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10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	4.94	65.83	17.95	4.96	50.0	± 9.6 %
		Y	5.02	66.25	18.34		50.0	
		Z	4.84	65.64	17.73		50.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	4.75	65.66	17.41	4.17	50.0	± 9.6 %
		Y	4.83	66.08	17.79		50.0	
		Z	4.64	65.47	17.20		50.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	4.51	68.40	19.79	6.02	35.0	± 9.6 %
		Y	4.43	68.18	19.99		35.0	
		Z	4.39	68.09	19.40		35.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	4.76	67.12	19.32	6.02	35.0	± 9.6 %
		Y	4.74	67.09	19.55		35.0	
		Z	4.66	66.93	19.05		35.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	4.67	67.29	19.26	6.02	35.0	± 9.6 %
		Y	4.63	67.23	19.50		35.0	
		Z	4.55	67.04	18.98		35.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	4.65	67.54	19.44	6.02	35.0	± 9.6 %
		Y	4.61	67.47	19.66		35.0	
		Z	4.54	67.29	19.14		35.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	4.81	67.33	19.46	6.02	35.0	± 9.6 %
		Y	4.79	67.33	19.71		35.0	
		Z	4.70	67.11	19.18		35.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	4.72	67.20	19.30	6.02	35.0	± 9.6 %
		Y	4.69	67.15	19.52		35.0	
		Z	4.61	67.00	19.03		35.0	
10311-AAC	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	2.91	68.06	15.74	0.00	150.0	± 9.6 %
		Y	3.11	69.12	16.40		150.0	
		Z	2.77	67.36	15.31		150.0	
10313-AAA	iDEN 1:3	X	4.37	76.96	17.78	6.99	70.0	± 9.6 %
		Y	8.15	85.72	21.00		70.0	
		Z	3.30	73.81	16.50		70.0	
10314-AAA	iDEN 1:6	X	8.03	89.65	25.25	10.00	30.0	± 9.6 %
		Y	13.22	99.87	28.91		30.0	
		Z	5.76	84.57	23.46		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.00	63.13	14.65	0.17	150.0	± 9.6 %
		Y	1.08	64.07	15.48		150.0	
		Z	0.96	62.56	14.10		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.48	66.47	16.20	0.17	150.0	± 9.6 %
		Y	4.55	66.74	16.40		150.0	
		Z	4.41	66.32	16.06		150.0	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.48	66.47	16.20	0.17	150.0	± 9.6 %
		Y	4.55	66.74	16.40		150.0	
		Z	4.41	66.32	16.06		150.0	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.56	66.72	16.13	0.00	150.0	± 9.6 %
		Y	4.64	67.02	16.35		150.0	
		Z	4.48	66.56	15.99		150.0	
10401-AAC	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.33	67.07	16.41	0.00	150.0	± 9.6 %
		Y	5.37	67.25	16.55		150.0	
		Z	5.26	66.94	16.31		150.0	

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10402-AAC	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.54	67.19	16.33	0.00	150.0	± 9.6 %
		Y	5.60	67.43	16.49		150.0	
		Z	5.47	67.04	16.23		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	1.08	65.42	11.50	0.00	115.0	± 9.6 %
		Y	1.40	68.67	13.64		115.0	
		Z	0.89	63.48	9.95		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	1.08	65.42	11.50	0.00	115.0	± 9.6 %
		Y	1.40	68.67	13.64		115.0	
		Z	0.89	63.48	9.95		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	100.00	124.77	31.67	0.00	100.0	± 9.6 %
		Y	100.00	122.07	30.41		100.0	
		Z	52.66	114.12	28.55		100.0	
10410-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	129.55	33.64	3.23	80.0	± 9.6 %
		Y	100.00	128.07	32.96		80.0	
		Z	100.00	129.45	33.32		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	0.93	62.31	14.01	0.00	150.0	± 9.6 %
		Y	1.00	63.18	14.83		150.0	
		Z	0.90	61.85	13.51		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.42	66.41	16.08	0.00	150.0	± 9.6 %
		Y	4.49	66.68	16.28		150.0	
		Z	4.35	66.26	15.94		150.0	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.42	66.41	16.08	0.00	150.0	± 9.6 %
		Y	4.49	66.68	16.28		150.0	
		Z	4.35	66.26	15.94		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	4.41	66.57	16.10	0.00	150.0	± 9.6 %
		Y	4.48	66.85	16.31		150.0	
		Z	4.34	66.43	15.97		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	4.43	66.52	16.10	0.00	150.0	± 9.6 %
		Y	4.50	66.80	16.31		150.0	
		Z	4.36	66.38	15.96		150.0	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.54	66.52	16.12	0.00	150.0	± 9.6 %
		Y	4.62	66.79	16.32		150.0	
		Z	4.47	66.38	15.99		150.0	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	4.69	66.81	16.23	0.00	150.0	± 9.6 %
		Y	4.77	67.09	16.43		150.0	
		Z	4.61	66.66	16.09		150.0	
10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.62	66.77	16.20	0.00	150.0	± 9.6 %
		Y	4.70	67.04	16.40		150.0	
		Z	4.54	66.61	16.06		150.0	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.24	67.09	16.42	0.00	150.0	± 9.6 %
		Y	5.30	67.31	16.58		150.0	
		Z	5.17	66.96	16.32		150.0	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.27	67.20	16.48	0.00	150.0	± 9.6 %
		Y	5.32	67.40	16.62		150.0	
		Z	5.21	67.08	16.38		150.0	

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10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.26	67.11	16.43	0.00	150.0	± 9.6 %
		Y	5.32	67.33	16.58		150.0	
		Z	5.19	66.94	16.31		150.0	
10430-AAB	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.10	70.64	17.90	0.00	150.0	± 9.6 %
		Y	4.15	70.65	17.99		150.0	
		Z	3.97	70.32	17.54		150.0	
10431-AAB	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	4.07	66.92	15.99	0.00	150.0	± 9.6 %
		Y	4.16	67.26	16.25		150.0	
		Z	3.97	66.72	15.78		150.0	
10432-AAB	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.38	66.81	16.12	0.00	150.0	± 9.6 %
		Y	4.46	67.11	16.35		150.0	
		Z	4.29	66.64	15.96		150.0	
10433-AAB	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.63	66.60	16.22	0.00	150.0	± 9.6 %
		Y	4.71	67.07	16.42		150.0	
		Z	4.55	66.64	16.08		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.18	71.39	17.74	0.00	150.0	± 9.6 %
		Y	4.23	71.47	17.90		150.0	
		Z	4.00	70.89	17.26		150.0	
10435-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	129.32	33.53	3.23	80.0	± 9.6 %
		Y	100.00	127.84	32.85		80.0	
		Z	100.00	129.21	33.20		80.0	
10447-AAB	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.32	66.73	15.05	0.00	150.0	± 9.6 %
		Y	3.44	67.25	15.47		150.0	
		Z	3.19	66.36	14.65		150.0	
10448-AAB	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	X	3.91	66.69	15.84	0.00	150.0	± 9.6 %
		Y	4.00	67.04	16.12		150.0	
		Z	3.82	66.49	15.63		150.0	
10449-AAB	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	X	4.20	66.63	16.01	0.00	150.0	± 9.6 %
		Y	4.28	66.94	16.24		150.0	
		Z	4.12	66.45	15.84		150.0	
10450-AAB	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.40	66.55	16.06	0.00	150.0	± 9.6 %
		Y	4.48	66.84	16.28		150.0	
		Z	4.33	66.39	15.92		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	3.17	66.71	14.50	0.00	150.0	± 9.6 %
		Y	3.31	67.35	15.00		150.0	
		Z	3.02	66.20	13.98		150.0	
10456-AAA	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.15	67.71	16.63	0.00	150.0	± 9.6 %
		Y	6.19	67.88	16.74		150.0	
		Z	6.12	67.68	16.59		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.71	65.06	15.78	0.00	150.0	± 9.6 %
		Y	3.77	65.33	15.99		150.0	
		Z	3.66	64.95	15.64		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	3.78	70.42	16.91	0.00	150.0	± 9.6 %
		Y	3.89	70.79	17.26		150.0	
		Z	3.57	69.69	16.25		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	4.94	68.36	17.97	0.00	150.0	± 9.6 %
		Y	4.99	68.35	18.00		150.0	
		Z	4.87	68.39	17.79		150.0	

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10460-AAA	UMTS-FDD (WCDMA, AMR)	X	0.77	66.48	14.67	0.00	150.0	± 9.6 %
		Y	0.94	69.39	16.73		150.0	
		Z	0.69	65.04	13.52		150.0	
10461-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	135.17	36.27	3.29	80.0	± 9.6 %
		Y	100.00	134.77	36.05		80.0	
		Z	100.00	134.38	35.65		80.0	
10462-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	111.38	25.26	3.23	80.0	± 9.6 %
		Y	100.00	110.02	24.56		80.0	
		Z	19.71	92.47	20.17		80.0	
10463-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	20.24	90.82	19.37	3.23	80.0	± 9.6 %
		Y	16.86	88.22	18.36		80.0	
		Z	1.56	65.93	11.16		80.0	
10464-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	132.58	34.88	3.23	80.0	± 9.6 %
		Y	100.00	132.18	34.66		80.0	
		Z	100.00	131.46	34.11		80.0	
10465-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	110.55	24.87	3.23	80.0	± 9.6 %
		Y	100.00	109.21	24.18		80.0	
		Z	5.62	79.57	16.55		80.0	
10466-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.58	78.05	15.78	3.23	80.0	± 9.6 %
		Y	6.25	78.66	15.65		80.0	
		Z	1.31	64.25	10.38		80.0	
10467-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	132.95	35.04	3.23	80.0	± 9.6 %
		Y	100.00	132.52	34.81		80.0	
		Z	100.00	131.85	34.28		80.0	
10468-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	110.83	25.00	3.23	80.0	± 9.6 %
		Y	100.00	109.48	24.30		80.0	
		Z	7.41	82.44	17.43		80.0	
10469-AAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.80	78.44	15.89	3.23	80.0	± 9.6 %
		Y	6.47	79.00	15.75		80.0	
		Z	1.32	64.31	10.41		80.0	
10470-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	133.00	35.05	3.23	80.0	± 9.6 %
		Y	100.00	132.58	34.83		80.0	
		Z	100.00	131.90	34.29		80.0	
10471-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	110.75	24.96	3.23	80.0	± 9.6 %
		Y	100.00	109.39	24.26		80.0	
		Z	7.21	82.14	17.32		80.0	
10472-AAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.67	78.19	15.80	3.23	80.0	± 9.6 %
		Y	6.33	78.77	15.66		80.0	
		Z	1.31	64.23	10.35		80.0	
10473-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	132.96	35.03	3.23	80.0	± 9.6 %
		Y	100.00	132.55	34.81		80.0	
		Z	100.00	131.86	34.27		80.0	
10474-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	110.75	24.96	3.23	80.0	± 9.6 %
		Y	100.00	109.40	24.26		80.0	
		Z	7.05	81.92	17.26		80.0	
10475-AAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.54	77.99	15.74	3.23	80.0	± 9.6 %
		Y	6.21	78.60	15.61		80.0	
		Z	1.30	64.19	10.34		80.0	

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10477-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	110.49	24.84	3.23	80.0	± 9.6 %
		Y	100.00	109.14	24.14		80.0	
		Z	5.72	79.73	16.57		80.0	
10478-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.35	77.61	15.61	3.23	80.0	± 9.6 %
		Y	6.01	78.26	15.50		80.0	
		Z	1.29	64.11	10.29		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	43.37	115.66	31.91	3.23	80.0	± 9.6 %
		Y	29.34	109.47	30.36		80.0	
		Z	27.04	107.94	29.57		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	44.57	106.12	26.89	3.23	80.0	± 9.6 %
		Y	34.26	102.52	25.93		80.0	
		Z	18.96	94.20	23.28		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	23.11	95.94	23.73	3.23	80.0	± 9.6 %
		Y	19.63	93.76	23.10		80.0	
		Z	10.19	85.11	20.15		80.0	
10482-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.02	72.87	16.91	2.23	80.0	± 9.6 %
		Y	4.27	77.91	19.17		80.0	
		Z	2.19	68.80	14.83		80.0	
10483-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	7.43	81.25	19.67	2.23	80.0	± 9.6 %
		Y	6.76	79.97	19.29		80.0	
		Z	4.32	73.95	16.58		80.0	
10484-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	6.11	78.40	18.70	2.23	80.0	± 9.6 %
		Y	5.78	77.63	18.47		80.0	
		Z	3.79	72.04	15.84		80.0	
10485-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.48	75.06	18.97	2.23	80.0	± 9.6 %
		Y	4.37	78.67	20.63		80.0	
		Z	2.81	72.16	17.54		80.0	
10486-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.09	69.61	16.08	2.23	80.0	± 9.6 %
		Y	3.59	71.83	17.27		80.0	
		Z	2.63	67.55	14.85		80.0	
10487-AAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.06	69.09	15.84	2.23	80.0	± 9.6 %
		Y	3.53	71.17	16.97		80.0	
		Z	2.62	67.13	14.64		80.0	
10488-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.57	73.39	19.20	2.23	80.0	± 9.6 %
		Y	4.10	75.69	20.32		80.0	
		Z	3.13	71.59	18.33		80.0	
10489-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.38	69.28	17.42	2.23	80.0	± 9.6 %
		Y	3.65	70.51	18.12		80.0	
		Z	3.10	68.23	16.80		80.0	
10490-AAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.46	69.08	17.34	2.23	80.0	± 9.6 %
		Y	3.72	70.24	18.00		80.0	
		Z	3.19	68.09	16.74		80.0	
10491-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.72	71.40	18.54	2.23	80.0	± 9.6 %
		Y	4.10	73.03	19.37		80.0	
		Z	3.37	70.11	17.90		80.0	
10492-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.69	68.33	17.36	2.23	80.0	± 9.6 %
		Y	3.91	69.28	17.90		80.0	
		Z	3.46	67.54	16.90		80.0	

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10493-AAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.75	68.18	17.30	2.23	80.0	± 9.6 %
		Y	3.96	69.09	17.83		80.0	
		Z	3.52	67.43	16.85		80.0	
10494-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.07	73.04	19.06	2.23	80.0	± 9.6 %
		Y	4.57	74.98	20.00		80.0	
		Z	3.63	71.49	18.35		80.0	
10495-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.72	68.69	17.57	2.23	80.0	± 9.6 %
		Y	3.95	69.68	18.12		80.0	
		Z	3.48	67.84	17.10		80.0	
10496-AAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.79	68.39	17.47	2.23	80.0	± 9.6 %
		Y	4.01	69.31	17.99		80.0	
		Z	3.56	67.62	17.03		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.83	66.24	12.89	2.23	80.0	± 9.6 %
		Y	2.76	71.40	15.46		80.0	
		Z	1.32	62.65	10.68		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.32	60.22	8.74	2.23	80.0	± 9.6 %
		Y	1.59	62.16	10.10		80.0	
		Z	1.24	60.00	8.12		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.31	60.00	8.47	2.23	80.0	± 9.6 %
		Y	1.51	61.41	9.55		80.0	
		Z	1.25	60.00	7.96		80.0	
10500-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.45	74.03	18.95	2.23	80.0	± 9.6 %
		Y	4.12	76.91	20.32		80.0	
		Z	2.91	71.77	17.81		80.0	
10501-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.25	69.65	16.67	2.23	80.0	± 9.6 %
		Y	3.63	71.37	17.62		80.0	
		Z	2.87	68.11	15.73		80.0	
10502-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.29	69.45	16.51	2.23	80.0	± 9.6 %
		Y	3.67	71.12	17.44		80.0	
		Z	2.92	67.93	15.57		80.0	
10503-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.52	73.17	19.09	2.23	80.0	± 9.6 %
		Y	4.05	75.46	20.22		80.0	
		Z	3.09	71.38	18.23		80.0	
10504-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.36	69.18	17.36	2.23	80.0	± 9.6 %
		Y	3.63	70.42	18.06		80.0	
		Z	3.09	68.13	16.73		80.0	
10505-AAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.44	68.98	17.28	2.23	80.0	± 9.6 %
		Y	3.70	70.15	17.95		80.0	
		Z	3.17	67.99	16.68		80.0	
10506-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.03	72.88	18.99	2.23	80.0	± 9.6 %
		Y	4.53	74.82	19.92		80.0	
		Z	3.60	71.35	18.28		80.0	
10507-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.70	68.62	17.53	2.23	80.0	± 9.6 %
		Y	3.93	69.62	18.09		80.0	
		Z	3.47	67.78	17.06		80.0	

10508-AAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.78	68.32	17.43	2.23	80.0	± 9.6 %
		Y	4.00	69.25	17.95		80.0	
		Z	3.55	67.55	16.99		80.0	
10509-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.31	71.31	18.34	2.23	80.0	± 9.6 %
		Y	4.69	72.72	19.04		80.0	
		Z	3.97	70.17	17.80		80.0	
10510-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.17	68.23	17.47	2.23	80.0	± 9.6 %
		Y	4.38	69.07	17.94		80.0	
		Z	3.95	67.52	17.09		80.0	
10511-AAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.22	67.97	17.39	2.23	80.0	± 9.6 %
		Y	4.42	68.76	17.84		80.0	
		Z	4.01	67.31	17.04		80.0	
10512-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.55	73.00	18.88	2.23	80.0	± 9.6 %
		Y	5.06	74.81	19.74		80.0	
		Z	4.10	71.55	18.23		80.0	
10513-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.06	68.49	17.58	2.23	80.0	± 9.6 %
		Y	4.28	69.40	18.08		80.0	
		Z	3.83	67.70	17.17		80.0	
10514-AAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.08	68.05	17.44	2.23	80.0	± 9.6 %
		Y	4.28	68.89	17.91		80.0	
		Z	3.87	67.34	17.07		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.89	62.45	14.03	0.00	150.0	± 9.6 %
		Y	0.96	63.39	14.90		150.0	
		Z	0.86	61.96	13.49		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.48	67.99	15.03	0.00	150.0	± 9.6 %
		Y	0.70	73.70	18.81		150.0	
		Z	0.41	65.71	13.25		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.73	63.98	14.31	0.00	150.0	± 9.6 %
		Y	0.82	65.62	15.70		150.0	
		Z	0.68	63.12	13.50		150.0	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.41	66.48	16.05	0.00	150.0	± 9.6 %
		Y	4.48	66.76	16.26		150.0	
		Z	4.34	66.34	15.91		150.0	
10519-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.58	66.70	16.17	0.00	150.0	± 9.6 %
		Y	4.66	66.98	16.37		150.0	
		Z	4.50	66.55	16.03		150.0	
10520-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.43	66.64	16.08	0.00	150.0	± 9.6 %
		Y	4.51	66.93	16.29		150.0	
		Z	4.35	66.47	15.93		150.0	
10521-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.36	66.62	16.06	0.00	150.0	± 9.6 %
		Y	4.44	66.92	16.28		150.0	
		Z	4.28	66.44	15.90		150.0	
10522-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.43	66.75	16.16	0.00	150.0	± 9.6 %
		Y	4.51	67.04	16.38		150.0	
		Z	4.34	66.59	16.01		150.0	

10523-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.32	66.62	16.01	0.00	150.0	± 9.6 %
		Y	4.40	66.92	16.23		150.0	
		Z	4.24	66.48	15.87		150.0	
10524-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.37	66.66	16.13	0.00	150.0	± 9.6 %
		Y	4.45	66.96	16.34		150.0	
		Z	4.29	66.51	15.98		150.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.37	65.72	15.73	0.00	150.0	± 9.6 %
		Y	4.45	66.01	15.94		150.0	
		Z	4.30	65.57	15.59		150.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.52	66.06	15.86	0.00	150.0	± 9.6 %
		Y	4.60	66.36	16.08		150.0	
		Z	4.44	65.89	15.72		150.0	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.44	66.01	15.80	0.00	150.0	± 9.6 %
		Y	4.53	66.32	16.02		150.0	
		Z	4.36	65.84	15.65		150.0	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.46	66.03	15.83	0.00	150.0	± 9.6 %
		Y	4.54	66.34	16.05		150.0	
		Z	4.38	65.85	15.68		150.0	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.46	66.03	15.83	0.00	150.0	± 9.6 %
		Y	4.54	66.34	16.05		150.0	
		Z	4.38	65.85	15.68		150.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.44	66.10	15.83	0.00	150.0	± 9.6 %
		Y	4.53	66.42	16.05		150.0	
		Z	4.35	65.90	15.67		150.0	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.31	65.95	15.76	0.00	150.0	± 9.6 %
		Y	4.39	66.27	15.98		150.0	
		Z	4.22	65.75	15.59		150.0	
10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.47	66.09	15.83	0.00	150.0	± 9.6 %
		Y	4.55	66.40	16.04		150.0	
		Z	4.38	65.92	15.68		150.0	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.01	66.14	15.93	0.00	150.0	± 9.6 %
		Y	5.08	66.40	16.10		150.0	
		Z	4.95	65.99	15.81		150.0	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.08	66.34	16.02	0.00	150.0	± 9.6 %
		Y	5.15	66.59	16.19		150.0	
		Z	5.01	66.17	15.90		150.0	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	4.95	66.28	15.97	0.00	150.0	± 9.6 %
		Y	5.02	66.54	16.15		150.0	
		Z	4.88	66.12	15.85		150.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.01	66.24	15.95	0.00	150.0	± 9.6 %
		Y	5.08	66.50	16.13		150.0	
		Z	4.94	66.08	15.84		150.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.09	66.25	16.00	0.00	150.0	± 9.6 %
		Y	5.16	66.51	16.17		150.0	
		Z	5.02	66.09	15.89		150.0	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.02	66.25	16.02	0.00	150.0	± 9.6 %
		Y	5.09	66.51	16.19		150.0	
		Z	4.95	66.07	15.89		150.0	

10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.00	66.13	15.94	0.00	150.0	± 9.6 %
		Y	5.07	66.39	16.12		150.0	
		Z	4.92	65.95	15.81		150.0	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.16	66.22	16.01	0.00	150.0	± 9.6 %
		Y	5.22	66.47	16.18		150.0	
		Z	5.08	66.07	15.89		150.0	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.22	66.24	16.04	0.00	150.0	± 9.6 %
		Y	5.29	66.49	16.21		150.0	
		Z	5.15	66.10	15.94		150.0	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.34	66.25	15.93	0.00	150.0	± 9.6 %
		Y	5.41	66.50	16.09		150.0	
		Z	5.28	66.10	15.82		150.0	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.54	66.72	16.12	0.00	150.0	± 9.6 %
		Y	5.60	66.94	16.27		150.0	
		Z	5.48	66.58	16.02		150.0	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.39	66.43	15.99	0.00	150.0	± 9.6 %
		Y	5.46	66.68	16.15		150.0	
		Z	5.32	66.25	15.87		150.0	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.47	66.50	16.01	0.00	150.0	± 9.6 %
		Y	5.53	66.74	16.17		150.0	
		Z	5.40	66.34	15.91		150.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.71	67.43	16.46	0.00	150.0	± 9.6 %
		Y	5.76	67.63	16.60		150.0	
		Z	5.63	67.22	16.32		150.0	
10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.44	66.53	16.05	0.00	150.0	± 9.6 %
		Y	5.50	66.75	16.20		150.0	
		Z	5.38	66.41	15.96		150.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.42	66.49	15.99	0.00	150.0	± 9.6 %
		Y	5.49	66.75	16.16		150.0	
		Z	5.35	66.30	15.87		150.0	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.35	66.32	15.91	0.00	150.0	± 9.6 %
		Y	5.42	66.57	16.07		150.0	
		Z	5.28	66.16	15.80		150.0	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.42	66.33	15.95	0.00	150.0	± 9.6 %
		Y	5.49	66.59	16.11		150.0	
		Z	5.35	66.16	15.83		150.0	
10554-AAB	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.76	66.63	16.03	0.00	150.0	± 9.6 %
		Y	5.82	66.86	16.18		150.0	
		Z	5.71	66.47	15.93		150.0	
10555-AAB	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.89	66.93	16.16	0.00	150.0	± 9.6 %
		Y	5.94	67.16	16.31		150.0	
		Z	5.82	66.77	16.06		150.0	
10556-AAB	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.91	66.98	16.18	0.00	150.0	± 9.6 %
		Y	5.97	67.21	16.33		150.0	
		Z	5.85	66.83	16.09		150.0	
10557-AAB	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.86	66.85	16.14	0.00	150.0	± 9.6 %
		Y	5.92	67.09	16.29		150.0	
		Z	5.80	66.69	16.03		150.0	

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10558-AAB	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	5.91	67.01	16.23	0.00	150.0	± 9.6 %
		Y	5.97	67.25	16.39		150.0	
		Z	5.84	66.83	16.12		150.0	
10560-AAB	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	5.90	66.86	16.19	0.00	150.0	± 9.6 %
		Y	5.96	67.10	16.35		150.0	
		Z	5.84	66.70	16.09		150.0	
10561-AAB	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.83	66.86	16.23	0.00	150.0	± 9.6 %
		Y	5.89	67.09	16.38		150.0	
		Z	5.78	66.70	16.13		150.0	
10562-AAB	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	5.93	67.16	16.38	0.00	150.0	± 9.6 %
		Y	6.00	67.41	16.54		150.0	
		Z	5.85	66.94	16.24		150.0	
10563-AAB	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.04	67.13	16.33	0.00	150.0	± 9.6 %
		Y	6.11	67.38	16.49		150.0	
		Z	5.95	66.90	16.19		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.74	66.58	16.23	0.46	150.0	± 9.6 %
		Y	4.81	66.85	16.44		150.0	
		Z	4.67	66.45	16.11		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	4.95	67.01	16.55	0.46	150.0	± 9.6 %
		Y	5.03	67.26	16.74		150.0	
		Z	4.87	66.87	16.43		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.79	66.84	16.36	0.46	150.0	± 9.6 %
		Y	4.86	67.11	16.56		150.0	
		Z	4.71	66.69	16.23		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	4.82	67.22	16.72	0.46	150.0	± 9.6 %
		Y	4.89	67.47	16.89		150.0	
		Z	4.73	67.07	16.58		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.70	66.63	16.14	0.46	150.0	± 9.6 %
		Y	4.78	66.94	16.37		150.0	
		Z	4.62	66.48	16.00		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.78	67.36	16.81	0.46	150.0	± 9.6 %
		Y	4.85	67.59	16.97		150.0	
		Z	4.71	67.22	16.68		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.81	67.20	16.73	0.46	150.0	± 9.6 %
		Y	4.88	67.44	16.90		150.0	
		Z	4.73	67.05	16.60		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.08	63.77	15.08	0.46	130.0	± 9.6 %
		Y	1.17	64.82	15.96		130.0	
		Z	1.03	63.10	14.50		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.09	64.31	15.43	0.46	130.0	± 9.6 %
		Y	1.18	65.42	16.33		130.0	
		Z	1.03	63.57	14.81		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	1.63	82.59	21.48	0.46	130.0	± 9.6 %
		Y	4.67	100.67	28.34		130.0	
		Z	1.02	75.27	18.21		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.15	69.62	18.12	0.46	130.0	± 9.6 %
		Y	1.32	71.73	19.52		130.0	
		Z	1.04	67.97	17.04		130.0	

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10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.53	66.40	16.31	0.46	130.0	± 9.6 %
		Y	4.60	66.66	16.51		130.0	
		Z	4.46	66.26	16.18		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.55	66.57	16.38	0.46	130.0	± 9.6 %
		Y	4.62	66.82	16.57		130.0	
		Z	4.48	66.43	16.25		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.74	66.84	16.54	0.46	130.0	± 9.6 %
		Y	4.81	67.09	16.73		130.0	
		Z	4.66	66.69	16.41		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.64	66.99	16.64	0.46	130.0	± 9.6 %
		Y	4.71	67.22	16.82		130.0	
		Z	4.56	66.83	16.50		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.40	66.24	15.93	0.46	130.0	± 9.6 %
		Y	4.48	66.56	16.17		130.0	
		Z	4.32	66.07	15.78		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.45	66.31	15.97	0.46	130.0	± 9.6 %
		Y	4.53	66.64	16.22		130.0	
		Z	4.37	66.15	15.82		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.54	67.02	16.59	0.46	130.0	± 9.6 %
		Y	4.61	67.28	16.77		130.0	
		Z	4.46	66.87	16.45		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.34	66.01	15.72	0.46	130.0	± 9.6 %
		Y	4.43	66.35	15.98		130.0	
		Z	4.26	65.85	15.57		130.0	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.53	66.40	16.31	0.46	130.0	± 9.6 %
		Y	4.60	66.66	16.51		130.0	
		Z	4.46	66.26	16.18		130.0	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.55	66.57	16.38	0.46	130.0	± 9.6 %
		Y	4.62	66.82	16.57		130.0	
		Z	4.48	66.43	16.25		130.0	
10585-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.74	66.84	16.54	0.46	130.0	± 9.6 %
		Y	4.81	67.09	16.73		130.0	
		Z	4.66	66.69	16.41		130.0	
10586-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.64	66.99	16.64	0.46	130.0	± 9.6 %
		Y	4.71	67.22	16.82		130.0	
		Z	4.56	66.83	16.50		130.0	
10587-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.40	66.24	15.93	0.46	130.0	± 9.6 %
		Y	4.48	66.56	16.17		130.0	
		Z	4.32	66.07	15.78		130.0	
10588-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.45	66.31	15.97	0.46	130.0	± 9.6 %
		Y	4.53	66.64	16.22		130.0	
		Z	4.37	66.15	15.82		130.0	
10589-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.54	67.02	16.59	0.46	130.0	± 9.6 %
		Y	4.61	67.28	16.77		130.0	
		Z	4.46	66.87	16.45		130.0	
10590-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.34	66.01	15.72	0.46	130.0	± 9.6 %
		Y	4.43	66.35	15.98		130.0	
		Z	4.26	65.85	15.57		130.0	

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10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.68	66.47	16.42	0.46	130.0	± 9.6 %
		Y	4.75	66.71	16.60		130.0	
		Z	4.61	66.34	16.30		130.0	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.82	66.79	16.55	0.46	130.0	± 9.6 %
		Y	4.89	67.04	16.73		130.0	
		Z	4.74	66.65	16.43		130.0	
10593-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.74	66.68	16.42	0.46	130.0	± 9.6 %
		Y	4.81	66.94	16.61		130.0	
		Z	4.66	66.53	16.29		130.0	
10594-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.80	66.86	16.58	0.46	130.0	± 9.6 %
		Y	4.87	67.10	16.76		130.0	
		Z	4.72	66.71	16.45		130.0	
10595-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.76	66.81	16.48	0.46	130.0	± 9.6 %
		Y	4.83	67.07	16.67		130.0	
		Z	4.68	66.67	16.35		130.0	
10596-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.70	66.80	16.48	0.46	130.0	± 9.6 %
		Y	4.77	67.07	16.68		130.0	
		Z	4.62	66.65	16.35		130.0	
10597-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.65	66.69	16.35	0.46	130.0	± 9.6 %
		Y	4.72	66.96	16.55		130.0	
		Z	4.57	66.53	16.21		130.0	
10598-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.63	66.91	16.61	0.46	130.0	± 9.6 %
		Y	4.70	67.16	16.79		130.0	
		Z	4.55	66.74	16.46		130.0	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.37	67.02	16.67	0.46	130.0	± 9.6 %
		Y	5.42	67.22	16.82		130.0	
		Z	5.31	66.93	16.60		130.0	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.51	67.51	16.89	0.46	130.0	± 9.6 %
		Y	5.56	67.66	17.02		130.0	
		Z	5.45	67.42	16.81		130.0	
10601-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.39	67.21	16.76	0.46	130.0	± 9.6 %
		Y	5.44	67.40	16.90		130.0	
		Z	5.33	67.10	16.67		130.0	
10602-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.51	67.34	16.74	0.46	130.0	± 9.6 %
		Y	5.56	67.52	16.88		130.0	
		Z	5.46	67.26	16.67		130.0	
10603-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.58	67.60	17.00	0.46	130.0	± 9.6 %
		Y	5.62	67.76	17.13		130.0	
		Z	5.52	67.53	16.94		130.0	
10604-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.43	67.20	16.79	0.46	130.0	± 9.6 %
		Y	5.48	67.36	16.92		130.0	
		Z	5.41	67.23	16.78		130.0	
10605-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.51	67.42	16.90	0.46	130.0	± 9.6 %
		Y	5.55	67.59	17.04		130.0	
		Z	5.44	67.31	16.81		130.0	
10606-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.22	66.63	16.36	0.46	130.0	± 9.6 %
		Y	5.28	66.85	16.53		130.0	
		Z	5.18	66.57	16.29		130.0	

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10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.52	65.78	16.04	0.46	130.0	± 9.6 %
		Y	4.59	66.04	16.24		130.0	
		Z	4.45	65.64	15.91		130.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.69	66.16	16.21	0.46	130.0	± 9.6 %
		Y	4.77	66.43	16.40		130.0	
		Z	4.61	66.01	16.07		130.0	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.58	66.00	16.03	0.46	130.0	± 9.6 %
		Y	4.66	66.29	16.24		130.0	
		Z	4.50	65.84	15.89		130.0	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.63	66.16	16.20	0.46	130.0	± 9.6 %
		Y	4.71	66.43	16.39		130.0	
		Z	4.55	66.00	16.06		130.0	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.55	65.97	16.05	0.46	130.0	± 9.6 %
		Y	4.62	66.25	16.25		130.0	
		Z	4.47	65.80	15.91		130.0	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.55	66.12	16.09	0.46	130.0	± 9.6 %
		Y	4.63	66.42	16.31		130.0	
		Z	4.46	65.94	15.95		130.0	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.55	65.97	15.96	0.46	130.0	± 9.6 %
		Y	4.63	66.28	16.18		130.0	
		Z	4.46	65.79	15.81		130.0	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.50	66.16	16.19	0.46	130.0	± 9.6 %
		Y	4.58	66.44	16.39		130.0	
		Z	4.42	65.98	16.04		130.0	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.55	65.80	15.82	0.46	130.0	± 9.6 %
		Y	4.63	66.12	16.05		130.0	
		Z	4.46	65.65	15.68		130.0	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.18	66.24	16.26	0.46	130.0	± 9.6 %
		Y	5.24	66.47	16.42		130.0	
		Z	5.11	66.09	16.15		130.0	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.26	66.47	16.35	0.46	130.0	± 9.6 %
		Y	5.32	66.68	16.50		130.0	
		Z	5.19	66.32	16.25		130.0	
10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.14	66.45	16.36	0.46	130.0	± 9.6 %
		Y	5.20	66.67	16.51		130.0	
		Z	5.07	66.32	16.25		130.0	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.15	66.24	16.19	0.46	130.0	± 9.6 %
		Y	5.21	66.48	16.35		130.0	
		Z	5.08	66.11	16.09		130.0	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.24	66.28	16.26	0.46	130.0	± 9.6 %
		Y	5.30	66.51	16.42		130.0	
		Z	5.17	66.14	16.15		130.0	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.24	66.41	16.45	0.46	130.0	± 9.6 %
		Y	5.30	66.62	16.58		130.0	
		Z	5.17	66.26	16.33		130.0	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.26	66.58	16.52	0.46	130.0	± 9.6 %
		Y	5.32	66.79	16.67		130.0	
		Z	5.18	66.40	16.40		130.0	

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10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.13	66.09	16.14	0.46	130.0	± 9.6 %
		Y	5.20	66.34	16.32		130.0	
		Z	5.05	65.90	16.02		130.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.32	66.30	16.32	0.46	130.0	± 9.6 %
		Y	5.38	66.52	16.47		130.0	
		Z	5.25	66.16	16.21		130.0	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.62	67.08	16.76	0.46	130.0	± 9.6 %
		Y	5.68	67.32	16.93		130.0	
		Z	5.46	66.69	16.54		130.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.49	66.30	16.23	0.46	130.0	± 9.6 %
		Y	5.55	66.52	16.38		130.0	
		Z	5.44	66.16	16.13		130.0	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.75	66.95	16.52	0.46	130.0	± 9.6 %
		Y	5.79	67.12	16.64		130.0	
		Z	5.70	66.84	16.44		130.0	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.51	66.35	16.15	0.46	130.0	± 9.6 %
		Y	5.58	66.60	16.32		130.0	
		Z	5.44	66.18	16.04		130.0	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.60	66.45	16.20	0.46	130.0	± 9.6 %
		Y	5.65	66.67	16.35		130.0	
		Z	5.54	66.32	16.11		130.0	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	6.03	67.95	16.95	0.46	130.0	± 9.6 %
		Y	6.06	68.09	17.06		130.0	
		Z	5.93	67.70	16.80		130.0	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.89	67.65	16.99	0.46	130.0	± 9.6 %
		Y	5.95	67.83	17.11		130.0	
		Z	5.80	67.42	16.85		130.0	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.72	67.01	16.69	0.46	130.0	± 9.6 %
		Y	5.76	67.16	16.79		130.0	
		Z	5.67	66.93	16.62		130.0	
10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.57	66.52	16.27	0.46	130.0	± 9.6 %
		Y	5.64	66.76	16.42		130.0	
		Z	5.51	66.38	16.18		130.0	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.55	66.54	16.33	0.46	130.0	± 9.6 %
		Y	5.62	66.76	16.48		130.0	
		Z	5.49	66.38	16.23		130.0	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.43	65.87	15.73	0.46	130.0	± 9.6 %
		Y	5.50	66.15	15.93		130.0	
		Z	5.36	65.70	15.62		130.0	
10636-AAB	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	5.92	66.67	16.32	0.46	130.0	± 9.6 %
		Y	5.97	66.88	16.46		130.0	
		Z	5.87	66.55	16.24		130.0	
10637-AAB	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.08	67.09	16.52	0.46	130.0	± 9.6 %
		Y	6.13	67.28	16.65		130.0	
		Z	6.02	66.94	16.42		130.0	
10638-AAB	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.08	67.05	16.47	0.46	130.0	± 9.6 %
		Y	6.13	67.25	16.60		130.0	
		Z	6.02	66.92	16.39		130.0	

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10639-AAB	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	6.04	66.96	16.47	0.46	130.0	± 9.6 %
		Y	6.10	67.17	16.61		130.0	
		Z	5.98	66.81	16.38		130.0	
10640-AAB	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	6.04	66.97	16.42	0.46	130.0	± 9.6 %
		Y	6.10	67.20	16.57		130.0	
		Z	5.98	66.81	16.32		130.0	
10641-AAB	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	6.11	66.95	16.43	0.46	130.0	± 9.6 %
		Y	6.16	67.15	16.57		130.0	
		Z	6.06	66.84	16.36		130.0	
10642-AAB	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.13	67.13	16.69	0.46	130.0	± 9.6 %
		Y	6.18	67.32	16.81		130.0	
		Z	6.07	66.99	16.60		130.0	
10643-AAB	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	5.98	66.86	16.45	0.46	130.0	± 9.6 %
		Y	6.03	67.07	16.59		130.0	
		Z	5.93	66.73	16.36		130.0	
10644-AAB	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	6.10	67.22	16.65	0.46	130.0	± 9.6 %
		Y	6.16	67.46	16.81		130.0	
		Z	6.01	67.00	16.51		130.0	
10645-AAB	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.27	67.37	16.69	0.46	130.0	± 9.6 %
		Y	6.33	67.60	16.84		130.0	
		Z	6.19	67.19	16.58		130.0	
10646-AAD	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	19.31	114.28	39.96	9.30	60.0	± 9.6 %
		Y	65.32	147.35	49.79		60.0	
		Z	13.53	106.61	37.67		60.0	
10647-AAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	16.27	110.85	39.07	9.30	60.0	± 9.6 %
		Y	45.52	139.18	47.88		60.0	
		Z	11.55	103.43	36.79		60.0	
10648-AAA	CDMA2000 (1x Advanced)	X	0.52	61.38	8.46	0.00	150.0	± 9.6 %
		Y	0.64	63.18	10.20		150.0	
		Z	0.45	60.27	7.19		150.0	
10652-AAB	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.48	66.73	16.48	2.23	80.0	± 9.6 %
		Y	3.65	67.47	16.95		80.0	
		Z	3.31	66.16	16.07		80.0	
10653-AAB	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	4.00	66.01	16.65	2.23	80.0	± 9.6 %
		Y	4.14	66.58	17.00		80.0	
		Z	3.87	65.59	16.36		80.0	
10654-AAB	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	3.99	65.63	16.65	2.23	80.0	± 9.6 %
		Y	4.12	66.17	16.99		80.0	
		Z	3.87	65.23	16.39		80.0	
10655-AAB	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.06	65.59	16.69	2.23	80.0	± 9.6 %
		Y	4.18	66.13	17.03		80.0	
		Z	3.94	65.19	16.43		80.0	

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

Attachment 7. – Dipole Calibration Data

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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)** Certificate No: **D750V3-1014_Aug18**

CALIBRATION CERTIFICATE

Object D750V3 - SN:1014

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

결	담 당 자	확 인 자
재		
재위/상명	GW / 개발3	GJ / 과장님
일 자	2018 / 08. 23	2018 / 08. 23

Calibration date: August 14, 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-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
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 Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 14, 2018

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

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.15 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.30 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.63 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.4 Ω + 6.4 jΩ
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 1.0 jΩ
Return Loss	- 39.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 22, 2010

DASY5 Validation Report for Head TSL

Date: 14.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1014

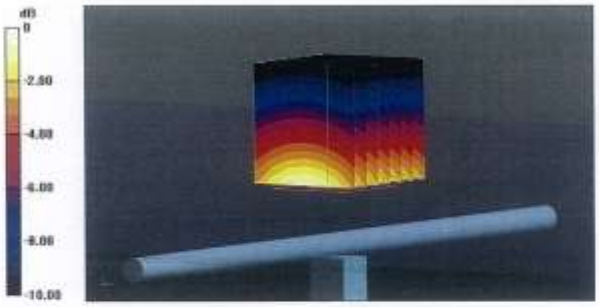
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

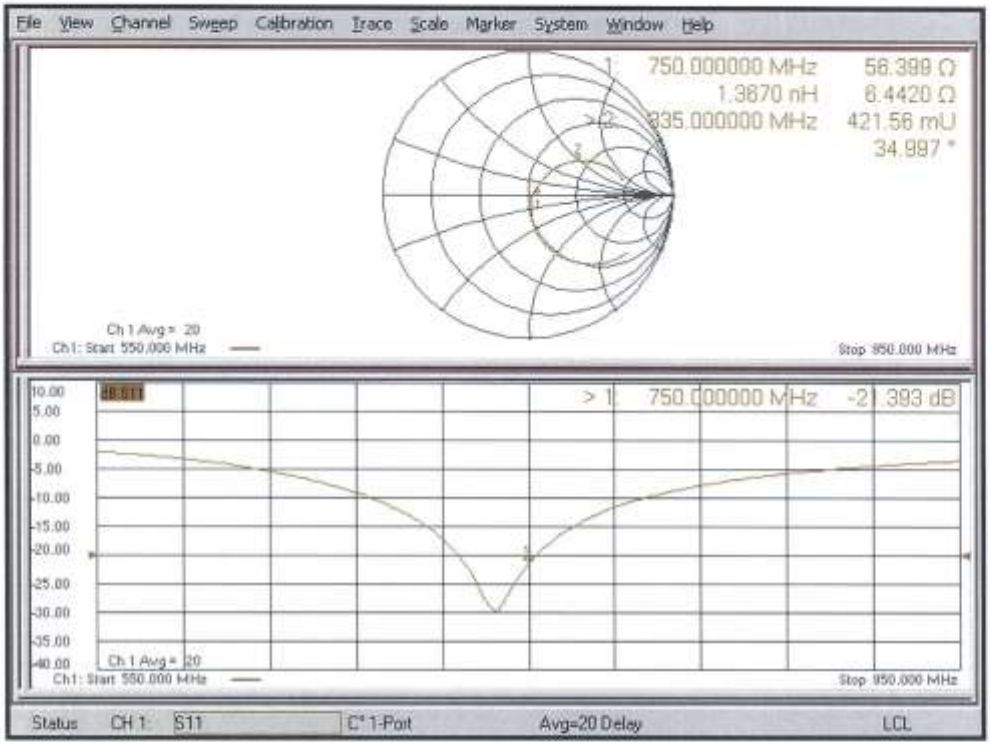
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.30 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.10 W/kg
SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



0 dB = 2.76 W/kg = 4.41 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1014

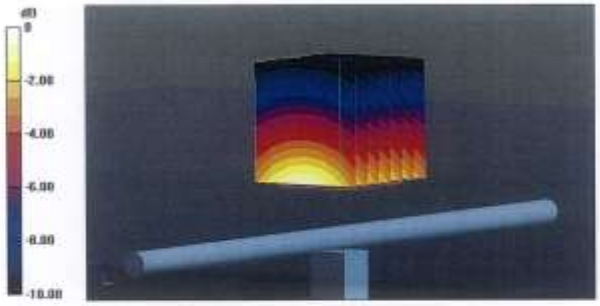
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

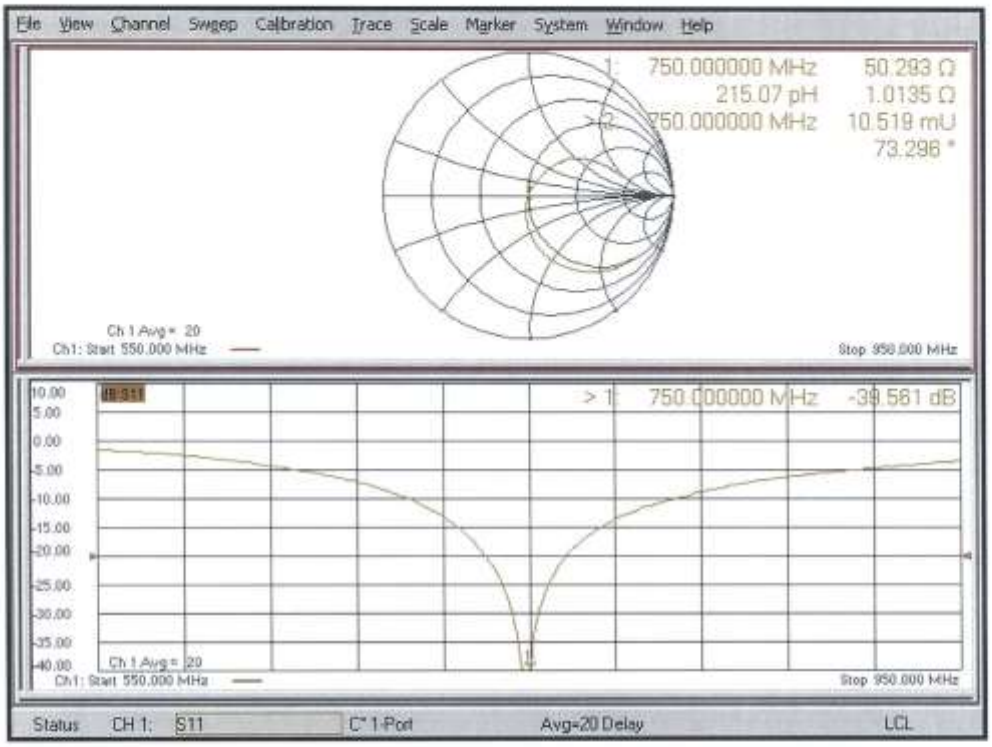
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.92 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.20 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



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

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec) Certificate No: D835V2-441_Sep17

CALIBRATION CERTIFICATE

Object D835V2 - SN:441

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

Calibration date: September 21, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: September 21, 2017

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.38 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.07 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.3 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.41 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.16 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω - 2.3 jΩ
Return Loss	- 32.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω - 5.0 jΩ
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.371 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 09, 2001

DASY5 Validation Report for Head TSL

Date: 21.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441

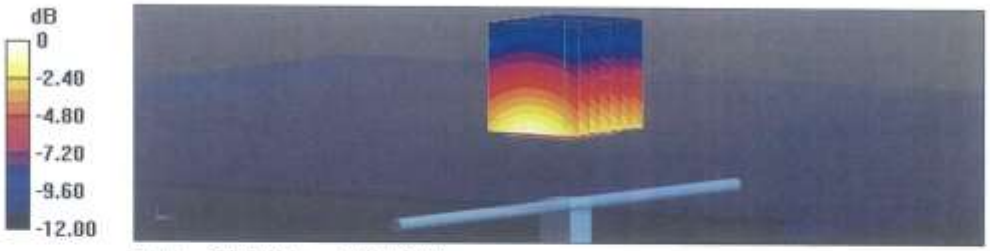
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.07, 10.07, 10.07); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

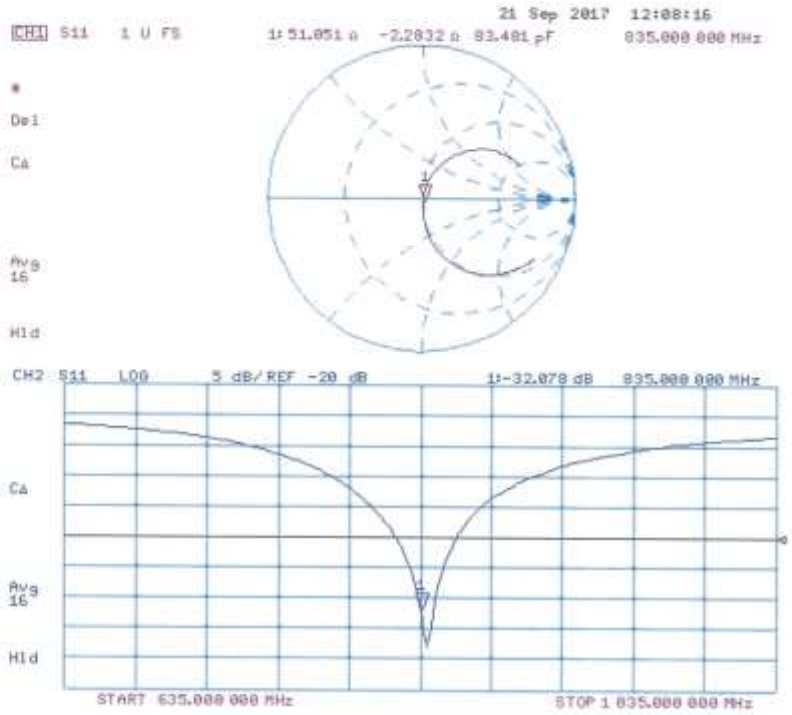
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.34 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441

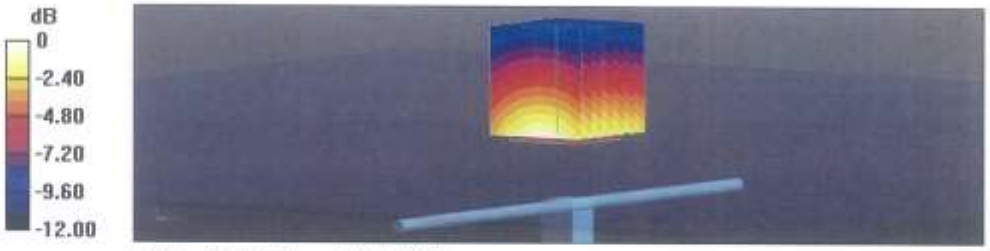
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.2, 10.2, 10.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

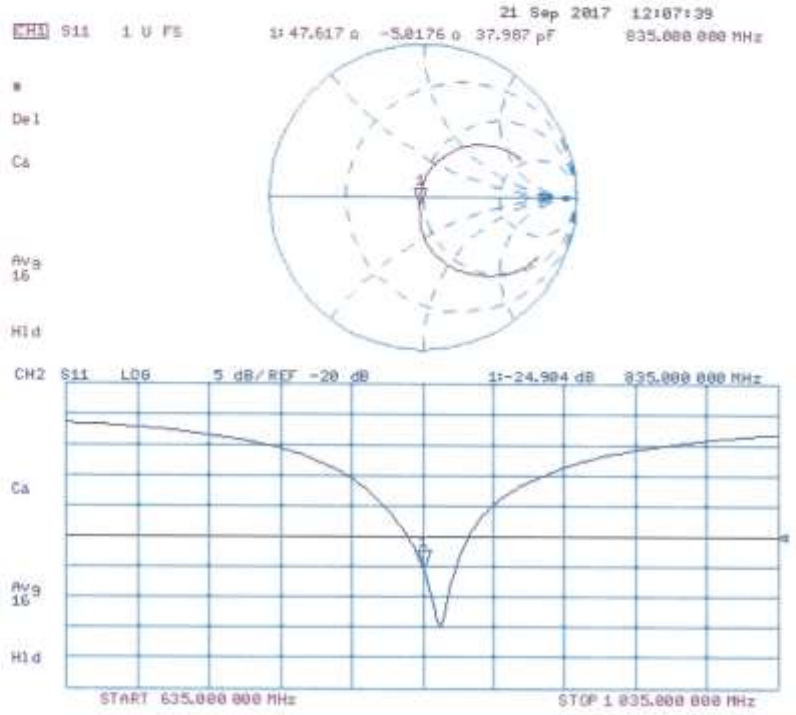
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.66 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.12 W/kg



0 dB = 3.12 W/kg = 4.94 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec) Certificate No: D1800V2-2d006_Nov17

CALIBRATION CERTIFICATE

결재	담당자	책임자
	2017.12.15	2017.12.15

Object D1800V2 - SN:2d006

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

Calibration date: November 15, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-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: November 15, 2017

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Certificate No: D1800V2-2d006_Nov17 Page 1 of 8

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**38.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.1 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**38.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.8 Ω - 7.3 jΩ
Return Loss	- 21.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	42.9 Ω - 6.0 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.208 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 23, 2001

DASY5 Validation Report for Head TSL

Date: 15.11.2017

Test Laboratory: SPEAG, Zurich, Switzerland

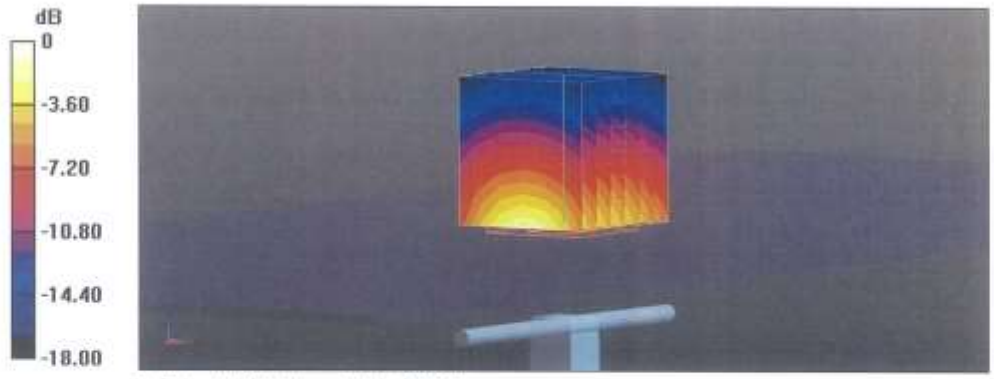
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d006

Communication System: UID 0 - CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.38 S/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

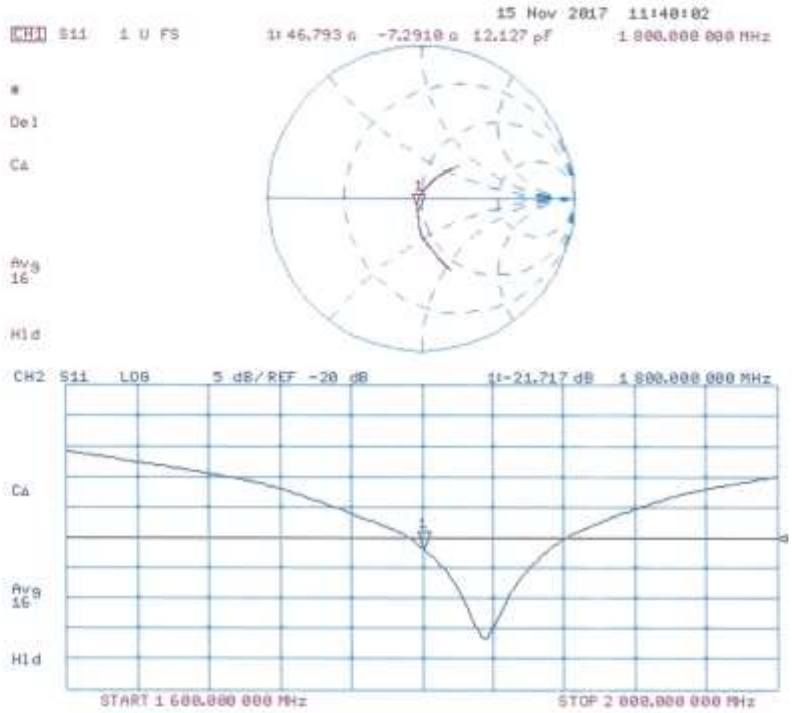
- Probe: EX3DV4 - SN7349; ConvF(8.56, 8.56, 8.56); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 108.6 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.63 W/kg; SAR(10 g) = 5.01 W/kg
Maximum value of SAR (measured) = 14.9 W/kg



0 dB = 14.9 W/kg = 11.73 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.11.2017

Test Laboratory: SPEAG, Zurich, Switzerland

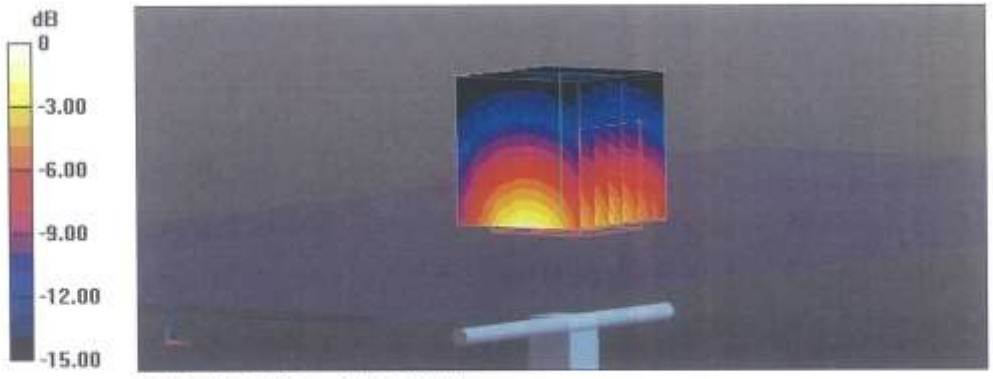
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d006

Communication System: UID 0 - CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.52 S/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

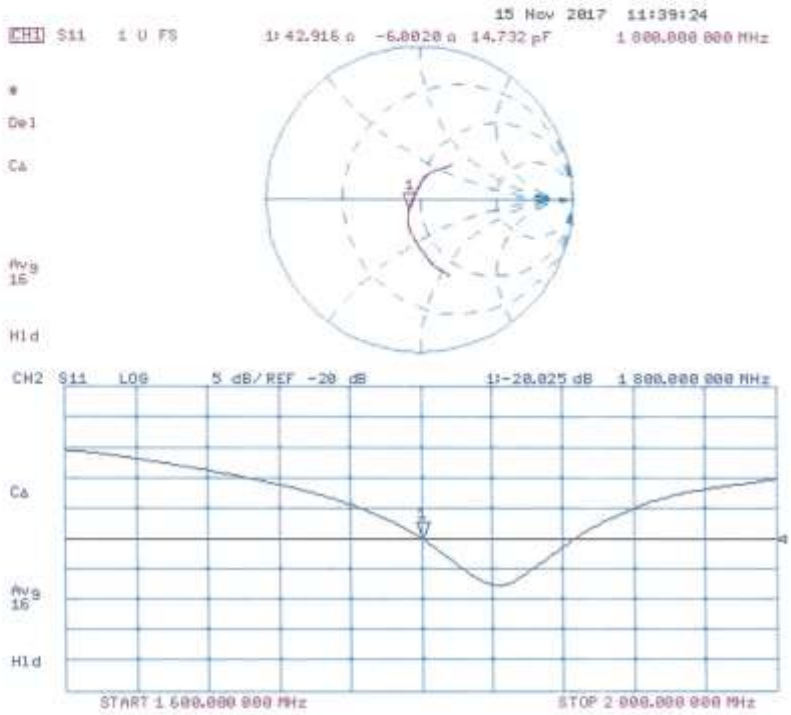
- Probe: EX3DV4 - SN7349; ConvF(8.38, 8.38, 8.38); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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) = 17.5 W/kg
SAR(1 g) = 9.75 W/kg; SAR(10 g) = 5.09 W/kg
Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 14.5 W/kg = 11.61 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec) Certificate No: D1900V2-5d061_Mar18

CALIBRATION CERTIFICATE

Object D1900V2 - SN:5d061

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

결재	담당자	확인자

Calibration date: March 15, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). 2018.4.2
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: March 15, 2018

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω + 6.2 jΩ
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.7 Ω + 4.9 jΩ
Return Loss	- 25.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 10, 2004

DASY5 Validation Report for Head TSL

Date: 15.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

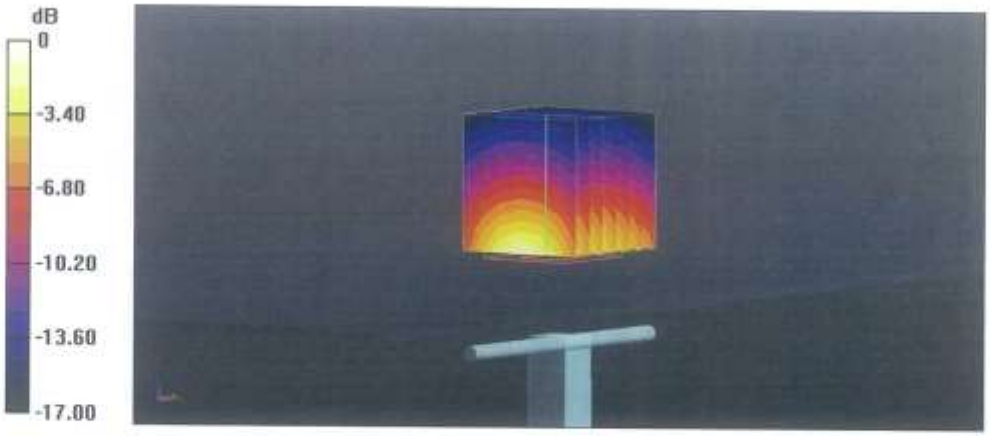
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d061

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.37 S/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

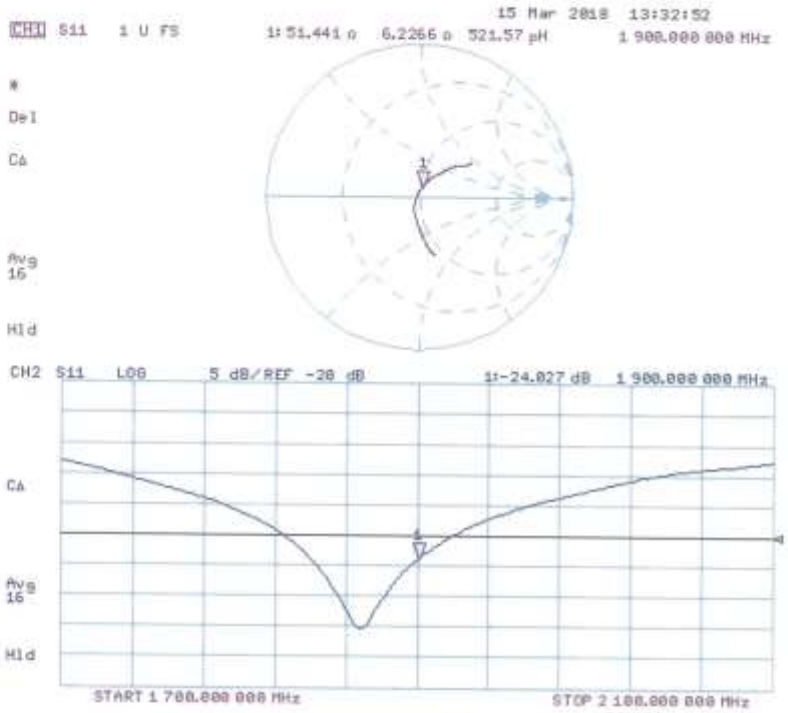
- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.8 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 9.88 W/kg; SAR(10 g) = 5.19 W/kg
Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 15.1 W/kg = 11.79 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

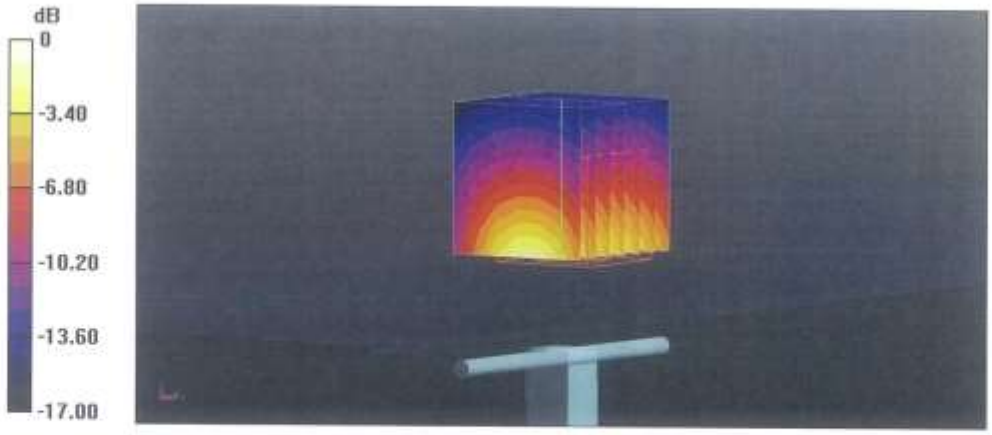
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d061

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

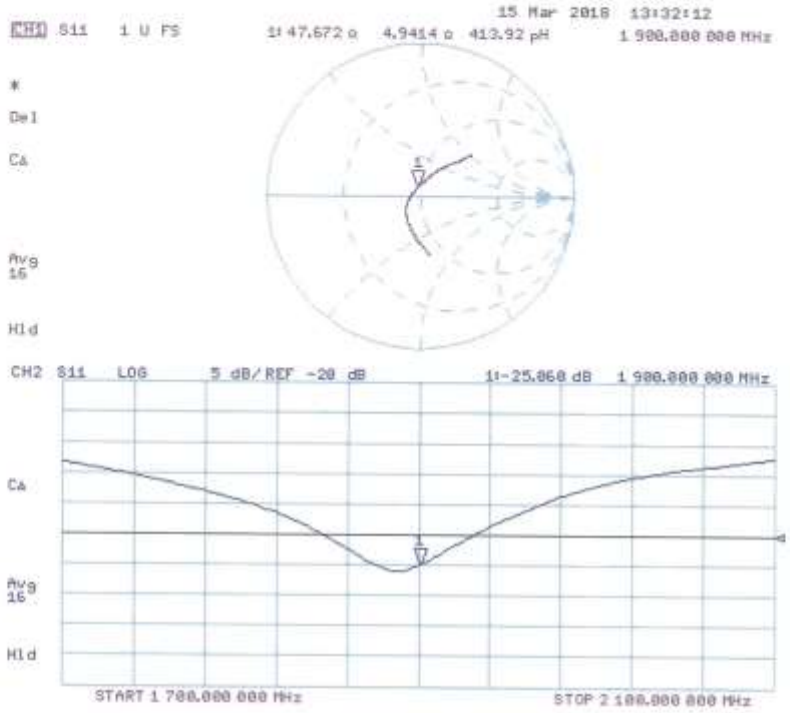
- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.9 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 9.64 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



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

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec) Certificate No: D2450V2-965_Feb18

CALIBRATION CERTIFICATE

Object D2450V2 - SN:965

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

Calibration date: February 16, 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 19, 2018

결재	담당자	확인자
직위/성명	선임	팀장
일자	2018.03.06	2018.03.06

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.98 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.9 Ω + 4.2 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω + 6.3 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.163 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 19, 2014

DASY5 Validation Report for Head TSL

Date: 16.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 965

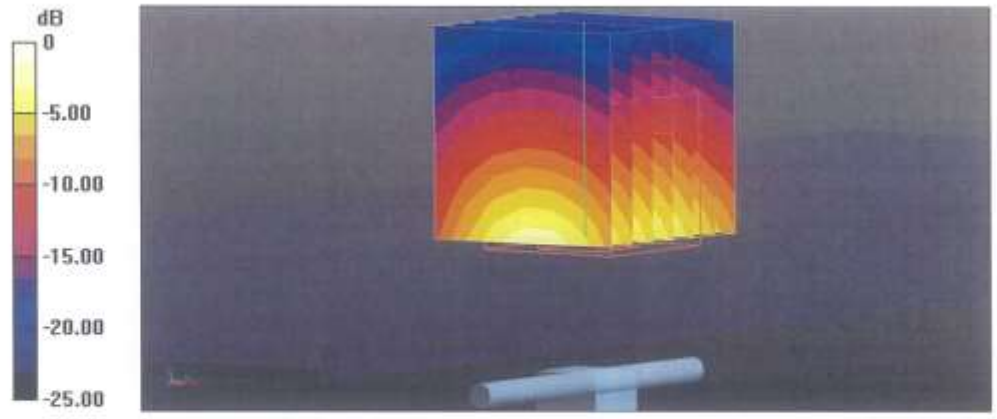
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.87 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(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)

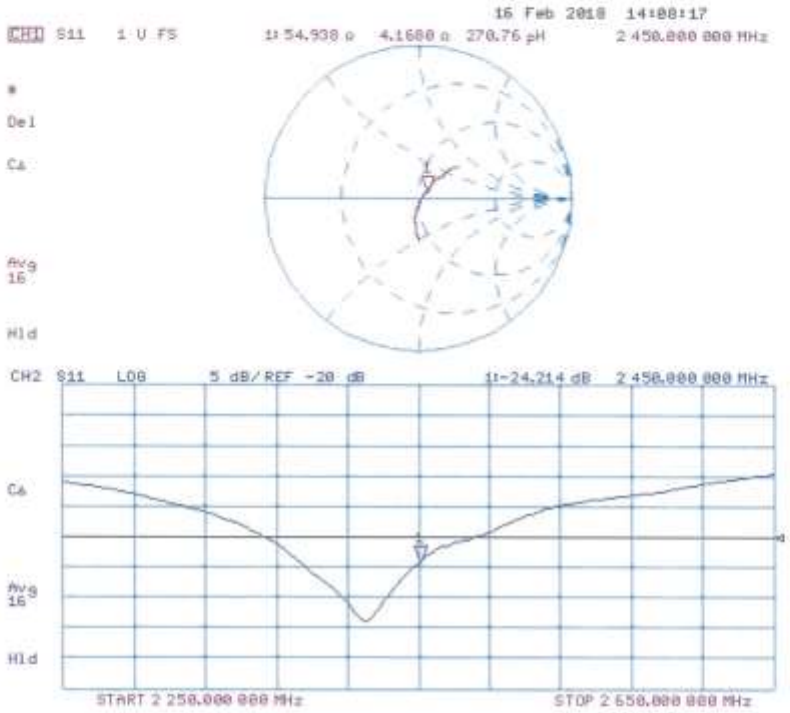
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 112.7 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.07 W/kg
Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 965

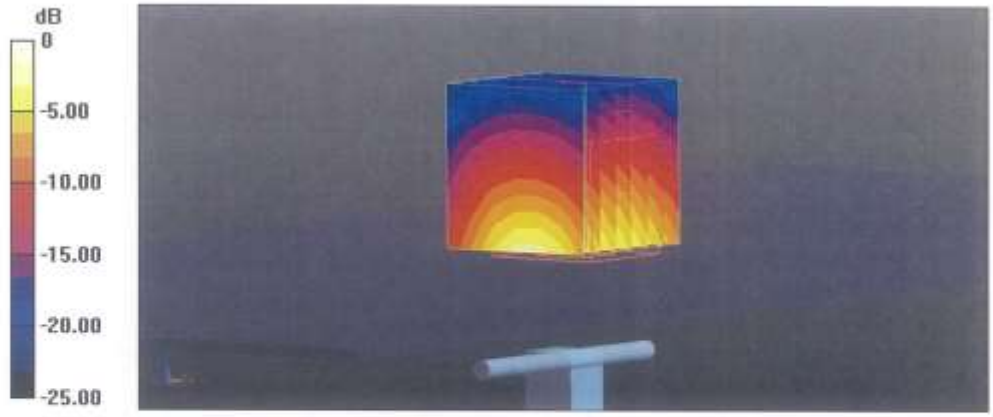
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.01, 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)

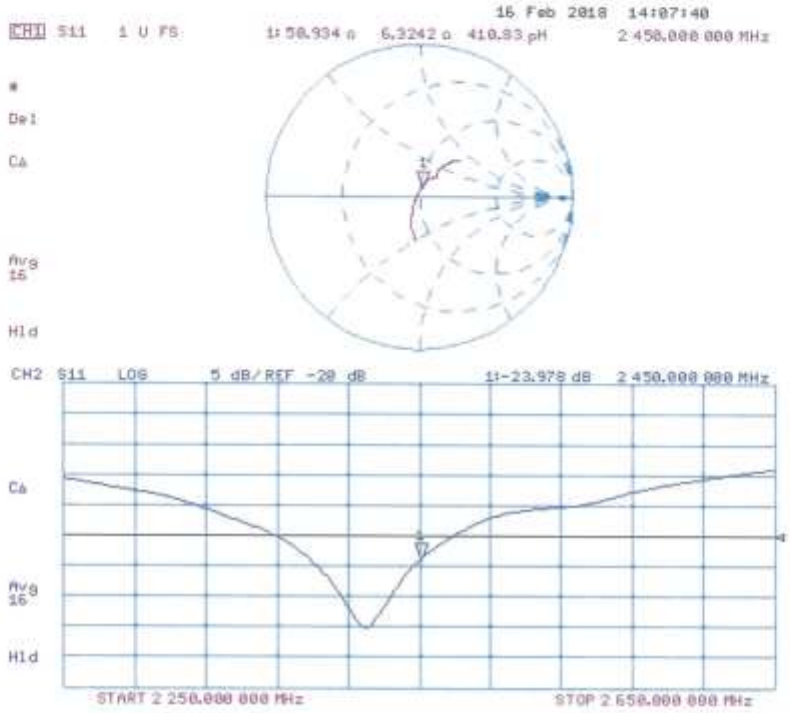
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

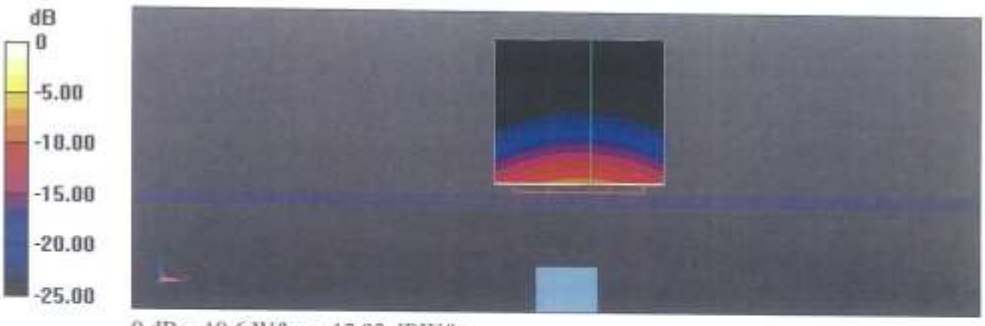
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 25.8 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.98 W/kg
Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

Impedance Measurement Plot for Body TSL





0 dB = 19.6 W/kg = 12.92 dBW/kg

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Accreditation No.: SCS 0108

Client HCT (Dymstec) Certificate No: D2600V2-1106_Dec17

CALIBRATION CERTIFICATE

Object D2600V2 - SN:1106

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

결재	담당자	확인자

Calibration date: December 15, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

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

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

Issued: December 18, 2017

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.1 ± 6 %	2.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**54.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.8 Ω - 8.3 jΩ
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.7 Ω - 5.9 jΩ
Return Loss	- 21.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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	February 18, 2015

DASY5 Validation Report for Head TSL

Date: 15.12.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1106

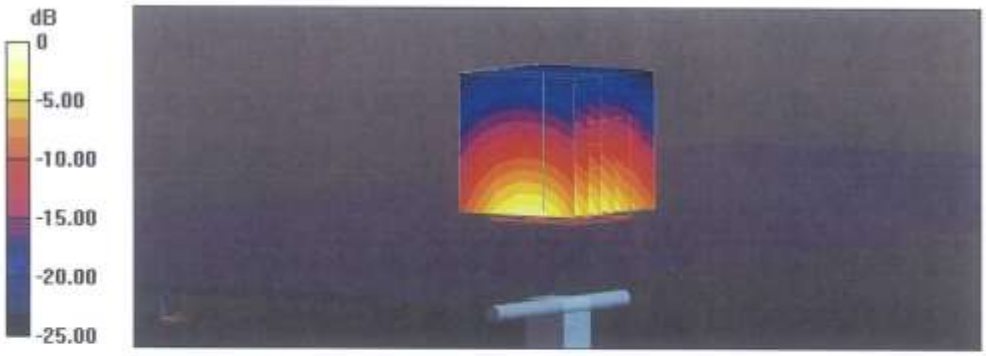
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 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)

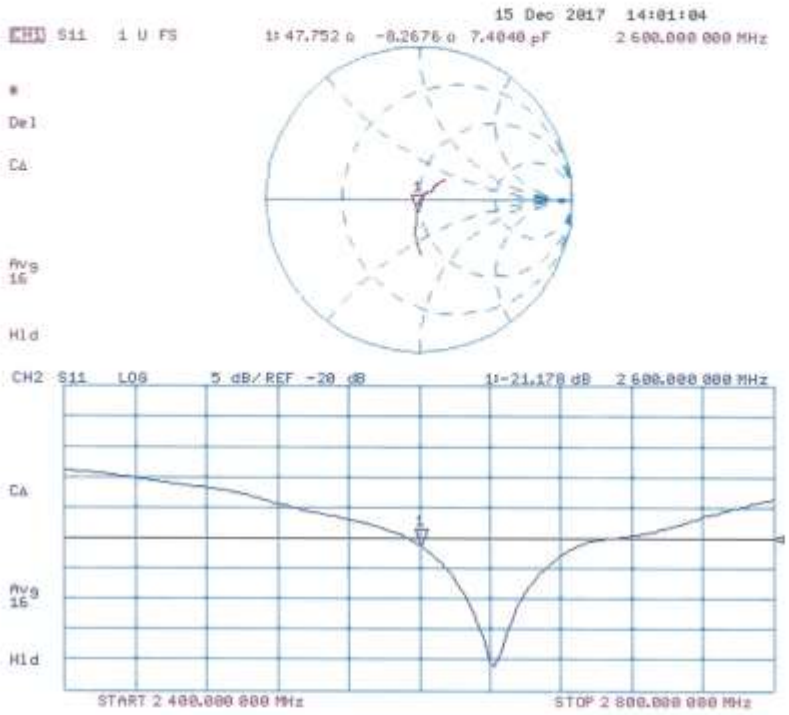
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.0 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.35 W/kg
Maximum value of SAR (measured) = 23.6 W/kg



0 dB = 23.6 W/kg = 13.73 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.12.2017

Test Laboratory: SPEAG, Zurich, Switzerland

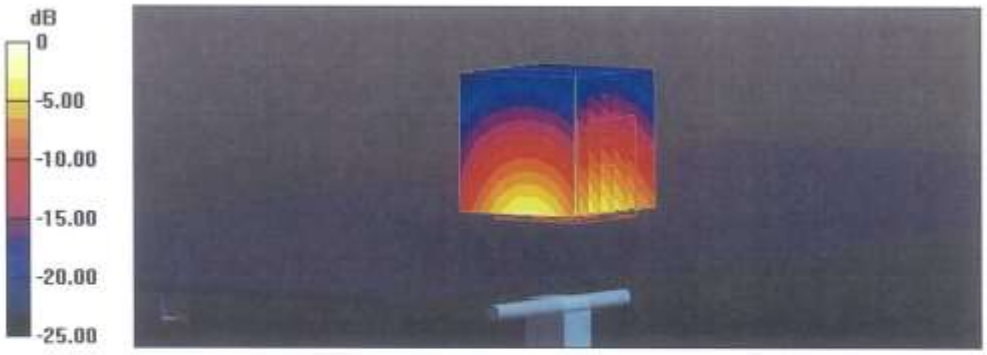
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1106

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.22 S/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

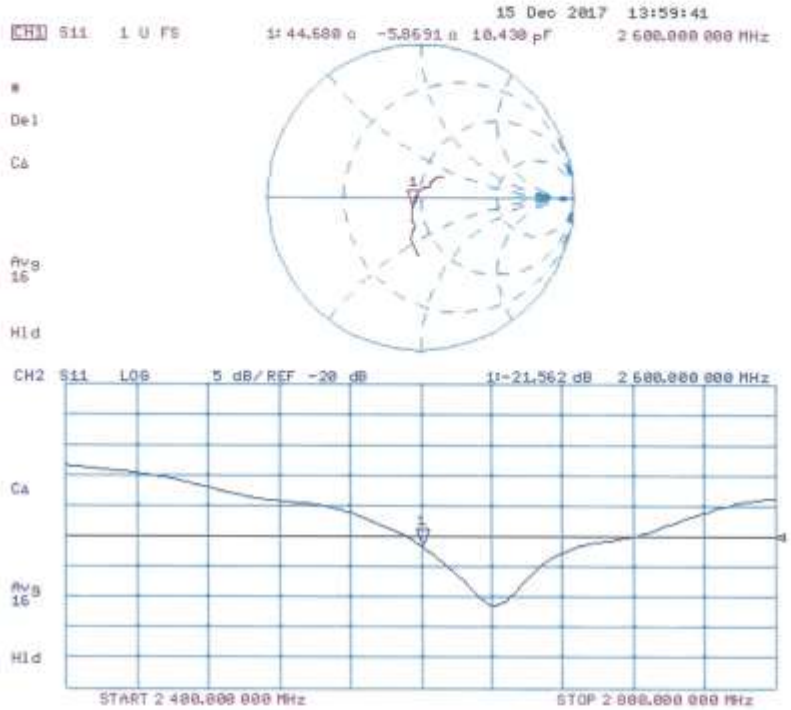
- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 104.4 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.13 W/kg
Maximum value of SAR (measured) = 22.4 W/kg

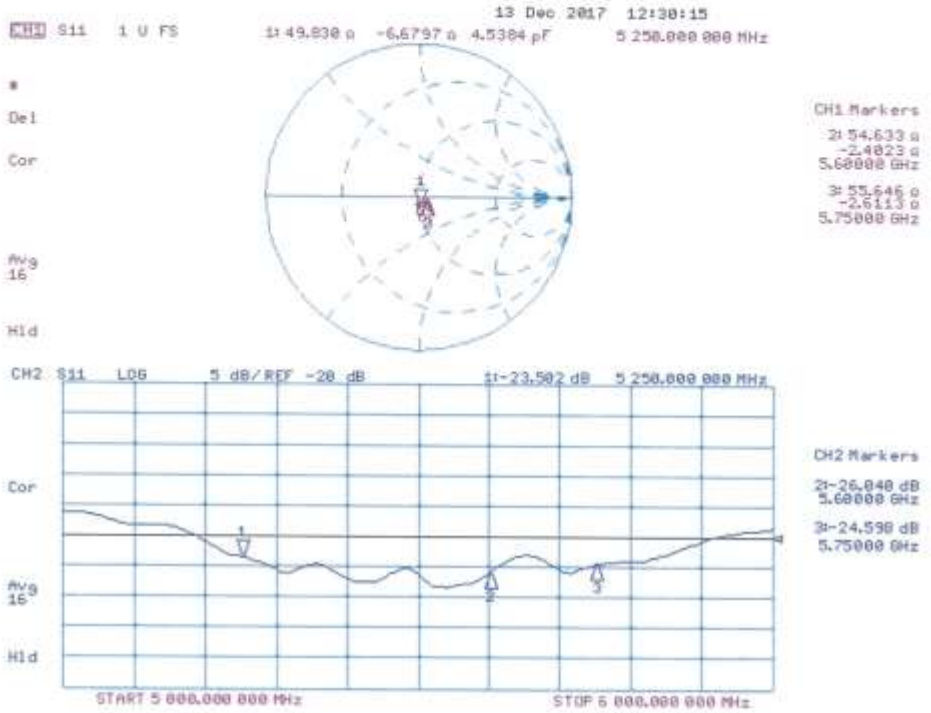


0 dB = 22.4 W/kg = 13.50 dBW/kg

Impedance Measurement Plot for Body TSL



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.12.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1107

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.51 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.97 S/m; ε_r = 46.5; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 6.18 S/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

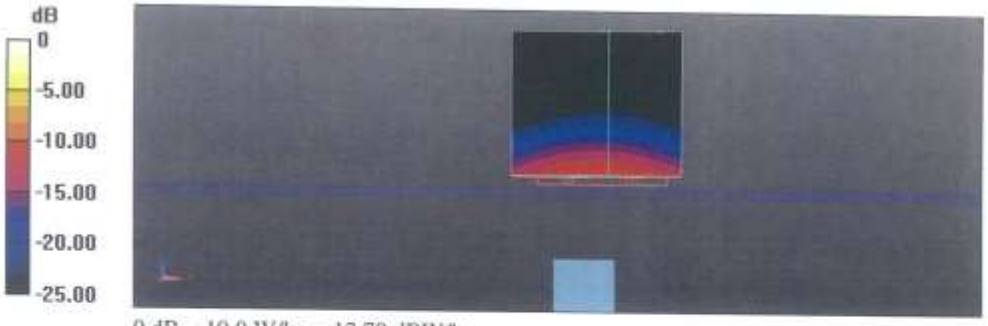
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.14, 5.14, 5.14); Calibrated: 31.12.2016, ConvF(4.57, 4.57, 4.57); Calibrated: 31.12.2016, ConvF(4.51, 4.51, 4.51); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 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=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.06 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

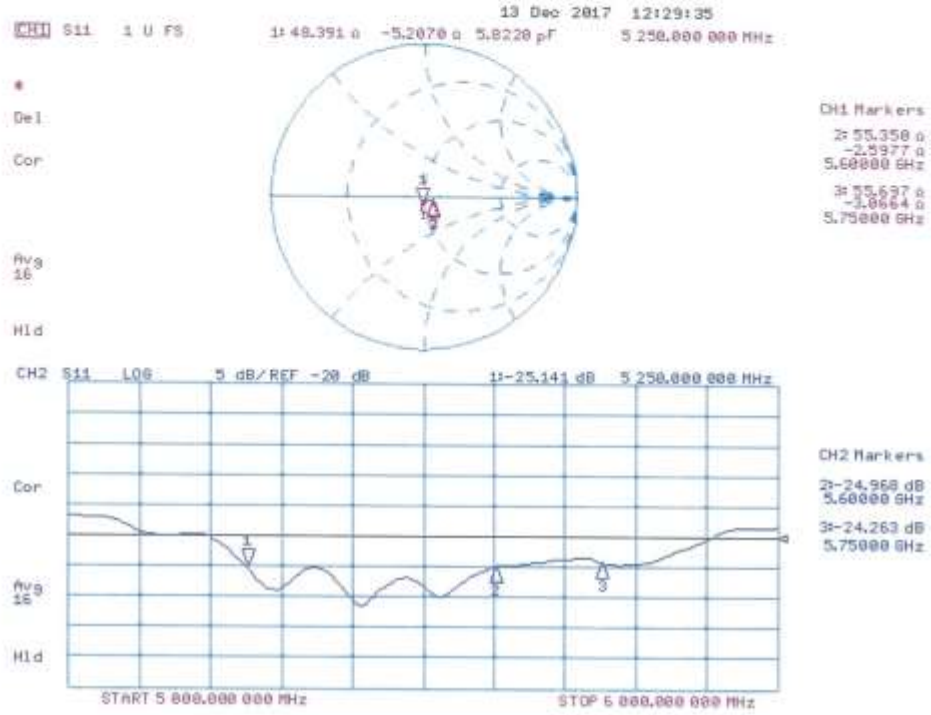
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.93 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 34.6 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.90 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 19.0 W/kg



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

Impedance Measurement Plot for Body TSL



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Certificate of conformity / First Article Inspection

Item	Triple Modular Flat Phantom V5.1
Type No	QD 000 P51 C
Series No	1100 and higher
Manufacturer / Origin	Untersee Composites Knebelstrasse 8, CH-8268 Mannenbach, Switzerland

Tests
The sub-units of item 1100 are identified with the designation 1100/1, 1100/2 and 1100/3. Tests were conducted on all 3 sub-units of this phantom.

Test	Requirement	Details	Units tested
Material thickness	Compliant with the standard requirements.	2 mm +/- 0.2 mm 30 points over the bottom area	all
Material parameters	Dielectric parameters for required frequencies	200 MHz – 6 GHz - Relative permittivity 3 - 5 Loss tangent < 0.05.	Material sample
Material resistivity	The material is compatible with the liquids defined in the standards if handled and cleaned according to the instructions.	DGBE based simulating liquids. Observe Technical Note for material compatibility.	Material Samples
Shape	Internal dimensions	Internal height: > 175 mm Bottom internal length: 280 mm Bottom internal width: 175 mm Nominal filling height: 155 mm Nominal volume: 9.2 l	Pre-series, design
Sagging	Depending on standard	No initial sagging (negative preshaped, change < 0.5 mm)	1100/2

Standards
[1] IEEE 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
[2] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005
[3] IEC 62209 – 2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation and Procedures, Part 2: Procedure to determine the Specific Absorption Rate (SAR) for ... including accessories and multiple transmitters", March 2010
[4] KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Conformity
Based on the dimensions and sample tests above, we certify that this item is in compliance with the standards [1] to [4] for frequencies > 700 MHz, if operated according to the specific requirements.

Date 16.07.2015

Signature / Stamp

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