

DESY Particle Physics

KET meeting Bad Honnef

Ties Behnke (DESY)
25/26 November 2021

Particle Physics at DESY

The main components of the program

Scientific Excellence

- Push cutting-edge science in particle physics
 - Experiment/ theory
- Build a world-class local program

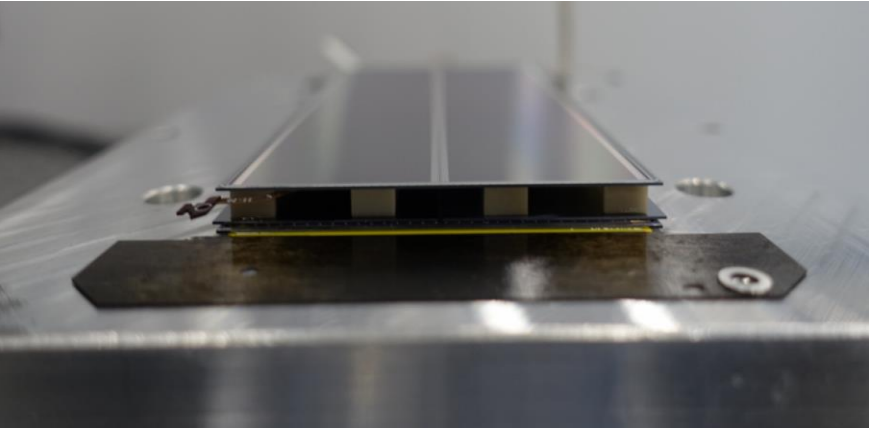
World-class infrastructure

- Part of the German Particle Physics landscape
- Leverage our strengths as a major laboratory
- Major infrastructure
 - IDAF (Computing infrastructure)
 - DAF (Detector assembly facility)
 - Testbeam



LHC/ HL-LHC

First Sensor Sandwich at DESY

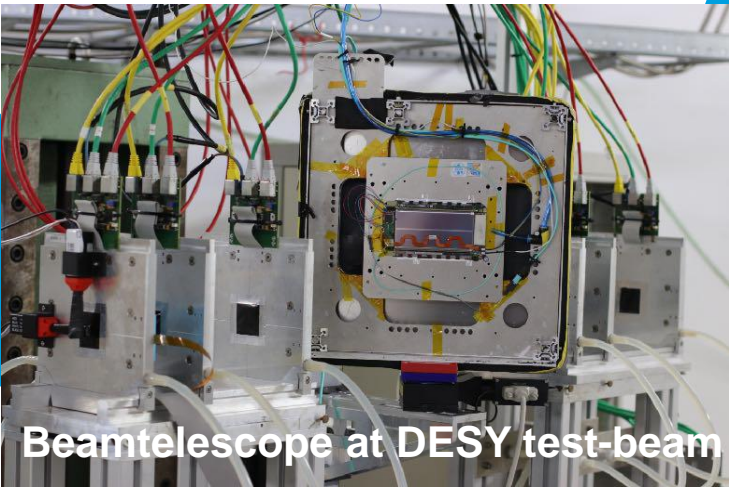


Detector Assembly Facility at DESY

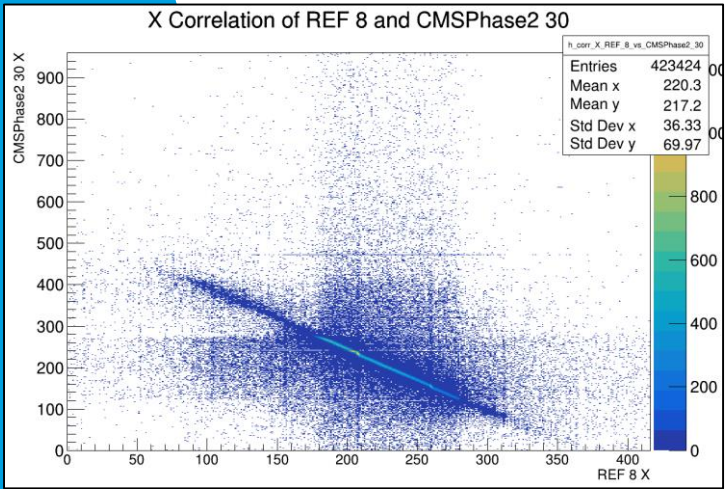
High level of activities
Lots of progress
Even in difficult Corona times



The first CMS module assembled at DESY



Beamtelescope at DESY test-beam



... and proven to be fully functional (correlation between sensor and reference detectors)

Future Collider/ Experiments

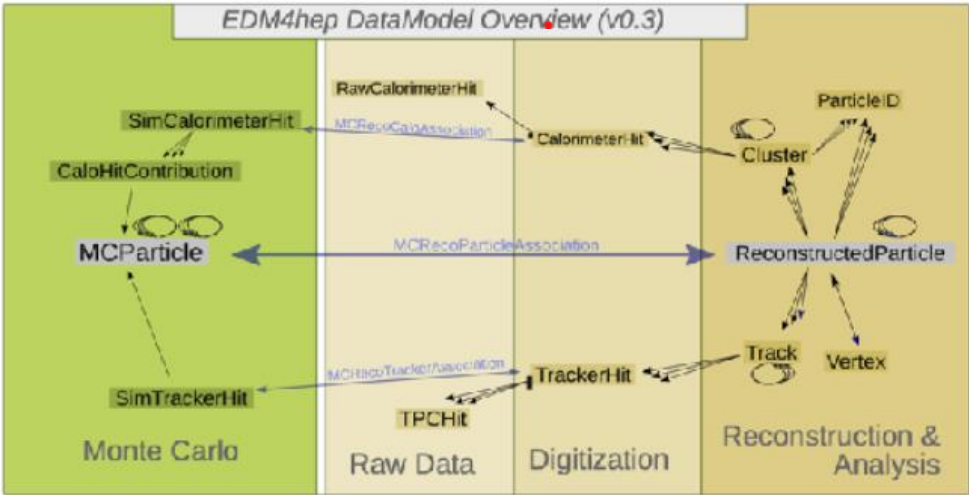
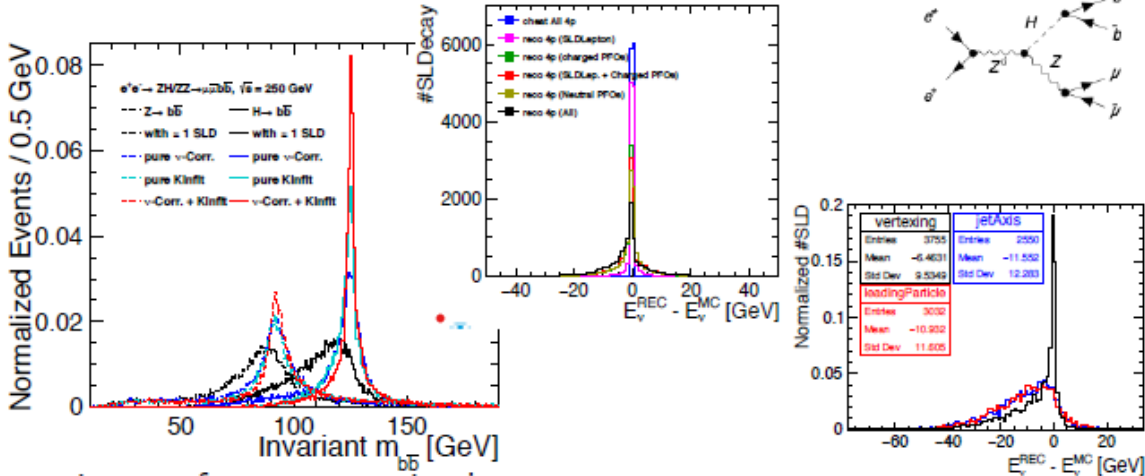
Exploring future directions

- Science studies ILC/ electron-positron
- Software framework
- Hardware developments
- Strategic development?



Reconstruction of b- and c-jets at e+e- Higgs Factories with ParticleFlow detectors

Correcting for neutrinos in semileptonic Heavy Flavour Decays (SLDs)





LUXE: a new experiment proposal at DESY

Non linear QED – search for New Physics

Collision of XFEL Electron bunch with laser beam

- Collaboration with about 100 members
- International participation from UK, Israel, others
- Funding under discussion
- Realisation at XFEL and DESY

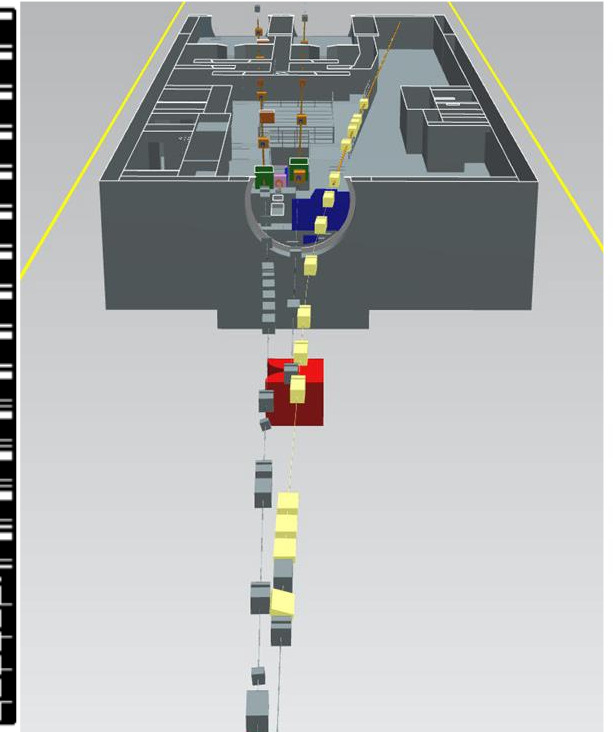
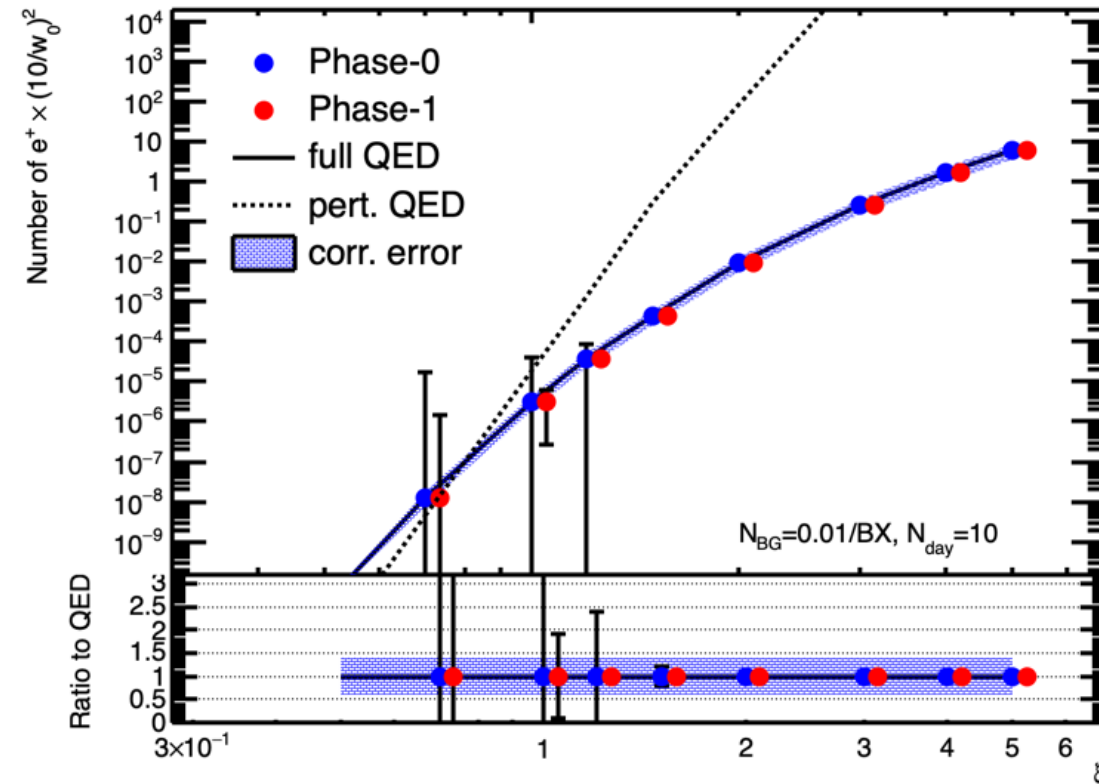
LUXE

Status

- Official “opportunity” in DESY (CD0)
- Funding partially secured
- More collaborators are welcome

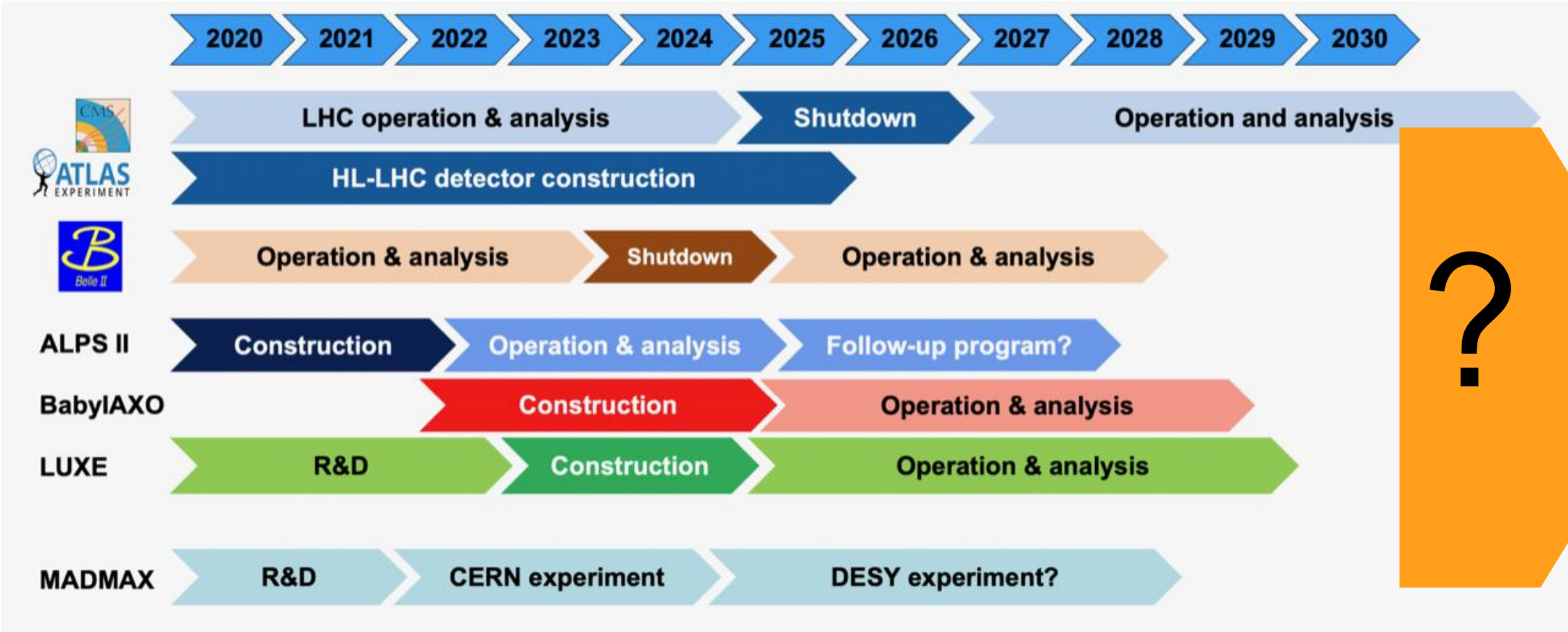
Beate.Heinemann@desy.de

<http://luxede.desy.de>



Projects in Particle Physics

Timeline of projects



DESY ambition

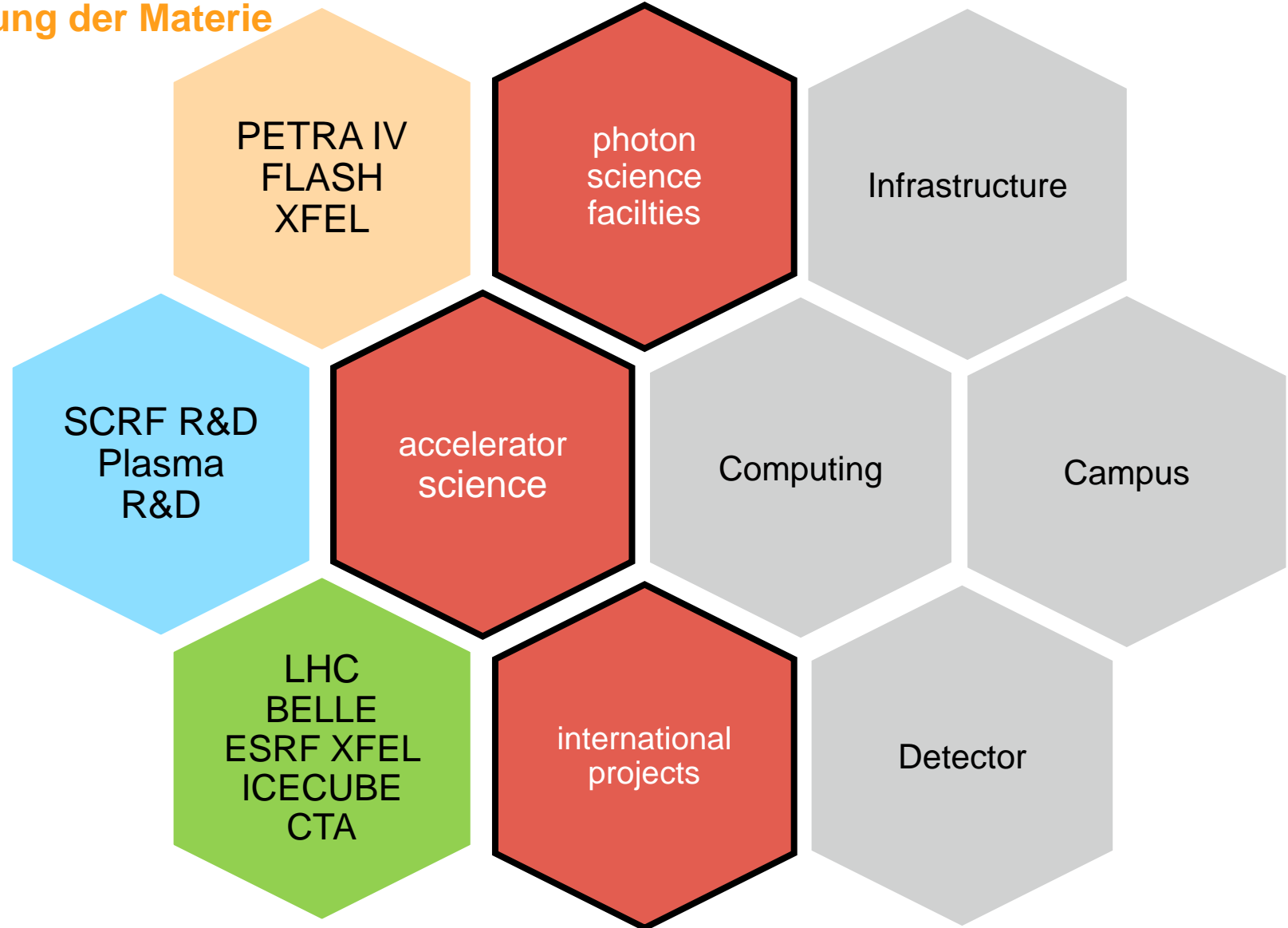
Decoding Matter/ Die Entschlüsselung der Materie

DESY ambition:

DESY a world-renowned research center with both on-site facilities and off-site participation

Funding period:

PoF IV until 2027
Annual budget increase 1.5%



DESY Campus Development

Science City Bahrenfeld



DESY Photon Science

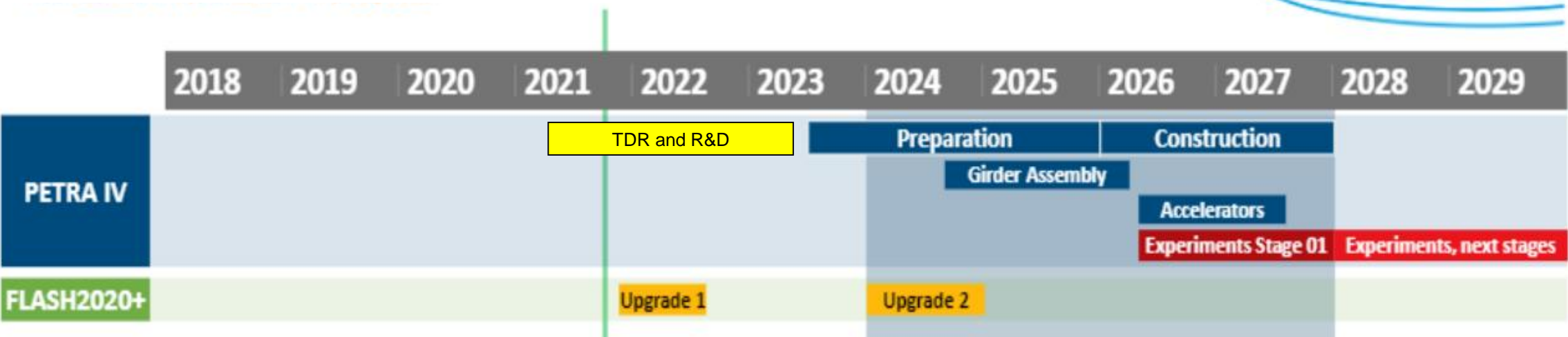
PETRA IV as flagship project

Development of the on-site photon sources PETRA and FLASH:

PETRA IV: Diffraction limited light source, upgrade of the existing PETRAIII light source

FLASH 2020+: upgrade of the FLASH free electron laser, towards CW operation

XFEL: main German shareholder, operate the linac. 2030+: second fan project



European XFEL

DESY responsible for linac operation



2km long superconducting
accelerator
(ILC like technology)

17.5 GeV
ILC bunch structure



Stable, efficient user operation
also during Corona times



Reached top energy (17.5)
and long stable operation for
full bunch train in 2020

DESY Accelerator R&D – Next Generation Facilities

Wim Leemans, DESY

A bold initiative to significantly advance the performance and readiness of plasma accelerators



Superconducting Accelerators



Accelerator R&D
New test facilities
at DESY

Plasma Accelerators

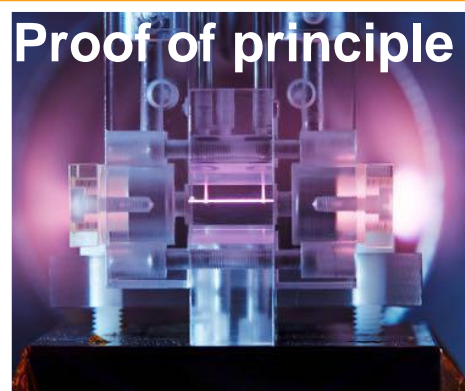


Where are we going?

Plasma Accelerators for HEP

LUX
FlashForward
ATHENA

Proof of principle



PETRA IV
Injector

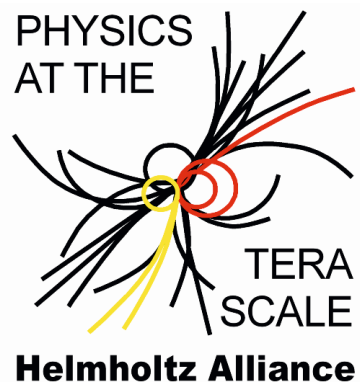
6 GeV single
stage



LUXE

O(20) GeV Linac
eLUXE

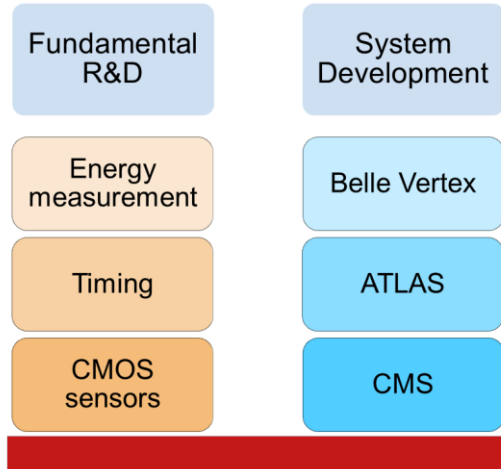
>10 GeV multi
stage



Transverse Topics

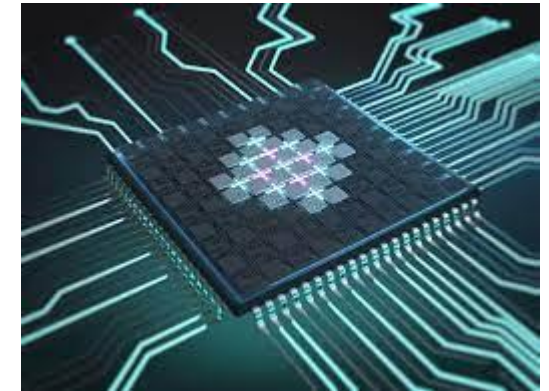
Technological Focus Topics with Large Strategic Weight

Detector Development



DESY QUANTUM.

- Quantum Computing
- Quantum Sensing
- Quantum Materials

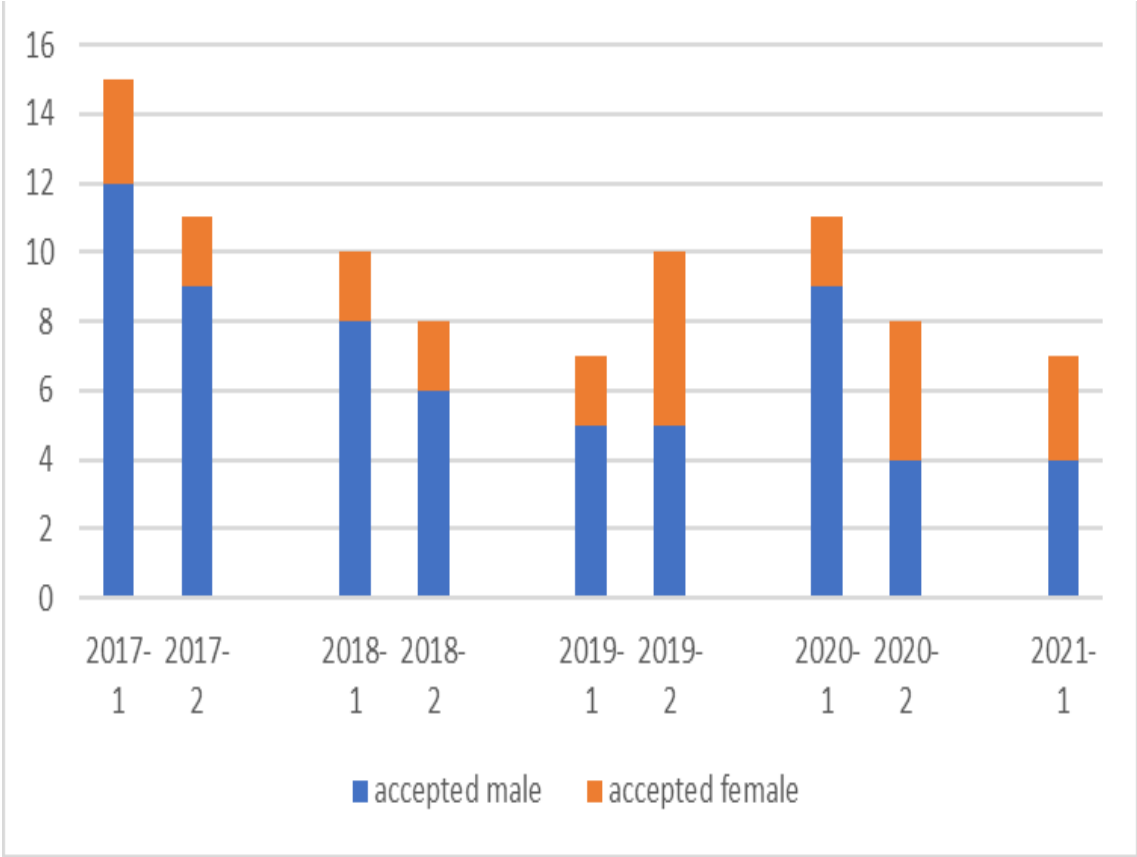


“Digitalisation”: Computing, IDAF (TierII)

DESY fellow program

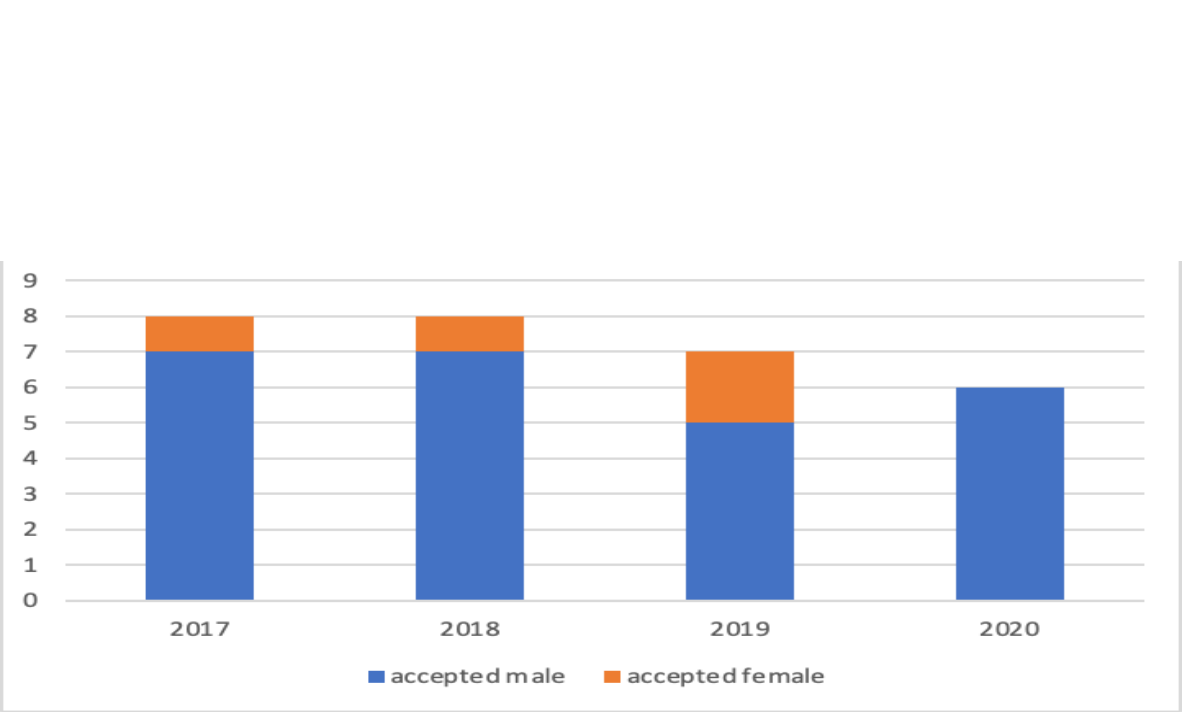
Particle Physics at DESY

Experimental fellows



Typically around 60-100 applications

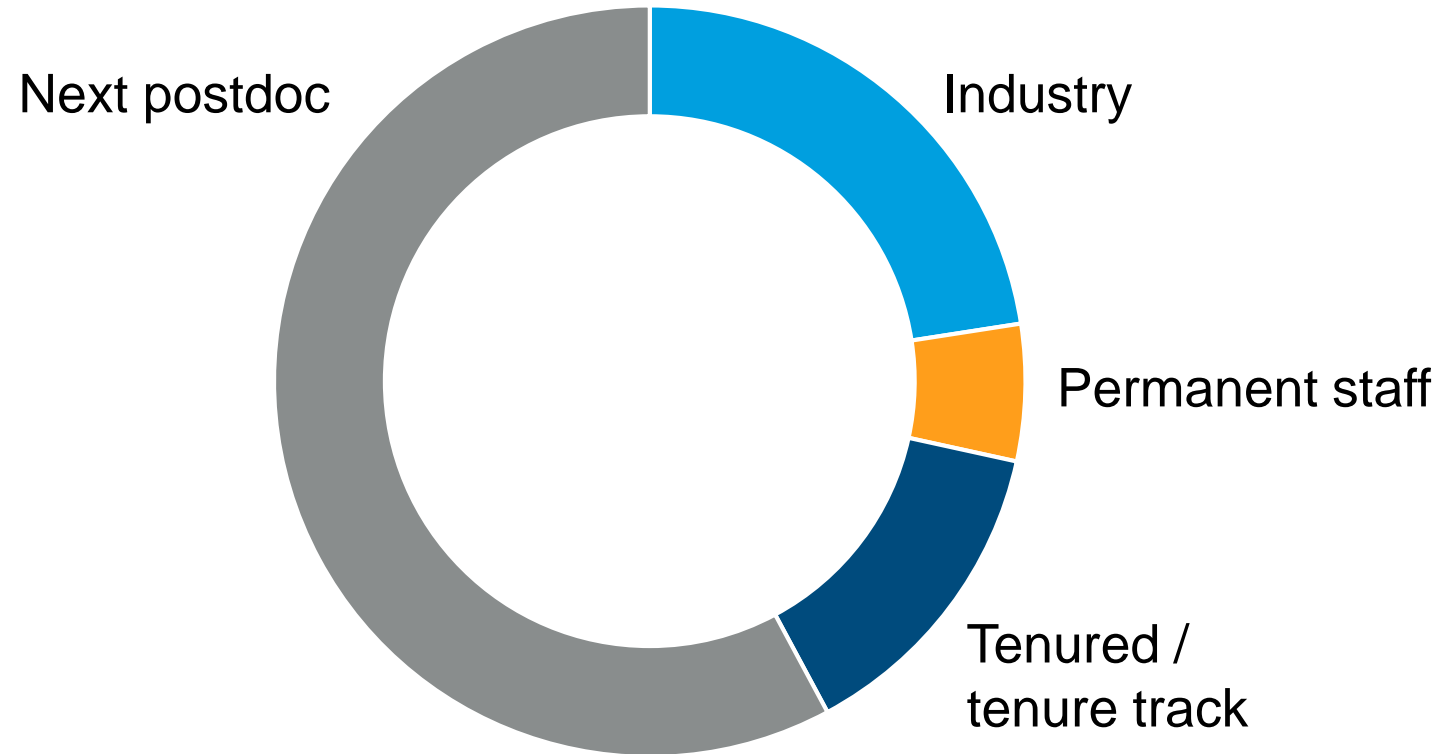
Theoretical fellows



Typically around 400 applications

Next Career Steps for DESY fellows

An incomplete survey



Source:
ATLAS and theory 2017-2020
(102 fellows altogether)

