



**Test laboratory** for multimodal  
lifetime tests on power  
electronics up to 10 MVA



University  
of Bremen



Institute for Electrical Drives,  
Power Electronics and Devices





## Informationen on the laboratory

**Whether in wind energy or photovoltaic systems, in HVDC systems or in electric traction** - power electronics has always to endure both the electrical loads and possible harsh environmental conditions. The combination of environmental and electrical stresses, which the power electronics is exposed to, is decisive for the lifetime of the systems. Therefore, predicting the effect of these multimodal loads already during the development phase is of great importance for avoiding field failures and for the long-term success of the product.

**The laboratory for high power electronics HiPE-LAB at the IALB of the University of Bremen** offers the unique opportunity to expose entire frequency converters of up to 10 MVA to electrical and climatic loads in almost any combination and to carry out tests to predict lifetime issues. In the field of wind energy, we - the IALB - collaborate closely with the Fraunhofer IWES.



# The laboratory for high power electronics

# Testing under climate conditions



## Informationen on the laboratory

With a temperature range of  $-40\text{ °C}$  to  $+120\text{ °C}$  and relative humidity between 10 % and 95 % in the temperature range of  $+10\text{ °C}$  to  $+95\text{ °C}$ , the climatic conditions of all climate zones can be largely simulated in the HiPE-LAB. Dynamic, reproducible electrical load profiles enable accelerated aging under the appropriate climatic conditions.

In addition to examining frequency converters as a whole, the targeted examination of individual components such as the power semiconductors (for example IGBTs), the driver circuits or the DC link capacitors is also possible in separate climate chambers.





## Informationen on the laboratory

**Thus, systems can be examined with regard to the following questions:** How does the converter system behave when starting up after it was stopped for a long time absorbing moisture? Does condensation occur? How quickly can a system be dried out by its own losses? Which are the particularly critical components or areas in the converter cabinet? The focus of the HiPE-LAB is on answering these and other questions already in the development phase of converter systems. Such issues can be investigated experimentally on complete converters based on field experience and individual component tests.

**The HiPE-LAB enables individual tests tailored to your product.** Even during the development phase of new components, tests can be carried out on prototypes as a whole or on individual components.



**On your product  
tailored tests**

# Our services



## Our services

- **System anamnesis and analysis**
- **Development and selection of test scenarios**
- **Modelling & simulation**
- **Execution of test scenarios**
  - pure electrical load
  - climatic tests (temperature, humidity)
  - multimodal tests, i.e. climatic tests combined with electrical stress
- **Individual component tests/component characterisation and intermediate measurement**
- **Sensors and measurement technology**
  - Voltage measurement, current measurement
  - Temperature measurement, humidity measurement and flow measurement (air)
  - High-resolution long-term acquisition and storage of measurement data
- **Integration of the control of the equipment** under test into the inspection process for carrying out fully automated tests
- **Analysis and evaluation as well as documentation** of the measurement data and results





## Power electronic load system and pretest platform

### Load system.....

Power range	10.8 MVA (4x 2.7 MVA)
Voltage range	0 to 1,000 V AC
Current range	up to 9,000 A AC (4x 2,250 A AC)
Frequency range	0 to 70 Hz, when operated with transformers 45 to 70 Hz
Electrical system	IT system (isolated against earth, other electrical systems on request)

### Pretest platform.....

Power range	300 kVA
Functional range	Identical to the load system
Application	Model development and low power testing



## Climate room and climate chamber

### Climate room.....

Temperature range	-40 °C to +120 °C
Relative humidity range	10 % to 95 % relative humidity at +10 °C to +95 °C
Test room (l x w x h)	7.5 m x 5.3 m x 4.3 m
Cooling water connection for device under test (DUT)	300 kW
Supply temperature	+16 °C to +60 °C

### Climate chamber.....

Temperature range	-70 °C to +180 °C
Relative humidity range	10 % to 98 % relative humidity
Test room	up to 1,000 l



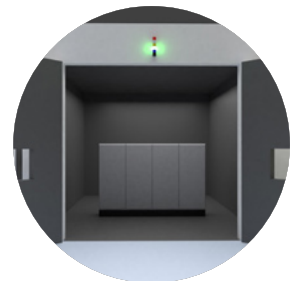


Climate room

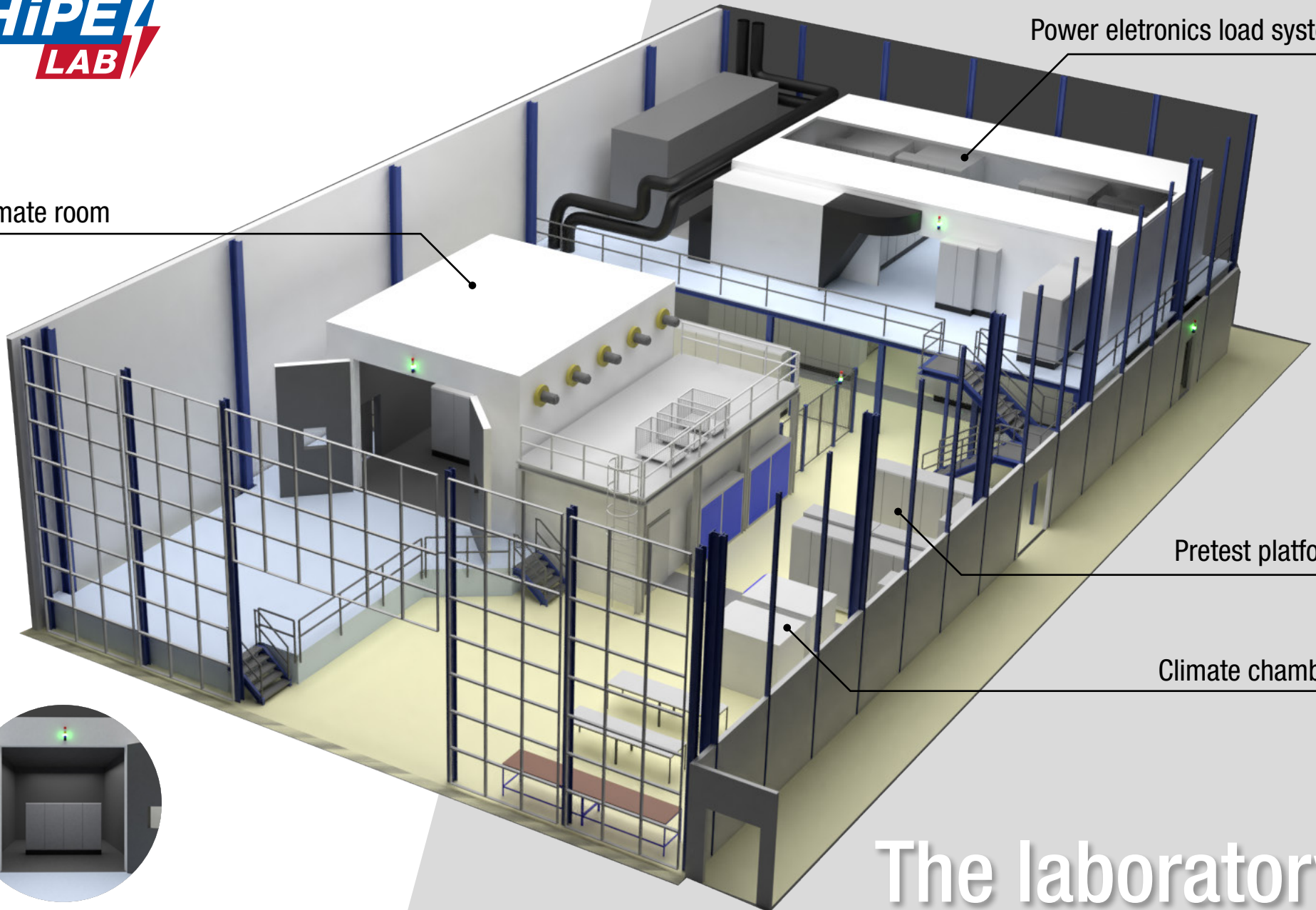
Power electronics load system

Pretest platform

Climate chamber



# The laboratory







## Contact

### HiPE-LAB

#### **Dr.-Ing. Wilfried Holzke**

Scientific management  
University of Bremen / IALB

Phone: 0421 / 218 - 627 66  
Fax: 0421 / 218 - 98 627 66  
eMail: [holzke@ialb.uni-bremen.de](mailto:holzke@ialb.uni-bremen.de)

#### **Dipl.-Ing. Johannes Adler**

Technical management  
University of Bremen / IALB

Phone: 0421 / 218 - 62 675  
Fax: 0421 / 218 - 98 626 75  
eMail: [adler@ialb.uni-bremen.de](mailto:adler@ialb.uni-bremen.de)

Klagenfurterstr. 3, 28359 Bremen  
[www.uni-bremen.de/HiPE-LAB](http://www.uni-bremen.de/HiPE-LAB)



# Contact