

Status of DATCON

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Tasks of the Data Concentrator





- Major tasks of the Data Concentrator (DATCON):
 - Acquire the data from the SVD on 48 optical links
 - Reconstruct the track segments, extrapolation to PXD, ROI creation and broadcast to ATCA system over Gbit Ethernet



Hardware: AMC v3

- Testbeam done with AMC v2
- Switched and successfully tested testbeam firmware with AMC v3
- Backplane communication fixed with AMC v3



Full-Detector Connection Topology





- 48 optical links from the SVD Front End Electronics (FEE)
- Average expected data rate: 6 Gbps
- 12x AMCs for data acquisition and preprocessing
- 1x AMC for Tracking and ROI calculation

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- One layer with a PXD half ladder and four layers of the SVD in the suggested distance as in the final design
- Full DAQ chain with event builder and data reduction system
- Results and Analysis of run 623
- Offline corrected overflow of ROI

Accumulated Tracks (Total 20k Tracks)





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Accumulated ROIs from DESY Testbeam





Accumulated ROIs from DESY Testbeam















- New BASF2 Hough tracking module
- Full detector simulation, no addition background, excluded slanted SVD parts
- Particle gun with 1-2 tracks, all secondaries, 500k events each
- Different energies between 2 and 0.06 GeV
- Optimization of Hough tracking parameters in:
 - Number of critical and maximum iterations
 - Start position in Hough space
 - Shape of the rectangular

Visualization: Two Tracks @2 GeV





Visualization: One Track @500 MeV





Corresponding Hough Space





Angle Spread in Phi e^- , e^+ @ 2 GeV





Angle Spread in Phi e^- , e^+ @ 60 MeV





Efficiency







- Various improvements of the Hough tracking algorithm (in BASF2) including implementation of
 - Layer filter to reduce fake rate by a factor of 10 100
 - New hash cluster algorithm for better efficiency and higher accuracy
 - Bug fixes in the simulation code
- Simulation with background: RBB, Touschek, Coloumb Number of SVD hits from 20 to 4000
- Particle gun with 2 tracks, all secondaries, 50k events each, full detector acceptance (including slanted parts)
- Energies from 2 GeV down to 50 MeV
- Efficiency breakdown starts at 80 MEV

Efficiency







- Fake rate with background is still very high from 10 additional tracks @2 GeV up to 80 @50 MeV
- New Bachelor student (Christian Wessel) for further tracking optimization and finding optimal working condition with respect to track efficiency and fake rate
- Script for Hough parameter sweep and analysis module (C.W.)
- Analysis of failed reconstructed tracks: Caused mainly by a missing hit in one of the detector layers (C.W.)
- Test with fake track reduction algorithm





- First Tests of DHHc finished and successful (received from TUM as tracking FPGA with Virtex 6 LX130T)
 → Check of Communication between AMC v3 and DHHc required
- Rewrite of HDL Hough core module to reduce resources and include the in BASF2 tested improved algorithm
- Write test system to compare results and speed from BASF2 simulation and FPGA system.
- Improve fake rates with a new track merger module

Thank you for your attention!