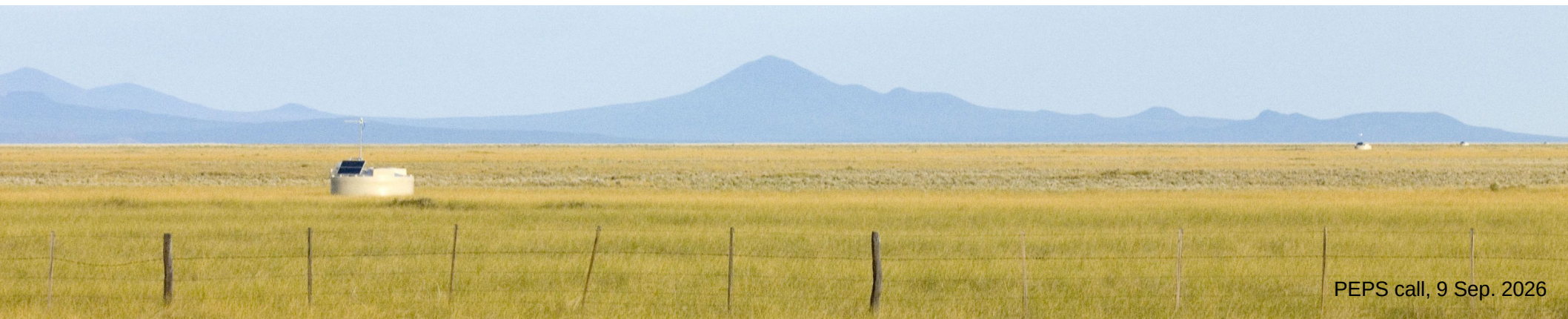


Status of the PEPS simulation in Offline

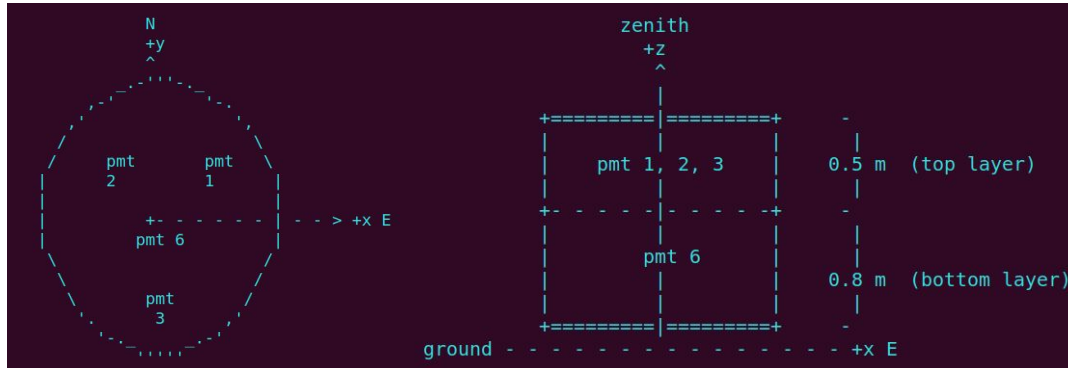
N. González¹ and I. Maris²

¹ Instituto de Tecnologías en Detección y Astropartículas (ITeDA)

² Université Libre de Bruxelles (ULB)



SModels: PMT numbering



- To be consistent with small PMT and SSD PMT, should we change the bottom layer's PMT to id = 6?

SModelsSegmented.xml

```
<tankCasing id="rotoplas">
  <insideRadius unit="m"> 1.5 </insideRadius>
  <insideHeight unit="m"> 1.3 </insideHeight>
  <casingThickness unit="mm"> 12.7 </casingThickness>
</tankCasing>
```

```
<!-- Positions defined assuming coordinate origin at the ground and center of the tank -->
<tankPMTConfig id="standard">
  <!-- Top three large PMTs -->
  <PMTPosition PMTId="1" unit="m"> 1.039 0.600 1.300 </PMTPosition>
  <PMTPosition PMTId="2" unit="m"> -1.039 0.600 1.300 </PMTPosition>
  <PMTPosition PMTId="3" unit="m"> 0.000 -1.200 1.300 </PMTPosition>
  <!-- Bottom large PMT. Ids 4 and 5 reserved for SPMT and SSD -->
  <PMTPosition PMTId="6" unit="m"> 0.000 0.000 0.800 </PMTPosition>
</tankPMTConfig>
```

```
<water id="standard">
  <waterAbsorptionLength> <!-- tabulated function -->
    <x unit="eV"> <!-- photon energy bins -->
      2.08 2.16 2.19 2.23 2.27 2.32
      2.36 2.41 2.46 2.50 2.56 2.61
      2.67 2.72 2.79 2.85 2.92 2.99
      3.06 3.14 3.22 3.31 3.40 3.49
      3.59 3.70 3.81 3.94 4.07 4.20
    </x>
    <y> <!-- absorption length in relative units -->
      0.092 0.133 0.180 0.203 0.226 0.258
    </y>
  </waterAbsorptionLength>
</water>
```

```
<liner id="1073B-tyvek">
  <reflectivity_shape>
    <x unit="eV">
      2.08 2.16 2.19 2.23 2.27 2.32
      2.36 2.41 2.46 2.50 2.56 2.61
      2.67 2.72 2.79 2.85 2.92 2.99
      3.06 3.14 3.22 3.31 3.40 3.49
      3.59 3.70 3.81 3.94 4.07 4.20
    </x>
    <y>
      0.9957 0.9953 0.9948 0.9942 0.9939 0.9937
    </y>
  </reflectivity_shape>
</liner>
```

First steps of the simulation chain ready

- Sets peak and charge parameters of each PMT. Used in the simulation of the detector's response
- Values obtained by Andrea Parenti using Billoir's toy MC

```
<simModule name="G4StationSimulatorPEPS">
  <electronics isUUB="0">
    <PMT id='1'>
      <peak> 40.91 </peak> <!-- +- 0.07 FADC -->
      <charge> 72.71 </charge> <!-- +- 0.11 FADC -->
    </PMT>
    <PMT id='2'>
      <peak> 40.91 </peak> <!-- +- 0.07 FADC -->
      <charge> 72.71 </charge> <!-- +- 0.11 FADC -->
    </PMT>
    <PMT id='3'>
      <peak> 40.91 </peak> <!-- +- 0.07 FADC -->
      <charge> 72.71 </charge> <!-- +- 0.11 FADC -->
    </PMT>
    <PMT id='6'>
      <peak> 114.61 </peak> <!-- +- 0.15 FADC -->
      <charge> 200.00 </charge> <!-- +- 0.2 FADC -->
    </PMT>
  </electronics>
</simModule>
```

SdSimCalibConstSegmentedTank.xml

```
<moduleControl>

  <loop numTimes="unbounded" pushEventToStack="yes">

    <module> EventFileReaderOG </module>

    <!-- increase numTimes if you want to throw the shower into the array more than once -->
    <loop numTimes="1" pushEventToStack="yes">

      <module> EventGeneratorOG </module>

      <!-- simulation of muon background -->
      <module> SdAccidentalInjectorKG </module>

      <!-- Event simulation -->

      <loop numTimes="unbounded" pushEventToStack="no">
        <module> CachedShowerRegeneratorOG </module>
        <!--<module> G4StationSimulatorOG </module>-->
        <module> G4StationSimulatorPEPS </module>
      </loop>

      <module> SdSimulationCalibrationFillerOG </module>
      <module> SdPMTSimulatorOG </module>
      <module> SdFilterFADCSimulatorMTU </module>
      <module> SdBaselineSimulatorOG </module>
      <module> TankTriggerSimulatorOG </module>
      <module> TankGPSSimulatorOG </module>

      <module> ClearParticleLists </module>

      <module> CentralTriggerSimulatorXb </module>
      <module> CentralTriggerEventBuilderOG </module>
      <module> EventBuilderOG </module>

      <!-- Event reconstruction (to be developed) -->
```

New G4 Station Simulator
PEPS module ready for review!

These modules should receive
dedicated configuration through
XMLs, ported from the old version of
the PEPS simulation

Top PMTs govern the station trigger
for the T3 formation?

ToDo

- ▶ G4StationSimulator module designed for segmented tanks, named [G4StationSimulatorPEPS](#)
 - merge the 'old' G4SimulatorSegmentedTank and current G4StationSimulator → done (to be tested)
 - adapt remaining XML configuration of simulation models from old Offline
 - verify that the T3 array trigger is working correctly
 - add simulation of buried scintillators (UMD) → should be significantly easier :)

- ▶ Mid-term: arrange a first reconstruction sequence for simulated events
 - include the SD-433 reconstruction parametrizations

Commands to run the application

1. `git clone git@gitlab.iap.kit.edu:auger-observatory/offline/offline.git`
2. `cd offline`
3. `git checkout -b peps origin/peps`
- < install Offline >
- 4, Run Example application:
 - a. `<install_dir>/share/auger-offline/doc/ExampleApplications/SegmentedTank/`
 - b. `make run`

Backup