



EX3DV4- SN:3898

June 27, 2017

10493-AAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.27	66.30	15.68	2.23	80.0	± 9.6 %
		Y	3.32	66.68	16.01		80.0	
		Z	3.17	66.04	15.65		80.0	
10494-AAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.07	68.52	16.54	2.23	80.0	± 9.6 %
		Y	3.18	69.34	17.07		80.0	
		Z	2.94	68.19	16.54		80.0	
10495-AAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.24	66.58	15.93	2.23	80.0	± 9.6 %
		Y	3.29	66.98	16.26		80.0	
		Z	3.13	66.30	15.90		80.0	
10496-AAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.33	66.50	15.93	2.23	80.0	± 9.6 %
		Y	3.38	66.87	16.25		80.0	
		Z	3.23	66.23	15.91		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.02	60.00	7.99	2.23	80.0	± 9.6 %
		Y	1.01	60.00	8.17		80.0	
		Z	0.98	60.00	7.95		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.18	60.00	6.81	2.23	80.0	± 9.6 %
		Y	1.17	60.00	6.95		80.0	
		Z	1.14	60.00	6.72		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.20	60.00	6.66	2.23	80.0	± 9.6 %
		Y	1.19	60.00	6.79		80.0	
		Z	1.16	60.00	6.55		80.0	
10500-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.18	67.02	14.79	2.23	80.0	± 9.6 %
		Y	2.32	68.22	15.55		80.0	
		Z	2.08	66.80	14.82		80.0	
10501-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.31	64.90	13.20	2.23	80.0	± 9.6 %
		Y	2.41	65.65	13.74		80.0	
		Z	2.22	64.72	13.17		80.0	
10502-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.34	64.77	13.06	2.23	80.0	± 9.6 %
		Y	2.43	65.49	13.58		80.0	
		Z	2.25	64.59	13.02		80.0	
10503-AAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.51	67.79	15.92	2.23	80.0	± 9.6 %
		Y	2.63	68.78	16.57		80.0	
		Z	2.39	67.48	15.93		80.0	
10504-AAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.75	66.25	15.06	2.23	80.0	± 9.6 %
		Y	2.83	66.84	15.51		80.0	
		Z	2.66	66.03	15.05		80.0	
10505-AAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.83	66.21	15.04	2.23	80.0	± 9.6 %
		Y	2.91	66.76	15.47		80.0	
		Z	2.73	65.99	15.02		80.0	
10506-AAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.05	68.40	16.47	2.23	80.0	± 9.6 %
		Y	3.16	69.22	17.00		80.0	
		Z	2.92	68.07	16.47		80.0	
10507-AAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.22	66.51	15.89	2.23	80.0	± 9.6 %
		Y	3.27	66.92	16.22		80.0	
		Z	3.12	66.24	15.86		80.0	

Certificate No: EX3-3898_Jun17

Page 29 of 38



EX3DV4- SN:3898

June 27, 2017

10508-AAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.32	66.43	15.89	2.23	80.0	± 9.6 %
		Y	3.37	66.80	16.20		80.0	
		Z	3.21	66.16	15.86		80.0	
10509-AAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.55	68.19	16.49	2.23	80.0	± 9.6 %
		Y	3.64	68.78	16.90		80.0	
		Z	3.42	67.89	16.49		80.0	
10510-AAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.74	66.59	16.18	2.23	80.0	± 9.6 %
		Y	3.77	66.88	16.45		80.0	
		Z	3.63	66.30	16.15		80.0	
10511-AAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.82	66.51	16.18	2.23	80.0	± 9.6 %
		Y	3.85	66.78	16.44		80.0	
		Z	3.71	66.23	16.15		80.0	
10512-AAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.53	68.87	16.64	2.23	80.0	± 9.6 %
		Y	3.65	69.60	17.11		80.0	
		Z	3.39	68.55	16.65		80.0	
10513-AAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.62	66.62	16.20	2.23	80.0	± 9.6 %
		Y	3.66	66.94	16.48		80.0	
		Z	3.51	66.32	16.17		80.0	
10514-AAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.68	66.43	16.16	2.23	80.0	± 9.6 %
		Y	3.72	66.71	16.42		80.0	
		Z	3.58	66.13	16.13		80.0	
10515-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.99	63.31	14.64	0.00	150.0	± 9.6 %
		Y	1.01	63.68	14.99		150.0	
		Z	0.99	63.31	14.65		150.0	
10516-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.57	68.71	16.68	0.00	150.0	± 9.6 %
		Y	0.65	71.13	18.13		150.0	
		Z	0.57	68.55	16.63		150.0	
10517-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.82	64.86	15.16	0.00	150.0	± 9.6 %
		Y	0.85	65.57	15.72		150.0	
		Z	0.83	64.83	15.16		150.0	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.32	66.96	16.17	0.00	150.0	± 9.6 %
		Y	4.35	67.04	16.27		150.0	
		Z	4.31	66.97	16.19		150.0	
10519-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.46	67.11	16.26	0.00	150.0	± 9.6 %
		Y	4.49	67.19	16.35		150.0	
		Z	4.45	67.12	16.27		150.0	
10520-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.32	67.04	16.17	0.00	150.0	± 9.6 %
		Y	4.35	67.12	16.27		150.0	
		Z	4.31	67.04	16.19		150.0	
10521-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.25	66.99	16.15	0.00	150.0	± 9.6 %
		Y	4.28	67.08	16.25		150.0	
		Z	4.24	66.99	16.16		150.0	
10522-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.29	67.08	16.22	0.00	150.0	± 9.6 %
		Y	4.32	67.17	16.32		150.0	
		Z	4.27	67.07	16.22		150.0	

Certificate No: EX3-3898_Jun17

Page 30 of 38



EX3DV4- SN:3898

June 27, 2017

10523-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.24	67.16	16.19	0.00	150.0	± 9.6 %
		Y	4.27	67.25	16.30		150.0	
		Z	4.23	67.18	16.21		150.0	
10524-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.25	67.08	16.24	0.00	150.0	± 9.6 %
		Y	4.28	67.17	16.34		150.0	
		Z	4.24	67.08	16.25		150.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.30	66.23	15.88	0.00	150.0	± 9.6 %
		Y	4.32	66.32	15.98		150.0	
		Z	4.29	66.24	15.90		150.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.40	66.47	15.98	0.00	150.0	± 9.6 %
		Y	4.43	66.56	16.08		150.0	
		Z	4.39	66.47	15.99		150.0	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.34	66.45	15.93	0.00	150.0	± 9.6 %
		Y	4.37	66.54	16.03		150.0	
		Z	4.33	66.45	15.94		150.0	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.35	66.46	15.96	0.00	150.0	± 9.6 %
		Y	4.38	66.56	16.06		150.0	
		Z	4.34	66.46	15.97		150.0	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.35	66.46	15.96	0.00	150.0	± 9.6 %
		Y	4.38	66.56	16.06		150.0	
		Z	4.34	66.46	15.97		150.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.31	66.46	15.92	0.00	150.0	± 9.6 %
		Y	4.34	66.56	16.03		150.0	
		Z	4.30	66.45	15.93		150.0	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.20	66.33	15.86	0.00	150.0	± 9.6 %
		Y	4.23	66.43	15.96		150.0	
		Z	4.19	66.33	15.87		150.0	
10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.35	66.55	15.96	0.00	150.0	± 9.6 %
		Y	4.39	66.64	16.06		150.0	
		Z	4.34	66.55	15.98		150.0	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	4.92	66.42	16.02	0.00	150.0	± 9.6 %
		Y	4.95	66.49	16.11		150.0	
		Z	4.91	66.42	16.04		150.0	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	4.95	66.52	16.07	0.00	150.0	± 9.6 %
		Y	4.98	66.59	16.16		150.0	
		Z	4.94	66.51	16.09		150.0	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	4.85	66.53	16.05	0.00	150.0	± 9.6 %
		Y	4.87	66.61	16.14		150.0	
		Z	4.84	66.52	16.07		150.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	4.92	66.56	16.07	0.00	150.0	± 9.6 %
		Y	4.95	66.63	16.16		150.0	
		Z	4.92	66.56	16.10		150.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	4.97	66.48	16.07	0.00	150.0	± 9.6 %
		Y	5.00	66.56	16.15		150.0	
		Z	4.96	66.47	16.09		150.0	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	4.90	66.44	16.07	0.00	150.0	± 9.6 %
		Y	4.93	66.52	16.16		150.0	
		Z	4.90	66.43	16.09		150.0	

Certificate No: EX3-3898_Jun17

Page 31 of 38



EX3DV4- SN:3898

June 27, 2017

10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	4.90	66.40	16.03	0.00	150.0	± 9.6 %
		Y	4.92	66.46	16.11		150.0	
		Z	4.89	66.39	16.04		150.0	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.05	66.48	16.09	0.00	150.0	± 9.6 %
		Y	5.07	66.55	16.17		150.0	
		Z	5.04	66.48	16.10		150.0	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.12	66.59	16.17	0.00	150.0	± 9.6 %
		Y	5.15	66.65	16.25		150.0	
		Z	5.12	66.59	16.19		150.0	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.27	66.48	16.01	0.00	150.0	± 9.6 %
		Y	5.30	66.55	16.09		150.0	
		Z	5.27	66.47	16.03		150.0	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.43	66.89	16.18	0.00	150.0	± 9.6 %
		Y	5.46	66.97	16.26		150.0	
		Z	5.43	66.89	16.20		150.0	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.30	66.59	16.04	0.00	150.0	± 9.6 %
		Y	5.33	66.66	16.12		150.0	
		Z	5.30	66.57	16.05		150.0	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.39	66.74	16.11	0.00	150.0	± 9.6 %
		Y	5.41	66.81	16.19		150.0	
		Z	5.39	66.75	16.14		150.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.49	67.22	16.33	0.00	150.0	± 9.6 %
		Y	5.52	67.32	16.42		150.0	
		Z	5.48	67.21	16.34		150.0	
10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.37	66.82	16.16	0.00	150.0	± 9.6 %
		Y	5.39	66.89	16.25		150.0	
		Z	5.37	66.84	16.20		150.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.29	66.55	15.99	0.00	150.0	± 9.6 %
		Y	5.31	66.62	16.07		150.0	
		Z	5.28	66.52	16.01		150.0	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.28	66.62	16.03	0.00	150.0	± 9.6 %
		Y	5.31	66.69	16.11		150.0	
		Z	5.28	66.61	16.05		150.0	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.33	66.55	16.02	0.00	150.0	± 9.6 %
		Y	5.35	66.61	16.10		150.0	
		Z	5.32	66.53	16.04		150.0	
10554-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.70	66.81	16.09	0.00	150.0	± 9.6 %
		Y	5.73	66.87	16.16		150.0	
		Z	5.70	66.79	16.10		150.0	
10555-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.78	66.99	16.17	0.00	150.0	± 9.6 %
		Y	5.80	67.06	16.24		150.0	
		Z	5.78	66.97	16.18		150.0	
10556-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.82	67.12	16.22	0.00	150.0	± 9.6 %
		Y	5.85	67.19	16.30		150.0	
		Z	5.83	67.12	16.24		150.0	
10557-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.78	67.00	16.18	0.00	150.0	± 9.6 %
		Y	5.80	67.06	16.25		150.0	
		Z	5.78	66.98	16.19		150.0	

Certificate No: EX3-3898_Jun17

Page 32 of 38



EX3DV4- SN:3898

June 27, 2017

10558-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	5.77	67.00	16.19	0.00	150.0	± 9.6 %
		Y	5.80	67.07	16.27		150.0	
		Z	5.76	66.96	16.20		150.0	
10560-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	5.80	66.97	16.21	0.00	150.0	± 9.6 %
		Y	5.83	67.03	16.29		150.0	
		Z	5.80	66.94	16.23		150.0	
10561-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.73	66.94	16.23	0.00	150.0	± 9.6 %
		Y	5.76	67.01	16.31		150.0	
		Z	5.73	66.92	16.25		150.0	
10562-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	5.77	67.07	16.30	0.00	150.0	± 9.6 %
		Y	5.80	67.15	16.38		150.0	
		Z	5.77	67.04	16.31		150.0	
10563-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	5.88	67.08	16.27	0.00	150.0	± 9.6 %
		Y	5.91	67.16	16.35		150.0	
		Z	5.88	67.06	16.28		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.62	66.91	16.26	0.46	150.0	± 9.6 %
		Y	4.65	67.00	16.37		150.0	
		Z	4.62	66.92	16.27		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	4.82	67.35	16.60	0.46	150.0	± 9.6 %
		Y	4.84	67.41	16.69		150.0	
		Z	4.81	67.36	16.62		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.65	67.13	16.38	0.46	150.0	± 9.6 %
		Y	4.68	67.22	16.48		150.0	
		Z	4.64	67.13	16.40		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	4.70	67.59	16.80	0.46	150.0	± 9.6 %
		Y	4.72	67.63	16.88		150.0	
		Z	4.69	67.60	16.83		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.52	66.74	16.04	0.46	150.0	± 9.6 %
		Y	4.56	66.86	16.17		150.0	
		Z	4.51	66.72	16.04		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.69	67.86	16.96	0.46	150.0	± 9.6 %
		Y	4.72	67.90	17.03		150.0	
		Z	4.69	67.89	17.00		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.68	67.60	16.83	0.46	150.0	± 9.6 %
		Y	4.71	67.65	16.91		150.0	
		Z	4.67	67.61	16.85		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.14	63.82	14.89	0.46	130.0	± 9.6 %
		Y	1.15	64.13	15.24		130.0	
		Z	1.12	63.61	14.84		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.14	64.32	15.21	0.46	130.0	± 9.6 %
		Y	1.16	64.65	15.58		130.0	
		Z	1.13	64.09	15.17		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	1.07	74.72	18.97	0.46	130.0	± 9.6 %
		Y	1.28	78.28	20.78		130.0	
		Z	0.96	73.37	18.65		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.18	68.96	17.73	0.46	130.0	± 9.6 %
		Y	1.21	69.63	18.27		130.0	
		Z	1.15	68.56	17.65		130.0	



EX3DV4-- SN:3898

June 27, 2017

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.39	66.58	16.17	0.46	130.0	± 9.6 %
		Y	4.42	66.67	16.29		130.0	
		Z	4.38	66.59	16.19		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.42	66.82	16.28	0.46	130.0	± 9.6 %
		Y	4.45	66.90	16.39		130.0	
		Z	4.41	66.83	16.31		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.57	67.04	16.43	0.46	130.0	± 9.6 %
		Y	4.60	67.12	16.53		130.0	
		Z	4.56	67.05	16.45		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.49	67.21	16.56	0.46	130.0	± 9.6 %
		Y	4.51	67.28	16.65		130.0	
		Z	4.48	67.22	16.59		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.22	66.25	15.71	0.46	130.0	± 9.6 %
		Y	4.25	66.38	15.85		130.0	
		Z	4.21	66.24	15.71		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.24	66.27	15.70	0.46	130.0	± 9.6 %
		Y	4.28	66.41	15.85		130.0	
		Z	4.23	66.24	15.70		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.40	67.30	16.54	0.46	130.0	± 9.6 %
		Y	4.43	67.38	16.64		130.0	
		Z	4.39	67.32	16.57		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.14	65.99	15.46	0.46	130.0	± 9.6 %
		Y	4.18	66.13	15.62		130.0	
		Z	4.12	65.96	15.46		130.0	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.39	66.58	16.17	0.46	130.0	± 9.6 %
		Y	4.42	66.67	16.29		130.0	
		Z	4.38	66.59	16.19		130.0	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.42	66.82	16.28	0.46	130.0	± 9.6 %
		Y	4.45	66.90	16.39		130.0	
		Z	4.41	66.83	16.31		130.0	
10585-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.57	67.04	16.43	0.46	130.0	± 9.6 %
		Y	4.60	67.12	16.53		130.0	
		Z	4.56	67.05	16.45		130.0	
10586-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.49	67.21	16.56	0.46	130.0	± 9.6 %
		Y	4.51	67.28	16.65		130.0	
		Z	4.48	67.22	16.59		130.0	
10587-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.22	66.25	15.71	0.46	130.0	± 9.6 %
		Y	4.25	66.38	15.85		130.0	
		Z	4.21	66.24	15.71		130.0	
10588-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.24	66.27	15.70	0.46	130.0	± 9.6 %
		Y	4.28	66.41	15.85		130.0	
		Z	4.23	66.24	15.70		130.0	
10589-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.40	67.30	16.54	0.46	130.0	± 9.6 %
		Y	4.43	67.38	16.64		130.0	
		Z	4.39	67.32	16.57		130.0	
10590-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.14	65.99	15.46	0.46	130.0	± 9.6 %
		Y	4.18	66.13	15.62		130.0	
		Z	4.12	65.96	15.46		130.0	

Certificate No: EX3-3898_Jun17

Page 34 of 38



EX3DV4- SN:3898

June 27, 2017

10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.55	66.71	16.33	0.46	130.0	± 9.6 %
		Y	4.58	66.79	16.43		130.0	
		Z	4.54	66.72	16.35		130.0	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.66	66.97	16.44	0.46	130.0	± 9.6 %
		Y	4.68	67.05	16.55		130.0	
		Z	4.65	66.98	16.47		130.0	
10593-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.57	66.83	16.29	0.46	130.0	± 9.6 %
		Y	4.60	66.92	16.40		130.0	
		Z	4.56	66.84	16.31		130.0	
10594-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.63	67.03	16.47	0.46	130.0	± 9.6 %
		Y	4.66	67.11	16.57		130.0	
		Z	4.62	67.04	16.49		130.0	
10595-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.59	67.00	16.37	0.46	130.0	± 9.6 %
		Y	4.62	67.08	16.48		130.0	
		Z	4.58	67.00	16.39		130.0	
10596-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.52	66.92	16.34	0.46	130.0	± 9.6 %
		Y	4.55	67.02	16.46		130.0	
		Z	4.51	66.92	16.36		130.0	
10597-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.47	66.79	16.19	0.46	130.0	± 9.6 %
		Y	4.50	66.89	16.31		130.0	
		Z	4.46	66.78	16.20		130.0	
10598-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.48	67.08	16.50	0.46	130.0	± 9.6 %
		Y	4.51	67.15	16.60		130.0	
		Z	4.47	67.09	16.52		130.0	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.24	67.14	16.59	0.46	130.0	± 9.6 %
		Y	5.26	67.22	16.69		130.0	
		Z	5.24	67.17	16.63		130.0	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.31	67.40	16.69	0.46	130.0	± 9.6 %
		Y	5.34	67.51	16.81		130.0	
		Z	5.31	67.43	16.73		130.0	
10601-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.24	67.31	16.67	0.46	130.0	± 9.6 %
		Y	5.27	67.39	16.76		130.0	
		Z	5.25	67.36	16.72		130.0	
10602-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.30	67.20	16.52	0.46	130.0	± 9.6 %
		Y	5.33	67.30	16.63		130.0	
		Z	5.29	67.21	16.55		130.0	
10603-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.36	67.49	16.82	0.46	130.0	± 9.6 %
		Y	5.39	67.59	16.92		130.0	
		Z	5.35	67.49	16.85		130.0	
10604-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.23	67.04	16.56	0.46	130.0	± 9.6 %
		Y	5.26	67.13	16.66		130.0	
		Z	5.22	67.02	16.58		130.0	
10605-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.29	67.25	16.66	0.46	130.0	± 9.6 %
		Y	5.32	67.35	16.78		130.0	
		Z	5.29	67.26	16.69		130.0	
10606-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.11	66.78	16.27	0.46	130.0	± 9.6 %
		Y	5.14	66.88	16.39		130.0	
		Z	5.11	66.80	16.31		130.0	

Certificate No: EX3-3898_Jun17

Page 35 of 38



EX3DV4- SN:3898

June 27, 2017

10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.40	66.05	15.97	0.46	130.0	± 9.6 %
		Y	4.43	66.14	16.08		130.0	
		Z	4.39	66.06	16.00		130.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.52	66.33	16.10	0.46	130.0	± 9.6 %
		Y	4.55	66.43	16.21		130.0	
		Z	4.51	66.34	16.13		130.0	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.41	66.15	15.91	0.46	130.0	± 9.6 %
		Y	4.45	66.26	16.03		130.0	
		Z	4.40	66.16	15.93		130.0	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.47	66.34	16.10	0.46	130.0	± 9.6 %
		Y	4.50	66.44	16.21		130.0	
		Z	4.46	66.36	16.12		130.0	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.38	66.11	15.92	0.46	130.0	± 9.6 %
		Y	4.41	66.22	16.04		130.0	
		Z	4.37	66.12	15.94		130.0	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.35	66.19	15.93	0.46	130.0	± 9.6 %
		Y	4.39	66.31	16.06		130.0	
		Z	4.34	66.18	15.94		130.0	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.35	66.00	15.77	0.46	130.0	± 9.6 %
		Y	4.39	66.13	15.90		130.0	
		Z	4.34	66.00	15.79		130.0	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.34	66.30	16.07	0.46	130.0	± 9.6 %
		Y	4.37	66.40	16.18		130.0	
		Z	4.33	66.31	16.10		130.0	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.36	65.90	15.65	0.46	130.0	± 9.6 %
		Y	4.40	66.04	15.79		130.0	
		Z	4.35	65.90	15.67		130.0	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.03	66.30	16.16	0.46	130.0	± 9.6 %
		Y	5.06	66.38	16.26		130.0	
		Z	5.03	66.31	16.19		130.0	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.05	66.37	16.17	0.46	130.0	± 9.6 %
		Y	5.09	66.47	16.28		130.0	
		Z	5.05	66.38	16.20		130.0	
10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	4.97	66.45	16.23	0.46	130.0	± 9.6 %
		Y	5.00	66.54	16.33		130.0	
		Z	4.97	66.45	16.26		130.0	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.00	66.32	16.09	0.46	130.0	± 9.6 %
		Y	5.04	66.42	16.20		130.0	
		Z	5.01	66.34	16.13		130.0	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.06	66.27	16.11	0.46	130.0	± 9.6 %
		Y	5.09	66.36	16.22		130.0	
		Z	5.05	66.27	16.14		130.0	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.08	66.45	16.34	0.46	130.0	± 9.6 %
		Y	5.11	66.51	16.42		130.0	
		Z	5.08	66.46	16.37		130.0	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.07	66.51	16.37	0.46	130.0	± 9.6 %
		Y	5.09	66.59	16.45		130.0	
		Z	5.06	66.52	16.40		130.0	

Certificate No: EX3-3898_Jun17

Page 36 of 38



EX3DV4- SN:3898

June 27, 2017

10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	4.96	66.07	15.99	0.46	130.0	± 9.6 %
		Y	4.99	66.16	16.09		130.0	
		Z	4.96	66.07	16.02		130.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.15	66.33	16.19	0.46	130.0	± 9.6 %
		Y	5.18	66.41	16.29		130.0	
		Z	5.15	66.34	16.22		130.0	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.25	66.51	16.35	0.46	130.0	± 9.6 %
		Y	5.27	66.57	16.43		130.0	
		Z	5.25	66.56	16.40		130.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.37	66.32	16.12	0.46	130.0	± 9.6 %
		Y	5.40	66.40	16.21		130.0	
		Z	5.37	66.32	16.15		130.0	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.58	66.89	16.38	0.46	130.0	± 9.6 %
		Y	5.61	66.98	16.48		130.0	
		Z	5.58	66.90	16.42		130.0	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.35	66.26	15.99	0.46	130.0	± 9.6 %
		Y	5.38	66.35	16.09		130.0	
		Z	5.35	66.25	16.01		130.0	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.47	66.50	16.11	0.46	130.0	± 9.6 %
		Y	5.50	66.59	16.21		130.0	
		Z	5.48	66.54	16.15		130.0	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	5.62	67.17	16.45	0.46	130.0	± 9.6 %
		Y	5.67	67.30	16.57		130.0	
		Z	5.62	67.15	16.47		130.0	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.65	67.38	16.76	0.46	130.0	± 9.6 %
		Y	5.68	67.44	16.84		130.0	
		Z	5.65	67.38	16.79		130.0	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.61	67.17	16.67	0.46	130.0	± 9.6 %
		Y	5.63	67.23	16.75		130.0	
		Z	5.62	67.22	16.73		130.0	
10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.38	66.36	16.08	0.46	130.0	± 9.6 %
		Y	5.41	66.43	16.17		130.0	
		Z	5.37	66.34	16.10		130.0	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.42	66.59	16.25	0.46	130.0	± 9.6 %
		Y	5.45	66.66	16.34		130.0	
		Z	5.42	66.59	16.28		130.0	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.25	65.74	15.52	0.46	130.0	± 9.6 %
		Y	5.29	65.85	15.64		130.0	
		Z	5.25	65.72	15.54		130.0	
10636-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	5.81	66.67	16.21	0.46	130.0	± 9.6 %
		Y	5.84	66.74	16.30		130.0	
		Z	5.82	66.67	16.24		130.0	
10637-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	5.91	66.92	16.32	0.46	130.0	± 9.6 %
		Y	5.94	67.00	16.42		130.0	
		Z	5.91	66.92	16.35		130.0	
10638-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	5.95	67.05	16.36	0.46	130.0	± 9.6 %
		Y	5.98	67.13	16.46		130.0	
		Z	5.96	67.06	16.40		130.0	

Certificate No: EX3-3898_Jun17

Page 37 of 38



EX3DV4- SN:3898

June 27, 2017

10639-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	5.90	66.89	16.33	0.46	130.0	± 9.6 %
		Y	5.93	66.97	16.42		130.0	
		Z	5.90	66.89	16.36		130.0	
10640-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	5.83	66.70	16.17	0.46	130.0	± 9.6 %
		Y	5.86	66.79	16.27		130.0	
		Z	5.83	66.67	16.19		130.0	
10641-AAA	IEEE 1602.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	5.95	66.83	16.26	0.46	130.0	± 9.6 %
		Y	5.98	66.93	16.36		130.0	
		Z	5.95	66.84	16.29		130.0	
10642-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	5.98	67.06	16.55	0.46	130.0	± 9.6 %
		Y	6.00	67.13	16.63		130.0	
		Z	5.98	67.06	16.58		130.0	
10643-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	5.81	66.70	16.25	0.46	130.0	± 9.6 %
		Y	5.84	66.79	16.35		130.0	
		Z	5.81	66.69	16.27		130.0	
10644-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	5.86	66.86	16.35	0.46	130.0	± 9.6 %
		Y	5.89	66.95	16.45		130.0	
		Z	5.86	66.84	16.37		130.0	
10645-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	5.99	66.94	16.36	0.46	130.0	± 9.6 %
		Y	6.02	67.02	16.45		130.0	
		Z	6.00	66.95	16.39		130.0	
10646-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	6.69	86.81	28.67	9.30	60.0	± 9.6 %
		Y	7.72	91.33	30.89		60.0	
		Z	5.52	83.14	27.53		60.0	
10647-AAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	5.99	84.97	28.10	9.30	60.0	± 9.6 %
		Y	6.77	88.96	30.17		60.0	
		Z	4.99	81.44	26.98		60.0	
10648-AAA	CDMA2000 (1x Advanced)	X	0.51	61.86	8.44	0.00	150.0	± 9.6 %
		Y	0.54	62.46	8.97		150.0	
		Z	0.50	61.70	8.25		150.0	

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



ANNEX E: D750V3 Dipole Calibration Certificate



In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client

TA(Shanghai)

Certificate No: Z17-97113

CALIBRATION CERTIFICATE

Object

D750V3 - SN: 1045

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

August 27, 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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 30, 2017

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

Certificate No: Z17-97113

Page 1 of 8



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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:

- 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
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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%.



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 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 $\pm$ 0.2) °C	41.7 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.08 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	8.34 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	5.45 mW / g $\pm$ 18.7 % (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 $\pm$ 0.2) °C	55.7 $\pm$ 6 %	0.95 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	8.78 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	5.87 mW / g $\pm$ 18.7 % (k=2)



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5Ω- 2.95jΩ
Return Loss	- 28.5dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5Ω- 5.53jΩ
Return Loss	- 24.2dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.140 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
-----------------	-------



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 08.27.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1045

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.886 \text{ S/m}$; $\epsilon_r = 41.66$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.05, 10.05, 10.05); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

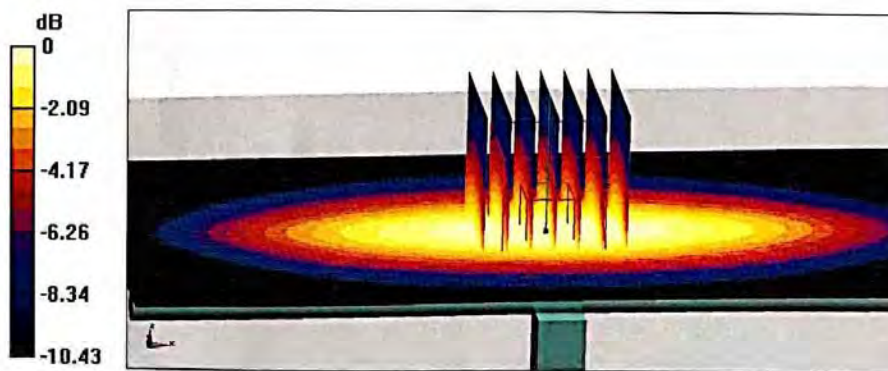
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.59 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.20 W/kg

SAR(1 g) = 2.08 W/kg; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.80 W/kg



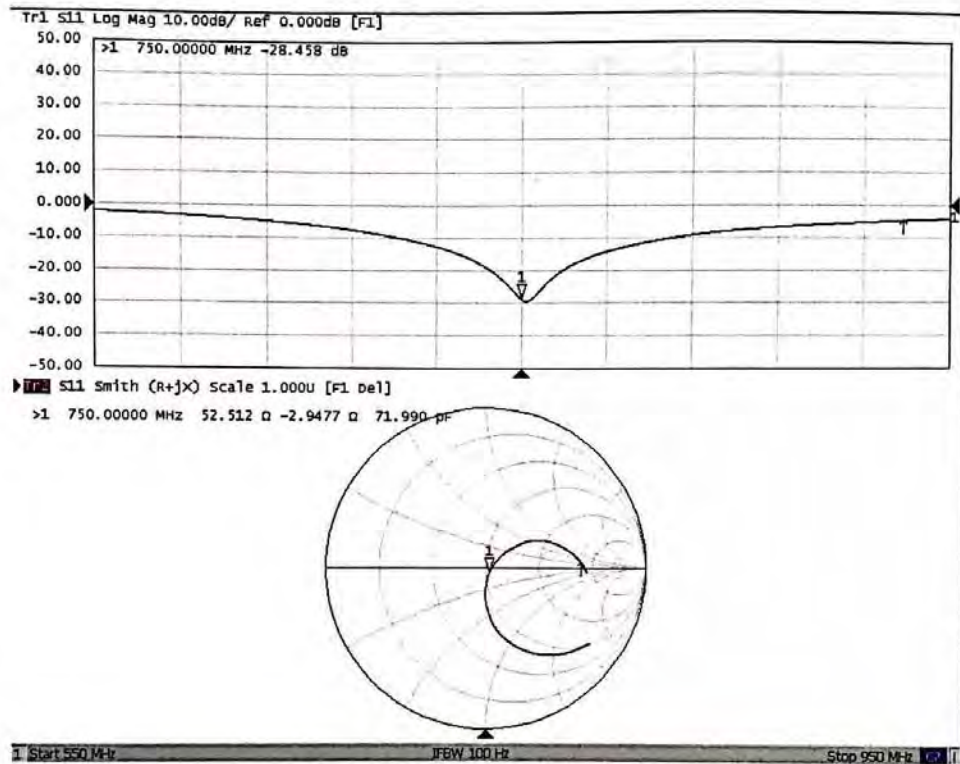
0 dB = 2.80 W/kg = 4.47 dBW/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 08.27.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1045

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.952 \text{ S/m}$; $\epsilon_r = 55.68$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.8, 9.8, 9.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

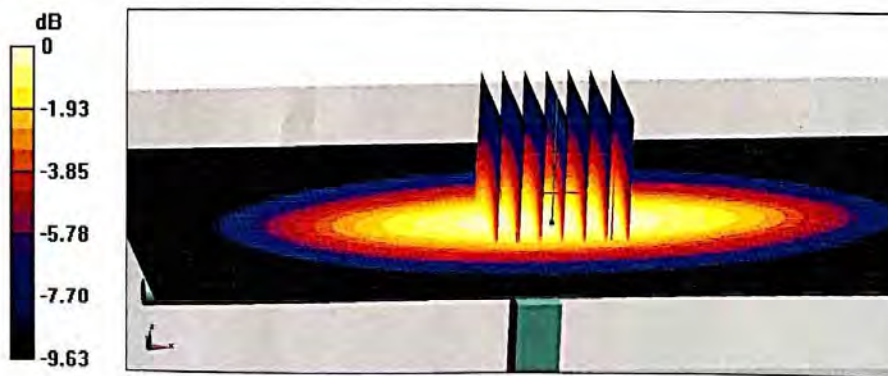
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.33 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.23 W/kg

SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.46 W/kg

Maximum value of SAR (measured) = 2.88 W/kg



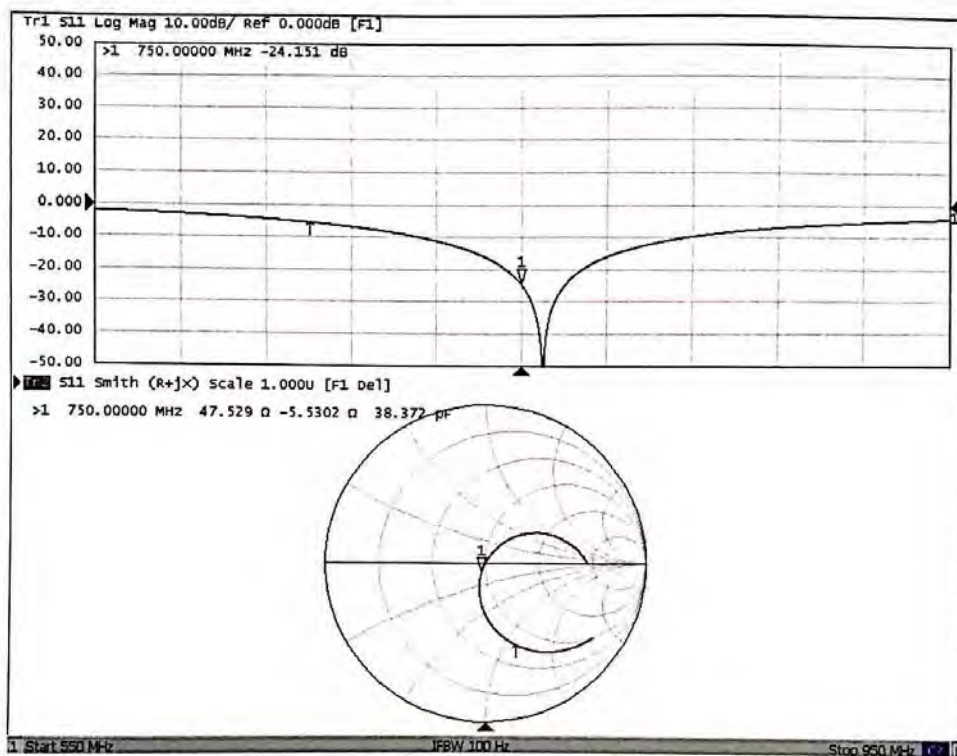
0 dB = 2.88 W/kg = 4.59 dBW/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



**ANNEX F: D1750V2 Dipole Calibration Certificate**

In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ctll@chinattl.com http://www.chinattl.cn

Client

TA(Shanghai)

Certificate No: Z17-97002

CALIBRATION CERTIFICATE

Object

D1750V2 - SN: 1033

Calibration Procedure(s)

FD-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

January 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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7307	19-Feb-16(SPEAG,No.EX3-7307_Feb16)	Feb-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: January 12, 2017

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

Certificate No: Z17-97002

Page 1 of 8



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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:

- 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
- 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 300MHz to 3GHz)", February 2005
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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%.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 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 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.35 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.27 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	37.2 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.90 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	19.7 mW / g $\pm$ 20.4 % (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 $\pm$ 0.2) °C	53.1 $\pm$ 6 %	1.48 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.40 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	37.6 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.03 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.1 mW / g $\pm$ 20.4 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8Ω+ 0.93jΩ
Return Loss	- 40.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.7Ω- 0.10jΩ
Return Loss	- 25.0dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.327 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
-----------------	-------



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 01.10.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.352$ S/m; $\epsilon_r = 39.36$; $\rho = 1000$ kg/m³

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.37, 8.37, 8.37); Calibrated: 2/19/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

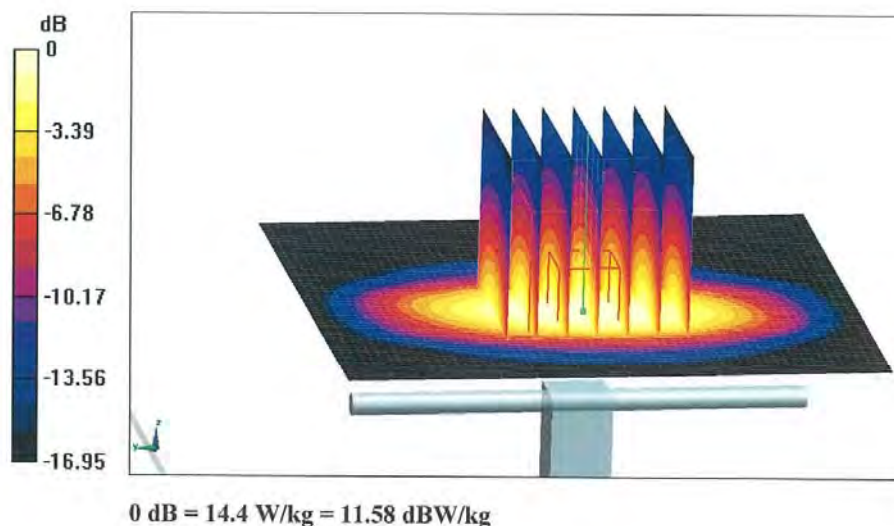
dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.21V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.1 W/kg

SAR(1 g) = 9.27 W/kg; SAR(10 g) = 4.9 W/kg

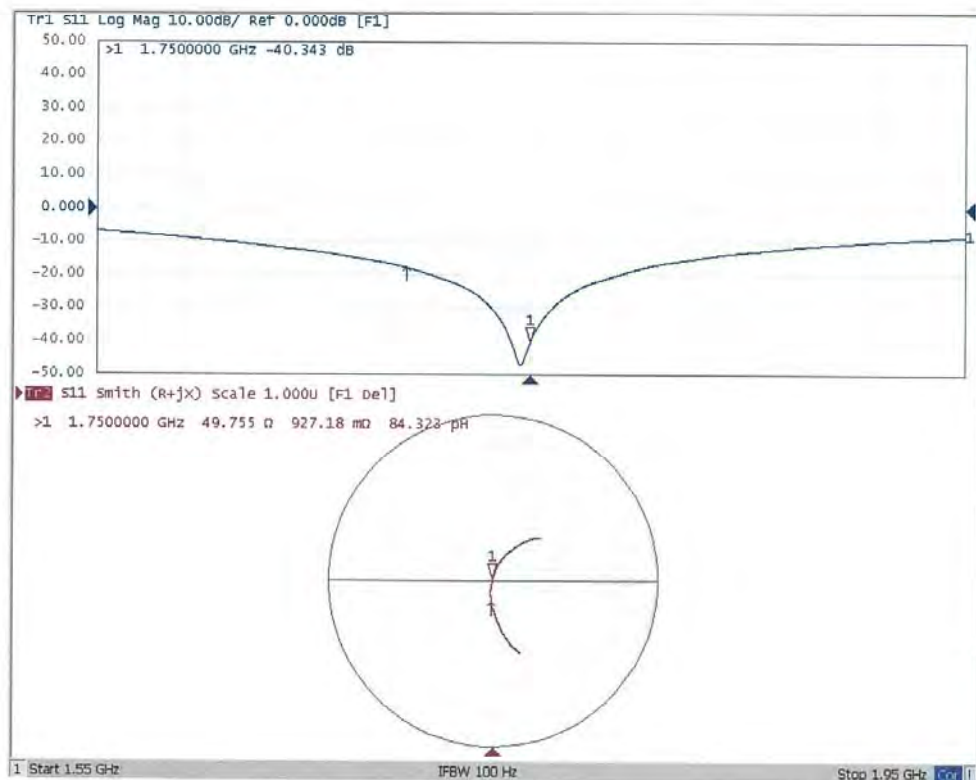
Maximum value of SAR (measured) = 14.4 W/kg





Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ctll@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 01.10.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.484$ S/m; $\epsilon_r = 53.05$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.18, 8.18, 8.18); Calibrated: 2/19/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

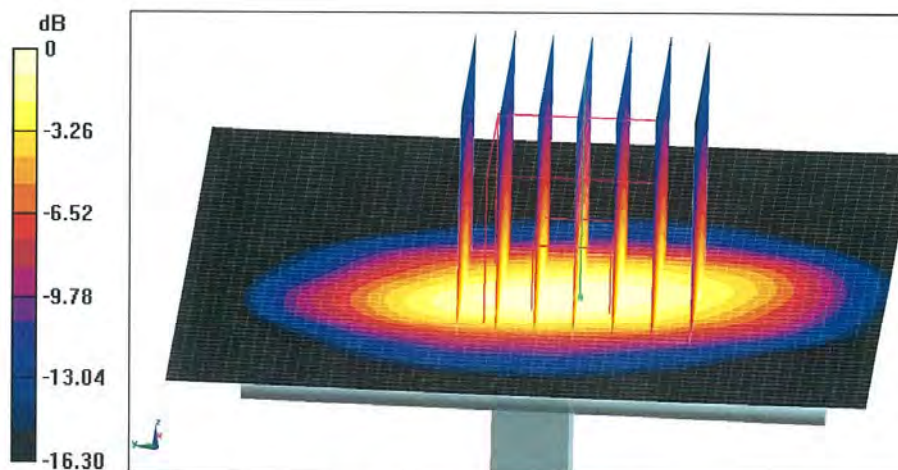
dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.52 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.4 W/kg; SAR(10 g) = 5.03 W/kg

Maximum value of SAR (measured) = 14.1 W/kg

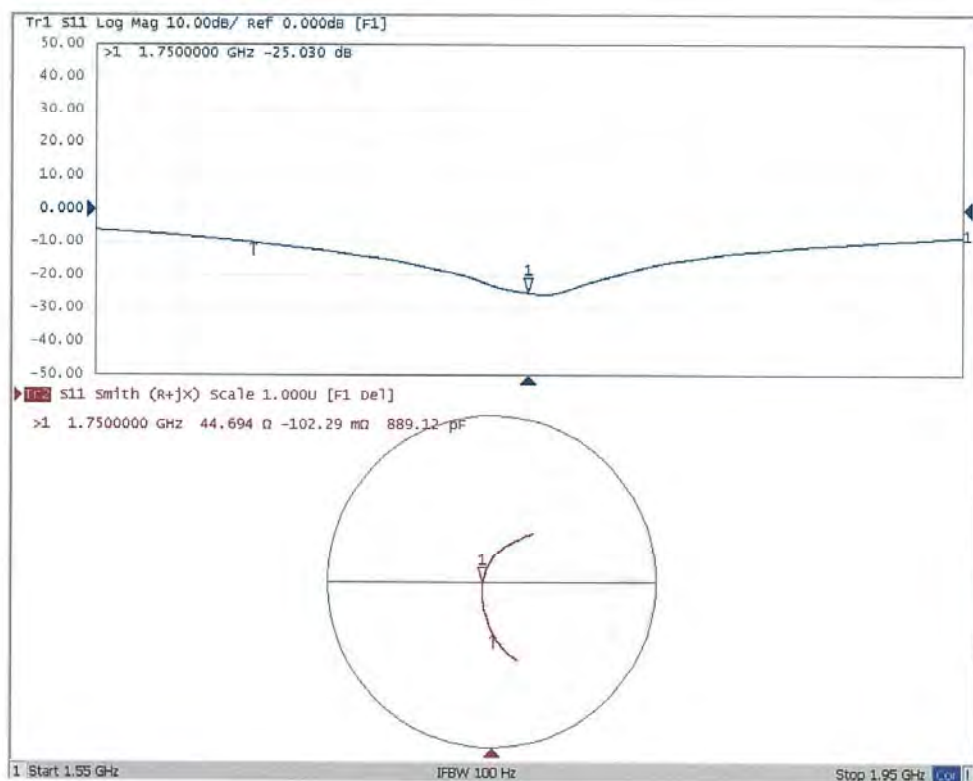


0 dB = 14.1 W/kg = 11.49 dBW/kg



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
 Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
 E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL





ANNEX G: D1900V2 Dipole Calibration Certificate



In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client

TA(Shanghai)

Certificate No: Z17-97115

CALIBRATION CERTIFICATE

Object

D1900V2 - SN: 5d060

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

August 26, 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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 30, 2017

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

Certificate No: Z17-97115

Page 1 of 8



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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:

- 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
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

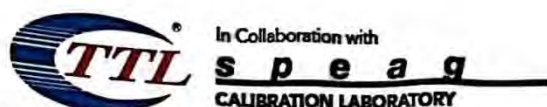
Additional Documentation:

- 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%.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 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 $\pm$ 0.2) °C	39.9 $\pm$ 6 %	1.41 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	40.1 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.19 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.7 mW / g $\pm$ 18.7 % (k=2)

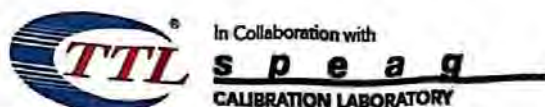
Body TSL parameters

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 $\pm$ 0.2) °C	53.6 $\pm$ 6 %	1.53 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.90 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	39.5 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.21 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.8 mW / g $\pm$ 18.7 % (k=2)



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0Ω+ 6.59jΩ
Return Loss	- 23.4dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.7Ω+ 8.35jΩ
Return Loss	- 21.4dB

General Antenna Parameters and Design

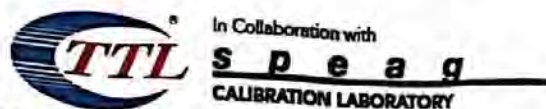
Electrical Delay (one direction)	1.302 ns
----------------------------------	----------

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
-----------------	-------



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 08.26.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.413$ S/m; $\epsilon_r = 39.85$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.26, 8.26, 8.26); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

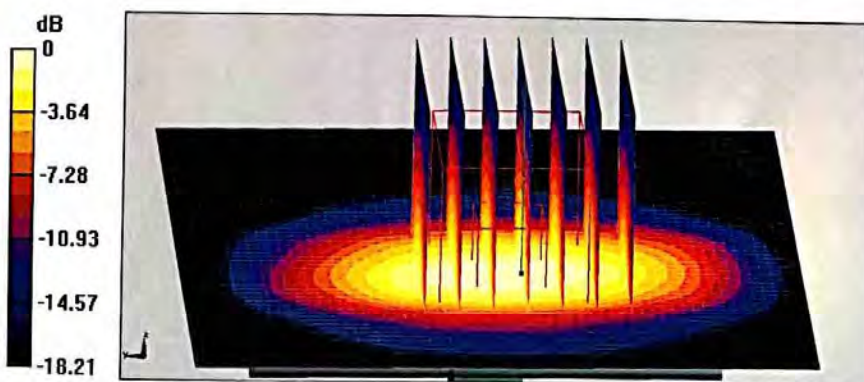
 $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 94.94 V/m; Power Drift = 0.01 dB

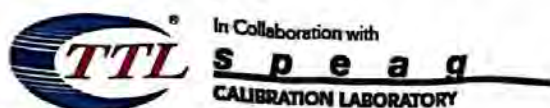
Peak SAR (extrapolated) = 19.5 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.19 W/kg

Maximum value of SAR (measured) = 15.9 W/kg

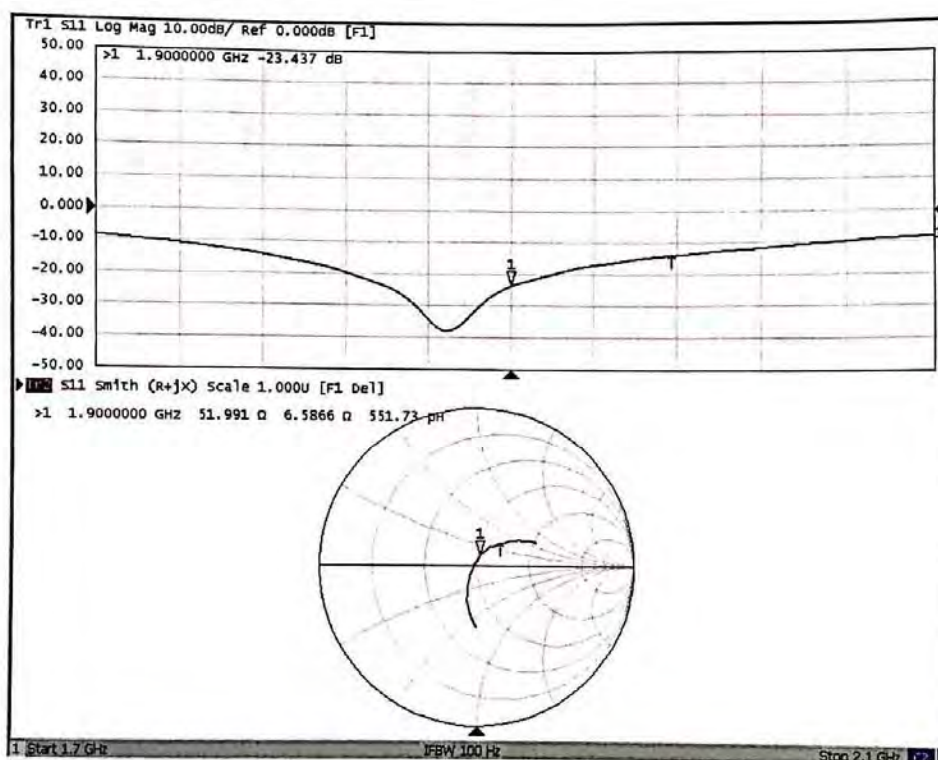


0 dB = 15.9 W/kg = 12.01 dBW/kg



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL

Date: 08.26.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.528$ S/m; $\epsilon_r = 53.55$; $\rho = 1000$ kg/m³

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.95, 7.95, 7.95); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

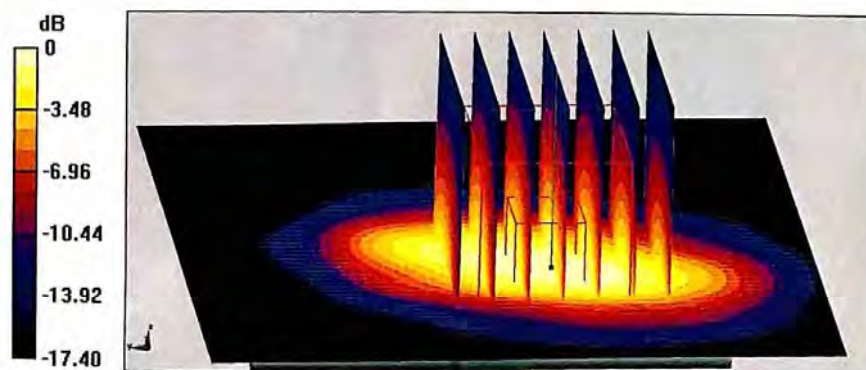
dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.19 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.21 W/kg

Maximum value of SAR (measured) = 15.3 W/kg



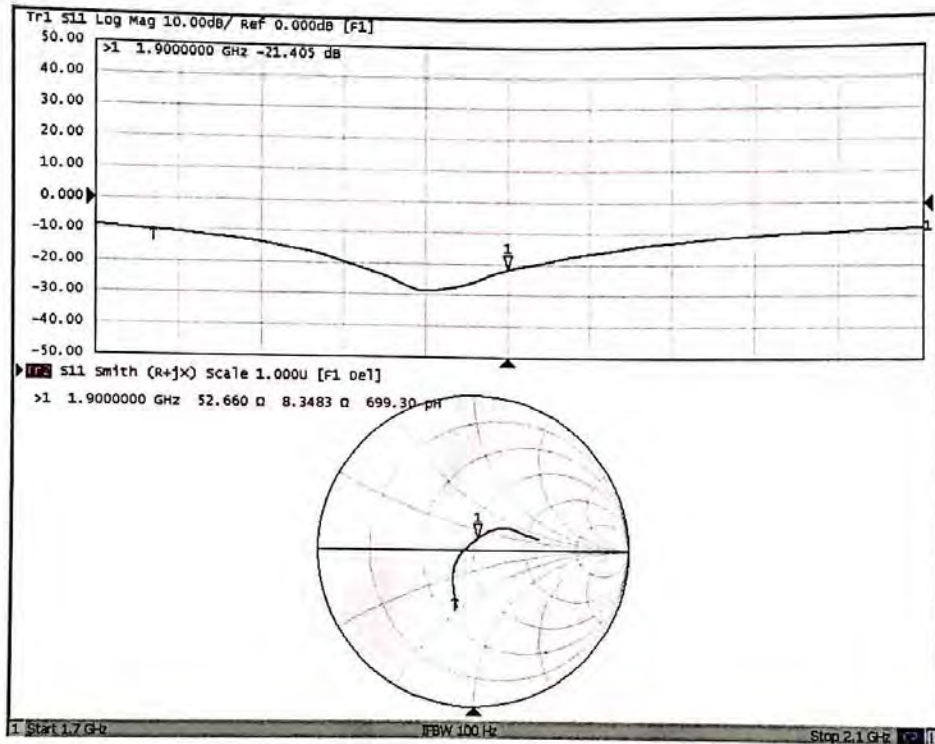
0 dB = 15.3 W/kg = 11.85 dBW/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



ANNEX H: The EUT Appearances and Test Configuration

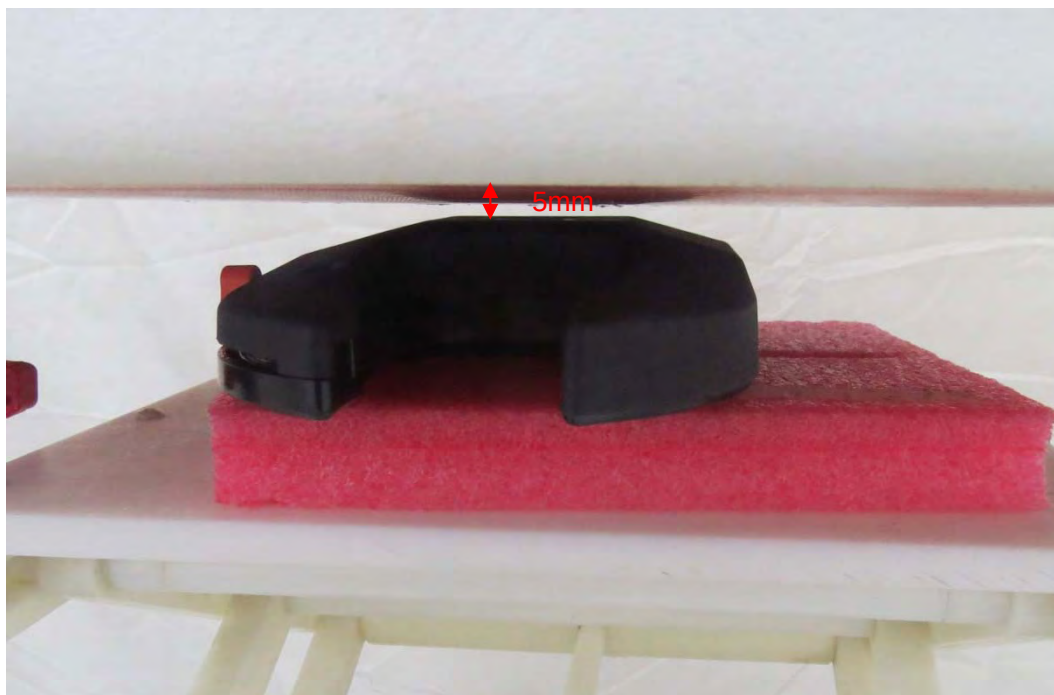


Front Side



Back Side

Picture 4: Constituents of EUT



Picture 5: Front Side, the distance from handset to the bottom of the Phantom is 5mm



Picture 6: Front-Right Tilt, the distance from handset to the bottom of the Phantom is 5mm



Picture 7: Right Edge, the distance from handset to the bottom of the Phantom is 5mm



Picture 8: Top Side, the distance from handset to the bottom of the Phantom is 10mm



Picture 9: Top-Right Tilt, the distance from handset to the bottom of the Phantom is 5mm