Fundamental Particles and Forces

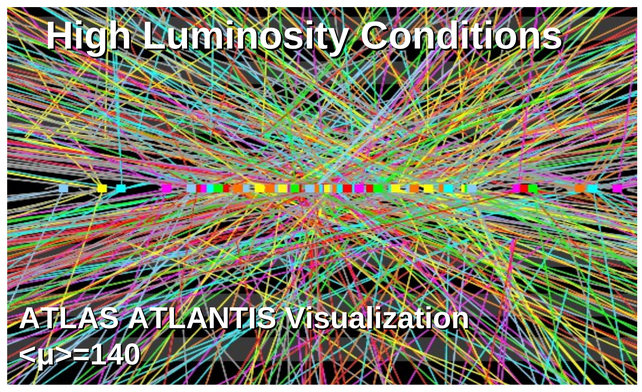
Matter and the Universe

ATLAS Silicon Strip Tracker Upgrade

Kerstin Tackmann (DESY) for the DESY ATLAS Group

LHC High Luminosity Upgrade

Proton-proton collision energy √s=14 TeV
Instantaneous luminosity of L=5x10^{34} cm^{-2}s^{-1}
Average number of 'pile-up' collisions per event <μ> = ~140
Integrated luminosity 3000 fb^{-1} over entire run

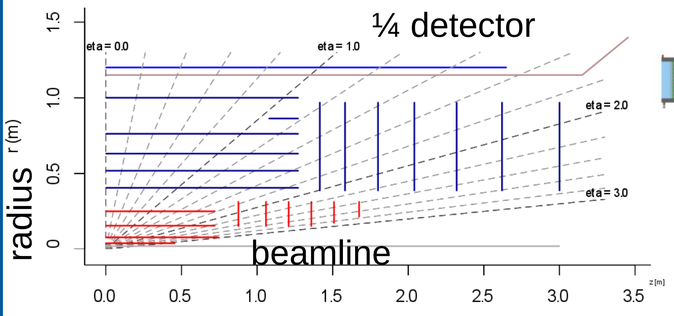


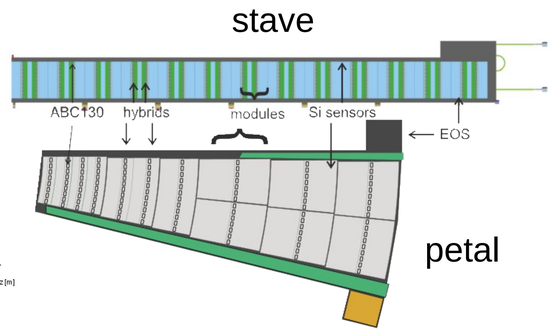
Proton-proton collision vertices from soft interactions

ATLAS Phase II Tracker Upgrade

- High Luminosity Upgrade extends possibilities for measurements and new physics searches
- Significant experimental challenges: current ATLAS Inner Detector to be replaced by all-silicon tracker suitable for high detector occupancy and high radiation tolerance

Phase II Strip Tracker Layout



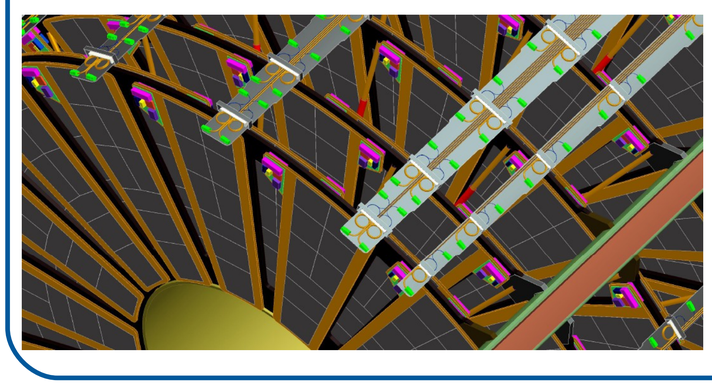


Upgraded Tracker Layout

5 +1 barrel layers D
7 Endcap layers
Tracker Barrel built from **Staves**
Tracker Endcap from **Petals**

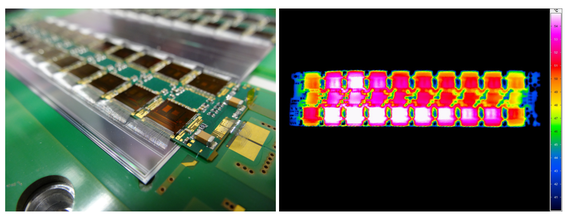
Strip Tracker Endcap

- 7 disks on each Endcap
- 32 petals/disk
- Petal surface: 0.083 m^2
- 116 readout chips/petal

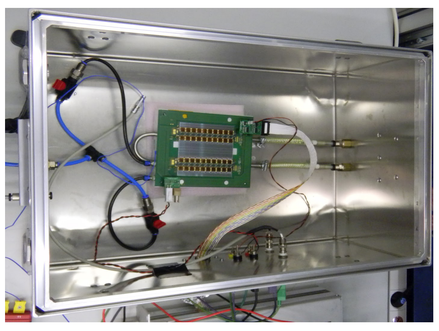


Total Endcap:
- 224 petals
- 25984 readout chips
- 18.6 m² silicon

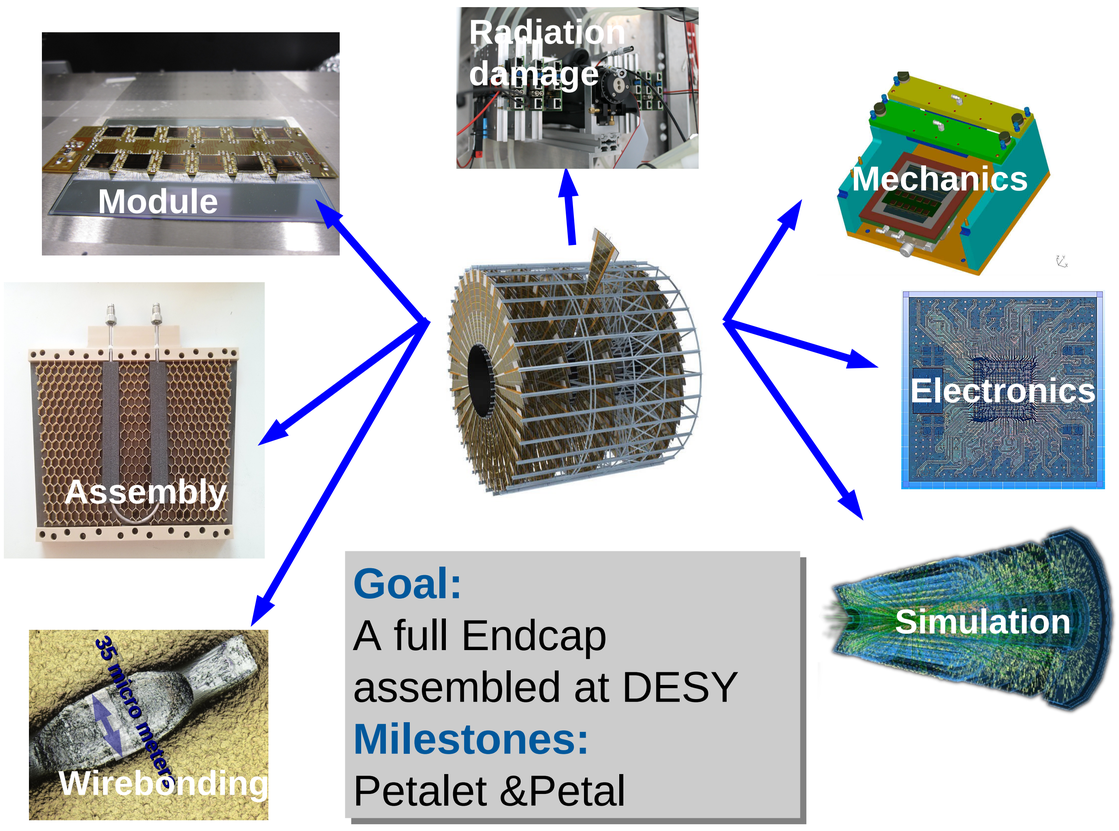
Module Production



Complete production in place
- Hybrid assembly
- Module assembly+bonding
- Connectivity, noise performance, thermal tests

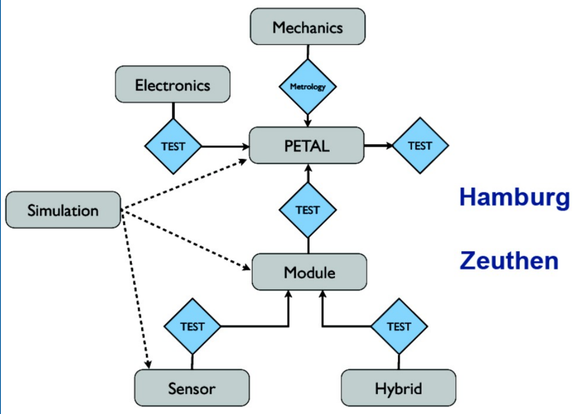


Towards a Tracker Endcap at DESY



Goal:
A full Endcap assembled at DESY
Milestones:
Petalet &Petal

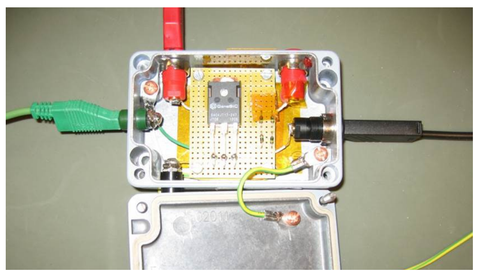
Sharing of Work



Distribution of work between Hamburg and Zeuthen:
- Efficient use of resources
- Sharing of expertise and responsibilities

Electronics

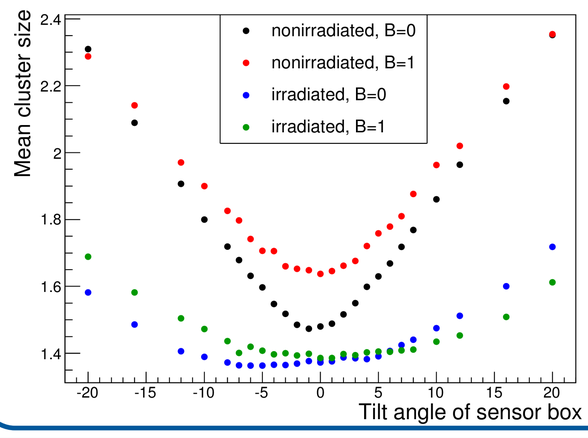
The petal/stave approach allows for significant reduction of services
DESY strongly involved in key areas:
- Design of Interface Card
- LV/HV multiplexing (irradiation studies)

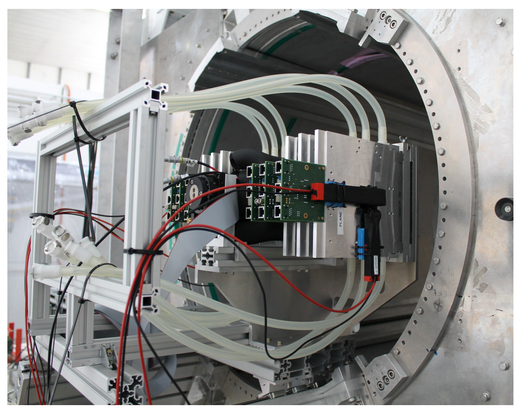


Radiation Damage Studies

Measurement of Lorentz angle and charge collection efficiency on non-irradiated sensors and sensors irradiated with different fluences.

DESY is ideally suited:
- Test beam on DESY site
- Telescope and 1T magnet





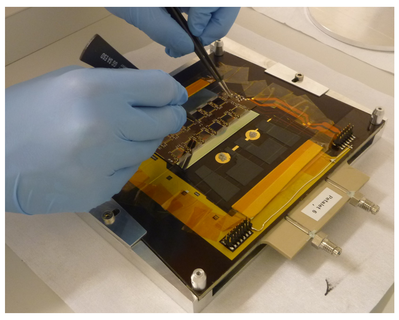
DESY test beam setup

irradiated: 5·10^{14} 1 MeV n$_{eq}$ cm^{-2}

Petalet Project

Study key aspects of petal design
- High strip density, split wafers, petal services

The first petalet has recently been assembled at DESY



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