

- Some information related to GEM and tracking.
 - Trying to provide some information about what already existed on my side, and hopefully can help to address some questions/issues.

Six Layers of GEM Tracker (Old Summary Slide)

- Cover entire 360 degrees azimuthal angle
- The inner, outer radius and the position along the beam line are summarized in the table below.

	R_{min} (cm)	R_{max} (cm)	z (cm)	Status	PVDIS configuration (cm)
Chamber1	46	76	197	New	N/A
Chamber2	28	93	250	PVDIS C1	50-115
Chamber3	31.5	107.5	290	PVDIS C2	64-140
Chamber4	39	135	352	PVDIS C3	104-200
Chamber5	49	95	435	PVDIS C4	109-215
Chamber6	67	127	592	PVDIS C4	109-215

Table 1: In this table, we present the required active area for the GEM detectors. For z position, we assume the zero point is at the center of the polarized ^3He target. The fifth column shows the status of current design. Five layers of GEM detectors will be reconfigured from the four PVDIS chambers. The first chamber will be built for this experiment. The last column shows the original configuration in terms of the radial coverage in the PVDIS design.

Discussion

- Original, there are 4 GEM planes in PVDIS, and 6 planes in SIDIS,
 - The 4th GEM plane in PVDIS has to be reconfigured to 5th and 6th GEM planes in SIDIS.
- Nilanga propose to add a new plane for PVDIS
 - XQ: Great!
- Nilanga think that we can cover 5th and 6th GEM planes in SIDIS by this new plane + 4th plane in PVDIS.
 - XQ: I am hoping to keep the original design, so that we can also add one plane for SIDIS, SIDIS → 7 planes instead of 6 planes. (Need to see where to put it, hopefully can be shared by small and large angle)
 - Maybe this can also help in terms hardware, so that each PVDIS chamber can be smaller? (e.g. 2 instead of 1)

About Tracking:

- For SIDIS:
 - We have a working tracking code which can start from hits.
 - We also have an optics model associated with this tracking code.
- For PVDIS:
 - We have a working tracking code starting with hits.
 - No optics model yet. (can be easily developed)

What we can do now

- Resolution on kinematics variables:
 - As long as one can tell us what is the resolution on hit position, we can easily do this study.
 - We can have different position resolutions for different planes.
- Tracking efficiency:
 - As long as one can tell us what is the expected hit efficiency/resolution, we can get tracking efficiency.
- About Background:
 - We have a simple treatment of background at this point, since the code starts from hits, so a more sophisticated simulation can also work as long as producing hits as inputs to tracking code.
 - This means that the resolution/efficiency can all be studied with background.

What is missing in this direction:

- Low level GEM simulation (including electronics and readout) to get the position resolutions.
- Background simulation: which will also include all possible correlations.
- A optics model for PVDIS case.
- An improved tracking for PVDIS case based on current framework.