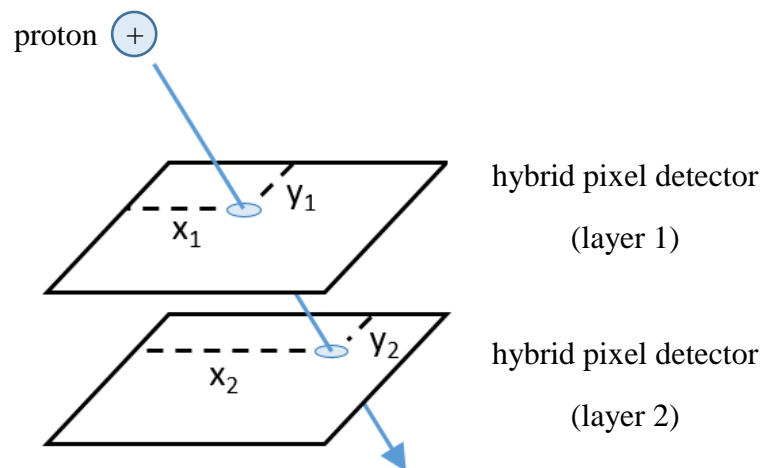


OVERVIEW OF THE PROJECT

Study of the possibilities of precise and high-speed proton detection with the use of specialized integrated circuits designed in nanometric CMOS technology

The research objective is to observe and analyze the influence of proton radiation on hybrid pixel detectors built in deep sub-micron (130 nm process or smaller) technology node. The research will allow to assess whether already available and relatively low-cost integrated circuit can be applied in studies of proton particle trajectory tracking. The research will also provide an answer to an important question whether standard deep-submicron CMOS technology can be used to effectively detect the proton trajectory.

Second research objective is to verify whether the detector built in deep sub-micron technology will enable the 3D proton particle trajectory tracking. This kind of tracking detector is also called a *vertex* detector. The idea to reconstruct the proton path is by registering transition points from two 2D detectors stacked one on the top of the other, as presented in the illustration. The analysis of coincidence between the events registered by two detectors should enable to determine the angle of incidence of the proton particle when very high frame-rate is provided together with precise synchronization of the detectors.



Assuming positive results of tests carried out with protons showing no significant influence on the IC operation, the proof that already produced, low-cost integrated circuit designed in deep sub-micron CMOS meets the requirements of the proton detection will enable low-cost studies on proton trajectory tracking for a wider group of scientists. Additionally, it will introduce the third, z-dimension to the low-cost studies of proton particles trajectory tracking.