Strips and Pixels progress

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Outline

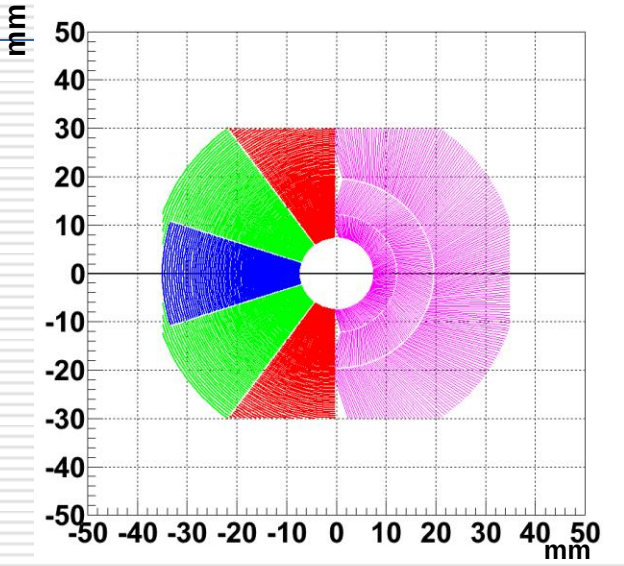
- Strip detector design
- PR01 Strip prototype detector status
- Pixels: thinning status

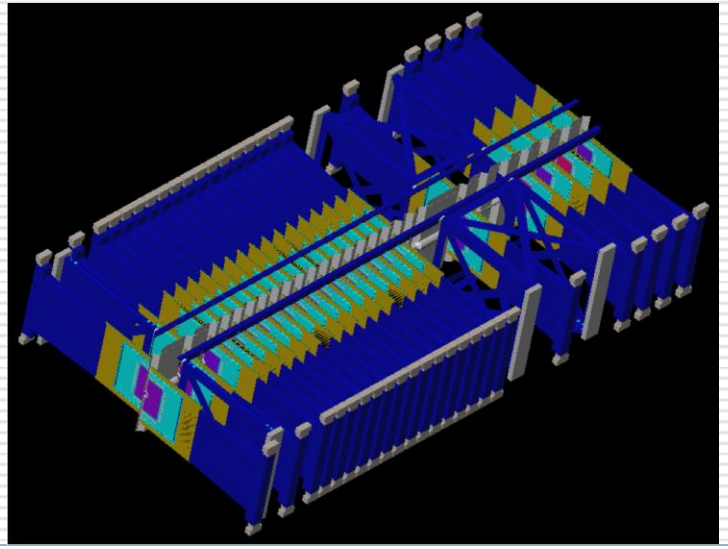
Strip geometry – Design driving parameters

- The current design occupancy at $2x10^{32}$ is ~ 0.7%. We aim to keep the occupancy ~ 1%, even at a 10 times higher luminosity.
- This is achieved by increasing the number of channels, and decreasing the minimum pitch.
- An ideal minimum pitch would be 25 μm. In our first prototypes with hamamatsu we will go for 30 μm.
- The sensor is kept within a rectangle of sides 60x35 mm.
- The material for the simulation is already installed, now the strip pattern should be added.
- It is imperative to match the strip readout to consecutive chip channels for reasons of cm correction. This is addressed in the sensor layout, and an example of a possible routing scheme suggested.
- First presented by Lars Ecklund in: http://indico.cern.ch/conferenceDisplay.py?confId=44185

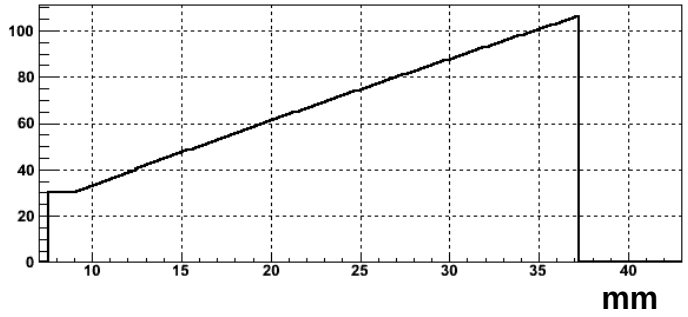
A possible design

- 30 μm minimum pitch
- 20 chips per sensor
- 3 sectors for ϕ
- Beneficial for the RF-foil as the detector protrudes much less
- R pitch is kept constant for the first 1.5 mm
- Φ pitches are 31/50/61 μm at the boundaries 7.5/12.3/19.8 mm
- R and ϕ occupancies shown on next slide
- Maximum radius in R is 37.2 mm
- XML description already implemented by Warwick in the simulation.

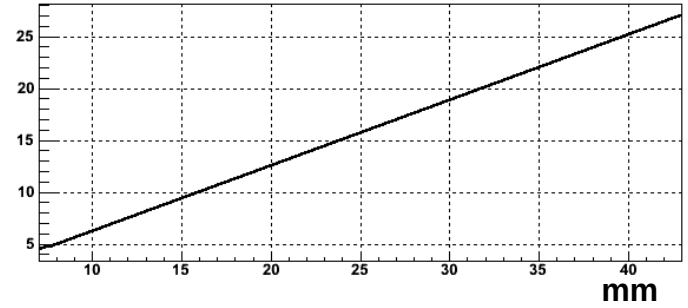




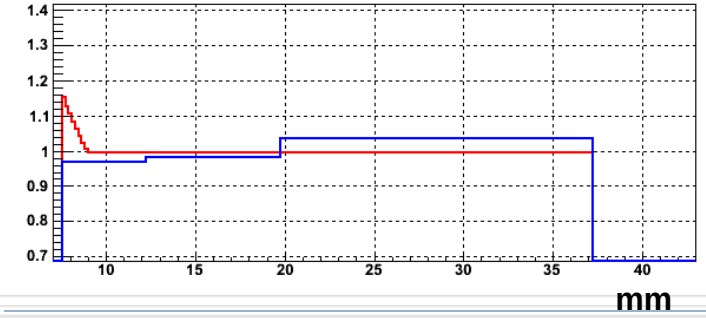
Variation of pitch, strip-length and occupancy as a function of radius



Strip pitch in μm as a function of radius in mm



Strip length in the R sensor as a function of radius



Maximum strip occupancy, in percent, for R (red) and Phi (blue) sensors as a function of radius

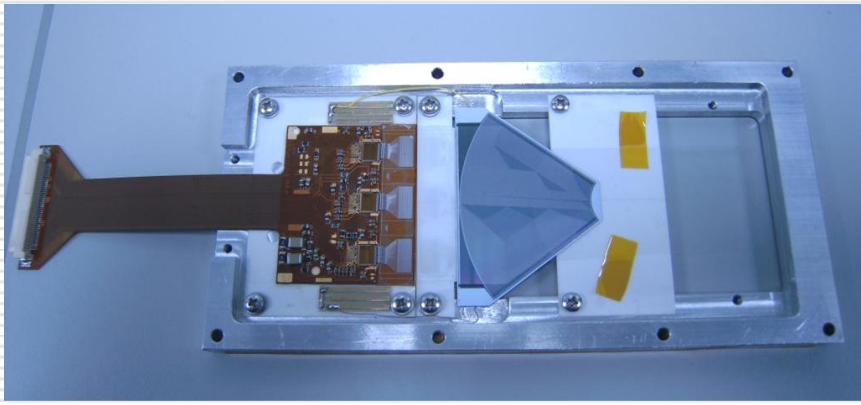
A possible routing scheme

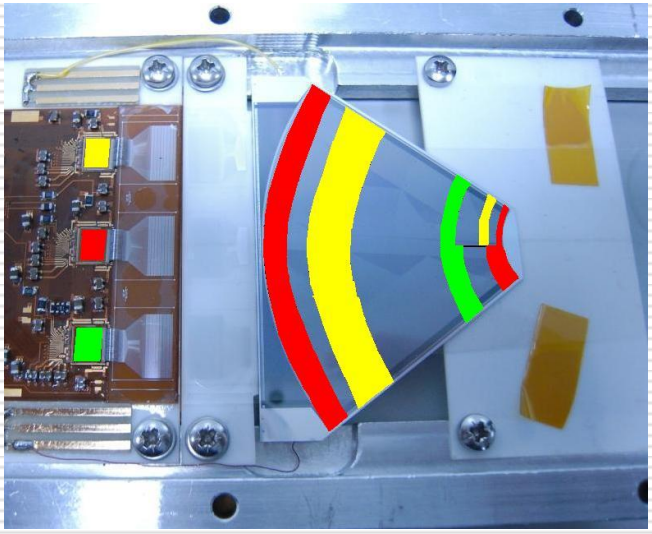
Consecutive strips in a sector in the same chip

Designed by Lars Ecklund

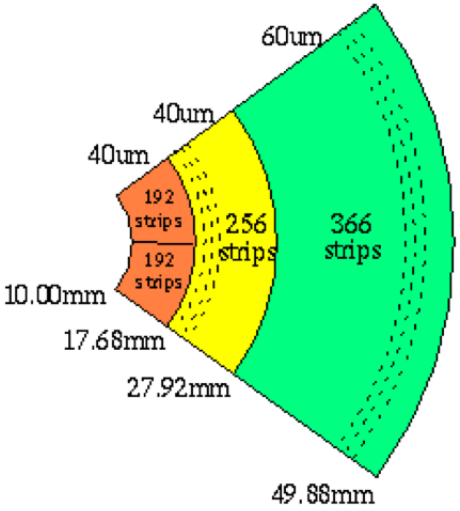
PR01 strip detector

- Hamamatsu sensor circa 1998
  - (n^+n) sensor p-stop
  - 300 µm thickness
- Instrumented with an IT-hybrid (3 Beetle chips)
- the aim is to measure eta and resolution for fine pitch with fast electronics



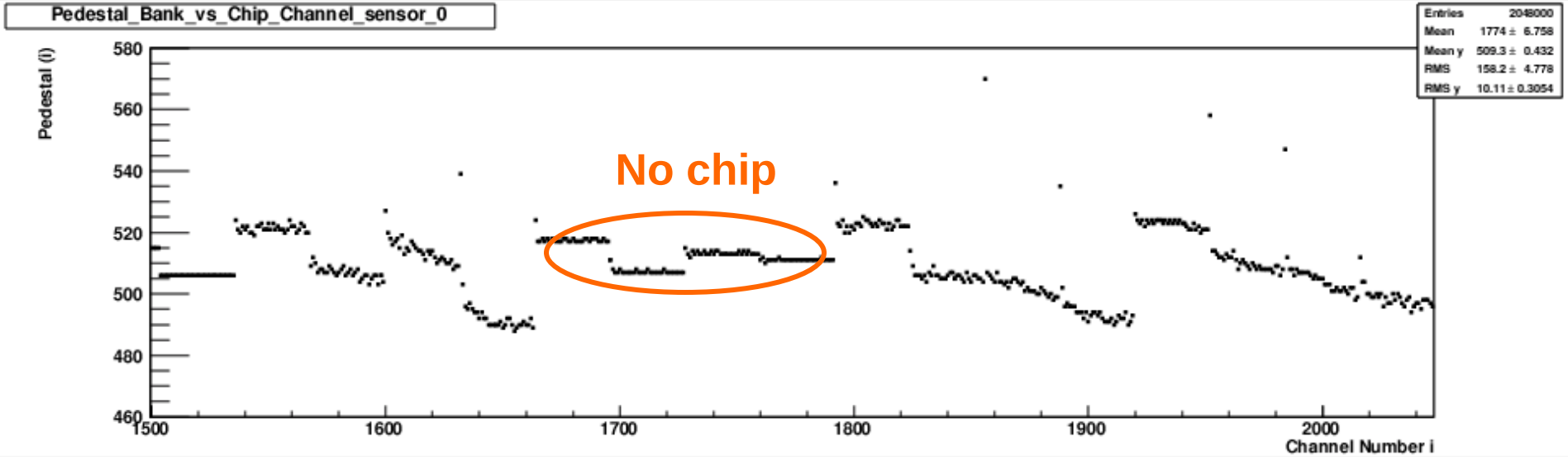


Instrumented strips

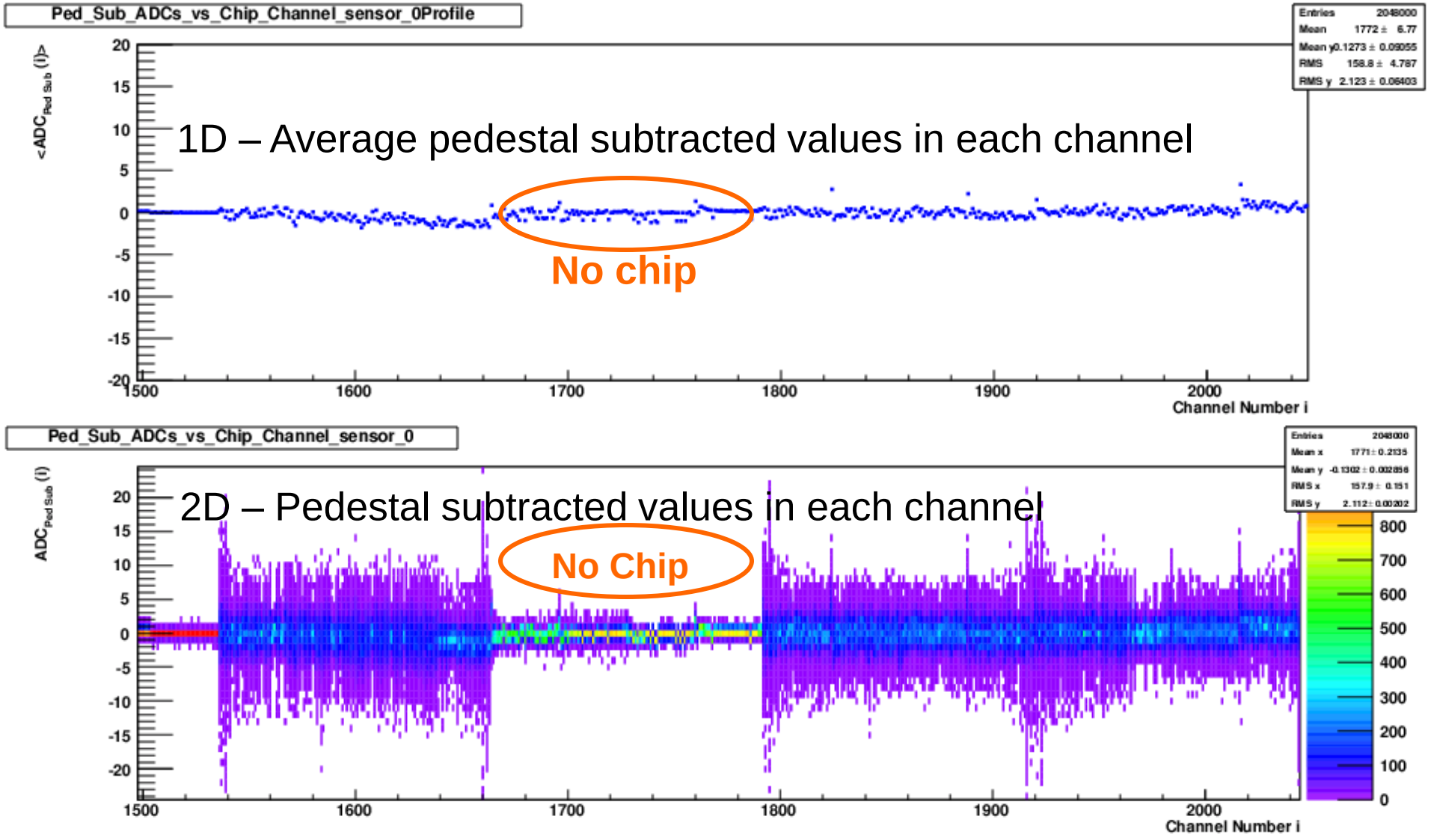


Pedestals

- Stored in the conditions Database (local).
- Obtained from a 10K noise run.
- Values that are subtracted in next runs.
- ADC sampling time not optimized.



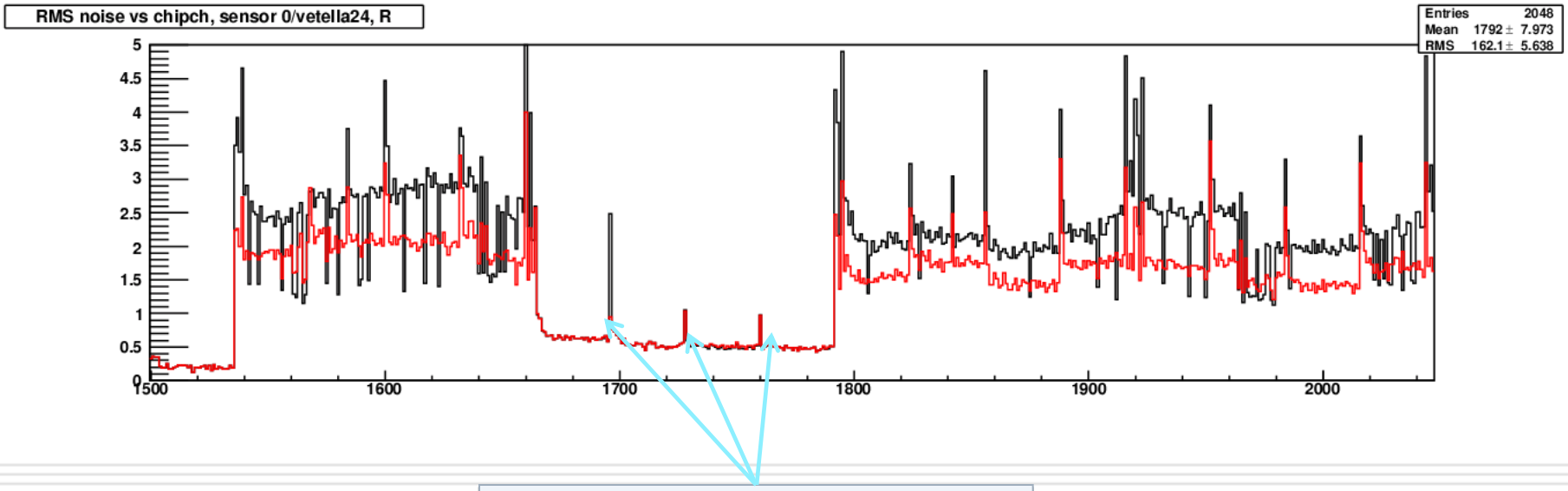
Pedestals


Ped_Sub_ADCs_vs_Chip_Channel_sensor_0Profile
Entries 2048000
Mean 1772 ± 6.77
Mean y 0.1273 ± 0.09055
RMS 158.8 ± 4.787
RMS y 2.123 ± 0.06403
<ADC Ped Sub (i)>
1D – Average pedestal subtracted values in each channel
No chip
Channel Number i
Ped_Sub_ADCs_vs_Chip_Channel_sensor_0
ADC Ped Sub (i)
2D – Pedestal subtracted values in each channel
No Chip
Channel Number i

Noise measurements

ADC raw noise

Common mode subtracted noise



No Beetle connected
EM Cross-talk?

Thin Pixel detectors

- Collaboration with CNM to thin 2D-pixel sensor from 300 µm down to (200, 150, 100 µm).
  - Goal: measure the resolution for such thin assemblies
  - Read out with TimePix-like ASIC.
  - Started with p-on-n sensor later
- Run started:
  - Bump bonding tests done on mechanical dummies this week.
  - Bump bonding of real sensors next week.

Photos from run 4967 – Medipix2 on SOI 150µm