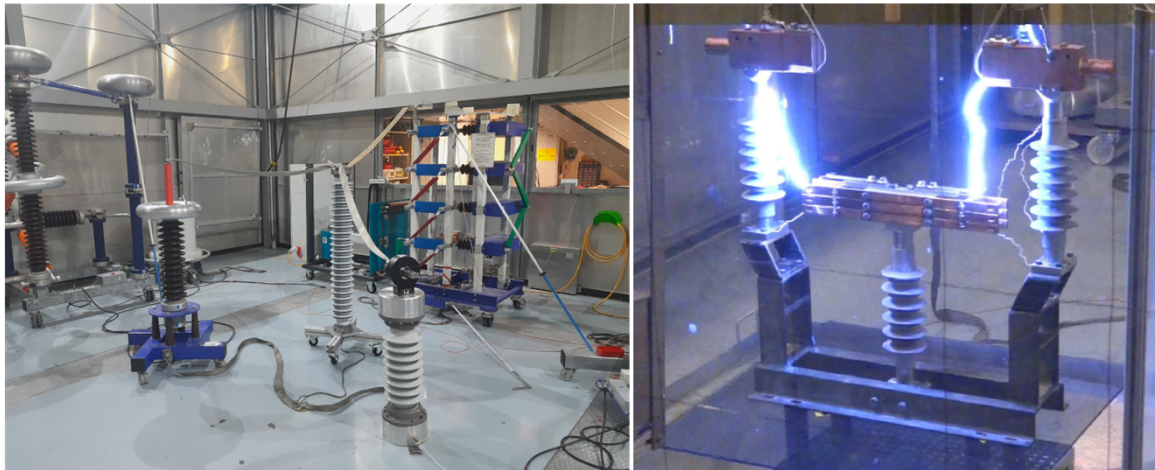


High Voltage Laboratory Overview



Activities

Introduction

The high-voltage laboratory of the engineering school is a modern, regularly calibrated facility. It has a command of the application of IEC standards such as IEC 60060. Its main activities are :

- Training
- Industrial testing
- Characterisation of dielectric materials
- Applied research and industrial collaboration

Training

The laboratory offers tailor-made training courses for industry in the fields of high-voltage safety, high-voltage generation, measurement techniques and diagnostics.

Industrial testing

- High-voltage tests on electrical equipment and components
- Type and routine tests according to IEC standards
- Power-frequency withstand tests
- Lightning impulse tests
- Switching impulse tests
- Partial discharge measurements
- Measurement of capacitance and dissipation factor $\tan \delta$

- Environmental and endurance tests
- Impulse current tests

A list of our equipment and test voltages can be found below.

Characterisation of dielectric materials

- Dielectric strength of solid or liquid materials
- Permittivity and dissipation factor ($\tan \delta$)
- Volume and surface resistivity
- Ageing of dielectric materials

A list of our equipment can be found below.

Applied research and industrial collaboration

Our research and development activities are carried out in close collaboration with industrial partners. They address practical challenges in the field of high voltage and support the development, testing and validation of new technologies, new products and new measurement methods.

Thanks to close collaboration with the various departments and institutes of our university of applied sciences, in particular in computer science, mechanical engineering, chemistry and civil engineering, we can provide multidisciplinary expertise at every phase of a project. Our compact size guarantees agility and responsiveness, while our academic environment keeps us at the forefront of the latest scientific and technological developments.

Collaboration can take the form of an Innosuisse project, a direct industrial mandate or a tailor-made research partnership. We also offer feasibility studies, proof-of-concept developments and projects carried out by students at Bachelor and Master level, including semester projects and theses.

These student projects are generally provided at no additional cost, except for significant expenses related to hardware, materials or specialised equipment.

We have extensive experience in handling confidential information and intellectual property. Non-disclosure agreements (NDAs) are an integral part of our collaborations and ensure a secure framework for industrial innovation and development.

Main equipment

Test hall (Faraday cage)

- Dimensions : 8.9 m $\times$ 7.8 m $\times$ 6.6 m (Length $\times$ Width $\times$ Height)
- Access door : 2 m $\times$ 4.1 m (Width $\times$ Height)
- Freight lift for access to the test hall : 2.8 m $\times$ 2.1 m $\times$ 2.45 m (Length $\times$ Width $\times$ Height), capacity 3.2 t
- Overhead crane : 1 t
- Attenuation ≥ 40 dB (10 kHz – 10 MHz)
- PD background noise ≤ 1 pC
- Coaxial feedthroughs : BNC, HF, N
- Filtered LV supply : 230 V + 400 V/ 32 A three-phase
- Panoramic gallery for visitors

AC and DC high-voltage sources

- AC 50 Hz : 200 kV / 250 mA 15 minutes (2 x 100 kV/25 kVA in cascade)
- DC : 400 kV / 12 mA bipolar
- DC : 50 kV / 160 mA bipolar (stabilised source 8 kVA, voltage or current mode, 0.1 % ripple)

Impulse voltages

- Marx generator 400 kV bipolar
 - BIL : full lightning impulse 1.2/50 μ s
 - BILch : lightning impulse chopped on the front or on the tail
 - SIL : switching impulse 250/2500 μ s
 - Step : 1.2/2500 μ s

Impulse currents

- Marx generator : 5 kA / 12 kJ : 8/20 μ s or other ($\leq$ 100kV)
- Capacitor bank : 100 kA / 20 kJ : damped oscillatory or other ($\leq$ 30)
- Table-top generator : 3.3 kA : 8/20 μ s

Dielectric measurements

- Omicron Tando 700
- Omicron MPD 600

Testing and characterisation of materials

- Keithley Electrometer 6517B
- Omicron SPECTANO 100
- Agilent 4294A
- Hioki IM3570
- Omicron Bode 100

Contact :

Dominique Rolle

dominique.rolle@hefr.ch

+41 (0)79 641 67 74

HEIA-FR

Pérolles 80

CH - 1700 Fribourg