

ECFA Midterm Report Germany

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Particle Physics Institutes

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

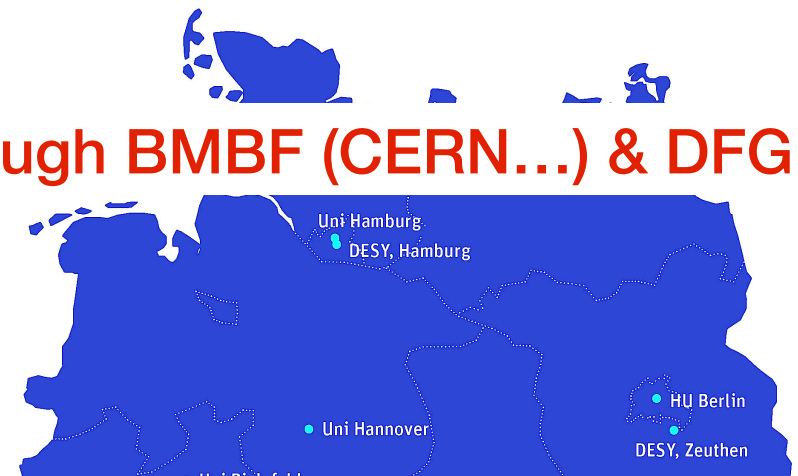


Particle Physics Institutes

Universities

project funding through BMBF (CERN...) & DFG

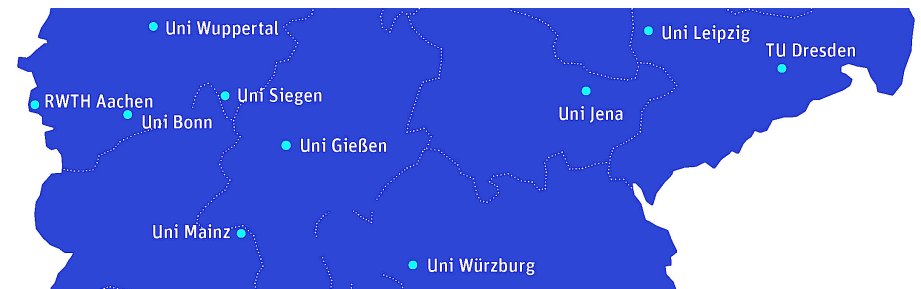
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Helmholtz Centres

institutional funding mostly through BMBF

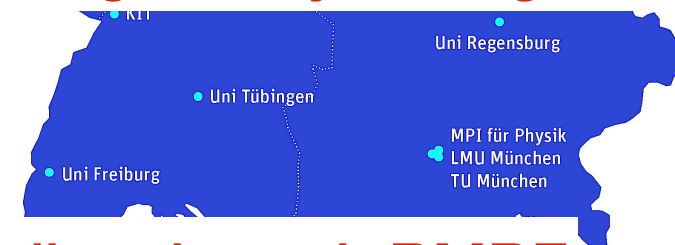
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Max-Planck Society

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CERN

institutional funding through BMBF

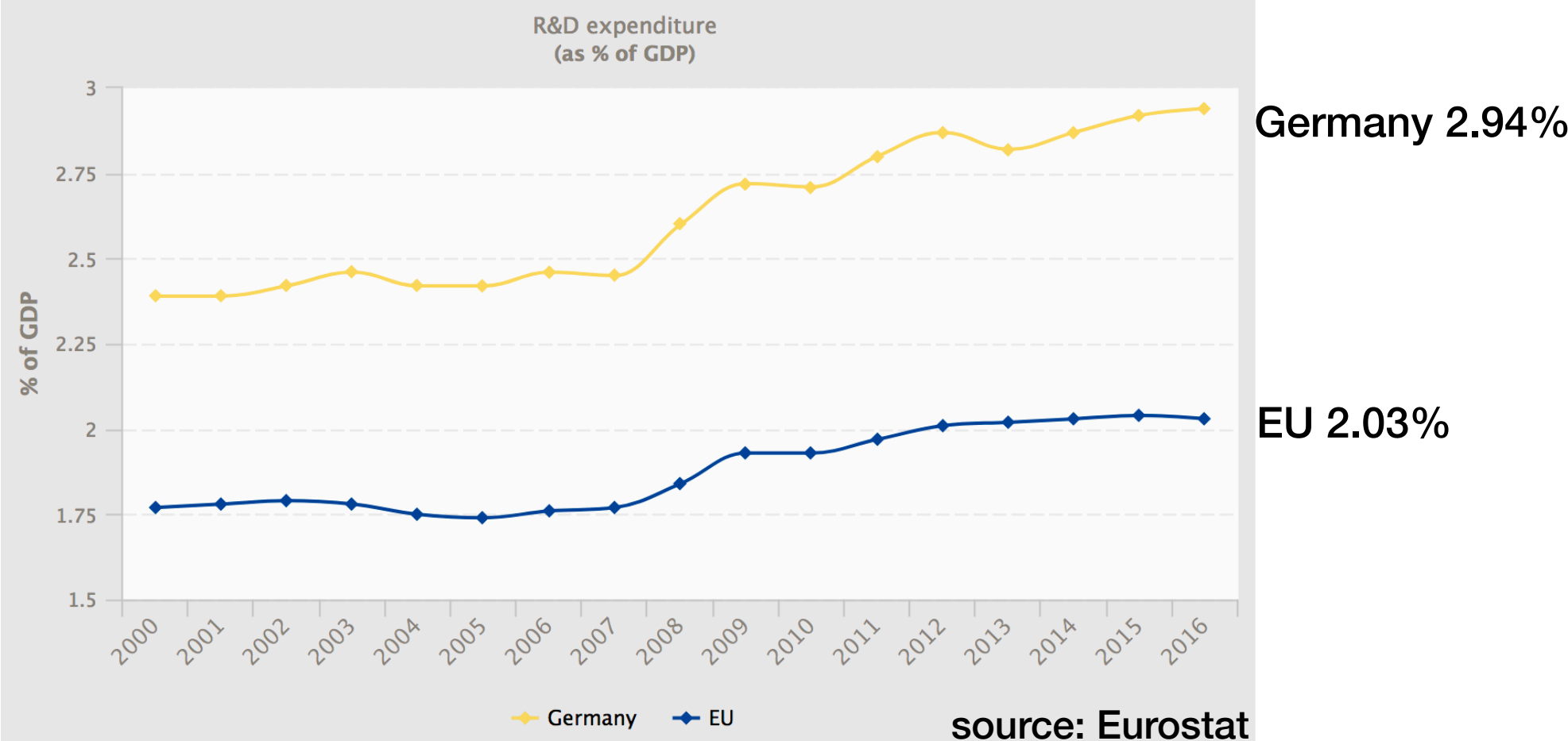
BMBF = Ministry for Science & Education

DFG = German Science Foundation

R&D expenditure

R&D in % of GDP 2016
Germany 2.94%
EU 2.03%

higher education only
Germany 0.54%
EU 0.47%



Project funding by BMBF

accelerator based particle physics 246 Mio € / year

- contribution to CERN budget (~21%) 217.0 Mio € / 2017
- project funding for university groups ~ 21.2 Mio € / year
- Genter program for technical students ~ 2.0 Mio € / year
- ATLAS/CMS upgrade R&D ~ 5.6 Mio € / year (2015 to 2018)

→ ATLAS/CMS upgrade: 90 Mio € (extra resources, budgeted, includes R&D)

FAIR

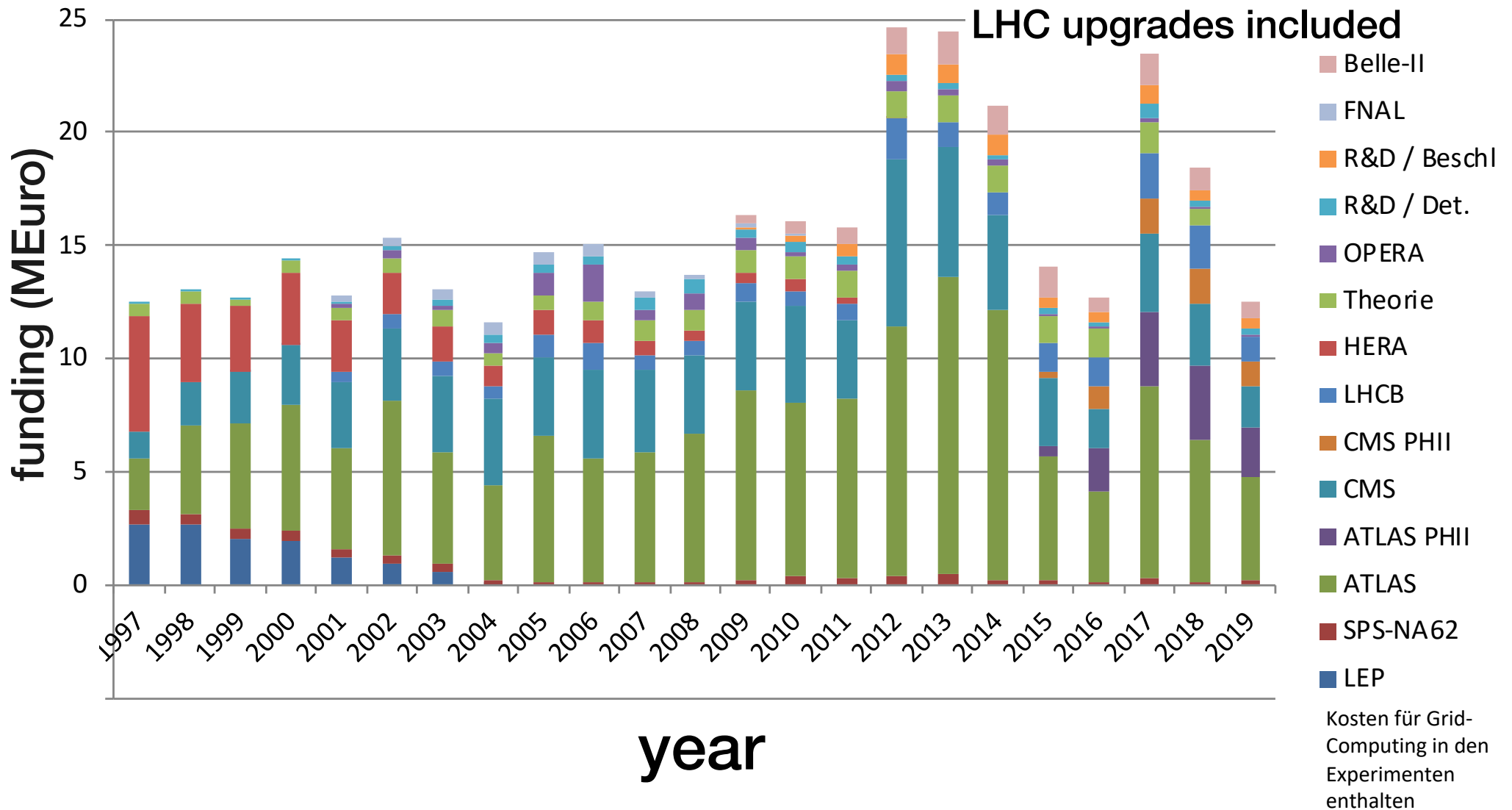
- construction costs: 1357 Mio €, contribution from Germany: 950 Mio €
- experiments core: 200 Mio €, contribution from Germany: 20.4 Mio €
(numbers without inflation since 2005)
- project funding for university groups : 7.8 Mio € / year

+ Helmholtz + Max-Planck

+ DFG/EU funds for individuals, research training, collaborative research centers

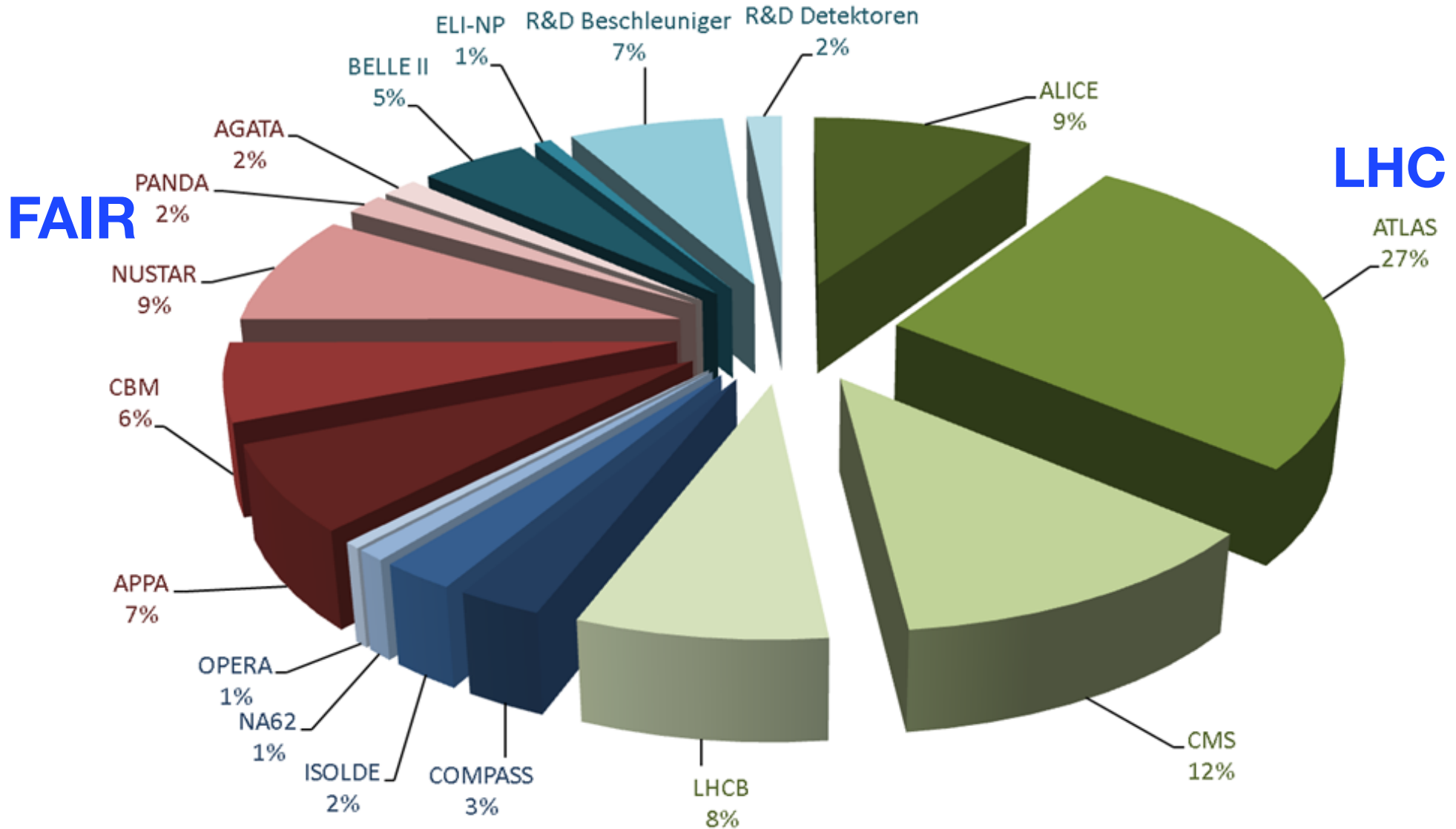
Funding particle physics (BMBF, only universities)

HEP: VBF + FIS, Förderung 1997-2018 inkl. PP, Stand Juni 2015



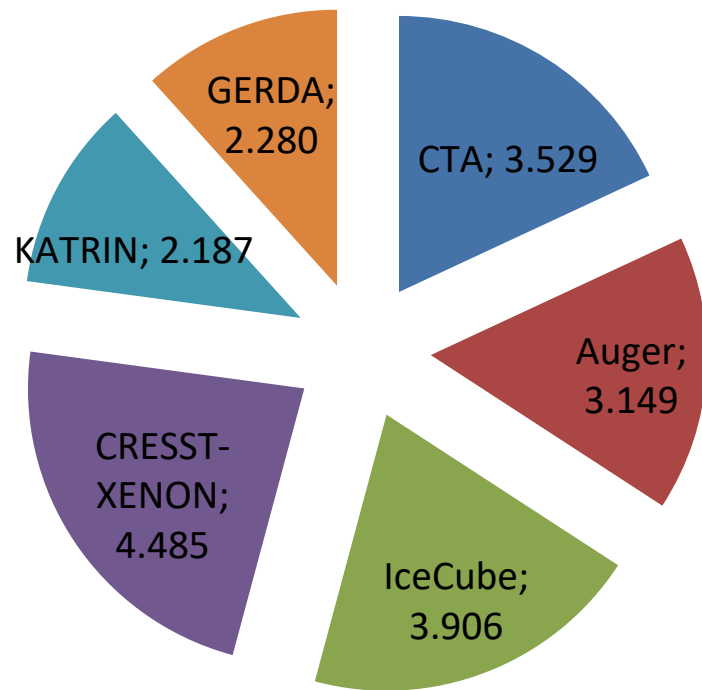
Federal Government: Physics of smallest particles

102 Mill Euro (3 years, 2015-18)

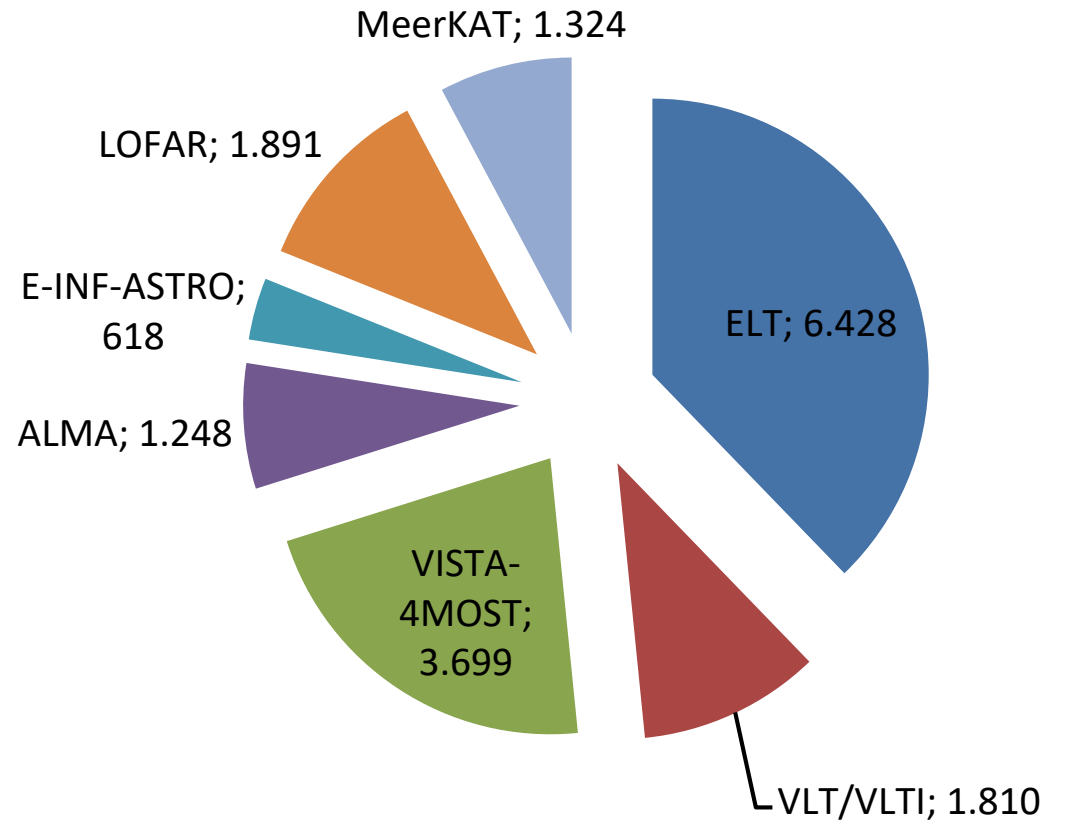


Astro & Astroparticle physics (BMBF funding)

Astroparticle physics
19.5 MEuro (3 years)



Astrophysics (ground-based)
17 MEuro (3 years)












Detector R&D and construction

BELLE II: DEPFET tracker

ALICE: TPC

LHCb: Fiber Tracker

examples

	ATLAS	phase II	CMS	phase II
Pixel Detector	New BN, DO, GÖ, HD, MPI, SI, W		New	 HH
Tracker	New, all silicon High granularity timing detector MZ, GI 	 B, DESY, DO, FR	New, all silicon	 AC, DESY, KA
Calorimeters	Replace Electronics DD, MPI 		Replace End-Caps Replace Electronics	
Muon System	Replace electronics FR, MZ, M, MPI, WÜ 		Extend End-Caps Replace Electronics	 AC
Trigger	Upgrade HD, MZ 		Upgrade	

Strategy for particle physics in Germany

Workshops in preparation for European Strategy Process

- May 2016: e+e- Colliders
- Feb 2017: Neutrino physics
- April 2017: Non-collider particle physics
- Dec 2017: Hadron colliders
- **May 2018: Summary Workshop**

Community driven:
KET-KAT-KHUK-KFB



Workshop results as input for the European Strategy Process Strategy

Colliders

- Continuation of strong participation in LHC and HL-LHC experiments
- Construction of an e+e- collider with highest priority, extendable to at least 500 GeV, support for ILC in Japan with initially 250 GeV
- R&D towards future hadron collider
- Flavour physics as part of future hadron collider program

Dark matter

- Direct detection experiments → Darwin
- Axion-like-particle experiments → IAXO, MADMAX at DESY
- Beam dump experiments → SHiP
- Precision experiments → EDM, Mu3e at PSI

Neutrino physics

- Neutrino Experiments → Katrin at KIT
- Neutrino long baseline LBNF/DUNE
- $0\nu\beta\beta$ → Legend
- ...

to be finalized in November