



COMOHAC E-Field Probe Calibration Report

Ref : ACR.41.4.25.BES.A

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MVG COMOHAC E-FIELD PROBE
SERIAL NO.: SN 07/22-EPH-50

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE

Calibration date: 02/05/2025



Accreditations #2-6789
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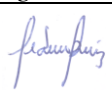

Summary:

This document presents the method and results from an accredited COMOHAC E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOHAC system only. The test results covered by accreditation are traceable to the International System of Units (SI).



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	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
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<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Pedro Ruiz	2/10/2025	Initial release



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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC E FIELD PROBE
Manufacturer	MVG
Model	SCE
Serial Number	0722-EPH-50
Product Condition (new / used)	Used
Frequency Range of Probe	0.7GHz-2.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.208 MΩ Dipole 2: R2=0.212 MΩ Dipole 3: R3=0.213 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG's COMOHAC E field Probes are built in accordance to the ANSI C63.19 and IEEE 1309 standards.



Figure 1 – MVG COMOHAC E field Probe

Probe Length	330 mm
Length of Individual Dipoles	3.3 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	3 mm

3 MEASUREMENT METHOD

All methods used to perform the measurements and calibrations comply with the ANSI C63.19 and IEEE 1309 standards.

3.1 SENSITIVITY

The sensitivity factors of the three dipoles were determined using the waveguide method outlined in the fore mentioned standards.

3.2 LINEARITY

The linearity was determined using a standard dipole with the probe positioned 10 mm above the dipole. The input power of the dipole was adjusted from -15 to 36 dBm using a 1dB step (to cover the range 2V/m to 1000A/m).



3.3 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the ANSI C63.19 and IEEE 1309 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique.

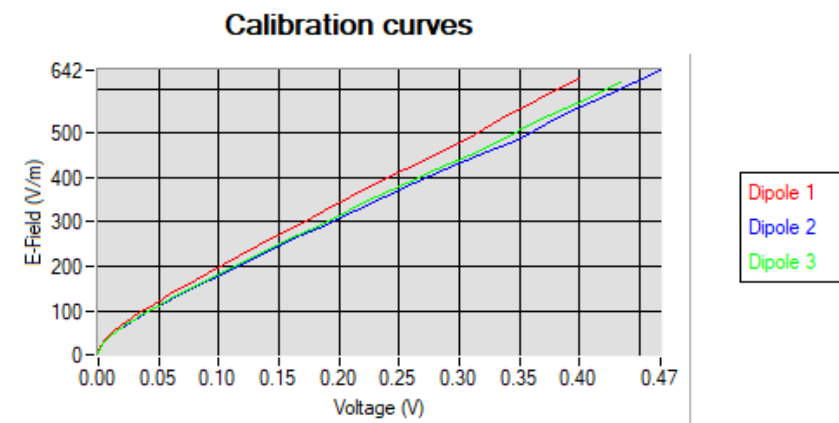
The estimated expanded uncertainty (k=2) in calibration for E-Field (V/m) is +/-9.6% with respect to measurement conditions.

5 CALIBRATION RESULTS

Calibration Parameters	
Lab Temperature	20 +/-1 °C
Lab Humidity	30-70 %

5.1 CALIBRATION IN AIR

The following curve represents the measurement in waveguide of the voltage picked up by the probe toward the E-field generated inside the waveguide.



From this curve, the sensitivity in air is calculated using the below formula.

$$E^2 = \sum_{i=1}^3 \frac{V_i (1 + V_i / DCP_i)}{Norm_i}$$

Vi=voltage readings on the 3 channels of the probe

DCPi=diode compression point given below for the 3 channels of the probe

Normi=dipole sensitivity given below for the 3 channels of the probe



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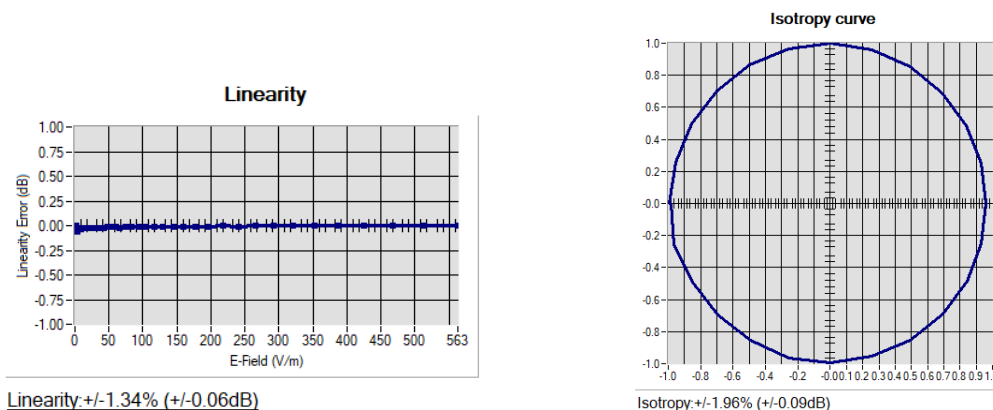
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Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$)
5.00	5.96	5.85

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
104	110	106

6 VERIFICATION RESULTS

The figures below represent the measured linearity and axial isotropy for this probe. The probe specification is ± 0.2 dB for linearity and ± 0.15 dB for axial isotropy.





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7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
HAC positioning ruler	MVG	TABH12 SN 42/09	Validated. No cal required.	Validated. No cal required.
COMOHAC Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2026
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2027
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	183277	05/2022	05/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2026
Power Meter	Keysight U2000A	SN: MY62340002	10/2024	10/2027
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44235403	02/2024	02/2027