FACULTÉ DES SCIENCES

Ingredients for the Final Telescope

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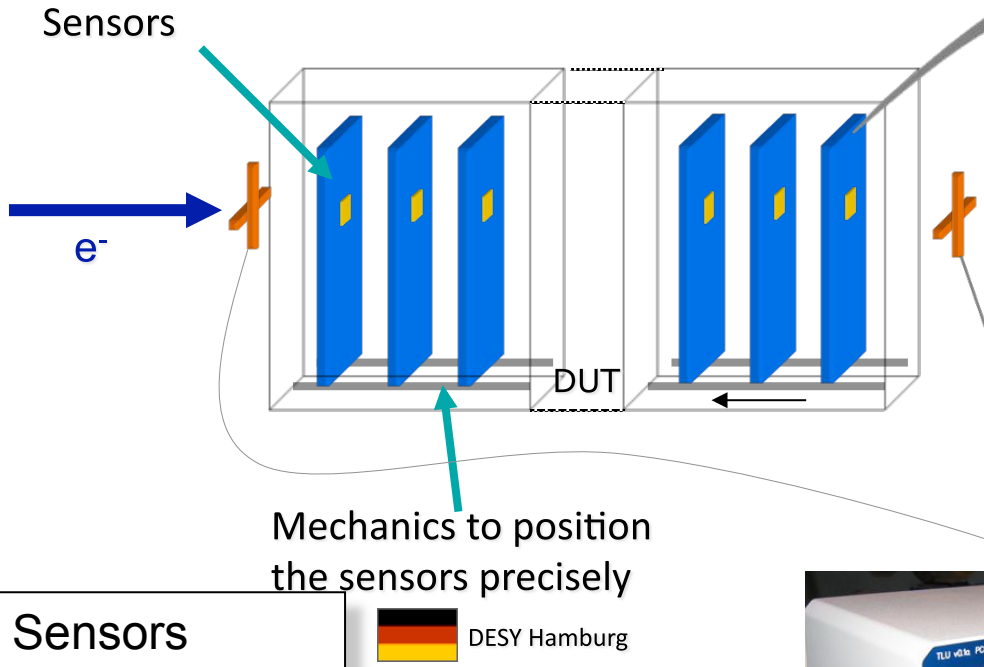
Telescope Ingredients (Demonstrator)



ReadOut (EUDRB)

LVDS

GBIT ETH

Trigger Logic Unit (TLU)

USB

EUDAQ

- ✓ Sensors
- ✓ Readout Boards
- ✓ EUDAQ
- ✓ Trigger Logic Unit
- ✓ Mechanics

Ingredients for the final telescope

Hardware

- 2 Crates with 3 EUDRBs
- Alternative: NI Solution (see Gilles)
- TLU with tagging mode
- 6 Mimosa 26
- Alternative: 'Ultimate' Chip
- Fiber-Hodoscope
- New Mechanics

Software

- EUDAQ
- With Producers for TLU, Mi-26, Hodoscope

Fiber-Hodoscope

Mail by Vincent Boudry

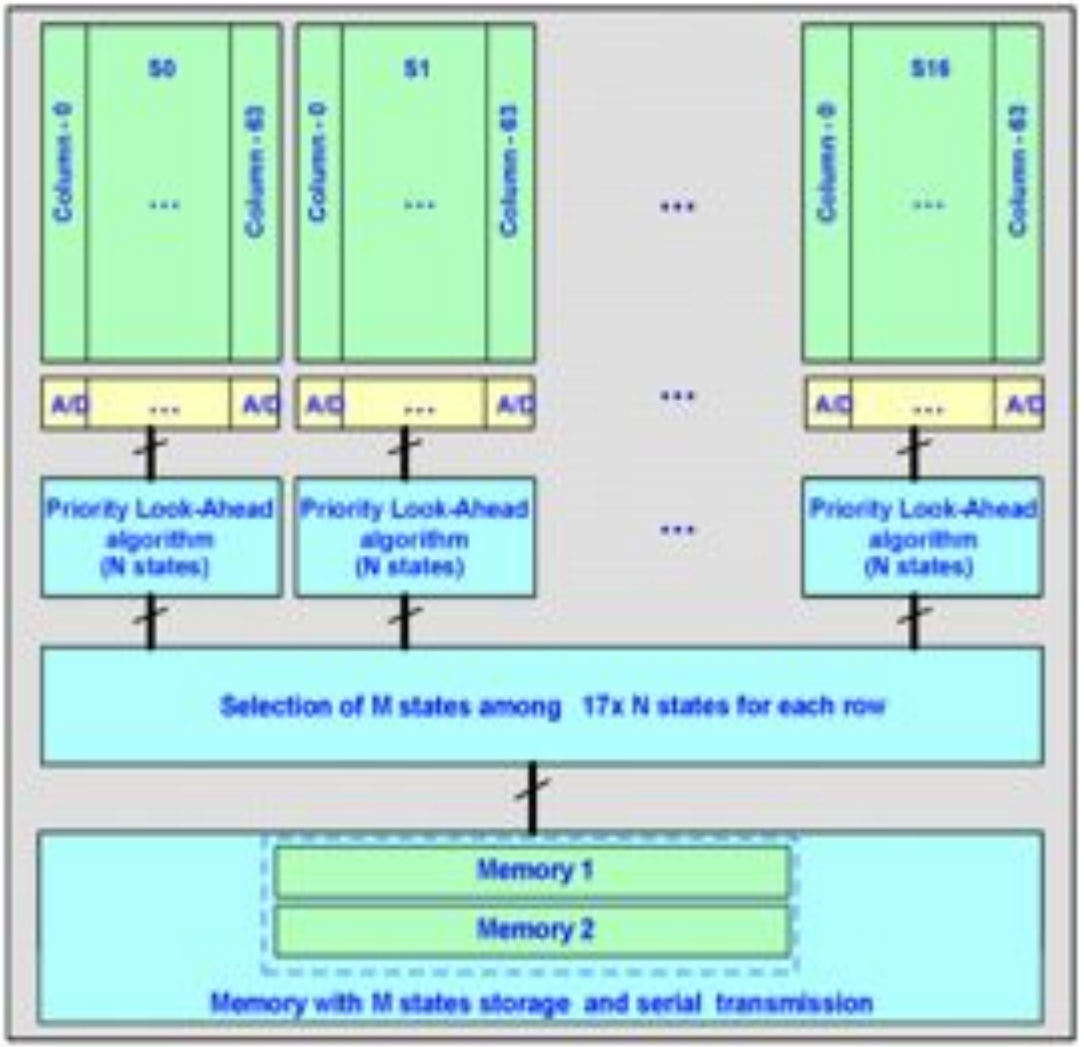
Since the LLR build the CMS H4 beam telescope, we have some materials and expertise there.I discussed this afternoon with Maurice Haguenhauer who was in charge of this project, and he gave me the following information:

- hodoscopes are made of 64 aluminised square fiber of 1mm² section, staggered on two planes, so the cell size of 0.5mm and cover ~3.2cm. the fibers are readout by multi-anode PMTs, amplified, discriminated and send over 100m as ECL signals and readout by a CAMAC register unit;
- this readout can reach an acquisition rate of 10kHz.Now, we have 1 spare plane immediately available (so it gives only 1 direction).
- The telescope of the CMS H4 line is apparently underused (if at all); as it belongs to the LLR we can certainly negotiate to recover and reuse it with the EUDET telescope or its successor, if needed.
- Alternately we can modify the readout to adapt it rather easily for the CALO readout (using a SPIROCs, HARDROC of simple FPGA).
- Should this be part of EUDET or AIDA ?

Final Telescope Chip: TC/Mimosa 26

Submission in Nov 2008

- Mimosa-22 (binary outputs) complemented with zero-suppression (SUZE-01)
- Active surface : 1152 columns of 576 pixels (21.2 x 10.6 mm^2)
- Pixel pitch : 18.4 µm → 0.7 million pixels → σ_{sp} <3.5 µm ⇒ pointing resolution 2µm on DUT surface
- Integration time ~110 µs → 10^4 frames / second
- Throughput: 1 output at 80 Mbits/s or 2 outputs at 40 Mbits/s
- Needs adoption of readout electronics (EUDRB)



TC/Mi26 available/under test since March 2009

DAQ Changes - EUDRB & EUDAQ

EUDRB evolves with new sensors

- was successfully adapted to sensor Mimosa 18 (4x more pixels)
  (still with on-board zero suppression)
- Changes to readout the final telescope chip:
  - All done in firmware, no hardware modification needed
  - embedded M26 simulator operating in mode 0 (two channels @ 90 MHz)
  - the M26 interface operates at up to 90MHz
  - overlapping INPUT (frame acq.) and OUTPUT (VME readout) operations
  - interrupt-driven event read-out
  - 2e-SST block transfer (> 100MB/s burst rate)
  - leading word count in the output event data block

Implementation Steps

Baseline (as of now)

- 2 VMEcrates with 3 EUDRBs
- 6 planes of Mi 26
- TLU in triggered mode

Step 1

- TLU in tagged mode

Step 2

- Additional Fiber-Hodoscope

Optional

- 'Ultimate' Chip and higher surface (may need NI-Readout)

In Parallel (needed for 'other' telescopes anyway)

- Implementation of NI-Solution