10508-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.95	68.98	17.84	2.23	80.0	± 9.6 %
		Y	4.21	69.23	17.90		80.0	
		Z	3.46	67.59	16.95		80.0	
10509-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.62	72.40	18.91	2.23	80.0	± 9.6 %
		Y	4.92	72.59	18.86		80.0	
		Z	3.86	70.20	17.85		80.0	
10510-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.34	68.87	17.84	2.23	80.0	± 9.6 %
		Y	4.61	69.18	17.91		80.0	
		Z	3.85	67.53	17.06		80.0	
10511-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.39	68.57	17.74	2.23	80.0	± 9.6 %
		Y	4.65	68.86	17.81		80.0	
		Z	3.92	67.35	17.00		80.0	
10512-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.95	74.43	19.59	2.23	80.0	± 9.6 %
		Y	5.29	74.60	19.52		80.0	
		Z	3.97	71.52	18.28		80.0	
10513-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.24	69.19	17.98	2.23	80.0	± 9.6 %
		Y	4.52	69.55	18.06		80.0	
		Z	3.73	67.67	17.13		80.0	
10514-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.25	68.69	17.82	2.23	80.0	± 9.6 %
		Y	4.51	69.03	17.90		80.0	
		Z	3.78	67.33	17.02		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.99	63.46	15.00	0.00	150.0	± 9.6 %
		Y	0.98	62.78	14.45		150.0	
		Z	0.99	63.59	14.96		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.69	72.54	18.63	0.00	150.0	± 9.6 %
		Y	0.56	68.11	16.08		150.0	
		Z	0.67	72.15	18.45		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.85	65.62	15.80	0.00	150.0	± 9.6 %
		Y	0.82	64.42	14.91		150.0	
		Z	0.84	65.62	15.72		150.0	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.53	66.80	16.29	0.00	150.0	± 9.6 %
		Y	4.59	66.58	16.17		150.0	
		Z	4.39	66.94	16.26		150.0	
10519-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.71	67.02	16.40	0.00	150.0	± 9.6 %
		Y	4.78	66.84	16.30		150.0	
		Z	4.54	67.11	16.34		150.0	
10520-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.56	66.98	16.32	0.00	150.0	± 9.6 %
		Y	4.63	66.80	16.22		150.0	
		Z	4.40	67.05	16.26		150.0	
10521-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.49	66.97	16.31	0.00	150.0	± 9.6 %
		Y	4.56	66.79	16.20		150.0	
		Z	4.33	67.02	16.25		150.0	
10522-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.56	67.08	16.40	0.00	150.0	± 9.6 %
		Y	4.62	66.86	16.28		150.0	
		Z	4.38	67.14	16.34		150.0	

10523-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.44	66.96	16.26	0.00	150.0	± 9.6 %
		Y	4.50	66.72	16.12		150.0	
		Z	4.31	67.14	16.26		150.0	
10524-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.50	67.00	16.37	0.00	150.0	± 9.6 %
		Y	4.57	66.78	16.25		150.0	
		Z	4.33	67.10	16.33		150.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.49	66.06	15.96	0.00	150.0	± 9.6 %
		Y	4.54	65.82	15.83		150.0	
		Z	4.36	66.21	15.95		150.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.65	66.41	16.10	0.00	150.0	± 9.6 %
		Y	4.72	66.20	15.98		150.0	
		Z	4.49	66.49	16.07		150.0	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.58	66.37	16.05	0.00	150.0	± 9.6 %
		Y	4.64	66.16	15.92		150.0	
		Z	4.42	66.47	16.01		150.0	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.59	66.39	16.08	0.00	150.0	± 9.6 %
		Y	4.65	66.18	15.96		150.0	
		Z	4.43	66.48	16.04		150.0	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.59	66.39	16.08	0.00	150.0	± 9.6 %
		Y	4.65	66.18	15.96		150.0	
		Z	4.43	66.48	16.04		150.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.58	66.48	16.09	0.00	150.0	± 9.6 %
		Y	4.65	66.29	15.97		150.0	
		Z	4.40	66.51	16.02		150.0	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.44	66.34	16.02	0.00	150.0	± 9.6 %
		Y	4.51	66.14	15.90		150.0	
		Z	4.28	66.37	15.96		150.0	
10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.60	66.44	16.07	0.00	150.0	± 9.6 %
		Y	4.66	66.22	15.94		150.0	
		Z	4.44	66.56	16.05		150.0	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.13	66.46	16.12	0.00	150.0	± 9.6 %
		Y	5.19	66.32	16.03		150.0	
		Z	4.99	66.46	16.09		150.0	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.20	66.64	16.21	0.00	150.0	± 9.6 %
		Y	5.25	66.49	16.10		150.0	
		Z	5.03	66.59	16.15		150.0	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	5.07	66.60	16.17	0.00	150.0	± 9.6 %
		Y	5.12	66.44	16.06		150.0	
		Z	4.92	66.60	16.13		150.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.12	66.56	16.15	0.00	150.0	± 9.6 %
		Y	5.18	66.41	16.05		150.0	
		Z	4.98	66.58	16.13		150.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.21	66.56	16.19	0.00	150.0	± 9.6 %
		Y	5.28	66.45	16.11		150.0	
		Z	5.05	66.54	16.15		150.0	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.14	66.58	16.22	0.00	150.0	± 9.6 %
		Y	5.20	66.45	16.12		150.0	
		Z	4.98	66.51	16.15		150.0	

10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.12	66.46	16.14	0.00	150.0	± 9.6 %
		Y	5.18	66.32	16.05		150.0	
		Z	4.96	66.43	16.09		150.0	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.27	66.53	16.19	0.00	150.0	± 9.6 %
		Y	5.33	66.40	16.10		150.0	
		Z	5.12	66.52	16.15		150.0	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.34	66.55	16.23	0.00	150.0	± 9.6 %
		Y	5.41	66.44	16.14		150.0	
		Z	5.19	66.58	16.21		150.0	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.45	66.57	16.12	0.00	150.0	± 9.6 %
		Y	5.49	66.44	16.03		150.0	
		Z	5.33	66.54	16.08		150.0	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.64	66.98	16.28	0.00	150.0	± 9.6 %
		Y	5.69	66.86	16.18		150.0	
		Z	5.50	66.96	16.25		150.0	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.50	66.75	16.18	0.00	150.0	± 9.6 %
		Y	5.56	66.68	16.11		150.0	
		Z	5.36	66.66	16.11		150.0	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.57	66.80	16.19	0.00	150.0	± 9.6 %
		Y	5.64	66.72	16.12		150.0	
		Z	5.44	66.76	16.16		150.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.80	67.67	16.61	0.00	150.0	± 9.6 %
		Y	5.91	67.72	16.59		150.0	
		Z	5.58	67.38	16.44		150.0	
10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.54	66.80	16.21	0.00	150.0	± 9.6 %
		Y	5.59	66.67	16.11		150.0	
		Z	5.42	66.83	16.21		150.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.54	66.82	16.18	0.00	150.0	± 9.6 %
		Y	5.59	66.72	16.10		150.0	
		Z	5.36	66.63	16.07		150.0	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.46	66.64	16.10	0.00	150.0	± 9.6 %
		Y	5.51	66.51	16.00		150.0	
		Z	5.34	66.66	16.08		150.0	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.54	66.66	16.14	0.00	150.0	± 9.6 %
		Y	5.59	66.56	16.06		150.0	
		Z	5.39	66.61	16.09		150.0	
10554-AAB	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.86	66.92	16.20	0.00	150.0	± 9.6 %
		Y	5.89	66.81	16.12		150.0	
		Z	5.75	66.87	16.15		150.0	
10555-AAB	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.98	67.22	16.33	0.00	150.0	± 9.6 %
		Y	6.03	67.12	16.25		150.0	
		Z	5.84	67.10	16.25		150.0	
10556-AAB	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	6.00	67.27	16.35	0.00	150.0	± 9.6 %
		Y	6.05	67.16	16.27		150.0	
		Z	5.88	67.20	16.30		150.0	
10557-AAB	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.96	67.16	16.31	0.00	150.0	± 9.6 %
		Y	6.02	67.08	16.25		150.0	
		Z	5.84	67.08	16.25		150.0	

10558-AAB	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	6.01	67.32	16.41	0.00	150.0	± 9.6 %
		Y	6.07	67.25	16.34		150.0	
		Z	5.85	67.15	16.31		150.0	
10560-AAB	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	6.01	67.17	16.37	0.00	150.0	± 9.6 %
		Y	6.06	67.10	16.31		150.0	
		Z	5.87	67.07	16.30		150.0	
10561-AAB	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.93	67.15	16.40	0.00	150.0	± 9.6 %
		Y	5.98	67.06	16.32		150.0	
		Z	5.80	67.05	16.32		150.0	
10562-AAB	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	6.04	67.49	16.57	0.00	150.0	± 9.6 %
		Y	6.12	67.48	16.53		150.0	
		Z	5.85	67.23	16.41		150.0	
10563-AAB	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.18	67.55	16.56	0.00	150.0	± 9.6 %
		Y	6.43	68.00	16.75		150.0	
		Z	5.95	67.17	16.35		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.86	66.88	16.45	0.46	150.0	± 9.6 %
		Y	4.92	66.69	16.36		150.0	
		Z	4.71	66.96	16.39		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	5.08	67.30	16.76	0.46	150.0	± 9.6 %
		Y	5.16	67.15	16.67		150.0	
		Z	4.90	67.36	16.69		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.91	67.15	16.58	0.46	150.0	± 9.6 %
		Y	4.99	67.00	16.50		150.0	
		Z	4.74	67.18	16.50		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	4.94	67.52	16.92	0.46	150.0	± 9.6 %
		Y	5.01	67.38	16.84		150.0	
		Z	4.77	67.57	16.87		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.83	66.96	16.38	0.46	150.0	± 9.6 %
		Y	4.90	66.77	16.27		150.0	
		Z	4.63	66.92	16.25		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.90	67.63	17.00	0.46	150.0	± 9.6 %
		Y	4.96	67.44	16.88		150.0	
		Z	4.75	67.78	17.00		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.93	67.48	16.92	0.46	150.0	± 9.6 %
		Y	5.00	67.29	16.82		150.0	
		Z	4.76	67.58	16.89		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.18	64.69	15.93	0.46	130.0	± 9.6 %
		Y	1.20	64.37	15.58		130.0	
		Z	1.13	64.22	15.49		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.19	65.27	16.29	0.46	130.0	± 9.6 %
		Y	1.21	64.91	15.92		130.0	
		Z	1.14	64.74	15.83		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	2.77	92.16	26.12	0.46	130.0	± 9.6 %
		Y	1.86	83.27	22.47		130.0	
		Z	1.57	83.20	23.00		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.31	71.26	19.39	0.46	130.0	± 9.6 %
		Y	1.31	70.26	18.63		130.0	
		Z	1.20	70.00	18.67		130.0	

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.64	66.67	16.51	0.46	130.0	± 9.6 %
		Y	4.71	66.50	16.43		130.0	
		Z	4.47	66.69	16.39		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.66	66.83	16.58	0.46	130.0	± 9.6 %
		Y	4.73	66.66	16.49		130.0	
		Z	4.50	66.89	16.47		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.86	67.11	16.74	0.46	130.0	± 9.6 %
		Y	4.94	66.97	16.66		130.0	
		Z	4.67	67.12	16.61		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.76	67.25	16.83	0.46	130.0	± 9.6 %
		Y	4.84	67.12	16.76		130.0	
		Z	4.57	67.26	16.72		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.52	66.57	16.17	0.46	130.0	± 9.6 %
		Y	4.61	66.44	16.10		130.0	
		Z	4.33	66.48	15.99		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.57	66.63	16.21	0.46	130.0	± 9.6 %
		Y	4.66	66.47	16.12		130.0	
		Z	4.36	66.53	16.01		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.65	67.30	16.78	0.46	130.0	± 9.6 %
		Y	4.73	67.15	16.70		130.0	
		Z	4.48	67.34	16.69		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.47	66.35	15.97	0.46	130.0	± 9.6 %
		Y	4.56	66.21	15.89		130.0	
		Z	4.26	66.25	15.78		130.0	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.64	66.67	16.51	0.46	130.0	± 9.6 %
		Y	4.71	66.50	16.43		130.0	
		Z	4.47	66.69	16.39		130.0	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.66	66.83	16.58	0.46	130.0	± 9.6 %
		Y	4.73	66.66	16.49		130.0	
		Z	4.50	66.89	16.47		130.0	
10585-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.86	67.11	16.74	0.46	130.0	± 9.6 %
		Y	4.94	66.97	16.66		130.0	
		Z	4.67	67.12	16.61		130.0	
10586-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.76	67.25	16.83	0.46	130.0	± 9.6 %
		Y	4.84	67.12	16.76		130.0	
		Z	4.57	67.26	16.72		130.0	
10587-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.52	66.57	16.17	0.46	130.0	± 9.6 %
		Y	4.61	66.44	16.10		130.0	
		Z	4.33	66.48	15.99		130.0	
10588-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.57	66.63	16.21	0.46	130.0	± 9.6 %
		Y	4.66	66.47	16.12		130.0	
		Z	4.36	66.53	16.01		130.0	
10589-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.65	67.30	16.78	0.46	130.0	± 9.6 %
		Y	4.73	67.15	16.70		130.0	
		Z	4.48	67.34	16.69		130.0	
10590-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.47	66.35	15.97	0.46	130.0	± 9.6 %
		Y	4.56	66.21	15.89		130.0	
		Z	4.26	66.25	15.78		130.0	

10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.79	66.72	16.61	0.46	130.0	± 9.6 %
		Y	4.86	66.57	16.53		130.0	
		Z	4.63	66.78	16.50		130.0	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.94	67.05	16.74	0.46	130.0	± 9.6 %
		Y	5.02	66.91	16.66		130.0	
		Z	4.75	67.07	16.63		130.0	
10593-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.86	66.96	16.62	0.46	130.0	± 9.6 %
		Y	4.94	66.83	16.55		130.0	
		Z	4.67	66.95	16.49		130.0	
10594-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.91	67.12	16.77	0.46	130.0	± 9.6 %
		Y	5.00	66.98	16.70		130.0	
		Z	4.72	67.12	16.65		130.0	
10595-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.88	67.08	16.67	0.46	130.0	± 9.6 %
		Y	4.96	66.94	16.59		130.0	
		Z	4.69	67.10	16.56		130.0	
10596-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.82	67.08	16.68	0.46	130.0	± 9.6 %
		Y	4.90	66.94	16.60		130.0	
		Z	4.62	67.07	16.55		130.0	
10597-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.77	66.98	16.56	0.46	130.0	± 9.6 %
		Y	4.85	66.85	16.49		130.0	
		Z	4.57	66.94	16.41		130.0	
10598-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.75	67.19	16.80	0.46	130.0	± 9.6 %
		Y	4.83	67.08	16.74		130.0	
		Z	4.56	67.16	16.67		130.0	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.46	67.23	16.81	0.46	130.0	± 9.6 %
		Y	5.53	67.13	16.74		130.0	
		Z	5.31	67.22	16.74		130.0	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.59	67.67	17.00	0.46	130.0	± 9.6 %
		Y	5.69	67.62	16.95		130.0	
		Z	5.40	67.56	16.88		130.0	
10601-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.48	67.41	16.88	0.46	130.0	± 9.6 %
		Y	5.56	67.33	16.83		130.0	
		Z	5.31	67.36	16.79		130.0	
10602-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.59	67.49	16.85	0.46	130.0	± 9.6 %
		Y	5.65	67.34	16.75		130.0	
		Z	5.41	67.42	16.75		130.0	
10603-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.65	67.74	17.10	0.46	130.0	± 9.6 %
		Y	5.74	67.66	17.04		130.0	
		Z	5.48	67.71	17.02		130.0	
10604-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.49	67.31	16.87	0.46	130.0	± 9.6 %
		Y	5.53	67.10	16.74		130.0	
		Z	5.37	67.37	16.83		130.0	
10605-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.58	67.57	17.01	0.46	130.0	± 9.6 %
		Y	5.65	67.44	16.92		130.0	
		Z	5.40	67.46	16.88		130.0	
10606-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.32	66.88	16.52	0.46	130.0	± 9.6 %
		Y	5.42	66.88	16.50		130.0	
		Z	5.18	66.90	16.45		130.0	

10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.63	66.06	16.24	0.46	130.0	± 9.6 %
		Y	4.69	65.87	16.14		130.0	
		Z	4.48	66.14	16.16		130.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.81	66.46	16.41	0.46	130.0	± 9.6 %
		Y	4.89	66.28	16.31		130.0	
		Z	4.62	66.47	16.30		130.0	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.70	66.31	16.25	0.46	130.0	± 9.6 %
		Y	4.78	66.14	16.15		130.0	
		Z	4.52	66.31	16.13		130.0	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.75	66.46	16.40	0.46	130.0	± 9.6 %
		Y	4.83	66.29	16.31		130.0	
		Z	4.57	66.47	16.29		130.0	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.67	66.27	16.25	0.46	130.0	± 9.6 %
		Y	4.74	66.11	16.17		130.0	
		Z	4.48	66.27	16.14		130.0	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.68	66.43	16.31	0.46	130.0	± 9.6 %
		Y	4.76	66.26	16.21		130.0	
		Z	4.47	66.40	16.18		130.0	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.68	66.30	16.19	0.46	130.0	± 9.6 %
		Y	4.76	66.16	16.10		130.0	
		Z	4.47	66.22	16.03		130.0	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.62	66.47	16.40	0.46	130.0	± 9.6 %
		Y	4.70	66.33	16.32		130.0	
		Z	4.44	66.44	16.27		130.0	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.67	66.12	16.05	0.46	130.0	± 9.6 %
		Y	4.75	65.95	15.95		130.0	
		Z	4.48	66.11	15.92		130.0	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.28	66.50	16.42	0.46	130.0	± 9.6 %
		Y	5.35	66.40	16.35		130.0	
		Z	5.12	66.44	16.33		130.0	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.35	66.70	16.50	0.46	130.0	± 9.6 %
		Y	5.42	66.55	16.40		130.0	
		Z	5.16	66.57	16.37		130.0	
10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.24	66.70	16.51	0.46	130.0	± 9.6 %
		Y	5.30	66.57	16.42		130.0	
		Z	5.08	66.64	16.42		130.0	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.25	66.50	16.35	0.46	130.0	± 9.6 %
		Y	5.33	66.41	16.28		130.0	
		Z	5.09	66.45	16.26		130.0	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.34	66.53	16.41	0.46	130.0	± 9.6 %
		Y	5.42	66.46	16.35		130.0	
		Z	5.16	66.45	16.31		130.0	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.34	66.65	16.59	0.46	130.0	± 9.6 %
		Y	5.41	66.55	16.51		130.0	
		Z	5.17	66.56	16.48		130.0	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.35	66.81	16.66	0.46	130.0	± 9.6 %
		Y	5.42	66.71	16.59		130.0	
		Z	5.16	66.65	16.52		130.0	

10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.23	66.36	16.32	0.46	130.0	± 9.6 %
		Y	5.30	66.25	16.24		130.0	
		Z	5.05	66.22	16.17		130.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.42	66.55	16.47	0.46	130.0	± 9.6 %
		Y	5.50	66.45	16.40		130.0	
		Z	5.25	66.47	16.36		130.0	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.75	67.41	16.95	0.46	130.0	± 9.6 %
		Y	5.89	67.51	16.98		130.0	
		Z	5.34	66.63	16.50		130.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.59	66.56	16.38	0.46	130.0	± 9.6 %
		Y	5.64	66.46	16.31		130.0	
		Z	5.45	66.47	16.28		130.0	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.82	67.13	16.63	0.46	130.0	± 9.6 %
		Y	5.88	67.03	16.55		130.0	
		Z	5.67	67.05	16.54		130.0	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.61	66.64	16.32	0.46	130.0	± 9.6 %
		Y	5.68	66.59	16.27		130.0	
		Z	5.44	66.46	16.18		130.0	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.69	66.69	16.34	0.46	130.0	± 9.6 %
		Y	5.78	66.69	16.31		130.0	
		Z	5.54	66.62	16.26		130.0	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	6.09	68.10	17.05	0.46	130.0	± 9.6 %
		Y	6.25	68.29	17.11		130.0	
		Z	5.78	67.54	16.72		130.0	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.99	67.90	17.13	0.46	130.0	± 9.6 %
		Y	6.12	67.99	17.15		130.0	
		Z	5.75	67.56	16.92		130.0	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.79	67.18	16.78	0.46	130.0	± 9.6 %
		Y	5.85	67.07	16.70		130.0	
		Z	5.67	67.21	16.76		130.0	
10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.68	66.80	16.43	0.46	130.0	± 9.6 %
		Y	5.74	66.74	16.37		130.0	
		Z	5.48	66.57	16.27		130.0	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.66	66.82	16.49	0.46	130.0	± 9.6 %
		Y	5.73	66.76	16.44		130.0	
		Z	5.50	66.72	16.40		130.0	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.54	66.19	15.93	0.46	130.0	± 9.6 %
		Y	5.62	66.14	15.87		130.0	
		Z	5.36	66.00	15.77		130.0	
10636-AAB	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	6.00	66.92	16.46	0.46	130.0	± 9.6 %
		Y	6.05	66.85	16.41		130.0	
		Z	5.88	66.82	16.36		130.0	
10637-AAB	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.16	67.31	16.64	0.46	130.0	± 9.6 %
		Y	6.21	67.23	16.58		130.0	
		Z	6.00	67.12	16.50		130.0	
10638-AAB	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.16	67.28	16.60	0.46	130.0	± 9.6 %
		Y	6.21	67.20	16.54		130.0	
		Z	6.02	67.18	16.51		130.0	

10639-AAB	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	6.13	67.21	16.61	0.46	130.0	± 9.6 %
		Y	6.20	67.17	16.57		130.0	
		Z	5.98	67.06	16.49		130.0	
10640-AAB	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	6.13	67.23	16.57	0.46	130.0	± 9.6 %
		Y	6.21	67.21	16.53		130.0	
		Z	5.95	66.98	16.40		130.0	
10641-AAB	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	6.19	67.17	16.55	0.46	130.0	± 9.6 %
		Y	6.24	67.06	16.48		130.0	
		Z	6.04	67.04	16.44		130.0	
10642-AAB	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.22	67.37	16.82	0.46	130.0	± 9.6 %
		Y	6.28	67.33	16.77		130.0	
		Z	6.06	67.23	16.70		130.0	
10643-AAB	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	6.06	67.09	16.58	0.46	130.0	± 9.6 %
		Y	6.12	67.02	16.52		130.0	
		Z	5.91	66.93	16.45		130.0	
10644-AAB	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	6.20	67.52	16.82	0.46	130.0	± 9.6 %
		Y	6.31	67.59	16.83		130.0	
		Z	5.97	67.13	16.57		130.0	
10645-AAB	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.41	67.77	16.91	0.46	130.0	± 9.6 %
		Y	6.76	68.49	17.23		130.0	
		Z	6.10	67.18	16.56		130.0	
10646-AAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	32.54	128.38	44.23	9.30	60.0	± 9.6 %
		Y	33.21	124.21	42.28		60.0	
		Z	8.58	97.27	34.21		60.0	
10647-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	24.86	122.50	42.74	9.30	60.0	± 9.6 %
		Y	27.83	120.75	41.46		60.0	
		Z	7.33	94.04	33.20		60.0	
10648-AAA	CDMA2000 (1x Advanced)	X	0.71	63.99	11.07	0.00	150.0	± 9.6 %
		Y	0.72	63.38	11.01		150.0	
		Z	0.57	62.72	9.40		150.0	
10652-AAB	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.64	67.29	16.91	2.23	80.0	± 9.6 %
		Y	3.79	67.25	16.93		80.0	
		Z	3.31	66.63	16.20		80.0	
10653-AAB	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	4.13	66.44	16.95	2.23	80.0	± 9.6 %
		Y	4.30	66.53	16.99		80.0	
		Z	3.84	65.89	16.44		80.0	
10654-AAB	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	4.11	66.04	16.93	2.23	80.0	± 9.6 %
		Y	4.26	66.17	16.97		80.0	
		Z	3.86	65.50	16.46		80.0	
10655-AAB	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.17	66.02	16.96	2.23	80.0	± 9.6 %
		Y	4.32	66.18	17.01		80.0	
		Z	3.93	65.42	16.50		80.0	

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Calibration Laboratory of
Schmid & Partner
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan18**

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1003
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 15, 2018

BN
01-25-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	Leif Klysner
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 15, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.28 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.42 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.71 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω - 2.1 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω - 6.2 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.94 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.32 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.22 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.06 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.70 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**4.60 W/kg ± 16.9 % (k=2)**

DASY5 Validation Report for Head TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003

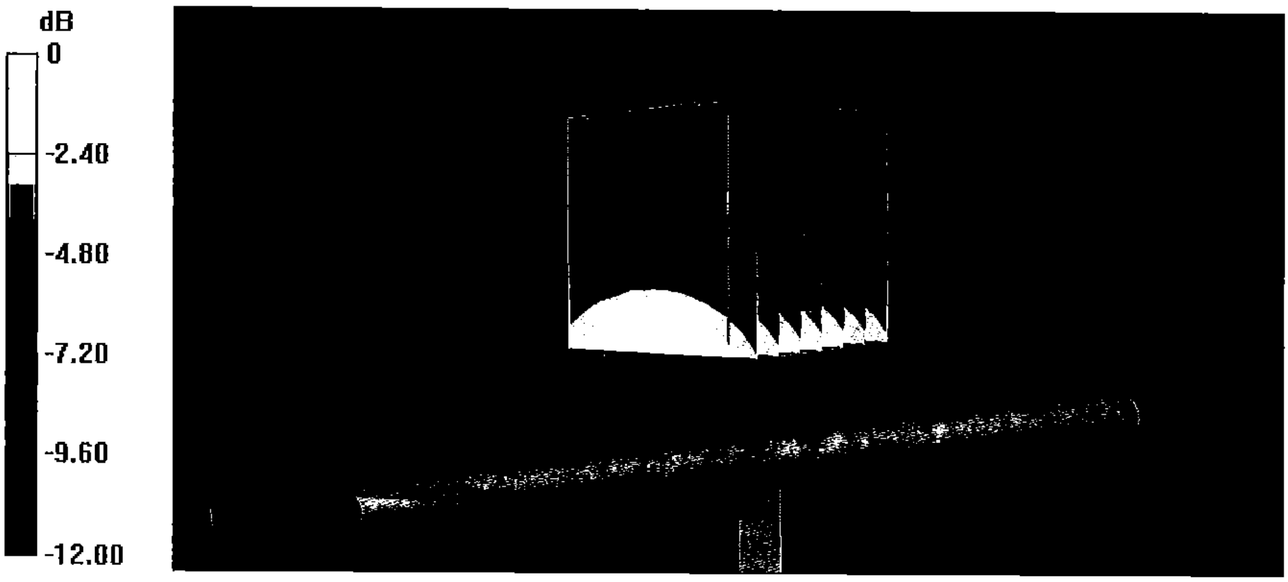
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

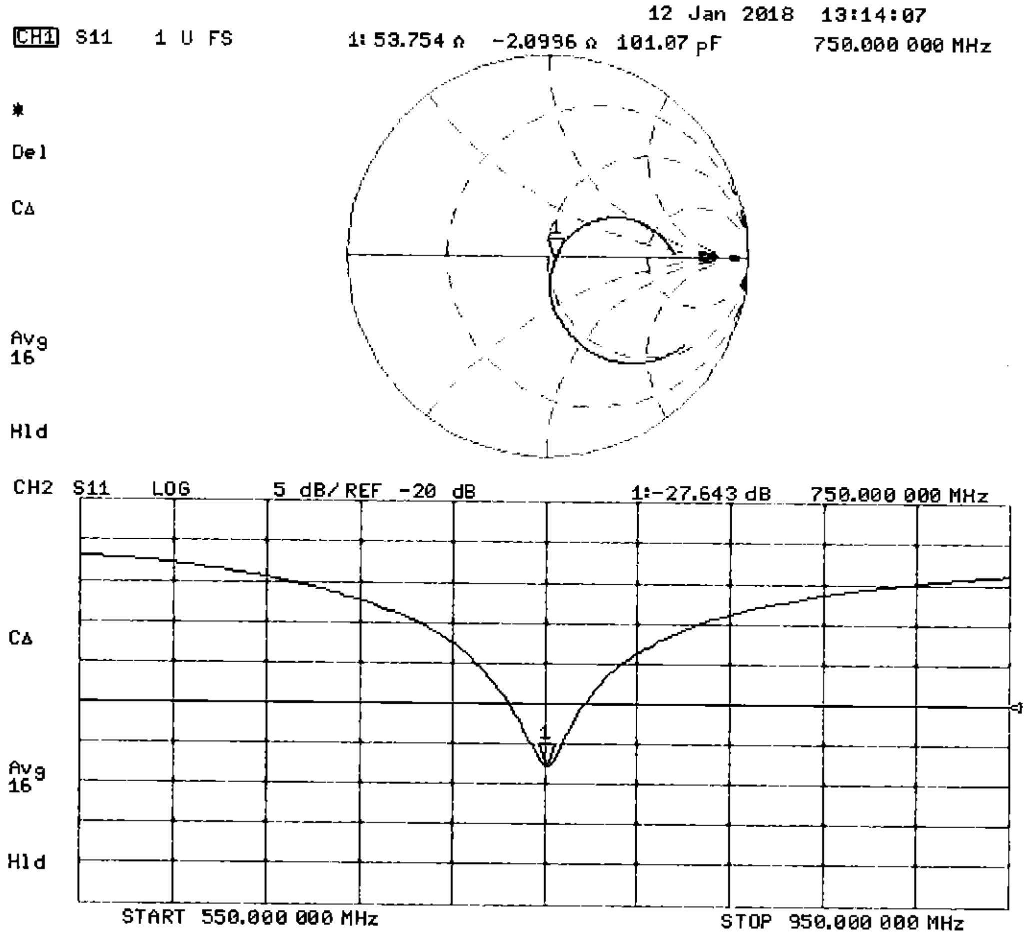
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.11 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.15 W/kg
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003

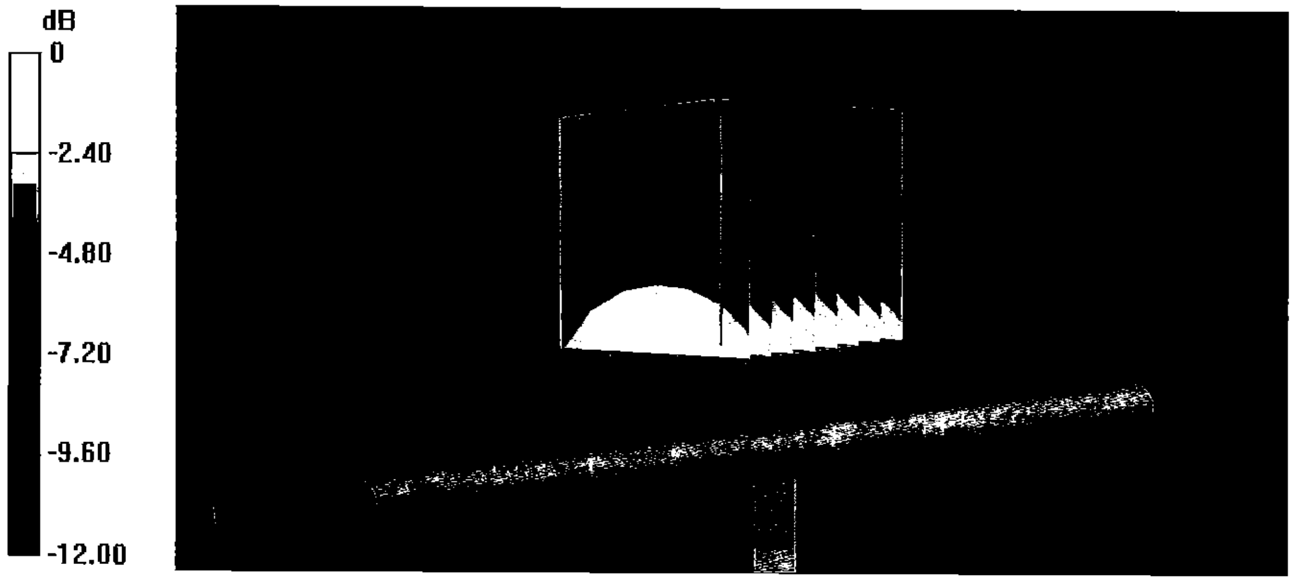
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

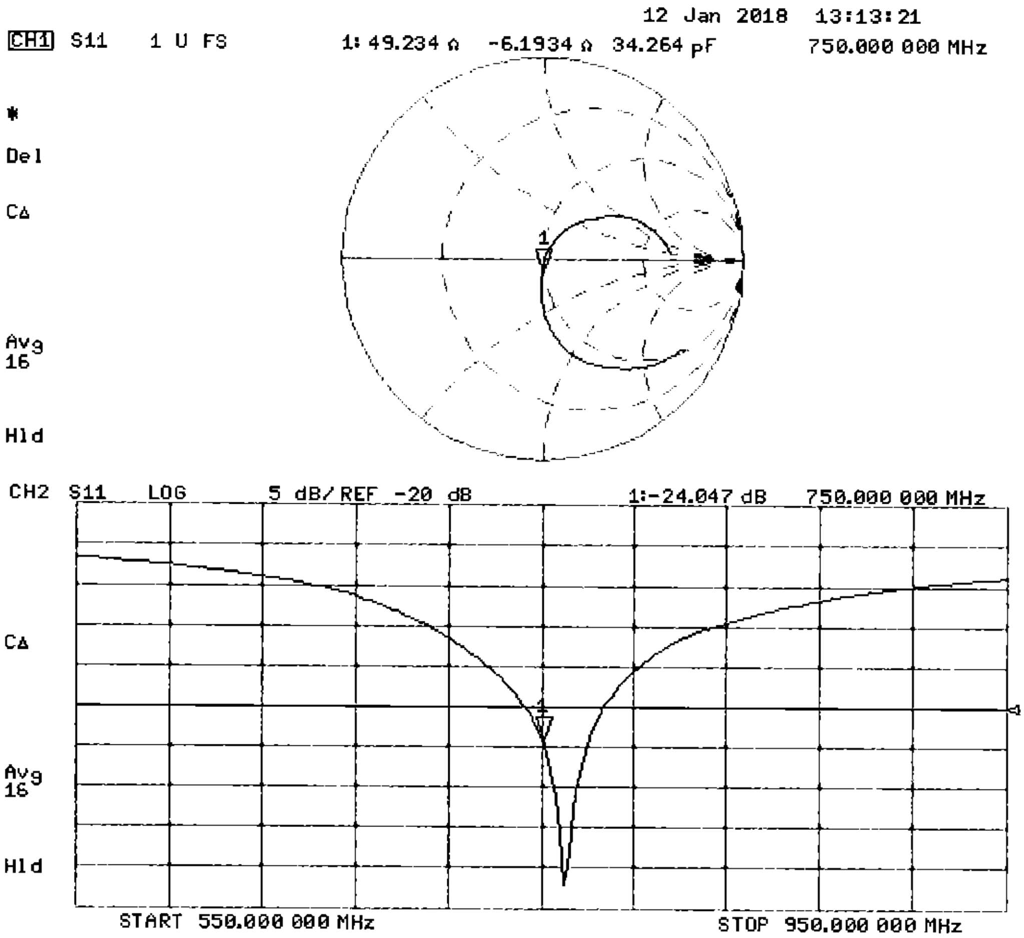
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.31 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.17 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg
Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dBW/kg

Impedance Measurement Plot for Body TSL



Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 44.2; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

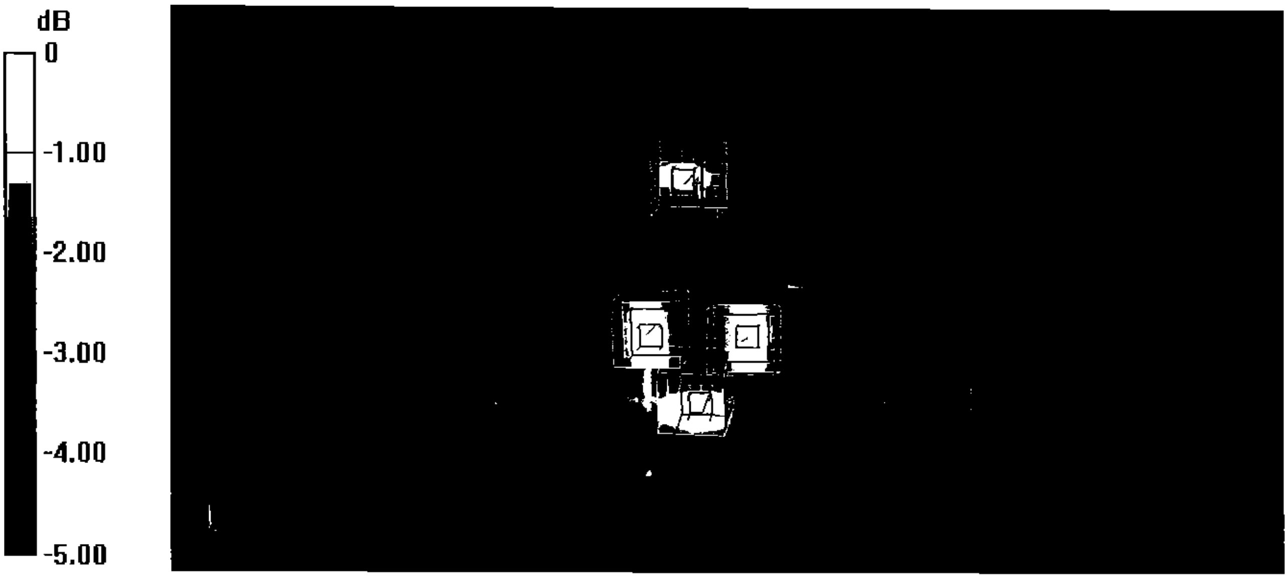
- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.79 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.89 W/kg
SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.58 W/kg

SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.85 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.94 W/kg
SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.62 W/kg

SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.29 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.56 W/kg

SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.01 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg
Maximum value of SAR (measured) = 2.11 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d132_Jan18

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d132
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 15, 2018

BN✓
01-25-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	(signature)
Approved by:	Katja Pokovic	Technical Manager	(signature)

Issued: January 15, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.36 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.8 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.71 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.39 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.9 jΩ
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 5.7 jΩ
Return Loss	- 23.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.41 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.21 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.69 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.45 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.22 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.25 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.96 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.39 W/kg ± 16.9 % (k=2)**

DASY5 Validation Report for Head TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

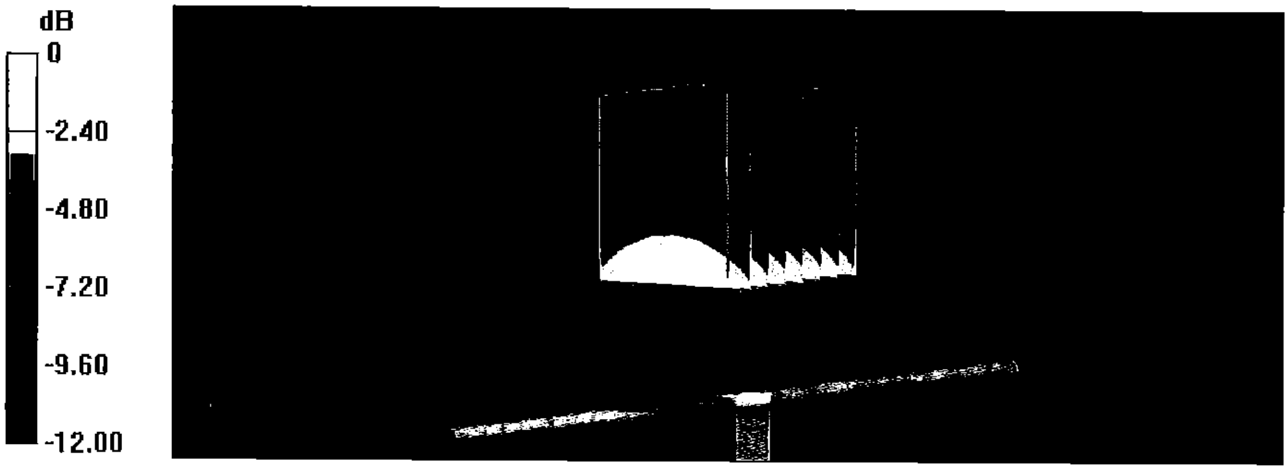
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

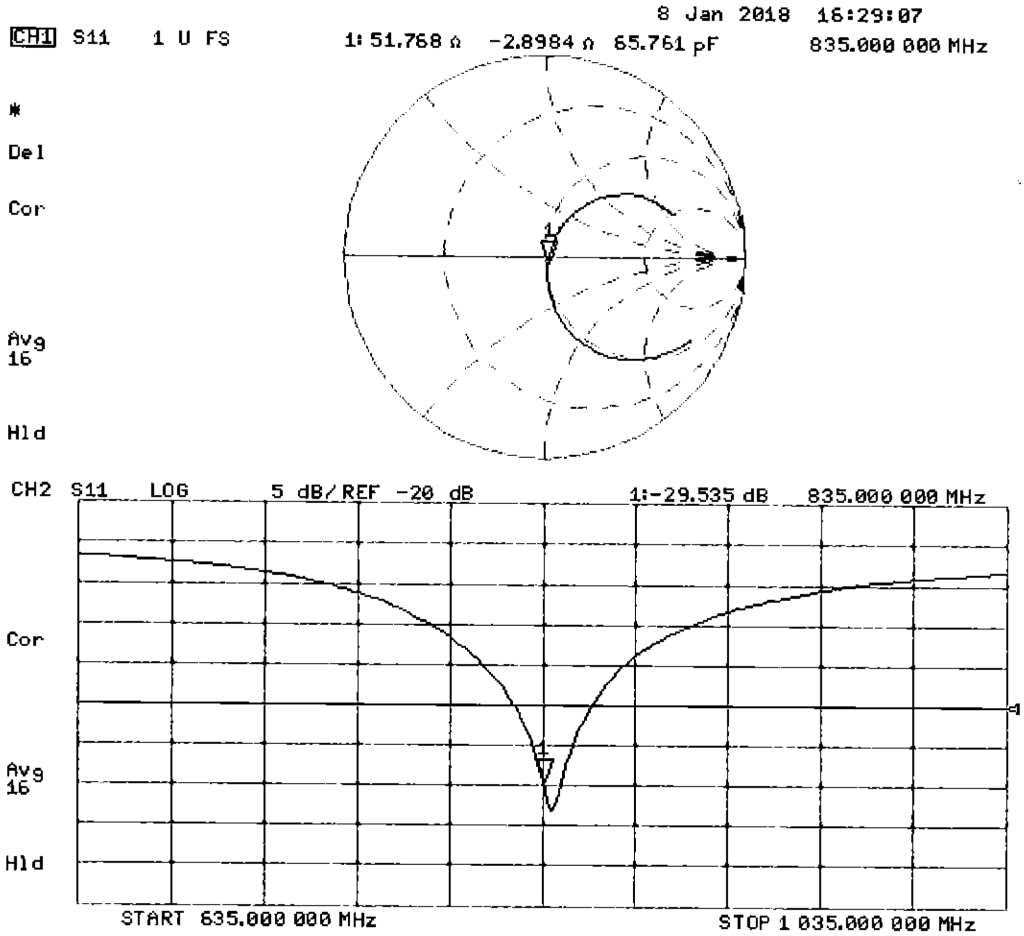
- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.23 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132

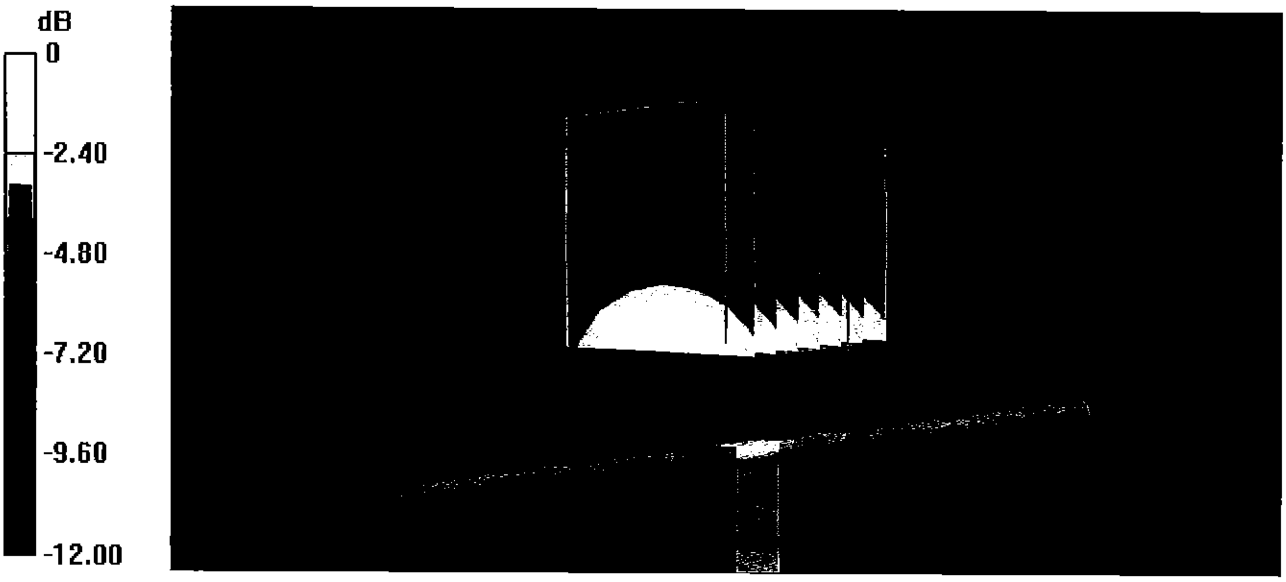
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

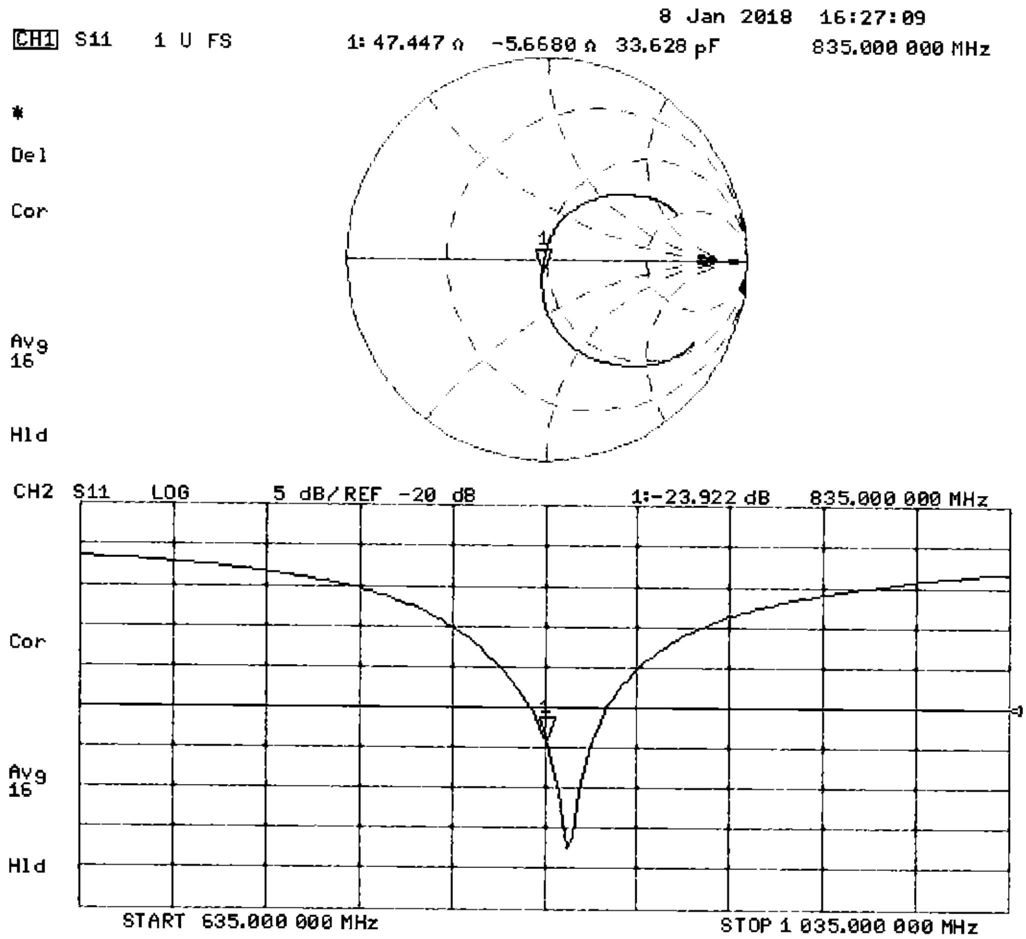
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.55 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.66 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 44.1; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

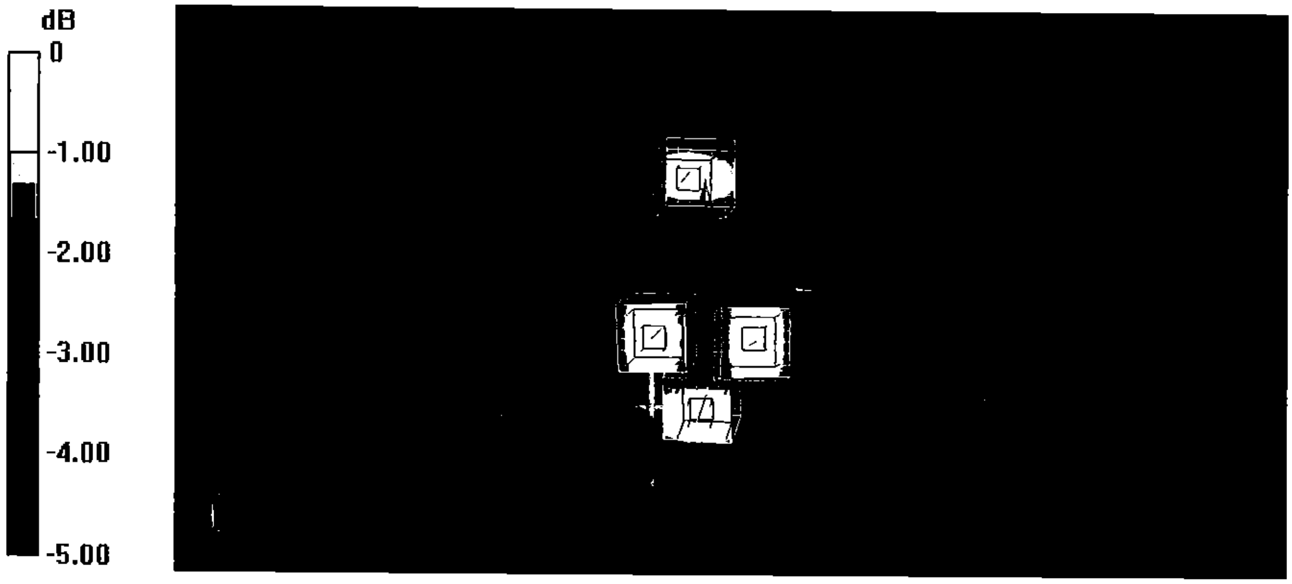
- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.00 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.16 W/kg

SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.99 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.65 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 3.19 W/kg

SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.20 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 3.04 W/kg

SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.03 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.90 W/kg
SAR(1 g) = 2.03 W/kg; SAR(10 g) = 1.37 W/kg
Maximum value of SAR (measured) = 2.61 W/kg



0 dB = 2.61 W/kg = 4.17 dBW/kg

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1750V2-1148_May17

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1148
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 09, 2017

BN ✓
05-23-2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 11, 2017

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 0.7 jΩ
Return Loss	- 42.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7 Ω - 0.5 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.223 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 30, 2014

DASY5 Validation Report for Head TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1148

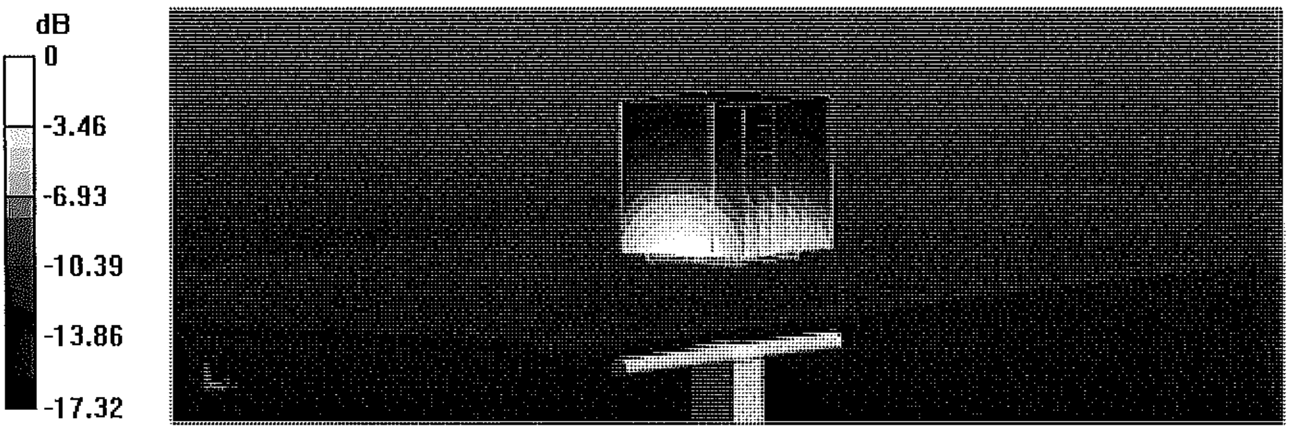
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

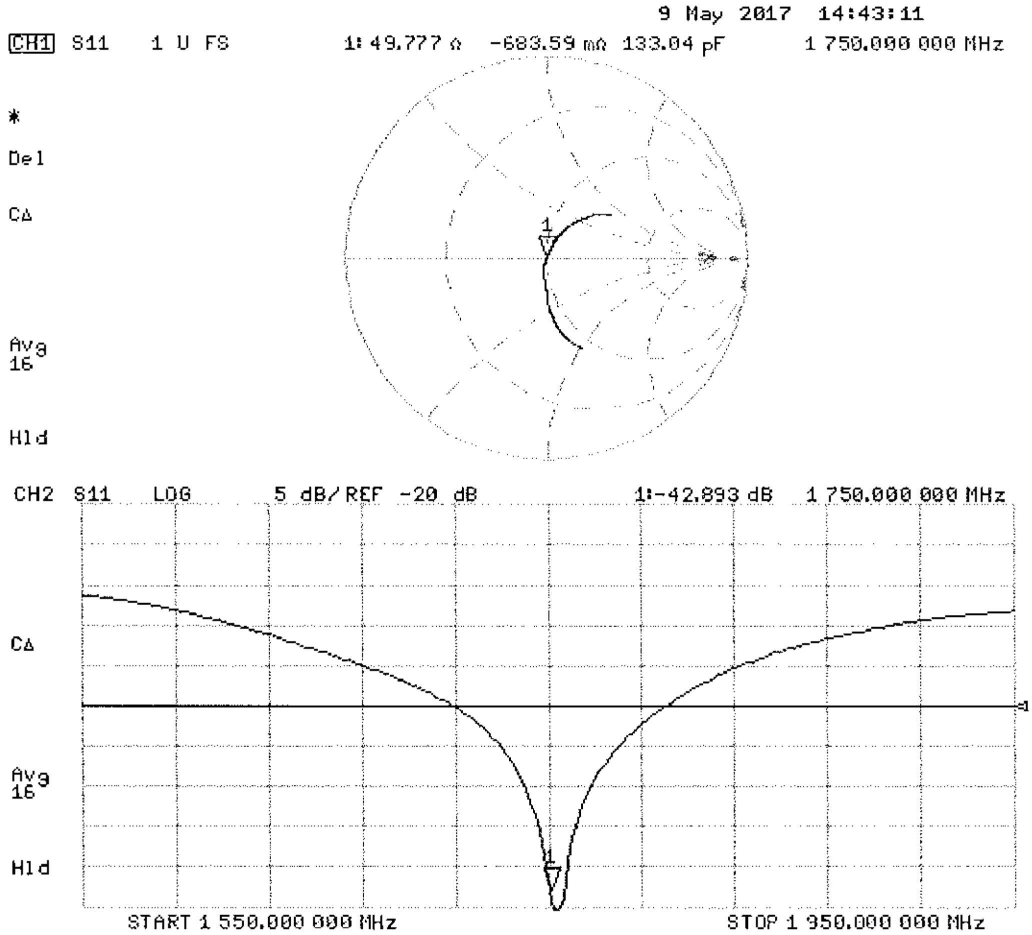
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.5 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.83 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1148

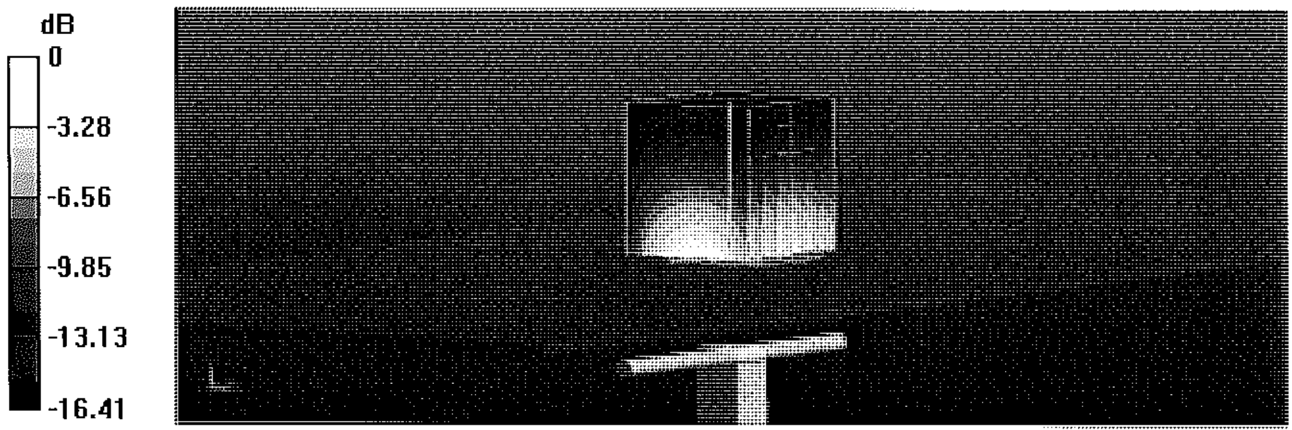
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.47 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

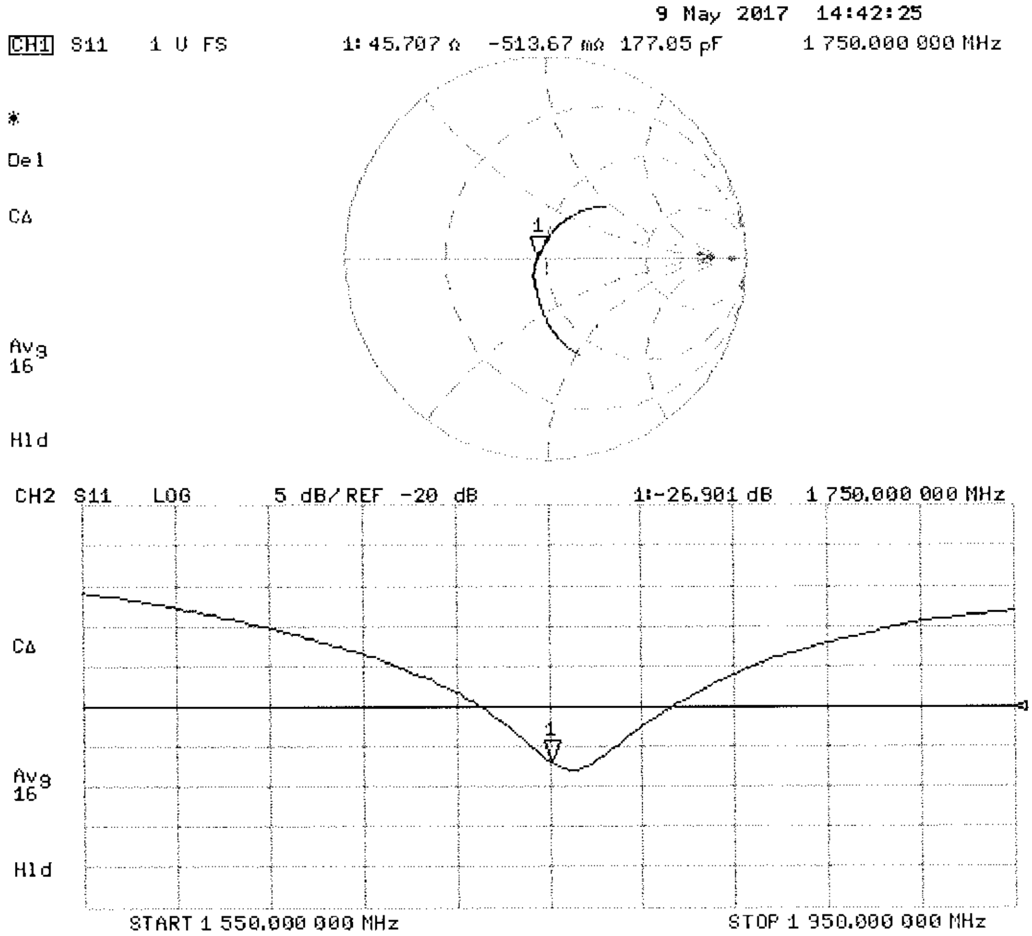
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.49 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.93 W/kg
Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1900V2-5d148_Feb18

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d148
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 07, 2018

BN ✓ 03-02-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 7, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, June 2013
b) IEC 62209-1, “Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)”, July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, “SAR Measurement Requirements for 100 MHz to 6 GHz”

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 5.8 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω + 6.5 jΩ
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 07.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148

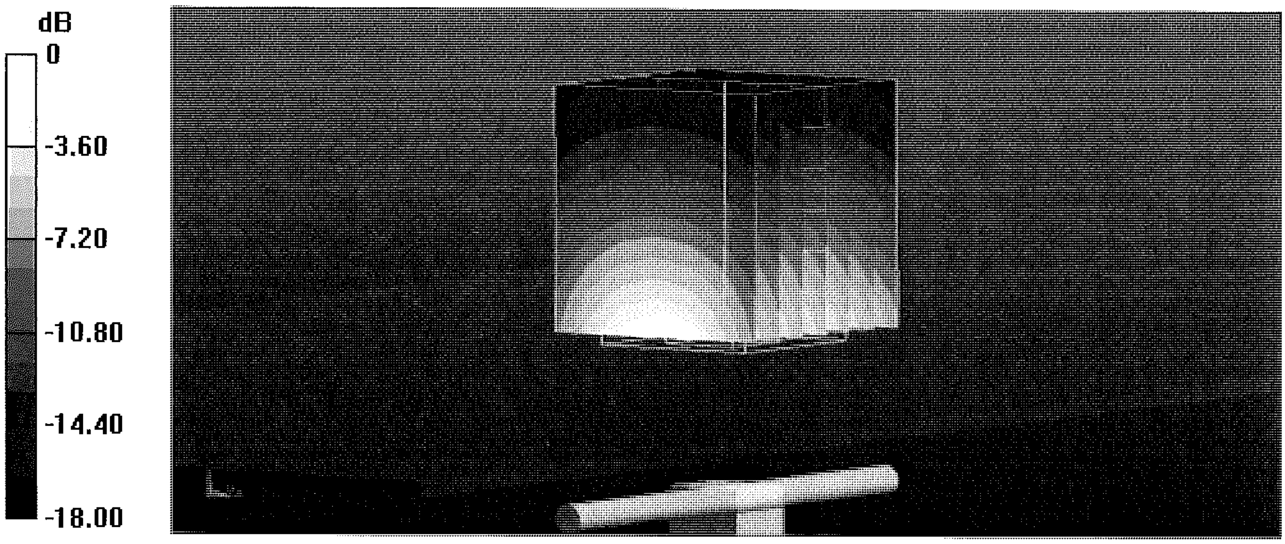
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

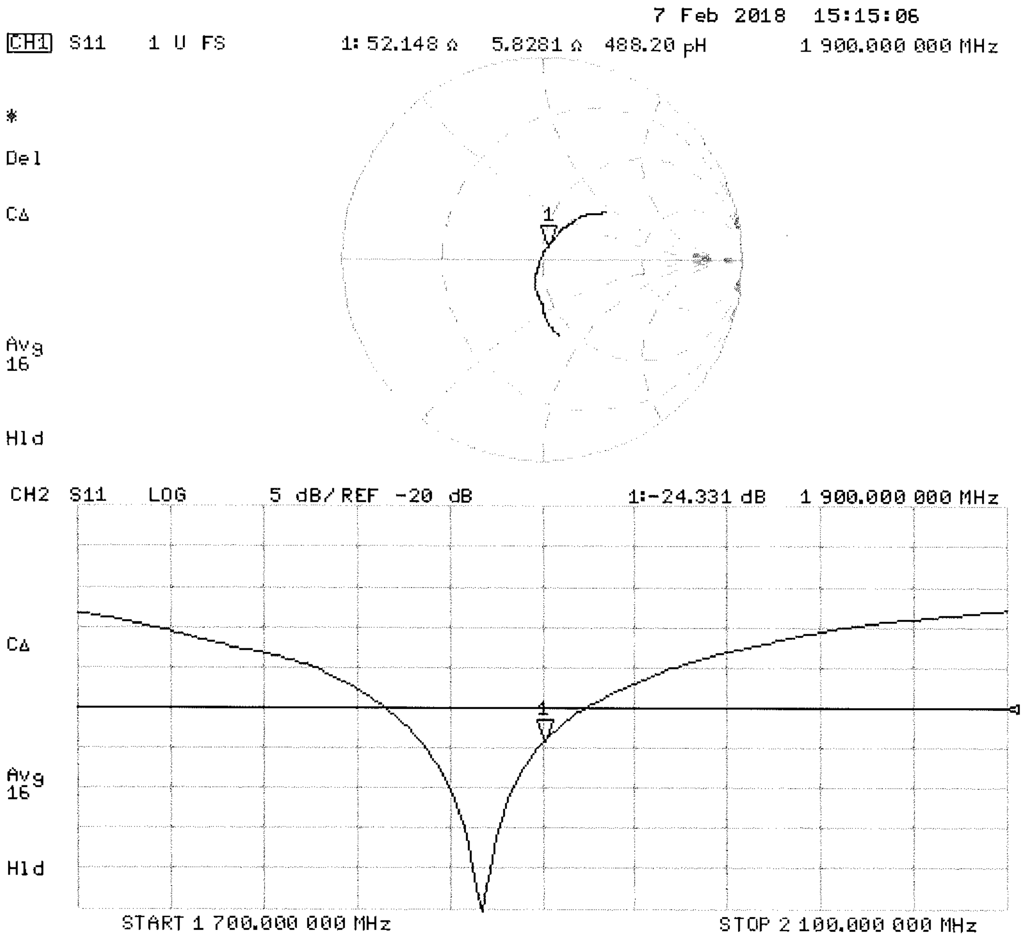
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.6 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148

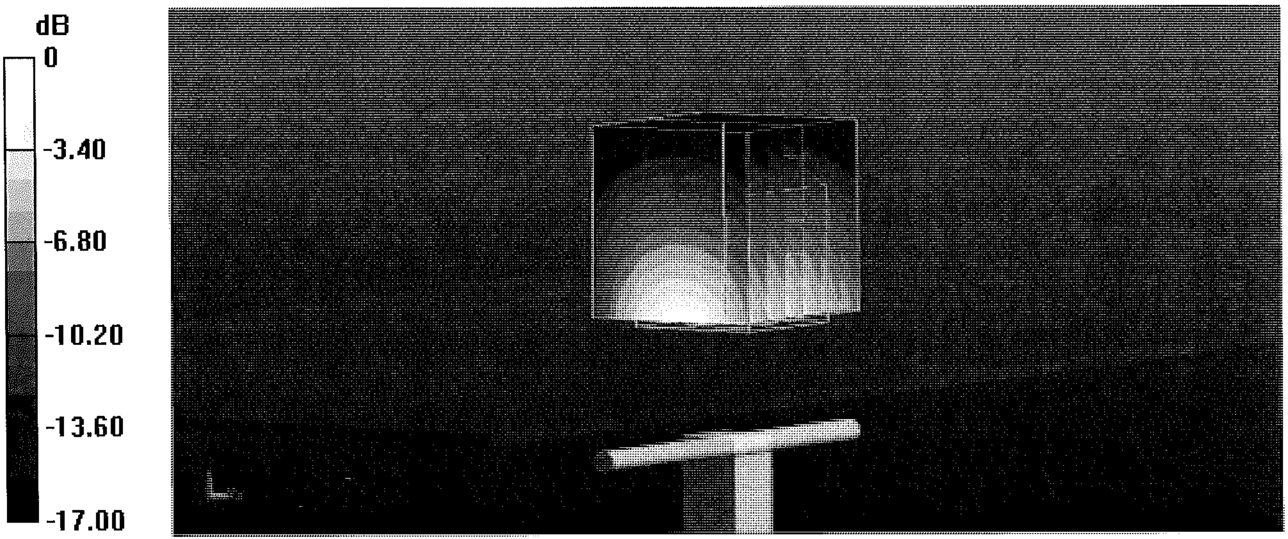
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.48 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

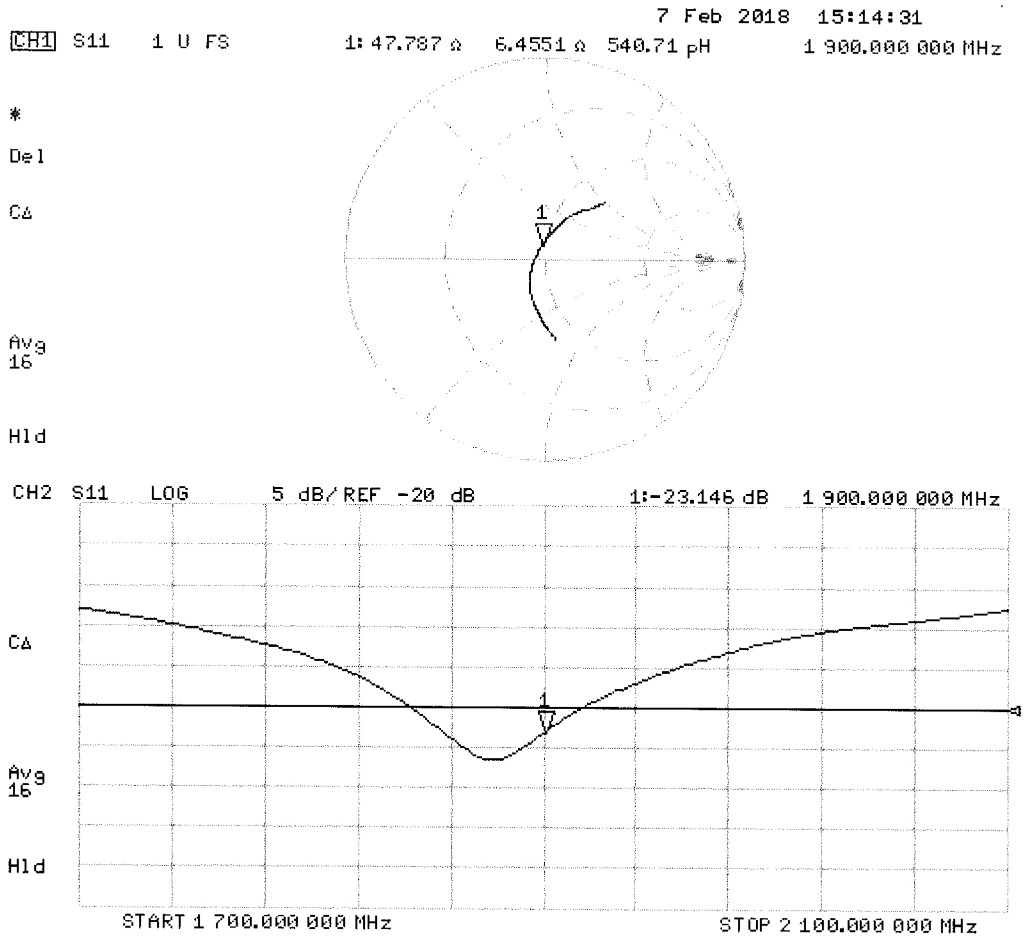
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.0 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL



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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2300V2-1073_Jul16

CALIBRATION CERTIFICATE

Object	D2300V2 - SN:1073
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 25, 2016

RPY 8/9/16 Extended 7/2017 SC ✓

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M. Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: July 26, 2016

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.69 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**48.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.9	1.81 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.85 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**48.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.85 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9 Ω - 4.9 jΩ
Return Loss	- 25.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.5 Ω - 4.1 jΩ
Return Loss	- 23.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.171 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 16, 2015

DASY5 Validation Report for Head TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1073

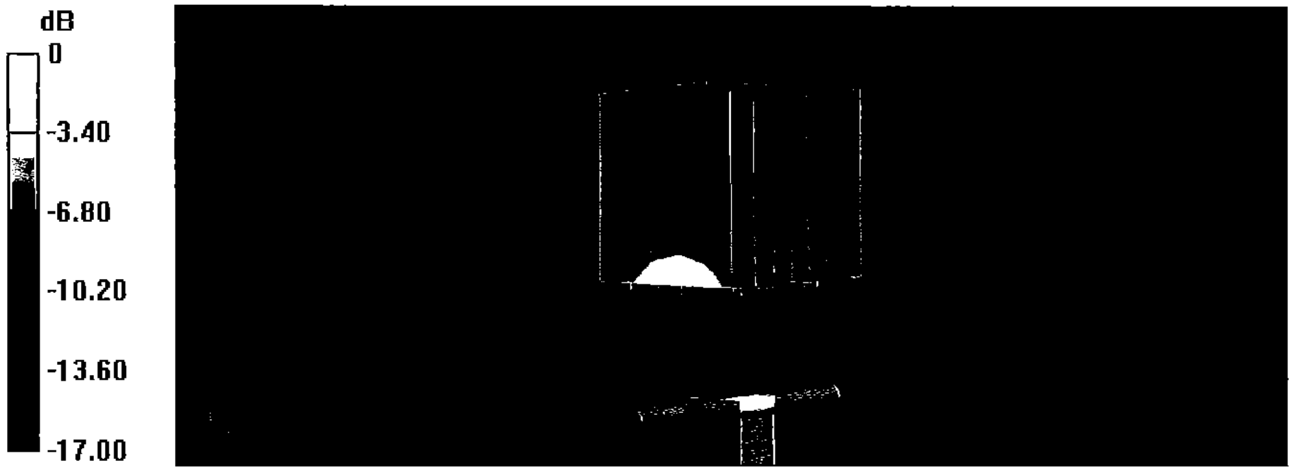
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.69 S/m; ε_r = 38.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.99, 7.99, 7.99); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

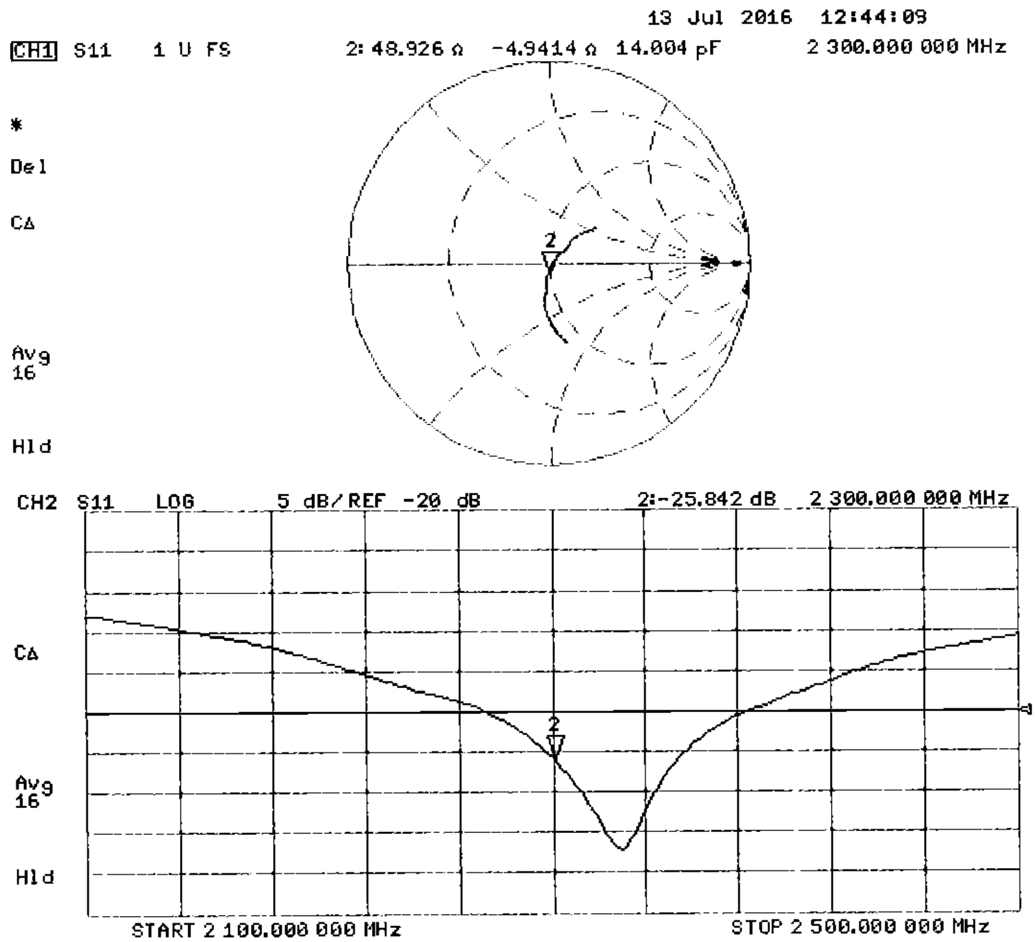
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.1 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 24.1 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.9 W/kg
Maximum value of SAR (measured) = 19.8 W/kg



0 dB = 19.8 W/kg = 12.97 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1073

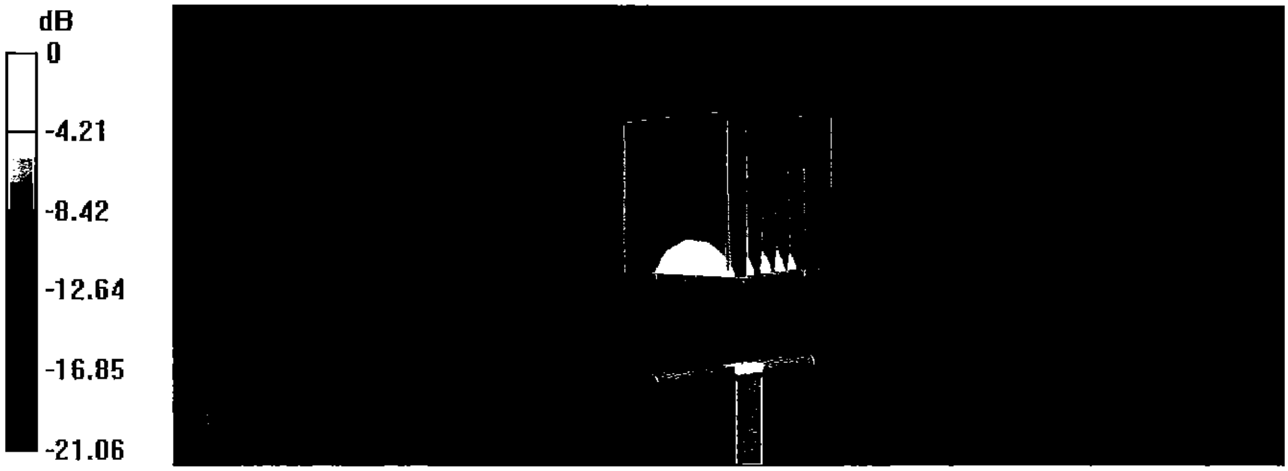
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.85 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

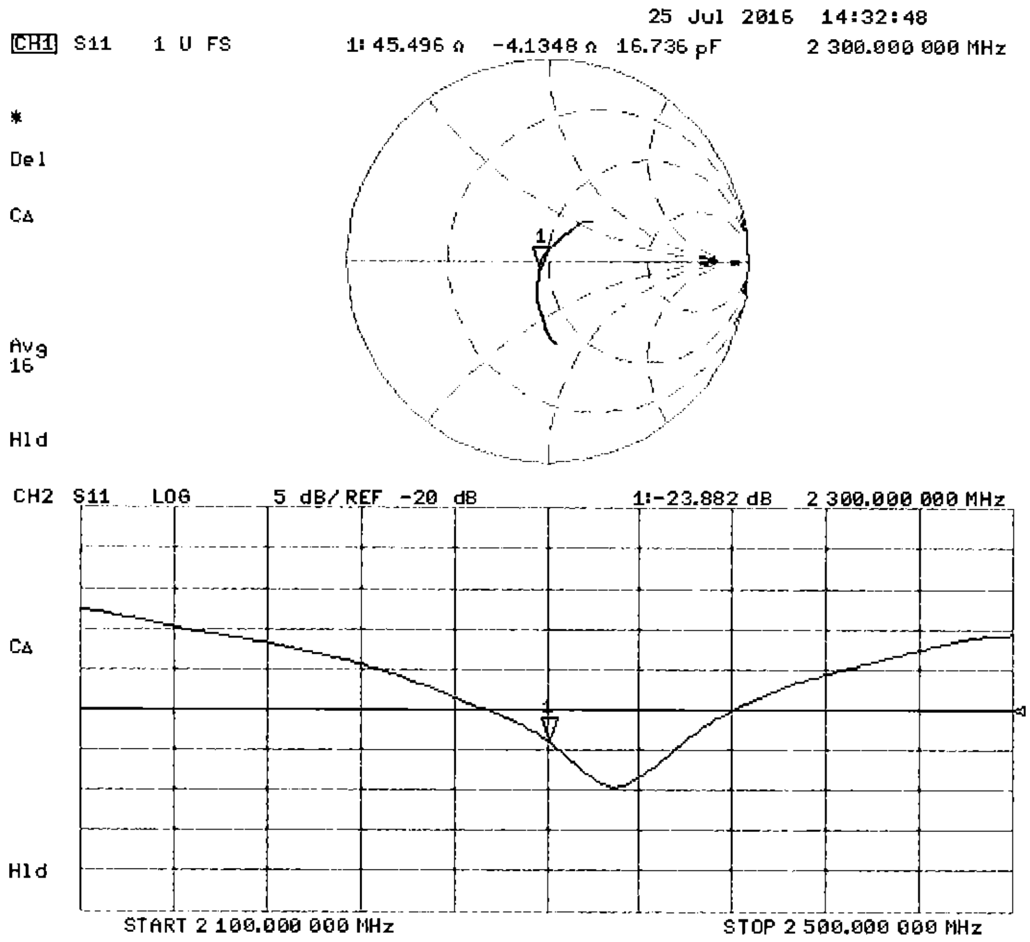
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.8 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 23.8 W/kg
SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.85 W/kg
Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

Impedance Measurement Plot for Body TSL



PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctest.com

Certification of Calibration

Object: D2300V2 – SN: 1073

Calibration procedure(s): Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 24, 2017

Description: SAR Validation Dipole at 2300 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Agilent	8753ES	S-Parameter Network Analyzer	10/26/2016	Annual	10/26/2017	US39170118
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/14/2016	Annual	9/14/2017	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	1272
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES3DV3	SAR Probe	9/19/2016	Annual	9/19/2017	3287
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3213
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1207364
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1339018
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	Brodie Halbfoster
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

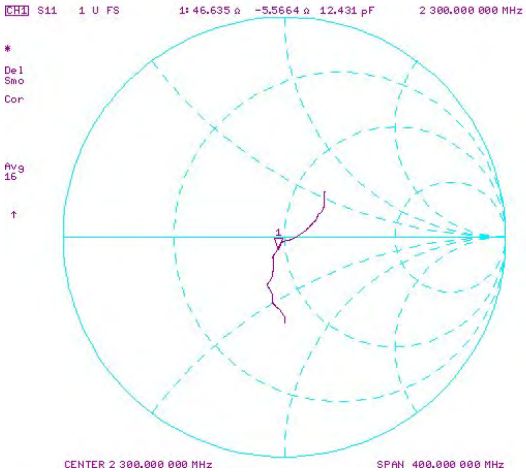
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

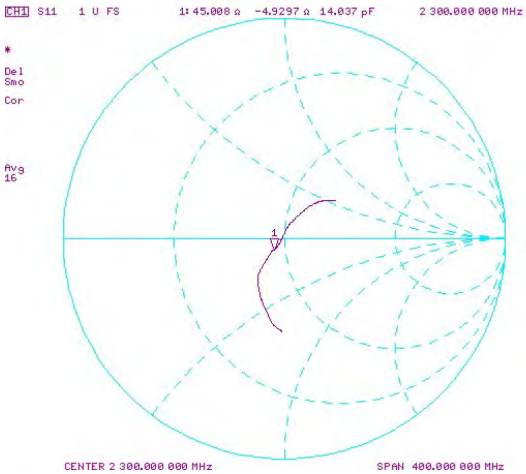
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
7/25/2016	7/24/2017	1.171	4.86	5.06	4.12%	2.34	2.40	2.56%	48.9	46.6	2.3	-4.9	-5.6	0.7	-25.8	-22.5	12.80%	PASS

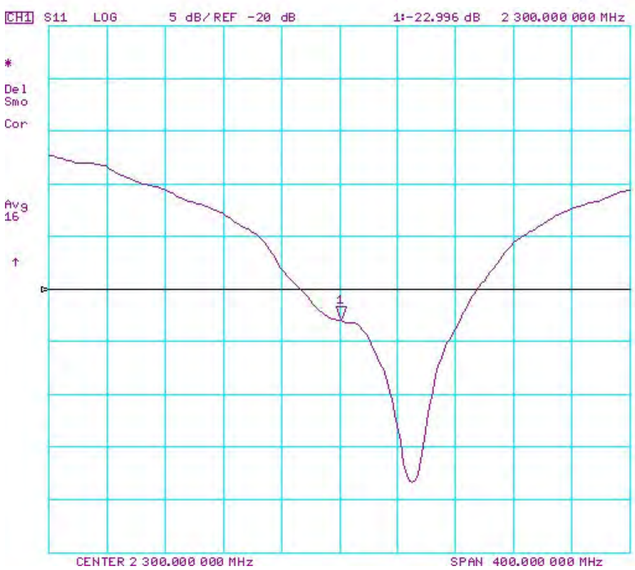
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
7/25/2016	7/24/2017	1.171	4.81	4.63	-3.74%	2.32	2.18	-6.03%	45.5	45.0	0.5	-4.1	-4.9	0.8	-23.9	-23.0	3.80%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Object:	Date Issued:	Page 4 of 4
D2300V2 – SN: 1073	07/24/2017	

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client PC Test

Certificate No: D2450V2-797_Sep17

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:797
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 11, 2017

SC ✓ 10/03/2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: September 11, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω + 7.4 jΩ
Return Loss	- 21.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω + 9.1 jΩ
Return Loss	- 20.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

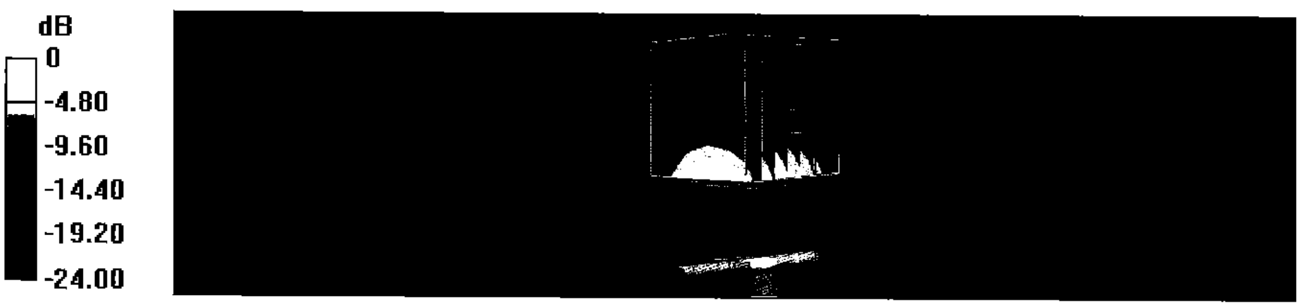
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

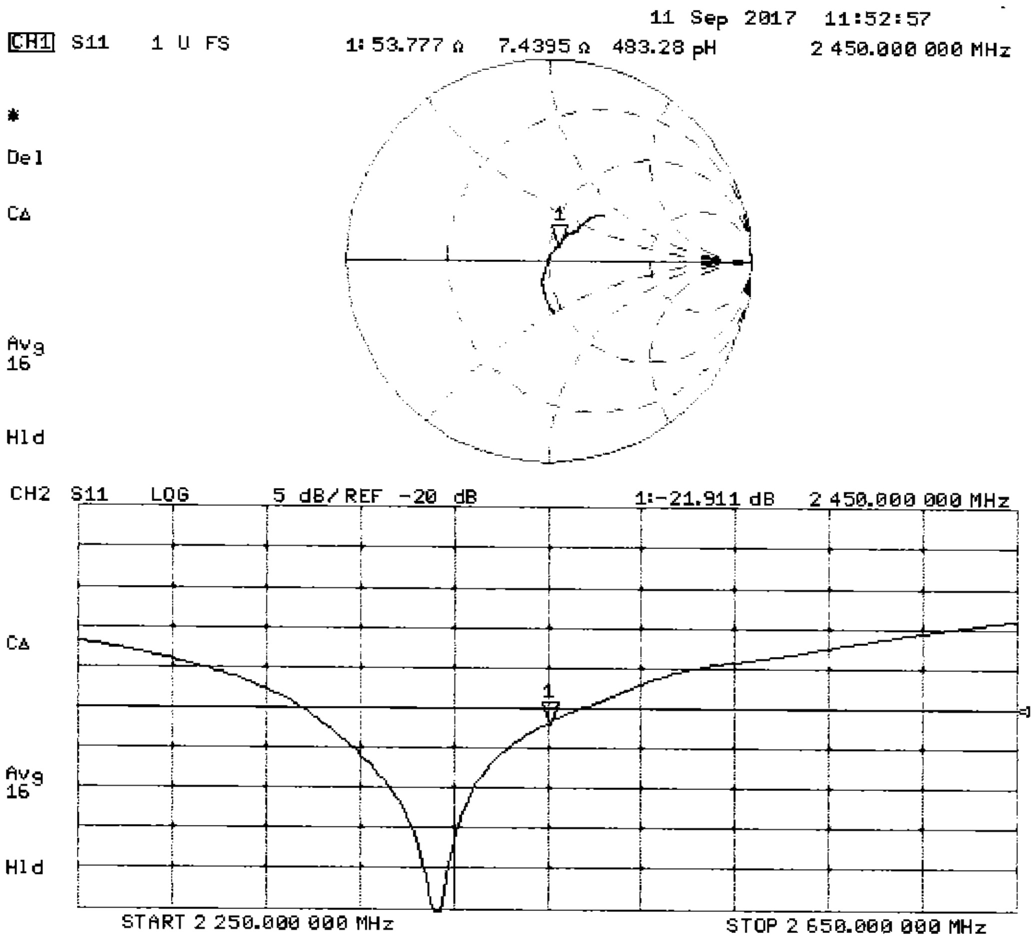
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.5 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg
Maximum value of SAR (measured) = 21.6 W/kg



0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

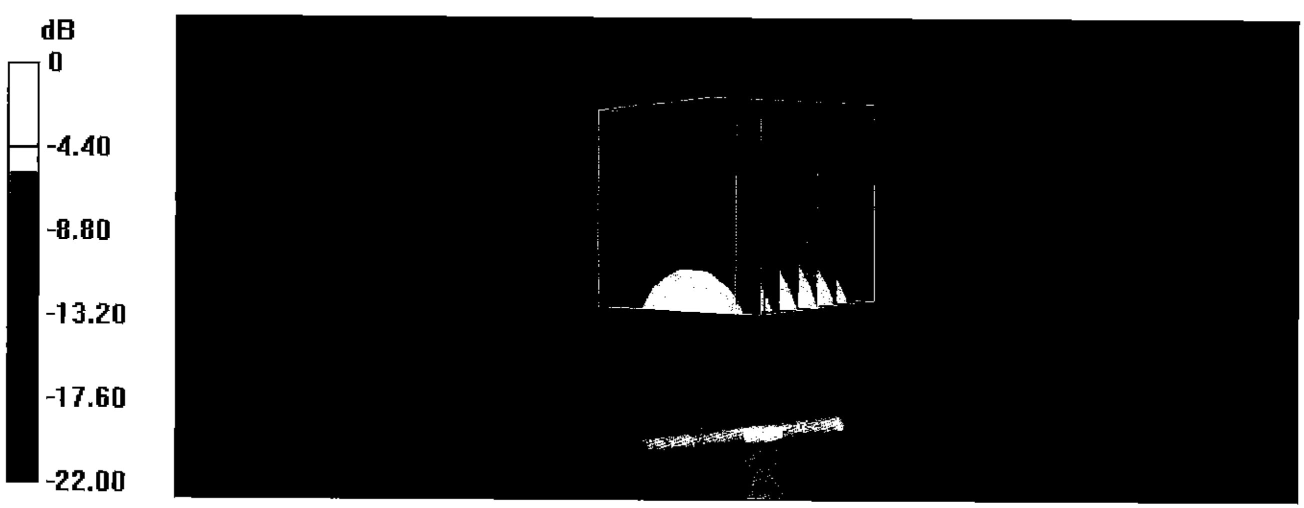
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

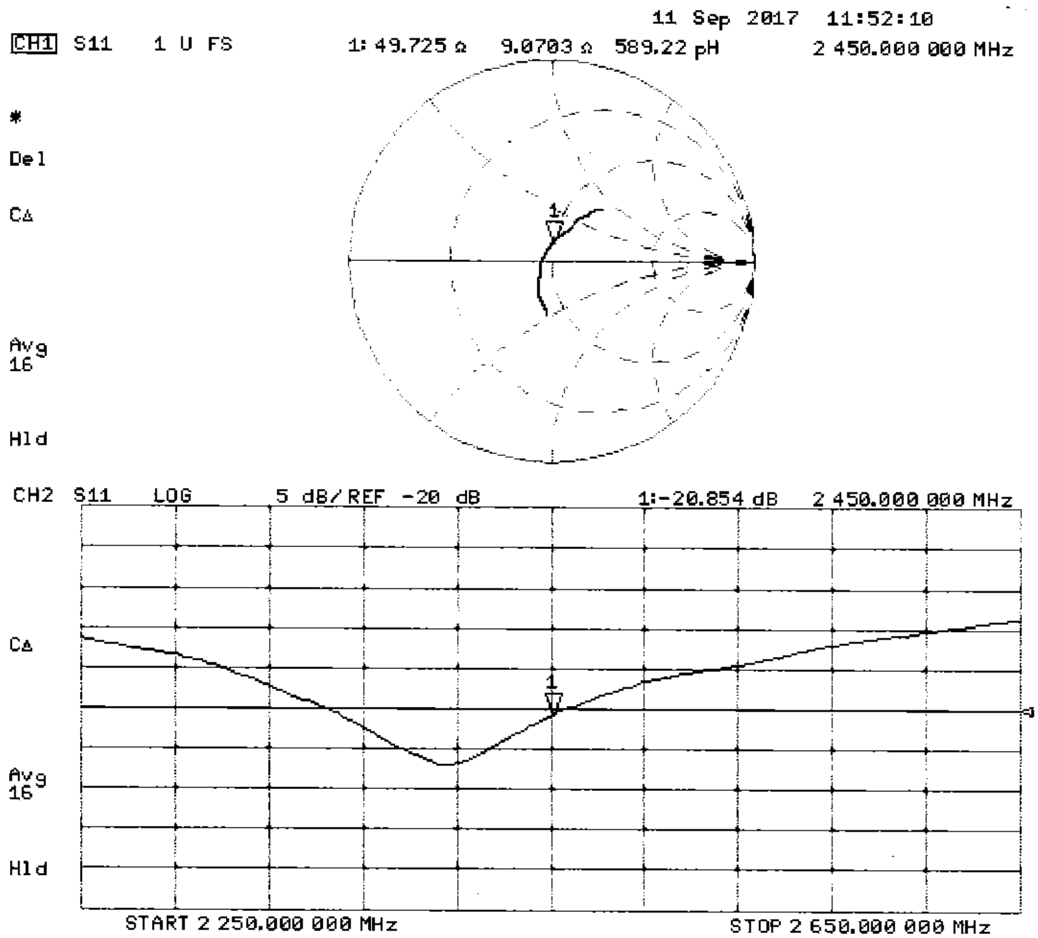
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 20.3 W/kg



0 dB = 20.3 W/kg = 13.07 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2600V2-1126_Jul17

CALIBRATION CERTIFICATE

Object D2600V2 - SN:1126

BN ✓ 8/3/2017

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 10, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: July 11, 2017

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.2 ± 6 %	2.04 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	2.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**54.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.8 Ω - 7.7 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8 Ω - 5.8 jΩ
Return Loss	- 21.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 22, 2015

DASY5 Validation Report for Head TSL

Date: 10.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1126

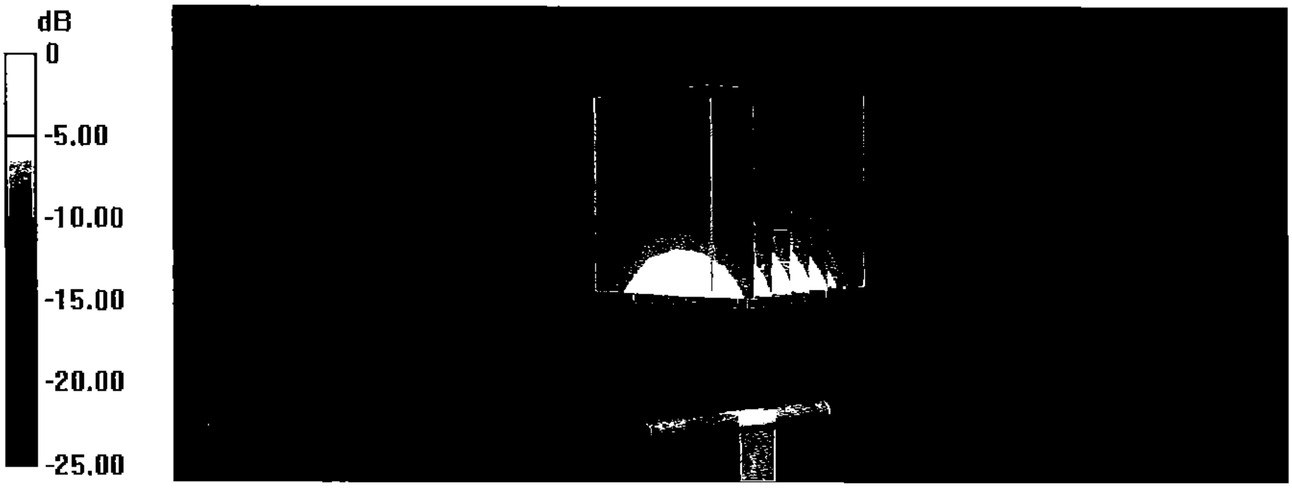
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.04 S/m; ε_r = 37.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

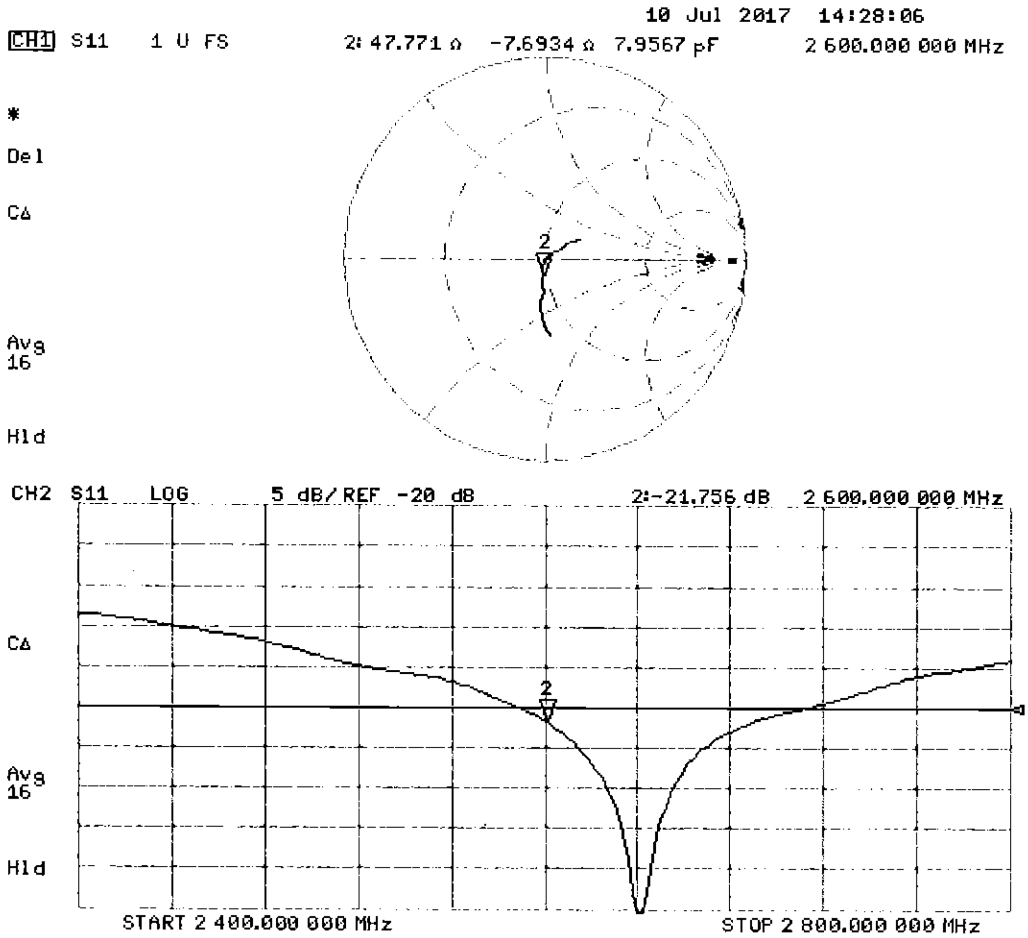
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.2 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.4 W/kg
Maximum value of SAR (measured) = 24.0 W/kg



0 dB = 24.0 W/kg = 13.80 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1126

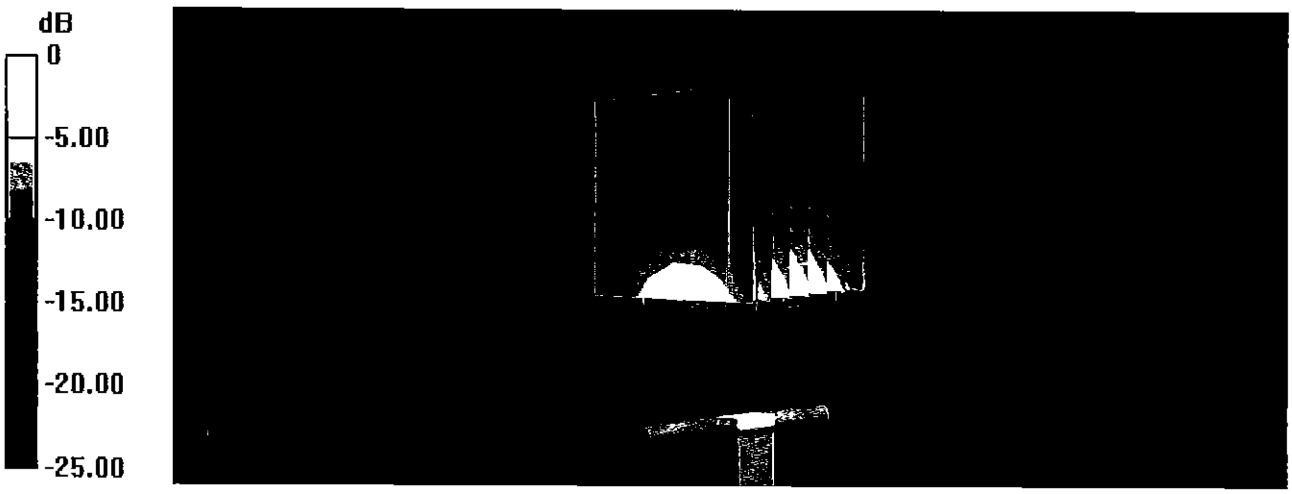
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.22 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

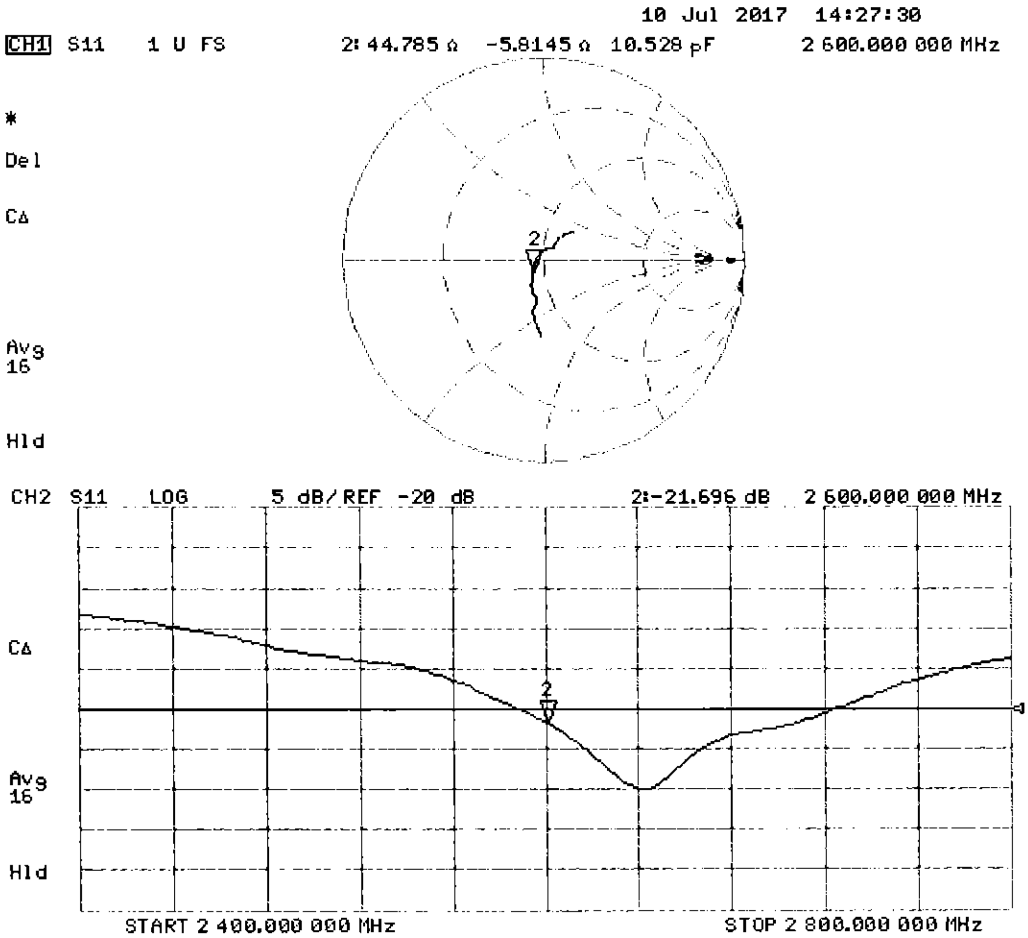
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.8 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.16 W/kg
Maximum value of SAR (measured) = 22.2 W/kg



0 dB = 22.2 W/kg = 13.46 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D5GHzV2-1191_Sep16

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1191

Calibration procedure(s): QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

BN✓ 09-28-2016

Extended 09/2017 SC✓

Calibration date: September 21, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3503	30-Jun-16 (No. EX3-3503_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	Leif Klysner
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: September 22, 2016

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.59 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	4.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.6 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.8 ± 6 %	5.08 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.4 ± 6 %	5.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.74 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	6.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	55.7 Ω - 4.3 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	58.3 Ω - 3.2 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	58.1 Ω + 4.8 jΩ
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	56.1 Ω - 3.7 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.9 Ω - 1.7 jΩ
Return Loss	- 21.7 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	59.5 Ω + 6.9 jΩ
Return Loss	- 19.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 28, 2003

((

DASY5 Validation Report for Head TSL

Date: 21.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 4.59 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.93 S/m; ε_r = 34; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 5.08 S/m; ε_r = 33.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

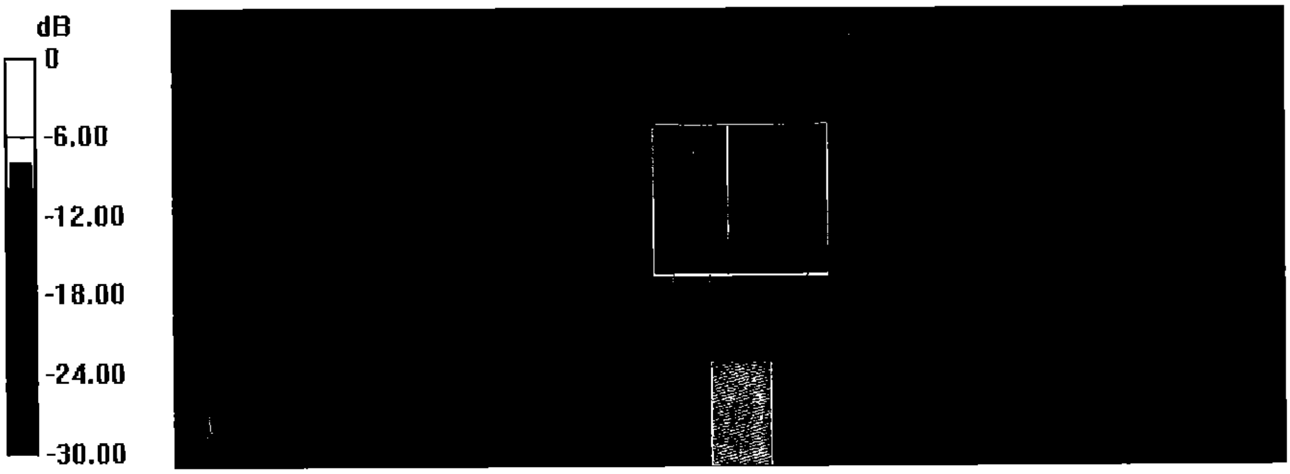
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.42, 5.42, 5.42); Calibrated: 30.06.2016, ConvF(4.89, 4.89, 4.89); Calibrated: 30.06.2016, ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.49 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.6 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 18.2 W/kg

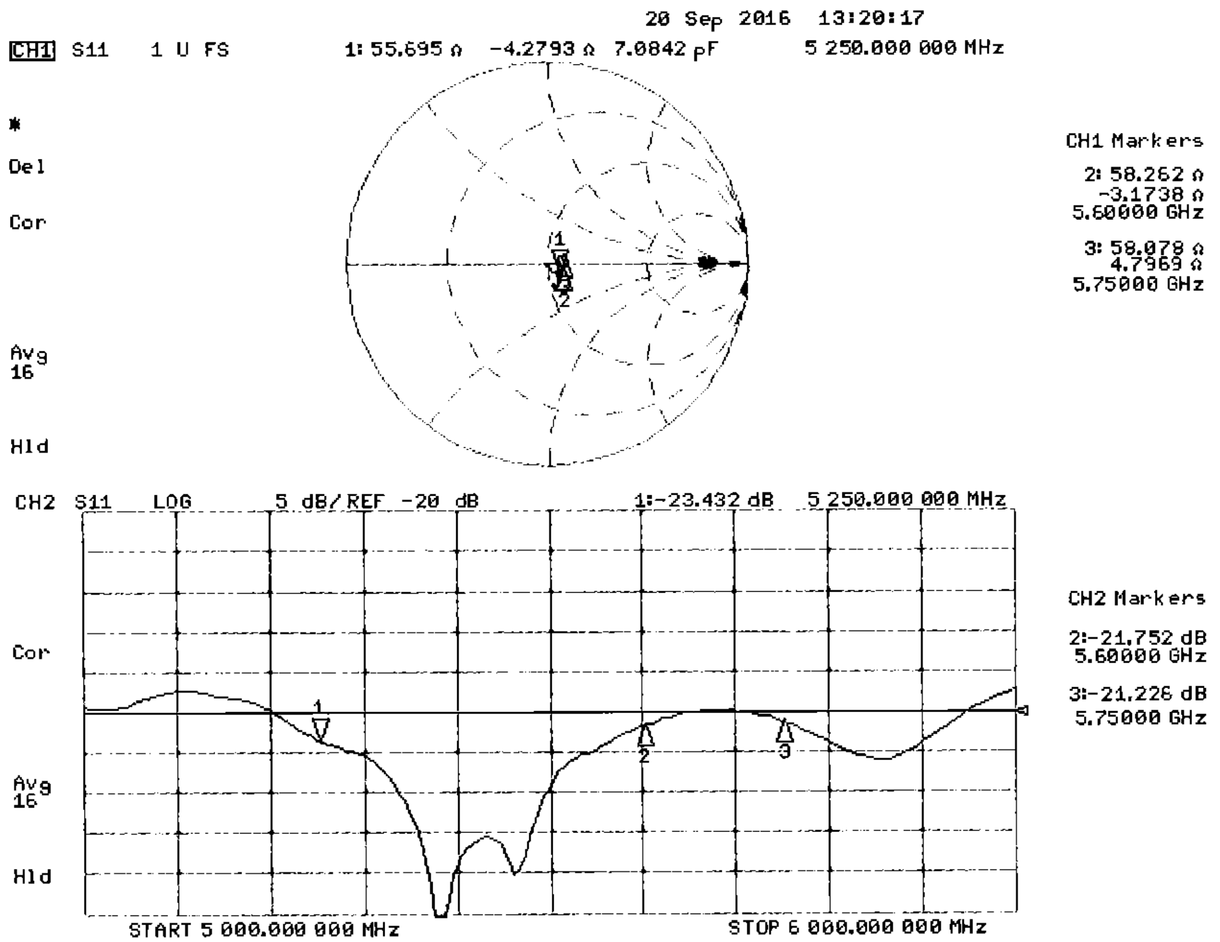
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.34 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 20.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.15 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 32.3 W/kg
SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.52 S/m; ε_r = 47.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 6 S/m; ε_r = 46.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 6.21 S/m; ε_r = 46.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

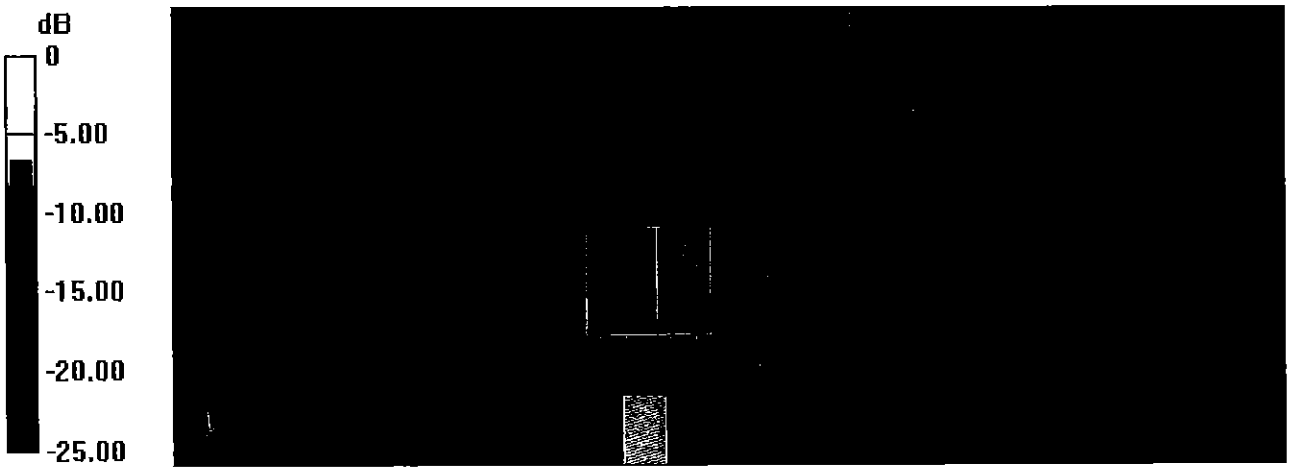
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016, ConvF(4.35, 4.35, 4.35); Calibrated: 30.06.2016, ConvF(4.3, 4.3, 4.3); Calibrated: 30.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.49 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 29.1 W/kg
SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 17.7 W/kg

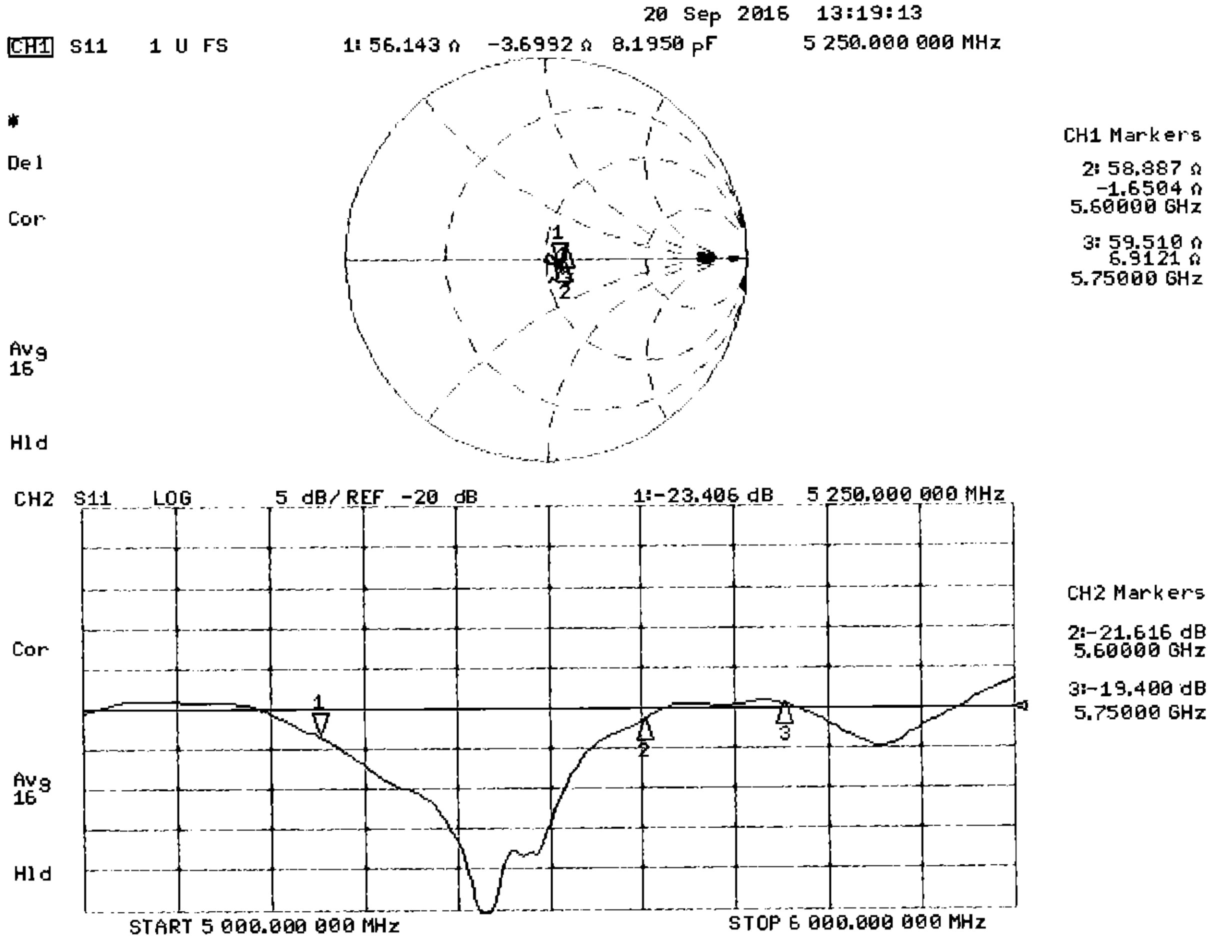
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.85 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.24 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.21 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D5GHzV2 – SN: 1191
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extension Calibration date:	9/19/2017
Description:	SAR Validation Dipole at 5250, 5600, and 5750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Agilent	8753ES	S-Parameter Network Analyzer	10/26/2016	Annual	10/26/2017	US39170118
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	EX3DV4	SAR Probe	1/13/2017	Annual	1/13/2018	3589
SPEAG	EX3DV4	SAR Probe	2/13/2017	Annual	2/13/2018	3914
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/16/2017	Annual	1/16/2018	1466
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1207364
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1339018
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	Brodie Halbfoster
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

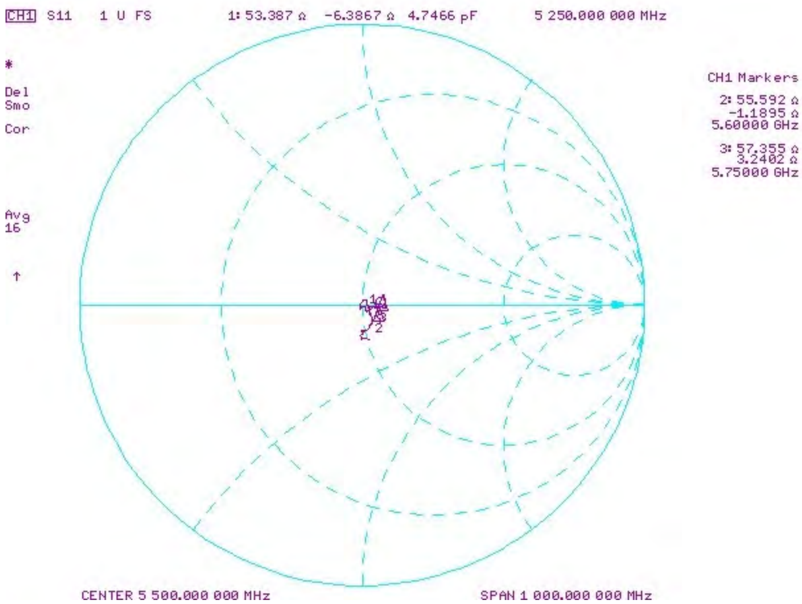
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

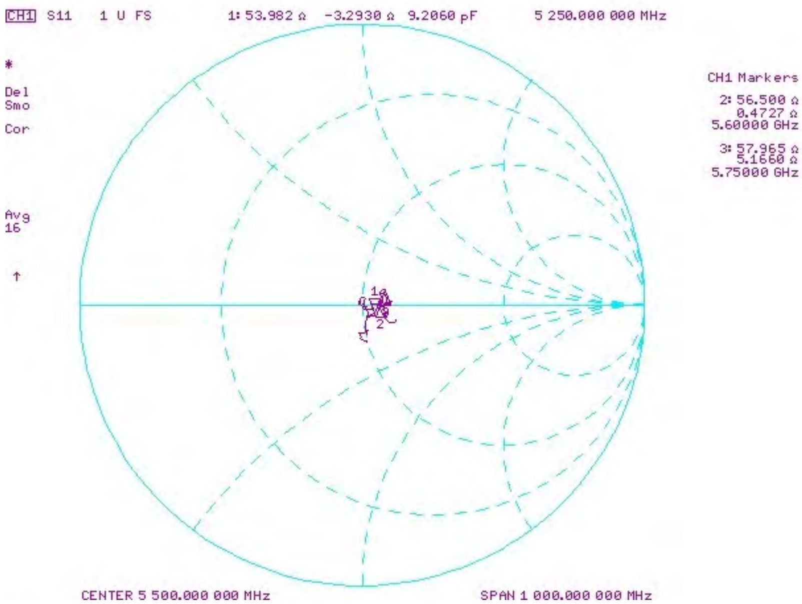
Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 17.0 dBm	Measured Head SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 17.0 dBm	Measured Head SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5250	9/21/2016	9/19/2017	1.204	3.95	3.70	-6.21%	1.13	1.05	-7.08%	55.7	53.4	2.3	-4.3	-6.4	2.1	-23.4	-26.9	-15.00%	PASS
5600	9/21/2016	9/19/2017	1.204	4.18	4.03	-3.59%	1.19	1.13	-5.04%	58.3	55.6	2.7	-3.2	-1.2	2.0	-21.8	-26.1	-19.80%	PASS
5750	9/21/2016	9/19/2017	1.204	3.96	3.94	-0.38%	1.12	1.10	-1.79%	58.1	57.4	0.7	4.8	3.2	1.6	-21.2	-21.0	0.90%	PASS

Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 17.0 dBm	Measured Body SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 17.0 dBm	Measured Body SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5250	9/21/2016	9/19/2017	1.204	3.85	3.80	-1.30%	1.08	1.06	-1.85%	56.1	54.0	2.1	-3.7	-3.3	0.4	-23.4	-26.0	-11.10%	PASS
5600	9/21/2016	9/19/2017	1.204	3.96	4.06	2.53%	1.11	1.13	1.80%	58.9	56.5	2.4	-1.7	0.5	2.2	-21.7	-24.5	-12.80%	PASS
5750	9/21/2016	9/19/2017	1.204	3.81	3.66	-3.81%	1.06	1.02	-3.77%	59.5	58.0	1.5	6.9	5.2	1.7	-19.4	-21.1	-8.70%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



Object:	Date Issued:	Page 4 of 4
D5GHzV2 – SN: 1191	09/19/2017	

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar17**

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1054
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 07, 2017

BN✓ 03-27-2017
BN✓ 04-04-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: March 14, 2017

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.37 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.60 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.61 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.68 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 0.7 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω - 3.6 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

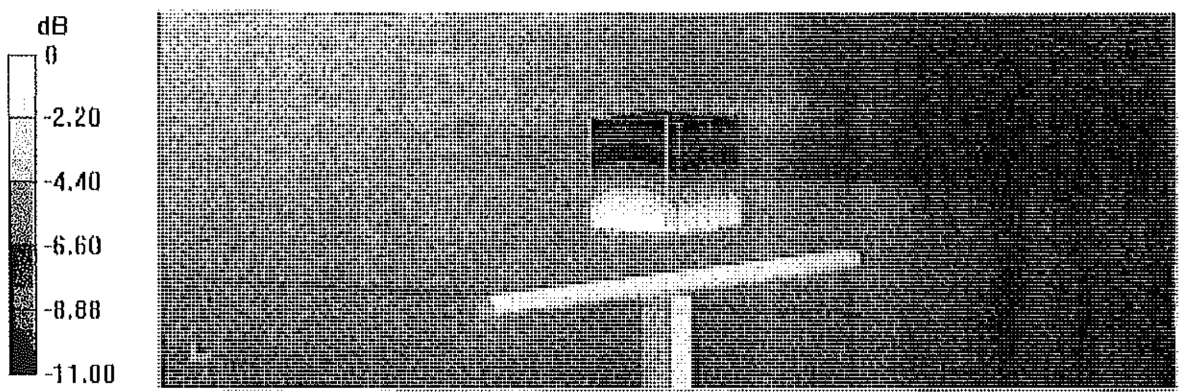
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

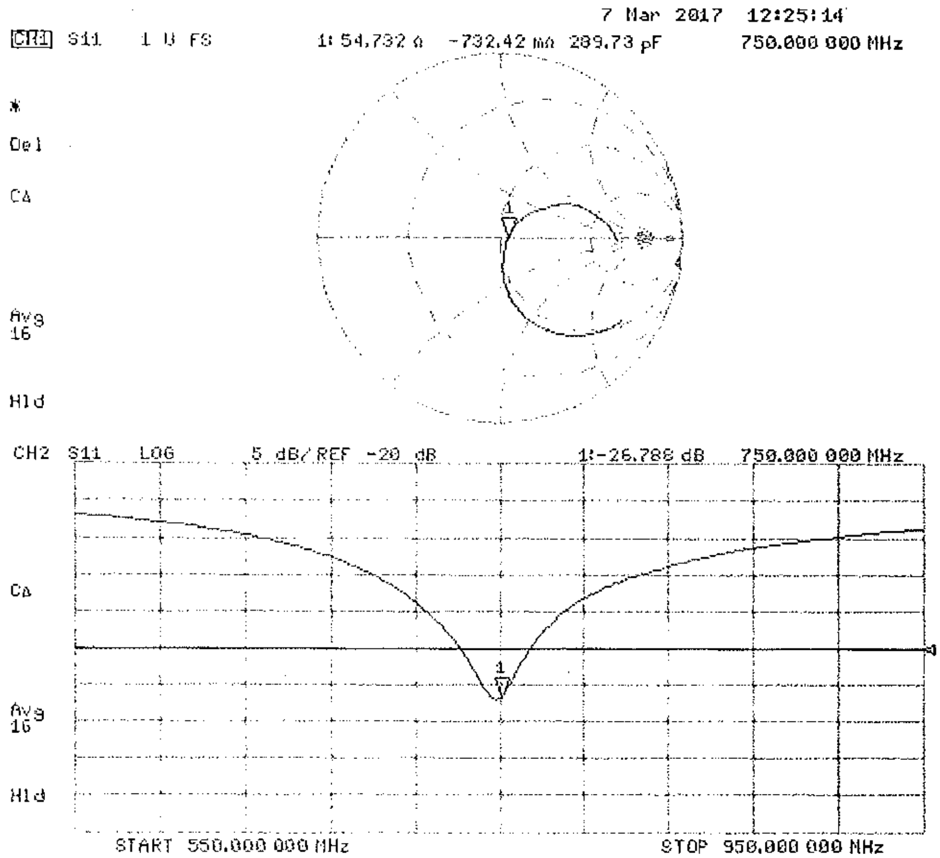
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.71 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.21 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.4 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

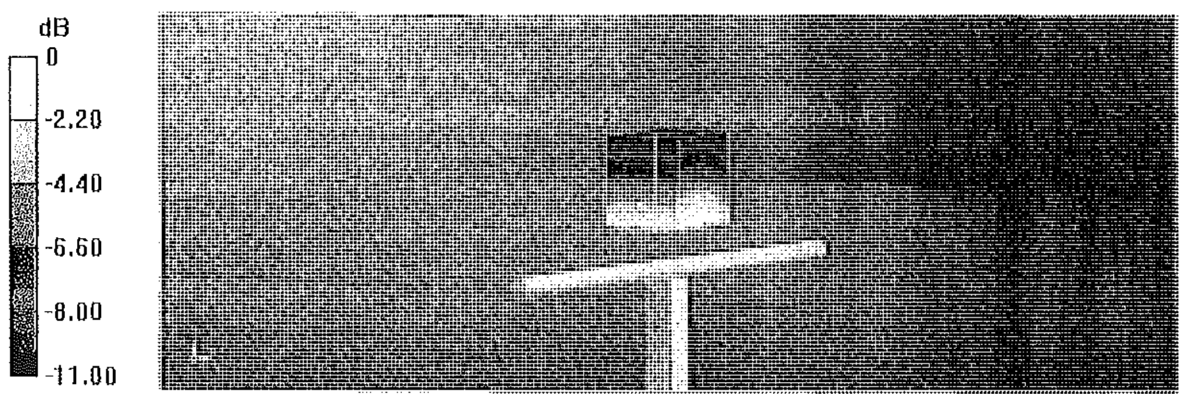
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.99 S/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

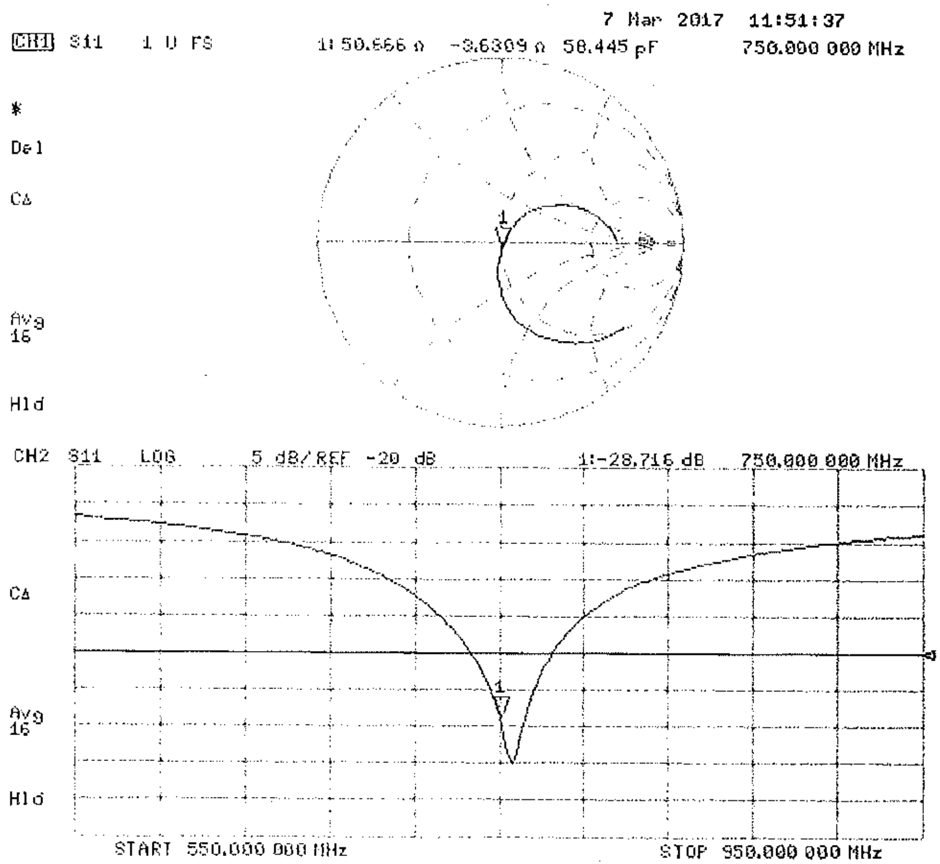
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.88 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.31 W/kg
SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Impedance Measurement Plot for Body TSL



PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctest.com

Certification of Calibration

Object	D750V3 – SN:1054
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	March 07, 2018
Description:	SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	8/3/2017	Annual	8/3/2018	MY40000670
Agilent	N5182A	MXG Vector Signal Generator	1/24/2018	Annual	1/24/2019	MY47420651
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	10/16/2017	Annual	10/16/2018	1126066
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	1328004
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	1/22/2018	Annual	1/22/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/13/2017	Annual	7/13/2018	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2017	Annual	6/21/2018	1333
SPEAG	EX3DV4	SAR Probe	7/17/2017	Annual	7/17/2018	7410
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	Brodie Halbfoster
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

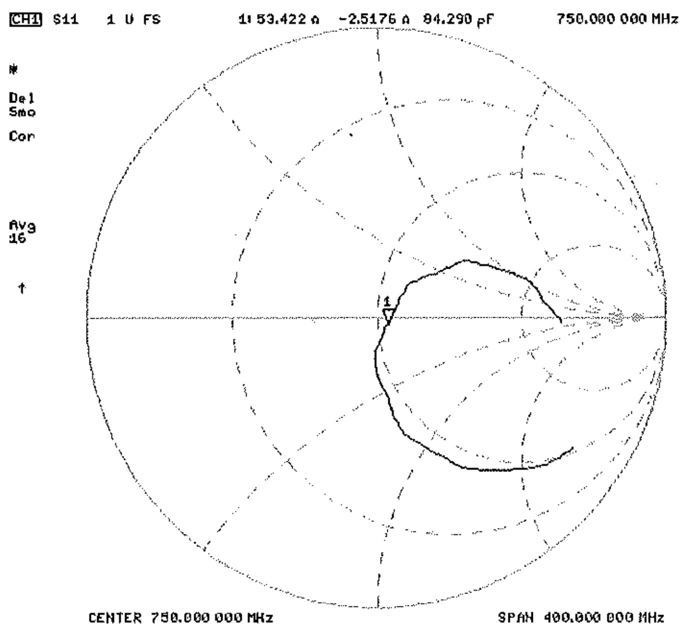
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

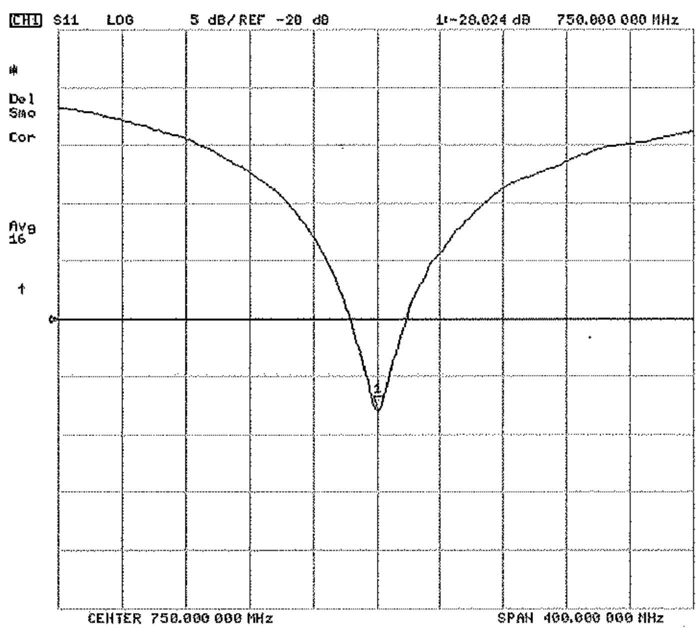
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.67	1.70	1.80%	1.10	1.11	0.91%	54.7	53.4	1.3	-0.7	-2.5	1.8	-26.8	-28.0	-4.60%	PASS

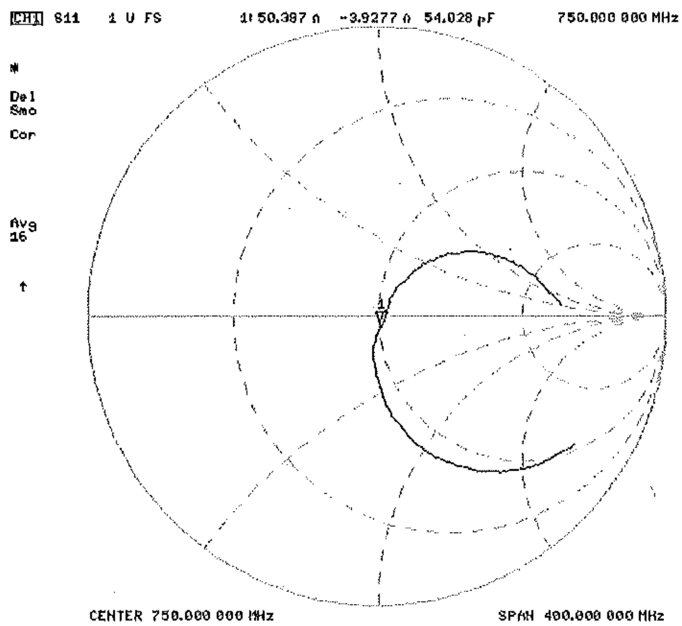
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.72	1.70	-1.20%	1.14	1.12	-1.41%	50.7	50.4	0.3	-3.6	-3.9	0.3	-28.7	-28.5	0.69%	PASS

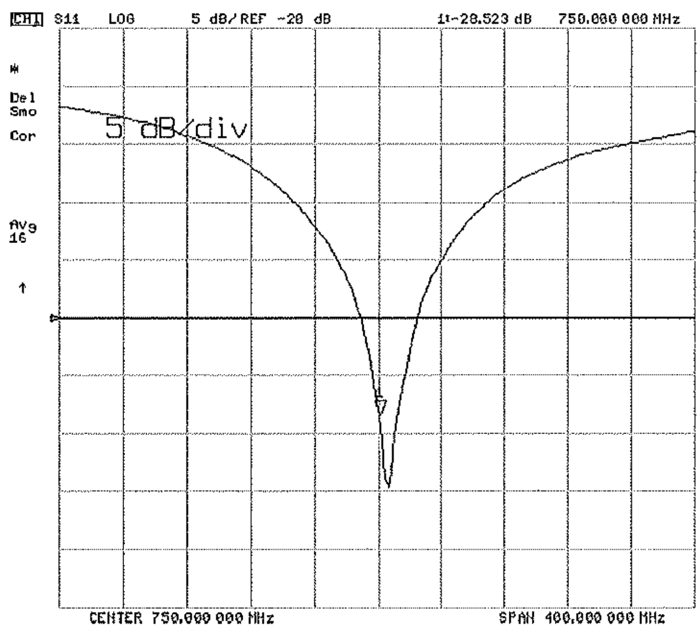
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1237_Aug17**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1237

Calibration procedure(s): QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

PM ✓
8/27/17

Calibration date: August 15, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 3503	31-Dec-16 (No. EX3-3503_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: August 16, 2017

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.49 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.5 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	4.99 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.93 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.13 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.4 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	49.9 Ω - 5.3 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	51.9 Ω + 2.3 jΩ
Return Loss	- 30.7 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	55.6 Ω - 0.5 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	46.9 Ω - 4.2 jΩ
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	50.2 Ω + 3.0 jΩ
Return Loss	- 30.4 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	53.4 Ω + 0.2 jΩ
Return Loss	- 29.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 04, 2015

DASY5 Validation Report for Head TSL

Date: 15.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; $\sigma = 4.49$ S/m; $\varepsilon_r = 34.7$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5600 MHz; $\sigma = 4.84$ S/m; $\varepsilon_r = 34.2$; $\rho = 1000$ kg/m^3 ,
Medium parameters used: f = 5750 MHz; $\sigma = 4.99$ S/m; $\varepsilon_r = 34$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

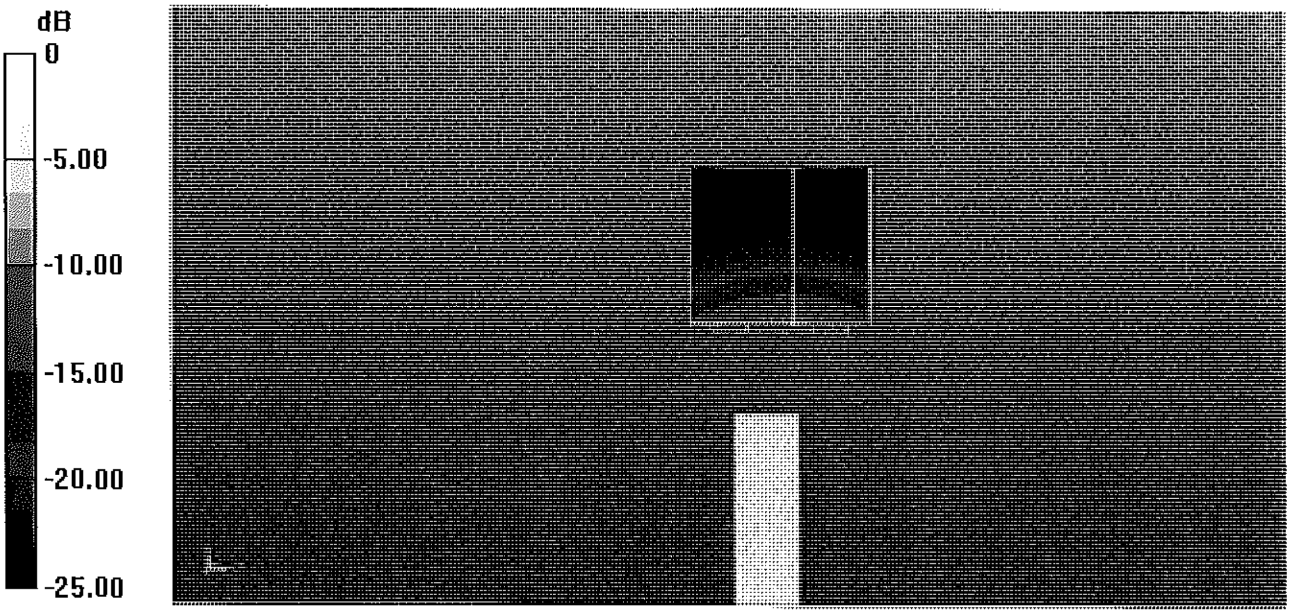
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.58, 5.58, 5.58); Calibrated: 31.12.2016, ConvF(5.09, 5.09, 5.09); Calibrated: 31.12.2016, ConvF(5.02, 5.02, 5.02); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.08 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

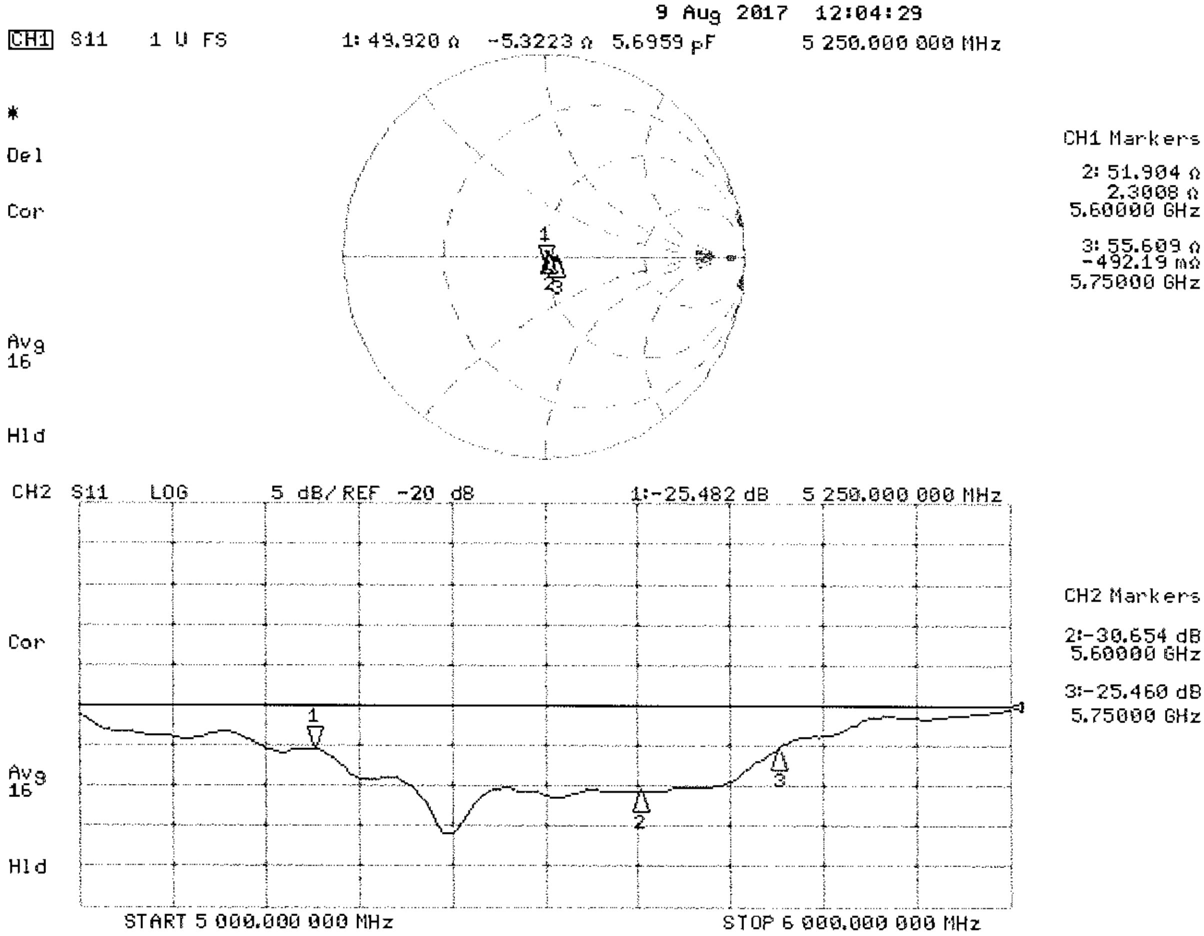
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.04 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.11 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.46 S/m; ε_r = 47; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.93 S/m; ε_r = 46.4; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 6.13 S/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

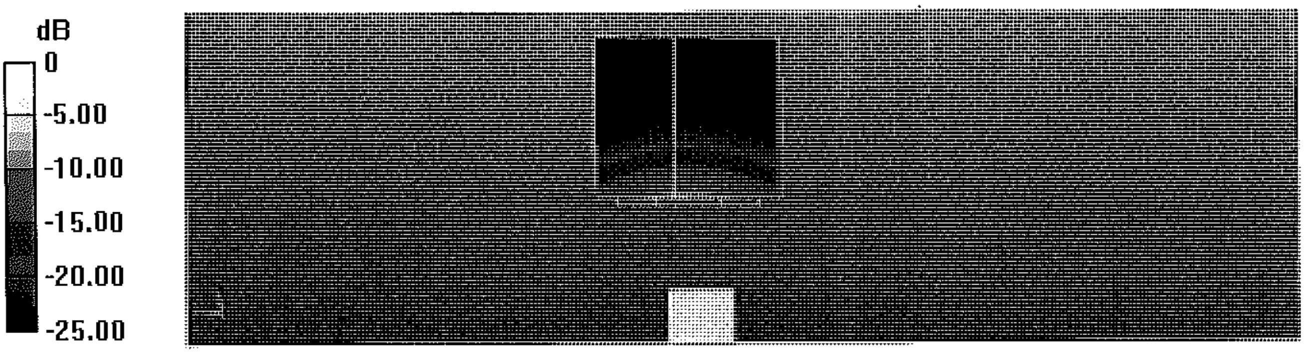
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.14, 5.14, 5.14); Calibrated: 31.12.2016, ConvF(4.57, 4.57, 4.57); Calibrated: 31.12.2016, ConvF(4.51, 4.51, 4.51); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.87 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.4 W/kg

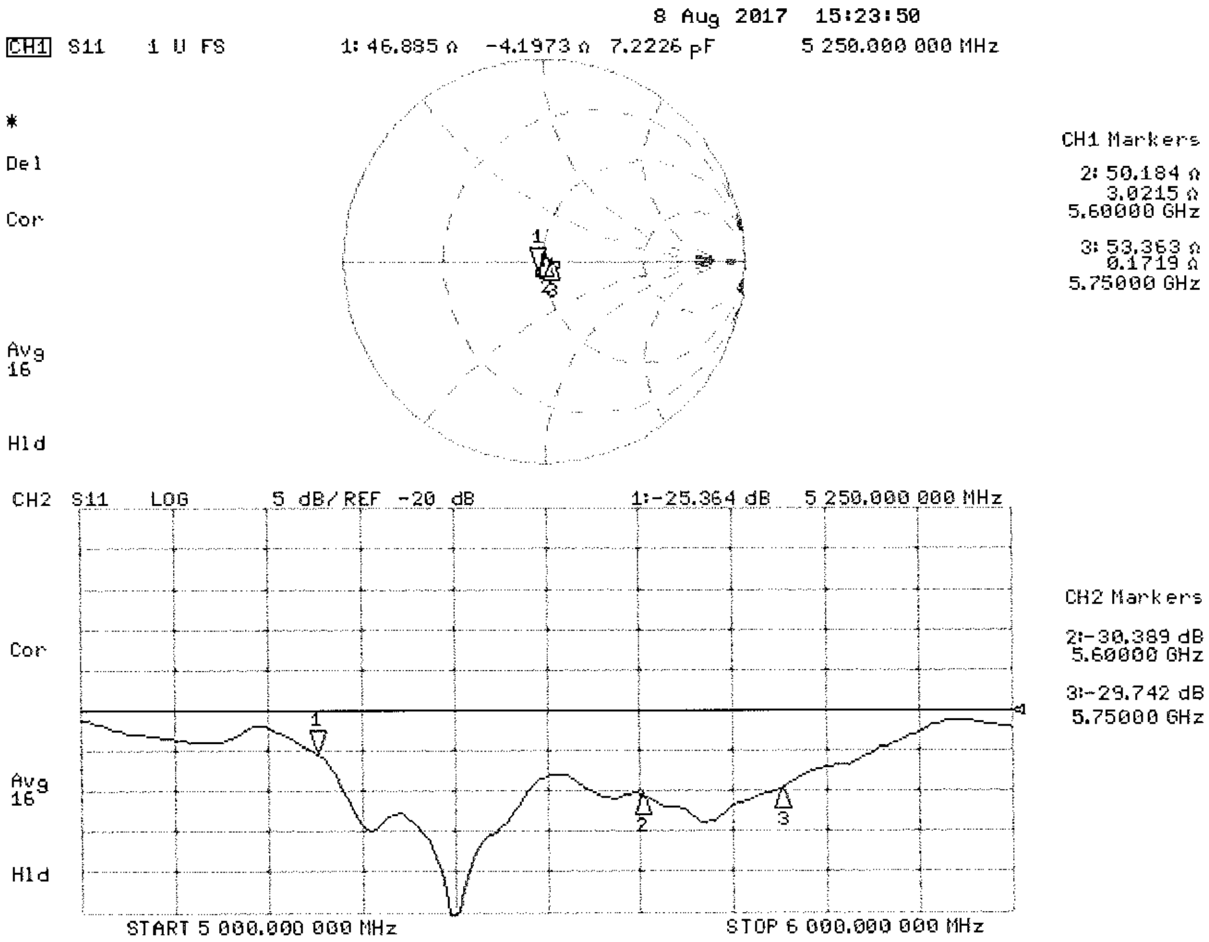
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.11 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.64 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

Impedance Measurement Plot for Body TSL



APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity ε' can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r^{'}\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where *Y* is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

Table D-I
Composition of the Tissue Equivalent Matter

Frequency (MHz)	750	750	835	835	1750	1750	1900	1900	2300-2600	2300-2600	5200-5800	5200-5800
Tissue	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)												
Bactericide			0.1	0.1								
DGBE					47	31	44.92	29.44		26.7		
HEC			1	1								
NaCl	See page 2-3	See page 2	1.45	0.94	0.4	0.2	0.18	0.39	See page 4	0.1	See page 5	
Sucrose			57	44.9								
Polysorbate (Tween) 80												20
Water			40.45	53.06	52.6	68.8	54.9	70.17		73.2		80

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H_2O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1 – 0.7% Relevant for safety; Refer to the respective Safety Data Sheet*.

Figure D-1
Composition of 750 MHz Head and Body Tissue Equivalent Matter

Note: 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL750V2)**
Product No.	SL AAM 075 AA (Batch: 170608-1)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

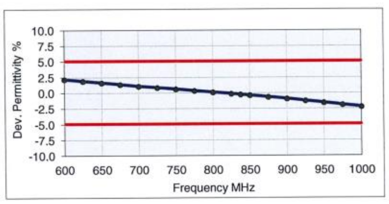
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density	1.212 g/cm^3
TSL Heat-capacity	3.006 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.3	25.02	0.84	56.1	0.95	2.2	-12.2
625	57.1	24.67	0.86	56.0	0.95	1.9	-10.1
650	56.8	24.32	0.88	55.9	0.96	1.6	-8.0
675	56.6	24.02	0.90	55.8	0.96	1.3	-5.8
700	56.3	23.71	0.92	55.7	0.96	1.1	-3.8
725	56.1	23.48	0.95	55.6	0.96	0.8	-1.5
750	**55.9**	**23.25**	**0.97**	**55.5**	**0.96**	**0.6**	**0.7**
775	55.6	23.04	0.99	55.4	0.97	0.3	2.9
800	55.4	22.82	1.02	55.3	0.97	0.1	5.0
825	55.2	22.65	1.04	55.2	0.98	-0.1	6.3
838	55.1	22.56	1.05	55.2	0.98	-0.3	6.9
850	54.9	22.47	1.06	55.2	0.99	-0.4	7.5
875	54.7	22.34	1.09	55.1	1.02	-0.7	6.7
900	54.5	22.21	1.11	55.0	1.05	-0.9	5.9
925	54.3	22.08	1.14	55.0	1.06	-1.3	6.9
950	54.1	21.95	1.16	54.9	1.08	-1.6	7.9
975	53.8	21.86	1.19	54.9	1.09	-1.9	9.1
1000	53.6	21.76	1.21	54.8	1.10	-2.2	10.2



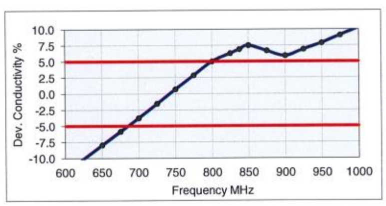


Figure D-2
750MHz Body Tissue Equivalent Matter

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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL750V2)**
Product No.	SL AAH 075 AA (Batch: 170612-4)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

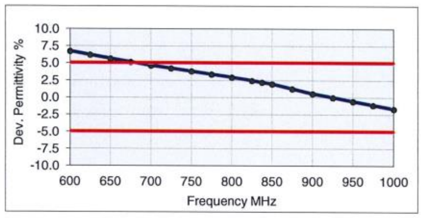
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density	1.284 g/cm^3
TSL Heat-capacity	2.701 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	45.6	22.97	0.77	42.7	0.88	6.7	-13.1
625	45.2	22.73	0.79	42.6	0.88	6.2	-10.6
650	44.9	22.49	0.81	42.5	0.89	5.6	-8.2
675	44.5	22.27	0.84	42.3	0.89	5.1	-5.8
700	44.2	22.05	0.86	42.2	0.89	4.6	-3.5
725	43.8	21.88	0.88	42.1	0.89	4.2	-1.0
750	**43.5**	**21.72**	**0.91**	**41.9**	**0.89**	**3.8**	**1.4**
775	43.2	21.55	0.93	41.8	0.90	3.4	3.7
800	42.9	21.38	0.95	41.7	0.90	2.9	6.0
825	42.6	21.24	0.97	41.6	0.91	2.4	7.5
838	42.5	21.17	0.99	41.5	0.91	2.2	8.2
850	42.3	21.09	1.00	41.5	0.92	2.0	8.9
875	42.0	20.98	1.02	41.5	0.94	1.2	8.3
900	41.7	20.87	1.05	41.5	0.97	0.5	7.7
925	41.5	20.76	1.07	41.5	0.98	0.0	8.7
950	41.2	20.64	1.09	41.4	0.99	-0.6	9.7
975	40.9	20.55	1.11	41.4	1.00	-1.1	10.9
1000	40.6	20.46	1.14	41.3	1.01	-1.7	12.1



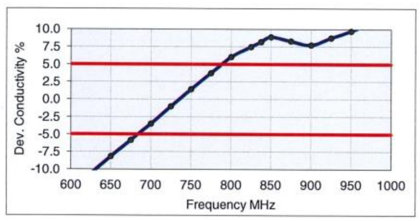


Figure D-3
750MHz Head Tissue Equivalent Matter

3 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 73 %	
Non-ionic detergents	25 – 50 %	polyoxyethylenesorbitan monolaurate
NaCl	0 – 2 %	
Preservative	0.05 – 0.1%	Preventol-D7

Safety relevant ingredients:

CAS-No. 55965-84-9	< 0.1 %	aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone
CAS-No. 9005-64-5	<50 %	polyoxyethylenesorbitan monolaurate

According to international guidelines, the product is not a dangerous mixture and therefore not required to be marked by symbols.

Figure D-4
Composition of 2.3-2.6 GHz Head Tissue Equivalent Matter

Note: 2.4 GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL1900-3800V3)**
Product No.	SL AAH 196 AB (Batch: 170619-1)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

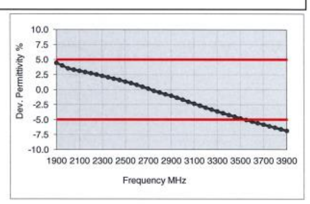
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density 1.054 g/cm³
TSL Heat-capacity 3.389 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
1900	41.8	12.2	1.3	40.0	1.4	4.5	-8.2
1950	41.6	12.3	1.3	40.0	1.4	4.0	-4.6
2000	41.4	12.4	1.4	40.0	1.4	3.6	-1.3
2050	41.2	12.6	1.4	39.9	1.4	3.3	-0.9
2100	41.1	12.7	1.5	39.8	1.5	3.1	-0.6
2150	40.9	12.8	1.5	39.7	1.5	2.9	-0.2
2200	40.7	12.9	1.6	39.6	1.6	2.7	0.2
2250	40.6	13.0	1.6	39.6	1.6	2.5	0.5
2300	40.4	13.2	1.7	39.5	1.7	2.3	1.1
2350	40.2	13.3	1.7	39.4	1.7	2.1	1.5
2400	40.0	13.4	1.8	39.3	1.8	1.8	2.1
2450	39.8	13.5	1.8	39.2	1.8	1.6	2.6
2500	39.7	13.7	1.9	39.1	1.9	1.3	2.6
2550	39.5	13.7	2.0	39.1	1.9	1.1	2.2
2600	39.3	13.9	2.0	39.0	2.0	0.8	2.5
2650	39.1	14.0	2.1	38.9	2.0	0.5	2.6
2700	39.0	14.2	2.1	38.9	2.1	0.2	2.7
2750	38.7	14.3	2.2	38.8	2.1	-0.2	2.6
2800	38.6	14.4	2.2	38.8	2.2	-0.4	2.5
2850	38.4	14.5	2.3	38.7	2.2	-0.8	2.6
2900	38.2	14.6	2.3	38.6	2.3	-1.0	2.6
2950	38.1	14.7	2.4	38.6	2.3	-1.3	2.6
3000	37.9	14.8	2.5	38.5	2.4	-1.7	2.6
3050	37.7	14.8	2.5	38.4	2.5	-2.0	2.8
3100	37.5	14.9	2.6	38.4	2.5	-2.3	2.8
3150	37.3	15.0	2.6	38.3	2.6	-2.6	2.9
3200	37.1	15.1	2.7	38.3	2.6	-3.0	2.9
3250	37.0	15.1	2.7	38.2	2.7	-3.3	3.0
3300	36.8	15.2	2.8	38.2	2.7	-3.6	3.1
3350	36.6	15.3	2.8	38.1	2.8	-3.9	3.2
3400	36.4	15.3	2.9	38.0	2.8	-4.2	3.3
3450	36.3	15.4	3.0	38.0	2.9	-4.5	3.4
3500	36.1	15.5	3.0	37.9	2.9	-4.8	3.5
3550	36.0	15.5	3.1	37.9	3.0	-5.0	3.6
3600	35.8	15.6	3.1	37.8	3.0	-5.3	3.8
3650	35.7	15.7	3.2	37.8	3.1	-5.6	3.7
3700	35.5	15.7	3.2	37.7	3.1	-5.8	3.9
3750	35.4	15.8	3.3	37.6	3.2	-6.1	3.9
3800	35.2	15.9	3.4	37.6	3.2	-6.3	4.1
3850	35.1	15.9	3.4	37.5	3.3	-6.6	4.1



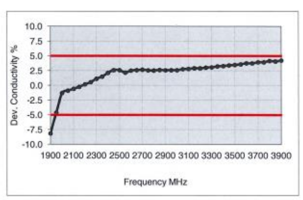


Figure D-5
2.3-2.6 GHz Head Tissue Equivalent Matter

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 65%
Mineral oil	10 – 30%
Emulsifiers	8 – 25%
Sodium salt	0 – 1.5%

Figure D-6
Composition of 5 GHz Head Tissue Equivalent Matter

Note: 5GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL3500-5800V5)**
Product No.	SL AAH 502 AG (Batch: 170613-1)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

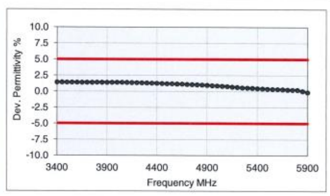
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density	0.985 g/cm^3
TSL Heat-capacity	3.383 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	38.6	15.03	2.84	38.0	2.81	1.5	1.1
3500	38.5	15.00	2.92	37.9	2.91	1.5	0.3
3600	38.3	14.98	3.00	37.8	3.02	1.3	-0.5
3700	38.2	14.96	3.08	37.7	3.12	1.3	-1.2
3800	38.1	14.96	3.16	37.6	3.22	1.4	-1.9
3900	38.0	14.95	3.24	37.5	3.32	1.4	-2.5
4000	37.9	14.95	3.33	37.4	3.43	1.5	-2.8
4100	37.8	14.96	3.41	37.2	3.53	1.5	-3.3
4200	37.6	15.00	3.50	37.1	3.63	1.3	-3.6
4300	37.5	15.05	3.60	37.0	3.73	1.3	-3.5
4400	37.4	15.11	3.70	36.9	3.84	1.4	-3.5
4500	37.2	15.18	3.80	36.8	3.94	1.1	-3.5
4600	37.1	15.24	3.90	36.7	4.04	1.2	-3.5
4700	37.0	15.29	4.00	36.6	4.14	1.2	-3.4
4800	36.8	15.35	4.10	36.4	4.25	1.0	-3.4
4850	36.8	15.35	4.14	36.4	4.30	1.1	-3.6
4900	36.7	15.38	4.19	36.3	4.35	1.0	-3.6
4950	36.6	15.39	4.24	36.3	4.40	0.9	-3.6
5000	36.5	15.42	4.29	36.2	4.45	0.8	-3.6
5050	36.5	15.43	4.34	36.2	4.50	0.9	-3.6
5100	36.4	15.46	4.39	36.1	4.55	0.8	-3.6
5150	36.3	15.48	4.43	36.0	4.60	0.7	-3.8
5200	36.2	15.50	4.48	36.0	4.66	0.6	-3.8
5250	36.1	15.53	4.54	35.9	4.71	0.5	-3.5
5300	36.1	15.55	4.58	35.9	4.76	0.6	-3.7
5350	36.0	15.56	4.63	35.8	4.81	0.5	-3.7
5400	35.9	15.57	4.68	35.8	4.86	0.4	-3.7
5450	35.9	15.59	4.73	35.7	4.91	0.6	-3.7
5500	35.8	15.61	4.78	35.6	4.96	0.4	-3.7
5550	35.7	15.65	4.83	35.6	5.01	0.3	-3.7
5600	35.6	15.66	4.88	35.5	5.07	0.2	-3.7
5650	35.6	15.70	4.93	35.5	5.12	0.4	-3.6
5700	35.5	15.72	4.98	35.4	5.17	0.2	-3.6
5750	35.4	15.76	5.04	35.4	5.22	0.1	-3.4
5800	35.4	15.78	5.09	35.3	5.27	0.3	-3.4
5850	35.3	15.81	5.14	35.3	5.34	0.0	-3.7
5900	35.3	15.82	5.19	35.3	5.40	0.0	-3.9



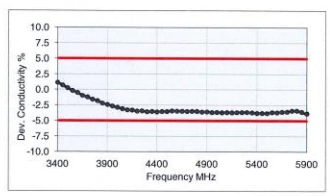


Figure D-7
5GHz Head Tissue Equivalent Matter

APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table E-1
SAR System Validation Summary – 1g

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE TYPE	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
							(σ)	(εr)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
J	750	4/12/2018	3914	EX3DV4	750	Head	0.904	41.090	PASS	PASS	PASS	N/A	N/A	N/A
E	835	3/5/2018	3213	ES3DV3	835	Head	0.925	43.335	PASS	PASS	PASS	GMSK	PASS	N/A
H	1750	8/30/2017	7410	EX3DV4	1750	Head	1.395	38.864	PASS	PASS	PASS	N/A	N/A	N/A
J	1900	3/15/2018	3914	EX3DV4	1900	Head	1.439	39.507	PASS	PASS	PASS	GMSK	PASS	N/A
G	2300	10/16/2017	3332	ES3DV3	2300	Head	1.715	39.101	PASS	PASS	PASS	N/A	N/A	N/A
G	2450	10/16/2017	3332	ES3DV3	2450	Head	1.880	38.615	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
G	2600	10/16/2017	3332	ES3DV3	2600	Head	2.051	38.039	PASS	PASS	PASS	TDD	PASS	N/A
H	5250	1/31/2018	3589	EX3DV4	5250	Head	4.516	36.066	PASS	PASS	PASS	OFDM	N/A	PASS
H	5600	1/31/2018	3589	EX3DV4	5600	Head	4.869	35.597	PASS	PASS	PASS	OFDM	N/A	PASS
H	5750	1/31/2018	3589	EX3DV4	5750	Head	5.112	35.351	PASS	PASS	PASS	OFDM	N/A	PASS
I	750	3/6/2018	3287	ES3DV3	750	Body	0.951	56.970	PASS	PASS	PASS	N/A	N/A	N/A
E	835	3/16/2018	3213	ES3DV3	835	Body	0.968	53.713	PASS	PASS	PASS	GMSK	PASS	N/A
I	1750	3/12/2018	3287	ES3DV3	1750	Body	1.462	52.350	PASS	PASS	PASS	N/A	N/A	N/A
J	1900	3/9/2018	3914	EX3DV4	1900	Body	1.533	53.731	PASS	PASS	PASS	GMSK	PASS	N/A
K	2300	4/3/2018	3319	ES3DV3	2300	Body	1.871	51.575	PASS	PASS	PASS	N/A	N/A	N/A
K	2450	4/3/2018	3319	ES3DV3	2450	Body	2.043	51.130	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
H	2450	9/7/2017	7410	EX3DV4	2450	Body	2.043	51.520	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
K	2600	4/3/2018	3319	ES3DV3	2600	Body	2.225	50.665	PASS	PASS	PASS	TDD	PASS	N/A
D	5250	10/24/2017	7308	EX3DV4	5250	Body	5.405	48.529	PASS	PASS	PASS	OFDM	N/A	PASS
D	5600	10/24/2017	7308	EX3DV4	5600	Body	5.910	47.818	PASS	PASS	PASS	OFDM	N/A	PASS
D	5750	10/24/2017	7308	EX3DV4	5750	Body	6.135	47.546	PASS	PASS	PASS	OFDM	N/A	PASS

Table E-2
SAR System Validation Summary – 10g

SAR SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE TYPE	PROBE CAL. POINT		COND.	PERM.	CW VALIDATION			MOD. VALIDATION		
							(σ)	(εr)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
I	1750	3/12/2018	3287	ES3DV3	1750	Body	1.462	52.350	PASS	PASS	PASS	N/A	N/A	N/A
J	1900	3/9/2018	3914	EX3DV4	1900	Body	1.533	53.731	PASS	PASS	PASS	GMSK	PASS	N/A
H	2450	9/7/2017	7410	EX3DV4	2450	Body	2.043	51.520	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
H	2600	9/6/2017	7410	EX3DV4	2600	Body	2.250	50.923	PASS	PASS	PASS	TDD	PASS	N/A
D	5250	10/24/2017	7308	EX3DV4	5250	Body	5.405	48.529	PASS	PASS	PASS	OFDM	N/A	PASS
D	5600	10/24/2017	7308	EX3DV4	5600	Body	5.910	47.818	PASS	PASS	PASS	OFDM	N/A	PASS
D	5750	10/24/2017	7308	EX3DV4	5750	Body	6.135	47.546	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.

APPENDIX G: POWER REDUCTION VERIFICATION

Per the May 2017 TCBC Workshop Notes, demonstration of proper functioning of the power reduction mechanisms is required to support the corresponding SAR configurations. The verification process was divided into two parts: (1) evaluation of output power levels for individual or multiple triggering mechanisms and (2) evaluation of the triggering distances for proximity-based sensors.

1.1 Power Verification Procedure

The power verification was performed according to the following procedure:

1. A base station simulator was used to establish a conducted RF connection and the output power was monitored. The power measurements were confirmed to be within expected tolerances for all states before and after a power reduction mechanism was triggered.

2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.

3. Steps 1 and 2 were repeated for all individual power reduction mechanisms and combinations thereof. For the combination cases, one mechanism was switched to a 'triggered' state at a time; powers were confirmed to be within tolerances after each additional mechanism was activated.

1.2 Distance Verification Procedure

The distance verification procedure was performed according to the following procedure:

1. A base station simulator was used to establish an RF connection and to monitor the power levels. The device being tested was placed below the relevant section of the phantom with the relevant side or edge of the device facing toward the phantom.

2. The device was moved toward and away from the phantom to determine the distance at which the mechanism triggers and the output power is reduced, per KDB Publication 616217 D04v01r02 and FCC Guidance. Each applicable test position was evaluated. The distances were confirmed to be the same or larger (more conservative) than the minimum distances provided by the manufacturer.

3. Steps 1 and 2 were repeated for all relevant frequency bands.

4. Steps 1 through 3 were repeated for all distance-based power reduction mechanisms.

1.3 Main Antenna Verification Summary

Table G-1
Power Measurement Verification for Main Antenna

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
		Un-triggered (Max)	Mechanism #1 (Reduced)
Proximity Sensor	UMTS B4	25.04	24.03
Proximity Sensor	UMTS B2	25.14	24.03
Proximity Sensor	LTE B4	25.15	24.11
Proximity Sensor	LTE B66	25.12	24.01
Proximity Sensor	LTE B2	24.98	23.78
Proximity Sensor	LTE B25	24.86	23.87

Table G-2
Distance Measurement Verification for Main Antenna

Mechanism(s)	Test Condition	Band	Distance Measurements (mm)		Minimum Distance per Manufacturer (mm)
			Moving Toward	Moving Away	
Proximity Sensor	Phablet - Back Side	Mid	10	14	6
Proximity Sensor	Phablet - Front Side	Mid	7	11	3
Proximity Sensor	Phablet - Bottom Edge	Mid	9	12	7

*Note: Mid band refers to: UMTS B2/4, LTE B2/4/25/66

1.4 WIFI Verification Summary

Table G-3
Power Measurement Verification WIFI

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
		Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	19.78	17.18
Held-to-Ear	802.11g	18.93	16.46
Held-to-Ear	802.11n (2.4GHz)	17.98	16.35

*Note: 802.11ac was not measured due to equipment limitation.

APPENDIX H: DOWNLINK LTE CA RF CONDUCTED POWERS

1.1 LTE Downlink Only Carrier Aggregation Test Reduction Methodology

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number of component carriers (CCs) supported by the product implementation. Per FCC Guidance, the following test reduction methodology was applied to determine the combinations required for conducted power measurements.

LTE DLCA Test Reduction Methodology:

- The supported combinations were arranged by the number of component carriers in columns.
- Any limitations on the PCC or SCC for each combination were identified alongside the combination (e.g. CA_2A-2A-4A-12A, but B12 can only be configured as a SCC).
- Power measurements were performed for "supersets" (LTE CA combinations with multiple components carriers) and any "subsets" (LTE CA combinations with fewer component carriers) that were not completely covered by the supersets.
- Only subsets that have the exact same components as a superset were excluded for measurement.
- When there were certain restrictions on component carriers that existed in the superset that were not applied for the subset, the subset configuration was additionally evaluated.
- Both inter-band and intra-band downlink carrier aggregation scenarios were considered.
- Downlink CA combinations for SISO and 4x4 Downlink MIMO operations were measured independently, per May 2017 TCBC Workshop notes.

Table 1 – Example of Exclusion Table for SISO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #1	CA_2C	5, 10, 15, 20	5, 10, 15, 20		3CC #4
2CC #2	CA_2A-5A	5, 10, 15, 20	5, 10		4CC #1
2CC #3	CA_2A-12A	5, 10, 15, 20	5, 10		3CC #3
2CC #4	CA_2A-13A	5, 10, 15, 20	10		3CC #9
2CC #5	CA_2A-17A	5, 10	5, 10		No
2CC #6	CA_2A-30A	5, 10, 15, 20	5, 10		3CC #14
2CC #8	CA_2A-66A (2)	5, 10, 15, 20	5, 10, 15, 20		5CC #1
2CC #9	CA_2A-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #10
2CC #10	CA_4A-4A	5, 10, 15, 20	5, 10, 15, 20		3CC #6
2CC #11	CA_4A-5A (1)	5, 10, 15, 20	5, 10		4CC #1
2CC #12	CA_4A-12A (4)	5, 10, 15, 20	5, 10		3CC #8
2CC #13	CA_4A-13A	5, 10, 15, 20	10		3CC #9
2CC #14	CA_4A-17A	5, 10	5, 10	B17 SCC Only	No
2CC #15	CA_5B	5, 10	5, 10		5CC #1
2CC #16	CA_5A-25A	5, 10	5, 10, 15, 20		No
2CC #17	CA_7C	15, 20	15, 20		No
2CC #18	CA_7A-7A (1)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #19	CA_7A-12A	5, 10, 15, 20	5, 10		3CC #12
2CC #20	CA_12B	5	5, 10		3CC #13
2CC #21	CA_12A-25A	5, 10	5, 10, 15, 20		No
2CC #22	CA_12A-30A	5, 10	5, 10		3CC #14
2CC #23	CA_41A-41A (1)	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #1	CA_2A-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #1
3CC #2	CA_2A-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #3	CA_2A-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #4	CA_2C-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #5	CA_2A-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #6	CA_2A-4A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #7	CA_2A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #8	CA_2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #9	CA_2A-4A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #10	CA_2A-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #11	CA_2A-5B	5, 10, 15, 20	5, 10	5, 10		4CC #5
3CC #12	CA_2A-7A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #13	CA_2A-12B	5, 10, 15, 20	5	5, 10		No
3CC #14	CA_2A-12A-30A	5, 10, 15, 20	5, 10	5, 10		No
3CC #15	CA_4A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #16	CA_5B-30A	5, 10	5, 10	5, 10		5CC #1
3CC #17	CA_5B-66A	5, 10	5, 10	5, 10, 15, 20		5CC #1
3CC #18	CA_5A-30A-66A	5, 10	5, 10	5, 10, 15, 20		4CC #9
3CC #19	CA_12A-66C	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
3CC #20	CA_30A-66A-66A	5, 10	5, 10, 15, 20	5, 10, 15, 20		4CC #9
3CC #21	CA_41D	10, 15, 20	10, 15, 20	10, 15, 20		No
3CC #22	CA_41A-41C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #23	CA_66D	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #24	CA_66A-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #1	CA_2A-2A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
4CC #2	CA_2A-2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10	B12 SCC Only	No
4CC #3	CA_2A-2A-5A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10		No
4CC #4	CA_2A-2A-5A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
4CC #5	CA_2A-5B-30A	5, 10, 15, 20	5, 10	5, 10	5, 10		5CC #1
4CC #6	CA_2A-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		5CC #1
4CC #7	CA_5B-30A-66A	5, 10	5, 10	5, 10	5, 10		5CC #1
4CC #8	CA_5B-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		5CC #2
4CC #9	CA_5A-30A-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #10	CA_41E	15, 20	15, 20	15, 20	20		No

Index	5CC	Supported Channel Bandwidth [MHz]					Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4	CC5		
5CC #1	CA_2A-5B-30A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10	5, 10, 15, 20		No
5CC #2	CA_2A-5B-66A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		No

Table 2 – Example of Exclusion Table for 4x4 Downlink MIMO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #M1	CA_[2C]	5, 10, 15, 20	5, 10, 15, 20		3CC #M6
2CC #M2	CA_[2A]-2A	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M3	CA_[2A]-[2A]	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M4	CA_[2A]-4A (2)	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M5	CA_[2A]-[4A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M6	CA_[2A]-5A	5, 10, 15, 20	5, 10		4CC #M3
2CC #M7	CA_[2A]-12A (1)	5, 10, 15, 20	3, 5, 10		No
2CC #M8	CA_[2A]-13A	5, 10, 15, 20	10		3CC #M4
2CC #M9	CA_[2A]-17A	5, 10	5, 10		No
2CC #M10	CA_[2A]-29A (2)	5, 10, 15, 20	5, 10	B29 SCC Only	3CC #M12
2CC #M11	CA_[2A]-30A	5, 10, 15, 20	5, 10		3CC #M5
2CC #M12	CA_[2A]-66A (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M1
2CC #M13	CA_2A-[66A] (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M2
2CC #M14	CA_[2A]-[66A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M15	CA_[2A]-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #M11
2CC #M16	CA_5A-[66A]	5, 10	5, 10, 15, 20		3CC #M16
2CC #M17	CA_12A-[66A] (4)	5, 10	5, 10, 15, 20		3CC #M17
2CC #M18	CA_13A-[66A]	5, 10	5, 10, 15, 20		3CC #M19
2CC #M19	CA_30A-[66A]	5, 10	5, 10, 15, 20		3CC #M20
2CC #M20	CA_[66B]	5, 10, 15	5, 10, 15		4CC #M4
2CC #M21	CA_[66C]	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
2CC #M22	CA_[66A]-66A	5, 10, 15, 20	5, 10, 15, 20		3CC #M28
2CC #M23	CA_[66A]-[66A]	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #M1	CA_[2A]-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M2	CA_[2A]-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M3	CA_[2A]-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M4	CA_[2A]-2A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #M5	CA_[2A]-2A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M6	CA_[2C]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M7	CA_2C-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M8	CA_[2C]-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M9	CA_[2A]-2A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M10	CA_2A-2A-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M11	CA_[2A]-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M12	CA_[2A]-4A-29A	5, 10, 15, 20	5, 10, 15, 20	5, 10	B29 SCC Only	No
3CC #M13	CA_[2A]-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M14	CA_[2A]-5B	5, 10, 15, 20	5, 10	5, 10		4CC #M1
3CC #M15	CA_[2A]-5A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M16	CA_2A-5A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M17	CA_2A-12A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M18	CA_[2A]-13A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M19	CA_2A-13A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M20	CA_2A-30A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M21	CA_[2A]-66B	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M3
3CC #M22	CA_2A-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M4
3CC #M23	CA_[2A]-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		No
3CC #M24	CA_[2A]-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M5
3CC #M25	CA_2A-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
3CC #M26	CA_[2A]-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M27	CA_[2A]-66A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M28	CA_2A-[66A]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M29	CA_[2A]-66A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #M1	CA_[2A]-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M2	CA_2A-5B-[66A]	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M3	CA_[2A]-5A-66B	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M4	CA_2A-5A-[66B]	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M5	CA_[2A]-5A-66C	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #M6	CA_2A-5A-[66C]	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No

Note: [CC] indicates component carrier with 4x4 DL MIMO antenna configuration

1.2 LTE Downlink Only Carrier Aggregation Test Selection and Setup

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by FCC Guidance, conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

General PCC and SCC configuration selection procedure

- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KBD 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
- All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.
- When a device supports LTE capabilities with overlapping transmission frequency ranges, the standalone powers from the band with a larger transmission frequency range can be used to select measurement configurations for the band with the fully covered transmission frequency range.

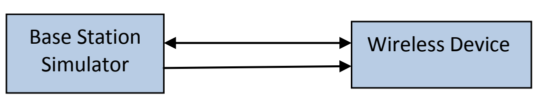


Figure 1
SISO CA Power Measurement Setup

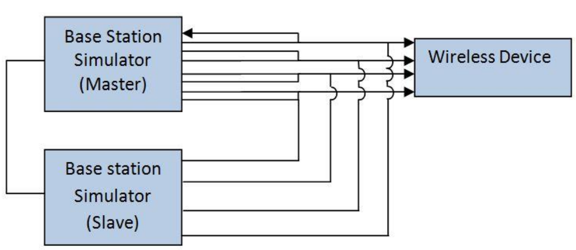


Figure 2
4x4 DL MIMO CA Power Measurement Setup

1.3 SISO Downlink Carrier Aggregation RF Conducted Powers

1.3.1 LTE Band 12 as PCC

Table 1
Maximum Output Powers

	PCC									SCC 1				SCC 2				SCC 3				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-12A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	25.49	25.37
CA_12A-66A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	25.50	25.37
CA_2A-12A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	25.50	25.37
CA_4A-12A (2)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	25.49	25.37
CA_12A-66A (2)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	25.50	25.37
CA_4A-12B	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B12	10	5107	738.7	LTE B4	20	2175	2132.5	-	-	-	-	25.40	25.37
CA_2A-12B	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B12	10	5107	738.7	LTE B2	20	900	1960	-	-	-	-	25.41	25.37
CA_12A-30A-66A-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	LTE B66	20	67236	2190	25.44	25.37
CA_2A-12A-66C	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	25.49	25.37
CA_2A-4A-7A-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	25.38	25.37
CA_2A-12A-30A-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B30	10	9820	2355	LTE B66	20	66786	2145	25.50	25.37
CA_2A-2A-12A-30A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B30	10	9820	2355	25.49	25.37
CA_2A-4A-4A-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	25.50	25.37
CA_4A-4A-12A-30A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B30	10	9820	2355	25.43	25.37
CA_2A-12A-66A-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	67236	2190	25.49	25.37
CA_2A-2A-12A-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	25.48	25.37
CA_2A-4A-12A-30A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B30	10	9820	2355	25.47	25.37

1.3.2 LTE Band 17 as PCC

Table 2
Maximum Output Powers

	PCC									SCC 1				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-17A	LTE B17	5	23755	706.5	QPSK	1	0	5755	736.5	LTE B4	10	2175	2132.5	25.47	25.37
CA_2A-17A	LTE B17	5	23755	706.5	QPSK	1	0	5755	736.5	LTE B2	10	900	1960	25.50	25.37

1.3.3 LTE Band 13 as PCC

Table 3
Maximum Output Powers

	PCC									SCC 1				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-13A	LTE B13	10	23230	782	QPSK	1	25	5230	751	LTE B4	20	2175	2132.5	25.14	25.19
CA_13A-66A	LTE B13	5	23230	782	QPSK	1	0	5230	751	LTE B66	20	66786	2145	25.31	25.38

1.3.4 LTE Band 71 as PCC

Table 4
Maximum Output Powers

	PCC									SCC 1				SCC 2				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-4A-71A	LTE B71	10	133297	680.5	QPSK	1	49	68761	634.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	25.49	25.48
CA_2A-66A-71A	LTE B71	10	133297	680.5	QPSK	1	49	68761	634.5	LTE B2	20	900	1960	LTE B66	20	66786	2145	25.50	25.48
CA_66A-66A-71A	LTE B71	10	133297	680.5	QPSK	1	49	68761	634.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	25.47	25.48

1.3.5 LTE Band 5 as PCC

Table 5
Maximum Output Powers

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-4A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	-	-	-	-	25.47	25.39
CA_2A-5A-30A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B30	10	9820	2355	LTE B66	20	66786	2145	-	-	-	-	25.44	25.39
CA_2A-2A-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B30	10	9820	2355	-	-	-	-	25.42	25.39
CA_2A-5A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.41	25.39
CA_2A-2A-5A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	-	-	-	-	25.40	25.39
CA_2A-4A-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B30	10	9820	2355	-	-	-	-	25.46	25.39
CA_5A-30A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.38	25.39
CA_2A-2A-5A-66C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	25.40	25.39

1.3.6 LTE Band 4 as PCC

Table 6
Maximum Output Powers

	PCC									SCC 1				SCC 2				SCC 3				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-13A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	25.18	25.20
CA_4A-12A (1)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	25.19	25.20
CA_4A-12A (2)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	25.19	25.20
CA_4A-17A	LTE B4	5	20375	1752.5	QPSK	1	12	2375	2152.5	LTE B17	10	5790	740	-	-	-	-	-	-	-	-	25.20	25.19
CA_2A-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	25.19	25.20
CA_4A-29A	LTE B4	5	20375	1752.5	QPSK	1	12	2375	2152.5	LTE B29	10	9715	722.5	-	-	-	-	-	-	-	-	25.18	25.19
CA_4A-4A-29A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B4	20	2300	2145	LTE B29	10	9715	722.5	-	-	-	-	25.15	25.20
CA_4A-12B	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	-	-	-	-	25.15	25.20
CA_2A-4A-71A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B71	20	68761	634.5	-	-	-	-	25.16	25.20
CA_2A-2A-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	-	-	-	-	25.14	25.20
CA_4A-4A-5A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B4	20	2300	2145	LTE B5	10	2525	881.5	-	-	-	-	25.18	25.20
CA_4A-4A-7A (1)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B4	20	2300	2145	LTE B7	20	3100	2655	-	-	-	-	25.20	25.20
CA_2A-4A-29A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	25.15	25.20
CA_2A-4A-7A-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B12	10	5095	737.5	25.18	25.20
CA_2A-4A-4A-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B4	20	2300	2145	LTE B2	20	900	1960	LTE B12	10	5095	737.5	25.12	25.20
CA_2A-4A-7A-7A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B7	20	2850	2630	25.19	25.20
CA_4A-4A-12A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B4	20	2300	2145	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	25.17	25.20
CA_2A-4A-12A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	25.17	25.20
CA_2A-4A-5A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	25.18	25.20
CA_2A-4A-7C	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B7	20	2902	2635.2	25.19	25.20

Table 7
Reduced Output Powers

	PCC									SCC 1				SCC 2				SCC 3				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled	LTE Single Carrier Tx Power (dBm)
CA_4A-13A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	24.19	24.20
CA_4A-12A (1)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	24.17	24.20
CA_4A-12A (2)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	24.17	24.20
CA_4A-17A	LTE B4	10	20300	1745	QPSK	1	0	2300	2145	LTE B17	10	5790	740	-	-	-	-	-	-	-	-	24.11	24.18
CA_2A-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	24.18	24.20
CA_4A-29A	LTE B4	10	20300	1745	QPSK	1	0	2300	2145	LTE B29	10	9715	722.5	-	-	-	-	-	-	-	-	24.13	24.18
CA_4A-4A-29A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B4	20	2300	2145	LTE B29	10	9715	722.5	-	-	-	-	24.00	24.20
CA_4A-12B	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	-	-	-	-	24.05	24.20
CA_2A-4A-71A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B71	20	68761	634.5	-	-	-	-	24.03	24.20
CA_2A-2A-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	-	-	-	-	24.02	24.20
CA_4A-4A-5A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B4	20	2300	2145	LTE B5	10	2525	881.5	-	-	-	-	23.99	24.20
CA_4A-4A-7A (1)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B4	20	2300	2145	LTE B7	20	3100	2655	-	-	-	-	23.98	24.20
CA_2A-4A-29A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	24.15	24.20
CA_2A-4A-7A-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B12	10	5095	737.5	24.12	24.20
CA_2A-4A-4A-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B4	20	2300	2145	LTE B2	20	900	1960	LTE B12	10	5095	737.5	24.11	24.20
CA_2A-4A-7A-7A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B7	20	2850	2630	24.08	24.20
CA_4A-4A-12A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B4	20	2300	2145	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	24.10	24.20
CA_2A-4A-12A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	24.12	24.20
CA_2A-4A-5A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	24.06	24.20
CA_2A-4A-7C	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B7	20	2902	2635.2	24.11	24.20

1.3.7 LTE Band 66 as PCC

Table 8
Maximum Output Powers

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-66A (1)	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	25.20	25.20
CA_13A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	-	-	-	-	25.19	25.20
CA_2A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	-	-	-	-	25.17	25.20
CA_12A-66A (2)	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	25.20	25.20
CA_7A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B7	20	3100	2655	-	-	-	-	-	-	-	-	-	-	-	-	25.19	25.20
CA_66A-66C	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67038	2170.2	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	25.19	25.20
CA_66C-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	66734	2139.8	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	25.18	25.20
CA_2A-66B	LTE B66	5	132647	1777.5	QPSK	1	12	67111	2177.5	LTE B66	15	67018	2168.2	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	25.17	25.19
CA_2A-66A-71A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	25.16	25.20
CA_29A-30A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	-	-	-	-	25.15	25.20
CA_66A-66A-71A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	25.12	25.20
CA_12A-30A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	25.17	25.20
CA_2A-12A-66C	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	66734	2139.8	LTE B2	20	900	1960	LTE B12	10	5095	737.5	-	-	-	-	25.20	25.20
CA_2A-2A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B2	20	700	1940	-	-	-	-	25.15	25.20
CA_2A-5A-30A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	25.18	25.20
CA_2A-12A-30A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	25.20	25.20
CA_2A-5A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B5	10	2525	881.5	-	-	-	-	25.19	25.20
CA_2A-12A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B12	10	5095	737.5	-	-	-	-	25.18	25.20
CA_2A-2A-12A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	-	-	-	-	25.19	25.20
CA_2A-2A-5A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	25.17	25.20
CA_5A-30A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	25.20	25.20
CA_2A-2A-5A-66C	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	66734	2139.8	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	25.20	25.20

Table 9
Reduced Output Powers

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-66A (1)	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	24.19	24.20
CA_13A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	-	-	-	-	24.18	24.20
CA_2A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	-	-	-	-	24.15	24.20
CA_12A-66A (2)	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	24.19	24.20
CA_7A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B7	20	3100	2655	-	-	-	-	-	-	-	-	-	-	-	-	24.17	24.20
CA_66A-66C	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67038	2170.2	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	24.09	24.20
CA_66C-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	66734	2139.8	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	24.12	24.20
CA_2A-66B	LTE B66	10	132322	1745	QPSK	1	0	66786	2145	LTE B66	10	66687	2135.1	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	24.13	24.18
CA_2A-66A-71A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	24.05	24.20
CA_29A-30A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	-	-	-	-	24.08	24.20
CA_66A-66A-71A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	24.06	24.20
CA_12A-30A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	24.15	24.20
CA_2A-12A-66C	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	66734	2139.8	LTE B2	20	900	1960	LTE B12	10	5095	737.5	-	-	-	-	24.16	24.20
CA_2A-2A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B2	20	700	1940	-	-	-	-	24.15	24.20
CA_2A-5A-30A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	24.17	24.20
CA_2A-12A-30A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	24.16	24.20
CA_2A-5A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B5	10	2525	881.5	-	-	-	-	24.11	24.20
CA_2A-12A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B12	10	5095	737.5	-	-	-	-	24.10	24.20
CA_2A-2A-12A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	-	-	-	-	24.17	24.20
CA_2A-2A-5A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	24.16	24.20
CA_5A-30A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	24.12	24.20
CA_2A-2A-5A-66C	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B6	20	66734	2139.8	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	24.09	24.20

1.3.8 LTE Band 2 as PCC

Table 10
Maximum Output Powers

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-29A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B29	10	9715	722.5	-	-	-	-	-	-	-	-	-	-	-	-	25.50	25.46
CA_2A-12A (1)	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	25.48	25.46
CA_2A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	-	-	-	-	25.49	25.46
CA_2C	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	1058	1975.8	-	-	-	-	-	-	-	-	-	-	-	-	25.47	25.46
CA_2A-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	-	-	-	-	25.48	25.46
CA_2A-17A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B17	10	5790	740	-	-	-	-	-	-	-	-	-	-	-	-	25.50	25.46
CA_2A-4A-71A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	25.45	25.46
CA_2A-12B	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	-	-	-	-	-	-	-	-	25.46	25.46
CA_2A-2A-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	25.47	25.46
CA_2A-66B	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B66	15	66786	2145	LTE B66	5	66879	2154.3	-	-	-	-	-	-	-	-	25.45	25.46
CA_2A-66A-71A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B66	20	66786	2145	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	25.48	25.46
CA_2A-12A-66C	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	-	-	-	-	25.48	25.46
CA_2A-2A-29A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	25.47	25.46
CA_2A-2A-66A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.49	25.46
CA_2A-4A-29A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	25.48	25.46
CA_2A-4A-7A-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B12	10	5095	737.5	-	-	-	-	25.42	25.46
CA_2A-5A-30A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	-	-	-	-	25.47	25.46
CA_2A-12A-30A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	-	-	-	-	25.44	25.46
CA_2A-2A-12A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	25.48	25.46
CA_2A-2A-5A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	25.46	25.46
CA_2A-4A-4A-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B12	10	5095	737.5	-	-	-	-	25.44	25.46
CA_2A-4A-7A-7A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B7	20	2850	2630	-	-	-	-	25.47	25.46
CA_2A-5A-66A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.46	25.46
CA_2A-12A-66A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.44	25.46
CA_2A-2A-12A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	25.47	25.46
CA_2A-2A-5A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	-	-	-	-	25.46	25.46
CA_2A-4A-12A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	25.49	25.46
CA_2A-4A-5A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	25.43	25.46
CA_2A-4A-7C	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B7	20	2902	2635.2	-	-	-	-	25.48	25.46
CA_2A-2A-5A-66C	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	25.45	25.46

Table 11
Reduced Output Powers

	PCC										SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-29A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B29	10	9715	722.5	-	-	-	-	-	-	-	-	-	-	-	-	24.49	24.50
CA_2A-12A (1)	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	24.50	24.50
CA_2A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	-	-	-	-	24.50	24.50
CA_2C	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	1006	1970.6	-	-	-	-	-	-	-	-	-	-	-	-	24.50	24.50
CA_2A-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	-	-	-	-	24.49	24.50
CA_2A-17A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B17	10	5790	740	-	-	-	-	-	-	-	-	-	-	-	-	24.47	24.50
CA_2A-4A-71A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	24.39	24.50
CA_2A-12B	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	-	-	-	-	-	-	-	-	24.45	24.50
CA_2A-2A-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	24.41	24.50
CA_2A-66B	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B66	15	66786	2145	LTE B66	5	66879	2154.3	-	-	-	-	-	-	-	-	24.46	24.50
CA_2A-66A-71A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B66	20	66786	2145	LTE B71	20	68761	634.5	-	-	-	-	-	-	-	-	24.42	24.50
CA_2A-12A-66C	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	-	-	-	-	24.48	24.50
CA_2A-2A-29A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	24.46	24.50
CA_2A-2A-66A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	24.49	24.50
CA_2A-4A-29A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	24.46	24.50
CA_2A-4A-7A-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B12	10	5095	737.5	-	-	-	-	24.49	24.50
CA_2A-5A-30A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	-	-	-	-	24.45	24.50
CA_2A-12A-30A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	LTE B66	20	66786	2145	-	-	-	-	24.50	24.50
CA_2A-2A-12A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	24.48	24.50
CA_2A-2A-5A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	24.47	24.50
CA_2A-4A-4A-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B12	10	5095	737.5	-	-	-	-	24.46	24.50
CA_2A-4A-7A-7A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B7	20	2850	2630	-	-	-	-	24.48	24.50
CA_2A-5A-66A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	24.47	24.50
CA_2A-12A-66A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	24.45	24.50
CA_2A-2A-12A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	24.50	24.50
CA_2A-2A-5A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	-	-	-	-	24.48	24.50
CA_2A-4A-12A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	24.47	24.50
CA_2A-4A-5A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	24.49	24.50
CA_2A-4A-7C	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	LTE B7	20	2902	2635.2	-	-	-	-	24.46	24.50
CA_2A-2A-5A-66C	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	24.49	24.50

1.3.9 LTE Band 30 as PCC

Table 12
Maximum Output Powers

	PCC										SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_29A-30A-66A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B29	10	9715	722.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	25.15	25.25
CA_12A-30A-66A-66A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.16	25.25
CA_2A-2A-29A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B29	10	9715	722.5	-	-	-	-	25.17	25.25
CA_2A-4A-29A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B29	10	9715	722.5	-	-	-	-	25.16	25.25
CA_2A-5A-30A-66A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	-	-	-	-	25.18	25.25
CA_2A-12A-30A-66A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	25.16	25.25
CA_2A-2A-12A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	-	-	-	-	25.18	25.25
CA_2A-2A-5A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	25.17	25.25
CA_4A-4A-12A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B12	10	5095	737.5	-	-	-	-	25.14	25.25
CA_2A-4A-12A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	-	-	-	-	25.17	25.25
CA_2A-4A-5A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	-	-	-	-	25.18	25.25
CA_5A-30A-66A-66A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	25.17	25.25

1.3.10 LTE Band 7 as PCC

Table 13
Maximum Output Powers

	PCC										SCC 1				SCC 2				SCC 3				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_7B	LTE B7	15	20825	2507.5	QPSK	1	0	2825	2627.5	LTE B7	5	2918	2636.8	-	-	-	-	-	-	-	-	25.33	25.31
CA_7A-66A	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	25.45	25.42
CA_4A-4A-7A (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	25.45	25.42
CA_2A-4A-7A-12A	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	25.43	25.42
CA_2A-4A-7A-7A	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE B7	20	3350	2680	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	25.38	25.42
CA_2A-4A-7C	LTE B7	20	21350	2560	QPSK	1	50	3350	2680	LTE B7	20	3152	2660.2	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	25.18	25.31

1.3.11 LTE Band 41 as PCC

Table 14
Maximum Output Powers

	PCC										SCC 1				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C (1)	LTE B41	20	39750	2506	QPSK	1	50	39750	2506	LTE B41	20	39948	2525.8	25.14	25.20

1.4 4x4 Downlink MIMO RF Conduction Powers

This device supports downlink 4x4 MIMO operations for some LTE bands. Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Section 1.2 were applied.

Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive. Additionally, SAR for 4x4 MIMO Downlink Carrier Aggregation was not needed since the maximum average output power in 4x4 MIMO Downlink Carrier Aggregation mode was not more than 0.25 dB higher than the maximum output power with 4x4 MIMO Downlink and downlink carrier aggregation inactive.

1.4.1 LTE 4x4 DL MIMO Standalone Powers

Table 15
Maximum Output Powers

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]
4	20	20050	1720	QPSK	1	0	25.07	25.20
66	20	132072	1720	QPSK	1	0	25.15	25.20
2	5	19175	1907.5	QPSK	1	0	25.35	25.46

Table 16
Reduced Output Powers

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]
4	20	20050	1720	16QAM	1	50	24.18	24.20
66	20	132072	1720	16QAM	1	50	24.20	24.20
2	10	19150	1905	QPSK	25	25	24.45	24.50

1.4.2 LTE Band 12 as PCC

Table 17
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-[66A] (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	-	-	-	-	-	25.34	25.37
CA_12A-[66A] (2)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	-	-	-	-	-	25.34	25.37
CA_[2A]-12A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	-	-	-	-	-	25.32	25.37
CA_[4A]-12A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	-	-	-	-	-	25.30	25.37
CA_[4A]-12A (2)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	-	-	-	-	-	25.30	25.37
CA_12A-30A-[66A]	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.33	25.37
CA_[2A]-12A-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.30	25.37
CA_2A-[4A]-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.38	25.37
CA_12A-[66A]-66A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	25.29	25.37
CA_2A-12A-[66A]	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.32	25.37
CA_[4A]-12A-30A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.36	25.37
CA_12A-[66C]	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	66984	2164.8	4x4 MIMO	25.31	25.37
CA_[2A]-2A-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.32	25.37
CA_[2A]-4A-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	25.35	25.37
CA_[2A]-12A-30A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.30	25.37
CA_[4A]-4A-12A	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B4	10	2350	2150	2x2 MIMO	25.34	25.37
CA_[4A]-7A-12A (1)	LTE B12	5	23035	701.5	QPSK	1	0	5035	731.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	25.35	25.37

1.4.3 LTE Band 17 as PCC

Table 18
Maximum Output Powers

	PCC										SCC 1					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-17A	LTE B17	5	23755	706.5	QPSK	1	0	5755	736.5	2x2 MIMO	LTE B4	10	2175	2132.5	4x4 MIMO	25.38	25.37
CA_[2A]-17A	LTE B17	5	23755	706.5	QPSK	1	0	5755	736.5	2x2 MIMO	LTE B2	10	900	1960	4x4 MIMO	25.34	25.37

1.4.4 LTE Band 5 as PCC

Table 19
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-2A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.30	25.39
CA_[2A]-5A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.32	25.39
CA_2A-[4A]-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.35	25.39
CA_[4A]-4A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B4	10	2350	2150	2x2 MIMO	25.32	25.39
CA_5A-30A-[66A]	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.37	25.39
CA_[2A]-4A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	25.31	25.39
CA_[4A]-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.29	25.39
CA_5A-[66A]-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	25.35	25.39
CA_[2A]-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.39	25.39

1.4.5 **LTE Band 4 as PCC**

Table 20
Maximum Output Powers

Combination	PCC										SCC 1					SCC 2					Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-17A	LTE B4	5	20375	1752.5	QPSK	1	12	2375	2152.5	4x4 MIMO	LTE B17	10	5790	740	2x2 MIMO	-	-	-	-	-	25.00	25.19
CA_[4A]-[4A]	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	4x4 MIMO	-	-	-	-	-	25.17	25.20
CA_[4A]-12A (1)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	25.11	25.20
CA_[4A]-29A	LTE B4	5	20375	1752.5	QPSK	1	12	2375	2152.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	25.14	25.19
CA_[4A]-12A (2)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	25.11	25.20
CA_[2A]-[4A]	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	-	-	-	-	-	25.10	25.20
CA_[2A]-4A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.15	25.20
CA_2A-[4A]-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.11	25.20
CA_2A-[4A]-5A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.19	25.20
CA_[4A]-4A-29A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.17	25.20
CA_[4A]-4A-29A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.19	25.20
CA_[4A]-7A-7A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	LTE B7	20	2850	2630	2x2 MIMO	25.15	25.20
CA_[2A]-4A-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	25.16	25.20
CA_2A-[4A]-29A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.15	25.20
CA_2A-[4A]-7A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B7	20	3100	2655	2x2 MIMO	25.14	25.20
CA_[4A]-12A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.12	25.20
CA_[4A]-4A-5A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.14	25.20
CA_[4A]-4A-5A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.17	25.20
CA_[2A]-4A-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.19	25.20
CA_[2A]-4A-5A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.16	25.20
CA_2A-2A-[4A]	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.19	25.20
CA_2A-[4A]-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.17	25.20
CA_[4A]-29A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.12	25.20
CA_[4A]-5A-30A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.18	25.20
CA_[2A]-2A-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.13	25.20
CA_[2A]-4A-29A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.18	25.20
CA_2A-[4A]-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.10	25.20
CA_2A-[4A]-4A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.12	25.20
CA_[4A]-4A-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.14	25.20
CA_[4A]-4A-12A	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.15	25.20
CA_[4A]-7A-12A (1)	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.15	25.20

Table 21
Reduced Output Powers

Combination	PCC										SCC 1					SCC 2					Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-17A	LTE B4	10	20300	1745	QPSK	1	0	2300	2145	4x4 MIMO	LTE B17	10	5790	740	2x2 MIMO	-	-	-	-	-	24.13	24.18
CA_[4A]-[4A]	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	4x4 MIMO	-	-	-	-	-	24.15	24.20
CA_[4A]-12A (1)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	24.18	24.20
CA_[4A]-29A	LTE B4	10	20300	1745	QPSK	1	0	2300	2145	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	24.13	24.18
CA_[4A]-12A (2)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	24.18	24.20
CA_[2A]-[4A]	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	-	-	-	-	-	24.13	24.20
CA_[2A]-4A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.14	24.20
CA_2A-[4A]-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.12	24.20
CA_2A-[4A]-5A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.18	24.20
CA_[4A]-4A-29A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.16	24.20
CA_[4A]-4A-29A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.17	24.20
CA_[4A]-7A-7A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	LTE B7	20	2850	2630	2x2 MIMO	24.18	24.20
CA_[2A]-4A-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	24.16	24.20
CA_2A-[4A]-29A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.09	24.20
CA_2A-[4A]-7A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B7	20	3100	2655	2x2 MIMO	24.17	24.20
CA_[4A]-12A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.13	24.20
CA_[4A]-4A-5A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.13	24.20
CA_[4A]-4A-5A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.14	24.20
CA_[2A]-4A-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.14	24.20
CA_[2A]-4A-5A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.12	24.20
CA_2A-2A-[4A]	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	24.19	24.20
CA_2A-[4A]-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.17	24.20
CA_[4A]-29A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.18	24.20
CA_[4A]-5A-30A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.10	24.20
CA_[2A]-2A-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	24.15	24.20
CA_[2A]-4A-29A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.10	24.20
CA_2A-[4A]-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.10	24.20
CA_2A-[4A]-4A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.11	24.20
CA_[4A]-4A-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B4	20	2300	2145	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.18	24.20
CA_[4A]-4A-12A	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	2x2 MIMO	LTE B4	20	2300	2145	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.13	24.20
CA_[4A]-7A-12A (1)	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.16	24.20

1.4.6 LTE Band 66 as PCC

Table 22
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_29A-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	25.10	25.20
CA_12A-[66A] (1)	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	25.09	25.20
CA_12A-[66A] (2)	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	25.09	25.20
CA_[66A]-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	-	-	-	-	-	25.08	25.20
CA_[2A]-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	-	-	-	-	-	25.09	25.20
CA_12A-30A-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.11	25.20
CA_[2A]-12A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.19	25.20
CA_[2A]-5A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.15	25.20
CA_[2A]-[66C]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	25.13	25.20
CA_2A-[66C]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.12	25.20
CA_[66C]-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	25.17	25.20
CA_12A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.12	25.20
CA_12A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.18	25.20
CA_[2A]-2A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.16	25.20
CA_[2A]-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	25.17	25.20
CA_2A-12A-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.19	25.20
CA_5A-30A-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.12	25.20
CA_12A-[66C]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.10	25.20
CA_[2A]-66B	LTE B66	5	132647	1777.5	QPSK	1	12	67111	2177.5	2x2 MIMO	LTE B66	15	67018	2168.2	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	25.15	25.19
CA_2A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.18	25.20
CA_2A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.16	25.20
CA_5A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.17	25.20
CA_5A-[66A]-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.18	25.20
CA_[2A]-66C	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B66	20	66734	2139.8	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	25.14	25.20
CA_2A-2A-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	25.12	25.20
CA_2A-[66B]	LTE B66	5	132647	1777.5	QPSK	1	12	67111	2177.5	4x4 MIMO	LTE B66	15	67018	2168.2	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	25.00	25.19
CA_[66A]-[66C]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE B66	20	67038	2170.2	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	25.13	25.20

Table 23
Reduced Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_29A-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	24.08	24.20
CA_12A-[66A] (1)	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	24.12	24.20
CA_12A-[66A] (2)	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	24.12	24.20
CA_[66A]-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	-	-	-	-	-	24.10	24.20
CA_[2A]-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	-	-	-	-	-	24.14	24.20
CA_12A-30A-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.12	24.20
CA_[2A]-12A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.18	24.20
CA_[2A]-5A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.16	24.20
CA_[2A]-[66C]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B2	20	900	1960	4x4 MIMO	24.13	24.20
CA_2A-[66C]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.15	24.20
CA_[66C]-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	24.13	24.20
CA_12A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.12	24.20
CA_12A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.18	24.20
CA_[2A]-2A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	24.18	24.20
CA_[2A]-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	24.17	24.20
CA_2A-12A-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.10	24.20
CA_5A-30A-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.11	24.20
CA_12A-[66C]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	66734	2139.8	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.12	24.20
CA_[2A]-66B	LTE B66	10	132322	1745	QPSK	1	0	66786	2145	2x2 MIMO	LTE B66	10	66687	2135.1	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	24.15	24.18
CA_2A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.18	24.20
CA_2A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.13	24.20
CA_5A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.11	24.20
CA_5A-[66A]-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B66	20	67236	2190	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.13	24.20
CA_[2A]-66C	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B66	20	66734	2139.8	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	24.14	24.20
CA_2A-2A-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	24.16	24.20
CA_2A-[66B]	LTE B66	10	132322	1745	QPSK	1	0	66786	2145	4x4 MIMO	LTE B66	10	66687	2135.1	4x4 MIMO	LTE B2	20	900	1960	2x2 MIMO	24.20	24.18
CA_[66A]-[66C]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE B66	20	67038	2170.2	4x4 MIMO	LTE B66	20	67236	2190	4x4 MIMO	24.17	24.20

1.4.7 LTE Band 2 as PCC

Table 24
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2C]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	1058	1975.8	4x4 MIMO	-	-	-	-	-	25.37	25.46
CA_[2A]-12A (1)	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	25.35	25.46
CA_[2A]-[2A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	700	1940	4x4 MIMO	-	-	-	-	-	25.36	25.46
CA_[2A]-17A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B17	10	5790	740	2x2 MIMO	-	-	-	-	-	25.38	25.46
CA_[2A]-[66A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B66	20	66786	2145	4x4 MIMO	-	-	-	-	-	25.35	25.46
CA_[2A]-29A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	25.40	25.46
CA_[2A]-[4A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	-	-	-	-	-	25.39	25.46
CA_[2A]-12A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.36	25.46
CA_[2A]-2A-5A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.38	25.46
CA_[2A]-2A-5A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.35	25.46
CA_[2A]-4A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.37	25.46
CA_[2A]-5A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.37	25.46
CA_[2A]-[66C]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	66984	2164.8	4x4 MIMO	25.43	25.46
CA_2A-[4A]-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.38	25.46
CA_2A-[4A]-5A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.34	25.46
CA_2A-[66C]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	66984	2164.8	4x4 MIMO	25.40	25.46
CA_[2A]-29A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.41	25.46
CA_[2A]-2A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.40	25.46
CA_[2A]-2A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	25.39	25.46
CA_[2A]-4A-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B4	10	2350	2150	2x2 MIMO	25.38	25.46
CA_[2A]-66A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	LTE B66	20	67236	2190	2x2 MIMO	25.37	25.46
CA_2A-12A-[66A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.41	25.46
CA_2A-[4A]-29A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.36	25.46
CA_2A-[4A]-7A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	25.41	25.46
CA_[2A]-2A-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.34	25.46
CA_[2A]-2A-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.38	25.46
CA_[2A]-4A-12A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.32	25.46
CA_[2A]-4A-5A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.33	25.46
CA_[2A]-66B	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B66	15	66786	2145	2x2 MIMO	LTE B66	5	66879	2154.3	2x2 MIMO	25.41	25.46
CA_2A-2A-[4A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.32	25.46
CA_2A-[4A]-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.37	25.46
CA_2A-[66A]-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	25.34	25.46
CA_[2A]-12A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	23.35	25.46
CA_[2A]-2A-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	25.39	25.46
CA_[2A]-2A-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	25.43	25.46
CA_[2A]-4A-29A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.41	25.46
CA_[2A]-5A-30A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	25.36	25.46
CA_[2A]-66C	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	LTE B66	20	66984	2164.8	2x2 MIMO	25.36	25.46
CA_2A-2A-[66A]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.44	25.46
CA_2A-[4A]-4A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B4	10	2350	2150	2x2 MIMO	25.38	25.46
CA_2A-[66B]	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	2x2 MIMO	LTE B66	15	66786	2145	4x4 MIMO	LTE B66	5	66879	2154.3	4x4 MIMO	25.46	25.46

Table 25
Reduced Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2C]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	1006	1970.6	4x4 MIMO	-	-	-	-	-	24.24	24.50
CA_[2A]-12A (1)	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	-	-	-	-	-	24.29	24.50
CA_[2A]-[2A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	700	1940	4x4 MIMO	-	-	-	-	-	24.24	24.50
CA_[2A]-17A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B17	10	5790	740	2x2 MIMO	-	-	-	-	-	24.33	24.50
CA_[2A]-[66A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B66	20	66786	2145	4x4 MIMO	-	-	-	-	-	24.32	24.50
CA_[2A]-29A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	-	-	-	-	-	24.26	24.50
CA_[2A]-[4A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	-	-	-	-	-	24.30	24.50
CA_[2A]-12A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	24.29	24.50
CA_[2A]-2A-5A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.31	24.50
CA_[2A]-2A-5A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.35	24.50
CA_[2A]-4A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.32	24.50
CA_[2A]-5A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	24.35	24.50
CA_[2A]-[66C]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	66984	2164.8	4x4 MIMO	24.30	24.50
CA_2A-[4A]-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.35	24.50
CA_2A-[4A]-5A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.31	24.50
CA_2A-[66C]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	66984	2164.8	4x4 MIMO	24.30	24.50
CA_[2A]-29A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.28	24.50
CA_[2A]-2A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	24.40	24.50
CA_[2A]-2A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	24.33	24.50
CA_[2A]-4A-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B4	10	2350	2150	2x2 MIMO	24.29	24.50
CA_[2A]-66A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	LTE B66	20	67236	2190	2x2 MIMO	24.32	24.50
CA_2A-12A-[66A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	24.35	24.50
CA_2A-[4A]-29A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.32	24.50
CA_2A-[4A]-7A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B7	20	3100	2655	2x2 MIMO	24.30	24.50
CA_[2A]-2A-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.30	24.50
CA_[2A]-2A-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.31	24.50
CA_[2A]-4A-12A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	24.33	24.50
CA_[2A]-4A-5A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	24.33	24.50
CA_[2A]-66B	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B66	15	66786	2145	2x2 MIMO	LTE B66	5	66879	2154.3	2x2 MIMO	24.31	24.50
CA_2A-2A-[4A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	24.31	24.50
CA_2A-[4A]-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.36	24.50
CA_2A-[66A]-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	LTE B66	20	67236	2190	2x2 MIMO	24.33	24.50
CA_[2A]-12A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.31	24.50
CA_[2A]-2A-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	24.29	24.50
CA_[2A]-2A-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	24.30	24.50
CA_[2A]-4A-29A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	24.29	24.50
CA_[2A]-5A-30A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B30	10	9820	2355	2x2 MIMO	24.29	24.50
CA_[2A]-66C	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE B66	20	66786	2145	2x2 MIMO	LTE B66	20	66984	2164.8	2x2 MIMO	24.30	24.50
CA_2A-2A-[66A]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B2	20	700	1940	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	24.30	24.50
CA_2A-[4A]-4A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B4	10	2350	2150	2x2 MIMO	24.32	24.50
CA_2A-[66B]	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	2x2 MIMO	LTE B66	15	66786	2145	4x4 MIMO	LTE B66	5	66879	2154.3	4x4 MIMO	24.30	24.50

1.4.8 LTE Band 30 as PCC

Table 26
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-30A-[66A]	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.26	25.25
CA_[2A]-4A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B4	20	2175	2132.5	2x2 MIMO	25.23	25.25
CA_[2A]-29A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.24	25.25
CA_[4A]-12A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.21	25.25
CA_5A-30A-[66A]	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	LTE B66	20	66786	2145	4x4 MIMO	25.22	25.25
CA_2A-[4A]-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.21	25.25
CA_[4A]-29A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B29	10	9715	722.5	2x2 MIMO	25.23	25.25
CA_[4A]-5A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.22	25.25
CA_[2A]-12A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.20	25.25
CA_[2A]-5A-30A	LTE B30	10	27710	2310	QPSK	1	25	9820	2355	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE B5	10	2525	881.5	2x2 MIMO	25.24	25.25

1.4.9 LTE Band 7 as PCC

Table 27
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-7A-7A	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	2x2 MIMO	LTE B7	20	3350	2680	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.36	25.42
CA_2A-[4A]-7A	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	2x2 MIMO	LTE B2	20	900	1960	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	25.29	25.42
CA_[4A]-7A-12A (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	2x2 MIMO	LTE B4	20	2175	2132.5	4x4 MIMO	LTE B12	10	5095	737.5	2x2 MIMO	25.31	25.42

1.5 LAA Downlink Carrier Aggregation

This device supports LAA with downlink carrier aggregation only. It uses carrier aggregation in the downlink to combine LTE in the unlicensed spectrum (i.e. LTE Band 46) with LTE in the licensed band (served as PCC). All uplink communications and acknowledgements on the PCC remain identical to specifications when downlink carrier aggregation is inactive. Due to the wide downlink bandwidth, each Band 46 sub-band, represented by subscripts A, B, C, and D, was evaluated independently. The general test selection and setup procedures described in Section 1.2 were applied.

Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

1.5.1 SISO LAA Downlink Carrier Aggregation RF Conducted Powers

1.5.1.1 LTE Band 13 as PCC

Table 28
Maximum Output Powers

Combination	PCC									SCC 1				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_13A-46_AA	LTE B13	5	23230	782	QPSK	1	0	5230	751	LTE $B46_A$	20	47290	5200	25.42	25.38
CA_13A-46_BA	LTE B13	5	23230	782	QPSK	1	0	5230	751	LTE $B46_B$	20	48290	5300	25.41	25.38
CA_13A-46_CA	LTE B13	5	23230	782	QPSK	1	0	5230	751	LTE $B46_C$	20	51290	5600	25.38	25.38
CA_13A-46_DA	LTE B13	5	23230	782	QPSK	1	0	5230	751	LTE $B46_D$	20	53140	5785	25.37	25.38

1.5.1.2 LTE Band 4 as PCC

Table 29
Maximum Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-46_AA-46_DA	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_A$	20	47090	5180	LTE $B46_D$	20	53540	5825	-	-	-	-	25.14	25.20
CA_4A-46_AA-46_DC	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_A$	20	47090	5180	LTE $B46_D$	20	53540	5825	LTE $B46_D$	20	53342	5805.2	25.10	25.20
CA_4A-46_DA-46_AC	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_D$	20	53540	5825	LTE $B46_A$	20	47090	5180	LTE $B46_A$	20	47288	5199.8	25.11	25.20
CA_4A-46_AD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_A$	20	47290	5200	LTE $B46_A$	20	47488	5219.8	LTE $B46_A$	20	47092	5180.2	25.15	25.20
CA_4A-46_BD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_B$	20	48290	5300	LTE $B46_B$	20	48488	5319.8	LTE $B46_B$	20	48092	5280.2	25.19	25.20
CA_4A-46_CD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_C$	20	51290	5600	LTE $B46_C$	20	51488	5619.8	LTE $B46_C$	20	51092	5580.2	25.20	25.20
CA_4A-46_DD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	LTE $B46_D$	20	53140	5785	LTE $B46_D$	20	53338	5804.8	LTE $B46_D$	20	52942	5765.2	25.16	25.20

Table 30
Reduced Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-46_AA-46_DA	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_A$	20	47090	5180	LTE $B46_D$	20	53540	5825	-	-	-	-	24.03	24.20
CA_4A-46_AA-46_DC	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_A$	20	47090	5180	LTE $B46_D$	20	53540	5825	LTE $B46_D$	20	53342	5805.2	24.03	24.20
CA_4A-46_DA-46_AC	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_D$	20	53540	5825	LTE $B46_A$	20	47090	5180	LTE $B46_A$	20	47288	5199.8	24.06	24.20
CA_4A-46_AD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_A$	20	47290	5200	LTE $B46_A$	20	47488	5219.8	LTE $B46_A$	20	47092	5180.2	24.02	24.20
CA_4A-46_BD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_B$	20	48290	5300	LTE $B46_B$	20	48488	5319.8	LTE $B46_B$	20	48092	5280.2	24.05	24.20
CA_4A-46_CD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_C$	20	51290	5600	LTE $B46_C$	20	51488	5619.8	LTE $B46_C$	20	51092	5580.2	24.03	24.20
CA_4A-46_DD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	LTE $B46_D$	20	53140	5785	LTE $B46_D$	20	53338	5804.8	LTE $B46_D$	20	52942	5765.2	24.01	24.20

1.5.1.3 LTE Band 66 as PCC

Table 31
Maximum Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_46$_A$A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B46$_A$	20	47290	5200	-	-	-	-	25.16	25.20
CA_46$_B$A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B46$_B$	20	48290	5300	-	-	-	-	25.13	25.20
CA_46$_C$A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B46$_C$	20	51290	5600	-	-	-	-	25.14	25.20
CA_46$_D$A-66A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B66	20	67236	2190	LTE B46$_D$	20	53140	5785	-	-	-	-	25.15	25.20
CA_2A-46$_A$A-46$_D$A-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	25.14	25.20
CA_2A-46$_A$A-46$_D$C-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	25.12	25.20
CA_2A-46$_D$A-46$_A$C-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_D$	20	53540	5825	LTE B46$_A$	20	47090	5180	25.12	25.20
CA_2A-46$_A$D-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47290	5200	LTE B46$_A$	20	47488	5219.8	25.10	25.20
CA_2A-46$_B$D-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_B$	20	48290	5300	LTE B46$_B$	20	48488	5319.8	25.11	25.20
CA_2A-46$_C$D-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_C$	20	51290	5600	LTE B46$_C$	20	51488	5619.8	25.10	25.20
CA_2A-46$_D$D-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	LTE B2	20	900	1960	LTE B46$_D$	20	53140	5785	LTE B46$_D$	20	53338	5804.8	25.12	25.20

Table 32
Reduced Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_46$_A$A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B46$_A$	20	47290	5200	-	-	-	-	-	-	-	-	24.04	24.20
CA_46$_B$A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B46$_B$	20	48290	5300	-	-	-	-	-	-	-	-	23.97	24.20
CA_46$_C$A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B46$_C$	20	51290	5600	-	-	-	-	-	-	-	-	24.03	24.20
CA_46$_D$A-66A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B66	20	67236	2190	LTE B46$_D$	20	53140	5785	-	-	-	-	-	-	-	-	24.04	24.20
CA_2A-46$_A$A-46$_D$A-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	-	-	-	-	24.07	24.20
CA_2A-46$_A$A-46$_D$C-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	LTE B46$_D$	20	53342	5805.2	24.14	24.20
CA_2A-46$_D$A-46$_A$C-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_D$	20	53540	5825	LTE B46$_A$	20	47090	5180	LTE B46$_A$	20	47288	5199.8	24.11	24.20
CA_2A-46$_A$D-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_A$	20	47290	5200	LTE B46$_A$	20	47488	5219.8	LTE B46$_A$	20	47092	5180.2	24.12	24.20
CA_2A-46$_B$D-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_B$	20	48290	5300	LTE B46$_B$	20	48488	5319.8	LTE B46$_B$	20	48092	5280.2	24.09	24.20
CA_2A-46$_C$D-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_C$	20	51290	5600	LTE B46$_C$	20	51488	5619.8	LTE B46$_C$	20	51092	5580.2	24.12	24.20
CA_2A-46$_D$D-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	LTE B2	20	900	1960	LTE B46$_D$	20	53140	5785	LTE B46$_D$	20	53338	5804.8	LTE B46$_D$	20	52942	5765.2	24.15	24.20

1.5.1.4 LTE Band 2 as PCC

Table 33
Maximum Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-46$_A$A-46$_D$A-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	LTE B66	20	66786	2145	-	-	-	-	25.50	25.46
CA_2A-46$_A$A-46$_D$C-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	LTE B46$_D$	20	53342	5805.2	LTE B66	20	66786	2145	25.31	25.46
CA_2A-46$_D$A-46$_A$C-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_D$	20	53540	5825	LTE B46$_A$	20	47090	5180	LTE B46$_A$	20	47288	5199.8	LTE B66	20	66786	2145	25.33	25.46
CA_2A-46$_A$D-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_A$	20	47290	5200	LTE B46$_A$	20	47488	5219.8	LTE B46$_A$	20	47092	5180.2	LTE B66	20	66786	2145	25.32	25.46
CA_2A-46$_B$D-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_B$	20	48290	5300	LTE B46$_B$	20	48488	5319.8	LTE B46$_B$	20	48092	5280.2	LTE B66	20	66786	2145	25.32	25.46
CA_2A-46$_C$D-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_C$	20	51290	5600	LTE B46$_C$	20	51488	5619.8	LTE B46$_C$	20	51092	5580.2	LTE B66	20	66786	2145	25.33	25.46
CA_2A-46$_D$D-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	LTE B46$_D$	20	53140	5785	LTE B46$_D$	20	53338	5804.8	LTE B46$_D$	20	52942	5765.2	LTE B66	20	66786	2145	25.32	25.46

Table 34
Reduced Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-46$_A$A-46$_D$A-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	LTE B66	20	66786	2145	-	-	-	-	24.46	24.50
CA_2A-46$_A$A-46$_D$C-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_A$	20	47090	5180	LTE B46$_D$	20	53540	5825	LTE B46$_D$	20	53342	5805.2	LTE B66	20	66786	2145	24.32	24.50
CA_2A-46$_D$A-46$_A$C-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_D$	20	53540	5825	LTE B46$_A$	20	47090	5180	LTE B46$_A$	20	47288	5199.8	LTE B66	20	66786	2145	24.30	24.50
CA_2A-46$_A$D-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_A$	20	47290	5200	LTE B46$_A$	20	47488	5219.8	LTE B46$_A$	20	47092	5180.2	LTE B66	20	66786	2145	24.29	24.50
CA_2A-46$_B$D-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_B$	20	48290	5300	LTE B46$_B$	20	48488	5319.8	LTE B46$_B$	20	48092	5280.2	LTE B66	20	66786	2145	24.33	24.50
CA_2A-46$_C$D-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_C$	20	51290	5600	LTE B46$_C$	20	51488	5619.8	LTE B46$_C$	20	51092	5580.2	LTE B66	20	66786	2145	24.35	24.50
CA_2A-46$_D$D-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	LTE B46$_D$	20	53140	5785	LTE B46$_D$	20	53338	5804.8	LTE B46$_D$	20	52942	5765.2	LTE B66	20	66786	2145	24.31	24.50

1.5.1.5 LTE Band 7 as PCC

Table 35
Maximum Output Powers

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_7A-46_AA (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_A$	20	47290	5200	-	-	-	-	-	-	-	-	25.45	25.42
CA_7A-46_BA (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_B$	20	48290	5300	-	-	-	-	-	-	-	-	25.42	25.42
CA_7A-46_CA (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_C$	20	51290	5600	-	-	-	-	-	-	-	-	25.43	25.42
CA_7A-46_DA (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_D$	20	53140	5785	-	-	-	-	-	-	-	-	25.44	25.42
CA_7A-46_AC (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_A$	20	47290	5200	LTE $B46_A$	20	47488	5219.8	-	-	-	-	25.47	25.42
CA_7A-46_BC (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_B$	20	48290	5300	LTE $B46_B$	20	48488	5319.8	-	-	-	-	25.50	25.42
CA_7A-46_CC (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_C$	20	51290	5600	LTE $B46_C$	20	51488	5619.8	-	-	-	-	25.49	25.42
CA_7A-46_DC (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_D$	20	53140	5785	LTE $B46_D$	20	53338	5804.8	-	-	-	-	25.48	25.42
CA_7A-46_AD (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_A$	20	47290	5200	LTE $B46_A$	20	47488	5219.8	LTE $B46_A$	20	47092	5180.2	25.44	25.42
CA_7A-46_BD (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_B$	20	48290	5300	LTE $B46_B$	20	48488	5319.8	LTE $B46_B$	20	48092	5280.2	25.45	25.42
CA_7A-46_CD (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_C$	20	51290	5600	LTE $B46_C$	20	51488	5619.8	LTE $B46_C$	20	51092	5580.2	25.46	25.42
CA_7A-46_DD (1)	LTE B7	5	20775	2502.5	QPSK	1	0	2775	2622.5	LTE $B46_D$	20	53140	5785	LTE $B46_D$	20	53338	5804.8	LTE $B46_D$	20	52942	5765.2	25.48	25.42

1.5.2 4x4 DL MIMO LAA Downlink Carrier Aggregation RF Conducted Powers

1.5.2.1 LTE Band 4 as PCC

Table 36
Maximum Output Powers

Combination	PCC										SCC 1					SCC 2					SCC 3					Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-46_AA-46_DA	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	25.13	25.20
CA_[4A]-46_AA-46_DC	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	25.17	25.20
CA_[4A]-46_DA-46_AC	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	25.16	25.20
CA_[4A]-46_AD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	25.18	25.20
CA_[4A]-46_BD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	25.14	25.20
CA_[4A]-46_CD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	25.19	25.20
CA_[4A]-46_DD	LTE B4	20	20050	1720	QPSK	1	0	2050	2120	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	25.20	25.20

Table 37
Reduced Output Powers

Combination	PCC										SCC 1					SCC 2					SCC 3					Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-46_AA-46_DA	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	24.08	24.20
CA_[4A]-46_AA-46_DC	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	24.09	24.20
CA_[4A]-46_DA-46_AC	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	24.09	24.20
CA_[4A]-46_AD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	24.12	24.20
CA_[4A]-46_BD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	24.11	24.20
CA_[4A]-46_CD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	24.13	24.20
CA_[4A]-46_DD	LTE B4	20	20050	1720	16QAM	1	50	2050	2120	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	24.16	24.20

1.5.2.2 LTE Band 66 as PCC

Table 38
Maximum Output Powers

Combination	PCC										SCC 1					SCC 2					SCC 3					Power	
	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-46_AA-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	-	-	-	-	-	25.11	25.20
CA_[2A]-46_BA-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	-	-	-	-	-	25.10	25.20
CA_[2A]-46_CA-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	-	-	-	-	-	25.12	25.20
CA_[2A]-46_DA-66A	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	-	-	-	-	-	25.09	25.20
CA_46_AA-46_DA-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	25.15	25.20
CA_46_AA-46_DC-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	25.15	25.20
CA_46_DA-46_AC-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	25.18	25.20
CA_46_AD-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	25.16	25.20
CA_46_BD-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	25.15	25.20
CA_46_CD-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	25.15	25.20
CA_46_DD-[66A]	LTE B66	20	132072	1720	QPSK	1	0	66536	2120	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	25.17	25.20

Table 39
Reduced Output Powers

Combination	PCC: PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 1: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 2: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 3: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	Power: LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-46_AA-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	-	-	-	-	-	24.17	24.20
CA_[2A]-46_BA-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	-	-	-	-	-	24.15	24.20
CA_[2A]-46_CA-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	-	-	-	-	-	24.18	24.20
CA_[2A]-46_DA-66A	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	2x2 MIMO	LTE B2	20	900	1960	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	-	-	-	-	-	24.19	24.20
CA_46_AA-46_DA-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	24.12	24.20
CA_46_AA-46_DC-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	24.10	24.20
CA_46_DA-46_AC-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	24.15	24.20
CA_46_AD-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	24.13	24.20
CA_46_BD-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	24.13	24.20
CA_46_CD-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	24.12	24.20
CA_46_DD-[66A]	LTE B66	20	132072	1720	16QAM	1	50	66536	2120	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	24.11	24.20

1.5.2.3 LTE Band 2 as PCC

Table 40
Maximum Output Powers

Combination	PCC: PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 1: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 2: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 3: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	Power: LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-46_AA-46_DA	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	24.42	25.46
CA_[2A]-46_AA-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	25.47	25.46
CA_[2A]-46_BA-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	25.41	25.46
CA_[2A]-46_CA-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	25.45	25.46
CA_[2A]-46_DA-66A	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	25.48	25.46
CA_[2A]-46_AA-46_DC	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	25.44	25.46
CA_[2A]-46_DA-46_AC	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	25.41	25.46
CA_[2A]-46_AD	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	25.40	25.46
CA_[2A]-46_BD	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	25.48	25.46
CA_[2A]-46_CD	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	25.48	25.46
CA_[2A]-46_DD	LTE B2	5	19175	1907.5	QPSK	1	0	1175	1987.5	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	25.45	25.46

Table 41
Reduced Output Powers

Combination	PCC: PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 1: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 2: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC 3: SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	Power: LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-46_AA-46_DA	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	-	-	-	-	-	24.49	24.50
CA_[2A]-46_AA-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	24.49	24.50
CA_[2A]-46_BA-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	24.48	24.50
CA_[2A]-46_CA-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	24.48	24.50
CA_[2A]-46_DA-66A	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE B66	20	66786	2145	2x2 MIMO	-	-	-	-	-	24.50	24.50
CA_[2A]-46_AA-46_DC	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_D$	20	53342	5805.2	2x2 MIMO	24.50	24.50
CA_[2A]-46_DA-46_AC	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_D$	20	53540	5825	2x2 MIMO	LTE $B46_A$	20	47090	5180	2x2 MIMO	LTE $B46_A$	20	47288	5199.8	2x2 MIMO	24.48	24.50
CA_[2A]-46_AD	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_A$	20	47290	5200	2x2 MIMO	LTE $B46_A$	20	47488	5219.8	2x2 MIMO	LTE $B46_A$	20	47092	5180.2	2x2 MIMO	24.46	24.50
CA_[2A]-46_BD	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_B$	20	48290	5300	2x2 MIMO	LTE $B46_B$	20	48488	5319.8	2x2 MIMO	LTE $B46_B$	20	48092	5280.2	2x2 MIMO	24.49	24.50
CA_[2A]-46_CD	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_C$	20	51290	5600	2x2 MIMO	LTE $B46_C$	20	51488	5619.8	2x2 MIMO	LTE $B46_C$	20	51092	5580.2	2x2 MIMO	24.50	24.50
CA_[2A]-46_DD	LTE B2	10	19150	1905	QPSK	25	25	1150	1985	4x4 MIMO	LTE $B46_D$	20	53140	5785	2x2 MIMO	LTE $B46_D$	20	53338	5804.8	2x2 MIMO	LTE $B46_D$	20	52942	5765.2	2x2 MIMO	24.48	24.50