Status of the SciTil implementation in pandaroot

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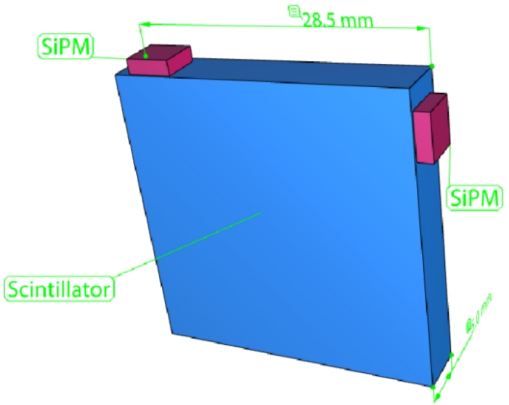
Outline

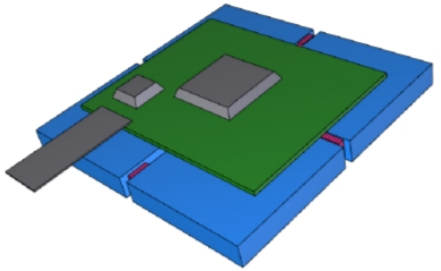
- Introduction
- Geometry update
- Time based simulation
- General update
- Summery

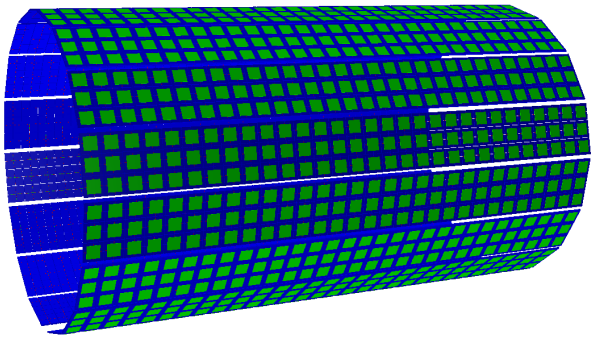
Introduction

- SciTil Boundary Conditions
  - Limited space (<2 cm in radial direction)
  - Minimum material budget (<2% of radiation length)
  - Mechanics shared with DIRC
  - Simple and robust, reliably from day-one
    - Reference for calibrating other detector systems
  - Fast readout
  - Time resolution <100 ps

- Raison d'être
  - Event timing, t0
  - Pattern recognition
  - Relative timing, PID
  - Preshower detection and correction



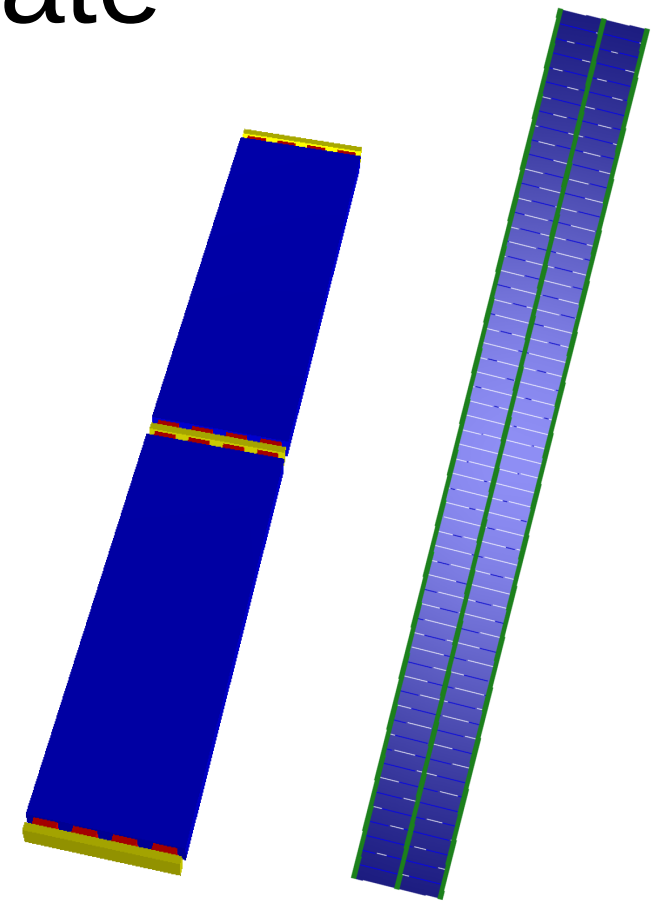




K. Goetzen et al., Proposal for a scintillator barrel hodoscope fo P^{-}ANDA

Geometry update

- Tile size
  - ~ 3x3 cm² → ~ 3x9 cm²
  - In total 1920 scintillating tiles
  - 4 SiPMs per Tile per side
    - better timing
    - well below 100 ps
  - Position resolution
    - Formaly limited to tile geometry
    - Time difference provide position information
- Implementation of SiPMs
- Implementation of readout cards
  - lower material budge

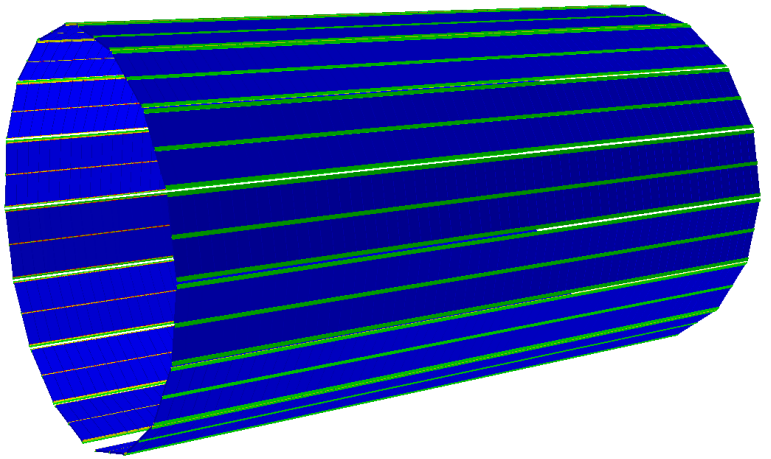


Right: Outline of scintillator tiles(blue), read out by 4 SiPM (red) on each side and the corresponding connector cards (yellow) Left: SciTil Module composed of 120 Tiles and 960 SiPMs

Geometry update

- SciTil_20150601.root
  - Latest geometry
- SciTil_201505.root
  - Proposal geometry
  - Updated to support current code
- SciTil_latest.root
  - Symbolic link pointing to latest geometry
  - Updated if new geometry is commited
- Old geometry files no longer supported!

```
PndSciT *SciT =
            new PndSciT("SCIT",kTRUE);
SciT->SetGeometryFileName(
                              "SciTil_latest.root");
fRun->AddModule(SciT);
```



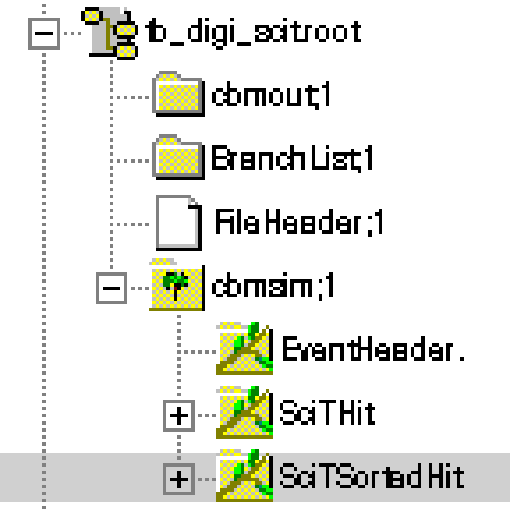
Time based simulation

- Time based simulation implemented
  - Using manual of the Workshop at GSI, September 2011
  - Derived necessary classes
    - PndSciTHitWriteOutBuffer
      - Final electronics uncertain
        - Only a basic digitization implemented
        - Using basic modify function
      - TOF-PET under consideration,
        - Provide Timing, Time over Threshold
        - Two Thresholds for timing and energy
    - PndSciTHitSorterTask
    - PndSciTHitRingSorter
  - FairLinks not implemented yet
    - Will be added as soon as I know how to

Time based simulation

- PndSciTDigiTask
  - Event based & Time based
    - Call SciTDigiTask → RunTimeBased() for time based simulation
  - Automatically manage sorting of data
  - Single tile dead time
    - Default value = 1000 ns
    - Modifiable: SciTDigiTask → SetDeadTime(double deadtime)
- PndSciTHitProducerIdeal
  - Usable for event based simulation
  - Not updated any more
- Example macros
  - Trunk/macro/scitil/timebased

```
PndSciTDigiTask* SciTDigi =
                    new PndSciTDigiTask();
SciTDigi->SetDeadTime(SciTDeadtime);
SciTDigi->RunTimeBased();
fRun->AddTask(SciTDigi);
```



General updates

- Rearranged folder structure
  - Scitil/SciTMC
  - Scitil/SciTDigi
- Parameter modification
  - Simulation: PndSciT
    - → SetThreshold(threshold) // in MeV
    - Default = 0.1 keV
  - Digitization: PndScitDigiTask
    - → RunTimeBased()
    - → SetDeadTime(double deadtime)
    - → SetTimeResolution(double dt)
    - Default = 0.1 ns

```
PndSciT *SciT =
            new PndSciT("SCIT",kTRUE);
SciT->SetGeometryFileName(
                              "SciTil_latest.root");
SciT->SetThreshold(SciTThreshold);
fRun->AddModule(SciT);
```

```
PndSciTDigiTask* SciTDigi =
                      new PndSciTDigiTask();
SciTDigi->SetDeadTime(SciTDeadtime);
SciTDigi->SetTimeResolution(SciTdt);
SciTDigi->RunTimeBased();
fRun->AddTask(SciTDigi);
```

General updates

- PndGeoHandling implemented
  - Unique “shortID” stored in simulation and digitization output as “fDetectorID”
  - Full volume path still stored as “fDetName”
- Reworked stored data
  - Redundant functions cleared
  - Redundant stored data in SciTPoint and SciTHit cleared
  - Position Error "dpos" equal to tile size
    - Coordinates in corresponding Tile frame
  - Check respective header files for access functions

- SciTPoint
  - Event ID, Track ID
  - Detector ID (short Id), DetectorName
  - HitPositionIn, HitPositionOut
  - Momentum In, Momentum Out
  - Time
  - TrackLength, Energyloss

- SciTHit
  - Detector ID (short Id), DetectorName
  - HitPosition, PositionError
  - Time, TimingError
  - Energyloss
  - MC Index

Summery

SciTil in Pandaroot:

- updated to current project status
- Timebased simulation ready to use
- Updates will be provided
  - digitization, electronics, timing

To do

- Give me feedbacks
  - Anything missing? Anything strange?
- Use the SciTil for higher level analysis
  - T0, pattern recognition, PID, preshower ...
- Give feedbacks again
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