APPENDIX F: DOWNLINK LTE CA RF CONDUCTED POWERS

1.1 LTE Downlink Only Carrier Aggregation Test Reduction Methodology

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number of component carriers (CCs) supported by the product implementation. Per April 2018 TCBC Workshop Notes, the following test reduction methodology was applied to determine the combinations required for conducted power measurements.

LTE DLCA Test Reduction Methodology:

- The supported combinations were arranged by the number of component carriers in columns.
- Any limitations on the PCC or SCC for each combination were identified alongside the combination (e.g. CA_2A-2A-4A-12A, but B12 can only be configured as a SCC).
- Power measurements were performed for "supersets" (LTE CA combinations with multiple components carriers) and any "subsets" (LTE CA combinations with fewer component carriers) that were not completely covered by the supersets.
- Only subsets that have the exact same components as a superset were excluded for measurement.
- When there were certain restrictions on component carriers that existed in the superset that were not applied for the subset, the subset configuration was additionally evaluated.
- Both inter-band and intra-band downlink carrier aggregation scenarios were considered.
- Downlink CA combinations for SISO and 4x4 Downlink MIMO operations were measured independently, per May 2017 TCBC Workshop notes.

Table 1 – Example of Exclusion Table for SISO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #1	CA_2C	5, 10, 15, 20	5, 10, 15, 20		3CC #1
2CC #2	CA_2A-5A	5, 10, 15, 20	5, 10		4CC #1
2CC #3	CA_2A-12A	5, 10, 15, 20	5, 10		3CC #2
2CC #4	CA_2A-13A	5, 10, 15, 20	10		3CC #3
2CC #5	CA_2A-17A	5, 10	5, 10		No
2CC #6	CA_2A-30A	5, 10, 15, 20	5, 10		3CC #14
2CC #7	CA_2A-66A (2)	5, 10, 15, 20	5, 10, 15, 20		3CC #1
2CC #8	CA_2A-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #10
2CC #9	CA_4A-4A	5, 10, 15, 20	5, 10, 15, 20		4CC #2
2CC #10	CA_4A-5A	5, 10, 15, 20	5, 10		3CC #4
2CC #11	CA_4A-5A (E)	5, 10, 15, 20	5, 10		3CC #5
2CC #12	CA_4A-12A (E)	5, 10, 15, 20	5, 10		3CC #8
2CC #13	CA_4A-13A	5, 10, 15, 20	10		3CC #9
2CC #14	CA_4A-17A	5, 10	5, 10	B17 SCC Only	No
2CC #15	CA_5B	5, 10	5, 10		3CC #7
2CC #16	CA_5A-20A	5, 10	5, 10, 15, 20		No
2CC #17	CA_7C	15, 20	15, 20		No
2CC #18	CA_7A-7A (E)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #19	CA_7A-12A	5, 10, 15, 20	5, 10		3CC #12
2CC #20	CA_12B	5	5, 10		3CC #11
2CC #21	CA_12A-25A	5, 10	5, 10, 15, 20		No
2CC #22	CA_12A-30A	5, 10	5, 10		3CC #16
2CC #23	CA_41A-41A (E)	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #1	CA_2A-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #1
3CC #2	CA_2A-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #3	CA_2A-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #4	CA_2C-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #5	CA_2A-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #6	CA_2A-4A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #7	CA_2A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #8	CA_2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #9	CA_2A-4A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #10	CA_2A-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #11	CA_2A-5B	5, 10, 15, 20	5, 10	5, 10		4CC #5
3CC #12	CA_2A-7A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #13	CA_2A-12B	5, 10, 15, 20	5	5, 10		No
3CC #14	CA_2A-12A-30A	5, 10, 15, 20	5, 10	5, 10		No
3CC #15	CA_4A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #16	CA_5B-30A	5, 10	5, 10	5, 10		3CC #1
3CC #17	CA_5B-66A	5, 10	5, 10	5, 10, 15, 20		3CC #1
3CC #18	CA_5A-30A-66A	5, 10	5, 10	5, 10, 15, 20		4CC #9
3CC #19	CA_12A-66C	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
3CC #20	CA_30A-66A-66A	5, 10	5, 10, 15, 20	5, 10, 15, 20		4CC #9
3CC #21	CA_41D	10, 15, 20	10, 15, 20	10, 15, 20		No
3CC #22	CA_41A-41C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #23	CA_66D	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #24	CA_66A-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #1	CA_2A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10		3CC #1
4CC #2	CA_2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10	B12 SCC Only	No
4CC #3	CA_2A-2A-5A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10		No
4CC #4	CA_2A-2A-5A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
4CC #5	CA_2A-5B-30A	5, 10, 15, 20	5, 10	5, 10	5, 10		3CC #1
4CC #6	CA_2A-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		3CC #1
4CC #7	CA_5B-30A-66A	5, 10	5, 10	5, 10	5, 10		3CC #1
4CC #8	CA_5B-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		3CC #2
4CC #9	CA_5A-30A-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #10	CA_51E	15, 20	15, 20	15, 20	20		No

Index	SCC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
SCC #1	CA_2A-5B-30A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
SCC #2	CA_2A-5B-66A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20	No

Table 2 – Example of Exclusion Table for 4x4 Downlink MIMO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #M1	CA_[2C]	5, 10, 15, 20	5, 10, 15, 20		3CC #M6
2CC #M2	CA_[2A]-2A	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M3	CA_[2A]-[2A]	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M4	CA_[2A]-4A (2)	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M5	CA_[2A]-[4A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M6	CA_[2A]-5A	5, 10, 15, 20	5, 10		4CC #M3
2CC #M7	CA_[2A]-12A (1)	5, 10, 15, 20	3, 5, 10		No
2CC #M8	CA_[2A]-13A	5, 10, 15, 20	10		3CC #M4
2CC #M9	CA_[2A]-17A	5, 10	5, 10		No
2CC #M10	CA_[2A]-29A (2)	5, 10, 15, 20	5, 10	B29 SCC Only	3CC #M12
2CC #M11	CA_[2A]-30A	5, 10, 15, 20	5, 10		3CC #M5
2CC #M12	CA_[2A]-66A (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M1
2CC #M13	CA_2A-[66A] (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M2
2CC #M14	CA_[2A]-[66A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M15	CA_[2A]-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #M11
2CC #M16	CA_5A-[66A]	5, 10	5, 10, 15, 20		3CC #M16
2CC #M17	CA_12A-[66A] (4)	5, 10	5, 10, 15, 20		3CC #M17
2CC #M18	CA_13A-[66A]	5, 10	5, 10, 15, 20		3CC #M19
2CC #M19	CA_30A-[66A]	5, 10	5, 10, 15, 20		3CC #M20
2CC #M20	CA_[66B]	5, 10, 15	5, 10, 15		4CC #M4
2CC #M21	CA_[66C]	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
2CC #M22	CA_[66A]-66A	5, 10, 15, 20	5, 10, 15, 20		3CC #M28
2CC #M23	CA_[66A]-[66A]	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #M1	CA_[2A]-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M2	CA_[2A]-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M3	CA_[2A]-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M4	CA_[2A]-2A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #M5	CA_[2A]-2A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M6	CA_[2C]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M7	CA_2C-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M8	CA_[2C]-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M9	CA_[2A]-2A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M10	CA_2A-2A-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M11	CA_[2A]-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M12	CA_[2A]-4A-29A	5, 10, 15, 20	5, 10, 15, 20	5, 10	B29 SCC Only	No
3CC #M13	CA_[2A]-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M14	CA_[2A]-5B	5, 10, 15, 20	5, 10	5, 10		4CC #M1
3CC #M15	CA_[2A]-5A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M16	CA_2A-5A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M17	CA_2A-12A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M18	CA_[2A]-13A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M19	CA_2A-13A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M20	CA_2A-30A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M21	CA_[2A]-66B	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M3
3CC #M22	CA_2A-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M4
3CC #M23	CA_[2A]-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		No
3CC #M24	CA_[2A]-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M5
3CC #M25	CA_2A-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
3CC #M26	CA_[2A]-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M27	CA_[2A]-66A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M28	CA_2A-[66A]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M29	CA_[2A]-66A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #M1	CA_[2A]-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M2	CA_2A-5B-[66A]	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M3	CA_[2A]-5A-66B	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M4	CA_2A-5A-[66B]	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M5	CA_[2A]-5A-66C	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #M6	CA_2A-5A-[66C]	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No

Note: [CC] indicates component carrier with 4x4 DL MIMO antenna configuration

© 2020 PCTEST

1.2 LTE Downlink Only Carrier Aggregation Test Selection and Setup

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by April 2018 TCBC Workshop Notes, conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

This device supports LAA with downlink carrier aggregation only. It uses carrier aggregation in the downlink to combine LTE in the unlicensed spectrum (i.e. LTE Band 46) with LTE in the licensed band (served as PCC). All uplink communications and acknowledgements on the PCC remain identical to specifications when downlink carrier aggregation is inactive.

Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the maximum average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive. All bands required for SAR testing per FCC KDB procedures were considered. Based on the measured maximum powers below, no additional SAR tests were required for DLCA SAR configurations.

General PCC and SCC configuration selection procedure

- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KDB 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
- All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.

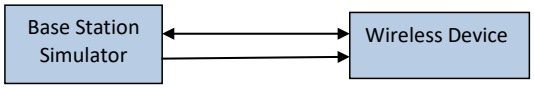


Figure 1
DL CA Power Measurement Setup

© 2020 PCTEST

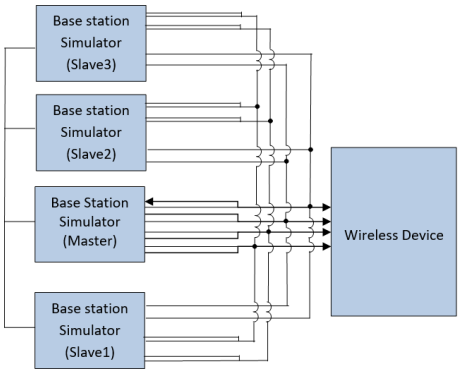


Figure 2
DL CA with DL 4x4 MIMO Power Measurement Setup

1.3 Downlink Carrier Aggregation RF Conducted Powers

1.3.1 LTE Band 12 as PCC

Table 1
Output Powers – Ant 4

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_4A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_4A-12A (2)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_12A-25A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B25	20	8365	1962.5	-	-	-	-	-	-	-	-	-	-	-	-	20.86	20.90
CA_12A-46A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_12A-66A (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_12A-66A (2)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	-	-	-	-	20.90	20.90
CA_2C-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B2	20	702	1940.2	-	-	-	-	-	-	-	-	20.89	20.90
CA_2A-2A-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	LTE B12	10	5107	738.7	LTE B2	20	900	1960	LTE B2	20	700	1940	-	-	-	-	20.80	20.86
CA_4A-4A-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	LTE B12	10	5107	738.7	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	20.77	20.86
CA_2A-2A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	-	-	-	-	20.88	20.90
CA_2A-4A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	20.85	20.90
CA_2A-4A-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	LTE B12	10	5107	738.7	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	-	-	-	-	20.81	20.86
CA_2A-12A-66C	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	-	-	-	-	20.87	20.90
CA_4A-4A-12A-30A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B30	10	9820	2355	-	-	-	-	20.86	20.90
CA_2A-4A-7A-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B7	20	3100	2655	-	-	-	-	20.87	20.90
CA_2A-4A-12A-30A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B30	10	9820	2355	-	-	-	-	20.84	20.90
CA_2A-7A-12A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B66	20	66786	2145	-	-	-	-	20.86	20.90
CA_2A-2A-12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	67236	2190	20.85	20.90
CA_2A-2A-12A-30A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B30	10	9820	2355	LTE B66	20	66786	2145	20.88	20.90
CA_2A-12A-30A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	LTE B2	20	900	1960	LTE B30	10	9820	2355	LTE B66	20	66786	2145	LTE B66	20	67236	2190	20.87	20.90

1.3.2 LTE Band 13 as PCC

Table 2
Output Powers – Ant 4

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-4A-13A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	-	-	-	-	20.93	21.10
CA_2A-4A-13A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	20.91	21.10
CA_2A-13A-46A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	20.96	21.10
CA_13A-46A-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B46	20	50665	5537.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	20.91	21.10
CA_13A-48A-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B48	20	55990	3625	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	21.10	21.10
CA_13A-66A-66B	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B66	20	66786	2145	LTE B66	5	67168	2183.2	LTE B66	15	67261	2192.5	-	-	-	-	20.88	21.10
CA_13A-66A-66C	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B66	20	66786	2145	LTE B66	20	67018	2170.2	LTE B66	20	67236	2190	-	-	-	-	20.87	21.10
CA_2A-2A-13A-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	-	-	-	-	20.90	21.10
CA_2A-13A-46C	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	20.74	21.10
CA_2A-13A-66A-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	20.85	21.10
CA_2A-13A-66B	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B66	15	66786	2145	LTE B66	5	66879	2154.3	-	-	-	-	20.87	21.10
CA_2A-13A-66C	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	-	-	-	-	20.83	21.10
CA_13A-46C-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B66	20	66786	2145	-	-	-	-	20.66	21.10
CA_13A-48C-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	LTE B66	20	66786	2145	-	-	-	-	21.10	21.10
CA_13A-46E	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5537.3	LTE B46	20	51061	5577.1	20.96	21.10
CA_2A-13A-46D	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	20.92	21.10
CA_13A-46D-66A	LTE B13	10	23230	782	16QAM	1	0	5230	751	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	LTE B66	20	66786	2145	20.93	21.10

© 2020 PCTEST

1.3.3 LTE Band 5 as PCC

Table 3
Output Powers – Ant 4

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-7A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B7	20	3100	2655	-	-	-	-	-	-	-	-	-	-	-	-	21.07	21.10
CA_5A-25A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B25	20	8365	1962.5	-	-	-	-	-	-	-	-	-	-	-	-	21.10	21.10
CA_5A-41A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B41	20	40620	2593	-	-	-	-	-	-	-	-	-	-	-	-	21.10	21.10
CA_5A-46A (1)	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	21.10	21.10
CA_5A-48A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B48	20	55990	3625	-	-	-	-	-	-	-	-	-	-	-	-	21.10	21.10
CA_2C-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	702	1940.2	-	-	-	-	-	-	-	-	21.07	21.10
CA_4A-5B (1)	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	5	2473	876.3	LTE B4	20	2175	2132.5	-	-	-	-	-	-	-	-	21.08	21.10
CA_5A-7A-7A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B7	20	3100	2655	LTE B7	20	2650	2630	-	-	-	-	-	-	-	-	21.10	21.10
CA_5A-7C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B7	20	3100	2655	LTE B7	20	2902	2635.2	-	-	-	-	-	-	-	-	21.06	21.10
CA_5A-46C (1)	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	21.06	21.10
CA_2A-5A-46A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	21.03	21.10
CA_5A-46A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	21.02	21.10
CA_4A-4A-5B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	21.05	21.10
CA_5A-46D (1)	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	21.04	21.10
CA_5A-66A-66B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B66	20	66786	2145	LTE B66	5	67168	2183.2	LTE B66	15	67261	2192.5	-	-	-	-	21.06	21.10
CA_5A-66A-66C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B66	20	66786	2145	LTE B66	20	67038	2170.2	LTE B66	20	67236	2190	-	-	-	-	21.03	21.10
CA_2A-2A-4A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B4	20	2175	2132.5	-	-	-	-	21.06	21.10
CA_2A-4A-4A-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	21.04	21.10
CA_2A-4A-5B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	-	-	-	-	21.07	21.10
CA_2A-5A-46C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	21.05	21.10
CA_4A-4A-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B30	10	9820	2355	-	-	-	-	21.09	21.10
CA_5A-46C-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B66	20	66786	2145	-	-	-	-	20.98	21.10
CA_2A-4A-5A-30A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B30	10	9820	2355	-	-	-	-	21.04	21.10
CA_2A-2A-5A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	67236	2190	21.10	21.10
CA_2A-2A-5A-66B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	15	66786	2145	LTE B66	5	66879	2154.3	21.10	21.10
CA_2A-2A-5A-66C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	21.10	21.10
CA_2A-5A-46D	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	21.10	21.10
CA_2A-5B-66B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B2	20	900	1960	LTE B66	15	66786	2145	LTE B66	5	66879	2154.3	21.07	21.10
CA_2A-5B-66C	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	66984	2164.8	21.10	21.10
CA_2A-5B-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B2	20	900	1960	LTE B66	20	66786	2145	LTE B66	20	67236	2190	21.10	21.10
CA_5A-46D-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	LTE B66	20	66786	2145	21.10	21.10
CA_5B-30A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B30	10	9820	2355	LTE B66	20	66786	2145	LTE B66	20	67236	2190	21.10	21.10
CA_2A-2A-5A-30A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B30	10	9820	2355	LTE B66	20	66786	2145	21.10	21.10
CA_2A-5A-30A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B2	20	900	1960	LTE B30	10	9820	2355	LTE B66	20	66786	2145	LTE B66	20	67236	2190	21.10	21.10
CA_2A-5B-30A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	LTE B5	10	2497	878.7	LTE B2	20	900	1960	LTE B30	10	9820	2355	LTE B66	20	66786	2145	21.10	21.10

1.3.4 LTE Band 26 as PCC

Table 4
Output Powers – Ant 4

	PCC									SCC 1				SCC 2				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_7A-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	LTE B7	20	3100	2655	-	-	-	-	21.10	21.10
CA_25A-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	LTE B25	20	8365	1962.5	-	-	-	-	21.10	21.10
CA_26A-41A	LTE B26	10	26740	819	16QAM	1	0	8740	864	LTE B41	20	40620	2593	-	-	-	-	21.10	21.10
CA_7A-7A-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	LTE B7	20	3100	2655	LTE B7	20	2850	2630	20.95	21.10
CA_25A-25A-26A	LTE B26	3	26705	815.5	64QAM	1	0	8705	860.5	LTE B25	20	8365	1962.5	LTE B25	20	8590	1985	20.89	21.10
CA_26A-41C	LTE B26	10	26740	819	16QAM	1	0	8740	864	LTE B41	20	40620	2593	LTE B41	20	40422	2573.2	21.03	21.10

© 2020 PCTEST

1.3.5 LTE Band 66 as PCC

Table 5
Output Powers - Ant 2a

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				SCC 5				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_12A-66A (1)	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_12A-66A (2)	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_29A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B29	10	9715	722.5	-	-	-	-	-	-	-	-	-	-	-	-	15.11	15.30
CA_46A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	15.04	15.30
CA_5A-46A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B5	10	2525	881.5	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	15.17	15.30
CA_13A-46A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B13	10	5230	751	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	15.14	15.30
CA_13A-46A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B13	10	5230	751	LTE B46	20	55990	3625	-	-	-	-	-	-	-	-	-	-	-	-	21.21	15.30
CA_2A-66A-66B	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	5	67168	2183.2	LTE B66	15	67261	2192.5	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	15.23	15.30
CA_2A-66B-66A	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B66	20	67238	2190	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	15.11	15.30
CA_2A-66C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67038	2170.2	LTE B66	20	67238	2190	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	15.10	15.30
CA_2A-66C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B66	20	67238	2190	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	15.15	15.30
CA_2C-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B2	20	702	1940.2	-	-	-	-	-	-	-	-	15.10	15.30
CA_5A-66A-66B	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	5	67168	2183.2	LTE B66	15	67261	2192.5	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	15.13	15.30
CA_5A-66B-66A	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B66	20	67236	2190	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	15.03	15.30
CA_5A-66A-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67038	2170.2	LTE B66	20	67238	2190	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	15.08	15.30
CA_5A-66C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B66	20	67238	2190	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	15.13	15.30
CA_13A-66A-66B	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	5	67168	2183.2	LTE B66	15	67261	2192.5	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.12	15.30
CA_13A-66B-66A	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B66	20	67238	2190	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.05	15.30
CA_13A-66A-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67038	2170.2	LTE B66	20	67238	2190	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.16	15.30
CA_13A-66C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B66	20	67236	2190	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.17	15.30
CA_48C-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B48	20	52665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	16.09	15.30
CA_48A-48A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B48	20	55990	3625	LTE B48	20	55340	3560	-	-	-	-	-	-	-	-	15.23	15.30
CA_48A-48C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B48	20	55990	3625	LTE B48	20	55340	3560	LTE B48	20	55538	3579.8	-	-	-	-	-	-	-	-	15.30	15.30
CA_48C-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	-	-	-	-	-	-	-	-	15.28	15.30
CA_2A-2A-13A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.03	15.30
CA_2A-12A-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B2	20	900	1960	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	15.10	15.30
CA_2A-13A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.12	15.30
CA_2A-13A-66B	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B2	20	900	1960	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.07	15.30
CA_2A-13A-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B2	20	900	1960	LTE B13	10	5230	751	-	-	-	-	-	-	-	-	15.14	15.30
CA_2A-46A-46A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	47060	5180	-	-	-	-	-	-	-	-	15.06	15.30
CA_5A-46C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B5	10	2525	881.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	15.11	15.30
CA_13A-46C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B13	10	5230	751	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	15.20	15.30
CA_13A-48C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B13	10	5230	751	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	-	-	-	-	-	-	-	-	15.26	15.30
CA_2A-7A-7A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B7	20	3100	2655	LTE B7	20	2850	2630	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	14.97	15.30
CA_2A-7A-12A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B7	20	3100	2655	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	15.04	15.30
CA_2A-29A-30A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B29	10	9715	722.5	LTE B30	10	9820	2355	-	-	-	-	-	-	-	-	15.05	15.30
CA_2A-46A-48A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B48	20	55990	3625	-	-	-	-	-	-	-	-	15.20	15.30
CA_46D-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	15.05	15.30
CA_48E-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	LTE B48	20	56386	3664.6	LTE B48	20	56584	3684.4	-	-	-	-	15.19	15.30
CA_2A-2A-5A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	15.13	15.30
CA_2A-2A-5A-66B	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	15.05	15.30
CA_2A-2A-5A-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	-	-	-	-	15.14	15.30
CA_2A-2A-12A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	-	-	-	-	15.10	15.30
CA_2A-5B-66B	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	LTE B66	5	66604	2126.8	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	-	-	-	-	14.95	15.30
CA_2A-5B-66C	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	66588	2125.2	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	-	-	-	-	15.10	15.30
CA_2A-5B-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	-	-	-	-	15.15	15.30
CA_2A-46A-46C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	53540	5825	-	-	-	-	15.08	15.30
CA_5A-46D-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B5	10	2525	881.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	15.06	15.30
CA_5B-30A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	LTE B30	10	9820	2355	-	-	-	-	15.05	15.30
CA_13A-46D-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B13	10	5230	751	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	15.10	15.30
CA_2A-2A-5A-30A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	14.99	15.30
CA_2A-2A-12A-30A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	15.03	15.30
CA_2A-5A-30A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B30	10	9820	2355	-	-	-	-	15.01	15.30
CA_2A-5B-30A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	LTE B30	10	9820	2355	-	-	-	-	15.08	15.30
CA_2A-12A-30A-66A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B66	20	67236	2190	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B30	10	9820	2355	-	-	-	-	15.04	15.30
CA_2A-46A-48C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	-	-	-	-	14.85	15.30
CA_2A-46C-48A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	-	-	-	-	15.19	15.30
CA_2A-46E-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	LTE B46	20	50269	5497.9	14.86	15.30
CA_2A-46A-48D-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	55990	3625	LTE B48	20	56188	3644.8	LTE B48	20	56386	3664.6	15.08	15.30
CA_2A-46C-48C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B48	20	55990	3625	LTE B48	20	56188	3644.8	LTE B48	20	56188	3644.8	15.01	15.30
CA_2A-46D-48A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	LTE B48	20	55990	3625	14.81	15.30

1.3.6 LTE Band 25 as PCC

Table 6
Output Powers - Ant 4

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-25A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	-	-	-	-	15.94	15.99
CA_12A-25A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B12	10	5095	737.5	-	-	-	-	-	-	-	-	-	-	-	-	15.95	15.99
CA_25A-26A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B26	10	8805	876.5	-	-	-	-	-	-	-	-	-	-	-	-	15.93	15.99
CA_25A-46A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	15.93	15.99
CA_25A-25A-26A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B25	20	8140	1940	LTE B26	5	8865	876.5	-	-	-	-	-	-	-	-	15.92	15.99
CA_25A-25A-41A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B25	20	8140	1940	LTE B41	20	40620	2593	-	-	-	-	-	-	-	-	15.66	15.99
CA_25A-41C	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B41	20	40620	2593	LTE B41	20	40422	2573.2	-	-	-	-	-	-	-	-	15.66	15.99
CA_25A-46C	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	15.91	15.99
CA_25A-25A-41C	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B25	20	8140	1940	LTE B41	20	40620	2593	LTE B41	20	40422	2573.2	-	-	-	-	15.58	15.99
CA_25A-46D	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	15.96	15.99
CA_25A-25A-41D	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	LTE B25	20	8140	1940	LTE B41	20	40422	2573.2	LTE B41	20	40620	2593	LTE B41	20	40818	2612.8	15.92	15.99

1.3.7 LTE Band 30 as PCC

Table 7
Output Powers - Ant 1a

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2C-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	702	1940.2	-	-	-	-	-	-	-	-	14.39	14.42
CA_2A-2A-29A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B29	10	9715	722.5	-	-	-	-	14.37	14.42
CA_4A-4A-5A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B5	10	2525	881.5	-	-	-	-	14.35	14.42
CA_4A-4A-12A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	LTE B12	10	5095	737.5	-	-	-	-	14.32	14.42
CA_2A-4A-5A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	-	-	-	-	14.33	14.42
CA_2A-4A-12A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	-	-	-	-	14.39	14.42
CA_2A-4A-29A-30A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B29	10	9715	722.5	-	-	-	-	14.37	14.42
CA_2A-29A-30A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B29	10	9715	722.5	LTE B66	20	66786	2145	-	-	-	-	14.28	14.42
CA_5B-30A-66A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	LTE B66	20	66786	2145	LTE B66	20	67236	2190	14.34	14.42
CA_2A-2A-5A-30A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	14.35	14.42
CA_2A-2A-12A-30A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B2	20	700	1940	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	14.31	14.42
CA_2A-5A-30A-66A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	14.35	14.42
CA_2A-5B-30A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B5	10	2525	881.5	LTE B5	5	2453	874.3	LTE B66	20	66786	2145	14.33	14.42
CA_2A-12A-30A-66A-66A	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	LTE B66	20	67236	2190	14.35	14.42

© 2020 PCTEST

1.3.8 LTE Band 7 as PCC

Table 8
Output Powers - Ant 2A

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_7B	LTE B7	15	20825	2507.5	16QAM	1	74	2825	2627.5	LTE B7	5	2918	2636.8	-	-	-	-	-	-	-	-	-	-	-	-	14.60	14.60
CA_5A-7A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	-	-	-	-	14.60	14.60
CA_7A-26A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B26	10	8865	876.5	-	-	-	-	-	-	-	-	-	-	-	-	14.60	14.60
CA_7A-46A (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	-	-	-	-	14.60	14.60
CA_4A-4A-7A (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B4	20	2175	2132.5	LTE B4	10	2350	2150	-	-	-	-	-	-	-	-	14.51	14.60
CA_5A-7A-7A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2850	2630	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	14.43	14.60
CA_5A-7C	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2902	2635.2	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	14.41	14.60
CA_7A-7A-26A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2850	2630	LTE B26	10	8865	876.5	-	-	-	-	-	-	-	-	14.45	14.60
CA_7A-46C (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	-	-	-	-	14.52	14.60
CA_7C-46A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2902	2635.2	LTE B46	20	50665	5537.5	-	-	-	-	-	-	-	-	14.49	14.60
CA_7A-46D (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	-	-	-	-	14.34	14.60
CA_7C-46C	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2902	2635.2	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	-	-	-	-	14.37	14.60
CA_2A-4A-7A-7A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2850	2630	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	-	-	-	-	14.43	14.60
CA_2A-4A-7C	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2902	2635.2	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	-	-	-	-	14.44	14.60
CA_2A-4A-7A-12A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B2	20	900	1960	LTE B4	20	2175	2132.5	LTE B12	10	5095	737.5	-	-	-	-	14.41	14.60
CA_2A-7A-7A-66A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2850	2630	LTE B2	20	900	1960	LTE B66	20	66786	2145	-	-	-	-	14.35	14.60
CA_2A-7A-12A-66A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B2	20	900	1960	LTE B12	10	5095	737.5	LTE B66	20	66786	2145	-	-	-	-	14.42	14.60
CA_7C-46D	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	LTE B7	20	2902	2635.2	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	14.24	14.60

1.3.9 LTE Band 41 as PCC

Table 9
Output Powers - Ant 2A

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41A (1)	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	41490	2680	-	-	-	-	-	-	-	-	-	-	-	-	16.58	16.60
CA_5A-41A	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B5	10	2525	2685	-	-	-	-	-	-	-	-	-	-	-	-	16.57	16.60
CA_26A-41A	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B26	10	8865	876.5	-	-	-	-	-	-	-	-	-	-	-	-	16.59	16.60
CA_41A-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	-	-	-	-	-	-	-	-	16.59	16.60
CA_41C-41A	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41490	2680	-	-	-	-	-	-	-	-	16.58	16.60
CA_25A-25A-41A	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B25	20	8365	1962.5	LTE B25	20	8590	1985	-	-	-	-	-	-	-	-	16.59	16.60
CA_25A-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B25	20	8365	1962.5	-	-	-	-	-	-	-	-	16.60	16.60
CA_25A-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B26	10	8865	876.5	-	-	-	-	-	-	-	-	16.54	16.60
CA_41E	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	40779	2608.9	-	-	-	-	16.59	16.60
CA_41A-41D	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	-	-	-	-	16.53	16.60
CA_41D-41A	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	41490	2680	-	-	-	-	16.59	16.60
CA_41C-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	-	-	-	-	16.54	16.60
CA_25A-25A-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B25	20	8365	1962.5	LTE B25	20	8590	1985	-	-	-	-	16.60	16.60
CA_41C-41D	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	16.50	16.60
CA_41D-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	16.51	16.60
CA_25A-25A-41D	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B25	20	8365	1962.5	LTE B25	20	8590	1985	16.53	16.60

1.3.10 LTE Band 48 as PCC

Table 10
Output Powers - Ant 4

	PCC									SCC 1				SCC 2				SCC 3				SCC 4				SCC 5				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-48A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B5	10	2525	881.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.47	16.50
CA_2A-48A-48A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	55340	3560	LTE B2	20	900	1960	-	-	-	-	-	-	-	-	-	-	-	-	16.41	16.50
CA_13A-48A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B13	10	5230	751	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	-	-	-	-	16.42	16.50
CA_48A-48A-66A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	55340	3560	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	16.37	16.50
CA_48A-48C-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	55340	3560	LTE B48	20	55538	3579.8	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	16.39	16.50
CA_48C-48A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B48	20	55340	3560	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	16.41	16.50
CA_48C-66A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B66	20	66786	2145	LTE B66	20	67236	2190	-	-	-	-	-	-	-	-	16.41	16.50
CA_13A-48C-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B13	10	5230	751	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	16.42	16.50
CA_2A-48A-48A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B2	20	900	1960	LTE B48	20	55965	3637.5	LTE B66	20	66786	2145	-	-	-	-	-	-	-	-	16.27	16.50
CA_2A-48E	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B48	20	55811	3607.1	LTE B48	20	55613	3587.3	LTE B2	20	900	1960	-	-	-	-	16.31	16.50
CA_48C-48D	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B48	20	55811	3607.1	LTE B46	20	50665	5537.5	LTE B46	20	50863	5557.3	-	-	-	-	16.21	16.50
CA_48E-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B48	20	55811	3607.1	LTE B46	20	55613	3587.3	LTE B66	20	66786	2145	-	-	-	-	16.46	16.50
CA_2A-48A-48C-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B2	20	900	1960	LTE B48	20	50665	5537.5	LTE B66	20	66786	2145	-	-	-	-	16.14	16.50
CA_2A-48C-48A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B66	20	66786	2145	-	-	-	-	16.25	16.50
CA_2A-48A-48D-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56018	3627.8	LTE B48	20	55820	3608	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B66	20	66786	2145	16.39	16.50
CA_2A-48C-48C-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B48	20	56009	3626.9	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B66	20	66786	2145	16.27	16.50
CA_2A-48D-48A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	LTE B2	20	900	1960	LTE B46	20	50665	5537.5	LTE B46	20	50467	5517.7	LTE B46	20	50863	5557.3	LTE B66	20	66786	2145	16.18	16.50

© 2020 PCTEST

1.4 DL CA with DL 4x4 MIMO RF Conduction Powers

This device supports downlink 4x4 MIMO operations for some LTE bands. Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Section 1.2 were applied.

Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive. Additionally, SAR for 4x4 MIMO Downlink Carrier Aggregation was not needed since the maximum average output power in 4x4 MIMO Downlink Carrier Aggregation mode was not more than 0.25 dB higher than the maximum output power with 4x4 MIMO Downlink and downlink carrier aggregation inactive.

1.4.1 LTE 4x4 MIMO DL Standalone Powers

Table 11
Output Powers - Ant 2a

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]	Target Power [dBm]
66	20	132322	1745	64QAM	1	0	15.30	15.30	15.3
7	20	21100	2535	16QAM	1	99	14.60	14.60	14.6
41	20	40185	2549.5	QPSK	50	0	16.57	16.60	16.6

Table 12
Output Powers - Ant 4

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]	Target Power [dBm]
25	15	26615	1907.5	16QAM	36	0	15.97	15.99	16.0

Table 13
Output Powers - Ant 1a

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]	Target Power [dBm]
30	10	27710	2310	QPSK	25	25	14.36	14.42	14.5

© 2020 PCTEST

1.4.2 LTE Band 12 as PCC

Table 14
Output Powers - Ant 4

	PCC										SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_{2A}-12A (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.83	20.90
CA_{4A}-12A (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.85	20.90
CA_{4A}-12A (2)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.85	20.90
CA_12A-{2A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B25	20	8365	1962.5	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.87	20.90
CA_12A-{66A} (1)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.89	20.90
CA_12A-{66A} (2)	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B66	20	66788	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.89	20.90
CA_{2C}-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	702	1940.2	4x4	-	-	-	-	-	-	-	-	-	-	-	20.85	20.90
CA_{2A}-{2A}-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	2x2	LTE B12	10	5107	738.7	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	-	-	-	-	-	20.56	20.86
CA_{4A}-{4A}-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	2x2	LTE B12	10	5107	738.7	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	20.57	20.86
CA_{2A}-{2A}-{4A}-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	20.79	20.90
CA_{2A}-{2A}-12A-{30A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	20.84	20.90
CA_{2A}-{2A}-12A-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.81	20.90
CA_{2A}-{4A}-{4A}-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	20.82	20.90
CA_{2A}-{4A}-12B	LTE B12	5	23035	701.5	16QAM	12	6	5035	731.5	2x2	LTE B12	10	5107	738.7	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	20.66	20.86
CA_{2A}-12A-{66A}-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	20.86	20.90
CA_{2A}-12A-{66C}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	66984	2164.8	4x4	-	-	-	-	-	20.87	20.90
CA_{4A}-{4A}-12A-{30A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	20.83	20.90
CA_12A-{30A}-{66A}-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	20.87	20.90
CA_{2A}-{4A}-{7A}-12A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B7	20	3100	2655	4x4	-	-	-	-	-	20.85	20.90
CA_{2A}-{4A}-12A-{30A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	20.83	20.90
CA_{2A}-{7A}-12A-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B7	20	3100	2655	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.85	20.90
CA_{2A}-12A-{30A}-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.86	20.90
CA_{2A}-{2A}-12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	2x2	LTE B66	20	67236	2190	2x2	20.84	20.90
CA_2A-2A-12A-{30A}-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	20.85	20.90
CA_2A-12A-30A-{66A}-{66A}	LTE B12	10	23095	707.5	QPSK	1	0	5095	737.5	2x2	LTE B2	20	900	1960	2x2	LTE B30	10	9820	2355	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	20.89	20.90

1.4.3 LTE Band 13 as PCC

Table 15
Output Powers - Ant 4

	PCC										SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_{4A}-{4A}-13A	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	-	-	-	-	-	20.62	21.10
CA_{2A}-{4A}-13A	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	-	-	-	-	-	20.69	21.10
CA_{2A}-13A-46A	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	20.81	21.10
CA_13A-46A-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	20.67	21.10
CA_13A-48A-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B48	20	55990	3625	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	20.70	21.10
CA_13A-{66A}-{66B}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B66	20	66786	2145	4x4	LTE B66	5	67168	2183.2	4x4	LTE B66	15	67261	2192.5	4x4	-	-	-	-	-	20.67	21.10
CA_13A-{66A}-{66C}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	20.64	21.10
CA_{2A}-{2A}-13A-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.60	21.10
CA_{2A}-13A-46C	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	-	-	-	-	-	20.66	21.10
CA_{2A}-13A-{66A}-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	20.89	21.10
CA_{2A}-13A-{66B}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B66	15	66786	2145	4x4	LTE B66	5	66879	2154.3	4x4	-	-	-	-	-	20.63	21.10
CA_{2A}-13A-{66C}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	66984	2164.8	4x4	-	-	-	-	-	20.61	21.10
CA_13A-46C-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.64	21.10
CA_13A-48C-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.62	21.10
CA_{2A}-13A-46D	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	20.90	21.10
CA_13A-46D-{66A}	LTE B13	10	23230	782	16QAM	1	0	5230	751	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	LTE B66	20	66786	2145	4x4	20.82	21.10

1.4.4 LTE Band 5 as PCC

Table 16
Output Powers - Ant 4

	PCC										SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-{7A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B7	20	3100	2655	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.95	21.10
CA_5A-{25A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B25	20	8365	1962.5	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.01	21.10
CA_5A-{41A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B41	20	40620	2593	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.02	21.10
CA_{2C}-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	702	1940.2	4x4	-	-	-	-	-	-	-	-	-	-	21.05	21.10
CA_{4A}-5B (1)	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	5	2473	876.3	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	-	-	-	-	-	21.04	21.10
CA_5A-{7A}-{7A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B7	20	3100	2655	4x4	LTE B7	20	2850	2630	4x4	-	-	-	-	-	-	-	-	-	-	20.99	21.10
CA_5A-{7C}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B7	20	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	-	-	-	-	-	-	-	-	-	-	21.01	21.10
CA_{2A}-5A-46A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	20.98	21.10
CA_5A-46A-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	20.96	21.10
CA_{4A}-{4A}-5B	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	21.03	21.10
CA_5A-{66A}-{66B}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	5	67168	2183.2	4x4	LTE B66	15	67261	2192.5	4x4	-	-	-	-	-	20.94	21.10
CA_5A-{66A}-{66C}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	21.01	21.10
CA_{2A}-{2A}-{4A}-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	20.97	21.10
CA_{2A}-{2A}-5A-{30A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	20.98	21.10
CA_{2A}-{2A}-5A-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	20.96	21.10
CA_{2A}-{4A}-{4A}-5A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	20.97	21.10
CA_{2A}-5A-{66B}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B66	15	66786	2145	4x4	LTE B66	5	66879	2154.3	4x4	-	-	-	-	-	21.01	21.10
CA_{2A}-5A-{66C}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	20.99	21.10
CA_{2A}-{4A}-5A-{30A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	20.96	21.10
CA_{2A}-5A-{30A}-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	21.01	21.10
CA_{2A}-{2A}-5A-66A-66A	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	2x2	LTE B66	20	67236	2190	2x2	20.95	21.10
CA_{2A}-{2A}-5A-{66B}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B66	15	66786	2145	4x4	LTE B66	5	66879	2154.3	2x2	20.99	21.10
CA_2A-{2A}-5A-{66C}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	66984	2164.8	4x4	20.97	21.10
CA_{2A}-5A-46D	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	21.02	21.10
CA_{2A}-5B-{66B}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B2	20	900	1960	4x4	LTE B66	15	66786	2145	4x4	LTE B66	5	66879	2154.3	4x4	20.98	21.10
CA_{2A}-5B-{66C}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	66984	2164.8	4x4	21.00	21.10
CA_{2A}-5B-{66A}-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	20.99	21.10
CA_5A-46D-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	LTE B66	20	66786	2145	4x4	21.03	21.10
CA_5B-{30A}-{66A}-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	21.01	21.10
CA_2A-5A-30A-{66A}-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B2	20	900	1960	2x2	LTE B30	10	9820	2355	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	21.02	21.10
CA_{2A}-5B-{30A}-{66A}	LTE B5	5	20425	826.5	QPSK	1	24	2425	871.5	2x2	LTE B5	10	2497	878.7	2x2	LTE B2	20	900	1960	4x4	LTE B30	10	9820	2355	4x4	LTE B66	20	66786	2145	4x4	21.00	21.10

© 2020 PCTEST

1.4.5 LTE Band 26 as PCC

Table 17
Output Powers - Ant 4

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[7A]-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	2x2	LTE B7	20	3100	2655	4x4	-	-	-	-	-	20.58	21.10
CA_[25A]-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	2x2	LTE B25	20	8365	1962.5	4x4	-	-	-	-	-	20.68	21.10
CA_26A-[41A]	LTE B26	10	26740	819	16QAM	1	0	8740	864	2x2	LTE B41	20	40620	2593	4x4	-	-	-	-	-	20.98	21.10
CA_[7A]-[7A]-26A	LTE B26	10	26740	819	16QAM	1	0	8740	864	2x2	LTE B7	20	3100	2655	4x4	LTE B7	20	2850	2630	4x4	20.60	21.10
CA_[25A]-[25A]-26A	LTE B26	3	26705	815.5	64QAM	1	0	8705	860.5	2x2	LTE B25	20	8365	1962.5	4x4	LTE B25	20	8590	1985	4x4	20.76	21.10
CA_26A-[41C]	LTE B26	10	26740	819	16QAM	1	0	8740	864	2x2	LTE B41	20	40620	2593	4x4	LTE B41	20	40422	2573.2	4x4	20.96	21.10

© 2020 PCTEST

1.4.6 LTE Band 66 as PCC

Table 18
Output Powers - Ant 2A

PCC										SCC 1						SCC 2						SCC 3						SCC 4						SCC 5					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.12	15.30
CA_12A-[66A] (1)	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.08	15.30
CA_12A-[66A] (2)	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.08	15.30
CA_29A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B29	10	9715	722.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.30
CA_46A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.93	15.30
CA_5A-46A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B5	10	2525	881.5	2x2	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.11	15.30
CA_13A-46A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B46	10	50665	5537.5	2x2	LTE B13	20	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.07	15.30
CA_13A-48A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B13	10	5230	751	2x2	LTE B48	20	55990	3625	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_2A-[2A]-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.24	15.30
CA_[2A]-[2A]-[66B]	LTE B66	15	132047	1717.5	16QAM	1	0	66513	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.15	15.30
CA_[2A]-[2A]-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	66588	2125.2	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.10	15.30
CA_[2A]-[66A]-[66B]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	5	67168	2183.2	4x4	LTE B66	15	67261	2192.5	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.07	15.30
CA_[2A]-[66B]-[66A]	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B66	15	67236	2190	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.18	15.30
CA_[2A]-[66A]-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.07	15.30
CA_[2A]-[68C]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B68	20	66588	2125.2	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.17	15.30
CA_[2C]-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	702	1940.2	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_5A-[66A]-[66B]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	5	67168	2183.2	4x4	LTE B66	15	67261	2192.5	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.09	15.30
CA_5A-[66B]-[66A]	LTE B66	15	132047	1717.5	16QAM	1	0	66513	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.04	15.30
CA_5A-[66A]-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.30
CA_5A-[66C]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	66588	2125.2	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.94	15.30
CA_13A-[66A]-[66B]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	5	67168	2183.2	4x4	LTE B66	15	67261	2192.5	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.13	15.30
CA_13A-[66B]-[66A]	LTE B66	15	132047	1717.5	16QAM	1	0	66513	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B66	20	67236	2190	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.10	15.30
CA_13A-[66A]-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67038	2170.2	4x4	LTE B66	20	67236	2190	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.85	15.30
CA_13A-[66C]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	66588	2125.2	4x4	LTE B66	20	67236	2190	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.92	15.30
CA_48C-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.08	15.30
CA_48A-48A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	55340	3560	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.03	15.30
CA_48A-48C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	55340	3560	2x2	LTE B48	20	55538	3579.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.21	15.30
CA_48C-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.16	15.30
CA_[2A]-[2A]-5A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.15	15.30
CA_[2A]-[2A]-12A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.30
CA_[2A]-[2A]-13A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.90	15.30
CA_[2A]-[2A]-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	4x4	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.09	15.30
CA_[2A]-5A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.03	15.30
CA_[2A]-[5A]-[66B]	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B2	20	900	1960	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.07	15.30
CA_[2A]-12A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.97	15.30
CA_[2A]-13A-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	66588	2125.2	4x4	LTE B2	20	900	1960	4x4	LTE B13	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.98	15.30
CA_[2A]-13A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.99	15.30
CA_[2A]-13A-[66B]	LTE B66	15	132047	1717.5	16QAM	1	0	66513	2117.5	4x4	LTE B66	5	66604	2126.8	4x4	LTE B2	20	900	1960	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.18	15.30
CA_[2A]-13A-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	66588	2125.2	4x4	LTE B2	20	900	1960	4x4	LTE B13	10	5230	751	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.09	15.30
CA_2A-[66A]-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	900	1960	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.10	15.30
CA_46A-46A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	47090	5180	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.08	15.30
CA_[2A]-48C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.97	15.30
CA_5A-[30A]-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.10	15.30
CA_13A-46C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B13	10	5230	751	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.14	15.30
CA_13A-48C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B13	10	5230	751	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.01	15.30
CA_46A-48C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.08	15.30
CA_[2A]-5A-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B5	10	2525	881.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.13	15.30
CA_[2A]-[7A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B7	20	3100	2655	4x4	LTE B7	10	3100	2655	4x4	LTE B2	20	2850	2630	4x4	LTE B2	20	900	1960	2x2	-	-	-	-	-	-	-	15.12	15.30
CA_[7A]-12A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B7	10	3100	2655	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	15.06	15.30
CA_[2A]-12A-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B12	10	5095	737.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.14	15.30
CA_[2A]-29A-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B29	10	9715	722.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	15.22	15.30
CA_[2A]-46A-48A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	55990	3625	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	14.96	15.30
CA_46D-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	-	-	-	-	-	-	-	-	-	15.12	15.30
CA_[2A]-[2A]-5A-46A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2146	2x2	LTE B66	20	67236	2190	2x2	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	15.26	15.30
CA_[2A]-[2A]-5A-[66B]	LTE B66	15	132047	1717.5	16QAM	1	0	66511	2117.5	2x2	LTE B66	5	66604	2126.8	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	15.23	15.30
CA_[2A]-5A-[66C]	LTE B66	20	132322	1745	64QAM	1	0	66786	2146	2x2	LTE B66	20	66588	2125.2	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	15.26	15.30
CA_[2A]-[4A]-[66B]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	LTE B48	20	56388	3664.6	2x2	-	-	-	-	-	-	-	-	-	15.13	15.30
CA_[2A]-48D-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	LTE B48	20	56388	3664.6	2x2	-	-	-	-	-	-	-	-	-	15.26	15.30
CA_5A-48D-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B5	10	2525	881.5	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B48	20	50863	5557.3	2x2	-	-	-	-	-	-	-	-	-	15.26	15.30
CA_5B-[30A]-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2146	4x4	LTE B66	20	67236	2190	4x4	LTE B5	10	2525	881.5	2x2	LTE B5	5	2453	874.3	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	15.13	15.30
CA_13A-46D-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B13	10	5230	751	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	-	-	-	-	-	-	-	-	-	15.28	15.30
CA_48C-48C-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	50467	5517.7	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	15.29	15.30
CA_2A-2A-5A-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	900	1960	2x2	LTE B5	10	2525	881.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	15.13	15.30
CA_2A-2A-12A-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B12	10	5095	737.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	15.10	15.30
CA_2A-5A-30A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	2x2	LTE B5	10	2525	881.5	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	15.17	15.30
CA_[2A]-5B-[30A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B5	10	2525	881.5	2x2	LTE B5	5	2453	874.3	2x2	LTE B30	10	9820	2355	4x4	-	-	-	-	-	-	-	-	-	15.19	15.30
CA_2A-12A-30A-[66A]-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2146	4x4	LTE B66	20	67236	2190	4x4	LTE B2	20	900	1960	2x2	LTE B12	10	5095	737.5	2x2	LTE B30	10	9820	2355	2x2	-	-	-	-	-	-	-	-	-	15.14	15.30
CA_[2A]-46A-48C-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2146	4x4	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	-	-	-	-	-	-	-	-	-	15.30	15.30
CA_[2A]-46C-48A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B48	20	55990	3625	2x2	-	-	-	-	-	-	-	-	-	15.23	15.30
CA_[2A]-48E-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	4x4	LTE B48	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B48	20	50863	5557.3	2x2	LTE B48	20	50269	5497.9	2x2	15.30	15.30
CA_[2A]-46A-48D-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	LTE B48	20	56386	3664.6	2x2	15.30	15.30
CA_[2A]-48C-48A-66A	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	2x2	LTE B2	20	900	1960	4x4	LTE B48	20	55990	3625	2x2	LTE B48	20	56188	3644.8	2x2	LTE B48	20	56388	3664.6	2x2	LTE B48	20	56188	3644.8	2x2	15.30	15.30
CA_2A-46D-48A-[66A]	LTE B66	20	132322	1745	64QAM	1	0	66786	2145	4x4	LTE B2	20	900	1960	2x2	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	LTE B48	20	55990	3625	2x2	15.30	15.30

1.4.7 LTE Band 25 as PCC

Table 19
Output Powers - Ant 4

PCC										SCC 1						SCC 2						SCC 3						SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-[25A]	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.97	15.99
CA_12A-[25A]	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.93	15.99
CA_[25A]-26A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	4x4	LTE B26	10	8865	876.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.88	15.99
CA_[25A]-46A	LTE B25	15	26615	1907.5	16QAM	36	0	8615	1987.5	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-

1.4.8 LTE Band 30 as PCC

Table 20
Output Powers - Ant 1a

PCC											SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2C]-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	702	1940.2	4x4	-	-	-	-	-	-	-	-	-	-	14.37	14.42
CA_2A]-[2A]-5A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	14.36	14.42
CA_2A]-[2A]-12A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	14.38	14.42
CA_2A]-[2A]-29A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B2	20	700	1940	4x4	LTE B29	10	9715	722.5	2x2	-	-	-	-	-	14.27	14.42
CA_2A-[2A]-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.41	14.42
CA_2A-[30A]-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	14.40	14.42
CA_[4A]-[4A]-5A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	14.38	14.42
CA_[4A]-[4A]-12A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B4	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	14.39	14.42
CA_5A-[30A]-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B5	10	2525	881.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	14.34	14.42
CA_12A-[30A]-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B12	10	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	14.37	14.42
CA_[2A]-[4A]-5A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	14.38	14.42
CA_[2A]-[4A]-12A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	14.35	14.42
CA_[2A]-[4A]-29A-[30A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B29	10	9715	722.5	2x2	-	-	-	-	-	14.37	14.42
CA_[2A]-5A-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B5	10	2525	881.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.42	14.42
CA_[2A]-12A-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B12	10	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.40	14.42
CA_[2A]-29A-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B29	10	9715	722.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.37	14.42
CA_5B-[30A]-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B5	10	2525	881.5	2x2	LTE B5	5	2453	874.3	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	14.33	14.42
CA_2A-2A-5A-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B5	10	2525	881.5	2x2	LTE B66	20	66786	2145	4x4	14.42	14.42
CA_2A-2A-12A-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	2x2	LTE B2	20	700	1940	2x2	LTE B12	10	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	14.38	14.42
CA_2A-5A-30A-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	2x2	LTE B2	20	900	1960	2x2	LTE B5	10	2525	881.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	14.38	14.42
CA_[2A]-5B-[30A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	4x4	LTE B2	20	900	1960	4x4	LTE B5	10	2525	881.5	2x2	LTE B5	5	2453	874.3	2x2	LTE B66	20	66786	2145	4x4	14.39	14.42
CA_2A-12A-30A-[66A]-[66A]	LTE B30	10	27710	2310	QPSK	25	25	9820	2355	2x2	LTE B2	20	900	1960	2x2	LTE B12	10	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	14.38	14.42

1.4.9 LTE Band 7 as PCC

Table 21
Output Powers - Ant 2A

PCC											SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[7B]	LTE B7	15	20825	2507.5	16QAM	1	74	2825	2627.5	4x4	LTE B7	5	2918	2636.8	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.27	14.60
CA_5A-[7A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.27	14.60
CA_[7A]-26A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B26	10	8865	876.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.24	14.60
CA_[7A]-46A (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.28	14.60
CA_[2A]-[7A]-[7A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2850	2630	4x4	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	14.58	14.60
CA_[4A]-[4A]-[7A] (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2175	2132.5	4x4	LTE B4	10	2350	2150	4x4	-	-	-	-	-	-	-	-	-	-	14.53	14.60
CA_5A-[7A]-[7A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2850	2630	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	14.27	14.60
CA_5A-[7C]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	LTE B5	10	2525	881.5	2x2	-	-	-	-	-	-	-	-	-	-	14.34	14.60
CA_[7A]-[7A]-26A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2850	2630	4x4	LTE B26	10	8865	876.5	2x2	-	-	-	-	-	-	-	-	-	-	14.29	14.60
CA_[7A]-46C (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	-	-	-	-	-	-	-	-	-	-	14.23	14.60
CA_[7C]-46A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	LTE B46	20	50665	5537.5	2x2	-	-	-	-	-	-	-	-	-	-	14.26	14.60
CA_[7A]-46D (1)	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	-	-	-	-	-	14.22	14.60
CA_[7C]-46C	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	-	-	-	-	-	14.25	14.60
CA_2A-[4A]-[7A]-[7A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2850	2630	4x4	LTE B2	20	900	1960	2x2	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	14.43	14.60
CA_[2A]-[4A]-[7C]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	-	-	-	-	-	14.60	14.60
CA_[2A]-[4A]-[7A]-12A	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B2	20	900	1960	4x4	LTE B4	20	2175	2132.5	4x4	LTE B12	10	5095	737.5	2x2	-	-	-	-	-	14.55	14.60
CA_2A-[7A]-[7A]-[66A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2850	2630	4x4	LTE B2	20	900	1960	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.46	14.60
CA_[2A]-[7A]-12A-[66A]	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B2	20	900	1960	4x4	LTE B12	10	5095	737.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	14.49	14.60
CA_[7C]-46D	LTE B7	20	21100	2535	16QAM	1	99	3100	2655	4x4	LTE B7	20	2902	2635.2	4x4	LTE B46	20	50665	5537.5	2x2	LTE B46	20	50467	5517.7	2x2	LTE B46	20	50863	5557.3	2x2	14.20	14.60

1.4.10 LTE Band 41 as PCC

Table 22
Output Powers - Ant 2A

PCC											SCC 1					SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[41A]-[41A] (1)	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.60	16.60
CA_5A-[41A]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B5	10	2525	2685	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.59	16.60
CA_26A-[41A]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B26	10	8865	876.5	2x2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.60	16.60
CA_[41A]-[41C]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	-	-	-	16.59	16.60
CA_[41C]-[41A]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	-	-	-	-	-	16.57	16.60
CA_[25A]-[25A]-[41A]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B25	20	8365	1962.5	4x4	LTE B25	20	8590	1985	4x4	-	-	-	-	-	-	-	-	-	-	16.60	16.60
CA_[25A]-[41C]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B25	20	8365	1962.5	4x4	-	-	-	-	-	-	-	-	-	-	16.60	16.60
CA_26A-[41C]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B26	10	8865	876.5	2x2	-	-	-	-	-	-	-	-	-	-	16.58	16.60
CA_[41E]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	40581	2589.1	4x4	LTE B41	20	40779	2608.9	4x4	-	-	-	-	-	16.48	16.60
CA_[41A]-[41D]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	41094	2640.4	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	16.53	16.60
CA_[41D]-[41A]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	40581	2589.1	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	16.50	16.60
CA_[41C]-[41C]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	16.50	16.60
CA_[25A]-[25A]-[41C]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B25	20	8365	1962.5	4x4	LTE B25	20	8590	1985	4x4	-	-	-	-	-	16.40	16.60
CA_[25A]-[41D]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	40581	2589.1	4x4	LTE B25	20	8590	1985	4x4	-	-	-	-	-	16.41	16.60
CA_41C-[41D]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	2x2	LTE B41	20	40383	2569.3	2x2	LTE B41	20	41094	2640.4	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	16.48	16.60
CA_[41D]-41C	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	4x4	LTE B41	20	40581	2589.1	4x4	LTE B41	20	41292	2660.2	2x2	LTE B41	20	41490	2680	2x2	16.49	16.60
CA_[25A]-[25A]-[41D]	LTE B41	20	40185	2549.5	QPSK	50	0	40185	2549.5	4x4	LTE B41	20	40383	2569.3	2x2	LTE B41	20	40581	2589.1	2x2	LTE B25	20	8365	1962.5	4x4	LTE B25	20	8590	1985	4x4	16.39	16.60

1.4.11 LTE Band 48 as PCC

Table 23
Output Powers - Ant 4

PCC											SCC 1					SCC 2					SCC 3					SCC 4					SCC 5					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[2A]-48A-48A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	55340	3560	2x2	LTE B2	20	900	1960	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.49	16.50
CA_13A-48A-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B13	10	52130	751	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.50	16.50
CA_48A-48A-[66A]-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	55340	3560	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.43	16.50
CA_48A-48C-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	55340	3560	2x2	LTE B48	20	55538	3579.8	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.46	16.50
CA_48C-48A-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B48	20	55340	3560	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.50	16.50
CA_48C-[66A]-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B66	20	66786	2145	4x4	LTE B66	20	67236	2190	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.43	16.50
CA_[2A]-48C-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.41	16.50
CA_13A-48C-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B13	10	52130	751	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.48	16.50
CA_46A-48C-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.42	16.50
CA_[2A]-46A-48A-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	16.49	16.50
CA_[2A]-46D-48A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	4x4	LTE B46	20	50467	5517.7	2x2	-	-	-	-	-	-	-	-	-	16.48	16.50
CA_[2A]-48D-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B48	20	55811	3607.1	2x2	LTE B2	20	900	1960	4x4	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	16.43	16.50
CA_46C-48C-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B46	20	50665	5537.5	2x2	LTE B48	20	50467	5517.7	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	16.46	16.50
CA_[2A]-46A-48C-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	2x2	-	-	-	-	-	-	-	-	-	16.38	16.50
CA_[2A]-46C-48A-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	50467	5517.7	2x2	LTE B66	20	66786	2145	4x4	-	-	-	-	-	-	-	-	-	16.37	16.50
CA_[2A]-46A-48D-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B2	20	900	1960	4x4	LTE B48	20	55811	3607.1	2x2	LTE B46	20	50665	5537.5	2x2	LTE B66	20	66786	2145	2x2	-	-	-	-	16.38	16.50
CA_[2A]-48C-46A-66A	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B48	20	56099	3626.9	2x2	LTE B2	20	900	1960	4x4	LTE B46	20	50665	5537.5	2x2	LTE B48	20	50467	5517.7	2x2	LTE B66	20	66786	2145	2x2	-	-	-	-	16.38	16.50
CA_2A-46D-48A-[66A]	LTE B48	20	56207	3646.7	QPSK	1	99	56207	3646.7	2x2	LTE B2	20	900	1960	2x2	LTE B46	20	50665	5537.5	2x2	LTE B48	20	50467	5517.7	2x2	LTE B66	20	50863	5557.3	2x2	LTE B66	20	66786	2145	4x4	16.39	16.50

1.5 Downlink Carrier Aggregation with Uplink Carrier Aggregation enabled

This device supports uplink carrier aggregation (ULCA) with additional Carrier Aggregation configurations active in the downlink. Power measurements were performed with ULCA active and additional CA configurations active in the downlink for the configuration per Fall 2017 TCB Workshop Notes.

Per FCC Guidance, additional SAR measurements for these configurations were not required since their maximum output power was not more than 0.25 dB higher than the maximum output power for with only ULCA active.

1.5.1 DL Carrier Aggregation RF Conducted Powers

1.5.1.1 LTE Band 41

Table 24
Output Powers – Ant 2A

	PCC										SCC 1								SCC 2				SCC 3				SCC 4				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (UL) Channel	SCC (UL) Freq. [MHz]	Mod	SCC UL# RB	SCC UL# RB Offset	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	ULCA Tx.Power with DL CA Enabled [dBm]	ULCA Tx Power [dBm]
CA_41C-41A	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	41490	2680	-	-	-	-	-	-	-	-	16.17	16.18
CA_41D-41A	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	40146	2546.6	LTE B41	20	41490	2680	-	-	-	-	16.19	16.18
CA_41C-41C	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	-	-	-	-	16.19	16.18
CA_41E	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	40146	2546.6	LTE B41	20	40344	2565.4	-	-	-	-	16.31	16.18
CA_41C-41D	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	16.19	16.18
CA_41D-41C	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	LTE B41	20	40146	2546.6	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	16.20	16.18

1.5.2 DL Carrier Aggregation with DL 4x4 MIMO RF Conducted Powers

Note: 4x4 DL MIMO is only operating in the downlink. Uplink transmission is limited to a single output stream for each component carrier of ULCA.

1.5.2.1 LTE Band 41

Table 25
Output Powers – Ant 2A

	PCC										SCC 1									SCC 2					SCC 3					SCC 4					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (UL) Ch.	SCC (UL) Freq. [MHz]	Mod	SCC UL # RB	SCC UL RB Offset	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	ULCA Tx.Power with DL CA Enabled (dBm)	ULCA Tx Power (dBm)
CA_41C-[41A]	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	4x4	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	4x4	LTE B41	20	41490	2680	4x4						-	-	-	-	-	16.16	16.18
CA_[41E]	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	4x4	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	4x4	LTE B41	20	40146	2546.6	4x4	LTE B41	20	40344	2565.4	4x4	-	-	-	-	-	16.15	16.18
CA_[41D]-[41A]	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	4x4	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	4x4	LTE B41	20	40146	2546.6	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	16.16	16.18
CA_[41C]-[41C]	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	4x4	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	16.18	16.18
CA_41C-[41D]	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	2x2	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	2x2	LTE B41	20	41094	2640.4	4x4	LTE B41	20	41292	2660.2	4x4	LTE B41	20	41490	2680	4x4	16.19	16.18
CA_[41D]-41C	LTE B41	20	39750	2506	QPSK	50	50	39750	2506	4x4	LTE B41	20	39948	2525.8	QPSK	50	0	39948	2525.8	4x4	LTE B41	20	40146	2546.6	4x4	LTE B41	20	41292	2660.2	2x2	LTE B41	20	41490	2680	2x2	16.15	16.18

1.5.2.2 LTE Band 7

Table 26
Output Powers - Ant 2A

	PCC										SCC 1										Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (UL) Ch.	SCC (UL) Freq. [MHz]	Mod	SCC UL # RB	SCC UL RB Offset	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	ULCA Tx.Power add'l CA config.	ULCA Tx Power (dBm)
CA_[7C]	LTE B7	20	20850	2510	QPSK	50	50	2850	2630	4x4	LTE B7	20	21048	2529.8	QPSK	50	0	3048	2649.8	4x4	14.56	14.58

© 2020 PCTEST

APPENDIX G: POWER REDUCTION VERIFICATION

© 2020 PCTEST

The device supports manufacturer's proprietary power reduction mechanism called "Detect Mode" for the Main Cellular Antenna. Details of this mechanism can be found in the Operational Description. When the device is being used "on-body" or "held in hand" by the user, the device will detect motion and reduce the power of the main antenna. Per the manufacturer, the mechanism is agnostic to different cellular air interfaces. Detect Mode operation was verified for two test cases, on-body and held in hand, for each supported cellular band. The power reduction verification results are below.

1.1 Main Antenna Power Reduction Verification Summary

Table G-1
Main Antenna Power Reduction Verification

Mode/Band	Antenna	Maximum Scenario Maximum Allowed Target Power [dBm]	Reduced Scenario Maximum Allowed Target Power [dBm]	Conducted Power [dBm]			
				Maximum	Test Case 1	Test Case 2	Verdict
GPRS 850 (2 Tx)	Antenna 4	31.25 (± 0.75)	27.45 (± 0.75)	31.23	27.55	27.54	PASS
	Antenna 3B	30.25 (± 0.75)	24.05 (± 0.75)	30.46	23.99	23.98	PASS
GPRS 1900 (2 Tx)	Antenna 4	29.25 (± 0.75)	22.25 (± 0.75)	29.53	22.31	22.33	PASS
	Antenna 2A	28.25 (± 0.75)	20.45 (± 0.75)	28.36	20.53	20.51	PASS
	Antenna 1A	29.25 (± 0.75)	21.25 (± 0.75)	29.31	21.32	21.30	PASS
	Antenna 3A	28.25 (± 0.75)	19.65 (± 0.75)	28.53	19.77	19.76	PASS
WCDMA B5	Antenna 4	25.00 (± 0.5)	20.60 (± 0.5)	24.89	20.89	20.88	PASS
	Antenna 3B	24.25 (± 0.5)	17.60 (± 0.5)	24.23	17.87	17.89	PASS
WCDMA B4	Antenna 4	24.25 (± 0.5)	15.00 (± 0.5)	24.22	15.03	15.01	PASS
	Antenna 2A	23.50 (± 0.5)	13.90 (± 1)	23.54	13.83	13.84	PASS
	Antenna 1A	24.00 (± 0.5)	14.60 (± 0.5)	24.01	14.96	14.98	PASS
	Antenna 3A	23.25 (± 0.5)	13.00 (± 1)	23.14	13.01	13.03	PASS
WCDMA B2	Antenna 4	24.25 (± 0.5)	15.80 (± 0.5)	24.21	15.93	15.91	PASS
	Antenna 2A	23.50 (± 0.5)	13.80 (± 1)	23.47	13.61	13.64	PASS
	Antenna 1A	24.00 (± 0.5)	13.80 (± 1)	23.51	13.77	13.79	PASS
	Antenna 3A	23.25 (± 0.5)	13.20 (± 1)	23.01	14.11	14.09	PASS
LTE Band 12	Antenna 4	25.00 (± 0.5)	20.40 (± 0.5)	25.23	20.50	20.51	PASS
	Antenna 3B	24.25 (± 0.5)	18.40 (± 0.5)	23.89	18.28	18.27	PASS
LTE Band 17	Antenna 4	25.00 (± 0.5)	20.40 (± 0.5)	24.77	20.16	20.17	PASS
	Antenna 3B	24.25 (± 0.5)	18.40 (± 0.5)	23.81	18.19	18.20	PASS
LTE Band 13	Antenna 4	25.00 (± 0.5)	20.60 (± 0.5)	25.01	20.68	20.67	PASS
	Antenna 3B	24.25 (± 0.5)	18.70 (± 0.5)	23.91	18.62	18.61	PASS
LTE Band 26	Antenna 4	25.00 (± 0.5)	20.60 (± 0.5)	25.10	20.52	20.53	PASS
	Antenna 3B	24.25 (± 0.5)	17.40 (± 0.5)	23.99	17.40	17.39	PASS
LTE Band 5	Antenna 4	25.00 (± 0.5)	20.60 (± 0.5)	25.04	20.61	20.62	PASS
	Antenna 3B	24.25 (± 0.5)	17.40 (± 0.5)	23.84	17.25	17.26	PASS
LTE Band 4	Antenna 4	24.25 (± 0.5)	13.40 (± 1)	23.85	12.50	12.51	PASS
	Antenna 2A	23.50 (± 0.5)	14.80 (± 0.5)	23.01	14.36	14.35	PASS
	Antenna 1A	24.00 (± 0.5)	13.80 (± 1)	23.63	13.21	13.20	PASS
	Antenna 3A	23.25 (± 0.5)	13.10 (± 1)	22.83	12.26	12.27	PASS
LTE Band 66	Antenna 4	24.25 (± 0.5)	13.40 (± 1)	24.11	13.02	13.00	PASS
	Antenna 2A	23.50 (± 0.5)	14.80 (± 0.5)	23.51	14.77	14.76	PASS
	Antenna 1A	24.00 (± 0.5)	13.80 (± 1)	24.12	13.23	13.25	PASS
	Antenna 3A	23.25 (± 0.5)	13.10 (± 1)	22.99	12.91	12.89	PASS
LTE Band 2	Antenna 4	24.25 (± 0.5)	15.50 (± 0.5)	23.98	15.13	15.11	PASS
	Antenna 2A	23.50 (± 0.5)	13.40 (± 1)	23.40	13.37	13.36	PASS
	Antenna 1A	24.00 (± 0.5)	13.60 (± 1)	23.55	13.11	13.10	PASS
	Antenna 3A	23.25 (± 0.5)	13.60 (± 1)	23.03	13.27	13.28	PASS
LTE Band 25	Antenna 4	24.25 (± 0.5)	15.50 (± 0.5)	23.87	15.37	15.36	PASS
	Antenna 2A	23.50 (± 0.5)	13.40 (± 1)	23.14	12.77	12.76	PASS
	Antenna 1A	24.00 (± 0.5)	13.60 (± 1)	23.65	13.10	13.11	PASS
	Antenna 3A	23.25 (± 0.5)	13.60 (± 1)	22.99	12.74	12.73	PASS
LTE Band 30	Antenna 4	22.20 (± 0.5)	12.70 (± 1)	21.93	12.37	12.38	PASS
	Antenna 2A	22.60 (± 0.5)	12.50 (± 1)	22.14	11.57	11.58	PASS
	Antenna 1A	22.00 (± 0.5)	13.50 (± 1)	21.57	12.57	12.58	PASS
	Antenna 3A	23.00 (± 0.5)	12.70 (± 1)	22.75	12.38	12.40	PASS
LTE Band 7	Antenna 4	24.50 (± 0.5)	12.70 (± 1)	24.23	12.01	12.02	PASS
	Antenna 2A	23.25 (± 0.5)	13.60 (± 1)	23.05	12.76	12.77	PASS
	Antenna 1A	23.75 (± 0.5)	12.90 (± 1)	23.51	12.14	12.15	PASS
	Antenna 3A	23.00 (± 0.5)	11.00 (± 1)	22.91	10.36	10.34	PASS
LTE Band 41 (PC3)	Antenna 4	24.00 (± 0.5)	15.10 (± 0.5)	23.61	14.87	14.85	PASS
	Antenna 2A	23.50 (± 0.5)	16.10 (± 0.5)	23.56	15.77	15.75	PASS
	Antenna 1A	23.75 (± 0.5)	14.50 (± 0.5)	23.52	14.35	14.37	PASS
	Antenna 3A	23.00 (± 0.5)	13.20 (± 1)	22.78	13.12	13.15	PASS
LTE Band 41 (PC2)	Antenna 4	26.00 (± 0.5)	15.10 (± 0.5)	25.93	15.12	15.11	PASS
	Antenna 2A	26.75 (± 0.5)	16.10 (± 0.5)	26.81	16.05	16.06	PASS
	Antenna 1A	26.50 (± 0.5)	14.50 (± 0.5)	26.49	14.61	14.60	PASS
	Antenna 3A	26.00 (± 0.5)	13.20 (± 1)	26.07	13.13	13.11	PASS
LTE Band 48	Antenna 4	24.75 (± 0.5)	16.00 (± 0.5)	24.91	15.93	15.91	PASS
	Antenna 3B	23.25 (± 0.5)	15.70 (± 0.5)	23.13	15.81	15.79	PASS
LTE B5 Intra-Band ULCA	Antenna 4	23.75 (± 1)	20.10 (± 1)	23.82	19.73	19.75	PASS
	Antenna 3B	22.75 (± 1)	16.90 (± 1)	22.56	16.73	16.77	PASS
LTE B7 Intra-Band ULCA	Antenna 4	23.25 (± 1)	12.70 (± 1)	23.15	12.59	12.51	PASS
	Antenna 2A	22.25 (± 1)	13.60 (± 1)	22.79	13.51	13.53	PASS
	Antenna 1A	22.75 (± 1)	12.90 (± 1)	22.81	13.06	13.05	PASS
	Antenna 3A	22.00 (± 1)	11.00 (± 1)	22.23	11.09	11.07	PASS
LTE B41 (PC3) Intra-Band ULCA	Antenna 4	23.25 (± 1)	14.60 (± 1)	23.13	14.17	14.15	PASS
	Antenna 2A	22.25 (± 1)	15.60 (± 1)	22.07	15.31	15.30	PASS
	Antenna 1A	22.75 (± 1)	14.00 (± 1)	22.81	14.15	14.18	PASS
	Antenna 3A	22.00 (± 1)	13.20 (± 1)	22.23	13.05	13.08	PASS
LTE B41 (PC2) Intra-Band ULCA	Antenna 4	24.75 (± 1)	14.60 (± 1)	24.71	14.53	14.52	PASS
	Antenna 2A	24.25 (± 1)	15.60 (± 1)	24.23	15.37	15.39	PASS
	Antenna 1A	24.75 (± 1)	14.00 (± 1)	24.79	14.13	14.10	PASS
	Antenna 3A	24.00 (± 1)	13.20 (± 1)	24.21	13.08	13.09	PASS

Test Case 1: Device Held in Hand

Test Case 2: Device Resting on Lap

Test Cases represent typical scenarios in which the device power would be reduced. In these scenarios detect mode has been verified to identify typical on-body use-cases including when thin objects, such as a magazine or newspaper, are placed between the body and the device. In the absence of detect mode output, the device defaults to the most conservative power.

© 2020 PCTEST

APPENDIX H: IEEE 802.11AX RU SAR EXCLUSION

© 2020 PCTEST Engineering Laboratory, Inc.

1.1 IEEE 802.11ax RU SAR Exclusion

To make the most efficient use of the additional available subcarriers (data tones), IEEE 802.11ax can utilize Orthogonal Frequency-Division Multiple Access (OFDMA) which divides the existing 802.11 channels into smaller subchannels called Resource Units (RUs). Possible RU sizes are: 26T, 52T, 106T, 242T, 484T and 996T.

Per FCC Guidance, 802.11ax was considered a higher order 802.11 mode when compared to a/b/g/n/ac to apply KDB Publication 248227 D01v02r02 for OFDM mode selection. Therefore, SAR tests were not required for 802.11ax based on the maximum allowed output powers of OFDM modes and the reported SAR values. Per FCC Guidance, maximum conducted powers were performed for each RU size to demonstrate that the output powers would not be higher than the other OFDM 802.11 modes.

1.1 IEEE 802.11ax RU Target Powers

1.1.1 Maximum 802.11ax RU Time-Averaged WLAN Output Power

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna 3A	20 MHz Bandwidth	1	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		2	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		3	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		4	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		5	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		6	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		7	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		8	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		9	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		10	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		11	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		12	11.00	9.50	11.00	9.50	11.00	9.50	11.00	9.50
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna 3A	20 MHz Bandwidth	1	12.50	11.00	12.50	11.00	12.50	11.00	12.50	11.00
		2	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		3	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		4	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		5	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		6	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		7	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		8	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		9	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		10	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		11	12.50	11.00	12.50	11.00	12.50	11.00	12.50	11.00
		12	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna 1A	20 MHz Bandwidth	1	13.00	11.50	13.00	11.50	13.00	11.50	13.00	11.50
		2	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		3	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		4	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		5	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		6	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		7	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		8	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		9	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		10	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		11	13.50	12.00	13.50	12.00	13.50	12.00	13.50	12.00
		12	11.00	9.50	11.00	9.50	11.00	9.50	11.00	9.50
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

© 2020 PCTEST Engineering Laboratory, Inc.

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna 1A	20 MHz Bandwidth	1	12.50	11.00	12.50	11.00	12.50	11.00	12.50	11.00
		2	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		3	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		4	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		5	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		6	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		7	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		8	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		9	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		10	13.75	12.25	13.75	12.25	13.75	12.25	13.75	12.25
		11	12.50	11.00	12.50	11.00	12.50	11.00	12.50	11.00
		12	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Ant 2A	20 MHz Bandwidth	36	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		40	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		44	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		48	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		52	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		56	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		60	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		64	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		100	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		104	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		108	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		112	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		116	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		120	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		124	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		128	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		132	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		136	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		140	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		144	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25				
		149	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		153	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		157	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		161	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		165	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
	40 MHz Bandwidth	38	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		110	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		118	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		126	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		134	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		142	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		151	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
		159	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
	80 MHz Bandwidth	42	10.00	8.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	9.50	8.00	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	9.50	8.00	10.50	9.00	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		122	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		138	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		155	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75

© 2020 PCTEST Engineering Laboratory, Inc.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - Ant 2A	20 MHz Bandwidth	36	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		40	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		44	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		48	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		52	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		56	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		60	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		64	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		100	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		104	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		108	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		112	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		116	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		120	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		124	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		128	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		132	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		136	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		140	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		144	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		149	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		153	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		157	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		161	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		165	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
	40 MHz Bandwidth	38	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		110	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		118	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		126	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		134	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		142	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		151	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
		159	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
	80 MHz Bandwidth	42	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		122	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		138	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		155	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 2A	20 MHz Bandwidth	36	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		40	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		44	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		48	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00				
		52	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		56	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		60	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		64	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25				
		100	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		104	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		108	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		112	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		116	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		120	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		124	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		128	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		132	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		136	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		140	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		144	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25				
		149	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		153	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		157	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		161	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
		165	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75				
	40 MHz Bandwidth	38	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		110	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		118	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		126	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		134	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		142	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25		
		151	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
		159	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75		
	80 MHz Bandwidth	42	8.00	6.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	8.00	6.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		122	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		138	8.00	6.50	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25	10.75	9.25
		155	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75	11.25	9.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Ant 2B	20 MHz Bandwidth	36	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		40	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		44	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		48	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00				
		52	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		56	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		60	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		64	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		100	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		104	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		108	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		112	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		116	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		120	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		124	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		128	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		132	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		136	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		140	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		144	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		149	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		153	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		157	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		161	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		165	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
	40 MHz Bandwidth	38	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		62	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		102	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		159	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
	80 MHz Bandwidth	42	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	10.50	9.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		106	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - Ant 2B	20 MHz Bandwidth	36	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		40	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		44	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		48	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		52	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		56	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		60	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		64	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		100	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		104	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		108	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		112	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		116	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		120	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		124	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		128	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		132	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		136	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		140	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		144	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		149	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		153	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		157	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		161	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		165	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
	40 MHz Bandwidth	38	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		62	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		102	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		159	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
	80 MHz Bandwidth	42	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		106	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 2B	20 MHz Bandwidth	36	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		40	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		44	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		48	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00				
		52	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		56	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		60	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		64	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		100	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		104	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		108	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		112	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		116	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		120	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		124	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		128	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		132	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		136	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		140	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		144	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		149	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		153	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		157	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		161	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		165	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
	40 MHz Bandwidth	38	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		46	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00		
		54	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		62	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		102	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		159	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
	80 MHz Bandwidth	42	9.00	7.50	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00	10.50	9.00
		58	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		106	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Ant 1B	20 MHz Bandwidth	36	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		40	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		44	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		48	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00				
		52	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		56	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		60	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		64	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25				
		100	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		104	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		108	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		112	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		116	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		120	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		124	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		128	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		132	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		136	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		140	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		144	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		149	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		153	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		157	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		161	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		165	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
	40 MHz Bandwidth	38	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		46	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		54	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		159	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
	80 MHz Bandwidth	42	11.00	9.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		58	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75

© 2020 PCTEST Engineering Laboratory, Inc.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD -Ant 1B	20 MHz Bandwidth	36	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		40	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		44	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		48	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		52	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		56	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		60	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		64	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		100	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		104	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		108	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		112	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		116	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		120	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		124	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		128	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		132	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		136	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		140	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		144	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		149	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		153	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		157	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		161	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		165	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
	40 MHz Bandwidth	38	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		46	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		54	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		159	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
	80 MHz Bandwidth	42	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		58	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 1B	20 MHz Bandwidth	36	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		40	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		44	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		48	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00				
		52	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		56	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		60	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		64	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25				
		100	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		104	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		108	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		112	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		116	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		120	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		124	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		128	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		132	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		136	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		140	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		144	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75				
		149	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		153	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		157	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		161	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
		165	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75				
	40 MHz Bandwidth	38	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		46	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00		
		54	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		62	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25		
		102	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		110	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		118	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		126	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		134	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		142	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		151	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
		159	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75		
	80 MHz Bandwidth	42	9.00	7.50	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00	11.50	10.00
		58	9.00	7.50	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25	9.75	8.25
		106	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		122	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		138	9.00	7.50	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75
		155	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75	10.25	8.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

1.1.2 **Reduced 802.11ax RU Time-Averaged WLAN Output Power**

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 3A/3B active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna 3A	20 MHz Bandwidth	1	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		2	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		3	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		4	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		5	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		6	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		7	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		8	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		9	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		10	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		11	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		12	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 3A/3B active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna 3A	20 MHz Bandwidth	1	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		2	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		3	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		4	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		5	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		6	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		7	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		8	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		9	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		10	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		11	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		12	6.00	4.50	6.00	4.50	6.00	4.50	6.00	4.50
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 1A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Antenna 1A	20 MHz Bandwidth	1	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		2	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		3	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		4	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		5	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		6	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		7	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		8	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		9	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		10	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		11	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		12	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 1A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) - Antenna 1A	20 MHz Bandwidth	1	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		2	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		3	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		4	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		5	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		6	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		7	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		8	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		9	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		10	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		11	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		12	6.75	5.25	6.75	5.25	6.75	5.25	6.75	5.25
		13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Ant 2A	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		104	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		108	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		112	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		116	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		120	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		124	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		128	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		132	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		136	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		140	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		144	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		149	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		153	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		157	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		161	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		165	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		110	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		118	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		126	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		134	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		142	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		151	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
		159	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		122	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		138	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		155	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - Ant 2A	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		104	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		108	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		112	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		116	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		120	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		124	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		128	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		132	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		136	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		140	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		144	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		149	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		153	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		157	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		161	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		165	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		110	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		118	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		126	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		134	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		142	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		151	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
		159	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		122	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		138	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		155	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 2A	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		104	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		108	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		112	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		116	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		120	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		124	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		128	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		132	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		136	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		140	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		144	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25				
		149	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		153	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		157	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		161	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
		165	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		110	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		118	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		126	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		134	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		142	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25		
		151	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
		159	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		122	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		138	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25	3.75	2.25
		155	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75	4.25	2.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - Ant 2B	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		56	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		60	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		64	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		153	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		157	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		161	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		165	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		62	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		159	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - Ant 2B	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		56	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		60	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		64	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		153	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		157	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		161	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		165	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		62	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		159	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 2A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 2B	20 MHz Bandwidth	36	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		40	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		44	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		48	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00				
		52	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		56	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		60	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		64	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		153	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		157	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		161	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		165	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
	40 MHz Bandwidth	38	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		46	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00		
		54	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		62	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	0.00	-1.50	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	0.00	-1.50	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	0.00	-1.50	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	0.00	-1.50	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	0.00	-1.50	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		159	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
	80 MHz Bandwidth	42	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00	3.50	2.00
		58	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 1A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - Single Tx Chain (dBm) - 1B	20 MHz Bandwidth	36	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		40	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		44	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		48	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		153	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		157	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		161	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		165	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
	40 MHz Bandwidth	38	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		46	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		159	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
	80 MHz Bandwidth	42	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 1A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) CDD - Ant 1B	20 MHz Bandwidth	36	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		40	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		44	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		48	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		153	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		157	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		161	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		165	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
	40 MHz Bandwidth	38	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		46	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		159	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
	80 MHz Bandwidth	42	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

Below table is applicable in the following conditions:
-Simultaneous conditions with Licensed Bands Antenna 1A active
-Simultaneous conditions with LTE Inter-band ULCA active

Mode/ Band		Tones	26T		52T		106T		242T		484T		996T	
		Channel	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal
Modulated Average - 2 Tx Chain (dBm) SDM - Ant 1B	20 MHz Bandwidth	36	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		40	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		44	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		48	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00				
		52	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		56	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		60	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		64	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25				
		100	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		104	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		108	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		112	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		116	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		120	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		124	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		128	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		132	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		136	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		140	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		144	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		149	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		153	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		157	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		161	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
		165	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75				
	40 MHz Bandwidth	38	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		46	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00		
		54	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		62	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25		
		102	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		110	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		118	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		126	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		134	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		142	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		151	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
		159	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75		
	80 MHz Bandwidth	42	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00
		58	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25	2.75	1.25
		106	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		122	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		138	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75
		155	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75	3.25	1.75

Note: In MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

© 2020 PCTEST Engineering Laboratory, Inc.

1.2 IEEE 802.11ax Measured Powers

Table 1
Maximum 2.4 GHz 802.11ax RU Time-Averaged WLAN Output Power – Ant 3A

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	26T	0	12.02
			4	12.20
			8	12.08
2437	6	26T	0	12.07
			4	12.07
			8	12.03
2462	11	26T	0	12.00
			4	12.03
			8	12.04

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	52T	37	12.00
			38	12.01
			40	12.15
2437	6	52T	37	12.01
			38	12.19
			40	12.09
2462	11	52T	37	12.08
			38	12.02
			40	12.07

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	106T	53	12.05
			54	12.02
2437	6	106T	53	12.04
			54	12.18
2462	11	106T	53	12.01
			54	12.11

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	242T	61	12.01
2437	6	242T	61	12.04
2462	11	242T	61	12.18

© 2020 PCTEST Engineering Laboratory, Inc.

Table 2
Maximum 2.4 GHz 802.11ax RU Time-Averaged WLAN Output Power – Ant 1A

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)	Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	26T	0	12.05	2412	1	52T	37	12.07
			4	12.10				38	12.11
			8	12.09				40	12.15
2417	2	26T	0	12.70	2417	2	52T	37	12.73
			4	12.85				38	12.90
			8	12.72				40	12.66
2437	6	26T	0	12.72	2437	6	52T	37	12.70
			4	12.63				38	12.71
			8	12.64				40	12.80
2457	10	26T	0	12.70	2457	10	52T	37	12.82
			4	12.75				38	12.77
			8	12.81				40	12.82
2462	11	26T	0	12.53	2462	11	52T	37	12.76
			4	12.46				38	12.90
			8	12.50				40	12.80

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	106T	53	12.04
			54	12.06
2417	2	106T	53	12.75
			54	12.77
2437	6	106T	53	12.70
			54	12.86
2457	10	106T	53	12.90
			54	12.72
2462	11	106T	53	12.56
			54	12.42

Freq [MHz]	Channel	Tones	RU Index	Avg Conducted Powers (dBm)
2412	1	242T	61	12.05
2417	2	242T	61	12.70
2437	6	242T	61	12.73
2457	10	242T	61	12.90
2462	11	242T	61	12.55

© 2020 PCTEST Engineering Laboratory, Inc.

Table 3
Maximum 5 GHz 802.11ax RU Time-Averaged WLAN Output Power – Ant 2B

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	4	8
20MHz BW	1	5180	36	26T	9.51	10.22	9.86
		5200	40	26T	9.60	10.20	9.85
		5220	44	26T	9.75	10.37	10.04
		5240	48	26T	9.54	10.15	9.71
	2A	5260	52	26T	10.55	11.33	10.75
		5280	56	26T	10.53	11.03	10.65
		5300	60	26T	10.88	11.44	11.03
		5320	64	26T	10.57	11.00	10.52
	2C	5500	100	26T	9.61	10.19	9.67
		5600	120	26T	9.58	10.13	9.60
		5620	124	26T	9.64	10.20	9.62
		5720	144	26T	9.90	10.48	10.00
	3	5745	149	26T	8.76	9.34	8.97
		5785	157	26T	8.85	9.46	9.02
		5825	165	26T	9.00	9.61	9.04

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	39	40
20MHz BW	1	5180	36	52T	9.70	10.25	9.92
		5200	40	52T	9.77	10.20	9.85
		5220	44	52T	9.93	10.41	10.00
		5240	48	52T	9.94	10.40	9.99
	2A	5260	52	52T	10.77	11.13	10.90
		5280	56	52T	10.90	11.37	11.00
		5300	60	52T	10.92	11.41	11.15
		5320	64	52T	10.95	11.30	11.05
	2C	5500	100	52T	9.30	9.70	9.26
		5600	120	52T	9.60	9.93	9.52
		5580	124	52T	9.50	9.87	9.64
		5720	144	52T	9.47	9.84	9.54
	3	5745	149	52T	8.90	9.41	9.05
		5785	157	52T	9.00	9.45	9.11
		5825	165	52T	9.09	9.51	9.24

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	54	N/A
20MHz BW	1	5180	36	106T	9.75	9.82	
		5200	40	106T	9.65	9.78	
		5220	44	106T	9.92	10.10	
		5240	48	106T	9.94	10.02	
	2A	5260	52	106T	10.91	11.01	
		5280	56	106T	10.95	11.04	
		5300	60	106T	10.85	10.92	
		5320	64	106T	11.02	11.00	
	2C	5500	100	106T	9.48	9.42	
		5600	120	106T	9.67	9.76	
		5620	124	106T	9.75	9.82	
		5720	144	106T	9.86	9.95	
	3	5745	149	106T	9.00	9.03	
		5785	157	106T	8.85	9.04	
		5825	165	106T	9.01	9.01	

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	N/A	N/A
20MHz BW	1	5180	36	242T	9.90		
		5200	40	242T	9.77		
		5220	44	242T	10.01		
		5240	48	242T	9.99		
	2A	5260	52	242T	10.75		
		5280	56	242T	11.06		
		5300	60	242T	10.94		
		5320	64	242T	10.85		
	2C	5500	100	242T	9.70		
		5600	120	242T	10.00		
		5620	124	242T	10.02		
		5720	144	242T	9.97		
	3	5745	149	242T	9.99		
		5785	157	242T	9.27		
		5825	165	242T	9.33		

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	8	17
40MHz BW	1	5190	38	26T	9.60	10.50	9.89
		5230	46	26T	9.74	10.49	9.92
	2A	5270	54	26T	10.78	11.45	10.86
		5310	62	26T	10.73	11.30	11.01
	2C	5510	102	26T	9.53	10.22	9.56
		5590	118	26T	9.33	9.81	9.25
		5630	126	26T	9.55	10.01	9.48
		5710	142	26T	9.44	10.12	9.70
	3	5755	151	26T	8.78	9.65	9.02
		5795	159	26T	8.66	9.60	9.08

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	40	44
40MHz BW	1	5190	38	52T	9.77	10.48	10.09
		5230	46	52T	9.85	10.47	10.15
	2A	5270	54	52T	10.68	11.36	10.79
		5310	62	52T	10.84	11.45	10.87
	2C	5510	102	52T	9.30	9.90	9.25
		5590	118	52T	9.31	9.86	9.26
		5630	126	52T	9.54	10.12	9.55
		5710	142	52T	9.53	10.18	9.65
	3	5755	151	52T	8.86	9.52	9.01
		5795	159	52T	8.90	9.74	9.13

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	54	56
40MHz BW	1	5190	38	106T	9.90	10.50	10.05
		5230	46	106T	9.89	10.47	10.22
	2A	5270	54	106T	10.74	11.24	10.92
		5310	62	106T	10.94	11.41	10.92
	2C	5510	102	106T	9.78	10.20	9.78
		5590	118	106T	9.49	10.02	9.61
		5670	126	106T	9.54	10.02	9.68
		5710	142	106T	9.40	10.10	9.44
	3	5755	151	106T	8.86	9.49	9.15
		5795	159	106T	8.89	9.45	9.00

	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	62	N/A
40MHz BW	1	5190	38	242T	9.90	10.00	
		5230	46	242T	9.92	10.17	
	2A	5270	54	242T	10.61	10.88	
		5310	62	242T	10.75	10.91	
	2C	5510	102	242T	10.05	10.10	
		5590	118	242T	9.81	9.75	
		5670	126	242T	9.54	9.60	
		5710	142	242T	9.61	9.58	
	3	5755	151	242T	9.07	9.20	
		5795	159	242T	9.08	9.00	

© 2020 PCTEST Engineering Laboratory, Inc.

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	N/A	N/A
	1	5190	38	484T	9.97		
		5230	46	484T	10.02		
	2A	5270	54	484T	10.61		
		5310	62	484T	10.72		
	2C	5510	102	484T	10.00		
		5590	118	484T	9.72		
		5630	126	484T	9.64		
		5710	142	484T	9.85		
	3	5755	151	484T	9.07		
		5795	159	484T	9.13		

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	18	36
	1	5210	42	26T	9.70	10.45	9.72
	2A	5290	58	26T	10.01	10.41	9.80
	2C	5530	106	26T	9.70	10.11	9.25
		5610	122	26T	9.40	9.92	9.12
		5690	138	26T	9.51	9.90	9.26
	3	5775	155	26T	8.89	9.19	8.75

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	44	52
	1	5210	42	52T	9.78	10.38	9.80
	2A	5290	58	52T	10.93	11.31	10.91
	2C	5530	106	52T	9.66	9.91	9.30
		5610	122	52T	9.70	9.90	9.40
		5690	138	52T	9.63	10.04	9.60
	3	5775	155	52T	9.30	9.69	9.08

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	56	60
	1	5210	42	106T	9.74	10.20	9.83
	2A	5290	58	106T	10.89	11.09	10.92
	2C	5530	106	106T	9.70	10.03	9.50
		5610	122	106T	9.64	9.84	9.28
		5690	138	106T	9.40	9.60	9.34
	3	5775	155	106T	9.12	9.50	8.96

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	62	64
	1	5210	42	242T	9.96	10.28	10.02
	2A	5290	58	242T	10.61	10.87	10.75
	2C	5530	106	242T	9.83	10.15	9.79
		5610	122	242T	9.38	9.70	9.31
		5690	138	242T	9.53	9.94	9.71
	3	5775	155	242T	9.27	9.66	9.02

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	66	N/A
	1	5210	42	484T	9.62	9.70	
	2A	5290	58	484T	10.61	10.91	
	2C	5530	106	484T	9.75	9.69	
		5610	122	484T	9.40	9.33	
		5690	138	484T	9.47	9.55	
	3	5775	155	484T	9.17	9.41	

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					67	N/A	N/A
	1	5210	42	996T	10.12		
	2A	5290	58	996T	11.11		
	2C	5530	106	996T	9.55		
		5610	122	996T	9.62		
		5690	138	996T	9.59		
	3	5775	155	996T	9.32		

© 2020 PCTEST Engineering Laboratory, Inc.

Table 4
Maximum 5 GHz 802.11ax RU Time-Averaged WLAN Output Power – Ant 2A

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	4	8
	1	5180	36	26T	9.73	10.35	9.90
		5200	40	26T	9.82	10.46	9.97
		5220	44	26T	9.77	10.42	9.99
		5240	48	26T	9.65	10.30	9.72
	2A	5260	52	26T	9.10	9.70	9.21
		5280	56	26T	8.95	9.60	9.07
		5300	60	26T	8.83	9.62	9.30
		5320	64	26T	8.74	9.45	9.09
	2C	5500	100	26T	10.06	10.59	10.12
		5520	120	26T	10.03	10.54	10.12
		5620	124	26T	9.95	10.51	10.04
		5720	144	26T	9.93	10.34	9.92
	3	5745	149	26T	10.75	11.20	10.62
		5785	157	26T	10.52	11.00	10.42
		5825	165	26T	10.56	10.90	10.43

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	39	40
	1	5180	36	52T	9.65	10.05	9.83
		5200	40	52T	9.62	10.11	9.89
		5220	44	52T	9.67	9.99	9.75
		5240	48	52T	9.65	10.20	9.82
	2A	5260	52	52T	8.94	9.47	9.14
		5280	56	52T	8.88	9.30	9.06
		5300	60	52T	8.90	9.37	9.11
		5320	64	52T	8.78	9.21	8.95
	2C	5500	100	52T	10.02	10.40	9.92
		5600	120	52T	9.80	10.15	9.84
		5580	124	52T	9.77	10.12	9.83
		5720	144	52T	9.80	10.06	9.77
	3	5745	149	52T	10.79	11.10	10.76
		5785	157	52T	10.60	10.95	10.55
		5825	165	52T	10.93	11.24	10.92

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	54	N/A
	1	5180	36	106T	9.67	9.72	
		5200	40	106T	9.65	9.70	
		5220	44	106T	9.60	9.70	
		5240	48	106T	9.75	9.90	
	2A	5260	52	106T	9.11	9.42	
		5280	56	106T	9.05	9.30	
		5300	60	106T	9.15	9.28	
		5320	64	106T	9.16	9.32	
	2C	5500	100	106T	10.15	10.26	
		5600	120	106T	10.12	10.19	
		5620	124	106T	10..05	10.21	
		5720	144	106T	10.32	10.24	
	3	5745	149	106T	10.65	10.62	
		5785	157	106T	10.43	10.30	
		5825	165	106T	10.40	10.30	

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	N/A	N/A
	1	5180	36	242T	9.93		
		5200	40	242T	9.88		
		5200	44	242T	9.90		
		5240	48	242T	9.83		
	2A	5260	52	242T	9.15		
		5260	56	242T	9.24		
		5300	60	242T	9.19		
		5320	64	242T	9.05		
	2C	5500	100	242T	9.78		
		5600	120	242T	9.95		
		5620	124	242T	10.01		
		5720	144	242T	9.98		
	3	5745	149	242T	9.90		
		5785	157	242T	10.51		
		5825	165	242T	10.88		

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	8	17
	1	5190	38	26T	9.51	10.45	9.85
		5230	46	26T	9.62	10.50	9.94
	2A	5270	54	26T	8.80	9.75	9.07
		5310	62	26T	8.75	9.74	9.10
	2C	5510	102	26T	9.80	10.72	10.08
		5590	118	26T	9.90	10.73	10.11
		5630	126	26T	9.77	10.58	9.82
		5710	142	26T	9.81	10.44	9.50
	3	5755	151	26T	10.30	10.84	10.03
		5795	159	26T	10.55	11.13	10.54

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	40	44
	1	5190	38	52T	9.63	10.43	10.08
		5230	46	52T	9.54	10.27	9.80
	2A	5270	54	52T	8.75	9.60	9.15
		5310	62	52T	8.82	9.74	9.29
	2C	5510	102	52T	9.75	10.53	10.03
		5590	118	52T	9.76	10.60	9.97
		5630	126	52T	9.79	10.54	9.87
		5710	142	52T	9.84	10.48	9.78
	3	5755	151	52T	10.41	10.97	10.32
		5795	159	52T	10.30	10.87	10.45

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	54	56
	1	5190	38	106T	9.81	10.49	10.11
		5230	46	106T	9.57	10.28	9.97
	2A	5270	54	106T	8.90	9.49	9.25
		5310	62	106T	8.76	9.59	9.01
	2C	5510	102	106T	9.95	10.47	10.25
		5590	118	106T	10.02	10.61	10.10
		5670	126	106T	9.89	10.45	10.03
		5710	142	106T	10.07	10.55	10.13
	3	5755	151	106T	10.49	11.07	10.60
		5795	159	106T	10.64	11.04	10.68

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	62	N/A
	1	5190	38	242T	10.01	10.25	
		5230	46	242T	10.10	10.42	
	2A	5270	54	242T	9.12	9.25	
		5310	62	242T	9.13	9.13	
	2C	5510	102	242T	10.35	10.40	
		5590	118	242T	10.29	10.32	
		5670	126	242T	10.10	10.17	
		5710	142	242T	10.19	10.19	
	3	5755	151	242T	10.49	10.70	
		5795	159	242T	10.63	10.79	

© 2020 PCTEST Engineering Laboratory, Inc.

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	N/A	N/A
	1	5190	38	484T	10.07		
		5230	46	484T	10.18		
	2A	5270	54	484T	9.60		
		5310	62	484T	9.41		
	2C	5510	102	484T	10.20		
		5550	118	484T	10.34		
		5630	126	484T	10.35		
		5710	142	484T	10.33		
	3	5755	151	484T	10.81		
		5795	159	484T	10.75		

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	18	36
	1	5210	42	26T	9.40	9.98	9.56
	2A	5290	58	26T	8.67	9.46	8.64
	2C	5530	106	26T	8.72	9.29	8.82
		5610	122	26T	10.07	10.61	9.99
		5690	138	26T	10.30	10.74	9.95
	3	5775	155	26T	10.45	10.95	10.40

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	44	52
	1	5210	42	52T	9.72	10.26	9.90
	2A	5290	58	52T	8.89	9.58	8.90
	2C	5530	106	52T	9.60	10.15	9.78
		5610	122	52T	10.05	10.57	10.05
		5690	138	52T	9.85	10.25	9.75
	3	5775	155	52T	10.90	11.00	10.64

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	56	60
	1	5210	42	106T	9.95	10.31	10.11
	2A	5290	58	106T	9.19	9.63	9.10
	2C	5530	106	106T	10.09	10.51	10.29
		5610	122	106T	10.23	10.70	10.29
		5690	138	106T	10.27	10.45	10.01
	3	5775	155	106T	11.03	11.09	10.89

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	62	64
	1	5210	42	242T	9.96	10.39	10.17
	2A	5290	58	242T	9.13	9.68	9.04
	2C	5530	106	242T	10.15	10.51	10.33
		5610	122	242T	10.12	10.65	10.01
		5690	138	242T	10.14	10.52	10.00
	3	5775	155	242T	10.75	11.00	10.78

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	66	N/A
	1	5210	42	484T	10.14	10.35	
	2A	5290	58	484T	9.33	9.54	
	2C	5530	106	484T	10.32	10.59	
		5610	122	484T	10.40	10.45	
		5690	138	484T	10.24	10.11	
	3	5775	155	484T	10.65	10.70	

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					67	N/A	N/A
	1	5210	42	996T	10.46		
	2A	5290	58	996T	9.61		
	2C	5530	106	996T	10.51		
		5610	122	996T	10.47		
		5690	138	996T	10.26		
	3	5775	155	996T	11.13		

© 2020 PCTEST Engineering Laboratory, Inc.

Table 5
Maximum 5 GHz 802.11ax RU Time-Averaged WLAN Output Power – Ant 1B

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 0	4	8
	1	5180	36	26T	10.78	11.37	10.90
		5200	40	26T	10.87	11.46	10.98
		5220	44	26T	10.80	11.37	10.90
		5240	48	26T	10.73	11.31	10.90
	2A	5260	52	26T	9.25	9.73	9.38
		5280	56	26T	9.18	9.72	9.38
		5300	60	26T	9.13	9.75	9.27
		5320	64	26T	9.21	9.68	9.36
	2C	5500	100	26T	9.40	9.94	9.50
		5520	120	26T	9.33	9.85	9.40
		5620	124	26T	9.65	10.13	9.59
		5720	144	26T	9.64	10.01	9.58
	3	5745	149	26T	9.67	10.19	9.65
		5785	157	26T	9.73	10.21	9.75
		5825	165	26T	9.77	10.21	9.70

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 37	39	40
	1	5180	36	52T	11.00	11.38	11.09
		5200	40	52T	10.90	11.31	11.02
		5220	44	52T	10.97	11.35	11.02
		5240	48	52T	10.87	11.38	10.97
	2A	5260	52	52T	9.38	9.73	9.50
		5280	56	52T	9.36	9.73	9.51
		5300	60	52T	9.34	9.72	9.47
		5320	64	52T	9.28	9.68	9.45
	2C	5500	100	52T	9.55	9.89	9.75
		5600	120	52T	9.52	9.80	9.51
		5580	124	52T	9.78	10.08	9.73
		5720	144	52T	9.75	10.08	9.73
	3	5745	149	52T	9.89	10.15	9.89
		5785	157	52T	9.88	10.24	9.92
		5825	165	52T	9.89	10.23	9.93

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 53	54	N/A
	1	5180	36	106T	11.21	11.26	
		5200	40	106T	11.11	11.22	
		5220	44	106T	11.06	11.15	
		5240	48	106T	11.10	11.16	
	2A	5260	52	106T	9.53	9.54	
		5280	56	106T	9.46	9.59	
		5300	60	106T	9.48	9.57	
		5320	64	106T	9.50	9.49	
	2C	5500	100	106T	9.82	9.80	
		5600	120	106T	9.66	9.58	
		5620	124	106T	9.98	9.93	
		5720	144	106T	9.89	9.90	
	3	5745	149	106T	9.97	10.00	
		5785	157	106T	10.21	10.08	
		5825	165	106T	10.05	10.03	

20MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 61	N/A	N/A
	1	5180	36	242T	11.15		
		5200	40	242T	11.25		
		5200	44	242T	11.13		
		5240	48	242T	11.22		
	2A	5260	52	242T	9.60		
		5260	56	242T	9.54		
		5300	60	242T	9.51		
		5320	64	242T	9.59		
	2C	5500	100	242T	9.89		
		5600	120	242T	9.73		
		5620	124	242T	9.95		
		5720	144	242T	9.92		
	3	5745	149	242T	9.71		
		5785	157	242T	10.20		
		5825	165	242T	9.07		

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 0	8	17
	1	5190	38	26T	10.63	11.49	10.90
		5230	46	26T	10.58	11.48	10.91
	2A	5270	54	26T	8.81	9.71	9.07
		5310	62	26T	8.83	9.70	9.02
	2C	5510	102	26T	9.33	10.09	9.50
		5590	118	26T	9.29	10.04	9.27
		5630	126	26T	9.47	10.20	9.64
		5710	142	26T	9.38	10.08	9.52
	3	5755	151	26T	9.45	10.21	9.65
		5795	159	26T	9.32	10.21	9.65

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 37	40	44
	1	5190	38	52T	10.56	11.32	10.83
		5230	46	52T	10.50	11.35	10.83
	2A	5270	54	52T	8.95	9.75	9.11
		5310	62	52T	8.97	9.72	9.23
	2C	5510	102	52T	9.49	10.10	9.59
		5590	118	52T	9.71	10.24	9.73
		5630	126	52T	9,60	10.17	9.76
		5710	142	52T	9.50	10.18	9.69
	3	5755	151	52T	9.61	10.24	9.87
		5795	159	52T	9.46	10.10	9.77

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 53	54	56
	1	5190	38	106T	10.97	11.50	11.18
		5230	46	106T	10.67	11.35	10.79
	2A	5270	54	106T	9.12	9.75	9.33
		5310	62	106T	9.05	9.68	9.29
	2C	5510	102	106T	9.65	10.23	9.71
		5590	118	106T	9.80	10.25	9.93
		5670	126	106T	9.70	10.18	9.81
		5710	142	106T	9.65	10.20	9.75
	3	5755	151	106T	9.69	10.22	9.95
		5795	159	106T	9.61	10.11	9.95

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm) RU Index 61	62	N/A
	1	5190	38	242T	10.91	11.09	
		5230	46	242T	10.94	11.18	
	2A	5270	54	242T	9.42	9.51	
		5310	62	242T	9.40	9.57	
	2C	5510	102	242T	9.88	9.92	
		5590	118	242T	10.01	10.18	
		5670	126	242T	9.95	10.12	
		5710	142	242T	9.97	10.01	
	3	5755	151	242T	10.00	10.23	
		5795	159	242T	9.90	10.19	

© 2020 PCTEST Engineering Laboratory, Inc.

40MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	N/A	N/A
	1	5190	38	484T	11.20		
		5230	46	484T	11.21		
	2A	5270	54	484T	9.47		
		5310	62	484T	9.45		
	2C	5510	102	484T	9.92		
		5550	118	484T	10.05		
		5630	126	484T	9.95		
		5710	142	484T	10.01		
	3	5755	151	484T	10.10		
		5795	159	484T	9.65		

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					0	18	36
	1	5210	42	26T	10.23	10.67	10.39
	2A	5290	58	26T	9.16	9.74	9.30
	2C	5530	106	26T	9.45	9.98	9.33
		5610	122	26T	9.32	9.90	9.30
		5690	138	26T	9.35	9.91	9.34
	3	5775	155	26T	9.68	10.23	9.76

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					37	44	52
	1	5210	42	52T	10.80	11.39	10.94
	2A	5290	58	52T	8.85	9.59	9.04
	2C	5530	106	52T	9.20	9.90	9.34
		5610	122	52T	9.46	9.76	9.50
		5690	138	52T	9.53	9.80	9.57
	3	5775	155	52T	9.60	10.09	9.70

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					53	56	60
	1	5210	42	106T	10.98	11.44	11.13
	2A	5290	58	106T	9.10	9.69	9.22
	2C	5530	106	106T	9.70	10.01	9.65
		5610	122	106T	9.67	10.06	9.72
		5690	138	106T	9.67	10.07	9.74
	3	5775	155	106T	9.92	10.17	9.97

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					61	62	64
	1	5210	42	242T	10.94	11.21	10.85
	2A	5290	58	242T	9.45	9.74	9.52
	2C	5530	106	242T	9.52	9.93	9.45
		5610	122	242T	9.65	10.03	9.67
		5690	138	242T	9.64	10.01	9.68
	3	5775	155	242T	9.98	10.24	10.18

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					65	66	N/A
	1	5210	42	484T	11.37	11.39	
	2A	5290	58	484T	9.43	9.48	
	2C	5530	106	484T	9.98	10.02	
		5610	122	484T	9.97	10.03	
		5690	138	484T	10.03	10.22	
	3	5775	155	484T	9.91	10.13	

80MHz BW	Band	Freq [MHz]	Channel	Tones	Avg Conducted Power (dBm)		
					RU Index		
					67	N/A	N/A
	1	5210	42	996T	11.49		
	2A	5290	58	996T	9.70		
	2C	5530	106	996T	10.07		
		5610	122	996T	10.15		
		5690	138	996T	10.22		
	3	5775	155	996T	10.07		

© 2020 PCTEST Engineering Laboratory, Inc.

APPENDIX I: TIME-AVERAGED SAR VERIFICATION

© 2020 PCTEST

1.1 Time-Averaged SAR Verification Summary

This device supports the manufacturer's time-averaged SAR (TAS) mechanism for WLAN operations. The output power is controlled in real-time so that the power averaged over any 60 second window does not exceed the level tested for SAR in this report. The time-averaged SAR algorithm tracks the energy contribution relative to the available energy budget for each transmitter, defined as the "utilization ratio." Once the utilization ratios for each of the individual WLAN transmitters are calculated, they are summed to derive the overall WLAN system power utilization ratio. This metric is used by the WLAN chipset to manage power levels over time and ensure that SAR limits are never exceeded.

Per FCC Guidance, the following test scenarios were defined to validate the TAS mechanism. The specific scenarios are constructed to validate the operation of the algorithm in all operational states, including transitions between states/antennas:

- Change in channel/band
- Change in antenna (includes connection drop scenario)
- Change in device state, e.g Cell on/off WiFi power change

Predefined transmit profiles for each test scenario are provided by the manufacturer's test automation software to control the operation of the DUT while synchronized operational data was recorded from internal firmware and external power monitors. The data was plotted over time relative to the utilization limit to demonstrate that the maximum time-averaged power is never exceeded. "Reported" values were output and captured directly from DUT firmware, while "Measured" results were obtained from external power metering. The uncertainty budget applied to the WLAN power control functions for this device is 1.5 dB. In all test cases, WLAN radios were configured to operate at 100% duty cycle.

Table 1-1
Test Configurations for Time-Averaged SAR Verification

Mode	Antenna	Channel	Plim (dBm)	Plim (mW)
802.11b, 22 MHz Bandwidth	3A	6	13	20
802.11b, 22 MHz Bandwidth (Reduced)	3A	6	6	4
802.11b, 22 MHz Bandwidth	1A	6	13.75	24
802.11a, 20 MHz Bandwidth	2B	149	9.75	9
802.11a, 20 MHz Bandwidth	2A	149	11.25	13

Plim is the maximum time-averaged output power evaluated for SAR compliance

© 2020 PCTEST

1.2 Verification Summary

Scenario 1: Change in Antenna

For this test, the effect on the time-averaging algorithm from a change in the active transmit antenna was evaluated. Figures I-1 and I-2 show a switch of 2.4 GHz transmissions from antenna 3A to antenna 1A at Time = 120 s, while Figures I-3 and I-4 show a comparable transition for antenna 2B to antenna 2A 5 GHz transmissions. In both cases the test automation is controlling the WLAN radios to operate at 100% duty cycle. In both cases the utilization ratio never exceeds 100% and the average transmit power never exceeds the Plim of each respective antenna.

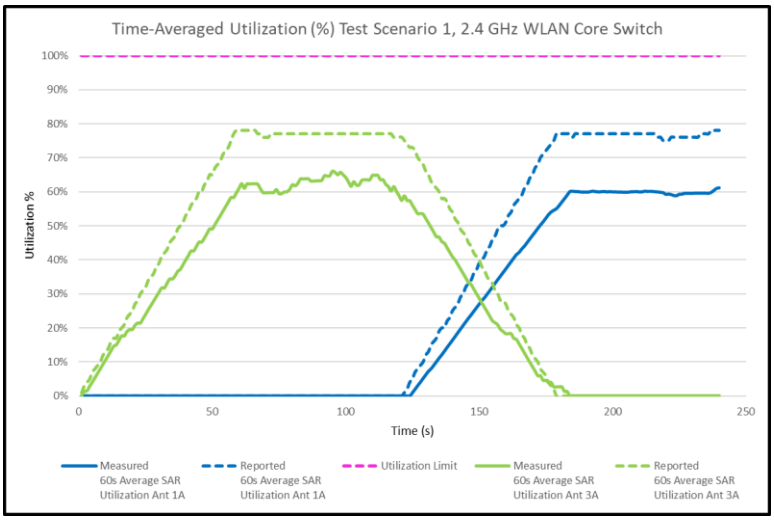


Figure I-1
60s Average SAR Utilization vs. Time, 2.4 GHz

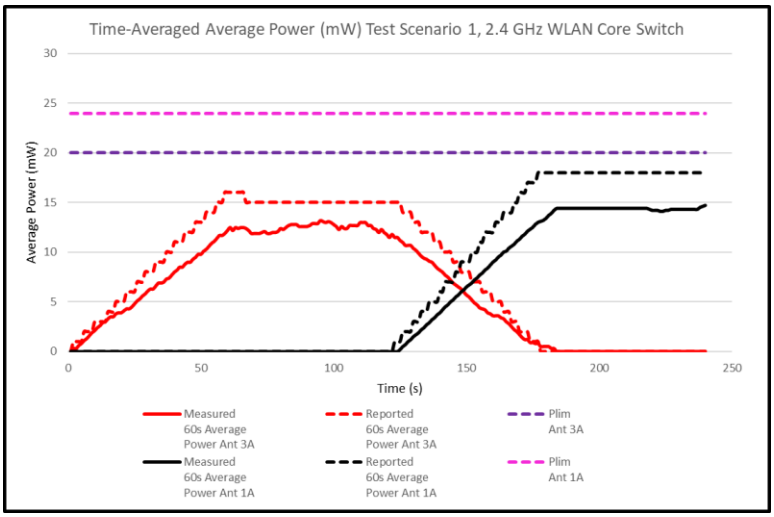


Figure I-2
60s Average Power vs. Time, 2.4 GHz

© 2020 PCTEST

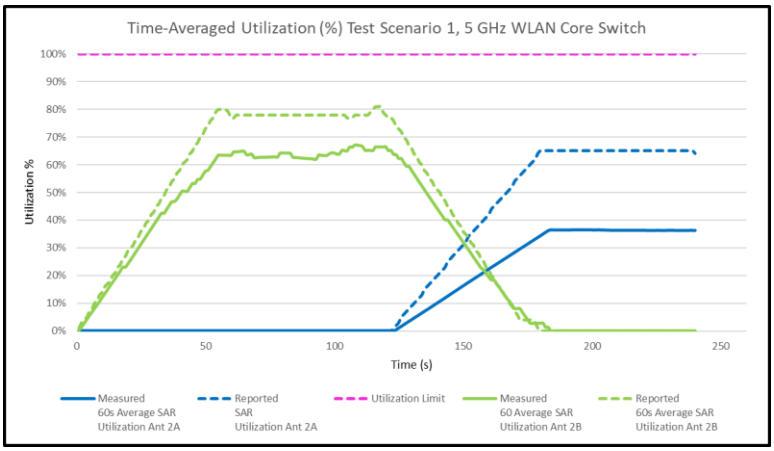


Figure I-3
60s Average SAR Utilization vs. Time, 5 GHz

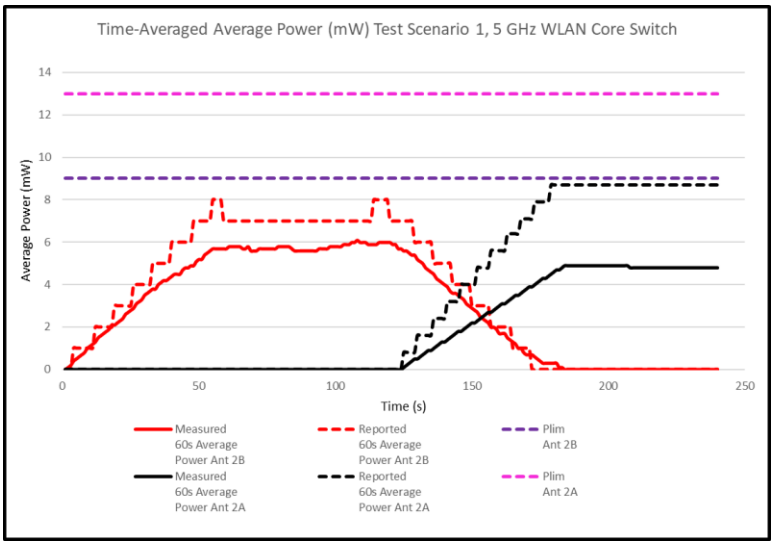


Figure I-4
60s Average Power vs. Time, 5 GHz

© 2020 PCTEST

Scenario 2: Change in Channel/Band Test Case

This test demonstrates the efficacy of the time-averaged SAR algorithm while switching between 2.4 GHz and 5 GHz WLAN bands. In addition, it shows that the algorithm tracks time-averaged power and system utilization when the active transmitter is disabled and then reconnects.

The 2.4 GHz Ant 3A transmitter is active at 100% duty cycle until Time = 120 s. When 2.4 GHz transmissions cease, the 5 GHz Ant 2B transmitter is activated and begins to negotiate a new connection. The connection is established and the increase in average transmit power and utilization can clearly be seen. In this case the utilization ratio never exceeds 100% and the average transmit power never exceeds the Plim of each respective antenna.

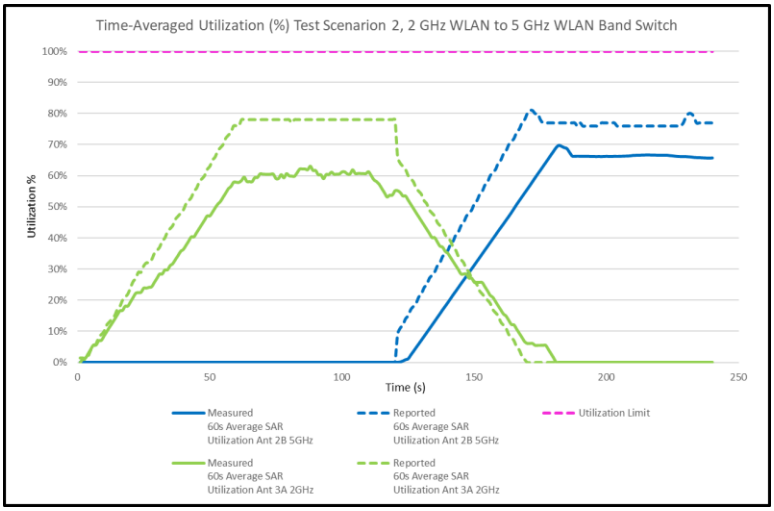


Figure I-5
60s Average Utilization vs. Time during Band Switch

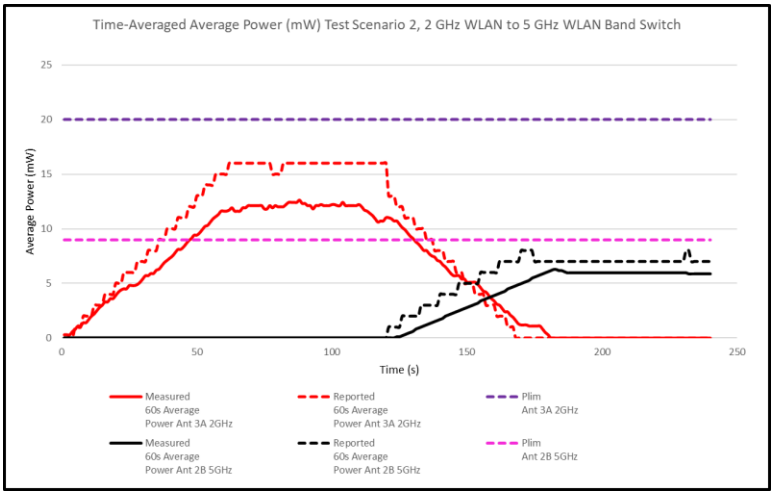


Figure I-6
60s Average Power vs. Time during Band Switch

© 2020 PCTEST

Scenario 3: Change in Device State

This test demonstrates the efficacy of the time-averaged SAR algorithm when an external power control trigger is activated, transitioning between cell off and cell on at Time = 120 s.

The 2.4 GHz Ant 3A transmitter is active at 100% duty cycle until Time = 120 s. At this point a cellular connection occurs. The connection is established and the decrease in average transmit power and can clearly be seen, while utilization remains consistent. In this case the utilization ratio never exceeds 100% and the average transmit power never exceeds the Plim of the device state.

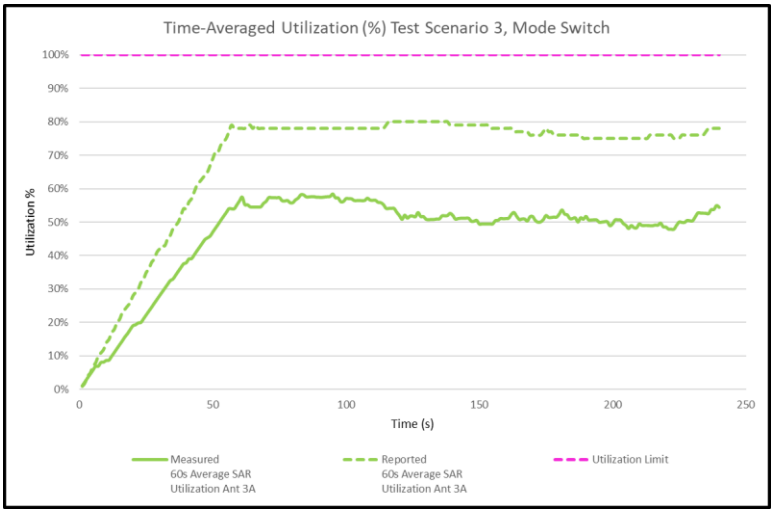


Figure I-7
60s Average Utilization vs. Time during Mode Switch

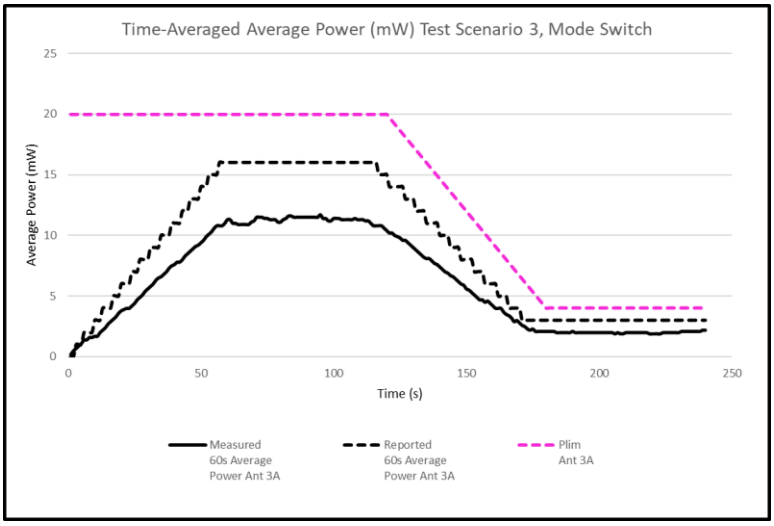


Figure I-8
60s Average Power vs. Time during Mode Switch

© 2020 PCTEST

APPENDIX J: PROBE AND DIPOLE CALIBRATION CERTIFICATES

© 2020 PCTEST

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

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

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

Accreditation No.: **SCS 0108**

Client: PC Test

Certificate No: **D750V3-1097_Sep17**

CALIBRATION CERTIFICATE

Object: D750V3 - SN:1097

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

SCV 10/03/2017

Calibration date: September 08, 2017

SCV 9/8/2018

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.

BN 10/10/2019

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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 8, 2017

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	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	41.2 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.22 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.39 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	55.5 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.56 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.68 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	54.4 Ω - 0.6 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.0 Ω - 3.6 jΩ
Return Loss	- 28.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 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 05, 2013

DASY5 Validation Report for Head TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1097

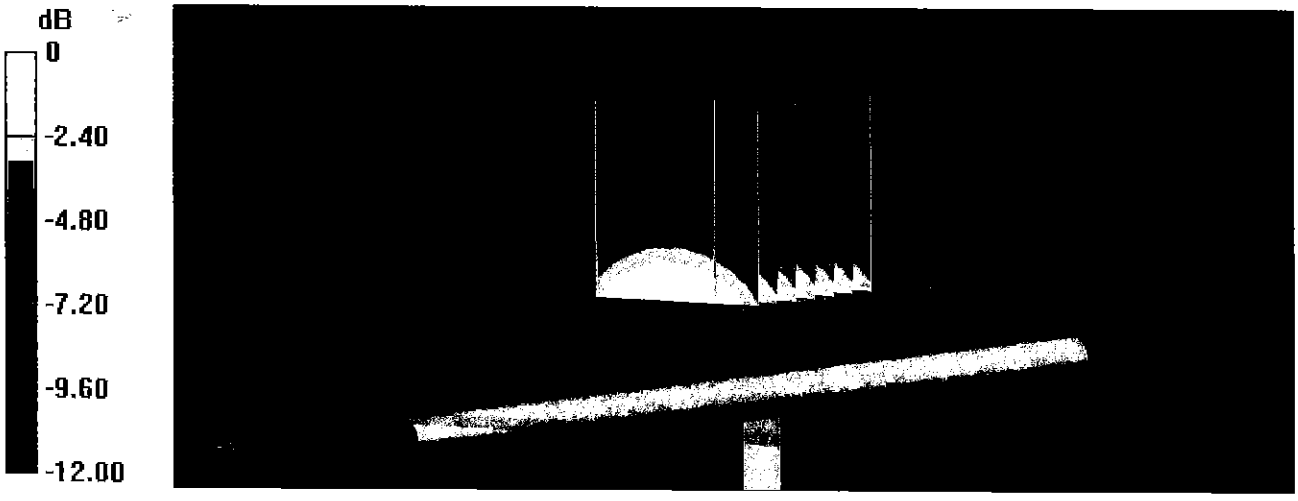
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.49, 10.49, 10.49); 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)

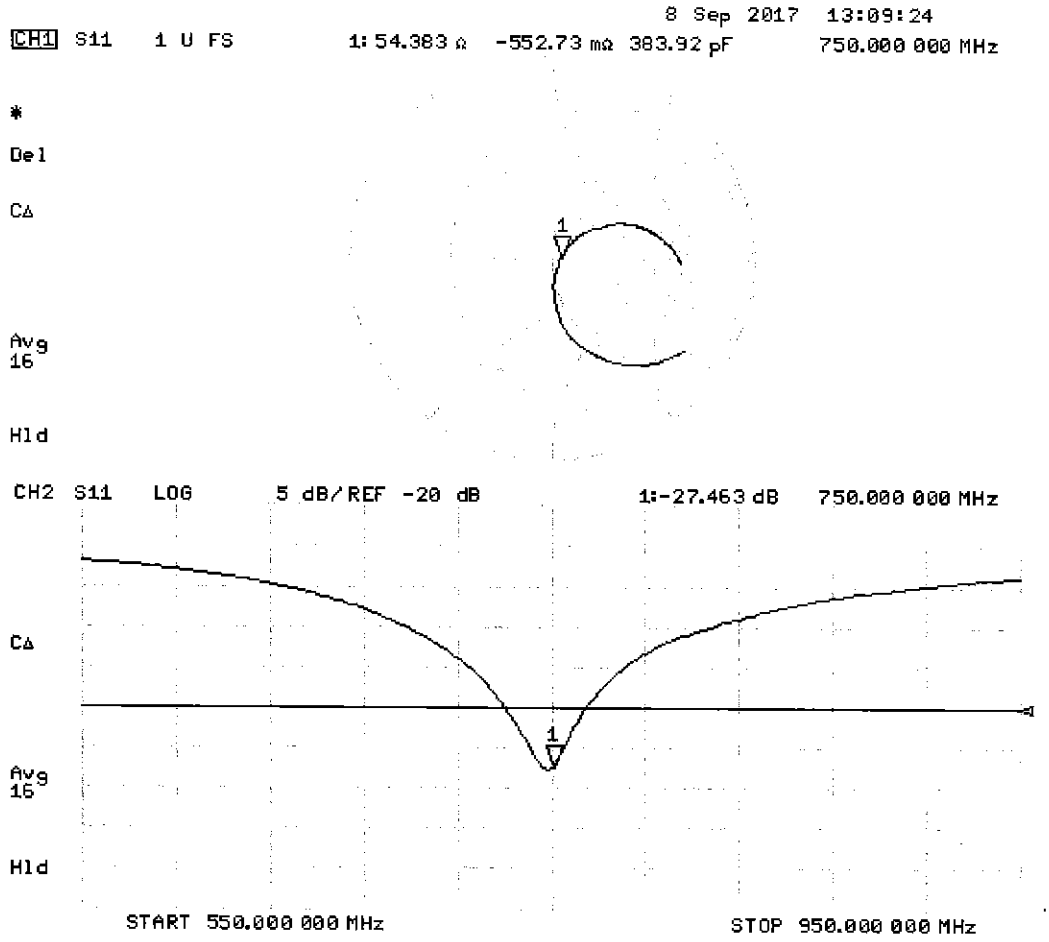
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.59 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.19 W/kg
SAR(1 g) = 2.08 W/kg; SAR(10 g) = 1.36 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1097

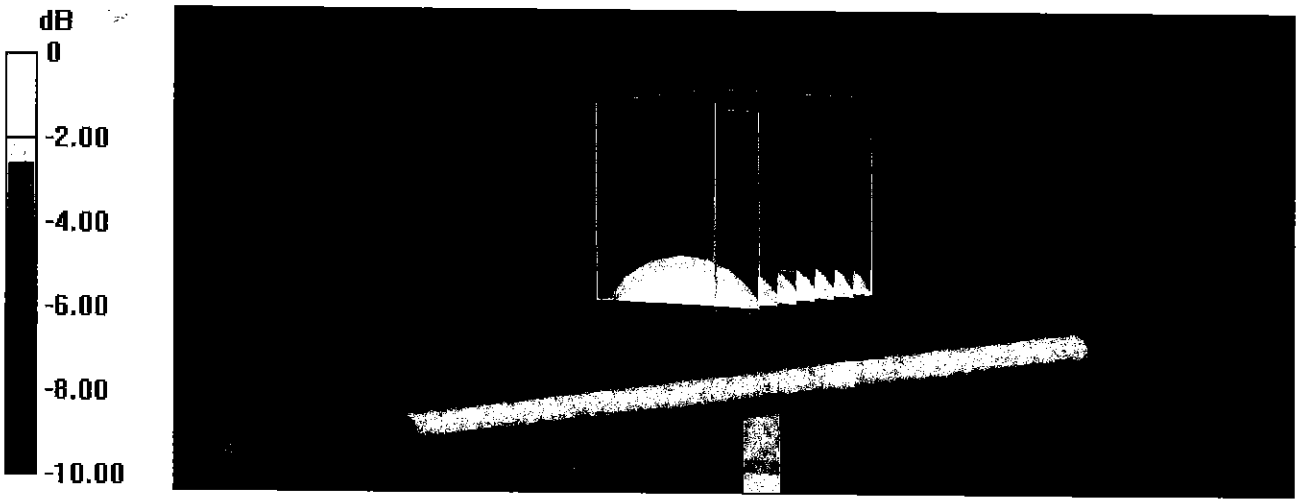
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.35, 10.35, 10.35); 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)

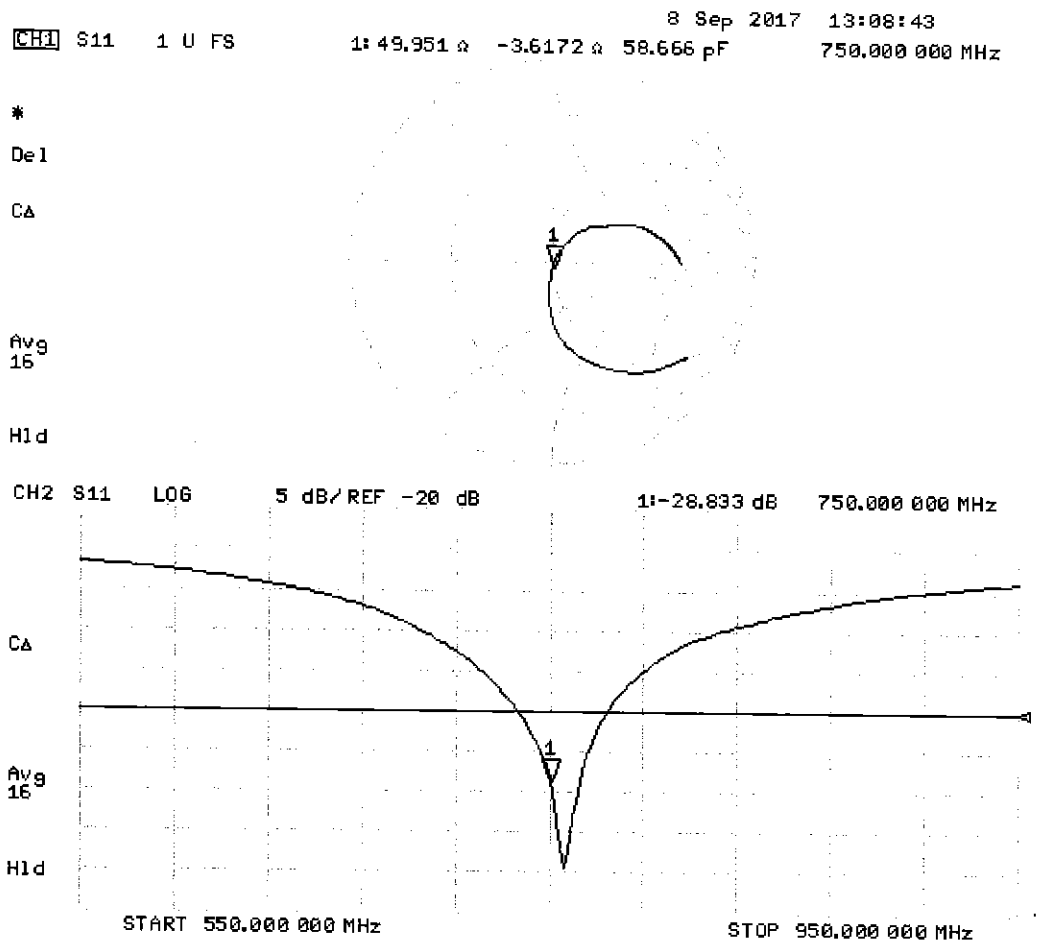
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.96 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.42 W/kg
Maximum value of SAR (measured) = 2.81 W/kg



0 dB = 2.81 W/kg = 4.49 dBW/kg

Impedance Measurement Plot for Body TSL



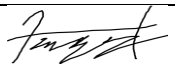
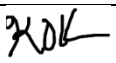
Certification of Calibration

Object	D750V3 – SN: 1097
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 08, 2018
Description:	SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	N5182A	MXG Vector Signal Generator	3/19/2018	Annual	3/19/2019	US46240505
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/22/2017	Annual	11/22/2018	1339008
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1533
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7416
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/18/2018	Annual	1/18/2019	793

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Team Lead Engineer	
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

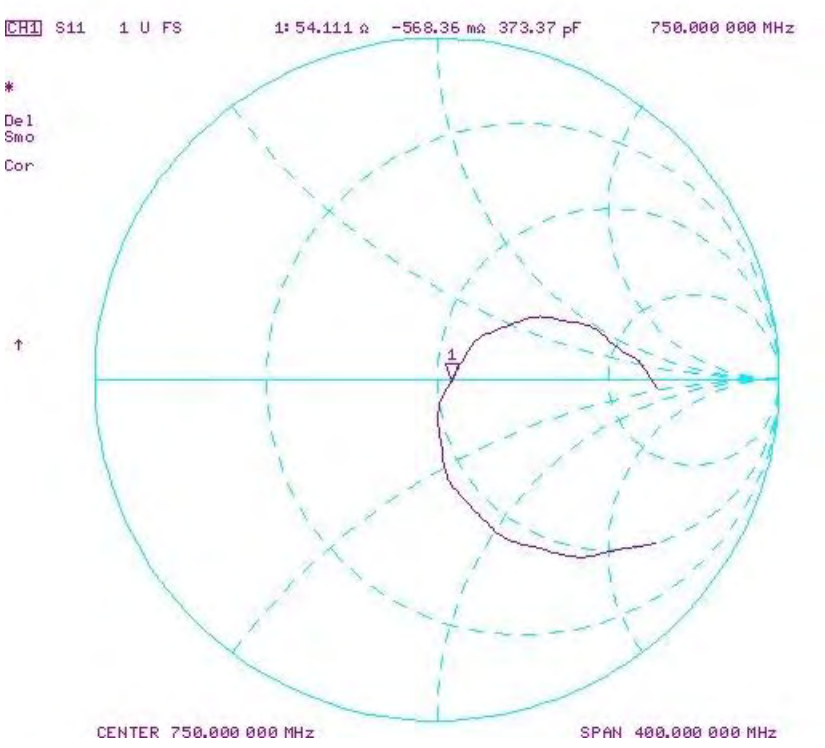
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

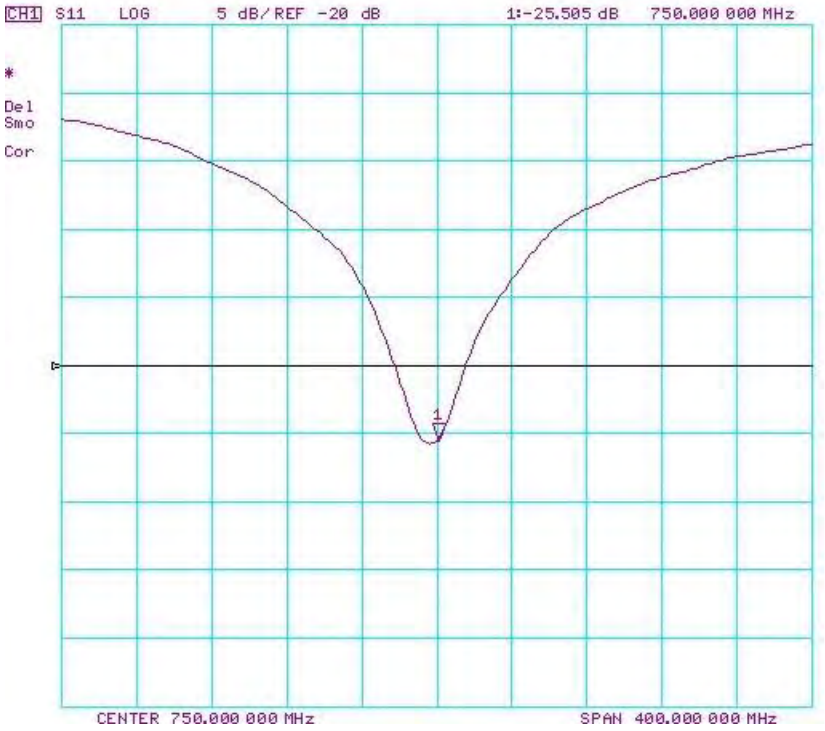
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2018	1.034	1.644	1.7	3.41%	1.078	1.12	3.90%	54.4	54.1	0.3	-0.6	-0.6	0	-27.5	-25.5	7.30%	PASS

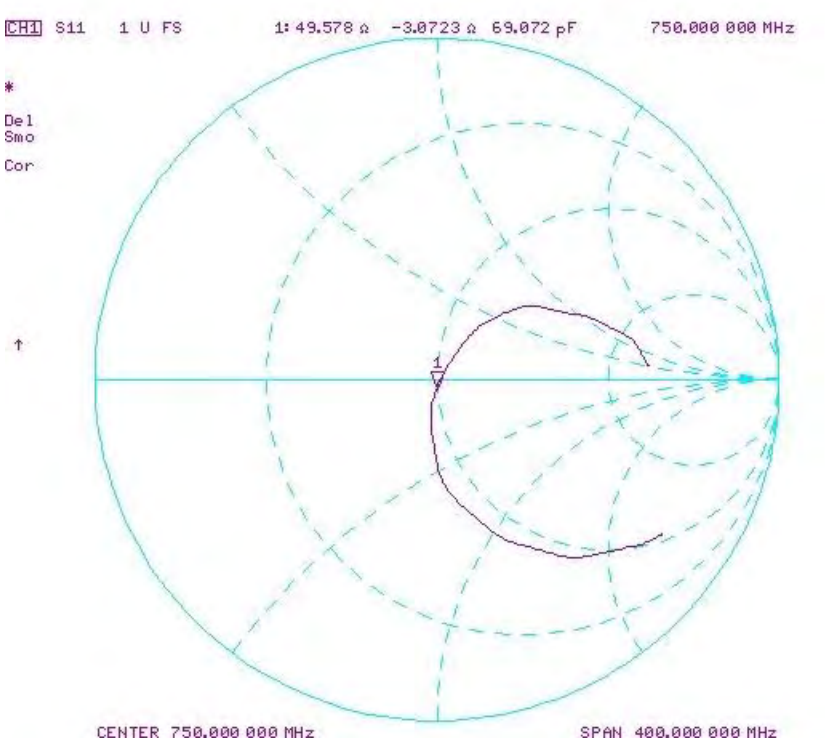
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2018	1.034	1.712	1.78	3.97%	1.136	1.17	2.99%	50	49.6	0.4	-3.6	-3.1	0.5	-28.8	-30.3	-5.20%	PASS

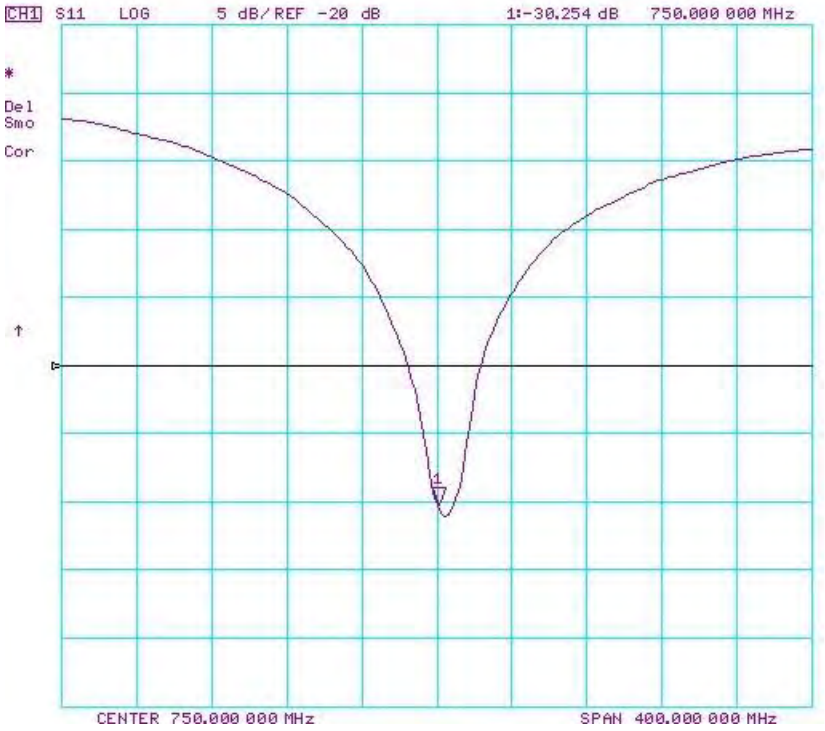
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Certification of Calibration

Object	D750V3 – SN: 1097
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 8, 2019
Description:	SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	E4438C	ESG Vector Signal Generator	6/27/2019	Annual	6/27/2020	MY45093852
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	11/1/2017	Biennial	11/1/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/7/2019	Annual	5/7/2020	1070
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7490
SPEAG	DAE4	Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

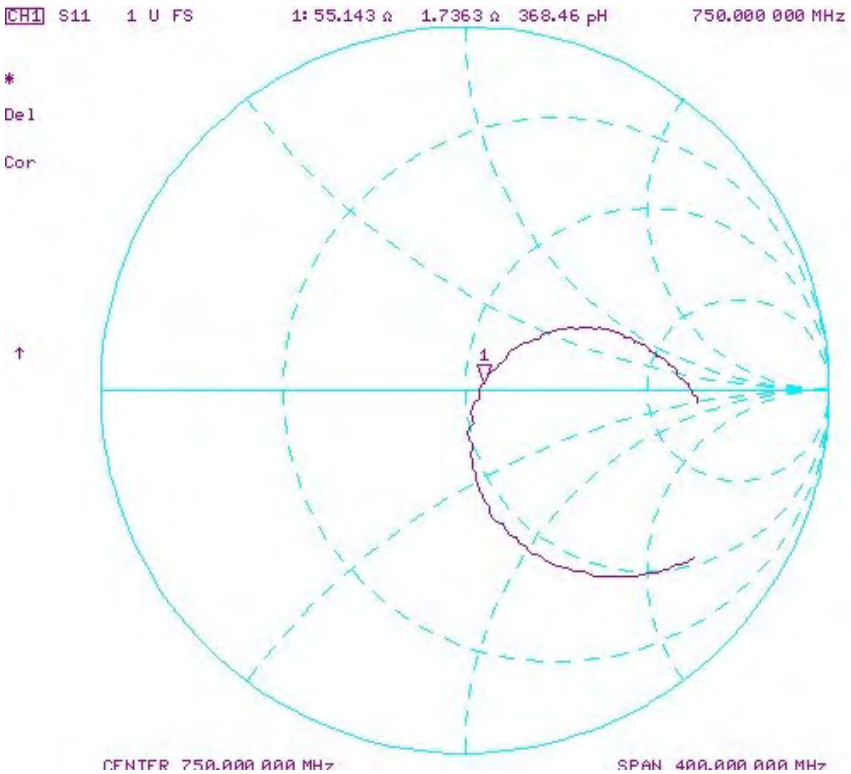
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

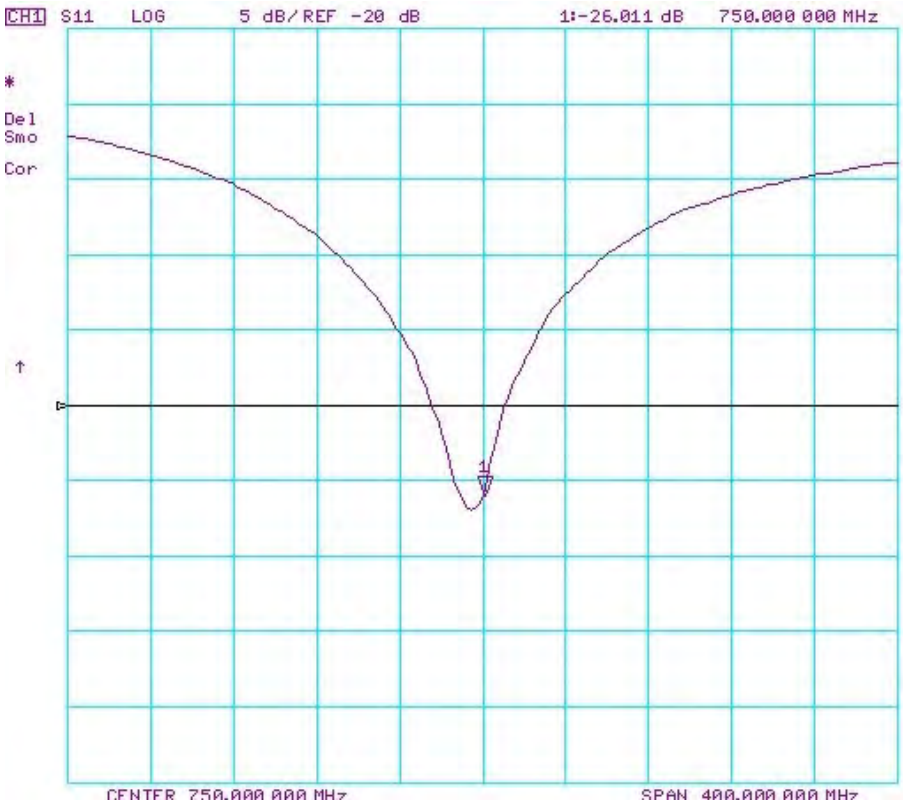
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2019	1.034	1.644	1.56	-5.11%	1.078	1.03	-4.45%	54.4	55.1	0.7	-0.6	1.7	2.3	-27.5	-26	5.50%	PASS

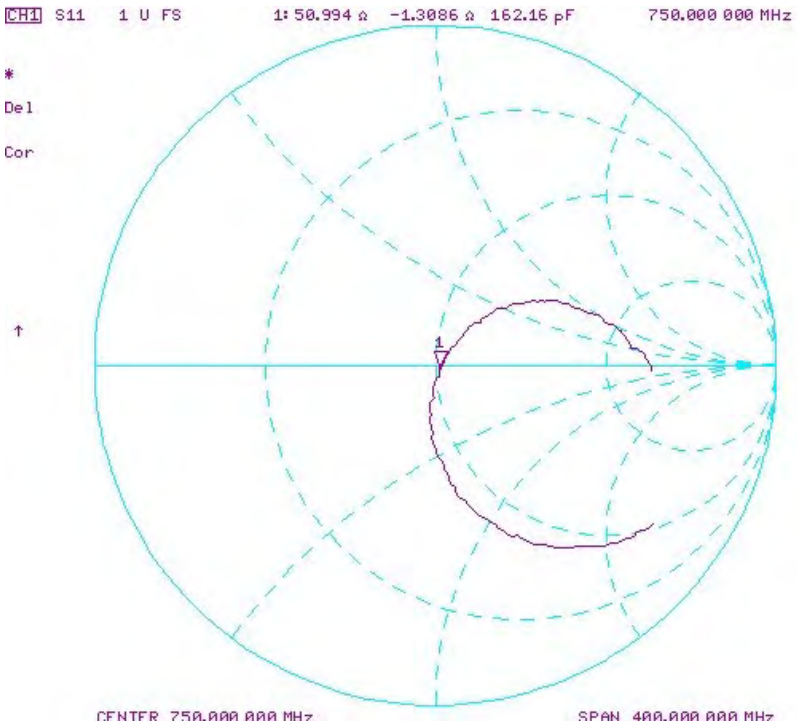
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2019	1.034	1.712	1.65	-3.62%	1.136	1.1	-3.17%	50	51	1	-3.6	-1.3	2.3	-28.8	-31.9	-10.80%	PASS

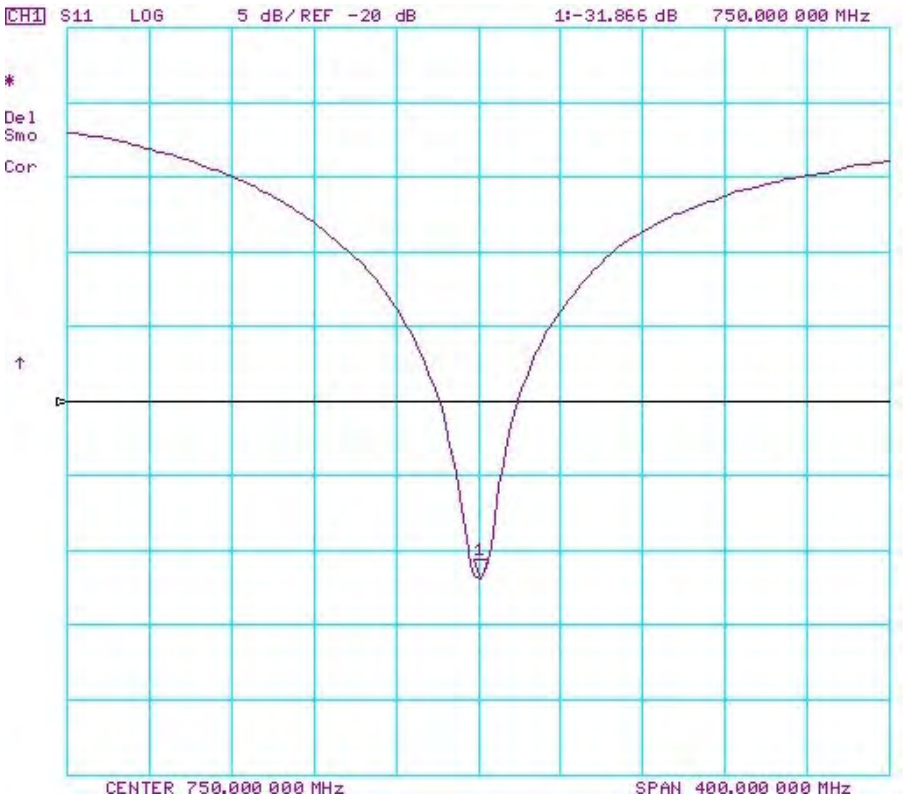
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: SCS 0108

Client PC Test **Certificate No: D835V2-4d180_May18**

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d180
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 18, 2018

SCV 5/31/2018
BN 06/01/2019
ATM 6/11/2020

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	28-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:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 22, 2018

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	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	40.8 ± 6 %	0.92 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	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.60 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.22 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	54.6 ± 6 %	0.99 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	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.59 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.31 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	50.7 Ω - 5.1 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.2 Ω - 8.2 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.396 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	September 24, 2014

DASY5 Validation Report for Head TSL

Date: 17.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d180

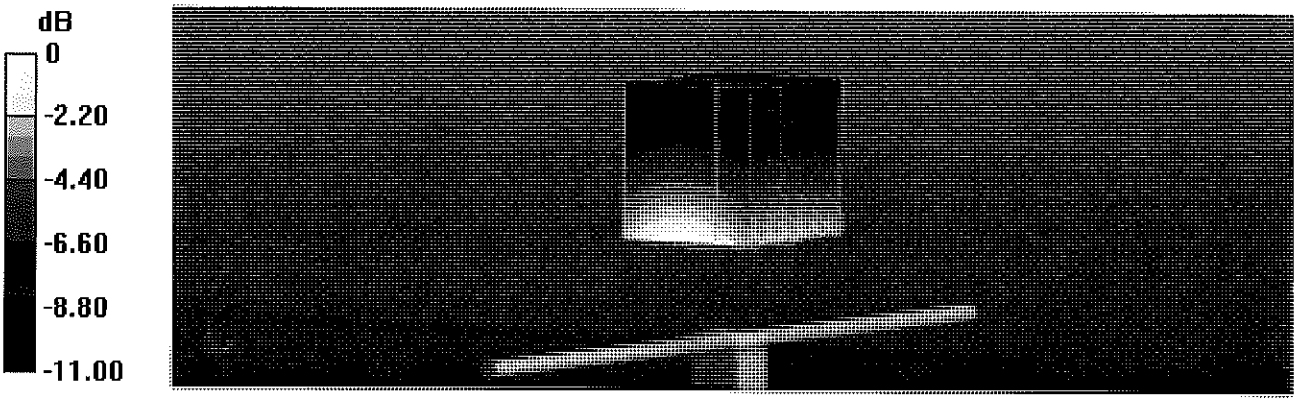
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 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)

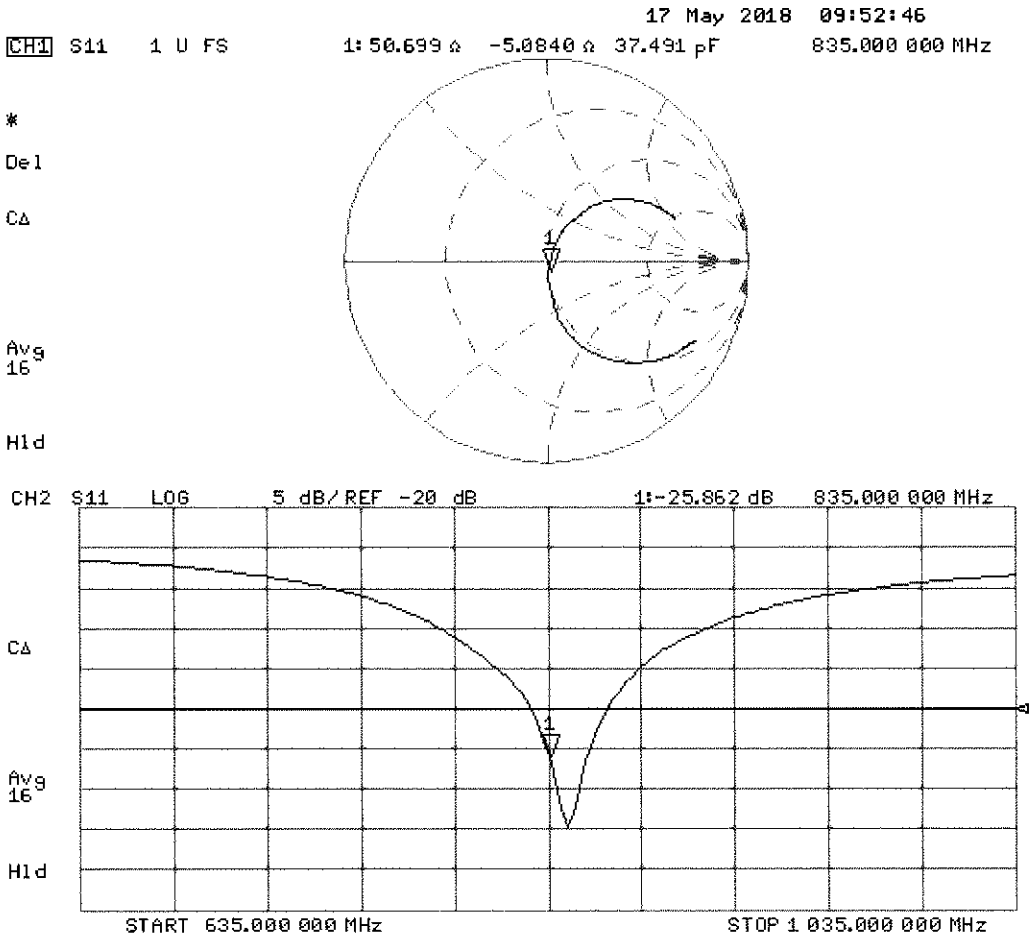
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.39 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.78 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.32 W/kg



0 dB = 3.32 W/kg = 5.21 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d180

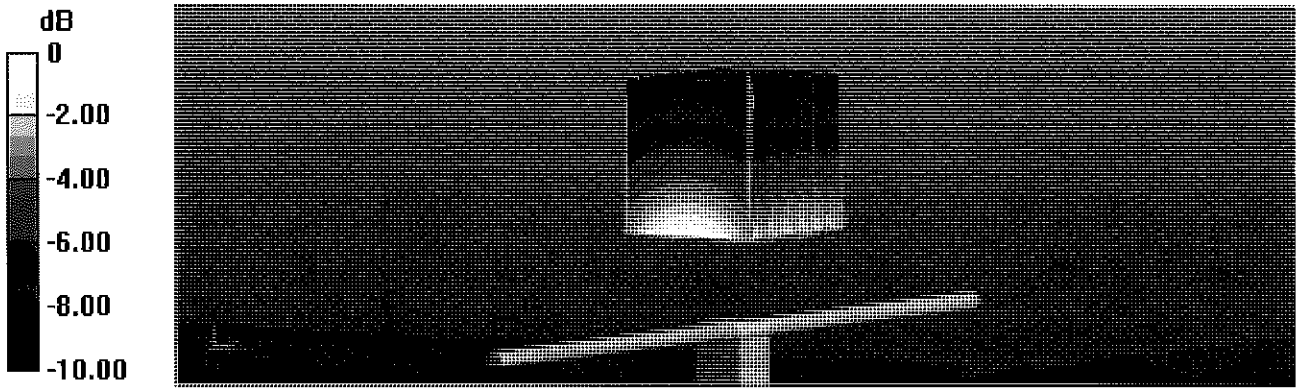
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 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)

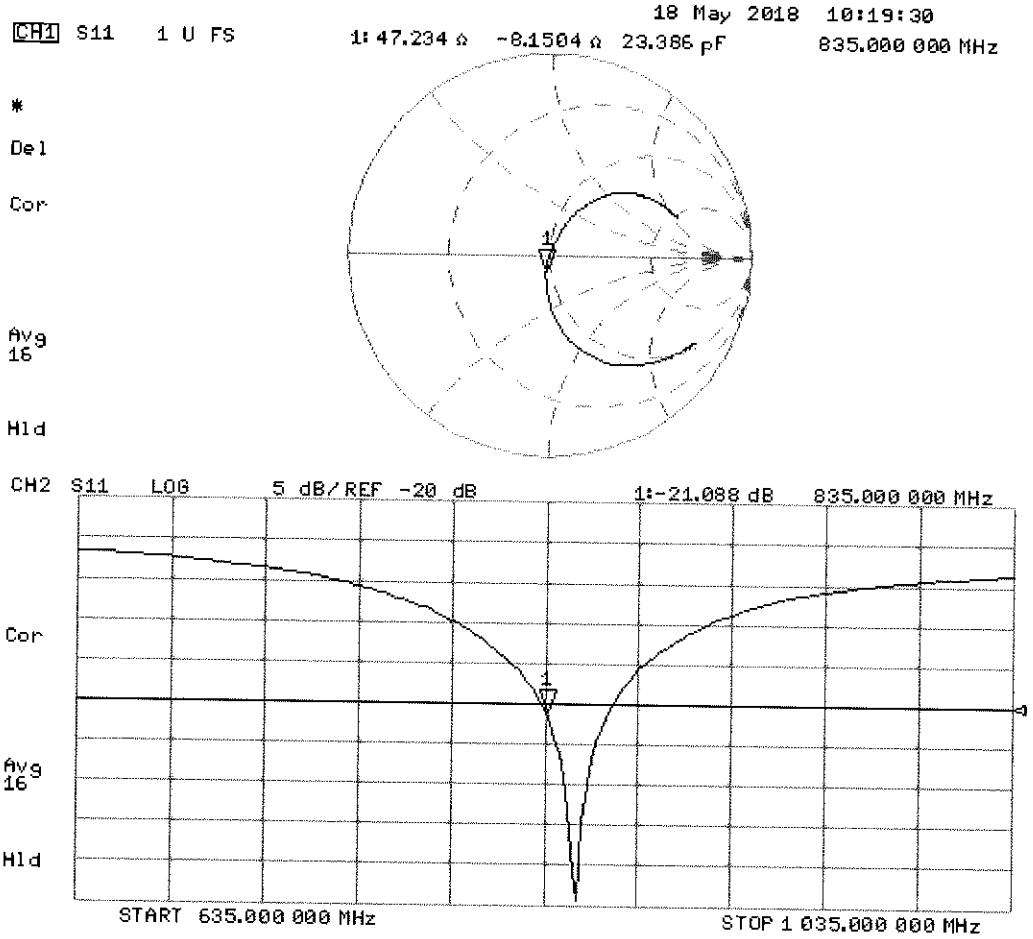
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.80 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D835V2 – SN: 4d180
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	May 16, 2019
Description:	SAR Validation Dipole at 835 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	N5182A	MXG Vector Signal Generator	6/15/2018	Annual	6/15/2019	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAKS-3.5	Portable DAK	9/11/2018	Annual	9/11/2019	1045
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7416
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/10/2018	Annual	7/10/2019	1402

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

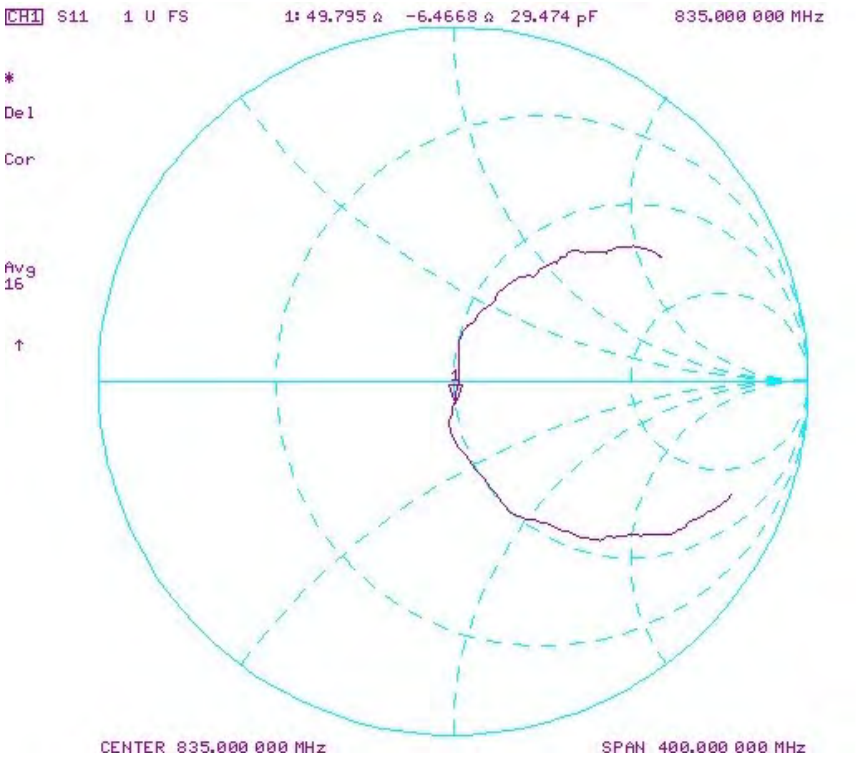
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

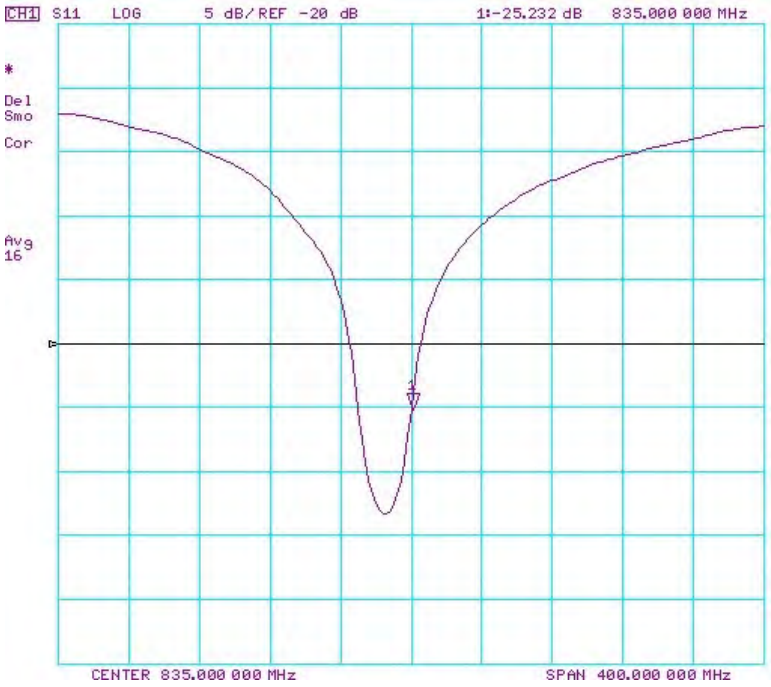
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/18/2018	5/16/2019	1.396	1.92	1.99	3.65%	1.244	1.3	4.50%	50.7	49.8	0.9	-5.1	-6.5	1.4	-25.9	-25.2	2.60%	PASS

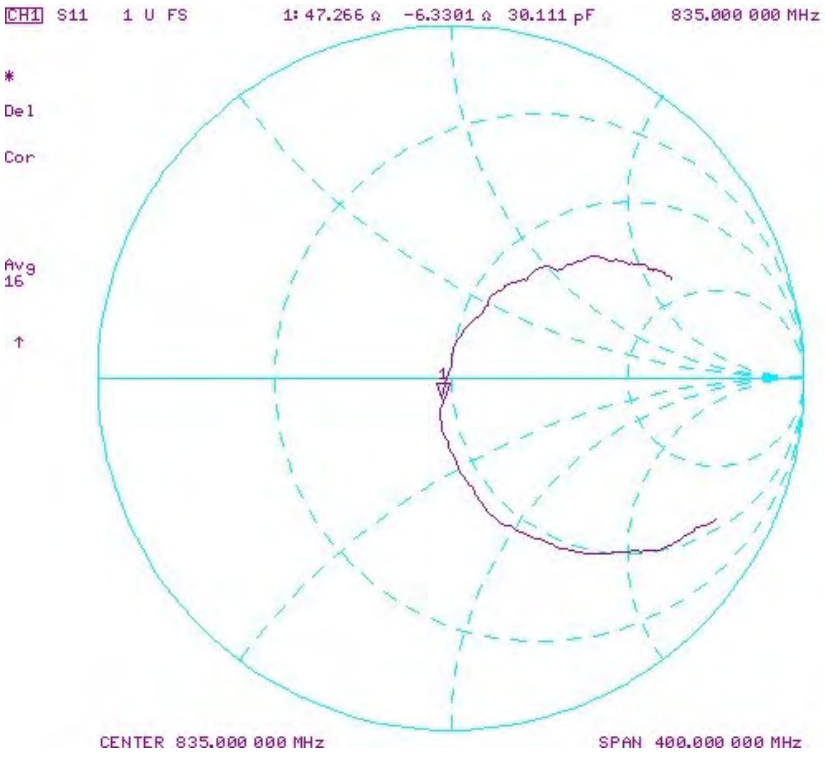
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/18/2018	5/16/2019	1.396	1.918	2.05	6.88%	1.262	1.34	6.18%	47.2	47.3	0.1	-8.2	-6.3	1.9	-21.1	-23.1	-9.20%	PASS

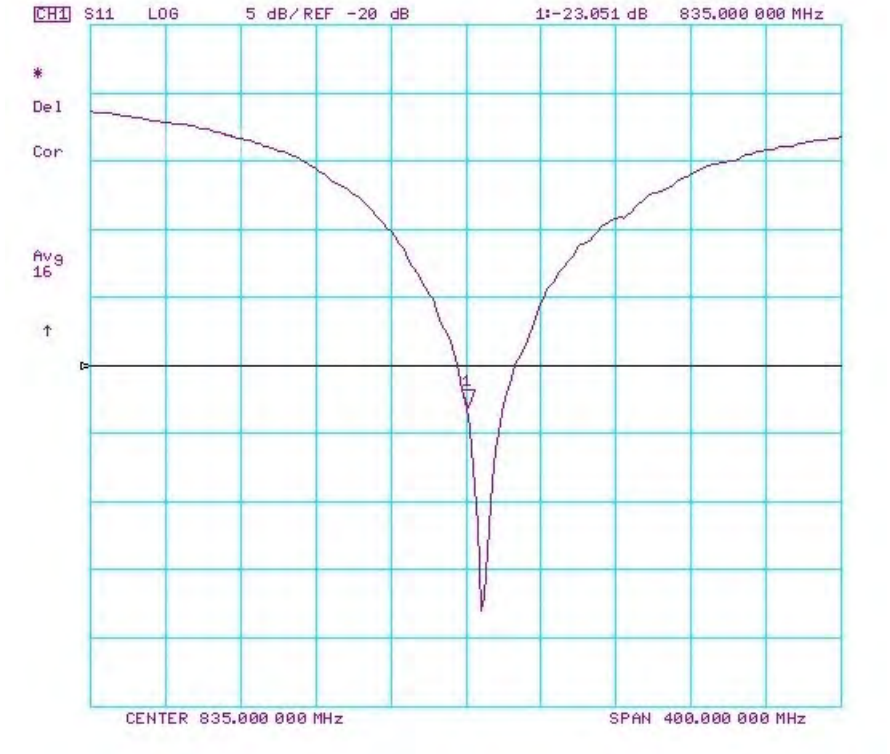
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Certification of Calibration

Object D835V2 – SN: 4d180

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: May 18, 2020

Description: SAR Validation Dipole at 835 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	1/16/2020	Annual	1/16/2021	US39170118
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1207470
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1339007
Anritsu	ML2495A	Power Meter	1/15/2020	Annual	1/15/2021	1328004
Control Company	62344-734	Therm./ Clock/ Humidity Monitor	3/18/2019	Biennial	3/18/2021	192038436
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181292000
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	5/23/2018	Biennial	5/23/2020	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2019	Annual	8/12/2020	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/19/2020	Annual	3/19/2021	604
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2020	Annual	5/12/2021	1070
SPEAG	EX3DV4	SAR Probe	8/29/2019	Annual	8/29/2020	3949
SPEAG	EX3DV4	SAR Probe	3/20/2020	Annual	3/20/2021	7421

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Managing Director	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

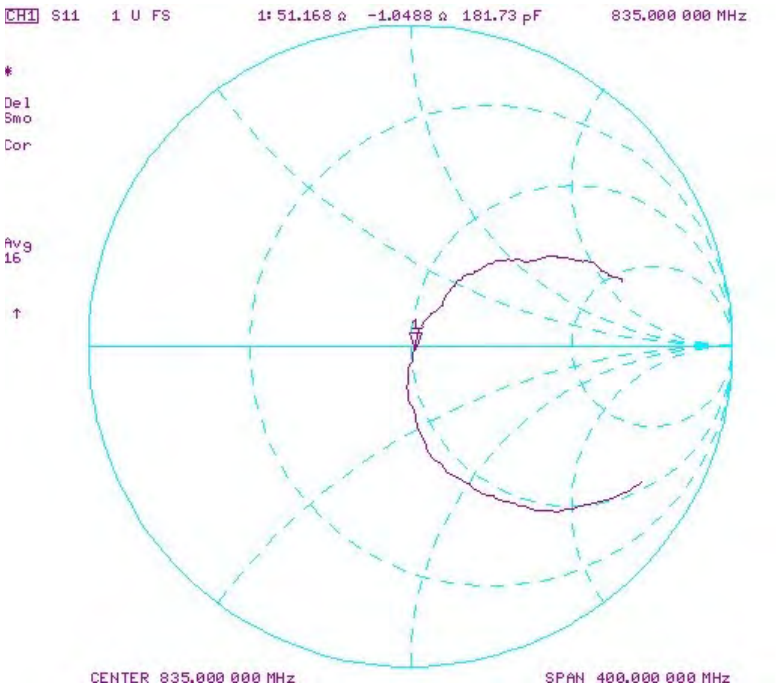
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

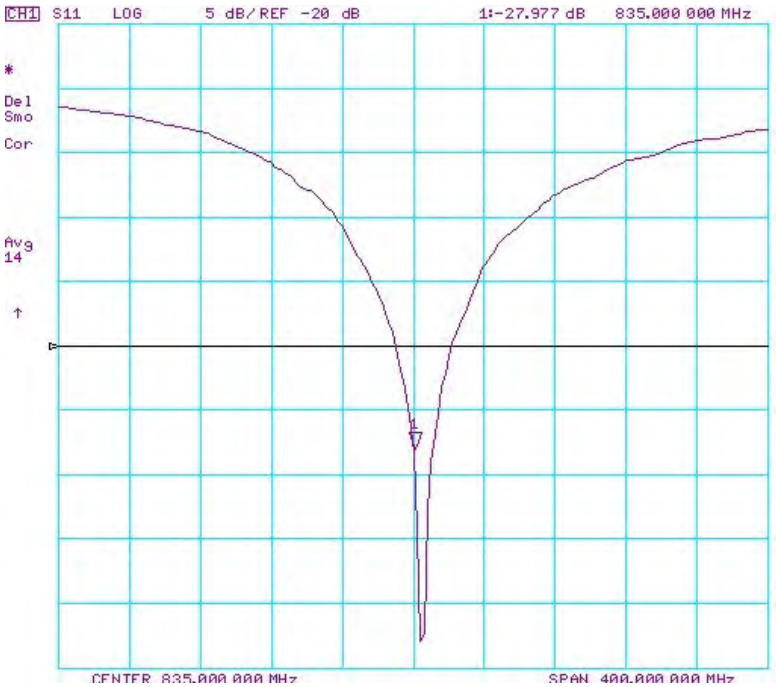
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/18/2018	5/18/2020	1.396	1.92	2	4.17%	1.244	1.32	6.11%	50.7	51.2	0.5	-5.1	-1	4.1	-25.9	-28	-8.10%	PASS

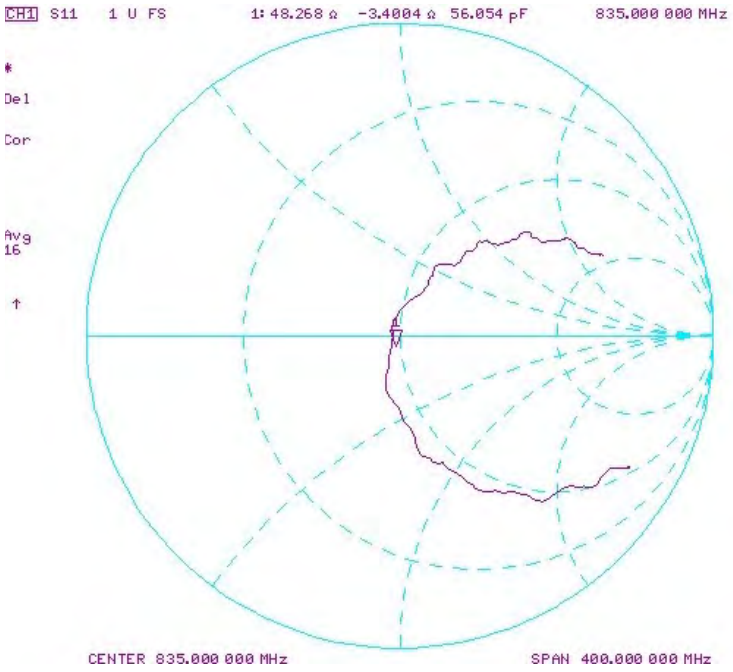
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/18/2018	5/18/2020	1.396	1.918	2	4.28%	1.262	1.31	3.80%	47.2	48.3	1.1	-8.2	-3.4	4.8	-21.1	-24.9	-18.00%	PASS

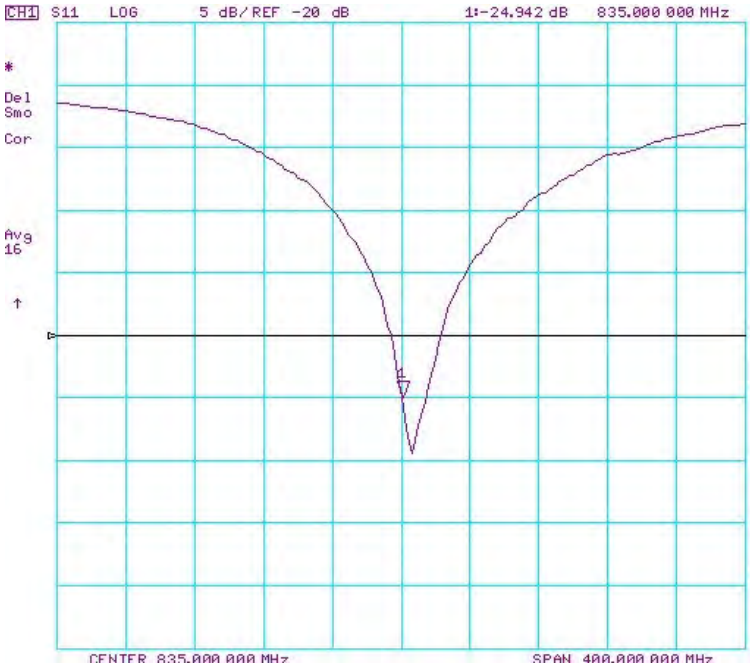
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: SCS 0108

Client **PC Test** Certificate No: **D850V2-1010_Sep17**

CALIBRATION CERTIFICATE

Object	D850V2 - SN:1010
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 08, 2017

SCV 10/03/2017
SCV 9/9/2018 BN 10/10/2019

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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 8, 2017

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	850 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	0.92 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.93 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.42 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	0.99 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.3 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**10.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.68 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	50.2 Ω - 3.1 jΩ
Return Loss	- 30.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 5.8 jΩ
Return Loss	- 23.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.432 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	September 04, 2012

DASY5 Validation Report for Head TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN:1010

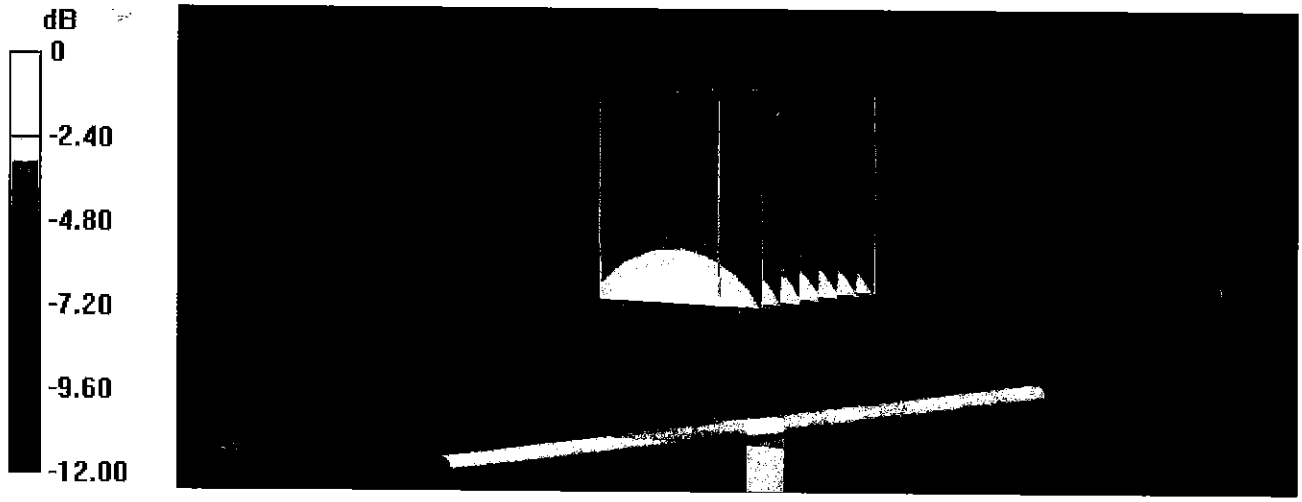
Communication System: UID 0 - CW; Frequency: 850 MHz
Medium parameters used: f = 850 MHz; σ = 0.94 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.93, 9.93, 9.93); 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)

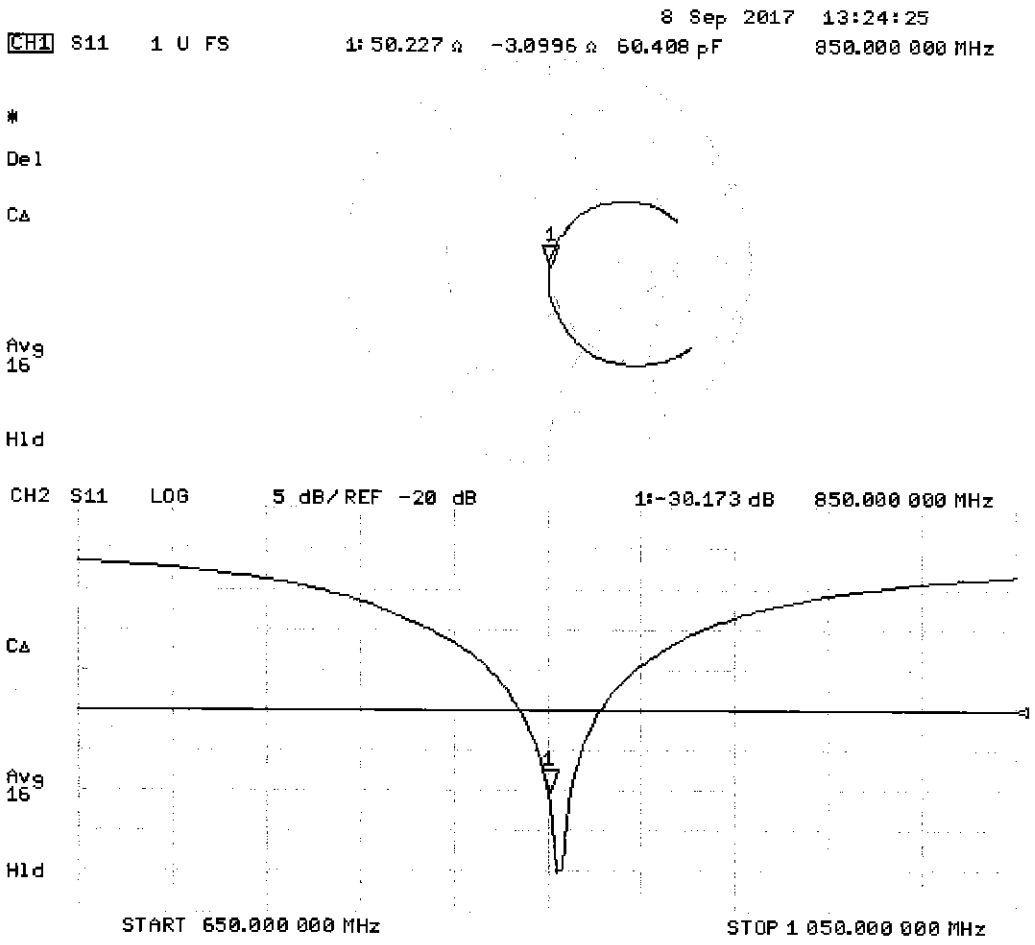
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.32 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.85 W/kg
SAR(1 g) = 2.53 W/kg; SAR(10 g) = 1.63 W/kg
Maximum value of SAR (measured) = 3.41 W/kg



0 dB = 3.41 W/kg = 5.33 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN:1010

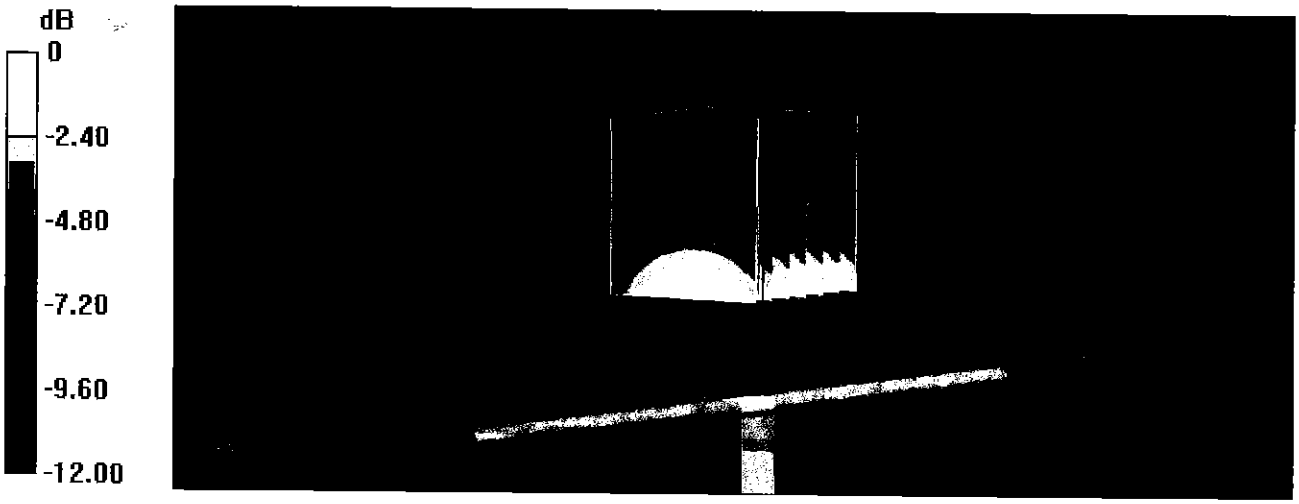
Communication System: UID 0 - CW; Frequency: 850 MHz
Medium parameters used: f = 850 MHz; σ = 0.99 S/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11); 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)

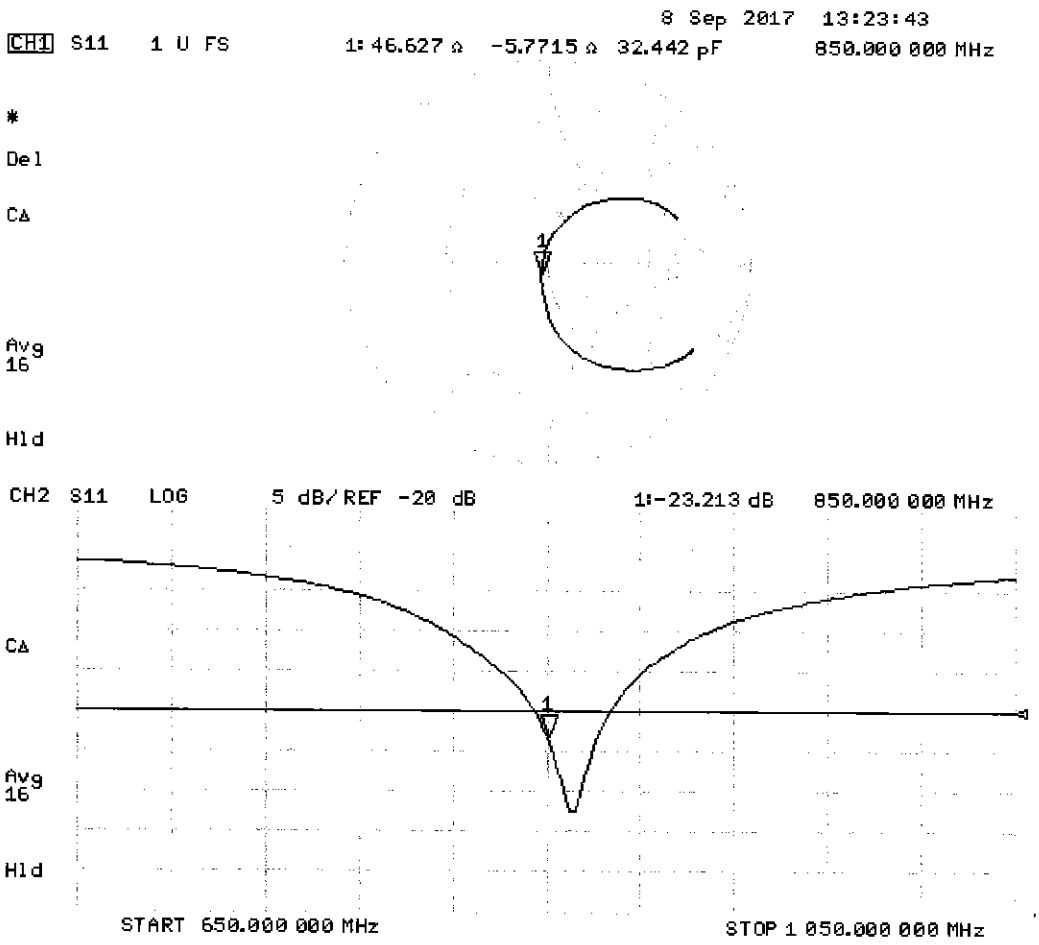
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.79 W/kg
SAR(1 g) = 2.55 W/kg; SAR(10 g) = 1.67 W/kg
Maximum value of SAR (measured) = 3.36 W/kg



0 dB = 3.36 W/kg = 5.26 dBW/kg

Impedance Measurement Plot for Body TSL



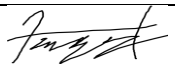
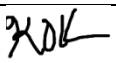
Certification of Calibration

Object	D850V2 – SN: 1010
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 08, 2018
Description:	SAR Validation Dipole at 850 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	N5182A	MXG Vector Signal Generator	3/19/2018	Annual	3/19/2019	US46240505
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/22/2017	Annual	11/22/2018	1339008
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1533
SPEAG	EX3DV4	SAR Probe	1/26/2018	Annual	1/26/2019	7490
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Team Lead Engineer	
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

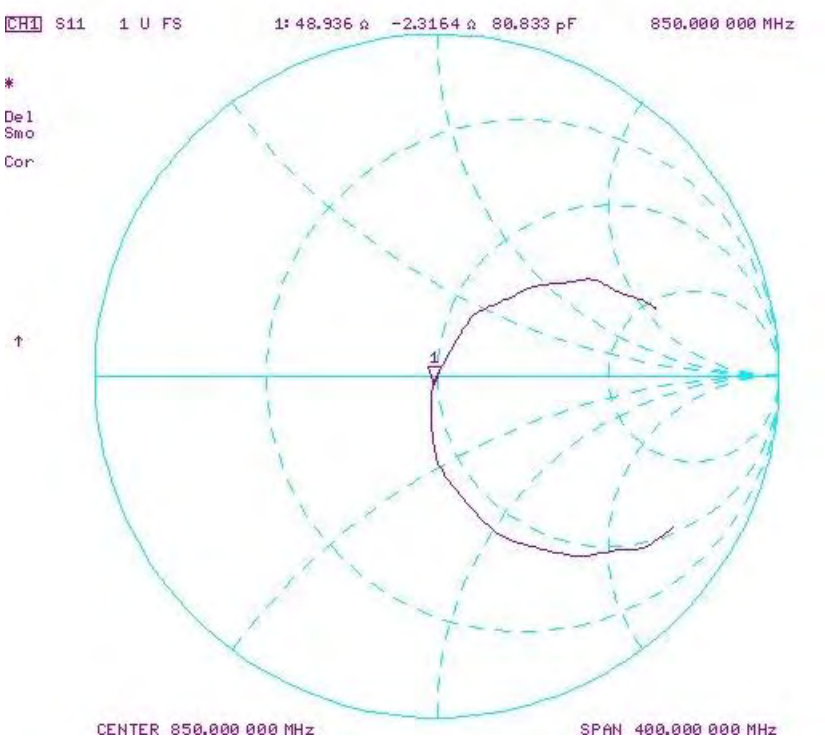
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

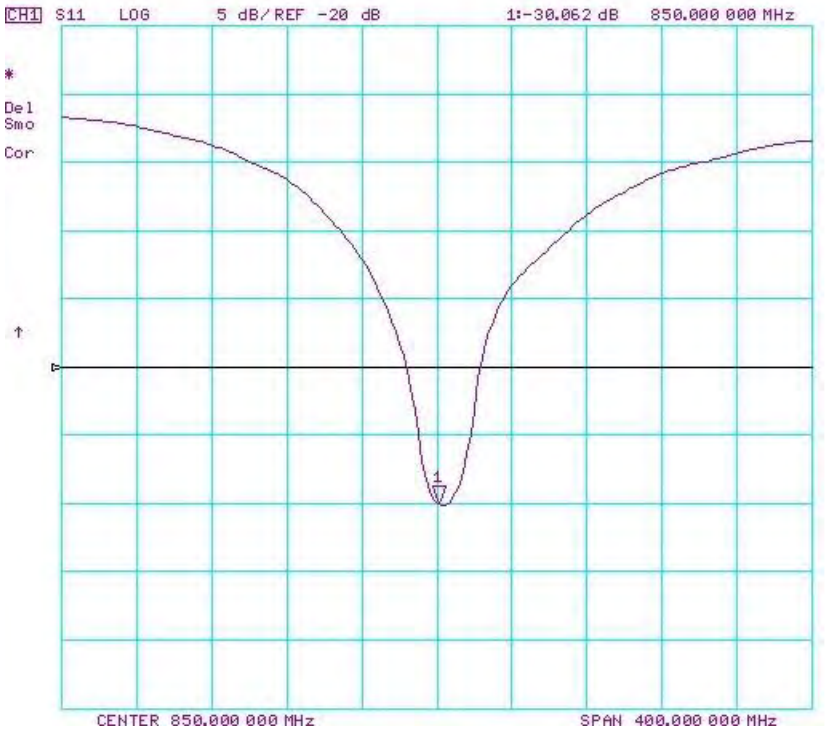
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2018	1.432	1.986	2.01	1.21%	1.284	1.31	2.02%	50.2	48.9	1.3	-3.1	-2.3	0.8	-30.2	-30.1	0.30%	PASS

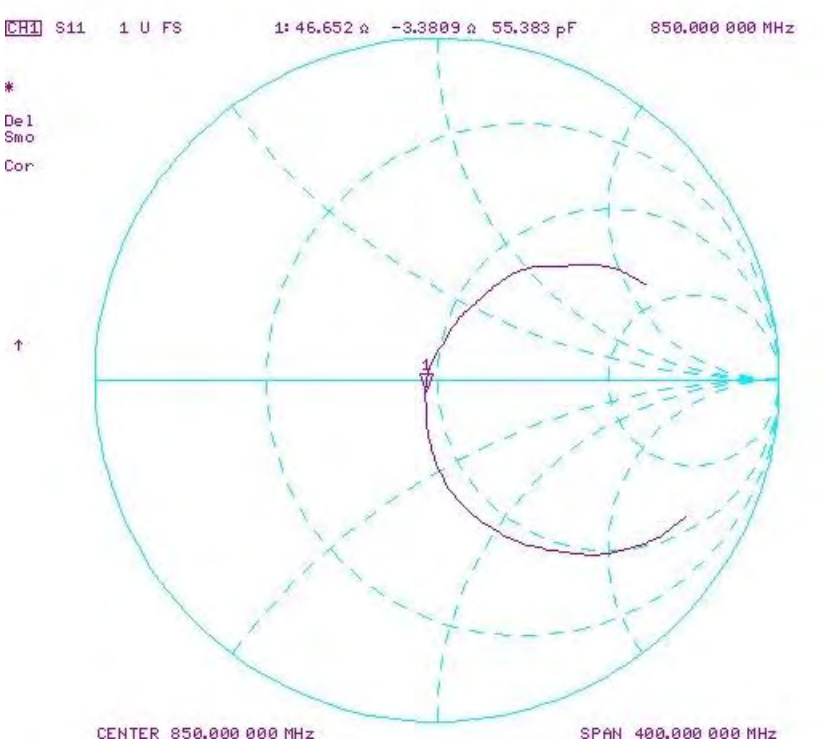
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2017	1.432	2.04	2.01	-1.47%	1.336	1.32	-1.20%	46.6	46.7	0.1	-5.8	-3.4	2.4	-23.2	-25.8	-11.20%	PASS

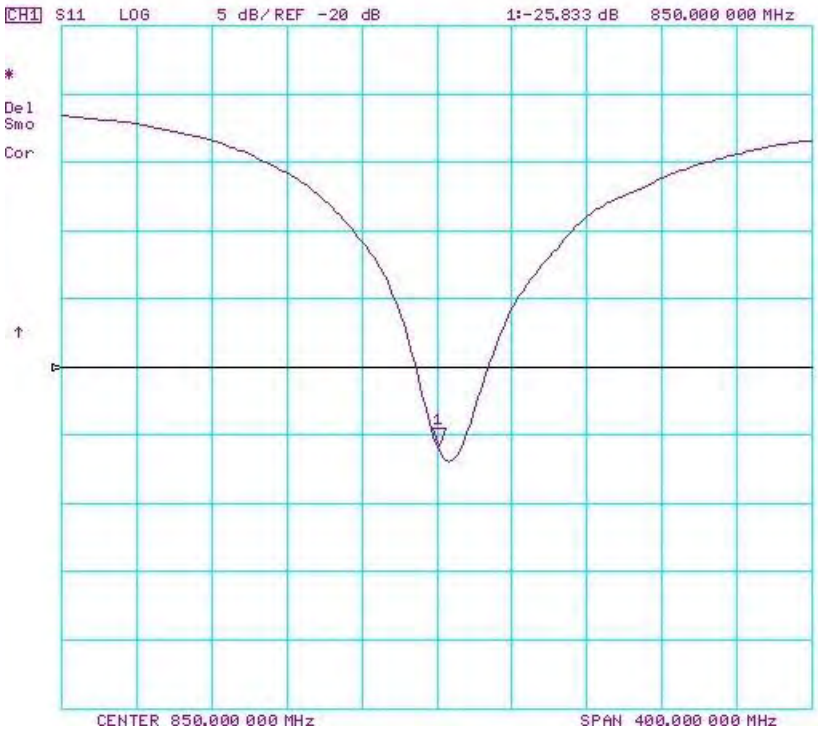
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Certification of Calibration

Object	D850V2 – SN: 1010
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 8, 2019
Description:	SAR Validation Dipole at 850 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	E4438C	ESG Vector Signal Generator	6/27/2019	Annual	6/27/2020	MY45093852
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	11/1/2017	Biennial	11/1/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/7/2019	Annual	5/7/2020	1070
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7490
SPEAG	DAE4	Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

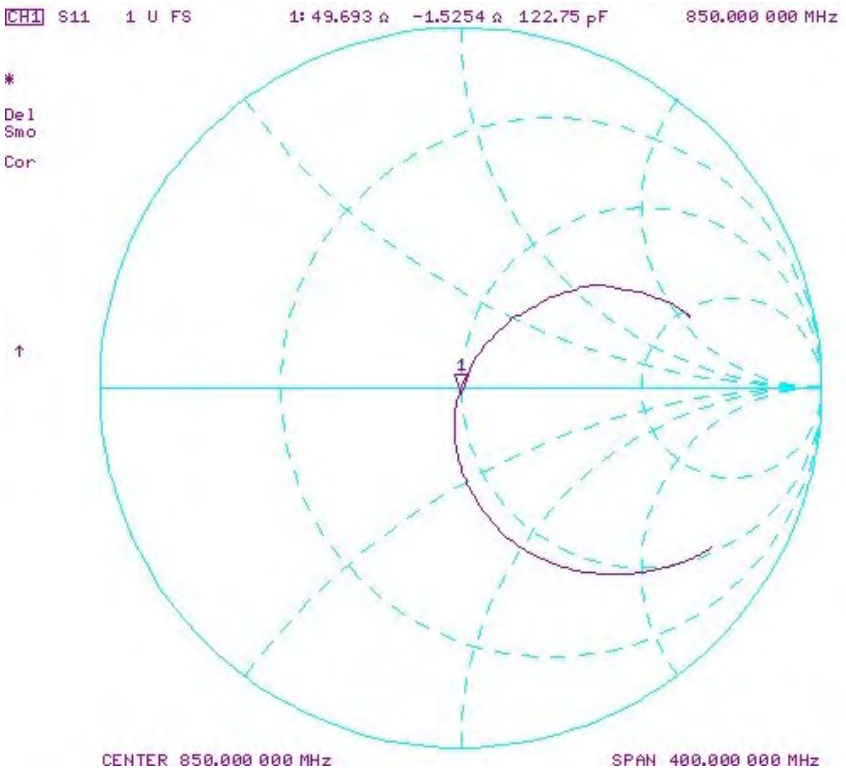
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

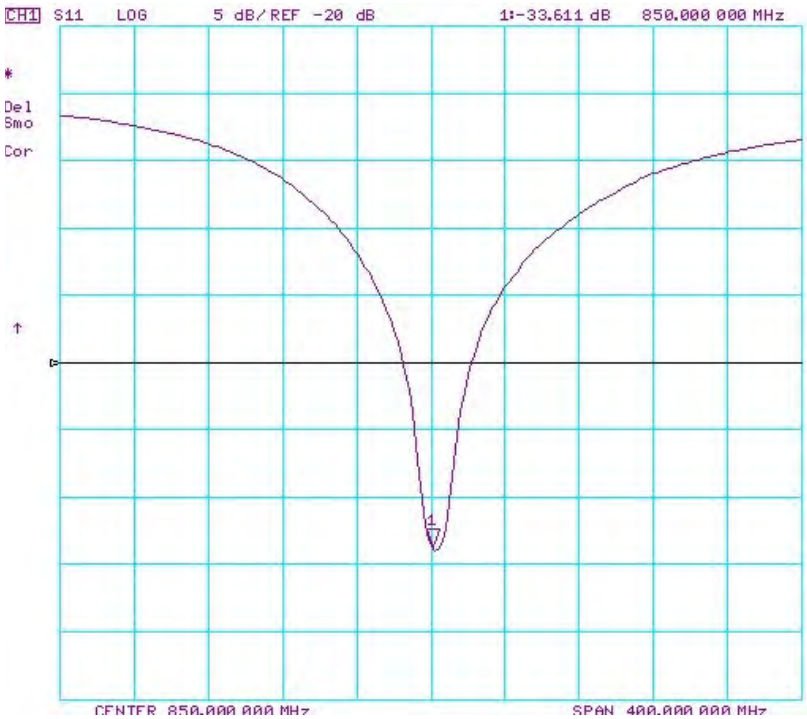
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2019	1.432	1.986	2.03	2.22%	1.284	1.33	3.58%	50.2	49.7	0.5	-3.1	-1.5	1.6	-30.2	-33.6	-11.30%	PASS

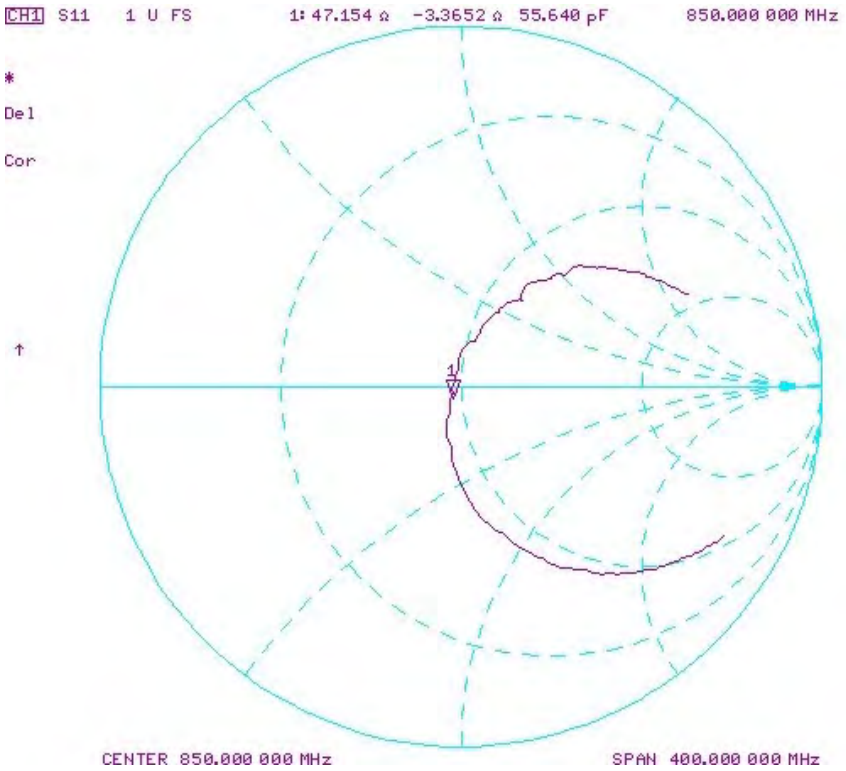
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/8/2017	9/8/2019	1.432	2.04	2.05	0.49%	1.336	1.36	1.80%	46.6	47.2	0.6	-5.8	-3.4	2.4	-23.2	-27.1	-16.80%	PASS

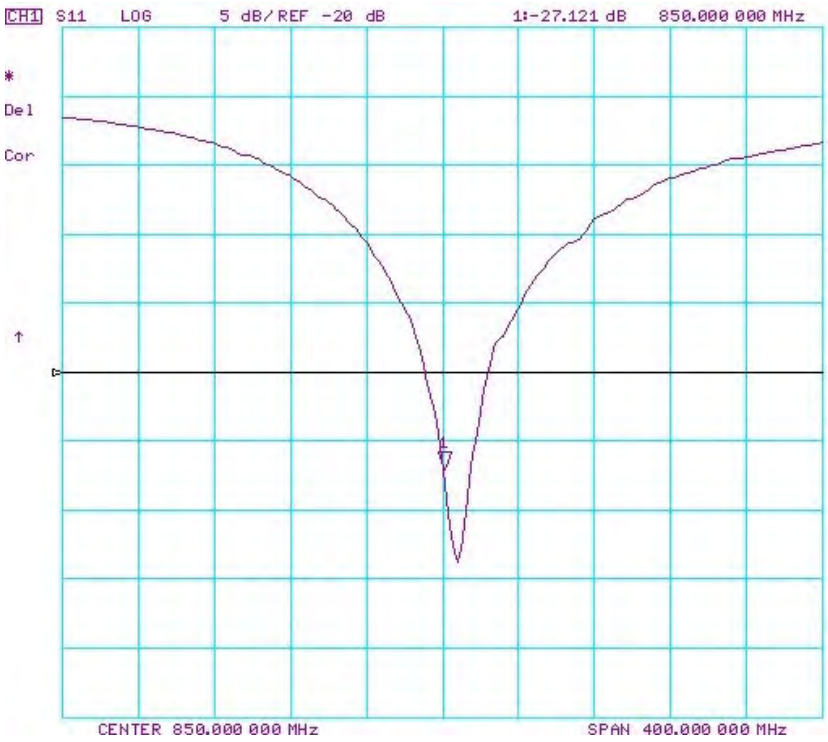
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1104_Sep17**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1104
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 07, 2017

SC ✓ 10/03/2017
SC ✓ 9/7/2018
BN ✓ 10/10/2019

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	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 7, 2017

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.81 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 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	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.6 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	50.8 Ω - 0.2 jΩ
Return Loss	- 41.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω - 0.7 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 16, 2013

DASY5 Validation Report for Head TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1104

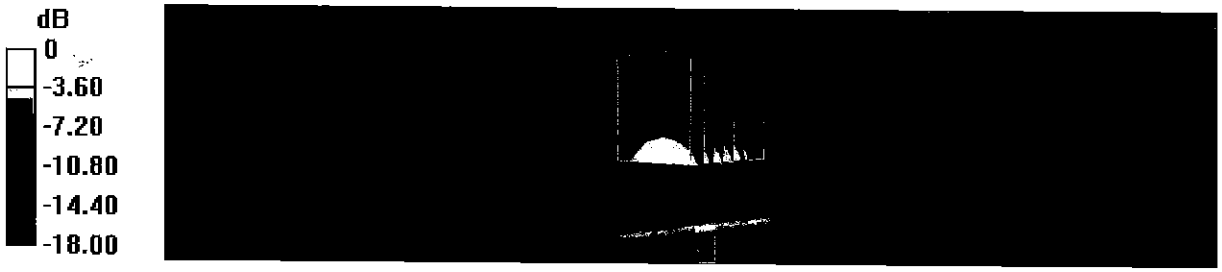
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.73, 8.73, 8.73); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

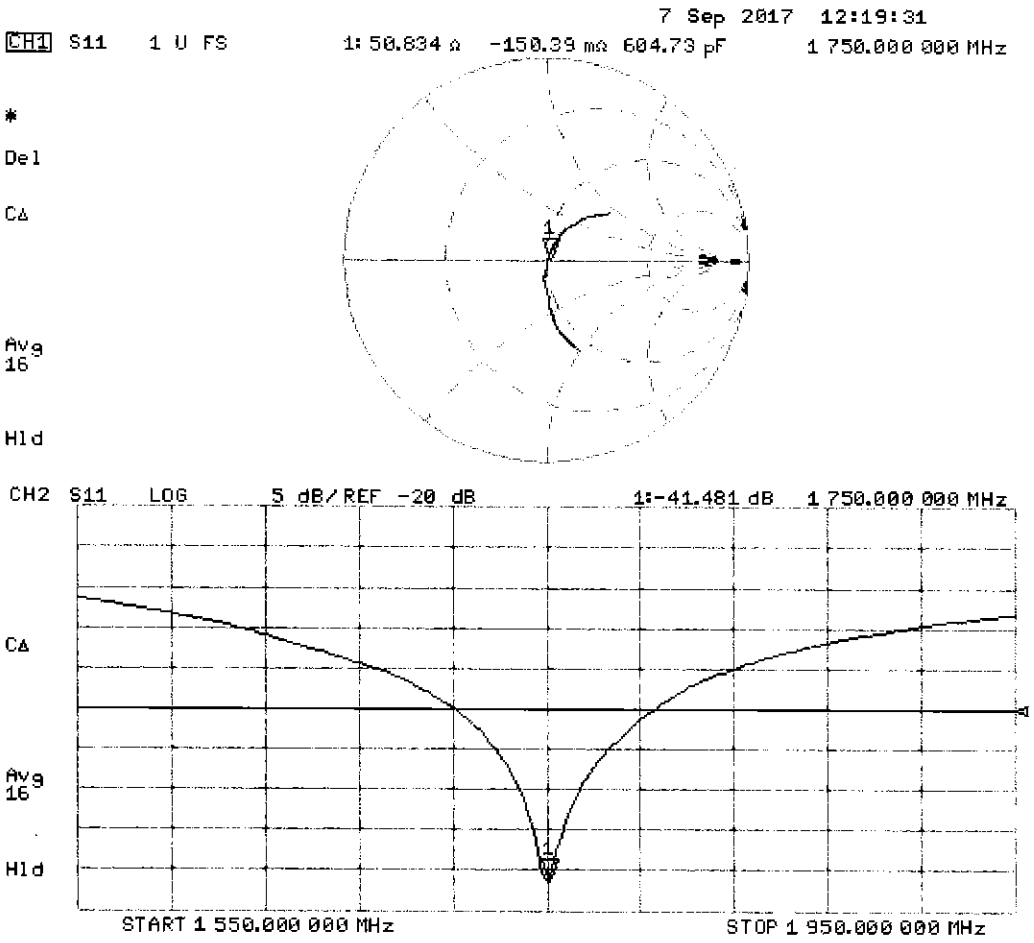
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.9 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.81 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 Head TSL



DASY5 Validation Report for Body TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1104

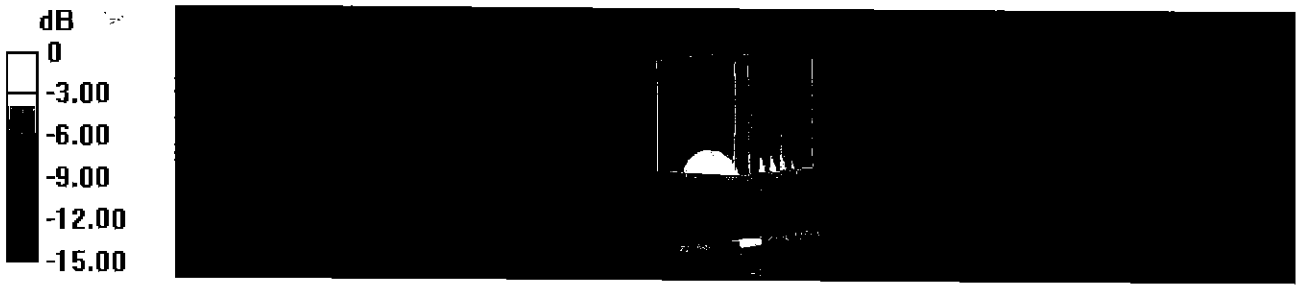
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

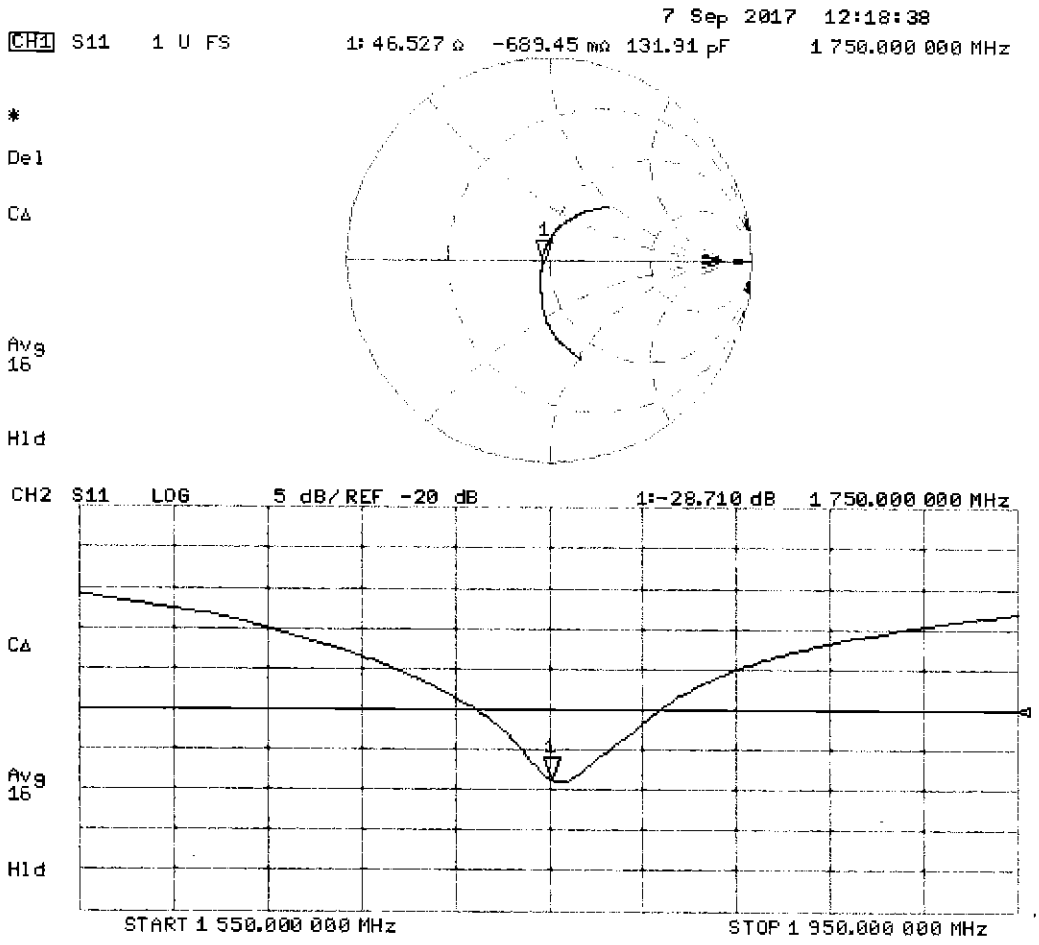
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.30 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 9.03 W/kg; SAR(10 g) = 4.85 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D1750V2 – SN: 1104
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 07, 2018
Description:	SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	N5182A	MXG Vector Signal Generator	3/19/2018	Annual	3/19/2019	US46240505
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/22/2017	Annual	11/22/2018	1339008
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1533

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Team Lead Engineer	
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

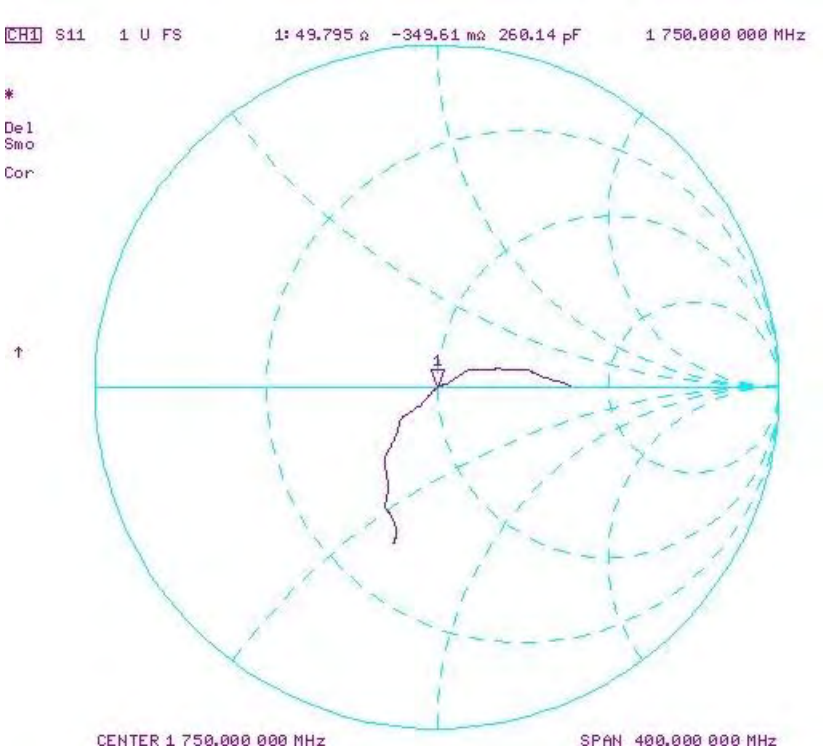
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

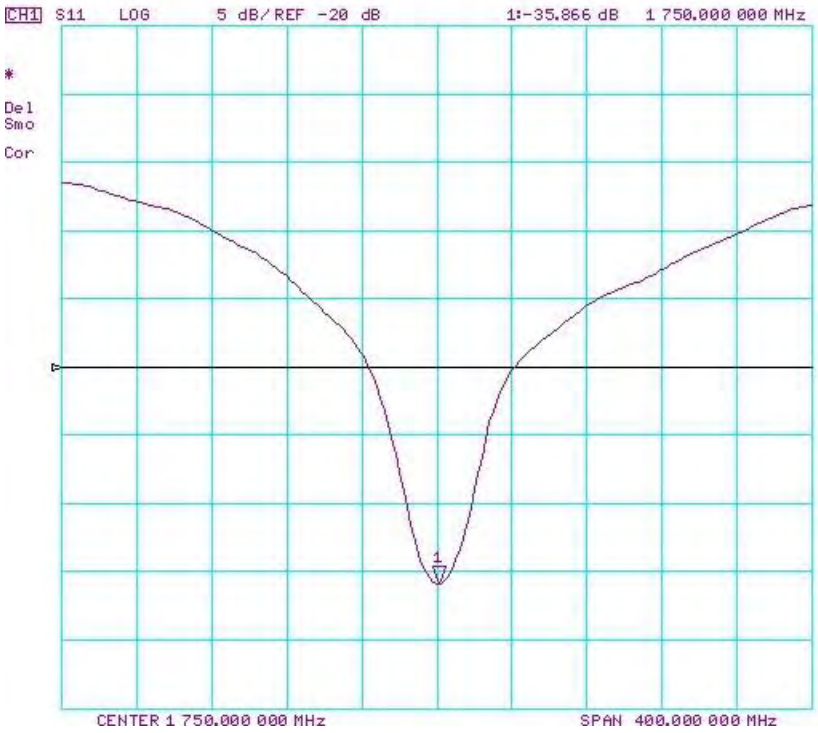
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2018	1.217	3.64	3.62	-0.55%	1.92	1.94	1.04%	50.8	49.8	1	-0.2	-0.3	0.1	-41.5	-35.9	13.50%	PASS

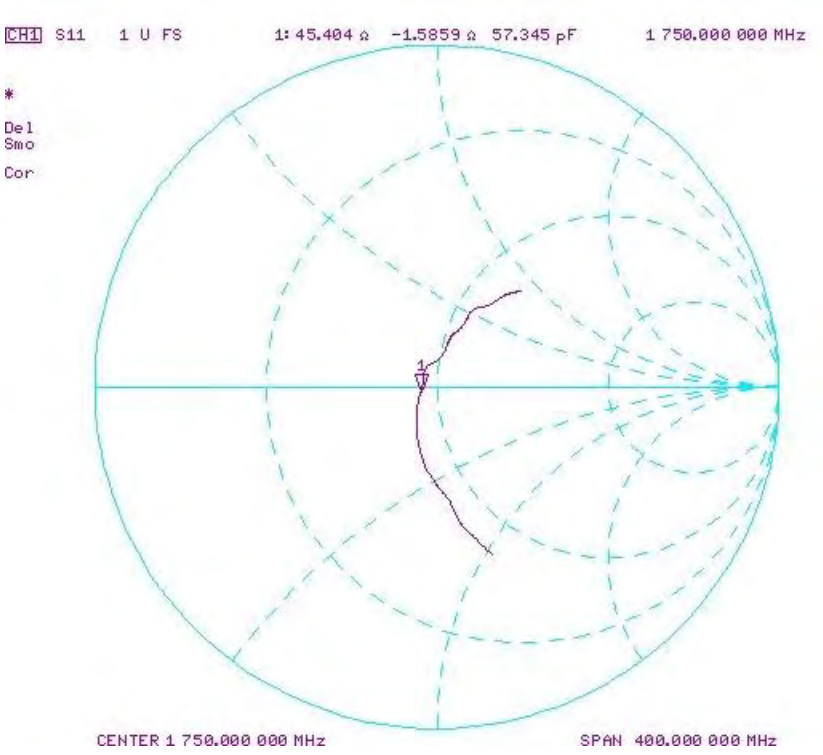
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2018	1.217	3.66	3.84	4.92%	1.96	2.07	5.61%	46.527	45.4	1.1	-0.69	-1.6	0.9	-28.7	-25.8	10.10%	PASS

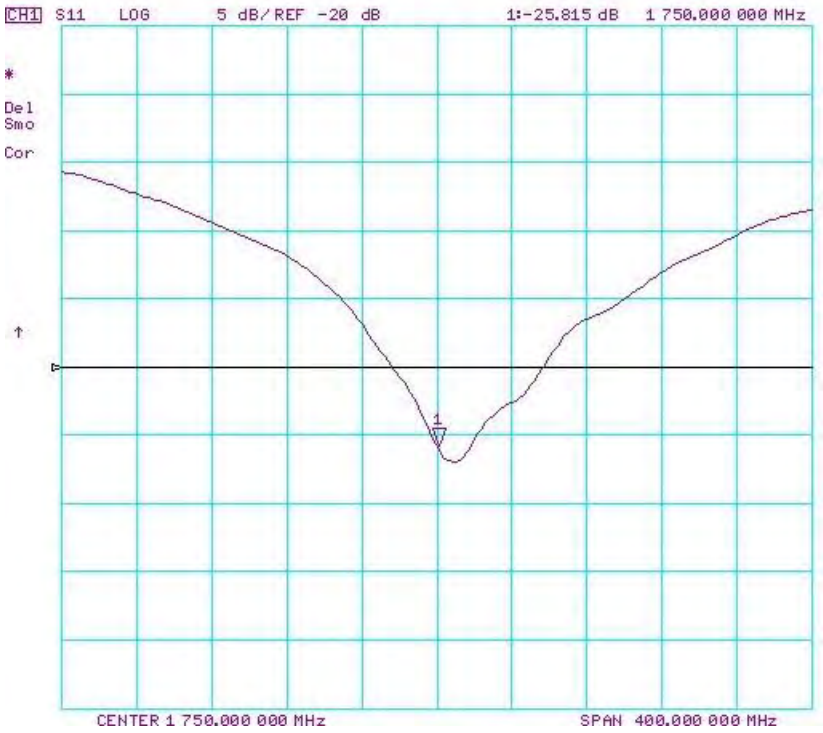
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Certification of Calibration

Object	D1750V2 – SN: 1104
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 7, 2019
Description:	SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	E4438C	ESG Vector Signal Generator	6/27/2019	Annual	6/27/2020	MY45093852
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	11/1/2017	Biennial	11/1/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/7/2019	Annual	5/7/2020	1070
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7490
SPEAG	DAE4	Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

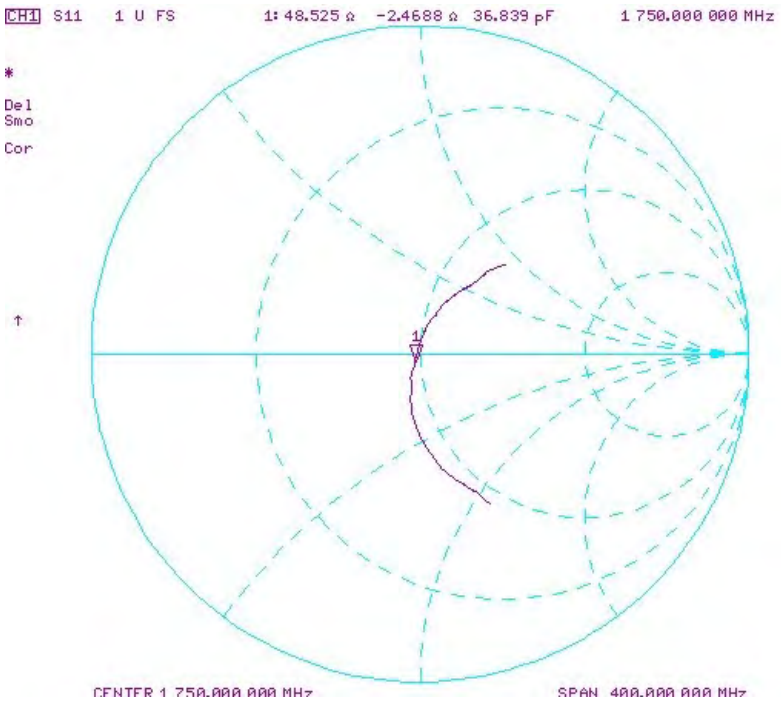
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

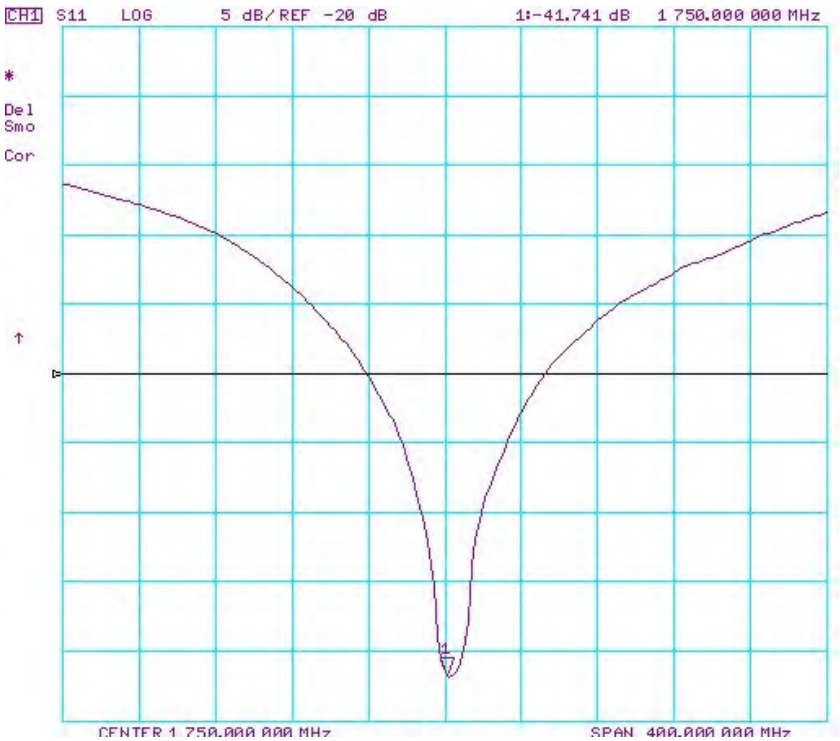
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2019	1.217	3.64	3.54	-2.75%	1.92	1.88	-2.08%	50.8	48.5	2.3	-0.2	-2.5	2.3	-41.5	-41.7	-0.50%	PASS

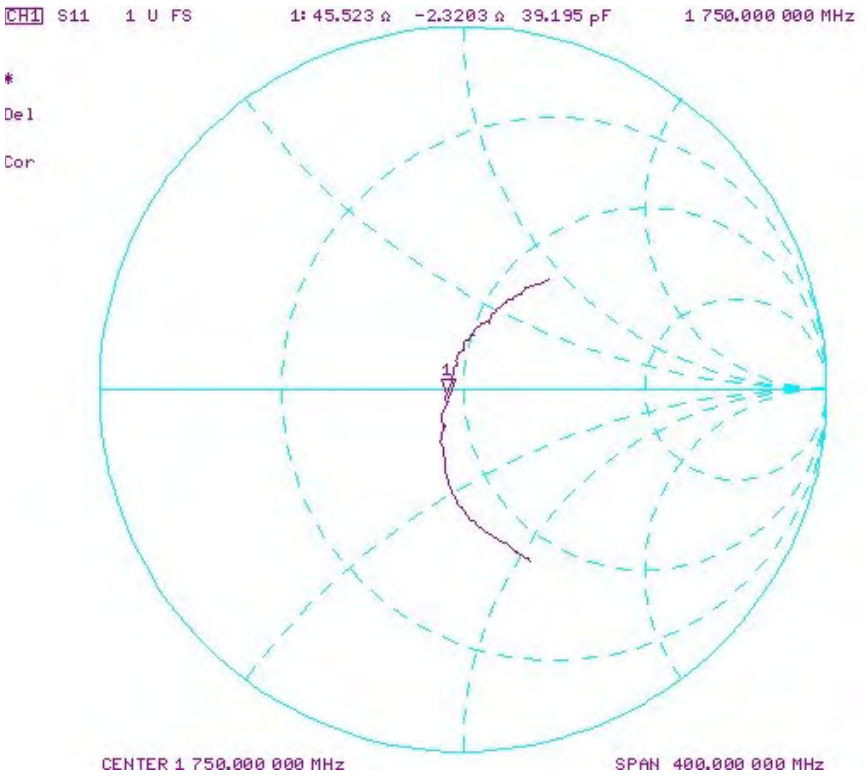
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2019	1.217	3.66	3.67	0.27%	1.96	1.96	0.00%	46.5	45.5	1	-0.7	-2.3	1.6	-28.7	-25.5	11.10%	PASS

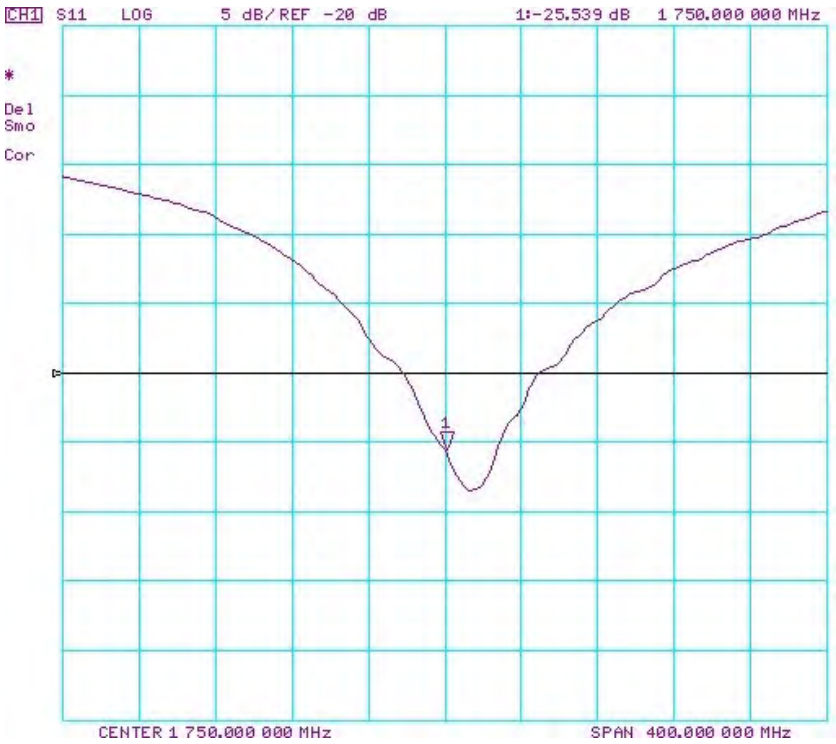
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1750V2-1092_May18

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1092
Calibration procedure(s)	QA CAL-05.N10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 15, 2018

SC ✓ 5/31/2018
BN ✓ 06/01/2019
ATM ✓ 06/11/2020

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 HP 8753E	SN: US37390585	18-Oct-01 (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: May 17, 2018

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.34 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	8.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.0 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	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.2 ± 6 %	1.46 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	8.99 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.81 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.4 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	49.2 Ω - 1.0 jΩ
Return Loss	- 37.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8 Ω - 0.6 jΩ
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 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 07, 2012

Date: 15.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1092

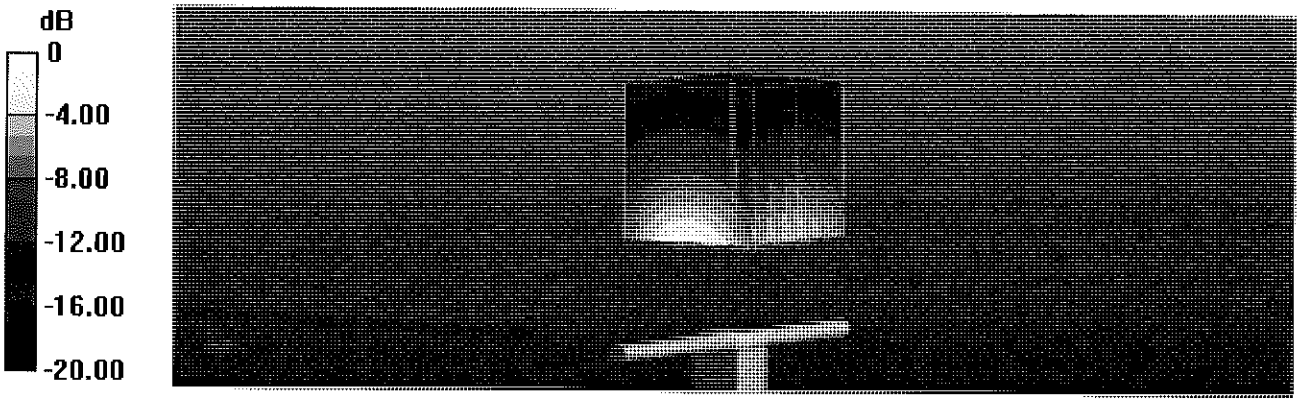
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.34 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

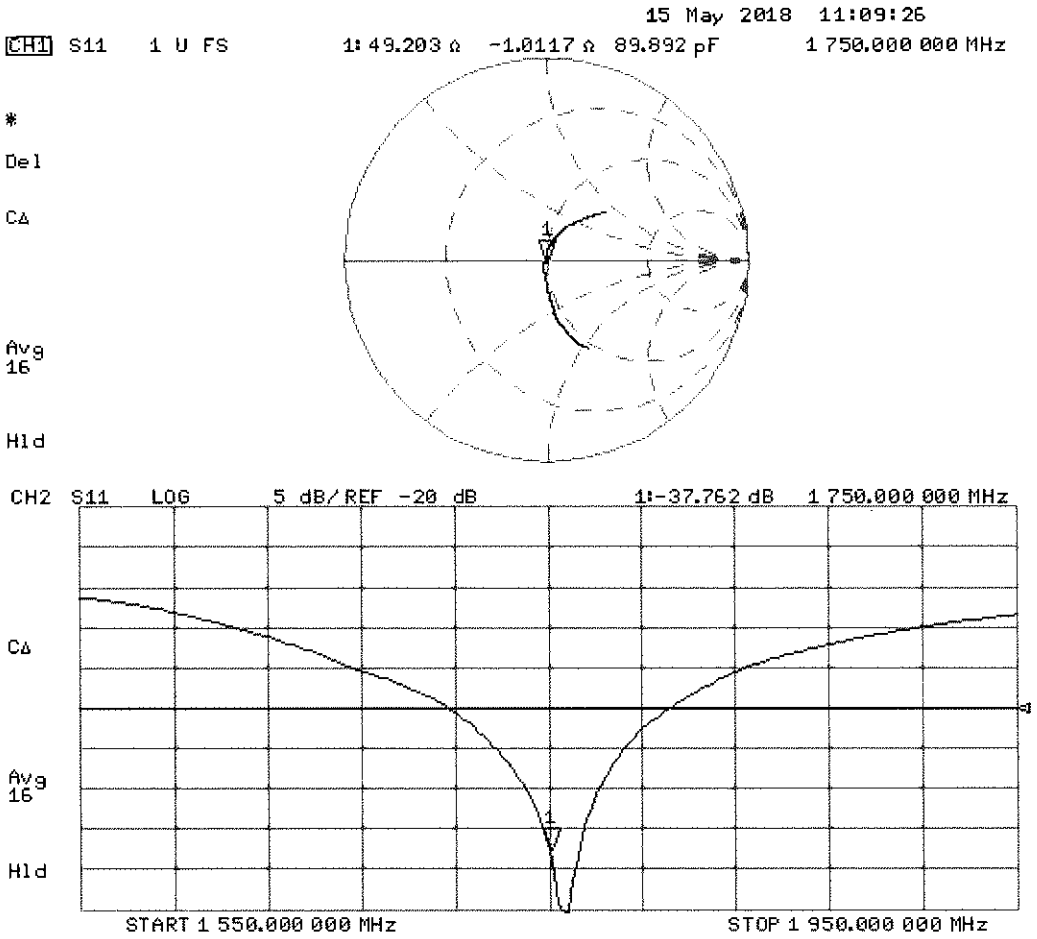
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.8 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 8.95 W/kg; SAR(10 g) = 4.73 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 11.40 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1092

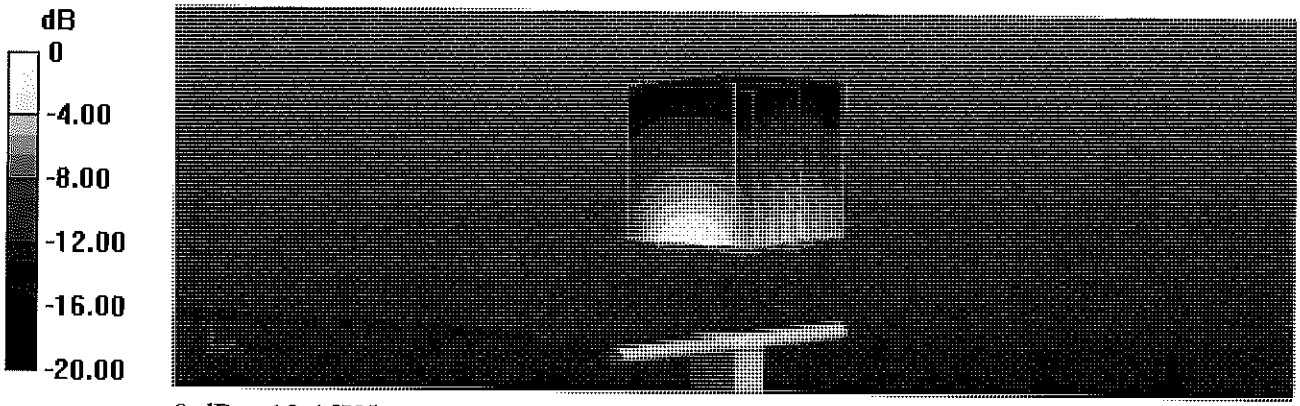
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

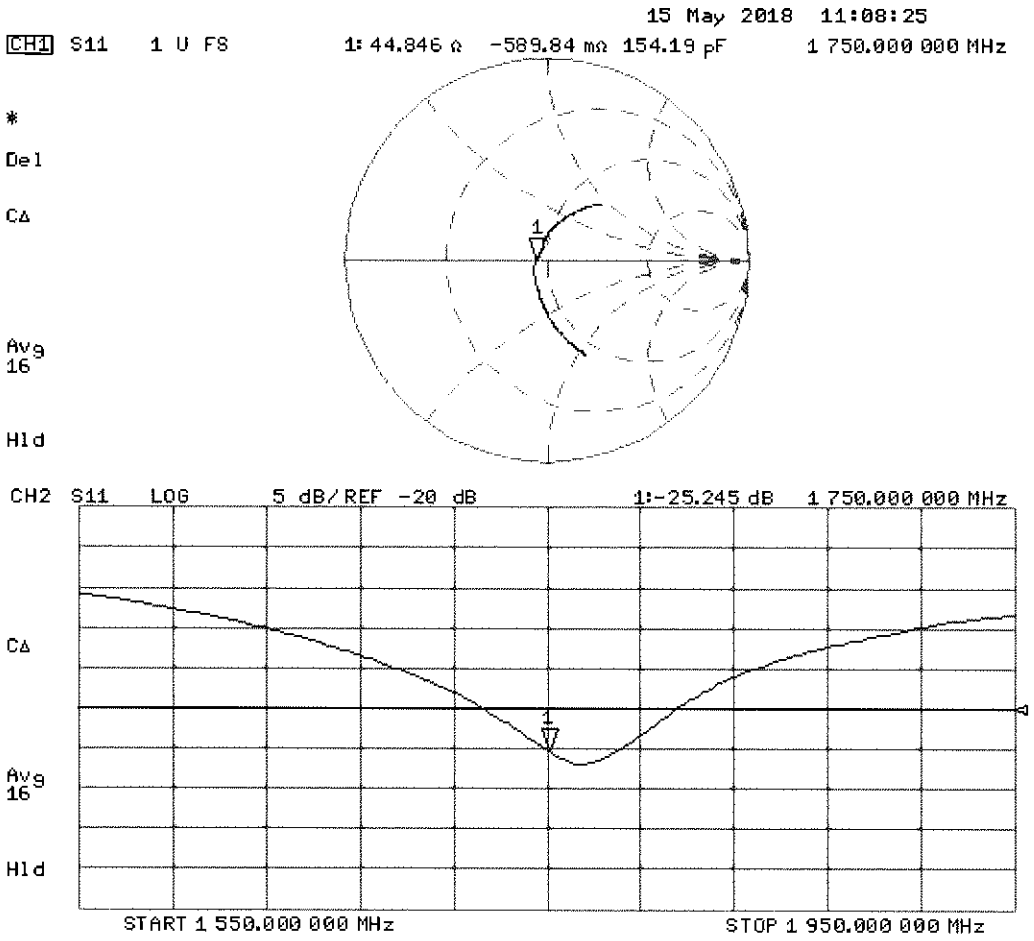
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.4 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 8.99 W/kg; SAR(10 g) = 4.81 W/kg
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D1750V2 – SN: 1092
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	May 15, 2019
Description:	SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	N5182A	MXG Vector Signal Generator	6/15/2018	Annual	6/15/2019	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAKS-3.5	Portable DAK	9/11/2018	Annual	9/11/2019	1045
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7416
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/10/2018	Annual	7/10/2019	1402

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

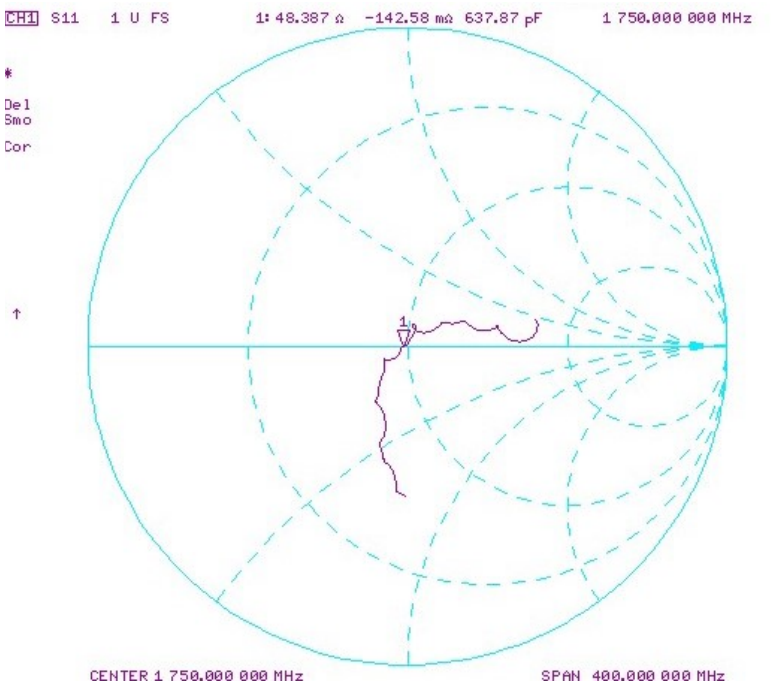
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

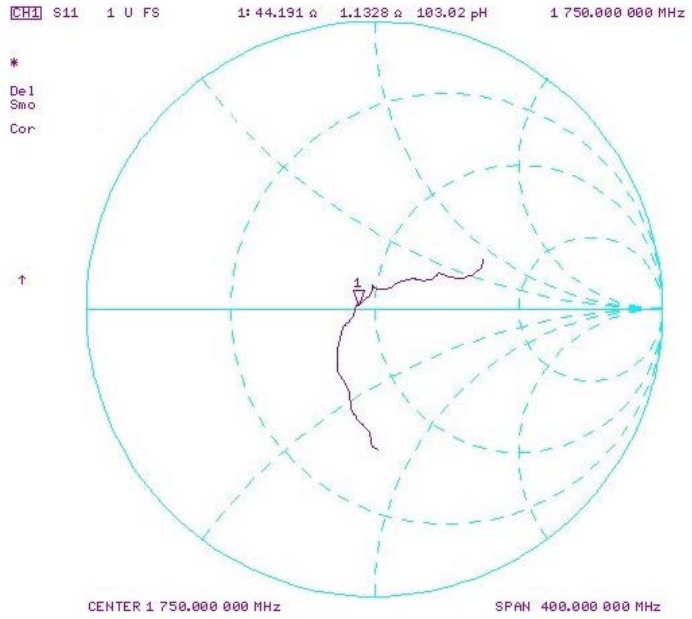
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/15/2018	5/15/2019	1.217	3.61	3.59	-0.55%	1.9	1.89	-0.53%	49.2	48.4	0.8	-1	-0.1	0.9	-37.8	-38.2	-1.00%	PASS

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/15/2018	5/15/2019	1.217	3.64	3.62	-0.55%	1.94	1.91	-1.55%	44.8	44.2	0.6	-0.6	1.1	1.7	-25.2	-24.2	3.90%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



Certification of Calibration

Object	D1750V2 – SN: 1092
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	May 15, 2020
Description:	SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	1/16/2020	Annual	1/16/2021	US39170118
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1207470
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1339007
Anritsu	ML2495A	Power Meter	1/15/2020	Annual	1/15/2021	1328004
Control Company	62344-734	Therm./ Clock/ Humidity Monitor	3/18/2019	Biennial	3/18/2021	192038436
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181292000
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	5/23/2018	Biennial	5/23/2020	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/13/2020	Annual	2/13/2021	1403
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/19/2020	Annual	3/19/2021	604
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2020	Annual	5/12/2021	1070
SPEAG	EX3DV4	SAR Probe	2/19/2020	Annual	2/19/2021	7427
SPEAG	EX3DV4	SAR Probe	3/20/2020	Annual	3/20/2021	7421

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Managing Director	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

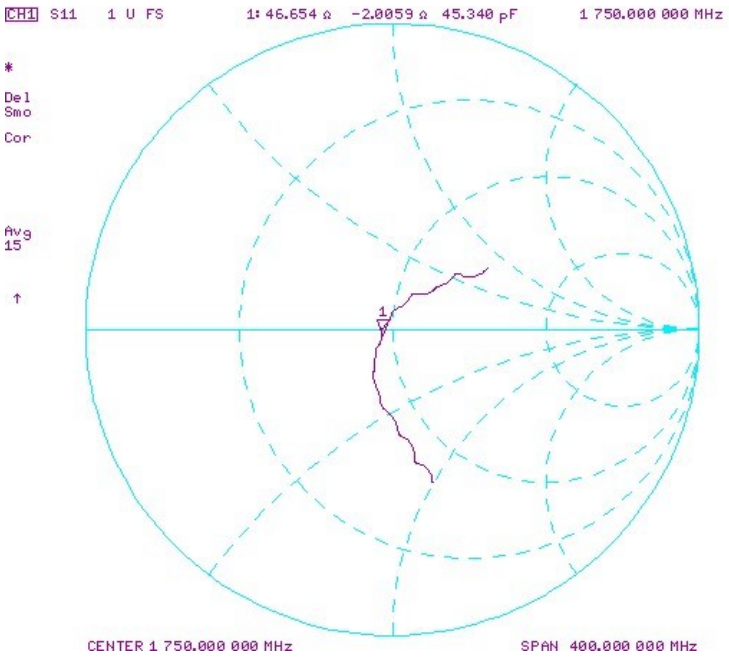
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

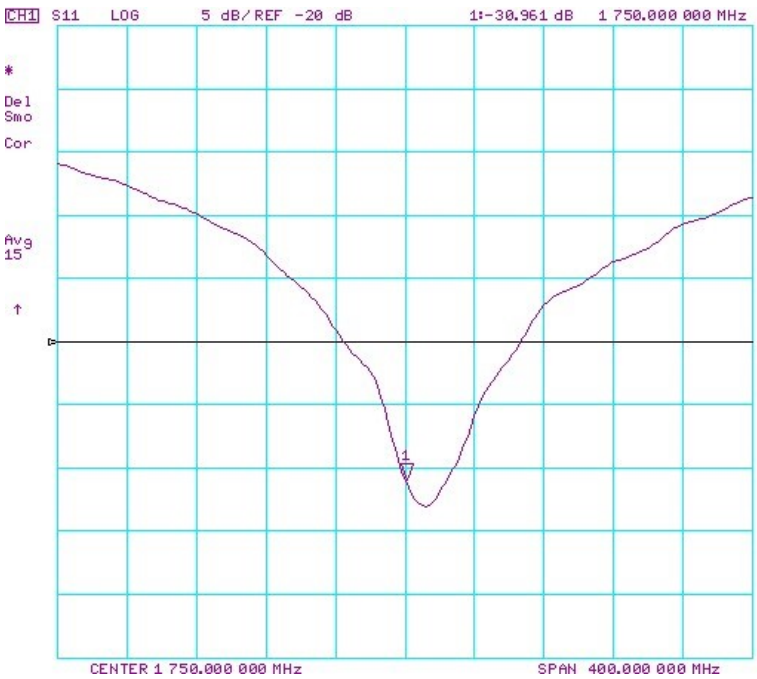
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/15/2018	5/15/2020	1.217	3.61	3.7	2.49%	1.9	1.97	3.68%	49.2	46.7	2.5	-1	-2	1	-37.8	-31	18.00%	PASS

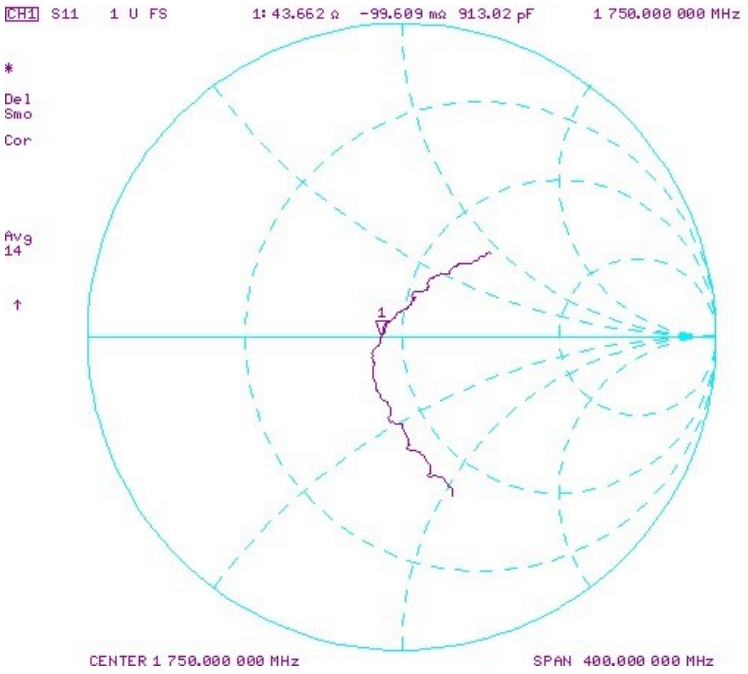
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/15/2018	5/15/2020	1.217	3.64	3.77	3.57%	1.94	2	3.09%	44.8	43.7	1.1	-0.6	-0.1	0.5	-25.2	-23.6	6.30%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1900V2-5d181_Sep17

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d181
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 07, 2017

SC ✓ 10/03/2017
SC ✓ 9/7/2018
BSN 10/10/2019

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: 7949	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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 7, 2017

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	39.0 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.6 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	54.3 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 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	53.7 Ω + 4.6 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω + 5.6 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 23, 2013

DASY5 Validation Report for Head TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d181

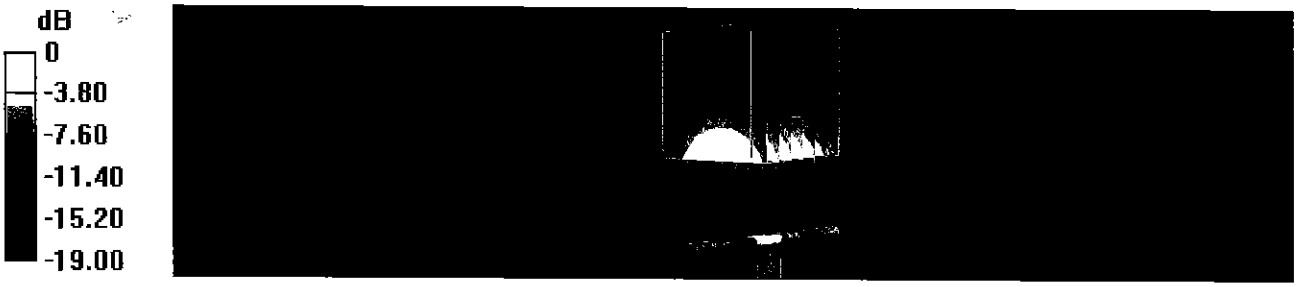
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

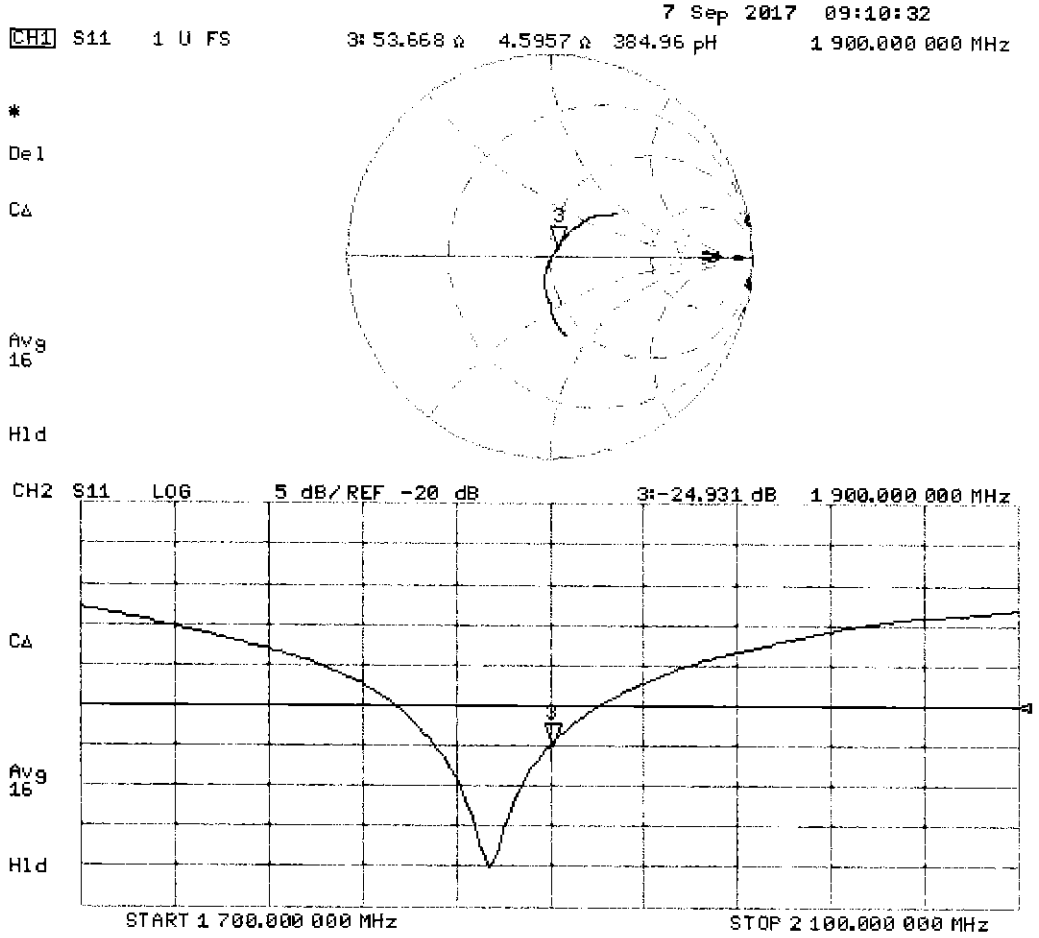
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.8 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.85 W/kg; SAR(10 g) = 5.15 W/kg
Maximum value of SAR (measured) = 14.8 W/kg



0 dB = 14.8 W/kg = 11.70 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d181

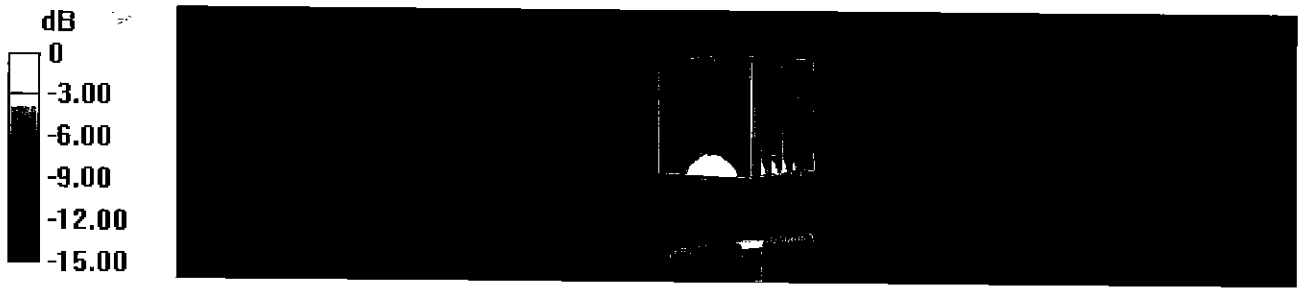
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

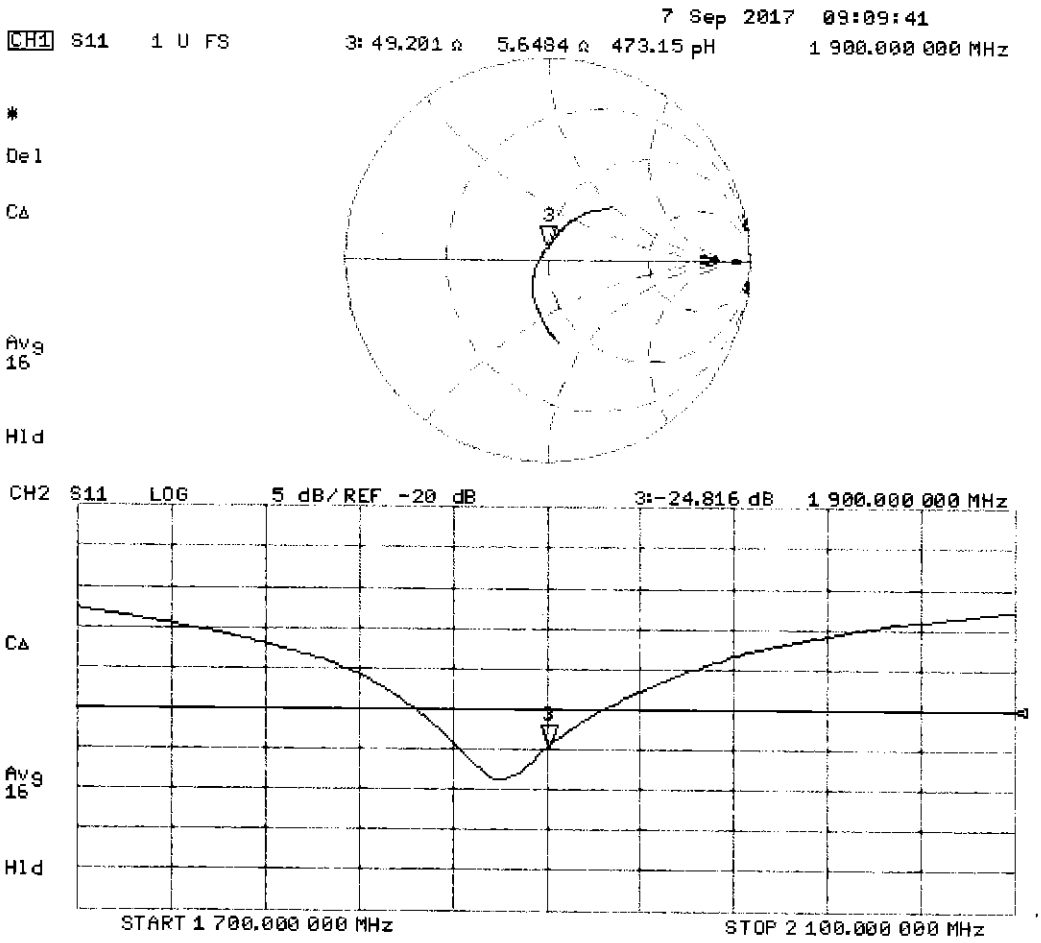
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.4 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 11.40 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D1900V2 – SN: 5d181
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 07, 2018
Description:	SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	N5182A	MXG Vector Signal Generator	3/19/2018	Annual	3/19/2019	US46240505
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/22/2017	Annual	11/22/2018	1339008
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1533
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3131
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	604

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Team Lead Engineer	
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

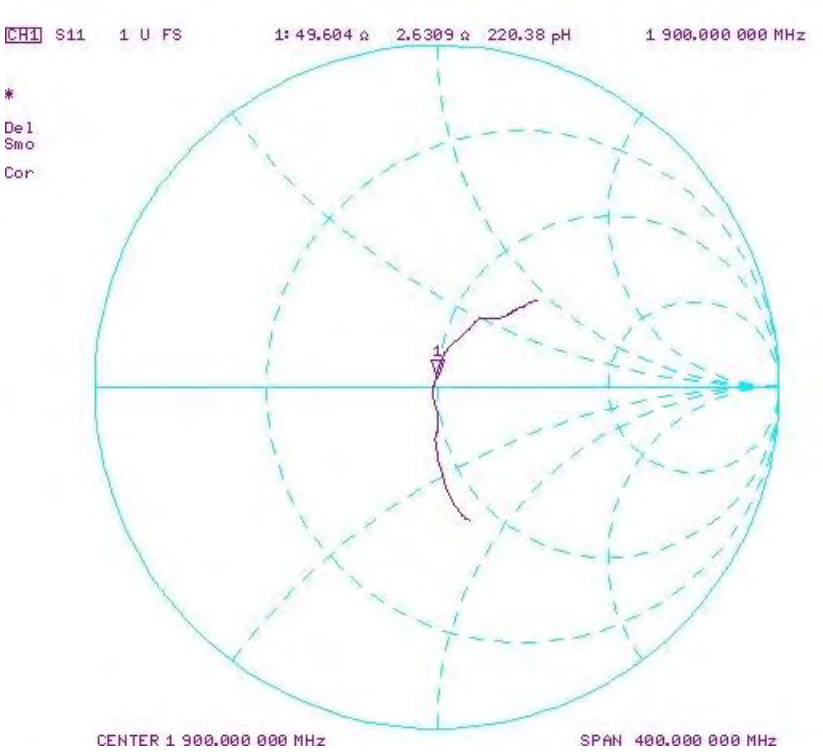
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

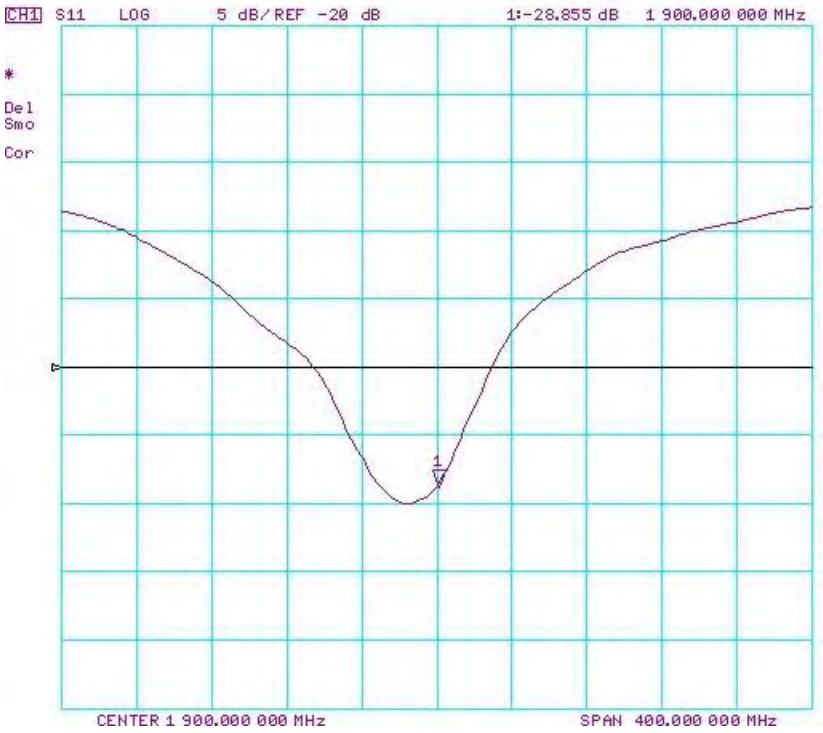
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2018	1.2	3.95	3.99	1.01%	2.06	2.07	0.49%	53.7	49.6	4.1	4.6	2.6	2	-24.9	-28.9	-16.10%	PASS

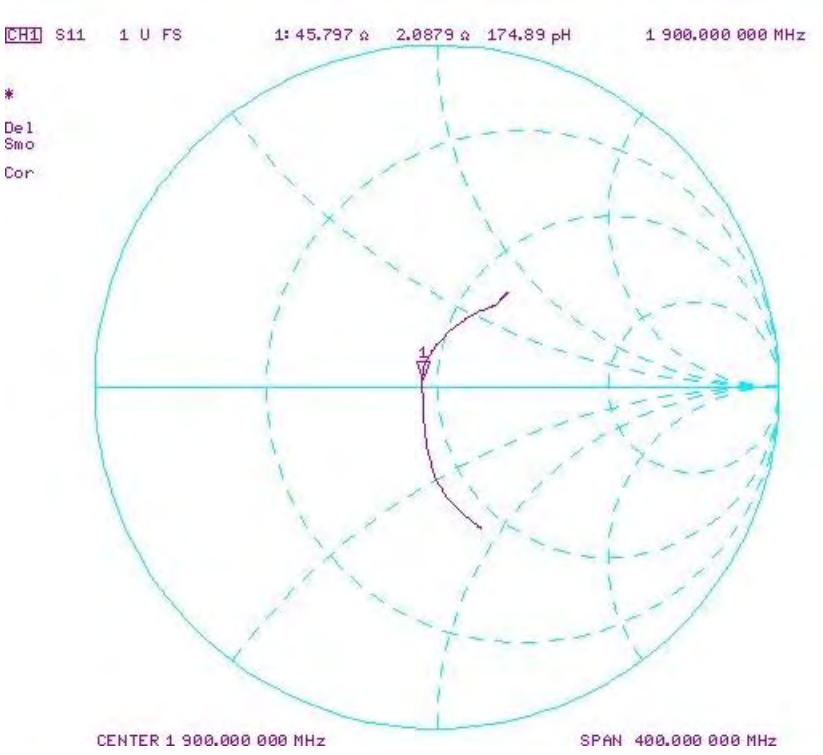
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2018	1.2	3.95	4.13	4.56%	2.09	2.14	2.39%	49.2	45.8	3.4	5.6	2.1	3.5	-24.8	-24.7	0.40%	PASS

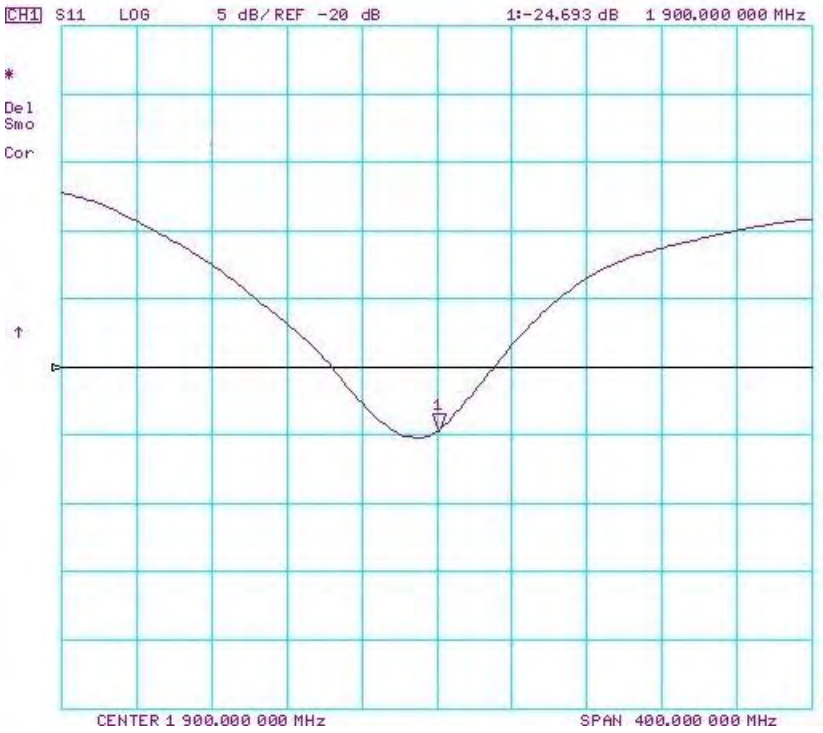
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





Certification of Calibration

Object	D1900V2 – SN: 5d181
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 7, 2019
Description:	SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	E4438C	ESG Vector Signal Generator	6/27/2019	Annual	6/27/2020	MY45093852
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/28/2018	Biennial	2/28/2020	170330160
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	11/1/2017	Biennial	11/1/2019	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/7/2019	Annual	5/7/2020	1070
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7490
SPEAG	DAE4	Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

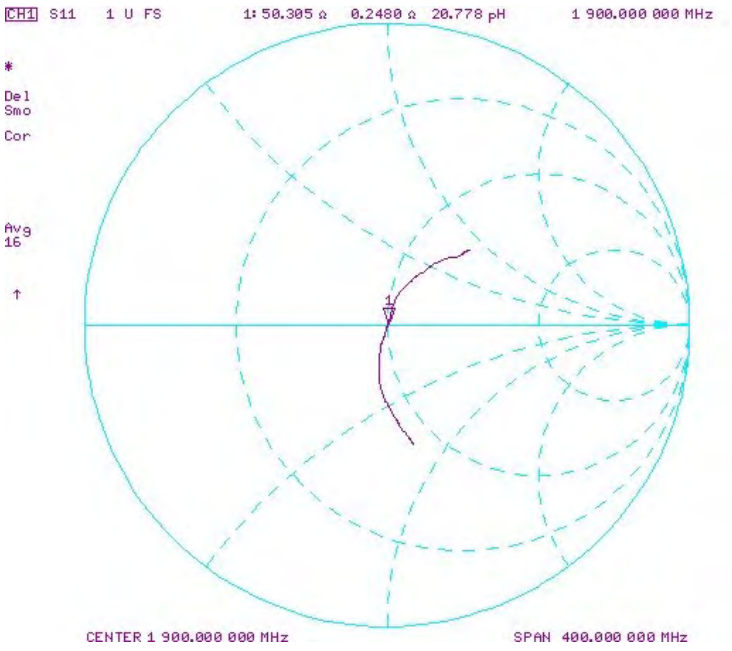
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

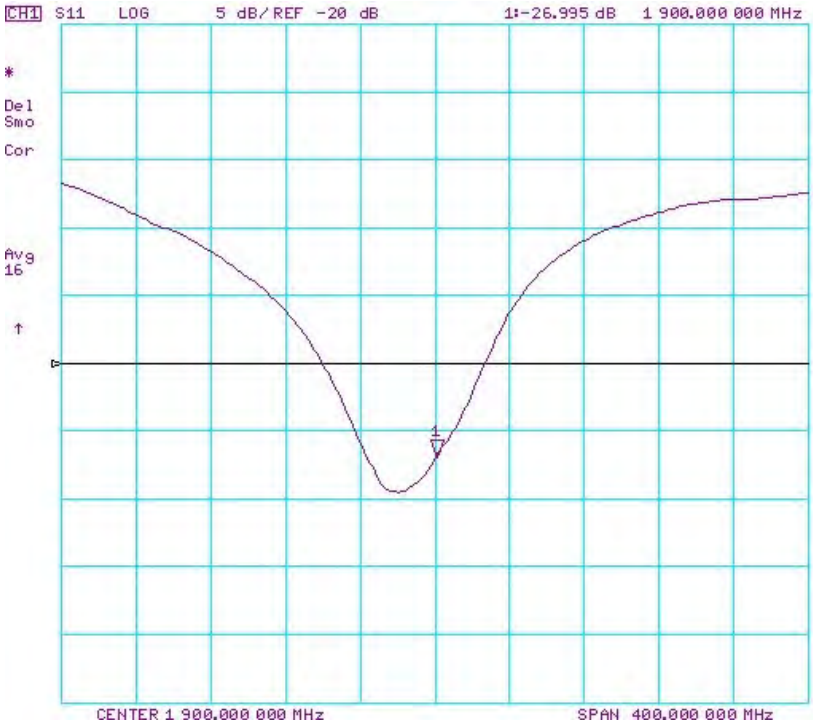
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2019	1.2	3.95	3.92	-0.76%	2.06	2.04	-0.97%	53.7	50.3	3.4	4.6	0.2	4.4	-24.9	-27	-8.40%	PASS

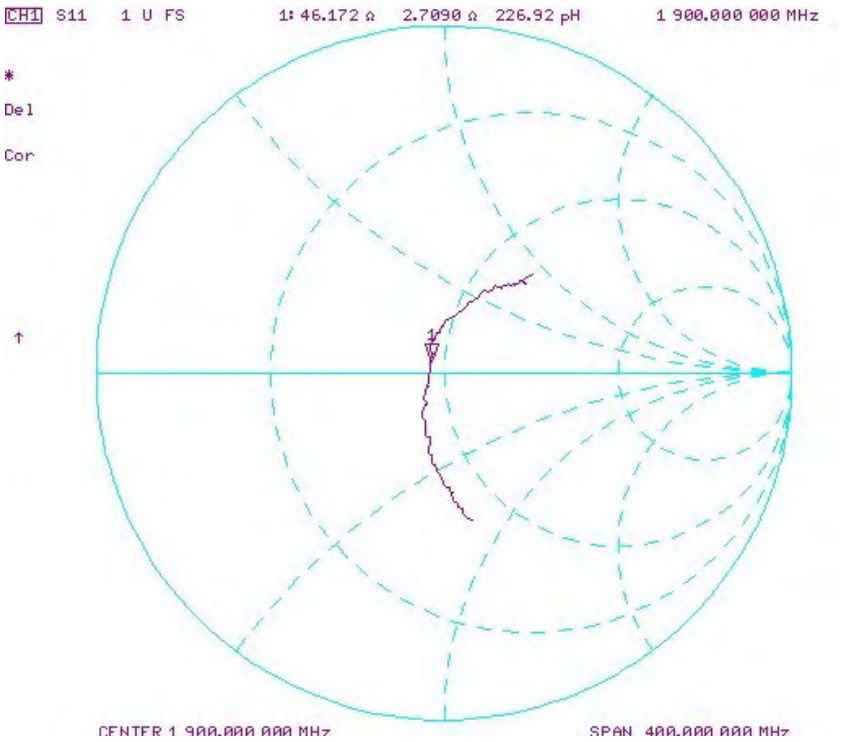
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/7/2017	9/7/2019	1.2	3.95	4.05	2.53%	2.09	2.1	0.48%	49.2	46.2	3	5.6	2.7	2.9	-24.8	-23.1	6.90%	PASS

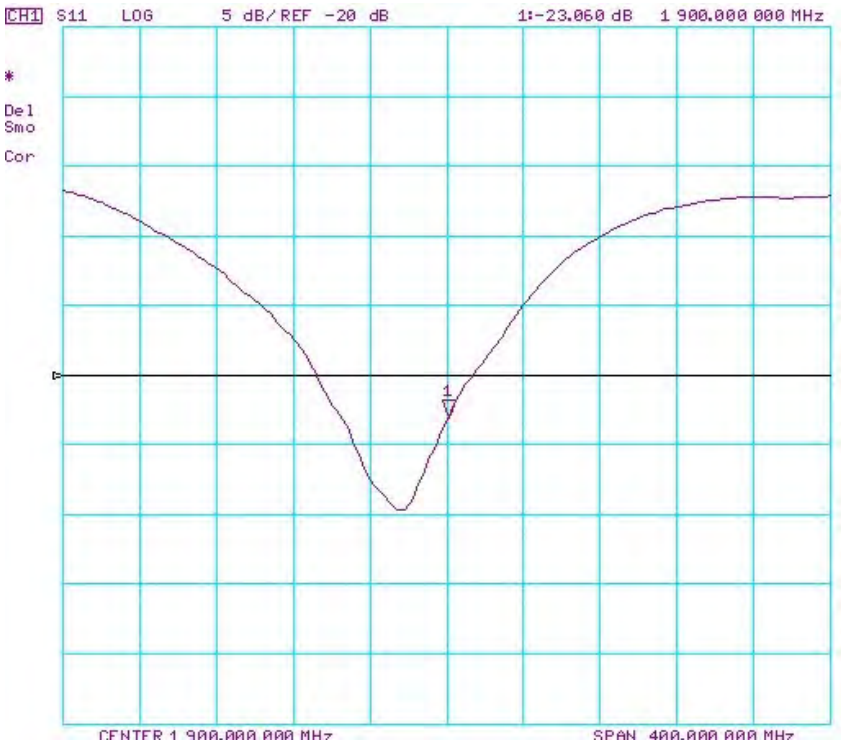
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d030_Jun19**

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d030

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: June 19, 2019

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	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512476	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

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

Issued: June 20, 2019

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	V52.10.2
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	41.4 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.9 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.2 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 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	50.0 Ω + 4.2 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω + 5.4 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.191 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

DASY5 Validation Report for Head TSL

Date: 19.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d030

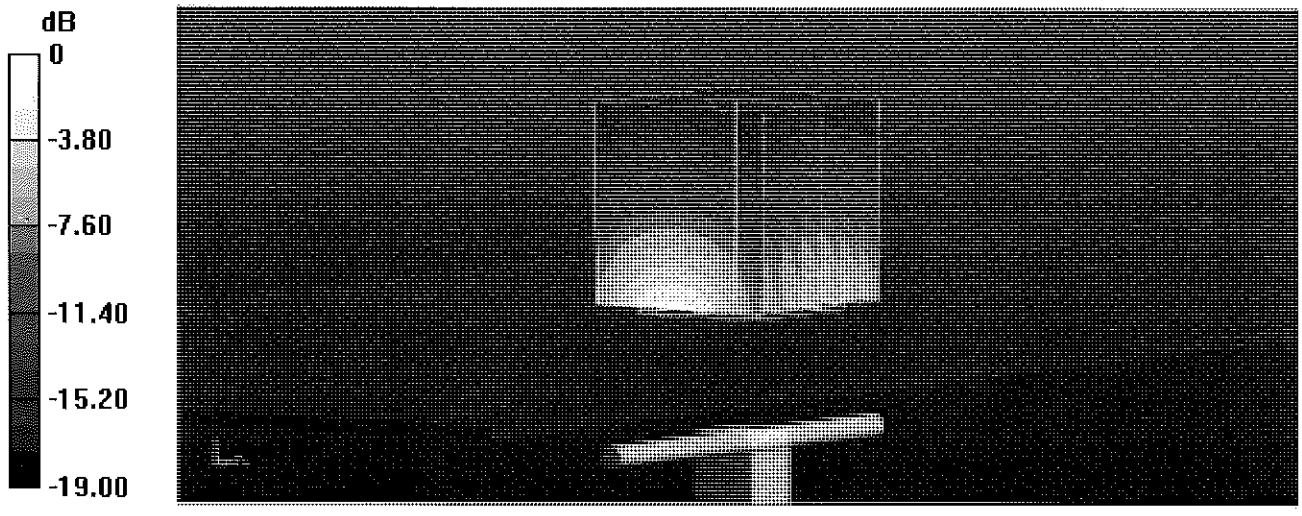
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.44, 8.44, 8.44) @ 1900 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

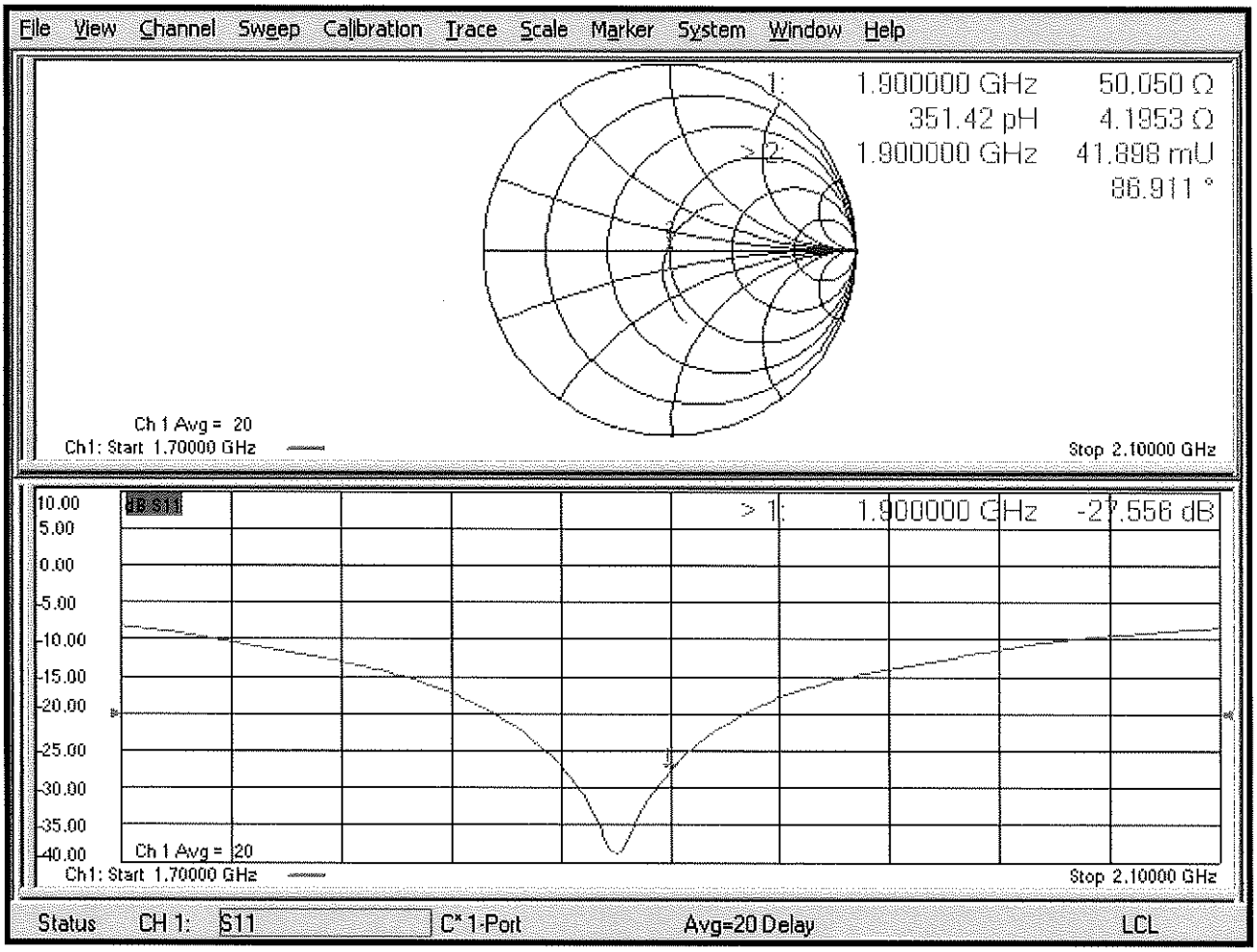
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.2 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.85 W/kg; SAR(10 g) = 5.19 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d030

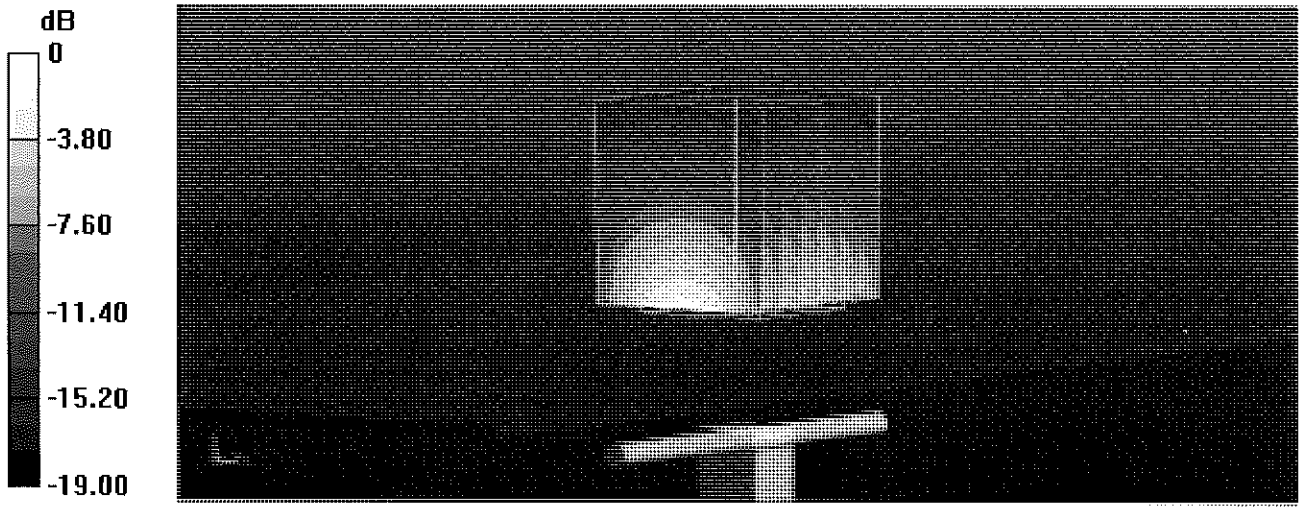
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.42, 8.42, 8.42) @ 1900 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

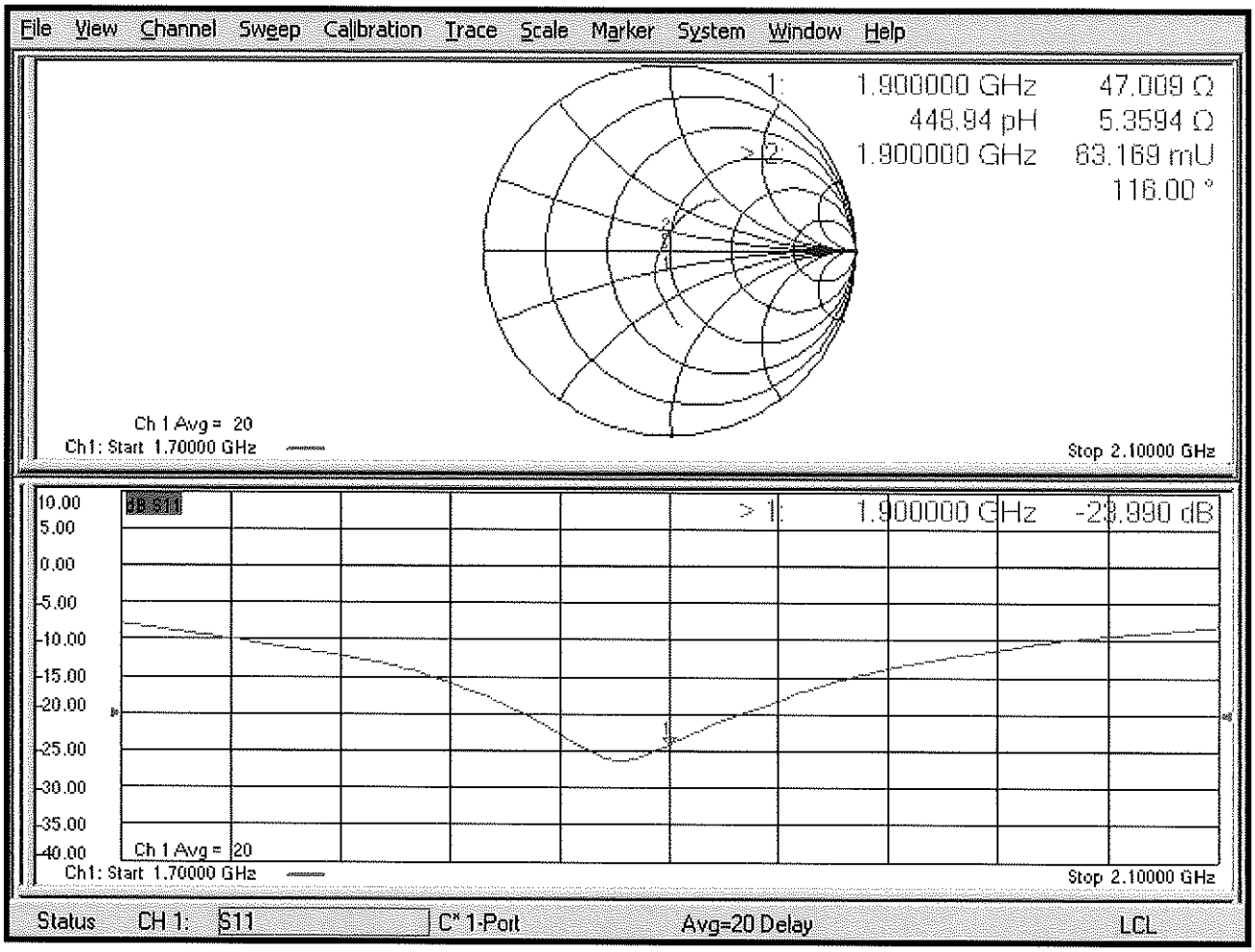
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.1 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 9.86 W/kg; SAR(10 g) = 5.24 W/kg
Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object D1900V2 – SN: 5d030

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: June 19, 2020

Description: SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	1/16/2020	Annual	1/16/2021	US39170118
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1207470
Anritsu	MA2411B	Pulse Power Sensor	1/21/2020	Annual	1/21/2021	1339007
Anritsu	ML2495A	Power Meter	1/15/2020	Annual	1/15/2021	1328004
Control Company	62344-734	Therm./ Clock/ Humidity Monitor	3/18/2019	Biennial	3/18/2021	192038436
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181292000
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	7/18/2019	Annual	7/18/2020	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/14/2020	Annual	1/14/2021	793
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2020	Annual	5/12/2021	1070
SPEAG	EX3DV4	SAR Probe	1/20/2020	Annual	1/20/2021	3837

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Parker Jones	Team Lead Engineer	Parker Jones
Approved By:	Kaitlin O'Keefe	Managing Director	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

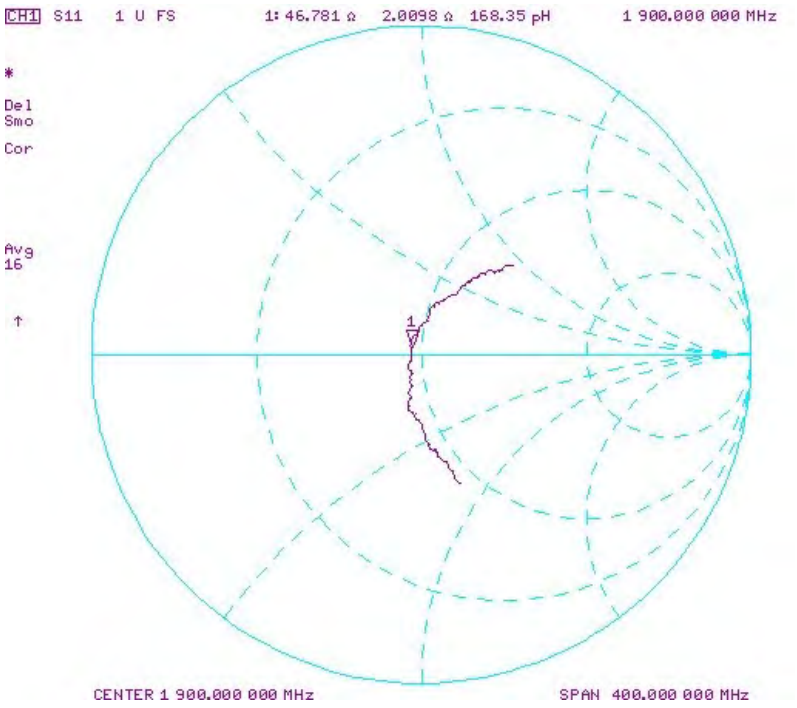
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

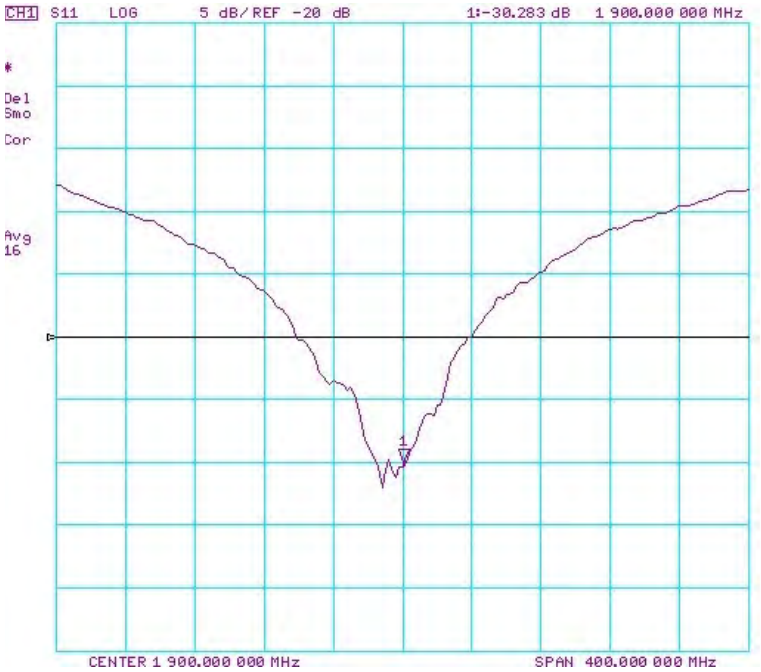
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
6/19/2019	6/19/2020	1.191	3.99	4.3	7.77%	2.09	2.2	5.26%	50	46.8	3.2	4.2	2	2.2	-27.6	-30.3	-9.80%	PASS

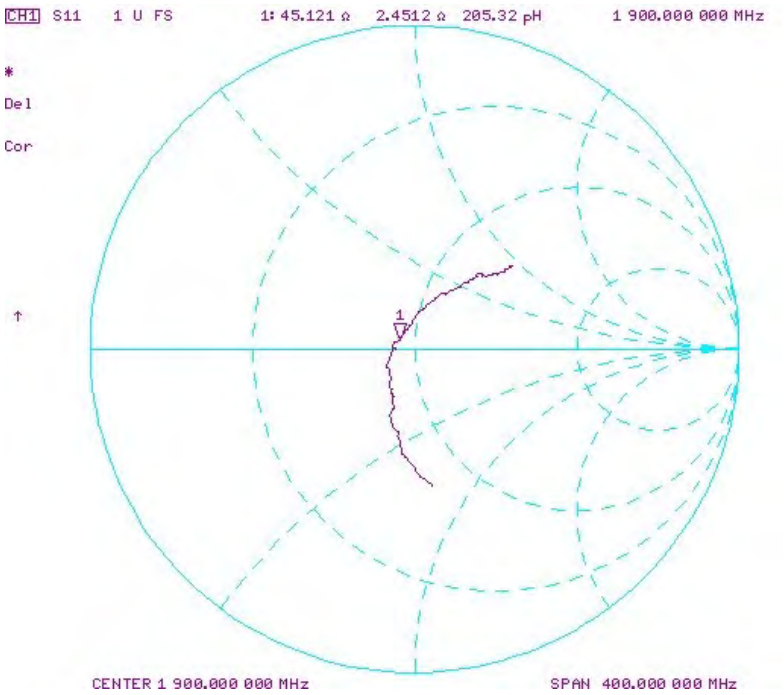
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
6/19/2019	6/19/2020	1.191	3.99	4.29	7.52%	2.11	2.2	4.27%	47	45.1	1.9	5.4	2.5	2.9	-24	-25	-4.20%	PASS

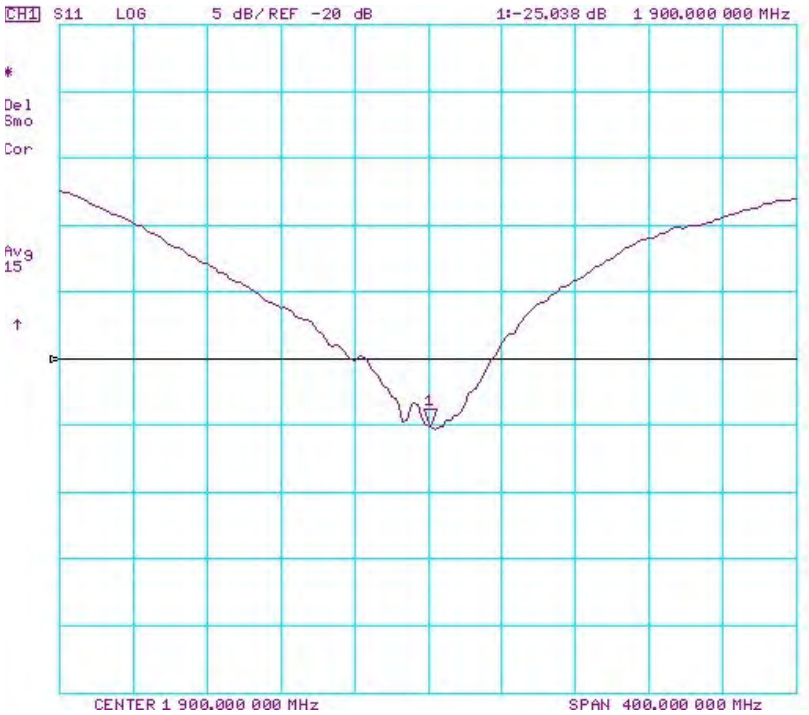
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: **SCS 0108**

Client: PC Test

Certificate No: **D2300V2-1038_Mar18**

CALIBRATION CERTIFICATE

Object: D2300V2 - SN: 1038

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

SC ✓ 3/21/18
SC ✓ 2/25/19
ATM ✓ 6/10/2020

Calibration date: March 07, 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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 9, 2018

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	2300 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.70 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**49.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 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	52.9	1.81 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	1.86 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	11.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**46.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.69 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.5 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 - 4.9 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.9 Ω - 3.4 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.170 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 02, 2013

DASY5 Validation Report for Head TSL

Date: 07.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1038

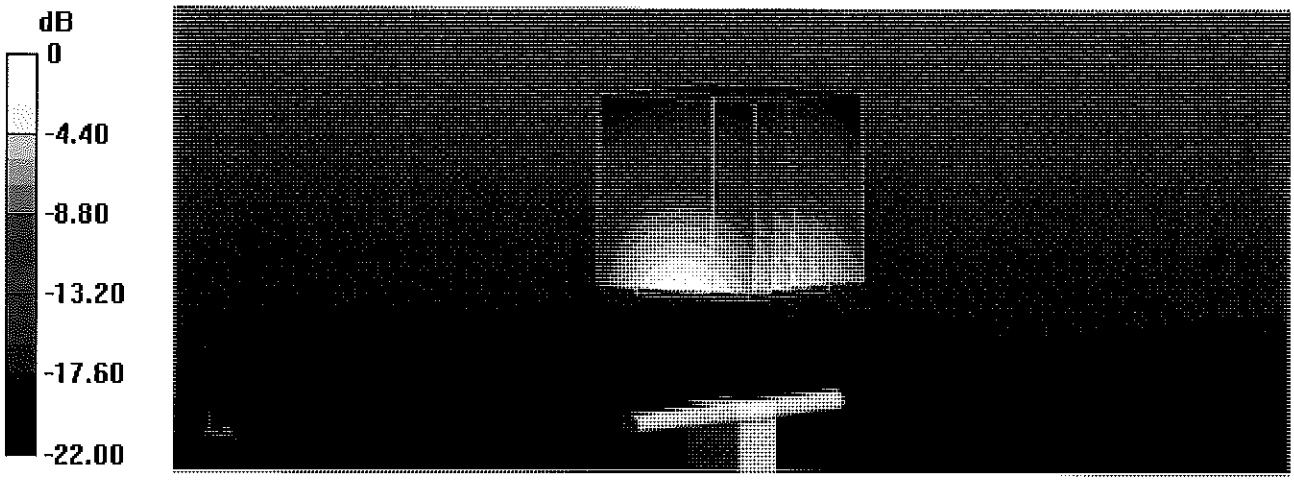
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.7 S/m; ε_r = 38.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08); 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)

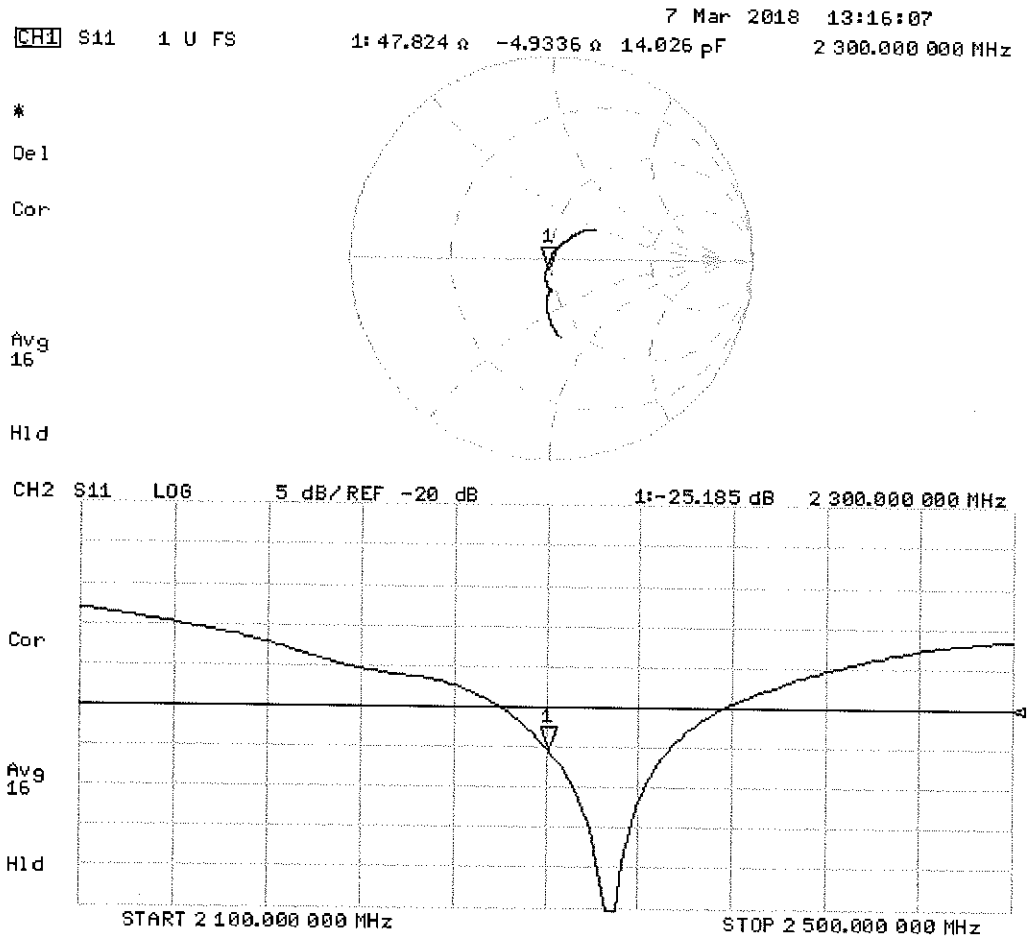
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 112.4 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 24.5 W/kg
SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.94 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1038

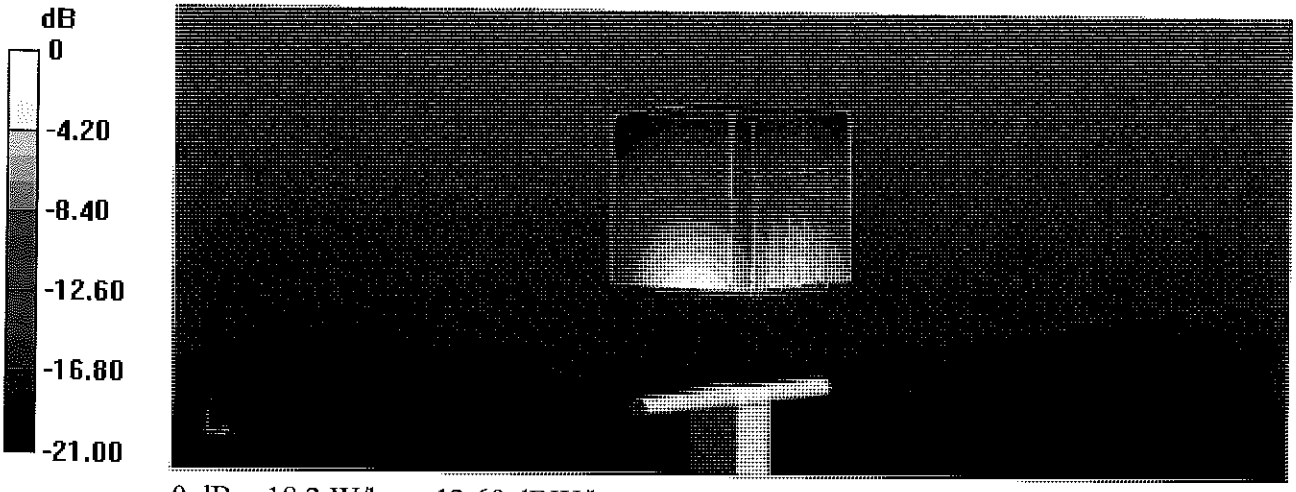
Communication System: UID 0 - CW; Frequency: 2300 MHz
Medium parameters used: f = 2300 MHz; σ = 1.86 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08); 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)

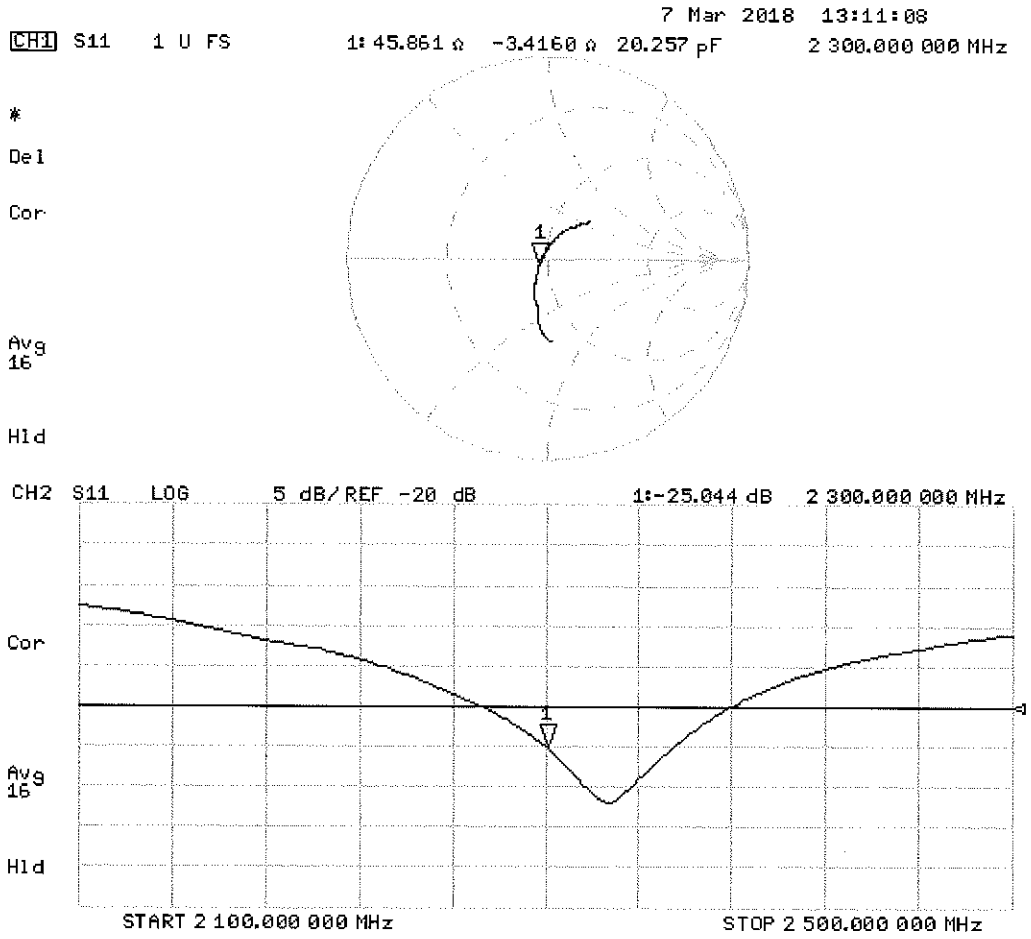
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.5 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 23.0 W/kg
SAR(1 g) = 11.9 W/kg; SAR(10 g) = 5.69 W/kg
Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL



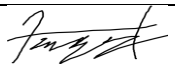
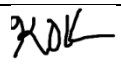
Certification of Calibration

Object	D2300V2 – SN: 1038
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	February 25, 2019
Description:	SAR Validation Dipole at 2300 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	N5182A	MXG Vector Signal Generator	6/15/2018	Annual	6/15/2019	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Anritsu	ML2496A	Power Meter	10/21/2018	Annual	10/21/2019	1138001
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Agilent	85033E	3.5mm Standard Calibration Kit	8/13/2018	Annual	8/13/2019	MY53402352
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/12/2018	Annual	4/12/2019	501
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/18/2018	Annual	10/18/2019	1364
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	4/12/2018	Annual	4/12/2019	3275
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7491

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Team Lead Engineer	
Approved By:	Kaitlin O'Keefe	Managing Director