

APPENDIX F - RETURN LOSS AND IMPEDANCE MEASUREMENT**Performance Qualification Report For 1750MHz SAR Dipole-1****Equipment Details:**

Description: Dipole
Manufacturer: Speag
Model Number: D1750V3
Serial Number: 1199
Calibration Date: 2024/03/27

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2023/09/27	2024/09/26
E-Field Probe	EX3DV4	7382	2023/09/27	2024/09/26
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/01/16	2025/01/15
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2023/06/08	2024/06/07
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	18.7 ~ 19.6℃
Ambient Temperature:	21 ~ 22.7℃
Relative Humidity:	43 ~ 48%
ATM Pressure:	101.3 kPa
Test Date:	2024/03/27

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
1750	Head	Return Loss	26.929 dB	26.017 dB	3.505%	±20%; ≥20dB	Pass
		Real Impedance	45.532 Ω	46.939 Ω	1.407 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-1.154 Ω	3.765 Ω	4.919 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
1750	Simulated Tissue Liquid Head	40.441	1.329	40.07	1.37	0.93	-2.99	±5

System Accuracy Check Results:

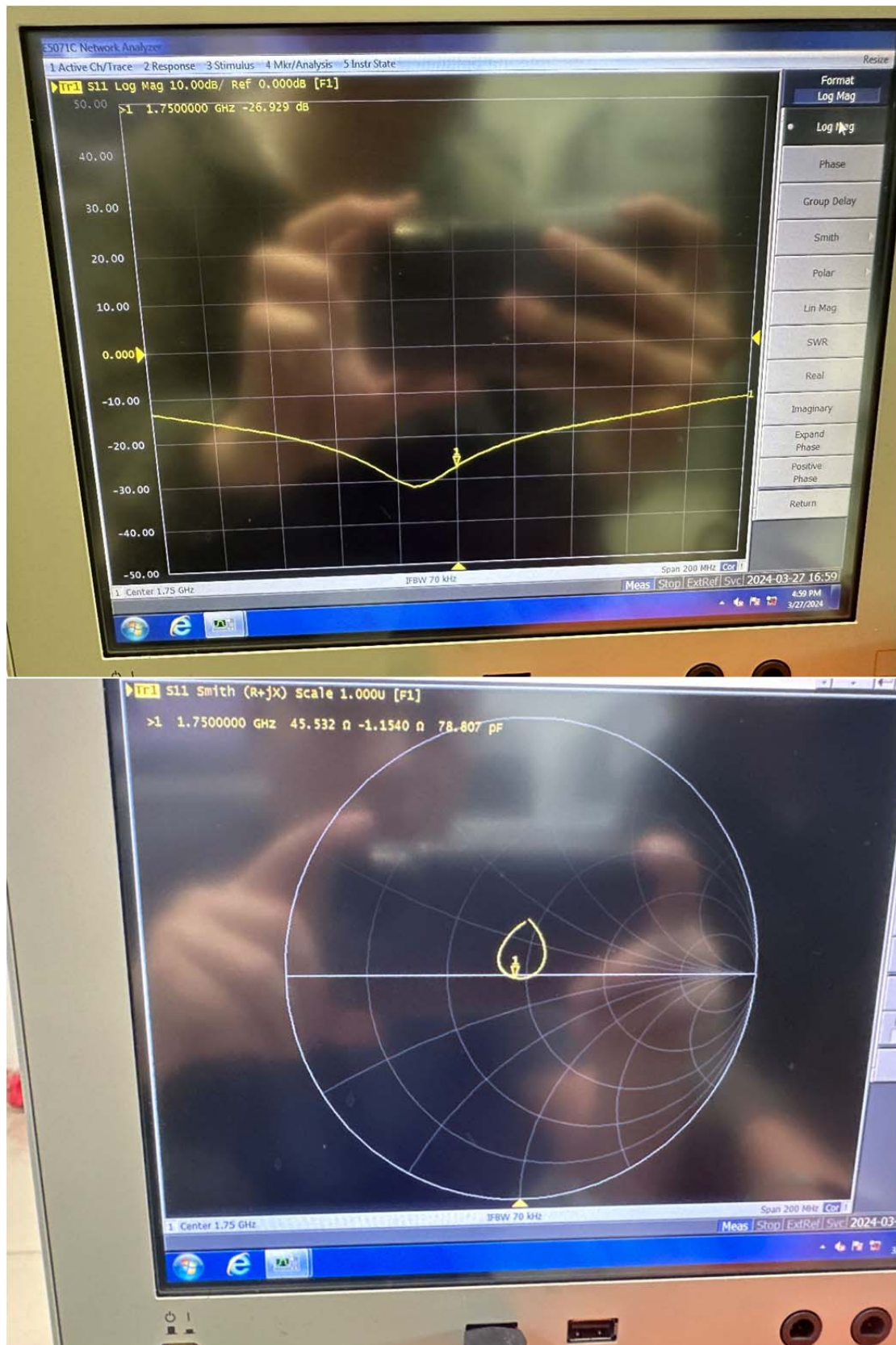
Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
1750	Head	100	1g	3.73	37.3	36.0	3.611	±10
			10g	2.01	20.1	18.9	6.349	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 1750MHz dipole calibration certificate (Certificate No.: D1750V2-1199_Mar23), which was issue by SPEAG.

5. Test Plot & System Validation Data:

Dipole, 1750MHz, 1199



System Performance 1750 MHz Head**DUT: Dipole 1750 MHz; Type: D1750V3; Serial: 1199**

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.329$ S/m; $\epsilon_r = 40.441$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7382; ConvF(8.6, 8.6, 8.6) @ 1750 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 1750MHz Pin=100mW/Area Scan (7x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 3.85 W/kg

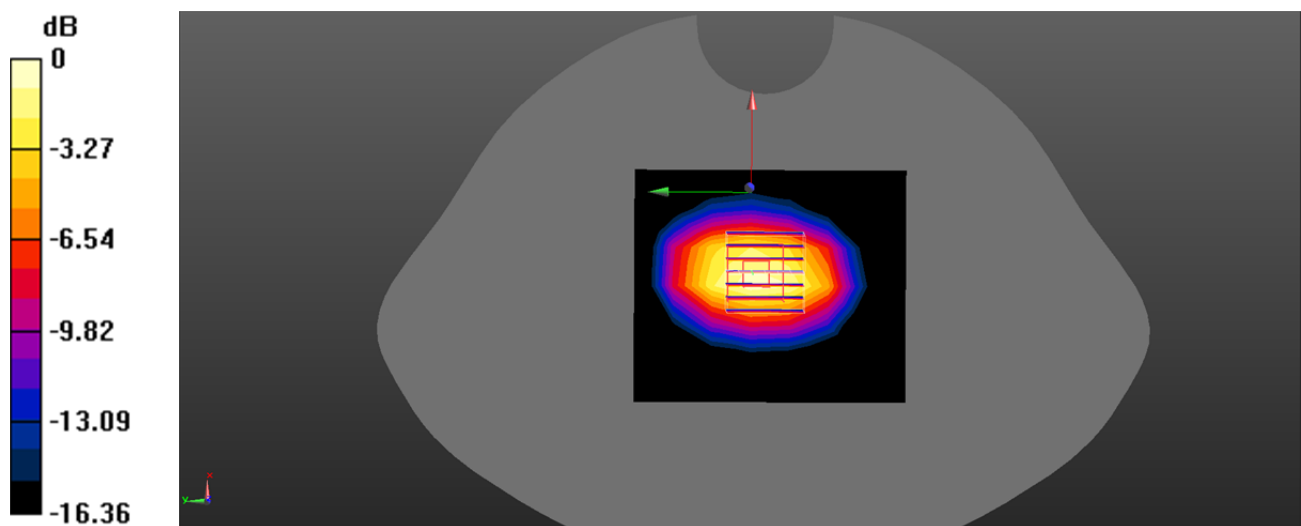
Configuration/Head 1750MHz Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.72 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 6.36 W/kg

SAR(1 g) = 3.73 W/kg; SAR(10 g) = 2.01 W/kg

Maximum value of SAR (measured) = 4.10 W/kg



0 dB = 4.10 W/kg = 6.13 dBW/kg

Performance Qualification Report For 1750MHz SAR Dipole-2

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D1750V3
 Serial Number: 1199
 Calibration Date: 2025/03/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2024/10/08	2025/10/07
Dosimetric E-field Probes	EX3DV4	7896	2024/11/07	2025/11/06
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2024/05/21	2025/05/20
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/12/04	2025/12/03
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2024/05/21	2025/05/20
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	18.2 ~ 19.6°C
Ambient Temperature:	18.8 ~ 20.7°C
Relative Humidity:	50 ~ 63%
ATM Pressure:	98.1 kPa
Test Date:	2025/03/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
1750	Head	Return Loss	26.228 dB	26.017 dB	0.811 %	±20%; ≥20dB	Pass
		Real Impedance	46.595 Ω	46.939 Ω	0.344 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	3.267 Ω	3.765 Ω	0.498 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε _r	σ' (S/m)	ε _r	σ' (S/m)	Δε _r	Δσ'	
1750	Simulated Tissue Liquid Head	39.304	1.345	40.07	1.37	-1.91	-1.82	±5

System Accuracy Check Results:

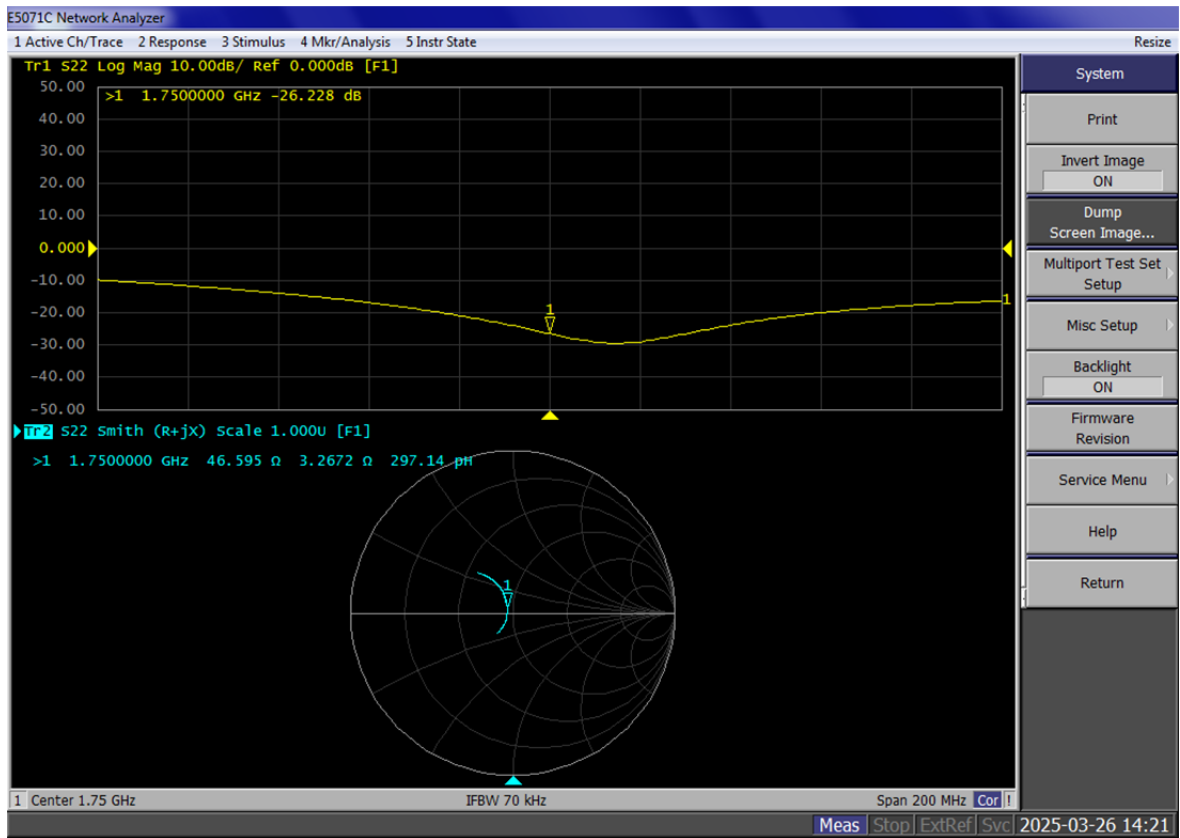
Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
1750	Head	100	1g	3.34	33.4	36.0	-7.222	±10
			10g	1.90	19.0	18.9	0.529	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 1750MHz dipole calibration certificate (Certificate No.: D1750V2-1199_Mar23), which was issue by SPEAG.

5. Test Plot & System Validation Data:

Dipole, 1750MHz, 1199



System Performance 1750 MHz Head

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1199

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.345$ S/m; $\epsilon_r = 39.304$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7896; ConvF(7.2, 7.55, 7.56) @ 1750 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 10/8/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 1750MHz Pin=100mW/Area Scan (7x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 4.21 W/kg

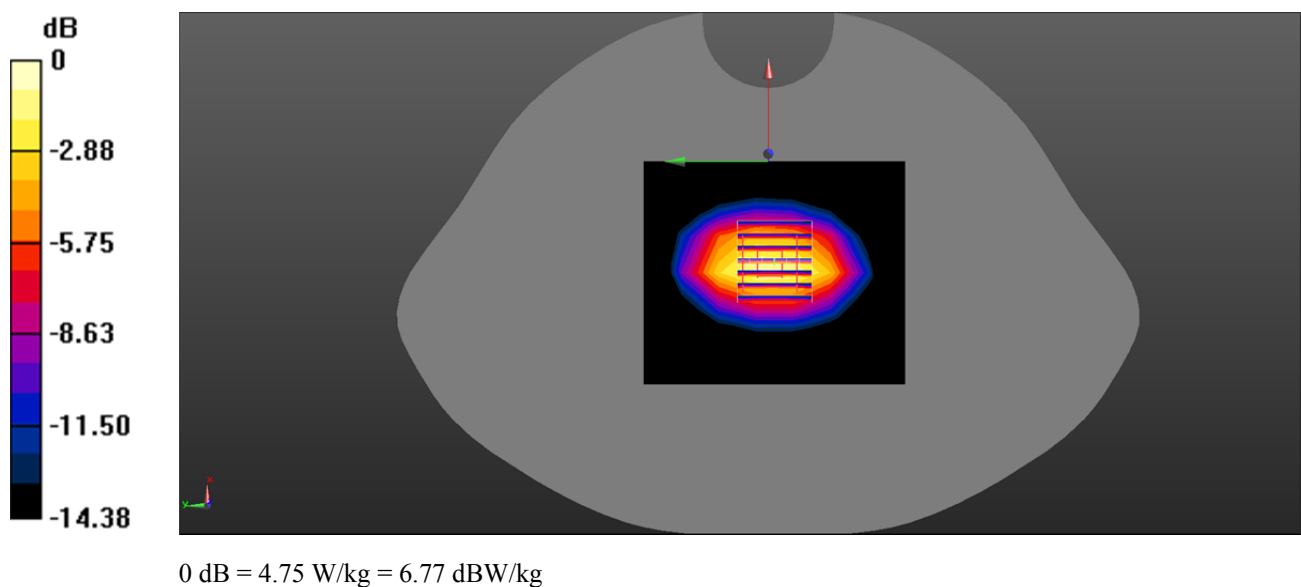
Configuration/Head 1750MHz Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.96 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 5.38 W/kg

SAR(1 g) = 3.34 W/kg; SAR(10 g) = 1.9 W/kg

Maximum value of SAR (measured) = 4.75 W/kg



Performance Qualification Report For 2600MHz SAR Dipole-1

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D2600V3
 Serial Number: 1207
 Calibration Date: 2024/03/27

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2023/09/27	2024/09/26
E-Field Probe	EX3DV4	7382	2023/09/27	2024/09/26
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/01/16	2025/01/15
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2023/06/08	2024/06/07
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	18.7 ~ 19.6℃
Ambient Temperature:	21 ~ 22.7℃
Relative Humidity:	43 ~ 48%
ATM Pressure:	101.3 kPa
Test Date:	2024/03/27

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
2600	Head	Return Loss	30.923 dB	27.361 dB	13.019%	±20%; ≥20dB	Pass
		Real Impedance	48.396 Ω	45.943 Ω	2.453 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-0.109 Ω	-0.667 Ω	0.558 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
2600	Simulated Tissue Liquid Head	37.773	1.962	39.00	1.96	-3.15	0.10	±5

System Accuracy Check Results:

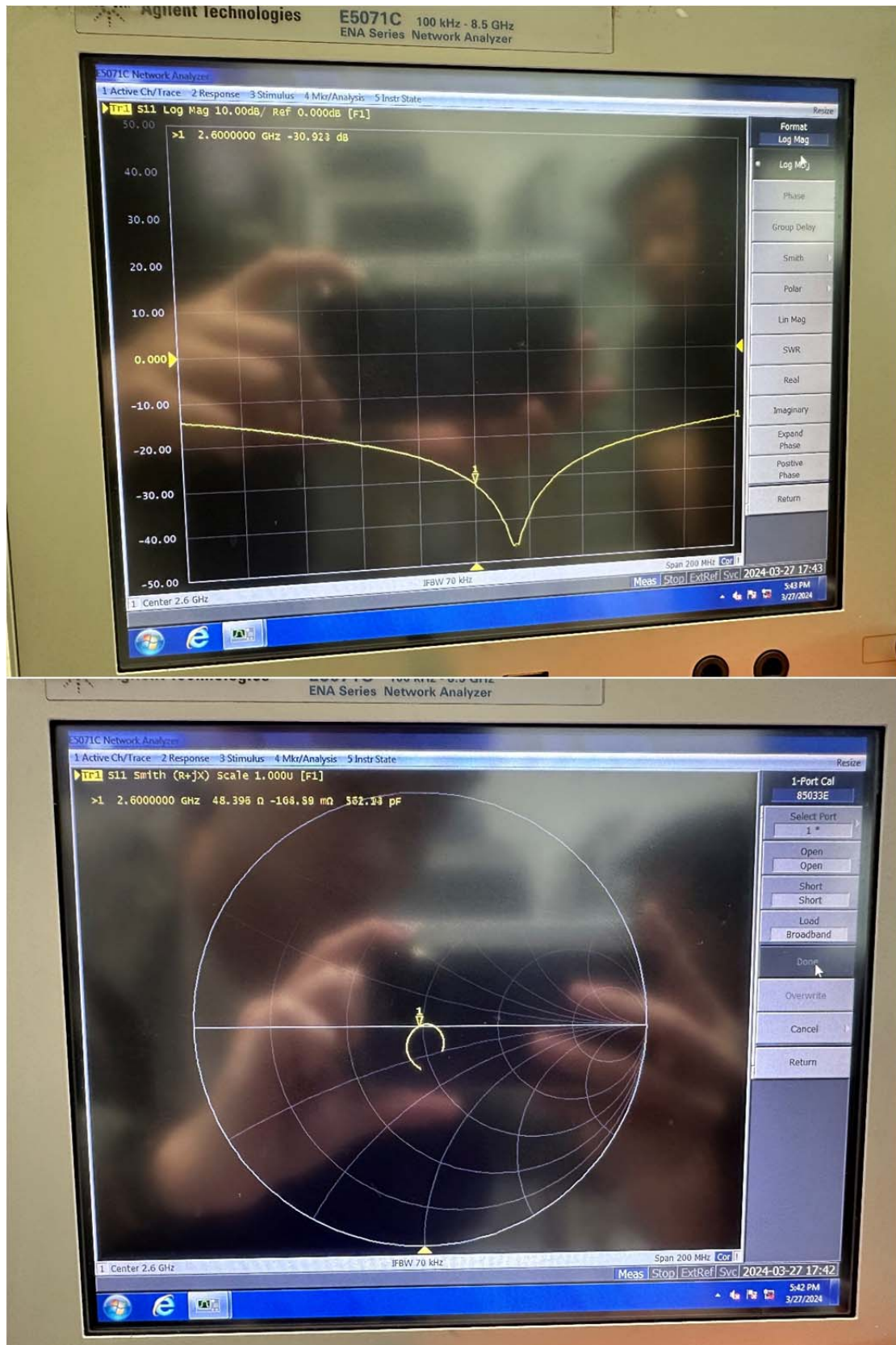
Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2600	Head	100	1g	5.53	55.3	55.2	0.181	±10
			10g	2.56	25.6	24.8	3.226	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 2600MHz dipole calibration certificate (Certificate No.: D2600V2-1207_Mar23), which was issue by SPEAG.

5. Test Plot & System Validation Data:

Dipole, 2600MHz, 1207



System Performance 2600 MHz Head

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1207

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.962$ S/m; $\epsilon_r = 37.773$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7382; ConvF(7.65, 7.65, 7.65) @ 2600 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 2600MHz Pin=100mW/Area Scan (9x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 8.73 W/kg

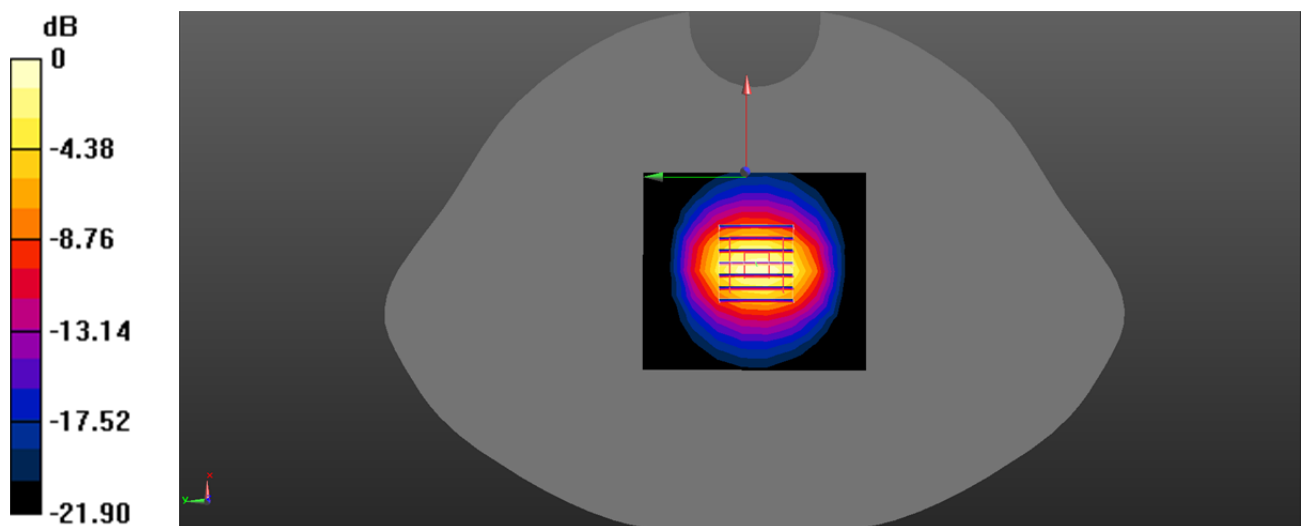
Configuration/Head 2600MHz Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.25 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 11.2 W/kg

SAR(1 g) = 5.53 W/kg; SAR(10 g) = 2.56 W/kg

Maximum value of SAR (measured) = 9.21 W/kg



0 dB = 9.21 W/kg = 9.64 dBW/kg

Performance Qualification Report For 2600MHz SAR Dipole-2

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D2600V3
 Serial Number: 1207
 Calibration Date: 2025/03/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2024/10/08	2025/10/07
Dosimetric E-field Probes	EX3DV4	7896	2024/11/07	2025/11/06
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2024/05/21	2025/05/20
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/12/04	2025/12/03
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2024/05/21	2025/05/20
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	18.2 ~ 19.6°C
Ambient Temperature:	18.8 ~ 20.7°C
Relative Humidity:	50 ~ 63%
ATM Pressure:	98.1 kPa
Test Date:	2025/03/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
2600	Head	Return Loss	26.677 dB	27.361 dB	-2.500 %	±20%; ≥20dB	Pass
		Real Impedance	47.675 Ω	45.943 Ω	1.732 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-3.890 Ω	-0.667 Ω	3.223 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε _r	σ' (S/m)	ε _r	σ' (S/m)	Δε _r	Δσ'	
2600	Simulated Tissue Liquid Head	39.478	1.977	39.00	1.96	1.23	0.87	±5

System Accuracy Check Results:

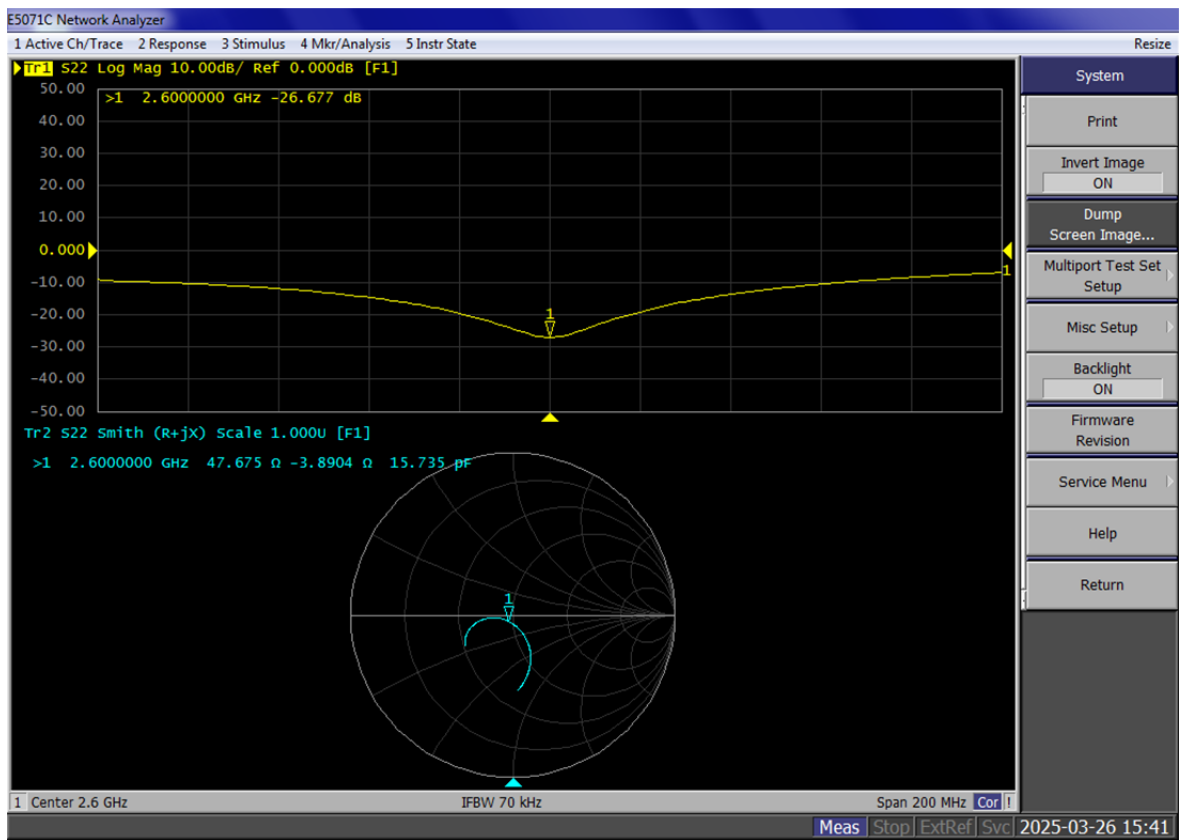
Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
2600	Head	100	1g	5.44	54.4	55.2	-1.449	±10
			10g	2.68	26.8	24.8	8.065	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 2600MHz dipole calibration certificate (Certificate No.: D2600V2-1207_Mar23), which was issue by SPEAG.

5. Test Plot & System Validation Data:

Dipole, 2600MHz, 1207



System Performance 2600 MHz Head

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1207

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.977$ S/m; $\epsilon_r = 39.478$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7896; ConvF(6.6, 6.92, 6.93) @ 2600 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 10/8/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 2600MHz Pin=100mW/Area Scan (9x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 8.19 W/kg

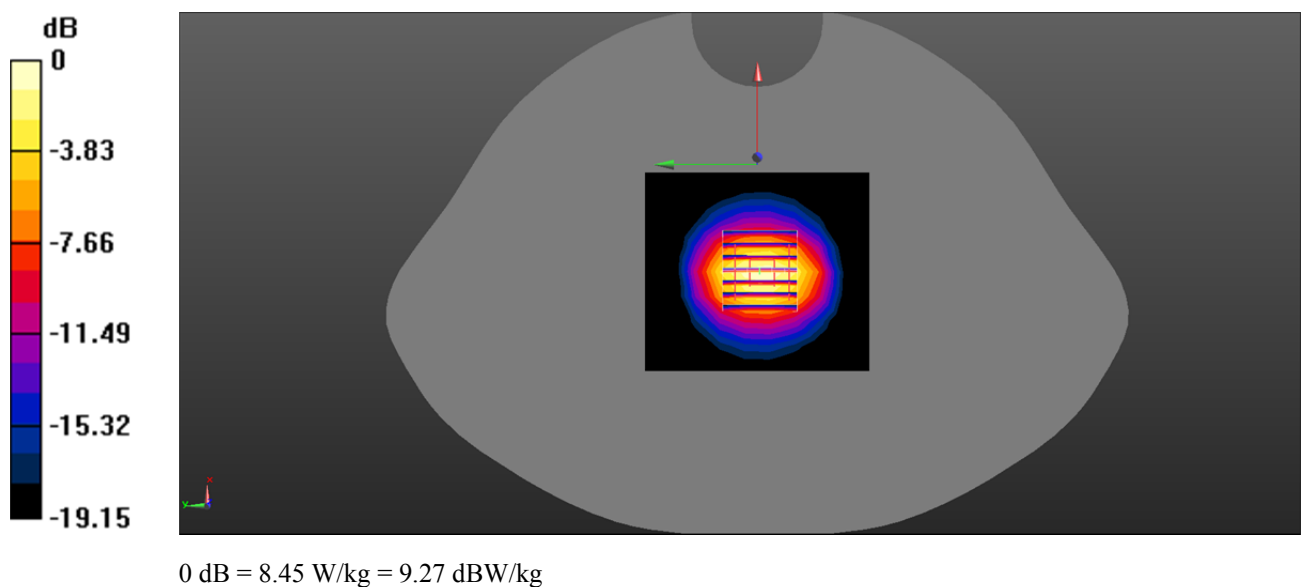
Configuration/Head 2600MHz Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.30 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 9.79 W/kg

SAR(1 g) = 5.44 W/kg; SAR(10 g) = 2.68 W/kg

Maximum value of SAR (measured) = 8.45 W/kg



Performance Qualification Report For 3500MHz SAR Dipole-1

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3500V2
 Serial Number: 1113
 Calibration Date: 2024/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1724	2024/03/28	2025/03/27
Dosimetric E-field Probes	EX3DV4	7557	2024/03/26	2025/03/25
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2024/05/21	2025/05/20
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/01/16	2025/01/15
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2024/05/21	2025/05/20
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.6 ~ 20.3℃
Ambient Temperature:	21.8 ~ 23℃
Relative Humidity:	49 ~ 63%
ATM Pressure:	101.3 kPa
Test Date:	2024/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3500	Head	Return Loss	21.690 dB	25.749 dB	-15.76%	±20%; ≥20dB	Pass
		Real Impedance	51.012 Ω	49.726 Ω	1.286 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	8.282 Ω	5.144 Ω	3.138 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

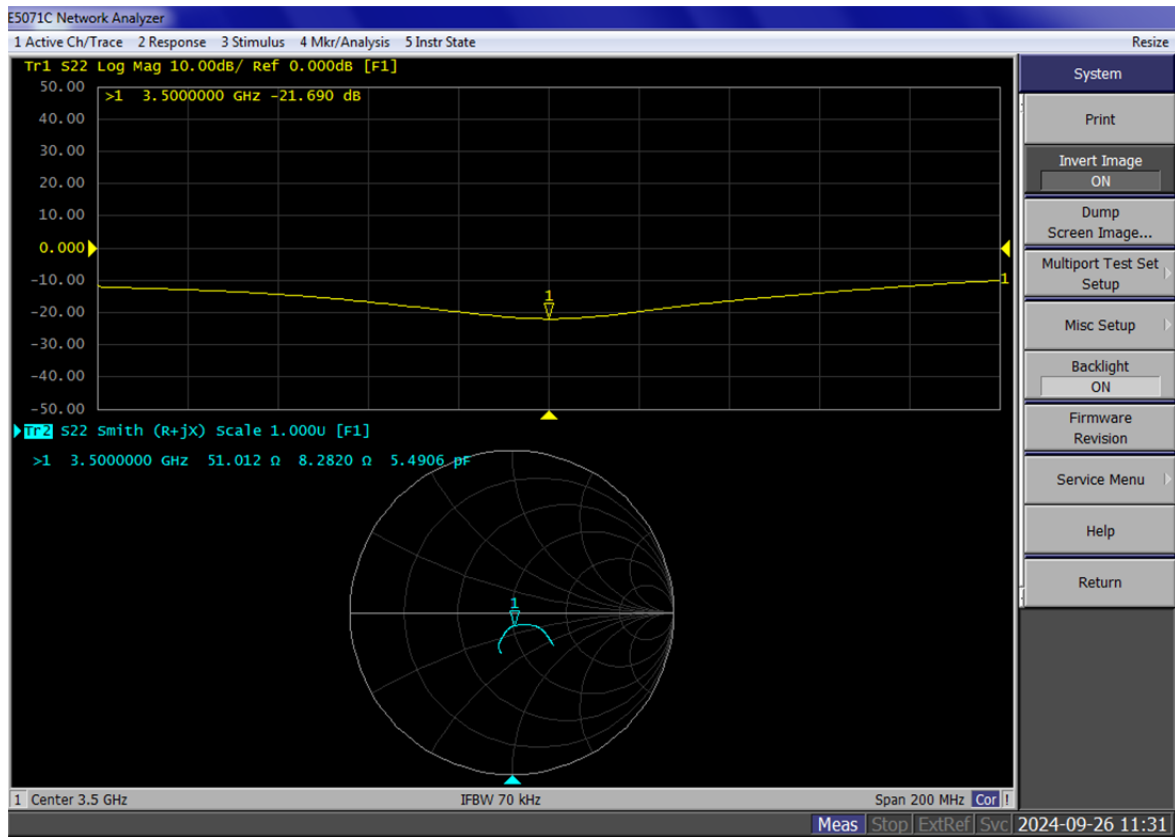
Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3500	Simulated Tissue Liquid Head	37.803	2.879	37.90	2.91	-0.26	-1.07	±5

System Accuracy Check Results:

Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3500	Head	100	1g	6.38	63.8	66.4	-3.916	±10
			10g	2.65	26.5	25.3	4.743	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 3500MHz dipole calibration certificate (Certificate No.: 23J02Z80072), which was issued by CTTL.

5. Test Plot & System Validation Data:**Dipole, 3500MHz, 1113**

System Performance 3500 MHz Head

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: 1113

Communication System: UID 0, CW (0); Frequency: 3500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3500$ MHz; $\sigma = 2.879$ S/m; $\epsilon_r = 37.803$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7557; ConvF(6.65, 6.65, 6.65) @ 3500 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1724; Calibrated: 3/28/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 3500MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 9.65 W/kg

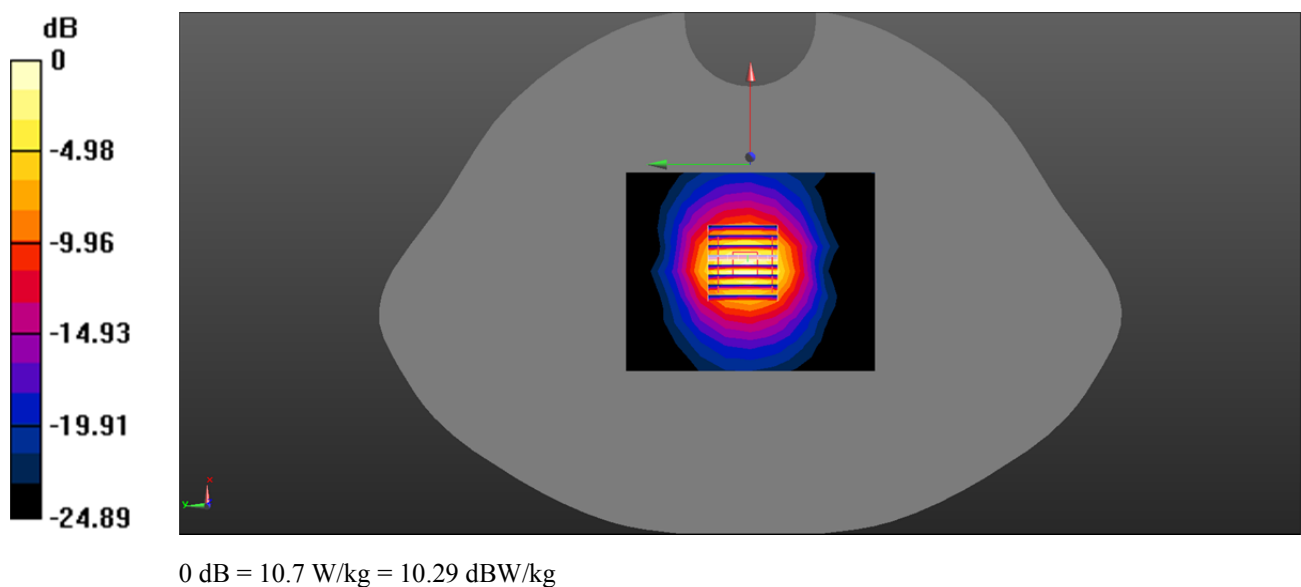
Configuration/Head 3500MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 47.52 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 13.5 W/kg

SAR(1 g) = 6.38 W/kg; SAR(10 g) = 2.65 W/kg

Maximum value of SAR (measured) = 10.7 W/kg



Performance Qualification Report For 3500MHz SAR Dipole-2

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3500V2
 Serial Number: 1113
 Calibration Date: 2025/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.4	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2024/10/08	2025/10/07
Dosimetric E-field Probes	EX3DV4	7896	2024/11/07	2025/11/06
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2025/04/29	2026/04/28
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/12/04	2025/12/03
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2025/04/29	2026/04/28
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.0 ~ 20.5℃
Ambient Temperature:	21.6 ~ 22.6℃
Relative Humidity:	49 ~ 65%
ATM Pressure:	100.5 kPa
Test Date:	2025/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3500	Head	Return Loss	24.669 dB	25.749 dB	-4.194 %	±20%; ≥20dB	Pass
		Real Impedance	54.649 Ω	49.726 Ω	4.923 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	3.976 Ω	5.144 Ω	1.168 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

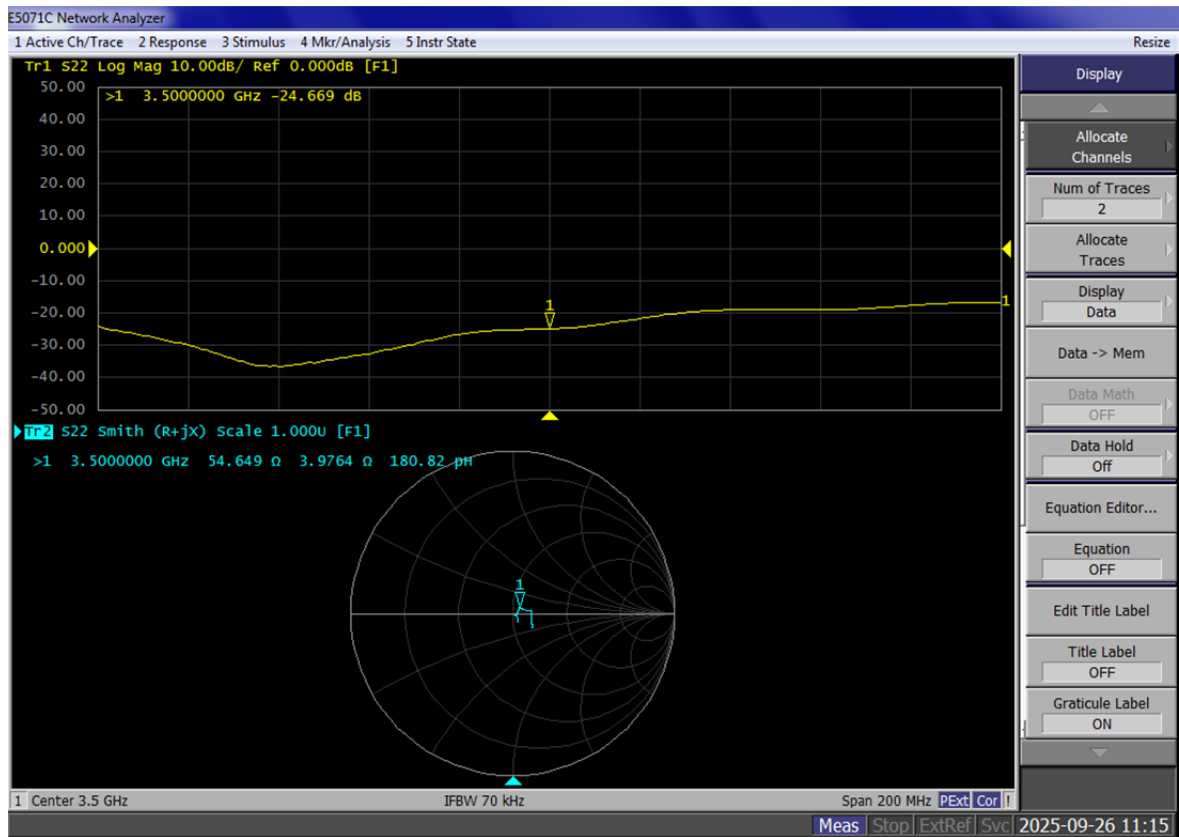
Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3500	Simulated Tissue Liquid Head	36.624	2.953	37.90	2.91	-3.37	1.48	±5

System Accuracy Check Results:

Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3500	Head	100	1g	6.96	69.6	66.4	4.819	±10
			10g	2.65	26.5	25.3	4.743	±10

Note:

1. Return Loss Deviation = (Measured-Target)/Target×100%
2. The target values above please refer to 3500MHz dipole calibration certificate (Certificate No.: 23J02Z80072), which was issued by CTTL.

5. Test Plot & System Validation Data:**Dipole, 3500MHz, 1113**

System Performance 3500 MHz Head**DUT: Dipole 3500 MHz; Type: D3500V2; Serial: 1113**

Communication System: UID 0, CW (0); Frequency: 3500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3500$ MHz; $\sigma = 2.953$ S/m; $\epsilon_r = 36.624$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7896; ConvF(5.91, 6.19, 6.2) @ 3500 MHz; Calibrated: 11/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 10/8/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Configuration/Head 3500MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 9.94 W/kg

Configuration/Head 3500MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 52.22 V/m; Power Drift = -0.05 dB

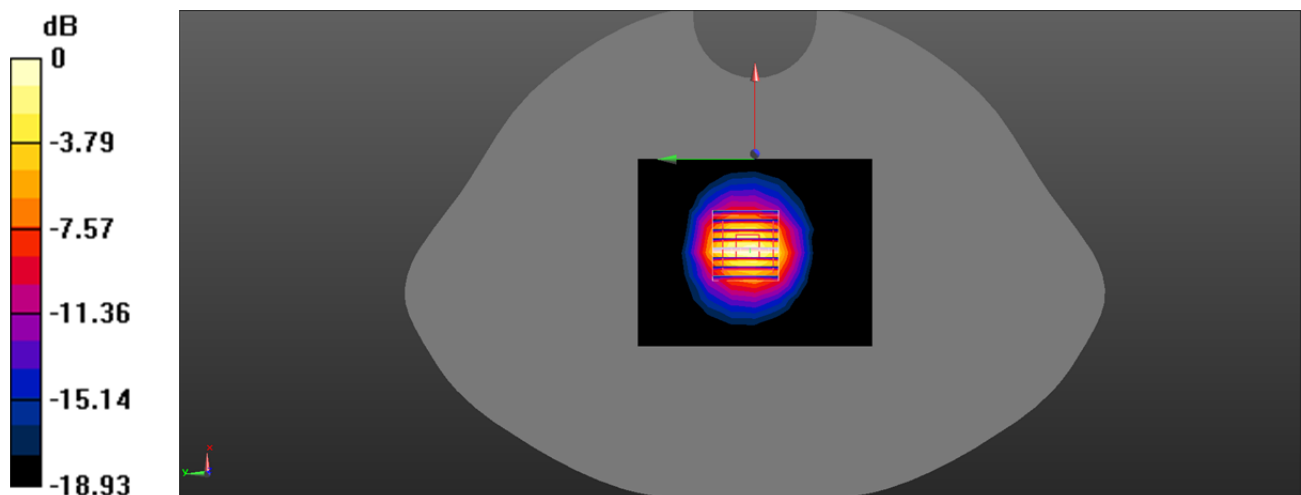
Peak SAR (extrapolated) = 12.5 W/kg

SAR(1 g) = 6.96 W/kg; SAR(10 g) = 2.65 W/kg

Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 81.7%

Maximum value of SAR (measured) = 10.6 W/kg



0 dB = 10.6 W/kg = 10.25 dBW/kg

Performance Qualification Report For 3700MHz SAR Dipole-1

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3700V2
 Serial Number: 1084
 Calibration Date: 2024/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1724	2024/03/28	2025/03/27
Dosimetric E-field Probes	EX3DV4	7557	2024/03/26	2025/03/25
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2024/05/21	2025/05/20
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/01/16	2025/01/15
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52370001	2024/05/21	2025/05/20
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.6 ~ 20.3℃
Ambient Temperature:	21.8 ~ 23℃
Relative Humidity:	49 ~ 63%
ATM Pressure:	101.3 kPa
Test Date:	2024/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3700	Head	Return Loss	21.247 dB	22.509 dB	-5.61%	±20%; ≥20dB	Pass
		Real Impedance	42.779 Ω	43.404 Ω	0.625 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	3.543 Ω	2.341 Ω	1.202 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3700	Simulated Tissue Liquid Head	36.448	3.153	37.70	3.12	-3.32	1.06	±5

System Accuracy Check Results:

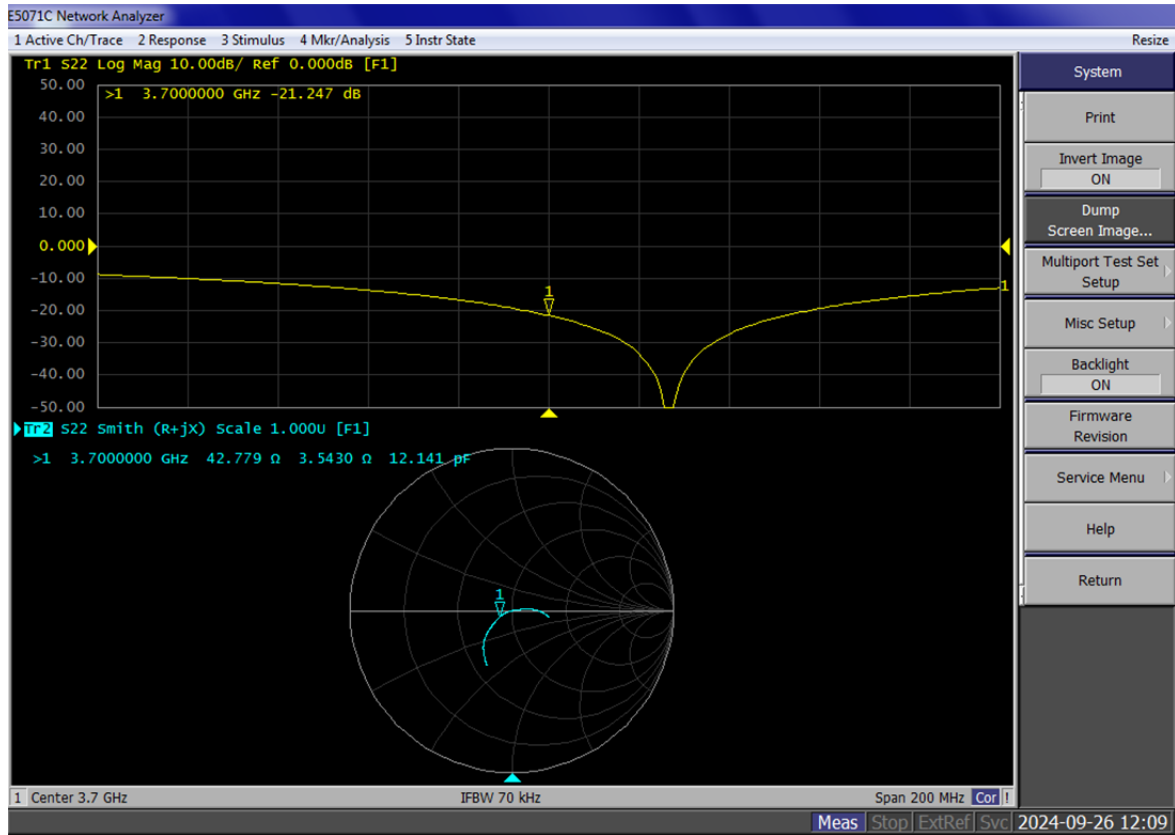
Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3700	Head	100	1g	6.52	65.2	66.7	-2.249	±10
			10g	2.65	26.5	24.3	9.053	±10

Note:

1. Return Loss Deviation = (Measured-Target)/Target×100%
2. The target values above please refer to 3700MHz dipole calibration certificate (Certificate No.: 23J02Z80074), which was issued by CTTL.

5. Test Plot & System Validation Data:

Dipole, 3700MHz, 1084



System Performance 3700 MHz Head

DUT: Dipole 3700 MHz; Type: D3700V2; Serial: 1084

Communication System: UID 0, CW (0); Frequency: 3700 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3700$ MHz; $\sigma = 3.153$ S/m; $\epsilon_r = 36.448$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7557; ConvF(6.47, 6.47, 6.47) @ 3700 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1724; Calibrated: 3/28/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 3700MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 11.9 W/kg

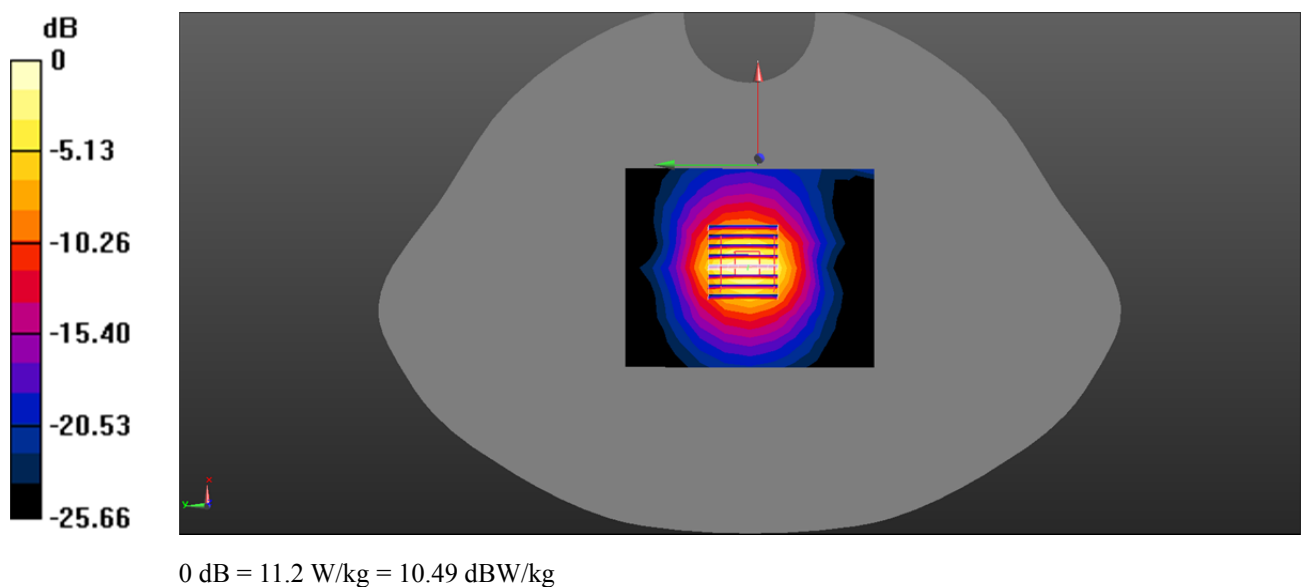
Configuration/Head 3700MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 51.57 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 14.1 W/kg

SAR(1 g) = 6.52 W/kg; SAR(10 g) = 2.65 W/kg

Maximum value of SAR (measured) = 11.2 W/kg



Performance Qualification Report For 3700MHz SAR Dipole-2

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3700V2
 Serial Number: 1084
 Calibration Date: 2025/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.4	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2024/10/08	2025/10/07
Dosimetric E-field Probes	EX3DV4	7896	2024/11/07	2025/11/06
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2025/04/29	2026/04/28
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/12/04	2025/12/03
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2025/04/29	2026/04/28
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.0 ~ 20.5℃
Ambient Temperature:	21.6 ~ 22.6℃
Relative Humidity:	49 ~ 65%
ATM Pressure:	100.5 kPa
Test Date:	2025/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3700	Head	Return Loss	21.418 dB	25.749 dB	-16.820 %	±20%; ≥20dB	Pass
		Real Impedance	46.309 Ω	49.726 Ω	3.417 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	0.623 Ω	5.144 Ω	4.521 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

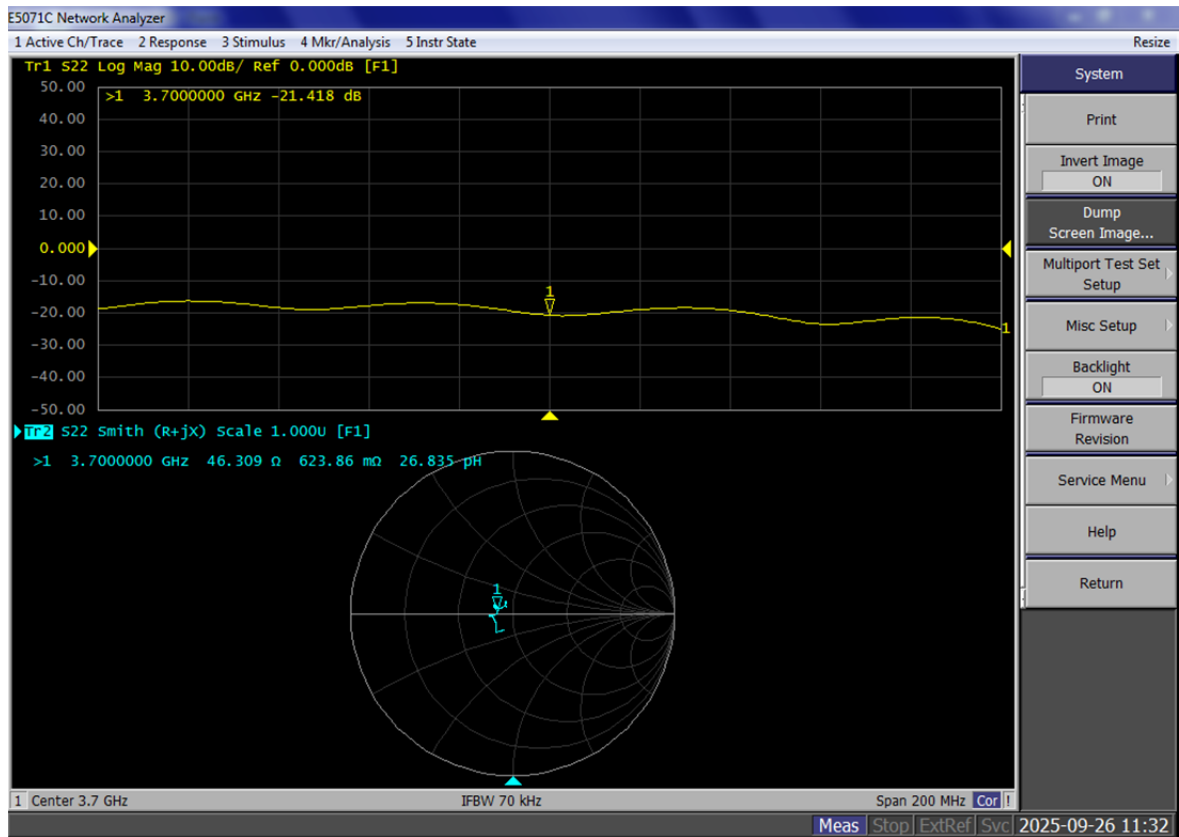
Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3700	Simulated Tissue Liquid Head	37.694	3.067	37.70	3.12	-0.02	-1.70	±5

System Accuracy Check Results:

Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3700	Head	100	1g	6.59	65.9	66.7	-1.199	±10
			10g	2.55	25.5	24.3	4.938	±10

Note:

1. Return Loss Deviation = (Measured-Target)/Target×100%
2. The target values above please refer to 3700MHz dipole calibration certificate (Certificate No.: 23J02Z80074), which was issued by CTTL.

5. Test Plot & System Validation Data:**Dipole, 3700MHz, 1084**

System Performance 3700 MHz Head**DUT: Dipole 3700 MHz; Type: D3700V2; Serial: 1084**

Communication System: UID 0, CW (0); Frequency: 3700 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3700$ MHz; $\sigma = 3.067$ S/m; $\epsilon_r = 37.694$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7896; ConvF(5.92, 6.2, 6.21) @ 3700 MHz; Calibrated: 11/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 10/8/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Configuration/Head 3700MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 10.3 W/kg

Configuration/Head 3700MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 51.22 V/m; Power Drift = -0.10 dB

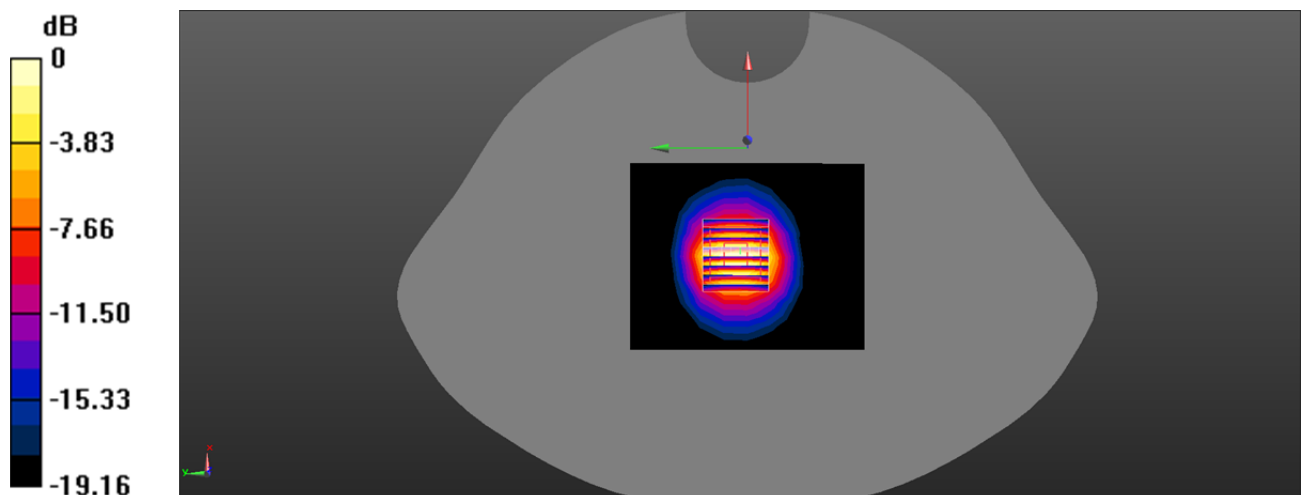
Peak SAR (extrapolated) = 12.1 W/kg

SAR(1 g) = 6.59 W/kg; SAR(10 g) = 2.55 W/kg

Smallest distance from peaks to all points 3 dB below = 8.2 mm

Ratio of SAR at M2 to SAR at M1 = 80.3%

Maximum value of SAR (measured) = 10.1 W/kg



0 dB = 10.1 W/kg = 10.04 dBW/kg

Performance Qualification Report For 3900MHz SAR Dipole-1

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3900V2
 Serial Number: 1058
 Calibration Date: 2024/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.2	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1724	2024/03/28	2025/03/27
Dosimetric E-field Probes	EX3DV4	7557	2024/03/26	2025/03/25
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2024/05/21	2025/05/20
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/01/16	2025/01/15
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52390001	2024/05/21	2025/05/20
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.6 ~ 20.3℃
Ambient Temperature:	21.8 ~ 23℃
Relative Humidity:	49 ~ 63%
ATM Pressure:	101.3 kPa
Test Date:	2024/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3900	Head	Return Loss	21.070 dB	23.417 dB	-10.02%	±20%; ≥20dB	Pass
		Real Impedance	50.044 Ω	46.285 Ω	3.759 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-8.893 Ω	-5.342 Ω	3.551 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

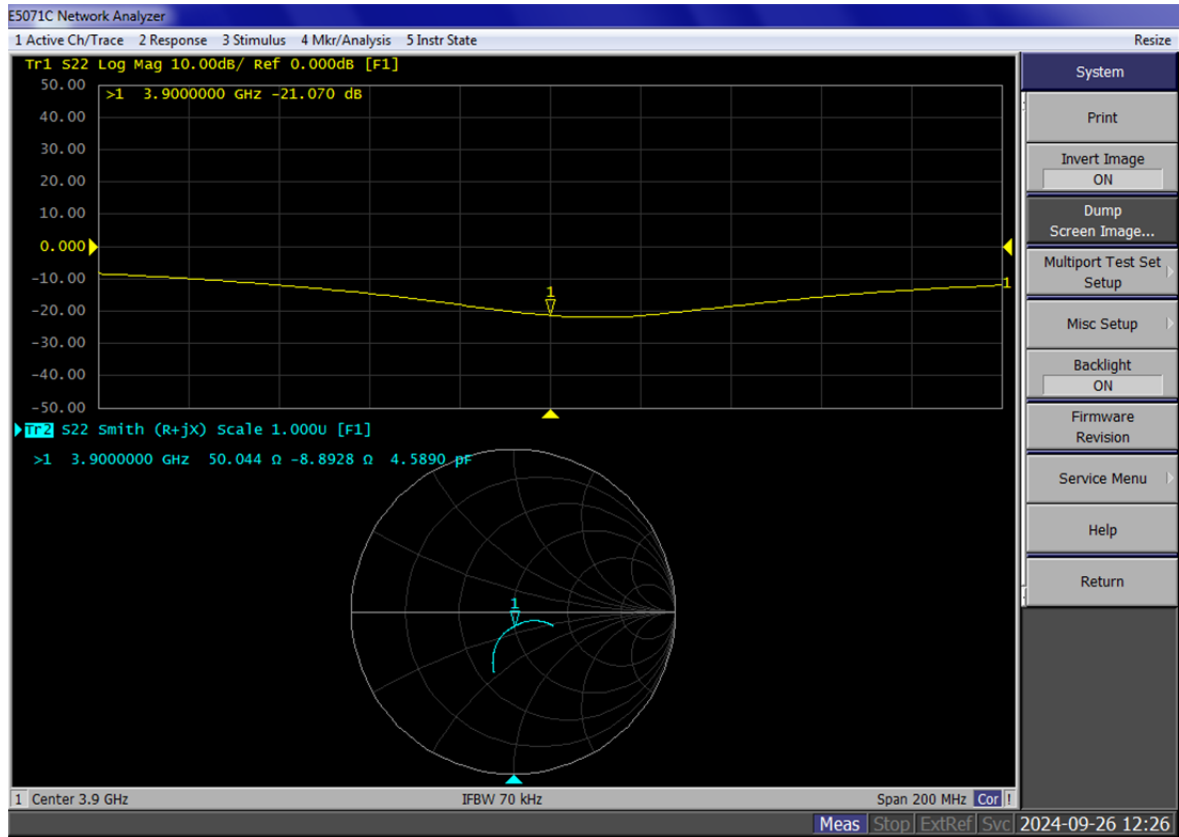
Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3900	Simulated Tissue Liquid Head	36.794	3.367	37.50	3.33	-1.88	1.11	±5

System Accuracy Check Results:

Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3900	Head	100	1g	6.49	64.9	68.6	-5.394	±10
			10g	2.50	25.0	24.0	4.167	±10

Note:

- Return Loss Deviation = (Measured-Target)/Target×100%
- The target values above please refer to 3900MHz dipole calibration certificate (Certificate No.: 23J02Z80064), which was issued by CTTL.

5. Test Plot & System Validation Data:**Dipole, 3900MHz, 1058**

System Performance 3900 MHz Head**DUT: Dipole 3900 MHz; Type: D3900V2; Serial: 1058**

Communication System: UID 0, CW (0); Frequency: 3900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3900$ MHz; $\sigma = 3.367$ S/m; $\epsilon_r = 36.794$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7557; ConvF(6.37, 6.37, 6.37) @ 3900 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1724; Calibrated: 3/28/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

Configuration/Head 3900MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 12.6 W/kg

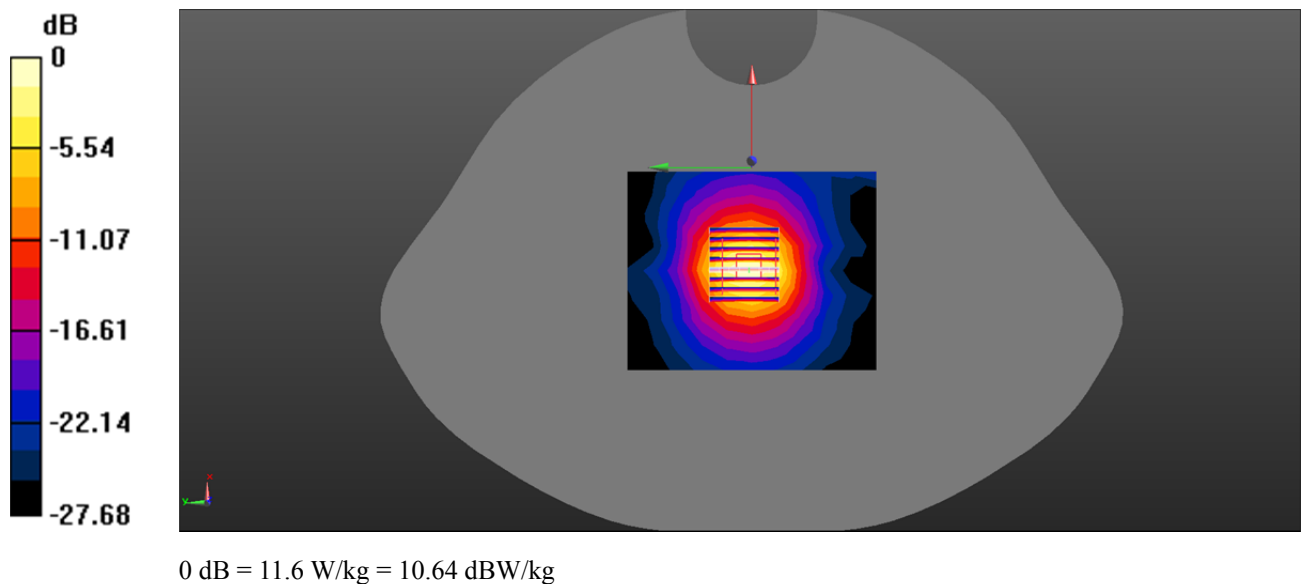
Configuration/Head 3900MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 48.30 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 15.3 W/kg

SAR(1 g) = 6.49 W/kg; SAR(10 g) = 2.5 W/kg

Maximum value of SAR (measured) = 11.6 W/kg



Performance Qualification Report For 3900MHz SAR Dipole-2

Equipment Details:

Description: Dipole
 Manufacturer: Speag
 Model Number: D3900V2
 Serial Number: 1058
 Calibration Date: 2025/09/26

Calibration and Checked By:

Bob Lu

Bob Lu

Approved By:

Luke Jiang

Luke Jiang

1. Equipment List & Calibration Information:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
DASY5 Test Software	DASY52 52.10.4	N/A	NCR	NCR
DASY6 Measurement Server	DASY6 6.0.31	N/A	NCR	NCR
Data Acquisition Electronics	DAE4	1325	2024/10/08	2025/10/07
Dosimetric E-field Probes	EX3DV4	7896	2024/11/07	2025/11/06
Mounting Device	MD4HHTV5	SD 000 H01 KA	NCR	NCR
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2025/04/29	2026/04/28
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR
MXG Analog Signal Generator	N5181A	MY48180408	2024/12/04	2025/12/03
Microwave peak power sensor	MA24418A	12622	NCR	NCR
USB wideband power sensor	U2021XA	MY52350001	2025/04/29	2026/04/28
20dB Attenuator	N/A	N/A	NCR	NCR
Directional Coupler	855673	3307	NCR	NCR

2. Standard Requirements:

Referring to KDB 865664 D01 3.3.2, for dipole calibration, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) When the measured SAR does not deviates from the calibrated SAR value by more than 10%.
- 2) When the most recent return-loss result, measured at least annually, does not deviate by more than 20% from the previous measurement or meeting the required 20 dB minimum return-loss requirement.
- 3) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, does not deviate by more than 5 Ω from the previous measurement.

3. Environmental Conditions:

TSL Temperature:	19.0 ~ 20.5℃
Ambient Temperature:	21.6 ~ 22.6℃
Relative Humidity:	49 ~ 65%
ATM Pressure:	100.5 kPa
Test Date:	2025/09/26

4. Test Results:

Return Loss & Impedance Measurement Results:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
3900	Head	Return Loss	20.893 dB	23.417 dB	-10.778 %	±20%; ≥20dB	Pass
		Real Impedance	41.861 Ω	46.285 Ω	4.424 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-1.490 Ω	-5.342 Ω	3.852 Ω	≤ 5 Ω	Pass

Liquid Verification Results:

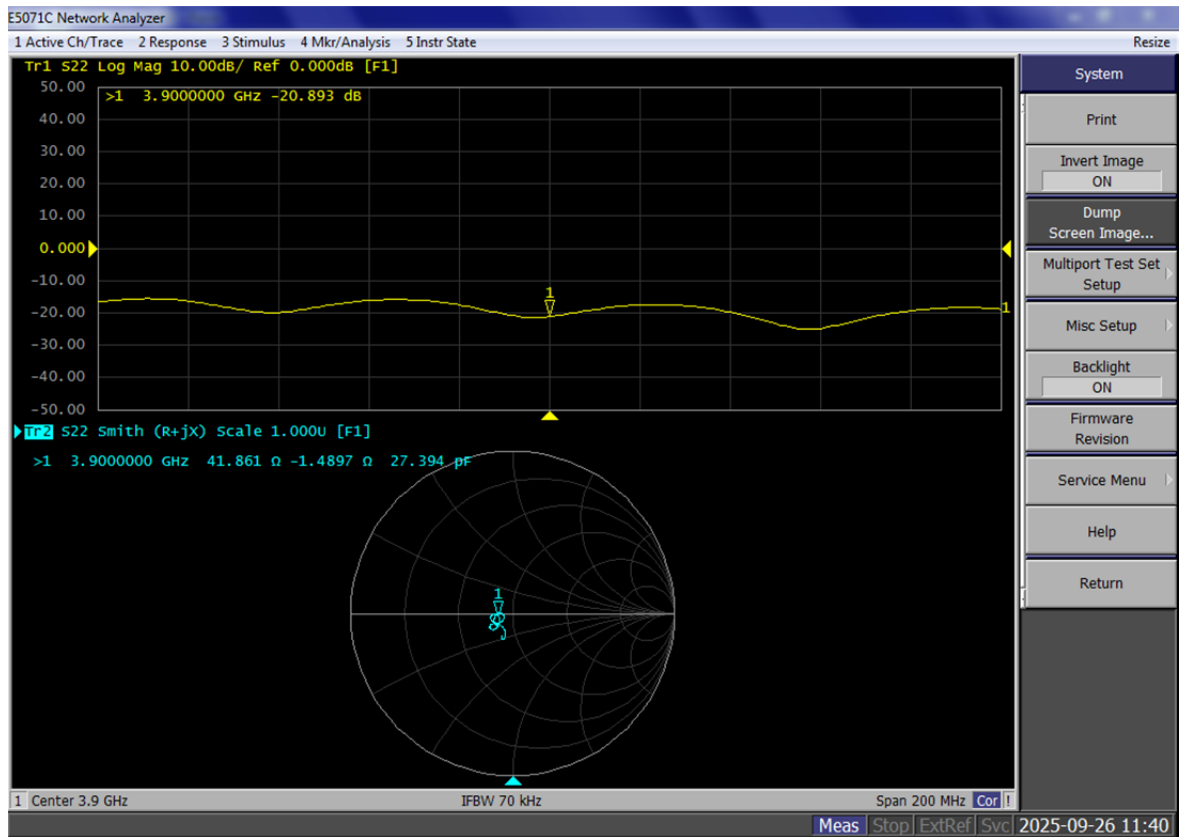
Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$	
3900	Simulated Tissue Liquid Head	37.300	3.397	37.50	3.33	-0.53	2.01	±5

System Accuracy Check Results:

Frequency Band (MHz)	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)
3900	Head	100	1g	6.67	66.7	68.6	-2.770	±10
			10g	2.49	24.9	24.0	3.750	±10

Note:

1. Return Loss Deviation = (Measured-Target)/Target×100%
2. The target values above please refer to 3900MHz dipole calibration certificate (Certificate No.: 23J02Z80064), which was issued by CTTL.

5. Test Plot & System Validation Data:**Dipole, 3900MHz, 1058**

System Performance 3900 MHz Head

DUT: Dipole 3900 MHz; Type: D3900V2; Serial: 1058

Communication System: UID 0, CW (0); Frequency: 3900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 3900$ MHz; $\sigma = 3.397$ S/m; $\epsilon_r = 37.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7896; ConvF(5.79, 6.07, 6.07) @ 3900 MHz; Calibrated: 11/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 10/8/2024
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

Configuration/Head 3900MHz Pin=100mW/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 10.8 W/kg

Configuration/Head 3900MHz Pin=100mW/Zoom Scan (8x8x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 46.57 V/m; Power Drift = -0.04 dB

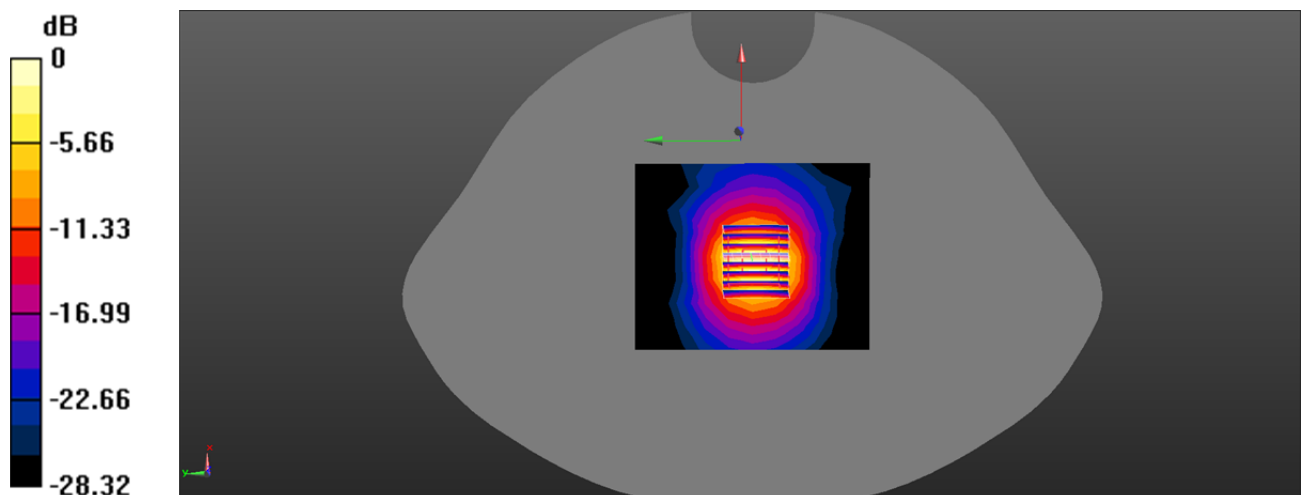
Peak SAR (extrapolated) = 15.0 W/kg

SAR(1 g) = 6.67 W/kg; SAR(10 g) = 2.59 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 73.2%

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg