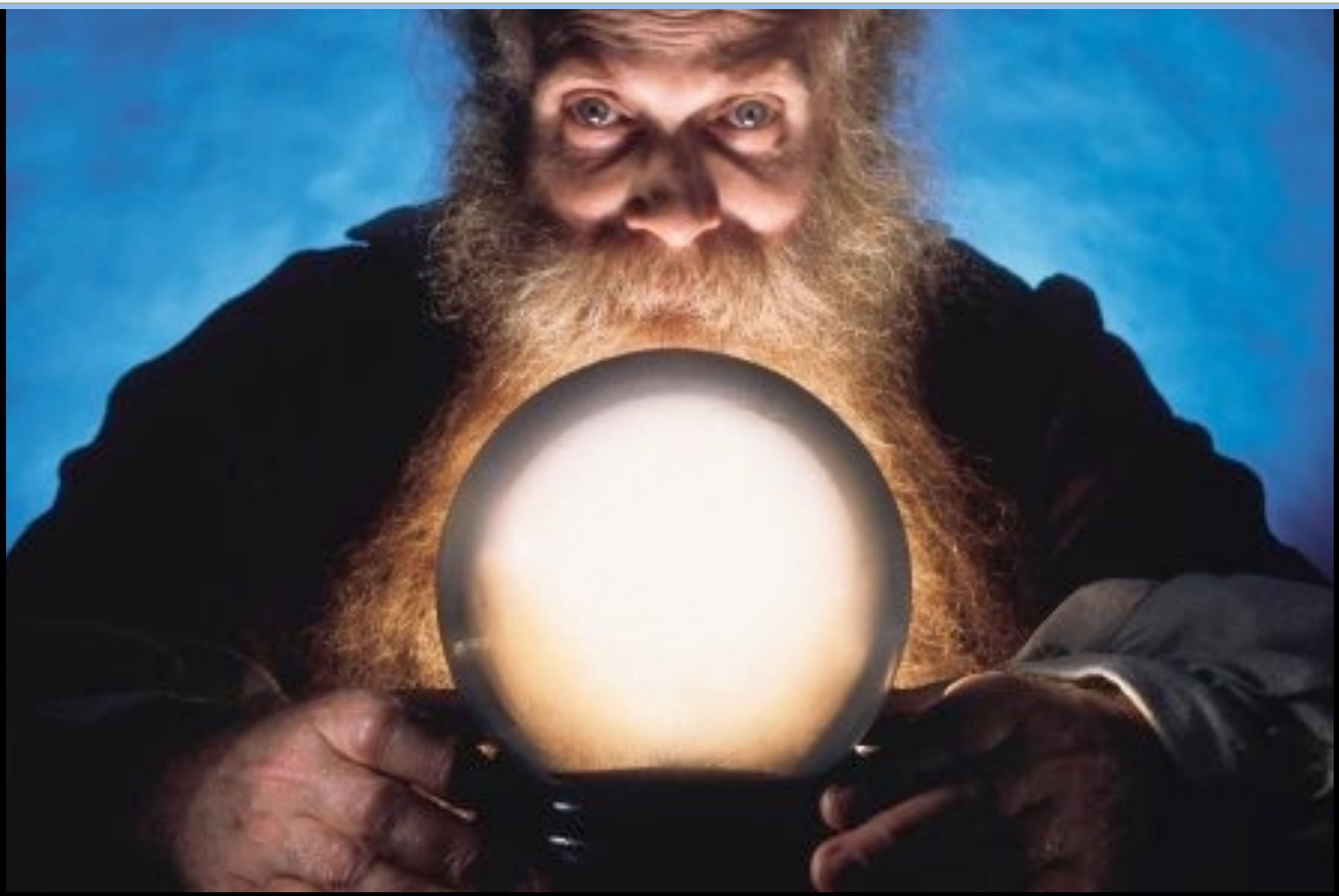
The Future - Helmholtz, MUTLink etc. *BLUEMER, Johannes*

Main auditorium, DESY Hamburg 10:20 - 10:40

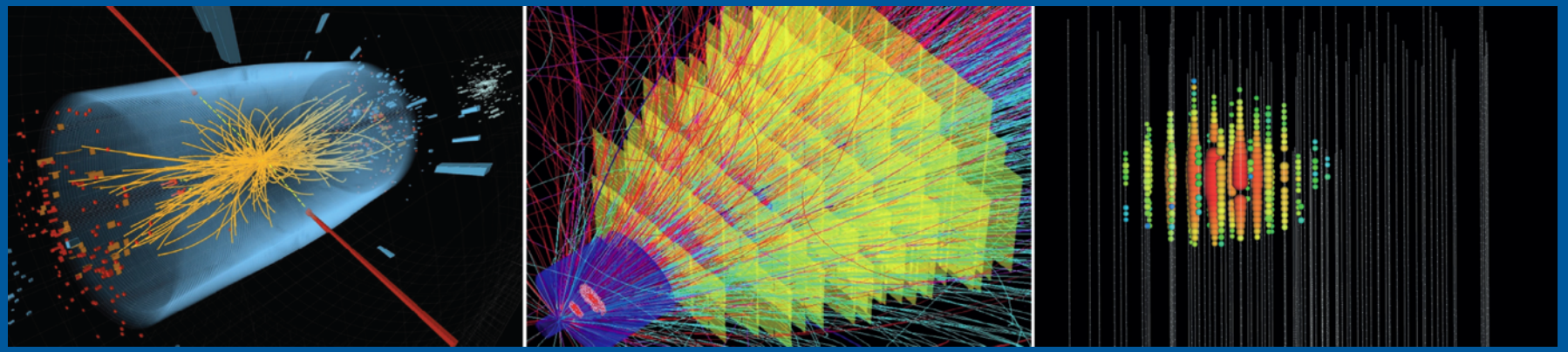
The Future - Helmholtz, MUTLink etc. *BLUEMER, Johannes*

Main auditorium, DESY Hamburg 10:20 - 10:40



Matter and the Universe

Programme Overview
The Alliances
MUTLink



Johannes Blümer – KIT

HELMHOLTZ ASSOCIATION

Research Field MATTER

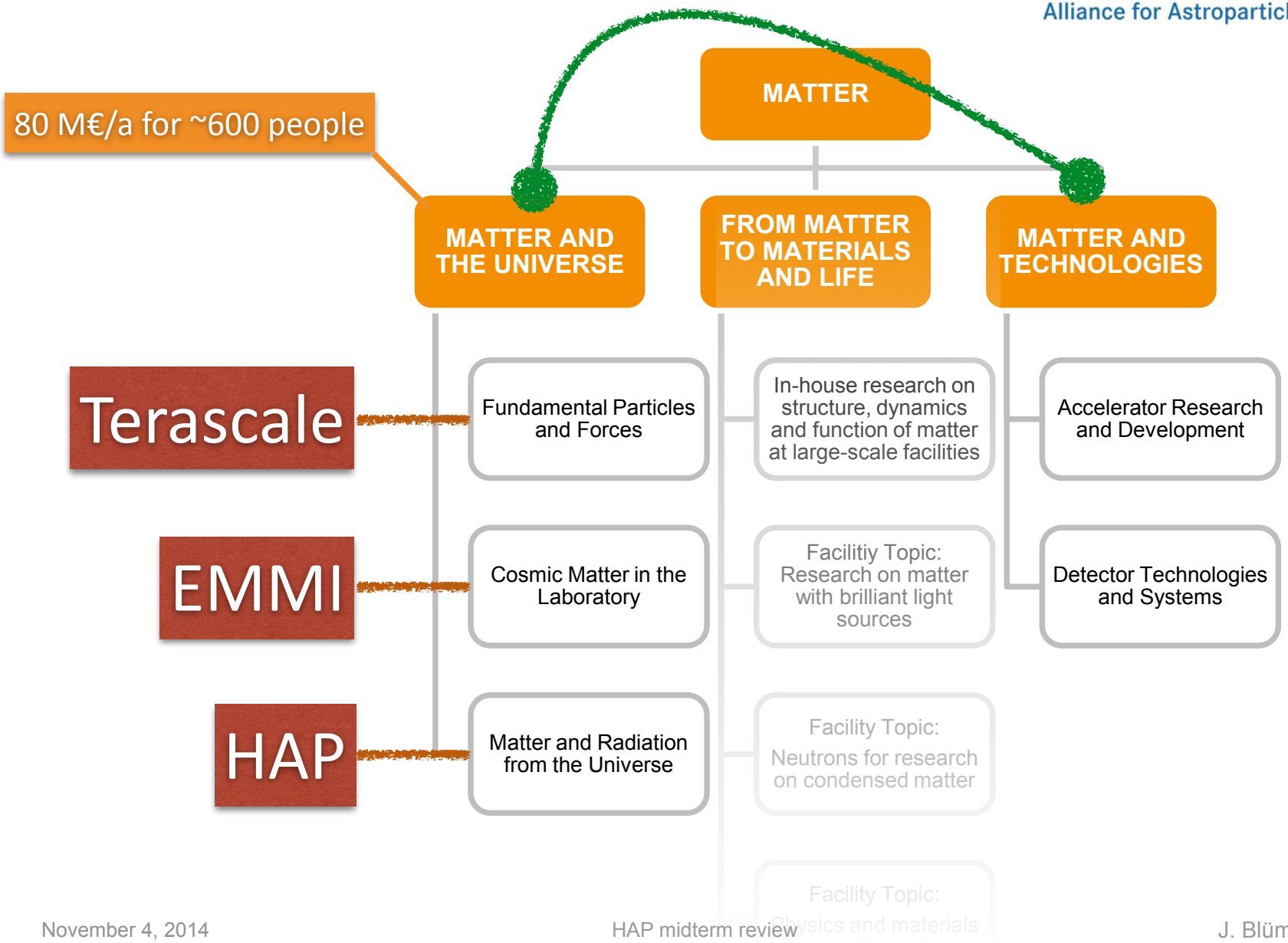
HELMHOLTZ ASSOCIATION
Alliance for Astroparticle Physics

Structure of Matter	**Matter 2015 – 2019**
P1 Elementary Particle Physics	P1 Matter and the Universe
P2 Hadrons and Nuclei	*Fundamental Particles and Forces*
P3 Astroparticle Physics	*Cosmic Matter in the Laboratory*
	Matter and Radiation from the Universe
P4 Photons, Ions, Neutrons	P2 From Matter to Materials and Life
	P3 Matter and Technology
Portfolio Accelerators	*Accelerators*
Portfolio Detectors	*Detectors*

Research Field MATTER

HELMHOLTZ ASSOCIATION

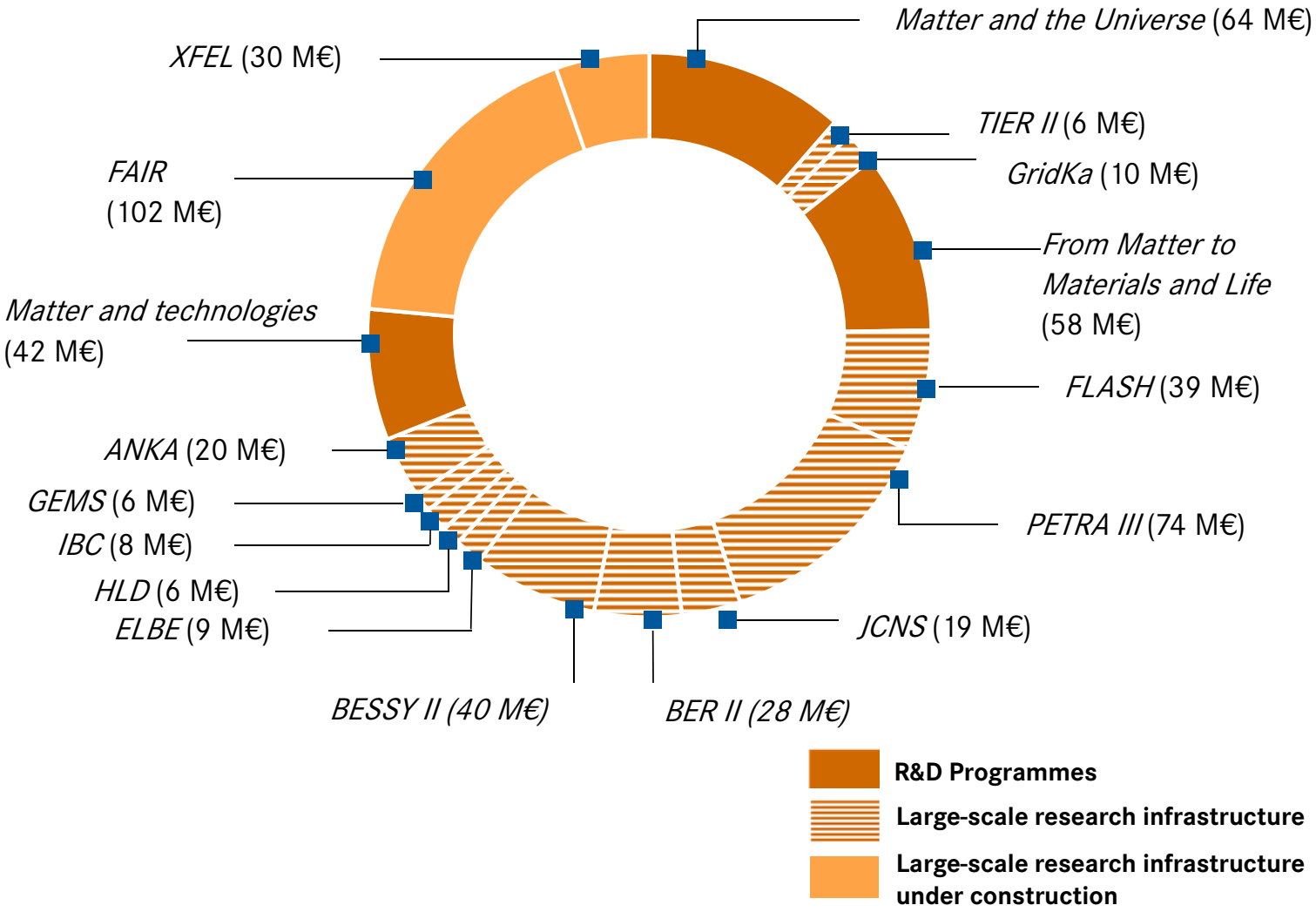
Alliance for Astroparticle Physics



Budget of the Research Field Matter

Distributions of costs in 2015 (starting values): 561 M€ total costs per year, thereof

- **164 M€ in R&D programmes (LK I)**
- **132 M€ large-scale research infrastructure under construction and**
- **265 M€ large-scale research infrastructure (LK II)**

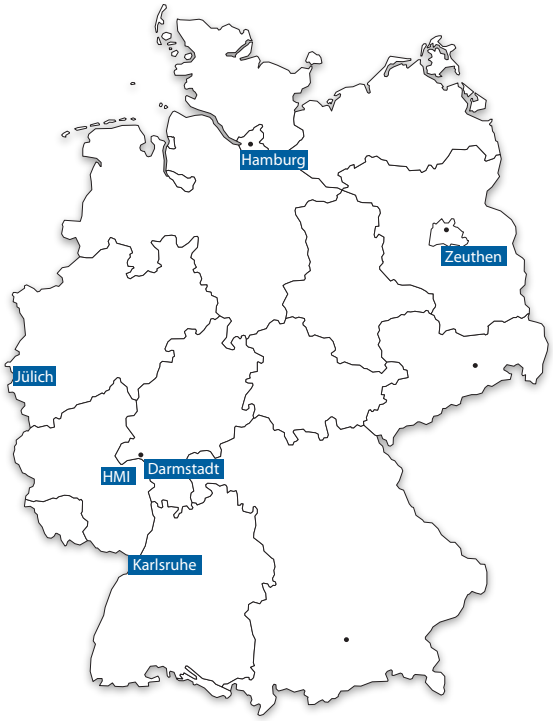


Matter and the Universe

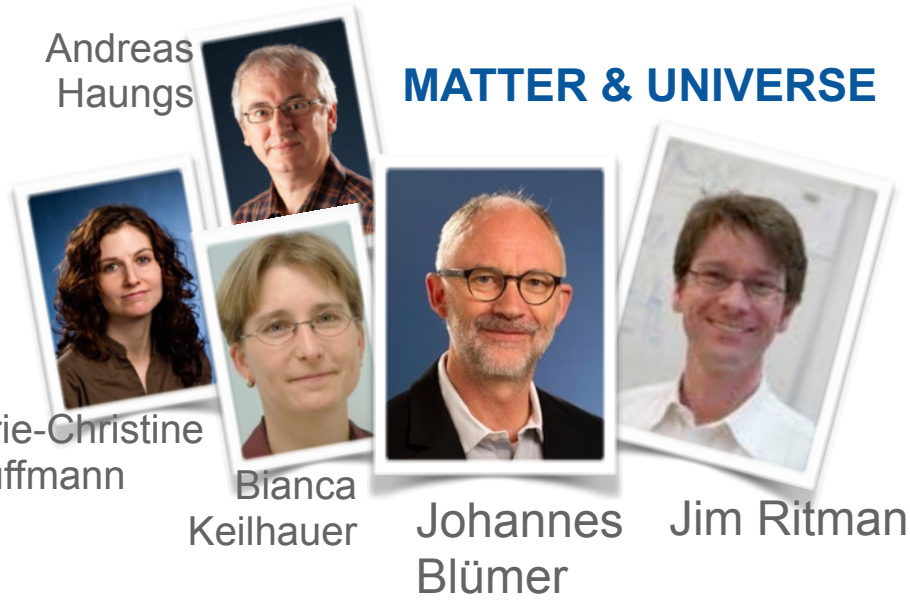
HELMHOLTZ ASSOCIATION

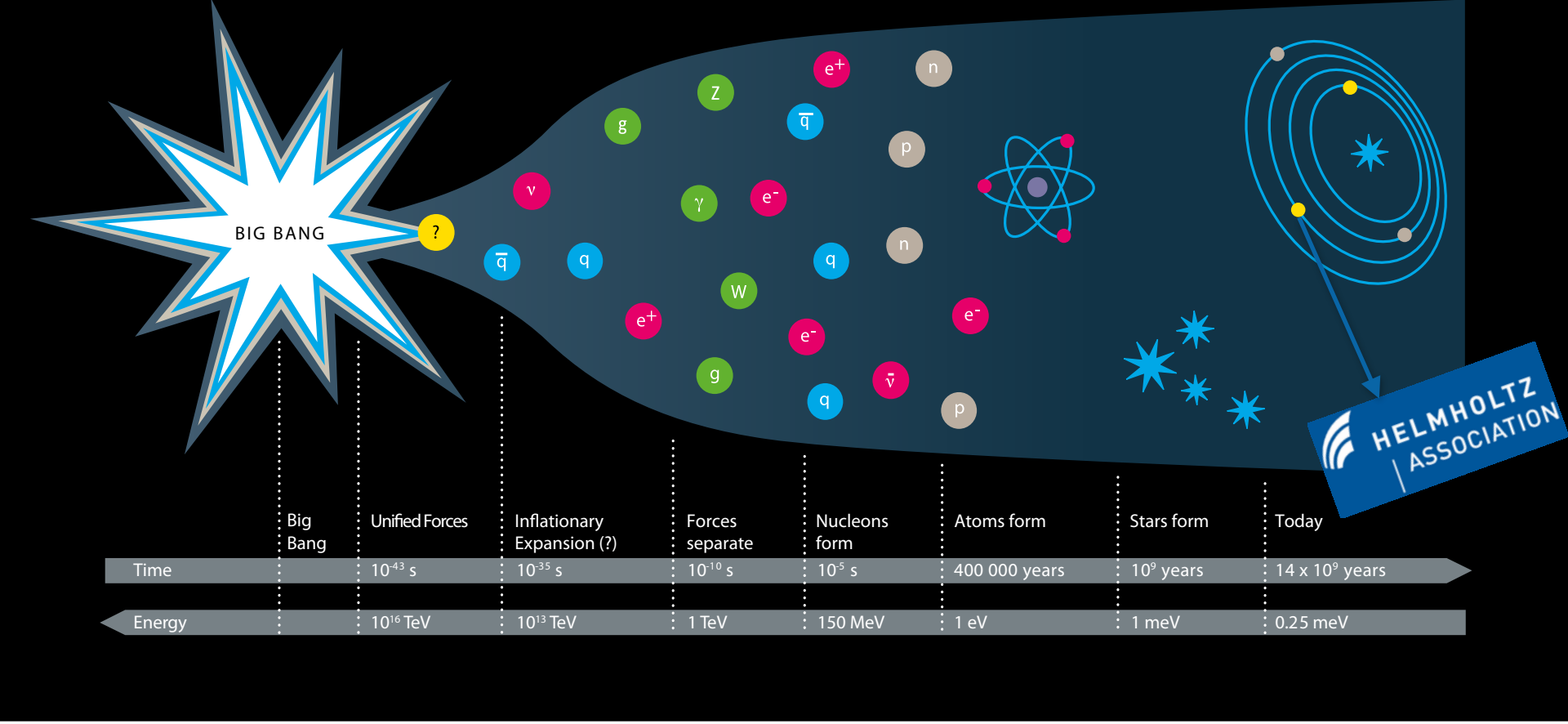
Alliance for Astroparticle Physics

M€/a	DESY	FZJ	GSI	KIT	sum
MU	**37**	**5**	**7**	**16**	**64**
GridKa				**10**	**10**
Tier2	**6**				**6**
					80
FAIR		*15*	*87*		*102*
FTE	218	17	49	116	400
Scientists FTE	152	12	25	53	242
Support FTE	31	3	11	57	102
PhD stud heads	69	4	25	12	110
MU headcount					557.2



The core team





Connect quarks and leptons with the cosmos

all in a single research programme

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Science questions

+ What is the origin of mass?

What is the dark matter?

What is the nature of the dark energy?

How did the universe begin?

Did Einstein have the last word on gravity?

What are the masses of the neutrinos, and how have they shaped the evolution of the universe?

How do cosmic accelerators work and what are they accelerating?

Are protons unstable?

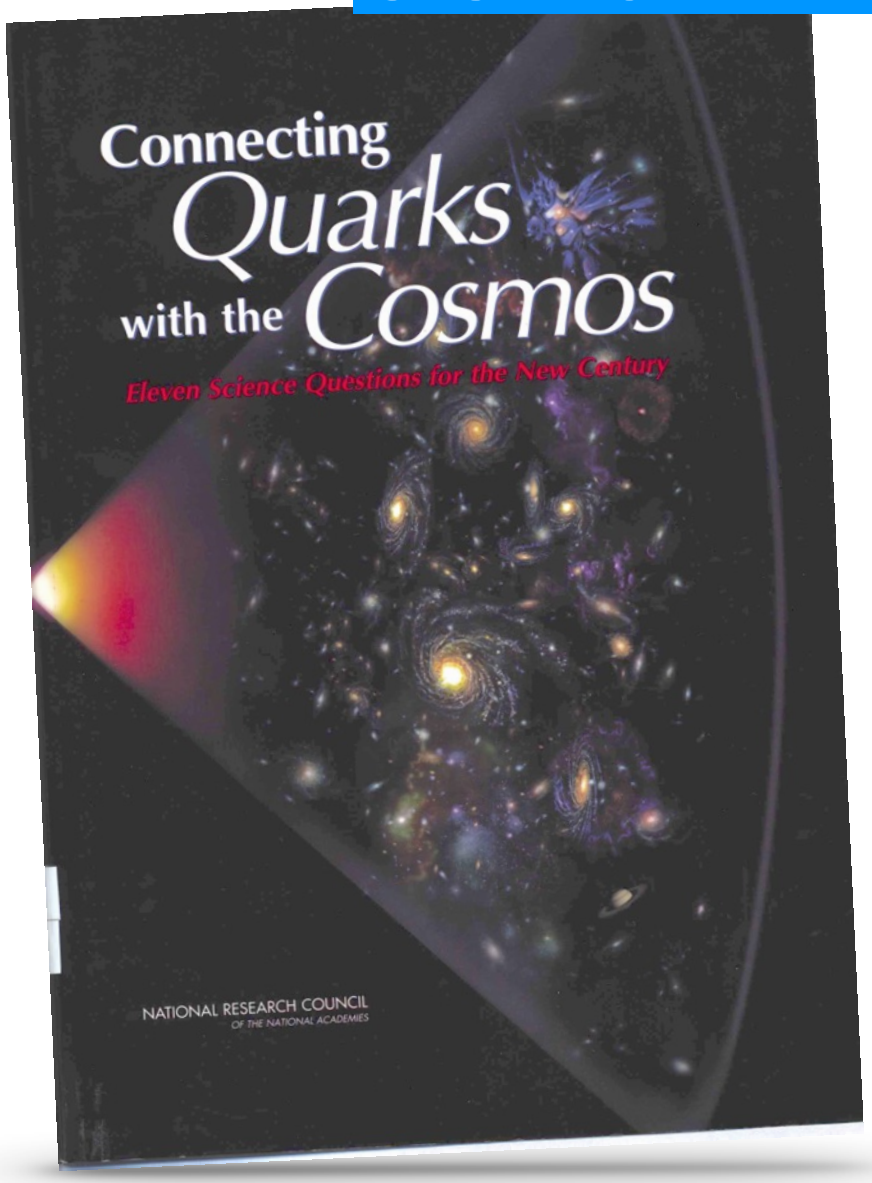
Are there new states of matter at exceedingly high density and temperature?

Are there additional spacetime dimensions?

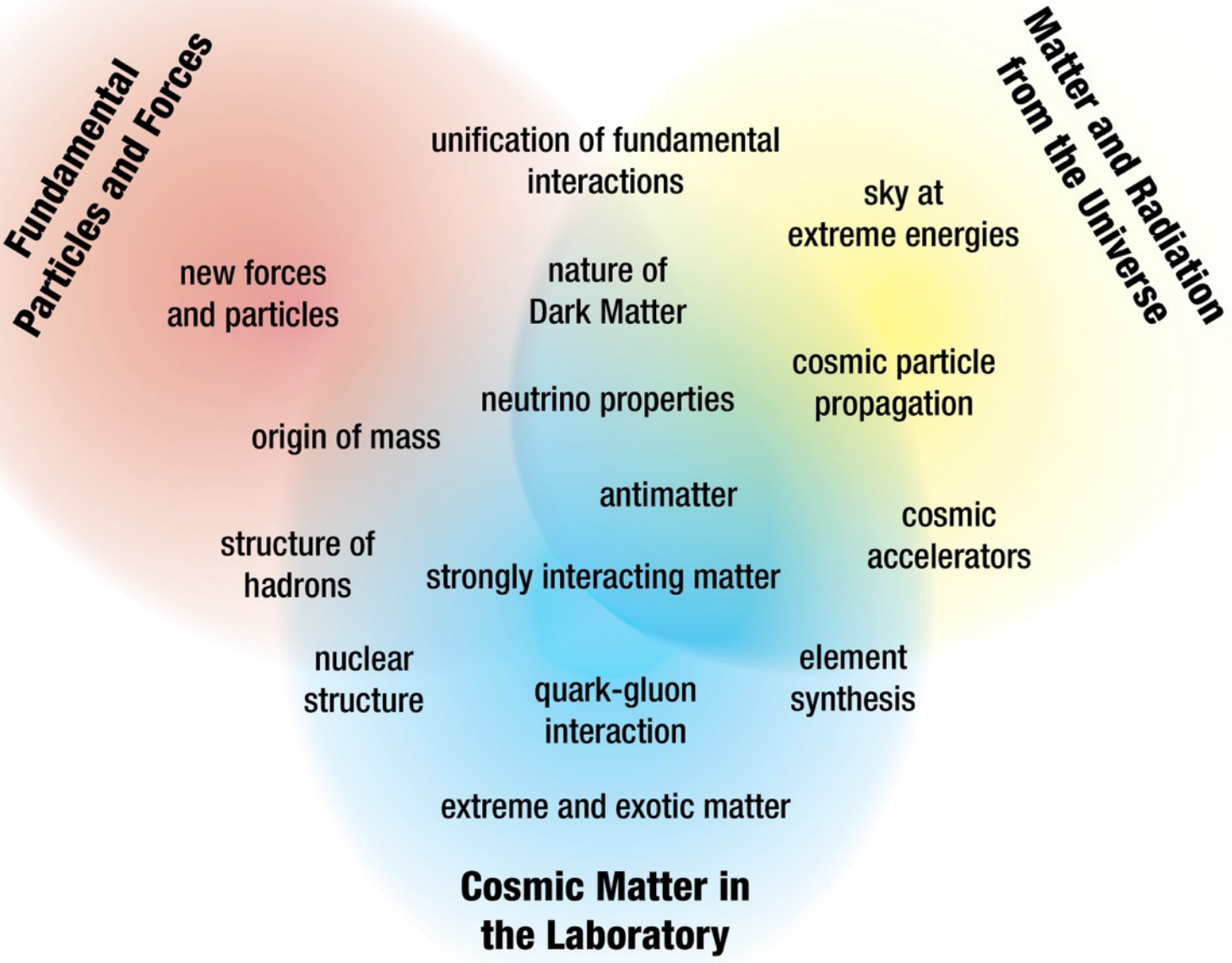
How were the elements from iron to uranium made?

Is a new theory of matter and light needed at the highest energies?

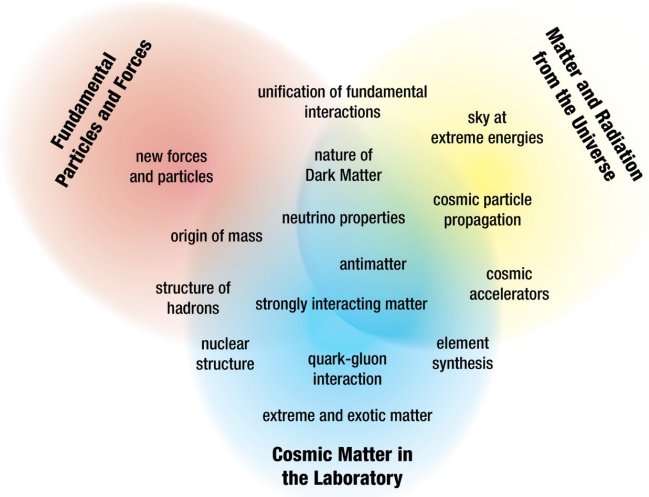
+ How can the knowledge and technological progress provided by nuclear physics best be used to benefit society?



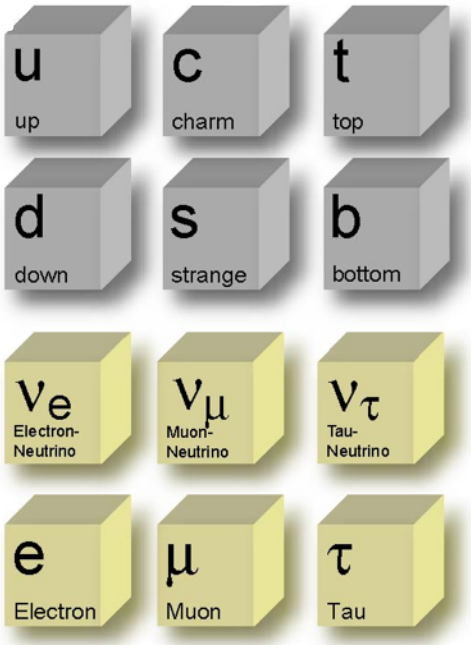
One programme | three topics

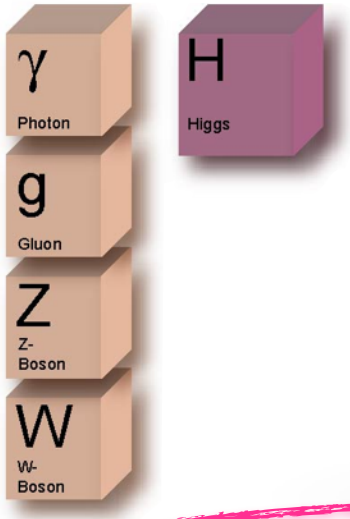


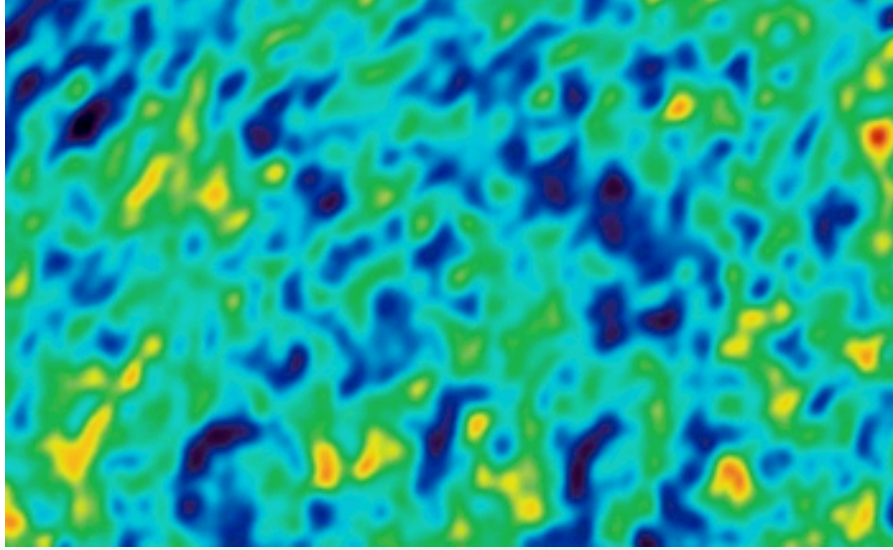
One programme | three topics



- Unification of fundamental interactions: *Schomerus (DESY), Klinkhamer (KIT)*;
- Nature of Dark Matter: *Buchmüller (DESY), Eitel (KIT)*;
- Neutrino properties: *Steidl (KIT), Winter (DESY), Martinez-Pinedo (GSI)*;
- Antimatter: *Niebuhr (DESY), Nierste (KIT), Ströher (FZJ), Walz (HIM)*;
- Origin of mass: *Weiglein (DESY), Zeppenfeld (KIT), Wittig (HIM)*;
- Strongly interacting matter: *Diehl (DESY), Ritman (FZJ), Braun-Munzinger (GSI), Engel (KIT), Vanderhaeghen (HIM)*;





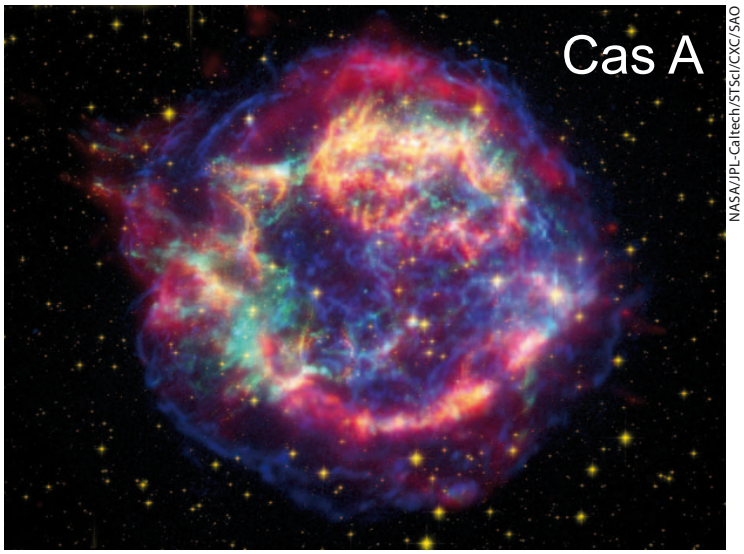


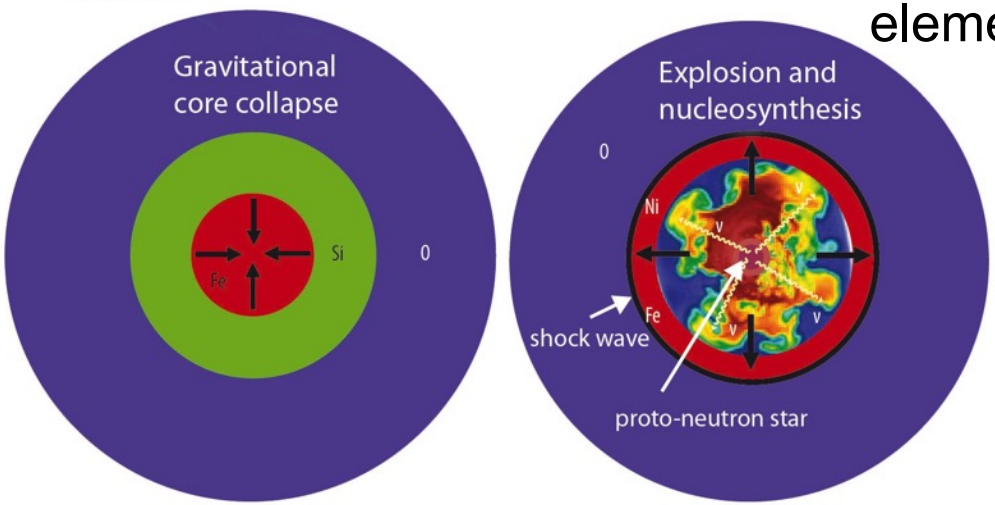
Universe structure

Theory of mass?

neutrino properties

Supernova and elements



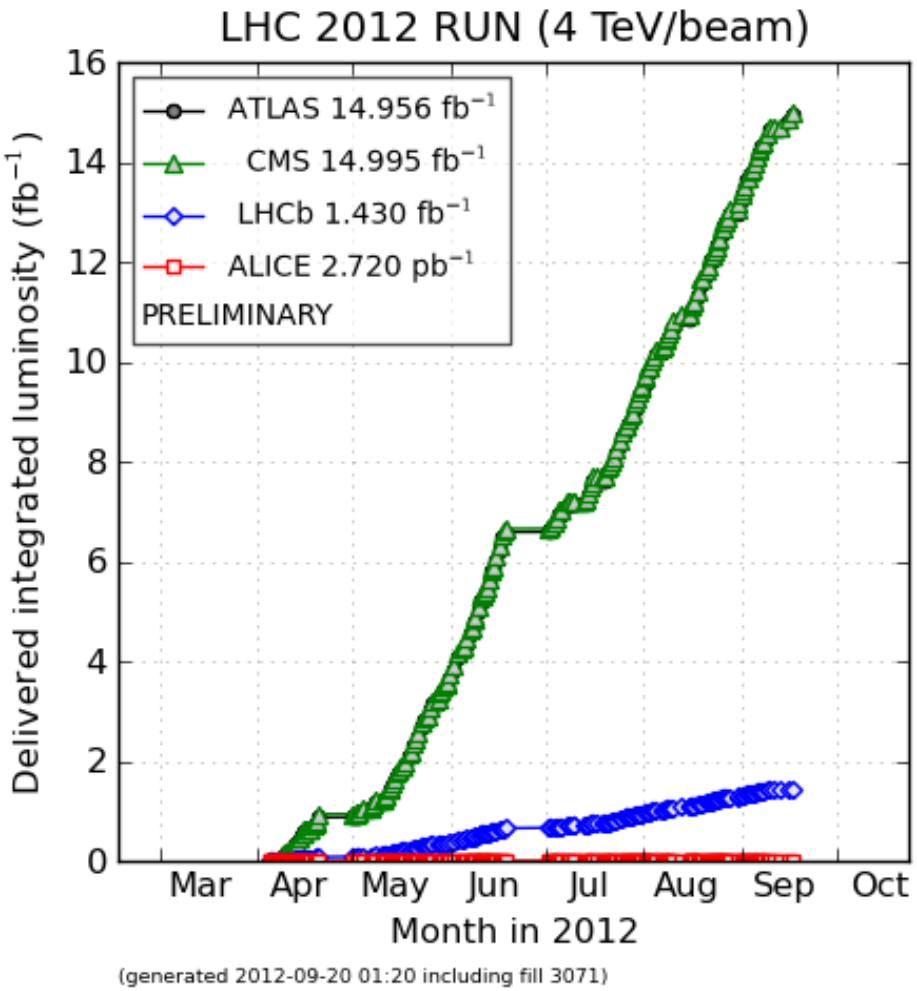


[Gabriel Martinez-Pinedo, Karlheinz Langanke, PhysikJournal Feb14]

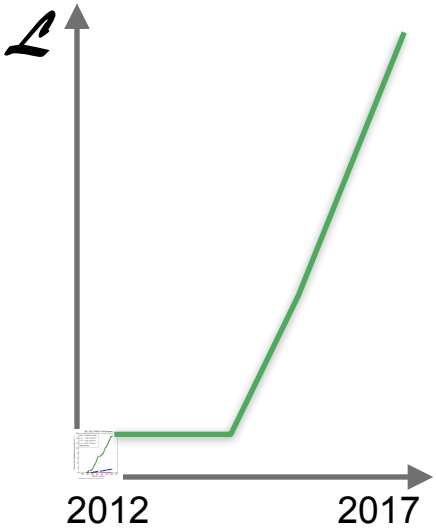
Infrastructures

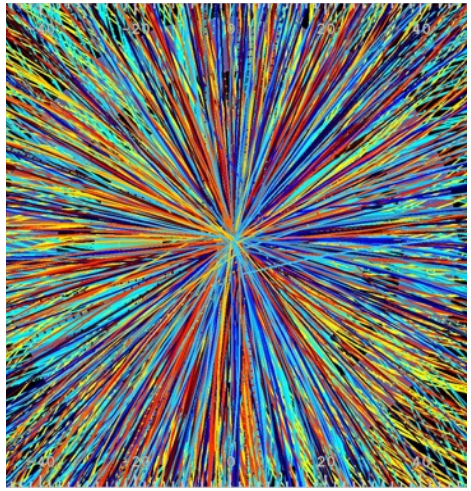
Category	Topic 1	Topic 2	Topic 3
Accelerators	LHC, SuperKEKB, DESY test-beams	COSY,UNILAC, SIS18, MAMI-C test-beam, TRIGA	
under construction		*FAIR (HESR)*	
planned	*ILC*	*CW-LINAC, EDM*	
Detectors, observatories	ATLAS, CMS, Belle II	ALICE, HADES	Auger, IceCube, H.E.S.S., KATRIN, EDELWEISS
under construction		*CBM, NUSTAR, PANDA*	
planned	*ATLAS, CMS upgrades*	*ALICE upgrade*	*Auger2023, PINGU, CTA, EURECA*
IT infrastructures	GridKa, DESY Tier2/NAF	GSI Compute Cluster (incl. ALICE Tier-2), JSC	KCDC
planned	*upgrade*	*FAIR Compute Cluster, Tier-2 upgrade*	

Infrastructures T1



Infrastructures T1





LHC improvements

ALICE
ATLAS
CMS
upgrade!

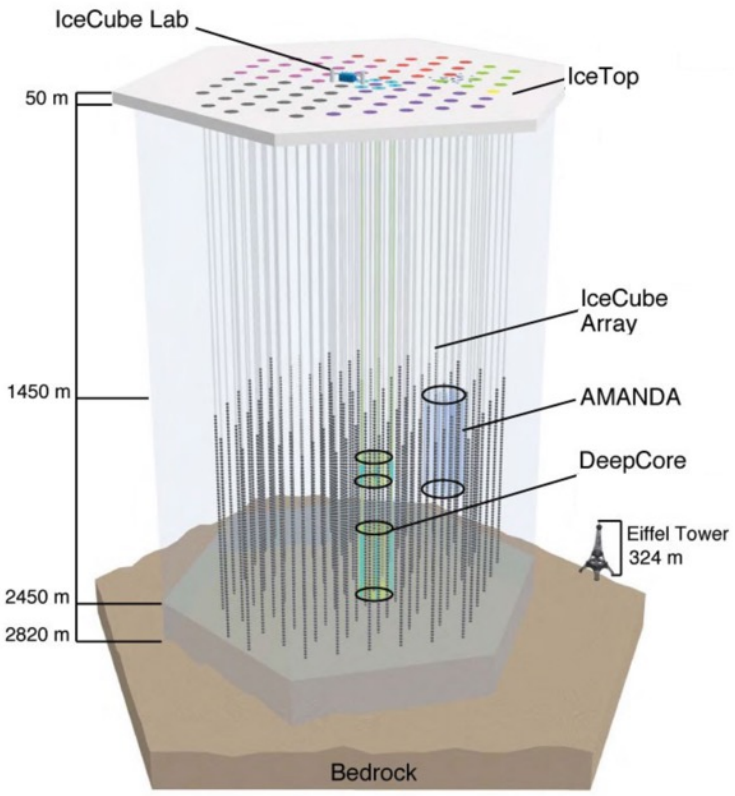
GridKa, Tier2s

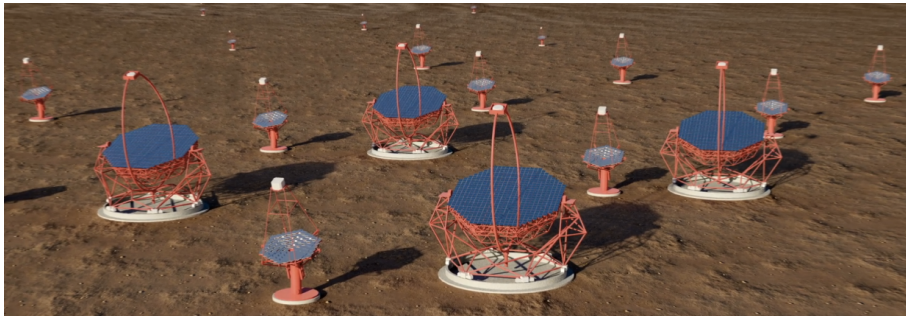
upgrade!

Infrastructures T2

from hadron physics to FAIR preparations and a novel EDM measurement

Infrastructures T3





➟ Auger, IceCube upgrades

➟ CTA construction

Infrastructures need investments

medium investments 2.5 - 15 M€: Centres!

Detector Assembly Facility	DESY	5.5	
CTA Construction	DESY	6	
EDM Precursor Experiment	FZJ	3	rounded to M€
Auger2023	KIT	3	
EURECA	KIT	3	

large investments >15 M€: Helmholtz!

LHC Detector upgrades	DESY-GSI-KIT	28	} 48 in one package
Computing & Data Infrastructures	KIT-DESY-GSI	20	

Milestones and timelines

Table 3.1: The most significant milestones of the programme *Matter and the Universe*

Date	Topic	Milestone
2015	T1	Successful startup of the LHC at increased c.m. energies of 13–14 TeV
	T2	Spin coherence time studies for EDM completed by JEDI at COSY
	T3	Start of CTA construction
	T3	Start of upgrade of Auger surface array
2016	T1	Start of the Belle II physics programme with vertex detector installed
	T2	Precision measurement of the proton magnetic moment
	T3	IceCube data reaches three times its current volume of events
	T3	10,000 kg-days exposure in WIMP search with EDELWEISS
	T3	Start of regular KATRIN data taking with kg-scale tritium throughput
2017	T2	Concept for EDM precursor measurement at COSY finalized
	T2	Floating power-supply and min.-invasive beam diagnostics for HESR
	T2	Finish construction of PANDA/FAIR detector contributions by HIM
	T3	Begin of operation of upgraded Auger surface array
	T3	Commissioning of the 1^{st} phase of the next-gen. cryogenic DM search
2018	T1	Collection of 100 fb^{-1} of data at the LHC before LS2
	T2	EDM systematic error studies for COSY completed
	T2	Design report for dedicated precision EDM storage ring ready
	T2	PANDA detector parts installed and pre-calibrated at FAIR
	T3	LoI for future multi-km^3 IceCube extension submitted
2019	T1	Collection of 10 ab^{-1} with Belle II at SuperKEKB
	T2	First direct (p,d) EDM measurements conducted at COSY
	T2	Start data taking at FAIR
	T3	CTA reaches design performance
	T3	KATRIN publishes high sensitivity neutrino mass result

A healthy mix of planning, development, construction, physics harvest at any given time

Milestones and timelines

Table 3.1: The most significant milestones of the progra

Date	Topic	Milestone
2015	T1	Successful startup of the LHC at increas
	T2	Spin coherence time studies for EDM co
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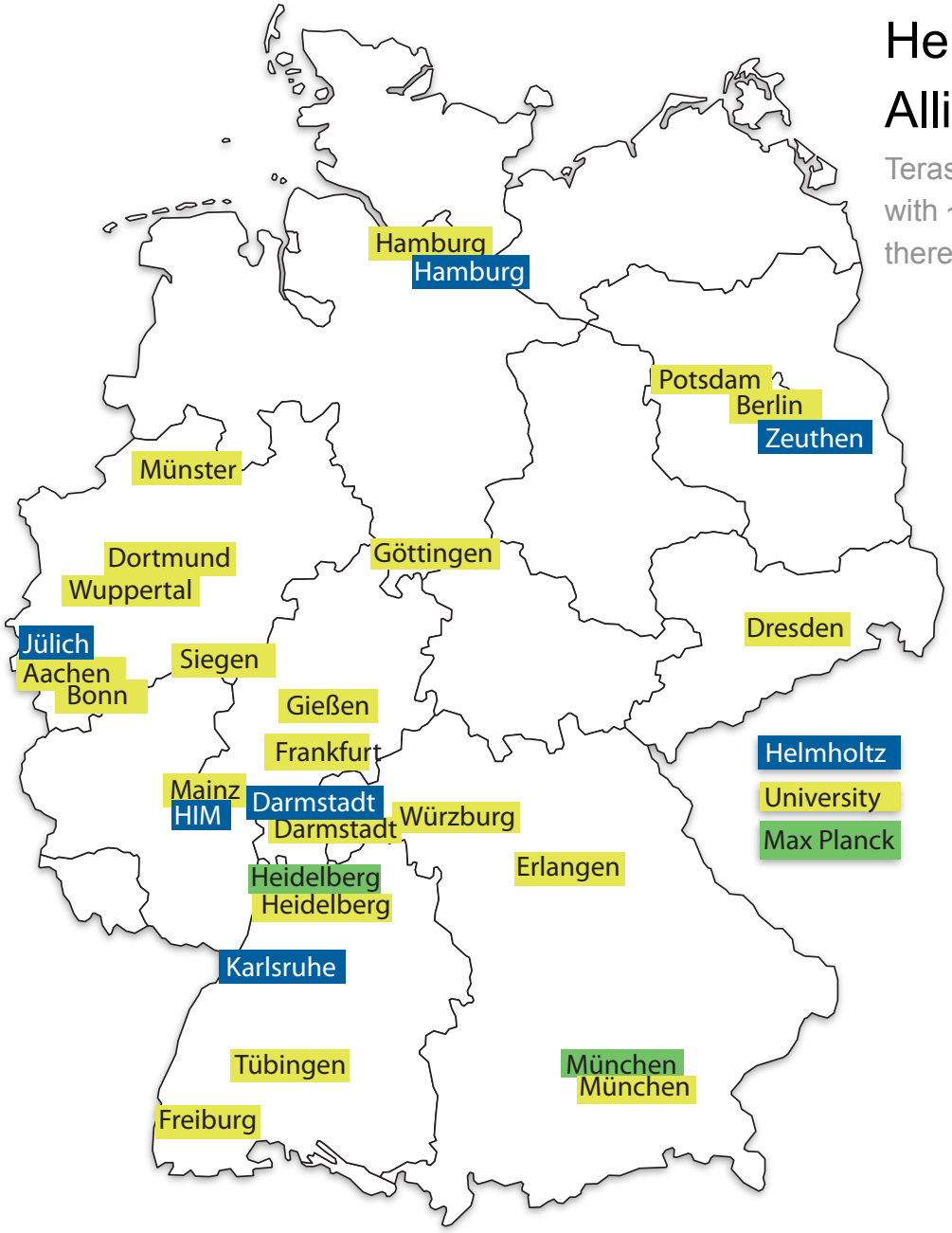
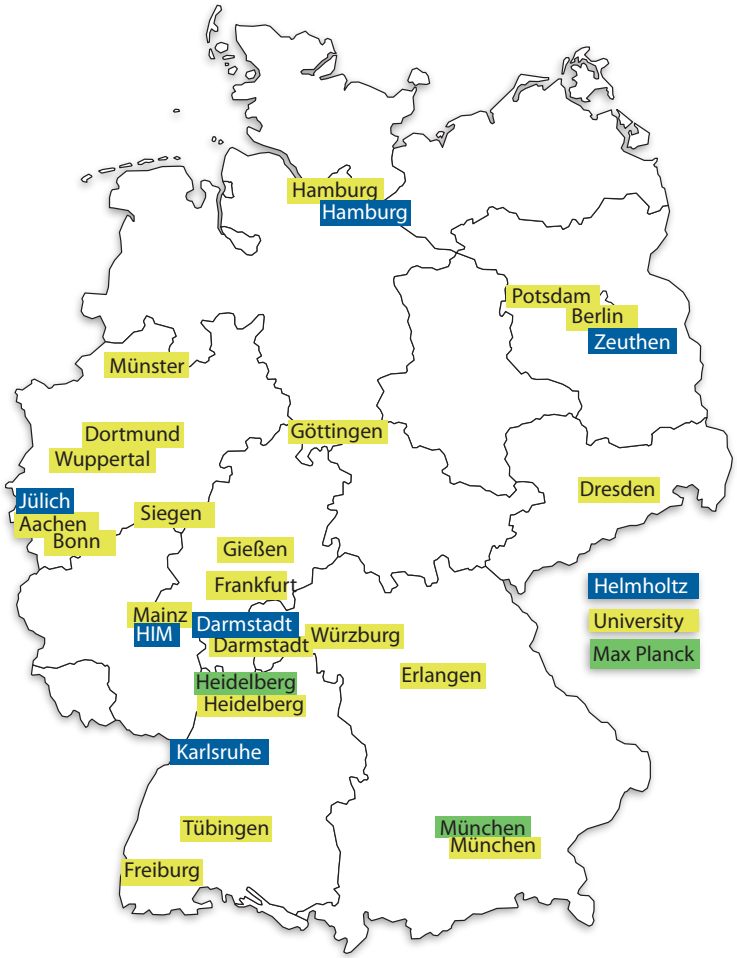
2017	T2	Concept for EDM precursor measuremen



Helmholtz Alliances

Terascale | EMMI | HAP
with ~1500 members,
thereof ~400 PhD students

Partner	Tera-scale	EMMI	HAP
DESY	**x**		**x**
KIT	**x**		**x**
GSI		**x**	
Jülich		**x**	
Aachen	x		x
Berlin HU	x		x
Bonn	x		x
Darmstadt		x	
Dortmund	x		x
Dresden	x		x
Erlangen-Nürnberg			x
Frankfurt FIAS		x	
Frankfurt U		x	
Freiburg	x		
Giessen	x		
Göttingen	x		
Hamburg	x		x
Heidelberg	x	x	
Heidelberg MPIK		*x*	*x*
Mainz	x		x
München TUM			x
München LMU	x		
München MPE			*x*
München MPP	*x*		*x*
Münster		x	x
Potsdam			x
Siegen	x		x
Tübingen			x
Würzburg	x		x
Wuppertal	x		x
Regensburg	x		
B. Aires, ITEDA, Argentina			*x*
Paris, APC, France			*x*
Paris, Univ. VI, France		*x*	
Tokyo, Univ., Japan		*x*	
Tokyo, RIKEN, Japan		*x*	
Troitsk INR, Russia			*x*
Moscow, SINP, Russia			*x*
Berkeley, LBNL, USA		*x*	
JINA, USA		*x*	
Chicago, KICP, USA			*x*



München TUM			x
München LMU	x		
München MPE			*x*
München MPP	*x*		*x*
Münster		x	x
Potsdam			x
Siegen	x		x
Tübingen			x
Würzburg	x		x
Wuppertal	x		x
Regensburg	x		
B. Aires, ITEDA, Argentina			*x*
Paris, APC, France			*x*
Paris, Univ. VI, France		*x*	
Tokyo, Univ., Japan		*x*	
Tokyo, RIKEN, Japan		*x*	
Troitsk INR, Russia			*x*
Moscow, SINP, Russia			*x*
Berkeley, LBNL, USA		*x*	
JINA, USA		*x*	
Chicago, KICP, USA			*x*

samples from the HAP midterm review

Why HAP?

HELMHOLTZ ASSOCIATION

Alliance for Astroparticle Physics

we work…	we exchange…	we shape…
in big projects	*people*	*communities*
internationally	*ideas*	*policies*
interdisciplinary	*methods*	*our future*

HAP mid-term review

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Alliance for Astroparticle Physics

- Was it successful? Absolutely yes
- Will it be/remain successful? of course

Topic relevant for Helmholtz? Yes

International visibility? High

Network established? vivid

Synergies? Many

Critical mass? Yes

Transfer? Public, media...

Management structures? very light

Talent management and equal opportunities? ongoing young investigator groups!

Resources adequate? limited scope

Alliances: impact & future

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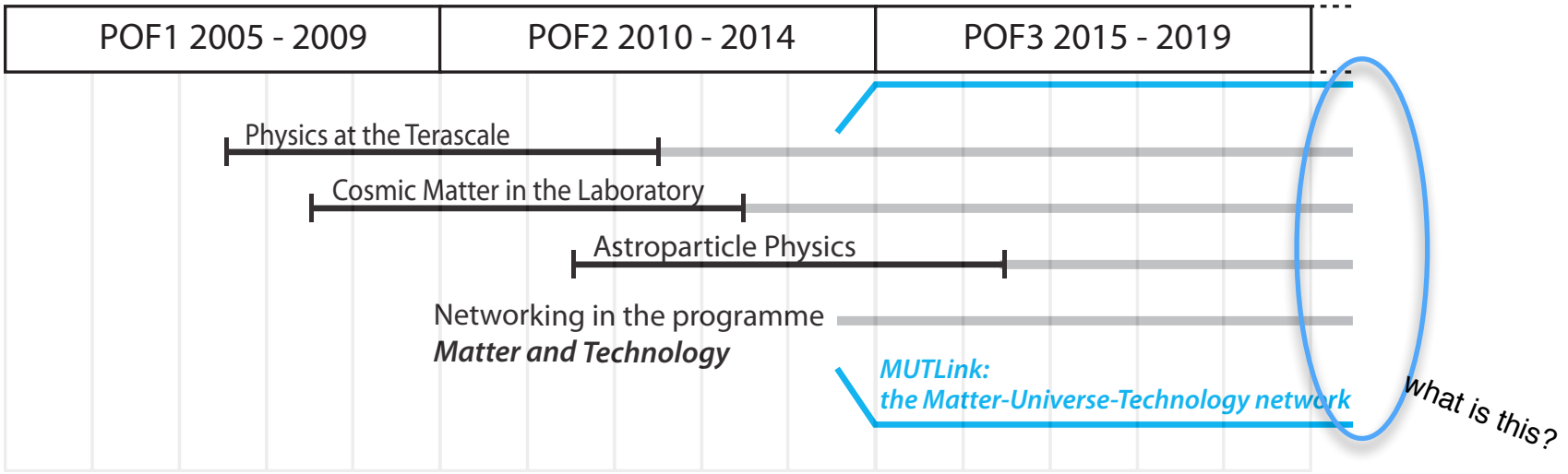
Alliance for Astroparticle Physics

	Helmholtz	Universities	Impact
Terascale	25 M€	50 M€	positions + actions
EMMI	19 M€	54 M€	positions + actions
HAP	10 M€	19 M€	actions
	54 M€	**123 M€**	**significant positive impact**



The alliances have proven to be extremely effective and efficient. They

- improved access of university groups to large-scale research projects driven by Helmholtz (and others), which increases the human resource basis for both sides,
- provided flexible additional funds to university groups for the quick and unbureaucratic start of novel research ideas,
- have initiated more than 20 professorships and made these and many more scientific and technical staff positions at universities sustainable,
- improved the mobility of people and exchange of ideas and methods across the borders that the federal German research system may draw, and
- by all of the above, they have fostered the careers of a huge number of doctoral students and young investigator group leaders,

risks and potential benefits. The risks include, but are not limited to

- *Matter and the Universe* remains fragmented in three large topics that don't interact,
- synergies between *Matter and the Universe* and *Matter and Technology* are not used, innovation and transfer don't grow,
- the now strong links between Helmholtz groups and university groups dissolve,
- talent management diminishes to local efforts, and
- due to any of the above the programmes MU and MT cannot gain enough visibility to be successful for POF4 - with all corresponding drawbacks for German science at large.

This must not happen.

MUTLink elements are:

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Schools: MUTLink will support 'Schools' in a broad sense and with an active role in their organisation. Financial aid will be given to organisationial issues that cannot be solved otherwise, attendance by students and attraction of high-valued lecturers. An example is the International School for Astroparticle Physics, ISAPP, which is supported and shaped already by HAP. The tentative budget for this item is 200 k€/a.

Programme Day: This event is a two-day meeting of *MU and all its partners*, possibly extended by satellite working group meetings. The purpose is to highlight scientific progress, in particular on the cross-topic themes listed above. It may be noted that the first event of this kind is scheduled for October 2015 in Jülich. The location would rotate in subsequent years. The tentative budget for this item is 60 k€/a.

Mobility This item is to support travels, teaching compensation, and expert trips. Special attention will be given to young investigtors. The tentative budget for this item is 300 k€/a.

Rapid Reaction Taskforces: These are specially formatted intense workshops, which would address the study and clarification of important scientific issues[1]. The tentative budget for this item is 320 k€/a.

Workshops: This item is to support workshops of a more classical format, mostly on cross-topic themes. The tentative budget for this item is 160 k€/a.

Outreach & information Outreach to the general public and the dissemination of information within the MUTLink members are summarized under this heading. MUTLink would employ two full-time scientists to co-organize the manyfold local outreach efforts in all partner groups, and to give high visibility to the network itself. The tentative budget for this item is 300 k€/a.

Equal Opportunities: Our efforts here would be subsidiary to the local programmes. The tentative budget for this item is 80 k€/a.

Project startup: Flexible funding for relatively small-scale project initiatives would be provided about five times per year in a competetive transparent scheme. The tentative budget for this item is 300 k€/a.

MU Fellows: MUTLink plans to establish highly visible and prestigious '*Matter and the Universe* Fellowships'. Up to 10 scientists at the 'bright postdoc level' would be hired for typically two years to work in particular on one of the cross-topic themes. The tentative budget for this item is 800 k€/a.

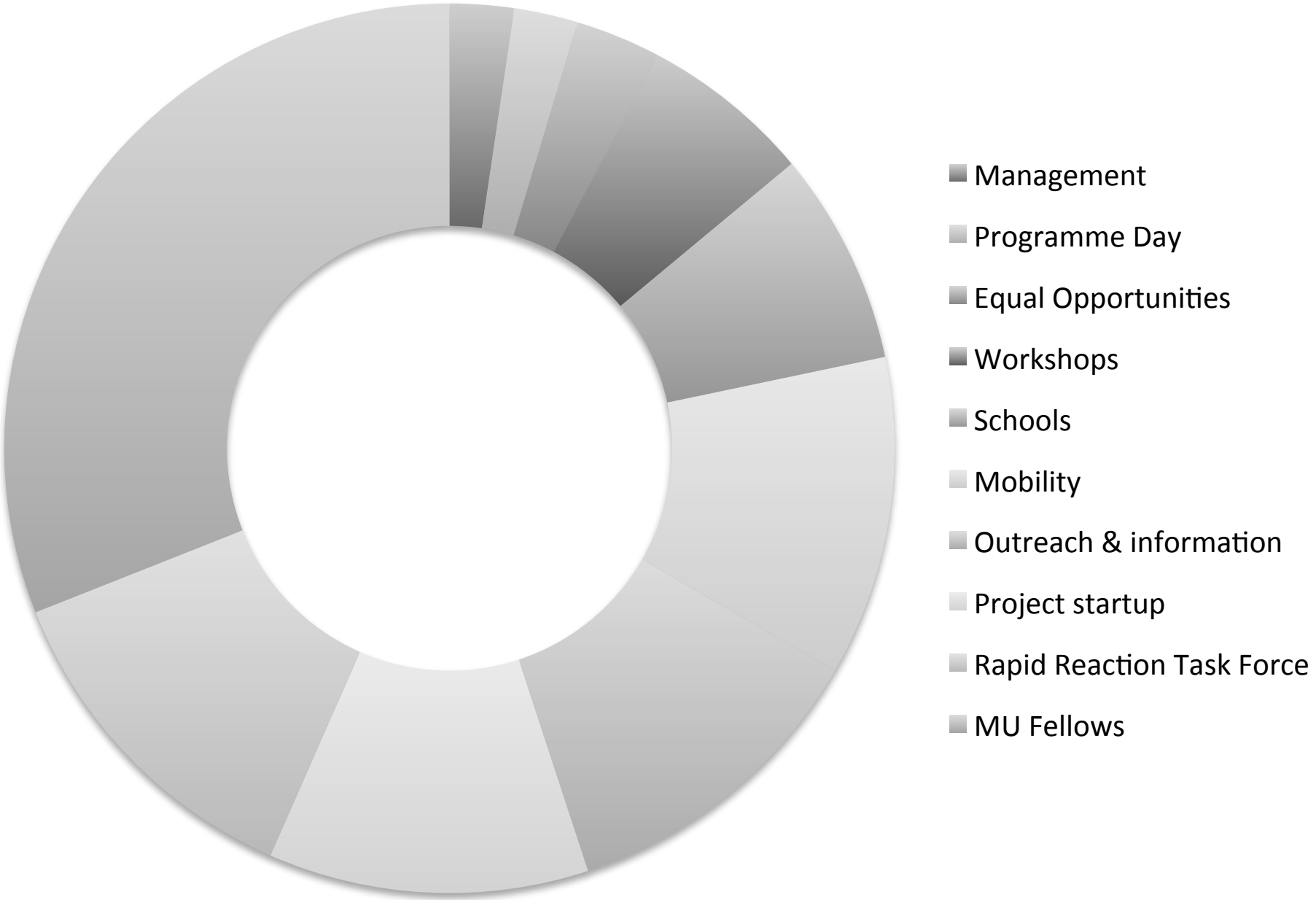
Management: The additional efforts for the internal organisation of MUTLink will be kept extremely efficient and compact. The management will embedd all existing structures of the Alliances and require one additional administrative staff. The tentative budget for this item is 60 k€/a.

[1] A lot of experience with this format has been gained by our colleagues in the 'Cosmic Matter' Alliance.

MUTLINK resources

k€	Action/item	Remark
200	Schools	support for the organisation and attendance
60	Communities Science Day	Highlights and next important things to do
300	Mobility	travels, teaching compensation, expert trips; [24 PM] [70 CM]
320	Rapid Reaction Task Force	8/yr * 40k€
160	Workshops	Topical workshops on overlapping subjects
300	Outreach & coordination, information	2 full scientist (E13), Hiwis, media, contracts, brochures…
80	gender equality	subsidiary to local support programmes
300	Project startup	small projects (5 decisions/yr);
800	Matter and the Universe Fellows	10 x advanced scientist (E14 * 2 yrs) + v small budget, cross-topic work
2520	**to be obtained in addition to the programme base funding per annum [until POF4]**	
	don't forget overheads	

mutlink@lists.kit.edu


Management
Programme Day
Equal Opportunities
Workshops
Schools
Mobility
Outreach & information
Project startup
Rapid Reaction Task Force
MU Fellows

In contrast, there are huge potential benefits if the achievements of the alliances can be extended into the future and if the new programme structure can be filled effectively with life:

- *Matter and the Universe* becomes well-connected all across nuclear, particle and astroparticle physics,
- *Matter and the Universe* and *Matter and Technology* are likewise well connected in terms of organisational matters and among the people, fostering innovation and transfer,
- the now existing strong links between Helmholtz groups and university groups are maintained,
- Helmholtz' large-scale research and the non-programmatic, idea-driven university research will be further for the benefit of both,
- the mobility of people and the exchange of ideas and methods is not ceasing but instead can be extended to entire science communities,
- talent management is lifted to an unprecedented level, and
- due to all of the above, the Research Field MATTER will be successful in POF4 and for the benefit of German science at large.

We believe that MUTLink is the right instrument to avoid the risks and to create the benefits. The

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see you at the next Terascale meeting

and at the MU(T) programme day
at Jülich, Sep/Oct 2015