

Presentation of the work and activities done at the Forschungszentrum Karlsruhe

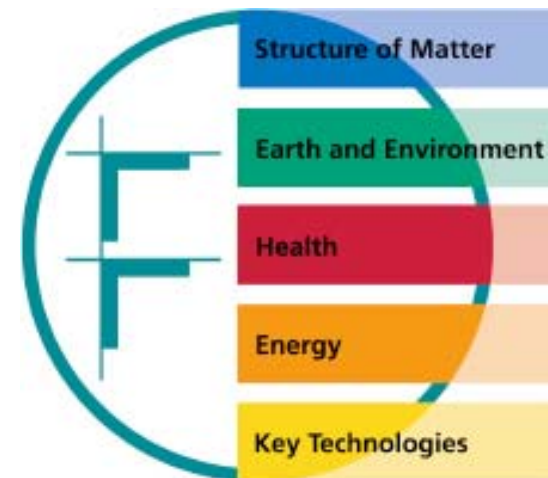
- **Major R&D work, Expertise**
- **Facilities**
- **Tools for analysis**

The Forschungszentrum Karlsruhe is one of the biggest science and engineering research institutions in Europe and funded jointly by the Federal Republic of Germany and the State of Baden-Württemberg.



Its R & D program is embedded in the superordinate program structure of the Hermann von Helmholtz Association of National Research Centers and concentrates on the five research areas of

- **Structure of Matter,**
- **Earth and Environment,**
- **Health,**
- **Energy,** and
- **Key Technologies.**





Major working areas of the Institute for Technical Physics (ITP) of the Forschungszentrum Karlsruhe are applied superconductivity and cryogenics and are concentrated in

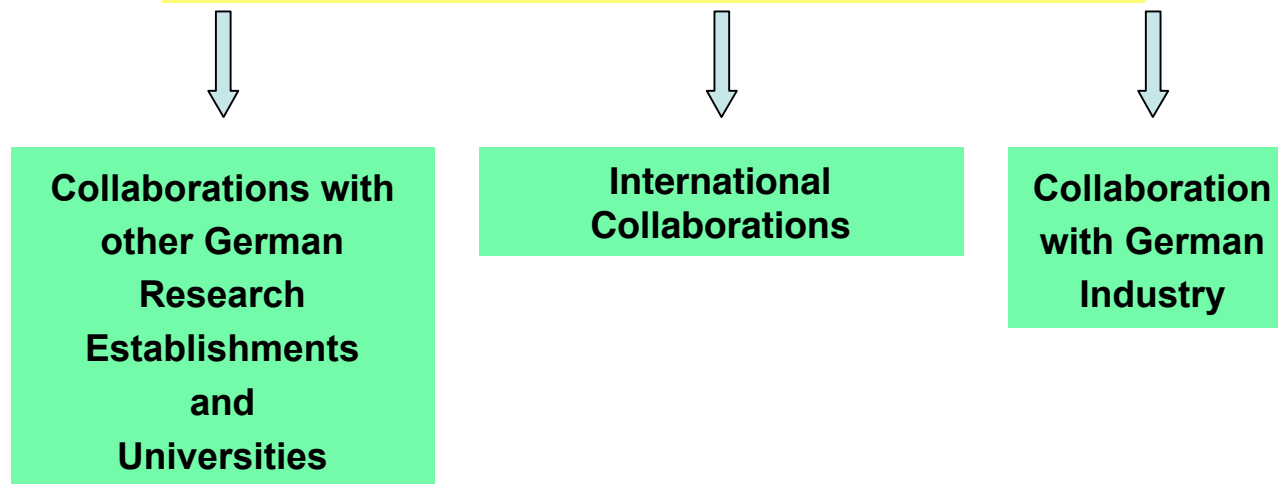
- **ENERGY**
 - Nuclear Fusion
 - Efficient Energy Conversion (REU)
- **STRUCTURE OF MATTER**
 - Particle Astrophysics



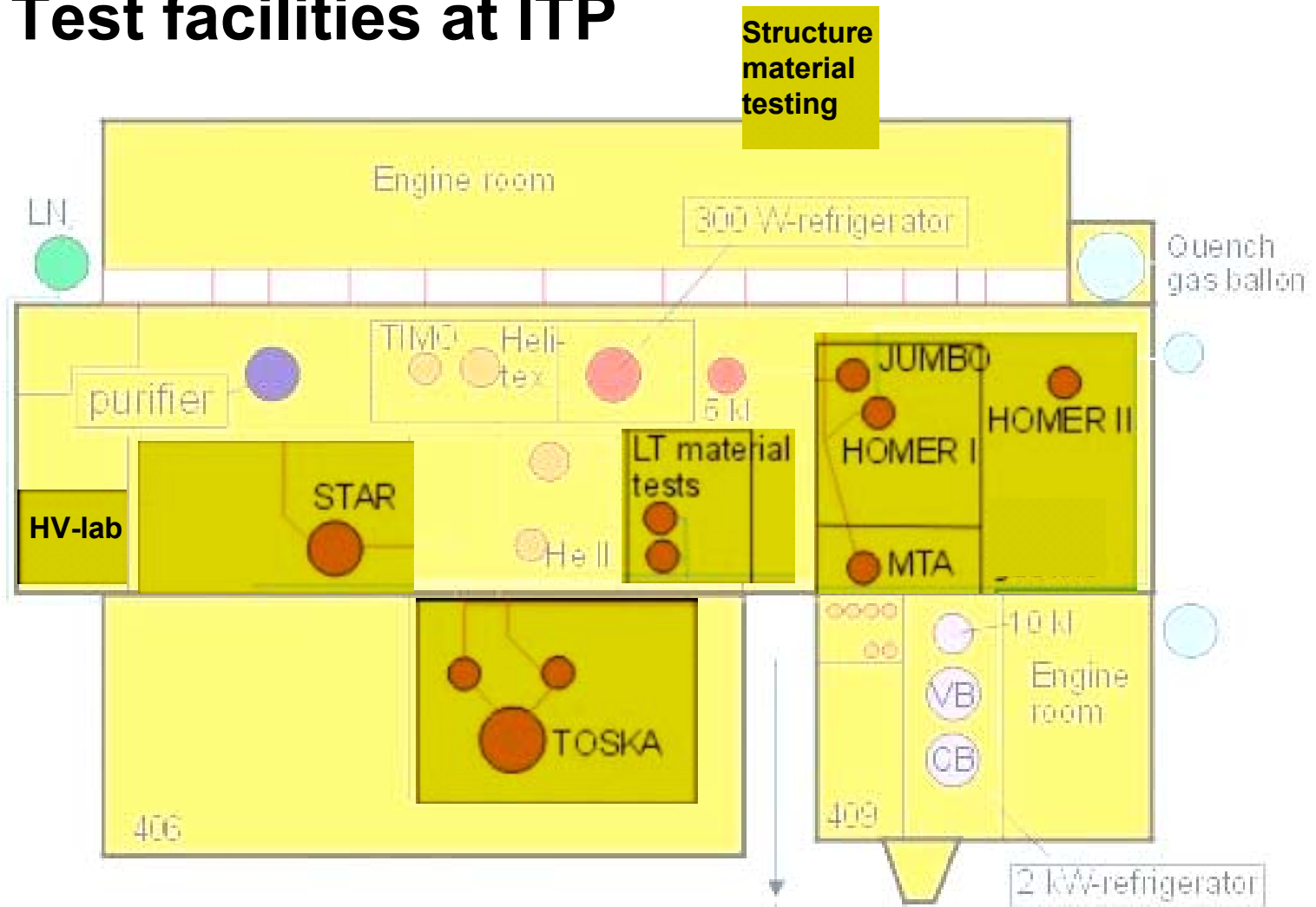
Focus of the technical developments:

- **Nuclear Fusion Program (ITER): sc Magnets and Cryopumps (fuel cycle)**
- **Power applications: SMES, FCL**
- **Sc. high-field magnets and NMR**
- **Material development (Bi-based, Coated cond., MgB₂)**
- **KATRIN neutrino experiment (sc magnets, vacuum, cryotechnology)**

**R & D work at the
Institute for Technical Physics**



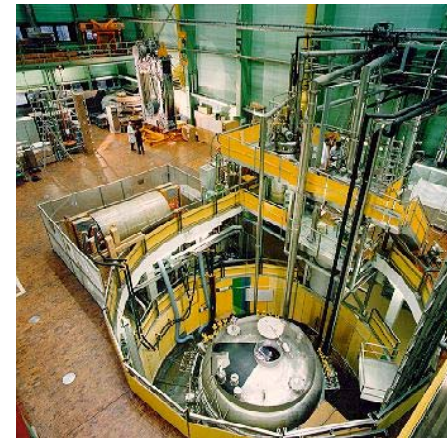
Test facilities at ITP



Test facilities at ITP

• TOSKA

- Cryogenic supply system
- High current power supplies (20, 30, 50 kA)
- And high current dump circuits
- Control and measuring system with DAS
- Special components (current leads, cold helium pumps, HV-instrumentation and measurement technique)



• STAR (ex TESPE)

- 6 T split-coil system (10 kA)
- 30 kA power supply
- FF-cooling



- **High-field sc. test facilities for sc (strand) characterization**

- **JUMBO (15 T)** 15 T in 44 mm, 4.2 K
- **HOMER I (20 T)** 20 T in 50 mm, 1.8 K
- **HOMER II (20 – 25 T)** 20 T in 180 mm, 1.8 K

final stage of construction



- **Test facilities for NMR magnets**

- **MTA I for NMR magnets up to 900 MHz**
Inner diameter up to 80 mm, height up to 1.5 m
- **MTA II for 1000 MHz class**

under construction



- **Cryogenic HV laboratory**

4 K, 200 kV



- **Structure material characterization at low temperatures**

4 K, 600 kN



- **FBI facility**

13 T, 4.2 K, 10 kA

**Stress-strain dependence of A15
conductors: strands and (sub-) cables**



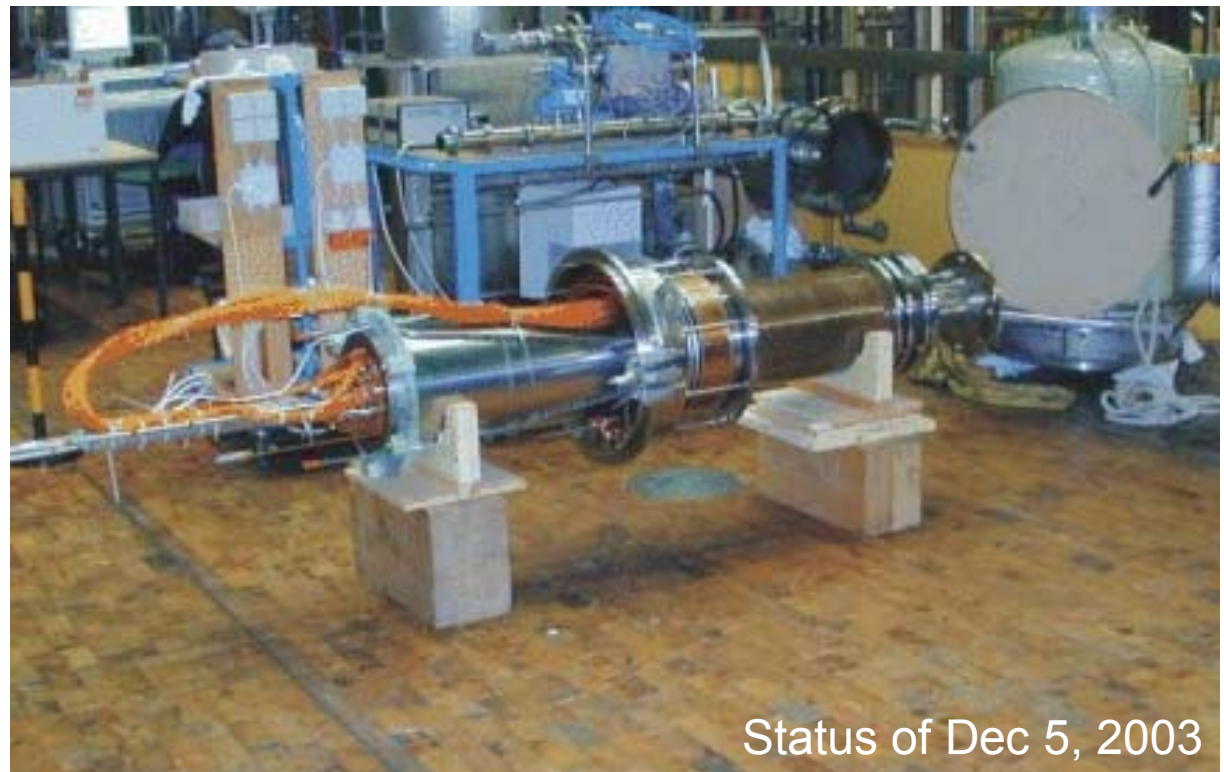
Tools for Analysis

- **Magnetic field, forces, inductances (EFFI, MAXWELL)**
- **Current diffusion in conductors and contacts / joints (MAXWELL)**
- **Quench propagation, Stability and Hotspot (GANDALF, ...)**
- **Optimisation of current leads and feeders (CURLEAD)**

Current project: 68 kA HTS current lead



HTS-module with instrumentation
cables



Status of Dec 5, 2003

HTS current lead ready for installation in TOSKA