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[illegible]-AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	± 9.6 %
		Y	5.19	67.39	16.49		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10430-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.58	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	4.49	73.15	19.04		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10431-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	4.67	67.63	16.48		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10432-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.15	66.66	16.31	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10433-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.39	66.91	16.54	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.42	74.13	18.26	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	4.17	72.08	17.69		150.0	
[illegible]-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	9.40	89.31	20.93	3.23	80.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	11.08	92.88	22.38		80.0	
10447-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	2.96	66.55	14.33	0.00	150.0	± 9.6 %
		Y	3.37	67.75	15.49		150.0	
		Z	3.15	66.53	14.56		150.0	
10448-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	X	3.66	66.95	15.83	0.00	150.0	± 9.6 %
		Y	3.93	67.43	16.16		150.0	
		Z	3.78	66.66	15.60		150.0	
10449-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	X	3.97	66.81	16.10	0.00	150.0	± 9.6 %
		Y	4.20	67.26	16.26		150.0	
		Z	4.08	66.61	15.81		150.0	
10450-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.19	66.68	16.18	0.00	150.0	± 9.6 %
		Y	4.40	67.13	16.29		150.0	
		Z	4.29	66.54	15.89		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	2.70	65.89	13.23	0.00	150.0	± 9.6 %
		Y	3.22	67.79	14.95		150.0	
		Z	2.96	66.32	13.88		150.0	
10456-AAB	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.06	67.79	16.82	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	6.56	67.70	16.46		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.57	65.33	15.93	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	3.84	65.12	15.81		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	4.34	73.34	18.13		150.0	
		Z	3.60	70.40	16.40		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	5.26	71.27	18.79	0.00	150.0	± 9.6 %
		Y	5.12	69.87	18.56		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	

10477-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	[illegible]	[illegible]	[illegible]	3.23	80.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	9.83	92.75	8.50		80.0	
10478-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.96	60.00	7.29	3.23	80.0	± 9.6 %
		Y	0.89	60.00	6.80		80.0	
		Z	0.89	60.00	7.50		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	45.10	109.19	27.60	3.23	80.0	± 9.6 %
		Y	15.72	96.20	25.05		80.0	
		Z	6.90	84.81	21.76		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.04	69.21	13.43	3.23	80.0	± 9.6 %
		Y	7.14	79.40	17.60		80.0	
		Z	3.96	72.66	15.62		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.13	65.01	11.27	3.23	80.0	± 9.6 %
		Y	4.28	72.85	14.93		80.0	
		Z	2.99	68.94	13.69		80.0	
10482-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.17	61.31	9.58	2.23	80.0	± 9.6 %
		Y	2.63	70.52	15.29		80.0	
		Z	1.70	64.90	12.42		80.0	
10483-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.50	60.67	8.86	2.23	80.0	± 9.6 %
		Y	3.07	68.75	13.76		80.0	
		Z	2.34	65.62	12.29		80.0	
10484-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.49	60.41	8.72	2.23	80.0	± 9.6 %
		Y	2.87	67.74	13.34		80.0	
		Z	2.25	64.87	11.98		80.0	
10485-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.15	68.29	14.58	2.23	80.0	± 9.6 %
		Y	3.39	74.14	18.00		80.0	
		Z	2.32	68.58	15.36		80.0	
10486-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.85	63.20	11.43	2.23	80.0	± 9.6 %
		Y	2.97	68.66	15.17		80.0	
		Z	2.31	65.29	13.27		80.0	
10487-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.86	62.92	11.27	2.23	80.0	± 9.6 %
		Y	2.84	68.37	14.93		80.0	
		Z	2.33	65.12	13.13		80.0	
10488-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.93	71.00	17.45	2.23	80.0	± 9.6 %
		Y	3.58	73.22	18.66		80.0	
		Z	2.85	69.54	16.89		80.0	
10489-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.90	67.67	15.87	2.23	80.0	± 9.6 %
		Y	3.42	69.49	17.05		80.0	
		Z	2.98	67.24	15.84		80.0	
10490-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.97	67.51	15.80	2.23	80.0	± 9.6 %
		Y	3.50	69.29	16.97		80.0	
		Z	3.07	67.17	15.82		80.0	
10491-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.19	69.71	17.35	2.23	80.0	± 9.6 %
		Y	3.74	71.43	18.14		80.0	
		Z	3.20	68.62	16.86		80.0	
10492-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.30	67.36	16.40	2.23	80.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	16.20		80.0	

[illegible]-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.41	67.37	16.58	2.23	80.0	± 9.6 %
		Y	3.82	68.59	17.16		80.0	
		Z	3.50	67.03	16.33		80.0	
10509-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.76	69.64	17.37	2.23	80.0	± 9.6 %
		Y	4.35	71.43	18.03		80.0	
		Z	3.81	69.14	16.94		80.0	
10510-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10511-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.87	67.13	16.77	2.23	80.0	± 9.6 %
		Y	4.26	68.26	17.18		80.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10512-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.83	70.67	17.64	2.23	80.0	± 9.6 %
		Y	4.57	72.98	18.50		80.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10514-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.74	67.09	16.78	2.23	80.0	± 9.6 %
		Y	4.12	68.32	17.22		80.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	0.99	64.09	15.32		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.90	79.74	18.57	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	0.69	63.32	13.66		150.0	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.19	66.67	16.18	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10519-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.33	66.84	16.27	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	4.45	66.68	15.98		150.0	
10520-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.19	66.76	16.18	0.00	150.0	± 9.6 %
		Y	4.42	67.19	16.30		150.0	
		Z	4.30	66.60	15.89		150.0	
10521-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.12	66.71	16.15	0.00	150.0	± 9.6 %
		Y	4.36	67.19	16.29		150.0	
		Z	4.24	66.57	15.86		150.0	
10522-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.17	66.84	16.25	0.00	150.0	± 9.6 %
		Y	4.41	67.31	16.38		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	

10541-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	4.79	66.10	16.07	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	4.87	66.06	15.76		150.0	
10542-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	4.95	66.23	16.15	0.00	150.0	± 9.6 %
		Y	5.13	66.67	16.16		150.0	
		Z	5.03	66.16	15.84		150.0	
10543-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.05	66.42	16.28	0.00	150.0	± 9.6 %
		Y	5.19	66.68	16.19		150.0	
		Z	5.10	66.20	15.89		150.0	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.18	66.17	16.05	0.00	150.0	± 9.6 %
		Y	5.30	66.70	16.06		150.0	
		Z	[illegible]	[illegible]	15.77		150.0	
[illegible]-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	5.49	67.06	16.21		150.0	
		Z	5.41	66.62	15.94		150.0	
10546-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.21	66.30	16.09	0.00	150.0	± 9.6 %
		Y	5.36	66.84	16.12		150.0	
		Z	5.27	66.33	15.81		150.0	
10547-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.35	66.64	16.25	0.00	150.0	± 9.6 %
		Y	5.43	66.89	16.14		150.0	
		Z	5.35	66.41	15.85		150.0	
10548-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.50	67.27	16.54	0.00	150.0	± 9.6 %
		Y	5.58	67.53	16.43		150.0	
		Z	5.51	67.08	16.15		150.0	
10550-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.35	66.79	16.34	0.00	150.0	± 9.6 %
		Y	5.40	66.91	16.17		150.0	
		Z	5.32	66.47	15.89		150.0	
10551-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.19	66.22	16.03	0.00	150.0	± 9.6 %
		Y	5.38	66.80	16.10		150.0	
		Z	5.28	66.32	15.79		150.0	
10552-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.18	66.28	16.05	0.00	150.0	± 9.6 %
		Y	5.34	66.81	16.08		150.0	
		Z	5.24	66.29	15.77		150.0	
10553-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.23	66.22	16.05	0.00	150.0	± 9.6 %
		Y	5.40	66.78	16.09		150.0	
		Z	5.30	66.27	15.79		150.0	
10554-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.63	66.53	16.15	0.00	150.0	± 9.6 %
		Y	5.73	67.01	16.14		150.0	
		Z	5.65	66.56	15.87		150.0	
10555-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.73	66.80	16.27	0.00	150.0	± 9.6 %
		Y	5.83	67.25	16.24		150.0	
		Z	5.75	66.79	15.97		150.0	
10556-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.79	66.96	16.35	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10557-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.70	66.72	16.24	0.00	150.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	5.74	66.76	[illegible]		[illegible]	

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10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	0.46	130.0	± 9.6 %
		Y	4.50	66.34	16.16		130.0	
		Z	4.40	65.72	15.80		130.0	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.43	66.20	16.24	0.46	130.0	± 9.6 %
		Y	4.65	66.59	16.30		130.0	
		Z	4.54	66.06	15.95		130.0	
10609-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.33	66.00	16.03	0.46	130.0	± 9.6 %
		Y	4.54	66.42	16.12		130.0	
		Z	4.44	65.87	15.76		130.0	
10610-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.38	66.21	16.23	0.46	130.0	± 9.6 %
		Y	4.60	66.60	16.30		130.0	
		Z	4.49	66.05	15.93		130.0	
10611-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.29	65.97	16.05	0.46	130.0	± 9.6 %
		Y	4.51	66.39	16.13		130.0	
		Z	4.40	65.84	15.77		130.0	
10612-AAB	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.28	66.08	16.08	0.46	130.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	4.39	[illegible]	[illegible]		[illegible]	
10613-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.27	65.88	15.89	0.46	130.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	4.38	65.79	15.65		130.0	
10614-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	4.47	[illegible]	[illegible]		[illegible]	
		Z	4.36	66.03	15.92		130.0	
10615-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.27	[illegible]	[illegible]	0.46	[illegible]	[illegible]
		Y	4.50	66.18	15.88		130.0	
		Z	4.39	65.65	15.52		130.0	
10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	4.98	66.20	16.34	0.46	130.0	± 9.6 %
		Y	5.12	66.54	16.29		130.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	5.17	[illegible]	[illegible]		130.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10618-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	4.91	66.35	16.40	0.46	130.0	± 9.6 %
		Y	5.08	66.77	16.40		130.0	
		Z	5.00	66.31	16.11		130.0	
10619-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	4.95	66.33	16.32	0.46	130.0	± 9.6 %
		Y	5.08	66.52	16.20		130.0	
		Z	5.01	66.09	15.93		130.0	
10620-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.02	66.21	16.31	0.46	130.0	± 9.6 %
		Y	5.16	66.53	16.25		130.0	
		Z	5.09	66.11	15.99		130.0	
10621-AAB	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.01	66.30	16.50	0.46	130.0	± 9.6 %
		Y	5.18	66.72	16.48		130.0	
		Z	5.10	66.27	16.20		130.0	
10622-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.01	66.42	16.55	0.46	130.0	± 9.6 %
		Y	5.18	66.82	16.52		130.0	
		Z	5.09	66.37	16.24		130.0	

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EX3DV4– SN:3708 October 22, 2018

10639-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	[illegible]	66.76	[illegible]	[illegible]	130.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	66.76	16.22		130.0	
10640-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	5.79	66.55	16.33	0.46	130.0	± 9.6 %
		Y	5.95	67.13	[illegible]		[illegible]	
		Z	[illegible]	66.72	16.13		130.0	
10641-AAC	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	0.46	[illegible]	[illegible]
		Y	6.01	67.08	16.38		130.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10642-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	67.26	[illegible]		130.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10643-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10644-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	5.83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10645-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.16	67.41	16.83	0.46	130.0	± 9.6 %
		Y	6.07	67.25	16.48		130.0	
		Z	6.04	66.95	16.31		130.0	
10646-AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	9.04	92.83	31.00	9.30	60.0	± 9.6 %
		Y	16.22	106.06	35.45		60.0	
		Z	10.43	96.01	32.33		60.0	
10647-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	8.14	91.27	30.60	9.30	60.0	± 9.6 %
		Y	13.96	103.45	34.79		60.0	
		Z	9.34	94.22	31.85		60.0	
[illegible]-AAA	CDMA2000 (1x Advanced)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	0.59	63.51	9.94		150.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]-AAD	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	67.36	[illegible]		80.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10653-AAD	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		80.0	
		Z	[illegible]	[illegible]	[illegible]		[illegible]	
10654-AAD	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	3.81	65.38	16.33	2.23	80.0	± 9.6 %
		Y	4.06	66.15	16.62		80.0	
		Z	3.89	65.26	16.10		80.0	
10655-AAE	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	3.89	65.27	16.38	2.23	80.0	± 9.6 %
		Y	4.12	66.08	16.65		80.0	
		Z	3.96	65.22	16.15		80.0	
10658-AAA	Pulse Waveform (200Hz, 10%)	X	3.95	69.00	12.97	10.00	50.0	± 9.6 %
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	6.32	75.78	16.00		50.0	
10659-AAA	Pulse Waveform (200Hz, 20%)	X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Y	[illegible]	[illegible]	[illegible]		[illegible]	
		Z	[illegible]	81.20	[illegible]		60.0	

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D835V2 Sn:4d023

In Collaboration with s p e a g CALIBRATION LABORATORY

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Client SRTC Certificate No: Z17-97135

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d023
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	September 13, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Power sensor NRV-Z5	100596	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

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

Issued: September 16, 2017

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, 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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.37 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.06 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.7 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.34 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.47 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.17 mW /g ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0Ω- 2.79jΩ
Return Loss	- 30.7dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6Ω- 3.61jΩ
Return Loss	- 25.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.495 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

D835V2 Sn:4d023

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DASY5 Validation Report for Head TSL Date: 09.13.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.903 S/m; ε_r = 41.34; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.82, 9.82, 9.82); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

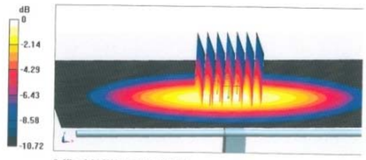
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.28V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.66 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.52 W/kg

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



0 dB = 3.21 W/kg = 5.07 dBW/kg

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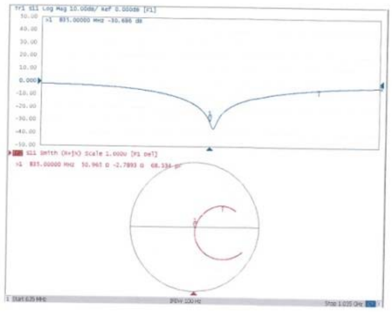
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.13.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.958 S/m; ε_r = 55.68; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.5,9.5, 9.5); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

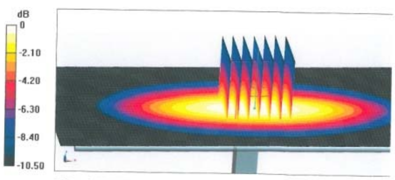
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.17 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.57 W/kg

SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (measured) = 3.15 W/kg



0 dB = 3.15 W/kg = 4.98 dBW/kg

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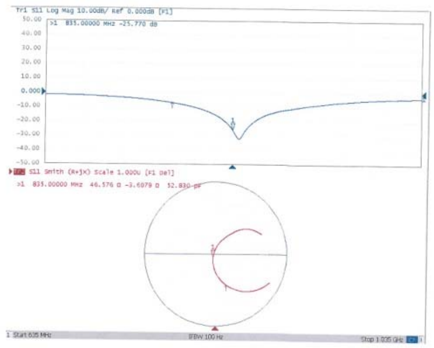
Impedance Measurement Plot for Body TSL



D1800V2 Sn:2d084

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Client SRTC Certificate No: Z17-97138

CALIBRATION CERTIFICATE

Object: D1800V2 - SN: 2d084

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Power sensor NRP-Z91	100596	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

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

Issued: September 18, 2017

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, 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.
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- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
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- *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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	40.4 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.79 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**38.9 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.12 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.4 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.84 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**39.7 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 mW /g ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.3Ω- 1.55jΩ
Return Loss	- 35.4dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.0Ω- 1.32jΩ
Return Loss	- 27.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.316 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

D1800V2 Sn:2d084

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DASY5 Validation Report for Head TSL Date: 09.15.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d084

Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1800 MHz; σ = 1.423 S/m; εr = 40.37; ρ = 1000 kg/m3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.97, 7.97, 7.97); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

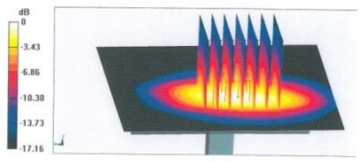
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.90 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.7 W/kg

SAR(1 g) = 9.79 W/kg; SAR(10 g) = 5.12 W/kg

Maximum value of SAR (measured) = 15.5 W/kg



0 dB = 15.5 W/kg = 11.90 dBW/kg

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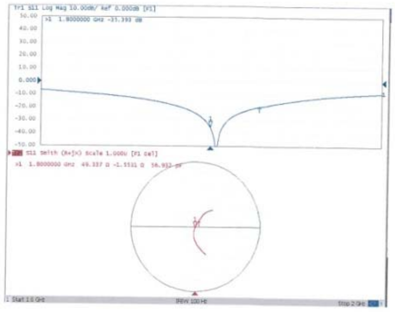
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 09.14.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d084

Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1800 MHz; σ = 1.503 S/m; ε_r = 53.79; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.75, 7.75, 7.75); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7413)

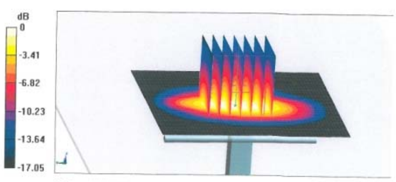
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.57 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 9.84 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 15.2 W/kg



0 dB = 15.2 W/kg = 11.82 dBW/kg

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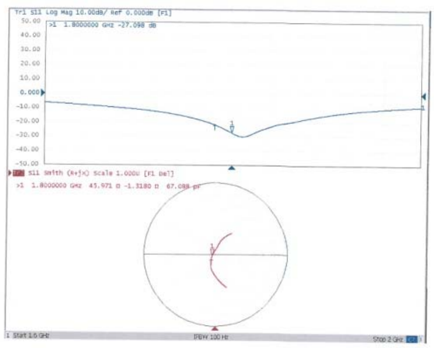
Impedance Measurement Plot for Body TSL



D2000V2 Sn:1009

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Client SRTC Certificate No: Z18-97021

CALIBRATION CERTIFICATE

Object	D2000V2 - SN: 1009
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	February 1, 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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Power sensor NRV-Z5	100596	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Reference Probe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1525	02-Oct-17(SPEAG,No.DAE4-1525_Oct17)	Oct-18
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

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

Issued: February 4, 2018

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, 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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2000 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	38.9 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**40.3 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.5 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.56 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.3 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 mW /g ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8Ω- 2.08jΩ
Return Loss	- 33.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3Ω- 1.63jΩ
Return Loss	- 27.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.047 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

D2000V2 Sn:1009

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DASY5 Validation Report for Head TSL Date: 02.01.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009

Communication System: UID 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2000 MHz; σ = 1.416 S/m; εr = 38.89; ρ = 1000 kg/m3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.39, 8.39, 8.39); Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

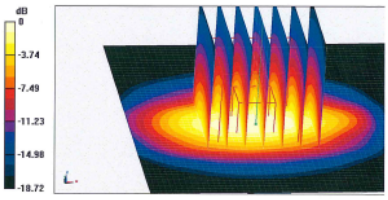
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.98 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 19.7 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.17 W/kg

Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

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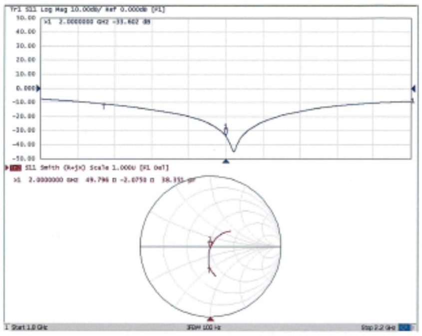
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 02.01.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009

Communication System: UID 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2000 MHz; σ = 1.564 S/m; ε_r = 51.83; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.24,8.24,8.24); Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

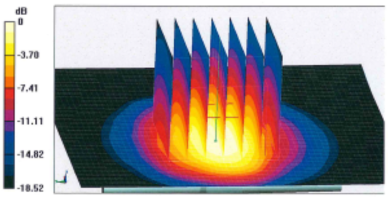
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.84 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 19.7 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 16.3 W/kg



0 dB = 16.3 W/kg = 12.12 dBW/kg

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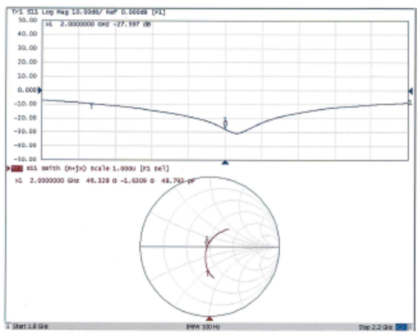
Impedance Measurement Plot for Body TSL



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