

# Report on DESY

## Overview and Highlights

**European XFEL**  
**LHC phase II in Germany**  
**Belle II**  
**Accelerator R&D @ DESY**

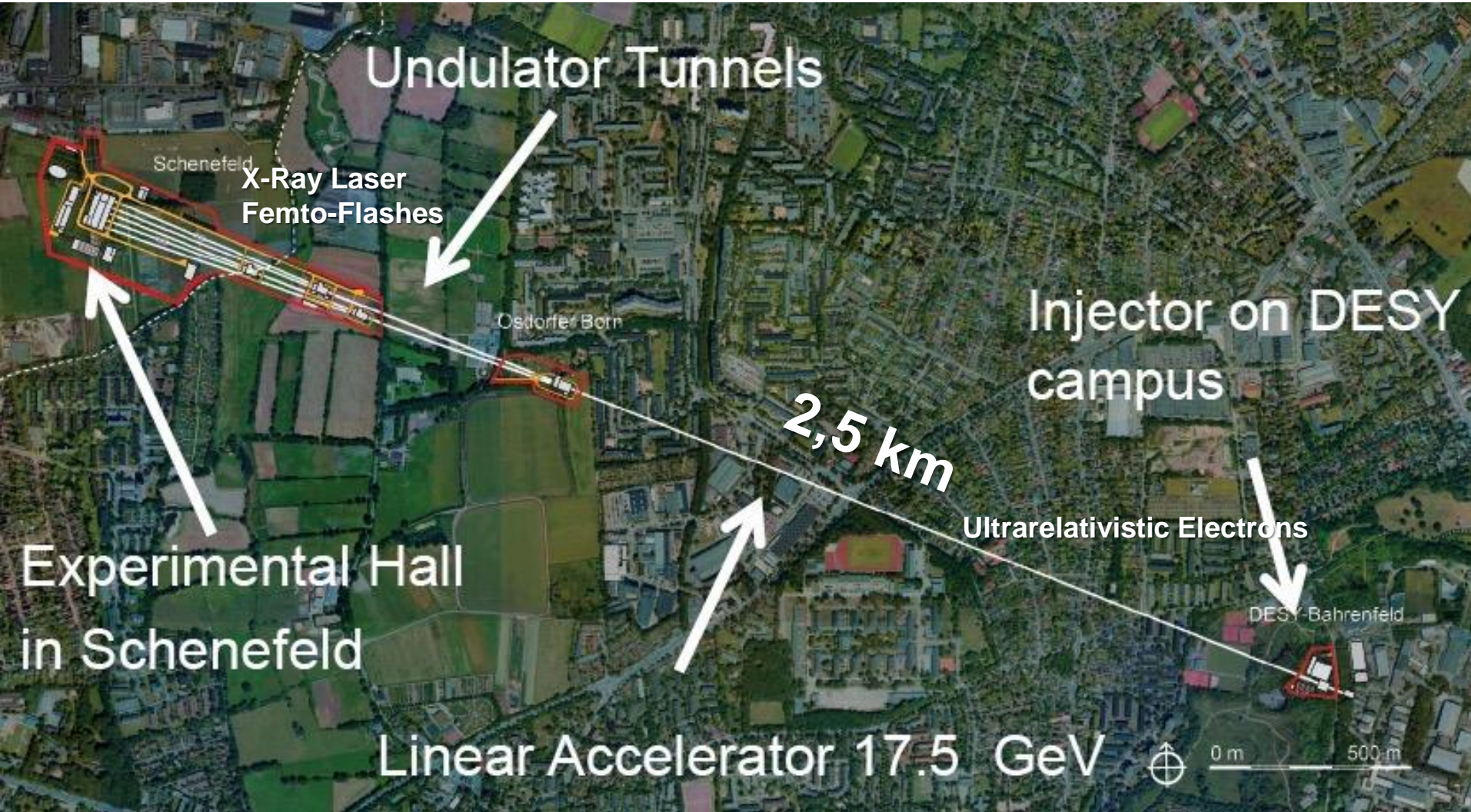
**Strategy discussions in Germany**

**Joachim Mnich**

Plenary ECFA Meeting  
Gran Sasso, 30 June 2016

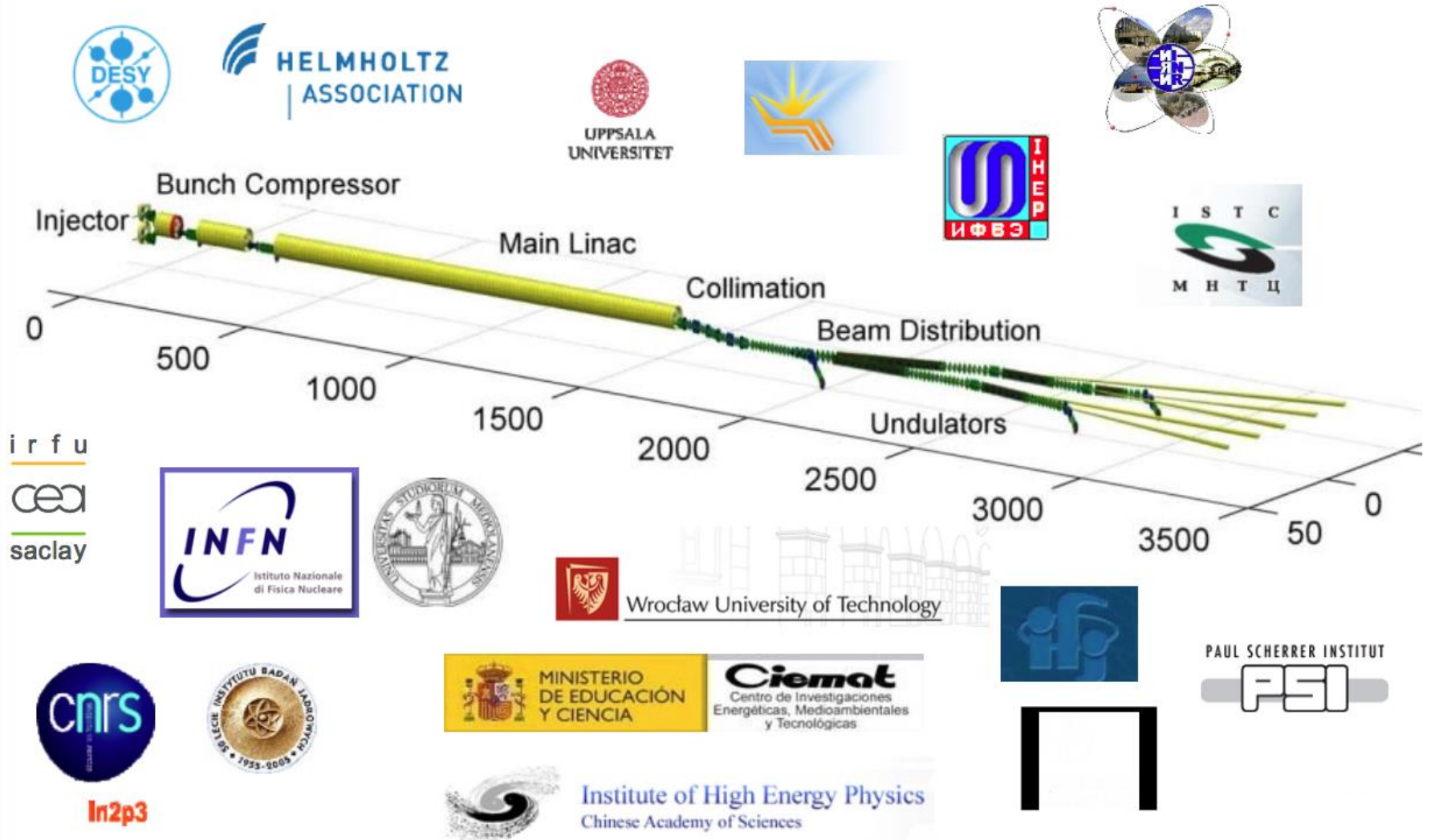


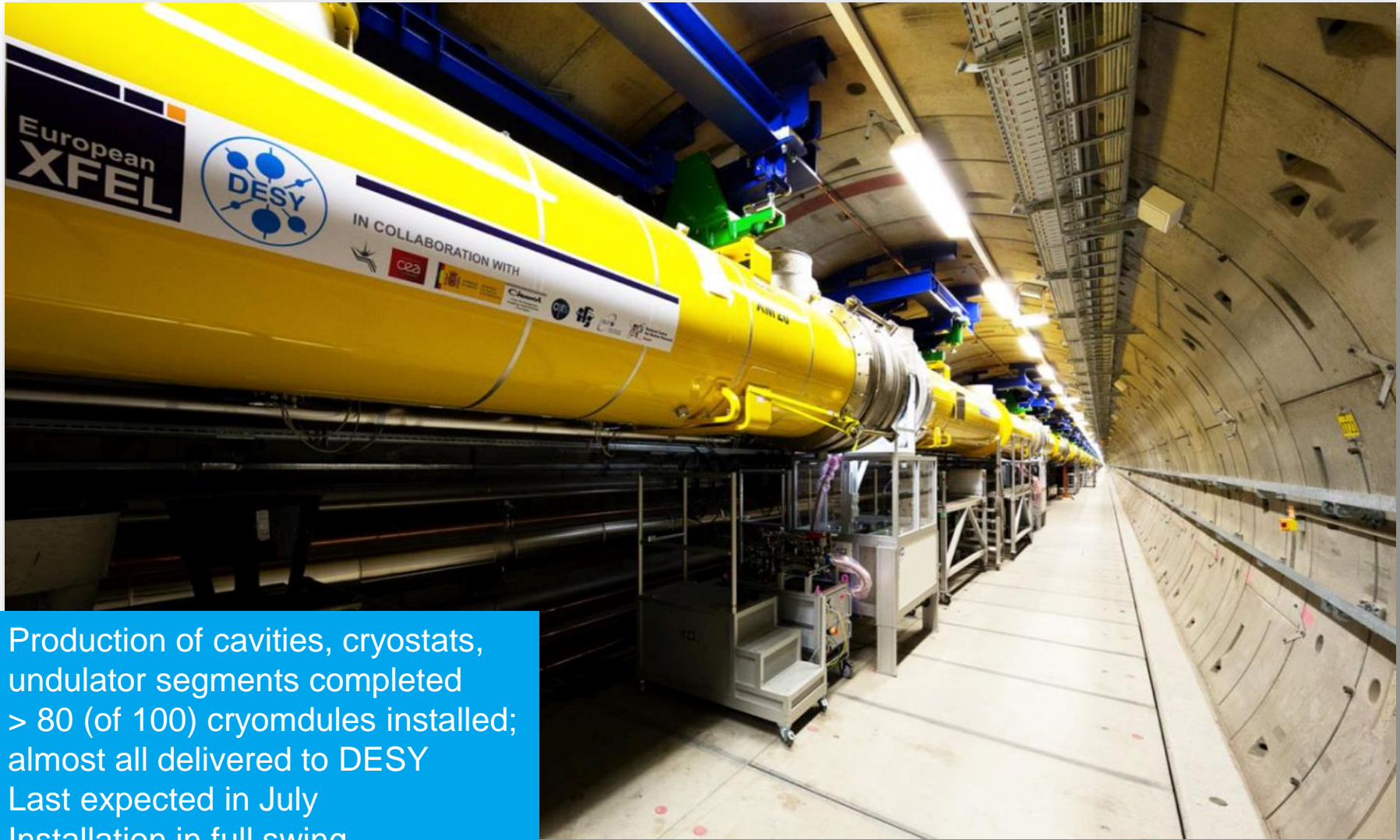
# EUROPEAN XFEL





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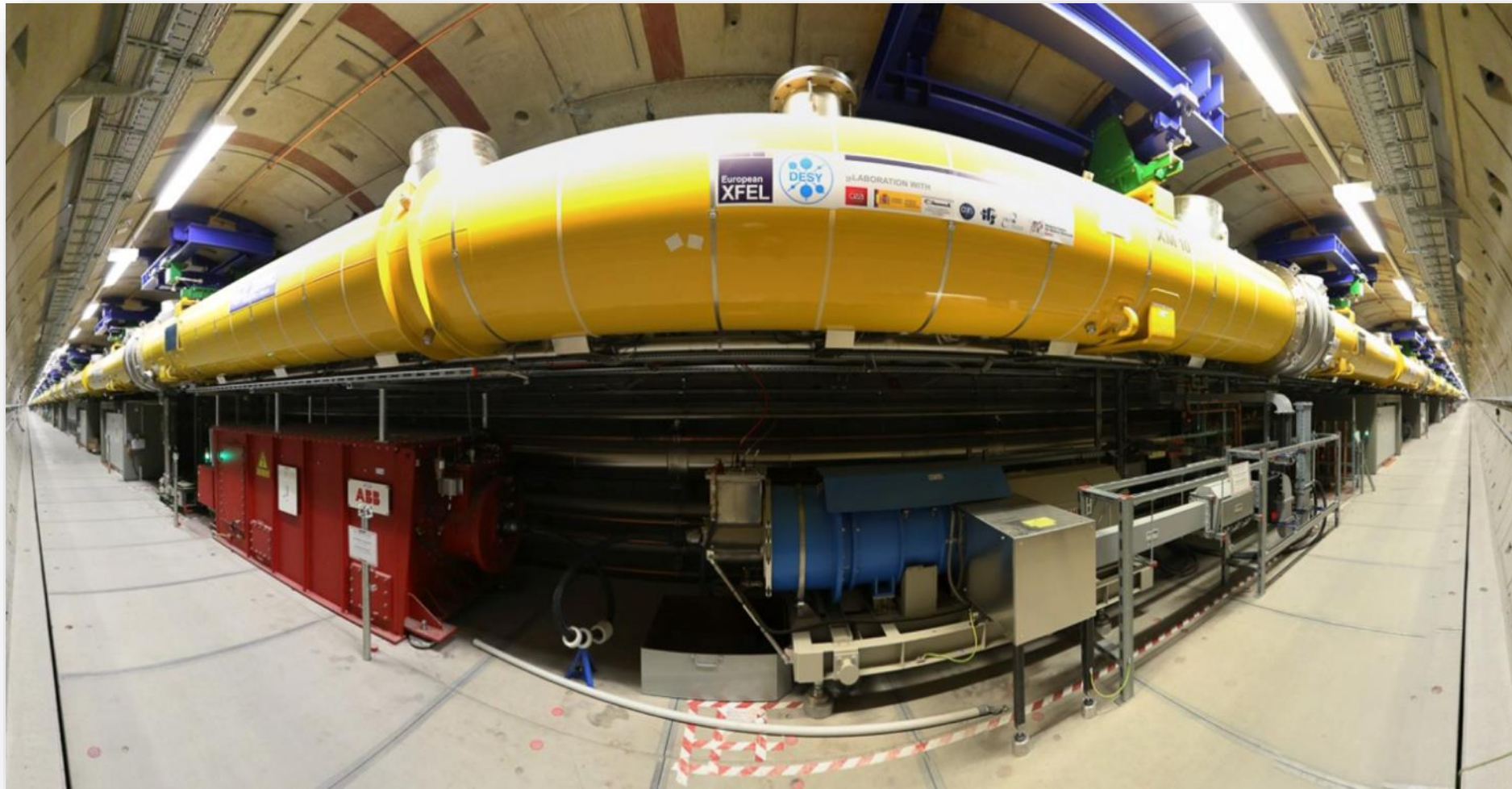




- Production of cavities, cryostats, undulator segments completed
- > 80 (of 100) cryomodules installed; almost all delivered to DESY
- Last expected in July
- Installation in full swing, commissioning started

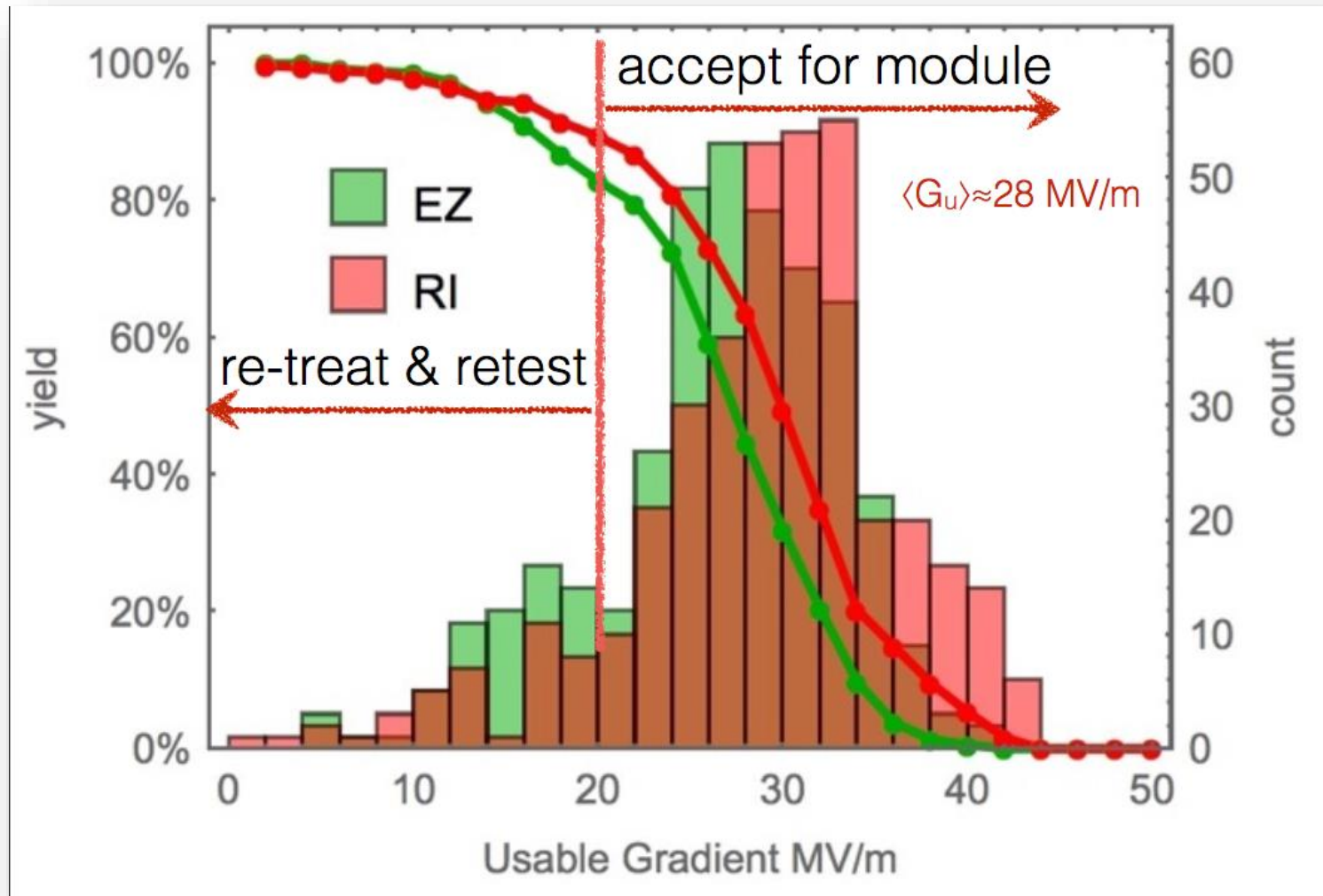


# XFEL – CRYOMODULE STATUS ETC.

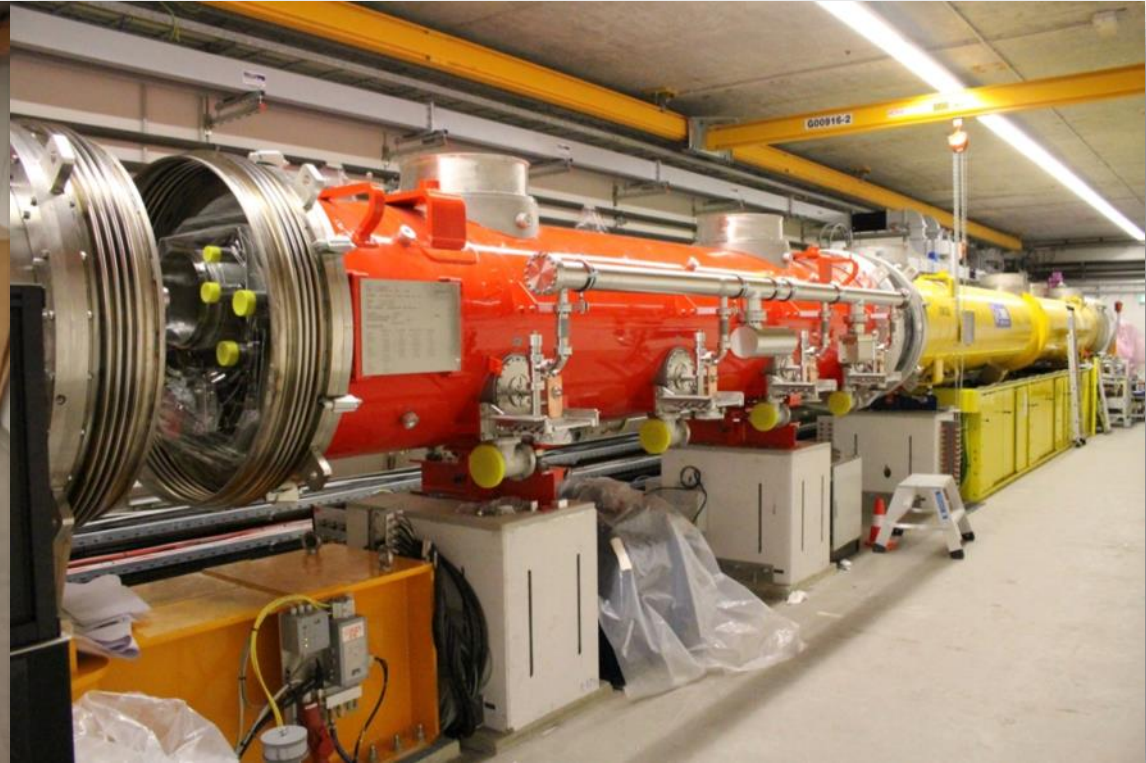
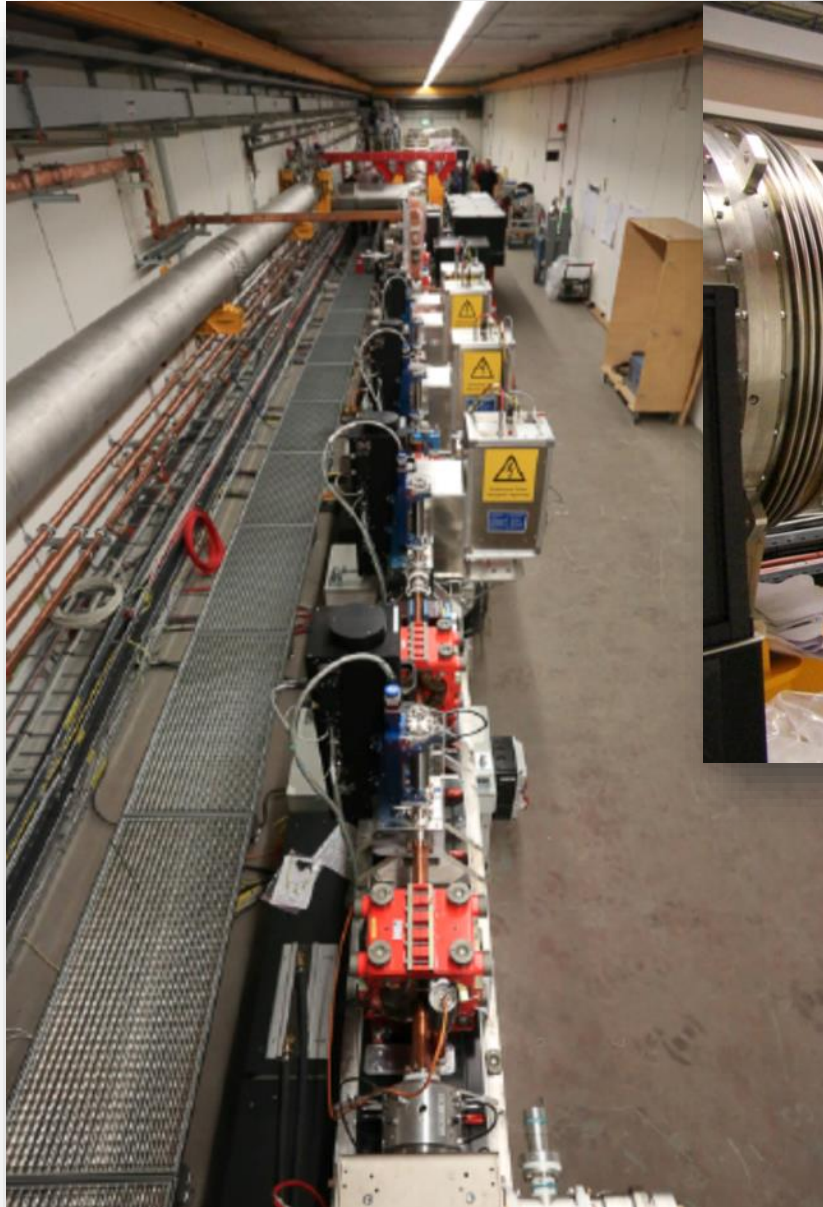


# CAVITY PERFORMANCE AFTER RE-TREATMENT

- > Very close to ILC specs, on an industrial scale!







- > Injector commissioning completed
  - Injector tunnel closed, cool-down to 2 K successful
  - First 130 MeV electron beam in December 2015
  - March 2016: acceleration of 2700 bunches

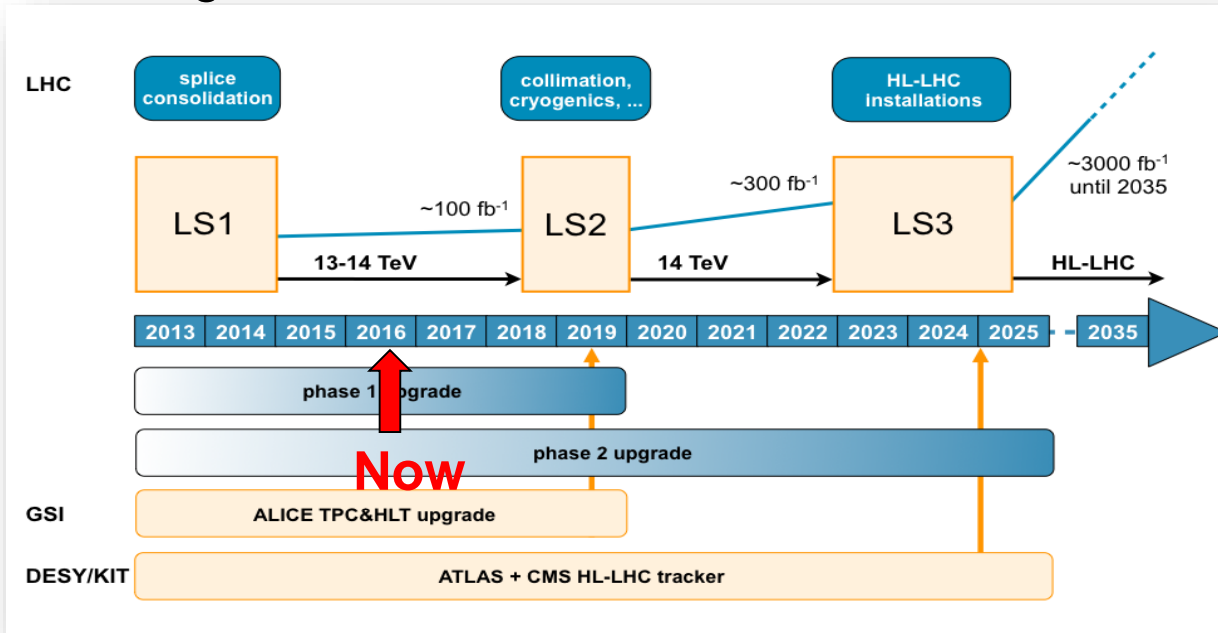
# XFEL – MOVED TO SCHENEFELD IN JUNE 2016





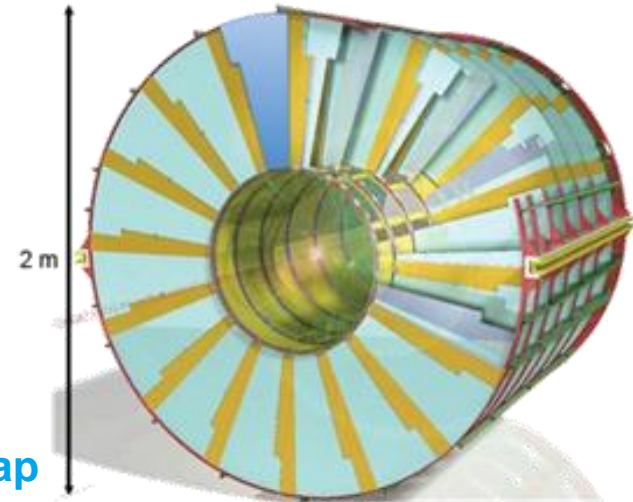
# PHASE 2 UPGRADE: FUNDING IN GERMANY

- > BMBF: 90 MEUR for universities for phase 2 upgrades
- > Helmholtz: 22 MEUR approved for
  - ATLAS + CMS (DESY, KIT), ALICE (GSI)
- > DESY projects: ATLAS+CMS tracker end-caps:
  - 16 MEUR as part of Helmholtz funding (80% of request)
- > Investments into new infrastructure (DAF): 10 MEUR from DESY additional funding



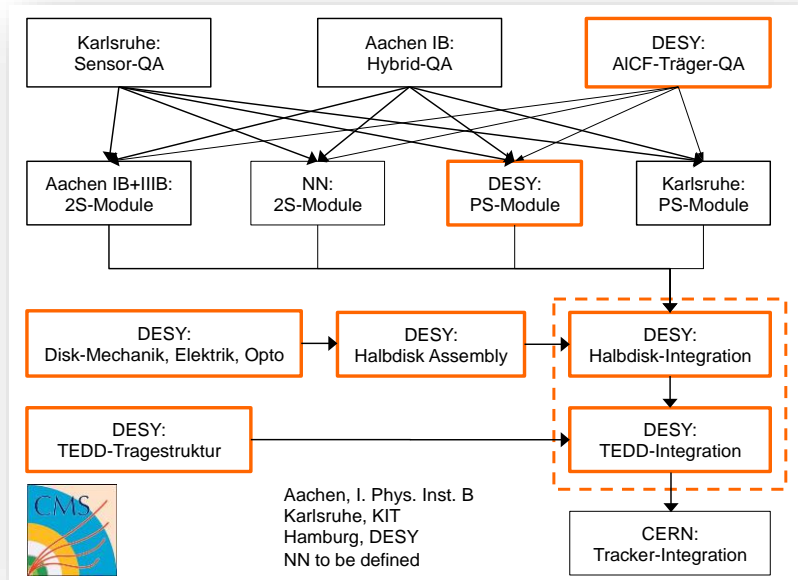
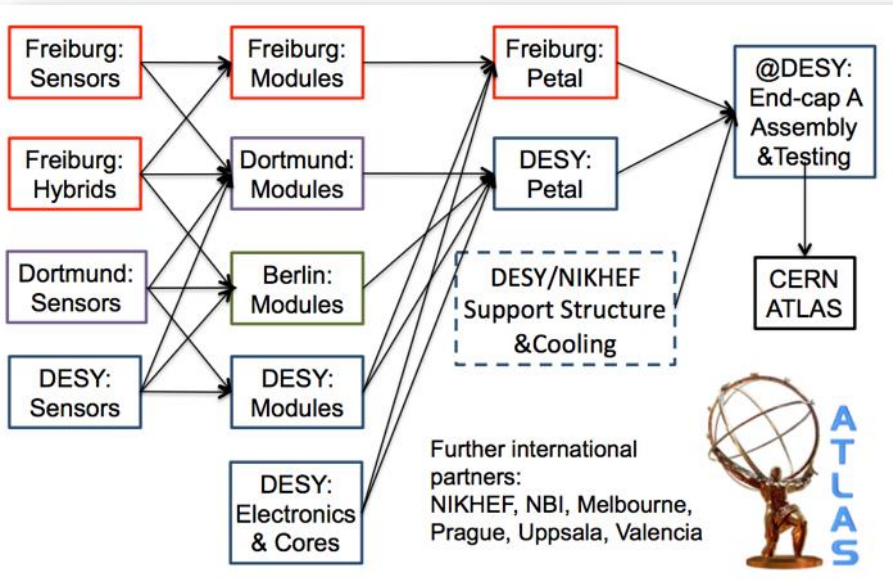
# DESY: ATLAS + CMS END-CAPS

- > Complex projects with German universities and other partners
- > Production, construction and integration in detector assembly facility (DAF, see next slide)



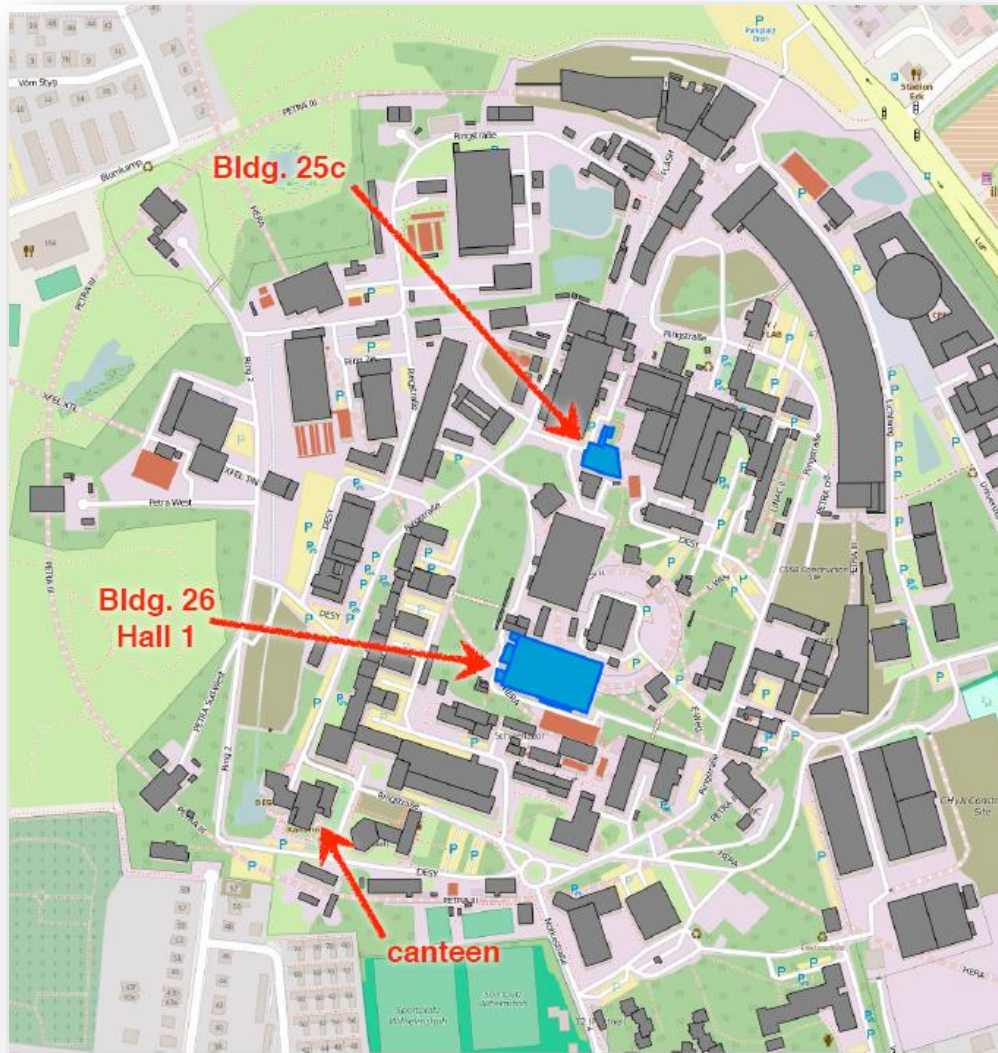
ATLAS end-cap

## Collaboration DESY – universities





# DAF: DETECTOR ASSEMBLY FACILITY @ DESY



- > Large project (10 MEUR) for construction and integration of ATLAS+CMS tracker end-caps
- > Building 25c
  - Lab space & clean room for module production + testing
  - Start NOW! Commissioned mid-2017
- > Building 26 (hall 1)
  - Hall with cleanrooms for substructure assembly
  - Endcap integration + system tests
  - Commissioning 2018
- > Later use for other projects

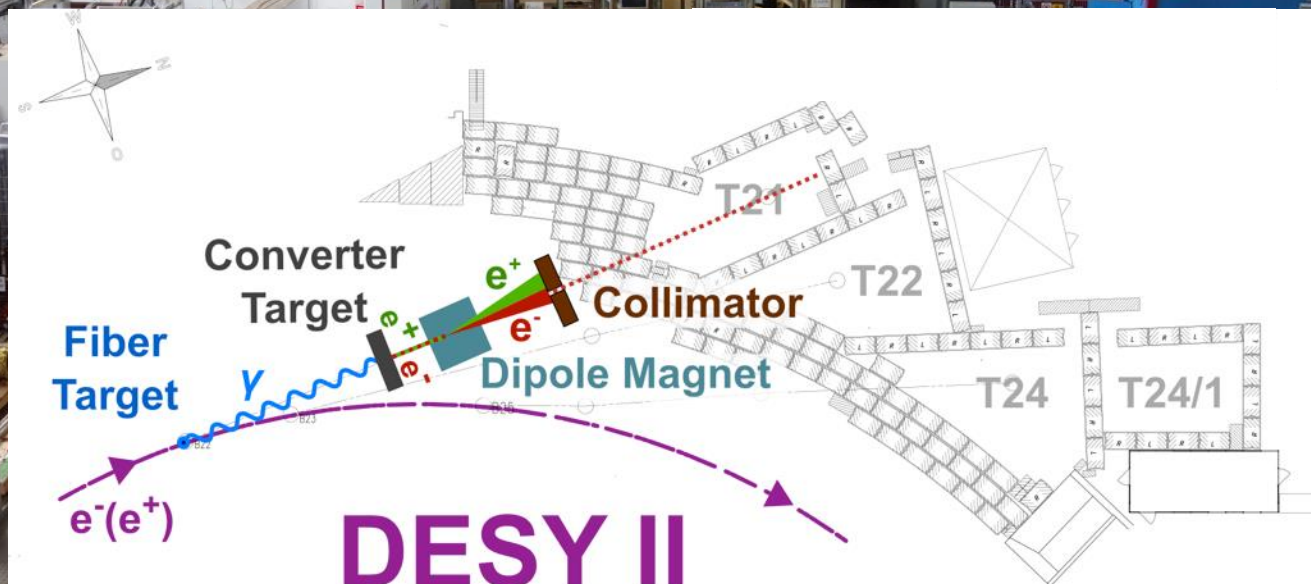
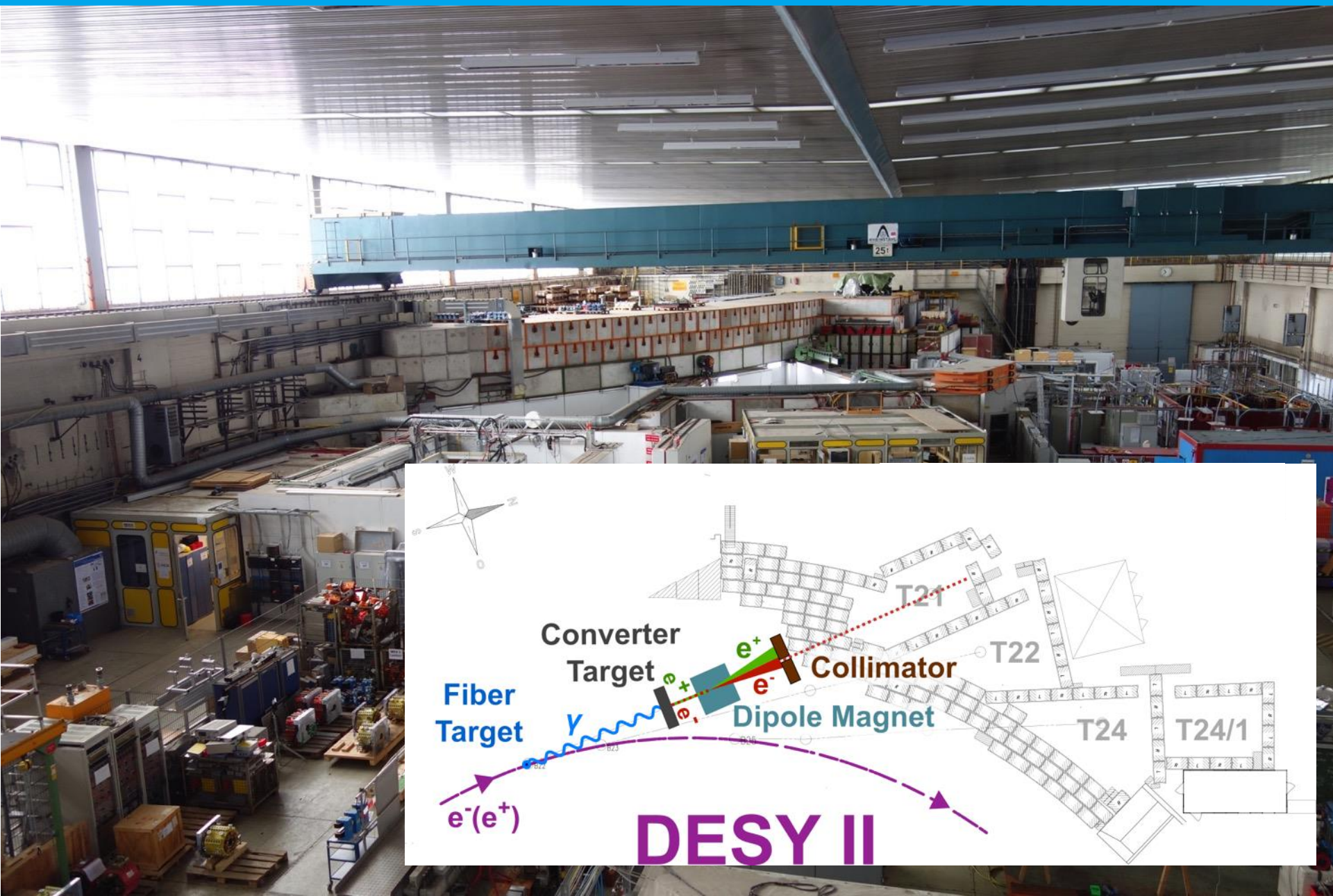


# DESY-II TEST BEAM FACILITY





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## > Summary 2015

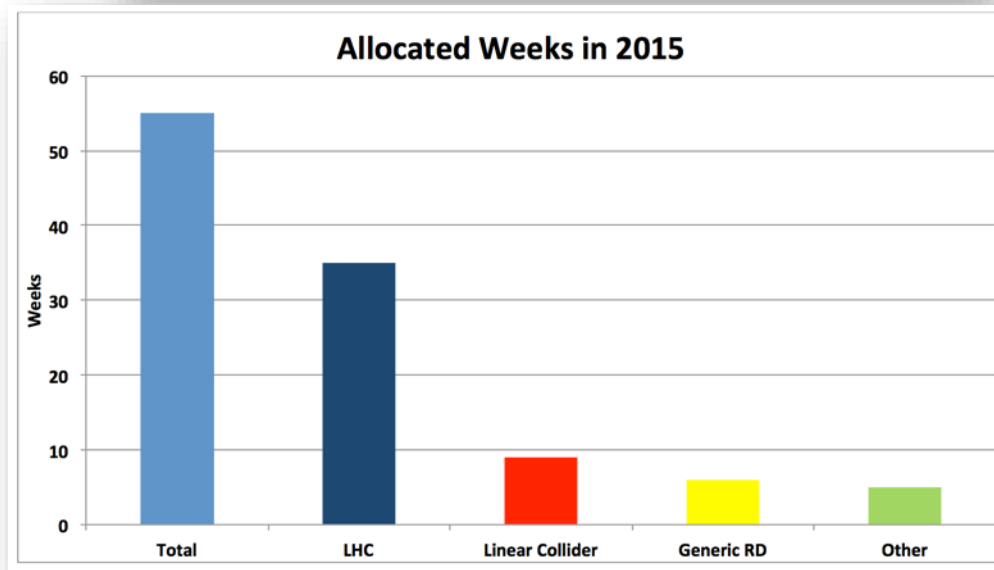
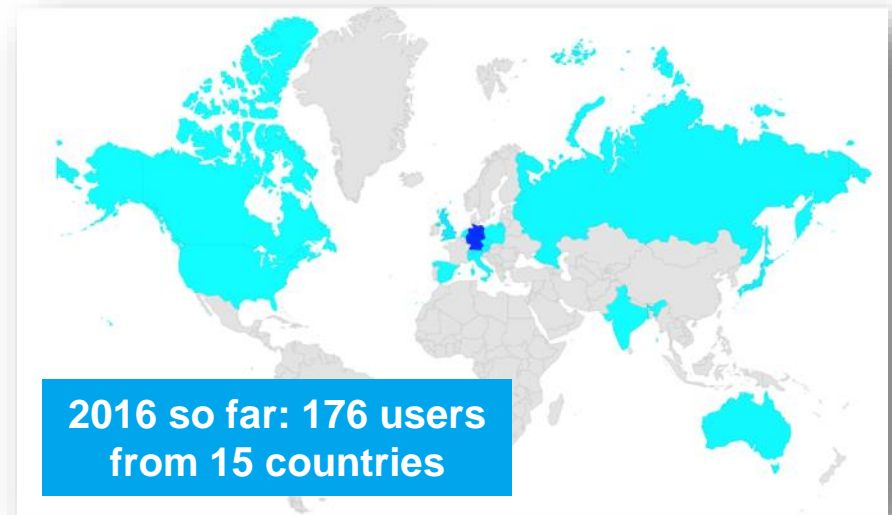
- 277 users from 17 countries
- 42 projects in 55 test beam weeks

## > Run 2016

- March 14th -December 23rd, 57% already booked
- 70% of all groups request telescopes; also PCMAG in high demand (unique!)

## > Highlights

- Belle-II tracking system test with 66 users
- First time: Physics teachers from Hamburg will do experiments at the facility





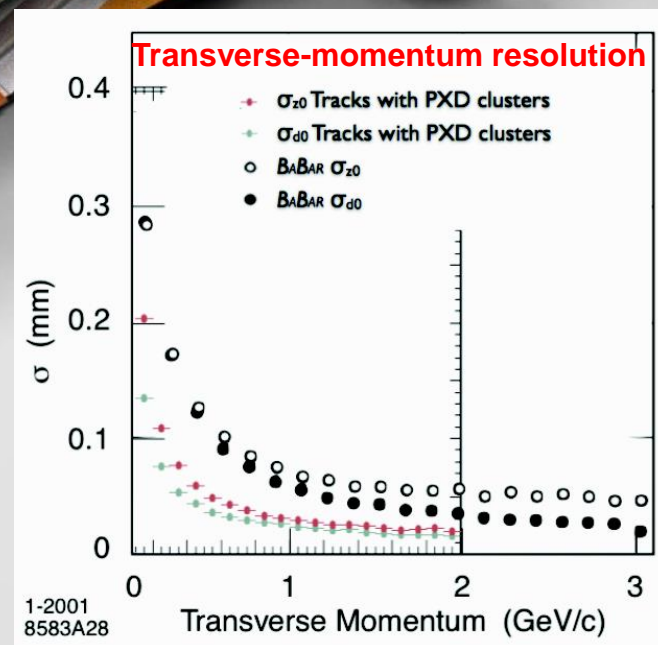
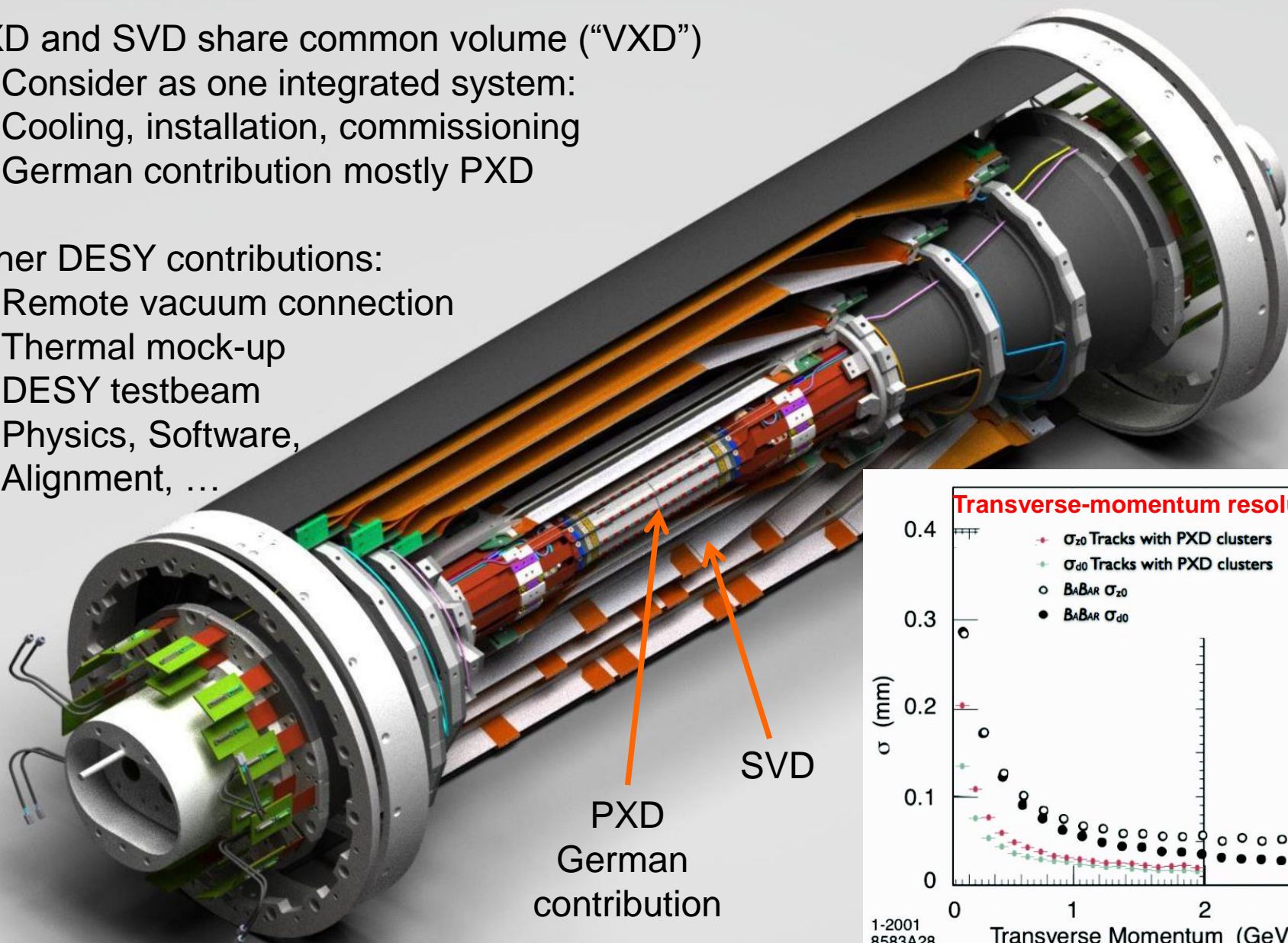
# BELLE II: PXD

PXD and SVD share common volume (“VXD”)

- Consider as one integrated system:  
Cooling, installation, commissioning
- German contribution mostly PXD

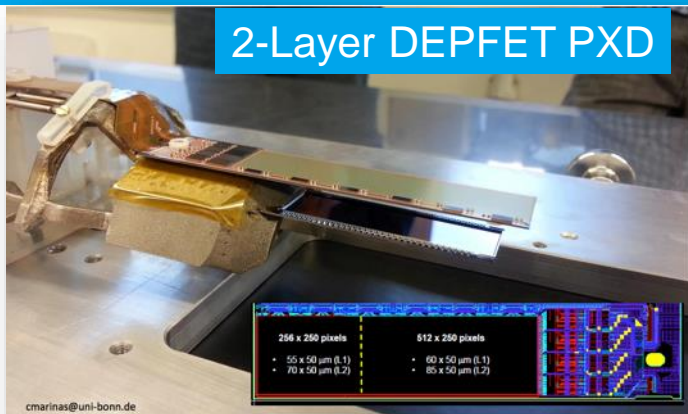
Other DESY contributions:

- Remote vacuum connection
- Thermal mock-up
- DESY testbeam
- Physics, Software, Alignment, ...



# BELLE II VXD AT DESY TESTBEAM APRIL 2016

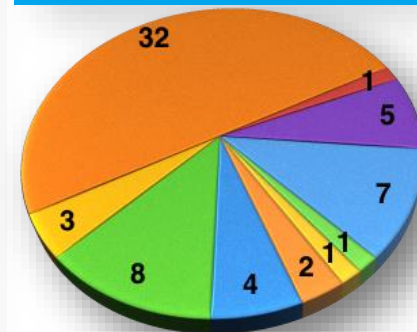
2-Layer DEPFET PXD



SVD Cartridge



60 Participants



## > Major Belle II milestone

- 2 PXD + 4 SVD layers fully operational
- Almost final Phase 2 hardware
- Realistic environmental conditions (e.g. CO<sub>2</sub> cooling)
- Online data reduction (region-of-Interest finding)
- Alignment and track reconstruction

## > Next steps

- Detector integration and final beam test: Nov/Dec 2016 at DESY
- Preparation for BEAST II (Phase 2, 2017)

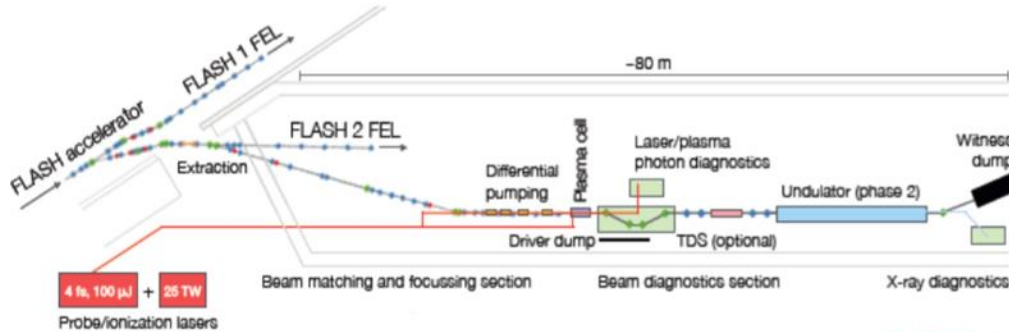




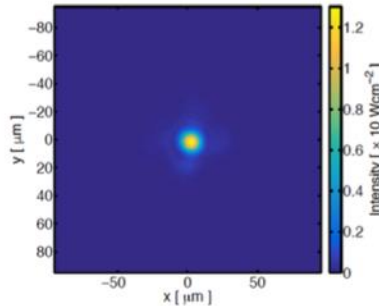
# ACCELERATOR R&D @ DESY: FLASHForward

> Novel acc. concepts and fs beams!

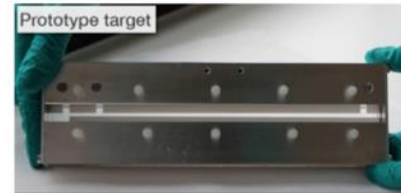
R. Brinkmann



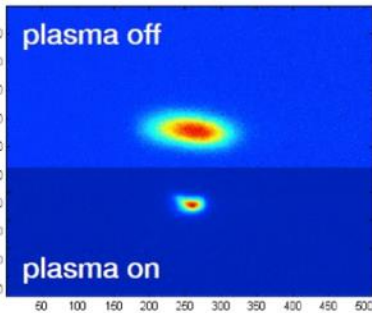
FLASHforward beam driven PWA experiment in FLASH2 tunnel



25 TW laser operational



Plasma cell test set-up ready



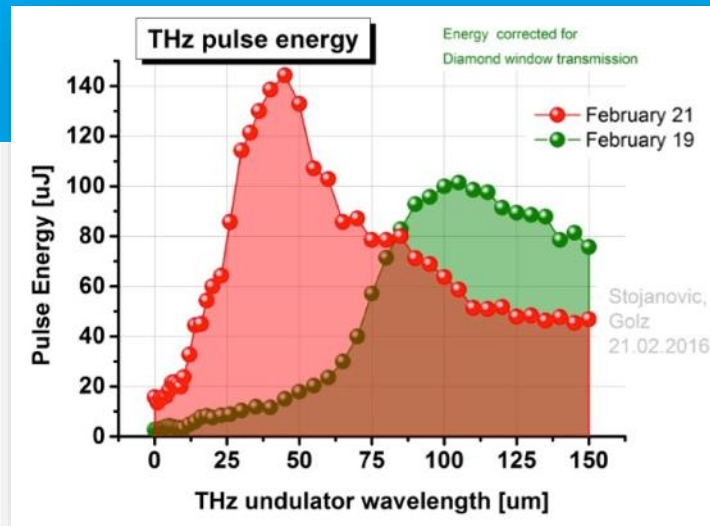
Plasma lens beam test at MaMi

**Dedicated beam time in FLASH used for drive bunch/witness studies**  
**Installations delayed (June 2017), priority in technical groups for XFEL**



# FLASH AND FLASH 2

- > FLASH: similar performance as end of 2015!
  - SASE delivery about 81% of time!
  - New record of THz pulse energy!
- > Simultaneous operation of FLASH and FLASH 2



FLASH1

FLASH2

FLASH1, 10.2 nm, 400 pulses / train

FLASH2, 13.2 nm, 11 pulses / train

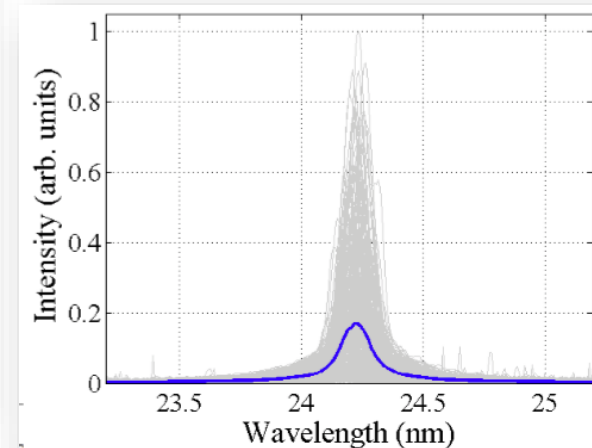
1<sup>st</sup> user run @ FLASH2:  
8 April, 2016

The complex block contains a schematic diagram of the FLASH1 and FLASH2 undulator lines, showing the arrangement of undulator modules and beam transport. It also includes three photographs: a long view of the FLASH1 undulator tunnel, a close-up of a yellow undulator module labeled 'MODUL 6', and a view of the FLASH2 undulator tunnel with yellow support structures.

R. Brinkmann

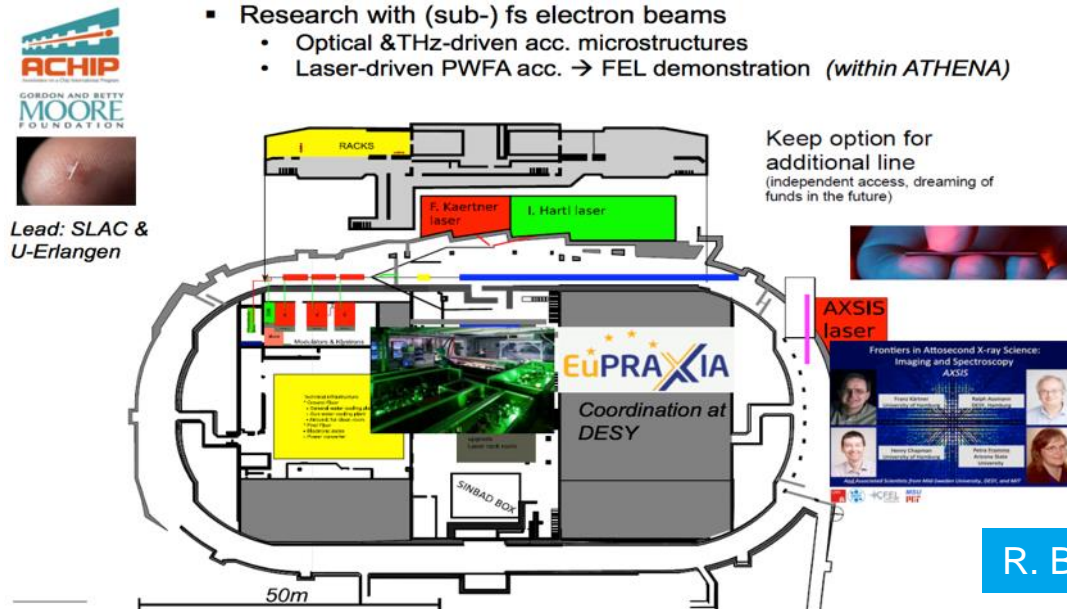
- > S-FLASH seeding studies:

- Brandnew result (May 2016): signal observed at 11th harmonic!



# SINBAD AND ATHENA

- > SINBAD: conversion of DORIS into large dedicated accelerator R&D facility.
  - Tunnel completely emptied, refurbishment under way.
  - Preparing procurement for (a) a short S band linac for external injection into novel accelerators, for (b) an attosecond X ray source based on THz driven dielectric structures (ERC grant) and (c) for accelerator on a chip R&D (Gordon&Betty Moore Grant)
- > ATHENA: Required Helmholtz infrastructure upgrade (30 M€) for staying competitive in world-wide competition on novel accelerators
  - Outstanding review result, still in selection process. Expect decision towards end of the year.



R. Brinkmann



- > “European Plasma Research Accelerator with Excellence in Applications”
- > A Horizon2020 design study for a future large research infrastructure
  - EU funding for CDR (11/2015 – 10/2019)
- > Coordinator: R. Aßmann
- > Project started with 16 excellent partners (plus 16 associated)
  - From HEP, accelerator technology, photon science, laser expertise ... → unique combination of required competences to design & engineer a plasma accelerator and pilot user areas for end of 2019
  - This week: meeting with : 120 registratns in Pisa – scientific / technical kick-off
  - Coordinated by DESY / Helmholtz
- > First layout of CDR produced – to be completed in next 3.5 years. Open site study



# EUPRAXIA

R. Aßmann

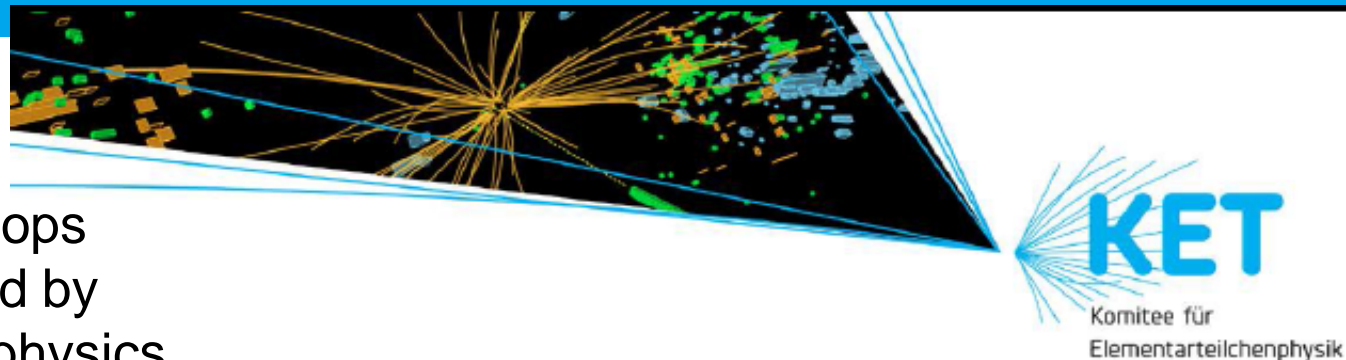


# STRATEGY DISCUSSIONS IN GERMANY





# FUTURE ELECTRON-POSITRON COLLIDERS



- > Series of Workshops is being organised by German particle physics community
- > First on future  $e^+e^-$  colliders
- > Conclusions:

Conclusions of the

KET Workshop on Future  $e^+e^-$  Colliders<sup>a</sup>

Max-Planck-Institut für Physik Munich, May 2-3, 2016

1. The physics case for a future  $e^+e^-$  collider, covering energies from  $M_z$  up to the TeV regime, is regarded to be very strong, justifying (and in fact requiring) the timely construction and operation of such a machine.<sup>i</sup>
2. The ILC meets all the requirements discussed at this workshop.<sup>ii</sup> It is currently the only project in a mature technical state. Therefore this project, as proposed by the international community and discussed to be hosted in Japan, should be realised with urgency. As the result of this workshop, this project receives our strongest support.<sup>iii</sup>
3. FCC-ee, as a possible first stage of FCC-hh, and CEPC could well cover the low-energy part of the  $e^+e^-$  physics case, and would thus be complementary to the ILC.<sup>iv</sup>
4. CLIC has the potential to reach significantly higher energies than the ILC. CLIC R&D should be continued until a decision on future CERN projects, based on further LHC results and in the context of the 2019/2020 European Strategy, will be made.

# NEUTRINO PHYSICS IN GERMANY

## > Short paper by Astroparticle, Particle and Nuclear Physics Communities

- Neutrinos with low energies
- High energy neutrinos
- Astrophysical neutrinos at ultra-high energies



## NeutrinoPhysik in Deutschland

31. Mai 2016

V. Büscher, A. Haungs, M. Lindner, C. Weinheimer<sup>1</sup>, J.P. Wessels<sup>2</sup>, U. Wiedner, C. Zeitnitz<sup>3</sup>  
für die Komitees KAT, KET, KHuK

- > 1) Completion & operation of GERDA, KATRIN and IceCube
- > 2) Participation in JUNO
- > 3) Participation in LNGS programme
- > 4) At a later stage, possibly participation in LBNF/DUNE and/or Hyper-Kmiokande
- > 5) Next generation neutrino telescope: IceCube Gen2., or alternatively KM3NET
- > 6) Support through theory

