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10899	AAD	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.67	± 9.6 %
10900	AAD	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10901	AAD	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10902	AAD	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10903	AAD	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10904	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10905	AAD	5G NR (DFT-s-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10906	AAD	5G NR (DFT-s-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10907	AAD	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.78	± 9.6 %
10908	AAD	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10909	AAD	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.96	± 9.6 %
10910	AAD	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10911	AAD	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10912	AAD	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10913	AAD	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10914	AAD	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.85	± 9.6 %
10915	AAD	5G NR (DFT-s-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10916	AAD	5G NR (DFT-s-OFDM, 50% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10917	AAD	5G NR (DFT-s-OFDM, 50% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10918	AAD	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10919	AAD	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10920	AAD	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10921	AAD	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10922	AAD	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.82	± 9.6 %
10923	AAD	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10924	AAD	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10925	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.95	± 9.6 %
10926	AAD	5G NR (DFT-s-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10927	AAD	5G NR (DFT-s-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10928	AAD	5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10929	AAD	5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10930	AAD	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10931	AAD	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10932	AAB	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10933	AAA	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10934	AAA	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10935	AAA	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10936	AAC	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10937	AAB	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.77	± 9.6 %
10938	AAB	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10939	AAB	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.82	± 9.6 %
10940	AAB	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.89	± 9.6 %
10941	AAB	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10942	AAB	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10943	AAB	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.95	± 9.6 %
10944	AAB	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.81	± 9.6 %
10945	AAB	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10946	AAC	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10947	AAB	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10948	AAB	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10949	AAB	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10950	AAB	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10951	AAB	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.92	± 9.6 %
10952	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.25	± 9.6 %
10953	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.15	± 9.6 %
10954	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.23	± 9.6 %
10955	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.42	± 9.6 %
10956	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.14	± 9.6 %
10957	AAC	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.31	± 9.6 %

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10958	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.61	± 9.6 %
10959	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.33	± 9.6 %
10960	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.32	± 9.6 %
10961	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.36	± 9.6 %
10962	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.40	± 9.6 %
10963	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10964	AAB	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.29	± 9.6 %
10965	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.37	± 9.6 %
10966	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10967	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.42	± 9.6 %
10968	AAB	5G NR DL (CP-OFDM, TM 3.1, 100 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.49	± 9.6 %
10972	AAB	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	11.59	± 9.6 %
10973	AAB	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	9.06	± 9.6 %
10974	AAB	5G NR (CP-OFDM, 100% RB, 100 MHz, 256-QAM, 30 kHz)	5G NR FR1 TDD	10.28	± 9.6 %
10978	AAA	ULLA BDR	ULLA	1.16	± 9.6 %
10979	AAA	ULLA HDR4	ULLA	8.58	± 9.6 %
10980	AAA	ULLA HDR8	ULLA	10.32	± 9.6 %
10981	AAA	ULLA HDRp4	ULLA	3.19	± 9.6 %
10982	AAA	ULLA HDRp8	ULLA	3.43	± 9.6 %
10983	AAC	5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.31	± 9.6 %
10984	AAB	5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.42	± 9.6 %
10985	AAC	5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.54	± 9.6 %
10986	AAB	5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.50	± 9.6 %
10987	AAC	5G NR DL (CP-OFDM, TM 3.1, 60 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.53	± 9.6 %
10988	AAB	5G NR DL (CP-OFDM, TM 3.1, 70 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.38	± 9.6 %
10989	AAC	5G NR DL (CP-OFDM, TM 3.1, 80 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.33	± 9.6 %
10990	AAB	5G NR DL (CP-OFDM, TM 3.1, 90 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.52	± 9.6 %
11003	AAA	5G NR DL (CP-OFDM, TM 3.1, 30 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	10.24	± 9.6 %
11004	AAA	5G NR DL (CP-OFDM, TM 3.1, 30 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	10.73	± 9.6 %
11005	AAA	5G NR DL (CP-OFDM, TM 3.1, 25 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.70	± 9.6 %
11006	AAA	5G NR DL (CP-OFDM, TM 3.1, 30 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.55	± 9.6 %
11007	AAA	5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.46	± 9.6 %
11008	AAA	5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.51	± 9.6 %
11009	AAA	5G NR DL (CP-OFDM, TM 3.1, 25 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.76	± 9.6 %
11010	AAA	5G NR DL (CP-OFDM, TM 3.1, 30 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.95	± 9.6 %
11011	AAA	5G NR DL (CP-OFDM, TM 3.1, 40 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.96	± 9.6 %
11012	AAA	5G NR DL (CP-OFDM, TM 3.1, 50 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.68	± 9.6 %
11013	AAB	IEEE 802.11be (320MHz, MCS1, 99pc duty cycle)	WLAN	8.47	± 9.6 %
11014	AAB	IEEE 802.11be (320MHz, MCS2, 99pc duty cycle)	WLAN	8.45	± 9.6 %
11015	AAB	IEEE 802.11be (320MHz, MCS3, 99pc duty cycle)	WLAN	8.44	± 9.6 %
11016	AAB	IEEE 802.11be (320MHz, MCS4, 99pc duty cycle)	WLAN	8.44	± 9.6 %
11017	AAB	IEEE 802.11be (320MHz, MCS5, 99pc duty cycle)	WLAN	8.41	± 9.6 %
11018	AAB	IEEE 802.11be (320MHz, MCS6, 99pc duty cycle)	WLAN	8.40	± 9.6 %
11019	AAB	IEEE 802.11be (320MHz, MCS7, 99pc duty cycle)	WLAN	8.29	± 9.6 %
11020	AAB	IEEE 802.11be (320MHz, MCS8, 99pc duty cycle)	WLAN	8.27	± 9.6 %
11021	AAB	IEEE 802.11be (320MHz, MCS9, 99pc duty cycle)	WLAN	8.46	± 9.6 %
11022	AAB	IEEE 802.11be (320MHz, MCS10, 99pc duty cycle)	WLAN	8.36	± 9.6 %
11023	AAB	IEEE 802.11be (320MHz, MCS11, 99pc duty cycle)	WLAN	8.09	± 9.6 %
11024	AAB	IEEE 802.11be (320MHz, MCS12, 99pc duty cycle)	WLAN	8.42	± 9.6 %
11025	AAB	IEEE 802.11be (320MHz, MCS13, 99pc duty cycle)	WLAN	8.37	± 9.6 %
11026	AAB	IEEE 802.11be (320MHz, MCS0, 99pc duty cycle)	WLAN	8.39	± 9.6 %

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

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Client: 7layers **Certificate No: 24J02Z000853**

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1200
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 7, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 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	41.7 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	-----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.42 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.55 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5Ω- 5.04jΩ
Return Loss	- 25.2dB

General Antenna Parameters and Design

Electrical Delay (one direction)	0.939 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-07

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1200

Communication System: UID 0, CW; Frequency: 750 MHz

Medium parameters used: f = 750 MHz; σ = 0.903 S/m; ε_r = 41.65; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(9.85, 9.85, 9.85) @ 750 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 54.97 V/m; Power Drift = -0.01 dB

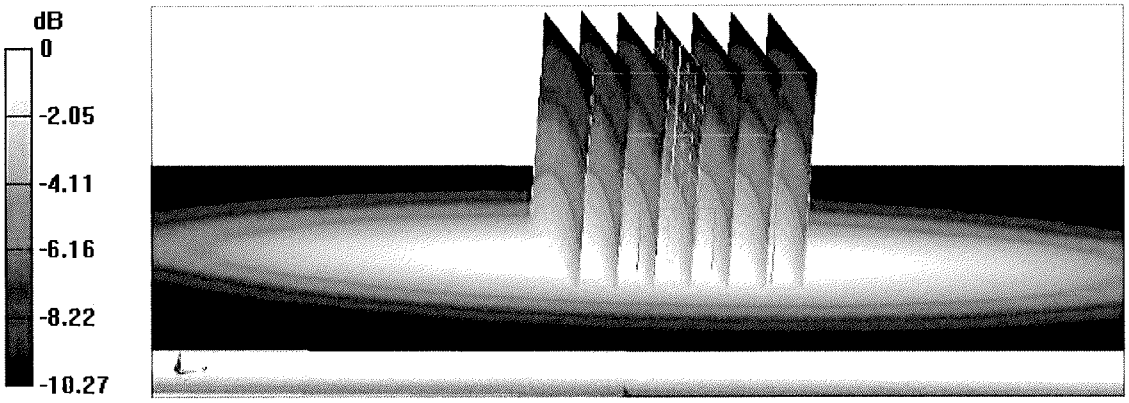
Peak SAR (extrapolated) = 3.39 W/kg

SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.4 W/kg

Smallest distance from peaks to all points 3 dB below = 17 mm

Ratio of SAR at M2 to SAR at M1 = 63.5%

Maximum value of SAR (measured) = 2.92 W/kg



0 dB = 2.92 W/kg = 4.65 dBW/kg

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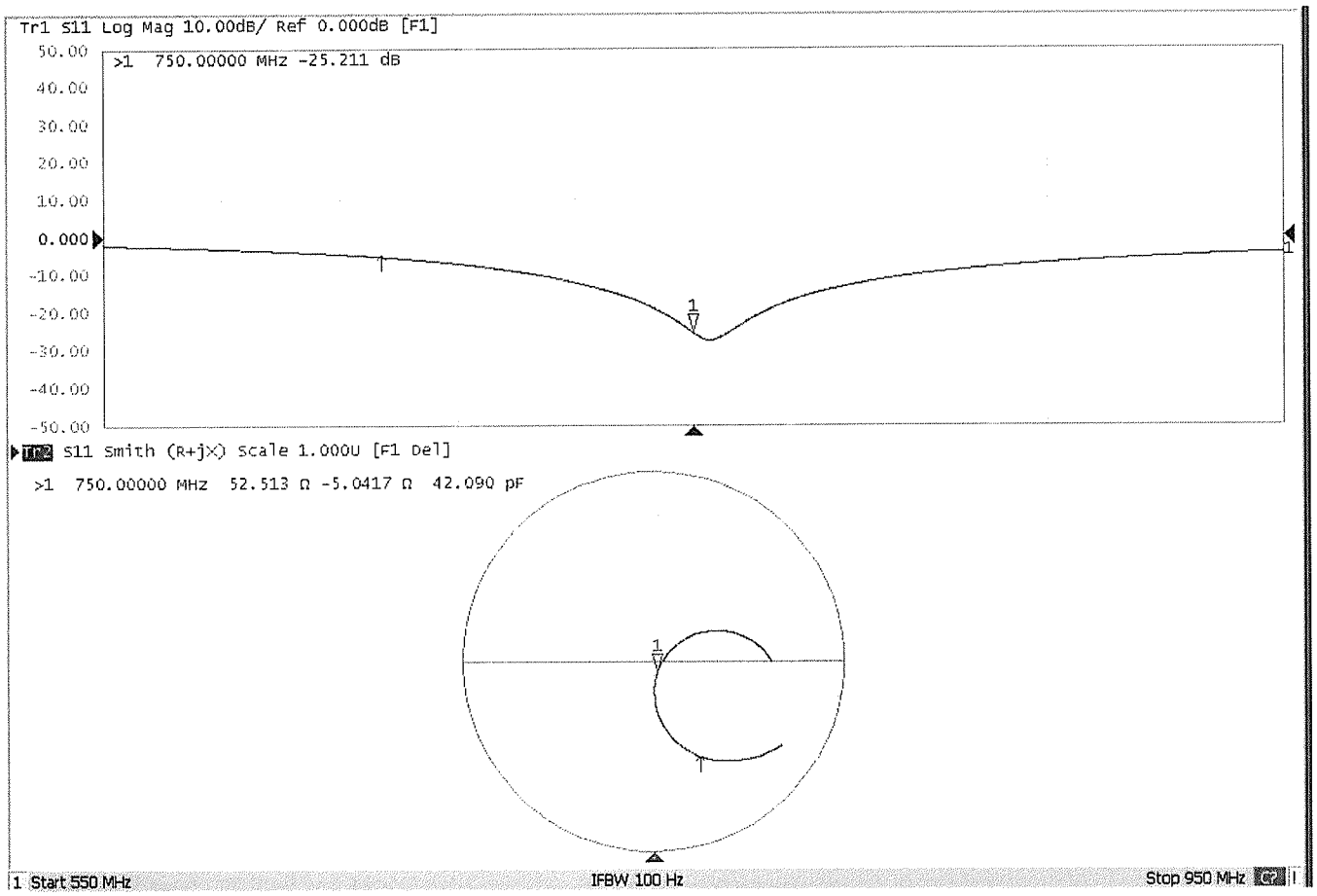
Impedance Measurement Plot for Head TSL



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Client **7layers** **Certificate No: 24J02Z000854**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d265
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 4, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.6 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.63 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.33 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.4Ω- 1.88jΩ
Return Loss	- 32.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.304 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-04

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d265

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

Medium parameters used: f = 835 MHz; σ = 0.916 S/m; ε_r = 41.57; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(9.85, 9.85, 9.85) @ 835 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 58.33 V/m; Power Drift = -0.01 dB

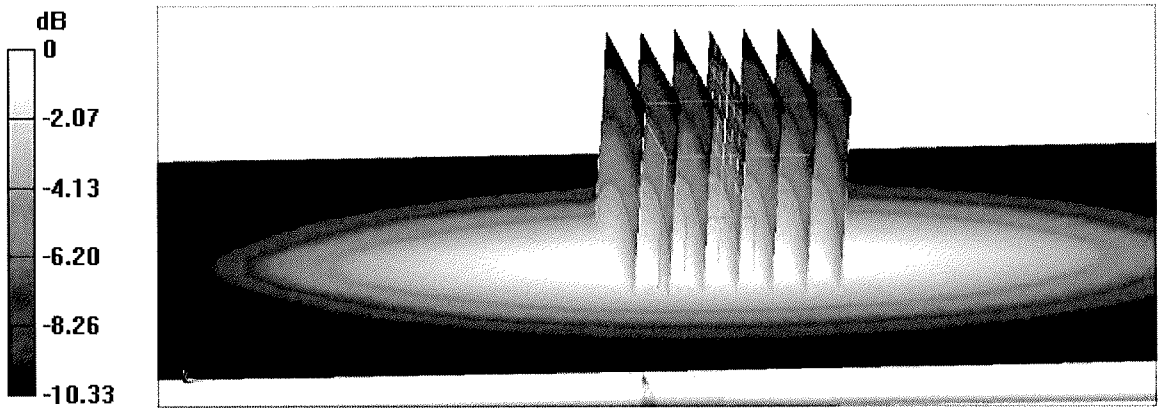
Peak SAR (extrapolated) = 3.87 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg

Smallest distance from peaks to all points 3 dB below = 17.5 mm

Ratio of SAR at M2 to SAR at M1 = 63.5%

Maximum value of SAR (measured) = 3.35 W/kg



0 dB = 3.35 W/kg = 5.25 dBW/kg

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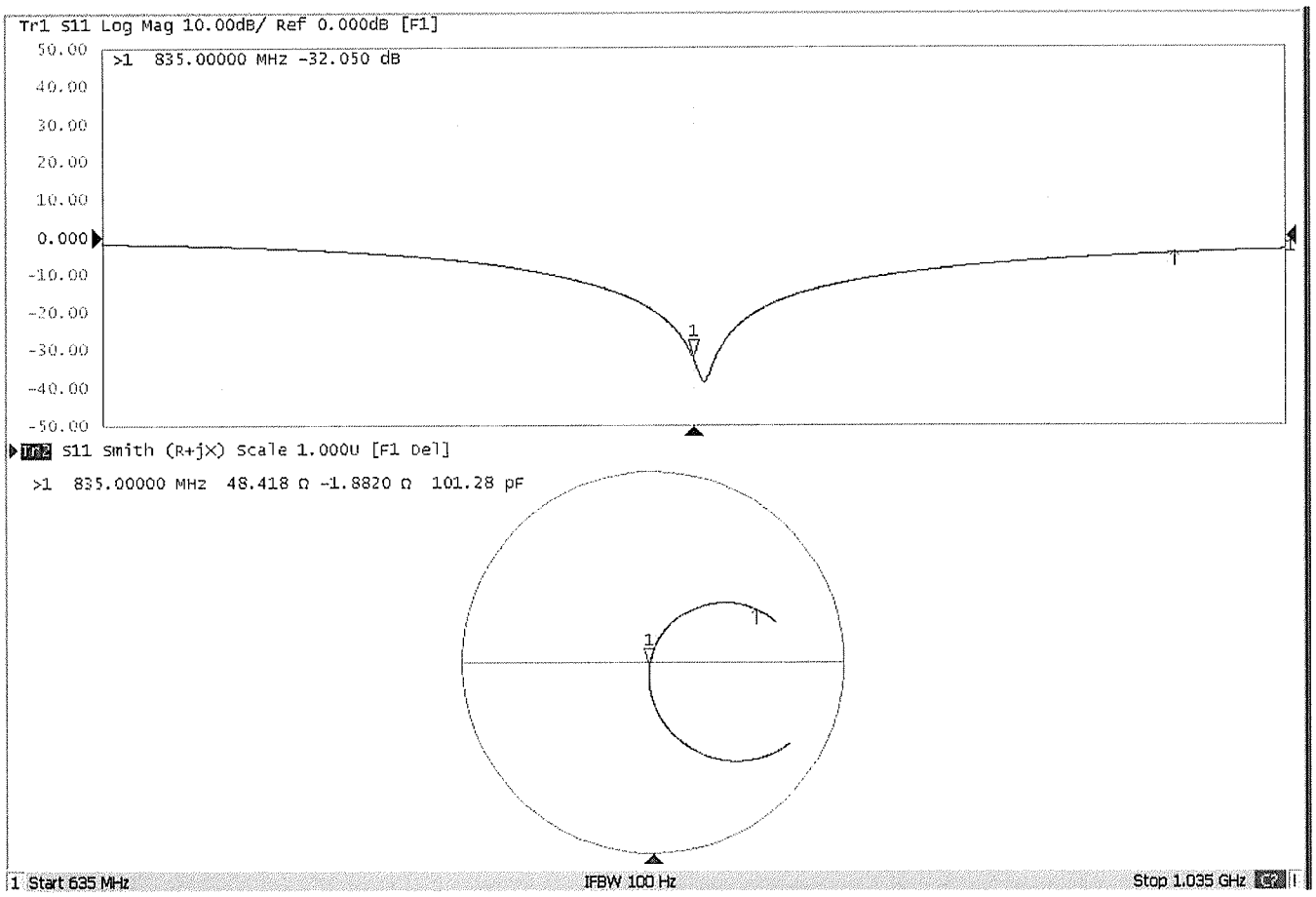
Impedance Measurement Plot for Head TSL



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Client **7layers** **Certificate No: 24J02Z000856**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1176
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 6, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 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	41.1 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.7 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.5 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6Ω- 2.87jΩ
Return Loss	- 30.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.135 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-06

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1176

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

Medium parameters used: f = 1750 MHz; σ = 1.384 S/m; ε_r = 41.11; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(8.22, 8.22, 8.22) @ 1750 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 97.34 V/m; Power Drift = -0.03 dB

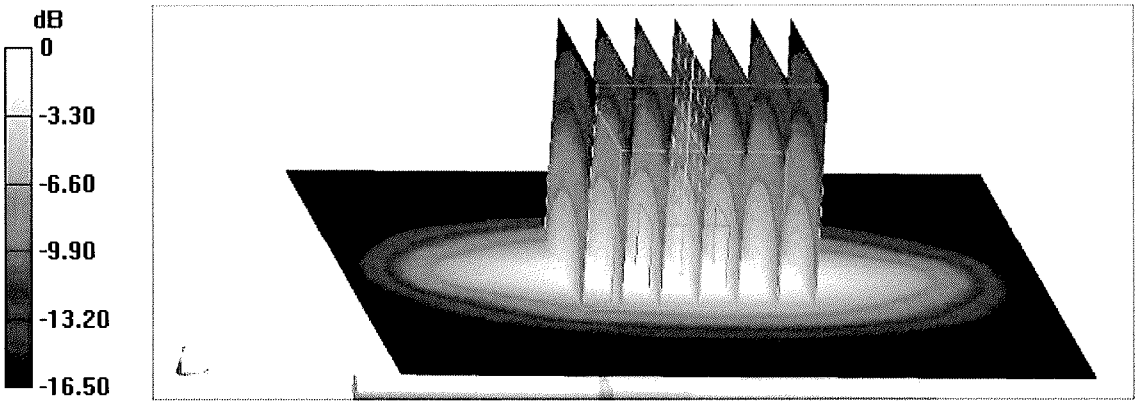
Peak SAR (extrapolated) = 17.0 W/kg

SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.87 W/kg

Smallest distance from peaks to all points 3 dB below = 9.5 mm

Ratio of SAR at M2 to SAR at M1 = 54.8%

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

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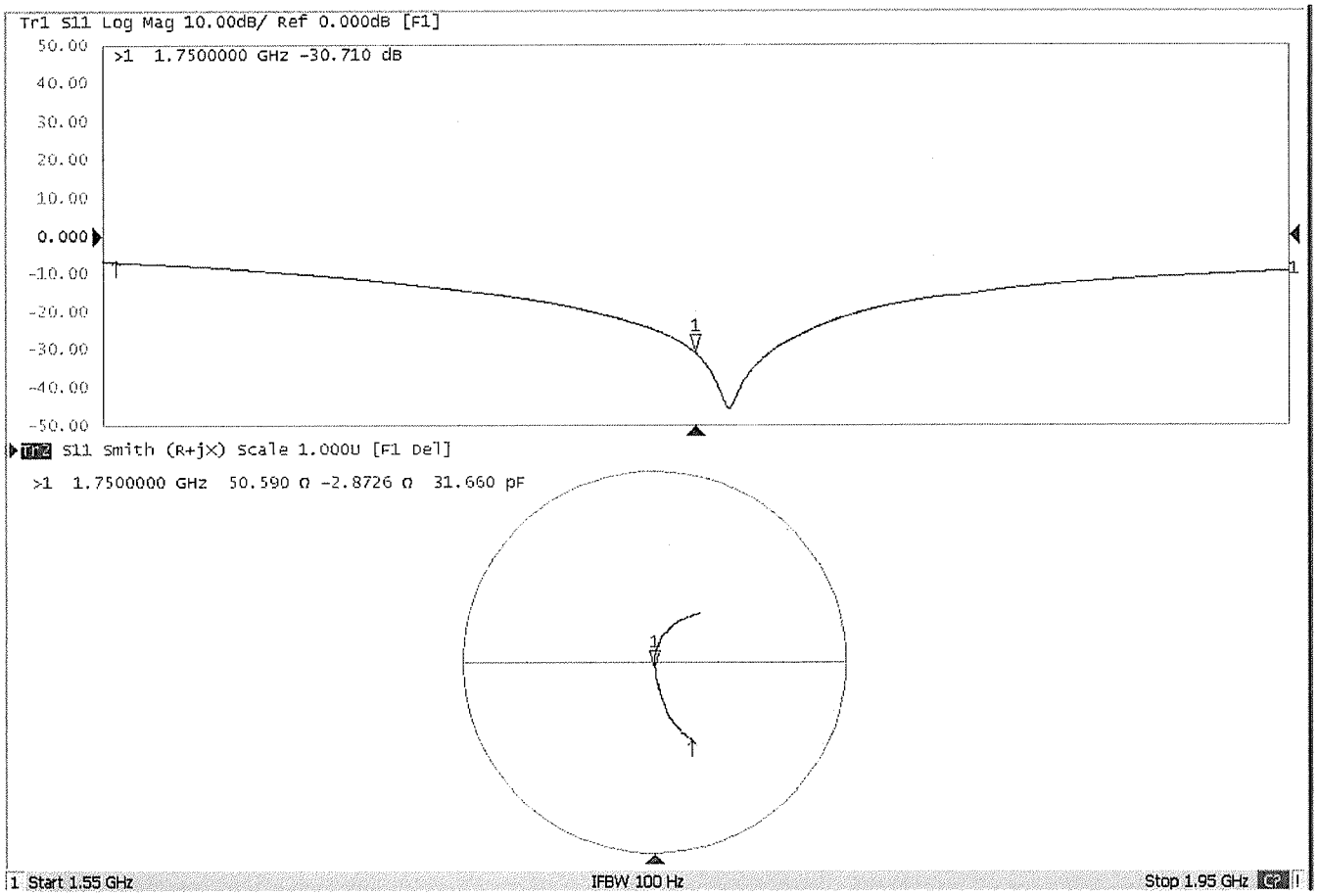
Impedance Measurement Plot for Head TSL



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Client: 7layers **Certificate No: 24J02Z000857**

CALIBRATION CERTIFICATE

Object D1950V3 - SN: 1229

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

Calibration date: November 7, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1950 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.8 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.9 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.3Ω+ 2.24jΩ
Return Loss	- 28.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.098 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-07

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1950 MHz; Type: D1950V2; Serial: D1950V2 - SN: 1229

Communication System: UID 0, CW; Frequency: 1950 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1950 MHz; σ = 1.385 S/m; ε_r = 40.68; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.95, 7.95, 7.95) @ 1950 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 103.1 V/m; Power Drift = 0.00 dB

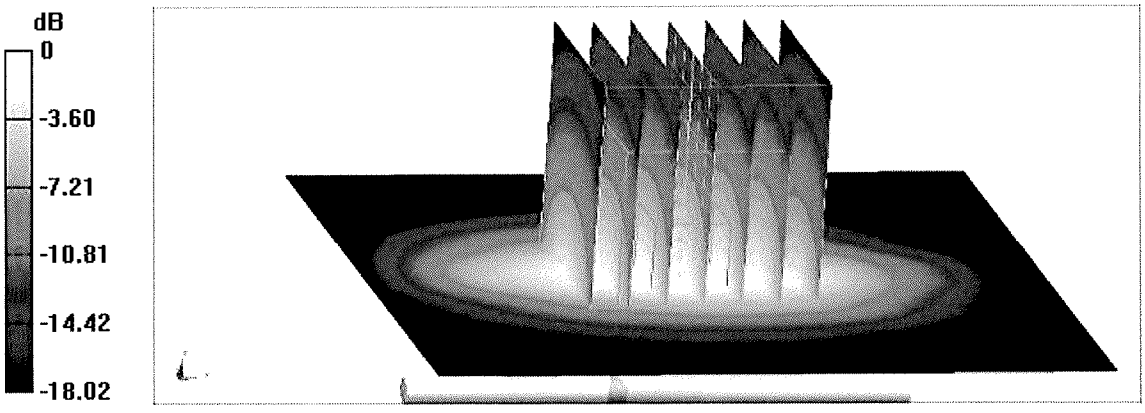
Peak SAR (extrapolated) = 19.3 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.18 W/kg

Smallest distance from peaks to all points 3 dB below = 9.1 mm

Ratio of SAR at M2 to SAR at M1 = 53.3%

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



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

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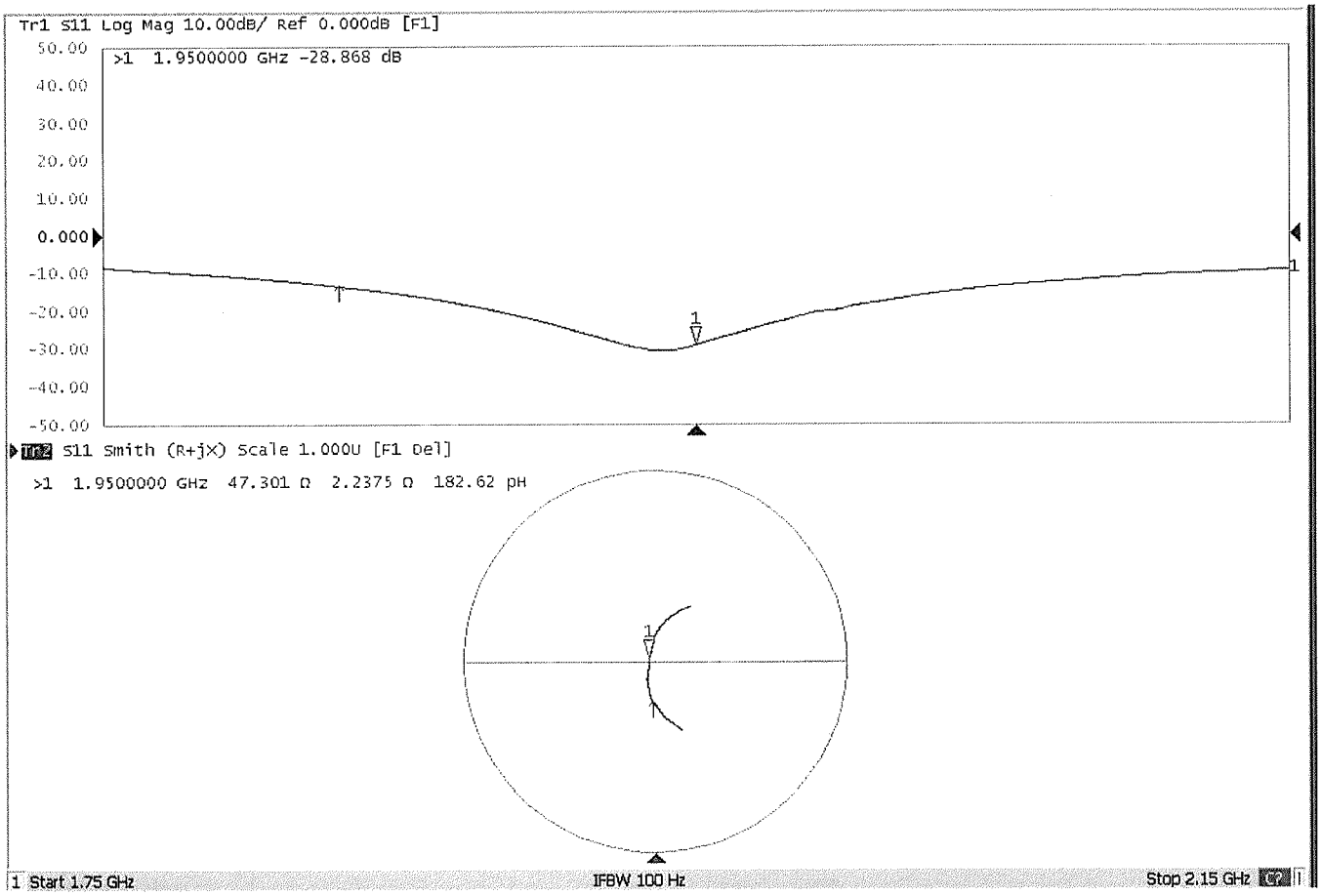
Impedance Measurement Plot for Head TSL



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Client **7layers** **Certificate No: 24J02Z000859**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 1048
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 6, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.3 W/kg ± 18.8 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 18.7 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.4Ω+ 9.16jΩ
Return Loss	- 20.2dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.059 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-06

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 1048

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

Medium parameters used: f = 2450 MHz; σ = 1.809 S/m; ε_r = 40.08; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.37, 7.37, 7.37) @ 2450 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 107.2 V/m; Power Drift = 0.00 dB

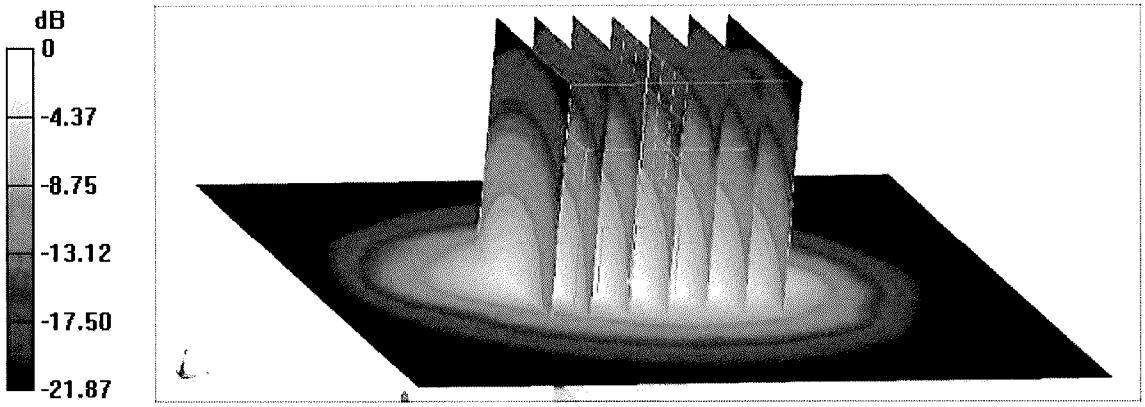
Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.14 W/kg

Smallest distance from peaks to all points 3 dB below = 8.5 mm

Ratio of SAR at M2 to SAR at M1 = 49.5%

Maximum value of SAR (measured) = 22.1 W/kg



0 dB = 22.1 W/kg = 13.44 dBW/kg

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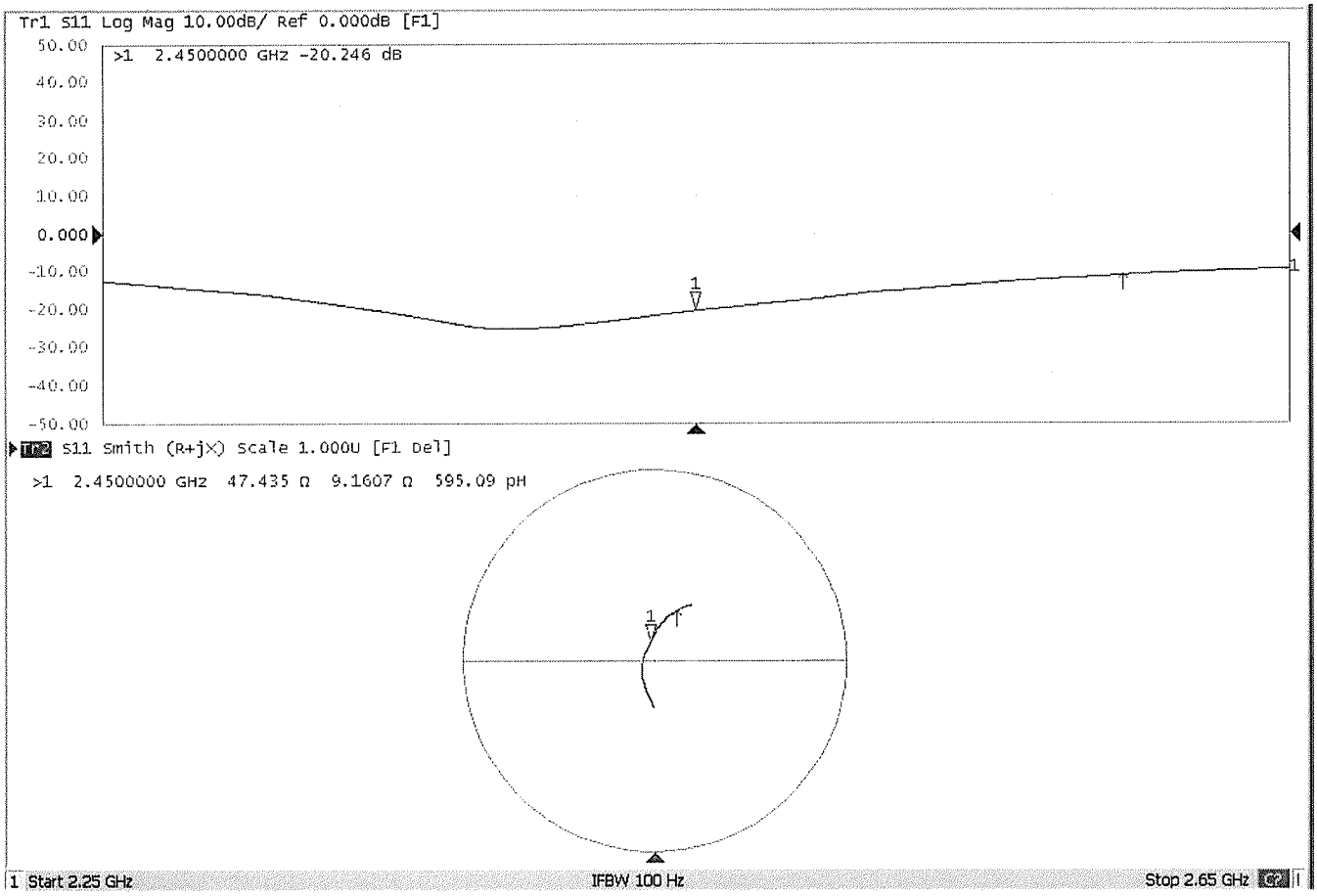
Impedance Measurement Plot for Head TSL



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

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Accreditation No.: SCS 0108

Client 7-Layers (Auden)

Certificate No: D2550V2-1022_Sep22

CALIBRATION CERTIFICATE

Object	D2550V2 - SN:1022
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	September 22, 2022

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-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	31-Aug-22 (No. DAE4-601_Aug22)	Aug-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: September 23, 2022

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) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2550 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.4 ± 6 %	1.95 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	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 4.0 jΩ
Return Loss	- 27.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.157 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: 22.09.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1022

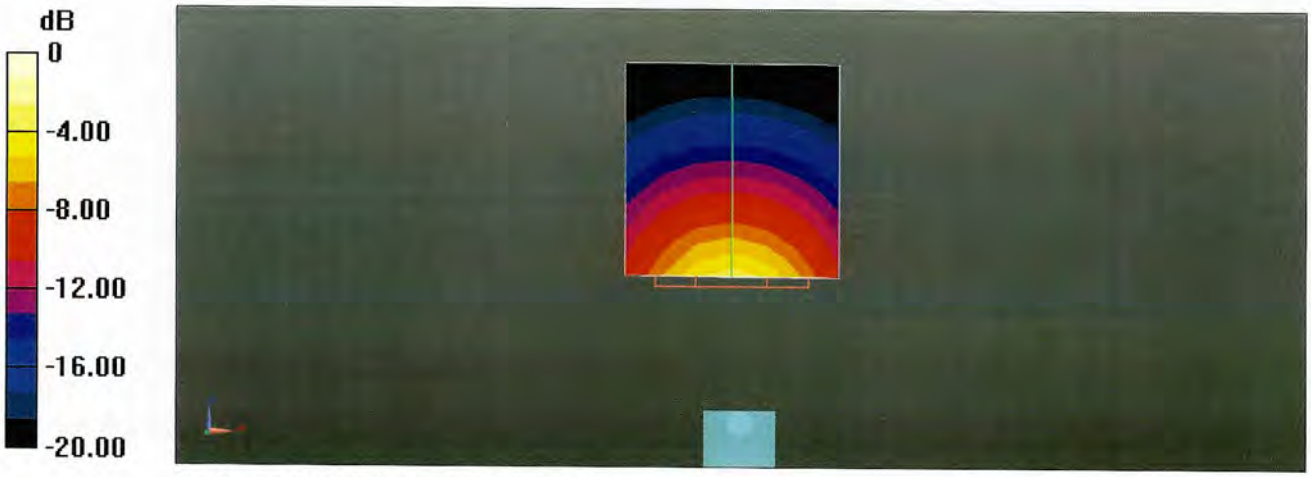
Communication System: UID 0 - CW; Frequency: 2550 MHz
Medium parameters used: f = 2550 MHz; σ = 1.95 S/m; ε_r = 37.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.85, 7.85, 7.85) @ 2550 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 31.08.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

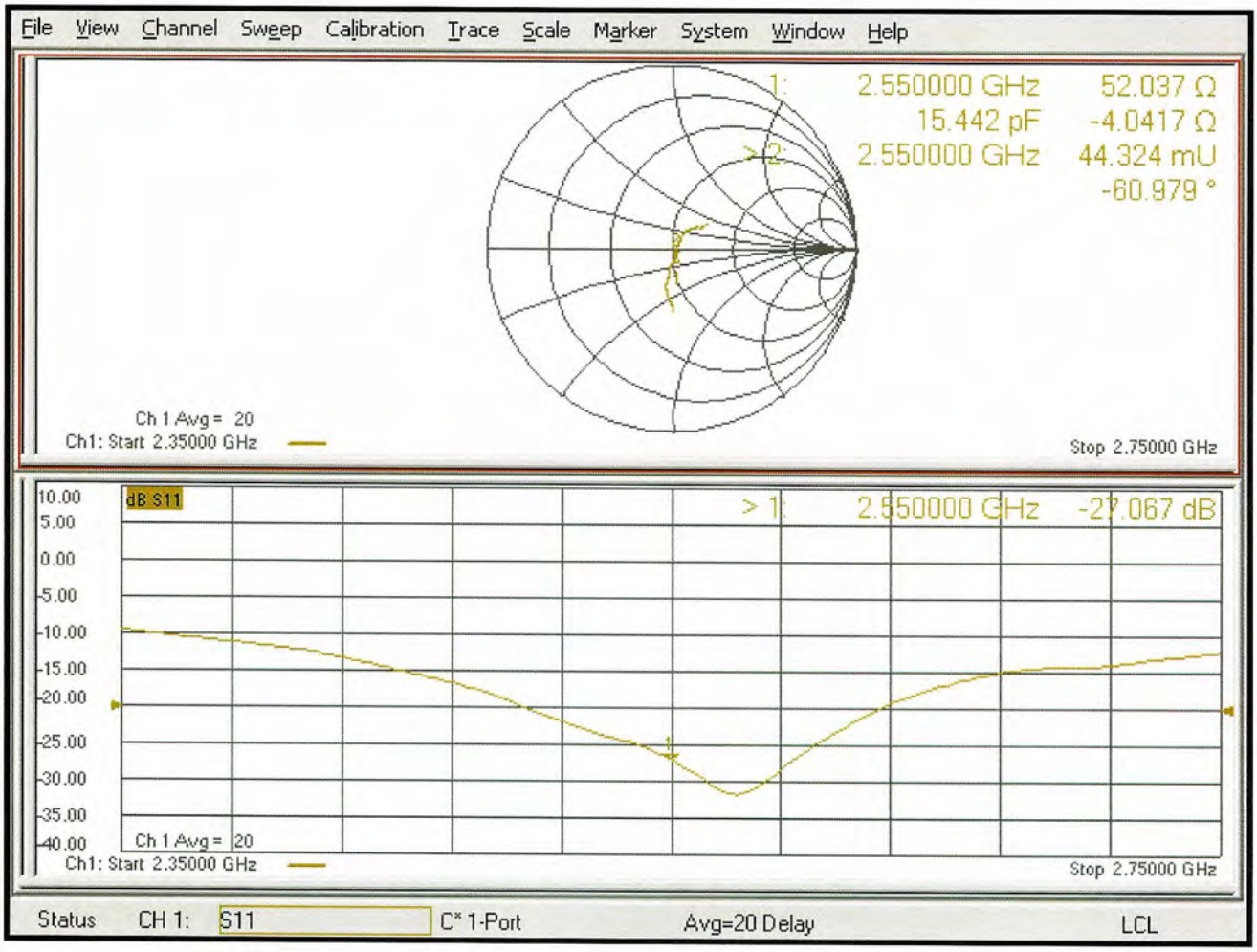
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.1 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.13 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 49%
Maximum value of SAR (measured) = 22.6 W/kg



0 dB = 22.6 W/kg = 13.54 dBW/kg

Impedance Measurement Plot for Head TSL



D2550V2 - SN: 1022 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

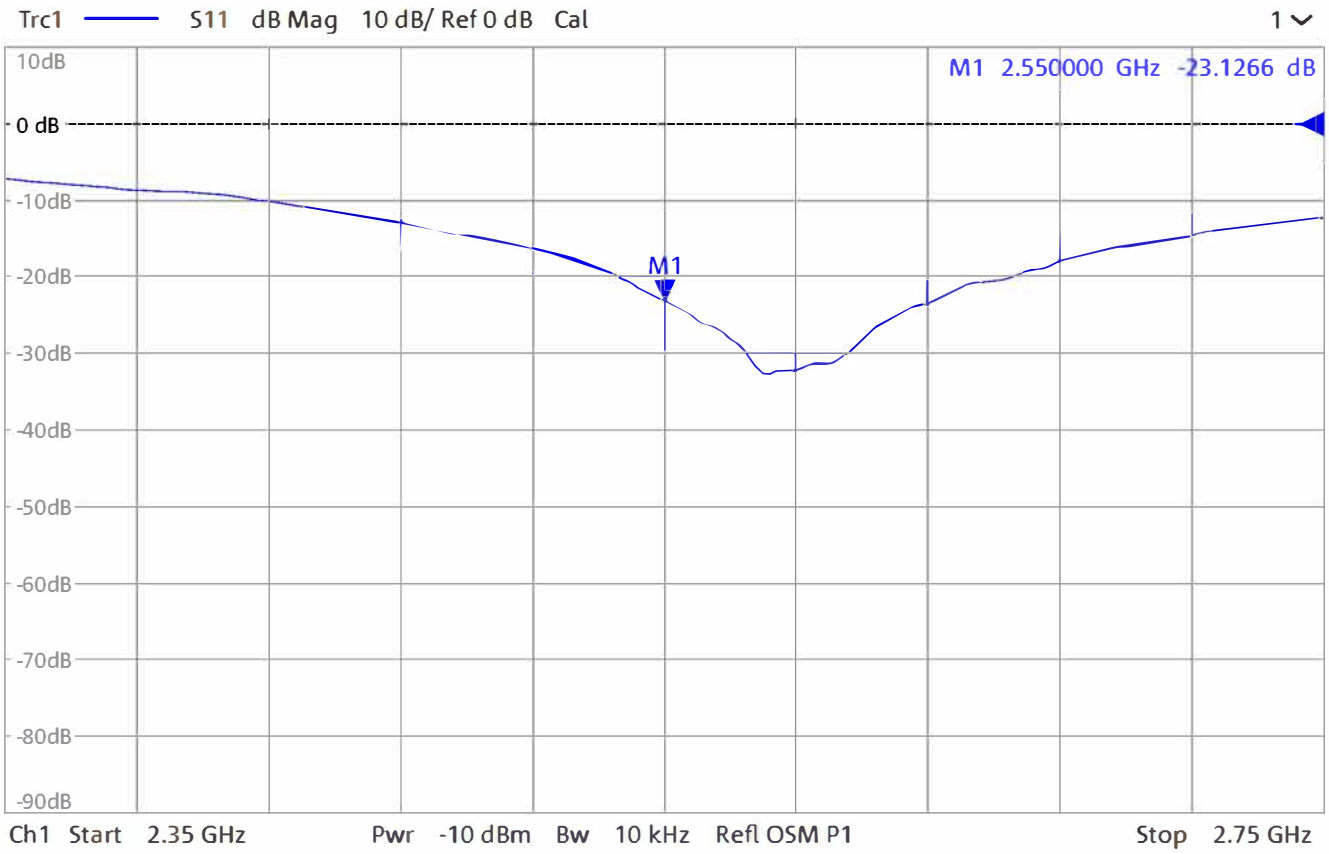
D2550V2 - SN: 1022						
2550MHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
9.22.2022	-27.1		52		-4	
9.21.2023	-23.13	-14.66	54.77	2.77	-5.52	-1.52

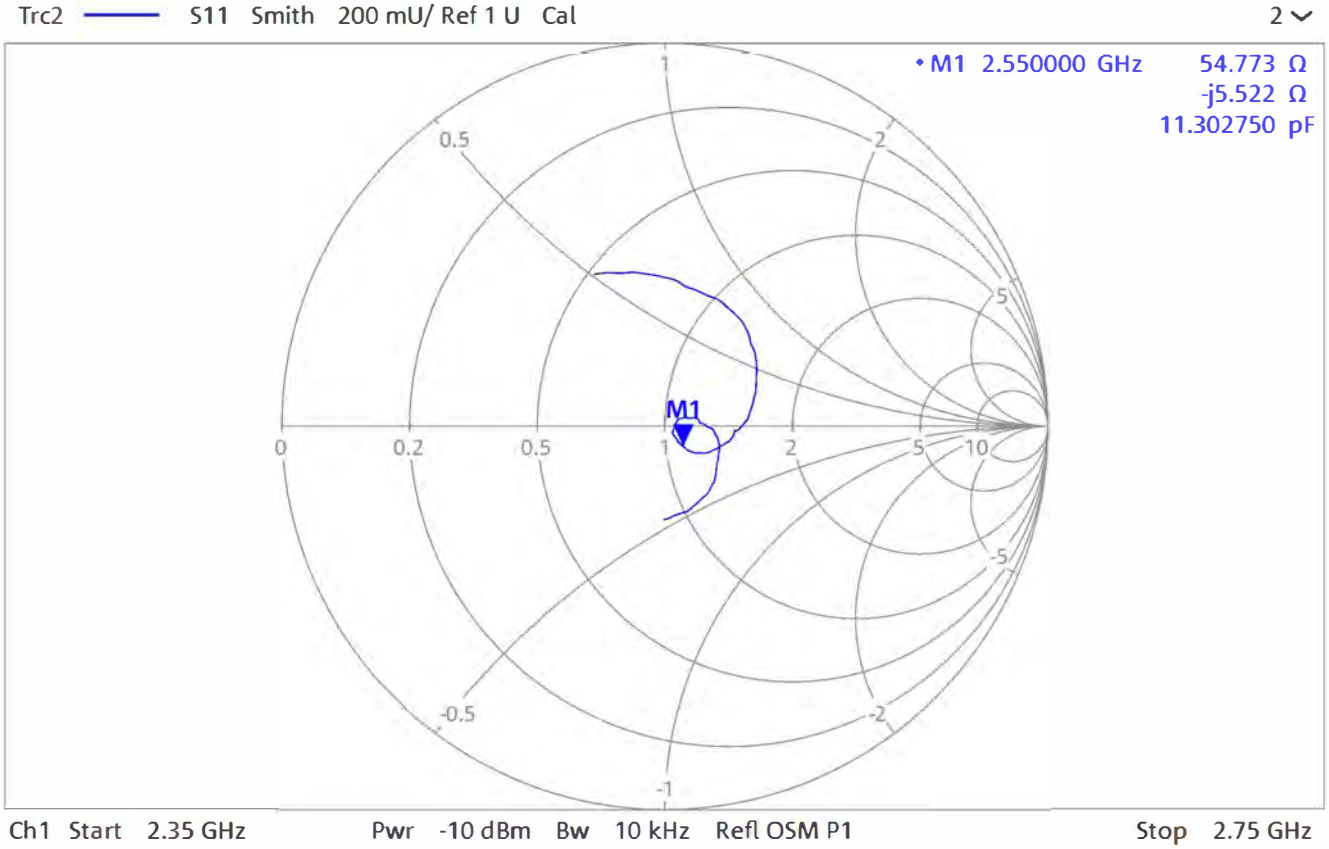
<Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 2550MHz _2023.09.21





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Client 7layers **Certificate No: 24J02Z000860**

CALIBRATION CERTIFICATE

Object	D3500V2 - SN: 1111
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 11, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3400 MHz ± 1 MHz 3500 MHz ± 1 MHz	

Head TSL parameters at 3400 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	38.0	2.81 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	2.80 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 3400 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**67.5 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.5 W/kg ± 24.2 % (*k*=2)**

Head TSL parameters at 3500 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	2.92 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 3500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**65.7 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.48 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 W/kg ± 24.2 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 3400 MHz

Impedance, transformed to feed point	42.4Ω- 0.85jΩ
Return Loss	- 21.6dB

Antenna Parameters with Head TSL at 3500 MHz

Impedance, transformed to feed point	48.6Ω+ 3.70jΩ
Return Loss	- 27.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-11

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN: 1111

Communication System: CW; Frequency: 3400 MHz, CW; Frequency: 3500 MHz,
Medium parameters used: f = 3400 MHz; σ = 2.8 S/m; ε_r = 38.04; ρ = 1000 kg/m^3,
Medium parameters used: f = 3500 MHz; σ = 2.922 S/m; ε_r = 37.75; ρ = 1000 kg/m^3,
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(6.95, 6.95, 6.95) @ 3400 MHz; ConvF(6.72, 6.72, 6.72) @ 3500 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=3400 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 57.90 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 6.74 W/kg; SAR(10 g) = 2.55 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 77.3%
Maximum value of SAR (measured) = 12.2 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=3500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.01 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 6.58 W/kg; SAR(10 g) = 2.48 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 76.5%
Maximum value of SAR (measured) = 12.1 W/kg

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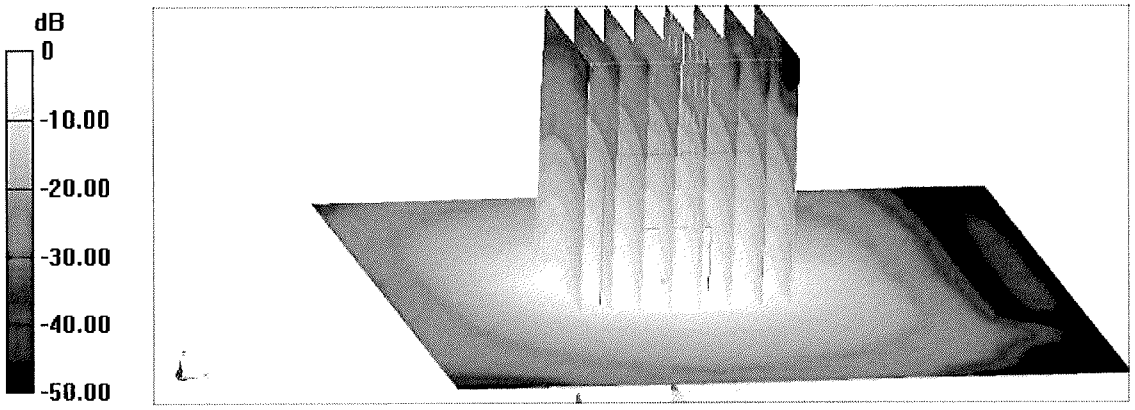

0 dB = 12.1 W/kg = 10.83 dBW/kg

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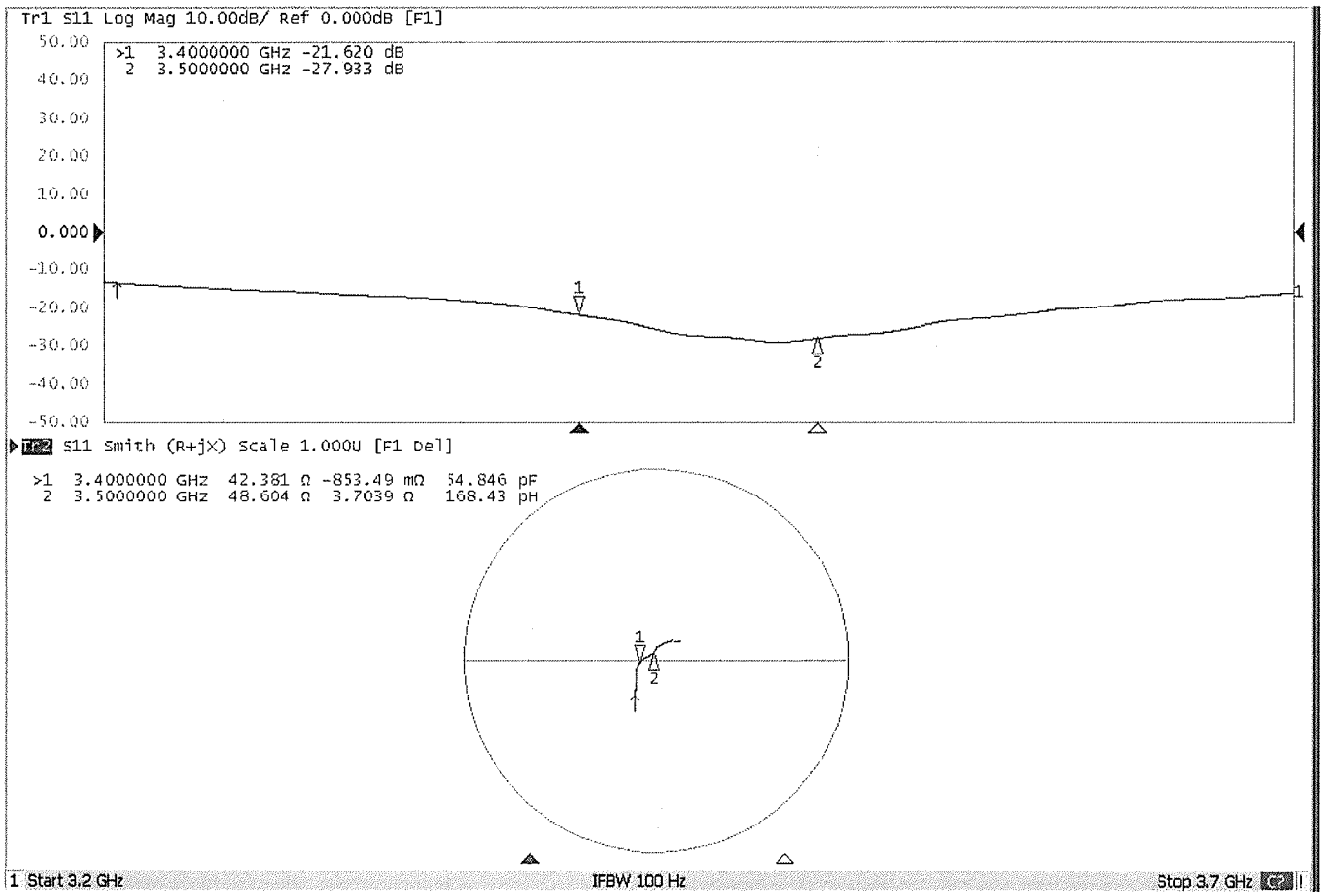
Impedance Measurement Plot for Head TSL



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Client **7layers** **Certificate No: 24J02Z000865**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1315
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 5, 2024

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106276	17-May-24 (CTTL, No. J24X04107)	May-25
Power sensor NRP6A	101369	17-May-24 (CTTL, No. J24X04107)	May-25
Reference Probe EX3DV4	SN 7517	21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Feb-25
DAE4	SN 1588	13-Sep-24(CTTL-SPEAG, No. 24J02Z000713)	Sep-25
Secondary Standards	**ID #**	**Cal Date (Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	25-Dec-23 (CTTL, No. J23X13426)	Dec-24
NetworkAnalyzer E5071C	MY46110673	25-Dec-23 (CTTL, No. J23X13425)	Dec-24
OCP DAK-3.5(weighted)	1040	22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Jan-25

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

Issued: November 15, 2024

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.70 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5250MHz

SAR averaged over 1 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.3 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.6 W/kg ± 24.2 % (*k*=2)**

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Head TSL parameters at 5600MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	5.08 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600MHz

SAR averaged over 1 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.7 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 24.2 % (*k*=2)**

Head TSL parameters at 5750MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	5.24 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5750MHz

SAR averaged over 1 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.1 W/kg ± 24.4 % (*k*=2)**
SAR averaged over 10 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.2 W/kg ± 24.2 % (*k*=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5250MHz

Impedance, transformed to feed point	49.2Ω- 1.60jΩ
Return Loss	- 34.8dB

Antenna Parameters with Head TSL at 5600MHz

Impedance, transformed to feed point	53.2Ω+ 4.15jΩ
Return Loss	- 25.9dB

Antenna Parameters with Head TSL at 5750MHz

Impedance, transformed to feed point	49.3Ω+ 4.49jΩ
Return Loss	- 26.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.099 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2024-11-05

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1315

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used: f = 5250 MHz; σ = 4.698 S/m; ε_r = 35.84; ρ = 1000 kg/m^3

Medium parameters used: f = 5600 MHz; σ = 5.077 S/m; ε_r = 35.24; ρ = 1000 kg/m^3

Medium parameters used: f = 5750 MHz; σ = 5.241 S/m; ε_r = 35.02; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(5.43, 5.43, 5.43) @ 5250 MHz; ConvF(4.83, 4.83, 4.83) @ 5600 MHz; ConvF(4.95, 4.95, 4.95) @ 5750 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.02 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.16 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.4%
Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.79 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 38.0 W/kg
SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.27 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 60.8%
Maximum value of SAR (measured) = 20.4 W/kg

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Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.50 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 37.3 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.13 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 59.4%
Maximum value of SAR (measured) = 19.7 W/kg

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Impedance Measurement Plot for Head TSL

Appendix D. Conducted RF Output Power Table

The detailed power table are shown as follows.

GSM WCDMA Default Power

Band	GSM850 (Ant0)				GSM1900 (Ant1)			
Channel	128	189	251	Max. Tune-up Power (dBm)	512	661	810	Max. Tune-up Power (dBm)
Frequency (MHz)	824.2	836.4	848.8		1850.2	1880	1909.8	
GSM	32.21	32.22	32.09	33.00	24.96	25.08	25.03	25.50
GPRS 1Tx Slot	**32.24**	32.21	32.11	33.00	24.95	**25.10**	25.04	25.50
GPRS 2Tx Slot	31.69	31.68	31.60	32.00	23.92	24.07	24.01	24.50
GPRS 3Tx Slot	30.40	30.05	29.94	31.00	22.33	22.49	22.40	23.50
GPRS 4Tx Slot	28.90	28.88	28.78	30.00	20.90	21.04	20.94	22.50
EDGE 1Tx Slot	27.21	27.22	27.02	28.00	20.74	20.57	20.57	22.50
EDGE 2Tx Slot	26.10	26.17	25.65	27.00	19.67	19.56	19.58	21.50
EDGE 3Tx Slot	23.98	24.01	23.76	25.00	18.04	17.89	17.96	19.50
EDGE 4Tx Slot	22.83	22.72	22.55	24.00	16.29	16.50	16.24	17.50

Band	WCDMA II (Ant1)			WCDMA II	WCDMA IV (Ant1)			WCDMA IV	WCDMA V (Ant0)			WCDMA V
TX Channel	9262	9400	9538	Max. Tune-up Power (dBm)	1312	1413	1513	Max. Tune-up Power (dBm)	4132	4182	4233	Max. Tune-up Power (dBm)
Rx Channel	9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)	1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
RMC 12.2K	**20.11**	20.07	19.99	20.50	**20.13**	19.87	19.91	20.50	23.92	**23.93**	23.83	24.50
HSDPA Subtest-1	19.20	19.47	19.21	20.00	19.39	19.12	19.17	20.00	22.93	22.97	22.91	24.00
HSDPA Subtest-2	19.08	19.09	19.10	20.00	19.28	19.03	19.05	20.00	22.89	22.93	22.95	24.00
HSDPA Subtest-3	18.83	18.71	18.72	20.00	18.93	18.65	18.71	20.00	22.56	22.59	22.51	24.00
HSDPA Subtest-4	18.70	18.72	18.71	20.00	18.93	18.63	18.70	20.00	22.40	22.45	22.36	24.00
DC-HSDPA Subtest-1	19.18	19.41	19.11	20.00	19.35	18.98	19.06	20.00	22.90	22.89	22.85	24.00
DC-HSDPA Subtest-2	18.93	18.98	19.01	20.00	19.22	18.91	19.01	20.00	22.82	22.88	22.87	24.00
DC-HSDPA Subtest-3	18.72	18.64	18.69	20.00	18.89	18.51	18.57	20.00	22.46	22.48	22.40	24.00
DC-HSDPA Subtest-4	18.61	18.57	18.56	20.00	18.82	18.49	18.59	20.00	22.27	22.40	22.26	24.00
HSUPA Subtest-1	17.02	17.08	17.04	18.00	17.05	16.66	16.72	18.00	21.36	21.38	21.32	22.00
HSUPA Subtest-2	17.11	17.18	17.16	18.00	17.38	17.11	17.15	18.00	20.90	20.91	20.84	22.00
HSUPA Subtest-3	17.91	17.86	17.81	18.00	17.84	17.86	17.88	18.00	20.91	20.90	20.83	22.00
HSUPA Subtest-4	16.71	16.77	16.72	18.00	16.91	16.68	16.67	18.00	20.40	20.41	20.34	22.00
HSUPA Subtest-5	18.15	18.17	18.19	19.00	18.38	18.09	18.11	19.00	21.85	21.87	21.79	23.00
HSPA+ Subtest-1	18.63	18.65	18.64	20.00	18.83	18.58	18.63	20.00	22.49	22.53	22.41	24.00

LTE Default Power

LTE Band 12 (Ant0)							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		23060	23095	23130	
		Frequence (MHz)		704	707.5	711	
10M	QPSK	1	0	23.27	23.28	**23.31**	24
		1	24	23.16	23.22	23.24	24
		1	49	23.24	23.20	23.19	24
		25	0	22.23	22.25	**22.30**	23
		25	12	22.22	22.21	22.28	23
		25	25	22.18	22.18	22.25	23
		50	0	22.16	22.23	22.26	23
	16QAM	1	0	22.53	22.44	22.39	23
		1	24	22.46	22.35	22.37	23
		1	49	22.50	22.31	22.41	23
		25	0	21.16	21.18	21.25	22
		25	12	21.20	21.17	21.21	22
		25	25	21.17	21.24	21.16	22
		50	0	21.15	21.22	21.23	22
	64QAM	1	0	21.38	21.41	21.46	22
		1	24	21.27	21.26	21.30	22
		1	49	21.27	21.31	21.27	22
		25	0	20.15	20.17	20.13	21
		25	12	20.09	20.07	20.09	21
		25	25	20.08	20.08	20.13	21
		50	0	20.10	20.15	20.13	21
BW	MCS Index	Channel		23035	23095	23155	Max. Tune-up
		Frequence (MHz)		701.5	707.5	713.5	
5M	QPSK	1	0	23.23	23.18	23.30	24
		1	12	23.02	23.10	23.22	24
		1	24	23.24	23.05	23.08	24
		12	0	22.13	22.10	22.15	23
		12	6	22.20	22.14	22.27	23
		12	13	22.10	22.06	22.23	23
		25	0	22.07	22.13	22.17	23
	16QAM	1	0	22.41	22.40	22.31	23
		1	12	22.38	22.20	22.25	23
		1	24	22.48	22.17	22.36	23
		12	0	21.01	21.10	21.22	22
		12	6	21.05	21.07	21.06	22
		12	13	21.12	21.12	21.10	22
		25	0	21.01	21.14	21.13	22
	64QAM	1	0	21.32	21.38	21.38	22
		1	12	21.13	21.11	21.27	22
		1	24	21.19	21.28	21.17	22
		12	0	20.05	20.09	20.06	21
		12	6	19.96	19.93	19.99	21
		12	13	19.94	20.05	19.99	21
		25	0	20.07	20.09	20.05	21
BW	MCS Index	Channel		23025	23095	23165	Max. Tune-up
		Frequence (MHz)		700.5	707.5	714.5	
3M	QPSK	1	0	23.21	23.13	23.27	24
		1	7	23.05	23.16	23.16	24
		1	14	23.26	23.06	23.17	24
		8	0	22.08	22.15	22.18	23
		8	3	22.13	22.09	22.19	23
		8	7	22.10	22.06	22.23	23
		15	0	22.01	22.17	22.21	23
	16QAM	1	0	22.45	22.43	22.24	23
		1	7	22.43	22.21	22.35	23
		1	14	22.40	22.27	22.35	23
		8	0	21.13	21.07	21.15	22
		8	3	21.17	21.08	21.11	22
		8	7	21.13	21.15	21.02	22
		15	0	21.03	21.15	21.14	22
	64QAM	1	0	21.28	21.36	21.35	22
		1	7	21.26	21.19	21.16	22
		1	14	21.12	21.30	21.25	22
		8	0	20.07	20.08	20.12	21
		8	3	20.02	19.97	19.99	21
		8	7	20.03	19.93	20.04	21
		15	0	20.05	20.01	20.00	21
BW	MCS Index	Channel		23017	23095	23173	Max. Tune-up
		Frequence (MHz)		699.7	707.5	715.3	
1.4M	QPSK	1	0	23.18	23.17	23.17	24
		1	2	23.08	23.10	23.18	24
		1	5	23.19	23.15	23.10	24
		3	0	23.09	23.14	23.26	24
		3	1	23.19	23.12	23.21	24
		3	3	23.16	23.08	23.11	24
		6	0	22.15	22.11	22.21	23
	16QAM	1	0	22.41	22.35	22.28	23
		1	2	22.39	22.22	22.23	23
		1	5	22.49	22.17	22.37	23
		3	0	22.05	22.11	22.17	23
		3	1	22.06	22.02	22.18	23
		3	3	22.15	22.23	22.10	23
		6	0	21.09	21.19	21.16	22
	64QAM	1	0	21.35	21.37	21.32	22
		1	2	21.21	21.22	21.26	22
		1	5	21.18	21.20	21.25	22
		3	0	21.04	21.07	21.02	22
		3	1	20.99	20.98	20.94	22
		3	3	21.03	20.97	21.12	22
		6	0	20.07	20.03	20.10	21

LTE Band 41 (2496 ~ 2690MHz) (Ant0)									
BW	MCS Index	RB Size	RB Offset	Low	Low Mid	Mid	High Mid	High	Max. Tune-up (dBm)
		Channel		39750	40185	40620	41055	41490	
		Frequence (MHz)		2506	2549.5	2593	2636.5	2680	
20M	QPSK	1	0	19.16	19.18	**19.28**	19.18	19.06	20
		1	50	19.12	19.15	19.20	19.17	19.04	20
		1	99	19.02	19.06	19.11	18.99	18.97	20
		50	0	19.16	19.18	**19.19**	19.18	19.10	20
		50	25	19.11	19.16	19.14	19.13	19.07	20
		50	50	19.14	19.13	19.11	19.09	19.04	20
		100	0	19.15	19.14	19.21	19.12	19.05	20
	16QAM	1	0	19.08	19.12	19.12	19.14	18.99	20
		1	50	19.07	19.10	19.12	19.11	18.95	20
		1	99	18.94	19.01	19.05	18.98	18.92	20
		50	0	19.01	19.03	19.02	19.02	18.93	20
		50	25	19.01	19.02	19.00	18.97	18.93	20
		50	50	18.97	18.98	19.00	18.96	18.89	20
		100	0	19.00	18.99	19.00	18.96	18.91	20
	64QAM	1	0	19.01	18.86	18.83	18.84	18.76	20
		1	50	18.79	18.82	18.87	18.81	18.72	20
		1	99	18.70	18.75	18.76	18.70	18.66	20
		50	0	19.06	18.95	19.02	18.82	19.12	20
		50	25	19.00	19.03	19.04	18.99	18.95	20
		50	50	18.96	18.98	18.99	18.95	18.91	20
		100	0	18.98	19.00	19.01	18.96	18.92	20
BW	MCS Index	Channel		39725	40173	40620	41068	41515	Max. Tune-up
		Frequence (MHz)		2503.5	2548.3	2593	2637.8	2682.5	
15M	QPSK	1	0	19.07	19.09	19.23	19.06	18.95	20
		1	37	19.08	19.08	19.17	19.14	18.89	20
		1	74	19.00	18.91	18.98	18.94	18.83	20
		36	0	19.14	19.13	19.04	19.09	19.07	20
		36	19	18.96	19.12	19.07	19.01	19.05	20
		36	39	19.02	18.99	19.09	19.01	18.91	20
		75	0	19.12	19.13	19.13	19.04	18.94	20
	16QAM	1	0	19.03	19.01	18.99	19.05	18.90	20
		1	37	19.05	19.03	19.06	18.98	18.81	20
		1	74	18.80	18.93	18.98	18.83	18.83	20
		36	0	18.92	18.94	18.95	18.91	18.84	20
		36	19	18.89	18.90	18.89	18.94	18.89	20
		36	39	18.87	18.89	18.90	18.94	18.86	20
		75	0	18.91	18.94	18.97	18.95	18.81	20
	64QAM	1	0	19.00	18.74	18.78	18.73	18.66	20
		1	37	18.76	18.71	18.85	18.66	18.63	20
		1	74	18.60	18.60	18.72	18.56	18.56	20
		36	0	19.02	18.86	18.95	18.80	19.00	20
		36	19	18.97	18.88	18.95	18.84	18.90	20
		36	39	18.95	18.85	18.93	18.81	18.78	20
		75	0	18.93	18.98	18.93	18.89	18.91	20
BW	MCS Index	Channel		39700	40160	40620	41080	41540	Max. Tune-up
		Frequence (MHz)		2501	2547	2593	2639	2685	
10M	QPSK	1	0	19.13	19.15	19.13	19.13	18.96	20
		1	24	19.01	19.06	19.16	19.07	18.91	20
		1	49	18.91	18.98	19.00	18.85	18.94	20
		25	0	19.09	19.04	19.08	19.08	19.07	20
		25	12	19.10	19.10	19.01	19.09	19.04	20
		25	25	19.09	18.99	19.03	19.05	18.99	20
		50	0	19.06	19.09	19.06	19.07	18.90	20
	16QAM	1	0	19.01	19.08	19.03	19.09	18.90	20
		1	24	18.97	19.04	19.05	18.99	18.93	20
		1	49	18.80	18.99	19.03	18.85	18.85	20
		25	0	18.90	18.90	18.99	18.90	18.81	20
		25	12	18.88	18.91	18.94	18.83	18.90	20
		25	25	18.95	18.85	18.92	18.88	18.77	20
		50	0	18.99	18.85	18.88	18.91	18.82	20
	64QAM	1	0	18.95	18.79	18.73	18.70	18.68	20
		1	24	18.77	18.69	18.77	18.72	18.60	20
		1	49	18.61	18.64	18.63	18.59	18.63	20
		25	0	19.00	18.87	19.01	18.74	19.11	20
		25	12	18.97	18.89	18.91	18.86	18.93	20
		25	25	18.88	18.93	18.85	18.91	18.84	20
		50	0	18.87	18.93	18.97	18.82	18.80	20
BW	MCS Index	Channel		39675	40148	40620	41093	41565	Max. Tune-up
		Frequence (MHz)		2498.5	2545.8	2593	2640.3	2687.5	
5M	QPSK	1	0	19.08	19.15	19.23	19.07	19.01	20
		1	12	19.06	19.04	19.05	19.09	18.91	20
		1	24	18.90	19.00	19.05	18.92	18.91	20
		12	0	19.07	19.10	19.04	19.07	19.09	20
		12	6	19.08	19.10	19.12	19.11	19.03	20
		12	13	19.01	19.10	18.96	18.97	19.02	20
		25	0	19.07	19.03	19.12	19.09	19.00	20
	16QAM	1	0	19.07	19.04	18.99	19.13	18.95	20
		1	12	19.06	19.05	19.10	18.99	18.91	20
		1	24	18.93	18.97	19.02	18.85	18.78	20
		12	0	18.86	18.89	18.94	18.91	18.91	20
		12	6	18.89	19.00	18.99	18.83	18.89	20
		12	13	18.94	18.85	18.86	18.88	18.81	20
		25	0	18.99	18.89	18.85	18.81	18.80	20
	64QAM	1	0	18.95	18.79	18.69	18.78	18.73	20
		1	12	18.64	18.68	18.80	18.66	18.70	20
		1	24	18.57	18.60	18.73	18.69	18.63	20
		12	0	19.05	18.90	18.97	18.70	18.97	20
		12	6	18.94	19.01	19.01	18.95	18.83	20
		12	13	18.88	18.90	18.93	18.82	18.90	20
		25	0	18.90	18.87	18.97	18.92	18.87	20

LTE Band 42 Part27Q (Ant0)							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Tune-up (dBm)
		Channel		42190	42590	42990	
		Frequence (MHz)		3460	3500	3540	
20M	QPSK	1	0	19.27	19.32	19.27	20.5
		1	50	19.25	19.44	19.26	20.5
		1	99	19.53	19.48	19.29	20.5
		50	0	19.28	19.29	19.27	20.5
		50	25	19.27	19.31	19.23	20.5
		50	50	19.46	19.36	19.30	20.5
		100	0	19.47	19.38	19.27	20.5
	16QAM	1	0	19.38	19.41	19.37	20.5
		1	50	19.34	19.35	19.25	20.5
		1	99	19.27	19.33	19.31	20.5
		50	0	19.30	19.41	19.29	20.5
		50	25	19.28	19.32	19.28	20.5
		50	50	19.29	19.18	19.30	20.5
		100	0	19.29	19.17	19.28	20.5
	64QAM	1	0	18.96	19.23	18.95	20.5
		1	50	18.91	19.33	18.94	20.5
		1	99	18.96	19.18	18.91	20.5
		50	0	19.31	19.24	19.29	20.5
		50	25	19.32	19.39	19.30	20.5
		50	50	19.28	19.25	19.31	20.5
		100	0	19.30	19.19	19.29	20.5
BW	MCS Index	Channel		42165	42590	43015	Max. Tune-up
		Frequence (MHz)		3457.5	3500	3542.5	
15M	QPSK	1	0	19.21	19.27	19.25	20.5
		1	37	19.20	19.42	19.21	20.5
		1	74	19.46	19.42	19.25	20.5
		36	0	19.27	19.27	19.13	20.5
		36	19	19.22	19.28	19.08	20.5
		36	39	19.37	19.29	19.22	20.5
		75	0	19.38	19.32	19.20	20.5
	16QAM	1	0	19.32	19.26	19.32	20.5
		1	37	19.19	19.21	19.12	20.5
		1	74	19.16	19.30	19.19	20.5
		36	0	19.16	19.40	19.19	20.5
		36	19	19.24	19.26	19.26	20.5
		36	39	19.15	19.03	19.22	20.5
		75	0	19.17	19.09	19.16	20.5
	64QAM	1	0	18.85	19.13	18.81	20.5
		1	37	18.86	19.30	18.83	20.5
		1	74	18.86	19.05	18.90	20.5
		36	0	19.30	19.20	19.23	20.5
		36	19	19.18	19.29	19.25	20.5
		36	39	19.14	19.17	19.30	20.5
		75	0	19.16	19.09	19.28	20.5
BW	MCS Index	Channel		42140	42590	43040	Max. Tune-up
		Frequence (MHz)		3455	3500	3545	
10M	QPSK	1	0	19.13	19.17	19.16	20.5
		1	24	19.17	19.34	19.19	20.5
		1	49	19.40	19.37	19.23	20.5
		25	0	19.24	19.21	19.25	20.5
		25	12	19.17	19.30	19.18	20.5
		25	25	19.44	19.25	19.25	20.5
		50	0	19.42	19.35	19.25	20.5
	16QAM	1	0	19.32	19.40	19.34	20.5
		1	24	19.24	19.34	19.10	20.5
		1	49	19.17	19.20	19.18	20.5
		25	0	19.26	19.27	19.14	20.5
		25	12	19.19	19.19	19.27	20.5
		25	25	19.18	19.07	19.19	20.5
		50	0	19.23	19.08	19.20	20.5
	64QAM	1	0	18.93	19.22	18.82	20.5
		1	24	18.87	19.20	18.83	20.5
		1	49	18.89	19.15	18.77	20.5
		25	0	19.27	19.16	19.26	20.5
		25	12	19.19	19.27	19.15	20.5
		25	25	19.22	19.13	19.19	20.5
		50	0	19.22	19.07	19.22	20.5
BW	MCS Index	Channel		42115	42590	43065	Max. Tune-up
		Frequence (MHz)		3452.5	3500	3547.5	
5M	QPSK	1	0	19.15	19.27	19.17	20.5
		1	12	19.15	19.42	19.21	20.5
		1	24	19.48	19.43	19.15	20.5
		12	0	19.24	19.19	19.22	20.5
		12	6	19.12	19.18	19.22	20.5
		12	13	19.35	19.29	19.27	20.5
		25	0	19.44	19.25	19.25	20.5
	16QAM	1	0	19.25	19.31	19.29	20.5
		1	12	19.33	19.25	19.22	20.5
		1	24	19.14	19.19	19.24	20.5
		12	0	19.20	19.38	19.20	20.5
		12	6	19.17	19.19	19.22	20.5
		12	13	19.15	19.06	19.16	20.5
		25	0	19.22	19.14	19.27	20.5
	64QAM	1	0	18.83	19.13	18.83	20.5
		1	12	18.82	19.21	18.80	20.5
		1	24	18.83	19.05	18.86	20.5
		12	0	19.27	19.09	19.21	20.5
		12	6	19.22	19.38	19.19	20.5
		12	13	19.15	19.19	19.20	20.5
		25	0	19.15	19.11	19.27	20.5

LTE Default Power

CA_41C Ant0										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	PCC Frequency	SCC Channel	SCC Frequency	Modulation	PCC		SCC		Measured Power	Max Tune-up
					RB Size	RB offset	RB Size	RB offset		
39750	2506	39948	2525.8	QPSK	1	99	1	0	19.12	20.0
				16QAM	1	99	1	0	19.29	20.0
				64QAM	1	99	1	0	18.85	20.0
40521	2583.1	40719	2602.9	QPSK	1	99	1	0	**19.39**	20.0
				16QAM	1	99	1	0	19.31	20.0
				64QAM	1	99	1	0	18.97	20.0
41292	2660.2	41490	2680	QPSK	1	99	1	0	19.09	20.0
				16QAM	1	99	1	0	19.21	20.0
				64QAM	1	99	1	0	18.79	20.0

Part27 CA_42C Ant0										
Combination 20MHz+20MHz (100RB+100RB)										
PCC Channel	PCC Frequency	SCC Channel	SCC Frequency	Modulation	PCC		SCC		Measured Power	Max Tune-up
					RB Size	RB offset	RB Size	RB offset		
42190	3460	42388	3479.8	QPSK	1	99	1	0	19.34	20.5
				16QAM	1	99	1	0	19.45	20.5
				64QAM	1	99	1	0	19.02	20.5
42491	3490.1	42689	3509.9	QPSK	1	99	1	0	**19.79**	20.5
				16QAM	1	99	1	0	19.72	20.5
				64QAM	1	99	1	0	19.57	20.5
42792	3520.2	42990	3540	QPSK	1	99	1	0	19.25	20.5
				16QAM	1	99	1	0	19.29	20.5
				64QAM	1	99	1	0	19.01	20.5

WLAN Default Power

2.4GHz WLAN	Ant6					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting
2.4GHz WLAN	802.11b 1Mbps	1	2412	13.05	14.00	12.00
		6	2437	13.01	14.00	12.00
		11	2462	**13.08**	14.00	12.00
	802.11g 6Mbps	1	2412	12.95	14.00	12.00
		6	2437	12.96	14.00	12.00
		11	2462	13.00	14.00	12.00
	802.11n-HT20 MCS0	1	2412	12.97	14.00	12.00
		6	2437	12.92	14.00	12.00
		11	2462	12.92	14.00	12.00
	802.11n-HT40 MCS0	1	2412	13.06	14.00	12.00
		6	2437	13.05	14.00	12.00
		11	2462	13.07	14.00	12.00

5GHz WLAN	Ant8					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting
5.2GHz WLAN	802.11a 6Mbps	36	5180	12.90	14.50	12.00
		40	5200	12.79	14.50	12.00
		44	5220	12.86	14.50	12.00
		48	5240	**13.09**	14.50	12.00
	802.11n-HT20 MCS0	36	5180	12.55	14.50	12.00
		40	5200	12.53	14.50	12.00
		44	5220	12.65	14.50	12.00
		48	5240	12.70	14.50	12.00
	802.11n-HT40 MCS0	38	5190	12.62	14.50	12.00
		46	5230	12.70	14.50	12.00
	802.11ac-VHT20 MCS0	36	5180	12.51	14.50	12.00
		40	5200	12.83	14.50	12.00
		44	5220	12.92	14.50	12.00
		48	5240	12.96	14.50	12.00
	802.11ac-VHT40 MCS0	38	5190	12.51	14.50	12.00
		46	5230	12.94	14.50	12.00
	802.11ac-VHT80 MCS0	42	5210	12.53	14.50	12.00

5GHz WLAN	Ant8					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting
5.3GHz WLAN	802.11a 6Mbps	52	5260	13.01	14.50	12.00
		56	5280	13.08	14.50	12.00
		60	5300	**13.13**	14.50	12.00
		64	5320	13.10	14.50	12.00
	802.11n-HT20 MCS0	52	5260	12.58	14.50	12.00
		56	5280	12.60	14.50	12.00
		60	5300	12.62	14.50	12.00
		64	5320	12.67	14.50	12.00
	802.11n-HT40 MCS0	54	5270	12.65	14.50	12.00
		62	5310	12.79	14.50	12.00
	802.11ac-VHT20 MCS0	52	5260	12.82	14.50	12.00
		56	5280	12.94	14.50	12.00
		60	5300	13.06	14.50	12.00
		64	5320	12.93	14.50	12.00
	802.11ac-VHT40 MCS0	54	5270	12.79	14.50	12.00
		62	5310	13.04	14.50	12.00
	802.11ac-VHT80 MCS0	58	5290	12.80	14.50	12.00

5GHz WLAN	Ant8					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.08	14.50	12.00
		116	5580	13.12	14.50	12.00
		124	5620	13.15	14.50	12.00
		132	5660	13.19	14.50	12.00
		140	5700	13.20	14.50	12.00
		144	5720	**13.48**	14.50	12.00
	802.11n-HT20 MCS0	100	5500	12.52	14.50	12.00
		116	5580	12.63	14.50	12.00
		124	5620	12.76	14.50	12.00
		132	5660	12.88	14.50	12.00
		140	5700	13.15	14.50	12.00
		144	5720	13.44	14.50	12.00
	802.11n-HT40 MCS0	102	5510	12.61	14.50	12.00
		110	5550	12.58	14.50	12.00
		126	5630	12.97	14.50	12.00
		134	5670	13.23	14.50	12.00
		142	5710	13.41	14.50	12.00
	802.11ac-VHT20 MCS0	100	5500	12.70	14.50	12.00
		116	5580	12.79	14.50	12.00
		124	5620	12.84	14.50	12.00
		132	5660	12.93	14.50	12.00
		140	5700	13.06	14.50	12.00
		144	5720	13.82	14.50	12.00
	802.11ac-VHT40 MCS0	102	5510	12.51	14.50	12.00
		110	5550	12.52	14.50	12.00
		126	5630	12.77	14.50	12.00
		134	5670	12.86	14.50	12.00
		142	5710	13.26	14.50	12.00
	802.11ac-VHT80 MCS0	106	5530	12.57	14.50	12.00
		122	5610	12.76	14.50	12.00
		138	5690	12.75	14.50	12.00

	Ant6					
BT	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Power Setting
BLE	1M	0	2402	5.41	6.00	7.00
		19	2440	5.37	6.00	7.00
		39	2480	5.14	6.00	7.00
	2M	1	2404	5.46	6.00	7.00
		19	2440	5.41	6.00	7.00
		38	2478	5.19	6.00	7.00
	S2	0	2402	5.41	6.00	7.00
		19	2440	5.36	6.00	7.00
		39	2480	5.11	6.00	7.00
	S8	0	2402	5.38	6.00	7.00
		19	2440	5.33	6.00	7.00
		39	2480	5.09	6.00	7.00
BR/EDR	GFSK	0	2402	13.28	14.00	8.00
		39	2441	**13.53**	14.00	8.00
		78	2480	13.49	14.00	8.00
	DQPSK	0	2402	9.72	10.00	8.00
		39	2441	9.95	10.00	8.00
		78	2480	9.93	10.00	8.00
	8DPSK	0	2402	9.50	10.00	8.00
		39	2441	9.72	10.00	8.00
		78	2480	9.70	10.00	8.00

Appendix E. Photographs of EUT and Setup