DESY News

Thomas Naumann

IPPOG Meeting
GSI, 23 May 2019

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

DESY Photon Research

European XFEL

completed within time and budget (1.2 billion €)
in routine user operation

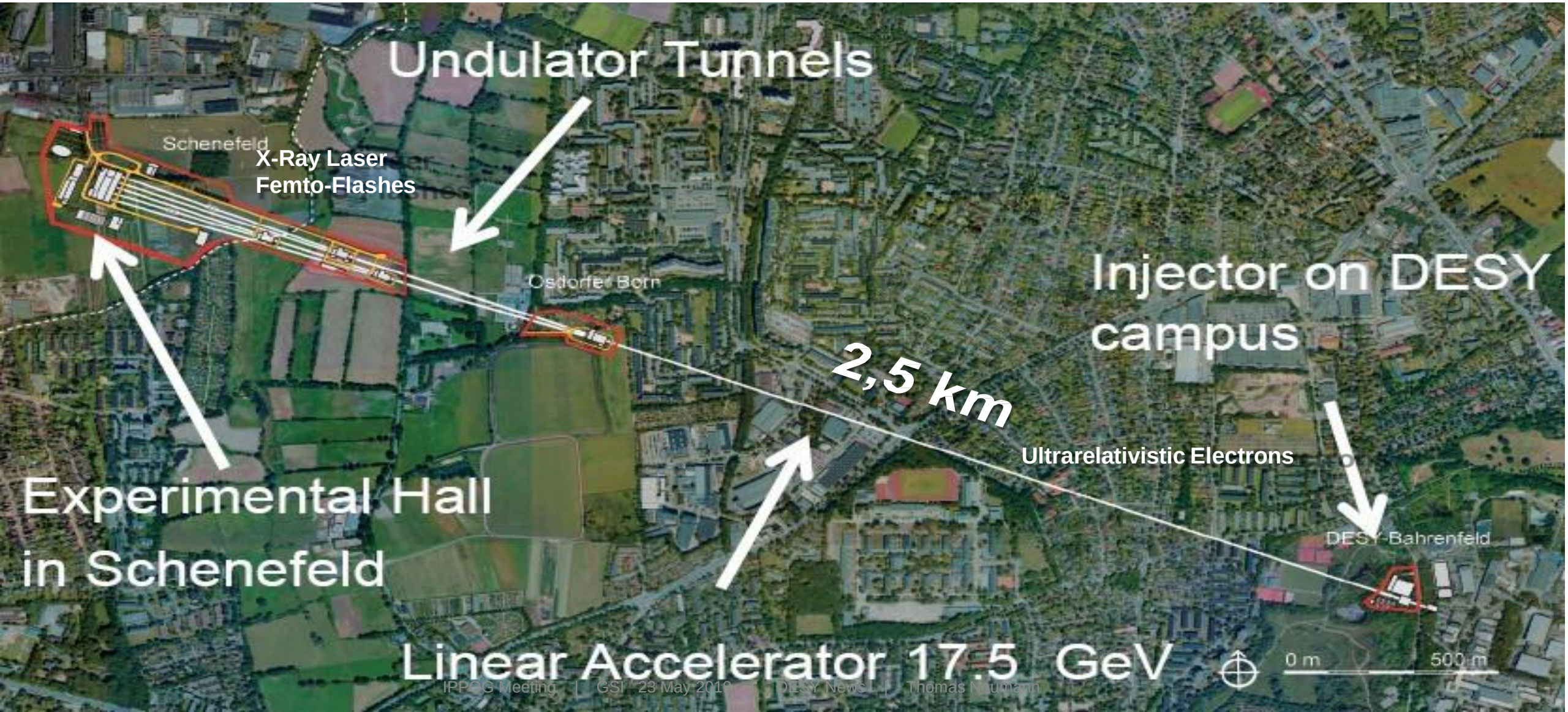
DESY Photon Research

PETRA, FLASH, European XFEL

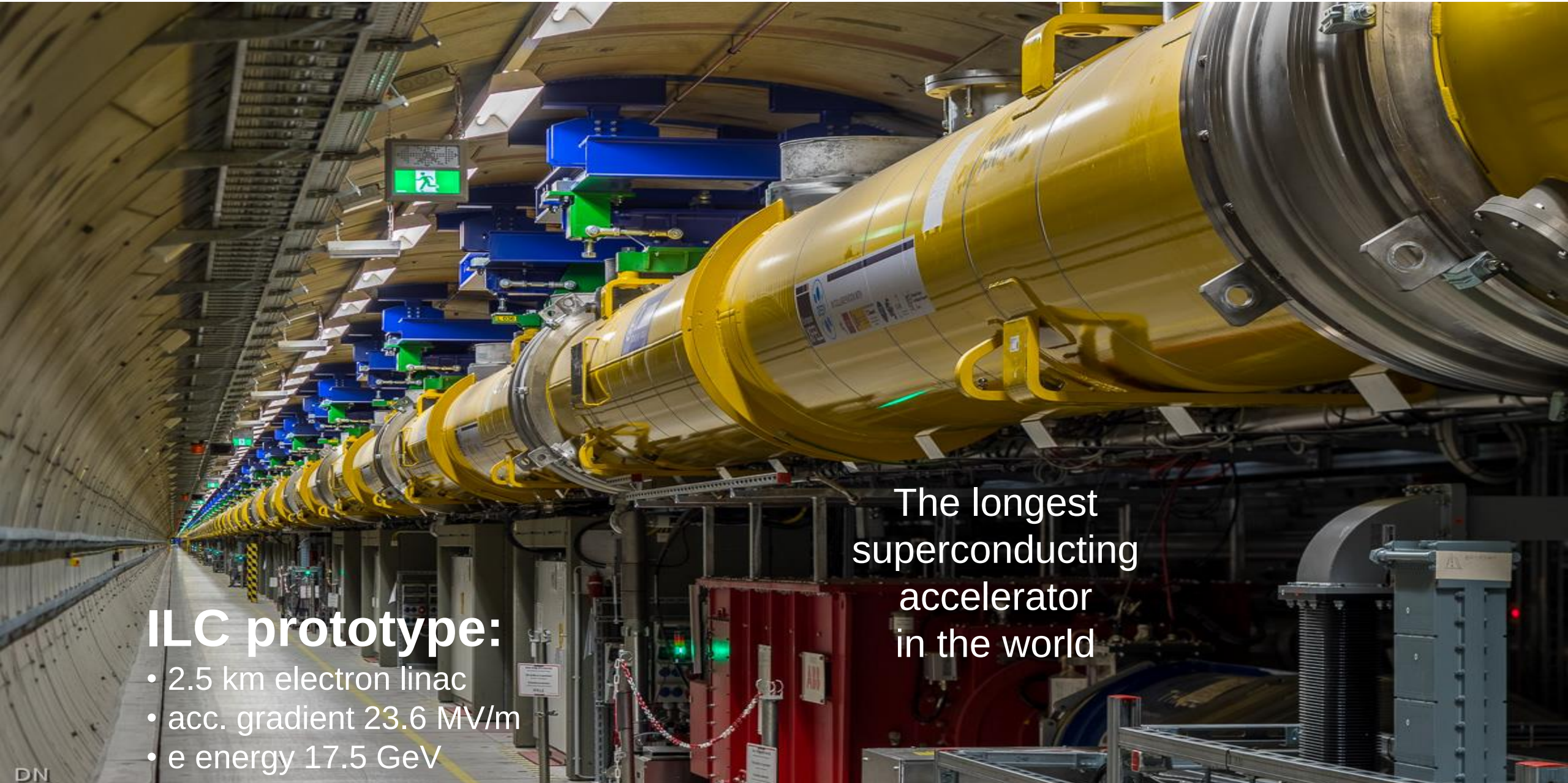
- condensed matter & **materials**:
  structure and dynamics: catalysis !
- **chemistry** at femtosecond level
- **biology** of macromolecules + cells:
  resolve time and disordered 3D structures

- **Science City** Hamburg-Bahrenfeld…
- Center for
  Free-Electron Laser Science CFEL
- Centre for
  Structural Systems Biology CSSB
- Helmholtz Innovation Centre, …

EUROPEAN XFEL



The European XFEL



ILC prototype:
- 2.5 km electron linac
- acc. gradient 23.6 MV/m
- e energy 17.5 GeV

The longest superconducting accelerator in the world

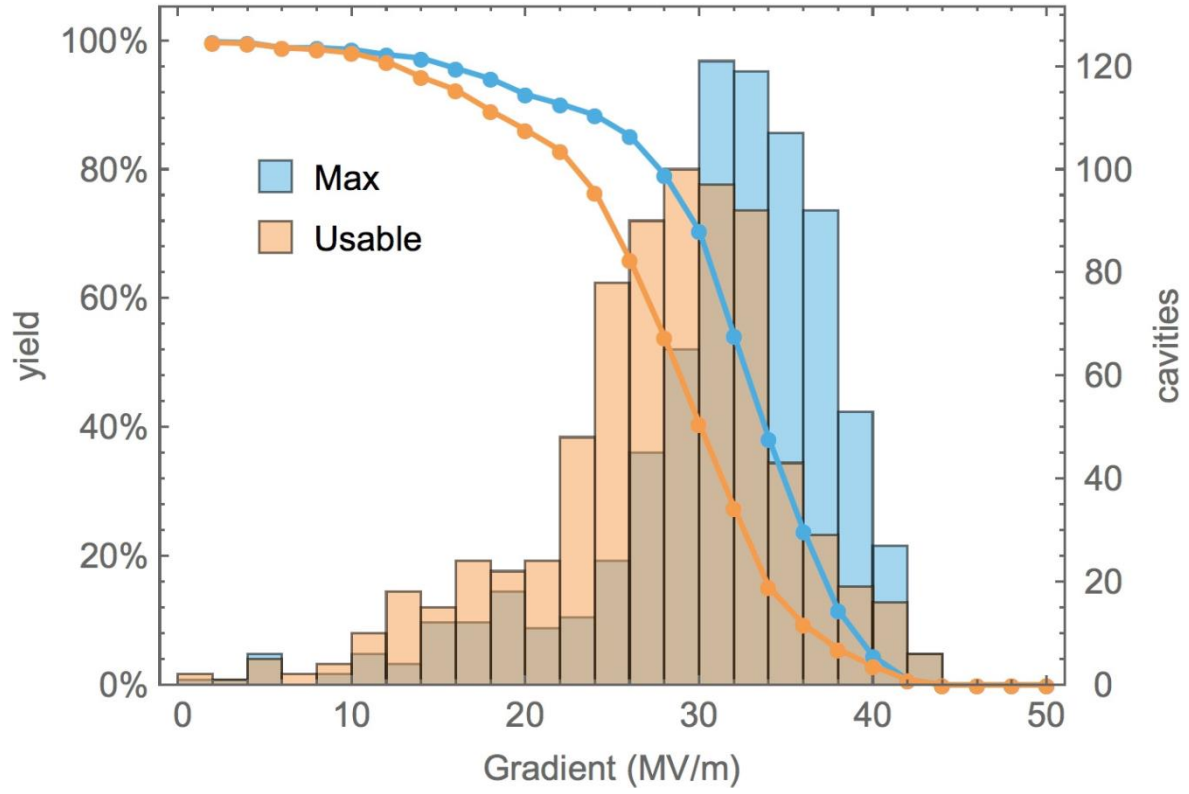
The European XFEL

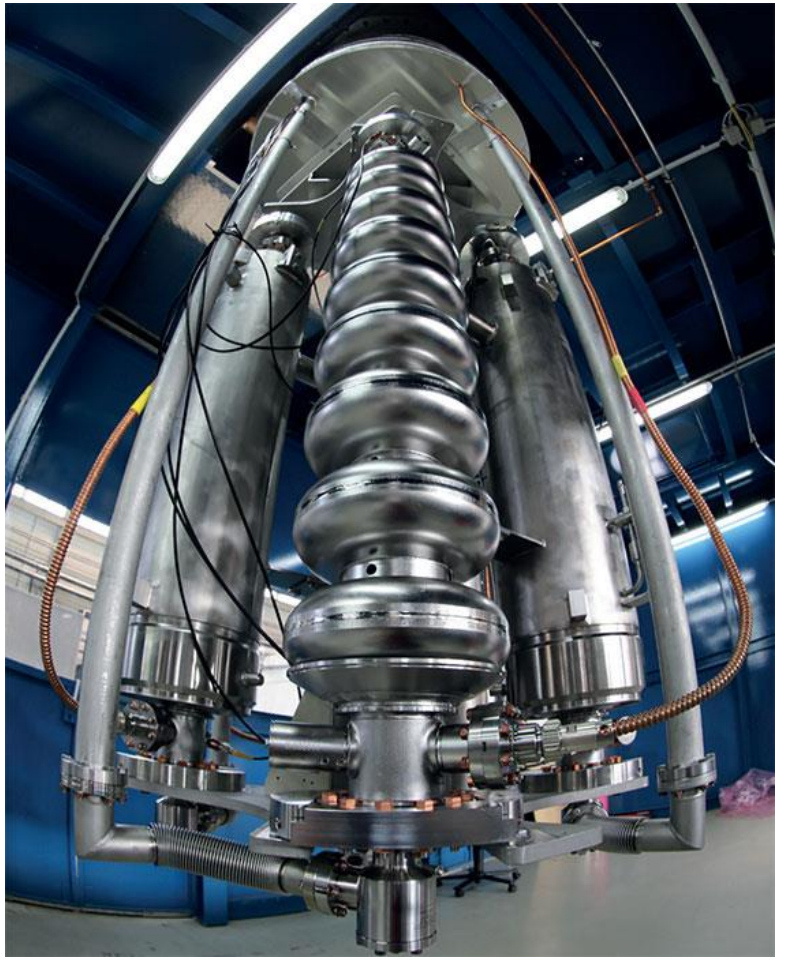
ILC prototype:

- 29 klystrons
- 800 SC cavities
- 96 cryo modules
- 1000 magnets

XFEL cavities

- XFEL: 23.6 MV/m. aver.: 28 MV/m
- close to ILC spec of 31.5 MV/m
- Large scale industrial production: >800 cavities





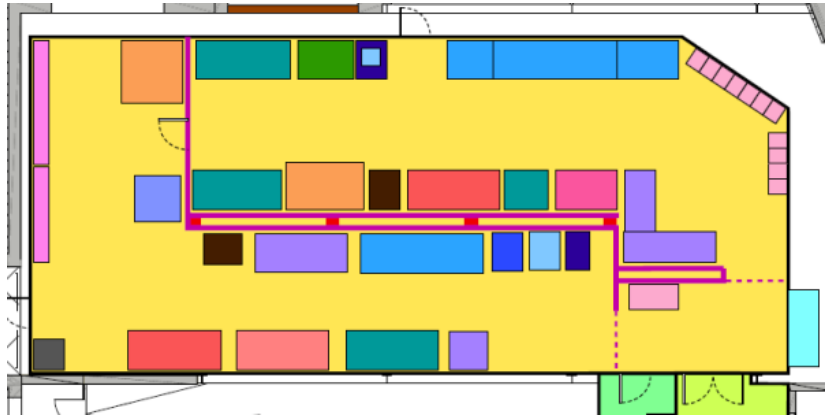
Particle Physics

- ATLAS + CMS groups of 100 people
- LHC Upgrades:
  - inner forward Si trackers
  - Detector Assembly Facility DAF
- ALPS axion search, …

Detector Assembly Facility DAF

10 MEUR investment for LHC upgrades

- DESY buildings 25c and hall 1
- infrastructure & 250 m^2 ISO-6 cleanroom ready
- R&D activities started



ATLAS cleanroom area: microscopes, probe station, gantry system for automated module assembly

CMS cleanroom area: microscopes and automated module assembly system.

Detector Assembly Facility DAF

DESY Building 26 and Hall 1

infrastructure refurbished:

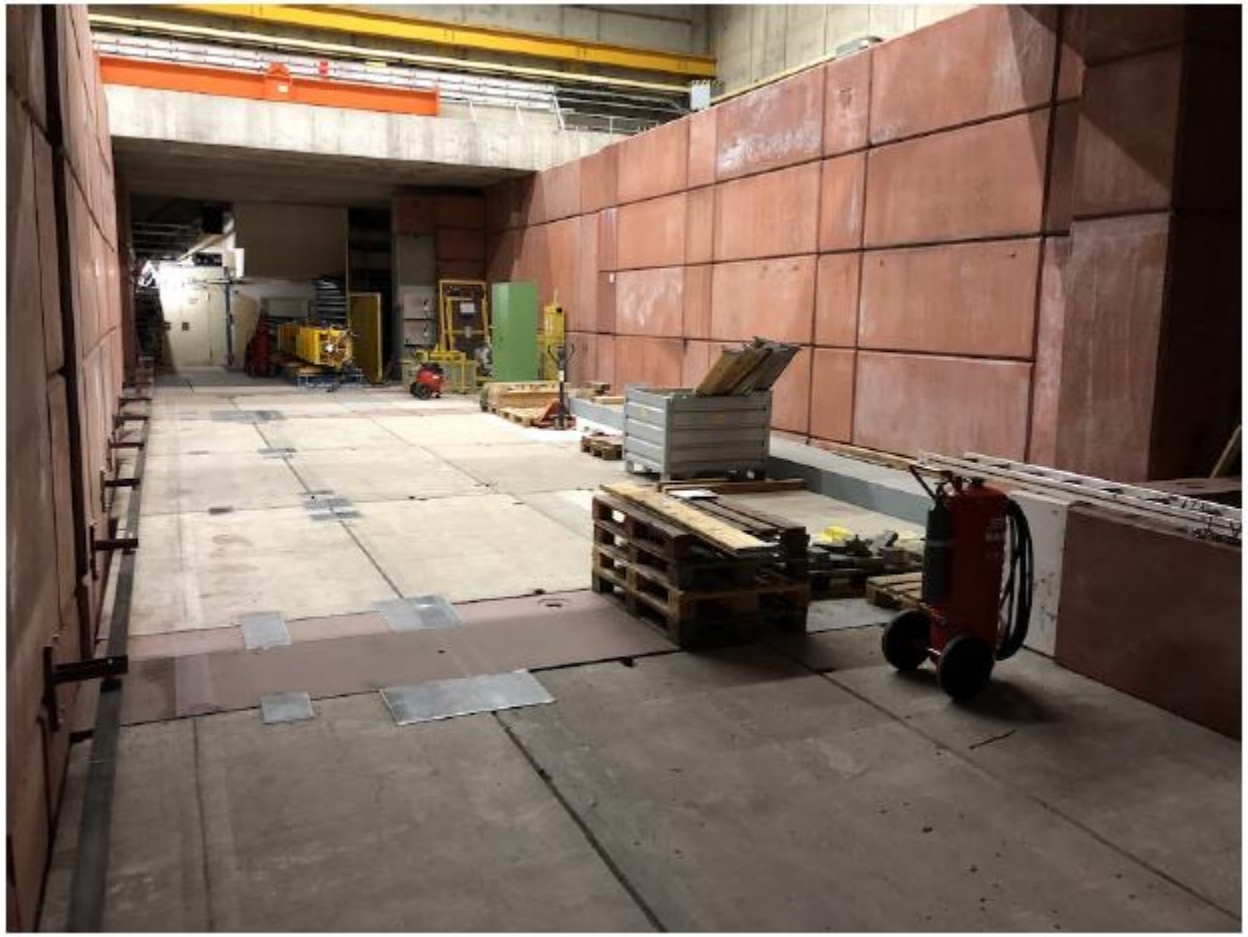
- ISO-7 cleanroom
- assemble 3000 ATLAS + CMS Si modules
  Si inner tracker forward endcaps

endcap integration area

with air conditioning and filter units on top

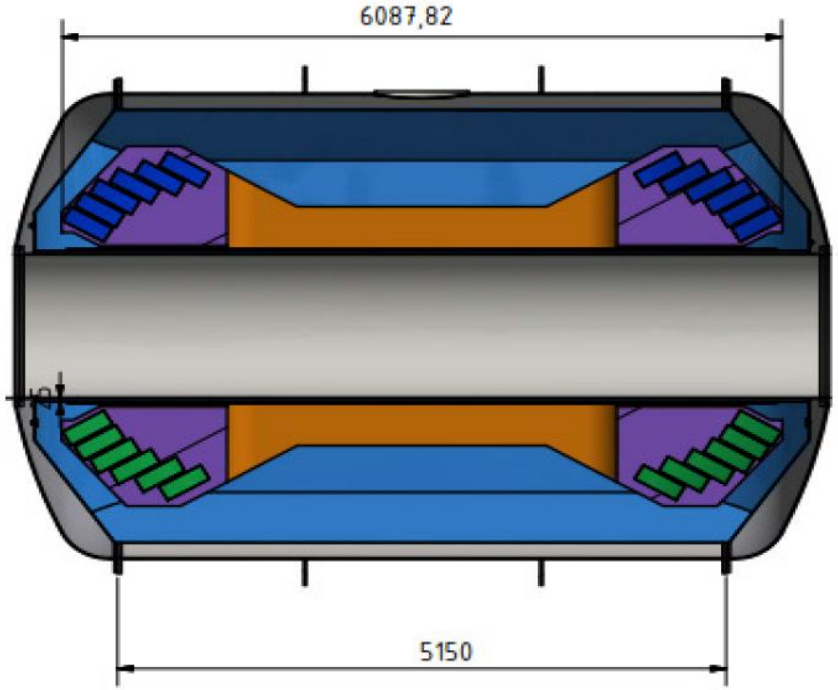
Axion search at DESY: ALPS II

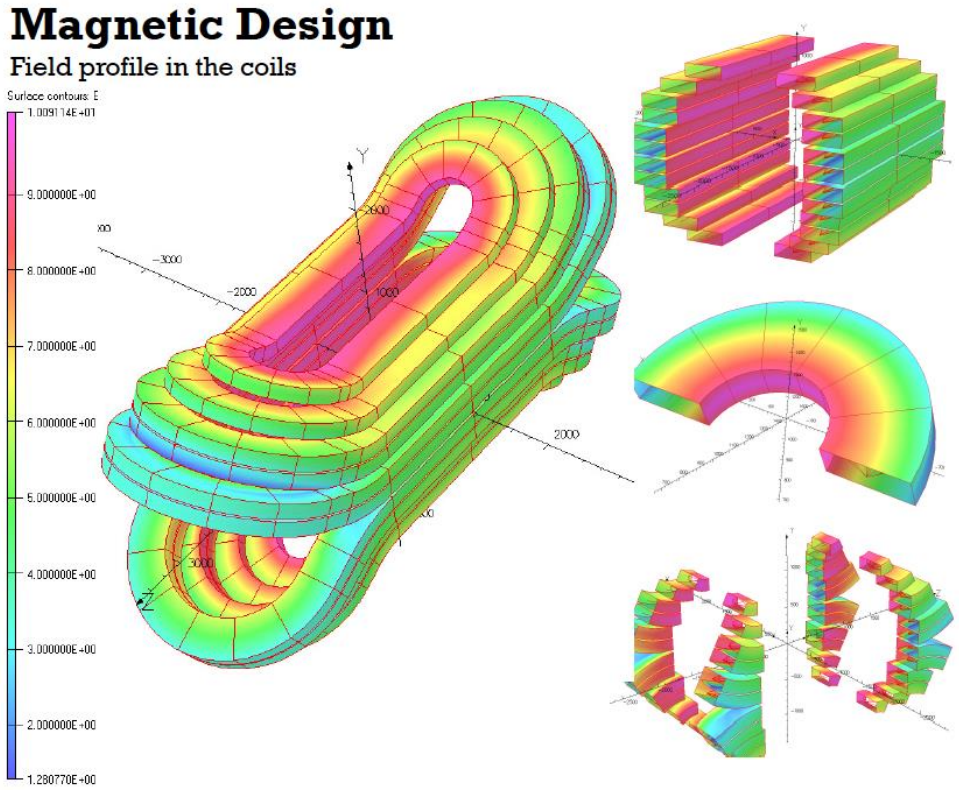
data taking in 2020 in HERA H1 north hall



Future On-Site Experiments

MADMAX – Search for dark matter axions





MADMAX (dark matter)

- Conversion of axion to microwave in 10T B field
  80 dieletric discs made of $LaAlO_3$ with ε = 25
- Aachen, DESY, Hamburg, MPI Munich, Saclay, Tübingen, Zaragoza

MADMAX collaboration

- Collaboration founded at DESY in 2017
  selected DESY site: north hall H1 area
- Site now being prepared
- Magnet studies by Bilfinger-Noell and CEA Saclay

Strategy DESY 2030

for particle physics

Explore the LHC and beyond

- Upgrade ATLAS and CMS for HL-LHC
- Prepare leading participation in future global collider project; awaiting ILC decision from Japan

Belle II Harvest

- Data taking and analysis until ~2027

On-site experiments

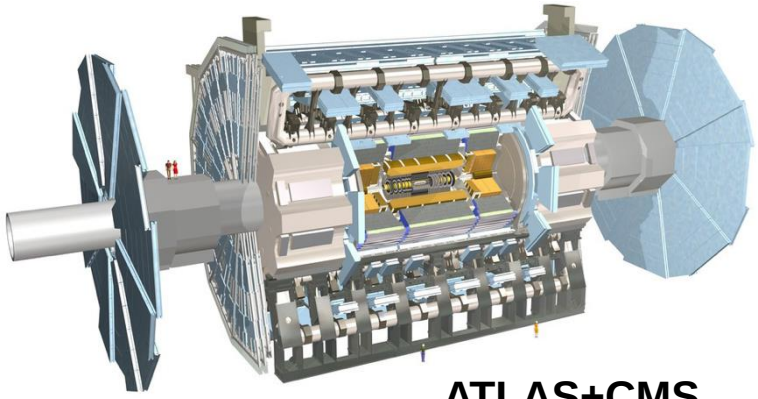
- Prepare future on-site experiment after ALPS-II
- Detector R&D & test beam operation

Theory:

- Maintain broad research spectrum and world-leading expertise

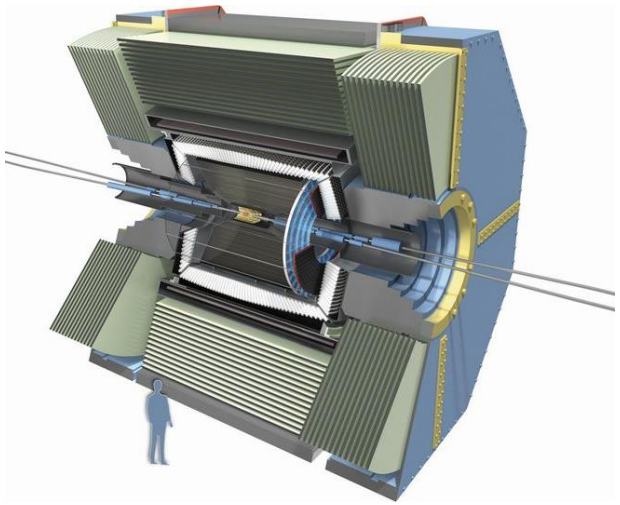
DESY - a hub

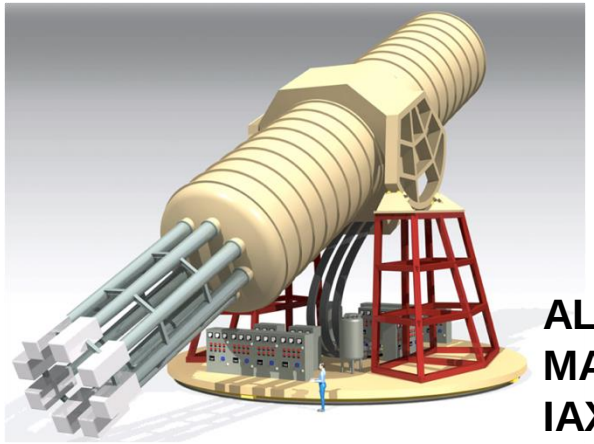
- for projects with large German participation



ATLAS+CMS

Belle II





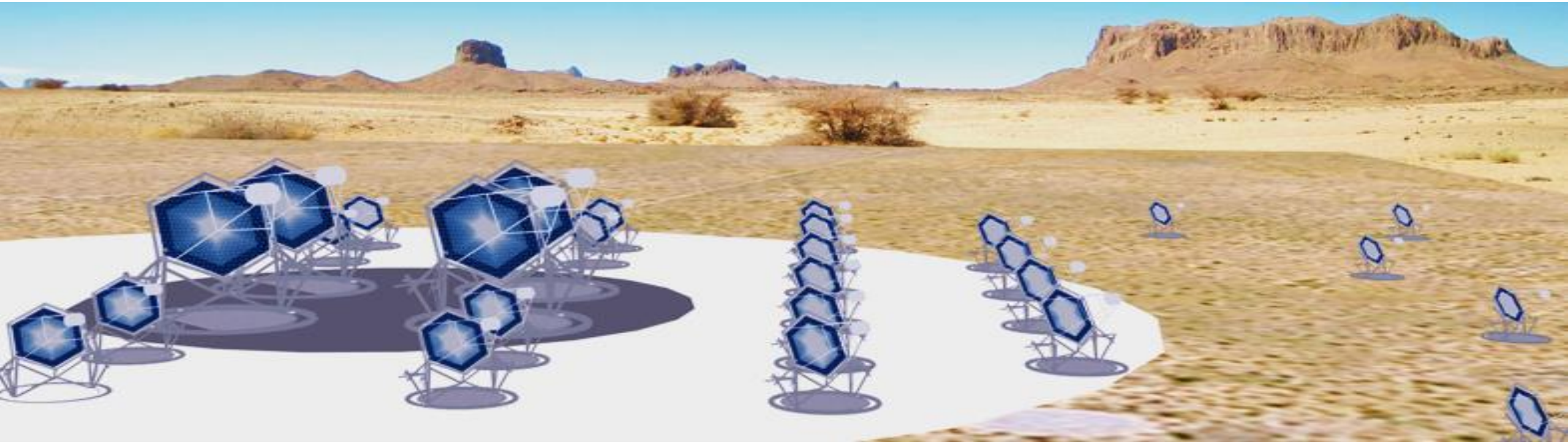
ALPS-II
MADMAX
IAXO

DESY in Zeuthen:

Astroparticle Physics:

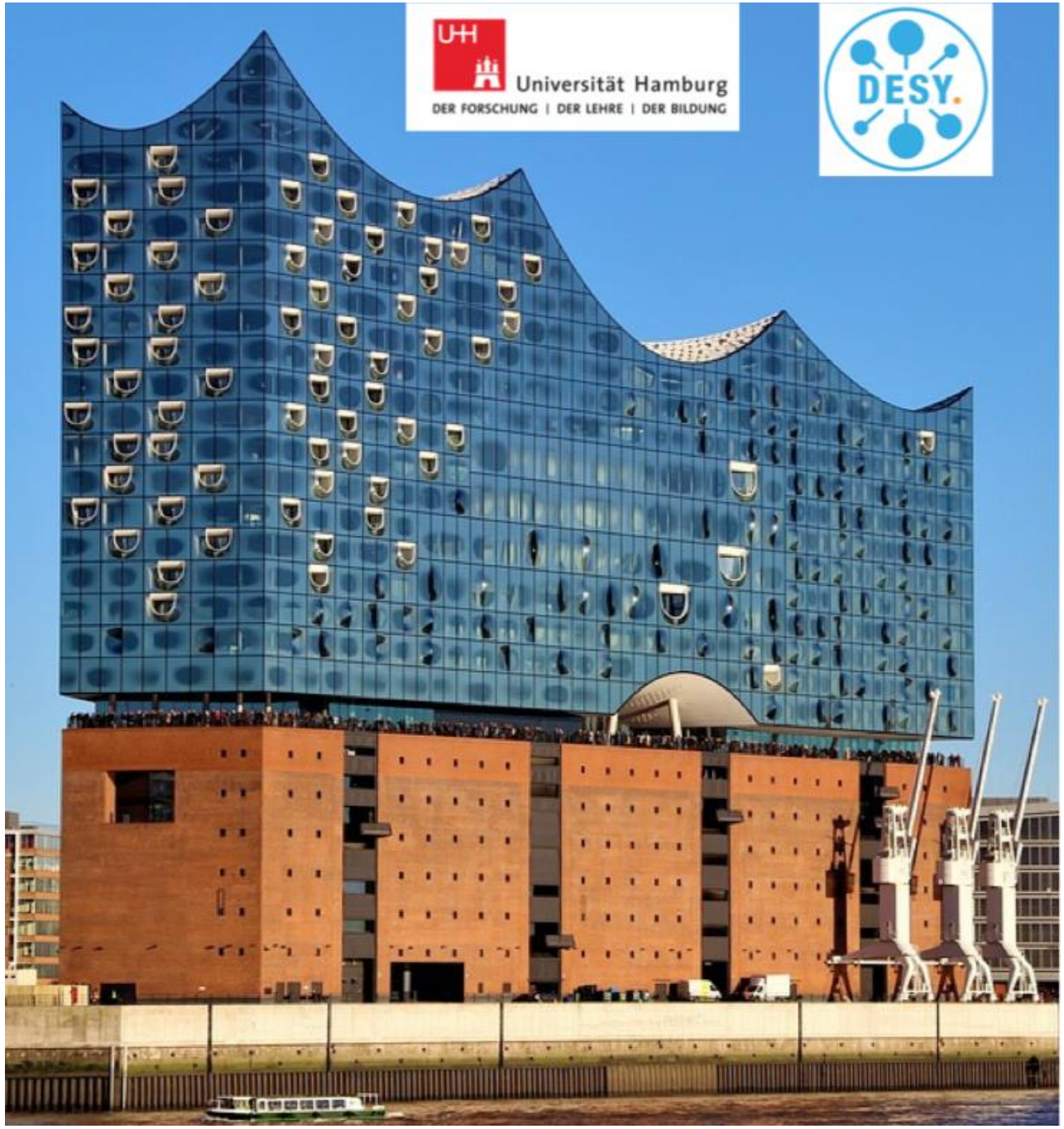
- gamma:
  running: HESS, Magic, Veritas, Fermi;
  under construction: CTA
- neutrino: IceCube
- multi-messenger: γ, υ, gravitational waves

Astroparticle Physics: Cherenkov Telescope Array CTA



- Sites on northern + southern hemisphere:
  Paranal (Chile) and La Palma (Spain)
- Small, Medium (**DESY**) + Large Size Telescopes
- **DESY Zeuthen:**
  - construct medium-size telescopes
  - Science Data Management Centre
  - array control, computing: on-site and offline Tier1 center

CTA Science Data Management Centre at DESY in Zeuthen



EPS HEP 2021

Hamburg

21.-28.July
2021