

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	2.48	66.86	14.99	0.00	150.0	± 9.6 %
		Y	2.30	65.90	14.17		150.0	
		Z	2.37	66.79	14.57		150.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	1.53	68.05	15.40	0.00	150.0	± 9.6 %
		Y	1.32	66.12	13.91		150.0	
		Z	1.45	67.75	14.99		150.0	
10277-CAA	PHS (QPSK)	X	1.30	58.93	4.20	9.03	50.0	± 9.6 %
		Y	1.32	58.56	3.87		50.0	
		Z	1.18	58.32	3.49		50.0	
10278-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	X	2.49	64.91	10.26	9.03	50.0	± 9.6 %
		Y	2.32	63.55	9.26		50.0	
		Z	2.17	63.27	8.86		50.0	
10279-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	X	2.57	65.18	10.47	9.03	50.0	± 9.6 %
		Y	2.38	63.76	9.44		50.0	
		Z	2.22	63.44	9.03		50.0	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	1.01	65.74	11.23	0.00	150.0	± 9.6 %
		Y	0.67	61.70	8.06		150.0	
		Z	0.69	62.65	8.67		150.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	0.64	64.08	10.26	0.00	150.0	± 9.6 %
		Y	0.41	60.32	6.85		150.0	
		Z	0.48	61.84	8.06		150.0	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	0.93	69.17	13.09	0.00	150.0	± 9.6 %
		Y	0.46	61.72	7.96		150.0	
		Z	0.63	65.19	10.18		150.0	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	2.58	81.84	18.38	0.00	150.0	± 9.6 %
		Y	0.61	64.42	9.84		150.0	
		Z	1.45	74.16	14.40		150.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	16.38	93.11	24.71	9.03	50.0	± 9.6 %
		Y	16.06	90.60	23.14		50.0	
		Z	41.75	104.48	26.91		50.0	
10297-AAC	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	2.56	69.49	16.58	0.00	150.0	± 9.6 %
		Y	2.33	68.15	15.68		150.0	
		Z	2.43	69.17	16.39		150.0	
10298-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	1.18	65.35	11.77	0.00	150.0	± 9.6 %
		Y	0.89	62.40	9.35		150.0	
		Z	0.90	63.00	9.64		150.0	
10299-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	1.36	63.05	9.42	0.00	150.0	± 9.6 %
		Y	1.26	62.26	8.62		150.0	
		Z	1.05	61.24	7.54		150.0	
10300-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	1.15	60.99	7.59	0.00	150.0	± 9.6 %
		Y	1.07	60.46	6.94		150.0	
		Z	0.89	59.75	5.99		150.0	
10301-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	X	4.25	64.73	16.86	4.17	50.0	± 9.6 %
		Y	4.21	64.78	16.74		50.0	
		Z	4.10	64.79	16.69		50.0	
10302-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	X	4.74	65.43	17.63	4.96	50.0	± 9.6 %
		Y	4.66	65.24	17.38		50.0	
		Z	4.60	65.49	17.44		50.0	

Certificate No: EX3-7494_Feb18

Page 23 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	4.49	65.00	17.39	4.96	50.0	± 9.6 %
		Y	4.44	65.13	17.34		50.0	
		Z	4.36	65.13	17.21		50.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	4.34	65.04	16.98	4.17	50.0	± 9.6 %
		Y	4.25	64.81	16.70		50.0	
		Z	4.21	65.16	16.81		50.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	3.71	65.40	17.85	6.02	35.0	± 9.6 %
		Y	3.72	65.71	17.67		35.0	
		Z	3.59	65.50	17.36		35.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	4.14	65.15	17.96	6.02	35.0	± 9.6 %
		Y	4.12	65.33	17.82		35.0	
		Z	4.02	65.33	17.66		35.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	4.01	65.07	17.81	6.02	35.0	± 9.6 %
		Y	3.99	65.26	17.66		35.0	
		Z	3.89	65.22	17.49		35.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	3.97	65.21	17.93	6.02	35.0	± 9.6 %
		Y	3.96	65.42	17.79		35.0	
		Z	3.86	65.37	17.62		35.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	4.16	65.22	18.05	6.02	35.0	± 9.6 %
		Y	4.14	65.39	17.90		35.0	
		Z	4.03	65.36	17.74		35.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	4.09	65.15	17.92	6.02	35.0	± 9.6 %
		Y	4.07	65.35	17.79		35.0	
		Z	3.97	65.35	17.65		35.0	
10311-AAC	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	2.92	68.73	16.23	0.00	150.0	± 9.6 %
		Y	2.68	67.45	15.43		150.0	
		Z	2.78	68.38	16.08		150.0	
10313-AAA	iDEN 1:3	X	2.23	70.71	15.35	6.99	70.0	± 9.6 %
		Y	1.69	66.90	13.17		70.0	
		Z	2.30	71.64	15.93		70.0	
10314-AAA	iDEN 1:6	X	4.08	80.89	22.31	10.00	30.0	± 9.6 %
		Y	3.04	75.07	19.42		30.0	
		Z	4.65	83.62	23.48		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.04	63.55	14.98	0.17	150.0	± 9.6 %
		Y	0.94	62.52	14.02		150.0	
		Z	1.03	63.50	14.81		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.37	66.68	16.19	0.17	150.0	± 9.6 %
		Y	4.26	66.34	15.95		150.0	
		Z	4.26	66.72	16.11		150.0	
10317-AAC	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.37	66.68	16.19	0.17	150.0	± 9.6 %
		Y	4.26	66.34	15.95		150.0	
		Z	4.26	66.72	16.11		150.0	
10400-AAD	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.46	67.02	16.23	0.00	150.0	± 9.6 %
		Y	4.33	66.64	15.97		150.0	
		Z	4.31	66.98	16.13		150.0	
10401-AAD	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.12	66.82	16.24	0.00	150.0	± 9.6 %
		Y	5.01	66.51	16.06		150.0	
		Z	4.99	66.73	16.17		150.0	

Certificate No: EX3-7494_Feb18

Page 24 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10402-AAD	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.47	67.39	16.42	0.00	150.0	± 9.6 %
		Y	5.37	67.08	16.25		150.0	
		Z	5.37	67.35	16.39		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	1.01	65.74	11.23	0.00	115.0	± 9.6 %
		Y	0.67	61.70	8.06		115.0	
		Z	0.69	62.65	8.67		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	1.01	65.74	11.23	0.00	115.0	± 9.6 %
		Y	0.67	61.70	8.06		115.0	
		Z	0.69	62.65	8.67		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	13.40	94.87	22.42	0.00	100.0	± 9.6 %
		Y	37.24	104.89	24.38		100.0	
		Z	100.00	114.79	25.79		100.0	
10410-AAD	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4)	X	2.95	79.35	18.40	3.23	80.0	± 9.6 %
		Y	3.69	82.30	19.32		80.0	
		Z	3.87	84.90	20.56		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	1.00	63.14	14.62	0.00	150.0	± 9.6 %
		Y	0.91	62.12	13.65		150.0	
		Z	0.99	63.08	14.44		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.35	66.77	16.19	0.00	150.0	± 9.6 %
		Y	4.23	66.41	15.93		150.0	
		Z	4.24	66.81	16.11		150.0	
10417-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.35	66.77	16.19	0.00	150.0	± 9.6 %
		Y	4.23	66.41	15.93		150.0	
		Z	4.24	66.81	16.11		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)	X	4.35	66.98	16.25	0.00	150.0	± 9.6 %
		Y	4.23	66.61	15.99		150.0	
		Z	4.23	67.03	16.19		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)	X	4.36	66.91	16.23	0.00	150.0	± 9.6 %
		Y	4.24	66.55	15.97		150.0	
		Z	4.25	66.96	16.17		150.0	
10422-AAB	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.47	66.89	16.24	0.00	150.0	± 9.6 %
		Y	4.35	66.53	15.99		150.0	
		Z	4.35	66.92	16.18		150.0	
10423-AAB	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	4.59	67.14	16.33	0.00	150.0	± 9.6 %
		Y	4.47	66.78	16.08		150.0	
		Z	4.46	67.16	16.25		150.0	
10424-AAB	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.52	67.09	16.31	0.00	150.0	± 9.6 %
		Y	4.40	66.73	16.05		150.0	
		Z	4.39	67.09	16.23		150.0	
10425-AAB	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.15	67.27	16.49	0.00	150.0	± 9.6 %
		Y	5.05	66.98	16.31		150.0	
		Z	5.01	67.17	16.41		150.0	
10426-AAB	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.17	67.36	16.53	0.00	150.0	± 9.6 %
		Y	5.08	67.12	16.38		150.0	
		Z	5.05	67.33	16.49		150.0	

Certificate No: EX3-7494_Feb18

Page 25 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10427-AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.13	67.15	16.42	0.00	150.0	± 9.6 %
		Y	5.03	66.85	16.24		150.0	
		Z	5.01	67.11	16.38		150.0	
10430-AAB	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.23	72.27	18.34	0.00	150.0	± 9.6 %
		Y	3.99	71.49	17.71		150.0	
		Z	4.17	72.80	18.15		150.0	
10431-AAB	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	3.96	67.36	16.06	0.00	150.0	± 9.6 %
		Y	3.81	66.88	15.67		150.0	
		Z	3.81	67.37	15.87		150.0	
10432-AAB	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.29	67.19	16.23	0.00	150.0	± 9.6 %
		Y	4.15	66.79	15.93		150.0	
		Z	4.15	67.22	16.13		150.0	
10433-AAB	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.54	67.13	16.33	0.00	150.0	± 9.6 %
		Y	4.42	66.76	16.08		150.0	
		Z	4.41	67.14	16.25		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.34	73.15	18.13	0.00	150.0	± 9.6 %
		Y	3.97	71.83	17.20		150.0	
		Z	4.17	73.19	17.60		150.0	
10435-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.84	78.74	18.13	3.23	80.0	± 9.6 %
		Y	3.48	81.45	18.98		80.0	
		Z	3.64	83.98	20.20		80.0	
10447-AAB	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.20	67.15	14.91	0.00	150.0	± 9.6 %
		Y	2.99	66.28	14.17		150.0	
		Z	2.97	66.77	14.26		150.0	
10448-AAB	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	3.83	67.16	15.94	0.00	150.0	± 9.6 %
		Y	3.68	66.67	15.55		150.0	
		Z	3.69	67.18	15.75		150.0	
10449-AAB	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	4.13	67.03	16.13	0.00	150.0	± 9.6 %
		Y	4.00	66.61	15.83		150.0	
		Z	4.00	67.05	16.03		150.0	
10450-AAB	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.34	66.91	16.19	0.00	150.0	± 9.6 %
		Y	4.22	66.53	15.92		150.0	
		Z	4.23	66.92	16.11		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	2.99	66.88	14.14	0.00	150.0	± 9.6 %
		Y	2.74	65.78	13.23		150.0	
		Z	2.69	66.07	13.18		150.0	
10456-AAB	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.06	67.78	16.63	0.00	150.0	± 9.6 %
		Y	6.00	67.55	16.51		150.0	
		Z	6.07	68.05	16.78		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.71	65.53	15.92	0.00	150.0	± 9.6 %
		Y	3.61	65.20	15.66		150.0	
		Z	3.65	65.68	15.87		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	3.70	71.13	16.64	0.00	150.0	± 9.6 %
		Y	3.25	69.16	15.28		150.0	
		Z	3.15	69.17	14.95		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	4.84	69.11	17.84	0.00	150.0	± 9.6 %
		Y	4.69	68.77	17.48		150.0	
		Z	4.58	68.84	17.14		150.0	

Certificate No: EX3-7494_Feb18

Page 26 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10460-AAA	UMTS-FDD (WCDMA, AMR)	X	0.88	68.39	16.07	0.00	150.0	± 9.6 %
		Y	0.70	65.56	13.77		150.0	
		Z	0.84	67.99	15.62		150.0	
10461-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.57	72.49	16.91	3.29	80.0	± 9.6 %
		Y	2.31	77.86	18.85		80.0	
		Z	1.89	76.90	18.97		80.0	
10462-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.36	3.23	80.0	± 9.6 %
		Y	0.67	60.00	7.26		80.0	
		Z	0.57	60.00	7.02		80.0	
10463-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.67	3.23	80.0	± 9.6 %
		Y	0.68	60.00	6.58		80.0	
		Z	0.60	60.00	6.22		80.0	
10464-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.23	69.24	14.93	3.23	80.0	± 9.6 %
		Y	1.59	72.66	16.19		80.0	
		Z	1.42	72.83	16.69		80.0	
10465-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.28	3.23	80.0	± 9.6 %
		Y	0.67	60.00	7.19		80.0	
		Z	0.57	60.00	6.95		80.0	
10466-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.62	3.23	80.0	± 9.6 %
		Y	0.69	60.00	6.54		80.0	
		Z	0.60	60.00	6.18		80.0	
10467-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.28	69.83	15.22	3.23	80.0	± 9.6 %
		Y	1.71	73.64	16.62		80.0	
		Z	1.51	73.74	17.10		80.0	
10468-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.31	3.23	80.0	± 9.6 %
		Y	0.66	60.00	7.22		80.0	
		Z	0.57	60.00	6.98		80.0	
10469-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.62	3.23	80.0	± 9.6 %
		Y	0.68	60.00	6.54		80.0	
		Z	0.60	60.00	6.18		80.0	
10470-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.27	69.83	15.21	3.23	80.0	± 9.6 %
		Y	1.71	73.66	16.62		80.0	
		Z	1.50	73.77	17.11		80.0	
10471-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.29	3.23	80.0	± 9.6 %
		Y	0.66	60.00	7.20		80.0	
		Z	0.57	60.00	6.96		80.0	
10472-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.60	3.23	80.0	± 9.6 %
		Y	0.68	60.00	6.52		80.0	
		Z	0.31	55.91	4.03		80.0	
10473-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.27	69.80	15.19	3.23	80.0	± 9.6 %
		Y	1.70	73.59	16.59		80.0	
		Z	1.50	73.71	17.08		80.0	
10474-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.29	3.23	80.0	± 9.6 %
		Y	0.66	60.00	7.20		80.0	
		Z	0.57	60.00	6.96		80.0	
10475-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.60	3.23	80.0	± 9.6 %
		Y	0.68	60.00	6.52		80.0	
		Z	0.31	55.90	4.03		80.0	

Certificate No: EX3-7494_Feb18

Page 27 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4-- SN:7494

February 26, 2018

10477-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.65	60.00	7.26	3.23	80.0	± 9.6 %
		Y	0.66	60.00	7.17		80.0	
		Z	0.57	60.00	6.93		80.0	
10478-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.67	60.00	6.59	3.23	80.0	± 9.6 %
		Y	0.68	60.00	6.51		80.0	
		Z	0.31	55.89	4.01		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.24	76.16	18.67	3.23	80.0	± 9.6 %
		Y	4.42	80.82	20.23		80.0	
		Z	4.39	82.21	20.82		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.03	66.76	12.73	3.23	80.0	± 9.6 %
		Y	2.05	66.92	12.60		80.0	
		Z	1.85	67.01	12.43		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.62	63.96	11.04	3.23	80.0	± 9.6 %
		Y	1.57	63.66	10.70		80.0	
		Z	1.32	63.18	10.24		80.0	
10482-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.53	65.20	12.69	2.23	80.0	± 9.6 %
		Y	1.10	61.56	10.21		80.0	
		Z	1.14	62.42	10.54		80.0	
10483-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.45	61.38	9.71	2.23	80.0	± 9.6 %
		Y	1.32	60.52	8.97		80.0	
		Z	1.16	60.00	8.17		80.0	
10484-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.44	61.07	9.53	2.23	80.0	± 9.6 %
		Y	1.32	60.25	8.82		80.0	
		Z	1.19	60.00	8.15		80.0	
10485-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.16	69.31	16.02	2.23	80.0	± 9.6 %
		Y	1.69	66.06	14.04		80.0	
		Z	1.93	68.38	15.12		80.0	
10486-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.10	65.45	13.37	2.23	80.0	± 9.6 %
		Y	1.71	62.92	11.64		80.0	
		Z	1.73	63.60	11.80		80.0	
10487-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.11	65.08	13.16	2.23	80.0	± 9.6 %
		Y	1.73	62.69	11.49		80.0	
		Z	1.73	63.23	11.57		80.0	
10488-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.58	69.55	17.35	2.23	80.0	± 9.6 %
		Y	2.27	67.73	16.25		80.0	
		Z	2.45	69.44	17.18		80.0	
10489-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.75	67.17	16.06	2.23	80.0	± 9.6 %
		Y	2.49	65.86	15.18		80.0	
		Z	2.63	67.13	15.78		80.0	
10490-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.83	67.06	16.01	2.23	80.0	± 9.6 %
		Y	2.57	65.81	15.15		80.0	
		Z	2.69	66.99	15.69		80.0	
10491-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.92	68.61	17.17	2.23	80.0	± 9.6 %
		Y	2.65	67.28	16.37		80.0	
		Z	2.77	68.48	17.08		80.0	
10492-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.13	66.69	16.33	2.23	80.0	± 9.6 %
		Y	2.92	65.77	15.72		80.0	
		Z	3.01	66.69	16.19		80.0	

Certificate No: EX3-7494_Feb18

Page 28 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10493-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.19	66.60	16.28	2.23	80.0	± 9.6 %
		Y	2.99	65.70	15.69		80.0	
		Z	3.07	66.59	16.12		80.0	
10494-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.09	69.75	17.58	2.23	80.0	± 9.6 %
		Y	2.78	68.23	16.72		80.0	
		Z	2.93	69.54	17.51		80.0	
10495-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.15	66.91	16.53	2.23	80.0	± 9.6 %
		Y	2.94	65.97	15.94		80.0	
		Z	3.03	66.87	16.43		80.0	
10496-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.24	66.76	16.49	2.23	80.0	± 9.6 %
		Y	3.04	65.88	15.93		80.0	
		Z	3.12	66.74	16.39		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	0.93	60.00	8.57	2.23	80.0	± 9.6 %
		Y	0.90	60.00	7.78		80.0	
		Z	0.86	60.00	7.53		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.10	60.00	7.25	2.23	80.0	± 9.6 %
		Y	1.08	60.00	6.57		80.0	
		Z	1.05	60.00	6.14		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.12	60.00	7.08	2.23	80.0	± 9.6 %
		Y	1.11	60.00	6.40		80.0	
		Z	1.08	60.00	5.96		80.0	
10500-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.33	69.42	16.57	2.23	80.0	± 9.6 %
		Y	1.93	66.88	15.00		80.0	
		Z	2.16	69.02	16.03		80.0	
10501-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.42	66.55	14.60	2.23	80.0	± 9.6 %
		Y	2.06	64.46	13.19		80.0	
		Z	2.16	65.57	13.59		80.0	
10502-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.46	66.38	14.43	2.23	80.0	± 9.6 %
		Y	2.09	64.32	13.03		80.0	
		Z	2.17	65.33	13.38		80.0	
10503-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.55	69.37	17.25	2.23	80.0	± 9.6 %
		Y	2.24	67.56	16.15		80.0	
		Z	2.42	69.25	17.08		80.0	
10504-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.73	67.07	16.00	2.23	80.0	± 9.6 %
		Y	2.48	65.76	15.11		80.0	
		Z	2.61	67.02	15.71		80.0	
10505-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.82	66.97	15.95	2.23	80.0	± 9.6 %
		Y	2.56	65.72	15.09		80.0	
		Z	2.68	66.89	15.62		80.0	
10506-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.07	69.63	17.51	2.23	80.0	± 9.6 %
		Y	2.76	68.11	16.65		80.0	
		Z	2.91	69.41	17.44		80.0	
10507-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.14	66.85	16.49	2.23	80.0	± 9.6 %
		Y	2.93	65.91	15.90		80.0	
		Z	3.02	66.81	16.39		80.0	

Certificate No: EX3-7494_Feb18

Page 29 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10508-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.23	66.69	16.44	2.23	80.0	± 9.6 %
		Y	3.03	65.82	15.89		80.0	
		Z	3.11	66.67	16.35		80.0	
10509-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.52	68.96	17.25	2.23	80.0	± 9.6 %
		Y	3.24	67.75	16.57		80.0	
		Z	3.37	68.79	17.22		80.0	
10510-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.62	66.72	16.61	2.23	80.0	± 9.6 %
		Y	3.43	65.94	16.15		80.0	
		Z	3.50	66.61	16.55		80.0	
10511-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.70	66.58	16.58	2.23	80.0	± 9.6 %
		Y	3.51	65.85	16.14		80.0	
		Z	3.58	66.51	16.52		80.0	
10512-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.56	70.02	17.57	2.23	80.0	± 9.6 %
		Y	3.23	68.54	16.78		80.0	
		Z	3.39	69.70	17.50		80.0	
10513-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.50	66.80	16.66	2.23	80.0	± 9.6 %
		Y	3.31	65.98	16.18		80.0	
		Z	3.39	66.65	16.59		80.0	
10514-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.56	66.53	16.58	2.23	80.0	± 9.6 %
		Y	3.38	65.75	16.13		80.0	
		Z	3.45	66.40	16.52		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.96	63.31	14.68	0.00	150.0	± 9.6 %
		Y	0.87	62.23	13.64		150.0	
		Z	0.95	63.24	14.49		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.59	70.32	17.28	0.00	150.0	± 9.6 %
		Y	0.43	66.45	13.92		150.0	
		Z	0.56	69.40	16.67		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.81	65.09	15.27	0.00	150.0	± 9.6 %
		Y	0.69	63.42	13.73		150.0	
		Z	0.79	64.83	14.98		150.0	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.34	66.88	16.18	0.00	150.0	± 9.6 %
		Y	4.22	66.51	15.92		150.0	
		Z	4.23	66.93	16.12		150.0	
10519-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.48	67.04	16.27	0.00	150.0	± 9.6 %
		Y	4.36	66.68	16.01		150.0	
		Z	4.35	67.07	16.19		150.0	
10520-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.34	66.97	16.18	0.00	150.0	± 9.6 %
		Y	4.22	66.59	15.92		150.0	
		Z	4.22	66.99	16.11		150.0	
10521-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.28	66.94	16.16	0.00	150.0	± 9.6 %
		Y	4.15	66.54	15.89		150.0	
		Z	4.15	66.93	16.07		150.0	
10522-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.32	67.05	16.25	0.00	150.0	± 9.6 %
		Y	4.19	66.65	15.97		150.0	
		Z	4.18	66.98	16.13		150.0	

Certificate No: EX3-7494_Feb18

Page 30 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10523-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.26	67.08	16.19	0.00	150.0	± 9.6 %
		Y	4.13	66.69	15.91		150.0	
		Z	4.15	67.15	16.14		150.0	
10524-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.28	67.03	16.25	0.00	150.0	± 9.6 %
		Y	4.15	66.64	15.98		150.0	
		Z	4.14	67.03	16.17		150.0	
10525-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.31	66.15	15.88	0.00	150.0	± 9.6 %
		Y	4.19	65.75	15.61		150.0	
		Z	4.20	66.20	15.83		150.0	
10526-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.43	66.41	15.99	0.00	150.0	± 9.6 %
		Y	4.30	66.01	15.72		150.0	
		Z	4.30	66.42	15.92		150.0	
10527-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.36	66.39	15.93	0.00	150.0	± 9.6 %
		Y	4.23	65.97	15.65		150.0	
		Z	4.24	66.40	15.86		150.0	
10528-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.38	66.40	15.96	0.00	150.0	± 9.6 %
		Y	4.25	65.99	15.69		150.0	
		Z	4.25	66.41	15.89		150.0	
10529-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.38	66.40	15.96	0.00	150.0	± 9.6 %
		Y	4.25	65.99	15.69		150.0	
		Z	4.25	66.41	15.89		150.0	
10531-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.34	66.42	15.94	0.00	150.0	± 9.6 %
		Y	4.21	65.99	15.65		150.0	
		Z	4.20	66.38	15.85		150.0	
10532-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.23	66.28	15.87	0.00	150.0	± 9.6 %
		Y	4.09	65.84	15.58		150.0	
		Z	4.10	66.26	15.79		150.0	
10533-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.38	66.48	15.97	0.00	150.0	± 9.6 %
		Y	4.25	66.07	15.69		150.0	
		Z	4.25	66.50	15.90		150.0	
10534-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	4.94	66.38	16.03	0.00	150.0	± 9.6 %
		Y	4.83	66.04	15.82		150.0	
		Z	4.83	66.34	15.98		150.0	
10535-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	4.98	66.50	16.09	0.00	150.0	± 9.6 %
		Y	4.87	66.15	15.88		150.0	
		Z	4.85	66.43	16.03		150.0	
10536-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	4.87	66.51	16.07	0.00	150.0	± 9.6 %
		Y	4.76	66.13	15.84		150.0	
		Z	4.75	66.43	16.01		150.0	
10537-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	4.94	66.51	16.07	0.00	150.0	± 9.6 %
		Y	4.83	66.19	15.88		150.0	
		Z	4.83	66.50	16.04		150.0	
10538-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.00	66.46	16.08	0.00	150.0	± 9.6 %
		Y	4.89	66.12	15.88		150.0	
		Z	4.87	66.39	16.02		150.0	
10540-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	4.93	66.42	16.08	0.00	150.0	± 9.6 %
		Y	4.82	66.06	15.87		150.0	
		Z	4.81	66.35	16.02		150.0	

Certificate No: EX3-7494_Feb18

Page 31 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10541-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	4.92	66.35	16.03	0.00	150.0	± 9.6 %
		Y	4.81	65.99	15.82		150.0	
		Z	4.81	66.31	15.98		150.0	
10542-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.07	66.45	16.09	0.00	150.0	± 9.6 %
		Y	4.96	66.11	15.90		150.0	
		Z	4.95	66.40	16.04		150.0	
10543-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.15	66.53	16.16	0.00	150.0	± 9.6 %
		Y	5.05	66.25	16.00		150.0	
		Z	5.03	66.51	16.13		150.0	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.29	66.46	16.02	0.00	150.0	± 9.6 %
		Y	5.19	66.11	15.83		150.0	
		Z	5.19	66.38	15.97		150.0	
10545-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.46	66.89	16.19	0.00	150.0	± 9.6 %
		Y	5.37	66.61	16.04		150.0	
		Z	5.35	66.81	16.15		150.0	
10546-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.32	66.57	16.05	0.00	150.0	± 9.6 %
		Y	5.22	66.23	15.86		150.0	
		Z	5.22	66.48	15.99		150.0	
10547-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.40	66.70	16.10	0.00	150.0	± 9.6 %
		Y	5.32	66.42	15.95		150.0	
		Z	5.33	66.71	16.11		150.0	
10548-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.53	67.27	16.37	0.00	150.0	± 9.6 %
		Y	5.44	66.98	16.21		150.0	
		Z	5.38	67.07	16.27		150.0	
10550-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.38	66.78	16.16	0.00	150.0	± 9.6 %
		Y	5.31	66.53	16.02		150.0	
		Z	5.31	66.81	16.17		150.0	
10551-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.31	66.54	16.01	0.00	150.0	± 9.6 %
		Y	5.20	66.17	15.81		150.0	
		Z	5.19	66.41	15.94		150.0	
10552-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.30	66.58	16.03	0.00	150.0	± 9.6 %
		Y	5.19	66.23	15.83		150.0	
		Z	5.20	66.53	15.99		150.0	
10553-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.35	66.52	16.03	0.00	150.0	± 9.6 %
		Y	5.24	66.17	15.83		150.0	
		Z	5.24	66.44	15.97		150.0	
10554-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.71	66.79	16.10	0.00	150.0	± 9.6 %
		Y	5.62	66.47	15.93		150.0	
		Z	5.63	66.70	16.05		150.0	
10555-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.80	67.00	16.19	0.00	150.0	± 9.6 %
		Y	5.71	66.69	16.02		150.0	
		Z	5.70	66.87	16.12		150.0	
10556-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.84	67.12	16.24	0.00	150.0	± 9.6 %
		Y	5.76	66.85	16.09		150.0	
		Z	5.75	67.04	16.20		150.0	
10557-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.79	66.99	16.19	0.00	150.0	± 9.6 %
		Y	5.70	66.66	16.02		150.0	
		Z	5.70	66.88	16.14		150.0	

Certificate No: EX3-7494_Feb18

Page 32 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10558-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	5.80	67.03	16.23	0.00	150.0	± 9.6 %
		Y	5.69	66.67	16.04		150.0	
		Z	5.67	66.84	16.13		150.0	
10560-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	5.82	66.97	16.24	0.00	150.0	± 9.6 %
		Y	5.72	66.63	16.06		150.0	
		Z	5.71	66.83	16.16		150.0	
10561-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.76	66.95	16.26	0.00	150.0	± 9.6 %
		Y	5.66	66.63	16.09		150.0	
		Z	5.65	66.81	16.18		150.0	
10562-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	5.80	67.11	16.34	0.00	150.0	± 9.6 %
		Y	5.70	66.75	16.15		150.0	
		Z	5.68	66.93	16.24		150.0	
10563-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	5.91	67.11	16.30	0.00	150.0	± 9.6 %
		Y	5.83	66.82	16.15		150.0	
		Z	5.80	66.98	16.24		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.65	66.88	16.30	0.46	150.0	± 9.6 %
		Y	4.54	66.54	16.07		150.0	
		Z	4.53	66.91	16.24		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	4.85	67.29	16.62	0.46	150.0	± 9.6 %
		Y	4.73	66.97	16.40		150.0	
		Z	4.71	67.32	16.56		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.68	67.10	16.42	0.46	150.0	± 9.6 %
		Y	4.56	66.75	16.18		150.0	
		Z	4.55	67.11	16.35		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	4.72	67.51	16.80	0.46	150.0	± 9.6 %
		Y	4.60	67.16	16.57		150.0	
		Z	4.59	67.52	16.75		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.57	66.80	16.14	0.46	150.0	± 9.6 %
		Y	4.45	66.43	15.88		150.0	
		Z	4.42	66.71	16.01		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.71	67.75	16.95	0.46	150.0	± 9.6 %
		Y	4.59	67.42	16.73		150.0	
		Z	4.60	67.83	16.93		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.71	67.51	16.83	0.46	150.0	± 9.6 %
		Y	4.59	67.18	16.60		150.0	
		Z	4.57	67.54	16.78		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.08	63.64	15.05	0.46	130.0	± 9.6 %
		Y	0.98	62.63	14.12		130.0	
		Z	1.06	63.58	14.89		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.08	64.13	15.38	0.46	130.0	± 9.6 %
		Y	0.98	63.05	14.41		130.0	
		Z	1.07	64.06	15.22		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	1.08	77.41	20.56	0.46	130.0	± 9.6 %
		Y	0.73	71.46	16.79		130.0	
		Z	0.99	75.97	19.89		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.10	68.88	18.01	0.46	130.0	± 9.6 %
		Y	0.95	66.93	16.52		130.0	
		Z	1.07	68.54	17.74		130.0	

Certificate No: EX3-7494_Feb18

Page 33 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.42	66.59	16.28	0.46	130.0	± 9.6 %
		Y	4.31	66.26	16.05		130.0	
		Z	4.30	66.63	16.21		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.45	66.80	16.37	0.46	130.0	± 9.6 %
		Y	4.34	66.48	16.14		130.0	
		Z	4.33	66.87	16.32		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.61	67.03	16.52	0.46	130.0	± 9.6 %
		Y	4.49	66.71	16.29		130.0	
		Z	4.48	67.07	16.45		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.51	67.18	16.63	0.46	130.0	± 9.6 %
		Y	4.40	66.85	16.40		130.0	
		Z	4.39	67.23	16.57		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.26	66.33	15.85	0.46	130.0	± 9.6 %
		Y	4.14	65.96	15.59		130.0	
		Z	4.13	66.29	15.75		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.29	66.37	15.87	0.46	130.0	± 9.6 %
		Y	4.17	66.01	15.60		130.0	
		Z	4.14	66.28	15.72		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.43	67.26	16.60	0.46	130.0	± 9.6 %
		Y	4.31	66.92	16.36		130.0	
		Z	4.31	67.34	16.57		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.19	66.09	15.63	0.46	130.0	± 9.6 %
		Y	4.07	65.73	15.36		130.0	
		Z	4.05	66.04	15.51		130.0	
10583-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.42	66.59	16.28	0.46	130.0	± 9.6 %
		Y	4.31	66.26	16.05		130.0	
		Z	4.30	66.63	16.21		130.0	
10584-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.45	66.80	16.37	0.46	130.0	± 9.6 %
		Y	4.34	66.48	16.14		130.0	
		Z	4.33	66.87	16.32		130.0	
10585-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.61	67.03	16.52	0.46	130.0	± 9.6 %
		Y	4.49	66.71	16.29		130.0	
		Z	4.48	67.07	16.45		130.0	
10586-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.51	67.18	16.63	0.46	130.0	± 9.6 %
		Y	4.40	66.85	16.40		130.0	
		Z	4.39	67.23	16.57		130.0	
10587-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.26	66.33	15.85	0.46	130.0	± 9.6 %
		Y	4.14	65.96	15.59		130.0	
		Z	4.13	66.29	15.75		130.0	
10588-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.29	66.37	15.87	0.46	130.0	± 9.6 %
		Y	4.17	66.01	15.60		130.0	
		Z	4.14	66.28	15.72		130.0	
10589-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.43	67.26	16.60	0.46	130.0	± 9.6 %
		Y	4.31	66.92	16.36		130.0	
		Z	4.31	67.34	16.57		130.0	
10590-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.19	66.09	15.63	0.46	130.0	± 9.6 %
		Y	4.07	65.73	15.36		130.0	
		Z	4.05	66.04	15.51		130.0	

Certificate No: EX3-7494_Feb18

Page 34 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10591-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.58	66.69	16.41	0.46	130.0	± 9.6 %
		Y	4.47	66.39	16.20		130.0	
		Z	4.47	66.76	16.36		130.0	
10592-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.69	66.97	16.53	0.46	130.0	± 9.6 %
		Y	4.58	66.66	16.32		130.0	
		Z	4.56	67.00	16.47		130.0	
10593-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.61	66.84	16.38	0.46	130.0	± 9.6 %
		Y	4.49	66.52	16.16		130.0	
		Z	4.48	66.87	16.32		130.0	
10594-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.66	67.02	16.56	0.46	130.0	± 9.6 %
		Y	4.55	66.71	16.34		130.0	
		Z	4.54	67.06	16.50		130.0	
10595-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.63	67.00	16.46	0.46	130.0	± 9.6 %
		Y	4.51	66.68	16.25		130.0	
		Z	4.50	67.04	16.41		130.0	
10596-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.56	66.95	16.45	0.46	130.0	± 9.6 %
		Y	4.44	66.62	16.22		130.0	
		Z	4.42	66.95	16.38		130.0	
10597-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.51	66.82	16.30	0.46	130.0	± 9.6 %
		Y	4.39	66.48	16.06		130.0	
		Z	4.38	66.82	16.22		130.0	
10598-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.51	67.06	16.58	0.46	130.0	± 9.6 %
		Y	4.39	66.73	16.35		130.0	
		Z	4.39	67.10	16.52		130.0	
10599-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.26	67.16	16.67	0.46	130.0	± 9.6 %
		Y	5.19	66.95	16.55		130.0	
		Z	5.18	67.23	16.69		130.0	
10600-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.35	67.49	16.81	0.46	130.0	± 9.6 %
		Y	5.29	67.35	16.72		130.0	
		Z	5.23	67.44	16.76		130.0	
10601-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.26	67.29	16.73	0.46	130.0	± 9.6 %
		Y	5.19	67.12	16.62		130.0	
		Z	5.20	67.45	16.79		130.0	
10602-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.35	67.29	16.64	0.46	130.0	± 9.6 %
		Y	5.27	67.10	16.53		130.0	
		Z	5.22	67.23	16.59		130.0	
10603-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.42	67.60	16.94	0.46	130.0	± 9.6 %
		Y	5.33	67.37	16.81		130.0	
		Z	5.26	67.44	16.84		130.0	
10604-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.29	67.20	16.71	0.46	130.0	± 9.6 %
		Y	5.19	66.89	16.54		130.0	
		Z	5.14	67.01	16.59		130.0	
10605-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.34	67.34	16.78	0.46	130.0	± 9.6 %
		Y	5.26	67.13	16.66		130.0	
		Z	5.20	67.25	16.72		130.0	
10606-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.14	66.81	16.37	0.46	130.0	± 9.6 %
		Y	5.06	66.62	16.25		130.0	
		Z	5.05	66.87	16.38		130.0	

Certificate No: EX3-7494_Feb18

Page 35 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.43	66.05	16.06	0.46	130.0	± 9.6 %
		Y	4.31	65.70	15.83		130.0	
		Z	4.32	66.12	16.02		130.0	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.56	66.36	16.20	0.46	130.0	± 9.6 %
		Y	4.44	66.01	15.97		130.0	
		Z	4.43	66.38	16.15		130.0	
10609-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.46	66.19	16.02	0.46	130.0	± 9.6 %
		Y	4.34	65.83	15.77		130.0	
		Z	4.33	66.21	15.96		130.0	
10610-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.51	66.37	16.19	0.46	130.0	± 9.6 %
		Y	4.39	66.01	15.96		130.0	
		Z	4.38	66.40	16.14		130.0	
10611-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.42	66.15	16.03	0.46	130.0	± 9.6 %
		Y	4.30	65.79	15.79		130.0	
		Z	4.29	66.16	15.97		130.0	
10612-AAB	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.41	66.27	16.06	0.46	130.0	± 9.6 %
		Y	4.28	65.89	15.81		130.0	
		Z	4.26	66.23	15.98		130.0	
10613-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.40	66.08	15.90	0.46	130.0	± 9.6 %
		Y	4.28	65.70	15.65		130.0	
		Z	4.26	66.05	15.81		130.0	
10614-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.38	66.33	16.17	0.46	130.0	± 9.6 %
		Y	4.25	65.95	15.92		130.0	
		Z	4.25	66.33	16.10		130.0	
10615-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.41	65.98	15.79	0.46	130.0	± 9.6 %
		Y	4.29	65.61	15.54		130.0	
		Z	4.27	65.99	15.72		130.0	
10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.07	66.34	16.25	0.46	130.0	± 9.6 %
		Y	4.97	66.04	16.07		130.0	
		Z	4.96	66.31	16.21		130.0	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.10	66.45	16.28	0.46	130.0	± 9.6 %
		Y	5.00	66.15	16.11		130.0	
		Z	4.98	66.39	16.23		130.0	
10618-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.02	66.53	16.33	0.46	130.0	± 9.6 %
		Y	4.91	66.19	16.14		130.0	
		Z	4.89	66.45	16.27		130.0	
10619-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.04	66.36	16.18	0.46	130.0	± 9.6 %
		Y	4.96	66.11	16.03		130.0	
		Z	4.94	66.38	16.17		130.0	
10620-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.11	66.35	16.22	0.46	130.0	± 9.6 %
		Y	5.01	66.06	16.05		130.0	
		Z	4.98	66.26	16.16		130.0	
10621-AAB	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.12	66.47	16.41	0.46	130.0	± 9.6 %
		Y	5.02	66.16	16.23		130.0	
		Z	5.00	66.43	16.37		130.0	
10622-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.10	66.55	16.44	0.46	130.0	± 9.6 %
		Y	5.00	66.25	16.27		130.0	
		Z	4.99	66.50	16.40		130.0	

Certificate No: EX3-7494_Feb18

Page 36 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10623-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.00	66.11	16.08	0.46	130.0	± 9.6 %
		Y	4.90	65.81	15.90		130.0	
		Z	4.89	66.10	16.05		130.0	
10624-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.19	66.37	16.28	0.46	130.0	± 9.6 %
		Y	5.10	66.09	16.12		130.0	
		Z	5.07	66.34	16.24		130.0	
10625-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.27	66.50	16.40	0.46	130.0	± 9.6 %
		Y	5.19	66.27	16.28		130.0	
		Z	5.16	66.52	16.40		130.0	
10626-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.40	66.37	16.20	0.46	130.0	± 9.6 %
		Y	5.31	66.07	16.04		130.0	
		Z	5.31	66.31	16.17		130.0	
10627-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.62	66.96	16.47	0.46	130.0	± 9.6 %
		Y	5.56	66.76	16.37		130.0	
		Z	5.52	66.91	16.44		130.0	
10628-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.39	66.34	16.09	0.46	130.0	± 9.6 %
		Y	5.30	66.04	15.92		130.0	
		Z	5.29	66.26	16.04		130.0	
10629-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.50	66.54	16.19	0.46	130.0	± 9.6 %
		Y	5.44	66.36	16.08		130.0	
		Z	5.44	66.63	16.23		130.0	
10630-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	5.71	67.39	16.62	0.46	130.0	± 9.6 %
		Y	5.64	67.17	16.50		130.0	
		Z	5.64	67.11	16.48		130.0	
10631-AAB	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.70	67.46	16.84	0.46	130.0	± 9.6 %
		Y	5.61	67.18	16.70		130.0	
		Z	5.66	67.29	16.76		130.0	
10632-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.63	67.17	16.72	0.46	130.0	± 9.6 %
		Y	5.58	67.02	16.64		130.0	
		Z	5.57	67.27	16.77		130.0	
10633-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.42	66.43	16.17	0.46	130.0	± 9.6 %
		Y	5.32	66.10	15.99		130.0	
		Z	5.30	66.32	16.11		130.0	
10634-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.45	66.63	16.32	0.46	130.0	± 9.6 %
		Y	5.35	66.31	16.16		130.0	
		Z	5.35	66.57	16.29		130.0	
10635-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.30	65.85	15.65	0.46	130.0	± 9.6 %
		Y	5.21	65.54	15.48		130.0	
		Z	5.19	65.76	15.60		130.0	
10636-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	5.84	66.72	16.29	0.46	130.0	± 9.6 %
		Y	5.76	66.45	16.15		130.0	
		Z	5.76	66.66	16.26		130.0	
10637-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	5.95	67.01	16.43	0.46	130.0	± 9.6 %
		Y	5.88	66.76	16.30		130.0	
		Z	5.85	66.89	16.37		130.0	
10638-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	5.98	67.09	16.44	0.46	130.0	± 9.6 %
		Y	5.91	66.84	16.31		130.0	
		Z	5.91	67.08	16.44		130.0	

Certificate No: EX3-7494_Feb18

Page 37 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4- SN:7494

February 26, 2018

10639-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	5.93	66.96	16.42	0.46	130.0	± 9.6 %
		Y	5.85	66.68	16.27		130.0	
		Z	5.84	66.87	16.37		130.0	
10640-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	5.89	66.83	16.30	0.46	130.0	± 9.6 %
		Y	5.79	66.50	16.13		130.0	
		Z	5.76	66.65	16.20		130.0	
10641-AAC	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	5.99	66.93	16.36	0.46	130.0	± 9.6 %
		Y	5.93	66.70	16.25		130.0	
		Z	5.89	66.83	16.32		130.0	
10642-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.01	67.13	16.63	0.46	130.0	± 9.6 %
		Y	5.93	66.84	16.49		130.0	
		Z	5.91	67.00	16.57		130.0	
10643-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	5.86	66.81	16.36	0.46	130.0	± 9.6 %
		Y	5.78	66.52	16.22		130.0	
		Z	5.75	66.66	16.29		130.0	
10644-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	5.91	66.99	16.47	0.46	130.0	± 9.6 %
		Y	5.82	66.67	16.31		130.0	
		Z	5.80	66.82	16.38		130.0	
10645-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.04	67.04	16.47	0.46	130.0	± 9.6 %
		Y	5.97	66.82	16.36		130.0	
		Z	5.92	66.90	16.40		130.0	
10646-AAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	5.85	87.94	30.48	9.30	60.0	± 9.6 %
		Y	5.37	85.81	29.63		60.0	
		Z	4.49	83.14	29.09		60.0	
10647-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	5.17	85.51	29.66	9.30	60.0	± 9.6 %
		Y	4.78	83.60	28.89		60.0	
		Z	4.02	80.87	28.26		60.0	
10648-AAA	CDMA2000 (1x Advanced)	X	0.51	61.76	8.43	0.00	150.0	± 9.6 %
		Y	0.38	60.00	6.13		150.0	
		Z	0.38	60.10	6.48		150.0	
10652-AAB	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.13	65.98	15.78	2.23	80.0	± 9.6 %
		Y	2.93	65.12	15.15		80.0	
		Z	3.02	66.07	15.57		80.0	
10653-AAB	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	3.69	65.40	16.13	2.23	80.0	± 9.6 %
		Y	3.54	64.83	15.74		80.0	
		Z	3.60	65.47	16.04		80.0	
10654-AAB	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	3.72	65.03	16.17	2.23	80.0	± 9.6 %
		Y	3.58	64.50	15.83		80.0	
		Z	3.65	65.07	16.11		80.0	
10655-AAB	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	3.80	64.95	16.21	2.23	80.0	± 9.6 %
		Y	3.67	64.43	15.88		80.0	
		Z	3.74	64.95	16.16		80.0	
10658-AAA	Pulse Waveform (200Hz, 10%)	X	4.43	71.88	12.89	10.00	50.0	± 9.6 %
		Y	2.96	67.08	10.79		50.0	
		Z	4.92	73.02	13.29		50.0	
10659-AAA	Pulse Waveform (200Hz, 20%)	X	21.85	87.99	16.66	6.99	60.0	± 9.6 %
		Y	1.49	64.48	8.54		60.0	
		Z	100.00	101.11	19.71		60.0	

Certificate No: EX3-7494_Feb18

Page 38 of 39

Appendix A: DAE and Probe Calibration Certificate

EX3DV4– SN:7494

February 26, 2018

10660-AAA	Pulse Waveform (200Hz, 40%)	X	100.00	100.24	18.17	3.98	80.0	± 9.6 %
		Y	0.44	60.00	5.03		80.0	
		Z	100.00	101.16	18.48		80.0	
10661-AAA	Pulse Waveform (200Hz, 60%)	X	100.00	101.13	17.57	2.22	100.0	± 9.6 %
		Y	0.24	60.00	3.65		100.0	
		Z	100.00	102.26	17.94		100.0	
10662-AAA	Pulse Waveform (200Hz, 80%)	X	100.00	99.08	15.66	0.97	120.0	± 9.6 %
		Y	3.24	108.92	7.51		120.0	
		Z	100.00	98.42	15.34		120.0	

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

1.1. D835V2 Dipole Calibration Certificate

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
S Swiss Calibration Service

Accreditation No.: SCS 0108

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

Client CCIC-HTW (Auden)

Certificate No: D835V2-4d238_Feb18

CALIBRATION CERTIFICATE

Object D835V2 - SN:4d238

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

Calibration date: February 19, 2018

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

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-05	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: Name Michael Weber Function Laboratory Technician Signature M. Weber

Approved by: Katja Pokovic Technical Manager Signature K. Pokovic

Issued: February 19, 2018

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

Certificate No: D835V2-4d238_Feb18

Page 1 of 8

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
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**

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 the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.2 $\pm$ 6 %	0.92 mho/m $\pm$ 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	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.51 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters:	normalized to 1W	6.15 W/kg $\pm$ 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 $\pm$ 0.2) °C	55.0 $\pm$ 6 %	0.99 mho/m $\pm$ 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	2.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.64 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.32 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	50.8 Ω - 4.0 j Ω
Return Loss	- 27.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω - 6.0 j Ω
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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	June 02, 2017

DASY5 Validation Report for Head TSL

Date: 19.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d238

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 41.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

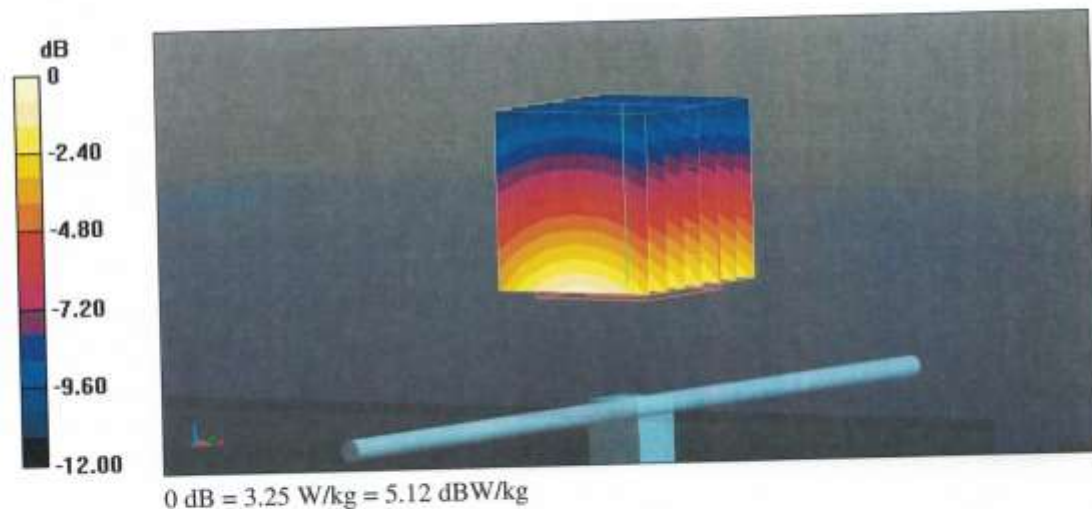
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 62.44 V/m; Power Drift = -0.03 dB

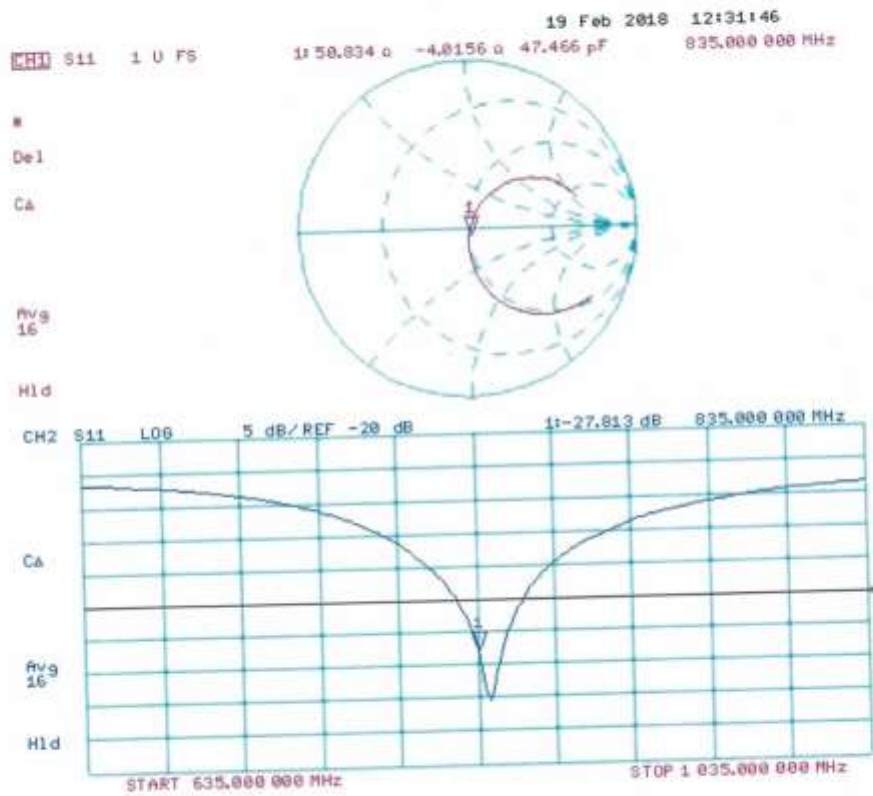
Peak SAR (extrapolated) = 3.69 W/kg

SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg

Maximum value of SAR (measured) = 3.25 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d238

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.99$ S/m; $\epsilon_r = 55$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

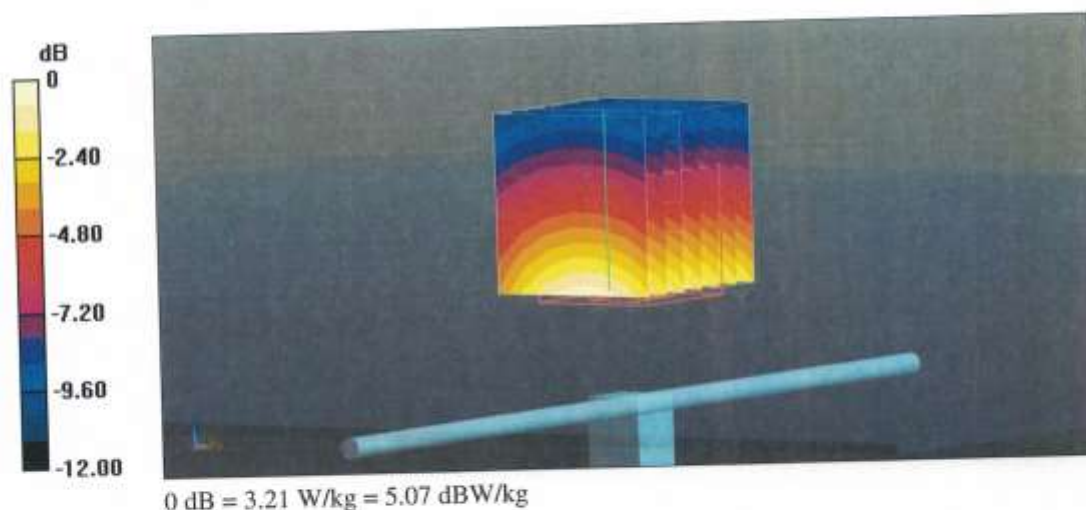
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.24 V/m; Power Drift = -0.01 dB

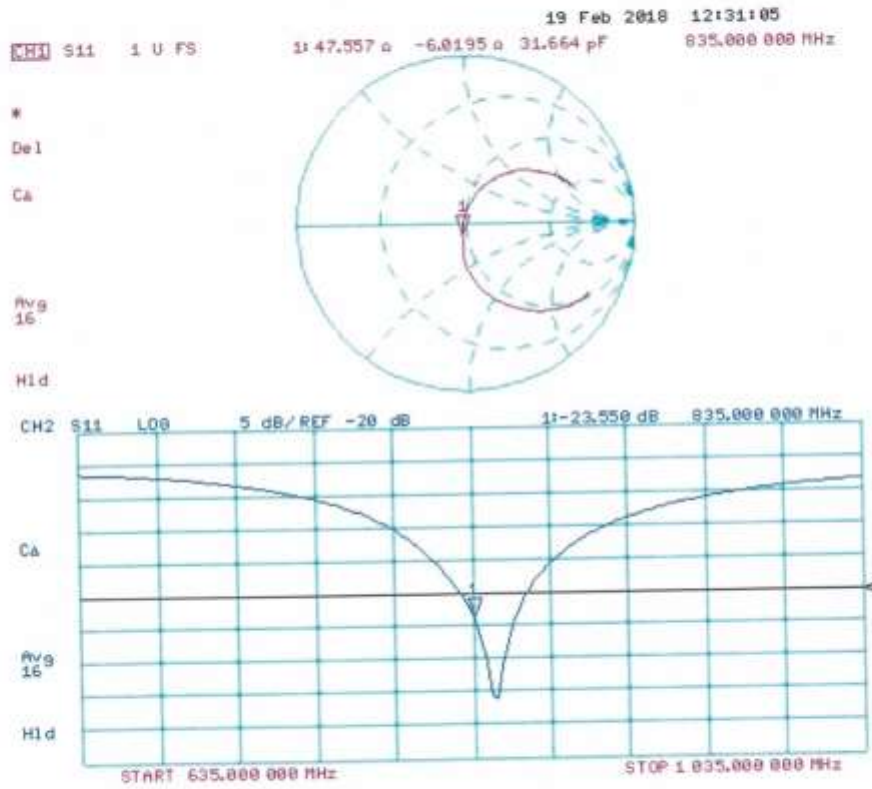
Peak SAR (extrapolated) = 3.70 W/kg

SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.6 W/kg

Maximum value of SAR (measured) = 3.21 W/kg



Impedance Measurement Plot for Body TSL



1.2. D1900V2 Dipole Calibration Certificate

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
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 **CCIC-HTW (Auden)**

Certificate No: **D1900V2-5d226_Feb18**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d226**

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

Calibration date: **February 22, 2018**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 22, 2018

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

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



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

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

Accreditation No.: **SCS 0108**

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 the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 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	40.7 $\pm$ 6 %	1.39 mho/m $\pm$ 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	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.3 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.1 W/kg $\pm$ 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 $\pm$ 0.2) °C	55.2 $\pm$ 6 %	1.48 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.71 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.9 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	$52.2 \Omega + 6.0 j\Omega$
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.9 \Omega + 7.5 j\Omega$
Return Loss	- 22.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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	April 16, 2015

DASY5 Validation Report for Head TSL

Date: 22.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d226

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

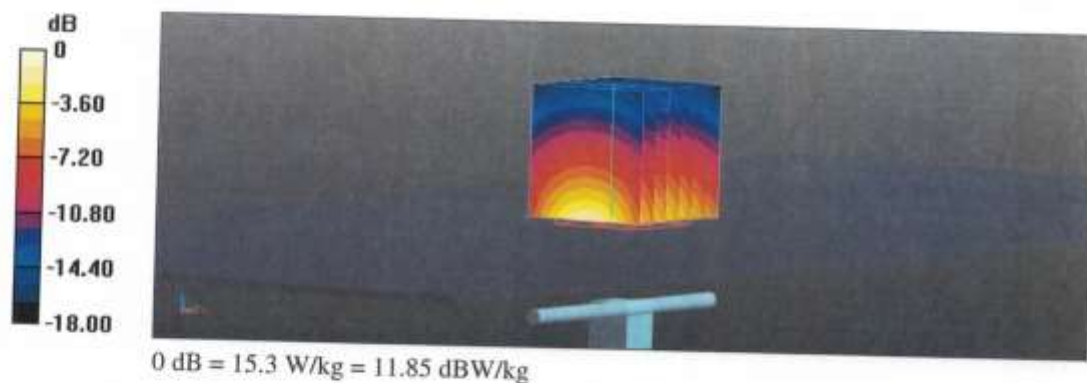
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.6 V/m; Power Drift = -0.09 dB

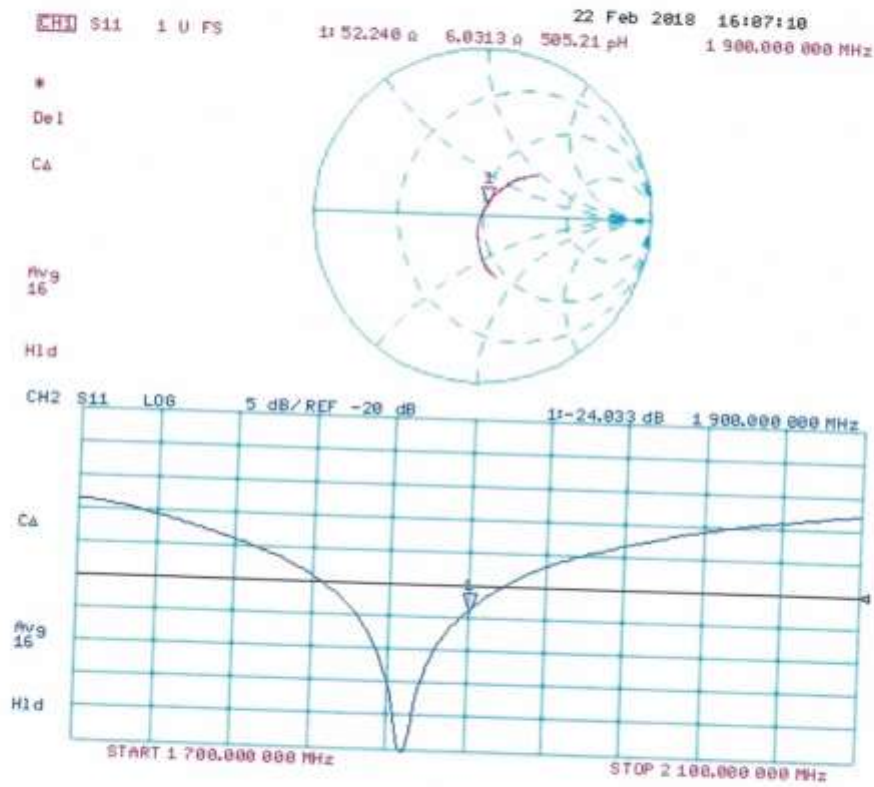
Peak SAR (extrapolated) = 18.5 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.25 W/kg

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



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d226

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 55.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

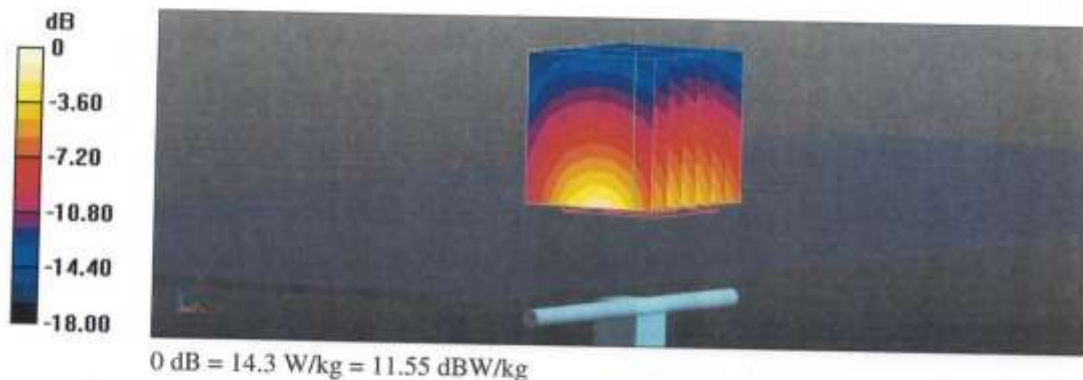
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.8 V/m; Power Drift = -0.09 dB

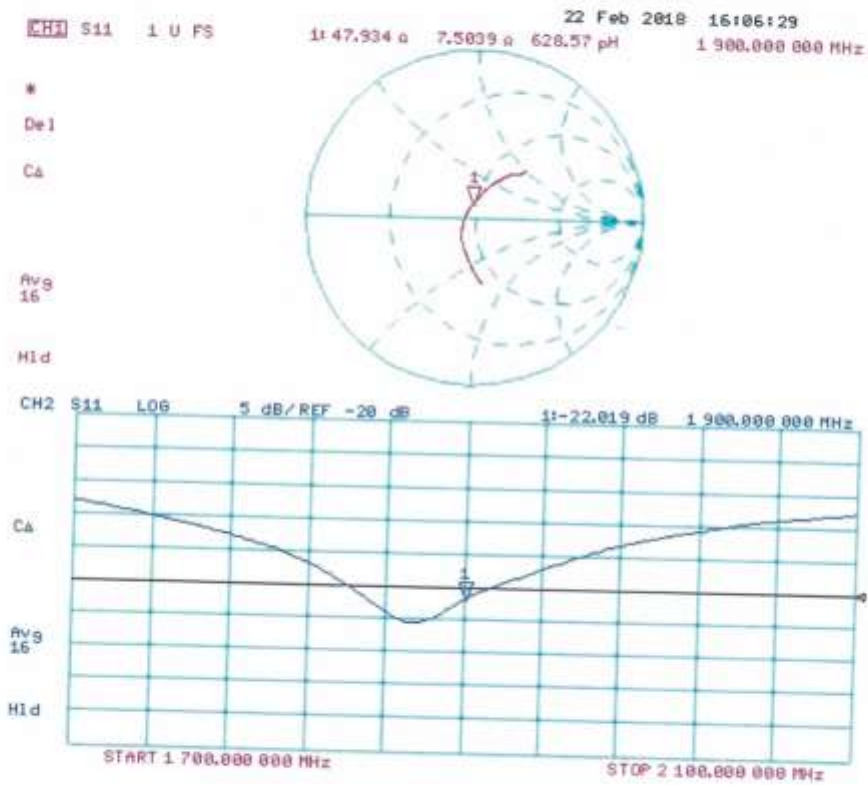
Peak SAR (extrapolated) = 17.2 W/kg

SAR(1 g) = 9.71 W/kg; SAR(10 g) = 5.16 W/kg

Maximum value of SAR (measured) = 14.3 W/kg



Impedance Measurement Plot for Body TSL



1.3. D2450V2 Dipole Calibration Certificate

**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
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 **CCIC-HTW (Auden)**

Certificate No: **D2450V2-1009_Feb18**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:1009**

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

Calibration date: **February 05, 2018**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leif Klysner** Name **Laboratory Technician** Function **Signature**

Approved by: **Katja Pokovic** Technical Manager

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

Issued: February 6, 2018

Certificate No: D2450V2-1009_Feb18

Page 1 of 8

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
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**

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 the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 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 $\pm$ 0.2) °C	37.9 $\pm$ 6 %	1.87 mho/m $\pm$ 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	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg $\pm$ 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 $\pm$ 0.2) °C	51.4 $\pm$ 6 %	2.04 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	49.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.3 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	53.8 Ω + 2.2 j Ω
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 4.6 j Ω
Return Loss	- 26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 17, 2017

DASY5 Validation Report for Head TSL

Date: 05.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:1009

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.87$ S/m; $\epsilon_r = 37.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

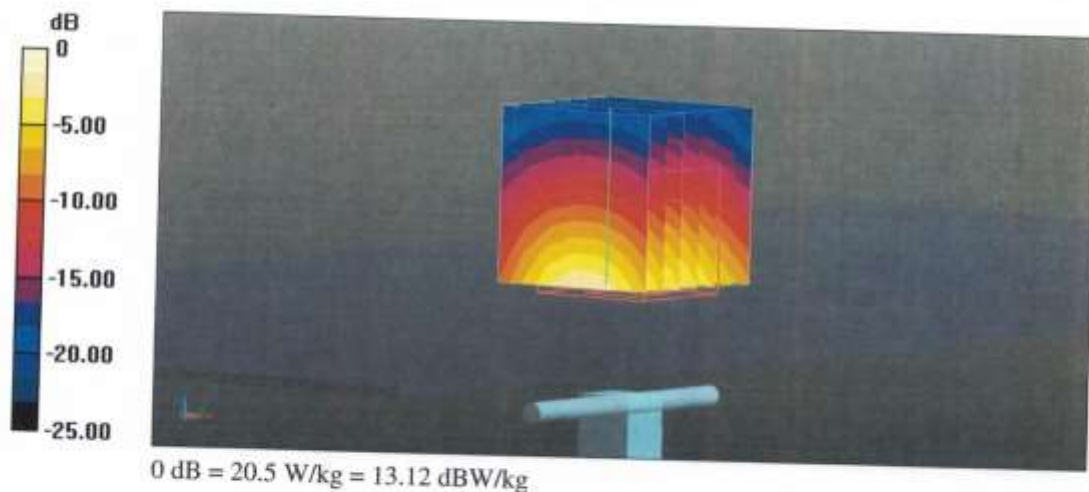
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 111.8 V/m; Power Drift = -0.02 dB

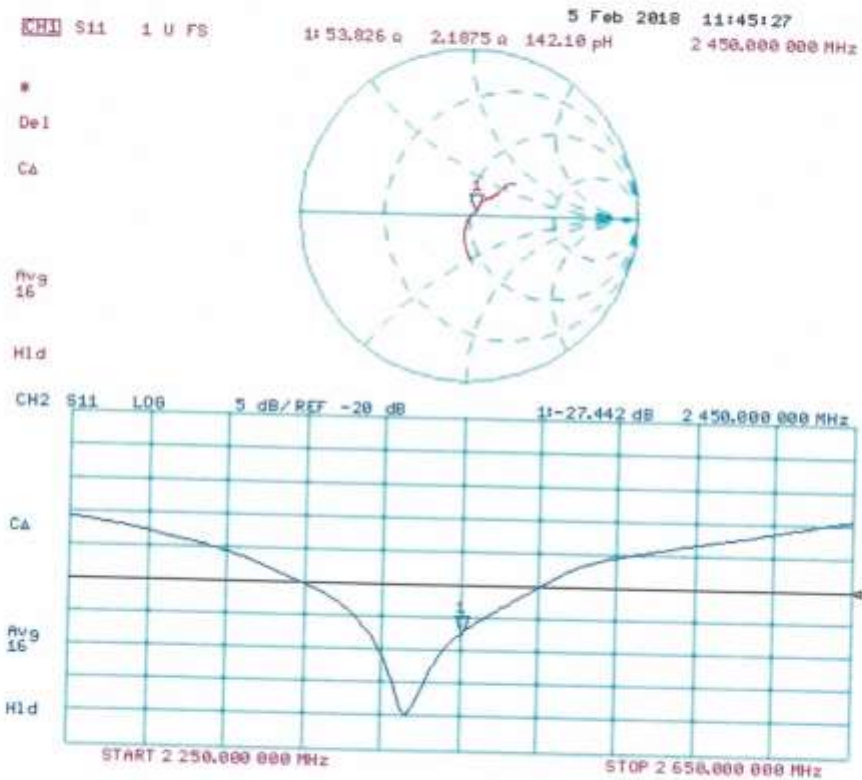
Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.13 W/kg

Maximum value of SAR (measured) = 20.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:1009

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.04$ S/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

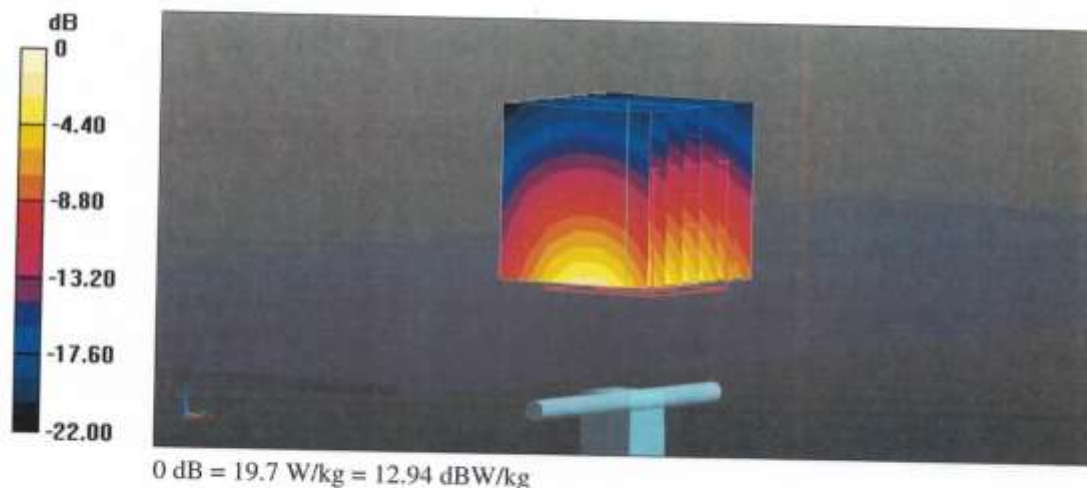
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.2 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 25.5 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.92 W/kg

Maximum value of SAR (measured) = 19.7 W/kg



Impedance Measurement Plot for Body TSL

