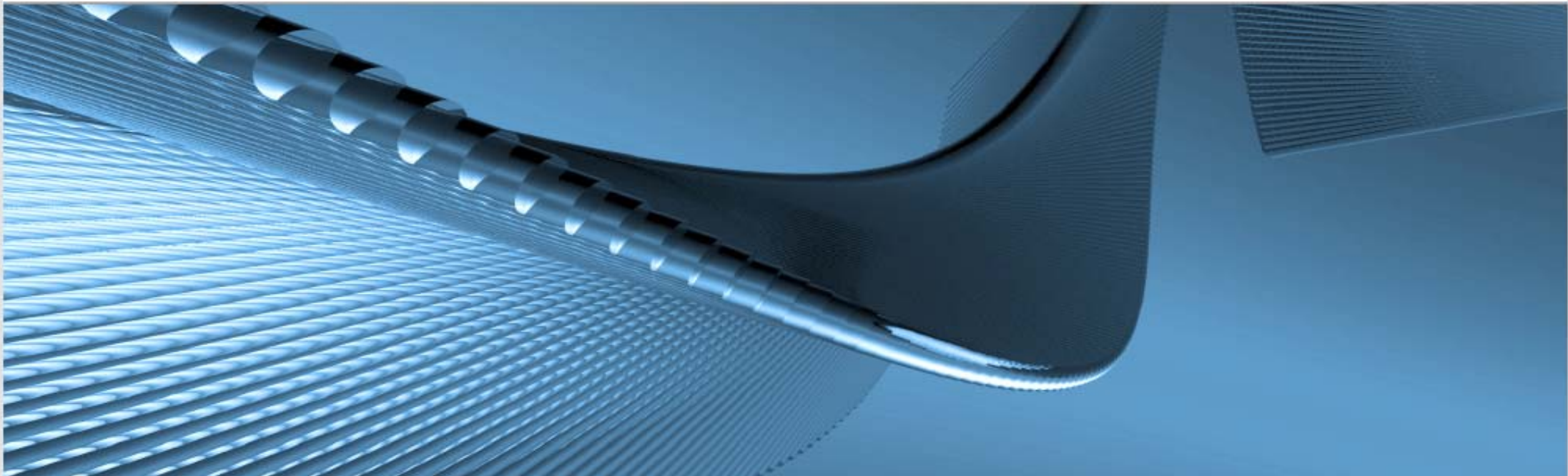
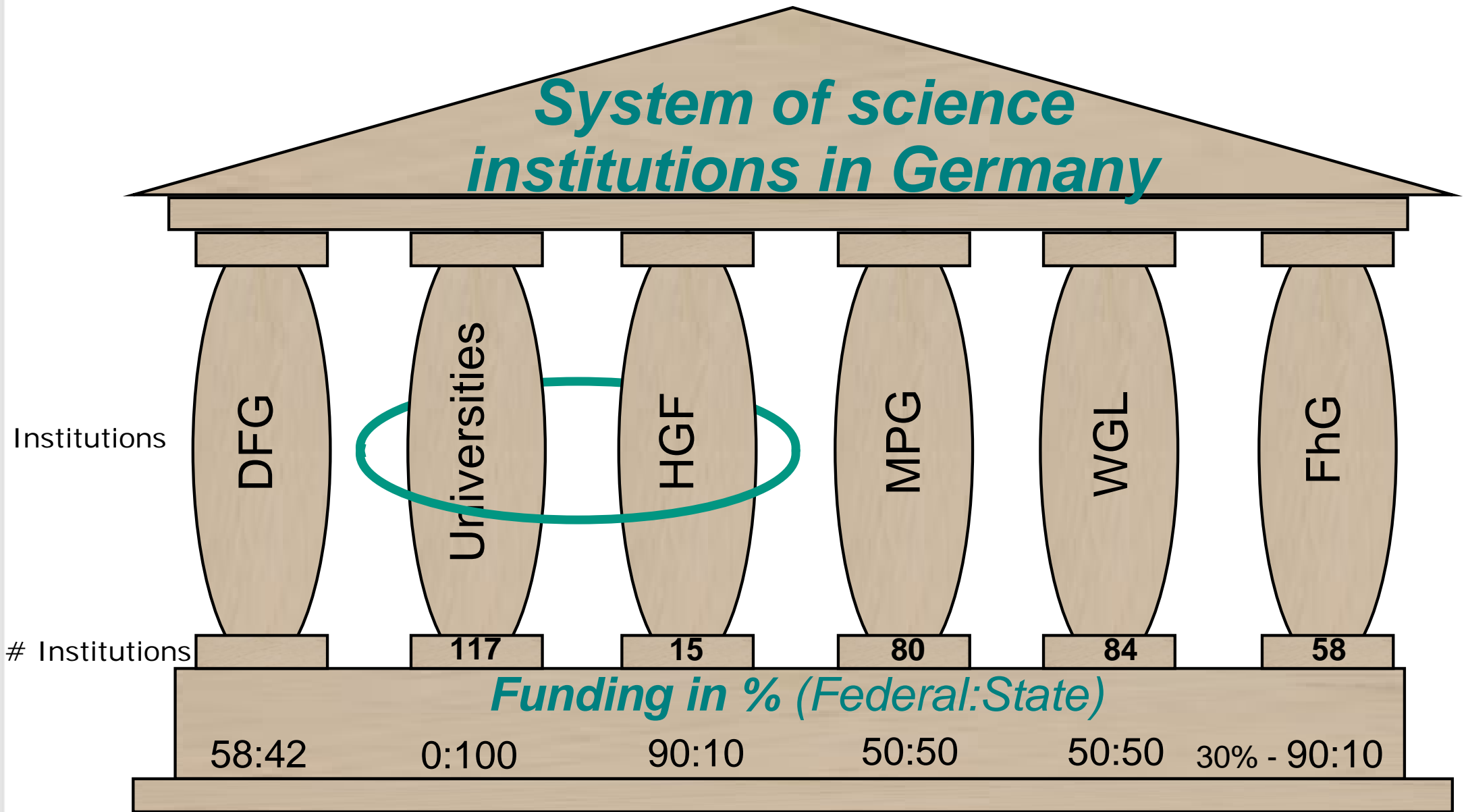


**Welcome to the**

# **Karlsruhe Institute of Technology KIT – A new model in higher education**



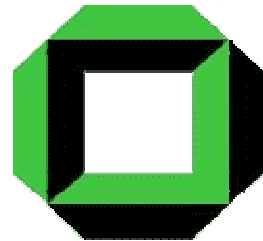
# Pillars of science in Germany



# University Fridericiana in Karlsruhe

**1825** Foundation as Polytechnical School similar to the Ecole Polytechnique in Paris

**1885** Technical College



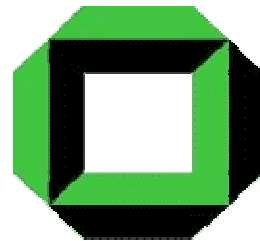
**1902** Additional name „Fridericiana“ in honor of the Grandduke Friedrich von Baden

**1967** University of Karlsruhe (TH)

**2005** Supplemental name:  
„Forschungsuniversität · founded 1825“

# 11 Departments at the University of Karlsruhe (TH)

- Mathematics
- Physics
- Chemistry and Biology
- Humanities and Social Sciences
- Architecture
- Civil Engineering, Geo- and Environmental Sciences



- Mechanical Engineering
- Chemical and Process Engineering
- Electrotechnical Engineering and Information Technology
- Computer Sciences
- Economics and Business Engineering



# Helmholtz Association

Energy

Earth and Environment

Health

Key Technologies

Structure of Matter

Aeronautics, Space,  
and Transport



# Research Center Karlsruhe (FZK)

**1956** Foundation as Society for Construction and Operation of Nuclear Reactors

**1963** Society for Nuclear Research Karlsruhe

**1978** Nuclear Research Center Karlsruhe GmbH (KfK)

**1995** Research Center Karlsruhe – Technology and Environment

**2002** Research Center Karlsruhe – Member of Helmholtz-Society

## Areas of Engagement:

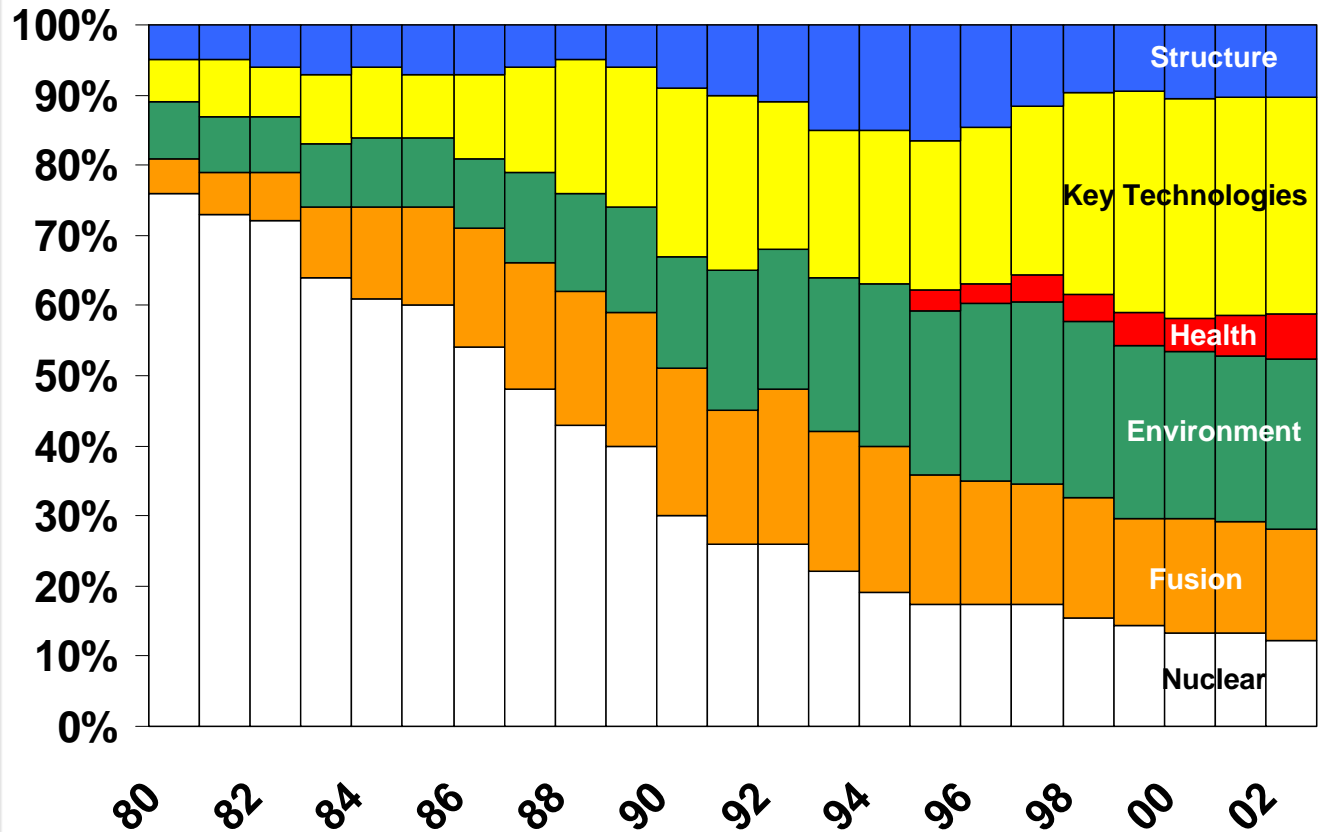
- Structure of matter
- Nuclear Fusion
- Sustainability
- Nucleare Security
- Atmosphere und Climate
- Conversion of Energy
- Biomedical Research
- Nano- and Microsystems
- Regenerative Medicine
- Scientific Computing



Employees: 3 700  
Budget: 305 Mio. €

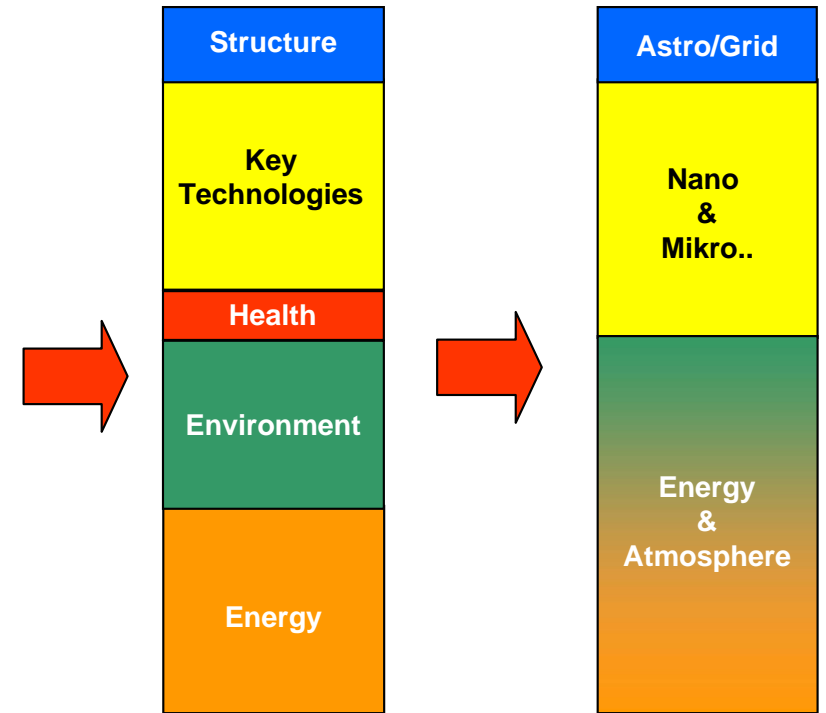


# Fields of Engagement of FZK



2006

Future



Federal Science Site, Member of the



# German Science System – Excellence Initiative (pre-proposal: July 2005)

"The 'Excellence Initiative' aims to both

- promote top-level research
- and improve the quality of German universities and research institutions,

thereby making a

- significant contribution to strengthening science and research in Germany in the long term,
- improving its international competitiveness,
- and raising the profile of the top performers in academia and research."

*Deutsche Forschungsgemeinschaft DFG*



## 3 Areas of Promotion:

- ✓ Graduate Schools
- ✓ Excellence Cluster
- ✓ Concepts for the Future



Research & Development



Higher Education



Innovation

**„... to form a novel Quality of Cooperation, and to overcome the Separation between Federal Research Facilities and State Universities ...“**

# Ideal Preconditions in Karlsruhe

## Research Centre Karlsruhe

15	Programs
21	Institutes
3 700	Employees
300	UKA-Members
300 Mio.€	Budget

10 km, 15 min

## University of Karlsruhe

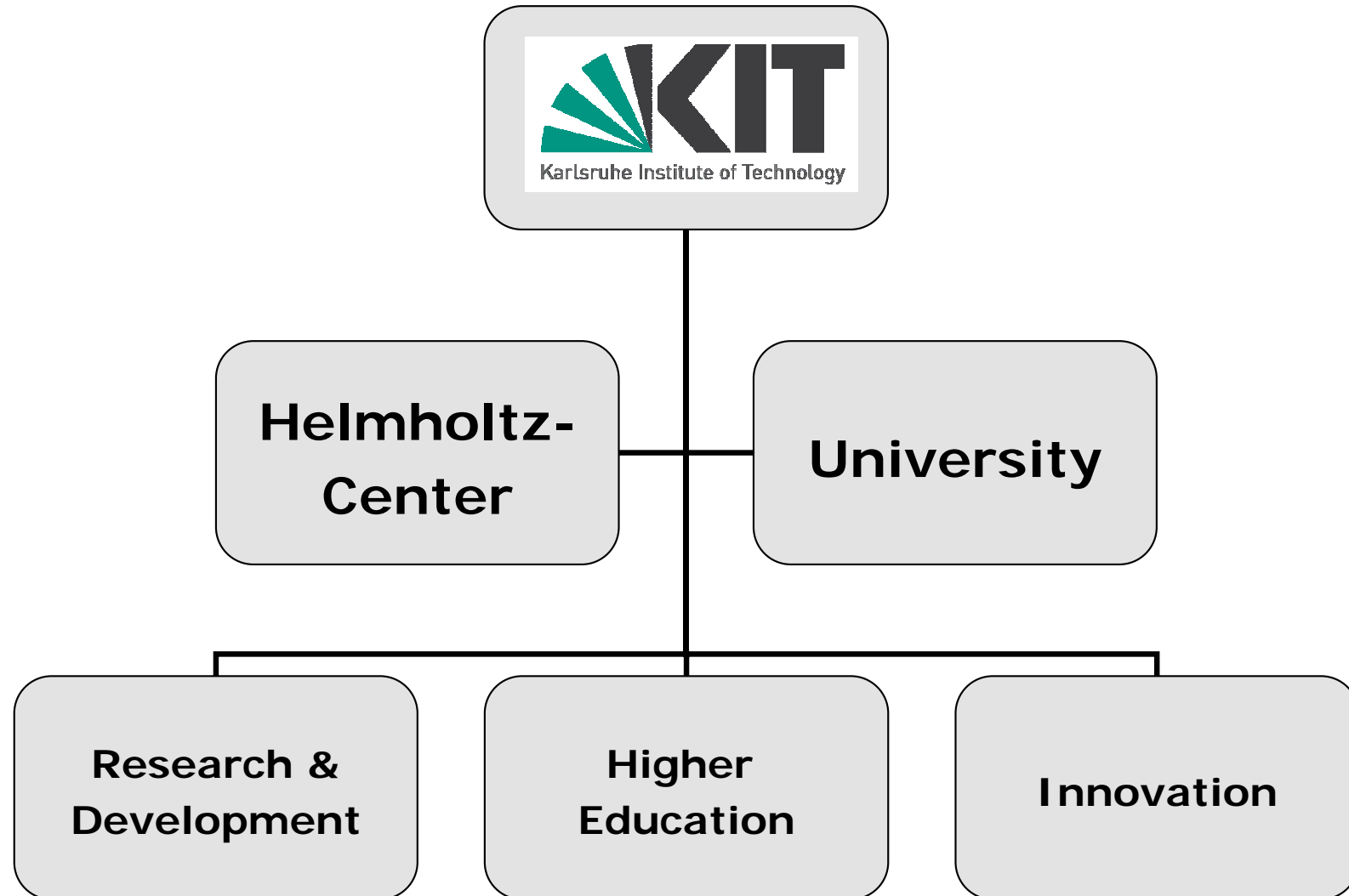
11	Faculties
120	Institutes
4 000	Employees
18 500	Students
300 Mio.€	Budget

# KIT – One Entity, two Missions, three Tasks

One  
Entity

Two  
Missions

Three  
Tasks



## Students

### House of Competence (HoC):

- Integration of FZK employees into teaching (100 new professorial positions (W2/W3))
- Foundation of KIT Schools (KSOP, School of Energy)
- Special courses of study for excellent students
- Research-based educational modules
- KIT Scholarships for excellent students

## Doctoral and Post-Doc students

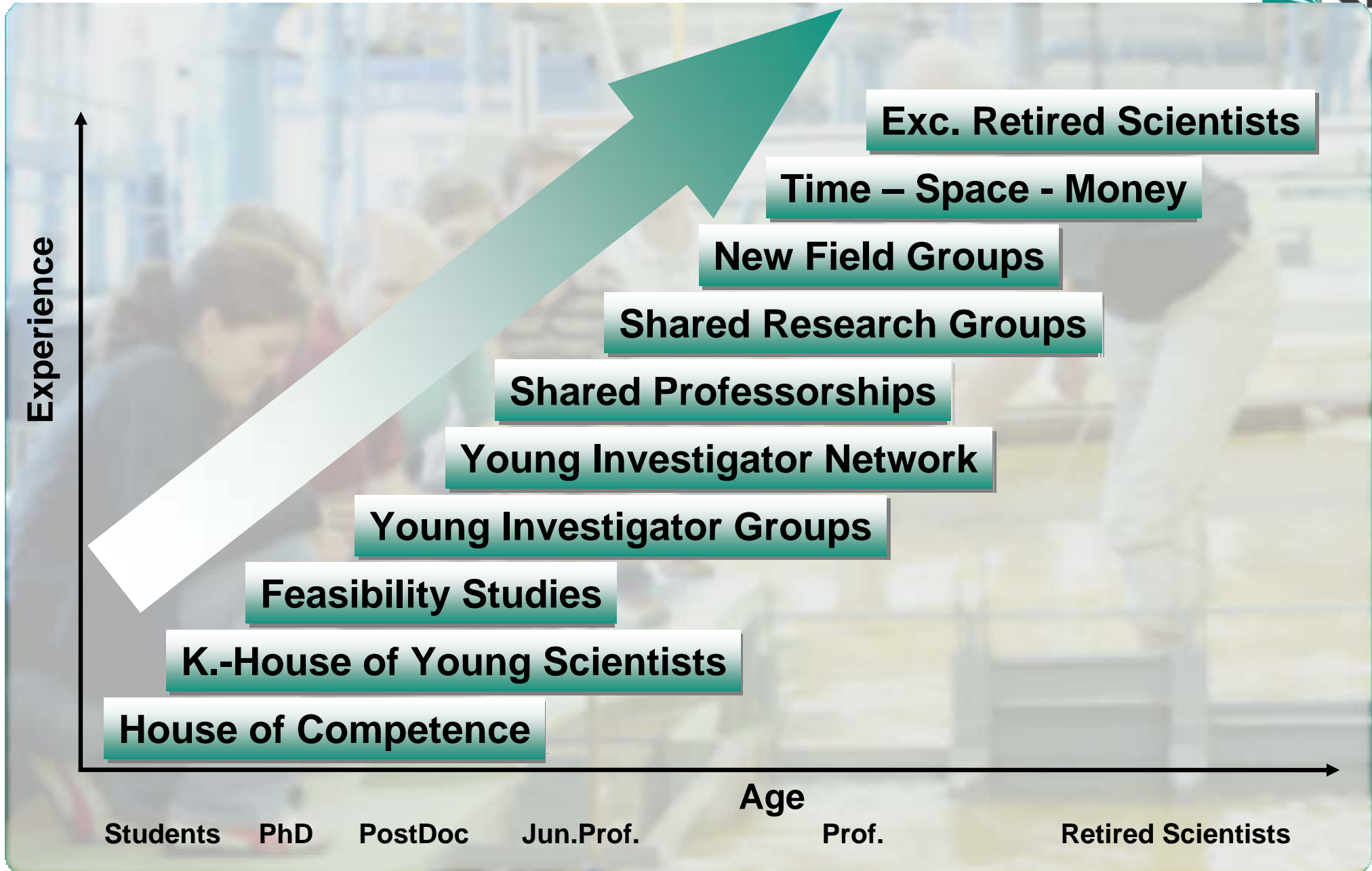
### Karlsruhe House of Young Scientists (KHYS):

- Mentoring and Services, Financing, Career Service
- advanced training modules

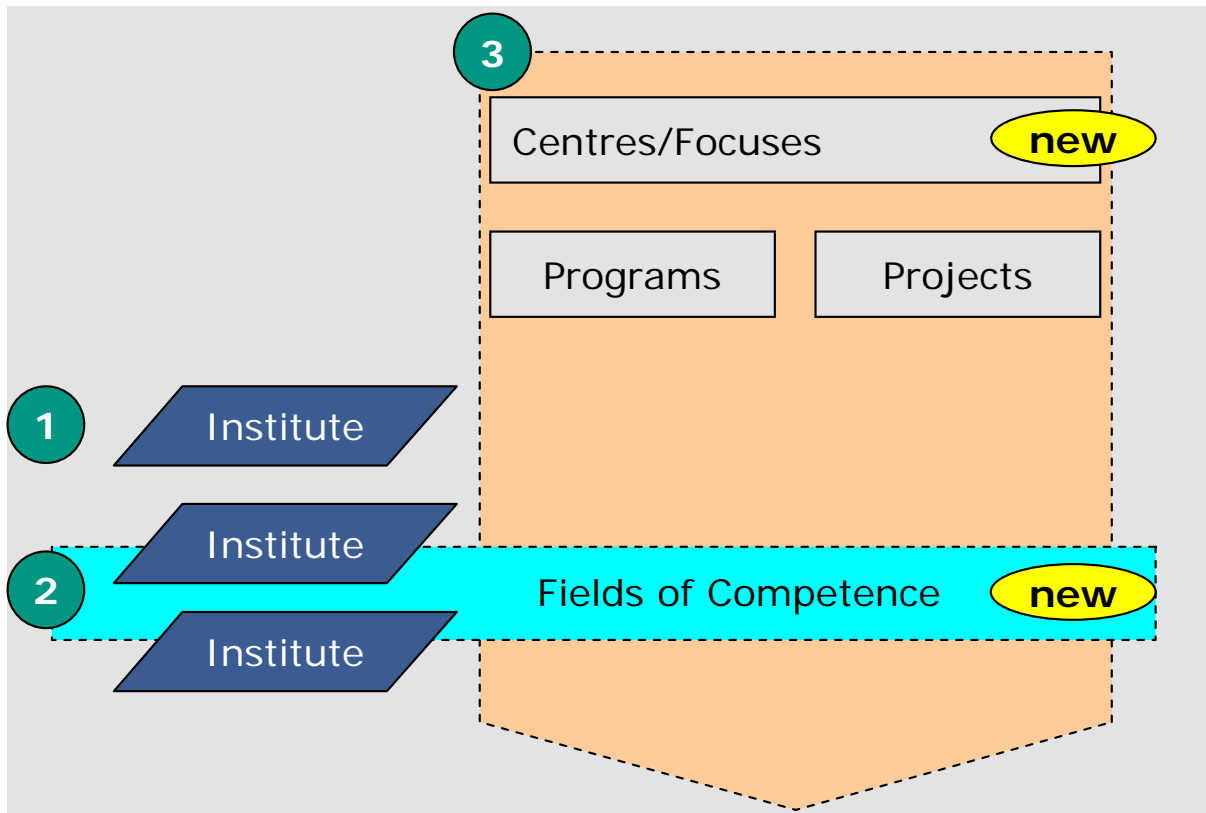
## Advanced Training

- Interdisciplinarity and Focus on Research
- Didactical Competences
- Development of an integrated program for advanced training

# Institutional Strategy: Promotion of Scientists



## Organisation/Coordination of Research at KIT bases upon 3 elements



- 1 Organizational elements (Institute) persist
- 2 Coordinational elements: Fields of Competence and Areas of Competence provide a interdisciplinary platform for dialog
- 3 Project-based elements are bundled in Centres and Focuses

# 4 KIT Centers and 4 KIT Focuses

## KIT Centers<sup>(1)</sup>

KIT Center  
Energy

KIT Center  
Nano and Micro Scale Science

KIT Center  
Elementary Particle and Astroparticle  
Physics

KIT Center  
Climate and Environment

 Step 1: establishment by January 1, 2008

## KIT Focuses<sup>(1)</sup>

KIT Focus  
Computation

KIT Focus  
Optics and Photonics

KIT Focus  
Mobility Systems

KIT Focus  
Human and Technology

 Concept planned for 2008 (target concept)

(1) Names and exact definition of Centers and Focuses are under development



## Topics and their Projects

Cosmic rays

KASCADE-Grande, Pierre Auger

Dark Matter

EDELWEISS, EURECA

Quantum field theory

Quantenfeldtheorie

Experimental collider physics

(CDF) CMS

Theoretical collider physics

Theoretische Kolliderphysik

Flavour physics

(CDF) BELLE/SuperBELLE

Neutrino physics

KATRIN

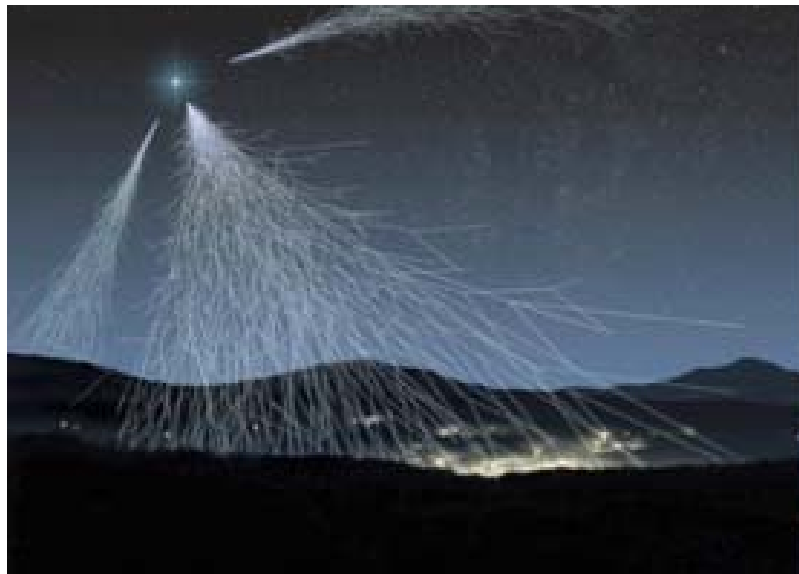
Computational physics

Computergestützte Physik

Technology development

LOPES, detectors...

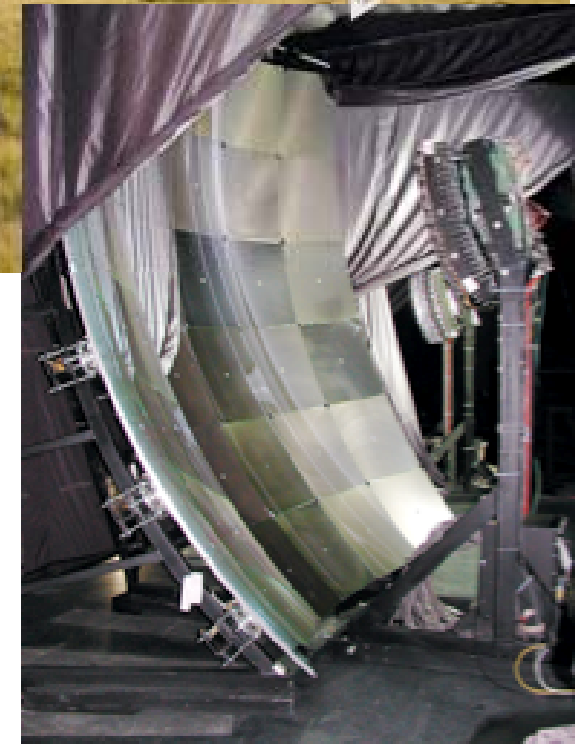
# Topic 1: Cosmic Rays



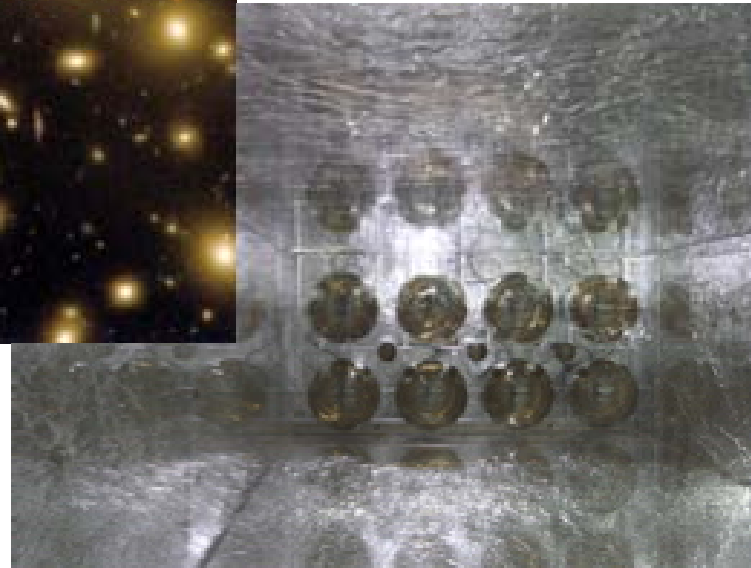
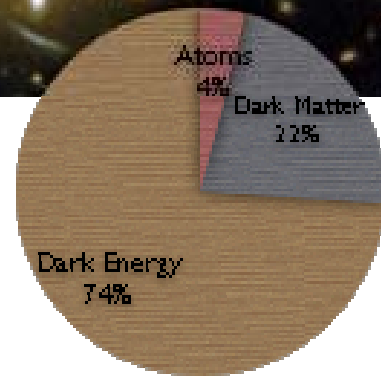
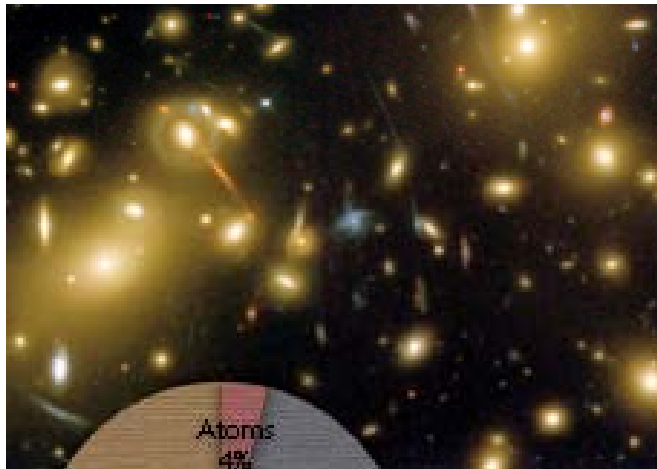
## Pierre Auger Observatory



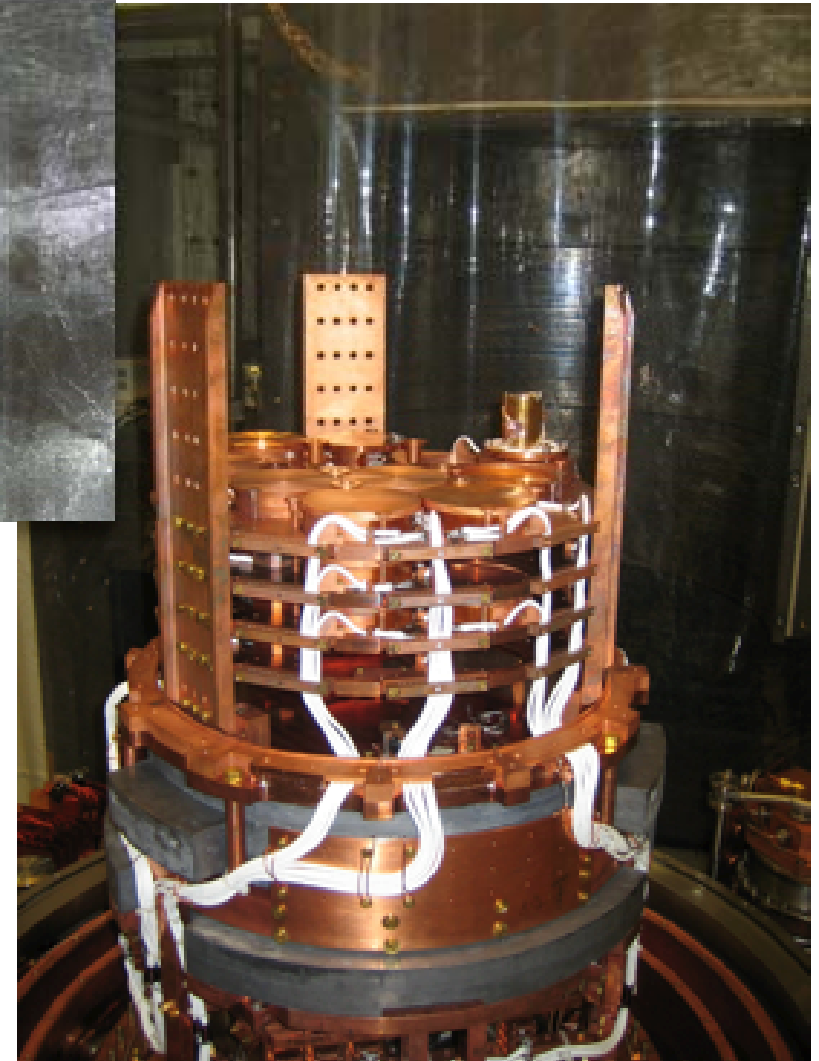
- © International collaboration (17 countries)
- © Auger-South in Argentina: area of 3000 km<sup>2</sup>  
1600 detector tanks and 24 telescope stations
- © Inauguration ceremony in November 2008
- © Science, 2007:  
Particle directions correlate with AGNs!
- © Plan: Auger-North (Colorado)  
for full sky coverage



## Topic 2: Dark Matter

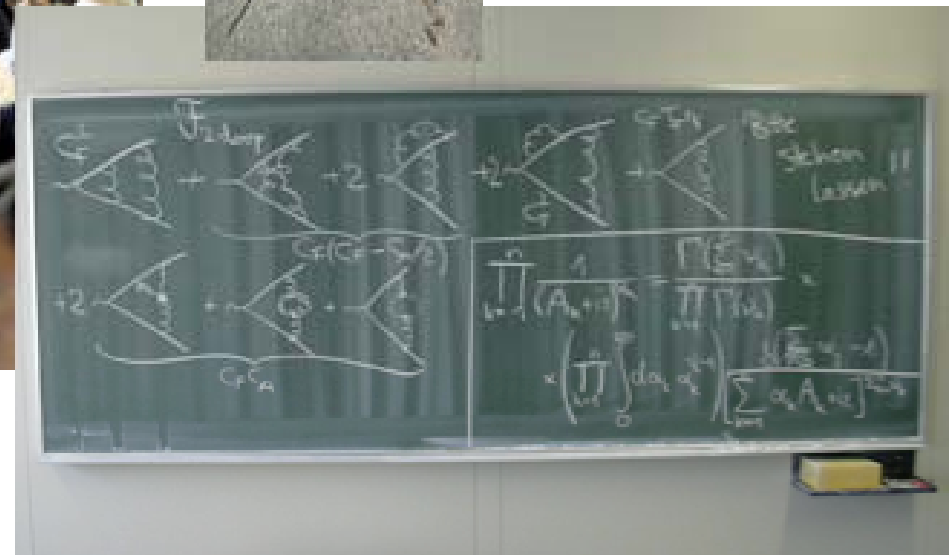
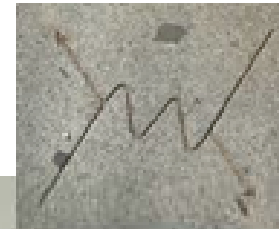


## EDELWEISS



- ⊗ Direct search for DM in the French-Italian Fréjus tunnel (Laboratoire Souterrain de Modane, LSM)
- ⊗ Search for WIMPs as major candidates for DM using more than 30 Germanium detectors
- ⊗ EURECA: European proposal recommended by ASPERA

# Topic 3: Quantum Field Theory

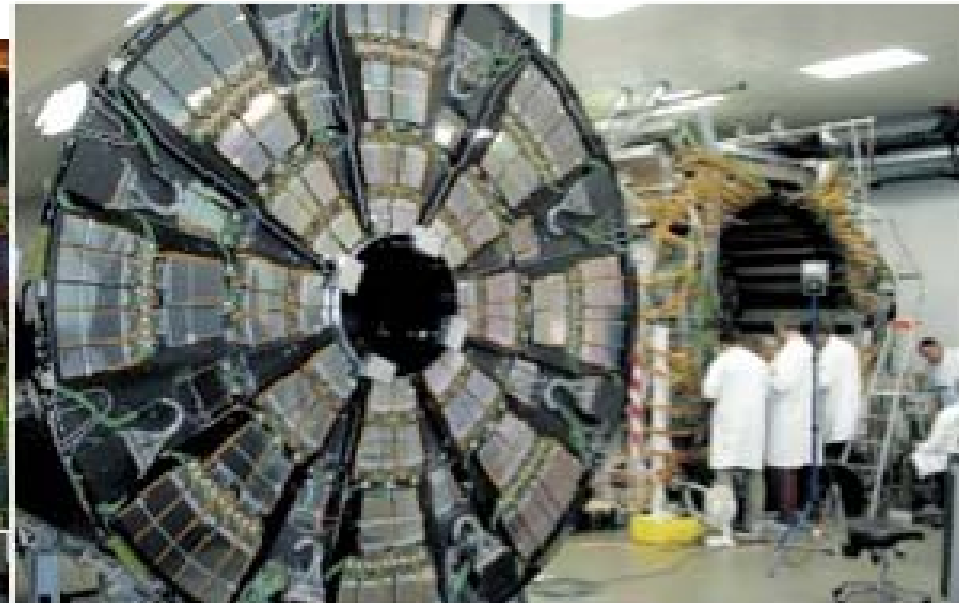


- ⊗ Standard model: a microscopic description of the fundamental building-blocks of matter: elementary particles and forces
- ⊗ Allows predictions of properties and forces acting between elementary particles
- ⊗ Core of all current investigations of elementary particle physics with relevance to experimental investigations



## CMS Experiment at LHC

- © Development and construction of  $\approx 20\%$  of the silicon track detector by KCETA
- © Search for Higgs boson and particles of Dark Matter

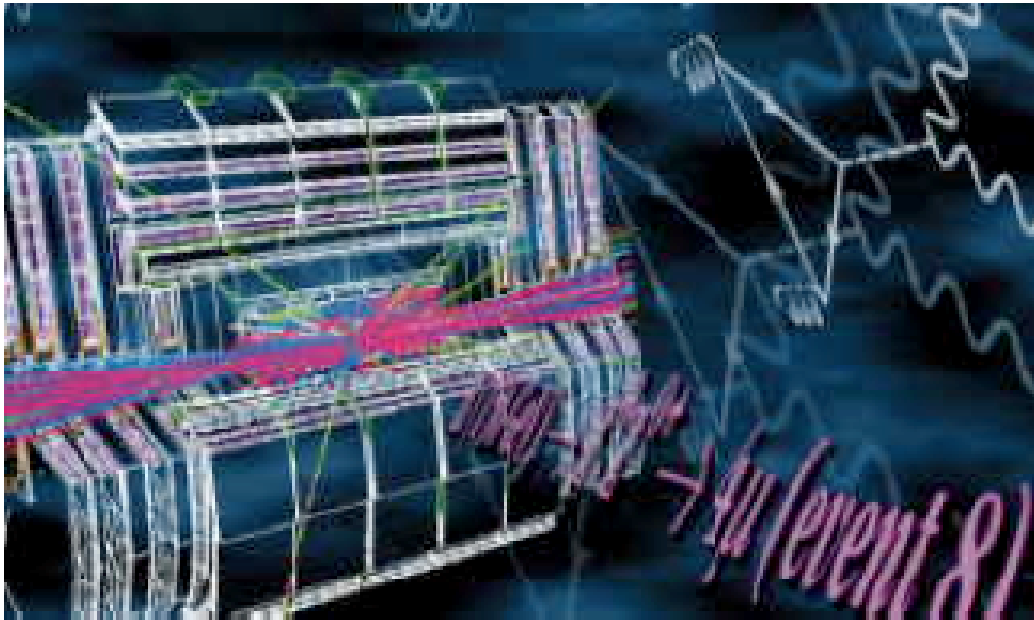


## CDF Experiment at Tevatron

- © Discovery of the heaviest elementary particle – the top quark



# Topic 5: Theoretical Collider Physics



- © Which forces are acting between elementary particles?
- © Major contributions of KCETA to the search for the Higgs boson
- © Predictions for experiments and interpretation of data at modern colliders (LHC Geneva)

## Topic 6: Flavor Physics



### CDF-II at Fermilab

- © 6 flavors of basic constituents of matter: quarks and leptons
- © Heaviest quark ("Top Quark") detected by the CDF detector at Fermilab/USA
- © KCETA recently joined Belle collaboration at Japanese Super B factory



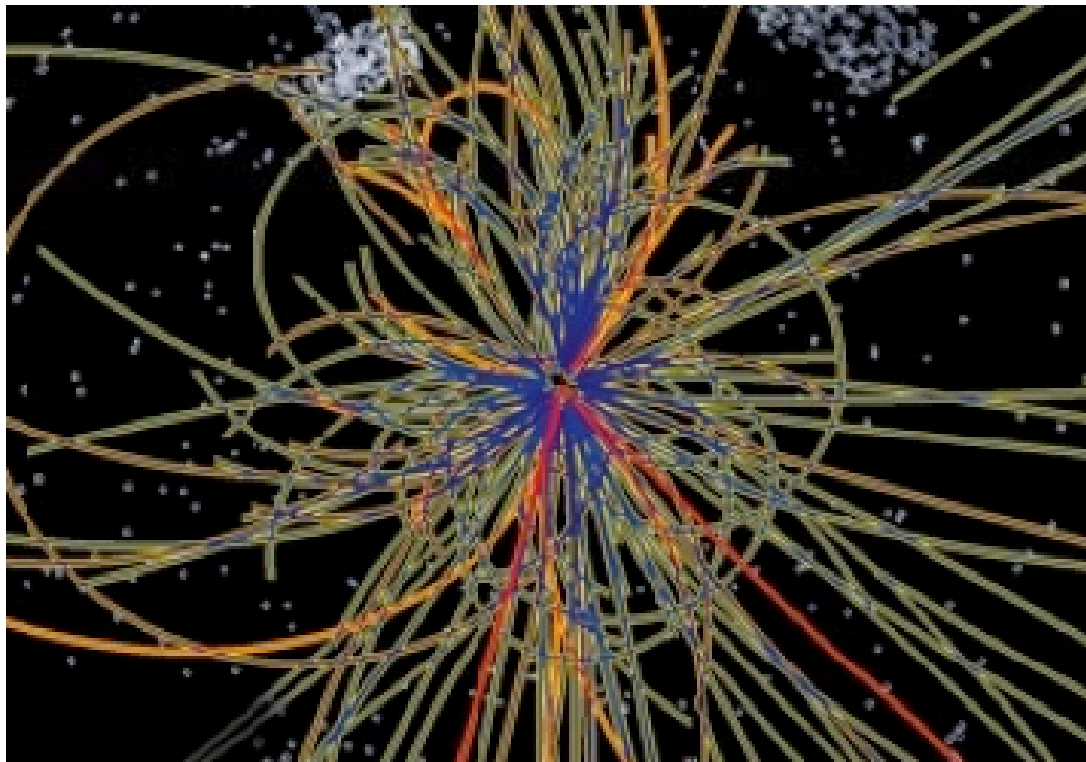
## KATRIN



- ⊗ Neutrino are the lightest and most abundant *massive* particle in the universe ( $336 \nu/\text{cm}^3$ )
- ⊗ Karlsruhe Tritium Neutrino Experiment KATRIN will measure directly the mass of neutrinos (sensitivity:  $0.2 \text{ eV}/c^2$ )
- ⊗ Addresses fundamental questions of particle physics and cosmology







## Simulation of particle collisions at LHC



- Ⓢ Implementation of effective algorithms in specialized computer programs
- Ⓢ KCETA develops software used to solve problems in particle and astroparticle physics

# Topic 9: Technology Development

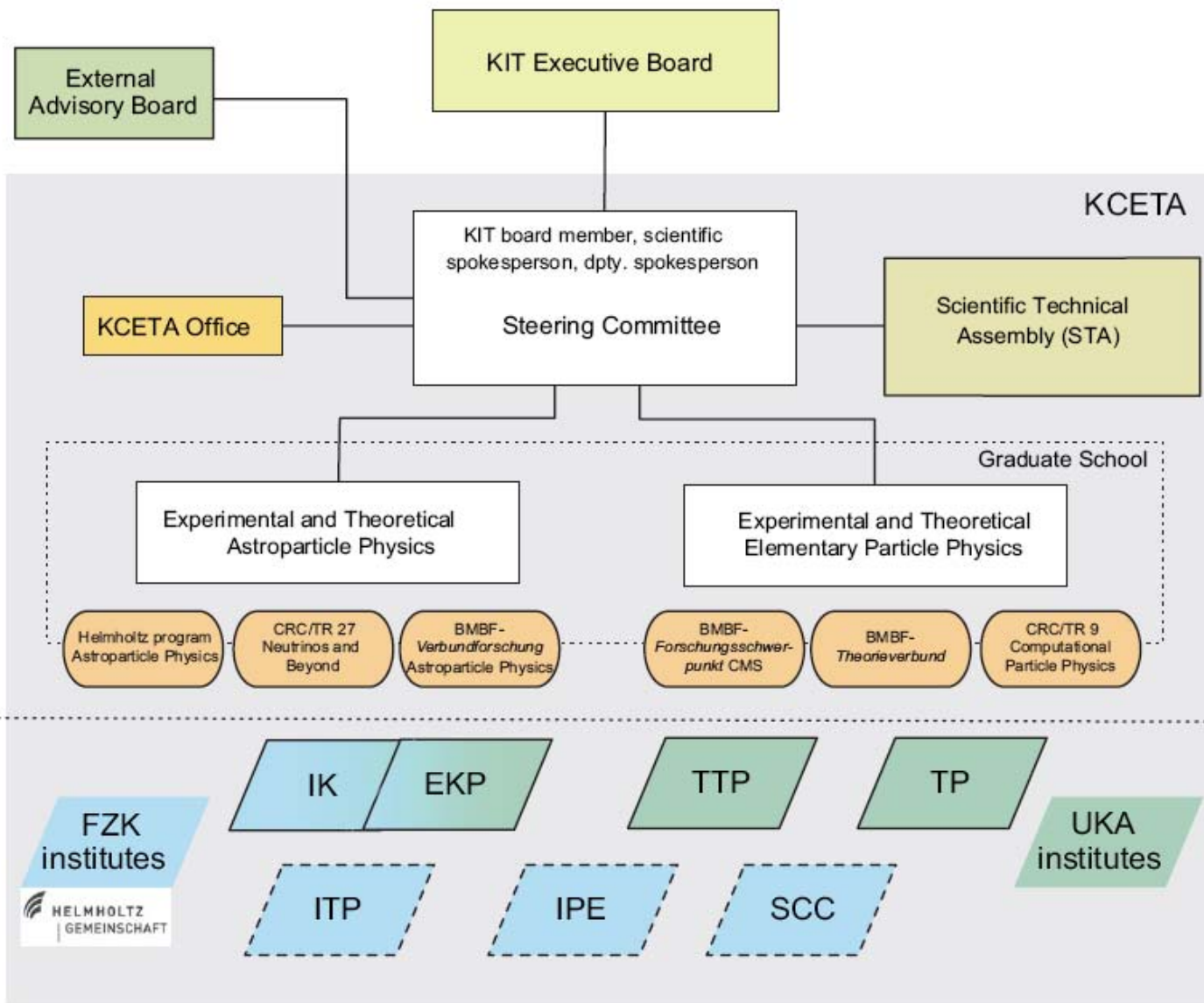


**LOPES**

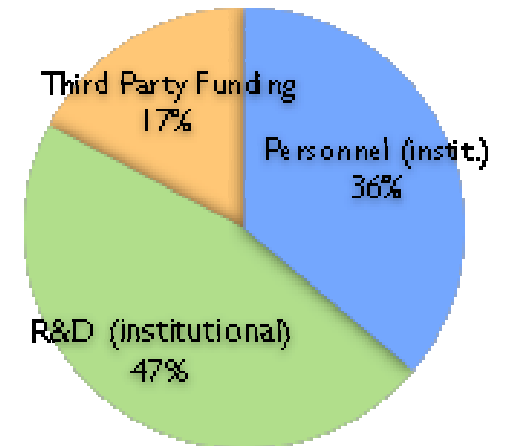
## GridKa

- ©Development of novel detectors for the next accelerator generation
- ©Detection of radiosignals for investigation of cosmic rays (LOPES)
- ©Unique high-vacuum systems and cryogenic facilities for KATRIN
- ©Worldwide Grid – revolution of data analysis (GridKa)

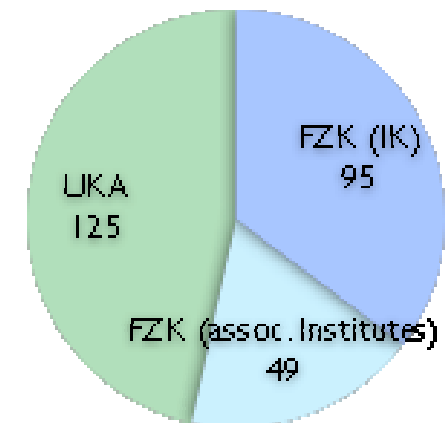
# KCETA Organisation



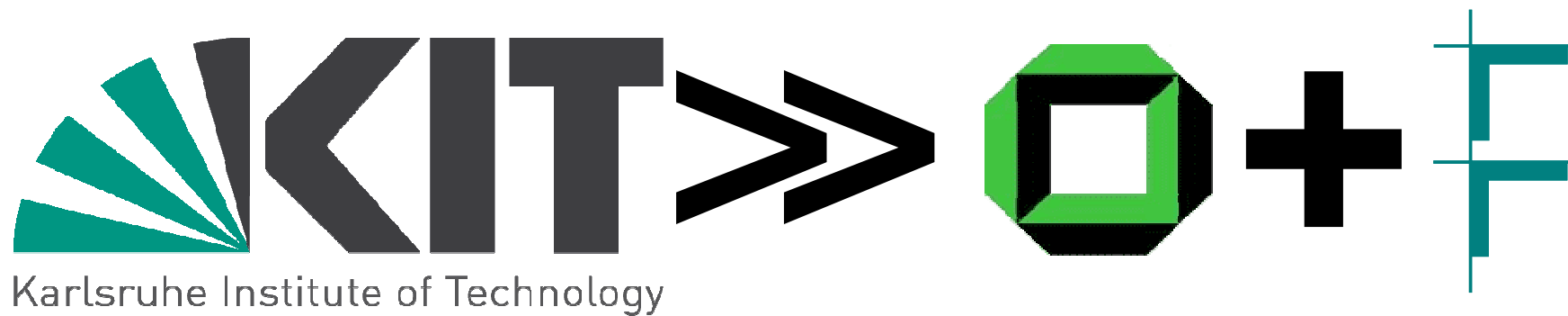
27.5 M€



270 FTE



# The KIT-Inequality



**„Coming together is a beginning,  
keeping together is progress,  
working together is success.“  
(Henry Ford)**