MaDPhoX Readout and DAQ - Status and Plans

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MaDPhoX Tracking Meeting

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Chip Status

- APV25 selected as baseline

  - Low noise - S/N headroom adds design flexibility, radiation tolerance

  - More robust against radiation exposure, changing conditions

  - *Multi-peak readout - allows 1-3 BC timing resolution for reduced background*

- Geoff Hall at CERN: **no** concerns about supply

- Price: 28CHF (currently $26)

- Gathering documentation Gunther will need for hybrid/DAQ design

Hybrid/Cable Status

- Hybrid design is constrained by mechanical considerations for modules

- Need short, fine-pitch cables. These are critical, potentially expensive.

- Hybrids not in active volume

  - Flexibility in material choice: avoid ceramics if cooling design allows.

DAQ Status

- We have a basic conceptual design of the DAQ. More detail will require a better understanding of APV25 operation.

- CMS APV25 setup is on the way so that we may gain experience.

    - Spare UCSB DAQ coming from Bristol (thanks to Chris Hill)

    - Spare TOB hybrids, modules coming from UCSB (thanks to Joe Incandela)

- Once we have the CMS DAQ up and running, we can begin replacing individual elements to "adiabatically" transition to our own, complete prototype readout chain.

Priorities

- Begin running the CMS DAQ to better understand APV operation and DAQ requirements and to learn the fundamentals of APV hybrid design

- Define the properties of the hybrids (electrical, mechanical, cooling)

- Begin investigating vendors for fine pitch cables (<5cm long, $60\mu m$ pitch)

- Turn vague DAQ concept into a fully designed system

- Aggressively pursue transition of CMS DAQ to complete prototype DAQ for the experiment.

- Simulate, as realistically as possible, the APV25 readout and DAQ to back up the validity of our studies.

Plans for Proposal

- Define the properties of the hybrids (electrical, mechanical, cooling)

    - *Tim, Bill, Gunther, (+Rich, Chris?)*

- Flesh out DAQ concept with as much detail as possible

    - *Gunther (+ Chris?)*

- Simulate, as realistically as possible, the APV25 readout and DAQ to back up the validity of our studies.

    - *Matt, Tim, Rich*

Proposal: The Bigger Picture

- Need a baseline experimental layout for tracker, vacuum enclosure, etc.

- Need to know if we will need to incorporate any small angle stereo layers

- Need to know if the baseline we have been discussing cannot do the physics and we need to incorporate major changes into the design:

  - overlap/additional layer required for acceptable tracking efficiency?

  - thinned sensors in first layer to improve vertex resolution?

  - oxygenated sensors in first layer for more radiation tolerance?

  - more complex layout around dead zone to maximize acceptance?

  - addition of small pixel device behind last layer of tracker to kill fakes?