

# Status of the SciTil implementation in pandaroot

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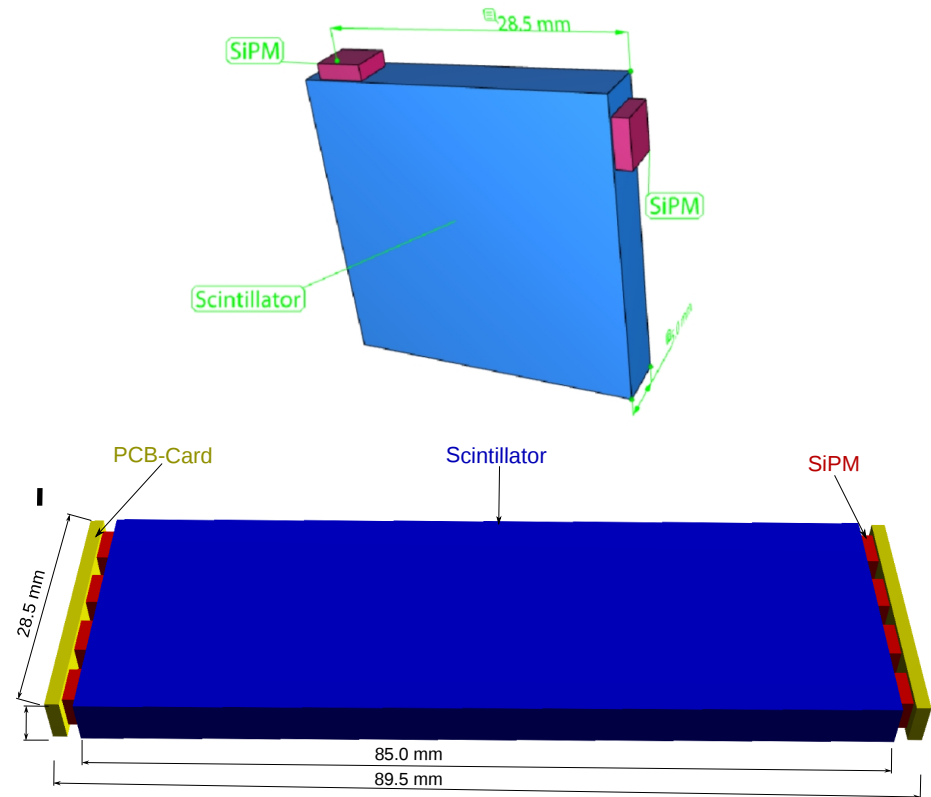


# Outline

- Geometry update
- Time based simulation
- General update
- Preliminary results and ongoing work
- Summary

# Geometry update

- Tile size
  - $\sim 3 \times 3 \text{ cm}^2 \rightarrow \sim 3 \times 9 \text{ cm}^2$
  - In total 1920 scintillating tiles
- 4 SiPMs per Tile per side
  - in serial connection
  - better timing
  - well below 100 ps



Top: Proposal geometry for a  $\sim 3 \times 3 \text{ cm}$  scintillator tile hodoscope for PANDA  
Bottom: Outline of  $\sim 3 \times 9 \text{ cm}$  scintillator tile (blue), read out by 4 SiPM (red) on each side and the corresponding connector cards (yellow)

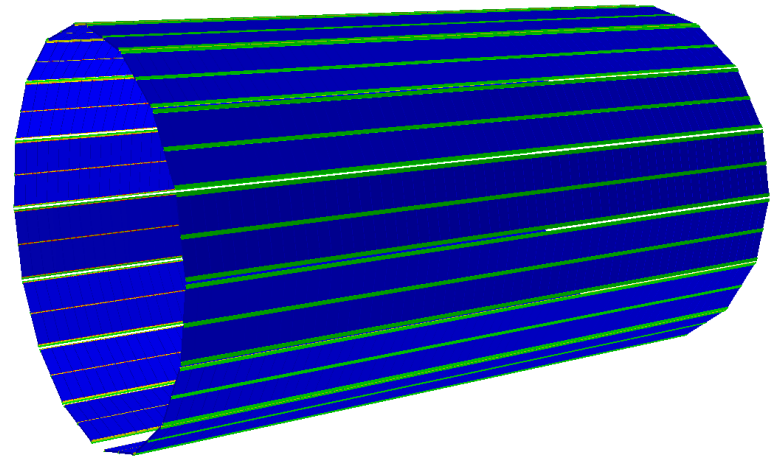
# Geometry update

- Hit Position
  - Y / Z Position → Center of scintillating Tile
  - X Position → Calculated using the timestamps
- Position resolution
  - y and z resolution limited to tile geometry
    - Consistant with proposal geometry
    - $dPos_Y \approx 1/\sqrt{12} * 3 \approx 0.85 \text{ cm}$
  - X resolution limited by timedifferenz resolution
    - $dt = 100 \text{ ns}$
    - $dPos_X = dt * c_{BC408} \approx 1.9 \text{ cm}$

# Geometry update

- SciTil\_20150801.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 committed
- **Older geometry files no longer supported!**

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



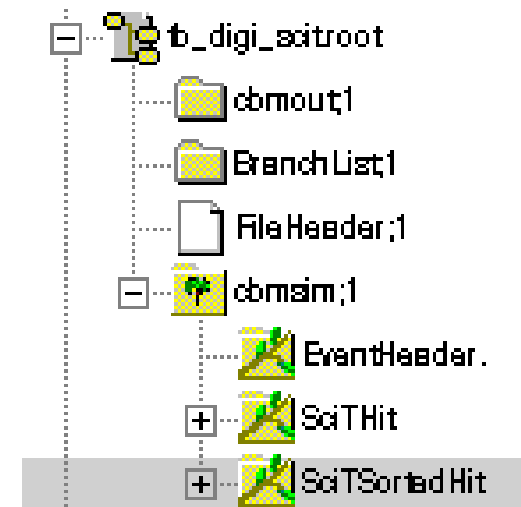
# Time based simulation

- Time based simulation implemented
  - Using manual of the Workshop at GSI, September 2011
  - new classes
    - PndSciTHitWriteOutBuffer
      - Final electronics uncertain
        - Only a basic digitization implemented
        - TOF-PET under consideration,
          - Provide Timing, Time over Threshold
          - Two Thresholds for timing and energy
    - PndSciTHitSorterTask
    - PndSciTHitRingSorter
  - **FairLinks implemented!**

# Time based simulation

- (old) PndSciTHitProducerIdeal
  - Still usable for event based simulation
  - Not updated any more
- 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(deadtime) // in ns
- 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 GeV
      - Default = 0.0001 GeV (100 keV)
  - Digitization: **PndScitDigiTask**
    - → RunTimeBased()
    - → SetDeadTime(deadtime)
    - → SetTimeResolution(dt)
      - Default = 0.1 ns

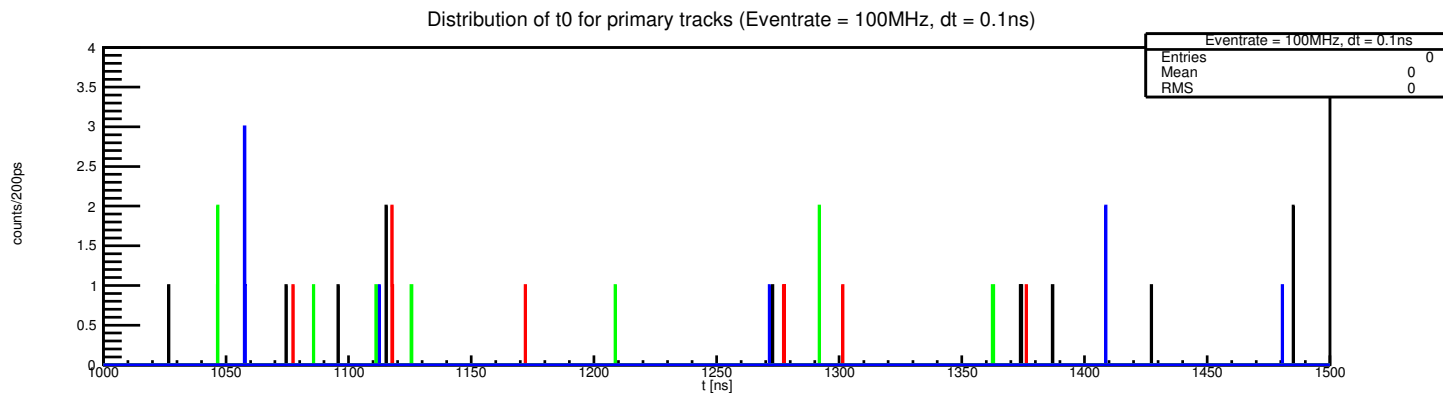
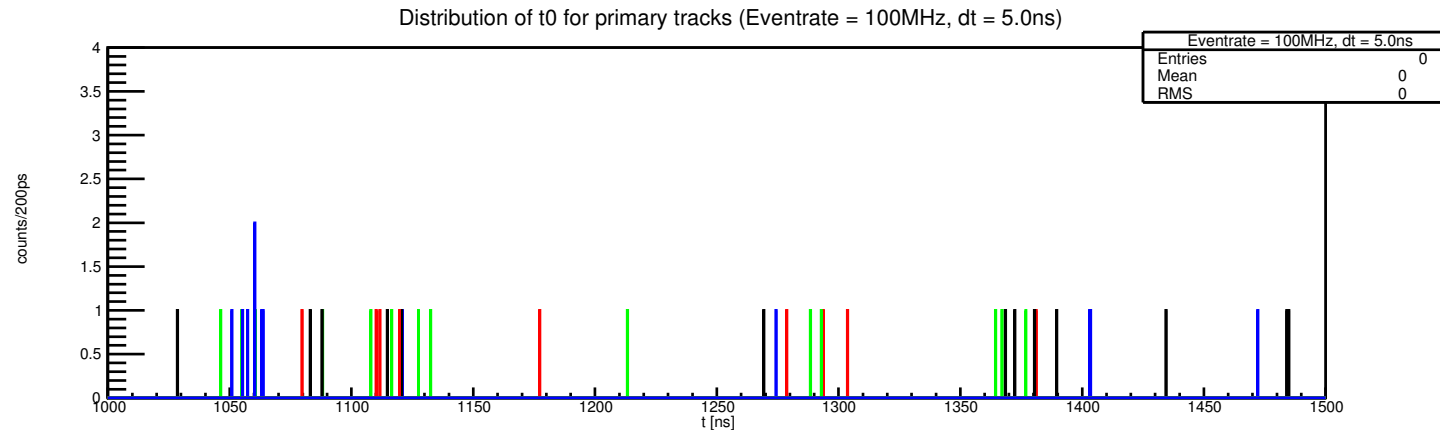
```
PndSciT *SciT =  
    new PndSciT("SCIT",kTRUE);  
SciT->SetGeometryFileName(  
    "SciTil_latest.root");  
SciT->SetThreshold(SciTThreshold);  
fRun->AddModule(SciT);
```

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



# Preliminary results

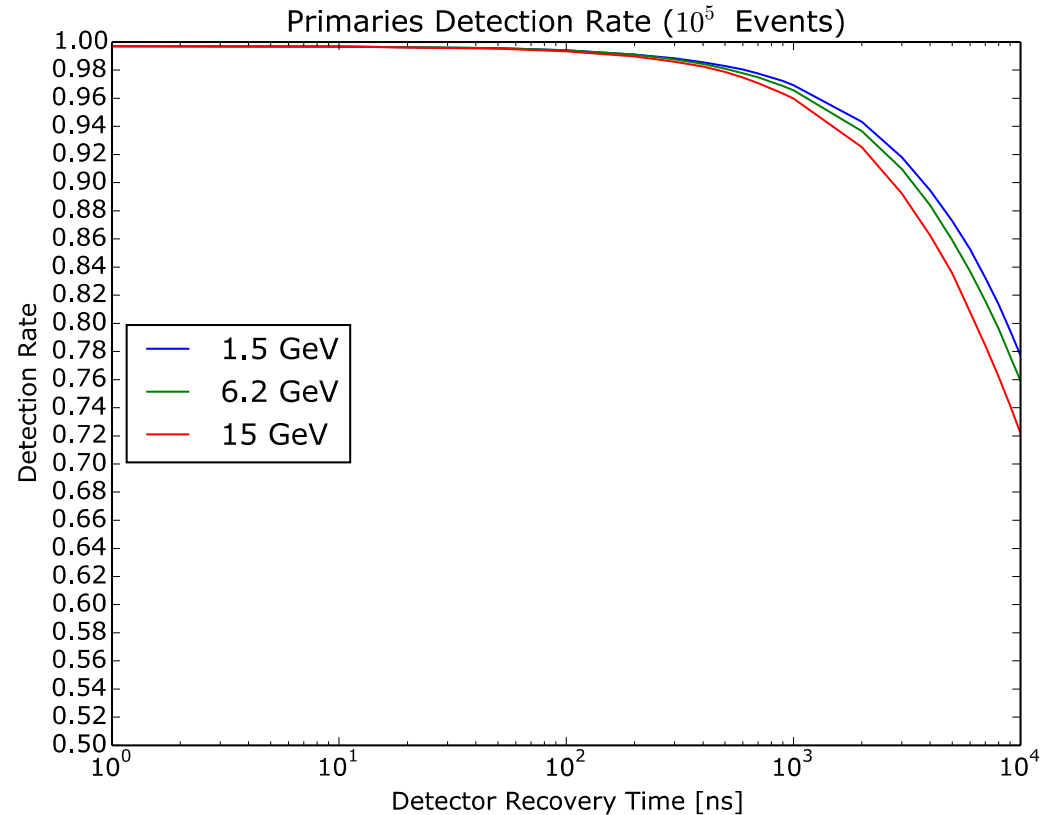
- Event mixing
  - DPM generator
  - Momentum = 6.2 GeV/c
  - $N_{\text{avg}} = 100 \text{ MHz}$
  - T0 distribution
    - Using length of track
    - Particle momentum
    - Timestamp from SciTil



# Preliminary results

- Detection efficiency

- Detected particles / passed particles
- What particles/tracks take into account?
  - e.g. backscattered from EMC
  - Secondary tracks
- Simulation parameters
  - DPM generator
  - $N_{\text{avg}} = 20$  MHz
  - $10^5$  events simulated



# Summary

## SciTil in Pandaroot:

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

## Ongoing Work:

- Started using the framework
- Eventmixing
- Detection efficiency