SAR	20.10	20.52	2.09	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20050	Low	1720.0	ϵ_r	53.70
			σ	1.48
20175	Middle	1732.5	ϵ_r	53.60
			σ	1.50
20300	High	1745.0	ϵ_r	53.60
			σ	1.51

Date: 15/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	23.2°C	ϵ_r	53.30	53.57	0.51	5.00
				σ	1.52	1.54	1.25	5.00
				1g SAR	37.80	37.80	0.00	5.00
				10g SAR	20.10	20.28	0.90	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20050	Low	1720.0	ϵ_r	53.70
			σ	1.48
20175	Middle	1732.5	ϵ_r	53.60
			σ	1.50
20300	High	1745.0	ϵ_r	53.60
			σ	1.51

System Check 1800 Body (Continued):

Date: 17/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	23.5°C	ϵ_r	53.30	52.57	-1.36	5.00
				σ	1.52	1.54	1.64	5.00
				1g SAR	37.80	37.04	-2.01	5.00
				10g SAR	20.10	19.92	-0.90	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20050	Low	1720.0	ϵ_r	52.80
			σ	1.47
20175	Middle	1732.5	ϵ_r	52.70
			σ	1.48
20300	High	1745.0	ϵ_r	52.70
			σ	1.50

Date: 18/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	23.5°C	ϵ_r	53.30	52.57	-1.36	5.00
				σ	1.52	1.54	1.64	5.00
				1g SAR	37.80	38.48	1.80	5.00
				10g SAR	20.10	20.64	2.69	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
19957	Low	1710.7	ϵ_r	52.8
			σ	1.46
20175	Middle	1732.5	ϵ_r	52.7
			σ	1.48
20393	High	1754.3	ϵ_r	52.7
			σ	1.50

System Check 1800 Body (Continued):

Date: 19/12/2012

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	22.3°C	ϵ_r	53.30	51.71	-2.99	5.00
				σ	1.52	1.54	1.52	5.00
				1g SAR	37.80	36.72	-2.86	5.00
				10g SAR	20.10	19.68	-2.09	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
19957	Low	1710.7	ϵ_r	51.90
			σ	1.47
20175	Middle	1732.5	ϵ_r	51.90
			σ	1.49
20393	High	1754.3	ϵ_r	51.80
			σ	1.51

Date: 08/02/2013

Validation Dipole and Serial Number: D1800V2; SN: 264

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1800	24.0°C	22.3°C	ϵ_r	53.30	53.61	0.58	5.00
				σ	1.52	1.54	1.45	5.00
				1g SAR	37.80	39.60	4.76	5.00
				10g SAR	20.10	21.04	4.68	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
20050	Low	1720.0	ϵ_r	52.23
			σ	1.46
20175	Middle	1732.5	ϵ_r	52.2
			σ	1.48
20300	High	1745.0	ϵ_r	52.16
			σ	1.49
Channel Number	Channel Description	Frequency (MHz)	Parameters	
19957	Low	1710.7	ϵ_r	52.25
			σ	1.46
20175	Middle	1732.5	ϵ_r	52.2
			σ	1.48
20393	High	1754.3	ϵ_r	52.15
			σ	1.49

System Check 1900 Head

Date: 03/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	24.0°C	23.2°C	ϵ_r	40.00	39.65	-0.87	5.00
				σ	1.40	1.45	3.29	5.00
				1g SAR	40.30	40.80	1.24	5.00
				10g SAR	21.00	20.88	-0.57	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
9262	Low	1852.4	ϵ_r	39.80
			σ	1.40
9400	Middle	1880.0	ϵ_r	39.70
			σ	1.43
9538	High	1907.6	ϵ_r	39.60
			σ	1.45

Date: 07/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	24.0°C	24.0°C	ϵ_r	40.00	39.49	-1.29	5.00
				σ	1.40	1.40	0.35	5.00
				1g SAR	40.30	40.40	0.25	5.00
				10g SAR	21.00	20.64	-1.71	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
512	Low	1850.2	ϵ_r	39.60
			σ	1.37
661	Middle	1880.0	ϵ_r	39.50
			σ	1.42
810	High	1909.8	ϵ_r	39.50
			σ	1.42

System Check 1900 Head (Continued):

Date: 12/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	24.0°C	24.0°C	ϵ_r	40.00	38.42	-3.95	5.00
				σ	1.40	1.40	-0.13	5.00
				1g SAR	40.30	38.84	-3.62	5.00
				10g SAR	21.00	20.12	-4.19	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18700	Low	1860.0	ϵ_r	38.71
			σ	1.37
18900	Middle	1880	ϵ_r	38.56
			σ	1.39
19100	High	1900	ϵ_r	38.42
			σ	1.40

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18607	Low	1850.7	ϵ_r	38.77
			σ	1.36
18900	Middle	1880.0	ϵ_r	38.56
			σ	1.38
19193	High	1908.5	ϵ_r	38.36
			σ	1.41

System Check 1900 Head (Continued):

Date: 08/02/2013

Validation Dipole and Serial Number: D1900V2; SN: 537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	24.0°C	22.4°C	ϵ_r	40.00	41.20	2.23	5.00
				σ	1.40	21.24	1.14	5.00
				1g SAR	39.40	41.20	4.57	5.00
				10g SAR	20.70	21.24	2.61	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18700	Low	1860.0	ϵ_r	39.75
			σ	1.40
18900	Middle	1880	ϵ_r	39.68
			σ	1.42
19100	High	1900	ϵ_r	39.61
			σ	1.44

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18607	Low	1850.7	ϵ_r	39.78
			σ	1.39
18900	Middle	1880.0	ϵ_r	39.68
			σ	1.42
19193	High	1908.5	ϵ_r	39.57
			σ	1.45

System Check 1900 Body

Date: 03/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	24.0°C	ϵ_r	53.30	53.38	0.15	5.00
				σ	1.52	1.54	1.55	5.00
				1g SAR	40.70	40.80	0.25	5.00
				10g SAR	21.60	21.56	-0.19	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters
9262	Low	1852.4	ϵ_r 53.40
			σ 1.50
9400	Middle	1880.0	ϵ_r 53.40
			σ 1.53
9538	High	1907.6	ϵ_r 53.40
			σ 1.55

Date: 04/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	24.0°C	ϵ_r	53.30	53.38	0.15	5.00
				σ	1.52	1.54	1.55	5.00
				1g SAR	40.70	40.80	0.25	5.00
				10g SAR	21.60	21.68	0.37	5.00

Channel Number	Channel Description	Frequency (MHz)	Parameters
9262	Low	1852.4	ϵ_r 53.40
			σ 1.50
9400	Middle	1880.0	ϵ_r 53.40
			σ 1.53
9538	High	1907.6	ϵ_r 53.40
			σ 1.55

System Check 1900 Body (Continued):**Date: 07/12/2012****Validation Dipole and Serial Number: D1900V2; SN: 540**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	23.0°C	ϵ_r	53.30	51.56	-3.26	5.00
				σ	1.52	1.52	-0.31	5.00
				1g SAR	40.70	40.40	-0.74	5.00
				10g SAR	21.60	20.92	-3.15	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
512	Low	1850.2	ϵ_r	51.60
			σ	1.50
661	Middle	1880.0	ϵ_r	51.60
			σ	1.50
810	High	1909.8	ϵ_r	51.60
			σ	1.53

Date: 09/12/2012**Validation Dipole and Serial Number: D1900V2; SN: 540**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	22.7°C	ϵ_r	53.30	51.56	-3.27	5.00
				σ	1.52	1.53	0.94	5.00
				1g SAR	40.70	41.20	1.23	5.00
				10g SAR	21.60	21.32	-1.30	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18700	Low	1860.0	ϵ_r	51.60
			σ	1.50
18900	Middle	1880.0	ϵ_r	51.60
			σ	1.52
19100	High	1900.0	ϵ_r	51.60
			σ	1.54

System Check 1900 Body (Continued):

Date: 10/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	22.7°C	ϵ_r	53.30	51.56	-3.27	5.00
				σ	1.52	1.53	0.94	5.00
				1g SAR	40.70	40.40	-0.74	5.00
				10g SAR	21.60	20.72	-4.07	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18700	Low	1860.0	ϵ_r	51.60
			σ	1.50
18900	Middle	1880.0	ϵ_r	51.60
			σ	1.52
19100	High	1900.0	ϵ_r	51.60
			σ	1.54

Date: 11/12/2012

Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0°C	22.7°C	ϵ_r	53.30	51.63	-3.14	5.00
				σ	1.52	1.54	1.33	5.00
				1g SAR	40.70	41.20	1.23	5.00
				10g SAR	21.60	20.92	-3.15	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18607	Low	1850.7	ϵ_r	51.90
			σ	1.50
18900	Middle	1880.0	ϵ_r	51.70
			σ	1.52
19193	High	1908.5	ϵ_r	51.60
			σ	1.55

System Check 1900 Body (Continued):

Date: 08/02/2013

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	23.0C	ϵ_r	53.30	51.70	-3.00	5.00
				σ	1.52	1.52	0.00	5.00
				1g SAR	40.50	39.20	-3.21	5.00
				10g SAR	21.40	21.04	-1.68	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18700	Low	1860.0	ϵ_r	51.80
			σ	1.48
18900	Middle	1880.0	ϵ_r	51.75
			σ	1.50
19100	High	1900.0	ϵ_r	51.79
			σ	1.52

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
18607	Low	1850.7	ϵ_r	51.83
			σ	1.47
18900	Middle	1880.0	ϵ_r	51.75
			σ	1.50
19193	High	1908.5	ϵ_r	51.68
			σ	1.53

System Check 2450 Head

Date: 12/12/2012

Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	24.0 °C	23.4 °C	ϵ_r	39.20	38.96	-0.61	5.00
				σ	1.80	1.83	1.94	5.00
				1g SAR	52.90	51.60	-2.46	5.00
				10g SAR	24.70	24.24	-1.86	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
1	Low	2412.0	ϵ_r	38.90
			σ	1.79
6	Middle	2437.0	ϵ_r	38.90
			σ	1.82
11	High	2463.0	ϵ_r	38.90
			σ	1.85

System Check 2450 Body

Date: 11/12/2012

Validation Dipole and Serial Number: D2450V2; SN: 725

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	51.27	-2.71	5.00
				σ	1.95	2.03	4.16	5.00
				1g SAR	51.90	50.80	-2.12	5.00
				10g SAR	24.10	23.28	-3.40	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
1	Low	2412.0	ϵ_r	51.30
			σ	1.99
6	Middle	2437.0	ϵ_r	51.30
			σ	2.02
11	High	2463.0	ϵ_r	51.20
			σ	2.05

System Check 5200/5500/5800 Head**Date: 17/12/2012****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	24.0 °C	ϵ_r	36.00	34.73	-3.53	10.00
				σ	4.66	4.74	1.67	5.00
				1g SAR	78.60	76.10	-3.18	5.00
				10g SAR	22.50	21.70	-3.56	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
48	Middle	5240.0	ϵ_r	34.60
			σ	4.77
64	Middle	5320.0	ϵ_r	34.50
			σ	4.83

Date: 18/12/2012**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	24.0 °C	ϵ_r	36.00	34.73	-3.53	10.00
				σ	4.66	4.74	1.67	5.00
				1g SAR	78.60	78.10	-0.64	5.00
				10g SAR	22.50	22.30	-0.89	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
38	Middle	5190.0	ϵ_r	34.80
			σ	4.73
54	Middle	5270.0	ϵ_r	34.60
			σ	4.79

System Check 5200/5500/5800 Head (Continued):

Date: 17/12/2012

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	24.0 °C	ϵ_r	35.60	34.36	-3.48	10.00
				σ	4.96	4.96	-0.02	5.00
				1g SAR	84.50	84.60	0.12	5.00
				10g SAR	24.20	24.00	-0.83	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
116	Middle	5580.0	ϵ_r	34.30
			σ	5.08
149	Middle	5745.0	ϵ_r	33.90
			σ	5.26

Date: 18/12/2012

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	24.0 °C	ϵ_r	35.60	34.36	-3.48	10.00
				σ	4.96	4.96	-0.02	5.00
				1g SAR	84.50	85.40	1.07	5.00
				10g SAR	24.20	24.10	-0.41	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
110	Middle	5550.0	ϵ_r	34.30
			σ	5.04

System Check 5200/5500/5800 Head (Continued):

Date: 17/12/2012

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	24.0 °C	ϵ_r	35.30	33.75	-4.38	10.00
				σ	5.27	5.32	1.03	5.00
				1g SAR	78.10	75.10	-3.84	5.00
				10g SAR	22.30	21.30	-4.48	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
149	Middle	5745.0	ϵ_r	33.90
			σ	5.26

Date: 18/12/2012

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	24.0 °C	ϵ_r	35.30	33.75	-4.38	10.00
				σ	5.27	5.32	1.03	5.00
				1g SAR	78.10	80.80	3.46	5.00
				10g SAR	22.30	23.00	3.14	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
159	Middle	5795.0	ϵ_r	33.80
			σ	5.33

System Check 5200/5500/5800 Body:

Date: 13/12/2012

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	49.00	47.78	-2.49	10.00
				σ	5.30	5.37	1.37	5.00
				1g SAR	76.70	75.60	-1.43	5.00
				10g SAR	21.20	21.80	2.83	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
48	Middle	5240.0	ϵ_r	47.70
			σ	5.38
64	Middle	5320.0	ϵ_r	47.40
			σ	5.56

Date: 14/12/2012

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	49.00	47.78	-2.49	10.00
				σ	5.30	5.37	1.37	5.00
				1g SAR	76.70	74.90	-2.35	5.00
				10g SAR	21.20	21.30	0.47	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
38	Middle	5190.0	ϵ_r	47.80
			σ	5.35
54	Middle	5270.0	ϵ_r	47.60
			σ	5.46

System Check 5200/5500/5800 Body (Continued):**Date: 13/12/2012****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	46.88	-3.55	10.00
				σ	5.65	5.74	1.59	5.00
				1g SAR	82.80	83.20	0.48	5.00
				10g SAR	22.80	23.40	2.63	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
64	Middle	5320.0	ϵ_r	47.40
			σ	5.56

Date: 14/12/2012**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	46.88	-3.55	10.00
				σ	5.65	5.74	1.59	5.00
				1g SAR	82.80	78.70	-4.95	5.00
				10g SAR	22.80	22.30	-2.19	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
110	Middle	5550.0	ϵ_r	46.90
			σ	5.80
136	Middle	5680.0	ϵ_r	46.30
			σ	5.92
149	Middle	5745.0	ϵ_r	46.40
			σ	6.04

System Check 5200/5500/5800 Body (Continued):

Date: 14/12/2012

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	46.18	-4.18	10.00
				σ	6.00	6.02	0.26	5.00
				1g SAR	71.70	69.60	-2.93	5.00
				10g SAR	19.70	19.50	-1.02	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
149	Middle	5745.0	ϵ_r	46.40
			σ	6.04
159	Middle	5795.0	ϵ_r	46.20

Appendix 6. 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
De-Ionized Water	52.87
Polysorbate 20	46.10
Salt	1.03

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

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

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

Ingredient (% by weight)	Frequency
	2450 MHz Head
De-Ionized Water	55.75 ¹
Polysorbate 20	45.25 ¹

Ingredient (% by weight)	Frequency
	2450 MHz Body
De-Ionized Water	71.70
Polysorbate 20	28.00
Salt	0.30

Simulated Tissues (Continued)

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):

1. 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 7. DASY4 System Details

A.7.1. DASY4 SAR Measurement System

UL, SAR measurement facility utilises the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, and the SAM phantom containing brain or muscle equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller; teach pendant (Joystick), and remote control. This is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. The data acquisition electronics (DAE) performs signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection etc. The DAE is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilises a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

A.7.2. DASY4 SAR System Specifications**Robot System**

Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number:	F00/SD89A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+

Robot System

Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number:	F01/5J86A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+

Robot System

Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Repeatability:	±0.030 mm
No. of Axis:	6
Serial Number:	F12/5MZ7A1/A/01
Reach:	920 mm
Payload:	2.0 kg
Control Unit:	CS8C
Programming Language:	V+

Data Acquisition Electronic (DAE) System

Serial Number:	DAE3 SN:394
Serial Number:	DAE3 SN:432
Serial Number:	DAE3 SN:431
Serial Number:	DAE3 SN:450

DASY4 SAR System Specifications (Continued)	
PC Controller	
PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 Measurement Server
Serial Number:	1080
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.
PC Interface Card	
Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 nit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.
E-Field Probe	
Model:	EX3DV4
Serial No:	3814
Construction:	Triangular core
Frequency:	10 MHz to >6 GHz
Linearity:	±0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	330
Probe Diameter (mm):	12
Tip Length (mm):	20
Tip Diameter (mm):	2.5
Sensor X Offset (mm):	1
Sensor Y Offset (mm):	1
Sensor Z Offset (mm):	1
E-Field Probe	
Model:	ES3DV3
Serial No:	3304
Construction:	Triangular core
Frequency:	10 MHz to >4 GHz
Linearity:	±0.2 dB (30 MHz to 4 GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	10
Tip Diameter (mm):	4
Sensor X Offset (mm):	2
Sensor Y Offset (mm):	2
Sensor Z Offset (mm):	2

DASY4 SAR System Specifications (Continued)	
E-Field Probe	
Model:	ET3DV6
Serial No:	1528
Construction:	Triangular core
Frequency:	10 MHz to 2.55GHz
Linearity:	±0.2 dB (30 MHz to 2.55GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	10
Tip Diameter (mm):	6.8
Sensor X Offset (mm):	2.7
Sensor Y Offset (mm):	2.7
Sensor Z Offset (mm):	2.7
E-Field Probe	
Model:	ET3DV6
Serial No:	1587
Construction:	Triangular core
Frequency:	10 MHz to 2.55GHz
Linearity:	±0.2 dB (30 MHz to 2.55GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	10
Tip Diameter (mm):	6.8
Sensor X Offset (mm):	2.7
Sensor Y Offset (mm):	2.7
Sensor Z Offset (mm):	2.7
Phantom	
Phantom:	SAM Phantom, Eli Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm

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											
Operating Mode	UE Information											
Active Cell	INSI: INEI(SU): (--) Power Class:											
	UE Expected Open Loop Transmit Power											
	Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm											
Originate Call	Call Processing Status											
	Current Service Type: None IMI Status: None GMI State: None Current DPCH Offset: 0 chips											
Paging Parameters	<table border="1"> <thead> <tr> <th>HSUPA Information</th> <th>HSDPA Information</th> </tr> </thead> <tbody> <tr> <td>Rep EDCH Cat/Ext: Unrep/Unrep</td> <td>Cur UE HS-DSCH Cat: ----</td> </tr> <tr> <td>Last received E-TFCI: ----</td> <td>Block Error Ratio: ---- %</td> </tr> <tr> <td>Throughput: ---- kbps</td> <td>Throughput: ---- kbps</td> </tr> <tr> <td>Acks Transmitted: ----</td> <td>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: ----
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	<table border="1"> <tr> <td>Active Cell</td> <td>Sys Type: UTRA FDD</td> </tr> <tr> <td>Idle</td> <td></td> </tr> </table>		Active Cell	Sys Type: UTRA FDD	Idle							
Active Cell	Sys Type: UTRA FDD											
Idle												
Clear UE Info	<table border="1"> <tr> <td>IntRef</td> <td></td> </tr> </table>		IntRef									
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) 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	
Close Menu	UE Information				HSDPA RB Test Mode Setup	
	INSI: INEI(SU): (--) Power Class:					
	UE Expected Open Loop Transmit Power				UE Category Parameters	
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm					
	HSDPA Uplink Parameters			Value		MAC-(e)hs Parameters
	DeltaACK			8		
	DeltaNACK			8		
	DeltaCQI			8		
	Ack-Nack Repetition Factor			1		HSDPA Uplink Parameters
	CQI Feedback Cycle (k)			2 ms		
CQI Repetition Factor			1			
					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				DL DTCH Data	
Active Cell	INSI: INEI(SU): (--) Power Class:				All Ones	
Originate Call	UE Expected Open Loop Transmit Power				RLC Reestablish	
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm				Auto	
Paging Parameters	Call Processing Status				Call Limit State	
	Current Service Type: None RII Status: None GMM State: None Current DPCH Offset: 0 chips				Off	
	HSUPA Information		HSDPA Information		Call Drop Timer	
	Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----		Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----		On	
Clear UE Info	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			
Additional Screens	UE Information						Cell Power	-35.00		
	INSI: INEI(SU): (--) Power Class:						dBm/3.84 MHz			
Cell Parameters	UE Expected Open Loop Transmit Power						Channel Type	12.2k RNC		
Generator Info	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm						Paging Service	RB Test Mode		
	Uplink Parameters			Value						
Uplink Parameters	PRACH Preambles			64			HSPA Parameters			
	PRACH Ramping Cycles(MMAX)			2						
UE Rep Neas	Available Subchannels (Bit Mask)			000000000001			34,121 Preset Call Configs			
	Uplink DPCCH Scrambling Code			0						
	Uplink DPCCH Bc/Bd Control			Auto						
Close Menu	Manual Uplink DPCCH Bc			8			Channel (UARFCN) Parm			
	Manual Uplink DPCCH Bd			15						
	Maximum Uplink Transmit Power Level			24 dBm						
		Active Cell			Sys Type: UTRA FDD					
		Idle								
2 of 5				IntRef					1 of 3	

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	-35.00		
	INSI: INEI(SU): (--) Power Class:						dBm/3.84 MHz			
	UE Expected Open Loop Transmit Power						Channel Type	12.2k RNC		
	Initial PRACH TX Power: -60.00 dBm Initial DPCCH TX Power: -11.55 dBm						Paging Service	RB Test Mode		
Voice Call	RB Test Mode Settings			Value						
	Uplink DTCH RNC CRC Presence			Present			HSPA Parameters			
	Uplink Dummy DCCH Data			Off						
	UE Loopback Type			Type 1			34,121 Preset Call Configs			
	Asymmetric RNC Loopback Messaging			Close/Open						
	Asymmetric RNC CN Domain			CS Domain						
	Close Menu							Channel (UARFCN) Parm		
		Active Cell			Sys Type: UTRA FDD					
		Idle								
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/HSPA

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

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_{a11} : 47/15 B_{a12} : 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 5.1g.

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		<table border="1"> <thead> <tr> <th colspan="2">UE Information</th> </tr> </thead> <tbody> <tr> <td>IMSI:</td> <td></td> </tr> <tr> <td>IMEI(SV):</td> <td>(--)</td> </tr> <tr> <td>Power Class:</td> <td></td> </tr> </tbody> </table>						UE Information		IMSI:		IMEI(SV):	(--)	Power Class:		AG Mode													
UE Information																													
IMSI:																													
IMEI(SV):	(--)																												
Power Class:																													
Active Cell		Single Shot																											
Originate Call		<table border="1"> <thead> <tr> <th colspan="2">UE Expected Open Loop Transmit Power</th> </tr> </thead> <tbody> <tr> <td>Initial PRACH TX Power:</td> <td>-60.00 dBm</td> </tr> <tr> <td>Initial DPCCH TX Power:</td> <td>-11.55 dBm</td> </tr> </tbody> </table>				UE Expected Open Loop Transmit Power		Initial PRACH TX Power:	-60.00 dBm	Initial DPCCH TX Power:	-11.55 dBm	Single Shot AG																	
		UE Expected Open Loop Transmit Power																											
Initial PRACH TX Power:	-60.00 dBm																												
Initial DPCCH TX Power:	-11.55 dBm																												
						21: (134/15)^2																							
Paging Parameters		<table border="1"> <thead> <tr> <th colspan="2">Call Processing Status</th> </tr> </thead> <tbody> <tr> <td>Current Service Type:</td> <td>None</td> </tr> <tr> <td>MM Status:</td> <td>Abs Single Shot AG</td> </tr> <tr> <td>MM State:</td> <td>Index 18: (95/15)^2</td> </tr> <tr> <td>Current DPCCH</td> <td>Index 19: (106/15)^2</td> </tr> <tr> <td>HSUPA In</td> <td>Index 20: (119/15)^2</td> </tr> <tr> <td>Rep EDCH Cat/B</td> <td>Index 21: (134/15)^2</td> </tr> <tr> <td>Last received</td> <td>Index 22: (150/15)^2</td> </tr> <tr> <td>Throughput:</td> <td>Index 23: (168/15)^2</td> </tr> <tr> <td>Acks Transmitt</td> <td></td> </tr> </tbody> </table>						Call Processing Status		Current Service Type:	None	MM Status:	Abs Single Shot AG	MM State:	Index 18: (95/15)^2	Current DPCCH	Index 19: (106/15)^2	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 Transmitt		Send Single Shot Absolute Grant	
Call Processing Status																													
Current Service Type:	None																												
MM Status:	Abs Single Shot AG																												
MM State:	Index 18: (95/15)^2																												
Current DPCCH	Index 19: (106/15)^2																												
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 Transmitt																													
Handovers						RB Setup AG																							
						33: 4(134/15)^2																							
Clear UE Info						AG Pattern Parameters																							
						Return																							
		Active Cell				Sys Type: UTRA FDD																							
		Idle																											
1 of 5		IntRef				1 of 2																							

Call Setup Screen																									
Call Control		Active Cell Operating Mode						Call Parm																	
Additional Screens		<table border="1"> <thead> <tr> <th colspan="2">UE Information</th> </tr> </thead> <tbody> <tr> <td>IMSI:</td> <td></td> </tr> <tr> <td>IMEI(SV):</td> <td>(--)</td> </tr> <tr> <td>Power Class:</td> <td></td> </tr> </tbody> </table>						UE Information		IMSI:		IMEI(SV):	(--)	Power Class:		Cell Power									
UE Information																									
IMSI:																									
IMEI(SV):	(--)																								
Power Class:																									
Cell Parameters		<table border="1"> <thead> <tr> <th colspan="2">UE Expected Open Loop Transmit Power</th> </tr> </thead> <tbody> <tr> <td>Initial PRACH TX Power:</td> <td>-60.00 dBm</td> </tr> <tr> <td>Initial DPCCH TX Power:</td> <td>-22.58 dBm</td> </tr> </tbody> </table>				UE Expected Open Loop Transmit Power		Initial PRACH TX Power:	-60.00 dBm	Initial DPCCH TX Power:	-22.58 dBm	-35.00													
UE Expected Open Loop Transmit Power																									
Initial PRACH TX Power:	-60.00 dBm																								
Initial DPCCH TX Power:	-22.58 dBm																								
Generator Info						dBm/3.84 MHz																			
						Channel Type																			
Uplink Parameters		<table border="1"> <thead> <tr> <th>Uplink Parameters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>PRACH Preambles</td> <td>64</td> </tr> <tr> <td>PRACH Ramping Cycles(MMAX)</td> <td>2</td> </tr> <tr> <td>Available Subchannels (Bit Mask)</td> <td>000000000001</td> </tr> <tr> <td>Uplink DPCH Scrambling Code</td> <td>0</td> </tr> <tr> <td>Uplink DPCH Bc/Bd Control</td> <td>Manual</td> </tr> <tr> <td>Manual Uplink DPCH Bc</td> <td>2</td> </tr> <tr> <td>Manual Uplink DPCH Bd</td> <td>15</td> </tr> <tr> <td>Maximum Uplink Transmit Power Level</td> <td>24 dBm</td> </tr> </tbody> </table>				Uplink Parameters	Value	PRACH Preambles	64	PRACH Ramping Cycles(MMAX)	2	Available Subchannels (Bit Mask)	000000000001	Uplink DPCH Scrambling Code	0	Uplink DPCH Bc/Bd Control	Manual	Manual Uplink DPCH Bc	2	Manual Uplink DPCH Bd	15	Maximum Uplink Transmit Power Level	24 dBm	12.2k + HSDPA	
Uplink Parameters	Value																								
PRACH Preambles	64																								
PRACH Ramping Cycles(MMAX)	2																								
Available Subchannels (Bit Mask)	000000000001																								
Uplink DPCH Scrambling Code	0																								
Uplink DPCH Bc/Bd Control	Manual																								
Manual Uplink DPCH Bc	2																								
Manual Uplink DPCH Bd	15																								
Maximum Uplink Transmit Power Level	24 dBm																								
UE Rep Meas						Paging Service																			
						RB Test Mode																			
Close Menu						HSPA Parameters																			
						34,121 Preset Call Configs																			
						Channel (UARFCN) Parm																			
		Cell Off				Sys Type: UTRA FDD																			
2 of 5		IntRef				1 of 3																			

- For HSPA 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 Mode	
Active Cell		INSI: INEI(SU): (--) Power Class:						Single Shot	
		UE Expected Open Loop Transmit Power						Single Shot AG	
		Initial PRACH TX Power: -60.00 dBm Initial DPCH TX Power: -11.55 dBm						31: $6(168/15)^2$	
Originate Call		Call Processing Status						Send Single Shot Absolute Grant	
		Current Service Type: None MM Status: None GMM State: None Current DPCH Offset: 0 chips						RB Setup AG	
Paging Parameters ▾		HSUPA Information				HSDPA Information		AG Pattern Parameters ▾	
		Rep EDCH Cat/Ext: Unrep/Unrep Last received E-TFCI: ---- Throughput: ---- kbps Acks Transmitted: ----				Cur UE HS-DSCH Cat: ---- Block Error Ratio: ---- % Throughput: ---- kbps Blocks Transmitted: ----		Return	
Clear UE Info		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 Parm
Operating Mode	UE Information		Cell Power
Cell Off	INSI: INEI(SU): (--) Called Party Number: UE Expected Open Loop Transmit Power Init PRACH TX Pou: -22.70 dBm Init DPCCCH TX Pou: -11.55 dBm	Power Class: Detected PRACH Sig: ----	-75.00 dBm/3.84 MHz
	Current Service Type		Channel Type
	None		12.2k RMC
Originate Call	Call Processing Status		Paging Service
	RRC State: Operating Mode MM Status: Active Cell GMM State: FDD Test		RB Test Mode
Paging Parameters	HSUPA In CU UE Rep E-DCH Last Happy Bit Throughput: ACKs Transmitt		HSPA Parameters
Handovers	Cell Off		34.121 Preset Call Configs
Clear UE Info	Background Cell Off Sys Type: UTRA FDD Logging: No Conn		Channel (UARFCN) Parm
1 of 5	IntRef	Offset	1 of 3

2. Set the **Channel type** to **12.2k + HSDPA**.
3. Set the downlink channel code. In order to achieve the 42 Mbps maximum downlink throughput, you have to set up 15 HS-PDSCHs which will possibly cause a code collision. To easily configure the downlink 15 HS-PDSCH for a maximum throughput, use the code preset to configure the code channels for both the serving cell and the secondary serving cell. Select **Call Control 2 of 6-> Generator Info (F3) -> Downlink Channel Configs (F4) -> DL Chan code Preset Configs (F5)**, choose **34.121 Tables E.6.2.3,4 (HSDPA 15 HS-PDSCHs)**. Set the **Conn S-CCPCH Cfg** to **Off** to avoid the code collision. To see the channel code allocation for the serving cell and the secondary serving cell, select **Additional Gen Info Screens (F1) -> DC-HSDPA DL Code Chan Info (F4)**.

Call Setup Screen									
Screen Ctrl	DC-HSDPA DL Code Channel Information								Call Parms
DL Code Channel Info Screen	Serving Cell Primary Scrambling Code: 0								Cell Power
	Secondary Serving Cell Primary Scrambling Code: 2								-75.00
Generated Power Info Screen	Channel	Serving Cell DL Chan Info			Sec Cell DL Chan Info			dBm/3.84 MHz	
	Channel	Level (dB)	Chan	Code	Level (dB)	Chan	Code	Channel Type	
OCNS Info Screen	CPICH:	Off	-3.30	256	0	Off	Off	256	0
	F-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	-9.30	256	3				
	(F-)DPCH:	Off	Off	128	7				
Return	E-AGCH:	Off	Off	256	42				
	E-HICH:	Off	Off	128	22				
Return	E-RGCH:	Off	Off	128	22				
	HS-SCCH 1:	Off	Off	128	2	Off	Off	128	2
Return	HS-SCCH 2:	Off	Off	128	3	Off	Off	128	3
	HS-SCCH 3:								
Return	HS-SCCH 4:								
	HS-PDSCHs:	Off	Off	16	1-15	Off	Off	16	1-15
Return	Comp OCNS:	Off	Off	128	WCDMA	Off	Off	128	HSDPA
	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 Parms 1 of 3 -> HSPA Parameters (F10) -> HSDPA Parameters (F10) -> HSDPA RB Test Mode Setup (F8) -> HSDPA RB Test Mode Settings (F8).

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

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

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

b) Set up the Serving Cell Parameters

Path: F10

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

c) Set up the Secondary Serving Cell Parameters

Path: F11

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

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

Path: Return (F12) -> HSDPA Params 2 of 2 -> Secondary Serv Cell Params (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		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 Node		
	None								
	Call Processing Status						HSPA Parameters		
Paging Parameters	RRC State: Idle		Soft Handover State: Off		Compressed Mode State: Off		34.121 Preset Call Configs		
	MM Status: None		Cur DPCH Offset: 0 chips		GMM State: Attached				
	HSUPA Information			HSDPA Information			Channel (UARFCN) Parms		
Handovers	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: ----						
	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		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 Node		
	RB Test Node - HSDPA								
	Call Processing Status						HSPA Parameters		
Paging Parameters	RRC State: CELL_DCH		Soft Handover State: Off		Compressed Mode State: Off		34.121 Preset Call Configs		
	MM Status: None		Cur DPCH Offset: 0 chips		GMM State: Attached				
	HSUPA Information			HSDPA Information			Channel (UARFCN) Parms		
Handovers	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						
	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									
Call Control	Active Cell Operating Mode						Call Parm		
Operating Mode	UE Information						Cell Power		
Active Cell	INSI: 001012345678901		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 Node		
	RB Test Node - HSDPA								
	Call Processing Status						HSPA Parameters		
Paging Parameters	RRC State: CELL_DCH		Soft Handover State: Off		Compressed Mode State: Off		34,121 Preset Call Configs		
	FIN Status: None		Cur DPCH Offset: 0 chips						
	GIN State: Attached						Channel (UARFCN) Parm		
Handovers	HSUPA Information			HSDPA Information					
	Rep EDCH Cat/Ext: 6/Unrep		Cur UE HS-DSCH Cat: 24		Block Error Ratio: 0 %				
	Last Happy Bit: None		Throughput: 21088 kbps		Blocks Transmitted: 35000				
Clear UE Info	ACKs Transmitted: ----								
	Active Cell			Sys Type: UTRA FDD					
	Connected			Logging: No Conn					
1 of 6	DBUS-INT	IntRef	Offset				1 of 3		

You can see more on the DC-HSDPA Information screen.
Path: CALL SETUP->Call Control 2 of 6 -> Additional Screens (F1) -> HSDPA Information (F4) -> DC-HSDPA Information (F4).

Call Setup Screen									
Screen Ctrl	DC-HSDPA Information						Call Parm		
Channel (UARFCN) Info	Secondary Serving Cell Status						Cell Power		
	Current Secondary Serving Cell Status: Configured-Inactive						-25.00 dBm/3.84 MHz		
	DC-HSDPA Information						Channel Type		
HSPA Information			Summary		Serving Cell		Secondary Serving Cell		12.2k + HSDPA
	Block Error Ratio:		0 %		0 %		---- %		Paging Service
	Throughput (kbps):		21082		21082		0		RB Test Node
E-TFCI Recording Information	Blocks Transmitted:		66000		66000		0		
	ACKs Received:		65958		65958		0		
	NACKs Received:		42		42		0		HSPA Parameters
HSDPA Information	statDTXs Received:		0		0		0		
	Count of Rep CQI Lim:		----		----		----		34,121 Preset Call Configs
	Last Received CQI:				30		30		
Clear UE Info	Max Allowed CQI:		----		----		----		Channel (UARFCN) Parm
	Test Node User Def TBS:				42192		42192		
	PS Data User Def TBS:				7298		7298		
Return	Last Sig Meas Pur Offs (dB):				6.0		6.0		
	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	-25.00		
	Current Secondary Serving Cell Status: Configured-Active						dBm/3.84 MHz			
HSPA Information	DC-HSDPA Information						Channel Type	12.2k + HSDPA		
		Summary	Serving Cell	Secondary Serving Cell				Paging Service	RB Test Node	
E-TFCI Recording Information	Block Error Ratio:	0 %	0 %	0 %				HSPA Parameters		
	Throughput (kbps):	41996	21064	20941						
HSDPA Information	Blocks Transmitted:	11000	6000	6000				34.121 Preset Call Configs ▾		
	ACKs Received:	10949	5991	5956						
Clear UE Info	NACKs Received:	51	9	44				Channel (UARFCN) Parms		
	statDTXs Received:	0	0	0						
Return	Count of Rep CQI Lim:	----	----	----						
	Last Received CQI:		30	30						
	Max Allowed CQI:		----	----						
	Test Mode User Def TBS:		42192	42192						
	PS Data User Def TBS:		7298	7298						
	Last Sig Meas Pur Offs (dB):		6.0	6.0						
		Active Cell Connected			Sys Type: UTRA FDD					
					Logging: No Conn					
1 of 2		DBUS-INT	IntRef	Offset				1 of 3		

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