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EUDET Beam Telescope: status of sensors

Wojciech Dulinski on behalf of IPHC

Outline

- Status of engineering run submission in AMS 0.35 µm OPTO
- Status of auxiliary components (PCBs) needed for sensor (s) testing
- Possible (and proposed) test schedule
- Status of DAQ (and hardware for DAQ) development at Strasbourg
- Conclusions

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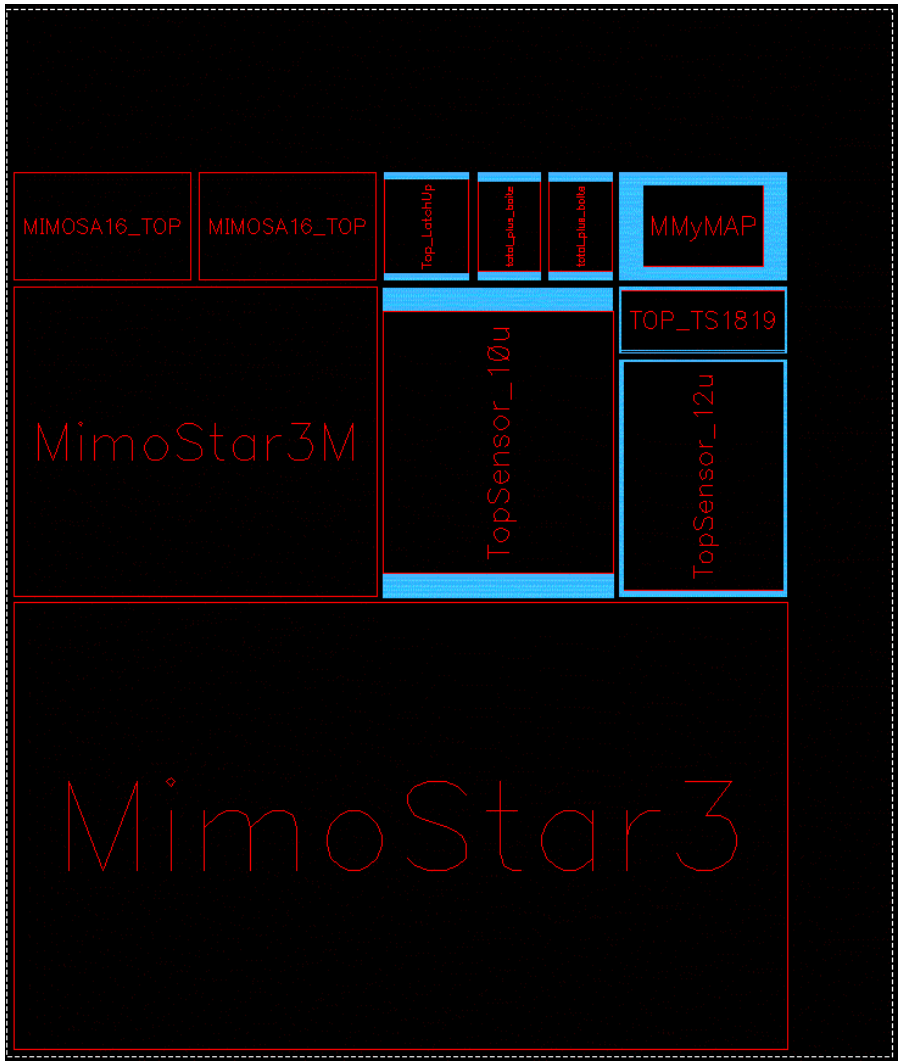
AMS 0.35 µm OPTO engineering run submission (June/July 2006)

Current status: production of 6 wafers at AMS



Final layout of the reticle

Structures of direct interest for EUDET

- Mimo*3M (MimoTEL): 256x256 pixels, 30µm pitch, 1KHz frame rate
- High Resolution Tracker: 512x512 pixels, 10 µm pitch, 300 Hz frame rate
- Mimosa16, the second prototype with a binary readout: 128x24 pixels, 25 µm pitch, on-chip column-level discriminator
- ADC: 5 bits
- TS1819: on-pixel amplifiers & clamping circuits

Two types of wafers with epitaxy layer thickness of 14 µm and 20 µm are used

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Wafers delivery schedule

- First wafer (14 µm epi) expected before the end of September, to be used for yield study (Mimo*L) at the probe station
- Second wafer (20 µm epi) shall be immediately cut at AMS and individual chips (non-thinned) expected mid-October
- There is an open option for the purchase of four remaining wafers, if the first test results positive…

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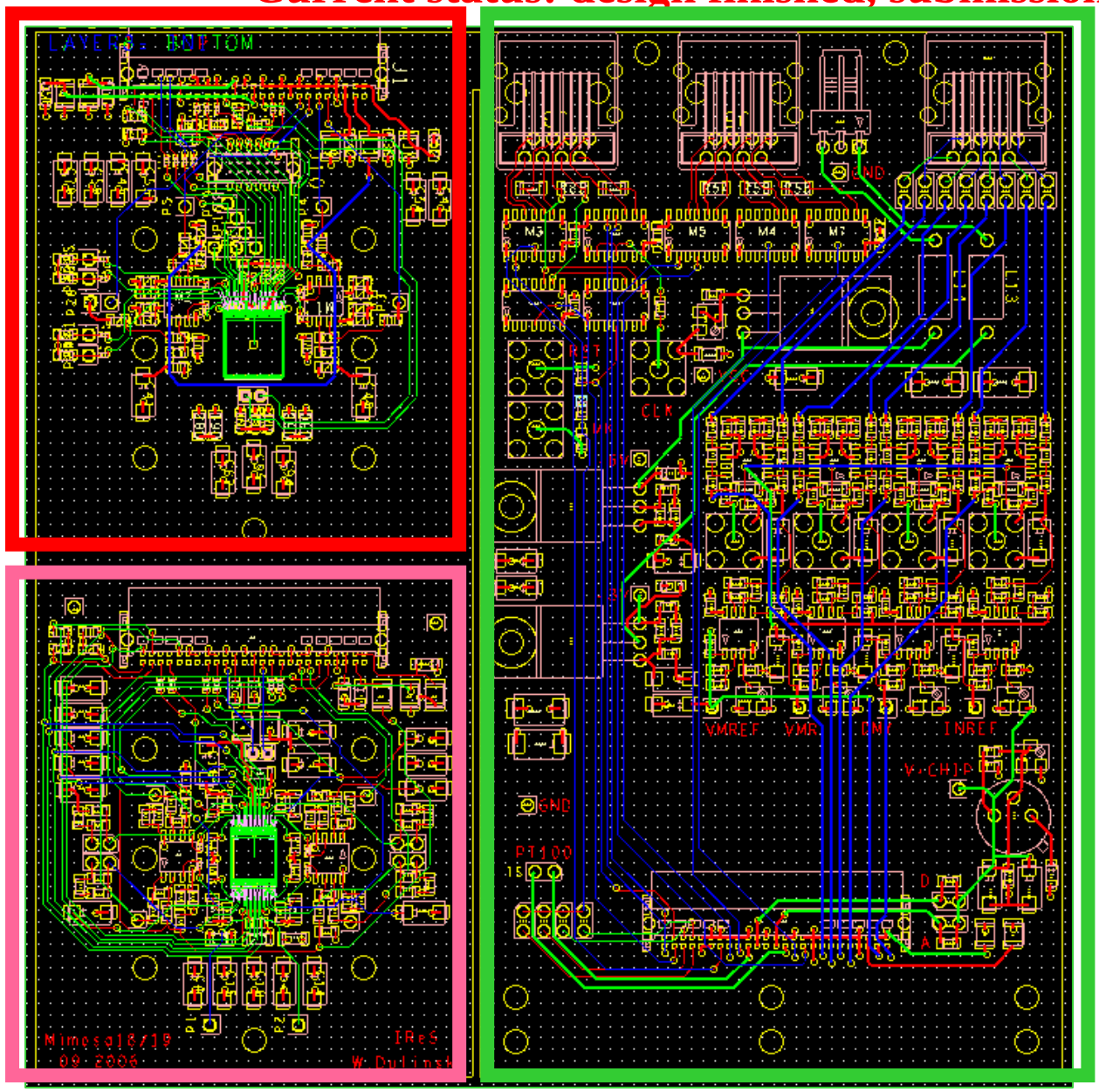
PCB's for tracker testing, compatible with the telescope mechanics

Current status: design finished, submission for production next week



One set of PCB's contain:

- Proximity board for Mimo*3M (MimoTEL):
- Proximity board for HiRes Tracker
- Auxiliary board for MimoTEL

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PCB's delivery schedule

- Twenty PCB sets (non-populated with components) shall be available before the end of September
- Five sets will be kept at Strasbourg and populated in October, others are available for EUDET collaboration members for components mounting/debugging
- To complete the demonstrator telescope set-up, the specific clock and JTAG distribution card is still needed: work on schematics in progress at Strasbourg. Candidates to take care of that PCB production are welcome!

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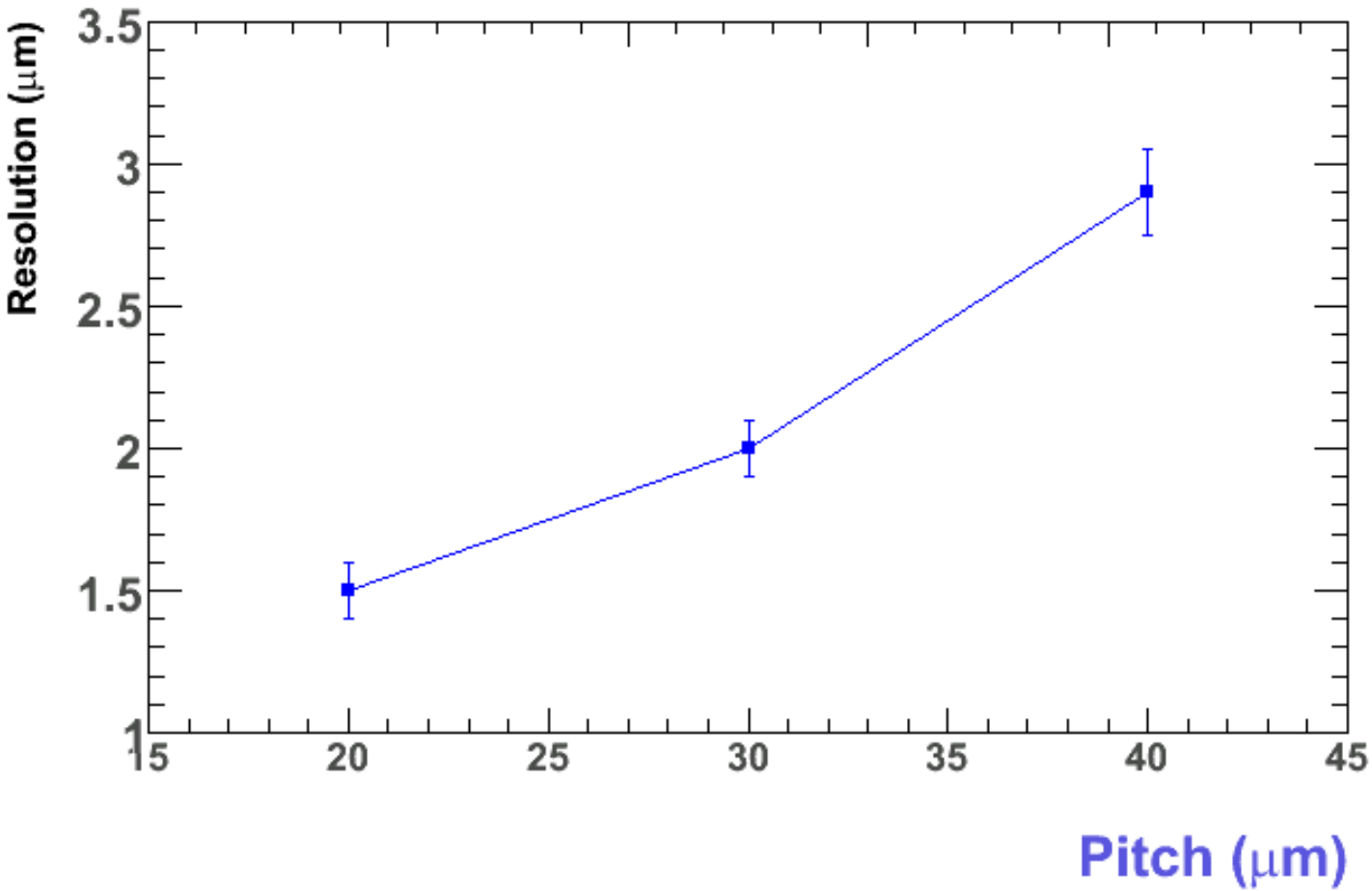
Sensors test status/schedule

Mimosa9 beam tests spatial resolution, after recent data re-analysis:



Spatial resolution @30 μm pitch: 2 μm

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Mimosa8 tests at CERN in August

- The goal was to measure the spatial resolution with the binary readout scheme using high-energy beam (180 GeV muons)
- Tests completed with no major problems
- Analysis in progress, first results shows already close to digital (binary) resolution (8 µm)
- Further algorithms optimization required in order to do better (as we hope) than digital

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Wafer tests of MimoStar3L

- The goal is to get an estimation of the production yield of large pixel devices in this new process
- Tests expected to begin in October/November
- If no major surprises, after the probe station test this wafer is going to be sent to LBNL for cutting and thinning (down to 50 µm?). Individual chips (~100 µm thick) expected back early 2007

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High-precision tracker tests

- Few proximity boards with bonded chips should be available in October. Other system components (auxiliary board, DAQ) available and used already in the past for Mimosa15 tests.
- Detailed laboratory test results of at least one prototype expected before the end of 2006
- Beam test shall follow, schedule to be defined

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Mimo*3M (MimoTEL) tests schedule (at Strasbourg)

- Chips available from mid-October on
- Proximity boards populated and chips bonded before the end of this year
- JTAG programming model expected mid-January
- Test results expected before March 2007

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Mimosa16 tests schedule

- Chips available from mid-October on
- Bonding PCB (relatively simple, daughter card for existing Mimosa8 Proximity PCB) has to be designed and fabricated
- Tests of analog part shall start at DAPNIA soon after bonding, using existing Mimosa8 set-up
- Laboratory tests of digital part expected to start at Strasbourg from March on
- Beam test in spring 2007?

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USB ADC Board & DAQ Status

To Do List for next weeks, on last EUDET meeting …04/04/2006 …

- On board CDS is implemented => Must be Tested
- Trigger handling is implemented => Must be Tested
- 6 Imager Boards synchronization - Master / Slave => Must be implemented & tested

It will require ~ 4 weeks. Due to others projects, this work has been shifted from April to September, we hope to finish for October meeting !

- A production of 12 USB ADC boards has been launched
  - Components ordering and mounting by a private company
  - We should receive first boards in October, Wait for result …Testing boards at lab …
  - We hope to deliver first boards in February - March 2007 (7 boards)
- JTAG GUI software extension for N Mimo* control is done

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Implementation plans: phase 2 (“the ultimate device”)

- **Serious discussion of the schedule and intermediate milestones should be foreseen for the next EUDET meeting in October**
- **Shall we foresee one intermediate step more, i.e. full size, fast, binary readout chip? I believe yes; such a chip will be very useful for testing of almost all building blocks of ILC detector, except for very high precision sensors**

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Conclusions

Sensor production and delivery follows the original schedule. All demonstrator components shall be easily available several months before June 2007.

For the second stage (digital readout sensor) the preparatory work (see Marc's talk) is progressing. The detailed planning should be discussed soon