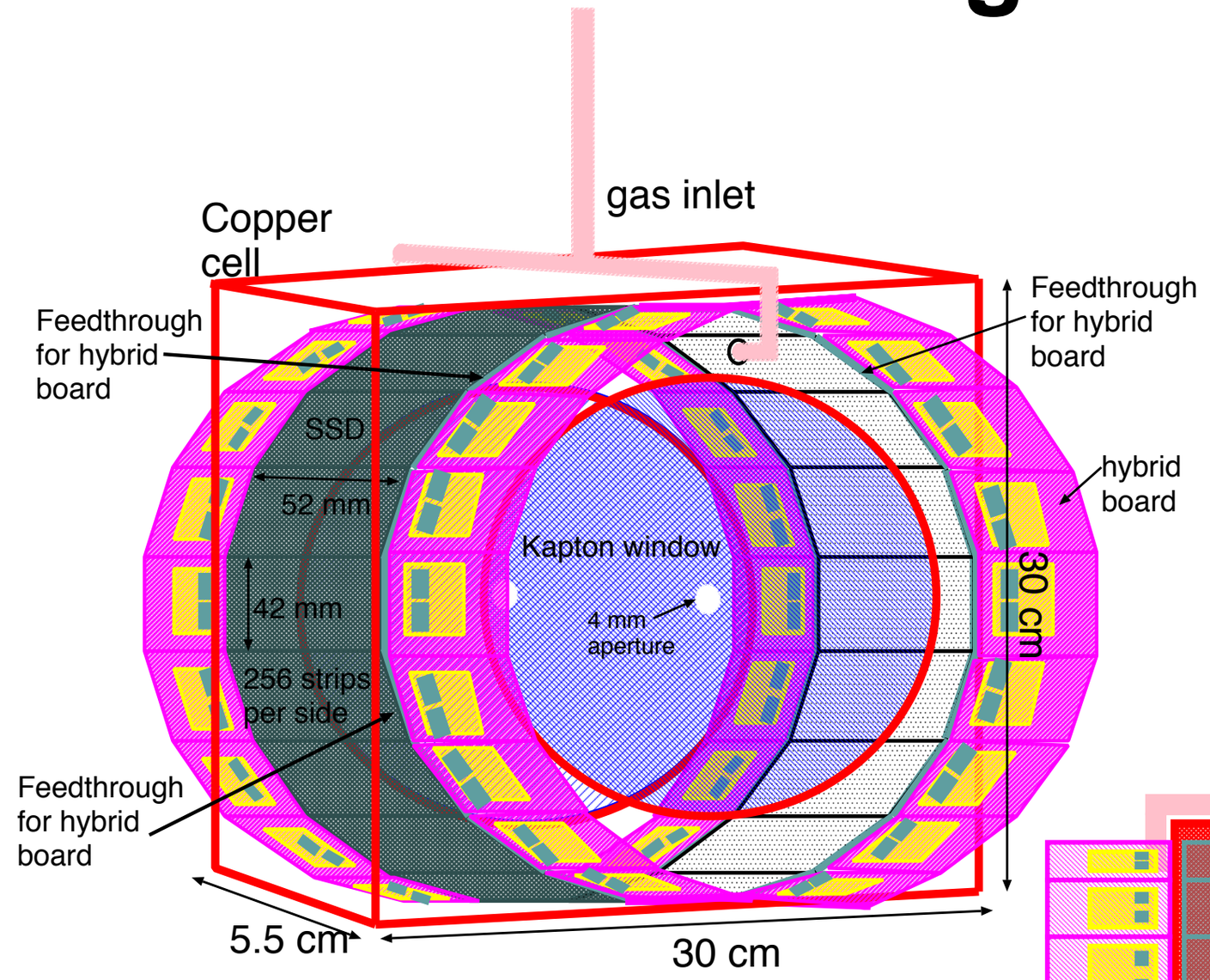
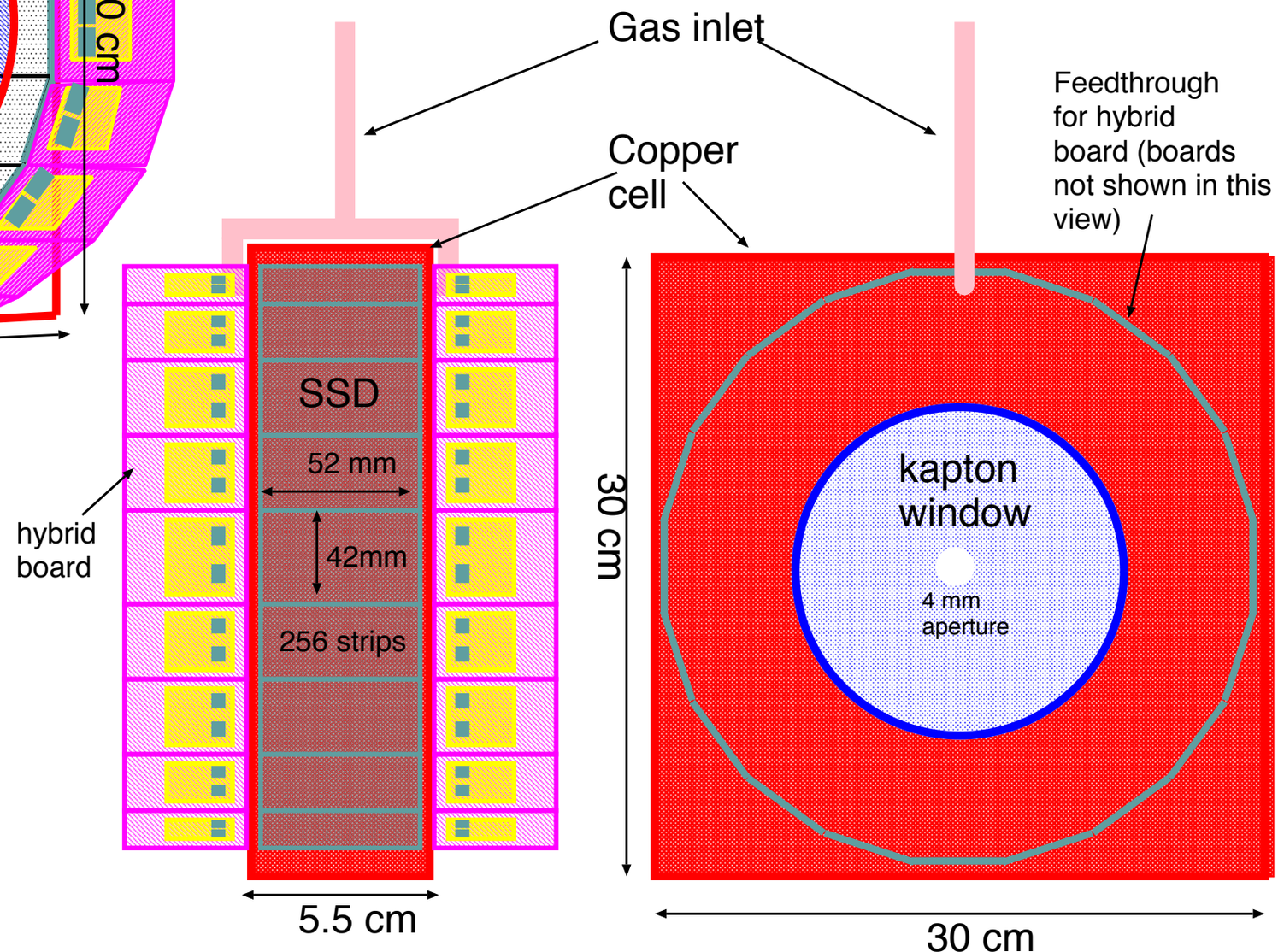
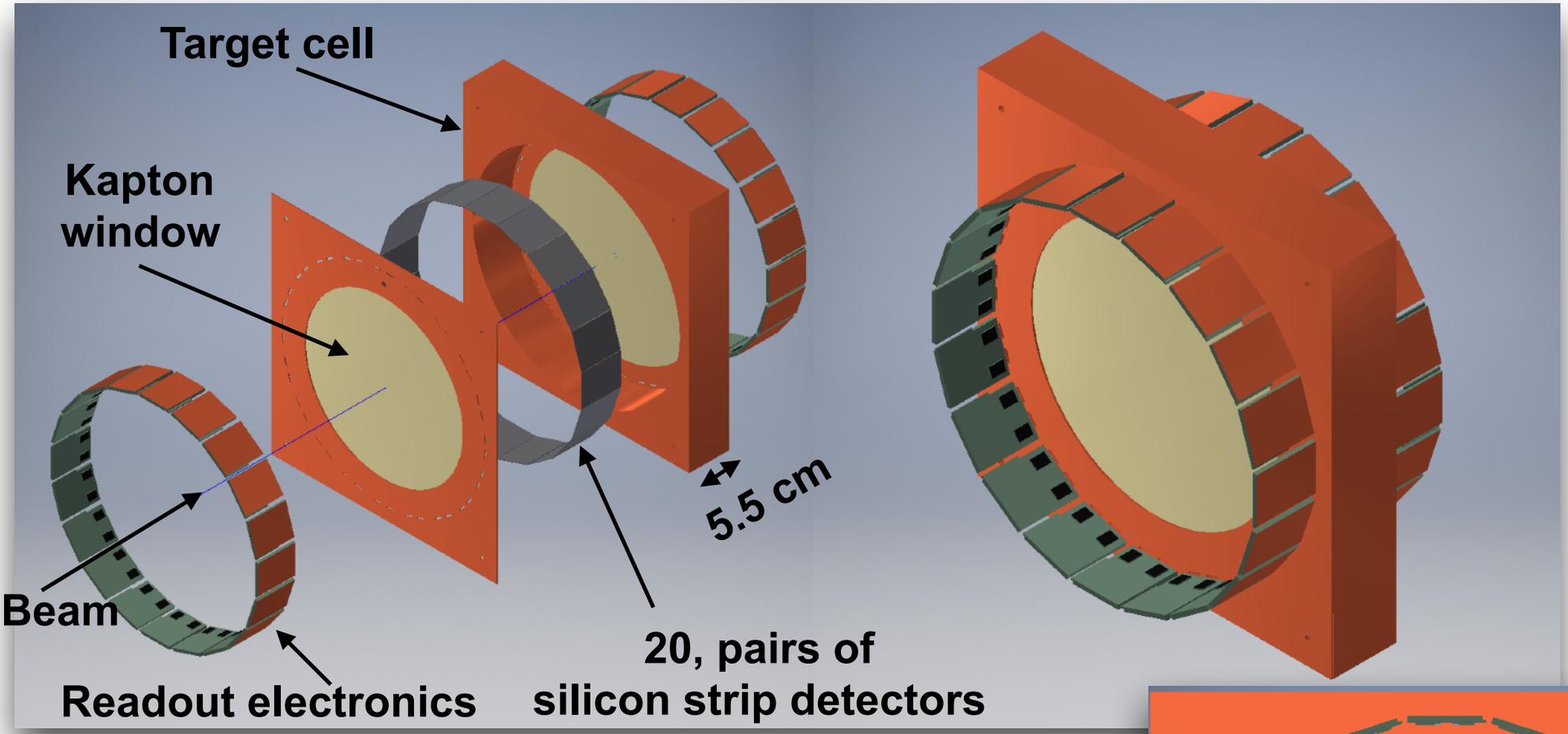
The Recoil Detector:
Updates for PAC47

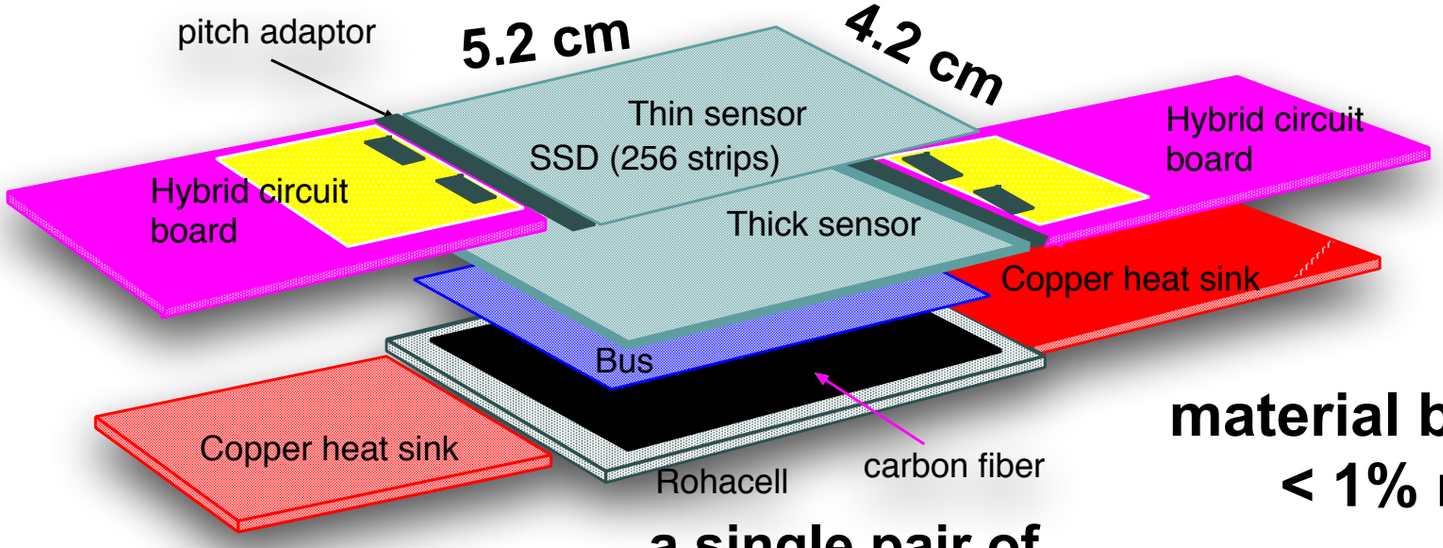
Windowless Target and Recoil Detector





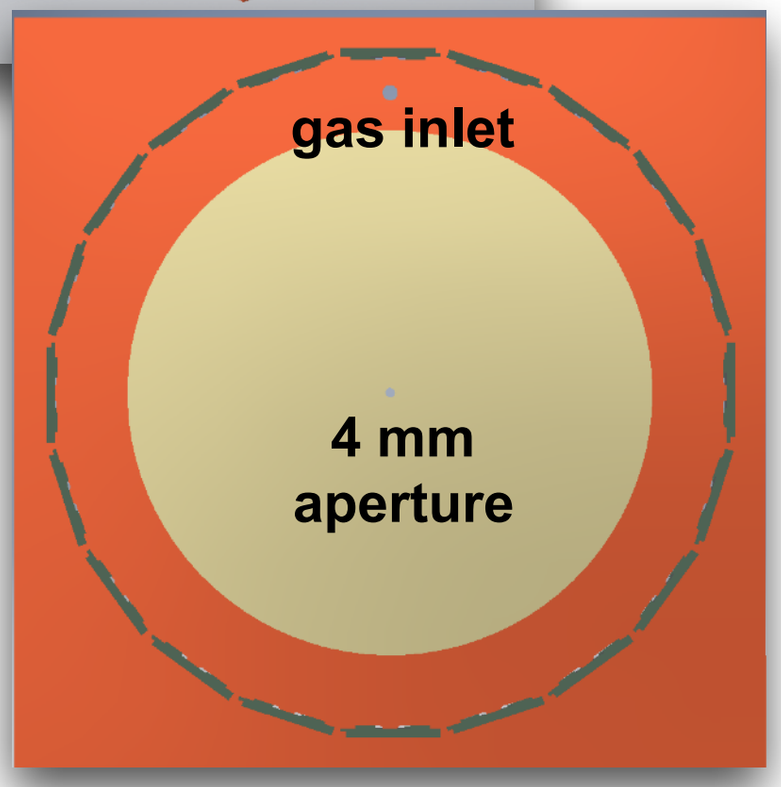
Windowless Target and Recoil Detector





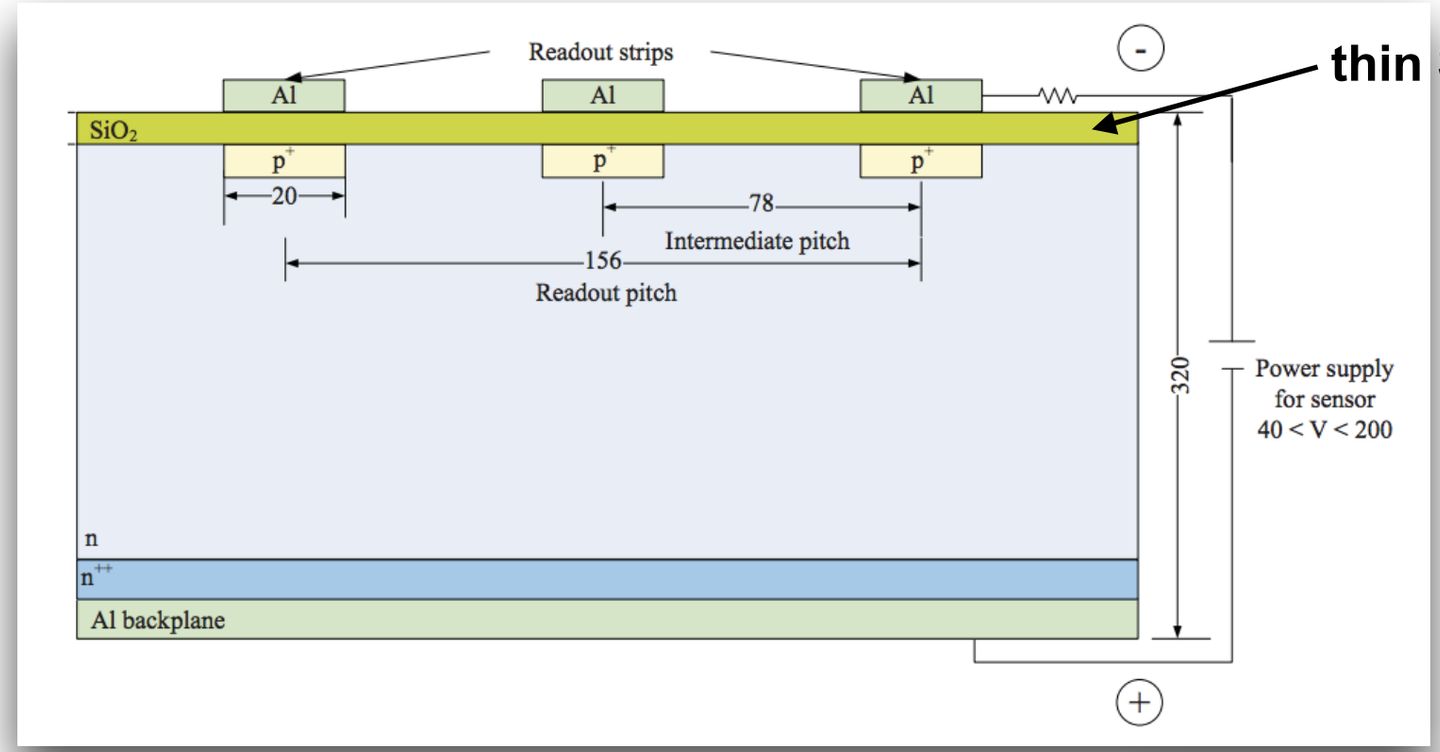
a single pair of
silicon strip detectors

material budget
< 1% r.l.



Front view

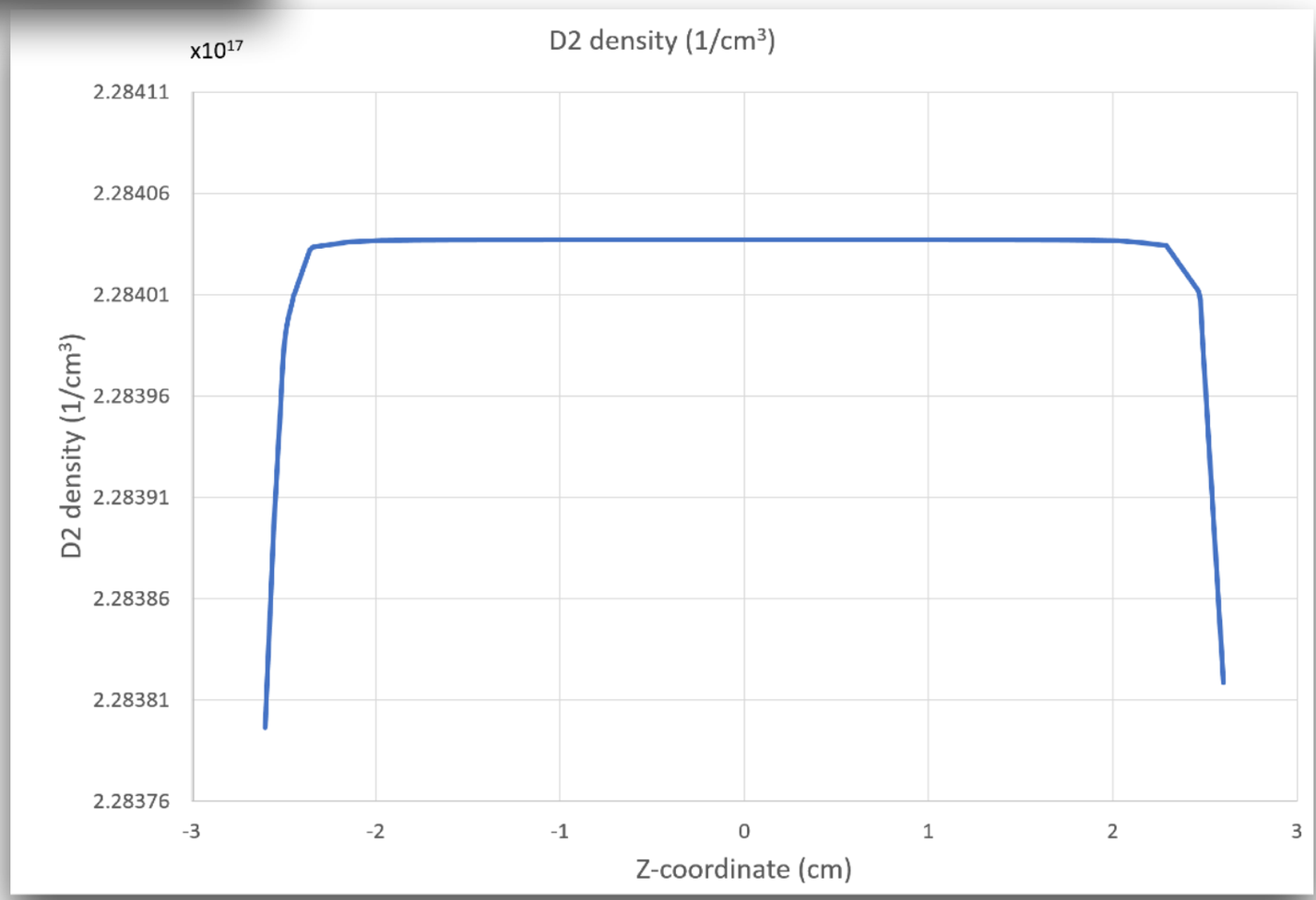
Windowless Target and Recoil Detector



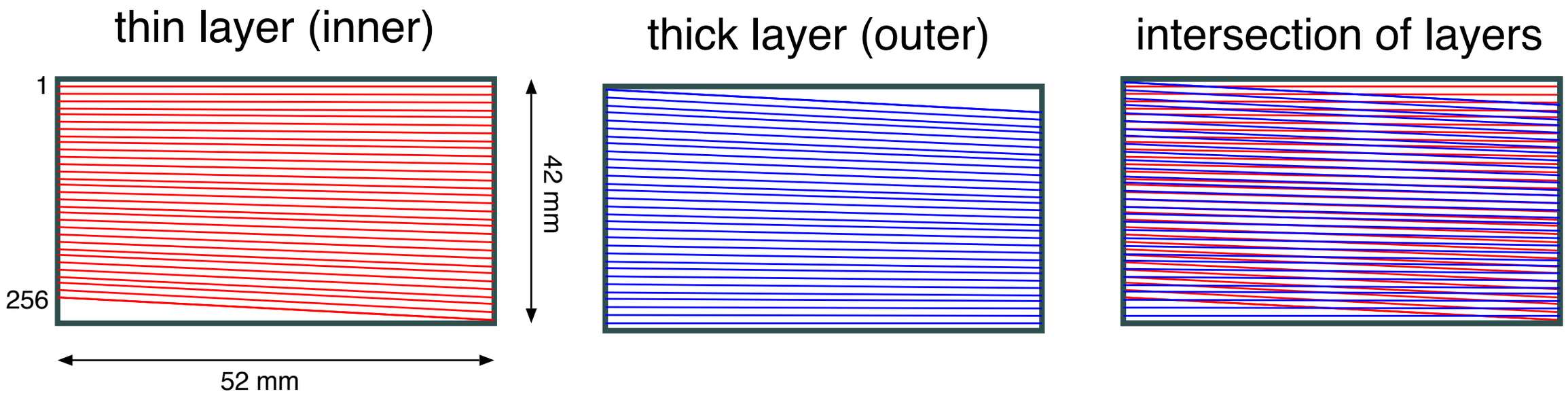
thin SiO_2 "passivation" layer

Cross section of silicon strip detector

Target density profile along z



Strip Pattern

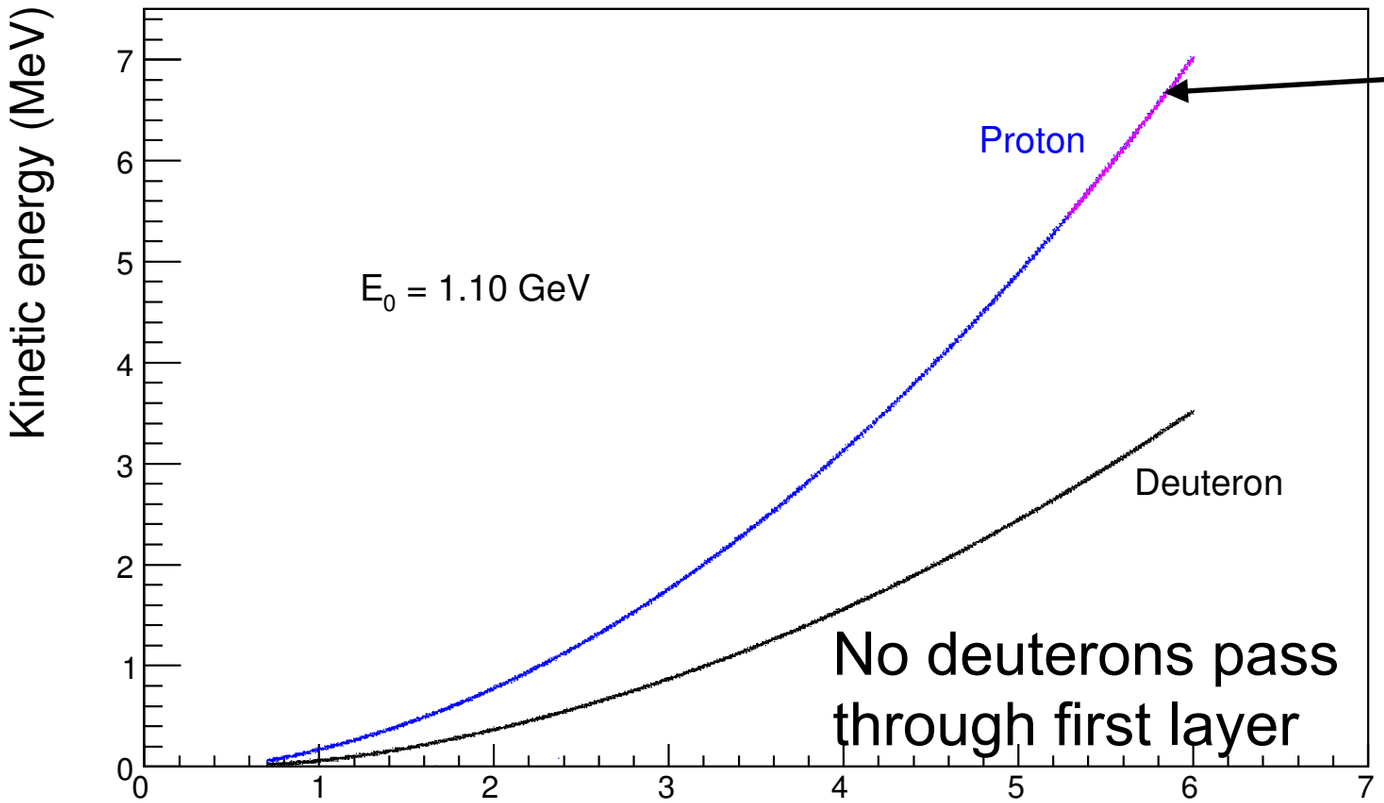


256 strips with linearly varying angles of 0 - 3 deg to minimizes dead zones. The strips will have a constant pitch of ~200 m (~1/85 deg^{-1}).

The angular resolution of $\delta\varphi \lesssim 5$ mrad and $\delta\theta \lesssim$ 10-20 mrad.

The readout system is identical to the one used by the BST in CLAS12 and we expect to use electronics from the spare planes of the BST.
The readout is build on FSSR2 ASIC developed and Fermilab.
Each channel of 128 input channel of the FSSR2 chip has a preamplifier, a shaper with adjustable shaping time (50 - 125 ns), a baseline restorer, and a 3-bit ADC.

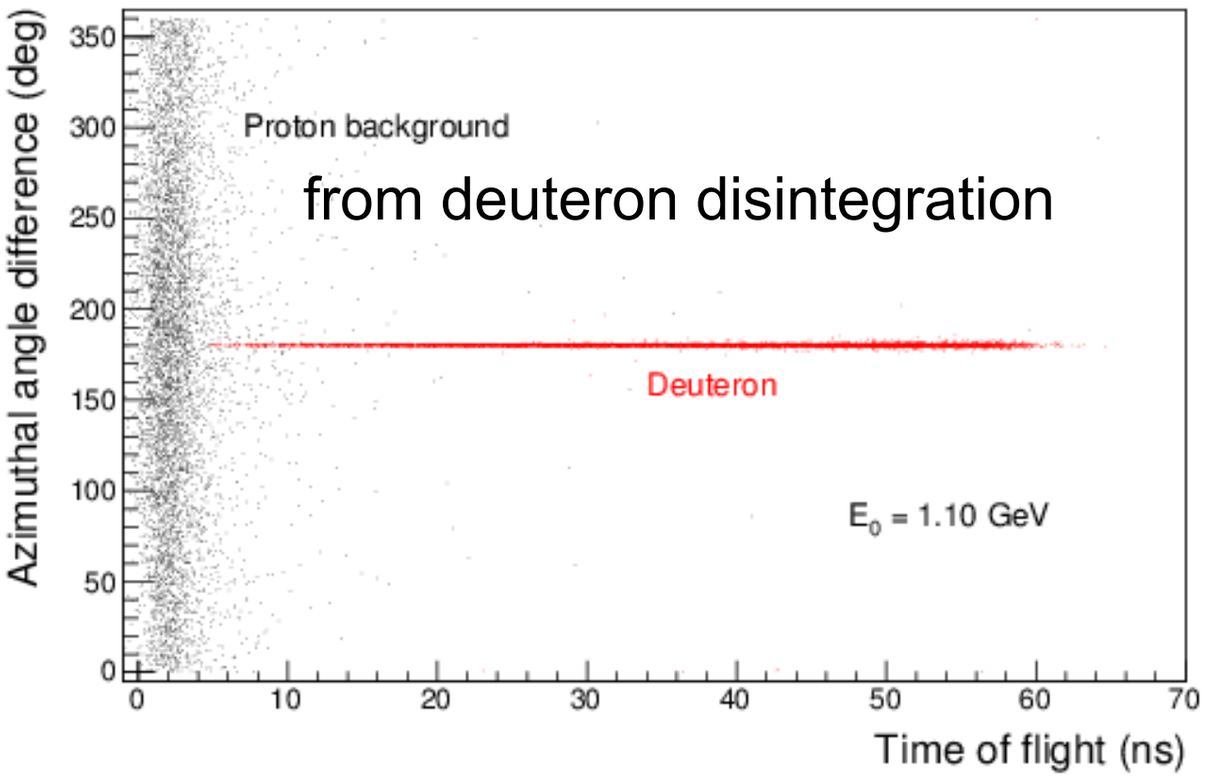
PID @ 1.1 GeV

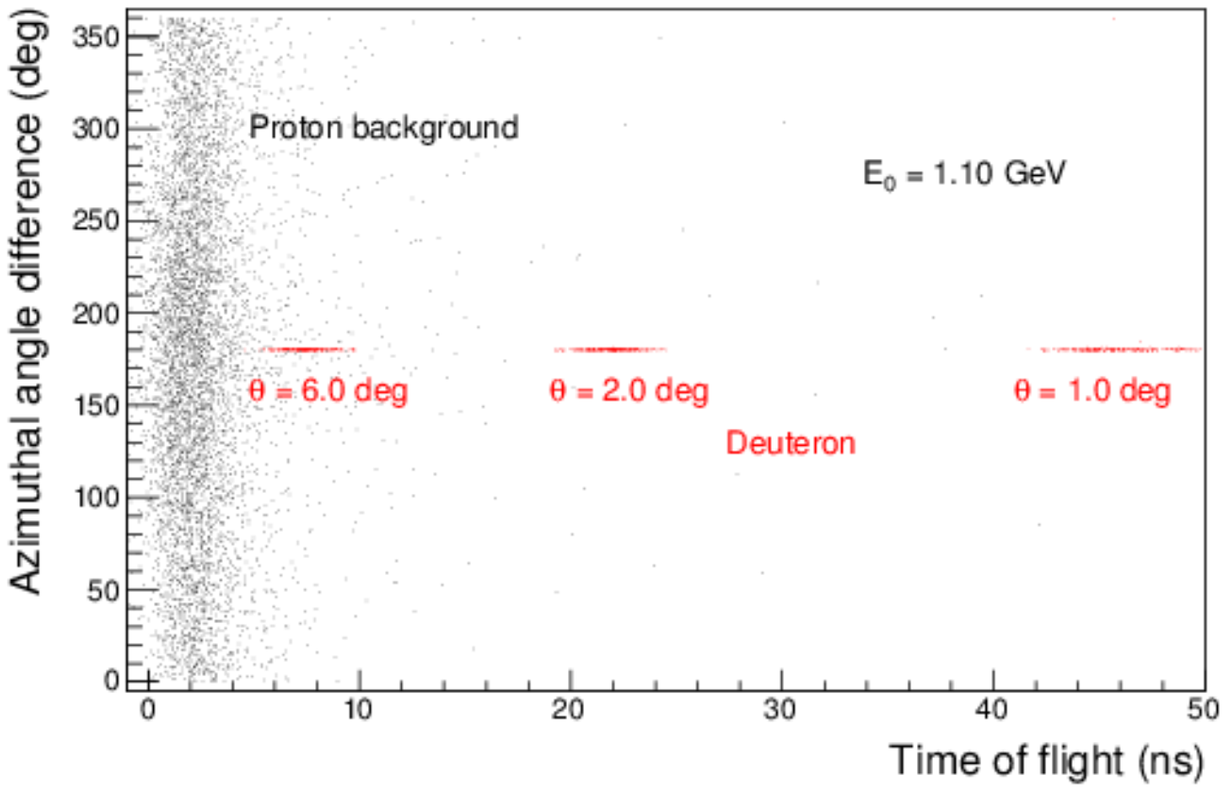


Protons that pass through first layer

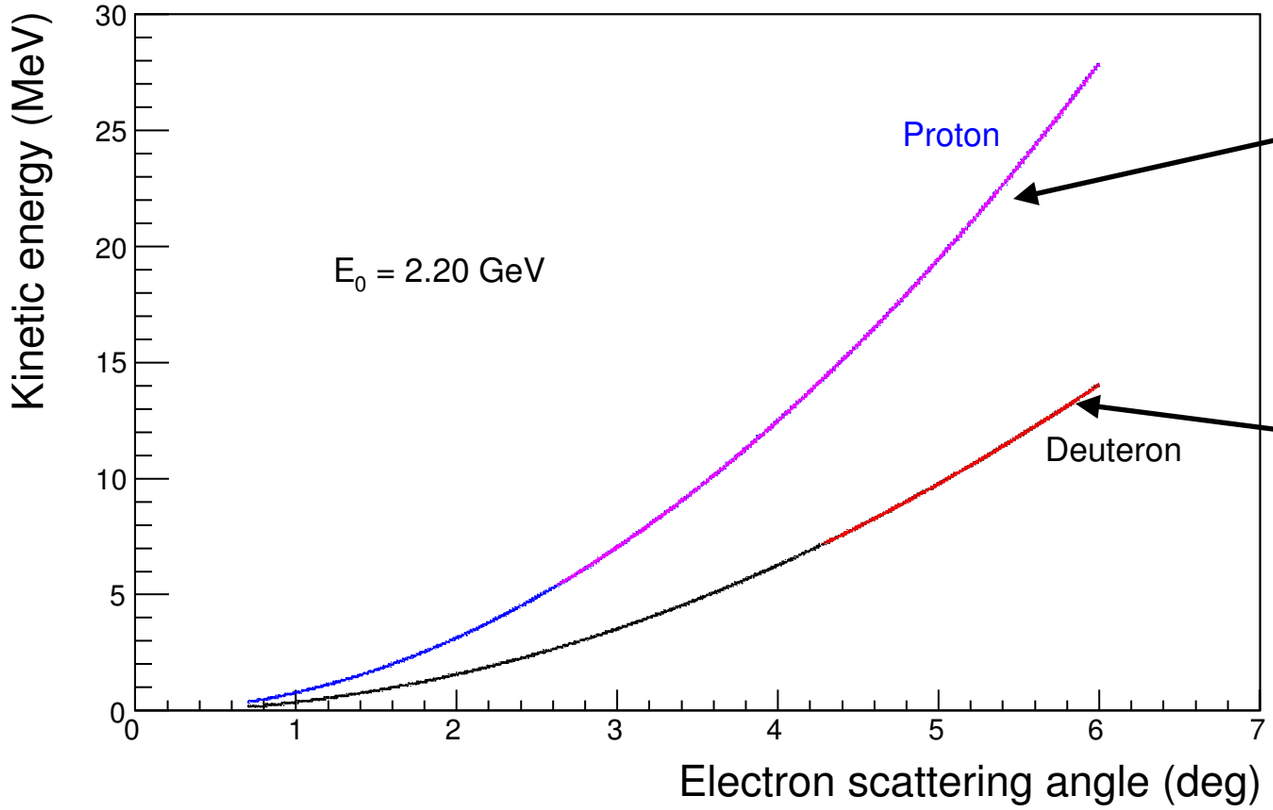
For large part of 1.1 GeV the deuterons do not disintegrate. The cross sections can be measured by detecting electrons only. We can use this fact to calibrate the recoil detector.

Electron scattering angle (deg)





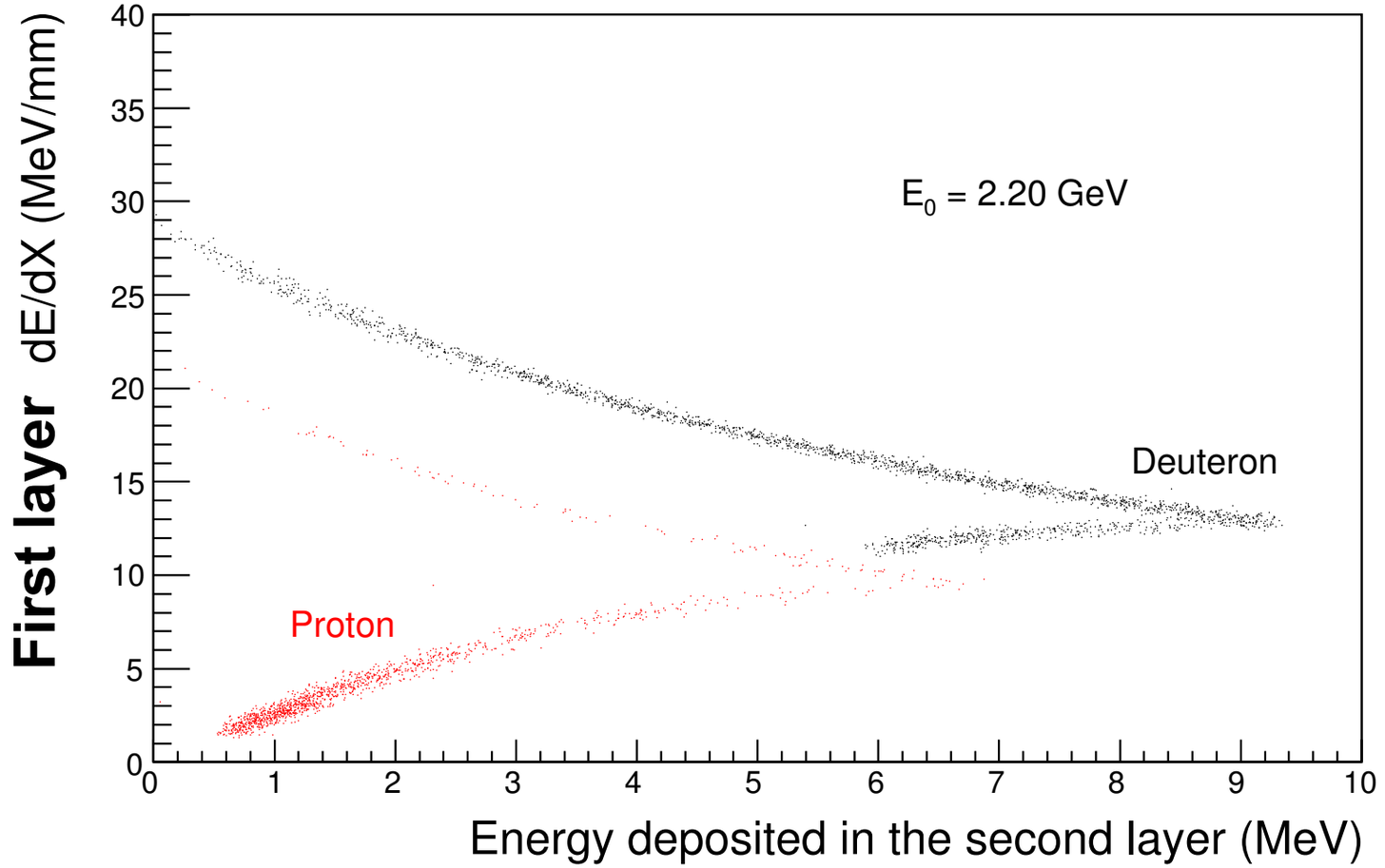
PID @ 2.2 GeV



Protons that pass through first layer

Deuterons that pass through first layer

$\Delta\varphi$ vs TOF will also be used



Main PAC issues to address

"It is not clear how the efficiency of this detector for the lowest energy deuterons can be determined and calibrated. Extrapolation from protons or higher energy deuterons leads to systematic errors which cannot be quantified."

Detector calibration: