10493-AAA	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.06	68.57	16.91	1.99	80.0	± 9.6 %
		Y	4.34	69.50	17.54		80.0	
		Z	3.77	67.63	16.46		80.0	
10494-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.51	73.11	18.16	1.99	80.0	± 9.6 %
		Y	5.25	75.42	19.28		80.0	
		Z	3.92	71.32	17.46		80.0	
10495-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.05	69.16	17.14	1.99	80.0	± 9.6 %
		Y	4.36	70.25	17.82		80.0	
		Z	3.73	68.10	16.65		80.0	
10496-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.12	68.87	17.08	1.99	80.0	± 9.6 %
		Y	4.40	69.84	17.71		80.0	
		Z	3.82	67.89	16.62		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.78	64.38	11.63	1.99	80.0	± 9.6 %
		Y	2.58	68.88	14.22		80.0	
		Z	1.48	62.75	10.71		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.52	60.54	8.88	1.99	80.0	± 9.6 %
		Y	1.92	62.87	10.65		80.0	
		Z	1.38	60.00	8.42		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.49	60.20	8.58	1.99	80.0	± 9.6 %
		Y	1.87	62.37	10.28		80.0	
		Z	1.40	60.00	8.30		80.0	
10500-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.67	72.93	17.59	1.99	80.0	± 9.6 %
		Y	4.61	76.30	19.26		80.0	
		Z	3.03	70.59	16.63		80.0	
10501-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.40	68.97	15.85	1.99	80.0	± 9.6 %
		Y	3.88	70.81	17.00		80.0	
		Z	3.02	67.59	15.17		80.0	
10502-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.45	68.78	15.73	1.99	80.0	± 9.6 %
		Y	3.91	70.55	16.86		80.0	
		Z	3.07	67.46	15.07		80.0	
10503-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.92	73.03	18.07	1.99	80.0	± 9.6 %
		Y	4.73	75.83	19.45		80.0	
		Z	3.32	70.92	17.22		80.0	
10504-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.63	69.24	16.76	1.99	80.0	± 9.6 %
		Y	3.99	70.61	17.63		80.0	
		Z	3.29	68.00	16.18		80.0	
10505-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.72	69.06	16.72	1.99	80.0	± 9.6 %
		Y	4.06	70.31	17.54		80.0	
		Z	3.38	67.89	16.17		80.0	
10506-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.46	72.94	18.08	1.99	80.0	± 9.6 %
		Y	5.20	75.24	19.20		80.0	
		Z	3.88	71.17	17.38		80.0	
10507-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.03	69.09	17.10	1.99	80.0	± 9.6 %
		Y	4.34	70.18	17.78		80.0	
		Z	3.71	68.04	16.61		80.0	

10508-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.10	68.79	17.03	1.99	80.0	± 9.6 %
		Y	4.39	69.77	17.66		80.0	
		Z	3.80	67.81	16.58		80.0	
10509-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.69	71.48	17.61	1.99	80.0	± 9.6 %
		Y	5.20	73.03	18.42		80.0	
		Z	4.24	70.19	17.09		80.0	
10510-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.51	68.81	17.13	1.99	80.0	± 9.6 %
		Y	4.78	69.67	17.68		80.0	
		Z	4.22	67.93	16.73		80.0	
10511-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.56	68.54	17.08	1.99	80.0	± 9.6 %
		Y	4.81	69.33	17.60		80.0	
		Z	4.28	67.72	16.70		80.0	
10512-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.96	73.03	18.01	1.99	80.0	± 9.6 %
		Y	5.69	75.12	19.02		80.0	
		Z	4.38	71.46	17.40		80.0	
10513-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.41	69.13	17.23	1.99	80.0	± 9.6 %
		Y	4.71	70.13	17.84		80.0	
		Z	4.10	68.17	16.80		80.0	
10514-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.42	68.69	17.13	1.99	80.0	± 9.6 %
		Y	4.68	69.57	17.69		80.0	
		Z	4.13	67.80	16.72		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.98	63.16	14.76	0.00	150.0	± 9.6 %
		Y	1.00	63.53	15.15		150.0	
		Z	0.97	62.69	14.29		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.60	70.13	17.31	0.00	150.0	± 9.6 %
		Y	0.73	73.75	19.30		150.0	
		Z	0.53	67.03	15.47		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.83	65.06	15.40	0.00	150.0	± 9.6 %
		Y	0.87	65.89	16.05		150.0	
		Z	0.81	64.12	14.65		150.0	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.57	66.71	16.22	0.00	150.0	± 9.6 %
		Y	4.63	66.76	16.32		150.0	
		Z	4.54	66.61	16.10		150.0	
10519-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.76	66.96	16.34	0.00	150.0	± 9.6 %
		Y	4.84	67.03	16.45		150.0	
		Z	4.73	66.84	16.23		150.0	
10520-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.62	66.92	16.27	0.00	150.0	± 9.6 %
		Y	4.69	67.00	16.38		150.0	
		Z	4.58	66.80	16.14		150.0	
10521-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.55	66.92	16.25	0.00	150.0	± 9.6 %
		Y	4.62	67.01	16.37		150.0	
		Z	4.51	66.79	16.13		150.0	
10522-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.61	66.99	16.33	0.00	150.0	± 9.6 %
		Y	4.67	67.04	16.42		150.0	
		Z	4.57	66.88	16.21		150.0	

10523-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.48	66.86	16.18	0.00	150.0	± 9.6 %
		Y	4.55	66.92	16.27		150.0	
		Z	4.45	66.75	16.06		150.0	
10524-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.55	66.91	16.30	0.00	150.0	± 9.6 %
		Y	4.62	66.97	16.40		150.0	
		Z	4.51	66.79	16.18		150.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.53	65.96	15.89	0.00	150.0	± 9.6 %
		Y	4.59	66.01	15.99		150.0	
		Z	4.50	65.85	15.77		150.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.71	66.34	16.04	0.00	150.0	± 9.6 %
		Y	4.78	66.40	16.13		150.0	
		Z	4.67	66.21	15.91		150.0	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.63	66.30	15.98	0.00	150.0	± 9.6 %
		Y	4.70	66.37	16.08		150.0	
		Z	4.59	66.17	15.86		150.0	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.64	66.32	16.01	0.00	150.0	± 9.6 %
		Y	4.71	66.39	16.12		150.0	
		Z	4.60	66.19	15.89		150.0	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.64	66.32	16.01	0.00	150.0	± 9.6 %
		Y	4.71	66.39	16.12		150.0	
		Z	4.60	66.19	15.89		150.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.64	66.43	16.03	0.00	150.0	± 9.6 %
		Y	4.72	66.53	16.14		150.0	
		Z	4.59	66.28	15.90		150.0	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.50	66.28	15.97	0.00	150.0	± 9.6 %
		Y	4.57	66.38	16.08		150.0	
		Z	4.46	66.14	15.83		150.0	
10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.65	66.36	16.00	0.00	150.0	± 9.6 %
		Y	4.73	66.42	16.10		150.0	
		Z	4.61	66.23	15.88		150.0	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.17	66.43	16.07	0.00	150.0	± 9.6 %
		Y	5.23	66.51	16.16		150.0	
		Z	5.14	66.32	15.96		150.0	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.24	66.59	16.14	0.00	150.0	± 9.6 %
		Y	5.30	66.66	16.22		150.0	
		Z	5.20	66.49	16.04		150.0	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	5.11	66.56	16.10	0.00	150.0	± 9.6 %
		Y	5.17	66.64	16.19		150.0	
		Z	5.07	66.44	15.99		150.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.17	66.52	16.09	0.00	150.0	± 9.6 %
		Y	5.23	66.60	16.18		150.0	
		Z	5.13	66.41	15.98		150.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.26	66.55	16.14	0.00	150.0	± 9.6 %
		Y	5.33	66.65	16.24		150.0	
		Z	5.22	66.43	16.03		150.0	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.19	66.56	16.16	0.00	150.0	± 9.6 %
		Y	5.25	66.63	16.24		150.0	
		Z	5.15	66.44	16.05		150.0	

10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.16	66.43	16.09	0.00	150.0	± 9.6 %
		Y	5.22	66.52	16.18		150.0	
		Z	5.13	66.32	15.98		150.0	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.31	66.50	16.14	0.00	150.0	± 9.6 %
		Y	5.38	66.57	16.23		150.0	
		Z	5.28	66.39	16.04		150.0	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.39	66.53	16.17	0.00	150.0	± 9.6 %
		Y	5.46	66.60	16.25		150.0	
		Z	5.36	66.43	16.07		150.0	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.47	66.55	16.06	0.00	150.0	± 9.6 %
		Y	5.52	66.62	16.14		150.0	
		Z	5.45	66.45	15.97		150.0	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.67	66.95	16.21	0.00	150.0	± 9.6 %
		Y	5.73	67.02	16.29		150.0	
		Z	5.64	66.84	16.11		150.0	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.55	66.77	16.14	0.00	150.0	± 9.6 %
		Y	5.61	66.87	16.23		150.0	
		Z	5.51	66.65	16.03		150.0	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.62	66.81	16.15	0.00	150.0	± 9.6 %
		Y	5.69	66.94	16.26		150.0	
		Z	5.58	66.69	16.04		150.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.87	67.72	16.57	0.00	150.0	± 9.6 %
		Y	5.96	67.91	16.72		150.0	
		Z	5.81	67.54	16.44		150.0	
10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.57	66.77	16.14	0.00	150.0	± 9.6 %
		Y	5.63	66.84	16.23		150.0	
		Z	5.54	66.66	16.05		150.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.58	66.82	16.13	0.00	150.0	± 9.6 %
		Y	5.64	66.91	16.22		150.0	
		Z	5.55	66.71	16.03		150.0	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.49	66.62	16.04	0.00	150.0	± 9.6 %
		Y	5.55	66.69	16.13		150.0	
		Z	5.46	66.52	15.95		150.0	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.58	66.66	16.09	0.00	150.0	± 9.6 %
		Y	5.64	66.74	16.18		150.0	
		Z	5.55	66.55	15.99		150.0	
10554-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.88	66.91	16.15	0.00	150.0	± 9.6 %
		Y	5.93	66.98	16.23		150.0	
		Z	5.85	66.81	16.06		150.0	
10555-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	6.01	67.20	16.27	0.00	150.0	± 9.6 %
		Y	6.06	67.29	16.36		150.0	
		Z	5.98	67.10	16.18		150.0	
10556-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	6.03	67.25	16.29	0.00	150.0	± 9.6 %
		Y	6.08	67.33	16.37		150.0	
		Z	6.00	67.15	16.20		150.0	
10557-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	6.00	67.17	16.27	0.00	150.0	± 9.6 %
		Y	6.06	67.27	16.36		150.0	
		Z	5.97	67.06	16.17		150.0	

10558-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	6.05	67.33	16.36	0.00	150.0	± 9.6 %
		Y	6.11	67.44	16.46		150.0	
		Z	6.01	67.21	16.26		150.0	
10560-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	6.04	67.19	16.33	0.00	150.0	± 9.6 %
		Y	6.11	67.29	16.43		150.0	
		Z	6.01	67.08	16.23		150.0	
10561-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.96	67.14	16.35	0.00	150.0	± 9.6 %
		Y	6.02	67.25	16.44		150.0	
		Z	5.93	67.04	16.25		150.0	
10562-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	6.09	67.54	16.54	0.00	150.0	± 9.6 %
		Y	6.17	67.69	16.66		150.0	
		Z	6.05	67.40	16.43		150.0	
10563-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.37	67.96	16.70	0.00	150.0	± 9.6 %
		Y	6.51	68.26	16.90		150.0	
		Z	6.27	67.67	16.52		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.90	66.77	16.36	0.46	150.0	± 9.6 %
		Y	4.96	66.85	16.48		150.0	
		Z	4.87	66.68	16.25		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	5.13	67.24	16.69	0.46	150.0	± 9.6 %
		Y	5.21	67.31	16.80		150.0	
		Z	5.10	67.14	16.58		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.97	67.08	16.50	0.46	150.0	± 9.6 %
		Y	5.04	67.17	16.62		150.0	
		Z	4.93	66.97	16.39		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	5.00	67.49	16.87	0.46	150.0	± 9.6 %
		Y	5.07	67.55	16.96		150.0	
		Z	4.96	67.38	16.75		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.88	66.83	16.25	0.46	150.0	± 9.6 %
		Y	4.95	66.94	16.39		150.0	
		Z	4.84	66.73	16.14		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.95	67.57	16.92	0.46	150.0	± 9.6 %
		Y	5.01	67.59	16.99		150.0	
		Z	4.92	67.46	16.81		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.99	67.41	16.85	0.46	150.0	± 9.6 %
		Y	5.05	67.44	16.93		150.0	
		Z	4.95	67.30	16.74		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.22	64.70	15.58	0.46	130.0	± 9.6 %
		Y	1.27	65.32	16.14		130.0	
		Z	1.18	63.87	15.00		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.24	65.28	15.93	0.46	130.0	± 9.6 %
		Y	1.29	65.94	16.51		130.0	
		Z	1.19	64.36	15.31		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	2.13	84.29	22.36	0.46	130.0	± 9.6 %
		Y	4.32	96.33	26.70		130.0	
		Z	1.23	75.57	19.05		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.39	71.10	18.81	0.46	130.0	± 9.6 %
		Y	1.49	72.50	19.69		130.0	
		Z	1.24	68.92	17.64		130.0	

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.68	66.53	16.37	0.46	130.0	± 9.6 %
		Y	4.75	66.63	16.51		130.0	
		Z	4.65	66.43	16.25		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.71	66.70	16.44	0.46	130.0	± 9.6 %
		Y	4.77	66.79	16.57		130.0	
		Z	4.67	66.59	16.32		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.92	67.01	16.61	0.46	130.0	± 9.6 %
		Y	5.00	67.11	16.75		130.0	
		Z	4.88	66.89	16.50		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.81	67.17	16.72	0.46	130.0	± 9.6 %
		Y	4.89	67.26	16.84		130.0	
		Z	4.77	67.04	16.60		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.57	66.44	16.01	0.46	130.0	± 9.6 %
		Y	4.66	66.62	16.21		130.0	
		Z	4.53	66.30	15.88		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.62	66.46	16.03	0.46	130.0	± 9.6 %
		Y	4.71	66.63	16.22		130.0	
		Z	4.58	66.34	15.91		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.71	67.20	16.65	0.46	130.0	± 9.6 %
		Y	4.79	67.30	16.78		130.0	
		Z	4.67	67.06	16.52		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.52	66.19	15.80	0.46	130.0	± 9.6 %
		Y	4.62	66.40	16.02		130.0	
		Z	4.48	66.06	15.67		130.0	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.68	66.53	16.37	0.46	130.0	± 9.6 %
		Y	4.75	66.63	16.51		130.0	
		Z	4.65	66.43	16.25		130.0	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.71	66.70	16.44	0.46	130.0	± 9.6 %
		Y	4.77	66.79	16.57		130.0	
		Z	4.67	66.59	16.32		130.0	
10585-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.92	67.01	16.61	0.46	130.0	± 9.6 %
		Y	5.00	67.11	16.75		130.0	
		Z	4.88	66.89	16.50		130.0	
10586-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.81	67.17	16.72	0.46	130.0	± 9.6 %
		Y	4.89	67.26	16.84		130.0	
		Z	4.77	67.04	16.60		130.0	
10587-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.57	66.44	16.01	0.46	130.0	± 9.6 %
		Y	4.66	66.62	16.21		130.0	
		Z	4.53	66.30	15.88		130.0	
10588-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.62	66.46	16.03	0.46	130.0	± 9.6 %
		Y	4.71	66.63	16.22		130.0	
		Z	4.58	66.34	15.91		130.0	
10589-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.71	67.20	16.65	0.46	130.0	± 9.6 %
		Y	4.79	67.30	16.78		130.0	
		Z	4.67	67.06	16.52		130.0	
10590-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.52	66.19	15.80	0.46	130.0	± 9.6 %
		Y	4.62	66.40	16.02		130.0	
		Z	4.48	66.06	15.67		130.0	

10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.83	66.60	16.47	0.46	130.0	± 9.6 %
		Y	4.90	66.69	16.60		130.0	
		Z	4.80	66.51	16.36		130.0	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.99	66.94	16.60	0.46	130.0	± 9.6 %
		Y	5.07	67.03	16.73		130.0	
		Z	4.95	66.84	16.49		130.0	
10593-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.91	66.85	16.48	0.46	130.0	± 9.6 %
		Y	4.99	66.97	16.63		130.0	
		Z	4.87	66.74	16.37		130.0	
10594-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.97	67.02	16.64	0.46	130.0	± 9.6 %
		Y	5.04	67.11	16.77		130.0	
		Z	4.93	66.91	16.53		130.0	
10595-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.93	66.96	16.53	0.46	130.0	± 9.6 %
		Y	5.02	67.08	16.67		130.0	
		Z	4.89	66.85	16.42		130.0	
10596-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.87	66.96	16.53	0.46	130.0	± 9.6 %
		Y	4.95	67.08	16.68		130.0	
		Z	4.83	66.84	16.41		130.0	
10597-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.82	66.87	16.42	0.46	130.0	± 9.6 %
		Y	4.90	67.01	16.58		130.0	
		Z	4.78	66.74	16.30		130.0	
10598-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.80	67.12	16.69	0.46	130.0	± 9.6 %
		Y	4.88	67.23	16.83		130.0	
		Z	4.76	66.98	16.56		130.0	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.49	67.14	16.67	0.46	130.0	± 9.6 %
		Y	5.56	67.25	16.80		130.0	
		Z	5.47	67.07	16.59		130.0	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.63	67.55	16.84	0.46	130.0	± 9.6 %
		Y	5.73	67.75	17.02		130.0	
		Z	5.59	67.42	16.73		130.0	
10601-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.52	67.31	16.74	0.46	130.0	± 9.6 %
		Y	5.60	67.45	16.88		130.0	
		Z	5.48	67.21	16.64		130.0	
10602-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.60	67.30	16.65	0.46	130.0	± 9.6 %
		Y	5.68	67.44	16.80		130.0	
		Z	5.58	67.22	16.57		130.0	
10603-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.70	67.65	16.96	0.46	130.0	± 9.6 %
		Y	5.77	67.75	17.08		130.0	
		Z	5.66	67.54	16.86		130.0	
10604-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.50	67.10	16.67	0.46	130.0	± 9.6 %
		Y	5.56	67.21	16.80		130.0	
		Z	5.48	67.04	16.60		130.0	
10605-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.60	67.41	16.82	0.46	130.0	± 9.6 %
		Y	5.67	67.52	16.95		130.0	
		Z	5.58	67.32	16.73		130.0	
10606-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.37	66.83	16.40	0.46	130.0	± 9.6 %
		Y	5.45	67.01	16.57		130.0	
		Z	5.33	66.70	16.29		130.0	

10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.66	65.90	16.09	0.46	130.0	± 9.6 %
		Y	4.73	65.99	16.22		130.0	
		Z	4.63	65.80	15.97		130.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.86	66.31	16.25	0.46	130.0	± 9.6 %
		Y	4.94	66.41	16.38		130.0	
		Z	4.82	66.19	16.14		130.0	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.74	66.16	16.09	0.46	130.0	± 9.6 %
		Y	4.82	66.28	16.24		130.0	
		Z	4.70	66.03	15.97		130.0	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.79	66.32	16.25	0.46	130.0	± 9.6 %
		Y	4.88	66.43	16.39		130.0	
		Z	4.75	66.20	16.13		130.0	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.71	66.12	16.10	0.46	130.0	± 9.6 %
		Y	4.79	66.25	16.25		130.0	
		Z	4.67	66.00	15.98		130.0	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.72	66.27	16.14	0.46	130.0	± 9.6 %
		Y	4.81	66.41	16.30		130.0	
		Z	4.68	66.14	16.01		130.0	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.73	66.16	16.03	0.46	130.0	± 9.6 %
		Y	4.82	66.32	16.20		130.0	
		Z	4.68	66.02	15.90		130.0	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.67	66.36	16.27	0.46	130.0	± 9.6 %
		Y	4.75	66.48	16.41		130.0	
		Z	4.63	66.22	16.14		130.0	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.71	65.94	15.87	0.46	130.0	± 9.6 %
		Y	4.80	66.09	16.04		130.0	
		Z	4.67	65.82	15.75		130.0	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.31	66.40	16.29	0.46	130.0	± 9.6 %
		Y	5.38	66.51	16.41		130.0	
		Z	5.28	66.30	16.19		130.0	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.37	66.55	16.33	0.46	130.0	± 9.6 %
		Y	5.44	66.63	16.44		130.0	
		Z	5.34	66.46	16.24		130.0	
10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.26	66.58	16.36	0.46	130.0	± 9.6 %
		Y	5.33	66.69	16.48		130.0	
		Z	5.23	66.47	16.26		130.0	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.28	66.39	16.20	0.46	130.0	± 9.6 %
		Y	5.36	66.53	16.34		130.0	
		Z	5.25	66.28	16.10		130.0	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.38	66.44	16.28	0.46	130.0	± 9.6 %
		Y	5.46	66.60	16.43		130.0	
		Z	5.34	66.33	16.17		130.0	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.37	66.57	16.46	0.46	130.0	± 9.6 %
		Y	5.44	66.66	16.57		130.0	
		Z	5.34	66.46	16.36		130.0	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.38	66.71	16.52	0.46	130.0	± 9.6 %
		Y	5.45	66.80	16.63		130.0	
		Z	5.35	66.61	16.43		130.0	

10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.26	66.24	16.16	0.46	130.0	± 9.6 %
		Y	5.33	66.37	16.30		130.0	
		Z	5.23	66.14	16.06		130.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.45	66.45	16.33	0.46	130.0	± 9.6 %
		Y	5.53	66.56	16.45		130.0	
		Z	5.42	66.35	16.23		130.0	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.83	67.44	16.87	0.46	130.0	± 9.6 %
		Y	5.92	67.61	17.03		130.0	
		Z	5.77	67.28	16.75		130.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.60	66.46	16.24	0.46	130.0	± 9.6 %
		Y	5.65	66.56	16.35		130.0	
		Z	5.57	66.38	16.15		130.0	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.83	67.00	16.47	0.46	130.0	± 9.6 %
		Y	5.90	67.11	16.58		130.0	
		Z	5.80	66.90	16.38		130.0	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.64	66.57	16.19	0.46	130.0	± 9.6 %
		Y	5.71	66.72	16.33		130.0	
		Z	5.61	66.45	16.09		130.0	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.72	66.66	16.22	0.46	130.0	± 9.6 %
		Y	5.80	66.79	16.36		130.0	
		Z	5.68	66.51	16.11		130.0	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	6.15	68.11	16.95	0.46	130.0	± 9.6 %
		Y	6.29	68.43	17.18		130.0	
		Z	6.08	67.89	16.80		130.0	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	6.06	67.95	17.07	0.46	130.0	± 9.6 %
		Y	6.17	68.16	17.22		130.0	
		Z	6.01	67.78	16.94		130.0	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.81	67.07	16.64	0.46	130.0	± 9.6 %
		Y	5.87	67.15	16.74		130.0	
		Z	5.78	66.98	16.56		130.0	
10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.70	66.73	16.30	0.46	130.0	± 9.6 %
		Y	5.78	66.89	16.44		130.0	
		Z	5.67	66.63	16.21		130.0	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.69	66.77	16.38	0.46	130.0	± 9.6 %
		Y	5.76	66.90	16.50		130.0	
		Z	5.66	66.66	16.29		130.0	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.57	66.09	15.77	0.46	130.0	± 9.6 %
		Y	5.66	66.29	15.95		130.0	
		Z	5.54	65.98	15.67		130.0	
10636-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	6.01	66.84	16.33	0.46	130.0	± 9.6 %
		Y	6.07	66.95	16.45		130.0	
		Z	5.99	66.75	16.25		130.0	
10637-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.16	67.20	16.50	0.46	130.0	± 9.6 %
		Y	6.23	67.32	16.61		130.0	
		Z	6.14	67.11	16.41		130.0	
10638-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.16	67.18	16.46	0.46	130.0	± 9.6 %
		Y	6.23	67.30	16.58		130.0	
		Z	6.14	67.09	16.38		130.0	

10639-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	6.15	67.15	16.49	0.46	130.0	± 9.6 %
		Y	6.22	67.29	16.62		130.0	
		Z	6.12	67.05	16.40		130.0	
10640-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	6.15	67.16	16.44	0.46	130.0	± 9.6 %
		Y	6.24	67.34	16.59		130.0	
		Z	6.12	67.05	16.34		130.0	
10641-AAA	IEEE 1602.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	6.19	67.03	16.39	0.46	130.0	± 9.6 %
		Y	6.25	67.14	16.51		130.0	
		Z	6.16	66.95	16.31		130.0	
10642-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.24	67.33	16.71	0.46	130.0	± 9.6 %
		Y	6.31	67.44	16.82		130.0	
		Z	6.21	67.23	16.62		130.0	
10643-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	6.07	66.99	16.44	0.46	130.0	± 9.6 %
		Y	6.14	67.13	16.57		130.0	
		Z	6.04	66.89	16.35		130.0	
10644-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	6.24	67.52	16.73	0.46	130.0	± 9.6 %
		Y	6.34	67.75	16.90		130.0	
		Z	6.20	67.38	16.61		130.0	
10645-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.65	68.29	17.06	0.46	130.0	± 9.6 %
		Y	6.77	68.57	17.26		130.0	
		Z	6.53	67.94	16.85		130.0	

[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

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Client **CTI cert (Auden)**

Certificate No: DAE4-1458_Feb16

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1458
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	February 26, 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
Keithley Multimeter Type 2001	SN: 0810278	09-Sep-15 (No:17153)	Sep-16
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	05-Jan-16 (in house check)	In house check: Jan-17
Calibrator Box V2.1	SE UMS 006 AA 1002	05-Jan-16 (in house check)	In house check: Jan-17

	Name	Function	Signature
Calibrated by:	R.Mayoraz	Technician	R. Mayoraz
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V. B. Lunner

Issued: February 26, 2016

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.357 ± 0.02% (k=2)	404.348 ± 0.02% (k=2)	404.579 ± 0.02% (k=2)
Low Range	3.99060 ± 1.50% (k=2)	3.95834 ± 1.50% (k=2)	3.96178 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	334.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200029.05	-2.61	-0.00
Channel X	+ Input	20002.74	-1.16	-0.01
Channel X	- Input	-20003.37	1.85	-0.01
Channel Y	+ Input	200037.70	0.70	0.00
Channel Y	+ Input	20003.11	-0.75	-0.00
Channel Y	- Input	-20007.07	-1.69	0.01
Channel Z	+ Input	200029.13	-7.99	-0.00
Channel Z	+ Input	20002.60	-1.22	-0.01
Channel Z	- Input	-20007.23	-1.82	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.10	-0.38	-0.02
Channel X	+ Input	200.81	0.25	0.13
Channel X	- Input	-198.85	0.63	-0.32
Channel Y	+ Input	2000.25	-0.15	-0.01
Channel Y	+ Input	199.69	-0.83	-0.41
Channel Y	- Input	-199.69	-0.21	0.10
Channel Z	+ Input	1999.84	-0.55	-0.03
Channel Z	+ Input	198.93	-1.60	-0.80
Channel Z	- Input	-201.41	-1.78	0.89

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	20.68	18.72
	- 200	-18.32	-19.98
Channel Y	200	-4.77	-4.88
	- 200	3.81	3.30
Channel Z	200	-1.97	-1.91
	- 200	-0.55	-0.32

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	0.20	-5.28
Channel Y	200	8.61	-	2.12
Channel Z	200	9.96	5.87	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16323	15393
Channel Y	15751	15672
Channel Z	16844	15985

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.27	-1.78	1.84	0.64
Channel Y	0.93	-1.29	2.12	0.55
Channel Z	-1.08	-2.84	0.61	0.76

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

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

S Schweizerischer Kalibrierdienst
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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 **Dgiele (Vitec)**

Certificate No: D835V2-4d193_Feb15

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d193
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 02, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: February 6, 2015

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) 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	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 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	41.5 ± 6 %	0.93 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	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.13 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.96 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	55.8 ± 6 %	1.01 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	2.39 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.30 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 3.4 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 5.3 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	November 27, 2014

DASY5 Validation Report for Head TSL

Date: 02.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

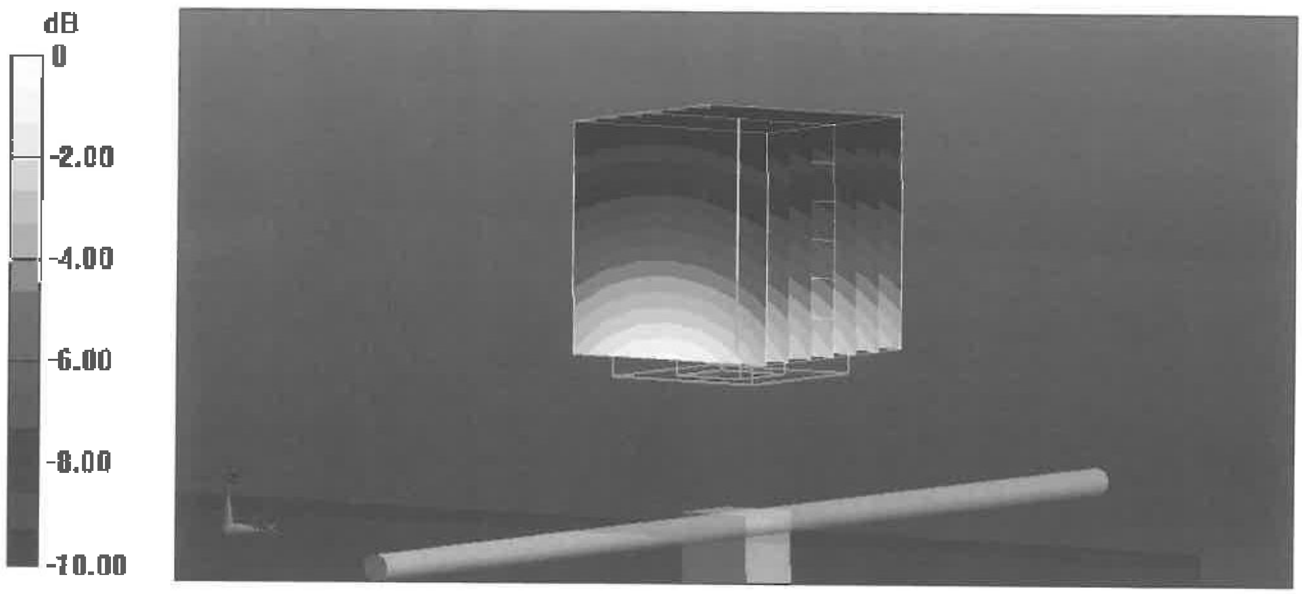
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d193

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

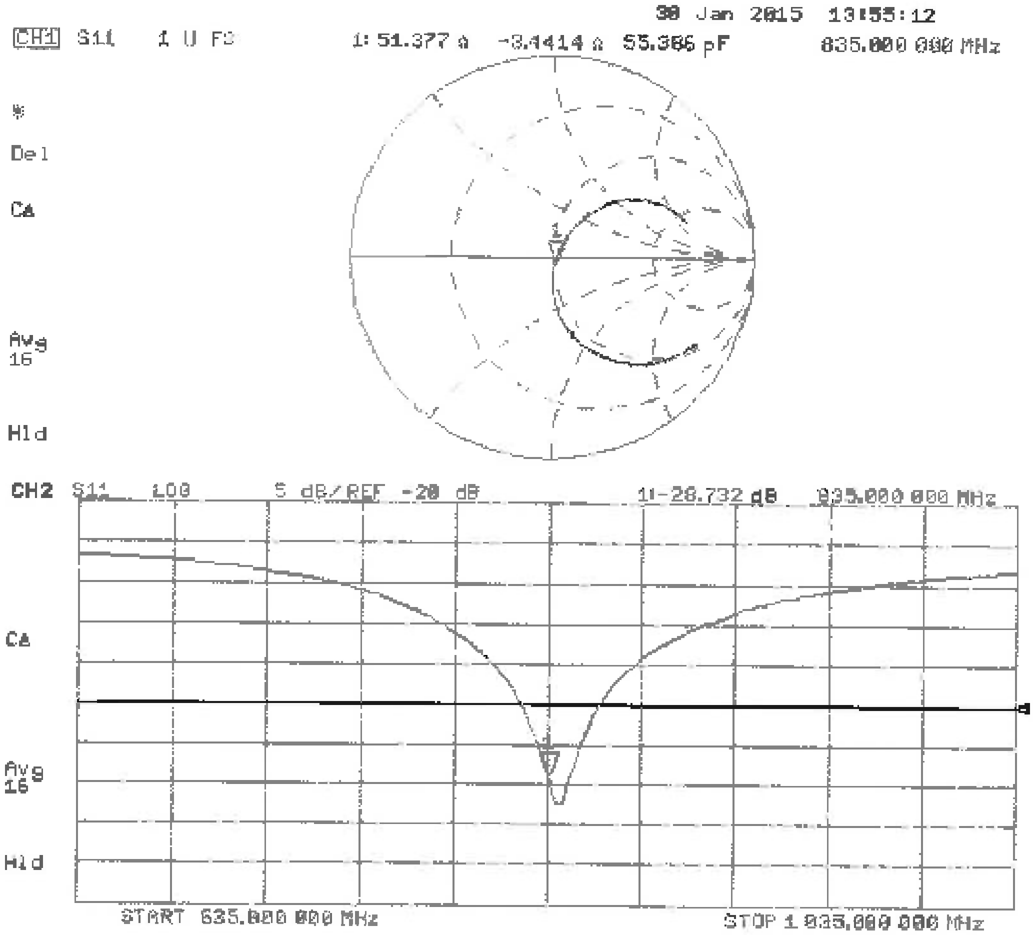
- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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 = 56.28 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.50 W/kg
SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.52 W/kg
Maximum value of SAR (measured) = 2.74 W/kg



0 dB = 2.74 W/kg = 4.38 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 02.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

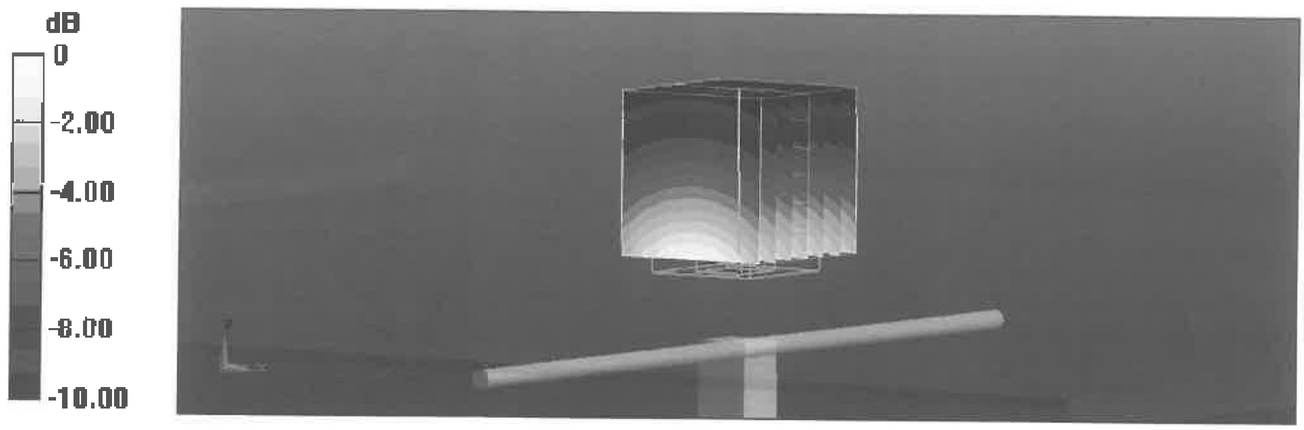
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d193

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 55.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

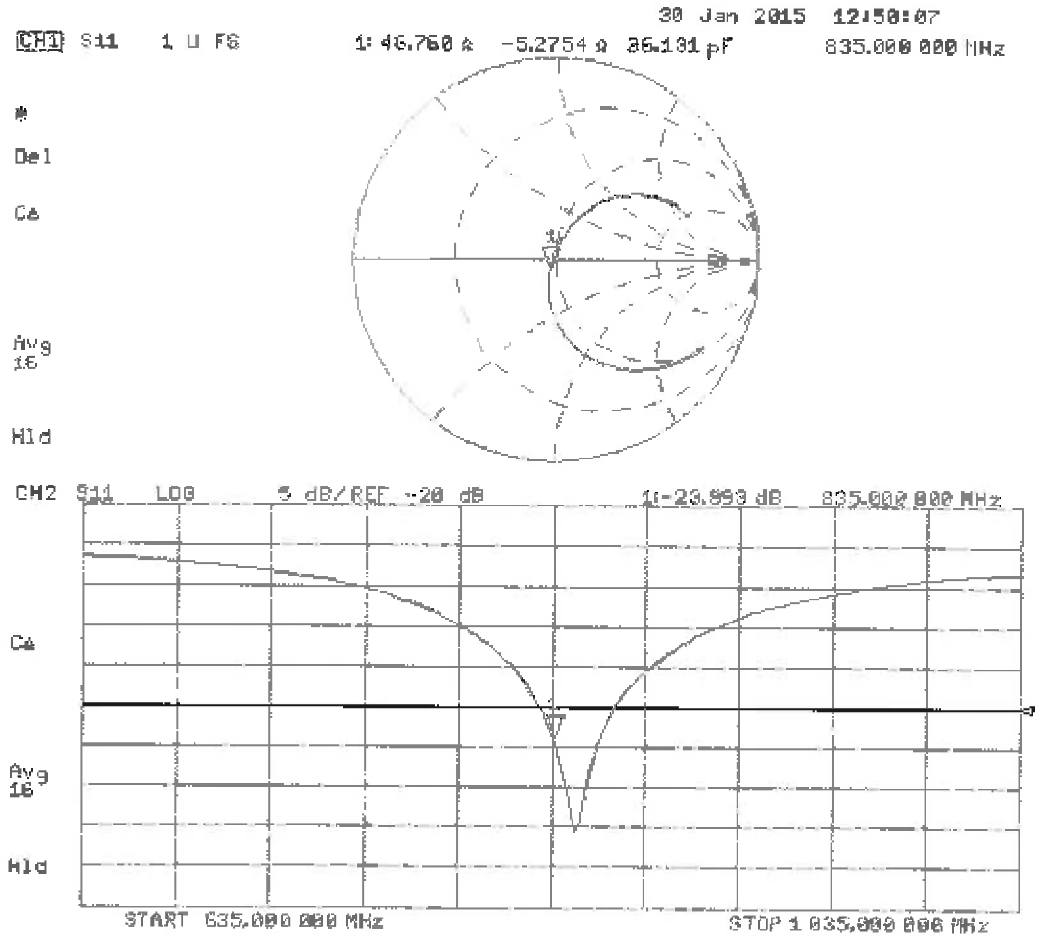
- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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 = 54.46 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.55 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 2.80 W/kg

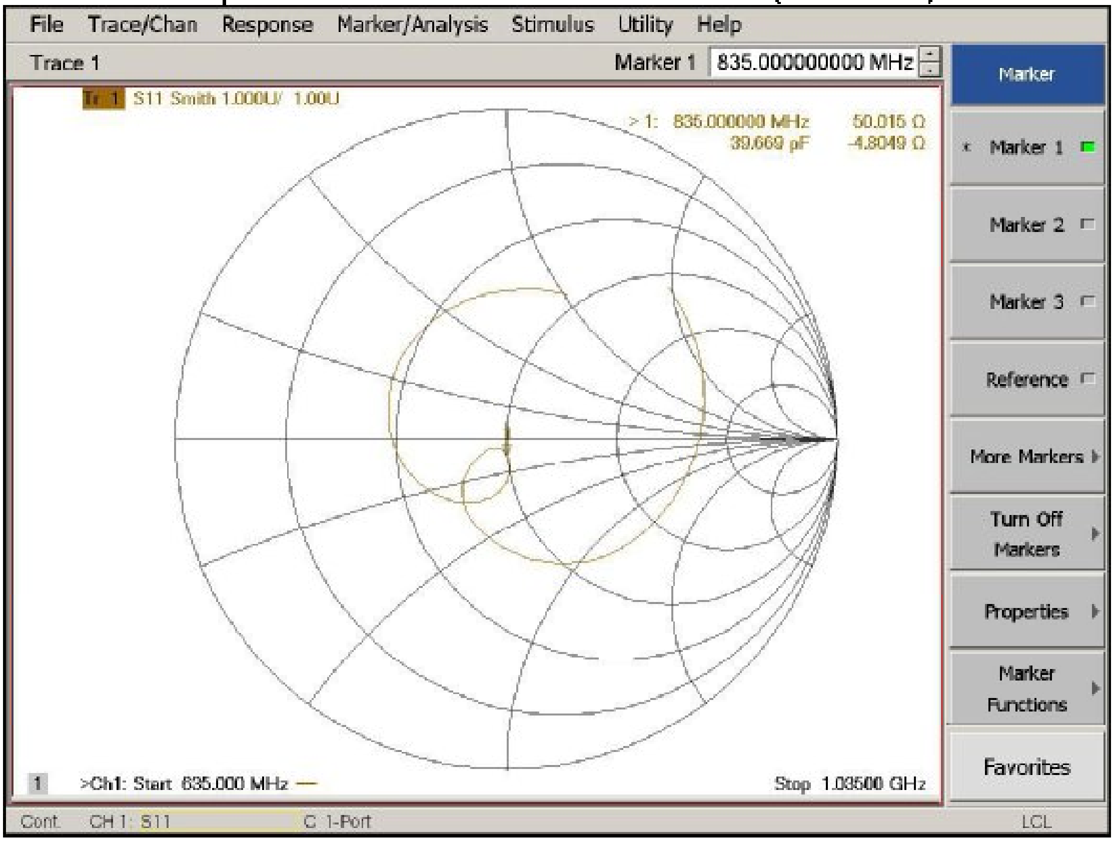


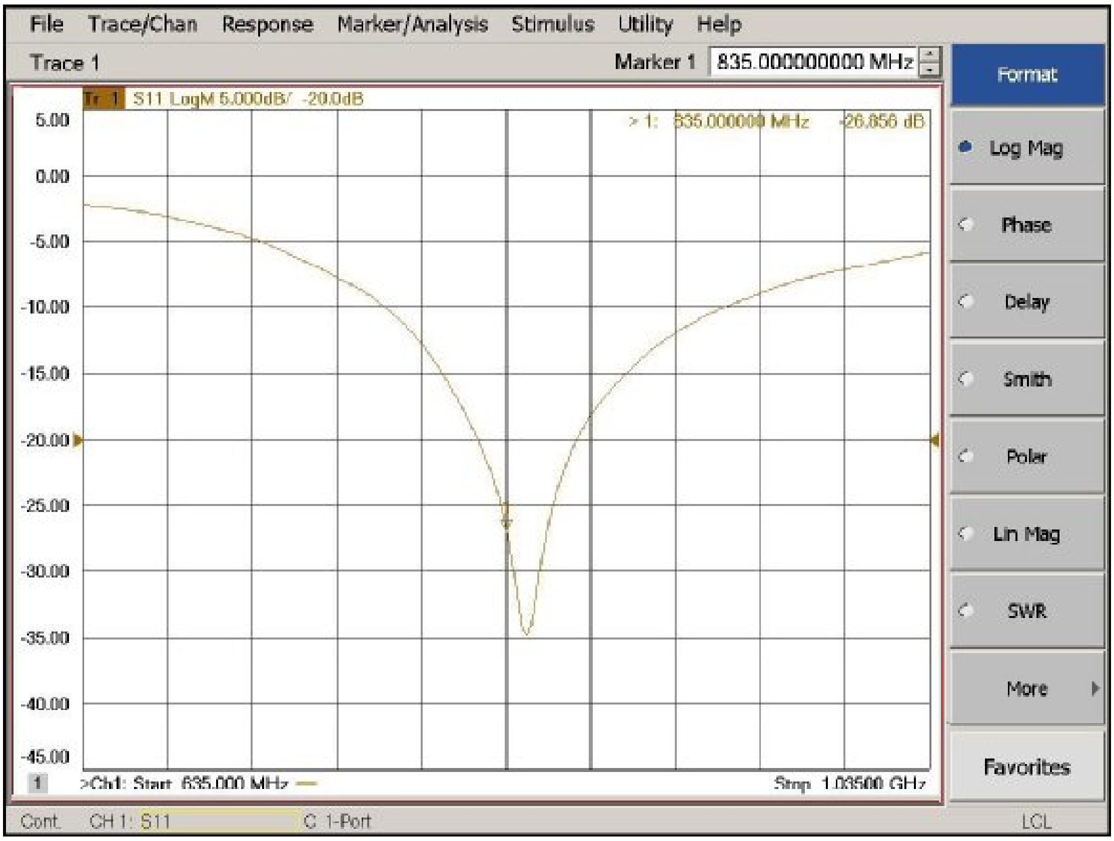
0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Body TSL

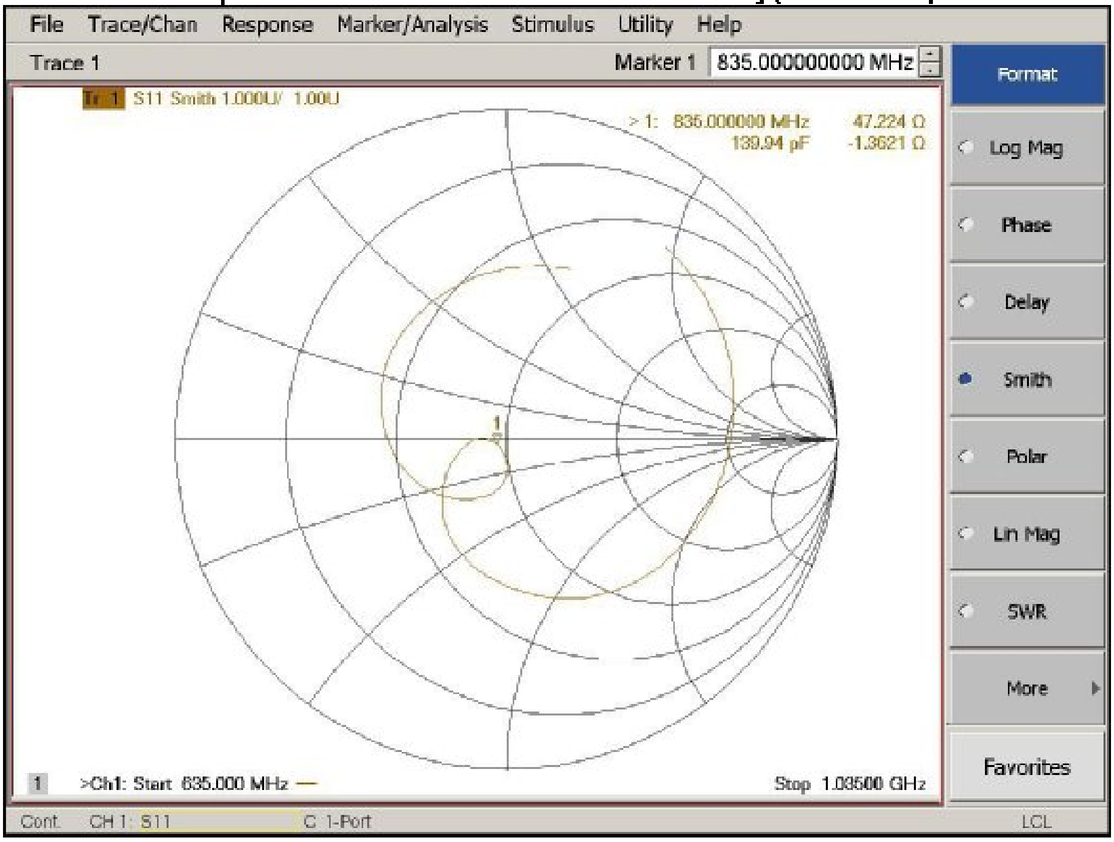


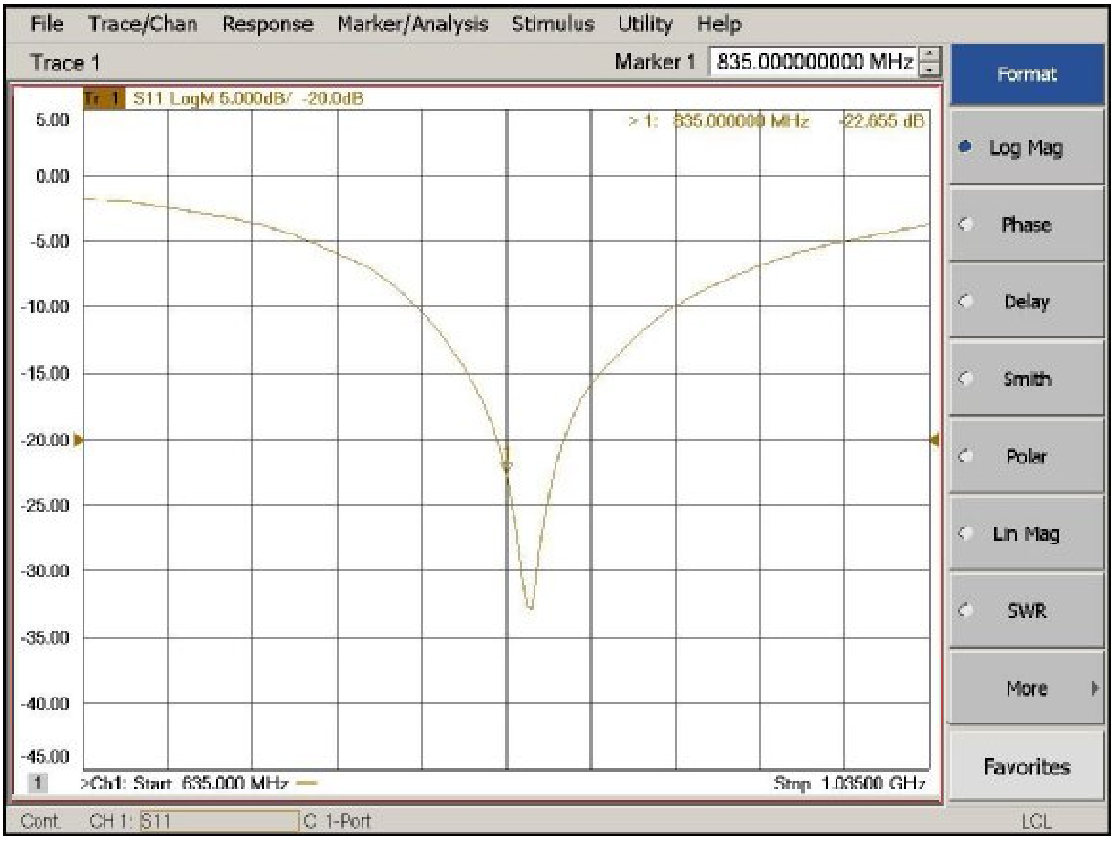
Impedance and Return Loss Test-Head(2016.2.19)





Impedance and Return Loss Test-Body(2016.2.19)





Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Client **Dgieie (Vitec)**

Certificate No: **D1900V2-5d198_Feb15**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d198
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 06, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: February 9, 2015

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) 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	
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	39.1 ± 6 %	1.42 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	10.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.4 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.1 ± 6 %	1.53 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	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**41.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 4.5 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4 Ω + 5.7 jΩ
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 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 06, 2014

DASY5 Validation Report for Head TSL

Date: 06.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d198

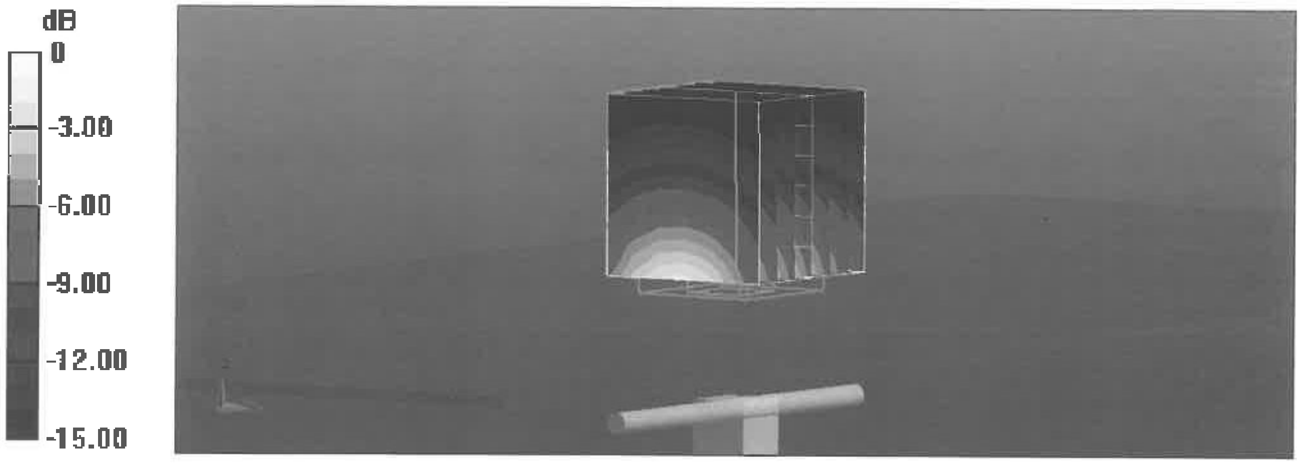
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.42 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

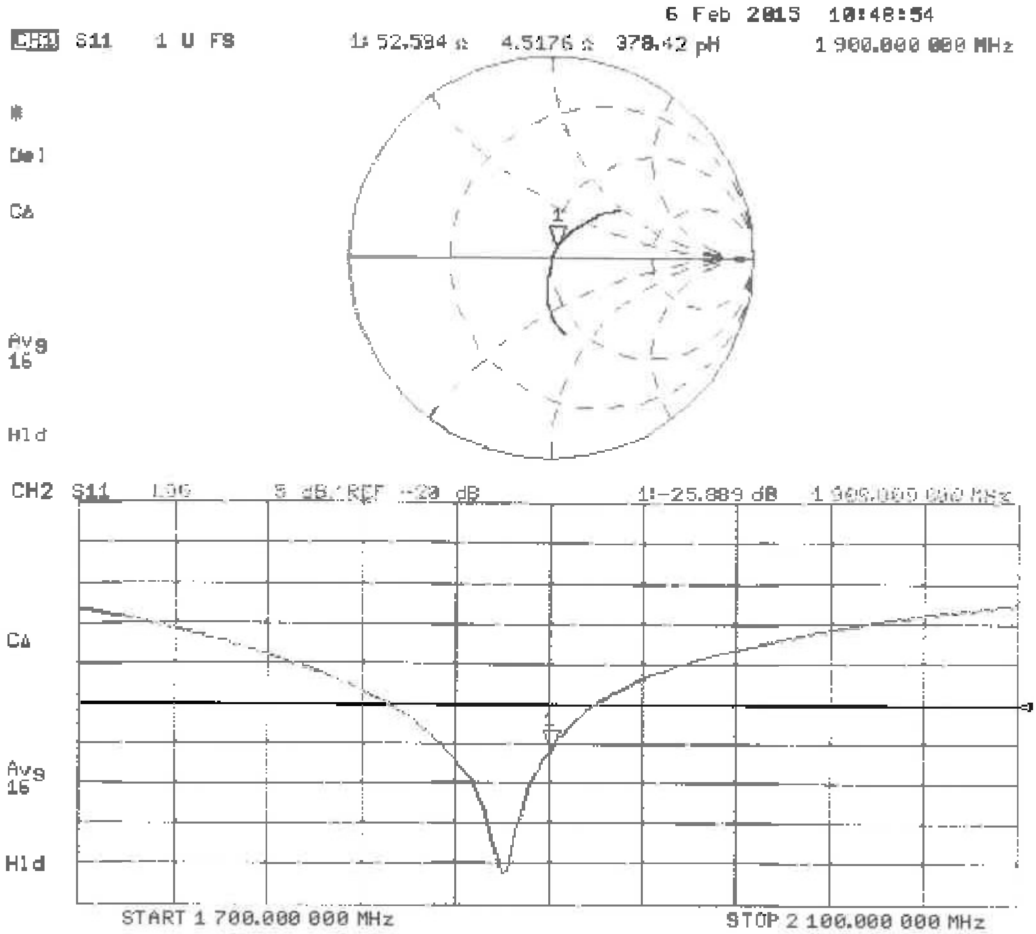
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.65 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 19.1 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.39 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 Head TSL



DASY5 Validation Report for Body TSL

Date: 06.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d198

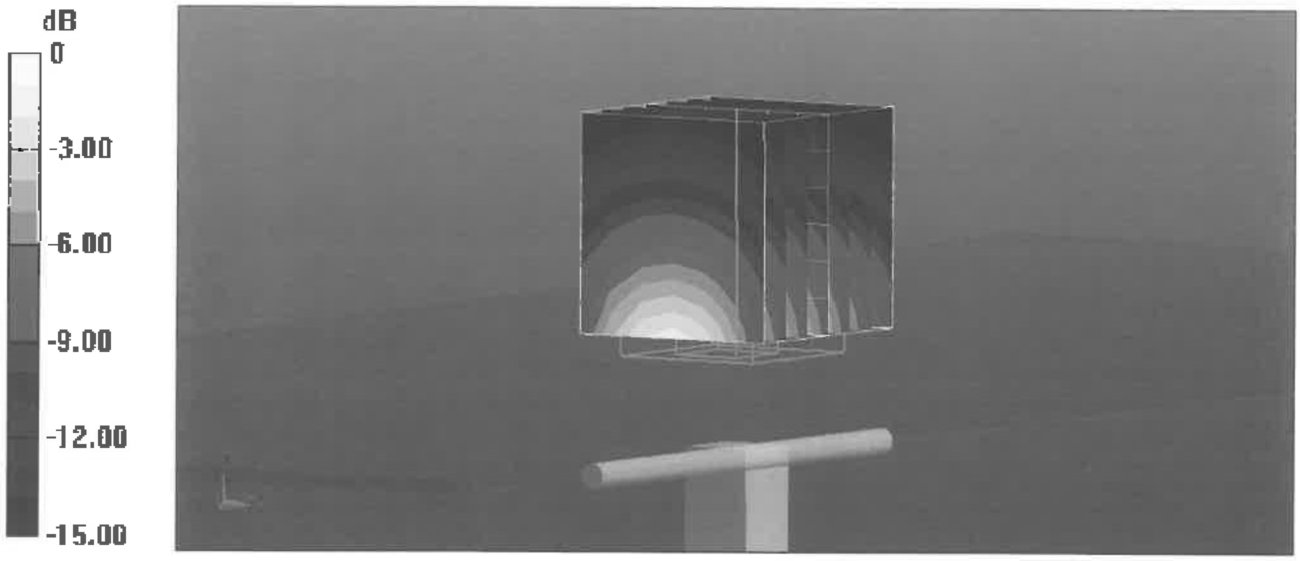
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.53$ S/m; $\varepsilon_r = 53.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

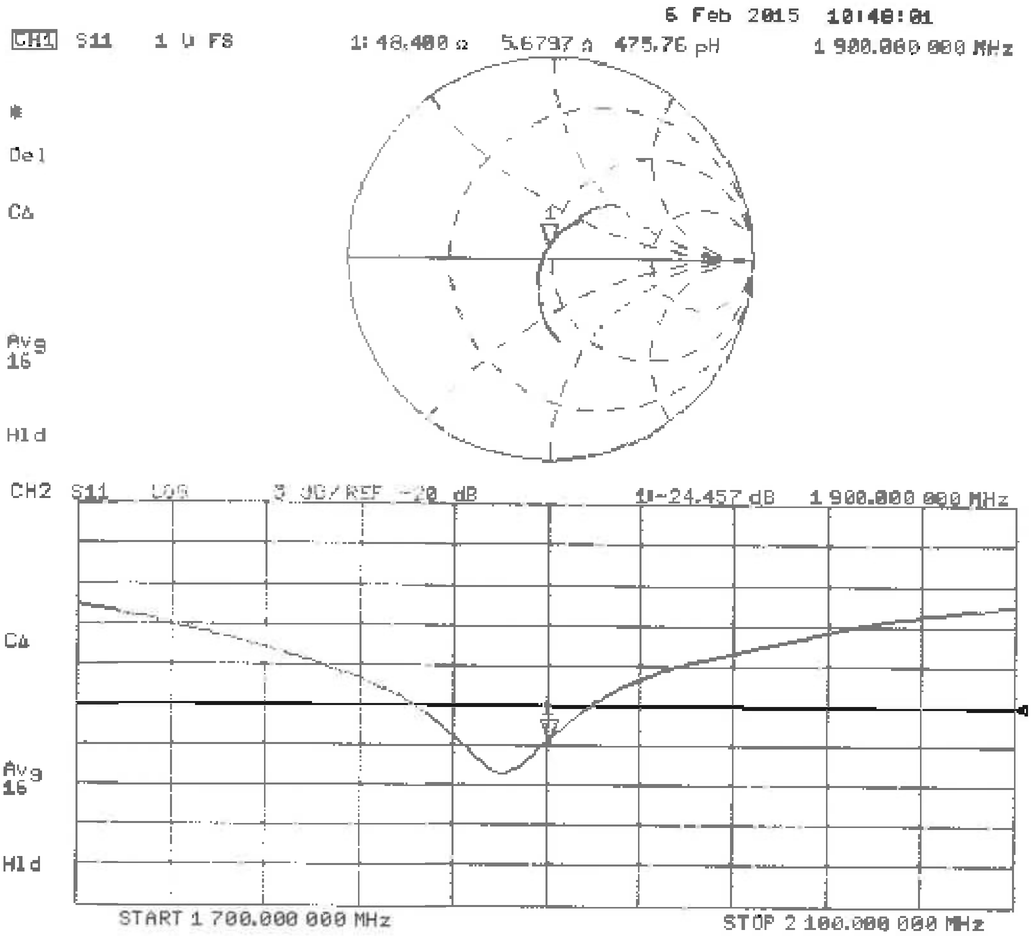
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.22 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.43 W/kg
Maximum value of SAR (measured) = 13.0 W/kg

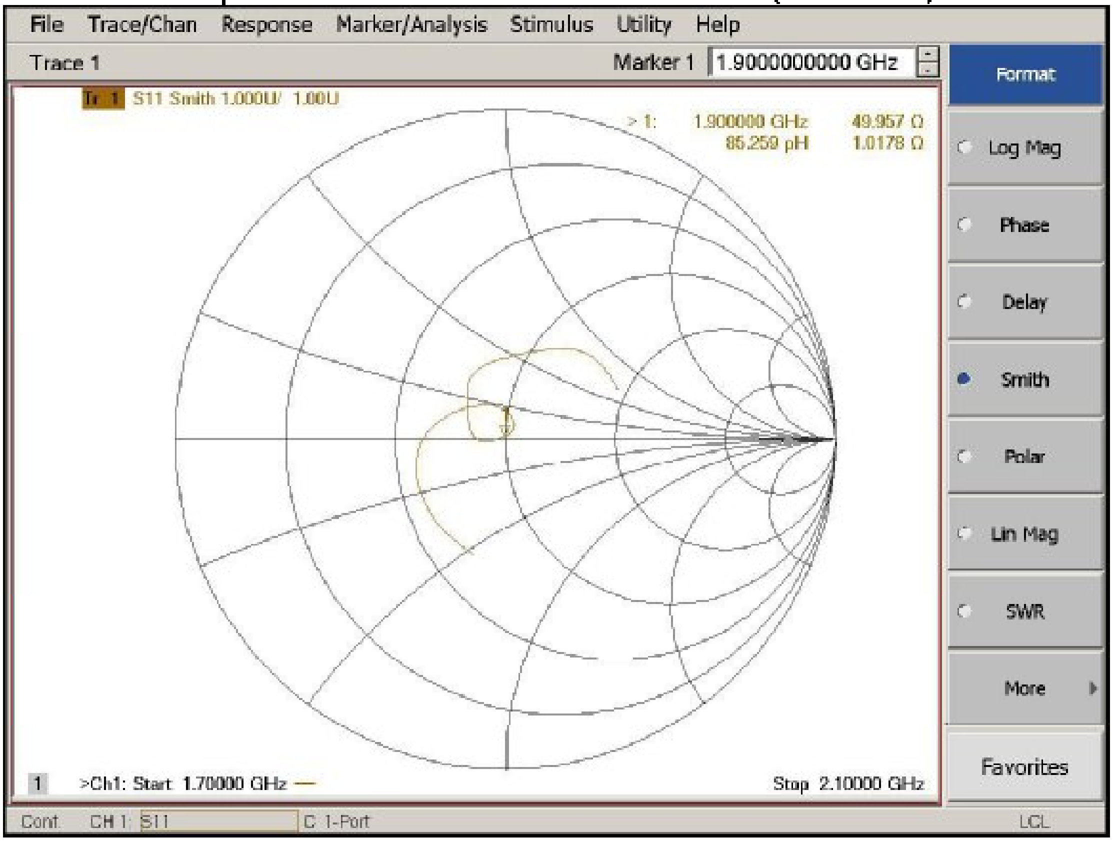


0 dB = 13.0 W/kg = 11.14 dBW/kg

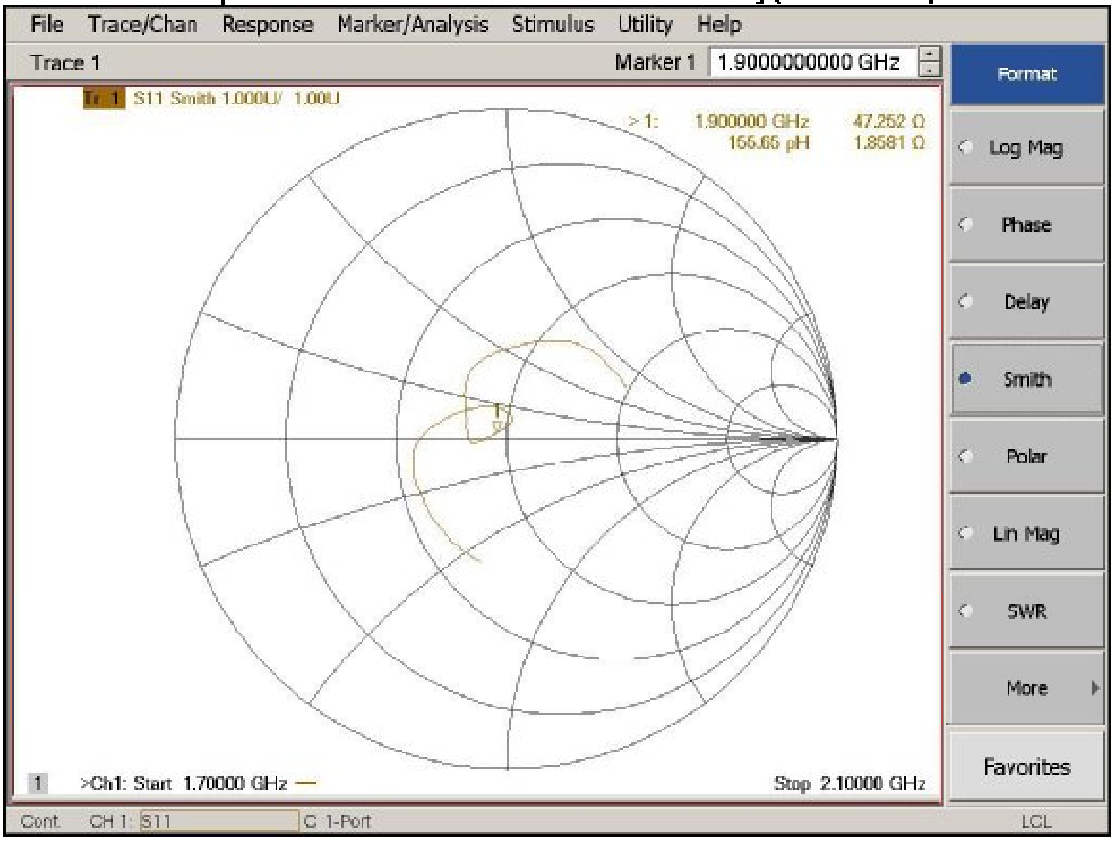
Impedance Measurement Plot for Body TSL

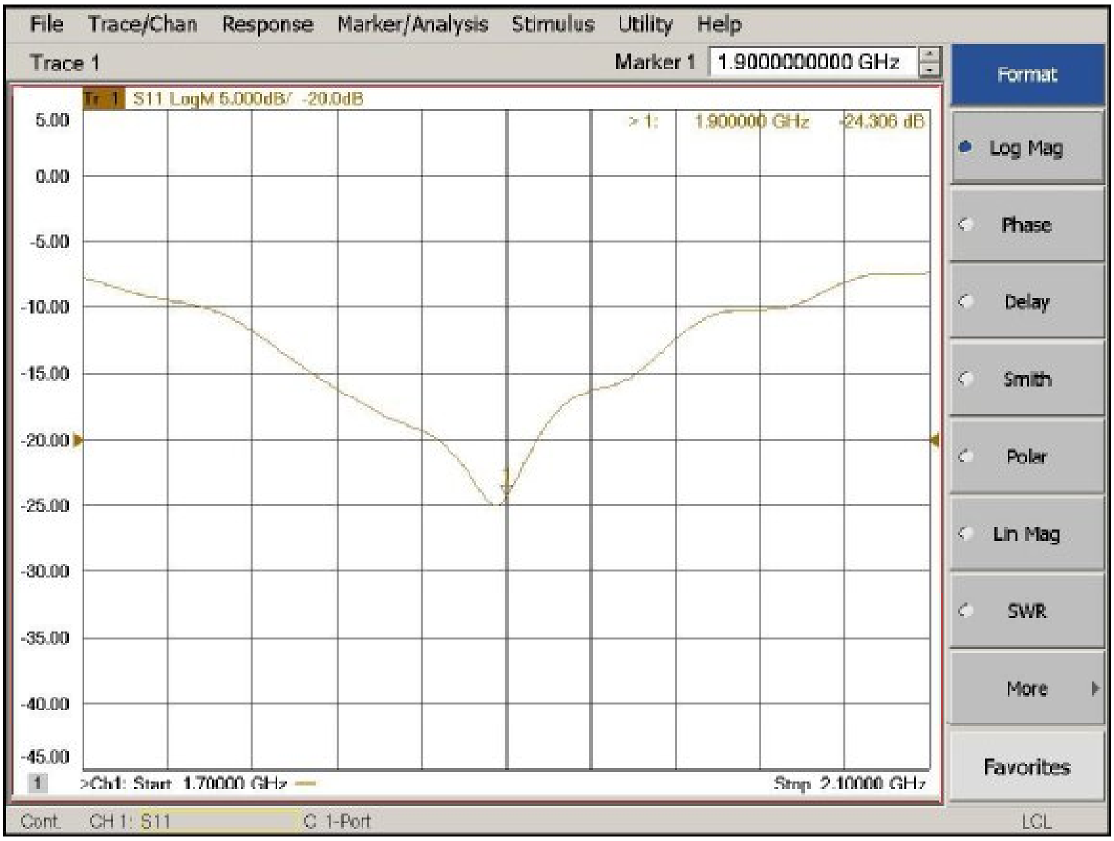


Impedance and Return Loss Test-Head(2016.2.19)



Impedance and Return Loss Test-Body(2016.2.19)





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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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 **Dgleie (Vitec)**

Certificate No: **D2450V2-959_Feb15**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:959
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 05, 2015

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 EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 6, 2015

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

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) 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	
Distance Dipole Center - TSL	15 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	39.3 ± 6 %	1.88 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	13.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.0 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	2.03 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	**51.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω + 0.5 jΩ
Return Loss	- 27.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.9 Ω + 5.1 jΩ
Return Loss	- 25.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 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 05, 2014

DASY5 Validation Report for Head TSL

Date: 04.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:959

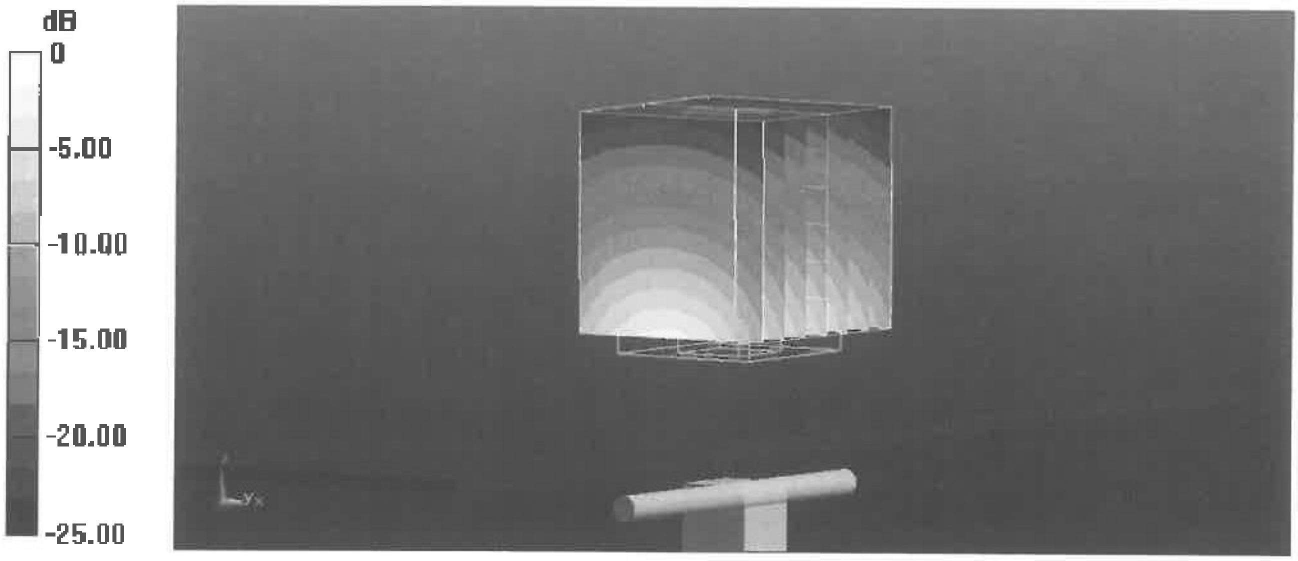
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.88 S/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.54, 4.54, 4.54); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

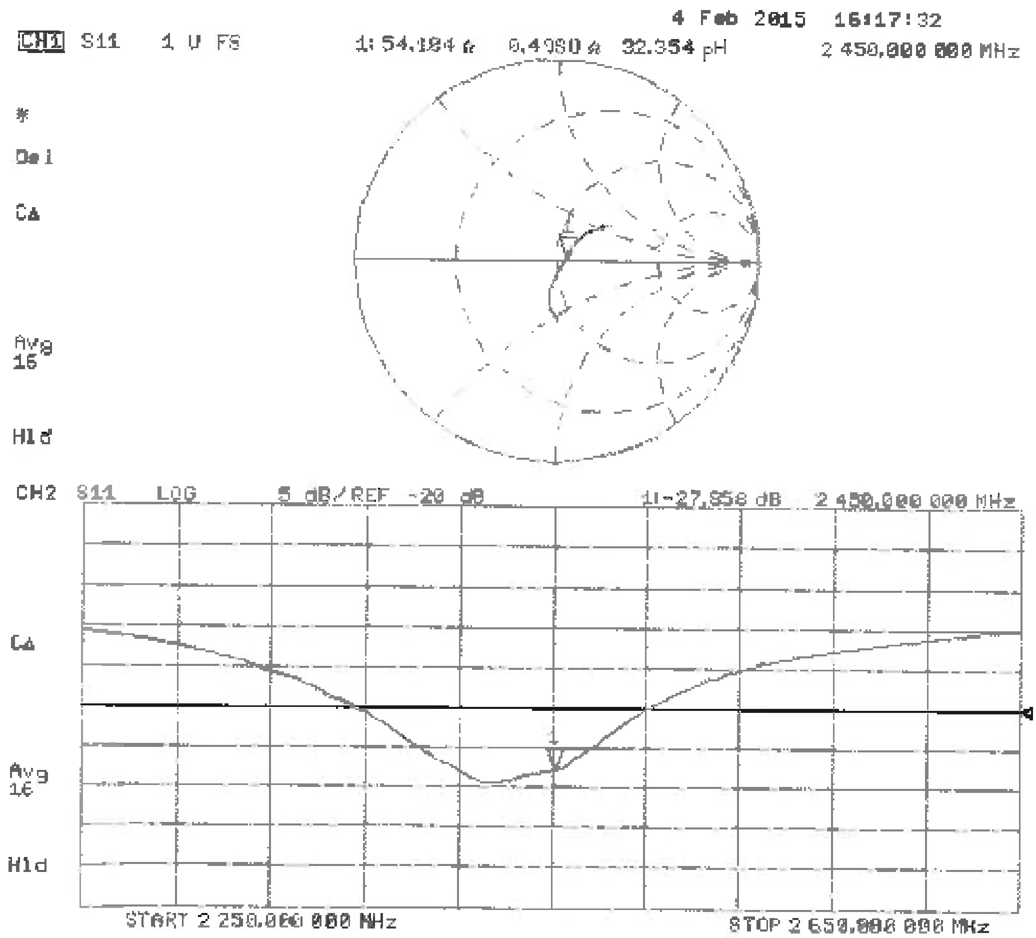
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.6 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.31 W/kg
Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.1 W/kg = 12.58 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:959

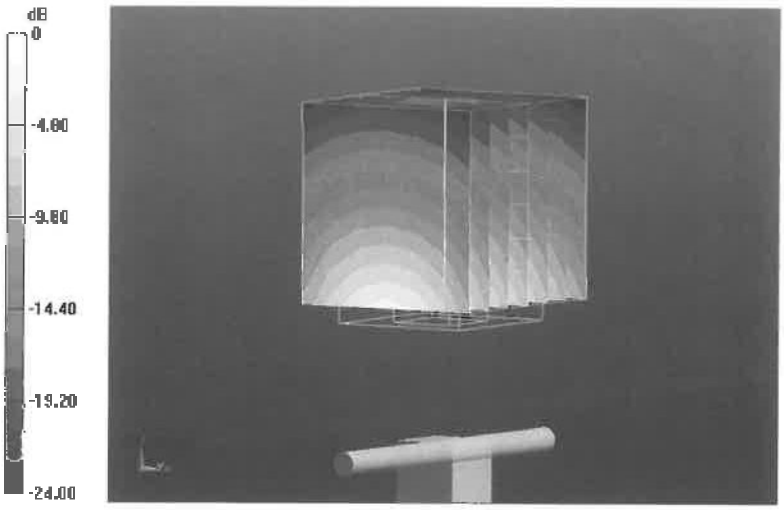
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

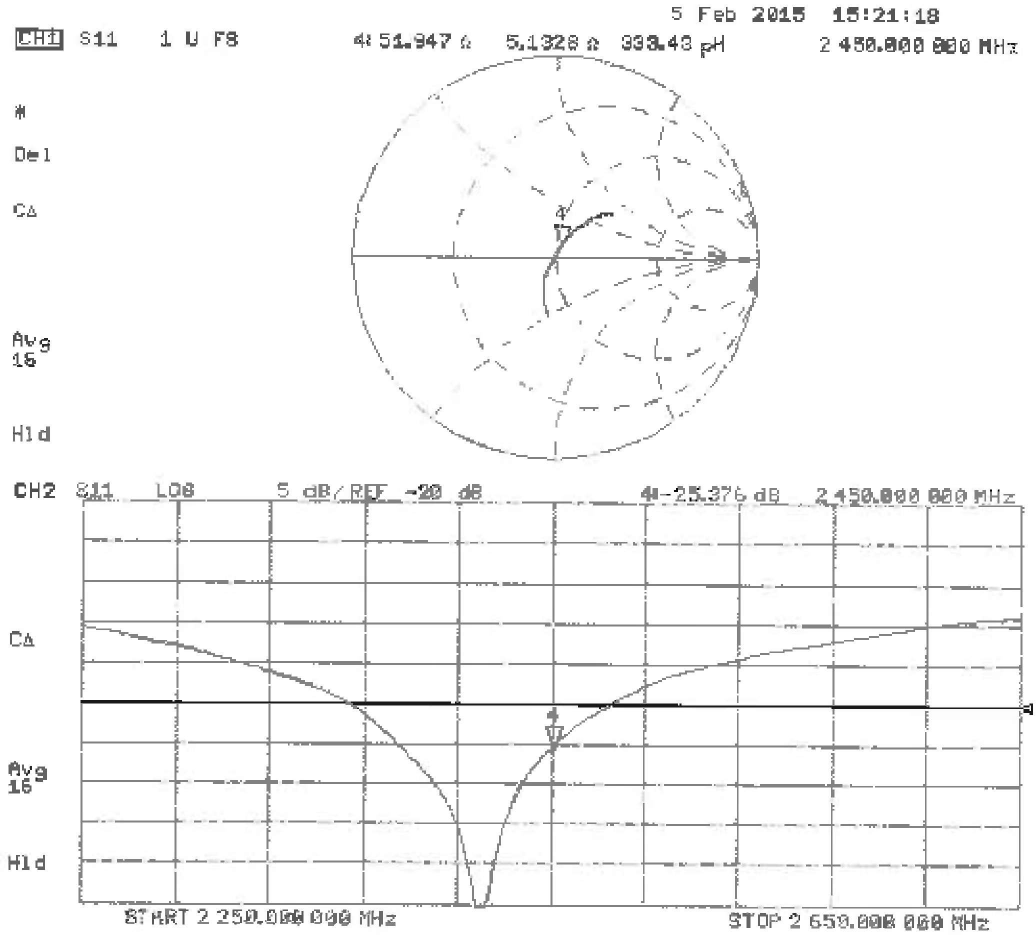
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.40 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6 W/kg
Maximum value of SAR (measured) = 17.3 W/kg

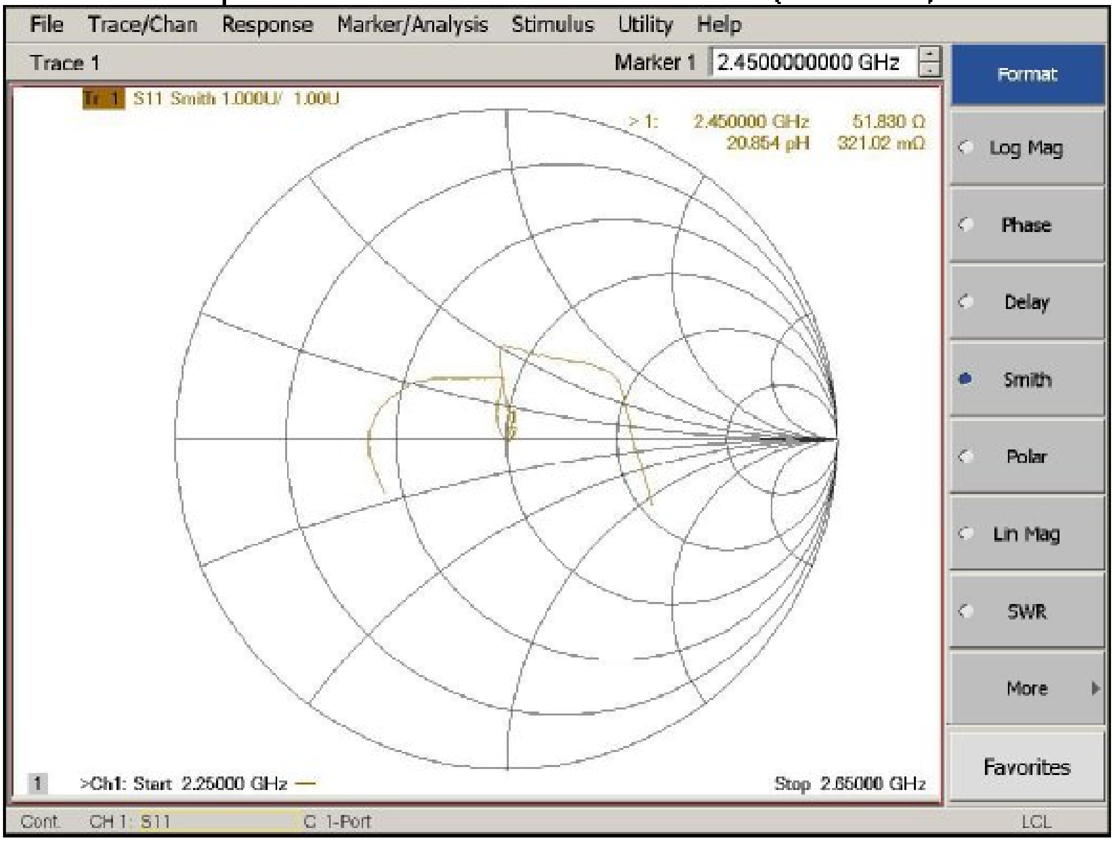


0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Body TSL



Impedance and Return Loss Test-Head(2016.2.19)



Impedance and Return Loss Test-Body(2016.2.19)