

***μ s- PULSED MODULATOR
- HIGH MW-POWER GENERATOR -***

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- I. Introduction: PPT Portray**
- II. New Short-Pulse Klystron Modulator**
- III. Conclusion: FUTURE VIEW**

Puls-Plasmatechnik GmbH - PPT -

20 people are the **2013-team:**

Scientists, engineers, technicians
develops and manufactures in Dortmund /Germany
pulsed power systems - prototyps and small series -
for industrial and scientific applifications.

Company start: **1986** Founders: **4 physicists**
- Pulsed Power Business for more than **26 years** -

Puls-Plasmatechnik GmbH

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R&D Products [Scientific accelerators]

- **Septum-/ Kicker Driver Systems**

for injection or extraction systems in booster/storage rings switched by thyratrons or solid-state-switches

- **Pulsers for Thermionic Electron Guns**

HV-floated ($\sim 100\text{kV}$) solid state switched triode units for ns-single bunch or μs -multibunch operation

- **Klystron Modulators**

— “Line-type-pulsers” switched by thyratrons;

“Hard-tube-pulsers” switched by solid-state switches like thyristors, IGBT's or IGCT's.

- **Control-/Interlock Systems**

based on PLC or VME with Interface Standards

CAN-, GPIB-, PROFIBUS, ETHERNET and EPICs implement.

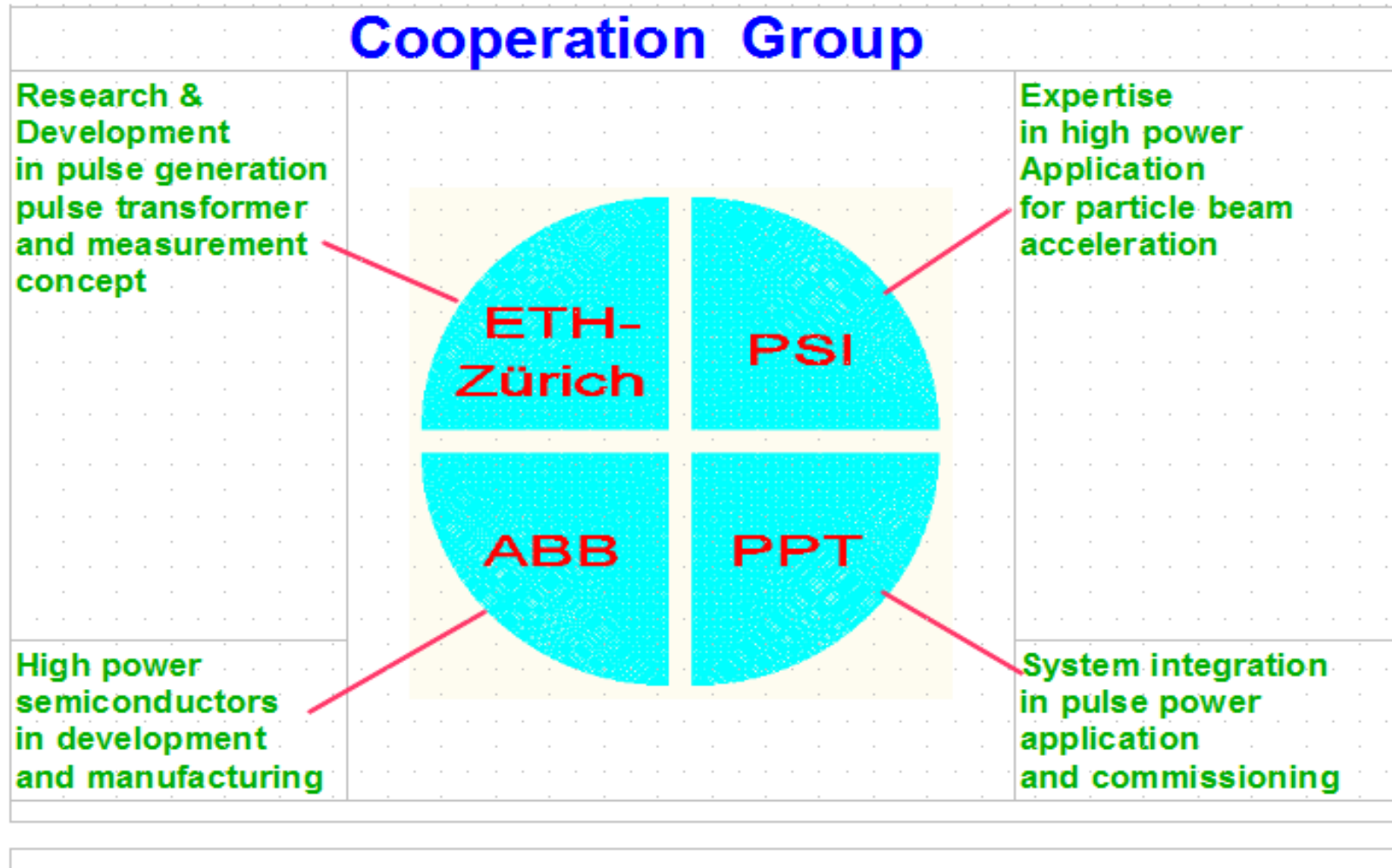
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140MW - 370kV Klystron Modulator



Short-Pulse Klystron Modulator: Design Goals

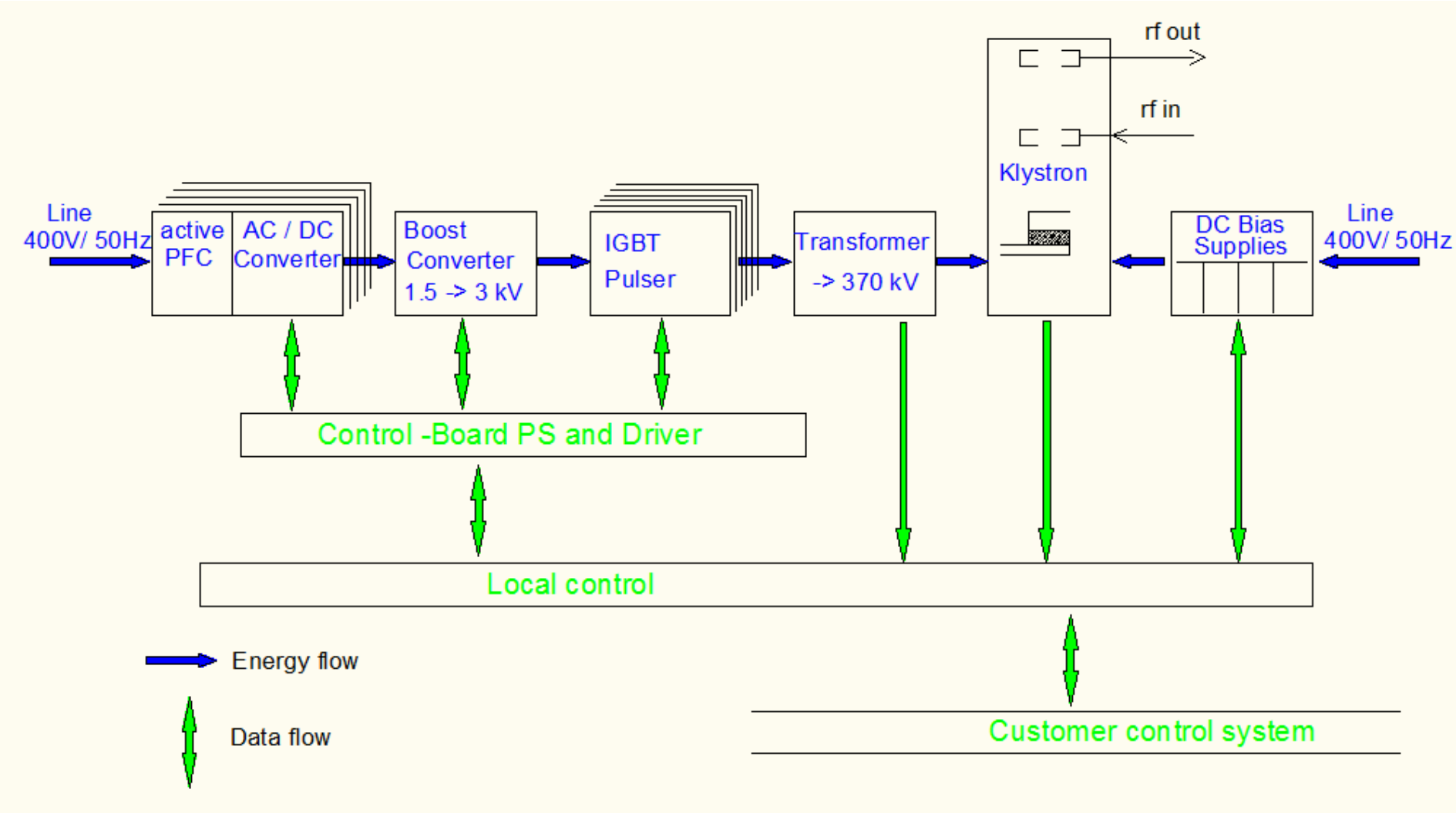
Pulse generation:

- IGBTs switched capacitor bank at **3 kV / 4 kA** (→ pulse shaping)
- Extra pulse droop compensation with bouncer circuit
- Via pulse transformer up to **450 kV**

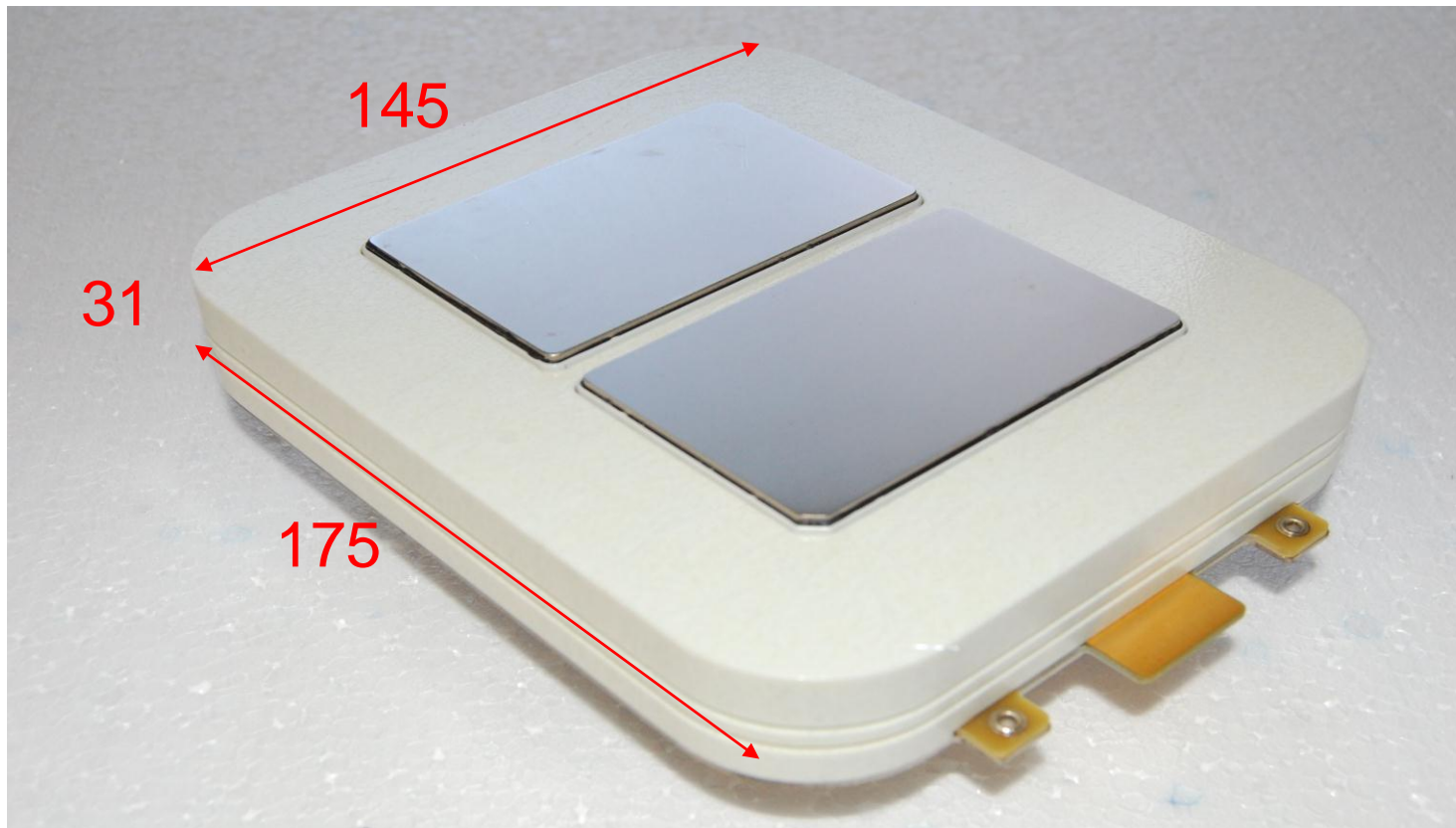
Pulse system performance for different applications:

- typical RF application Klystron: **1.5 GHz – 6 GHz**
- RF pulse power: **5 MW – 65 MW**
- Pulse transformer output (roughly): **14 MW - 140 MW**
- Pulse values: **370 kV / 350 A**
- Line input power: ca. 100 kW
- Pulse width: between **2 μs to 10 μs** selectable
- Pulse rise-/fall time: less than **0.8 μs**
- Repetition frequency over **100 Hz** is possible
- Accuracy concept (under development): **10^{-5}** voltage stability
-

Short-Pulse Klystron Modulator: Subsystems



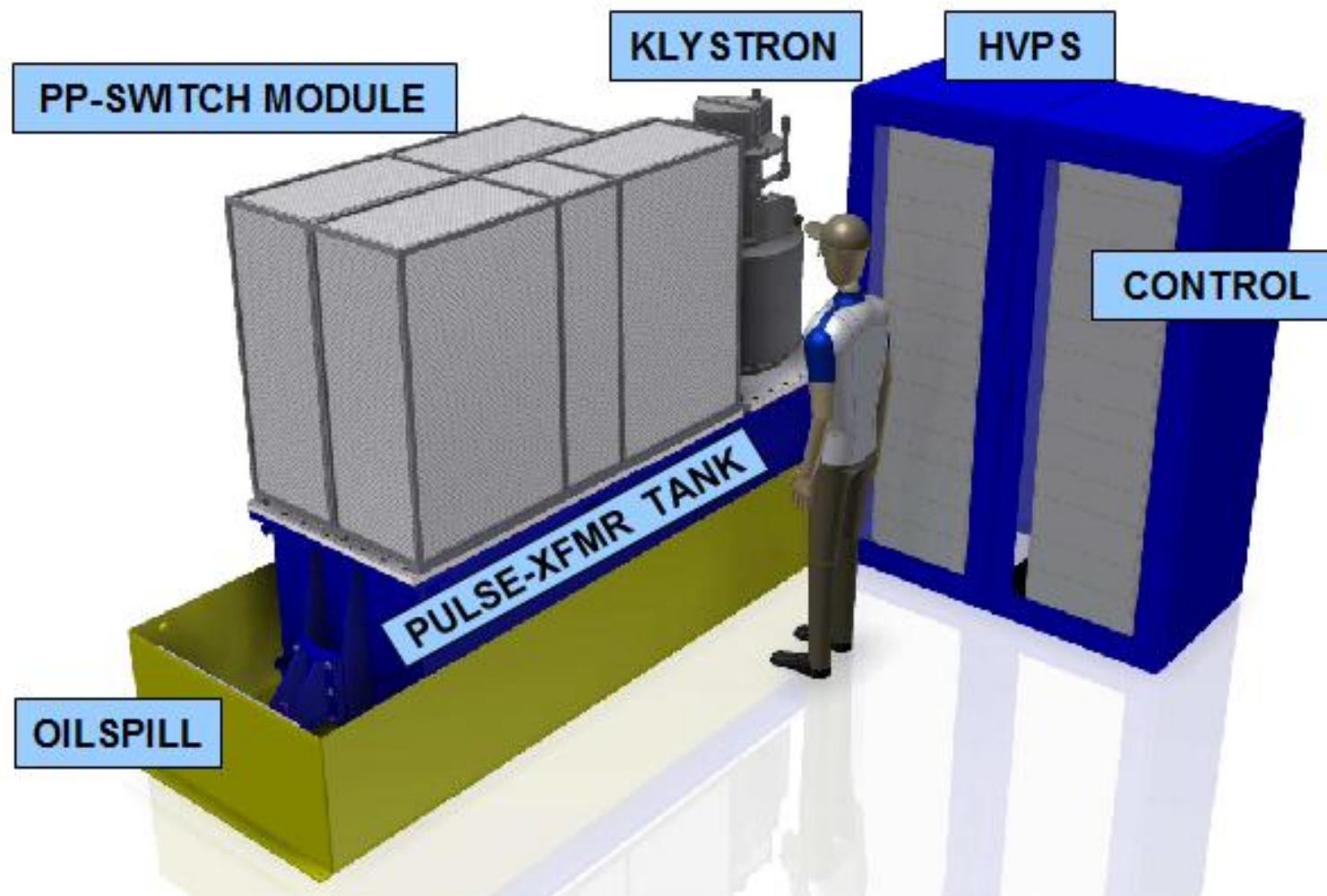
Short-Pulse Klystron Modulator: PP-IGBT Module



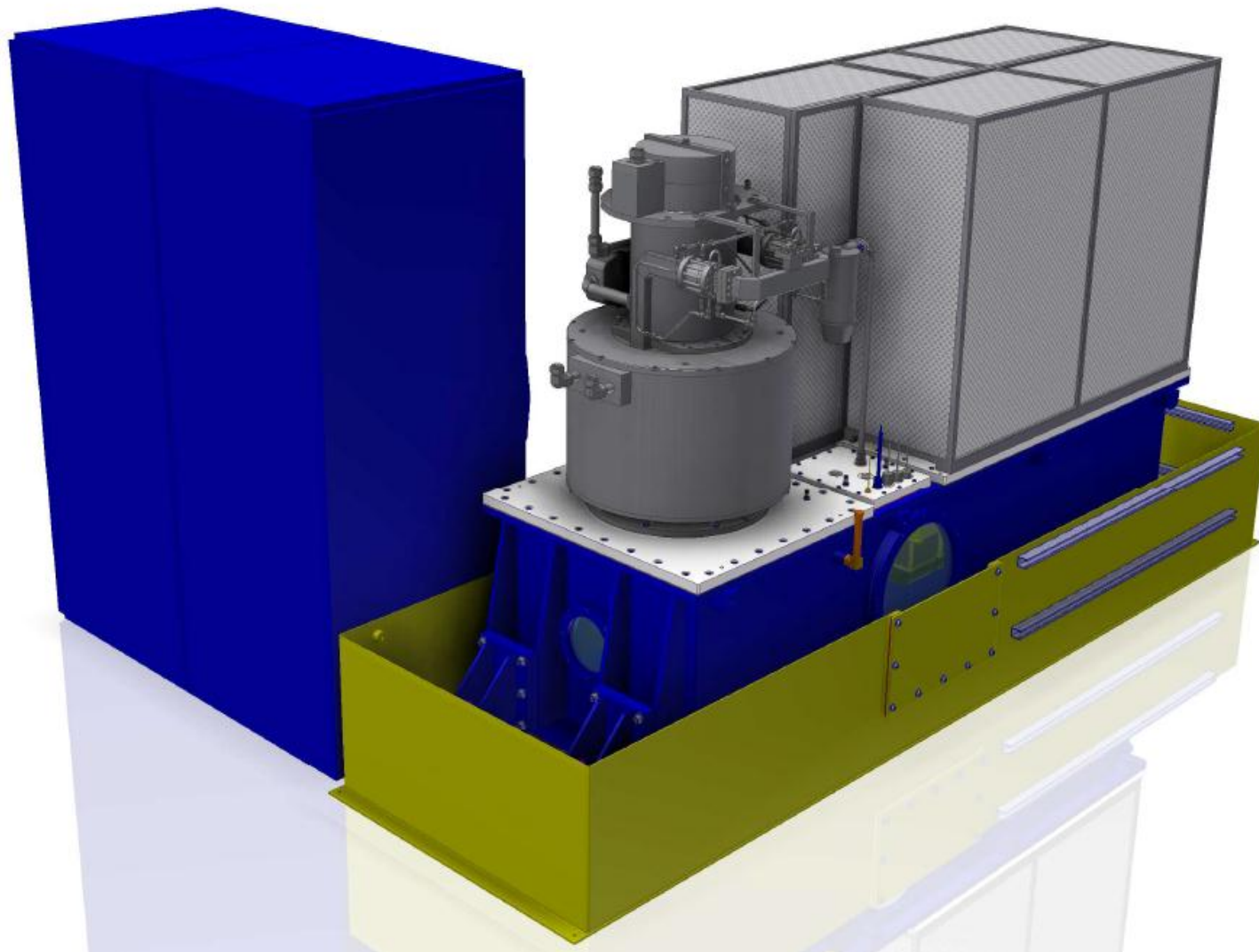
4.5kV IGBT in Press-Pack (PP) Technology - ABB -

Operating voltage: 3kV; Switch-off current: 4kA

Modulator 3D-Sketch (View #1)



Modulator 3D-Sketch (View #2)



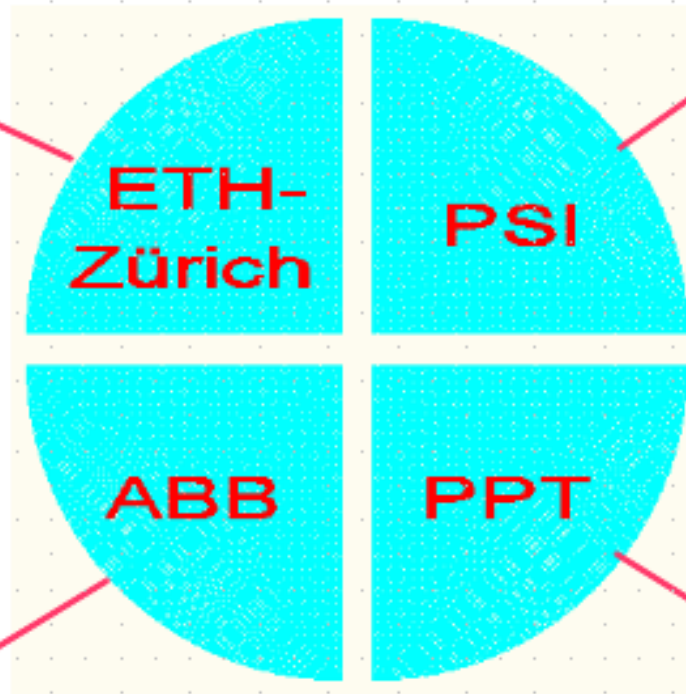
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Cooperation Group

Research & Development in pulse generation pulse transformer and measurement concept

Expertise in high power Application for particle beam acceleration



High power semiconductors in development and manufacturing

System integration in pulse power application and commissioning

In cooperation with **RI Research Instruments /Germany** and **DANFYSIK / Denmark**

The part of PPT in this cooperation are design, manufacturing, commissioning, training and documentation of the power -, rf- and control systems.

Examples for these cooperation with **RI** from 2000 until today are:

- LINAC, PSI; Aargau, Switzerland
- LINAC, DIAMOND ; Didcot , UK
- LINAC, ASP; Melbourne, Australia
- LINAC, PTB; Braunschweig, Germany
- LINAC, TPS; Hsinchu, Taiwan
- LINAC, FLARE ; Nijmegen, Netherlands
- LINAC, NSLS-II; BNL, USA

PPT - FUTURE PULSED MODULATOR R&D

- ***Design Cooperation***
- ***Fabrication / Production-Infrastructure***
- ***Project-Financing / Investor***

*Thank you colleagues for your
attention and endurance !!!*