PANDA LMD DAQ Plans

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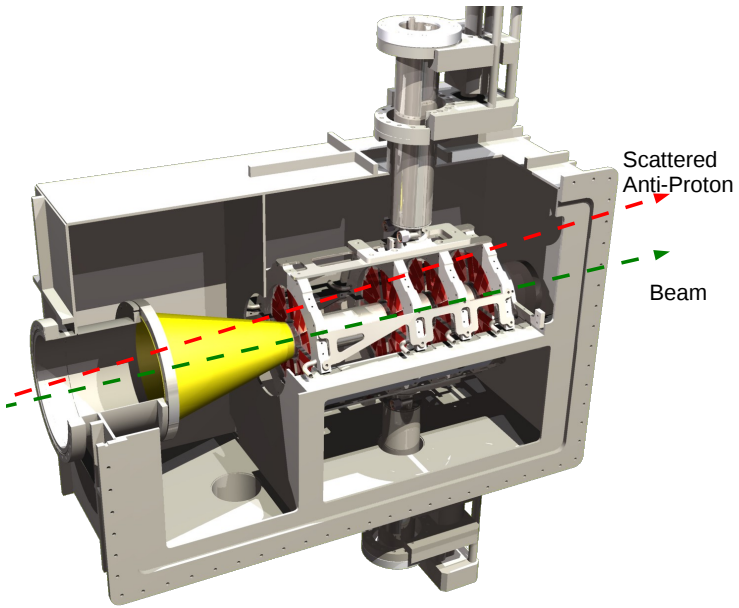
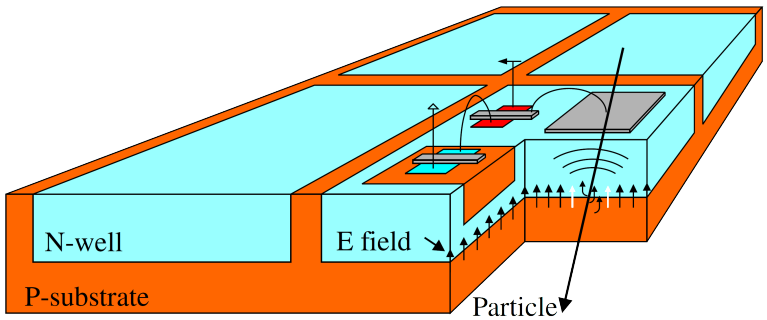
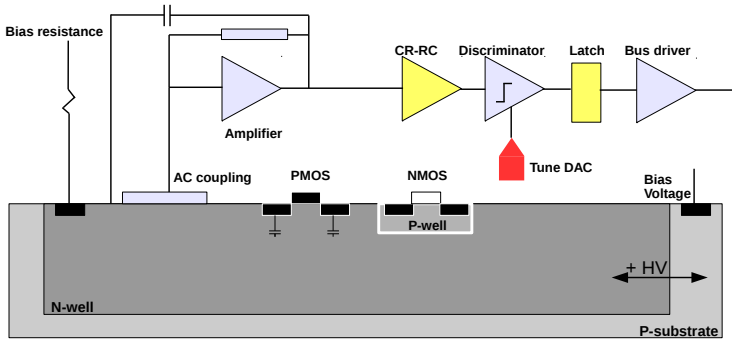
Luminosity Detector



- reconstruction of scattering angle distribution of elastic antiproton proton scattering
- four tracking layers of silicon pixel sensors
- 400 HV-MAPS in total

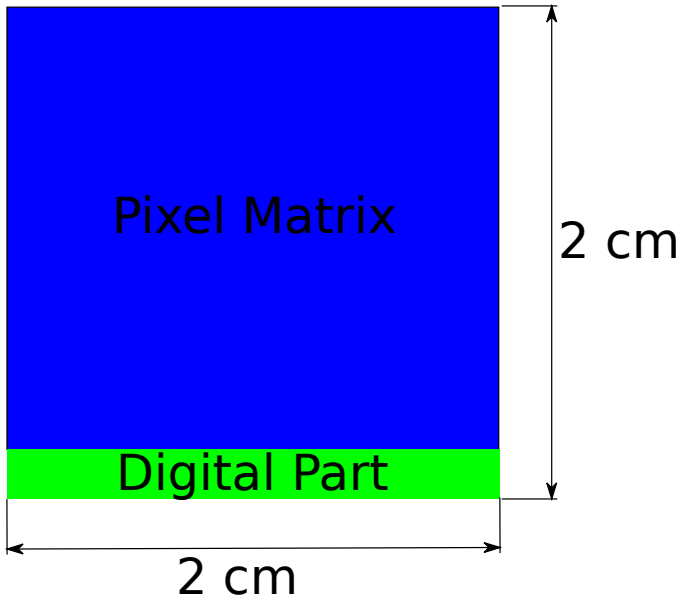
High Voltage Monolithic Active Pixel Sensors





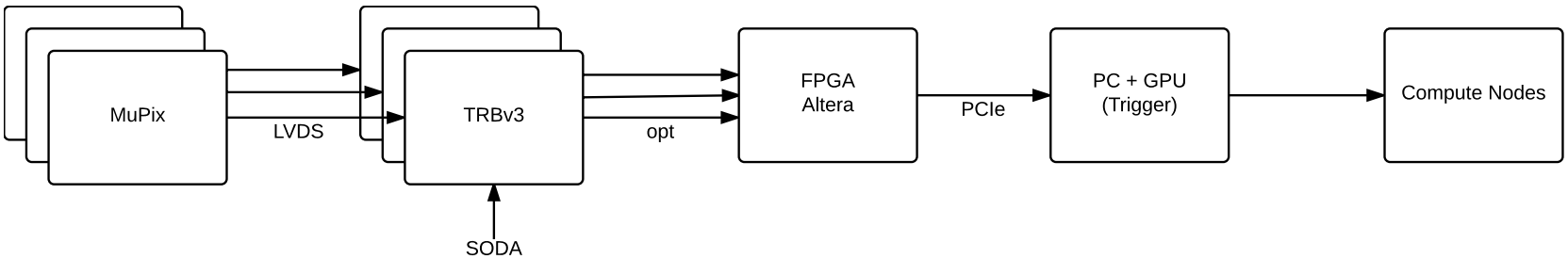
- design I. Peric for Mu3e
- 180 nm AMS/IBM process
- bias voltage ($\approx$ 60 V)
  - 14 µm depletion layer
  - fast charge collection
- radiation tolerant
- separately adjustable thresholds
- thickness below 50 µm

High Voltage Monolithic Active Pixel Sensors



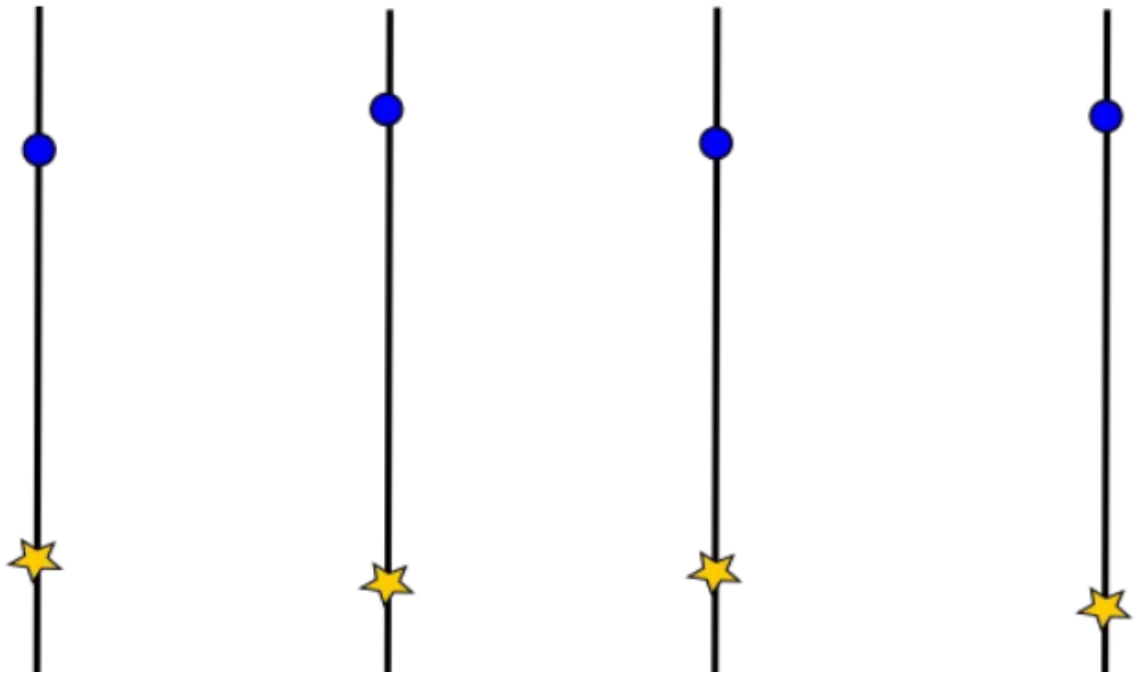
- size of 2x2 cm^2 with 80x80 μm^2 pixels
- digital part on one chip side, active area > 90%
- time stamp up to 40 MHz
- LVDS-Link @ 400-800 Mbps

LMD DAQ Scheme



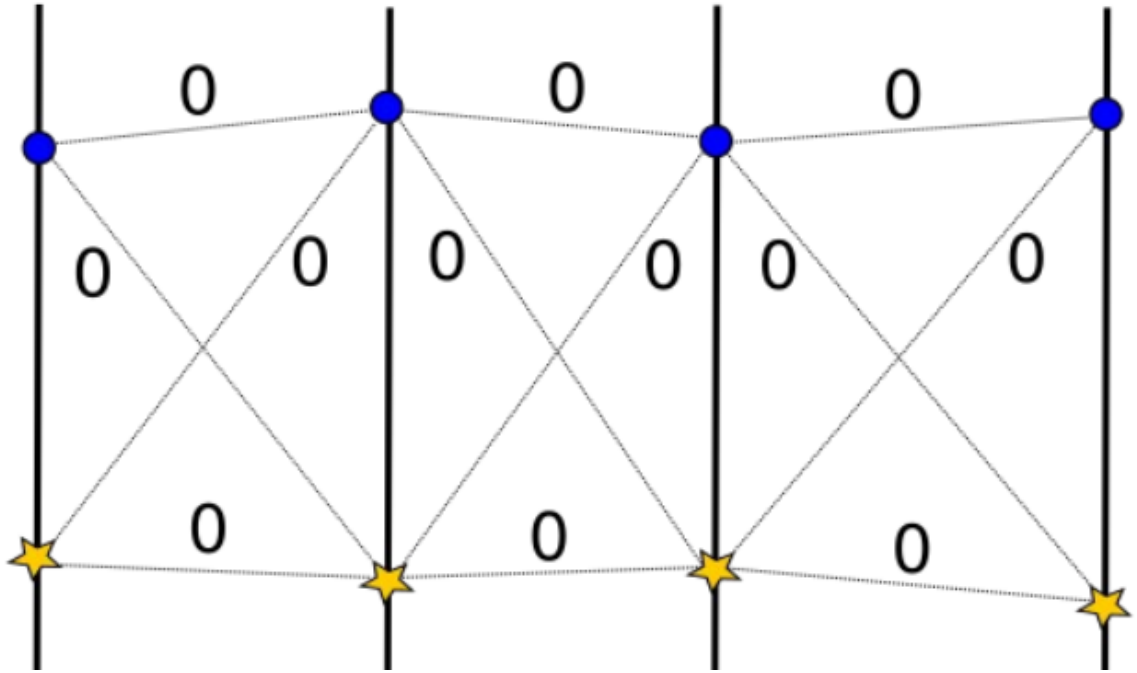
- Data stream from MuPix via LVDS links
- Slow Control via SPI like bus
- $\sim$ 20 MuPix per TRB
- Hitmerging on TRBs(?)
- Data stream to Stratix V development kit via optical links
- Stratix V development kit used already by Mu3e group (reuse firmware)
- Data stream to PC via PCIe
- Nvidia GTX 980 Ti for tracking (CUDA)

Cellular Automaton



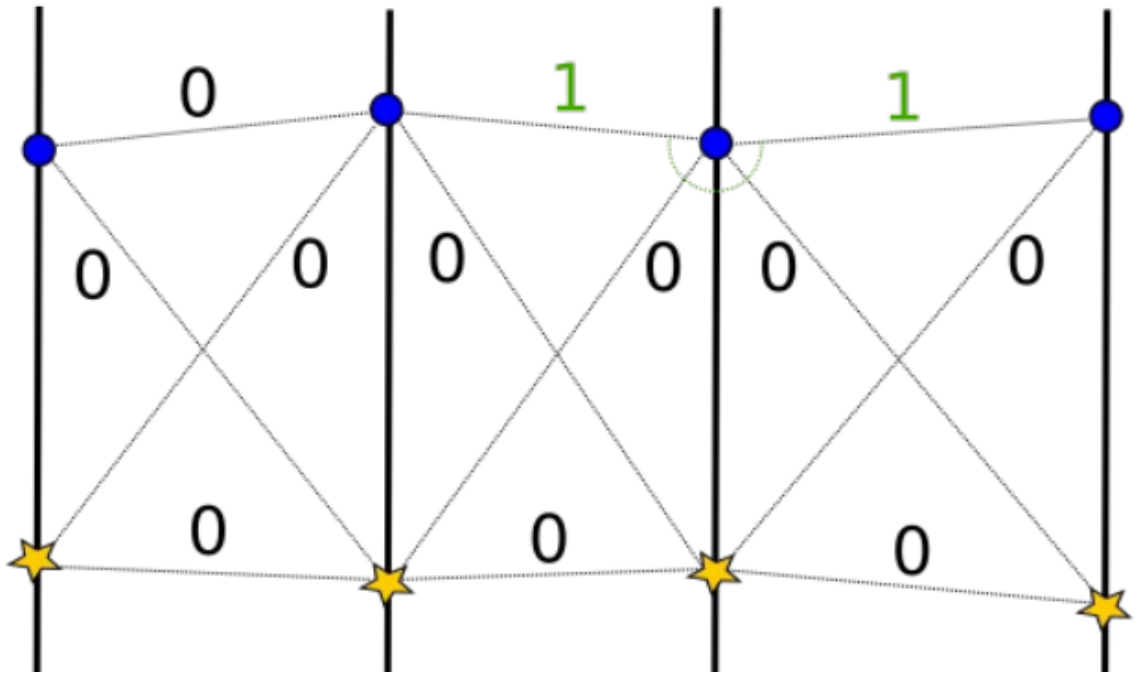
- Raw data

Cellular Automaton



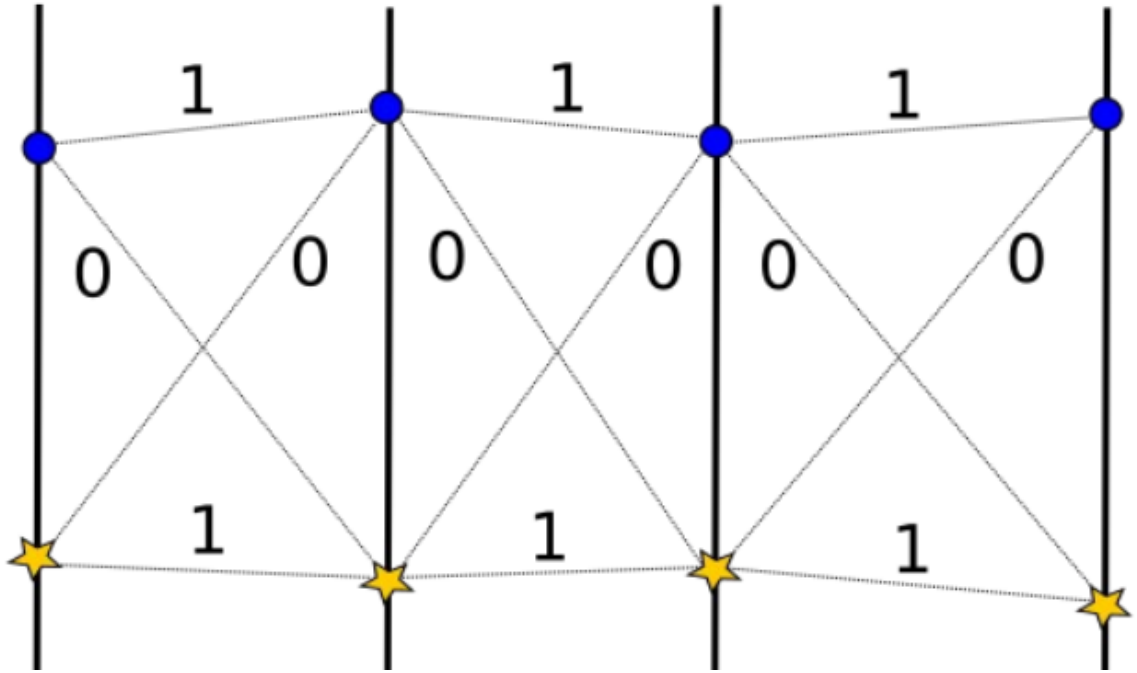
- Raw data
- Create cells

Cellular Automaton



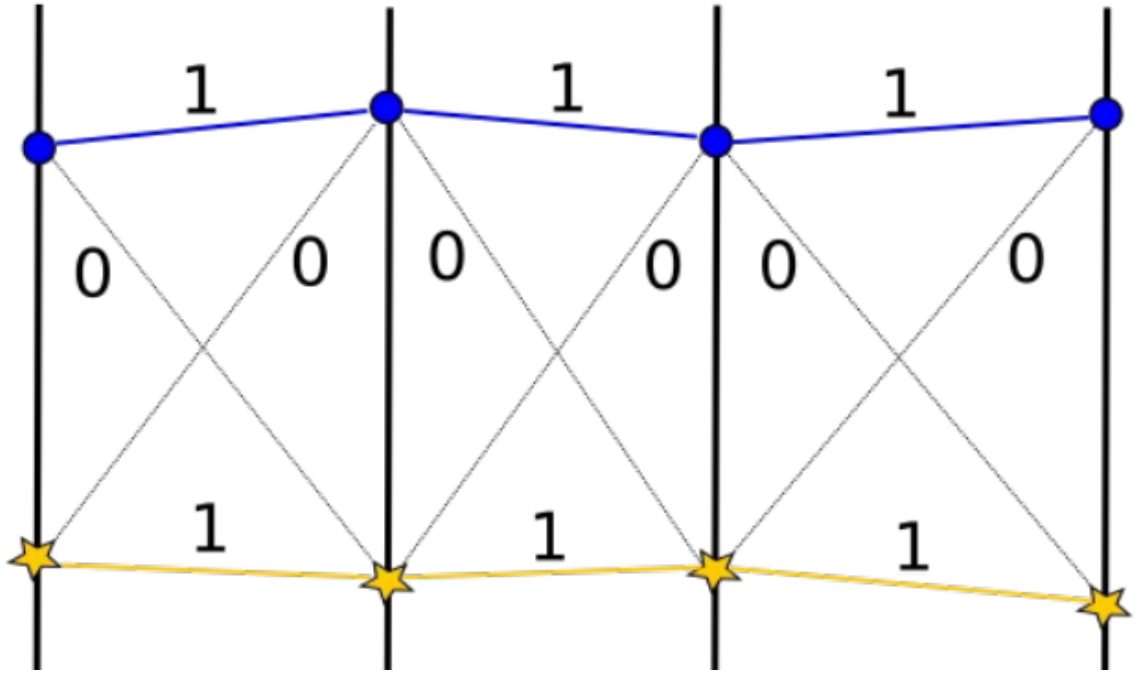
- Raw data
- Create cells
- Calculate angles

Cellular Automaton



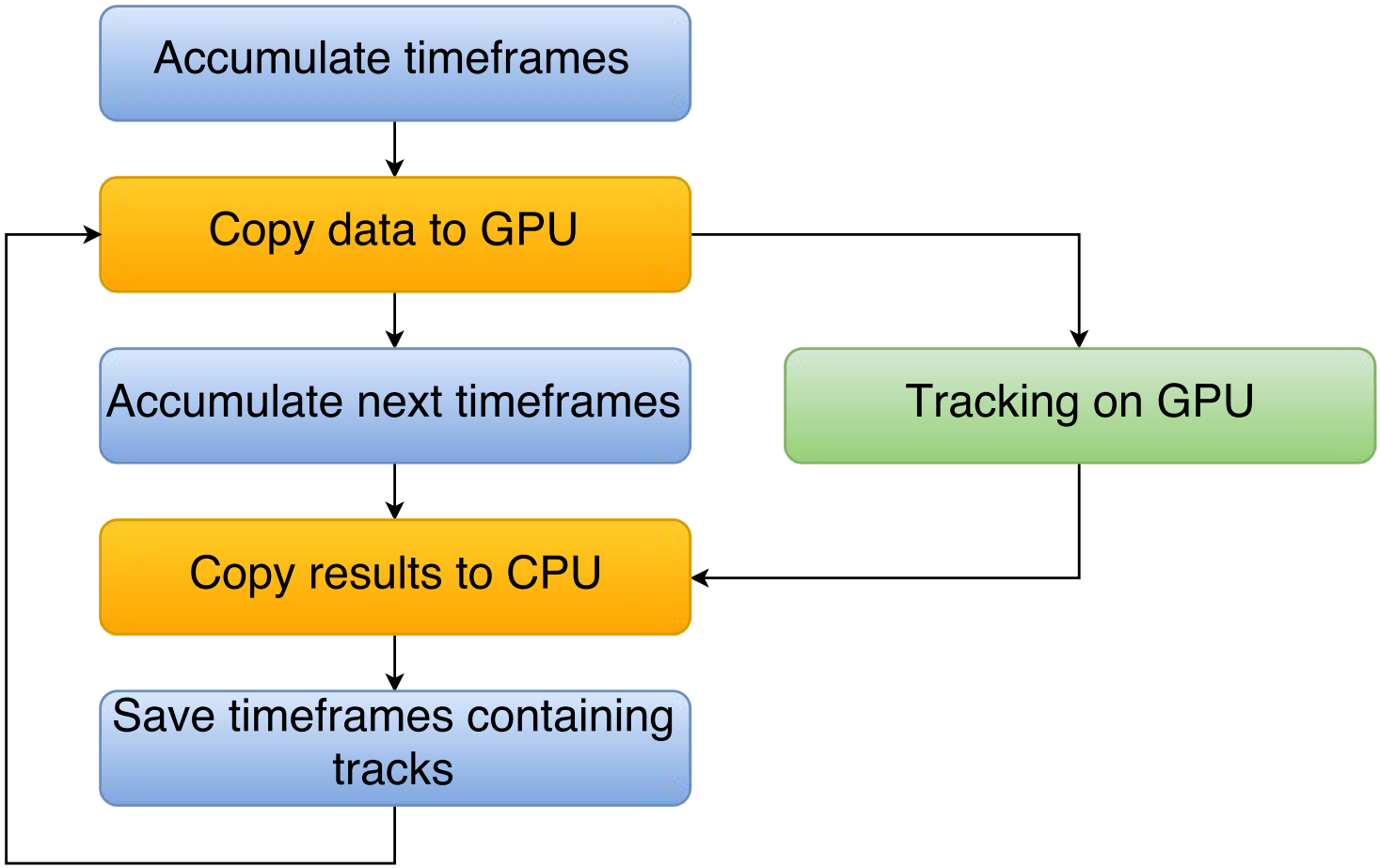
- Raw data
- Create cells
- Calculate angles

Cellular Automaton

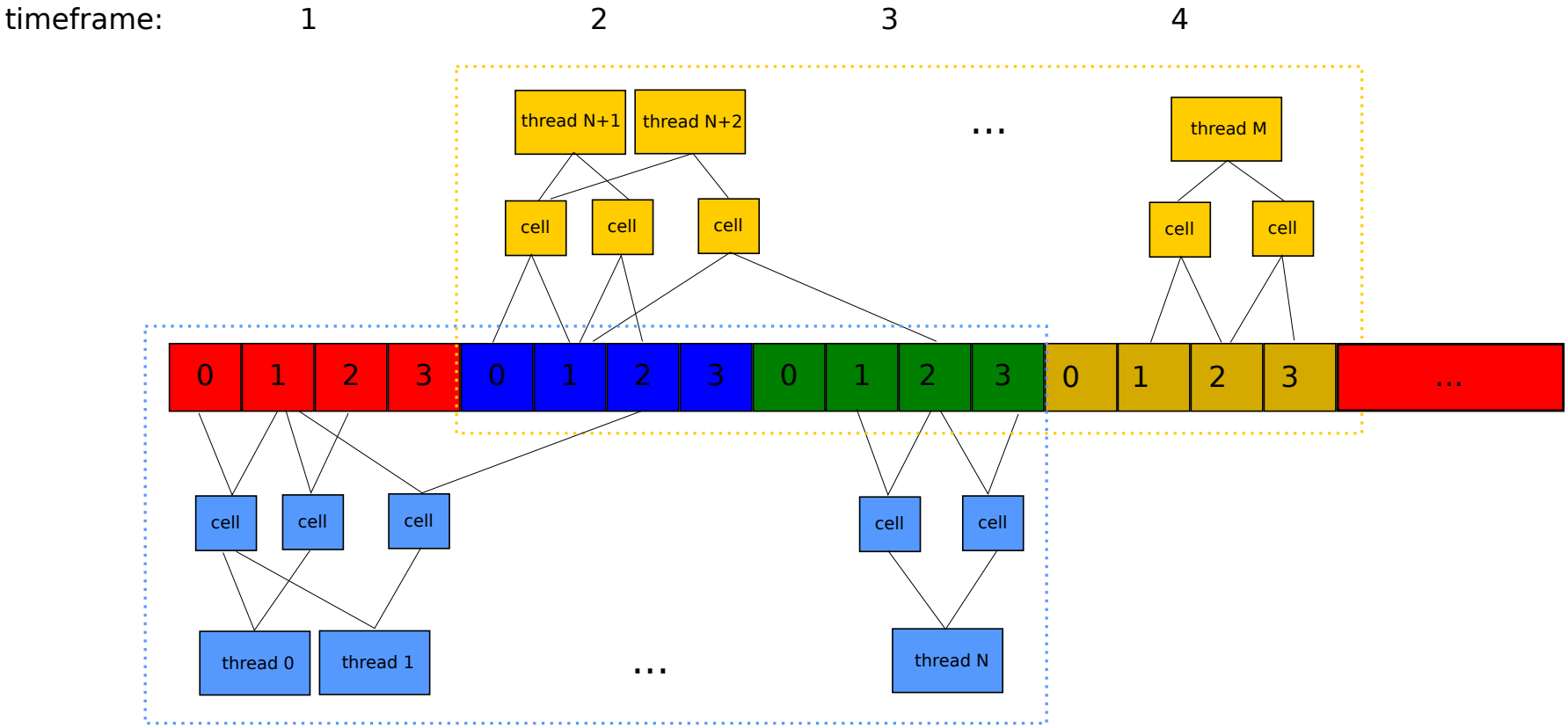


- Raw data
- Create cells
- Calculate angles
- find neighboring cell chains

Tracking Scheme



GPU Tracking



- Tracking for N timeframes simultaneously
- Track data in up to 3 timeframes
- Calculate angles for combinations in frame group
- Tracks must include hit in first frame of frame group

Future Tasks

- add SODANET superburst information to timestamps
- measure delay from SODANET source to FEE
- integrate Stratix V development kit
- complete GPU tracking code/daq software
- determine tracking latency

Open Questions

- Does someone need track information for triggering?
- How fast do you need it?
- How often is online Luminosity needed?
- Is our "Trigger-PC" already a Compute Node in the PANDA DAQ sense?