

Client **UL Verification Services Inc.**
Fremont, USA

Certificate No: **V-Coil50/400V2-**
1028_May24

CALIBRATION CERTIFICATE

Object **V-Coil50/400V2 - SN: 1028**

Calibration procedure(s) **QA CAL-47.v13**
Calibration Procedure for WPT Verification & Validation Sources

Calibration date: **May 27, 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 < 75%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
MAGPy-8H3D+E3D/DAS	SN: 3089/3079	17-Nov-23 (MAGPy-8H3D+E3D-3089)	Nov-24

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
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Calibrated by:	Name Jingtian Xi	Function Project Leader	Signature 
Approved by:	Sven Kühn	Technical Manager	

Issued: May 29, 2024

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

Glossary:

WPT wireless power transfer
V&V verification & validation

Calibration is Performed According to the Following Standards:

- Internal procedure QA CAL-47 Calibration procedure for WPT verification & validation sources from 3 kHz to 10 MHz
- IEC/IEEE 63164, "Assessment methods of the human exposure to electric and magnetic fields from wireless power transfer systems – Models, instrumentation, measurement and computational methods and procedures (Frequency range 3 kHz to 30 MHz)", draft standard, 2023

Additional Documentation:

- a) cDASY6/DASY8 Module WPT Manual

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* The V&V source is switched on for at least 30 minutes.
- *Source Positioning:* The V&V source is placed in the center of the UniPV1 phantom such that the source surface is parallel to phantom surface. The probe location used for DUT teaching is the top center of the coil (marked on the source casing). The probe distance is verified using mechanical gauges placed on the source surface.
- *H-field distribution:* H-field is measured in the volume above the V&V source in a rectilinear grid with a uniform grid step of 7.33 mm.

Calibrated Quantity

- Spatial peak of H-field (RMS value) at d mm from the DUT surface (extrapolated from measurements)

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

Software version	cDASY6 Module WPT	2.4.0.4346
	Notebook GUI	2.4.0.2
	Sim4Life	7.2.4
Scan setup	Grid dimensions	x: 125 mm, y: 125 mm, z: 36.7 mm
	Grid resolutions	dx, dy, dz: 7.33 mm
Nominal frequency	400 kHz	

Calibrated Quantities

Distance (relative to source surface) (mm)	Peak H-field (A/m)	Uncertainty (k=2) (dB)
0	267	1.13
2	235	1.13

Appendix (Additional assessments outside the scope of SCS 0108)

Peak values of induced fields¹

Distance (relative to source surface) (mm)	Induced peak current density, 1cm ² area avg. (A/m ²)	Induced peak E-field (V/m)			peak spatial SAR (mW/kg)	
		2mm cube avg.	Local	5mm line avg.	1g avg.	10g avg.
0	2.70	4.23	4.32	4.33	7.23	3.61
2	2.31	3.66	3.77	3.77	5.30	2.70

Voltage measurement

Total voltage (V)	Voltages at harmonics (dBc)
0.412	Highest harmonic: -19.6 2 nd highest harmonic: -32.2

¹ determined for a virtual half-space phantom with tissue properties $\epsilon_r = 55$, $\sigma = 0.75$ S/m, $\rho = 1000$ kg/m³

Measurement report

cDASY6 Module WPT Measurement Report

Device under test

Info:
V-Coil50/400

Serial number:
1028

Scenario:
source calibration

Tool info

DASY software version:
cDASY6 Module WPT 2.4.0.4346

Probe model, serial no. and configuration date:
MAGPy-8H3D+E3Dv2, WP000231, 2024/01/10

Software version:
2.0.49, backend: 2.2.3

Scan Info

Center location:
x: -186.17 mm, y: -319.36 mm, z: 36.37 mm

Dimensions:
x: 125.0 mm, y: 125.0 mm, z: 36.7 mm

Resolution:
x: 7.33 mm, y: 7.33 mm, z: 7.33 mm

Completed on:
2024/05/27 10:31:42

Measurement results

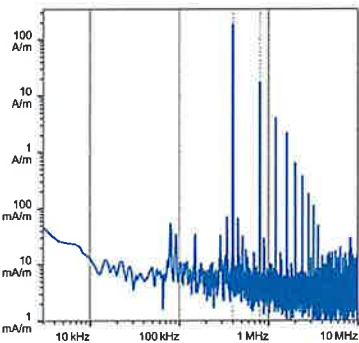
Maximum H-field [RMS]:
MAGNITUDE: 133.35 A/m
x: 20.67 A/m, y: 12.02 A/m, z: 131.19 A/m

Maximum H-field location relative to DUT:
x: 3.67 mm, y: 3.67 mm, z: 8.50 mm

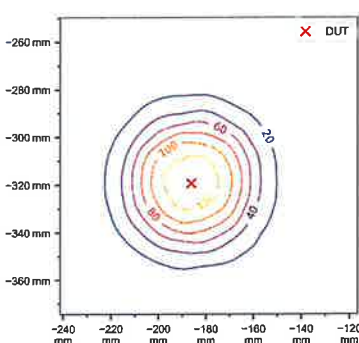
Distance to -20.0 dB boundary:
39.49 mm

Offset relative to DUT:
x: 0.00 m, y: 0.00 m, z: 1.00 mm

H-field magnitude [RMS] at maximum location



H-field magnitude [RMS] at lowest plane



Incident fields, and induced quantities in the anatomical model $(f = 399.99 \text{ kHz}, \sigma = 0.750 \text{ S/m}, \text{tissue density} = 1.000 \text{ kg/m}^3)$

Distance [mm]	Peak incident fields [RMS]	Peak E_{ind} [V/m, RMS]			Peak J_{ind} [A/m ² , RMS]	psSAR [mW/kg]		H-field extent	Errors		
	H_{inc} [A/m]	Cube avg.	Local	Line avg.	Surface avg.	1g avg.	10g avg.	-20 dB radius [mm]	Sign	Vector potential	Boundary effect
0.0	267.0	4.23	4.32	4.33	2.7	7.23	3.61	39.1	1%	9%	25%
2.0	235.0	3.66	3.77	3.77	2.31	5.3	2.7	39.3	1%	9%	28%

Standard compliance evaluation, Absolute

Distance [mm]	ICNIRP 2010/2020			ICNIRP 1998			IEEE 2019			FCC			HC Code 6		
	RL [RMS]	BR [RMS]	psSAR	RL [RMS]	BR [RMS]	psSAR	ERL [RMS]	DRL [RMS]	psSAR	MPE [RMS]	BR [RMS]	psSAR	RL [RMS]	BR [RMS]	psSAR
0.0	pH_{inc} [A/m]	pE_{ind} [V/m]		pH_{inc} [A/m]	pJ_{ind} [A/m ²]		pH_{inc} [A/m]	pE_{ind} [V/m]		pH_{inc} [A/m]	pE_{ind} [V/m]		pH_{inc} [A/m]	pE_{ind} [V/m]	
0.0	267.0	4.23	3.61	267.0	2.7	3.61	267.0	4.33	3.61	267.0	N/A	7.23	267.0	4.32	7.23
2.0	235.0	3.66	2.7	235.0	2.31	2.7	235.0	3.77	2.7	235.0	N/A	5.3	235.0	3.77	5.3

Standard compliance evaluation, Relative

Distance [mm]	ICNIRP 2010/2020 [dB]			ICNIRP 1998 [dB]			IEEE 2019 [dB]			FCC [dB]			HC Code 6 [dB]		
	RL	BR	psSAR	RL	BR	psSAR	ERL	DRL	psSAR	MPE	BR	psSAR	RL	BR	psSAR
0.0	pH_{inc}	pE_{ind}		pH_{inc}	pJ_{ind}		pH_{inc}	pE_{ind}		pH_{inc}	pE_{ind}		pH_{inc}	pE_{ind}	
0.0	26.8	-22.1	-27.4	43.3	10.6	-27.4	9.4	-25.7	-27.4	N/A	N/A	-23.5	43.3	-21.9	-23.5
2.0	25.6	-23.4	-28.7	42.2	9.2	-28.7	8.2	-26.9	-28.7	N/A	N/A	-24.8	42.2	-23.1	-24.8