

**GGSB – QUALI-Start-Up Science Lectures: Selection Workshop**

# **Helmholtz Association (HGF) Forschungszentrum Jülich (FZJ) Institute for Nuclear Physics (IKP)**

June 2017 | Hans Ströher (Forschungszentrum Jülich)

- **Helmholtz Association of German Research Centres (HGF)**



## Facts and Figures

- Created in 1995
- 18 autonomous research centres
- 250 subject-specific research institutes
- 38,000 staff (15,000 scientists)
- 7,500 foreign researchers (2014)
- 14,000 scientific publications (2014)
- 3 Nobel Prizes (2007, 2008, 2014)
- Annual budget: **€ 4.24 billion** (2015)

- We contribute to solving **grand challenges** which face society, science and industry. We do this by performing top-rate research in strategic programmes in the fields of:
  - **Aeronautics, Space and Transport**
  - **Earth and Environment**
  - **Energy**
  - **Health**
  - **Matter**
  - **Key Technologies** (→ Information)



- We research systems of great complexity using our **large-scale scientific infrastructure**, cooperating closely with national and international partners.



- We contribute to shaping our future by combining **research and technology development** with perspectives for innovative application and provision for tomorrow's world.



# HGF – Research Centres



AWI



DESY



DKFZ



DLR



DZNE



FZJ



GSI



GEOMAR



HZB



HZDR



HZI



UFZ



HZG



HZM



GFZ



KIT



MDC



IPP

## Science Campus Jülich – Research for the Future



# FZJ – Facts and Figures

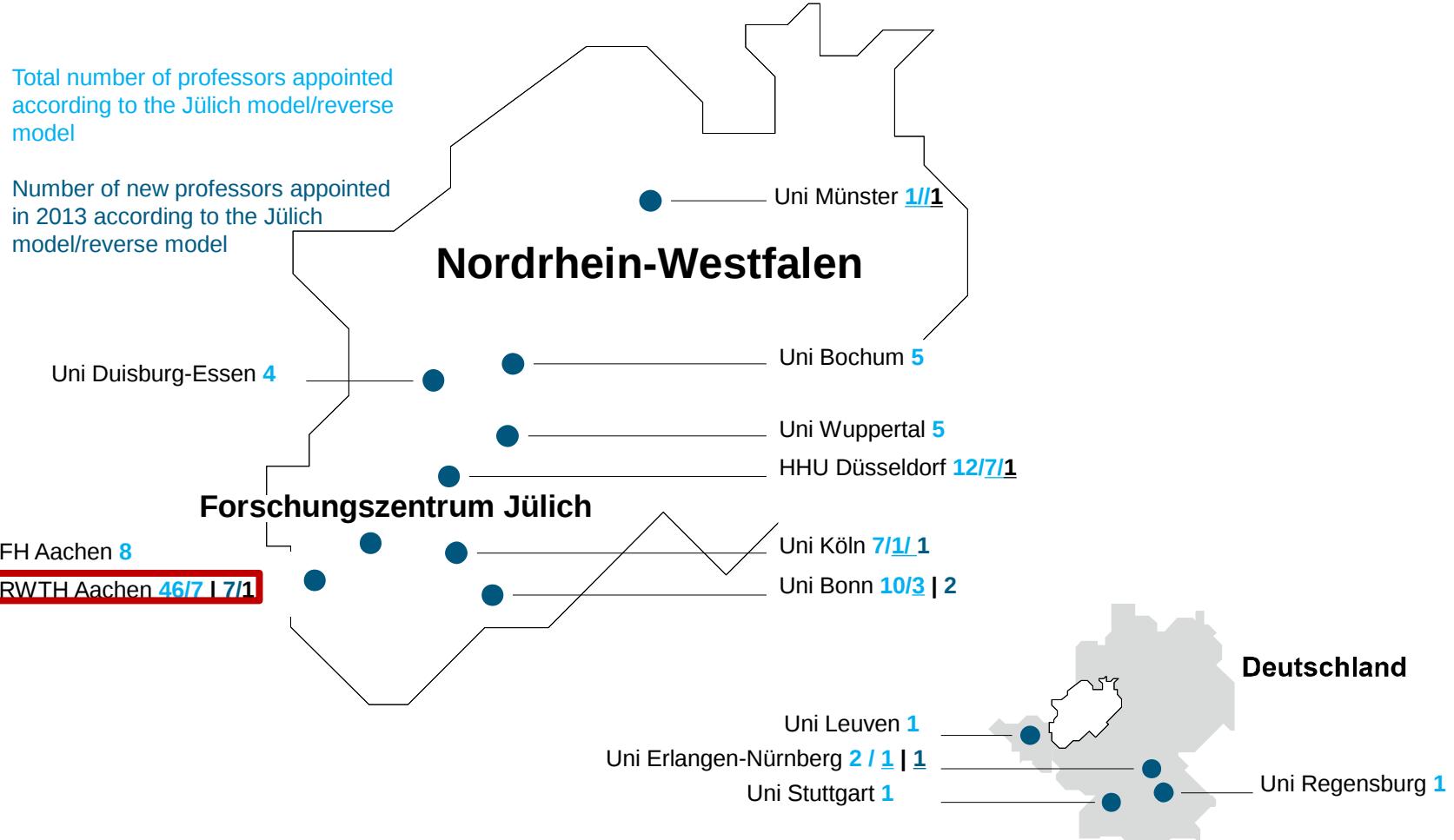


<b>Founded</b>	11 December 1956
<b>Partners</b>	Federal Republic of Germany (90 %) North Rhine-Westphalia (10 %)
<b>Revenue</b>	€ 615,7 million 2015 (39 % third-party funding)
<b>Structure</b>	9 institutes 2 project management organizations (project volume: € 1.4 billion)
<b>Employees</b>	5,684 (total) 2,048 scientists, incl. 537 PhD students 361 trainees & students on placement 1,041 visiting scientists from 68 countries

A multitude of national and international partners ...

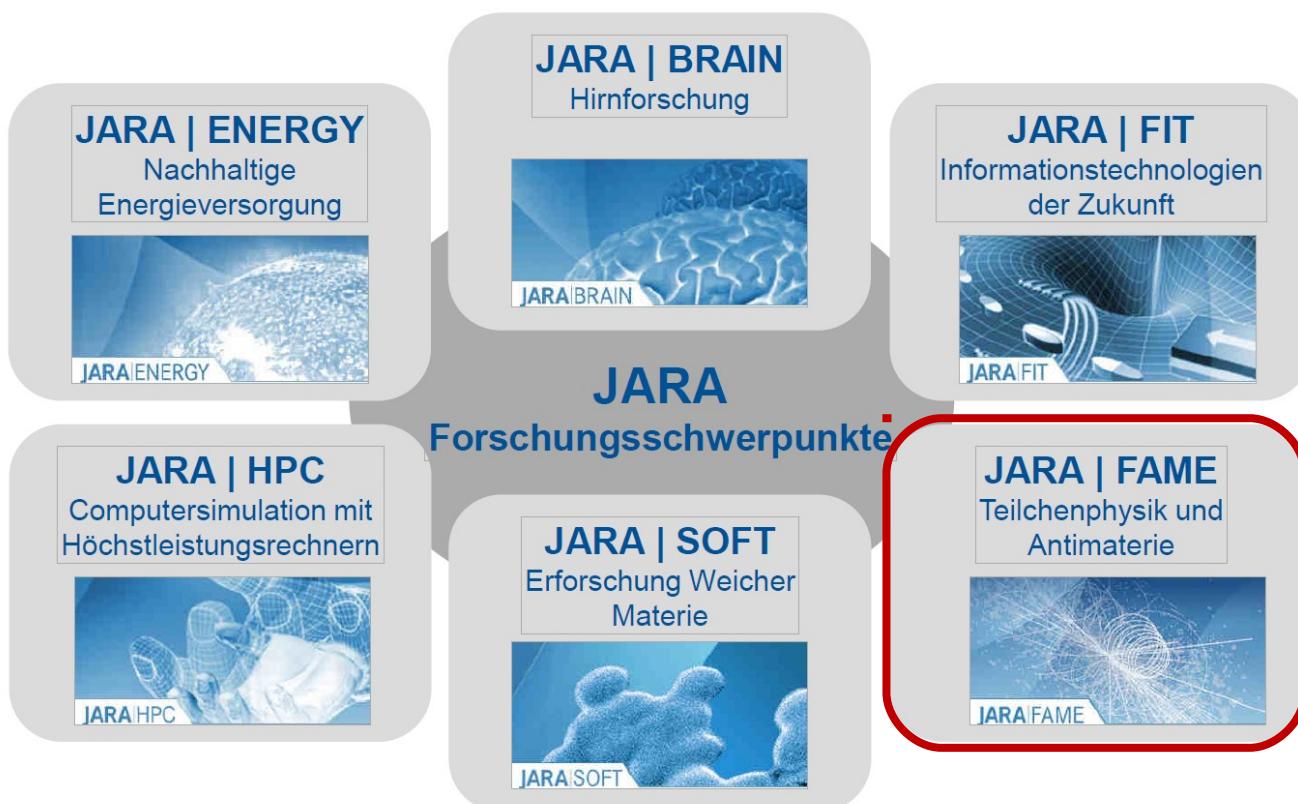


## Joint Professorial Appointments



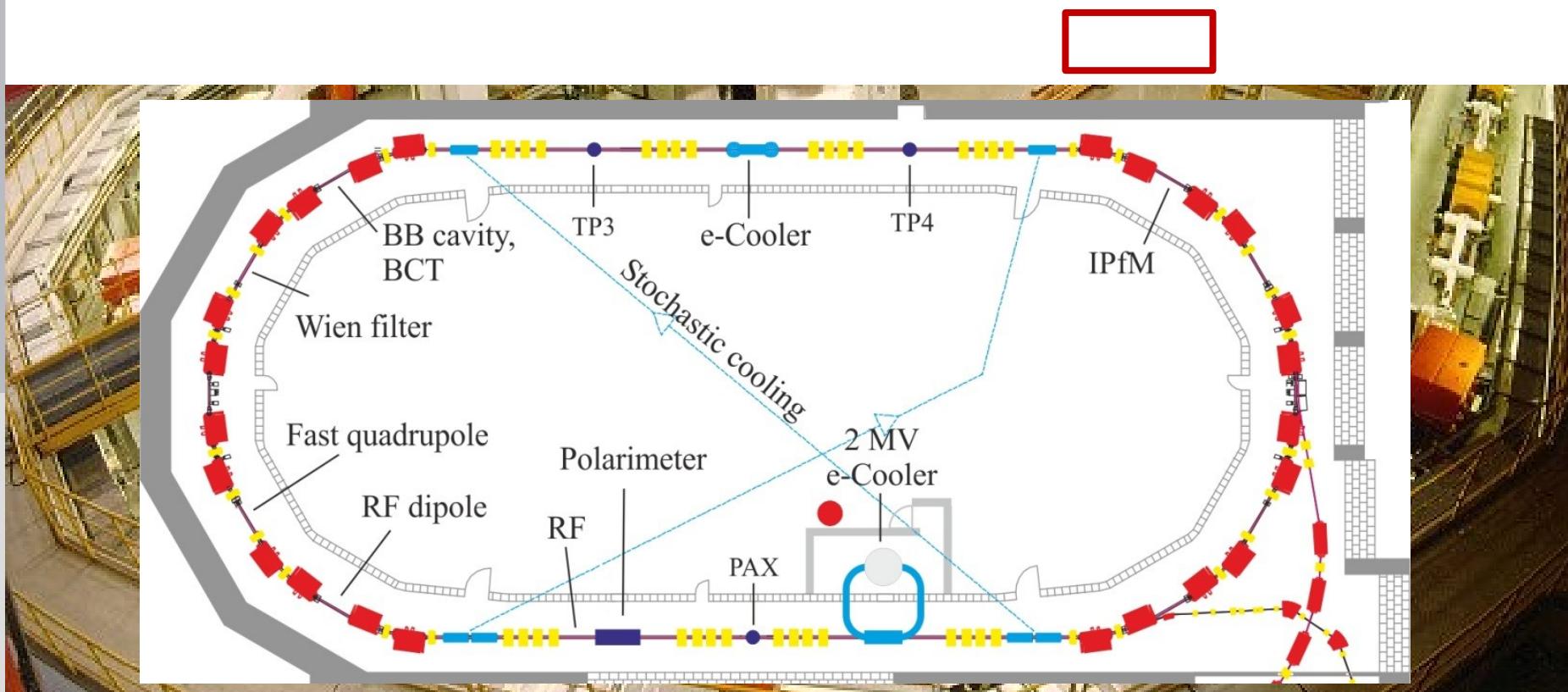
Cooperation with RWTH Aachen University:  
→Jülich Aachen Research Alliance (JARA)

→ 6 sections



## 4 sub-institutes:

IKP-1	James Ritman	Experiment	PANDA at FAIR
IKP-2	Hans Ströher	Experiment	JEDI, PAX, TRIC
IKP-3	Ulf-G. Meißner	Theory	... JSC
IKP-4	Ralf Gebel	Accelerator	COSY, HESR at FAIR



## Science:

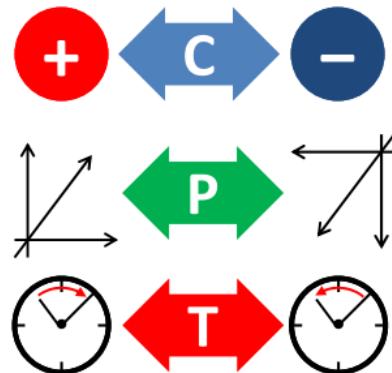
IKP is conducting basic research in the fields of nuclear and elementary particle physics. The physics program addresses two big questions of modern physics:

- Matter-anti-matter asymmetry of our universe  
("Fate of antimatter")  
→ **TRIC, JEDI**
- Building blocks matter is comprised of  
("How does nature *make* hadrons and nuclei?")  
→ **PANDA, PAX**

Both issues are tied together by the quest to understand:

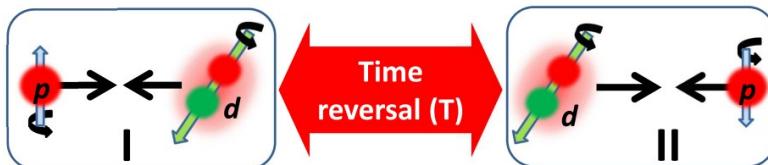
Why do we exist at all?

## TRIC (Time Reversal Investigations at COSY):



### Principle of TRIC

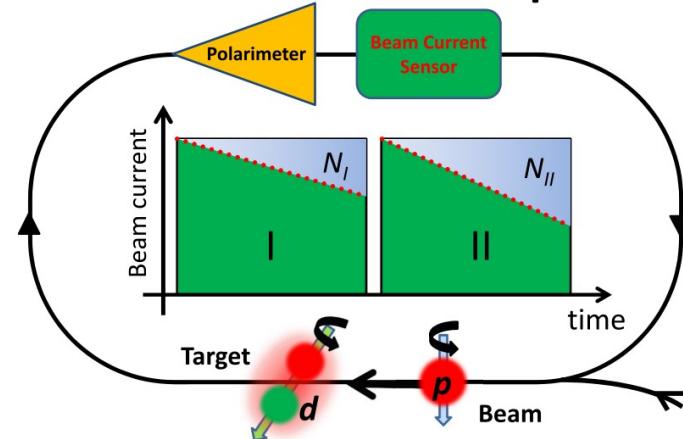
Genuine T-violating observable in  $\vec{p}\vec{d}$  scattering:  $A_{\vec{p},\vec{d}}$



$$A_{\vec{p},\vec{d}} \sim \frac{N_I - N_{II}}{N_I + N_{II}} \sim \begin{cases} = 0 & \text{T conserved} \\ \neq 0 & \text{T violated} \end{cases}$$

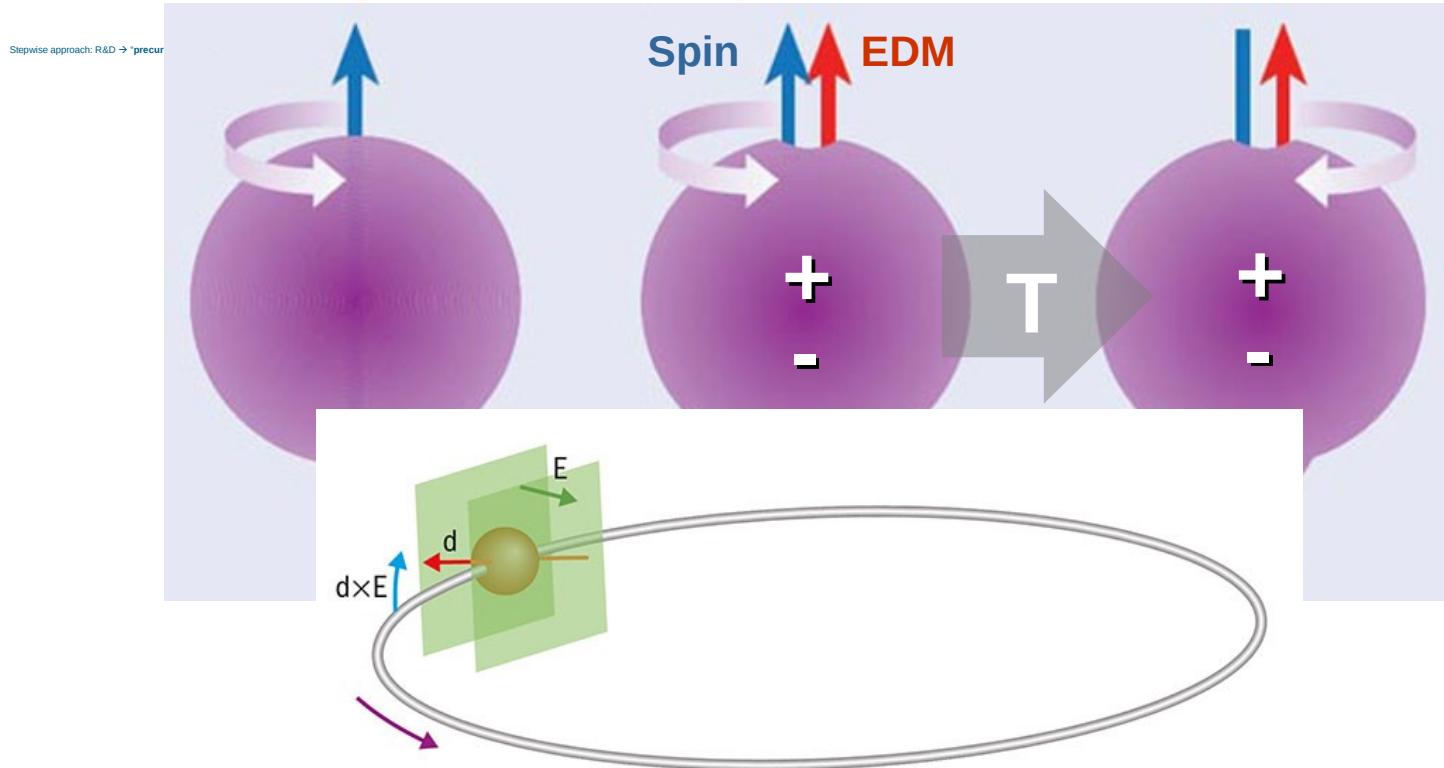
Trick behind TRIC: T reversal via spin-flip!

### Measurement Principle



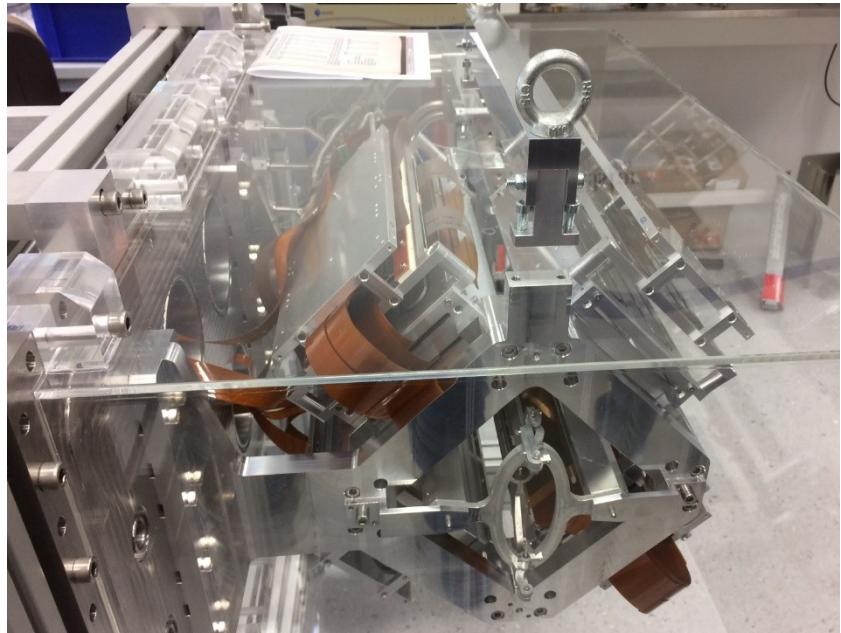
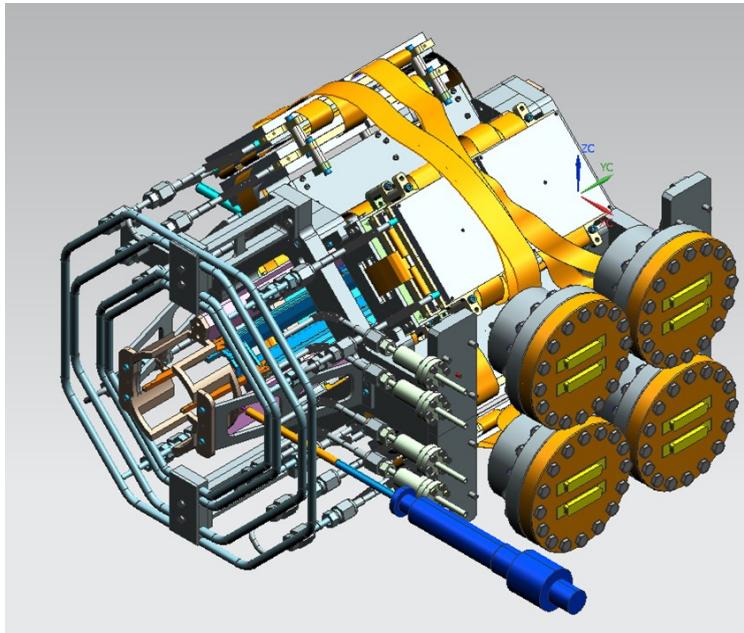
Comparison of slopes for I and II

JEDI (Julich Electric Dipole moment Investigations):



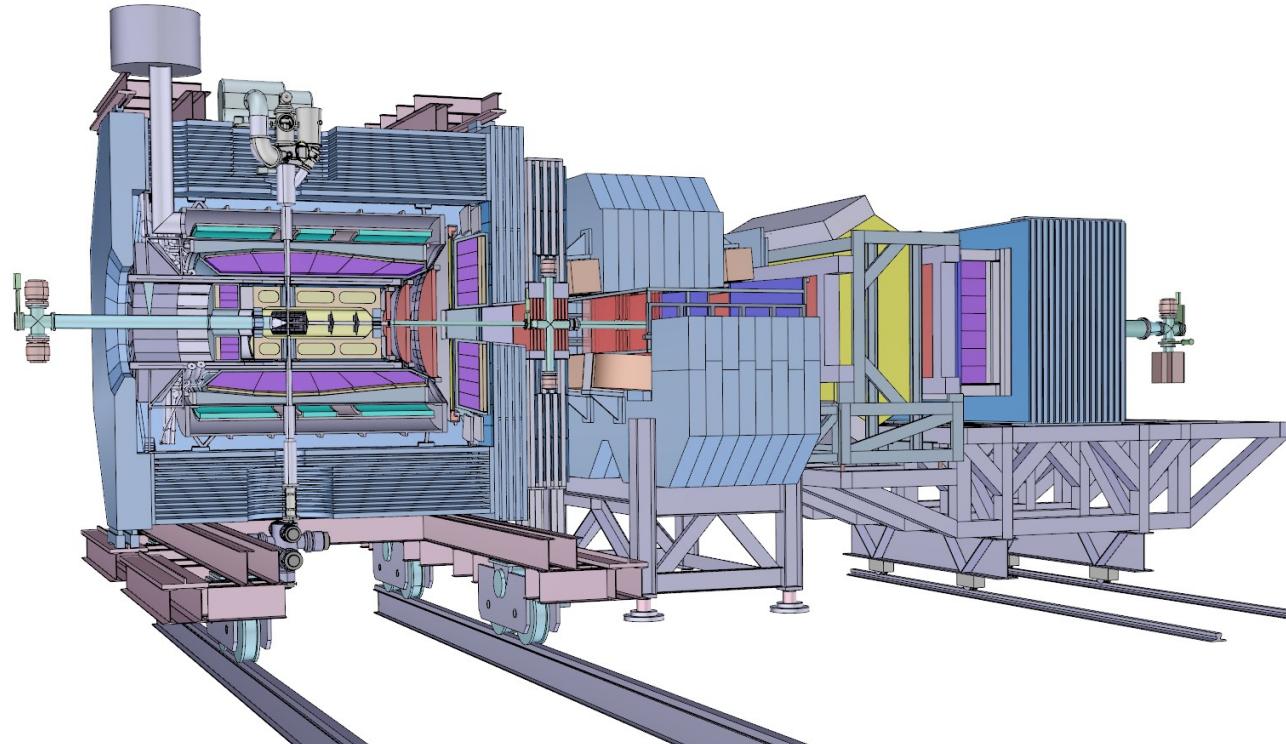
## PAX (Polarized Antiproton eXperiments):

IKP has demonstrated at COSY that “spin filtering” can be used to produce a beam of **polarized protons**;  
next step: anti-protons  
→ preparations ongoing, e.g., detector ...



## PANDA (AntiProton ANnihilations at DArmstadt):

IKP is involved in the construction of the large internal multi-purpose detector system in HESR at FAIR



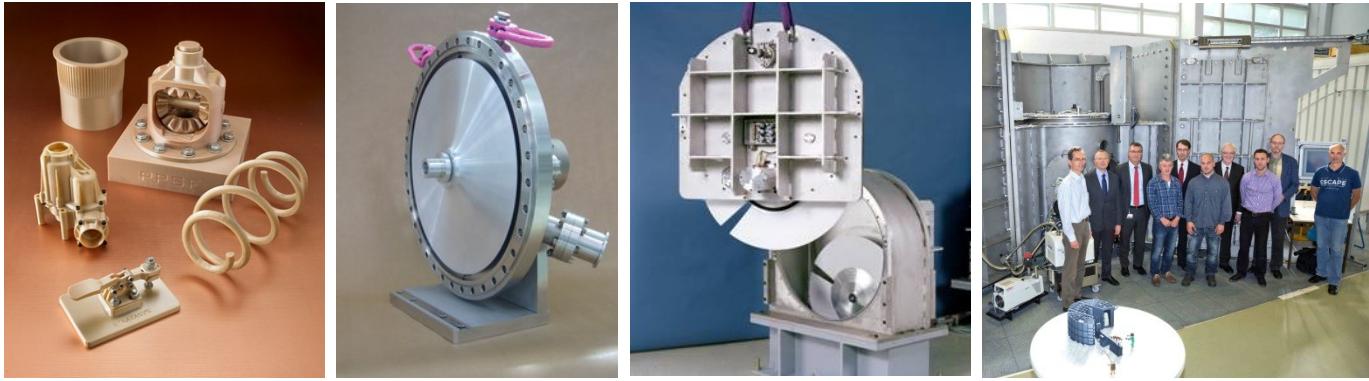
Set-up and operate/use of n-scattering equipment worldwide:



Also: development of HBS for FZJ

**ZEA-1:** Engineering and Technology

**ZEA-2:** Electronic Systems



New: SMART|Labs



## SMART|Labs

Science, Medicine, Applied Research and Technology

### Background and Objectives

Foster cooperation between institutes of **Forschungszentrum Jülich** and a consortium of **Georgian universities** (**Agrarian University of Georgia (AUG)**, **Georgian Technical University (GTU)**, **Ilia State University (ISU)** and **Tbilisi State University (TSU)**)

Umbrella organization for activities: **Georgian-German Science Bridge (GGSB)**

Connect scientists and students of both countries via common research projects and through education

New concept: **SMART|Labs**

Well-equipped and maintained modern laboratories affiliated with one of the Georgian universities

Small group of experts and students headed by an outstanding young Georgian scientist

Dedicated to specific projects in different fields of fundamental and applied science

