News on the first beam time with the NA60 Silicon Pixel Detectors

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on behalf of the NA60 Pixel Team

PHENIX Silicon Upgrades Meeting, June 21, 2002

- **Pixel detector in the NA60 vertex spectrometer**
- **Run conditions and first results**
- **Outlook on the production of the full pixel telescope**

Pixel Goals for the June 2002 SPS Proton Run

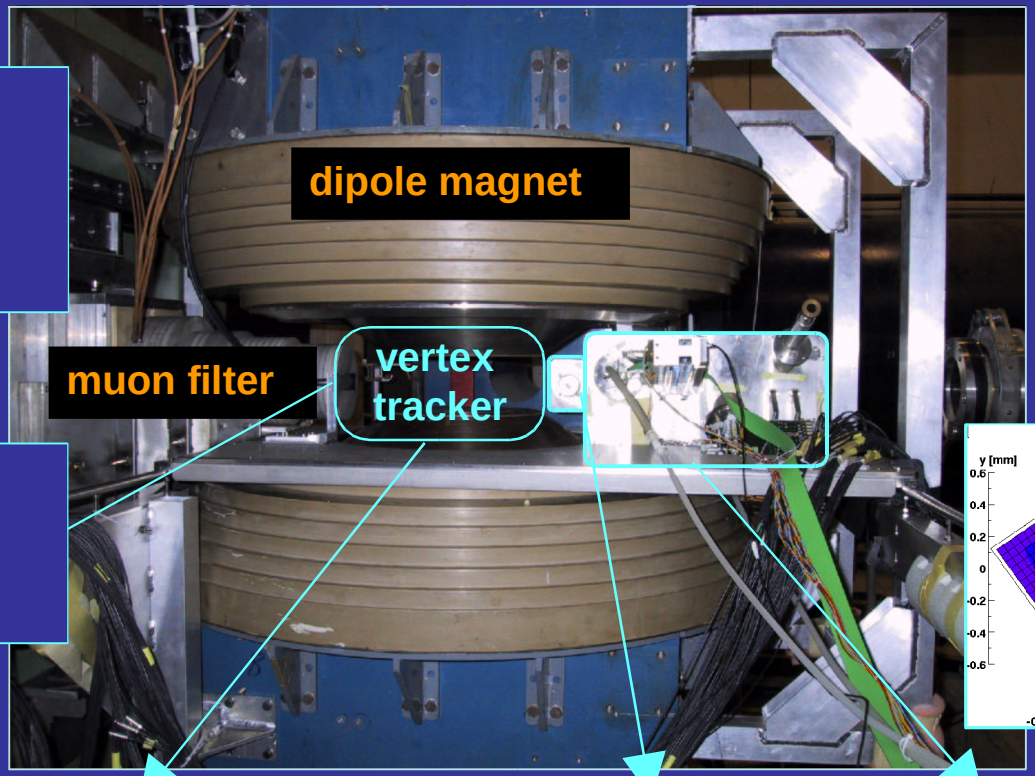
- Validate concept and design of the pixel detector, using the first full plane produced
- Verify JTAG control via PCI chain
- Verify PCI-bus based readout electronics
- Integration into NA60 Data Acquisition DATE
- Perform detailed analysis of the detector

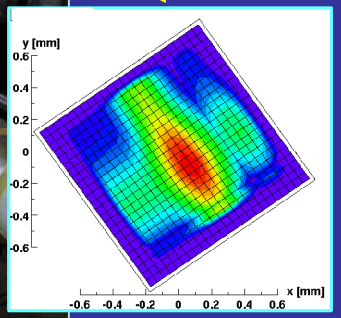
The NA60 Experiment

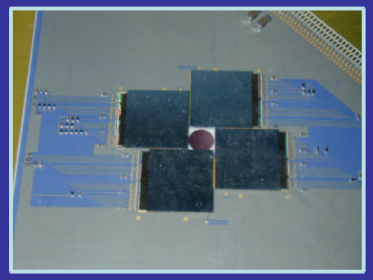
Study of open charm and prompt dimuon production in proton-nucleus and heavy ion collisions

- precise beam tracking
- accurate track and vertex reconstruction in high multiplicity environment

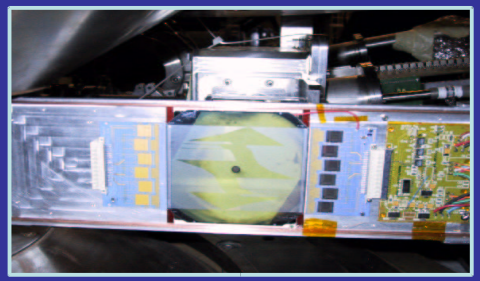
Innovative silicon detectors:
- cryogenic silicon strips
- rad-hard pixel detectors



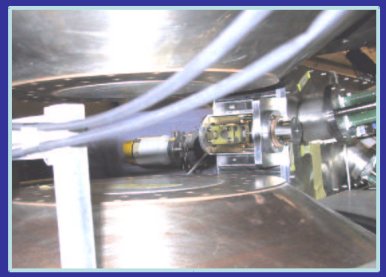




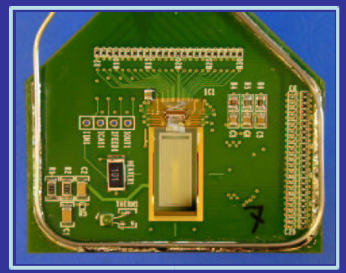
pixels



microstrips

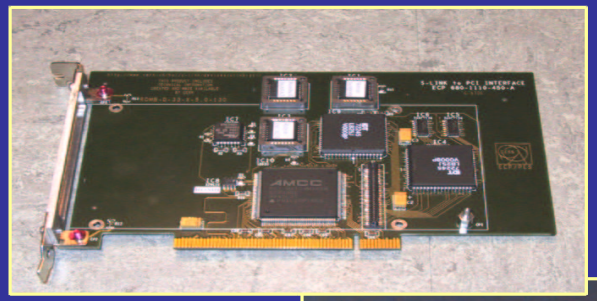


target

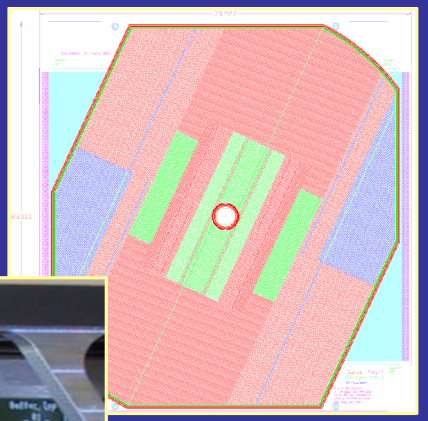


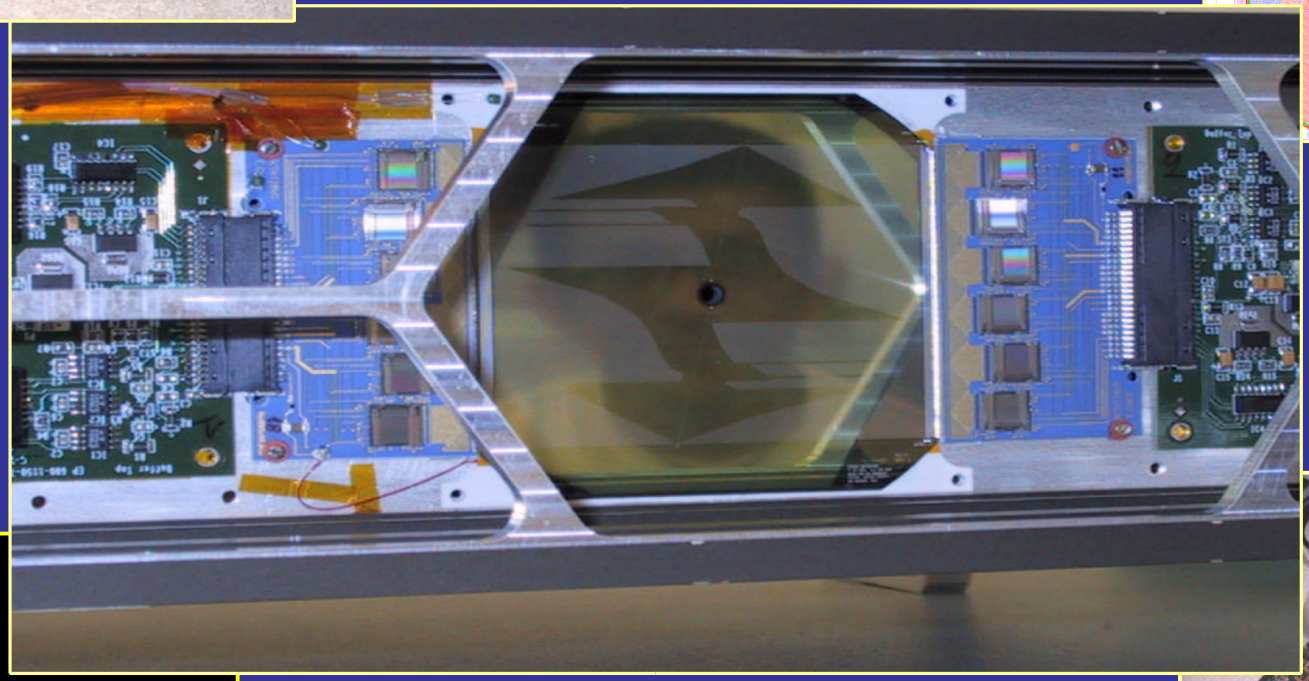
beamscope

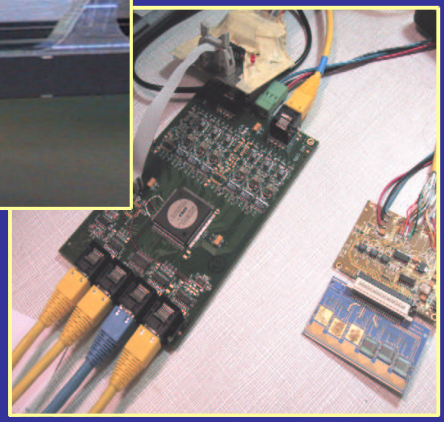
Silicon microstrip detector for *proton* physics



- 300 μm silicon sensors, 50 cm² area
- 1536 strips of 60 to 226 μm pitch
- readout developed with ATLAS & LHC-B



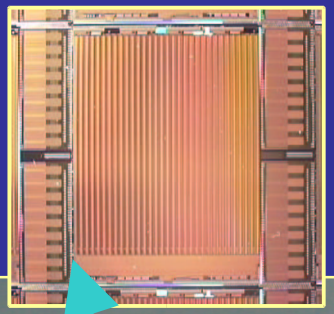


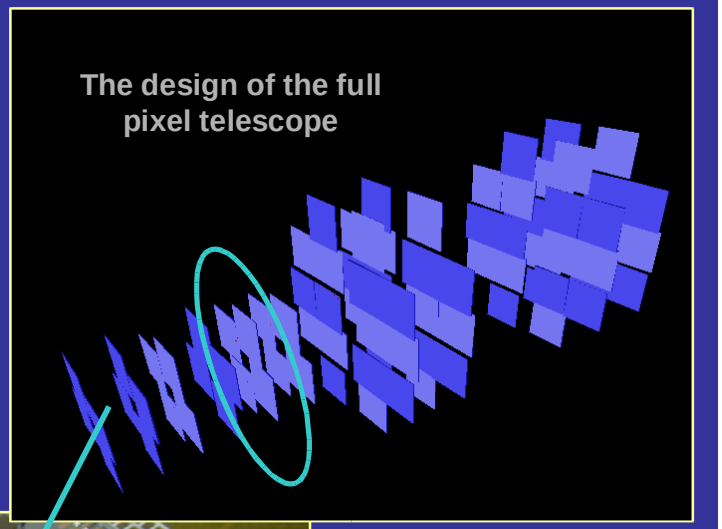


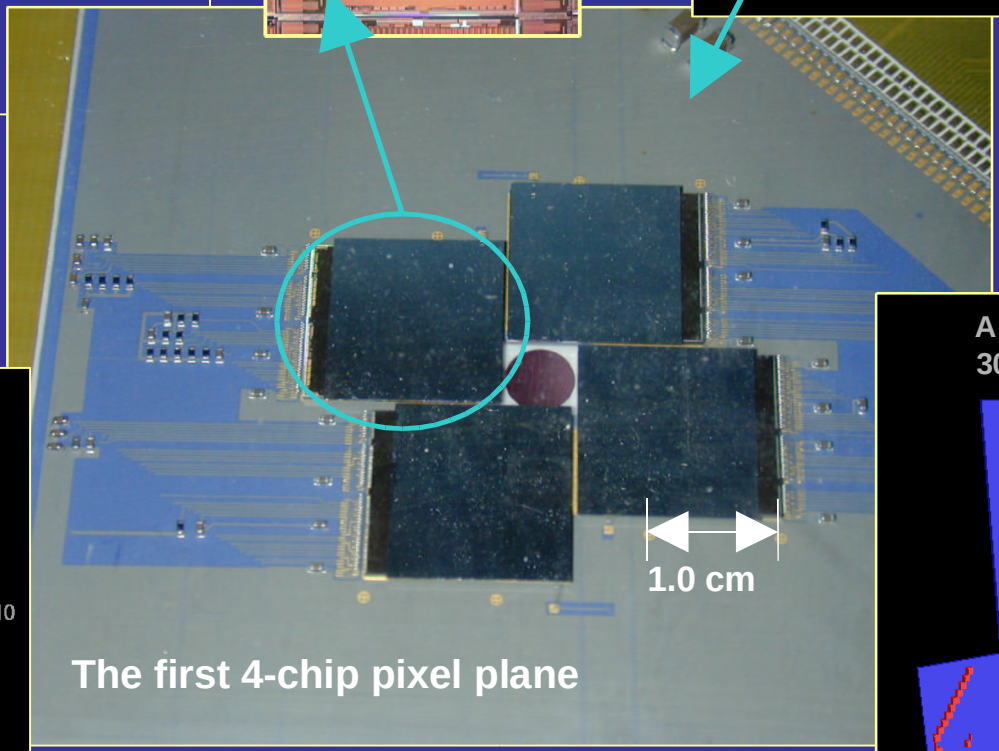
June 2002 : 16 planes in the proton beam

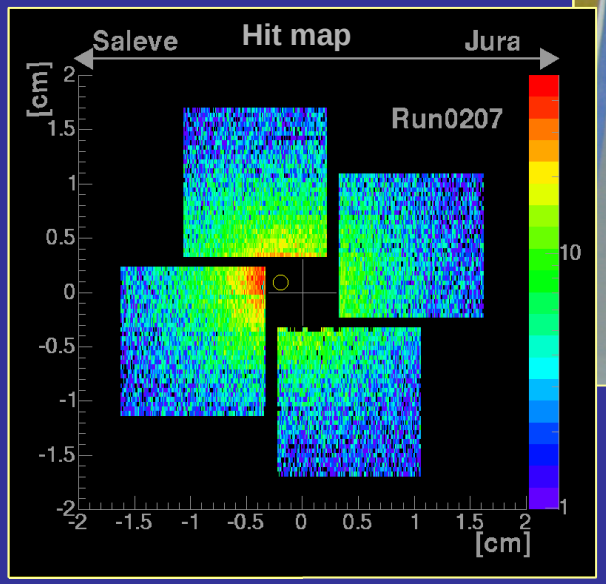
The NA60 Pixel Detector

- readout chip designed for Alice
- 8192 pixels of 50 µm x 425 µm
- radiation hard technology
- PCI readout developed by NA60
- Linux based DAQ
- 4- and 8-chip planes

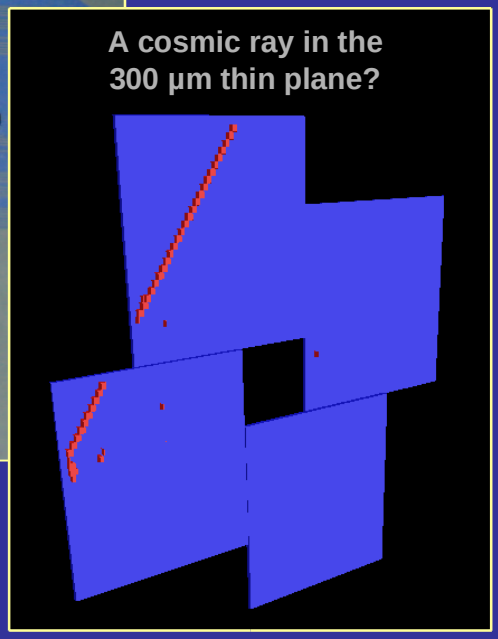






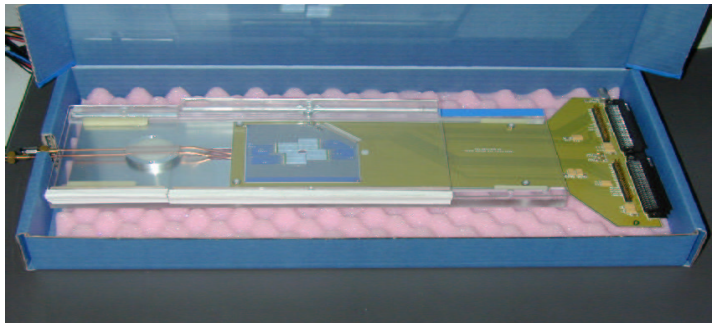


June 2002 : a 4-chip plane in the proton beam



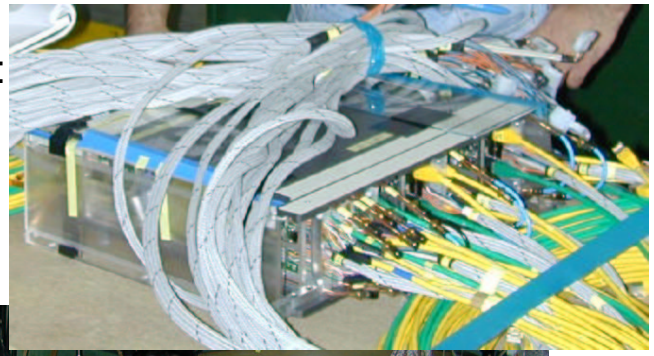
The Pixel Plane in the NA60 Pit

Pixel plane with cooling structure, prior to the instal-lation into NA60.



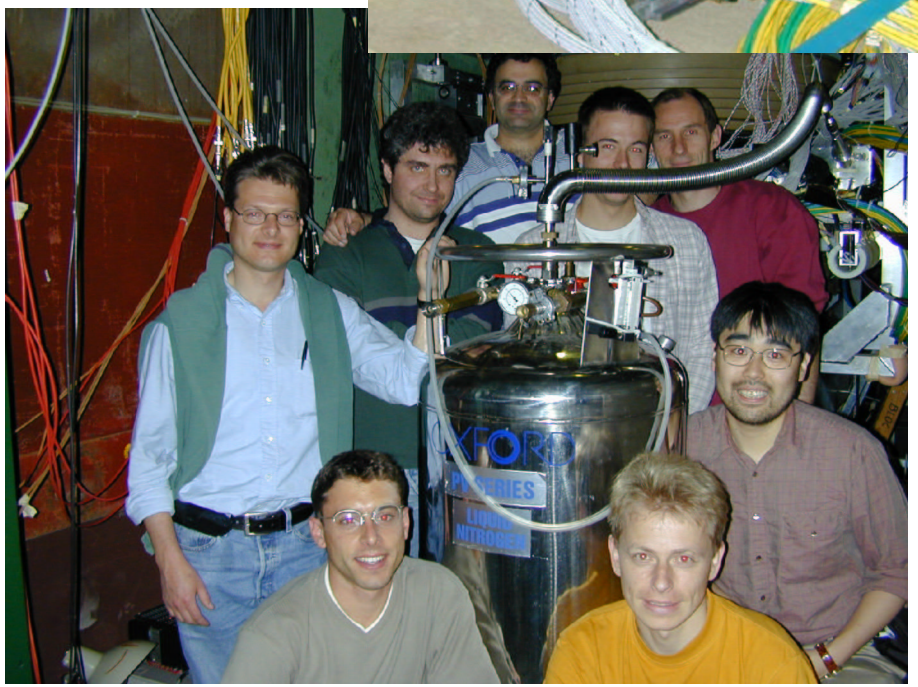
Reality: cable jungle in the PT7 magnet gap.

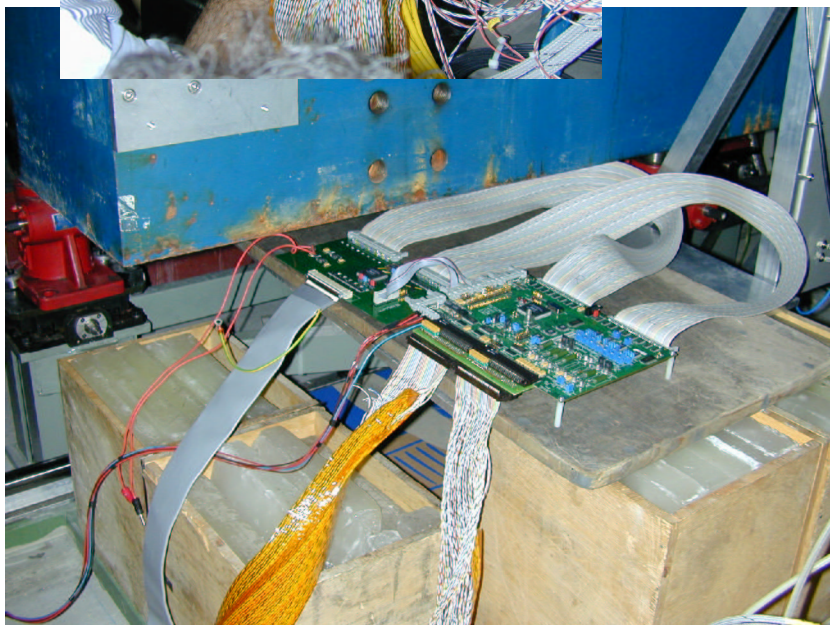
Silicon telescope box: 16 x strips, 1 x pixels



Pixel detector preliminary r/o electronics, protected from neutrons by parafine blocks.

Pixel fans: It's in!!

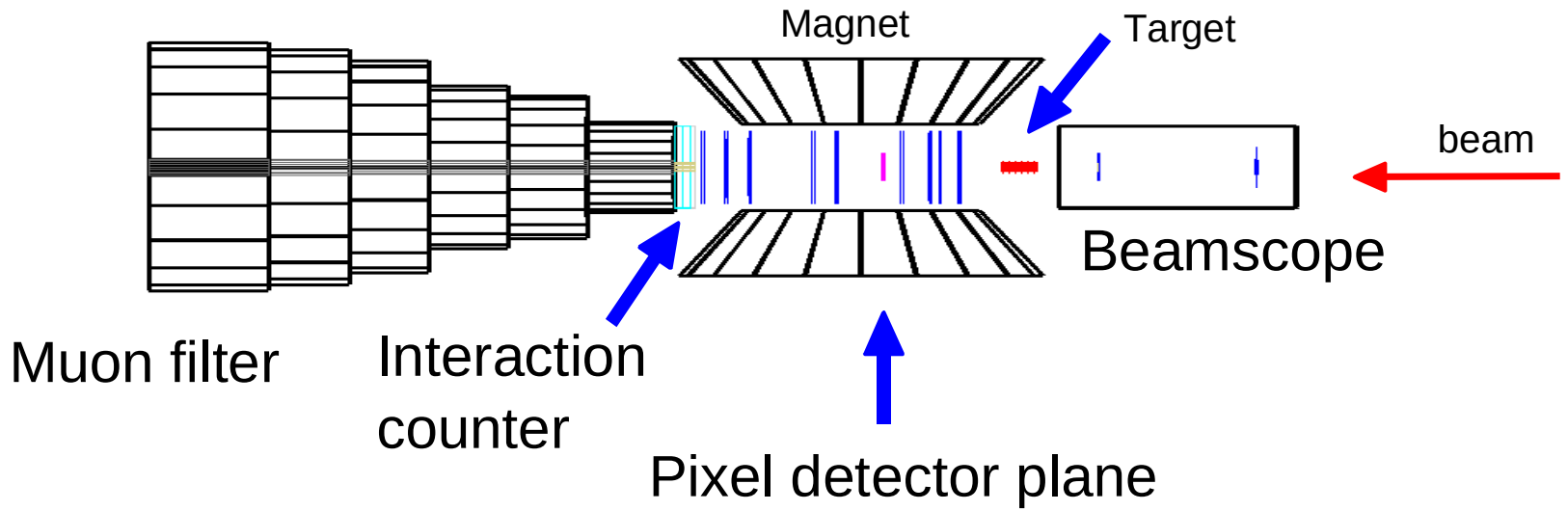




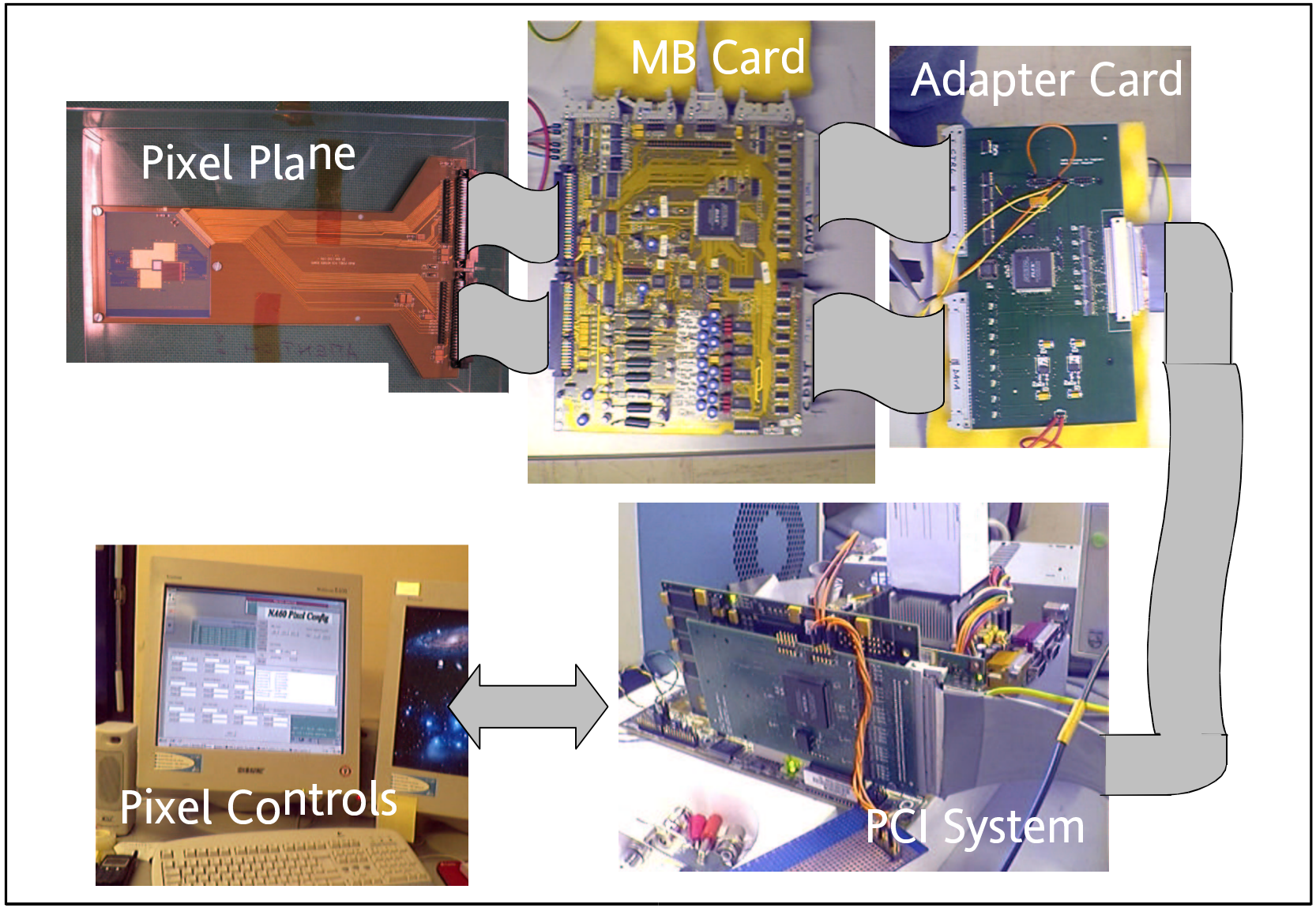
Pixel Detector Operation

Run conditions:

Beam: 400 GeV/c protons
Intensity: 2×10^7 - 2×10^8 protons / 5s
Trigger rate: 20 – 500 Hz
--> Dimuon triggers from NA60 muon spectrometer
--> Interaction Counter triggers in few special runs

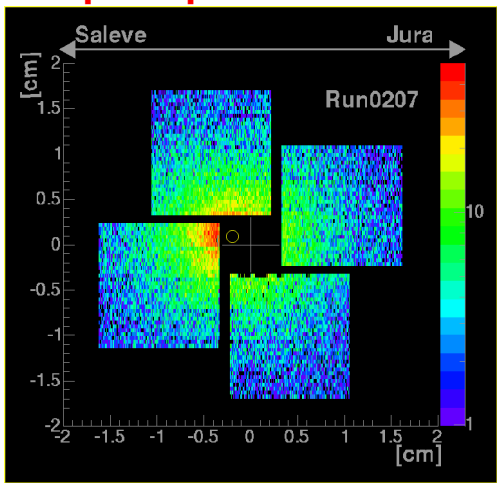


Pixel Detector Readout Chain

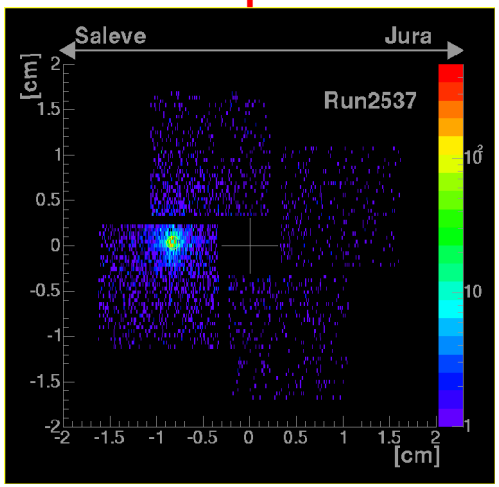


First Results

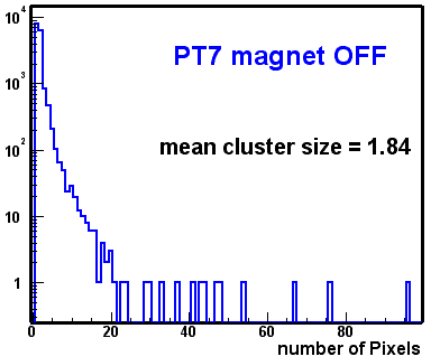
Beam almost centered in the pixel plane.

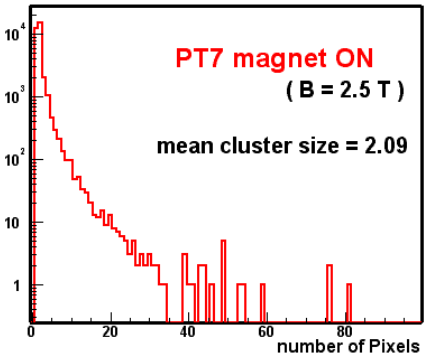


Low intensity beam steered onto one chip.

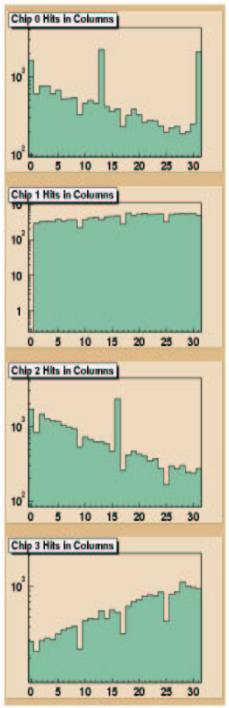


Cluster size distributions:

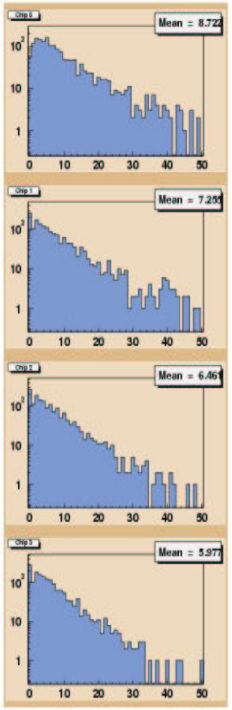




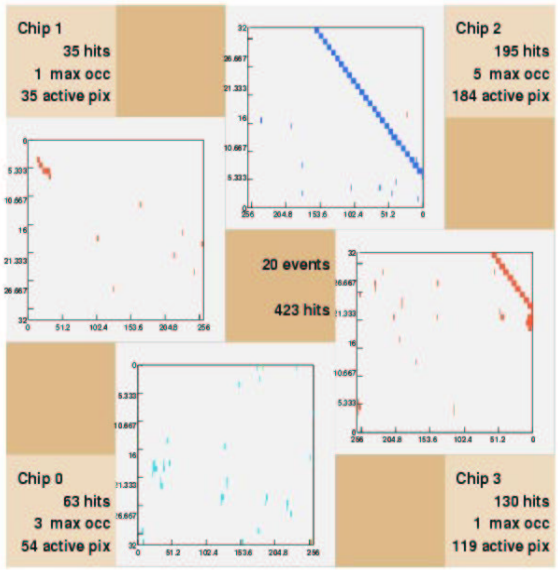
Beam profile: projection over pixel columns



Multiplicity distribution: pixels/event



Cosmic ray crossing the pixel sensors?



Let's party !!

behind the camera: Hiroaki

Summary and Outlook I

The first NA60 pixel detector plane was constructed during the last months and successfully installed and operated in the experiment during the June 2002 NA60 proton run.

Thorough assessment of the various components and the production chain, the construction of a prototype plane and its intensive characterization after every step of the complex assembly at CERN enabled the NA60 pixel team to build a fully functional detector from the small number of chips available so far. The pixel detector plane was installed in the NA60 experiment on 7 June 2002 inside of the silicon microstrips telescope for proton running. The detector proved its superb capabilities from the beginning of its operation. It was tested and operated both in standalone mode and within the NA60 data acquisition, with specific triggers and NA60 dimuon physics triggers, and contributed to the physics data of NA60 together with the other NA60 sub-sustems.

Summary and Outlook II

However, to date only one detector plane exists. While the planning of the production of the full pixel telescope has been finalized and all CERN-internal procedures are well under control to match the schedule, the timely delivery of the bump-bonded detector assemblies from the industry causes concern. Bump bonding is ***the*** critical issue with the construction of a hybrid pixel detector, and the only parameter of the detector assembly that in the current situation of NA60 cannot be directly controled by the Collaboration. Very recently, bad news on the total loss of a large fraction of our wafers in the foundry arrived. Consequences and strategies are being assessed.

We will report on the bump-bonding subject separately, which we consider highly relevant for a PHENIX upgrade with a pixel detector.