Summary of Activities and DESY Plans

- Remarks on funding environment

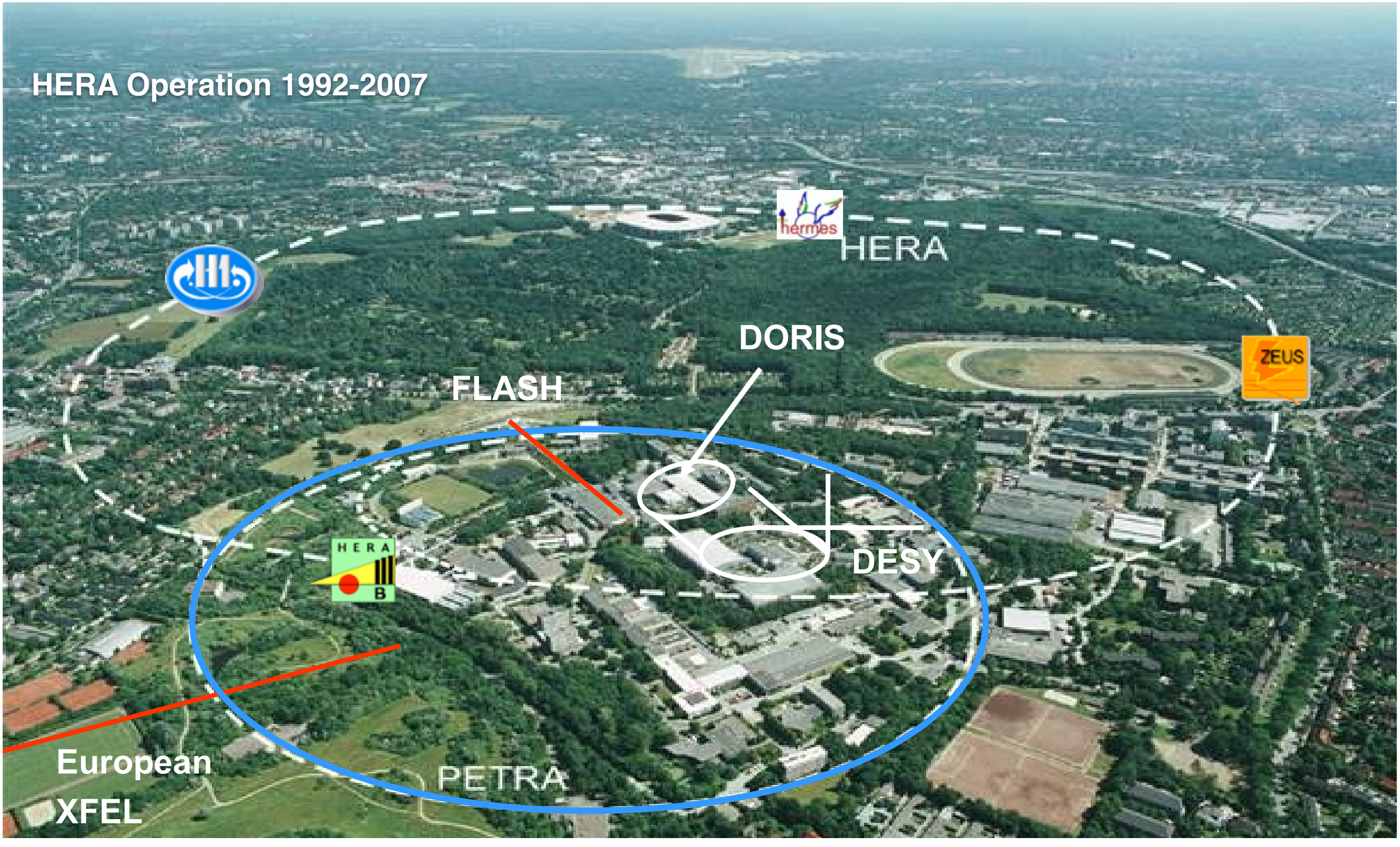
- Activities & Plans
  - thermal mock-up
  - background simulation
  - alignment and calibration
  - PXD slow control / DAQ software
  - DESY grid
  - physics analysis

DESY – Deutsches Elektronen-Synchrotron

- Founded in 1959
  - mission
    - Development, construction, operation and scientific exploitation of accelerators
    - Provide access and services for national and international users
      - **in particular: support of German universities**
- Nationally funded and internationally used research institute
  - two sites
    - Hamburg and Zeuthen
  - base budget
    - 185 Mio Euro
  - funding source
    - 90% federal, 10% state
  - personnel
    - staff ~ 2000
    - users ~ 3000 (1500 from abroad) from 45 nations

Core Competences

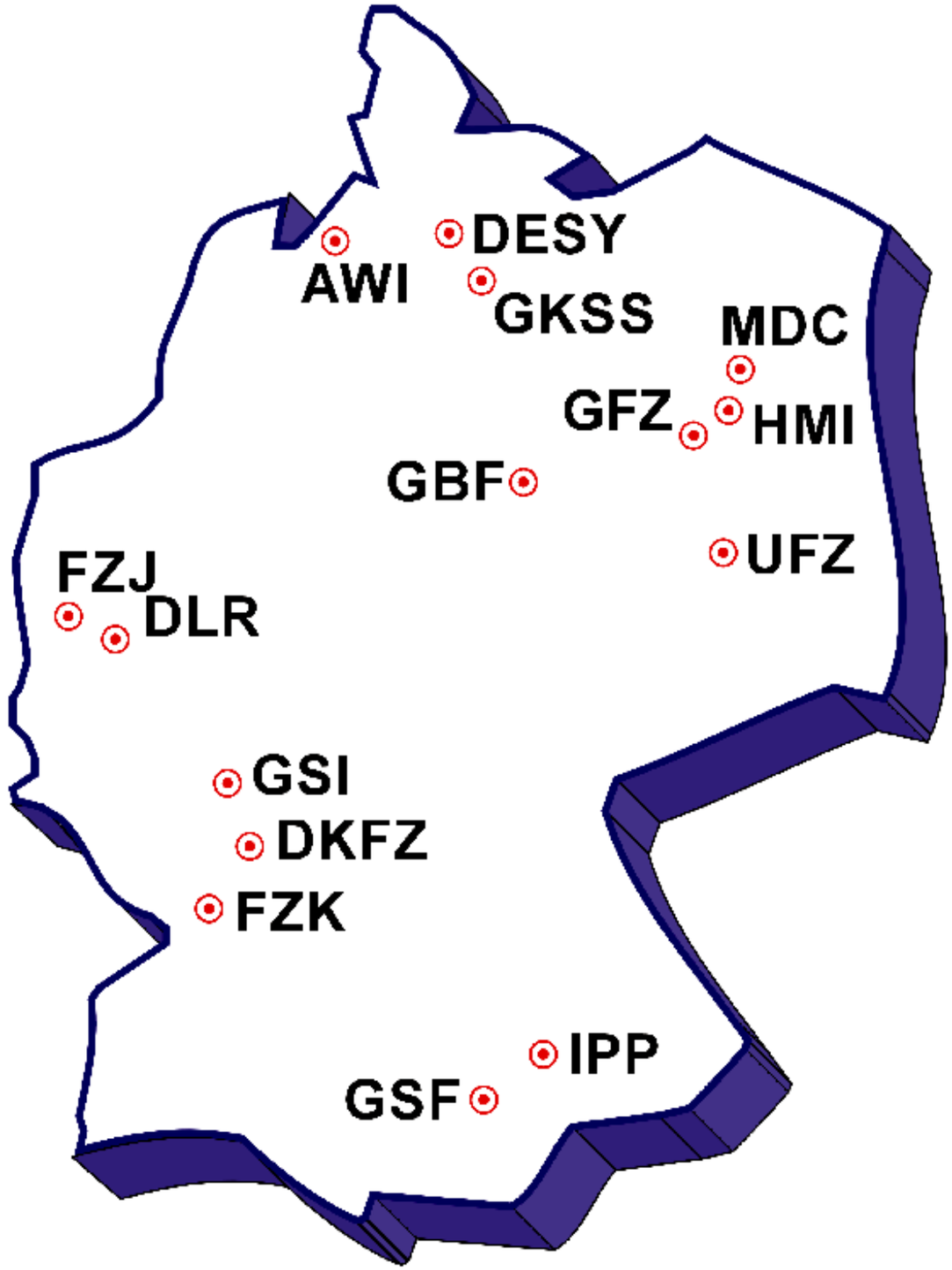
Accelerators at DESY



DESY is Member of Helmholtz Association

- Research Centres in Germany
  - 17
- Employees
  - ~ 24 000
- Budget
  - ~ 2.400 Mio Euro

- Research Fields
  - Health
  - Energy
  - Earth and Environment
  - Key Technologies
  - Structure of Matter
  - Traffic and Space



Five Year Plan for Particle Physics 2010-14

- Helmholtz Research Field „Structure of Matter“
  - Programme Elementary Particle Physics
    - current funding period has seven programme topics
      - HERA
      - LHC
      - Preparation for a future lepton collider
      - Theoretical particle physics
      - Experimental facilites
      - Large-scale facility DESY Grid centre
      - Large-scale facility GridKa (KIT)
    - i.e. Belle II **not included** in current funding period
  - But DESY can spend 20% of its funding for „programme independent research“ which is not subject to evaluation by Helmholtz Association
    - for the time being Belle II is a limited activity at DESY sailing under this flag
      - as is the case for e.g. ALPS and OLYMPUS
- For next funding period [2015-19] it is foreseen to include Belle II and ILC activities in one common research topic: e^+e^- physics

DESY People involved (part time) in Belle II

- Engineers
  - Karsten Gadow (mock-up)
  - Robert Volkenborn (mock-up)
  - NN (technician)

- Physicists
  - Yuri Soloviev (synrad simulation)
  - Claus Kleinwort (alignment)
  - Sergey Yashchenko (alignment)
  - Michael Steder (computing)
  - Alan Campbell (PXD daq)
  - Carsten Niebuhr

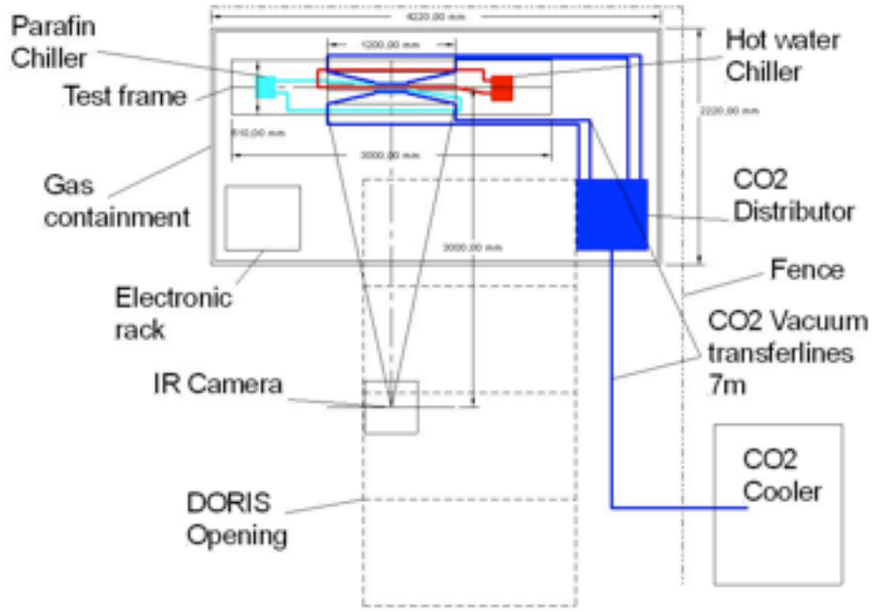
- PostDocs interested in analysis (Belle)
  - Ami Rostomyan
  - Sergey Yashchenko
  - Michael Steder
  - [Torben Ferber]

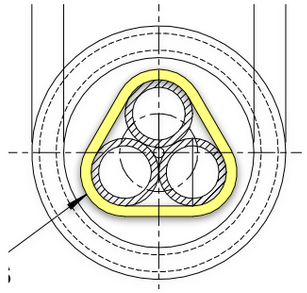
- Grid
  - Andreas Gellrich (IT)

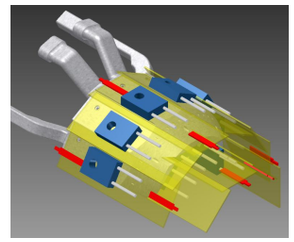
- Consultant
  - Wulfrin Bartel

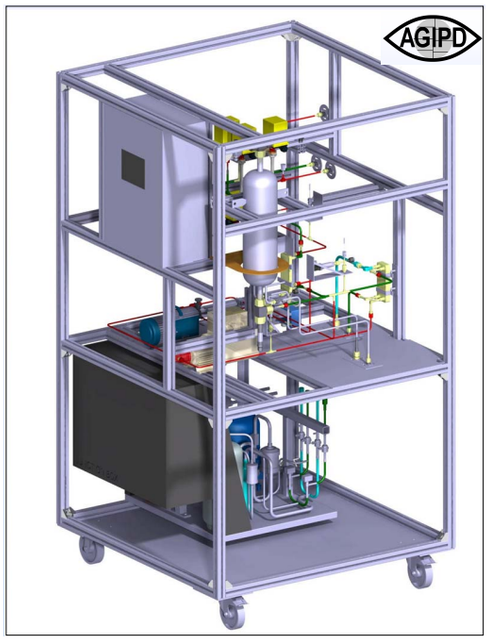
Thermal VXD Mockup

- Plan to build realistic mockup (w.r.t. thermal aspects) including
  - beam pipe
  - PXD
  - SVD
  - interface to CDC (thermal enclosure)
- Study interplay of
  - different heat sources
  - cooling systems
    - CO_2 cooling of EOS and SVD
    - air cooling for switchers / sensors / SVD
    - beam pipe cooling
- Plan to build CO_2 system
  - copy of MARCO or IBBelle
  - start tests with XFEL cooler





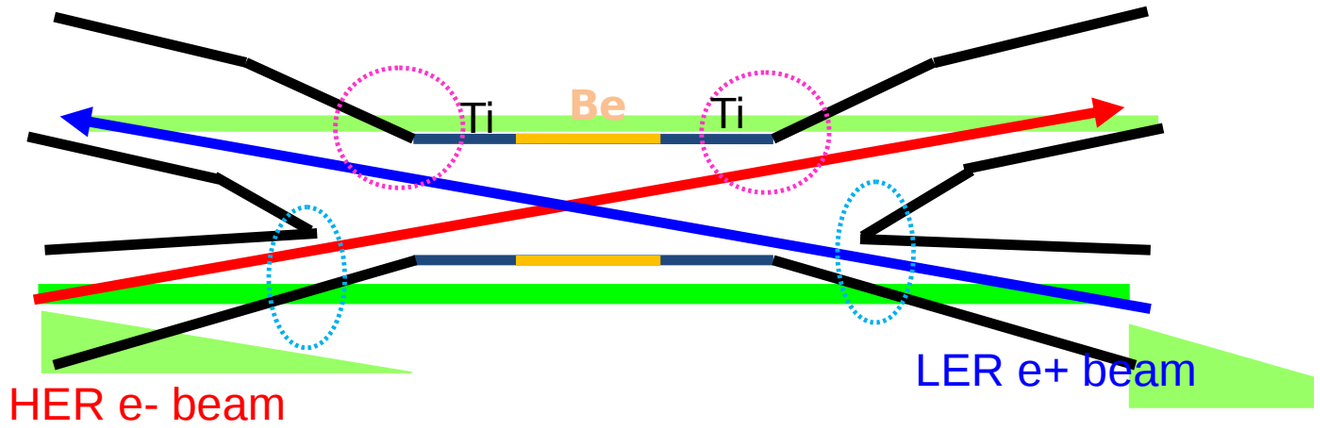




Karsten Gadow
Robert Volkenborn

Background Simulation

- In general background simulation for SuperKEKB/ Belle II already very well advanced
  - exception synchrotron radiation
- PXD/SVD sensitive to large variety of background sources
  - in particluar synrad photons in the range $E_\gamma \sim$ 5-20 keV might be a problem
- First results have been recently obtained
  - so far only simplified configuration implemented
  - continue work to get more realistic estimate



SR must not hit Be part.
SR is desired not to hit Ti part.

Collimator stops direct SR hit on Ti part for SR which is parallel to the beam.

Yuri Soloviev

Sigma interval	Nsrph > 5keV per 2000 electrons (simulated)	Tail probability	Number of e- in tail including halo electrons	Nsrph >5keV per bunch (hits per sec)
-4.7 – -4.9	23	5.1e-7	3.3e+4	380 (9.5e+10)
-4.9 – -5.5	40	2.9e-7	1.9e+4	380 (9.5e+10)
-5.5 – -7.5	66	1e-9	140	5 (1.2e+9)
-7.5 – -10.5	167	1.1e-19	75	6 (1.5e+9)
-10.5 – -13.5	277	7.2e-34	75	10 (2.5e+9)
-13.5 – -16.5	308	2.5e-51	75	12 (3e+9)
-16.5 – -19.5	430	4e-73	75	16 (4e+9)

Alignment and Calibration of Tracking System

- Alignment and calibration with MillePede using General Broken Lines interfaced by GENFIT

Claus Kleinwort
Sergey Yashchenko

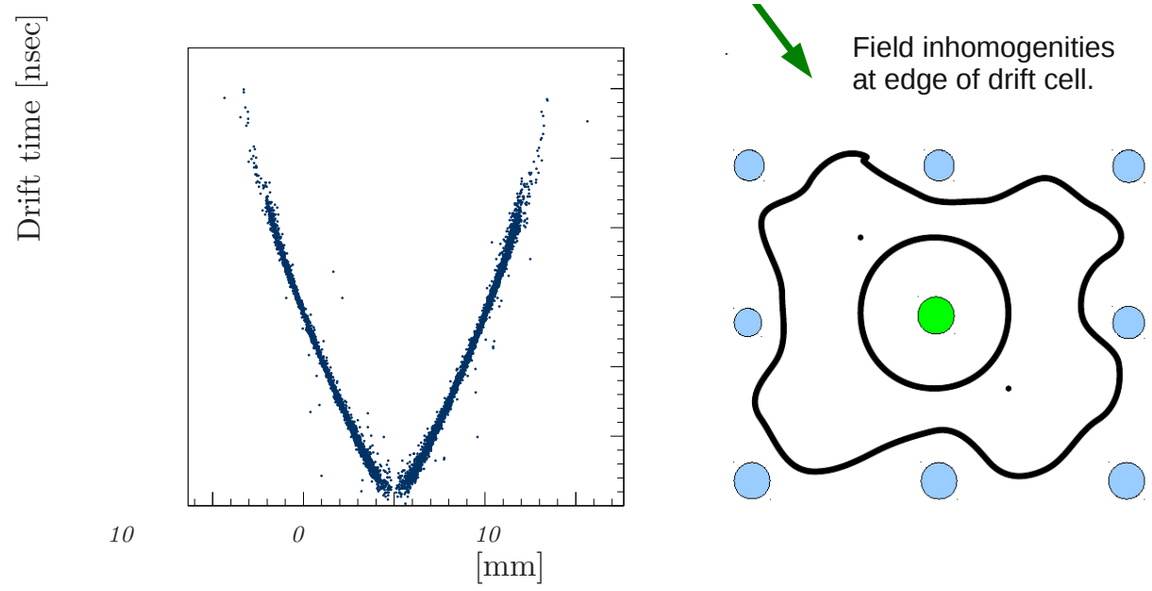
- Experience
  - Since 1997 main user has been H1 for calibration and alignment of the central drift chambers (Millepede I)
    - Online calibration:
      - mean drift velocity v_{drift}, Lorentz angle $\alpha_{Lorentz}$ as a function of time
    - Offline calibration:
      - v_{drift}, $\alpha_{Lorentz}$ as a function of r, φ, B(z,r), E, P, ...
  - CMS Tracker alignment based on MillePede II
    - 25k (curved) Silicon Sensors
    - allow for *O*(100000) parameters
  - General Broken Lines
    - Track model for MillePede
    - Fit implemented as single linear equation system delivering the complete covariance matrix

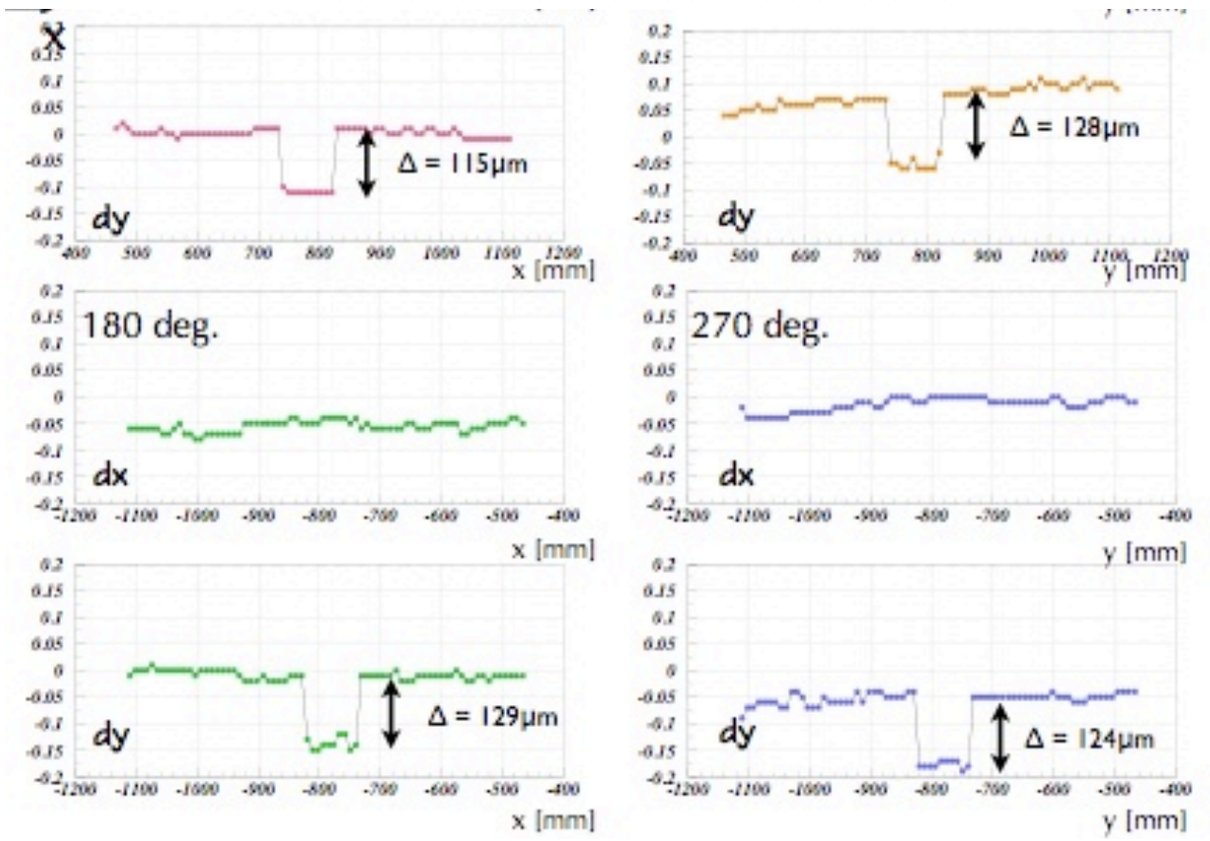
Alignment & Calibration

Summary

- ⋆ Based on H1 and CMS experience
  - Use MP⊗GBL for tracker calibration and alignment
- ⋆ Important is a variety of track samples
  - Interactions, cosmics, different E, B fields, ..
  - To avoid weak modes (χ^2 invariant distortions)
- ⋆ Technical implementation
  - GENFIT as interface, or
  - Custom coded GBL and Mille step (as CMS)

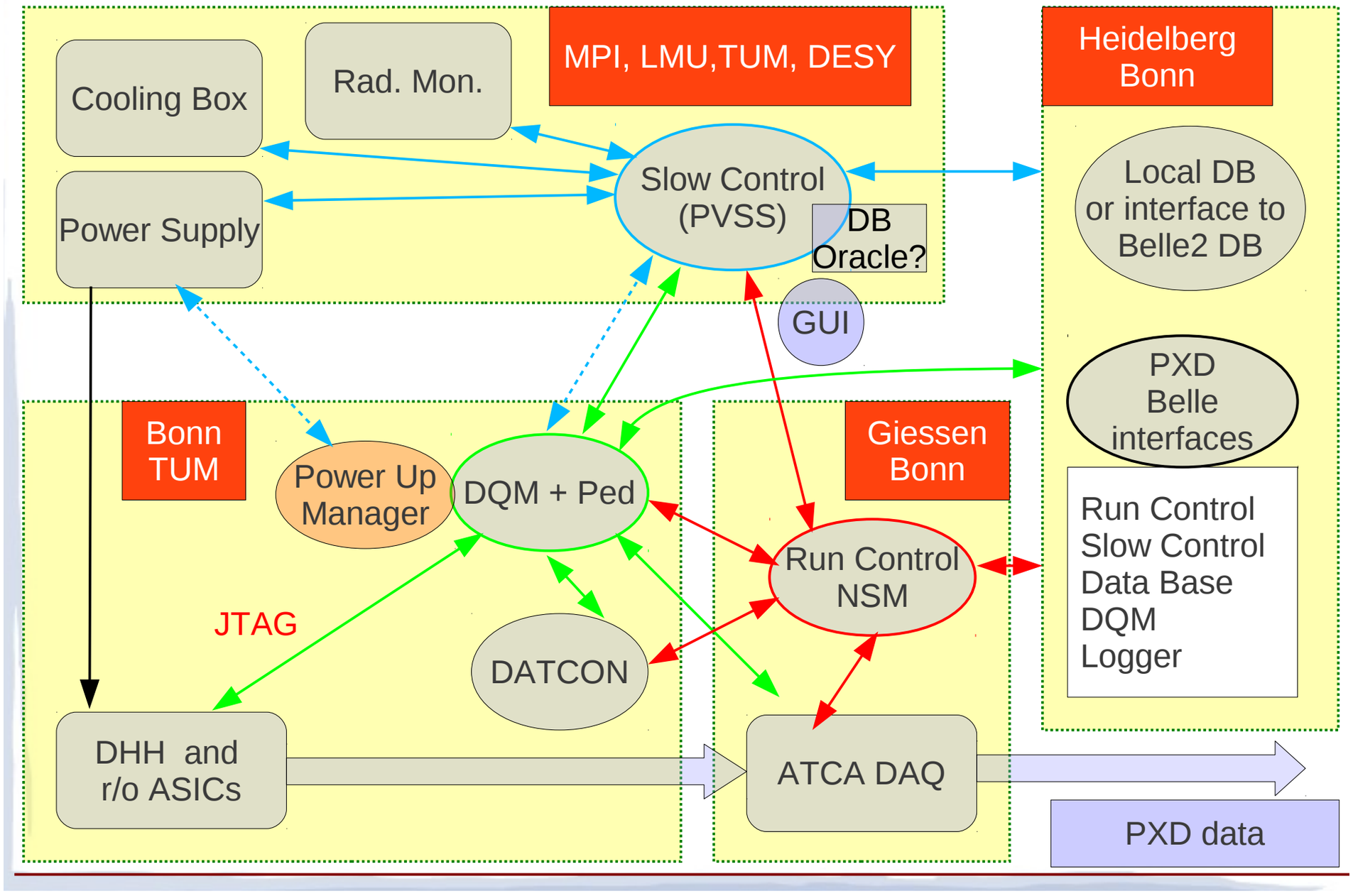
- Exploit potential of consistent treatment and simultaneous fit of large number of parameters
- Example CDC
  - space-drift time relation
  - drift velocity, T0
  - parametristion of edge effects
  - wire positions
  - etc.





PXD Slow Control / DAQ Software

- New working group has recently been formed
  - DESY member: Alan Campbell
- Discussions on structure and sharing of work load have just started



Sketch by
S. Furletov

Belle II @ DESY Grid Center

Andreas Gellrich
Michael Steder

- The DESY Grid Infrastructure supports the VO '*belle*'
  - Already now, a considerable contribution could be made to the BELLE2 MC production due to the opportunistic usage model of the DESY Grid Center
  - BELLE2 resource requirements for Germany are ~10% of the resources at DESY-HH
  - Grid services such as WMS (Workload management Services) to submit jobs globally (!) are available at DESY for the VO '*belle*'
  - A commitment to add more resources (computing and storage) is possible
  - Support is in place via NGI_DE (National Grid) of EGI (European Grid Infrastructure)

- National Analysis Facility (NAF) for BELLE2
  - complement to the batch-oriented globally accessible Grid
  - provides comparable amount of resources
  - optimized for interactive analysis
  - could be opened to the German BELLE2 community

Physics Analysis

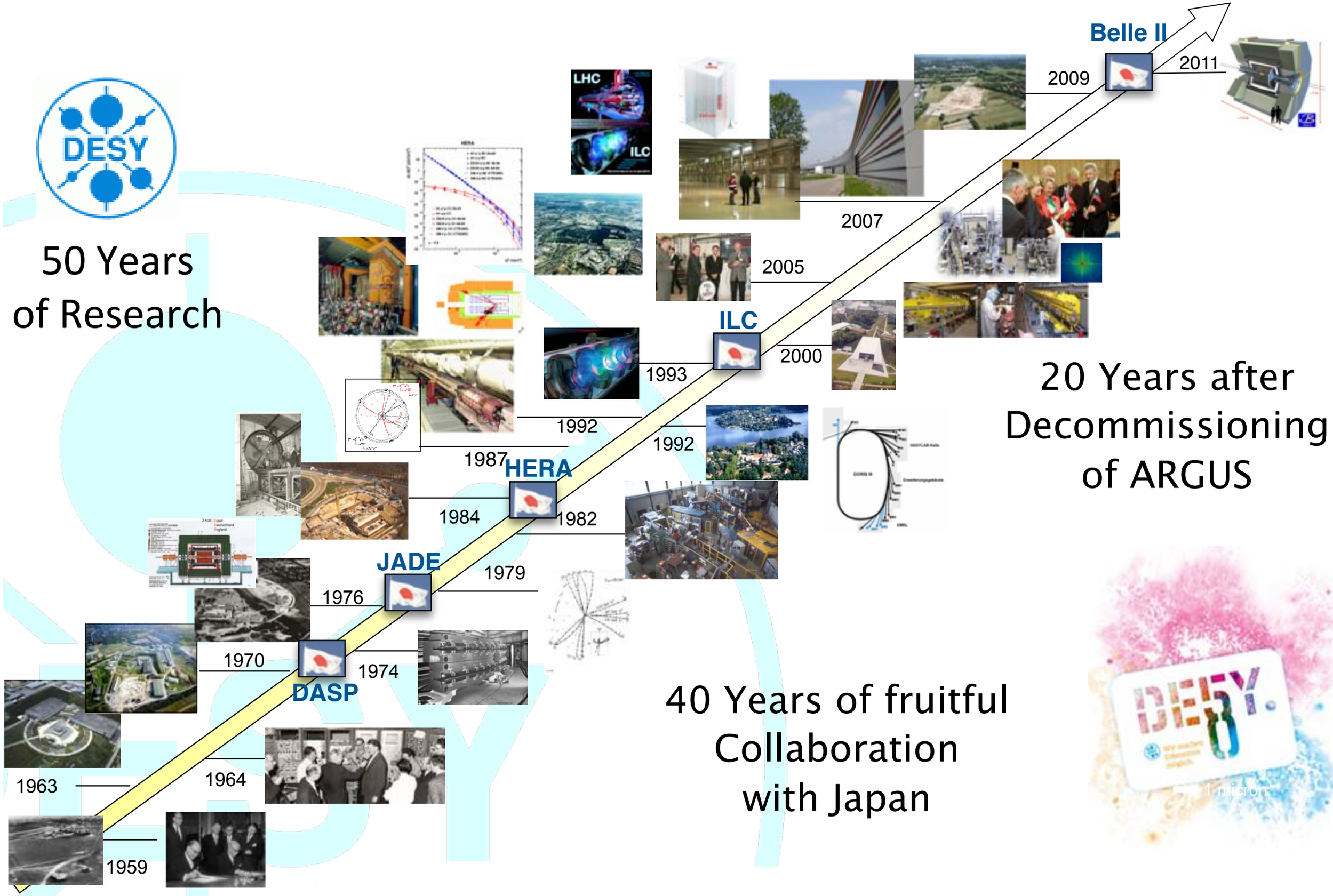
- So far we have concentrated efforts on technical issues around PXD
- Recently several people expressed interest to do physics analysis
  - limited time horizon => Belle data
- Presently evaluating what person power realistically available for continued effort in this direction
- First contacts established to members of τ analysis group in Belle at B2GM
  - it seems that there is no shortage of potential topics ...
- Try to converge in the near future

Summary

- DESY hast entered Belle II at relatively late stage
- Concentrating efforts around PXD project as support for German Universities
- Trying to fill gaps where we have some expertise from HERA, LHC and ILC
- Looking forward to „luminous“ future

50 Years of Research at DESY

50 Years
of Research



20 Years after
Decommissioning
of ARGUS

40 Years of fruitful
Collaboration
with Japan