



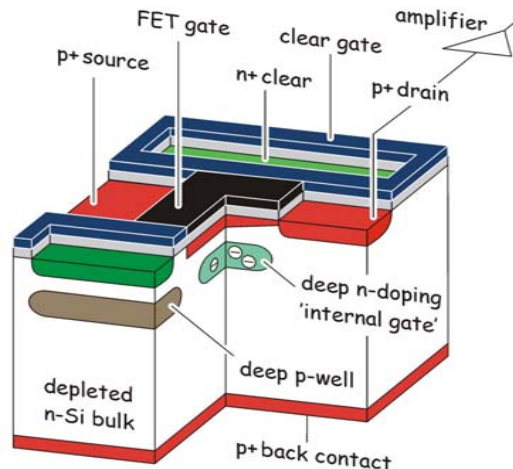
universität**bonn**



The DEPFET-PXD-Project: Towards a Pixel Vertex Detector @ Belle-II



C. Kiesling, Max-Planck-Institute for Physics, Munich
(for the DEPFET-Collaboration)



- Organizational Matters
- News from the German Funding Agencies
- Work Packages Update
- Timeline
- Conclusions & Outlook

DEPFET-Collab. @ Belle-II

Original Collaboration: DEPFET pixel detector @ ILC (since 2002)
now: Unite efforts to deliver a REAL PXD by 2013 for Belle-II

University of Barcelona, Spain
Universitat Ramon Llull, Barcelona, Spain
Bonn University, Germany
Heidelberg University, Germany
Giessen University, Germany
Goettingen University, Germany
Karlsruhe University, Germany
IFJ PAN, Krakow, Poland
MPI Munich, Germany
Charles University, Prague, Czech Republic
IGFAE, Santiago de Compostela University, Spain
IFIC, CSIC-UVEG, Valencia, Spain

with important help from Hawaii, KEK, Vienna

DEPFET@Belle-II

New management:

- IB- Board
- Project Leader
C. Kiesling
- Technical Coord.
H.-G. Moser
- „Integration Coord.“
(Liaison @ KEK)

Institutes and Group Leaders (IB)

| | | | |
|------------|-----|--|------------------------|
| Czech Rep. | PRA | Charles-University Prague | Zdenek Dolezal |
| Germany | BON | University of Bonn | Norbert Wermes |
| | GIE | University of Gießen | Sören Lange |
| | GOE | University of Göttingen | Ariane Frey |
| | HEI | University of Heidelberg | Peter Fischer |
| | KAR | University of Karlsruhe | Thomas Müller |
| | MPI | Max-Planck-Institute for Physics, Munich | Christian Kiesling |
| | | Semiconductor Laboratory (HLL) | Hans-Günther Moser |
| Poland | KRA | Institute of Nuclear Physics, Krakow | Henryk Palka |
| Spain | IFV | Instituto de Fisica Corpuscular (IFIC), Valencia | Carlos Lacasta |
| | URL | University Ramon Llull, Barcelona | Jordi Riera Babures |
| | UBA | University of Barcelona | Lluís Garrido |
| | CNM | Centro Nacional de Microelectronica, Barcelona | Enric Cabruja |
| | IFB | Instituto de Fisica d'Altes Energies (IFAE), Barcelona | Mokhtar Chmeissani |
| | USC | University of Santiago de Compostela | Pablo Vazquez Regueiro |
| | IFC | Instituto de Fisica de Cantabria (IFCA), Santander | Ivan Vila Alvarez |
| Austria | VIE | Institute for High Energy Physics (HEPHY), Vienna | Markus Friedl |
| Japan | KEK | KEK | Toru Tsuboyama |
| USA | HAW | University of Hawaii | Gary Varner |

Funding of the DEPFET-Collab.

Model: The DEPFET-Collaboration will deliver the PXD hardware and ensure the operation of the detector at Belle-II

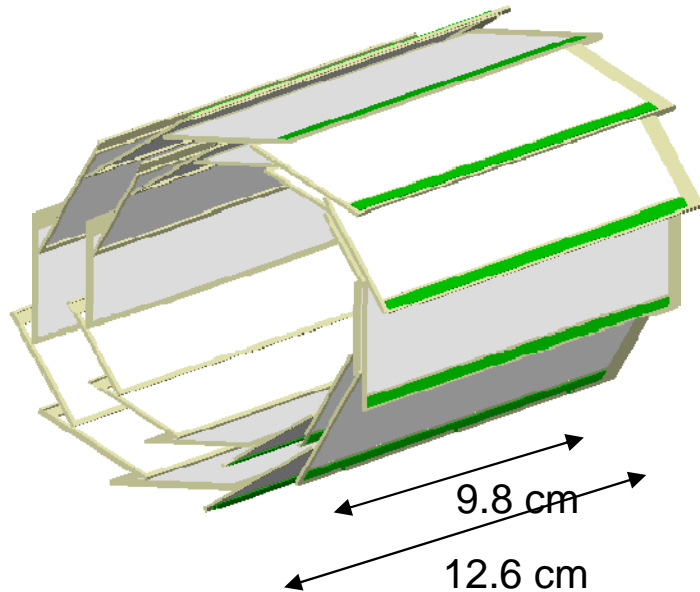
Total cost of deliverables (core cost): 2.5 M€

Funding will be provided by the DEPFET-Collaboration

The German groups have applied for Belle-II funding to the Government in December of 2008 (for the years 2009-2012):

- Asked for total of 2.17 M€ + 13.5 FTE
(includes travel, MPI will contribute another 1 M€)
- Very positive evaluation by the Ministry
Granted funds: 1.05 M€ + 3.5 FTE (48% of requested sum)
- New application possible after approval of SuperKEKB + MoU

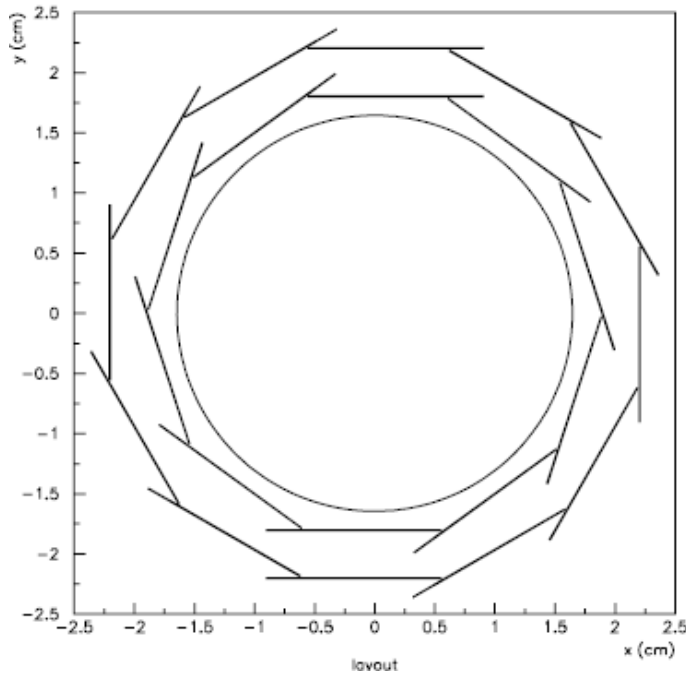
DEPFET Pixel Detector @ Belle-II



Small, thin (50 μ m) Detector:
2 layers, 20 modules (in total)

Beam pipe radius (presently):
1.0 cm in the nanobeam option (NB)

Radii still subject to optimisation:



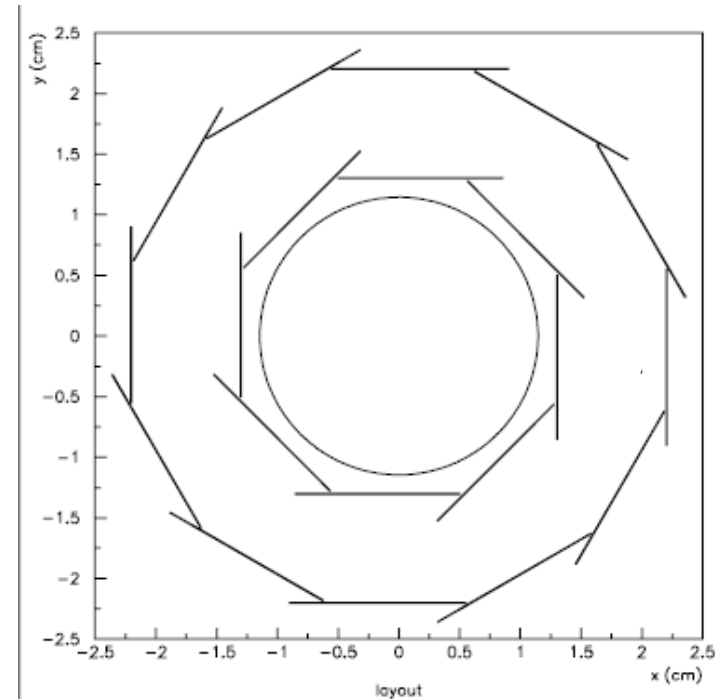
Likely scenario now:

Layer 1 at 1.3 cm
Layer 2 at 2.2 cm

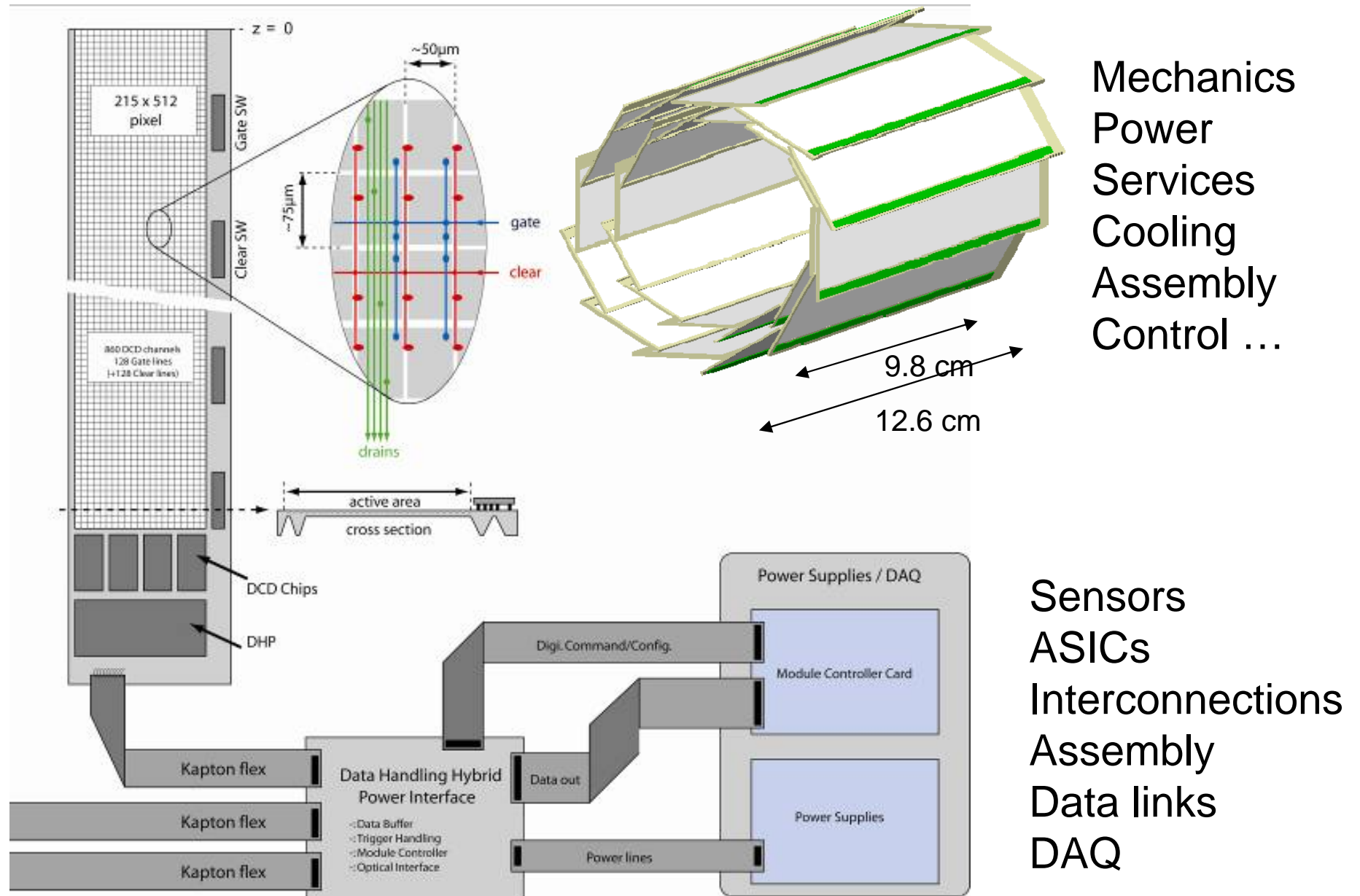
HC
(high current)



NB



Main Components of the PXD



Work Packages and Assignments

| Nr. | Work Package | Lead Institution | Collab. Institutions |
|------------|-------------------------------|------------------|----------------------------|
| 1.0 | DEPFET Modules | | |
| 1.1 | Parameter Definitions | MPI | KRA, PRA |
| 1.2 | Sensor Development | MPI | |
| 1.3 | ASIC Development | | |
| 1.3.1 | Switcher | HEI | |
| 1.3.2 | DCD | | |
| 1.3.3 | Data Handling Processor (DHP) | BON | MPI, UBA |
| 1.3.4 | Data link | | USC, URL |
| | | | |
| 1.4 | Module Design | | |
| 1.4.1 | Sensor Ladder | MPI | HEI, BON, IFV, CNM, IFB |
| 1.4.2 | Kapton Flex | KEK | VIE, BON |
| 1.4.3 | Data Handling Hybrid (DHH) | KEK | VIE, BON |
| | | | |

Work Packages and Assignments (cont.)

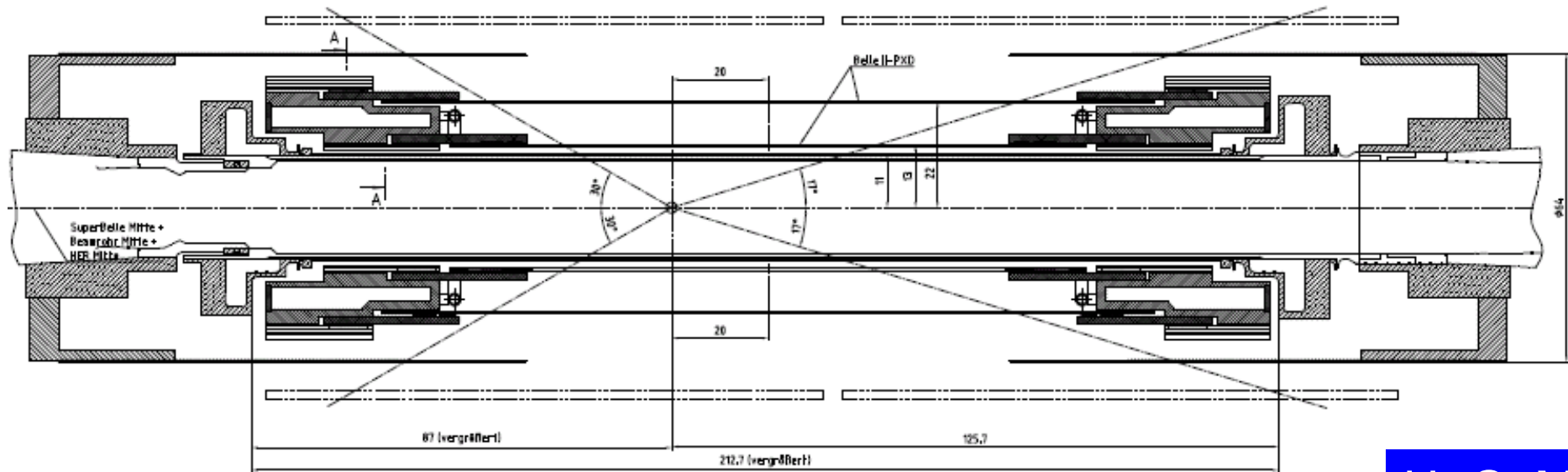
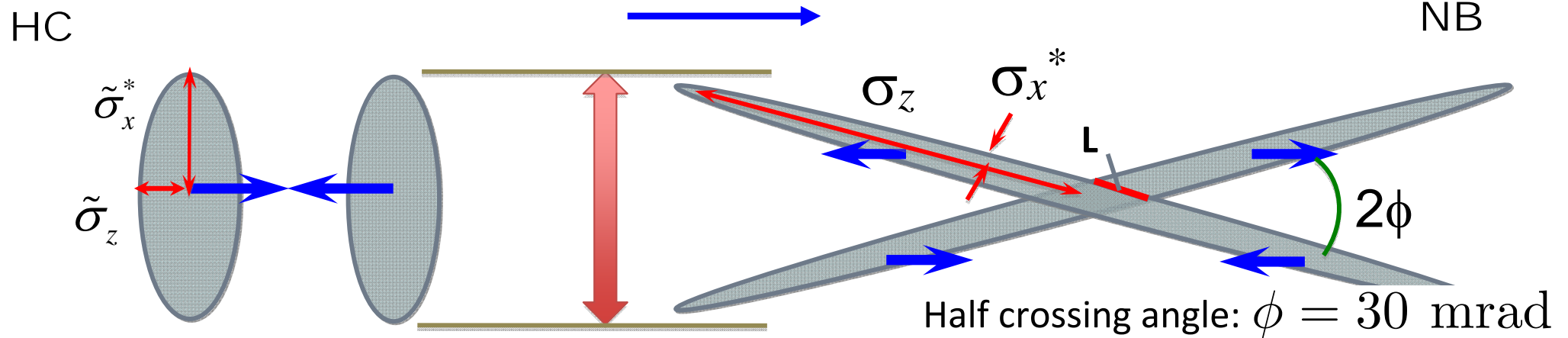
| Nr. | Work Package | Lead Institution | Collab. Institutions |
|-------|---|------------------|------------------------------|
| 1.5 | Mechanical Design | MPI | KAR, HAW, VIE; KRA, IFV, KEK |
| 1.6 | Thermal Issues | KAR | MPI, VIE, KRA, IFV, IFB |
| 1.7 | System | | |
| 1.7.1 | Data Acquisition (pre-event builder) | GIE | KRA, GOE, MPI, KEK, URL, HAW |
| 1.7.2 | Power supplies with slow control | KRA | KEK, USC |
| 1.7.3 | Cooling plant (refrigerator, heat exchanger) | KEK | |

Work Packages and Assignments (cont.)

| Nr. | Work Package | Lead Institution | Collab. Institutions |
|------------|---|------------------|---|
| 2.0 | Test Facilities | | |
| 2.1 | Test beams | PRA | KAR, BON, VIE, IFV, IFC URL, CNM, IFB, USC |
| 2.2 2.3 | Setups for thermal tests Mechanical mockup | KAR | MPI, VIE, IFV, USC, IFC |
| 3.0 | Integration and running-in scenario | | |
| 4.0 | Operation Issues | | |

- meetings of the WP partners on demand
Regular collaboration meetings (~ 2-3 times per year)
- Last „big“ Collaboration meeting: Ringberg Castle, May 4-6, 2009
4 Colleagues from Japan: preference for NanoBeam Scheme

NanoBeam Option



NB: so far only „good points“ for the PXD:

- less SR (~ Belle)
- smaller beam pipe (BP)
- BP parallel to Belle-II solenoid

H.-G. Moser

Main R&D Issues currently

K. Prothmann
Z. Drasal

Sensors:

pixel geometry -> parameter studies
prototyping, radiation hardness (> 10Mrad),
thinning, interconnection with ASICs

Read-out ASICs:

H.-G. Moser

Current Digitizer chip (DCD):

prototype OK, needs test at full speed (x2)

Switcher:

rad-hard design, speed OK, redesign for Belle-II

DHP & DHH:

Zero-suppr: 400 Gpx/s -> 3 Gpx/s (triggered)
-> 2.5 Gb/s per half module

DAQ:

100 Gb/s total -> Gießen ATCA system

K. Prothmann, S. Lange

Mechanics:

Mounting structure, cooling, alignment ...,

F. Simon

T. Müller

A. Moll

Timeline

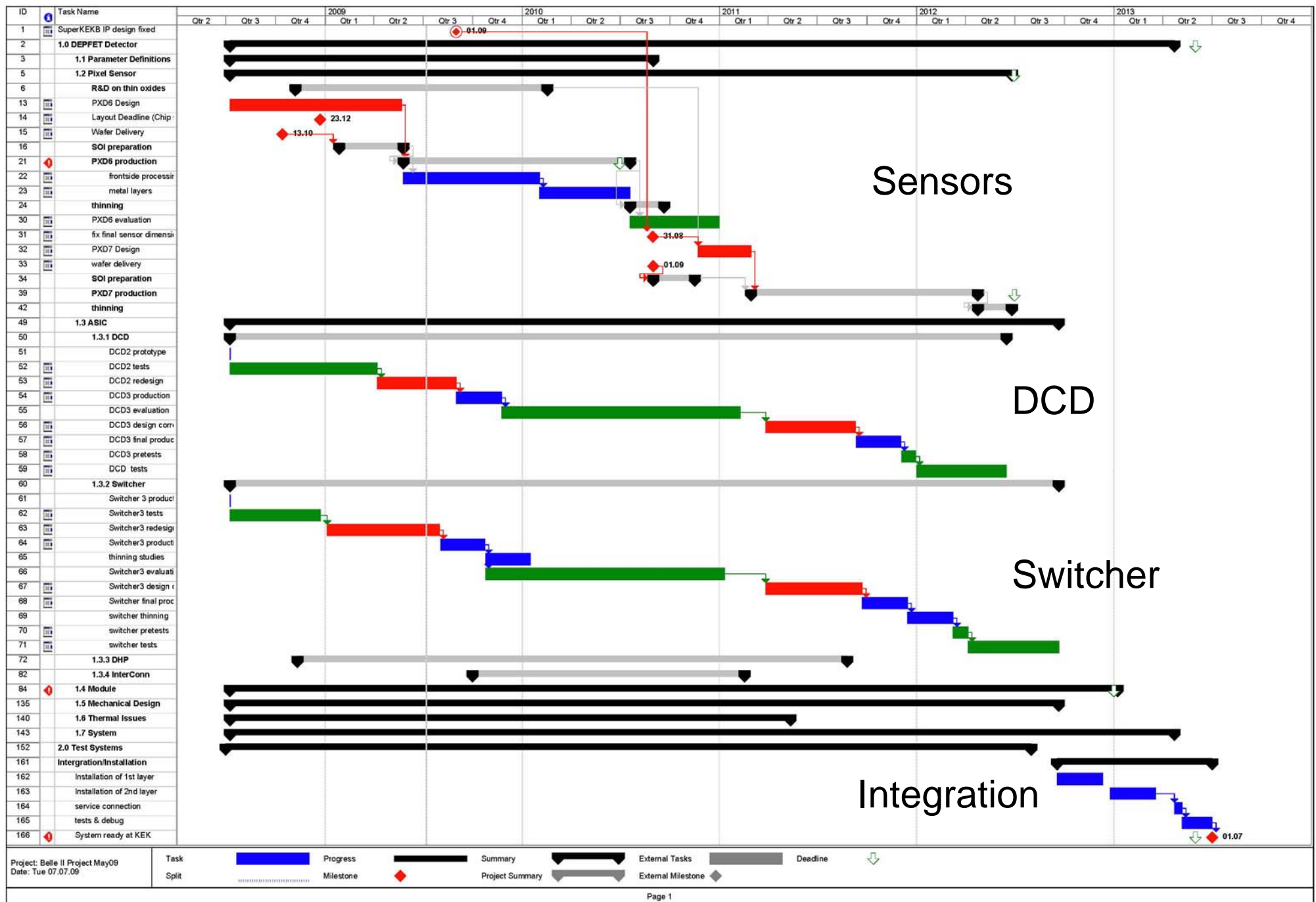
2009

2010

2011

2012

2013



Conclusions and Outlook

- DEPFET Collaboration stands firmly behind the PXD project for Belle-II
- Belle-II PXD group has decided on DEPFET as baseline
- Management structure of the DEPFET Collaboration @ Belle-II created
- Work packages are defined, lead institutions (+contacts) are identified
- Timeline for the project is established and agreed (but tight!)
- Working Groups have entered stage of detailed work for Belle-II PXD
- German funding agencies have approved about 50% of the core cost signals for further funding when SuperKEKB is approved
- Progress of workpackages needs now close monitoring and possibly some rework
- Next big step: TDR by spring 2010