dpol config

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SAMURAI Collaboration

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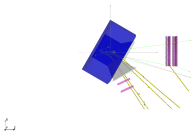
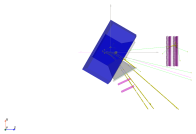
rough scan on parameter

Angle : 2, 4, 6, 8, 10 degree
magnetic field: 0.8, 1.0, 1.2, 1.6, 2.0 T
For magnetic field settings below 1.2 T, deuterons exit from the neutron exit window. Above 1.2 T, protons are prone to collisions. Therefore, a more detailed parameter scan test is conducted between 1.0 and 1.2 T at frame. see detailed in after frame**??**click to jump to detailed scan.

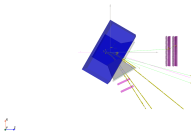
Combined Trajectories: $B = 0.8$ T



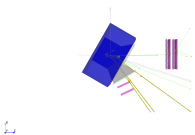
$\theta = 2.0°$



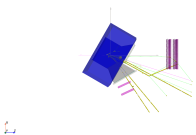
$\theta = 4.0°$



$\theta = 6.0°$



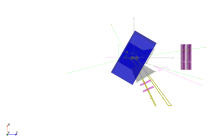
$\theta = 8.0°$



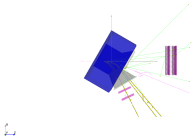
$\theta = 10.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

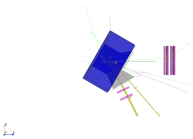
Combined Trajectories: $B = 1$ T



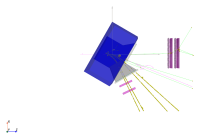
$\theta = 2.0°$



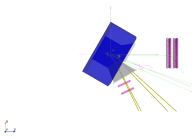
$\theta = 4.0°$



$\theta = 6.0°$



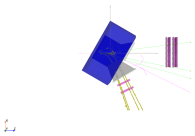
$\theta = 8.0°$



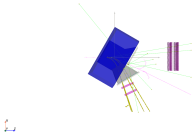
$\theta = 10.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

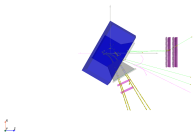
Combined Trajectories: $B = 1.2$ T



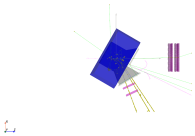
$\theta = 2.0°$



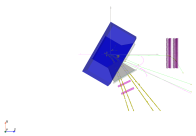
$\theta = 4.0°$



$\theta = 6.0°$



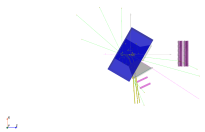
$\theta = 8.0°$



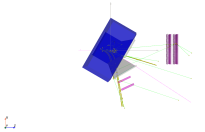
$\theta = 10.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

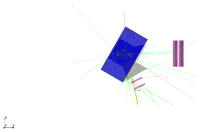
Combined Trajectories: $B = 1.6$ T



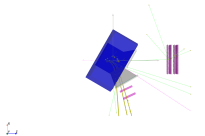
$\theta = 2.0°$



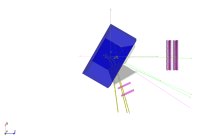
$\theta = 4.0°$



$\theta = 6.0°$



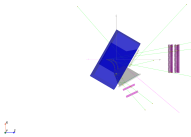
$\theta = 8.0°$



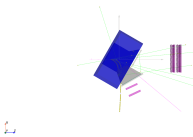
$\theta = 10.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

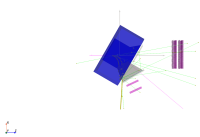
Combined Trajectories: $B = 2$ T



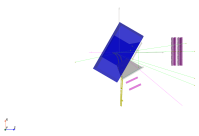
$\theta = 2.0°$



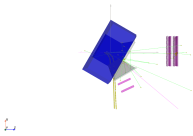
$\theta = 4.0°$



$\theta = 6.0°$



$\theta = 8.0°$



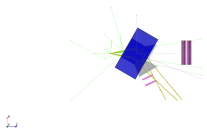
$\theta = 10.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

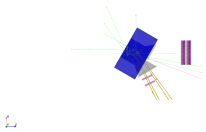
more detailed config

For magnetic field settings below 1.2 T, deuterons exit from the neutron exit window. Above 1.2 T, protons are prone to collisions. Therefore, a more detailed parameter scan test is conducted between 1.0 and 1.2 T.

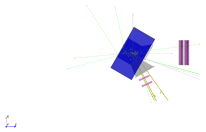
Combined Trajectories: $B = 1$ T



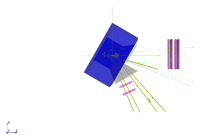
$\theta = 0.0°$



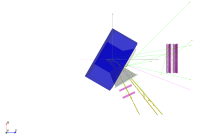
$\theta = 1.0°$



$\theta = 2.0°$



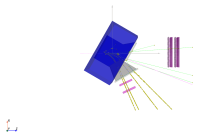
$\theta = 3.0°$



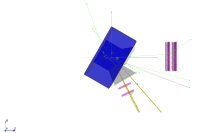
$\theta = 4.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

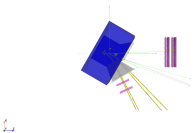
Combined Trajectories: $B = 1$ T



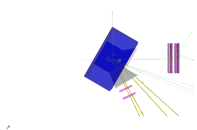
$\theta = 5.0^\circ$



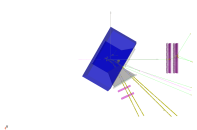
$\theta = 6.0^\circ$



$\theta = 7.0^\circ$



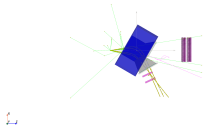
$\theta = 8.0^\circ$



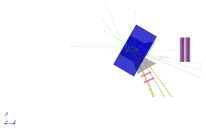
$\theta = 9.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

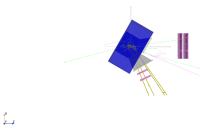
Combined Trajectories: $B = 1.05$ T



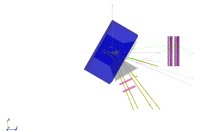
$\theta = 0.0^\circ$



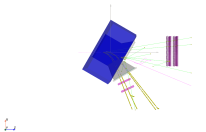
$\theta = 1.0^\circ$



$\theta = 2.0^\circ$



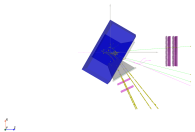
$\theta = 3.0^\circ$



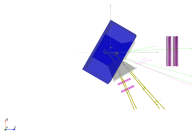
$\theta = 4.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

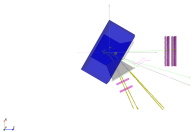
Combined Trajectories: $B = 1.05$ T



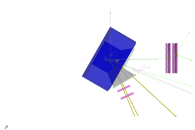
$\theta = 5.0^\circ$



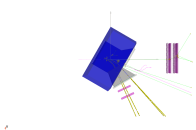
$\theta = 6.0^\circ$



$\theta = 7.0^\circ$



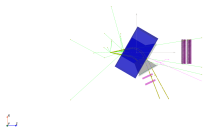
$\theta = 8.0^\circ$



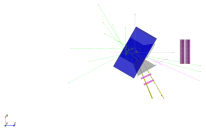
$\theta = 9.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

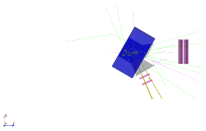
Combined Trajectories: $B = 1.1$ T



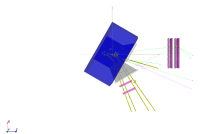
$\theta = 0.0^\circ$



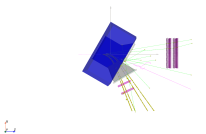
$\theta = 1.0^\circ$



$\theta = 2.0^\circ$



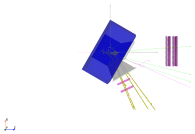
$\theta = 3.0^\circ$



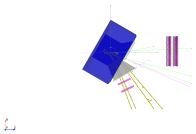
$\theta = 4.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

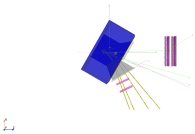
Combined Trajectories: $B = 1.1$ T



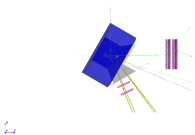
$\theta = 5.0^\circ$



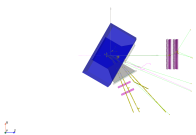
$\theta = 6.0^\circ$



$\theta = 7.0^\circ$



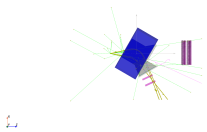
$\theta = 8.0^\circ$



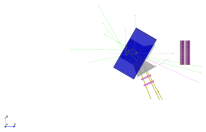
$\theta = 9.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

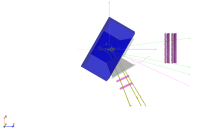
Combined Trajectories: $B = 1.15$ T



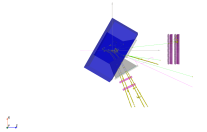
$\theta = 0.0^\circ$



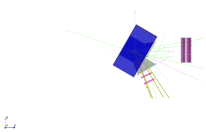
$\theta = 1.0^\circ$



$\theta = 2.0^\circ$



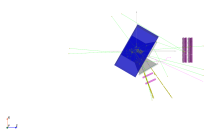
$\theta = 3.0^\circ$



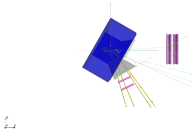
$\theta = 4.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

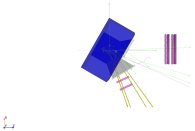
Combined Trajectories: $B = 1.15$ T



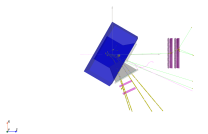
$\theta = 5.0^\circ$



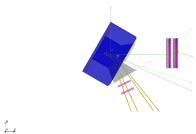
$\theta = 6.0^\circ$



$\theta = 7.0^\circ$



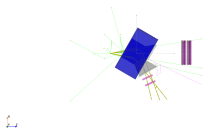
$\theta = 8.0^\circ$



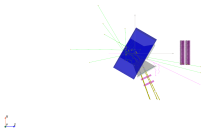
$\theta = 9.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

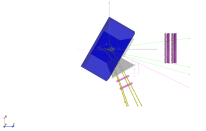
Combined Trajectories: $B = 1.2$ T



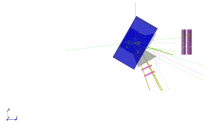
$\theta = 0.0°$



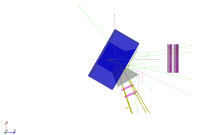
$\theta = 1.0°$



$\theta = 2.0°$



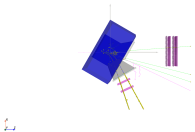
$\theta = 3.0°$



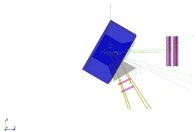
$\theta = 4.0°$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

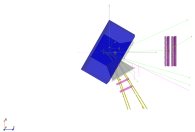
Combined Trajectories: $B = 1.2$ T



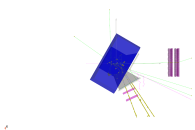
$\theta = 5.0^\circ$



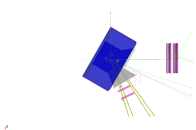
$\theta = 6.0^\circ$



$\theta = 7.0^\circ$



$\theta = 8.0^\circ$



$\theta = 9.0^\circ$

Magenta Deuteron (380 MeV), yellow: Proton trajectories green: neutron

1.15T , 3deg

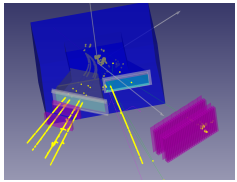


Figure: 1.15T , 3deg configuration visualization

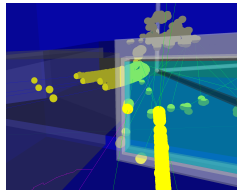
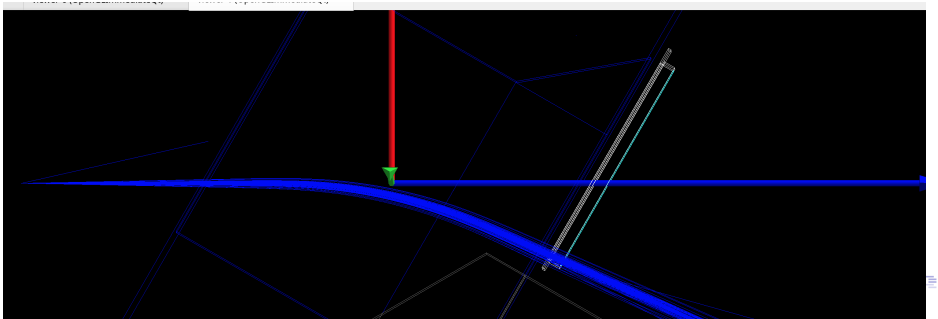


Figure: Caption

widthheightfigure[ht]

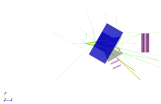


Rationale for Target Placement

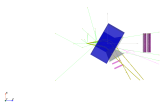
Why the target must be placed inside the magnetic field:

- **Strong B-field Case:**
  - Difficult proton track reconstruction.
- **Weak B-field Case:**
  - Risk of protons hitting the exit window.
- **General Constraint:**
  - Poor neutron geometric acceptance.

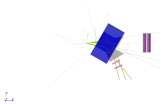
Target Outside Magnet: 0 deg Configuration



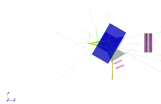
0.80 T



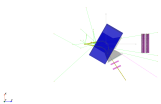
1.00 T



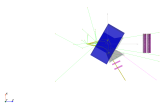
1.20 T



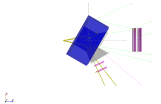
1.40 T



1.60 T



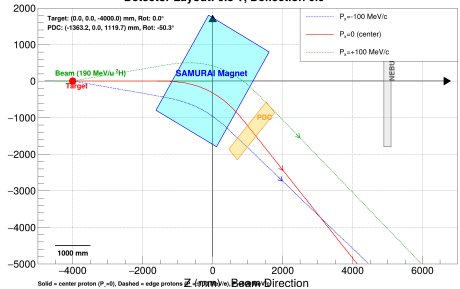
1.80 T



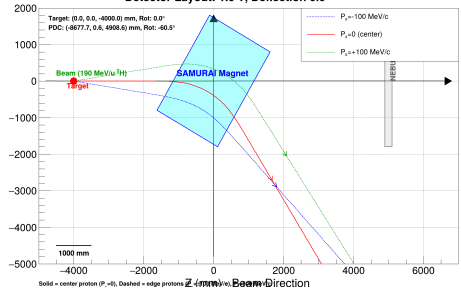
2.00 T

Figure: Target at (0, 0, -4m), Angle = 0 deg

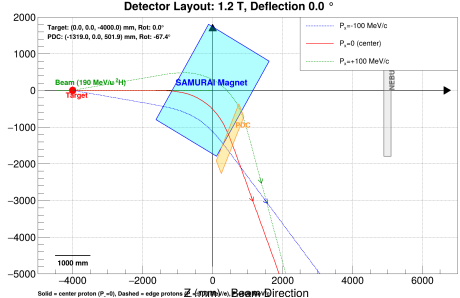
- Magenta: Deuteron (380 MeV)
- Blue: Proton + Neutron (Px = $\pm$100, $\pm$150 MeV/c)



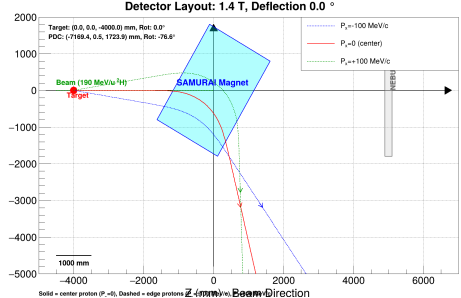
(a) 0.80 T



(b) 1.00 T

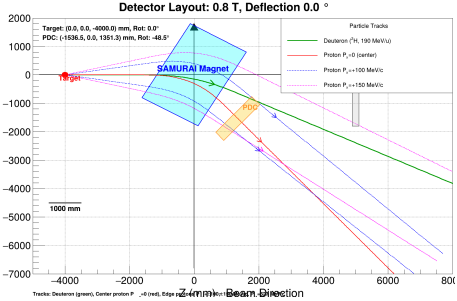


(c) 1.20 T

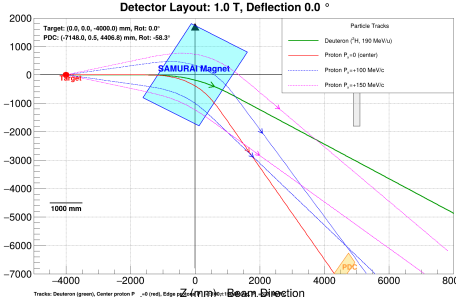


(d) 1.40 T

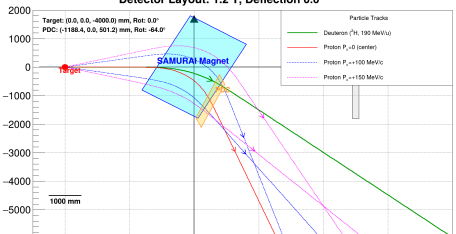
PDC Position: 0 deg (Low Field)



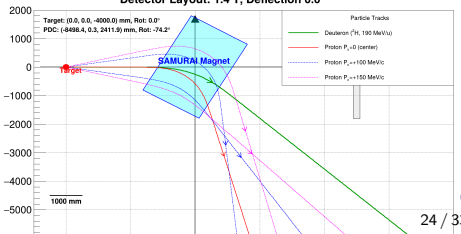
(a) 0.80 T



(b) 1.00 T

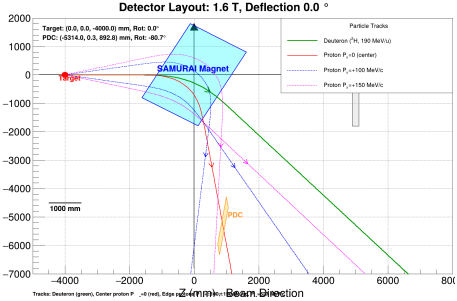


(c) 1.20 T

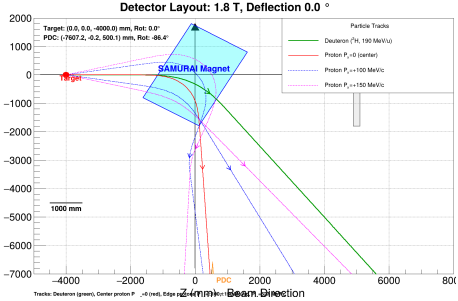


(d) 1.40 T

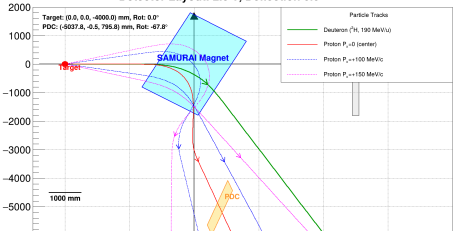
PDC Position: 0 deg (Mid Field)



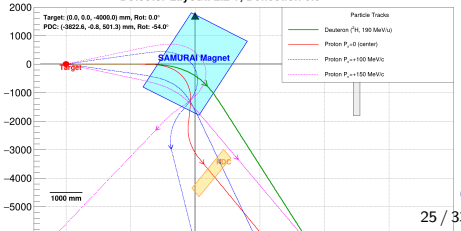
(a) 1.60 T



(b) 1.80 T

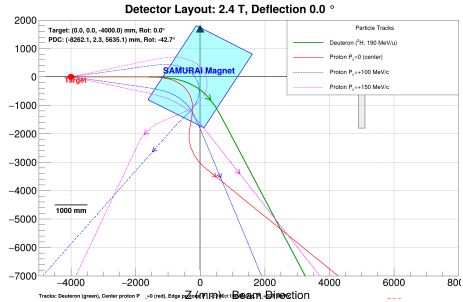


(c) 2.00 T

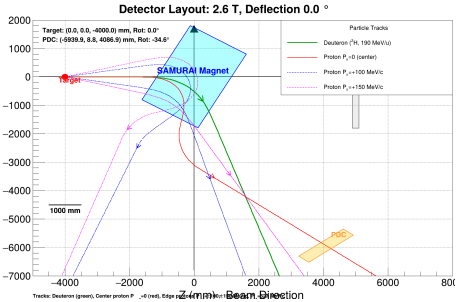


(d) 2.20 T

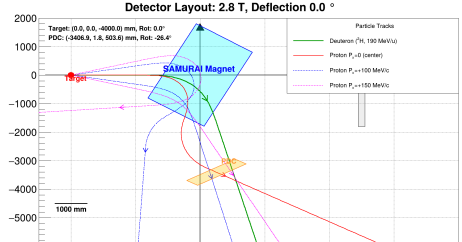
PDC Position: 0 deg (High Field)

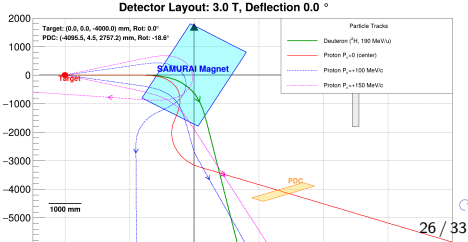


(a) 2.40 T

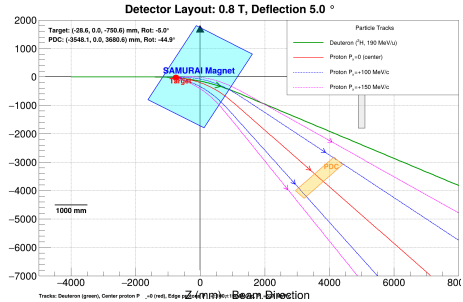


(b) 2.60 T

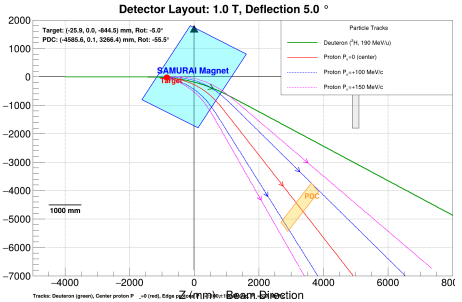




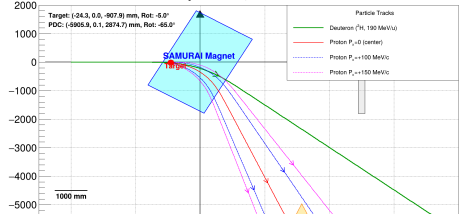
PDC Position: 5 deg (Low Field)

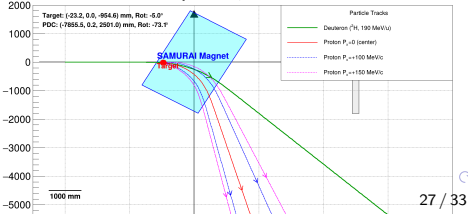


(a) 0.80 T

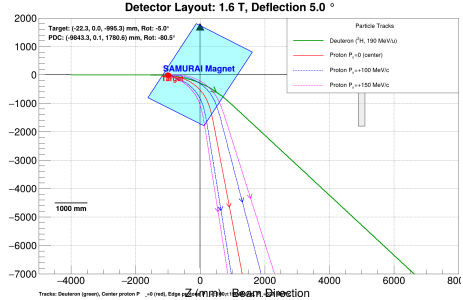


(b) 1.00 T

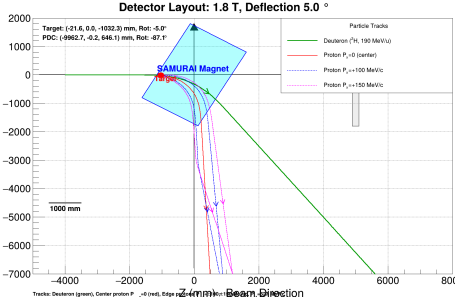




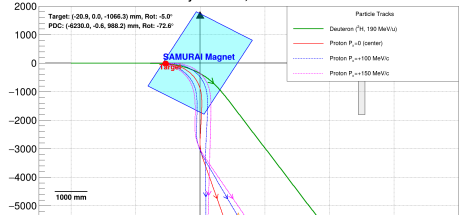
PDC Position: 5 deg (Mid Field)



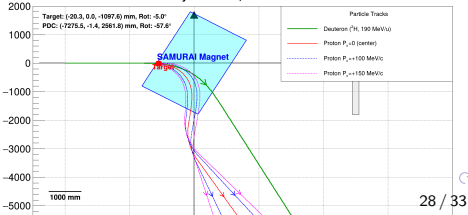
(a) 1.60 T



(b) 1.80 T

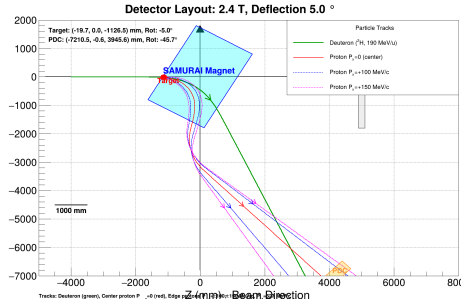


(c) 2.00 T

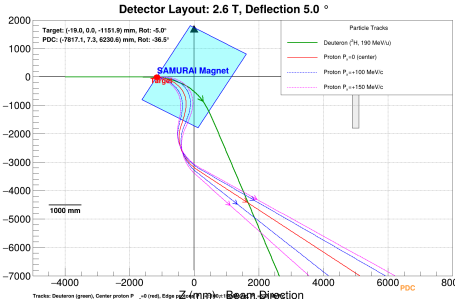


(d) 2.20 T

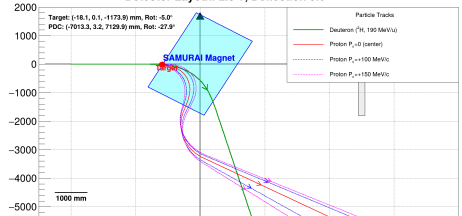
PDC Position: 5 deg (High Field)

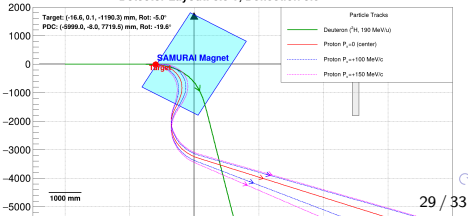


(a) 2.40 T

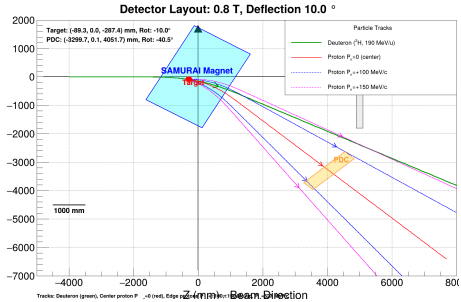


(b) 2.60 T

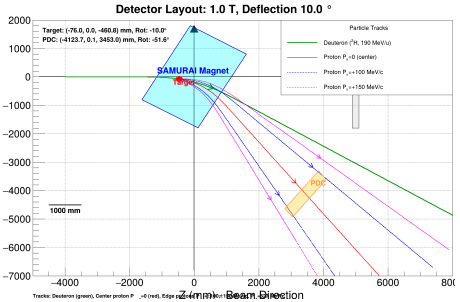




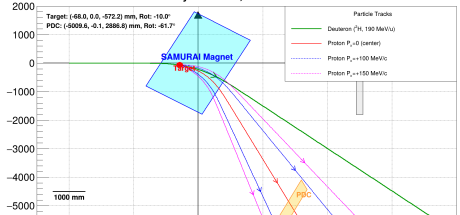
PDC Position: 10 deg (Low Field)



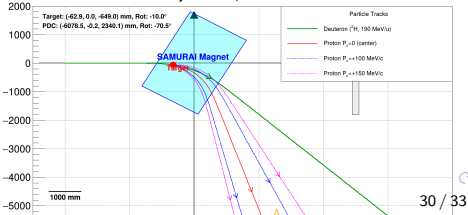
(a) 0.80 T



(b) 1.00 T

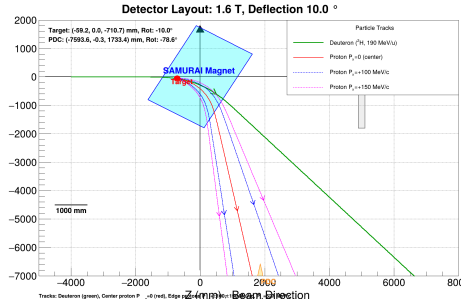


(c) 1.20 T

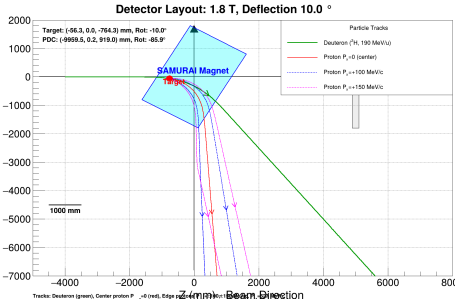


(d) 1.40 T

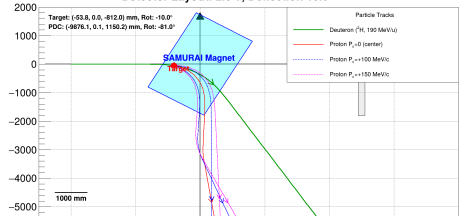
PDC Position: 10 deg (Mid Field)

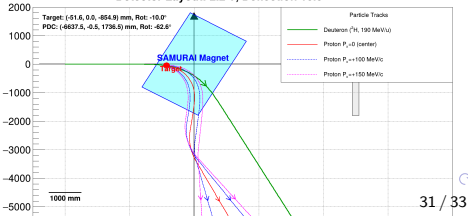


(a) 1.60 T

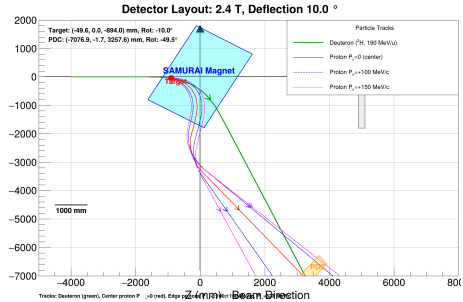


(b) 1.80 T

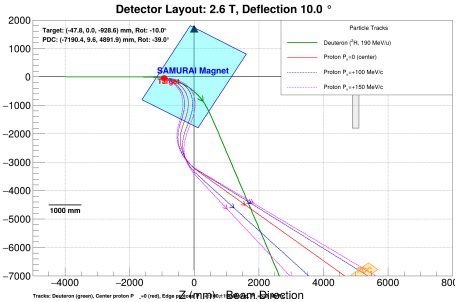




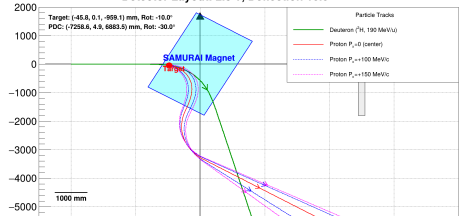
PDC Position: 10 deg (High Field)

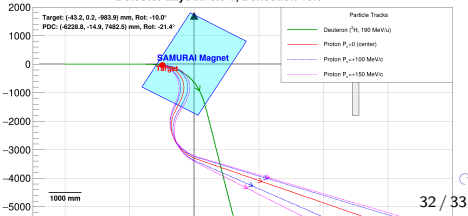


(a) 2.40 T



(b) 2.60 T





The neutron acceptance depends on the beam bending angle. Although different magnetic field settings cause slight differences in position, the impact of the magnetic field is negligible. The angle should be smaller than 10°. Furthermore, the neutron distribution does not correlate with the proton changes; for neutrons within a specific region, the corresponding protons are distributed across nearly the entire space, indicating no significant correlation. For neutrons within a specific region, the corresponding protons are distributed across nearly the entire space, indicating no significant correlation.