**Motivation**

- A network of 16 Medipix detectors has proven valuable for the investigation of the ATLAS machine's luminosity, the activation of surrounding material during and after collisions and the composition of the radiation fields at different positions within the cavern [1,2].
- During the 2013-2014 shutdown period this network was upgraded to a two layer Timepix design with a faster readout for an improved particle identification and the investigation of the directionality of the fast neutron component [3].

**Hodoscope design**

Timepix detectors:
- 256 x 256 pixels
- Pixel pitch: 55 µm
- Active area: 1.4 x 1.4 cm²
- Modes of operation (each pixel):
  - Counting (number of hits), Time-over-Threshold (energy mode), Time-of-Arrival (time mode)
- Readout speed:
  - up to 8 frames/sec (dead time between frames ~120 ms)
- Converter layers:
  - Polyethylene (sensitive to fast neutrons via recoil protons)
  - Polyethylene with additional aluminum (sensitive to fast neutrons with threshold ~4MeV neutron energy)
- Coincidences/anticoincidences for particle discrimination.

**Positions within the ATLAS cavern**

**Luminosity calibration with van der Meer scans**

**Online data visualization and examples of frames (TPX 01)**

**Data transfer and storage**

**Conclusion**

- During the recent long shut-down of the ATLAS-Medipix detector network was upgraded to the ATLAS Timepix detector network consisting of 15 operational two layer Timepix detectors.
- The detection efficiencies to neutral and charged particles were determined and the capability of applying the coincidence/anticoincidence technique was tested.
- The devices were able to run in a continuous mode from 10^9 to 10^12 particles per second using hit and cluster counting methods after calibration with van der Meer scans.
- Typical frames during and after the beam were shown. These can be displayed through a web application from atlastpx.utef.cvut.cz.

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