

dpol config

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SAMURAI Collaboration

January 26, 2026

1 config

- deutron hit exitwindow
- proton hit exitwindow
- target outside magnetic

2 filter

- nebula acceptance

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Operational Constraints

- **Requirement for Exit Window Configuration:** A magnetic field of $B \geq 2.0$ T is mandatory.
- **Rationale:** At lower field strengths ($B < 2.0$ T), the trajectory of beam line risks hitting on the vacuum exit window frame.

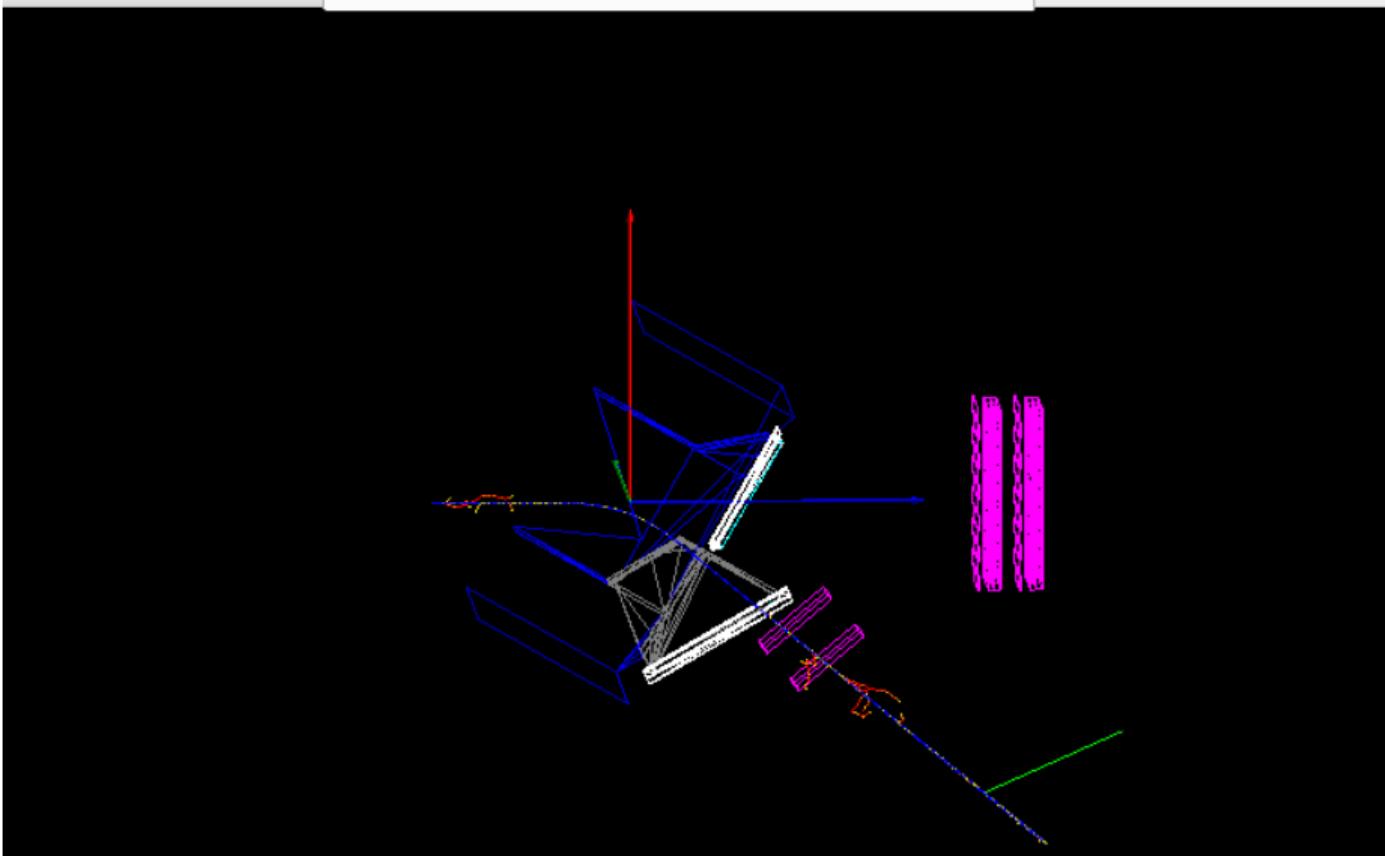


Figure: 2.0T

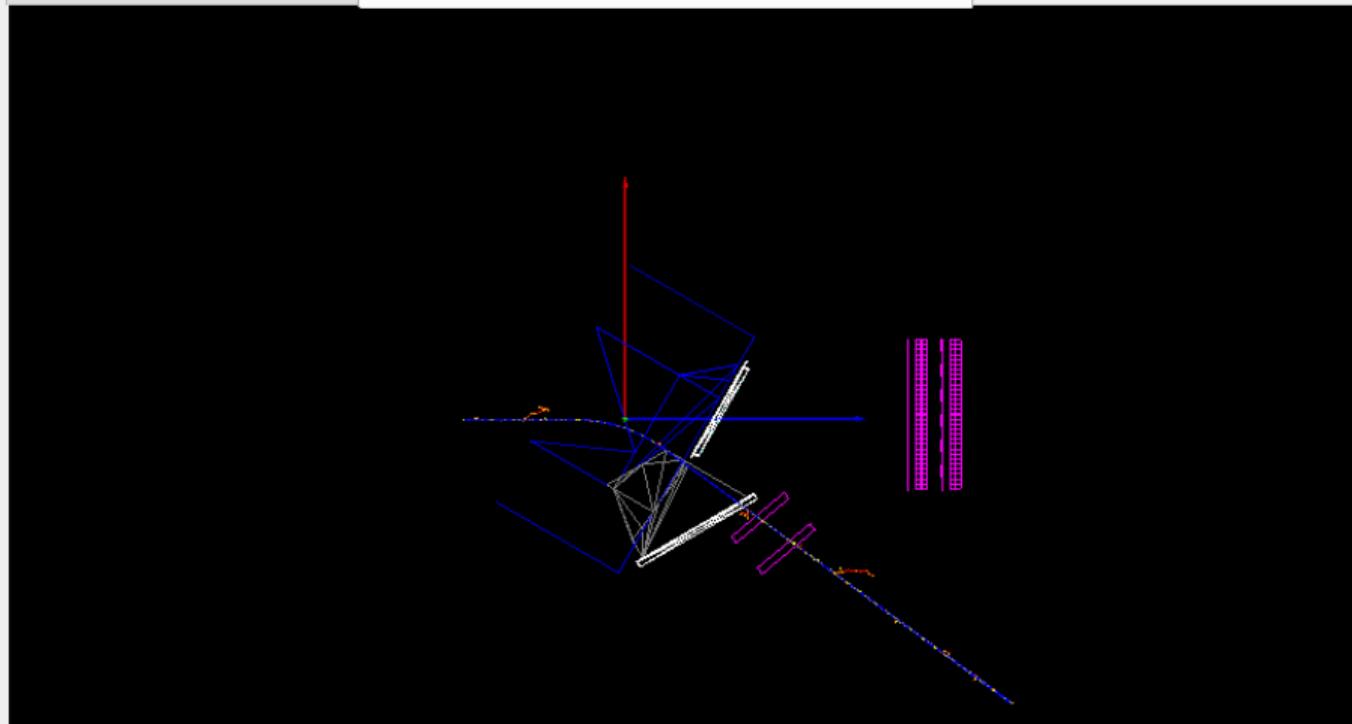


Figure: 1.8T

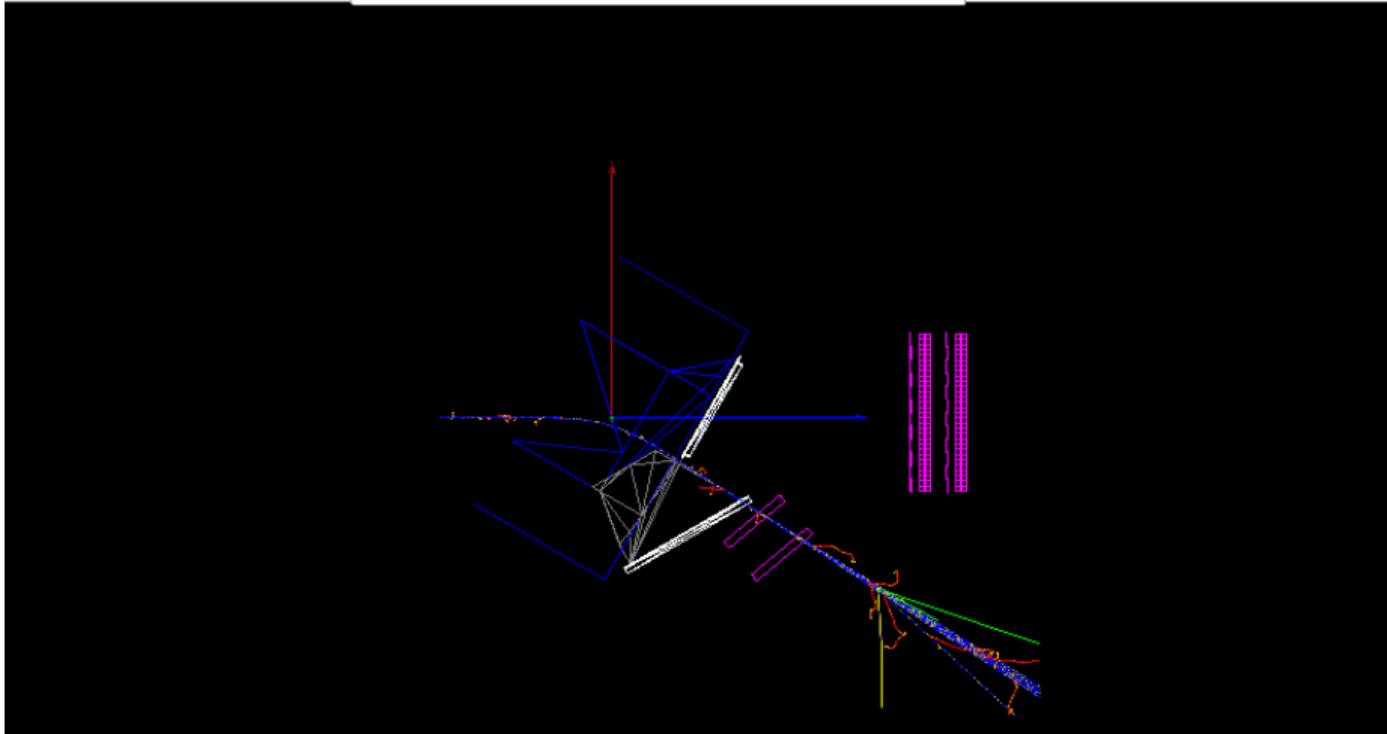


Figure: 1.6T

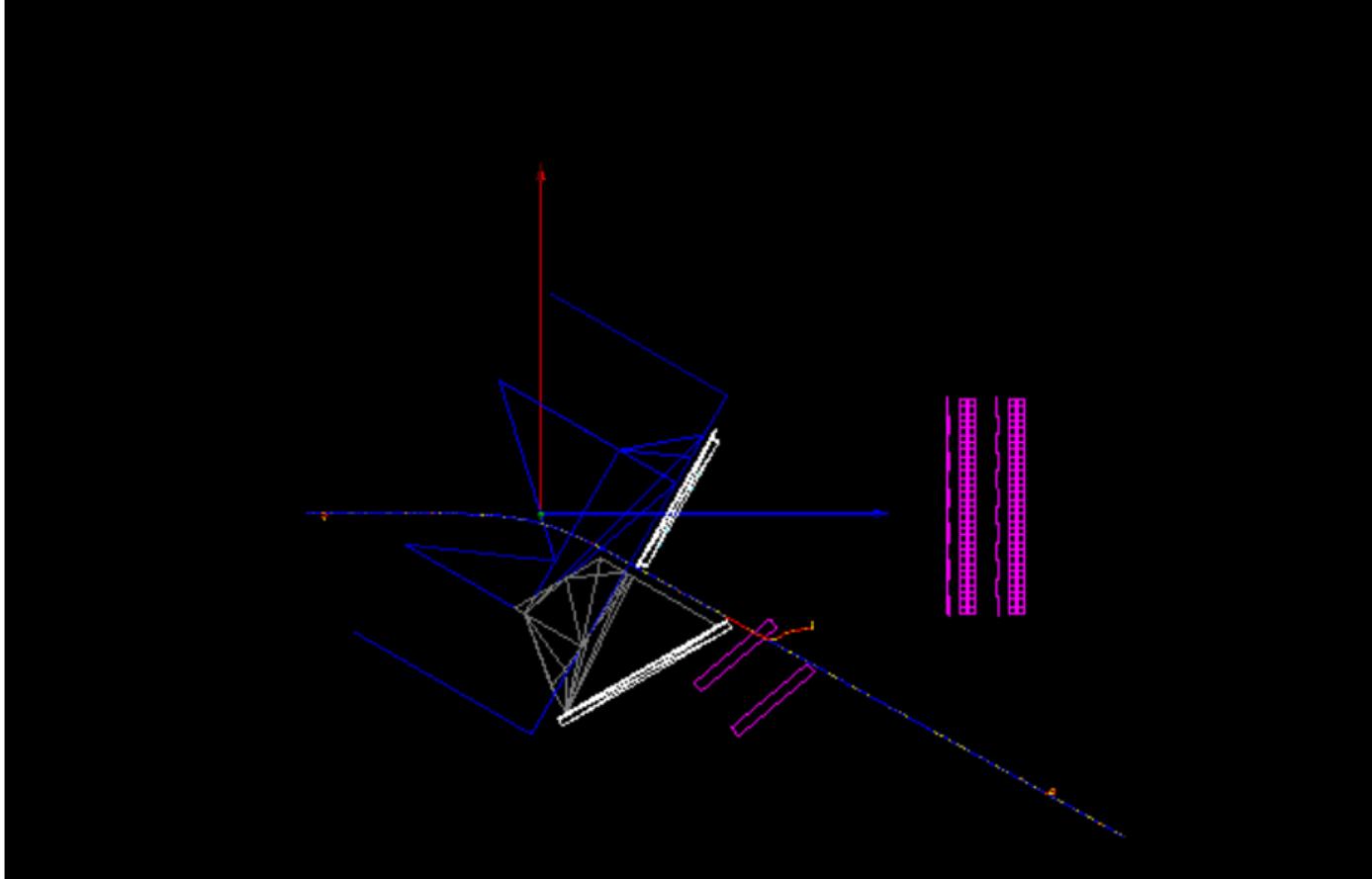


Figure: 1.4T

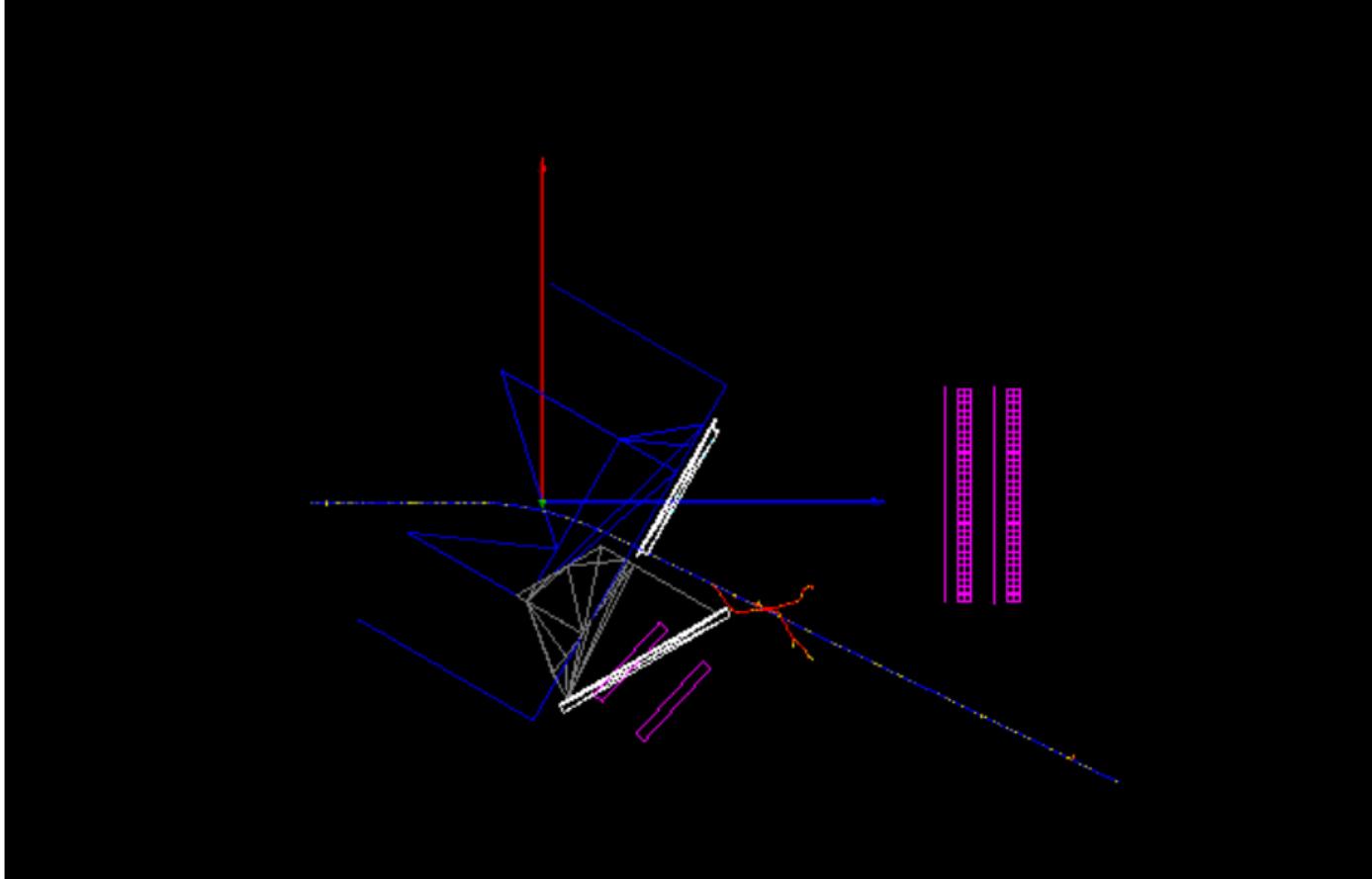


Figure: 1.2T

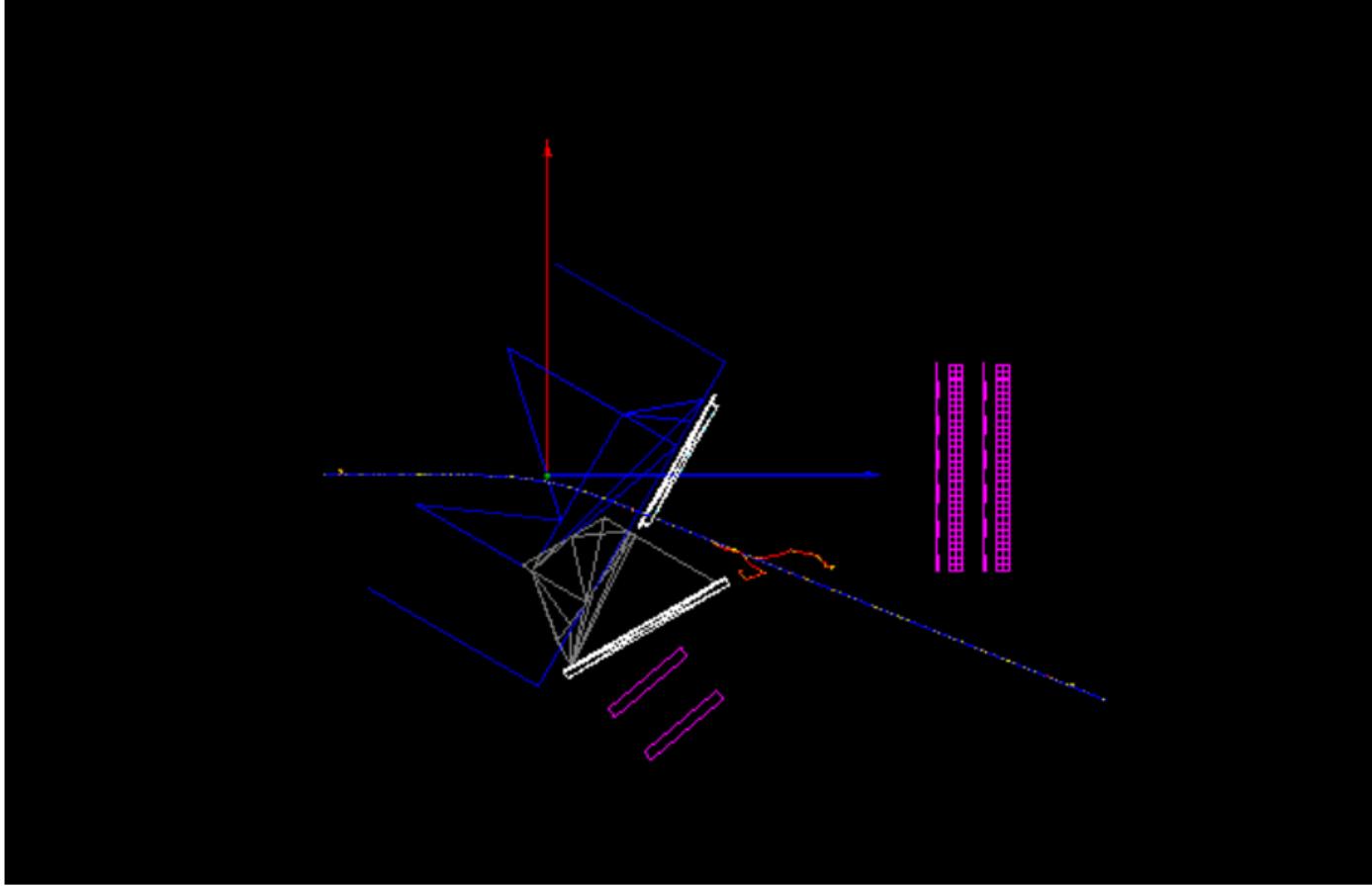


Figure: 1.0T

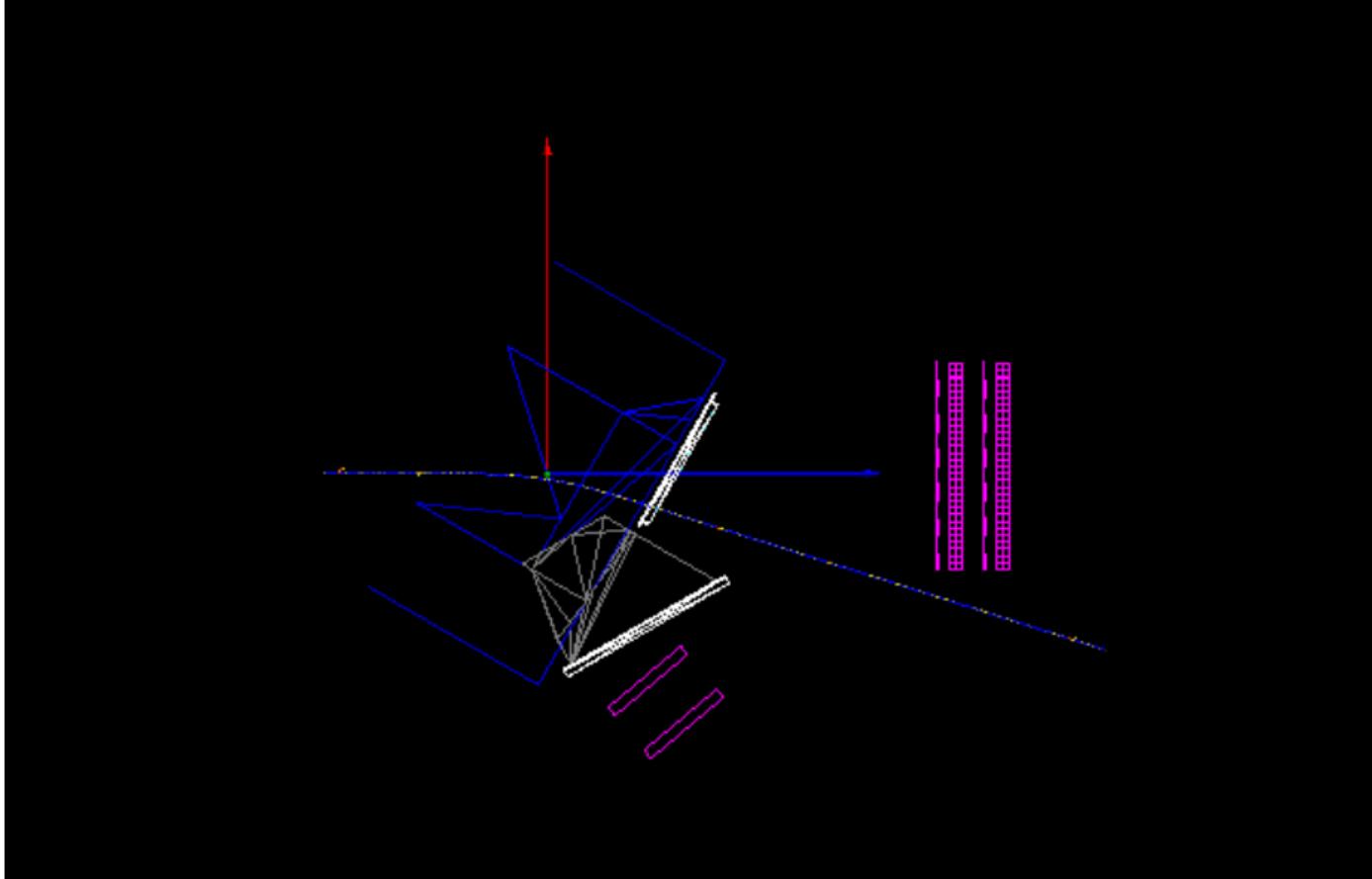


Figure: 0.8T

1 config

- deutron hit exitwindow
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i'am afriad that i caculate the wrong posit ion of target.

i should use geant4 code to do cross check with my Runge-Kutta code that caculate the deutron trajectory.

```
# [EN] Target positions: FIELD ANGLE TX TY TZ
# [CN] 靶点位置: 磁场 角度 X Y Z (单位mm, cm需要转换)
read -r -d '' TARGET_DATA << 'ENDDATA'
080 2.0 -8.1743 0.0046 -1093.7313
080 4.0 -20.6120 0.0063 -851.8761
080 6.0 -37.8391 0.0077 -654.3163
080 8.0 -60.6090 0.0088 -468.7377
080 10.0 -89.3315 0.0100 -287.3597
100 2.0 -7.7287 0.0075 -1151.8117
100 4.0 -18.9698 0.0105 -932.5705
100 6.0 -33.7681 0.0131 -762.6098
100 8.0 -52.6612 0.0157 -608.5314
100 10.0 -76.0454 0.0186 -460.8262
120 2.0 -7.4478 0.0082 -1193.9326
120 4.0 -17.9688 0.0107 -988.3352
120 6.0 -31.3605 0.0133 -834.3431
```

Simulation Scan: $B = 2.0 \text{ T}$ (Baseline) I

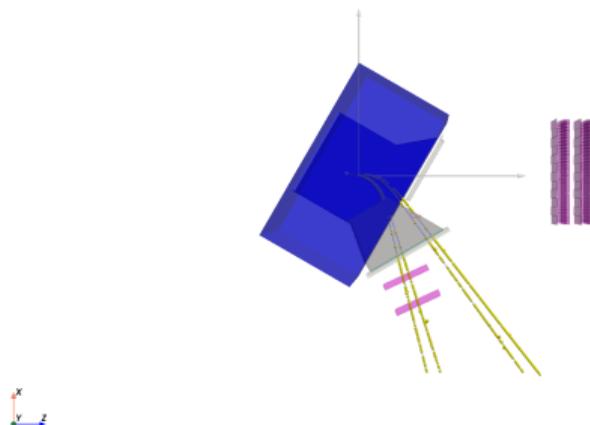


Figure: protons_B200T_2.0deg.png

Simulation Scan: $B = 2.0 \text{ T}$ (Baseline) II

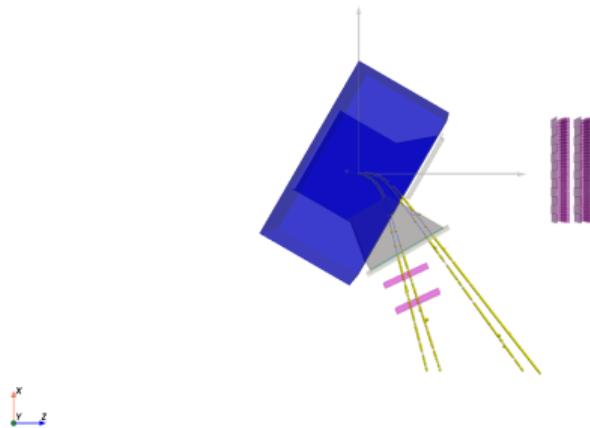


Figure: `protons_B200T_4.0deg.png`

Simulation Scan: $B = 2.0 \text{ T}$ (Baseline) III

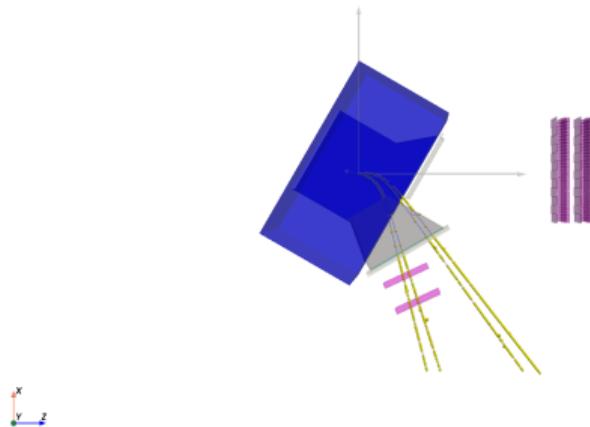


Figure: `protons_B200T_6.0deg.png`

Simulation Scan: $B = 2.0 \text{ T}$ (Baseline) IV

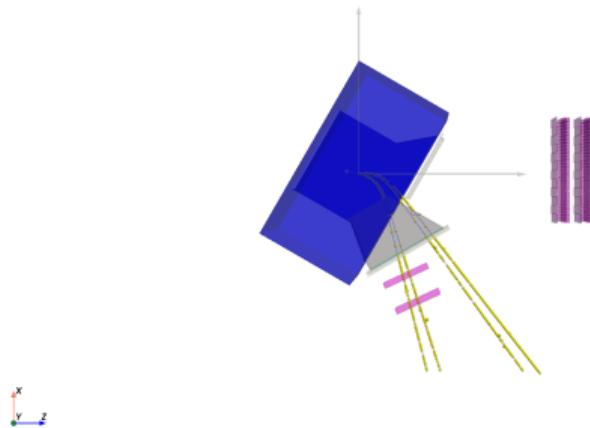


Figure: [protons_B200T_8.0deg.png](#)

Simulation Scan: $B = 2.0 \text{ T}$ (Baseline) V

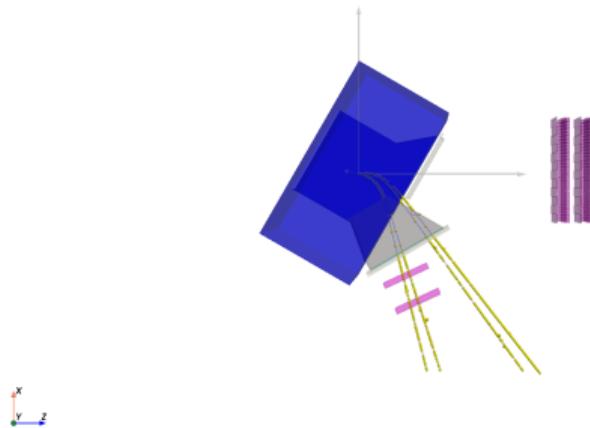


Figure: [protons_B200T_10.0deg.png](#)

Simulation Scan: $B = 1.6 \text{ T}$ I

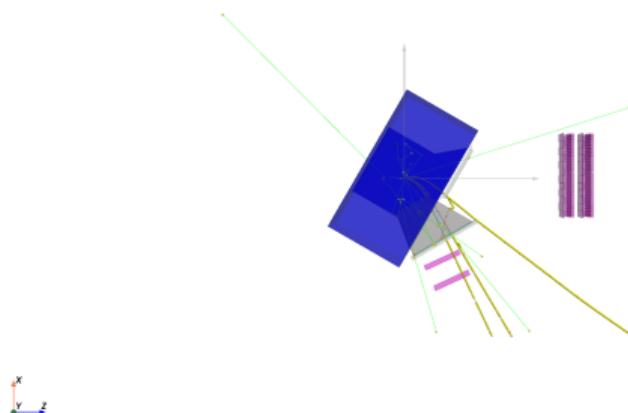


Figure: `protons_B160T_2.0deg.png`

Simulation Scan: $B = 1.6 \text{ T}$ II

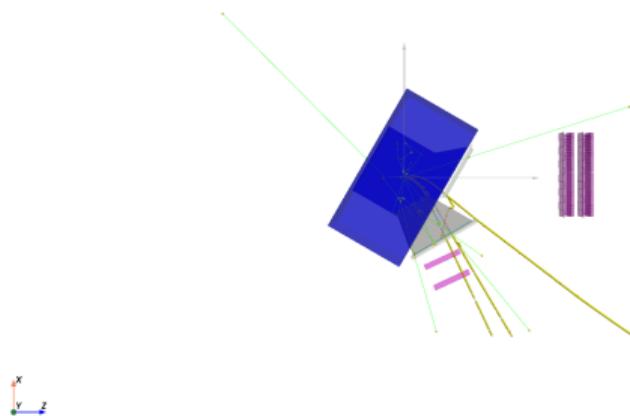


Figure: protons_B160T_4.0deg.png

Simulation Scan: $B = 1.6 \text{ T}$ III

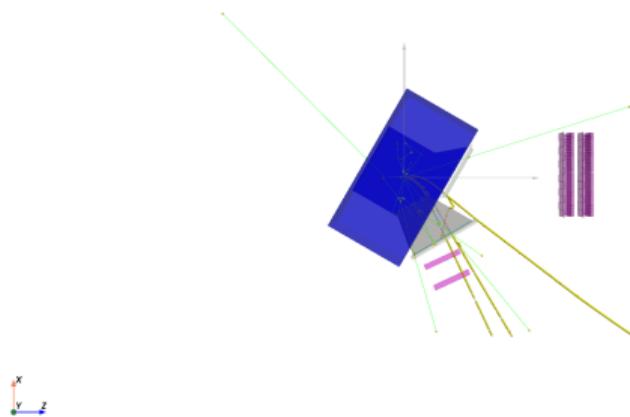


Figure: protons_B160T_6.0deg.png

Simulation Scan: $B = 1.6 \text{ T}$ IV

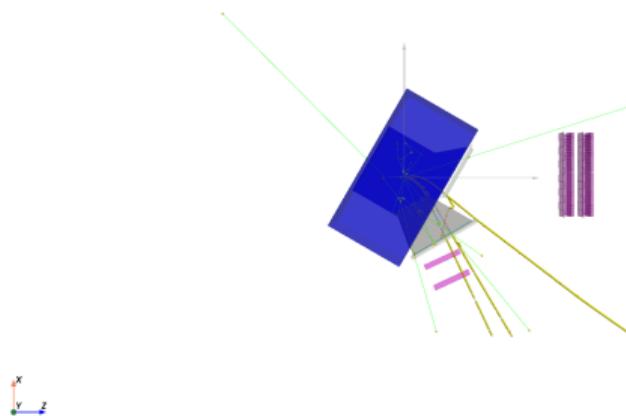


Figure: `protons_B160T_8.0deg.png`

Simulation Scan: $B = 1.6 \text{ T}$ V

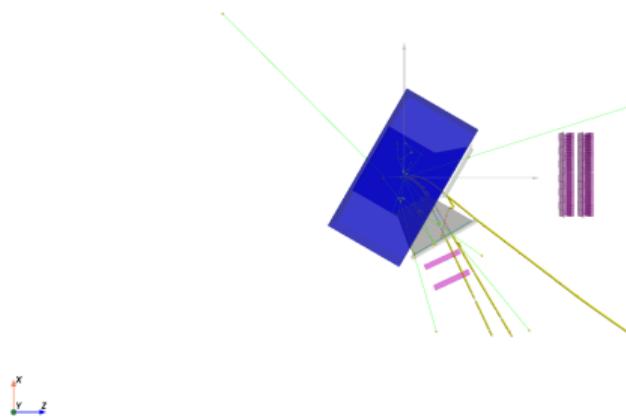


Figure: [protons_B160T_10.0deg.png](#)

Simulation Scan: $B = 1.2 \text{ T}$ I

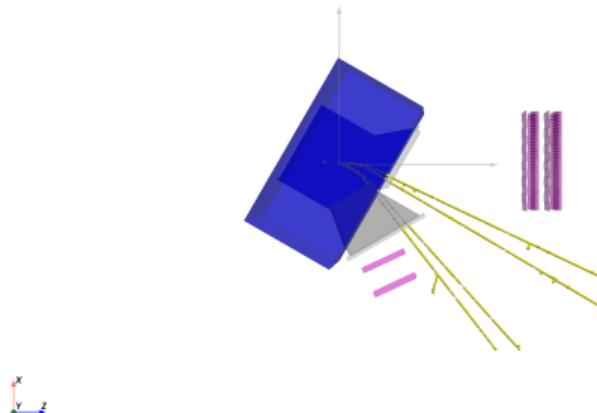


Figure: protons_B120T_2.0deg.png

Simulation Scan: $B = 1.2 \text{ T}$ II

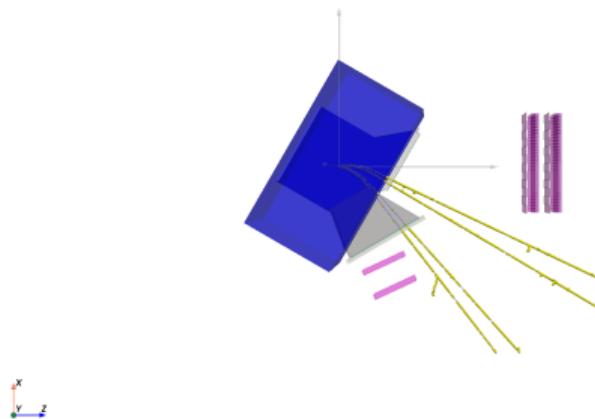


Figure: `protons_B120T_4.0deg.png`

Simulation Scan: $B = 1.2 \text{ T}$ III

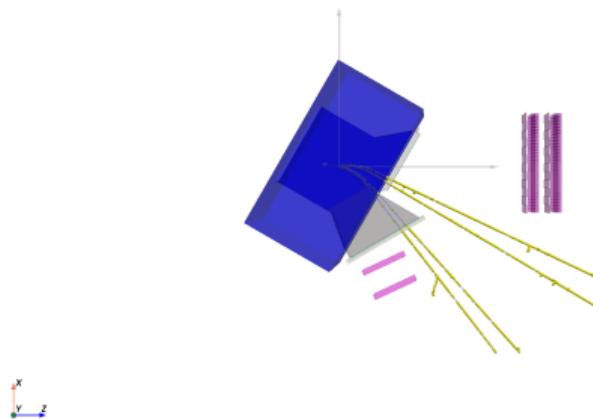


Figure: `protons_B120T_6.0deg.png`

Simulation Scan: $B = 1.2 \text{ T}$ IV

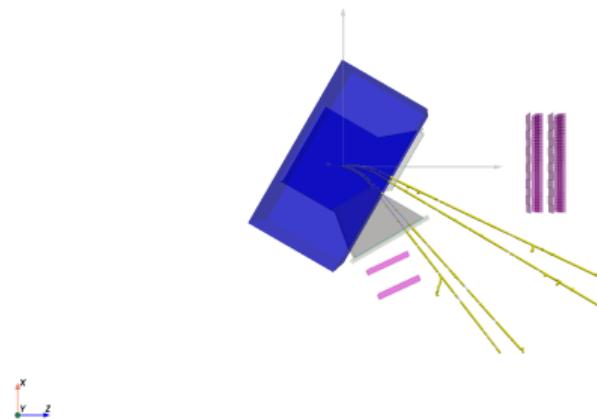


Figure: protons_B120T_8.0deg.png

Simulation Scan: $B = 1.2 \text{ T}$ V

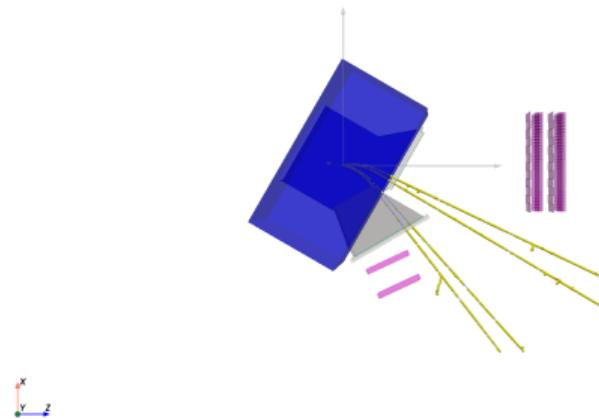


Figure: [protons_B120T_10.0deg.png](#)

Simulation Scan: $B = 1.0 \text{ T}$ I

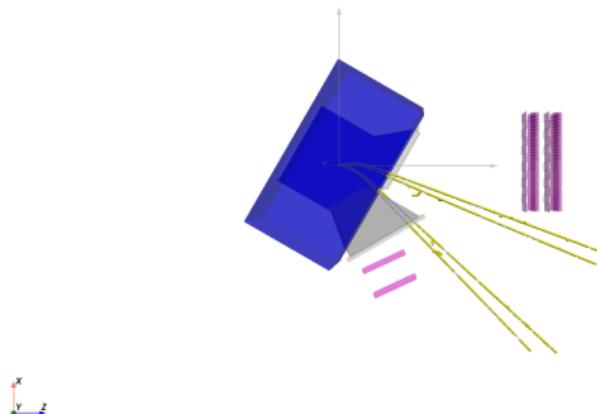


Figure: protons_B100T_2.0deg.png

Simulation Scan: $B = 1.0 \text{ T}$ II

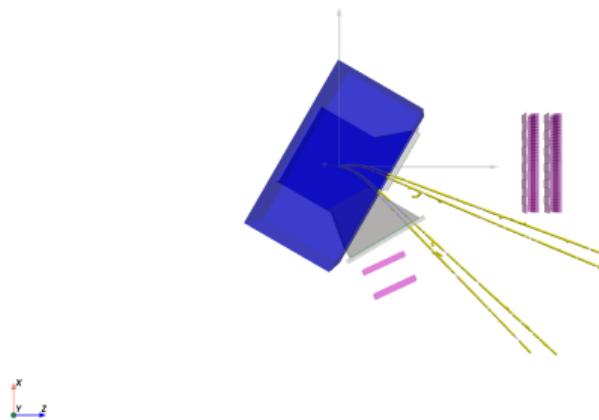


Figure: `protons_B100T_4.0deg.png`

Simulation Scan: $B = 1.0 \text{ T}$ III

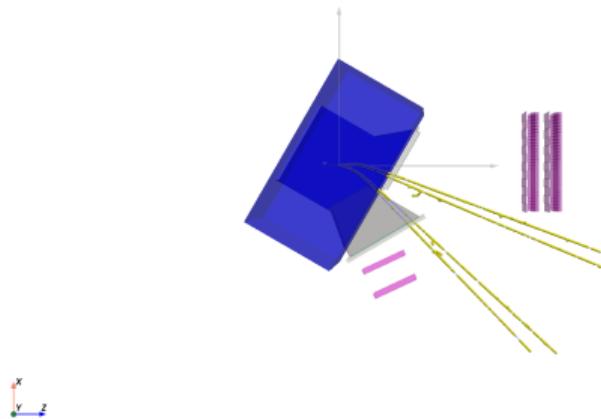


Figure: `protons_B100T_6.0deg.png`

Simulation Scan: $B = 1.0 \text{ T}$ IV

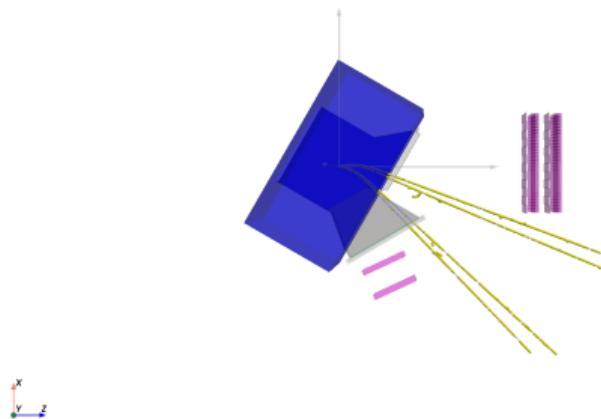


Figure: protons_B100T_8.0deg.png

Simulation Scan: $B = 1.0 \text{ T}$ V

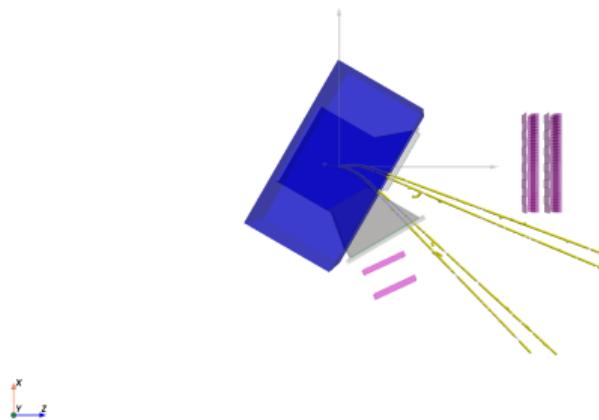


Figure: [protons_B100T_10.0deg.png](#)

Simulation Scan: $B = 0.8 \text{ T}$ I

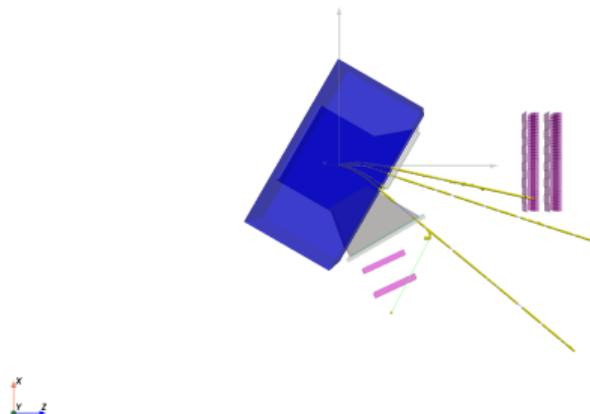


Figure: protons_B080T_2.0deg.png

Simulation Scan: $B = 0.8 \text{ T}$ II

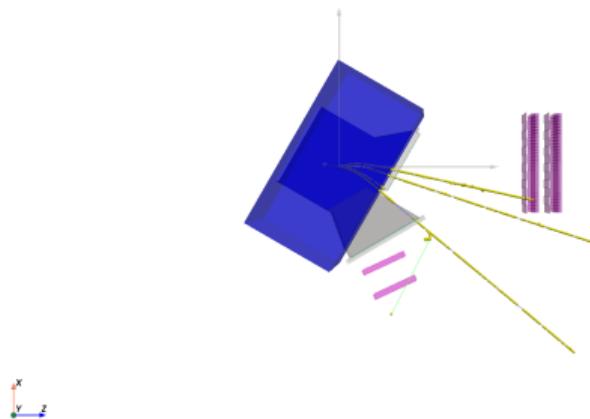


Figure: protons_B080T_4.0deg.png

Simulation Scan: $B = 0.8 \text{ T}$ III

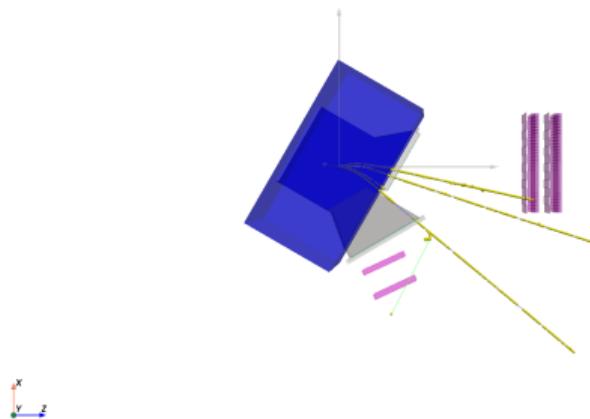


Figure: protons_B080T_6.0deg.png

Simulation Scan: $B = 0.8$ T IV

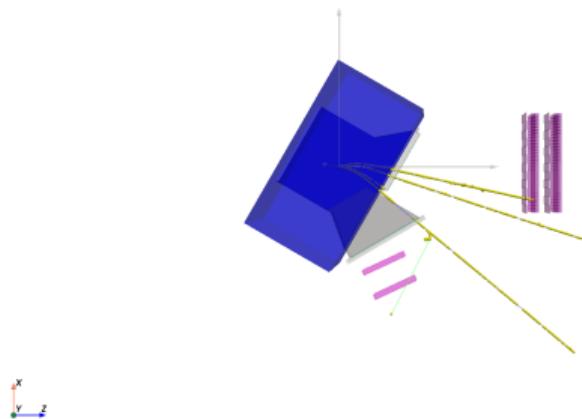


Figure: protons_B080T_8.0deg.png

Simulation Scan: $B = 0.8 \text{ T}$ V

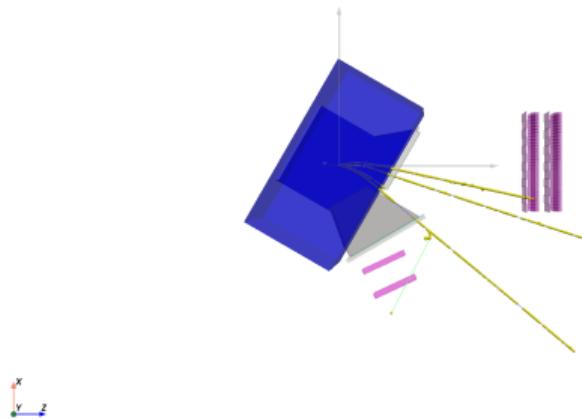


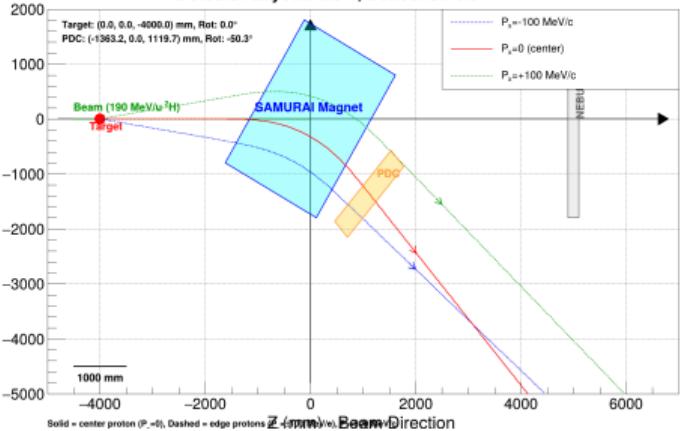
Figure: `protons_B080T_10.0deg.png`

Rationale for Target Placement

Why the target must be placed inside the magnetic field:

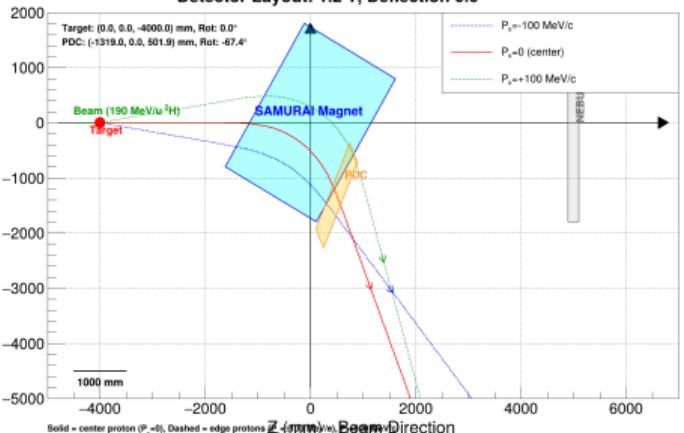
- **Strong B -field Case:**
 - Difficult proton track reconstruction.
- **Weak B -field Case:**
 - Risk of protons hitting the exit window.
- **General Constraint:**
 - Poor neutron geometric acceptance.

Detector Layout: 0.8 T, Deflection 0.0 °



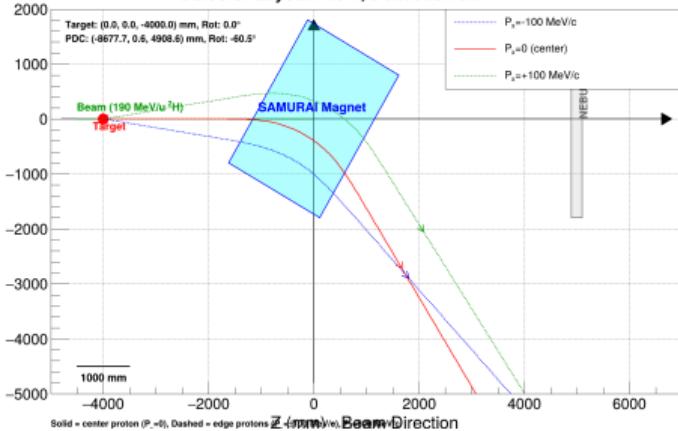
(a) 0.80 T

Detector Layout: 1.2 T, Deflection 0.0 °



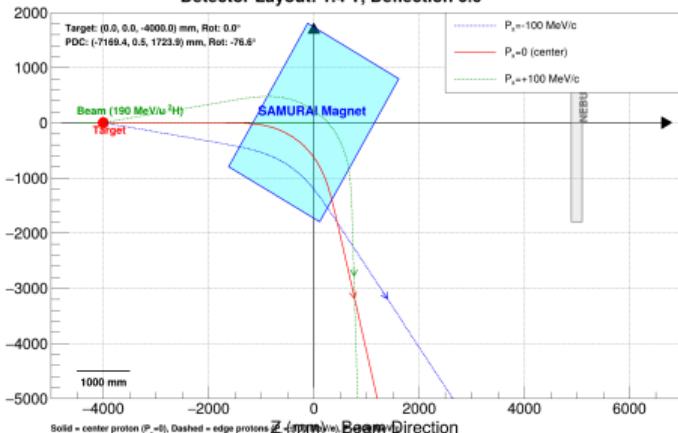
(c) 1.20 T

Detector Layout: 1.0 T, Deflection 0.0 °



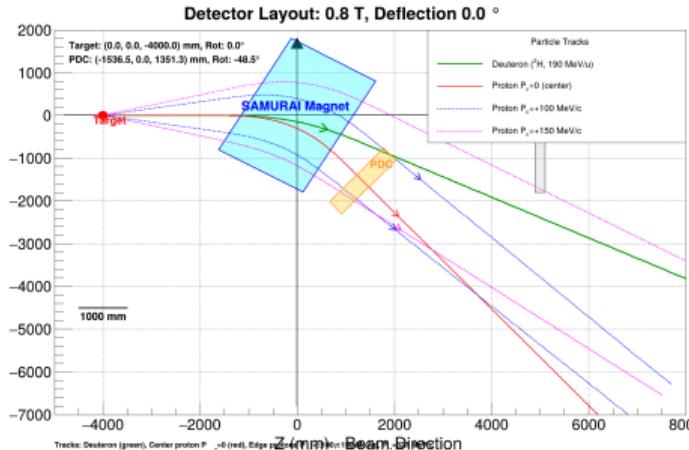
(b) 1.00 T

Detector Layout: 1.4 T, Deflection 0.0 °

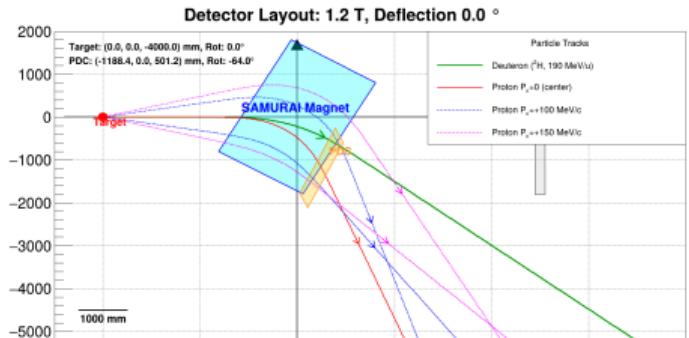


(d) 1.40 T

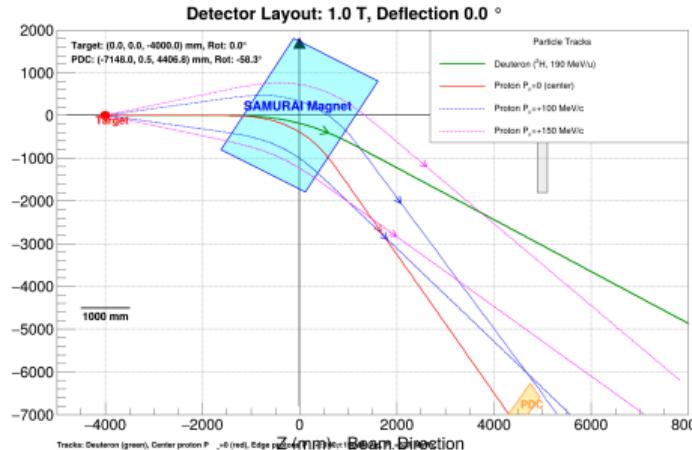
PDC Position: 0 deg (Low Field)



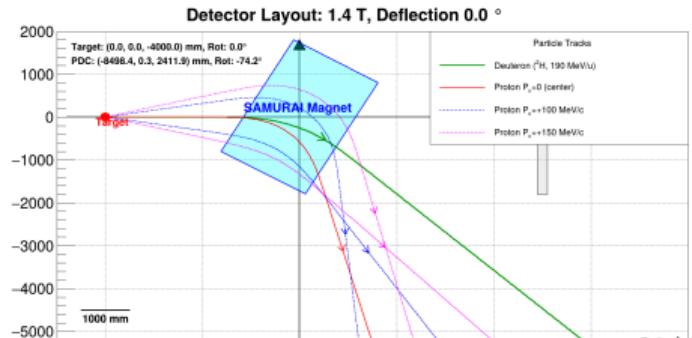
(a) 0.80 T



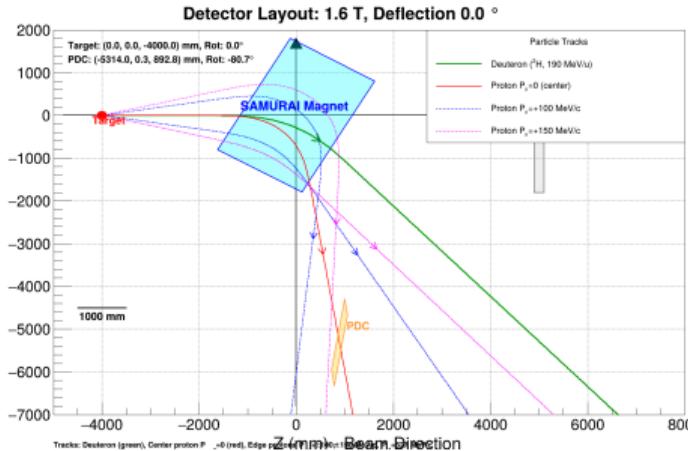
(b) 1.00 T



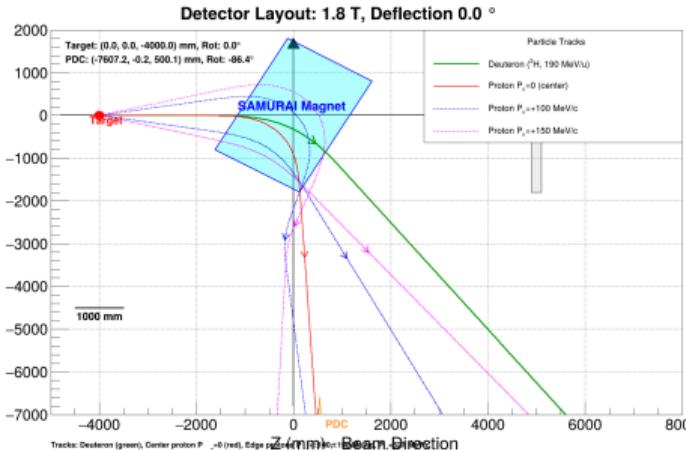
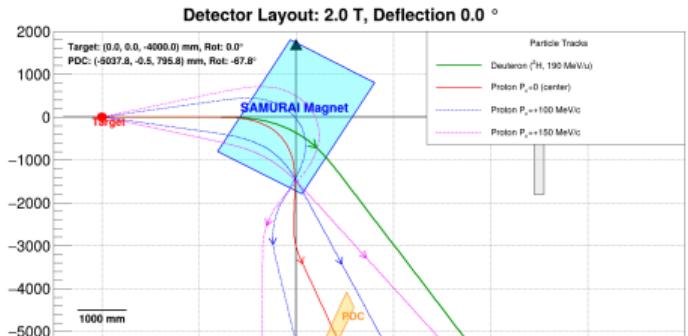
(c) 1.20 T



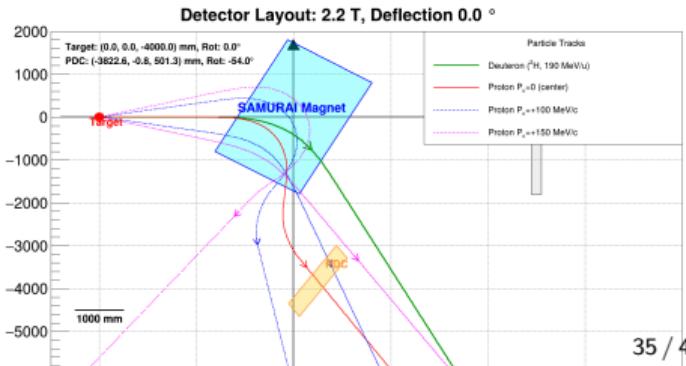
PDC Position: 0 deg (Mid Field)



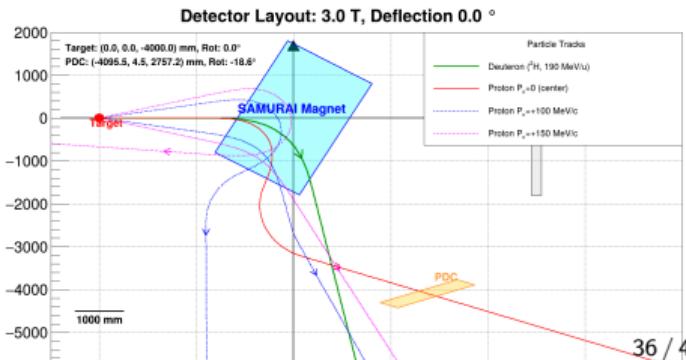
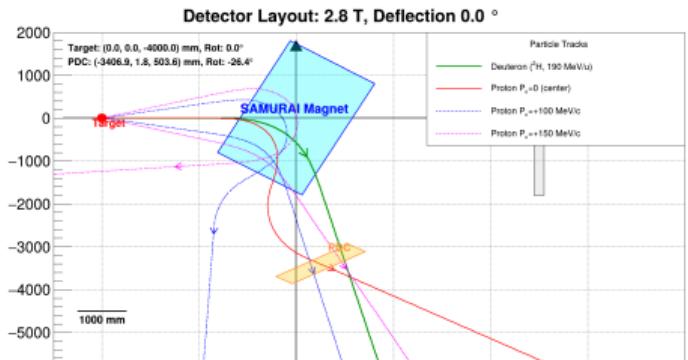
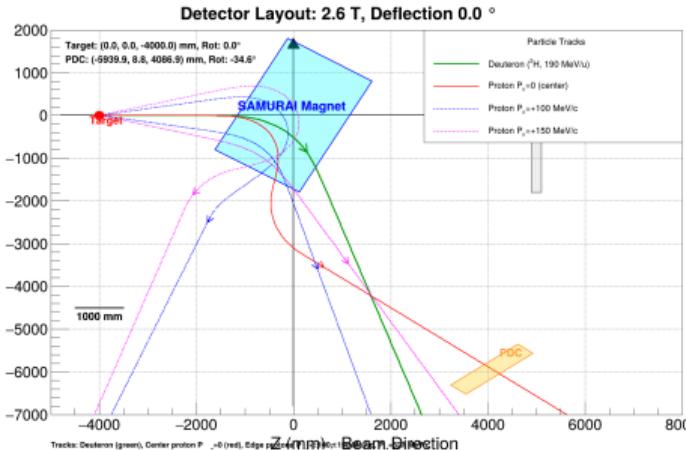
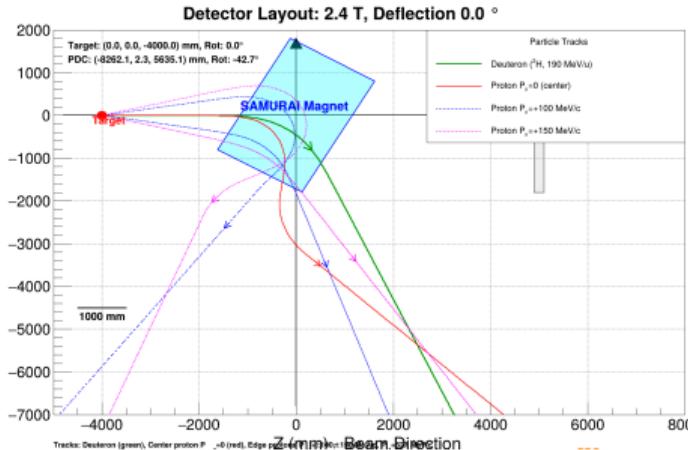
(a) 1.60 T



(b) 1.80 T

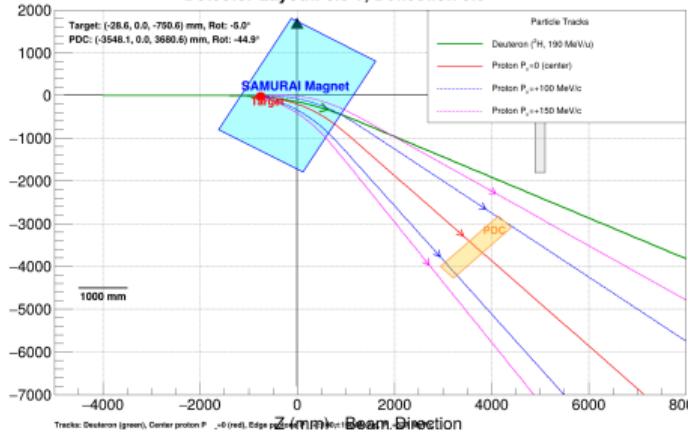


PDC Position: 0 deg (High Field)



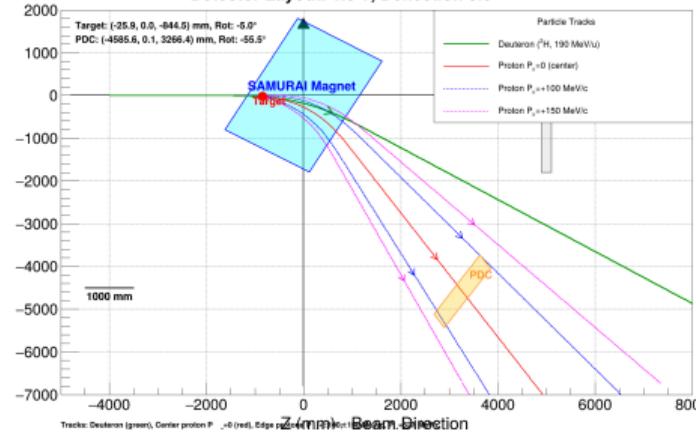
PDC Position: 5 deg (Low Field)

Detector Layout: 0.8 T, Deflection 5.0 °



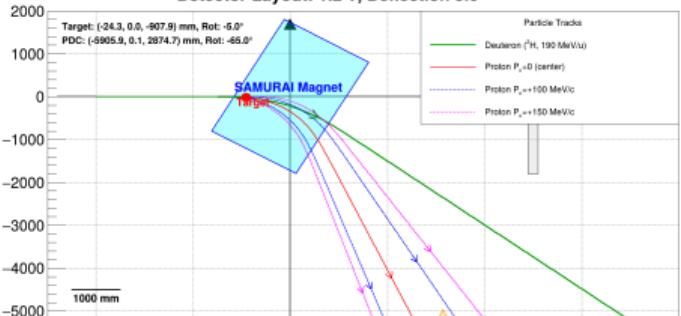
(a) 0.80 T

Detector Layout: 1.0 T, Deflection 5.0 °

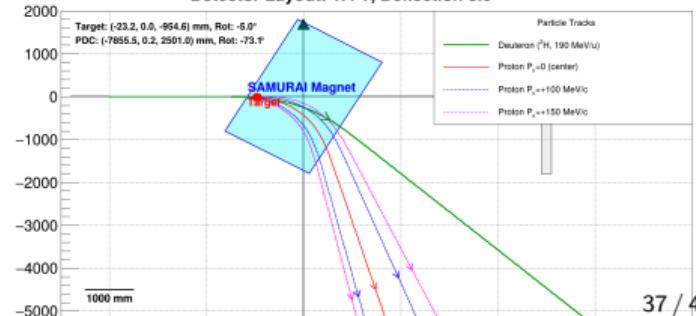


(b) 1.00 T

Detector Layout: 1.2 T, Deflection 5.0 °

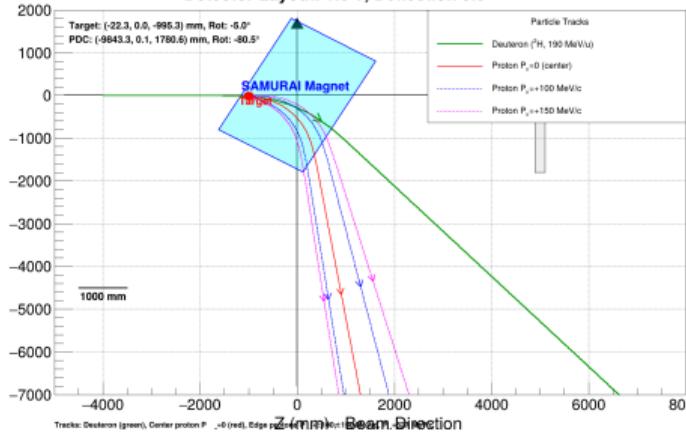


Detector Layout: 1.4 T, Deflection 5.0 °



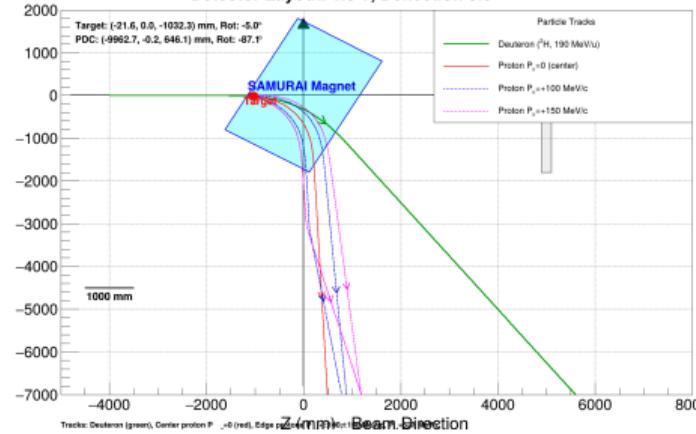
PDC Position: 5 deg (Mid Field)

Detector Layout: 1.6 T, Deflection 5.0 °



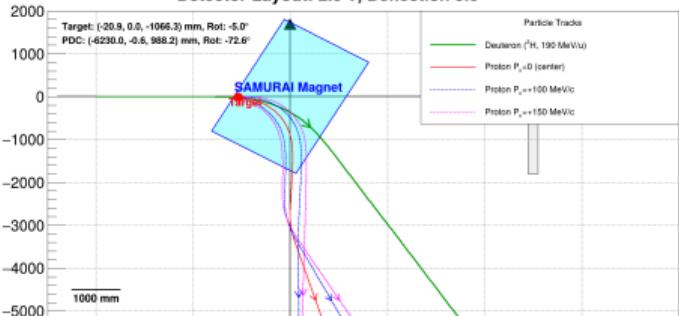
(a) 1.60 T

Detector Layout: 1.8 T, Deflection 5.0 °

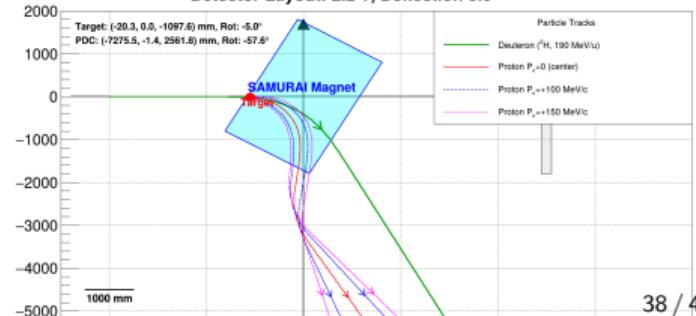


(b) 1.80 T

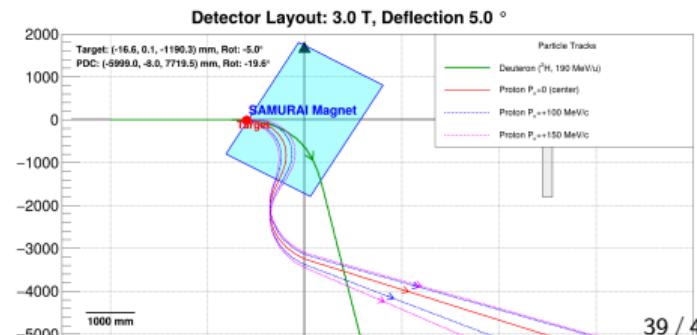
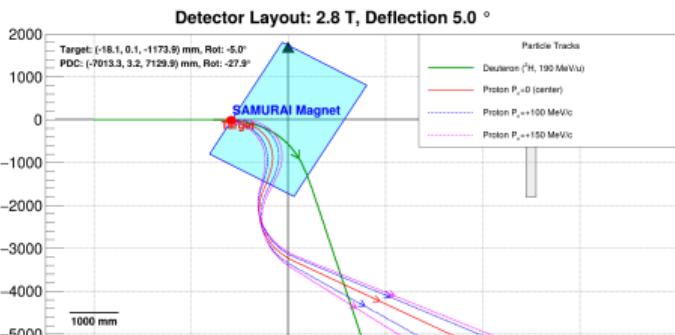
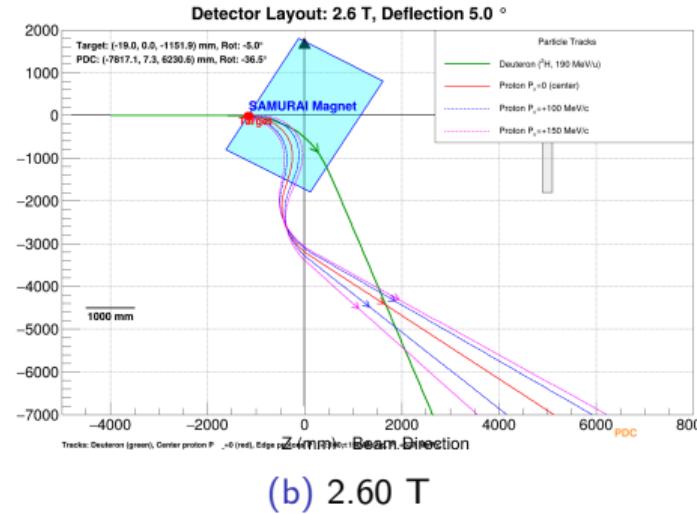
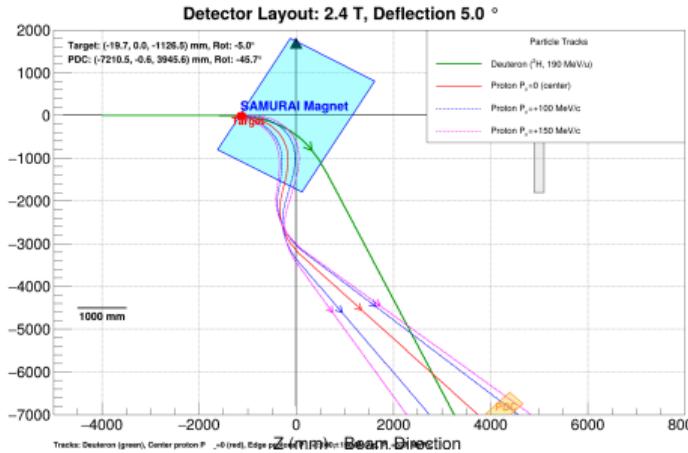
Detector Layout: 2.0 T, Deflection 5.0 °



Detector Layout: 2.2 T, Deflection 5.0 °

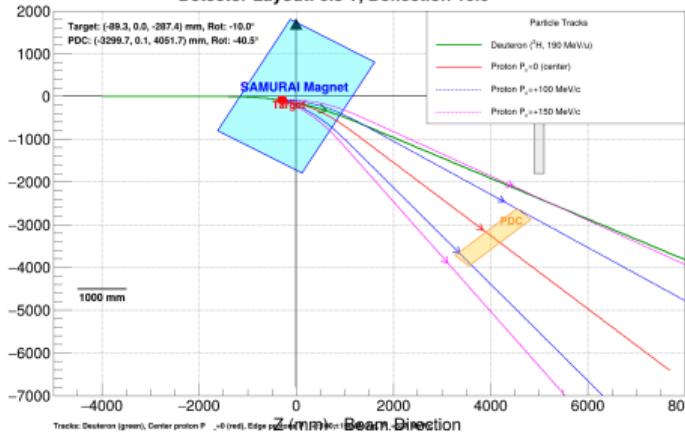


PDC Position: 5 deg (High Field)



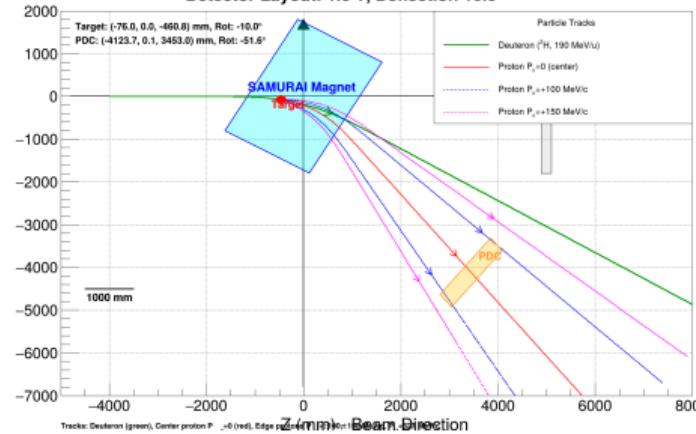
PDC Position: 10 deg (Low Field)

Detector Layout: 0.8 T, Deflection 10.0 °



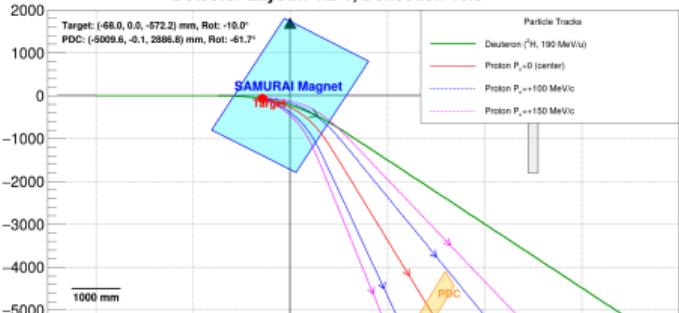
(a) 0.80 T

Detector Layout: 1.0 T, Deflection 10.0 °

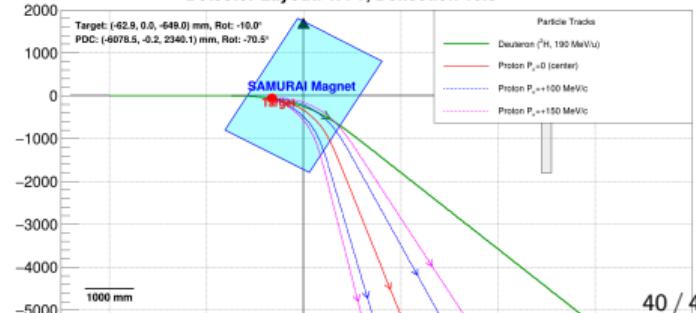


(b) 1.00 T

Detector Layout: 1.2 T, Deflection 10.0 °

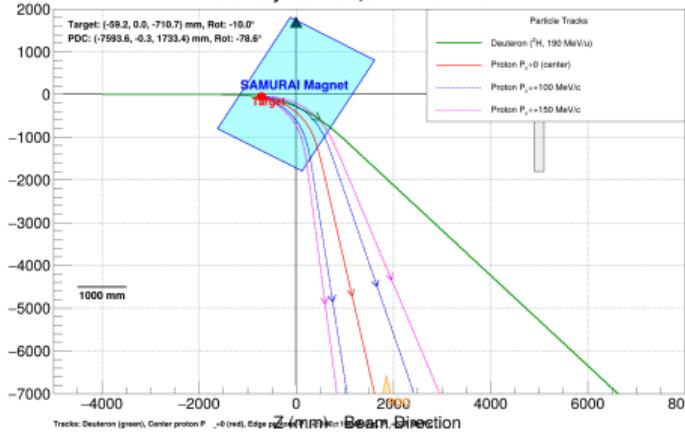


Detector Layout: 1.4 T, Deflection 10.0 °



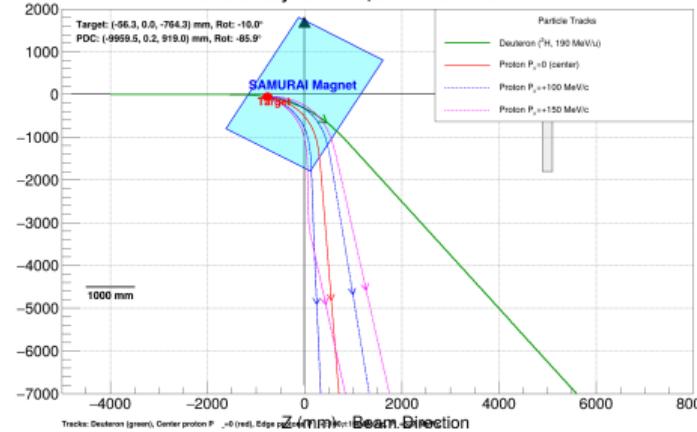
PDC Position: 10 deg (Mid Field)

Detector Layout: 1.6 T, Deflection 10.0 °



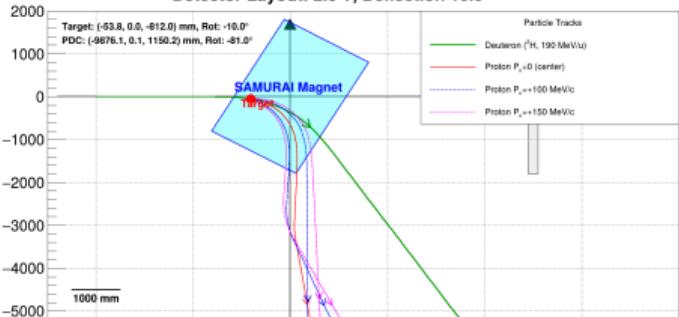
(a) 1.60 T

Detector Layout: 1.8 T, Deflection 10.0 °

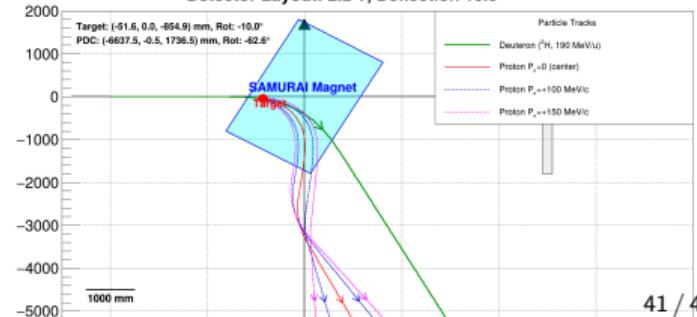


(b) 1.80 T

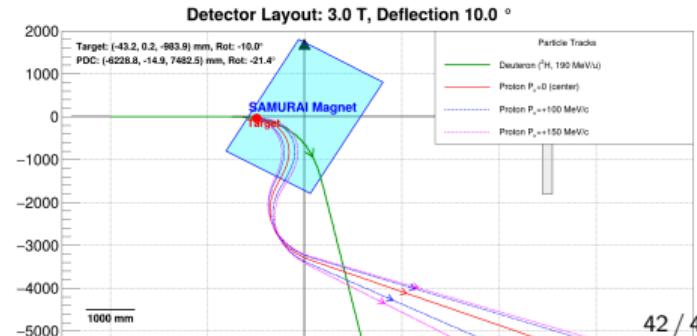
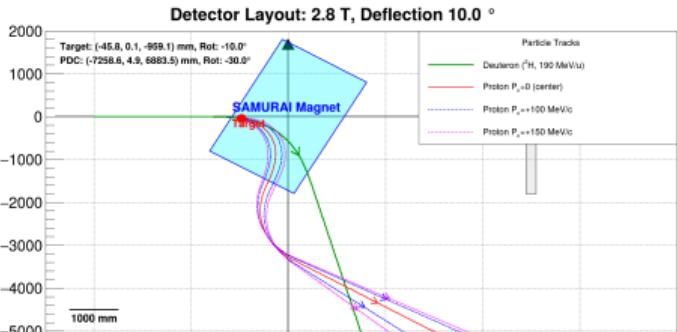
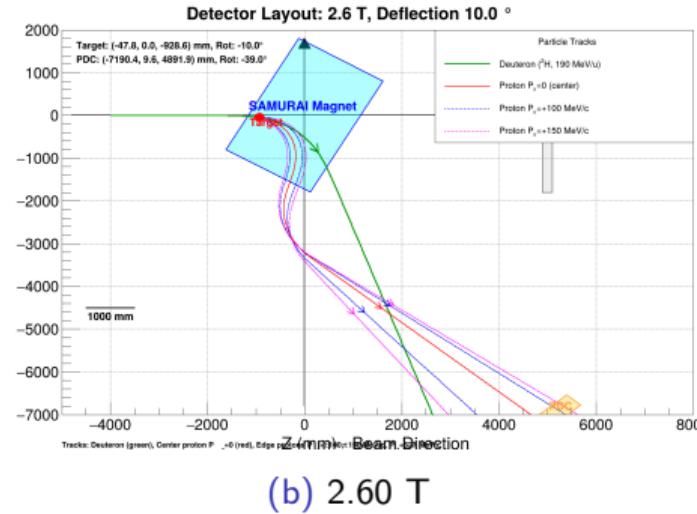
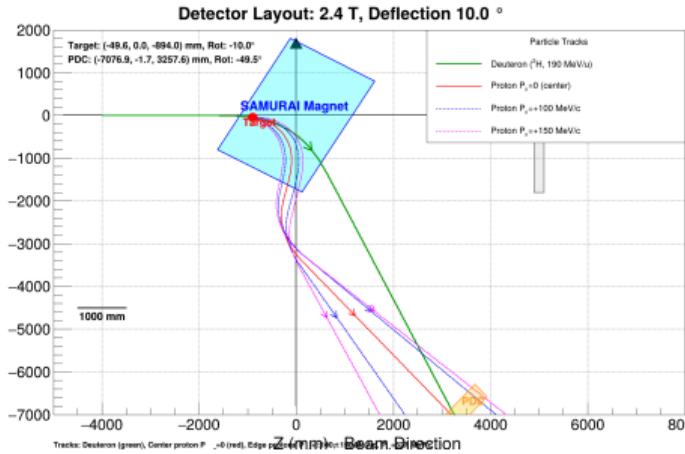
Detector Layout: 2.0 T, Deflection 10.0 °



Detector Layout: 2.2 T, Deflection 10.0 °



PDC Position: 10 deg (High Field)



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.