New coordinate-tracking detector on drift chambers for registration of muons in near-vertical EAS

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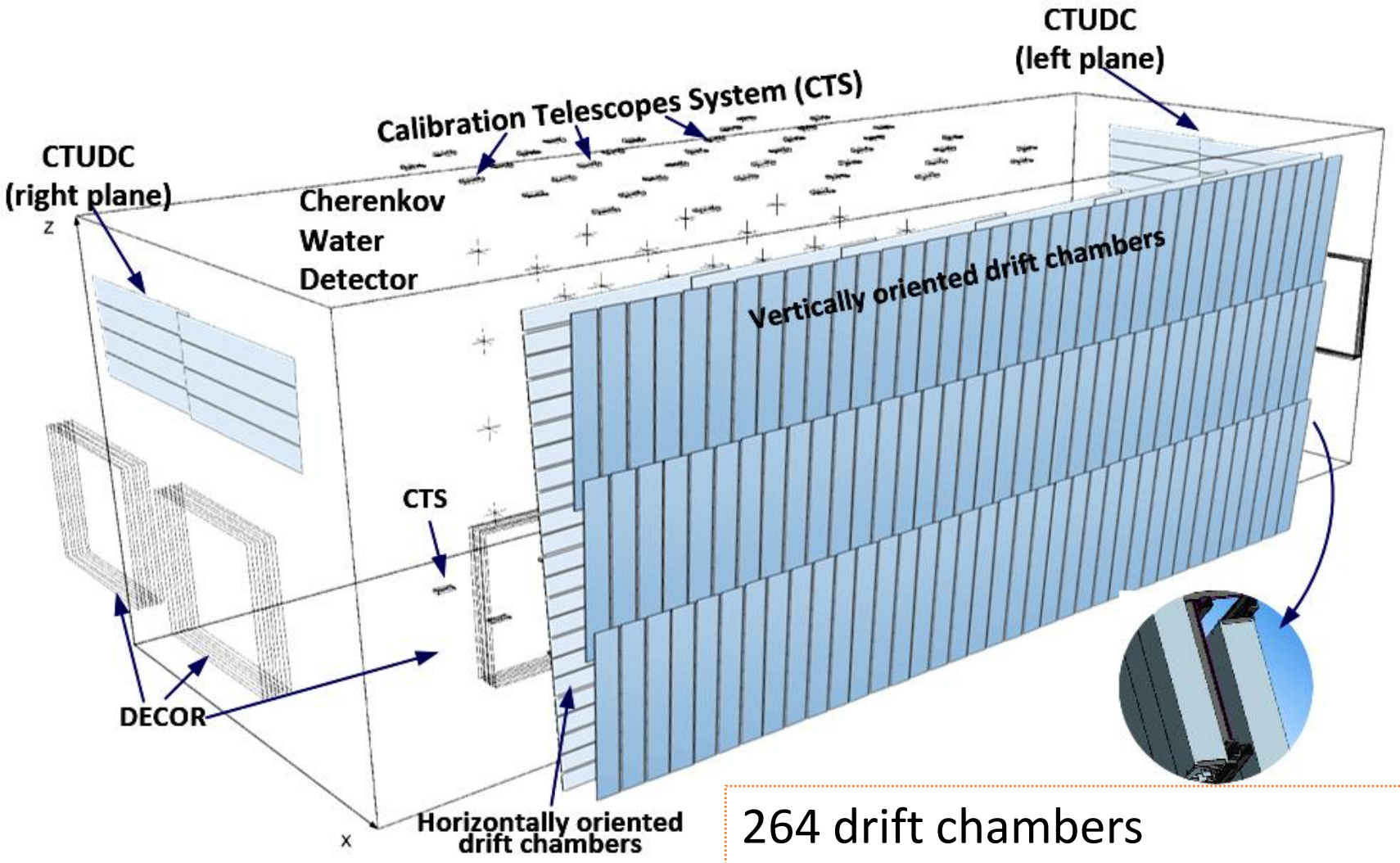
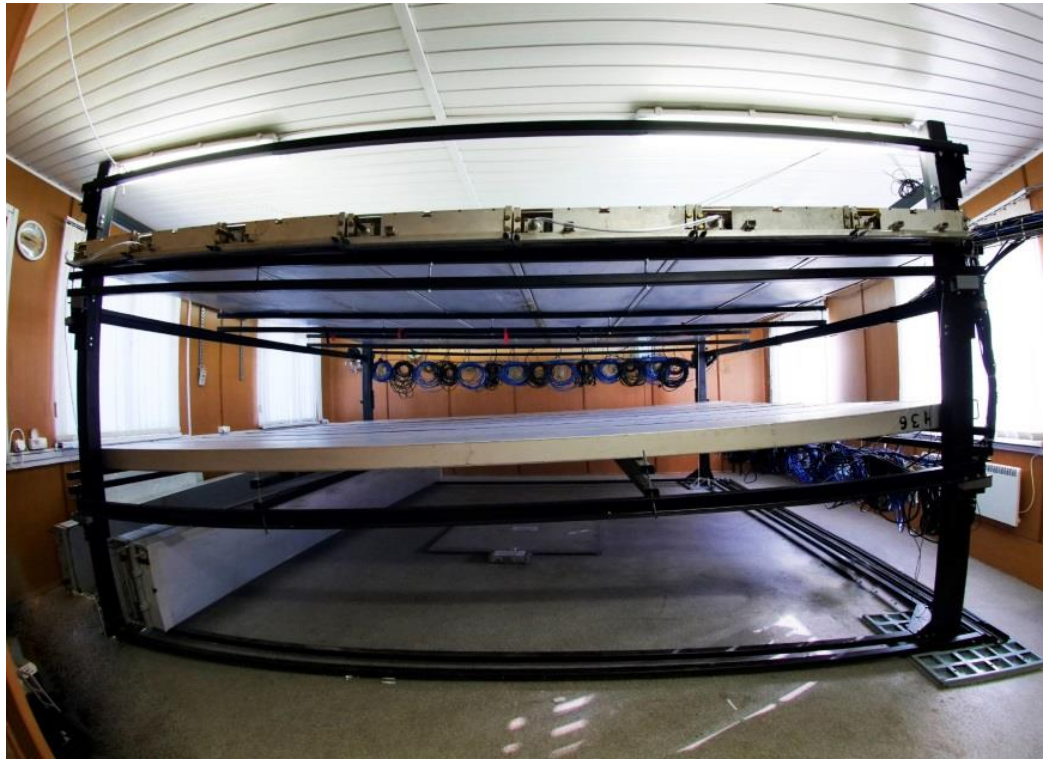
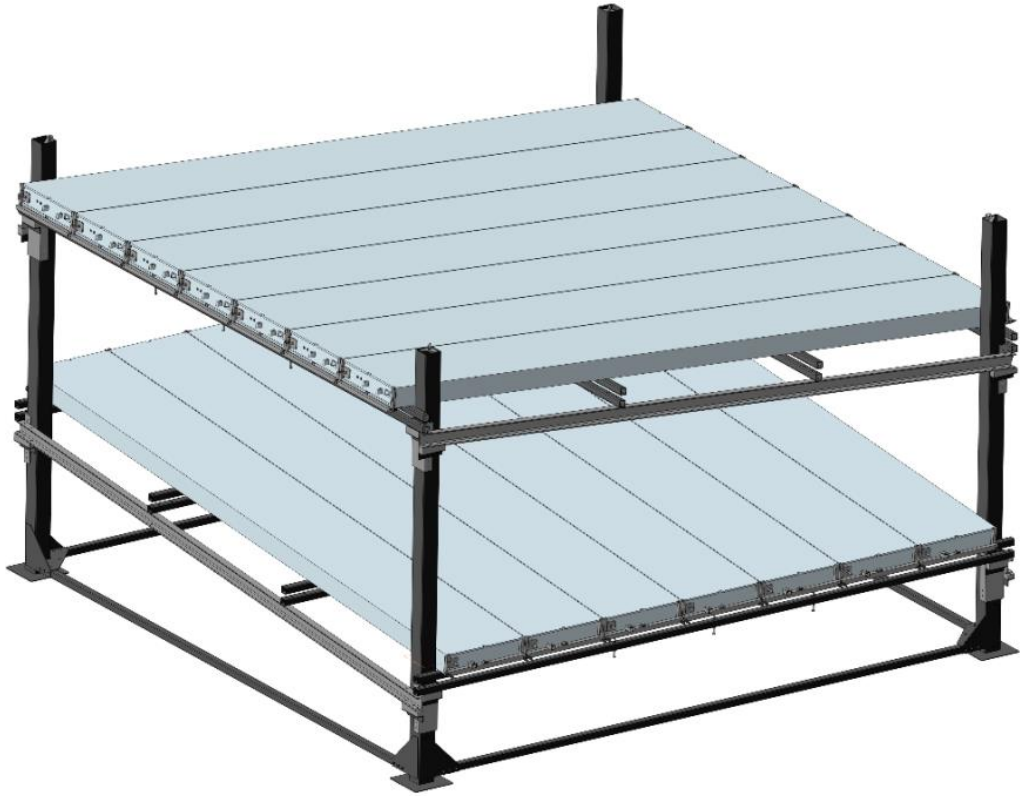
Detector TREK



264 drift chambers
Chamber's area is 2 m^2
TREK's area is about 250 m^2

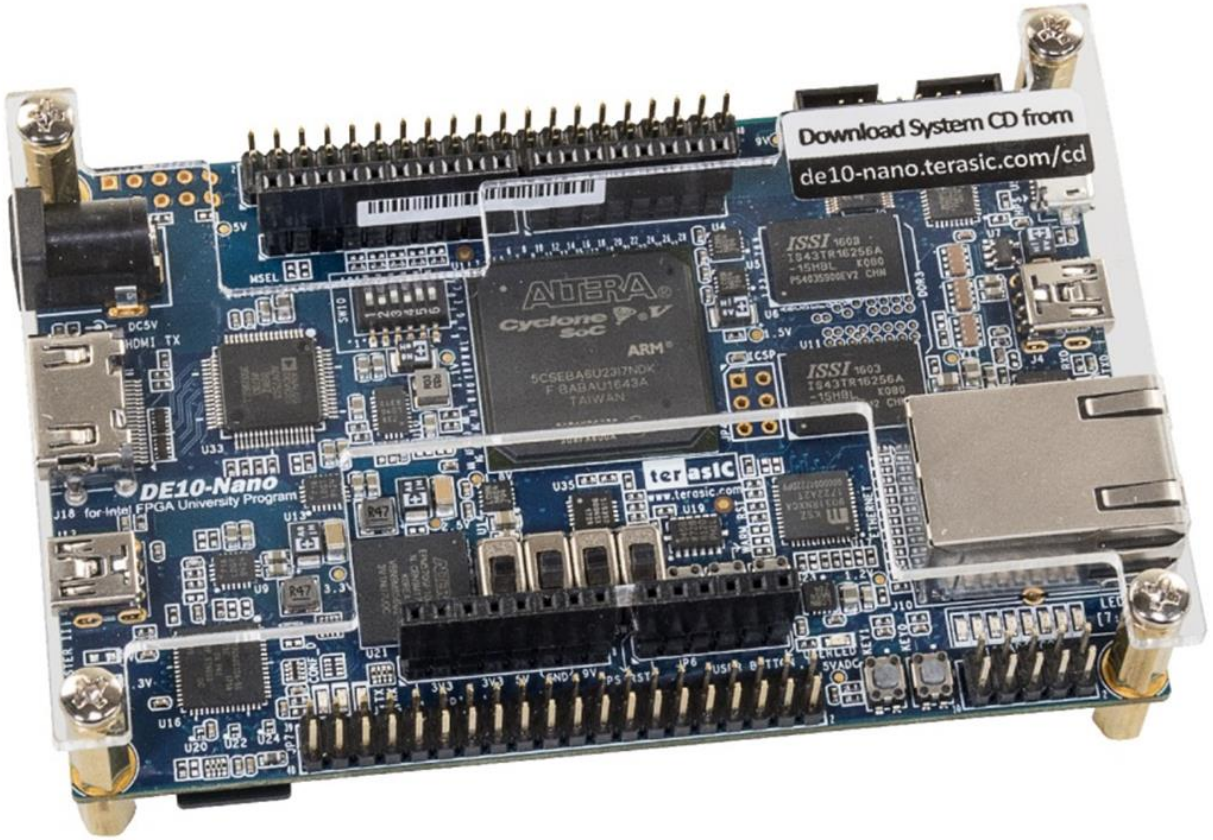
Coordinate-tracking detector ProtoTREK





- Two planes of multiwire drift chambers
- Each plane has seven chambers
- Two square scintillator detectors (1 m^2 each) above and below coordinate planes.

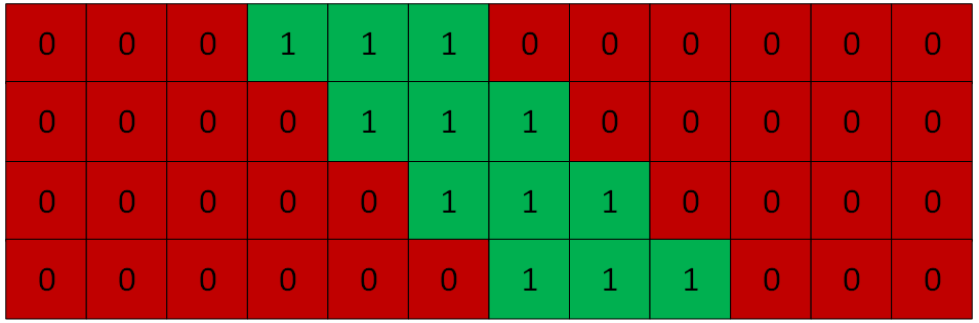
Time-to-digital converter based on FPGA



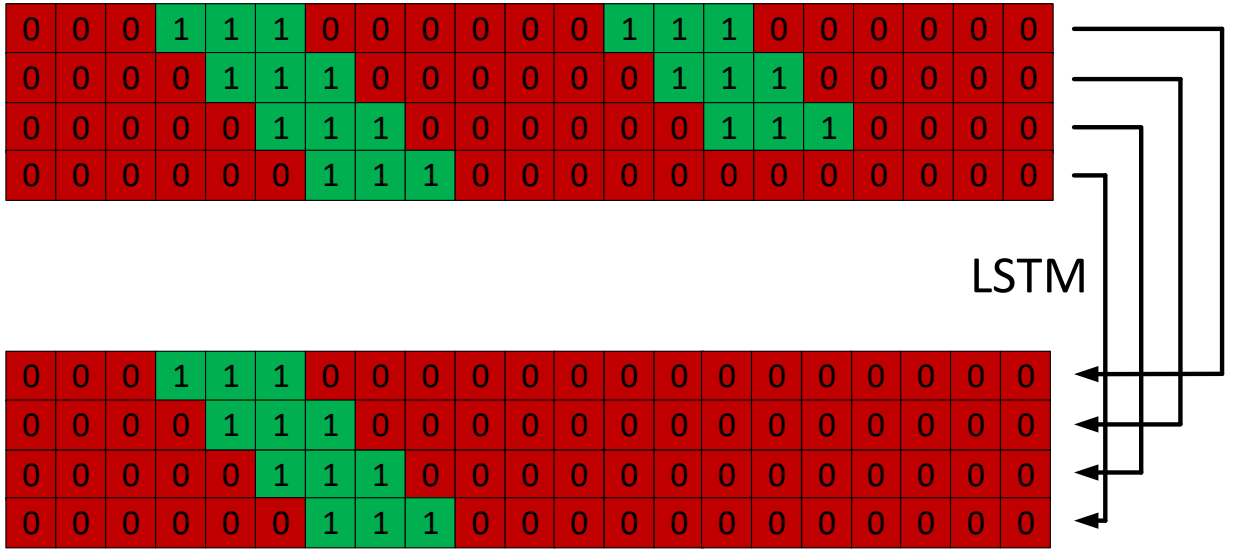
DE0-Nano-SoC Development Kit
FPGA Altera Cyclone V

- The new TDC is developed on DE0-Nano-SoC Development Kit with FPGA Altera Cyclone V.
- The time step is 5 ns.
- The width of the matching window is 20 μs
- It has Linux OS on board. It allows to control the TDC and get information from it by server-client system.

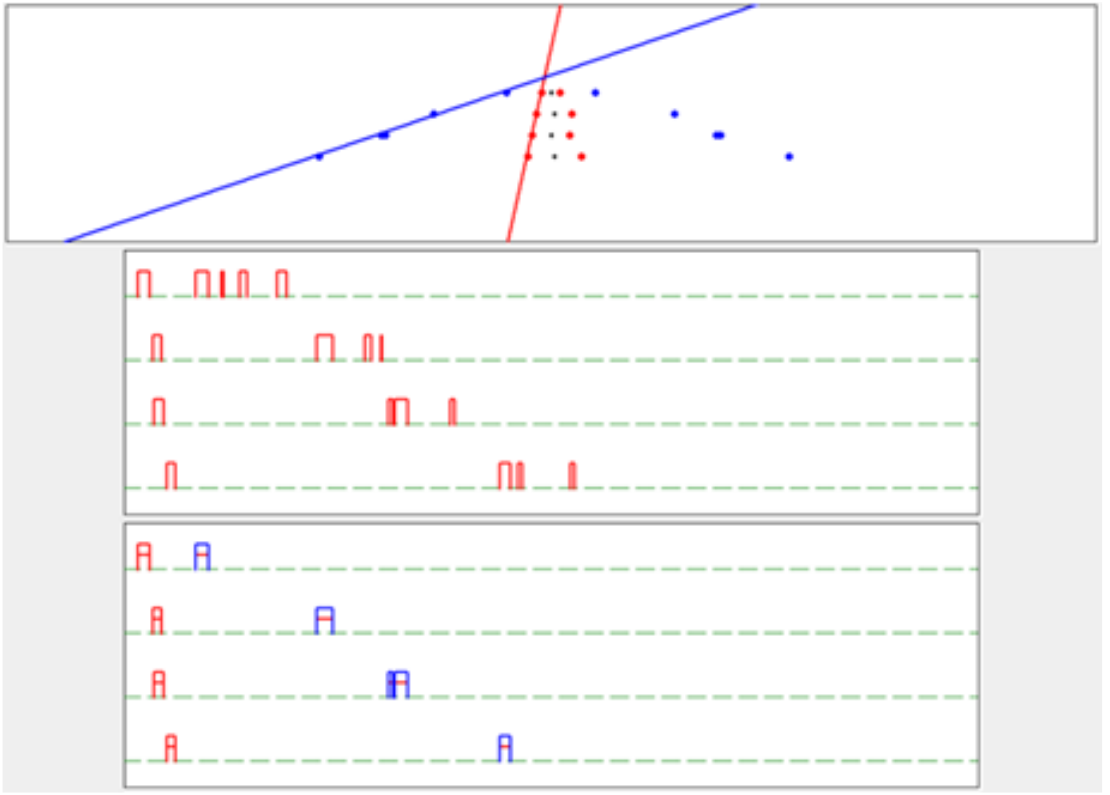
Event reconstruction by deep learning methods



Presentation of drift chambers data as matrix 4×600 (only 12 raws are shown)

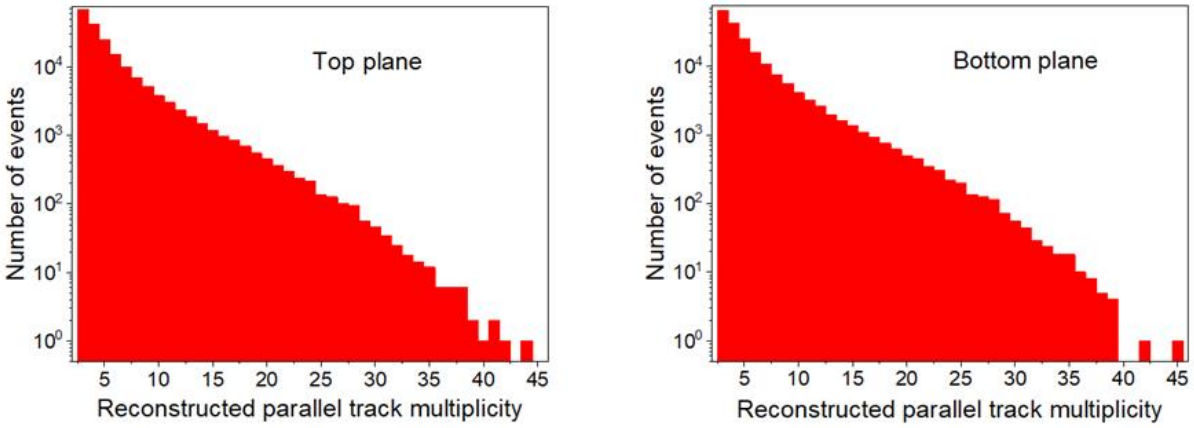


Principe of signal selection by recurrent neural network

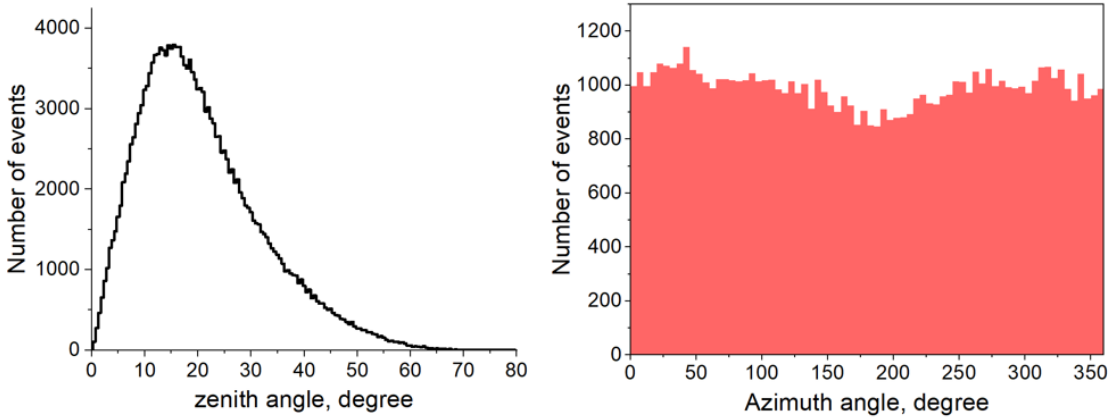


Experimental event reconstruction by deep learning approach

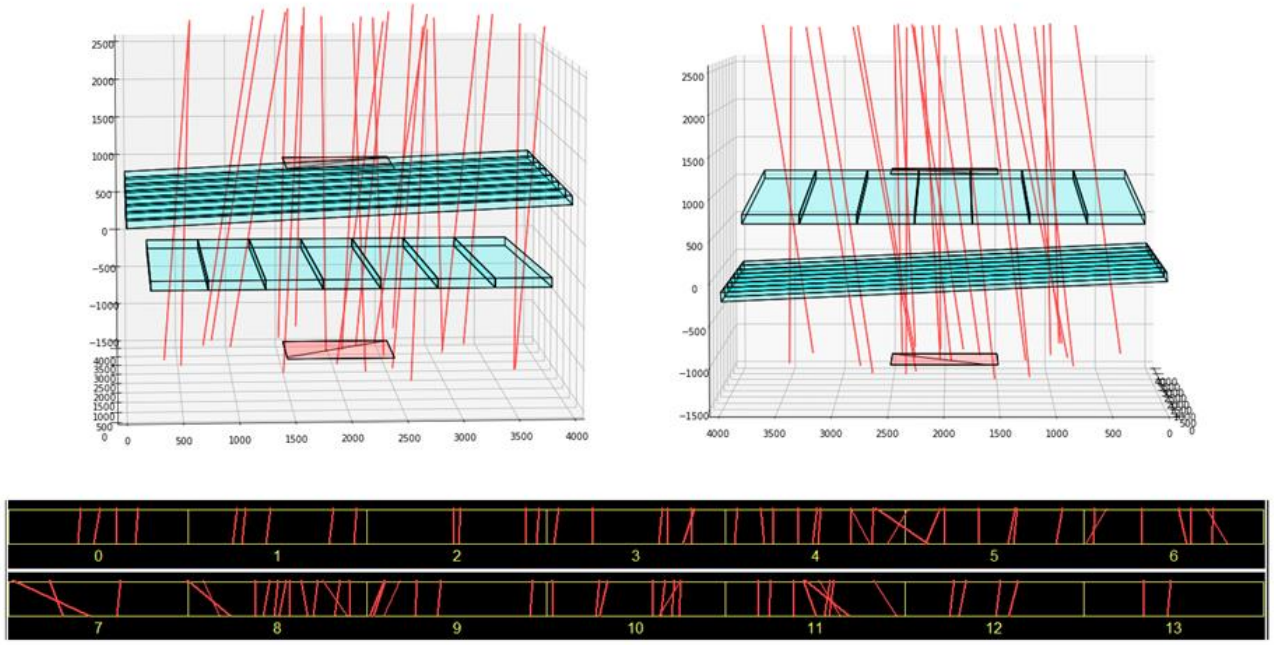
First results



Distributions of events in multiplicity of parallel tracks



Angular distributions of reconstructed events with parallel tracks



Example of multi-particle event reconstruction

Thank you for attention!