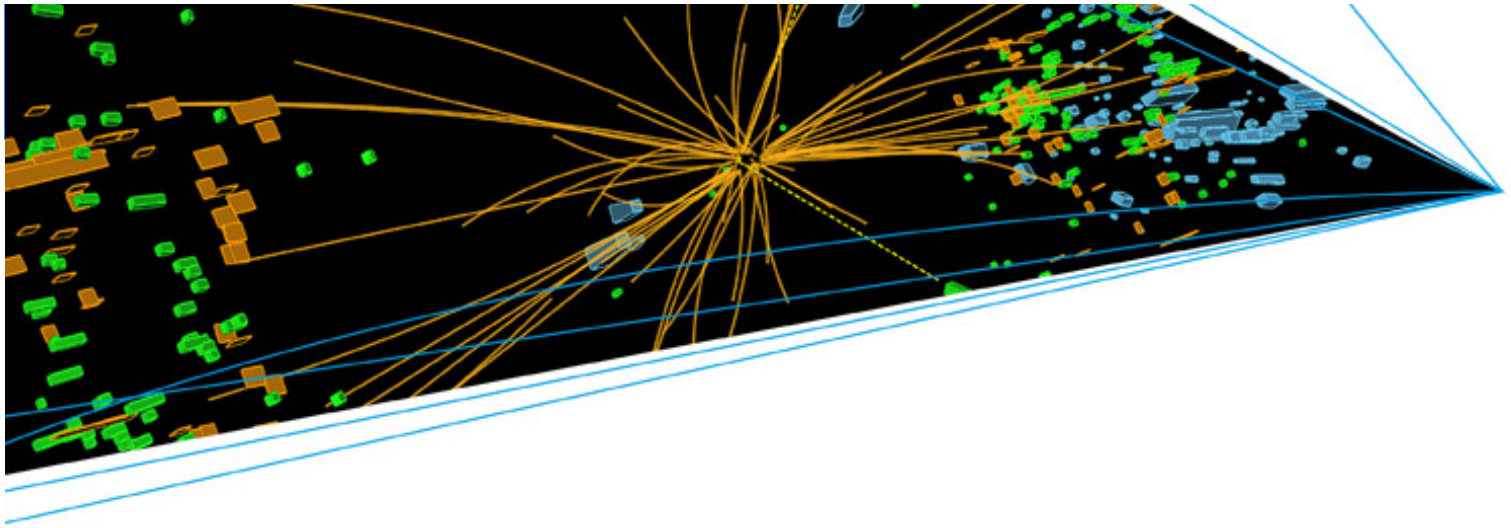


KET
Komitee für
Elementarteilchenphysik

Particle Physics in Germany

R-ECFA visit to Germany, Bonn, 2014

P. Schleper

Committee for Elementary Particle Physics (KET)

Science Case

Since last RECFA visit in 2007

Technological break through

- LHC accident, repair, great start
- Experiments got finished and perform better than expected, computing Grid works

Scientific break through

- Theoretical tools for higher order calculations
- Discovery of a Higgs
  Standard Model? Mass in SUSY range!
- Observation of Rare b-decays

Tensions & Phase transitions

- Higgs and top mass, neutrino properties
- High precision cosmology data, LHC searches, Rare b-decays, LHC/direct/indirect DM searches

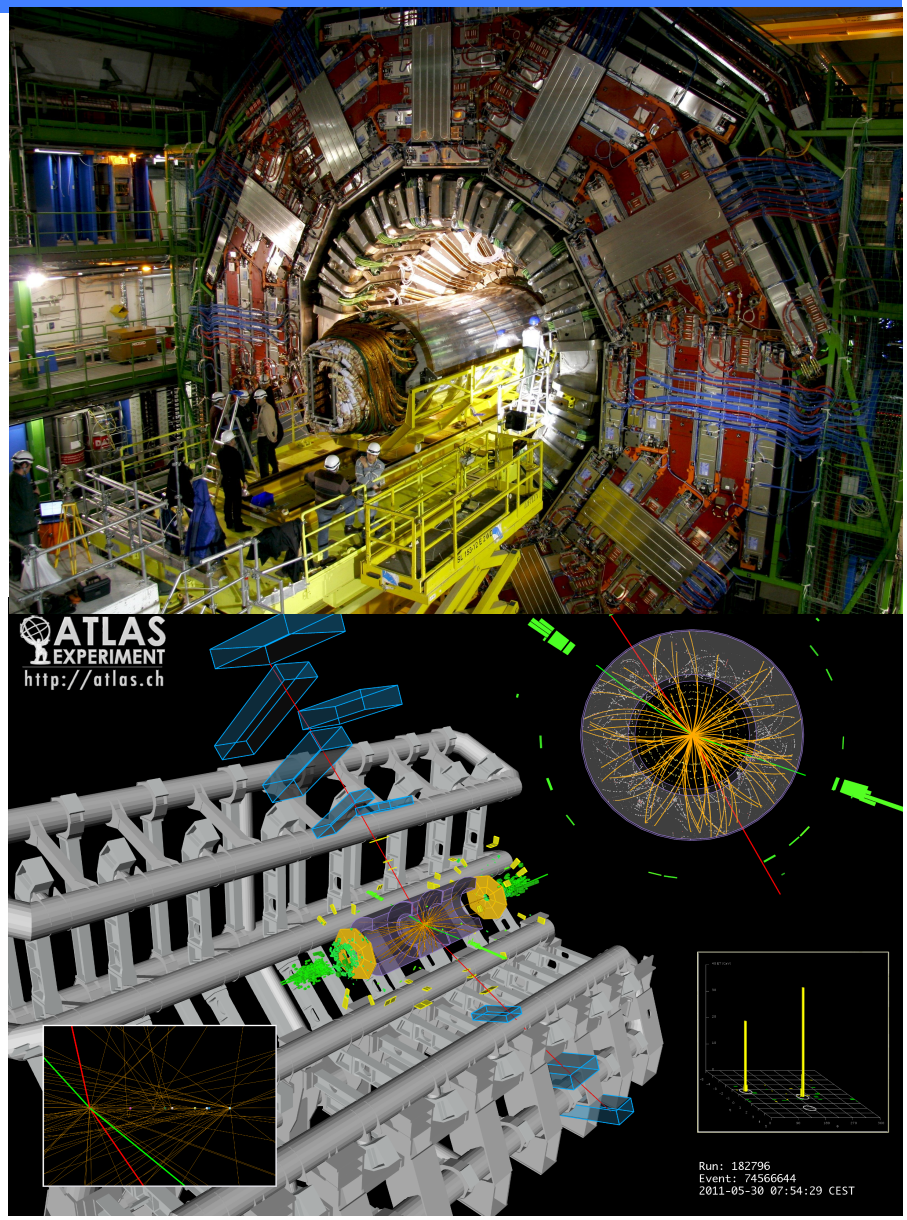
➔ Bridge the gap between HEP and cosmology

➔ Phases and phase transitions of the universe

The best is yet to come:

- LHC upgrade, BELLE-II, DM, Cosmology

Phase transition of public awareness



Organisation of Community

Astro-Particle KAT

- Dark Matter
- Neutrinos w/o accelerators
- Cosmic rays
- Gamma astronomy
- Nuclear astrophysics
- Gravitational waves

See talk by C. Weinheimer

Particle Physics KET

- LHC: ATLAS, CMS, LHCb
- Tevatron, HERA
- Belle-II
- Neutrinos @ accel, OPERA
- Fixed target experiments
- Theory, incl. math. Physics

This talk

Hadron & Nuclei KHuK

- Heavy Ion, ALICE
- FAIR experiments
- Nuclear structure

See talk by J. Wessels

Mandate of KET

- Elected by all scientists
- Defines research strategy and priorities
- Represents community at funding agencies
- Public outreach

Accelerators KfB

Accelerator R&D in all research areas particle, nuclear and photon science

See talk by Boine-Frankenheimer

Particle Physics Institutes

KET
Komitee für Elementarteilchenphysik

Particle physics with accelerators:

Universities

- 25 Universities
- Mostly both theory and experiment
- ~ 80% of scientists

Helmholtz Centres

- DESY at Hamburg and Zeuthen
- KIT, Karlsruhe
- GSI, Darmstadt

Max-Planck Society

- MPI for Physics, München
- MPI for Nuclear Physics, Heidelberg

CERN

Priorities of the German Community

Komitee für Elementarteilchenphysik

Last update in December 2012

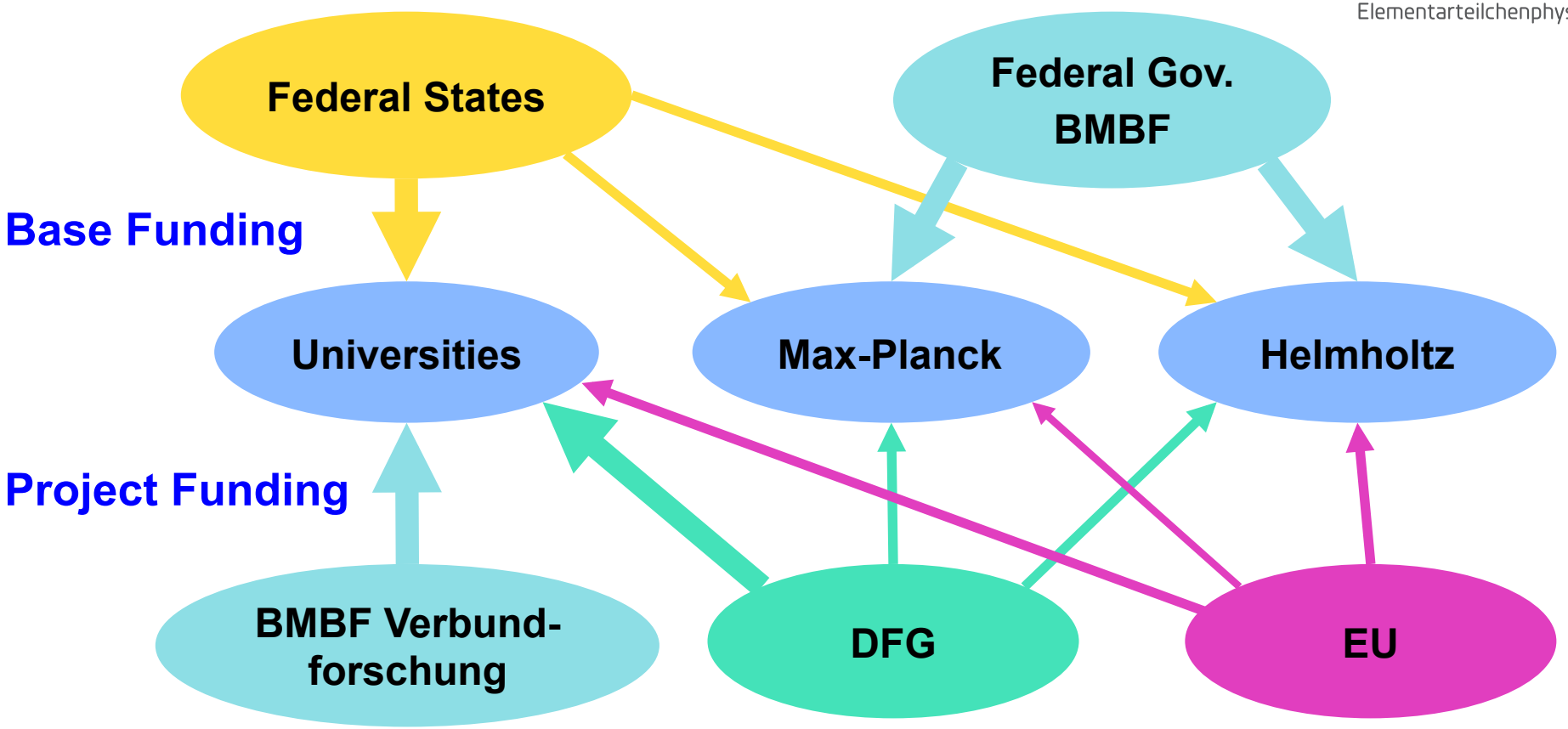
- input to European strategy process
- after LHC startup, Higgs discovery
- after proposal by the Japanese scientific community to host the ILC

1. LHC running and optimisation are of highest priority
2. High luminosity LHC and Phase-II detector upgrade
3. Linear e+e- collider: enthusiastic support for Japanese proposal, contribute actively to the realisation
4. Flavour physics with LHCb and Belle-II
5. Participation in further international projects, in particular neutrino physics, should be enabled
6. R&D on accelerator and detector technology
7. Theory, in particular related to experiments
8. Strong role of CERN and CERN council

Very much in line with the European Strategy for Particle Physics

- Strongly supported in Germany

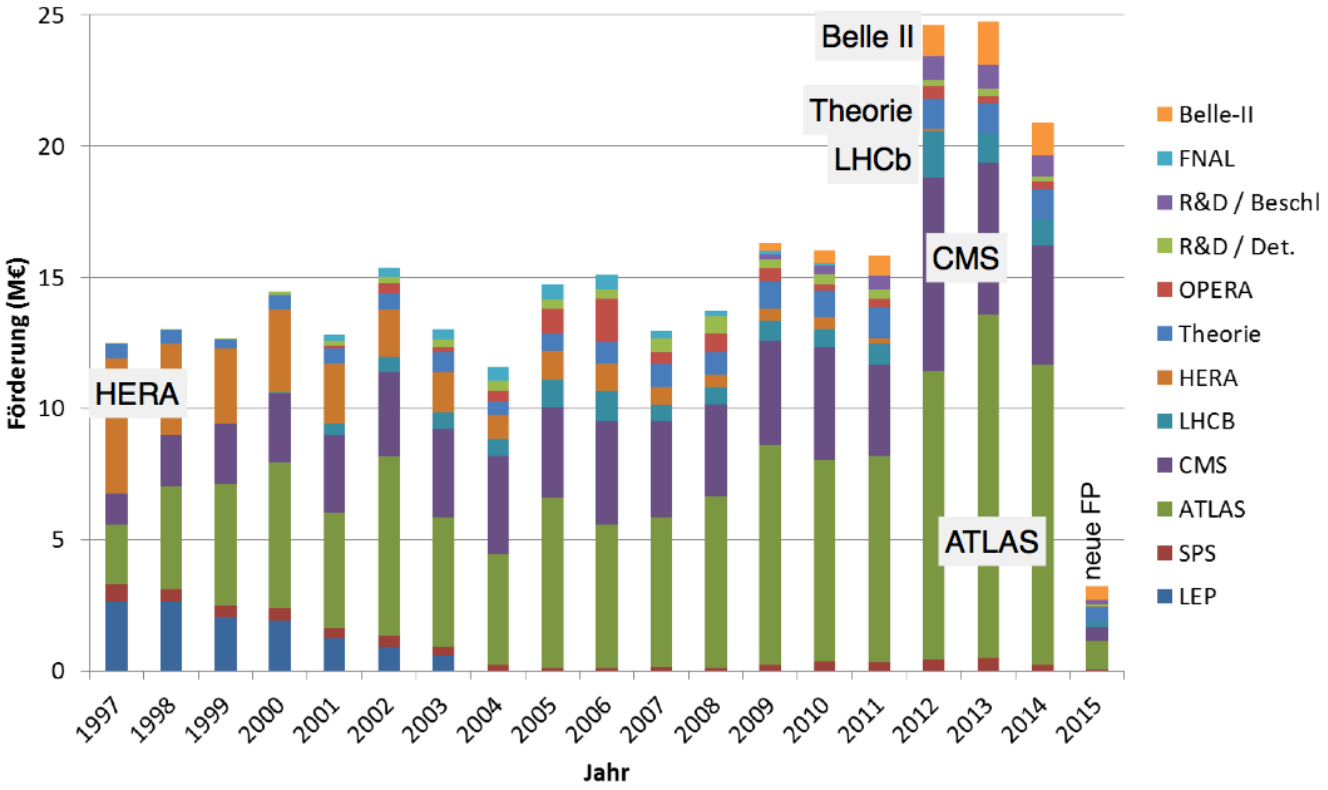
Funding


Federal States
Federal Gov.
BMBF
Base Funding
Universities
Max-Planck
Helmholtz
Project Funding
BMBF Verbund-
forschung
DFG
EU

Funding by federal Government (BMBF)

Verbundforschung

- Only accelerator related part is shown



Verbundforschung

- Backbone of University participation in large infrastructure, long time scales
- Matched by University funds
- Increase visible, but less than inflation
- 20% overhead as of 2012 to cover , major effort by BMBF to add this on top is much appreciated
- Level now at 21 M€ /year to be compared to 200 M€ /year for CERN budget

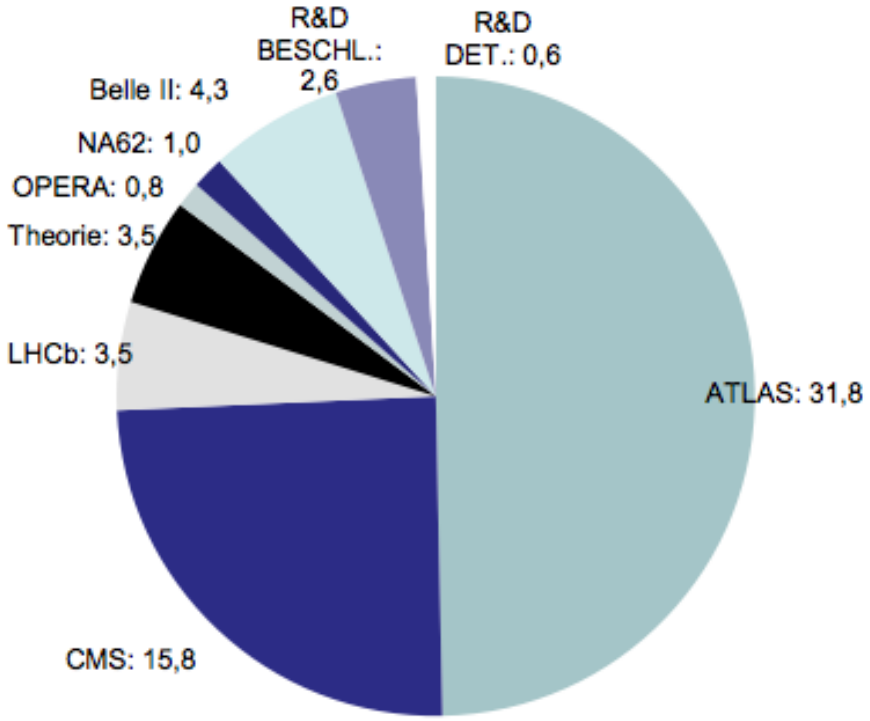
Funding

BMBF

- 20.3% of CERN budget, ~ 200 M€

BMBF Verbundforschung

- Project funding for Universities
- 3years period until 2012: 51.3 M€
- 3years period until 2015: 64.0 M€
  now including 20% overhead
- Research-clusters (FSP) on ATLAS, CMS
- Gentner program for technical students



Helmholtz *see talk by J. Mnich*

Alliance "Physics at the Terascale" 2 Helmholtz centres + 18 Unis + MPI

26 M€, 2007-2014 ➔ greatly enhanced collaboration between institutes in Germany

- Computing boards continue to coordinate all German LHC T1,2 centres and NAF
- Accelerator and detector projects are nuclei of the new "Matter and Technology" research area in Helmholtz
- Closely entangled LHC detector projects DESY/KIT/Universities
- Schools for students, Phds and Postdocs on particle physics are fully continued

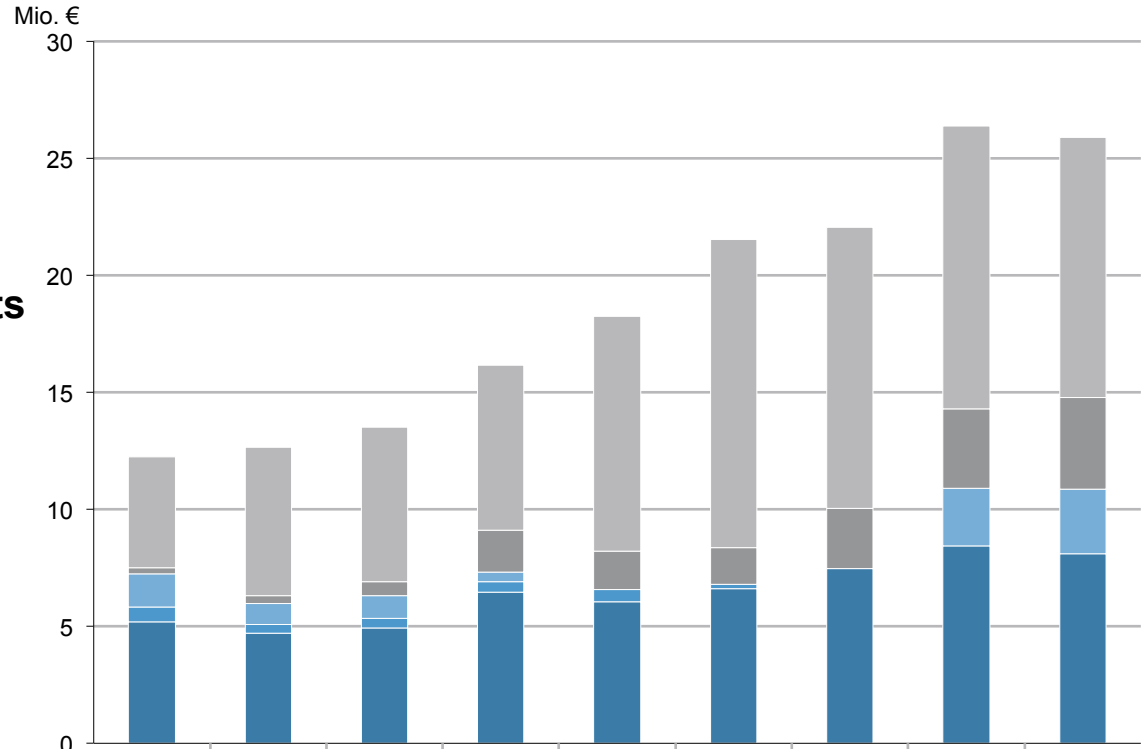
Funding by German Science Foundation (DFG)

Hadron and Particle Physics

- Graduate schools
- Integrated research clusters
- Individual grants
- …

Restricted to non-BMBF projects
Smaller experiments, theory

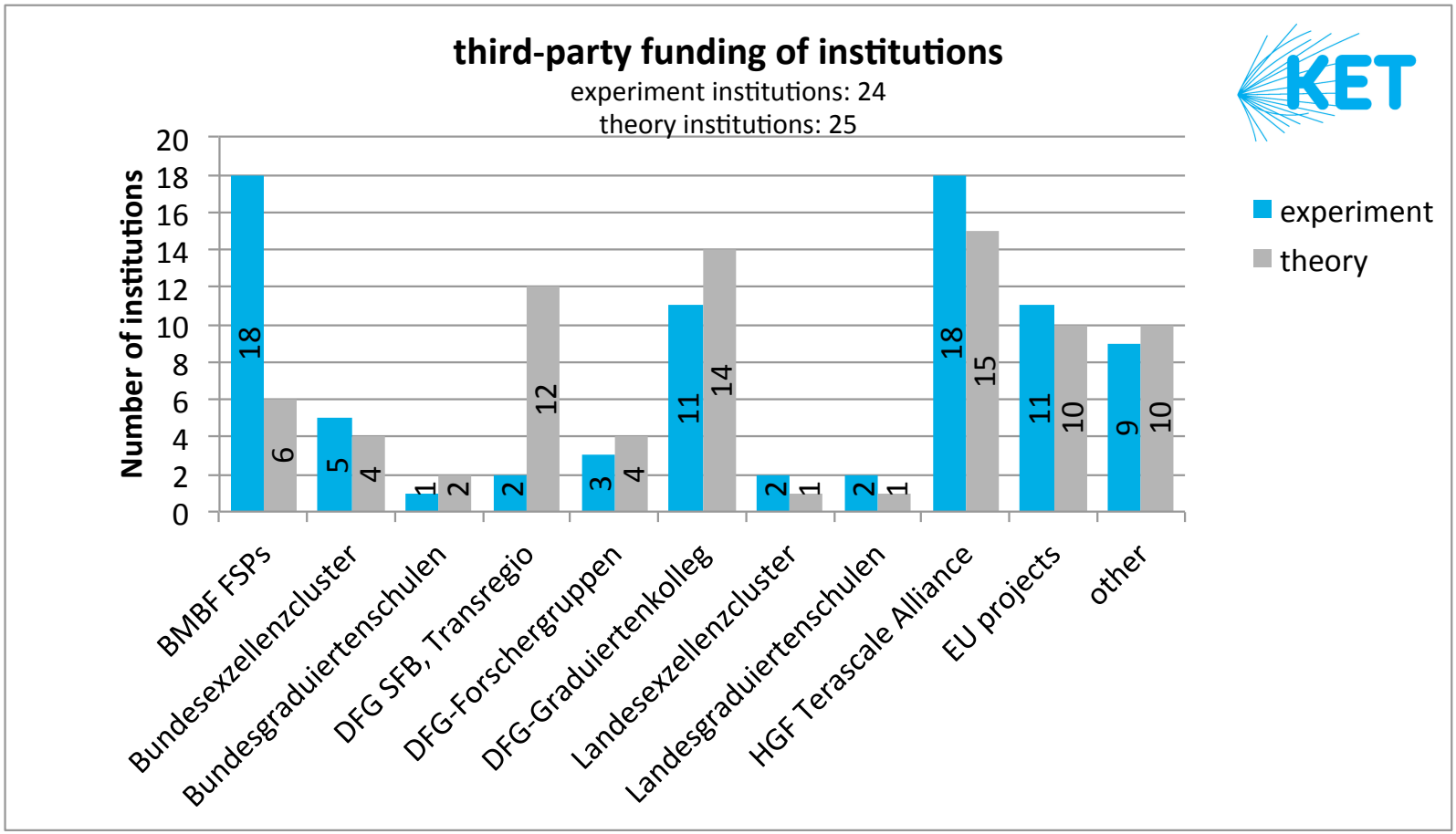
20% success rate
Increasingly successful



	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sonderforschungsbereiche	4,7	6,3	6,6	7,1	10,0	13,2	12,0	12,1	11,1
Graduiertenkollegs	0,3	0,3	0,6	1,8	1,6	1,6	2,5	3,4	3,9
Schwerpunktprogramme	1,4	0,9	1,0	0,4	-	-	-	2,4	2,8
Forschergruppen	0,6	0,4	0,4	0,5	0,5	0,2	-	-	-
Einzelförderung	5,2	4,7	4,9	6,4	6,1	6,6	7,5	8,5	8,1

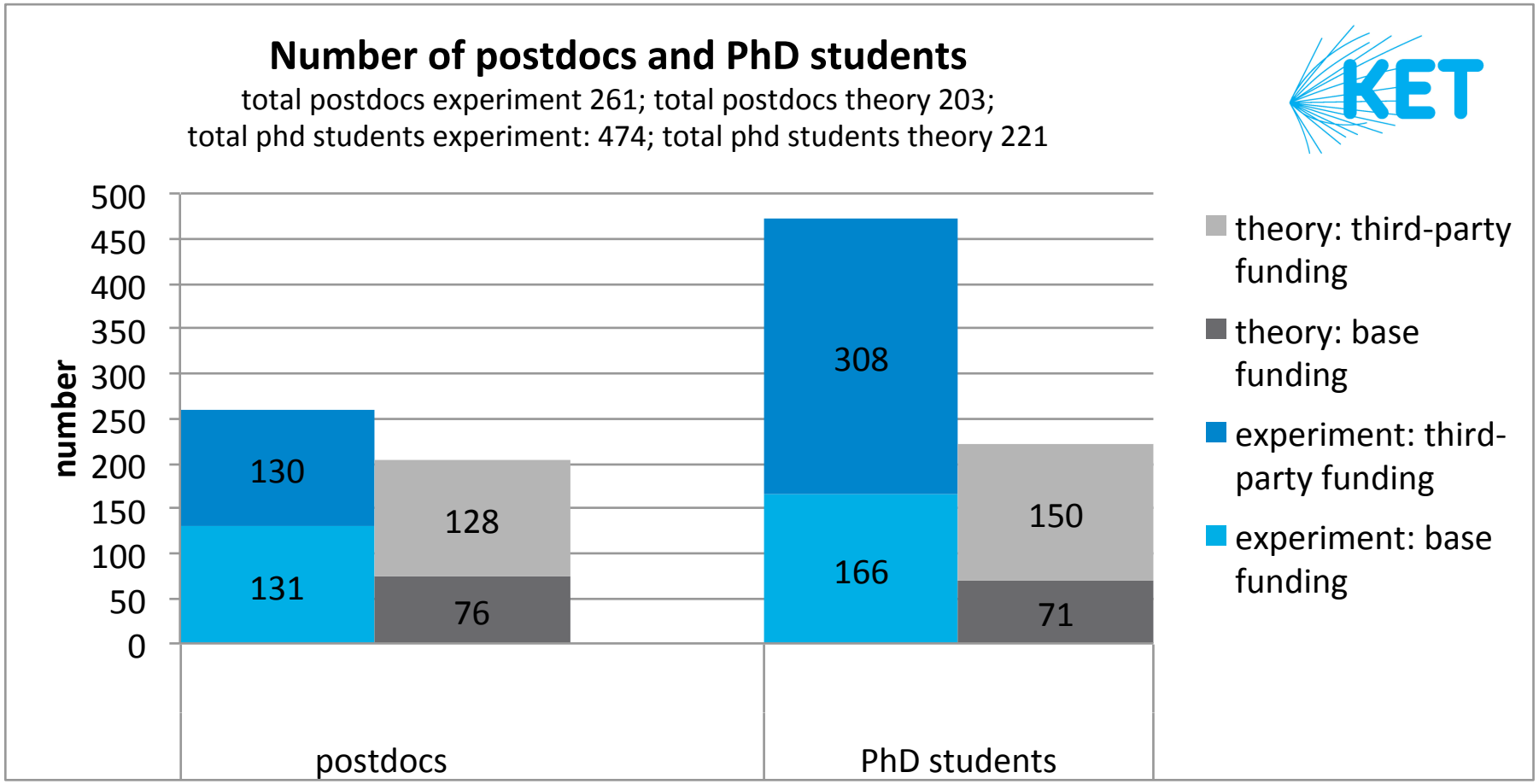
Particle Physics Community

KET Survey in 2013 **includes Helmholtz, Max-Planck, Universities, CERN**



- **Most sites participate in BMBF research clusters (FSPs) or HGF-Alliance**
- **Successful in DFG and EU grants**

Third party funding



Postdocs & PhD students: 50 – 70 % third party funding

Adding permant scientists: 50 % base funding, 50 % third party funding

Manpower and Projects

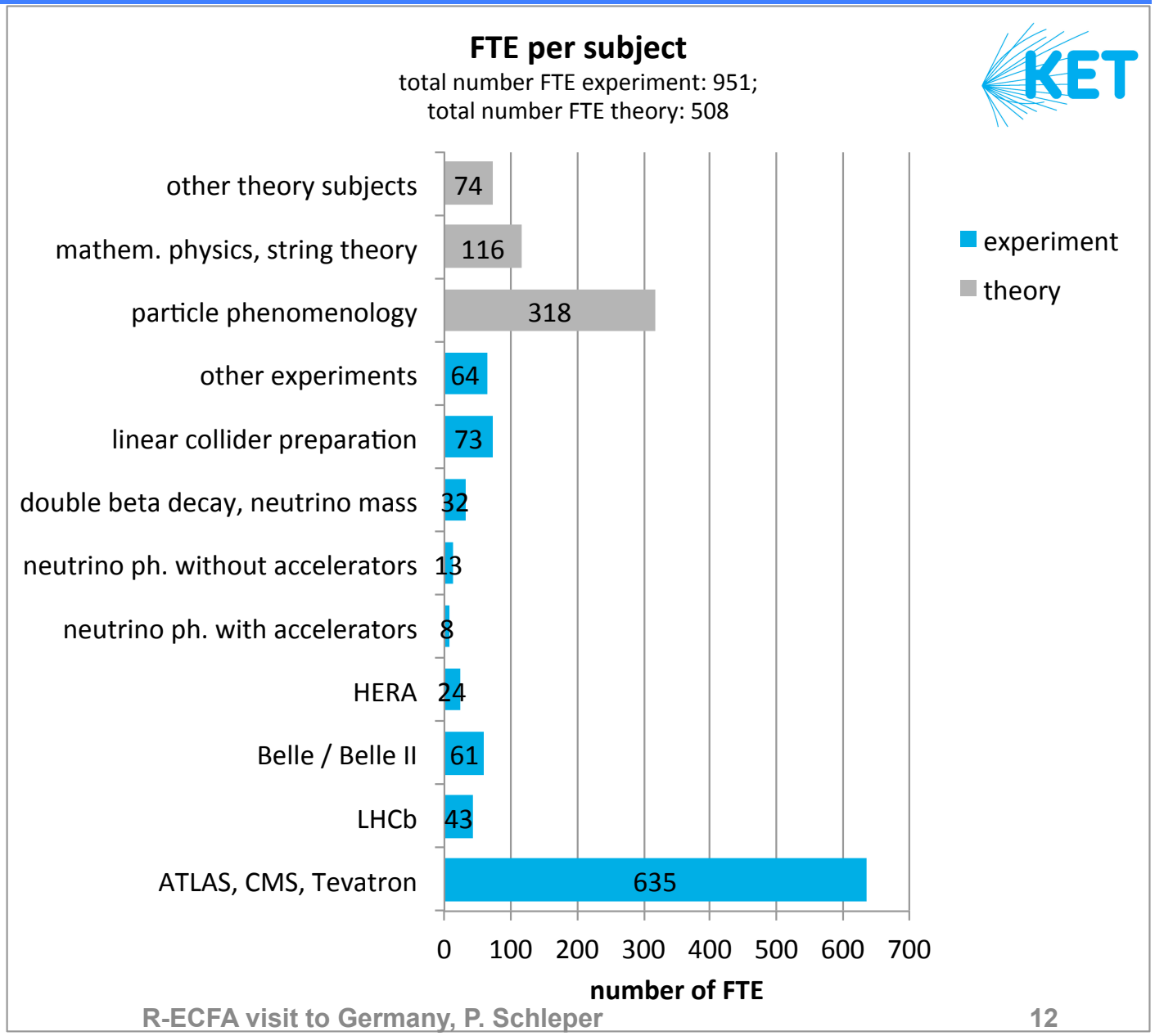
Manpower:

incl. PhD students

- **Experiment: 951**
- **Theory: 508**

Focus on

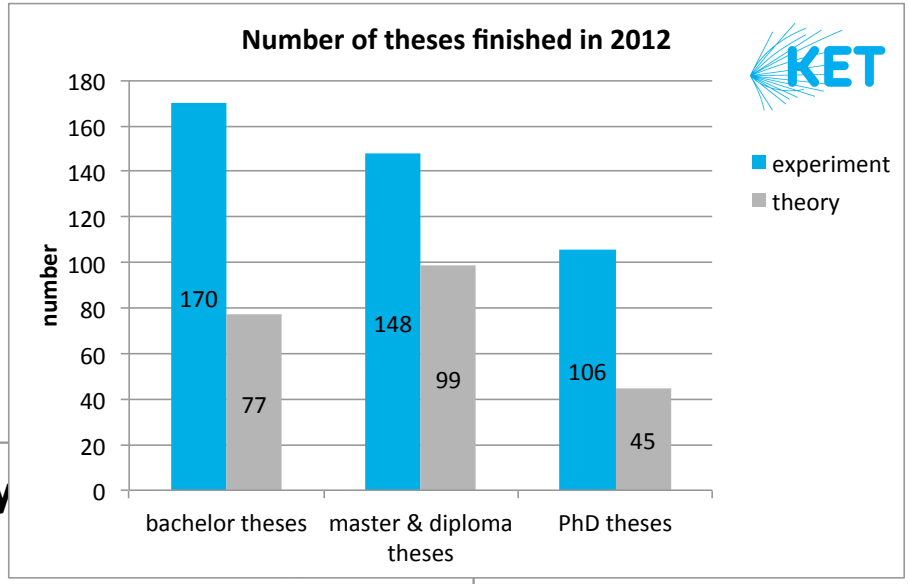
- **ATLAS & CMS (75%)**
- **b-Physics**
- **linear collider**
- **phenomenology**

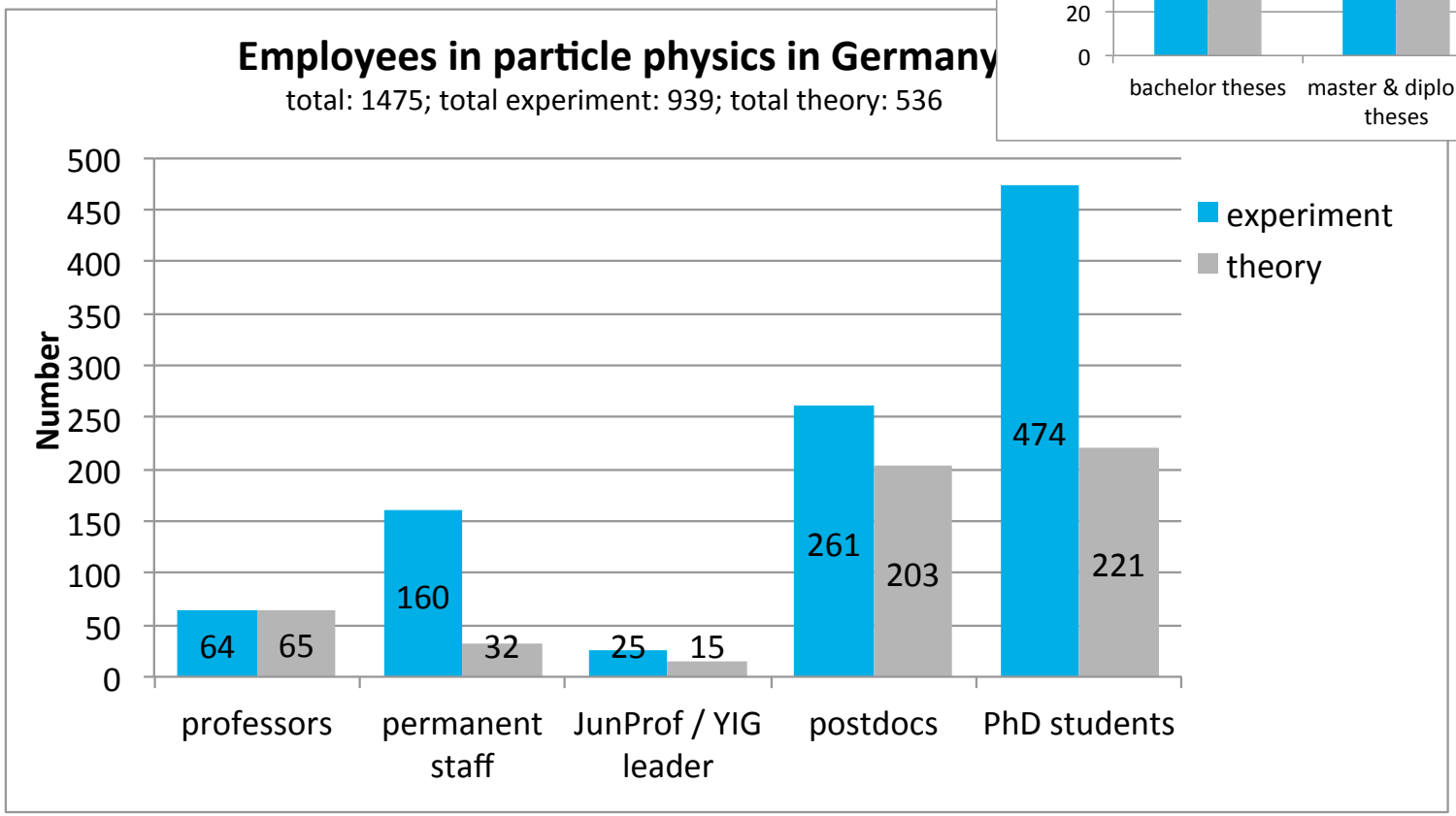


Particle Physics Community

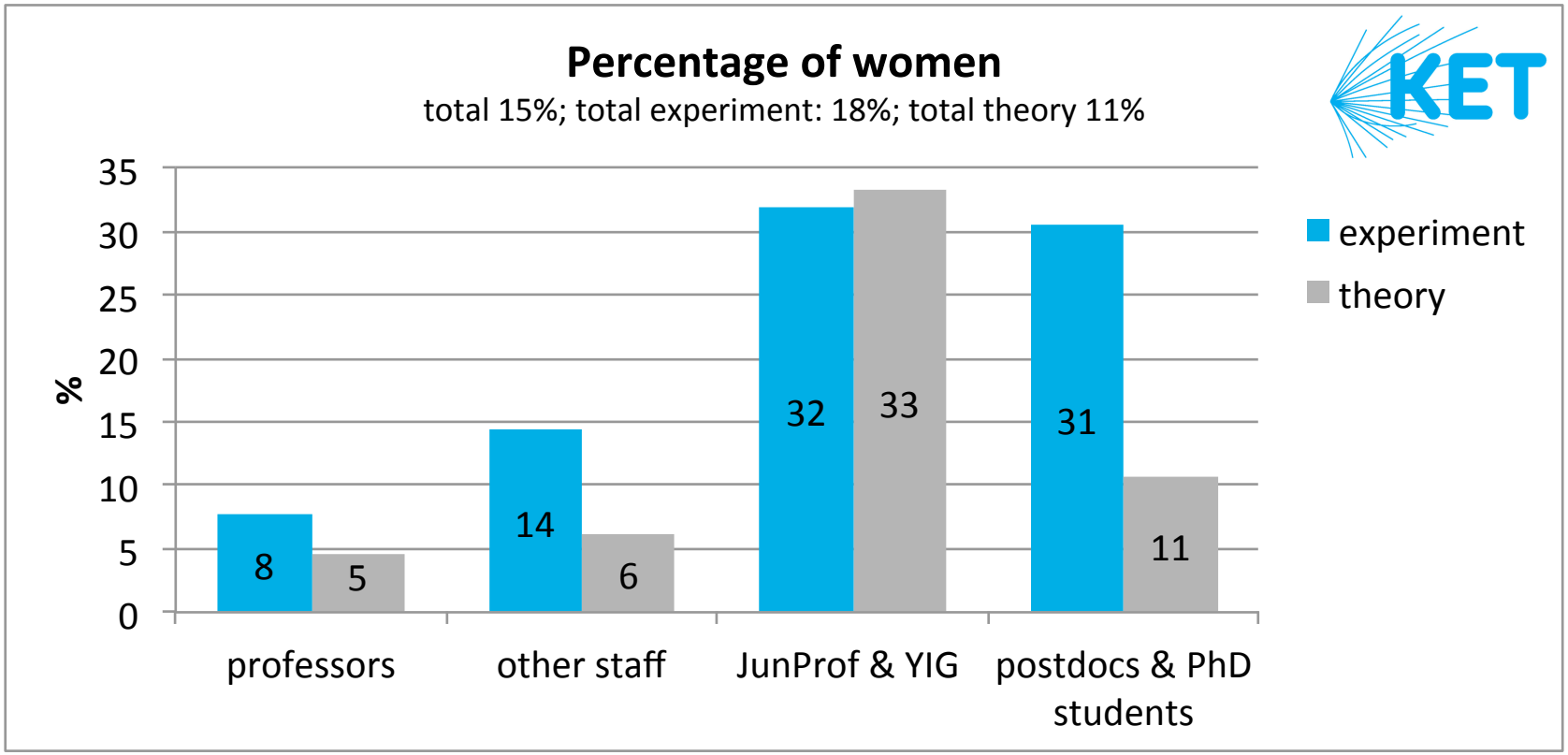
A particular strength:

Many young scientists





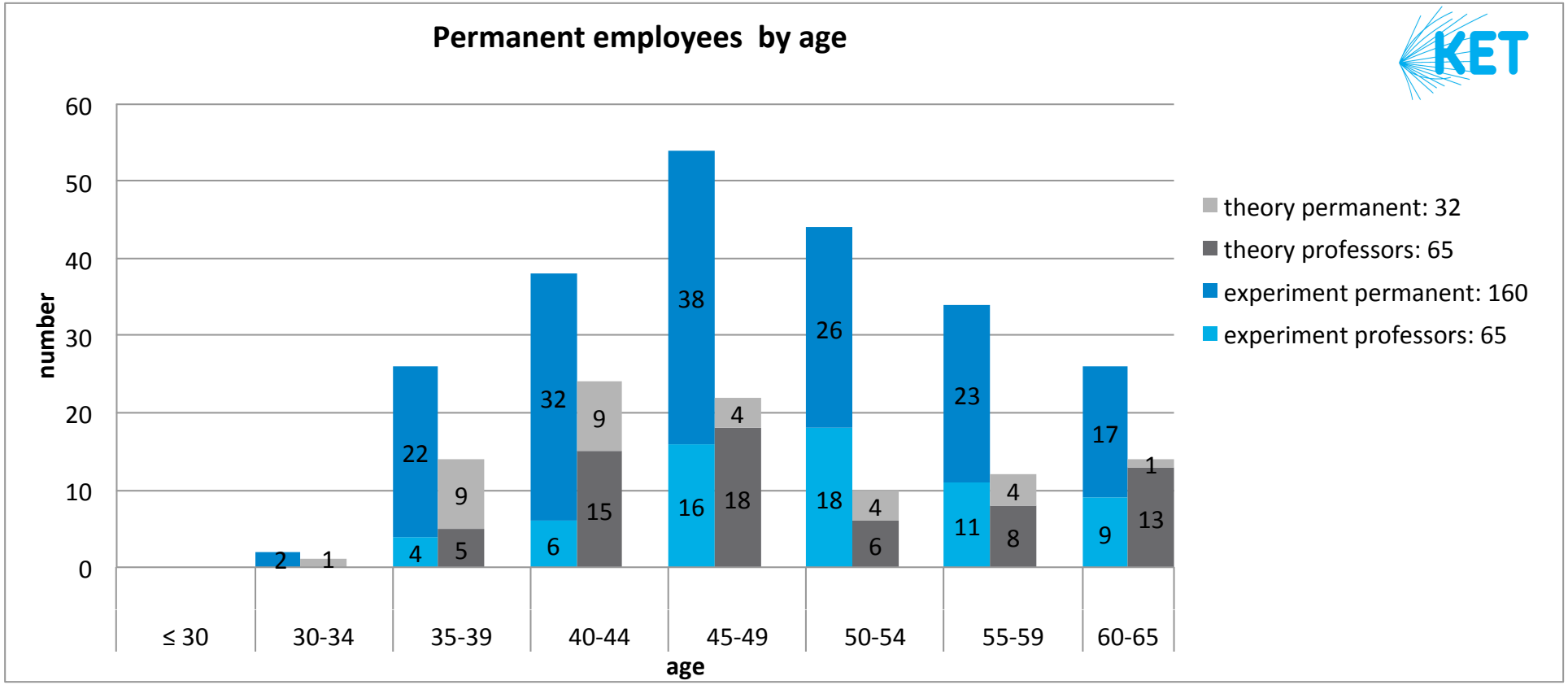
Particle Physics Community



Women in science

- **~ 20 % female students (was 10%)**
- **~ 30% PhD students, Junior-Profs and YIG leaders (increasing)**
- **~ 10% of permanent staff (up to now)**

Particle Physics Community

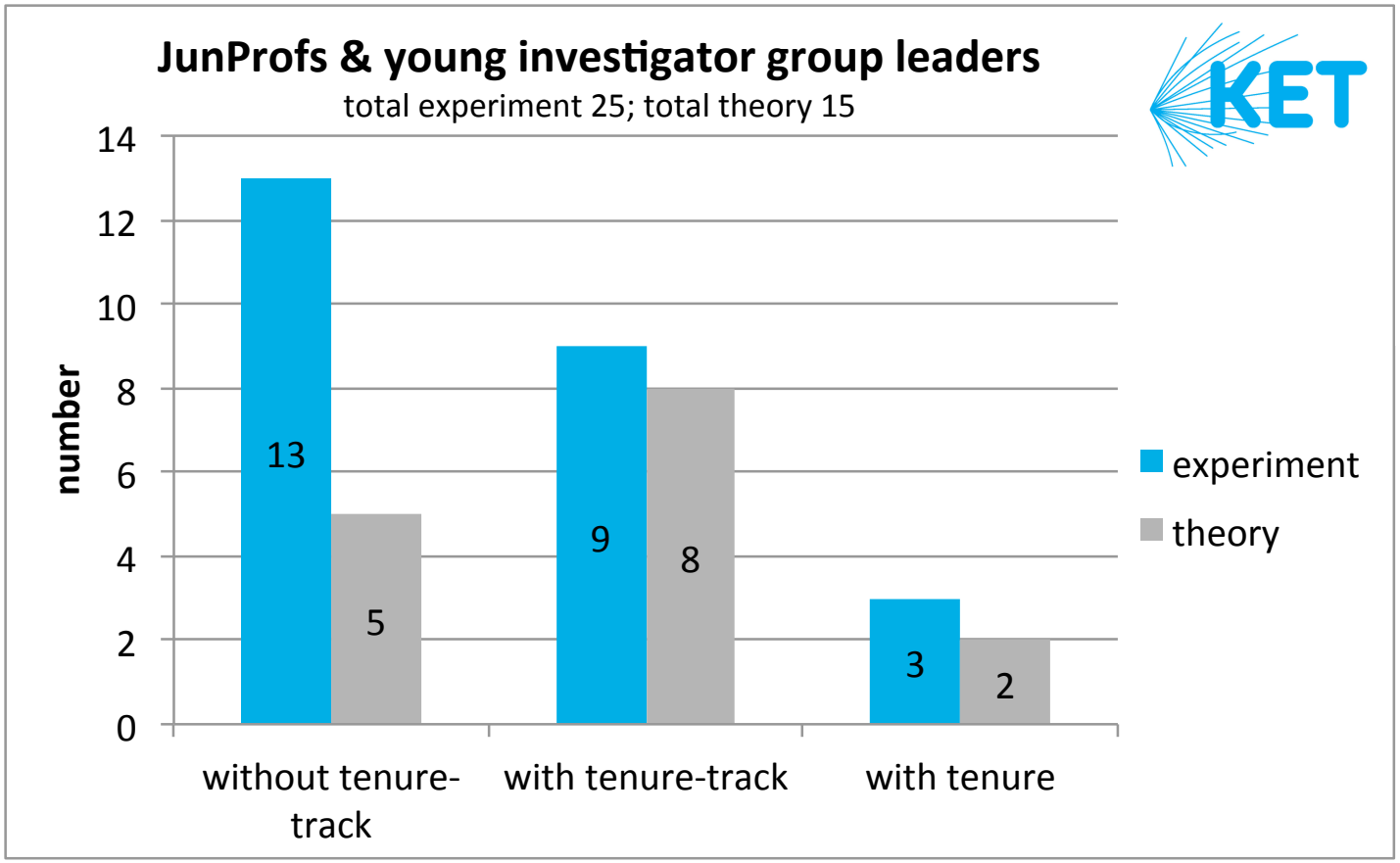


Number of permanent positions is limited

retirements within the next 5 years

- **Experiment: 26**
- **Theory: 14**

Particle Physics Community



- **Tenure track mostly at Helmoltz Institutes**
- **Number of JProfs and YIG leaders is 10 times smaller than number of postdocs**
- **But similar to number of retirements within next 5 years**
- **Typical career path: Phd → 1.Postdoc → 2.Postdoc → JProf/Yig ➔ permanent**
- **1/3 chance to get to the next career step up to JProf/Yig or permanent**

Critical items

LHC experiments ➔ *see talk by K. Desch*

- Phase-II detector upgrades require extra funds
  on top of current BMBF / Helmholtz / MPI funding
- All 4 exp: 97 M€, + inflation + 20 % contingency: 125 M€, + 20 % overhead
- Proposal in 2013 to BMBF to add LHC Phase-II to national Roadmap of large infrastructure ➔ decision process initiated by BMBF with HGF and MPG !
- BMBF/HGF funding periods require decision this year to obtain funds until 2018
- LHC on the Roadmap is essential to obtain matching funds and long term support of research field by Universities.

LHC Computing ➔ *see talk by Ch. Zeitnitz*

- Investment degrading as of 2015 → critical shortage in 2016
- 75% from Helmholtz: depends on successful application
- 25% from Universities: lack of short and long term means of application

Support of new projects

- Allow for limited funds for preparation of new major (LC, FCC?) and outstanding smaller projects.

Support of young scientists

- Harsh selection, few open positions in next 5 years
- Should enforce visibility and individual funding for best young scientists

Summary

Particle physics in Germany

- Highly dynamic field with results of major impact
- Much increased public recognition and fascination for fundamental physics, also due to LHC, Higgs, impact on cosmology

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German contribution

Cornerstone of European particle physics

- Long term vision by all funding agencies
- Importance of close interconnection of Verbundforschung + Helmholtz + MPG
- Excellent integration in international community
- LHC: Excellence in both accelerator and detector contribution
- Major impact on LHC phenomenology, analysis and discovery(ies)
- Major contribution also to Belle-II detector

Critical items

- LHC detector Phase-II upgrade costs → German Roadmap
- LHC Computing at HGF and Universities
- New projects on major and on smaller scales
- Career path of young scientists

Backup

Particle Physics Community