

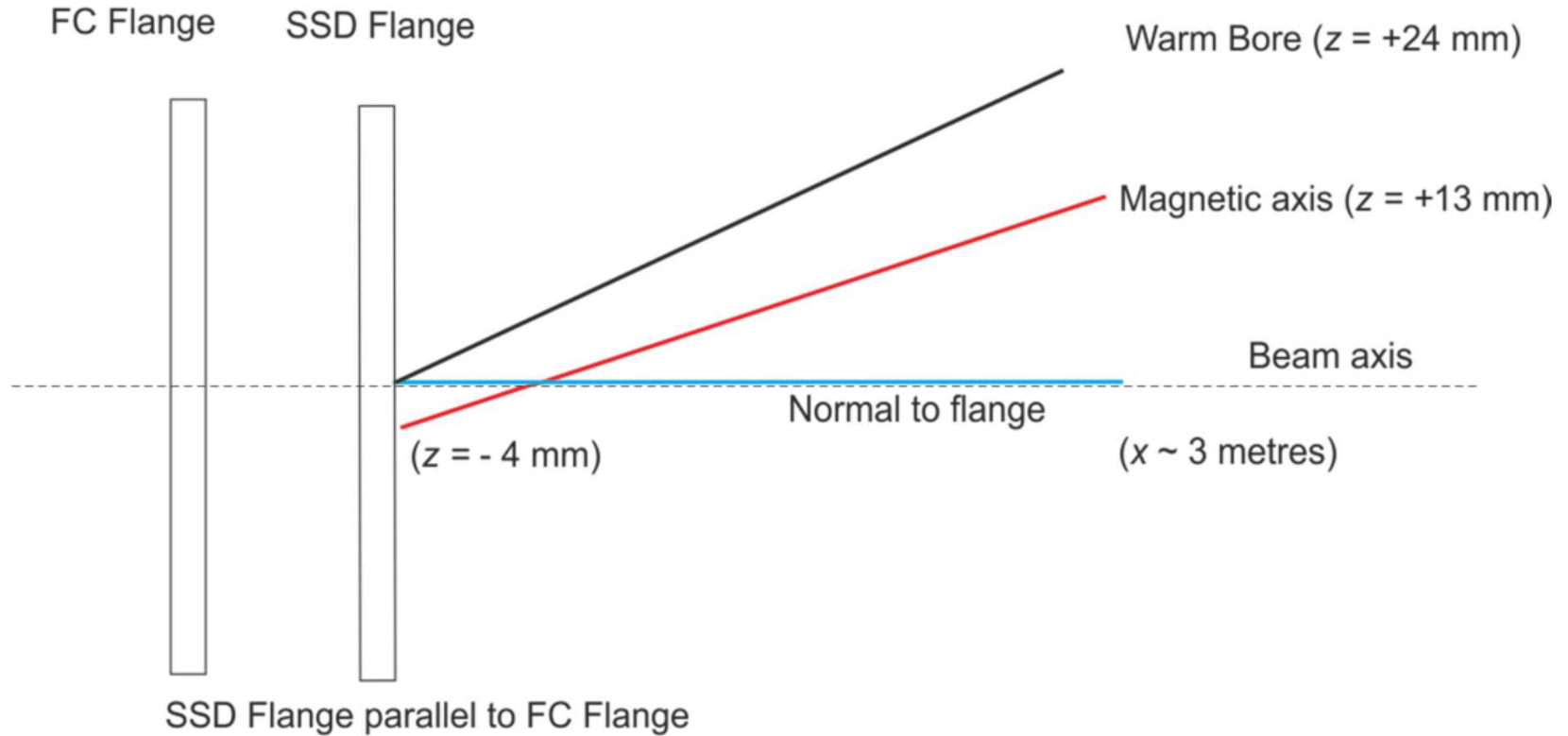
Force due to Spectrometer Misalignment

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MICE Spectrometer

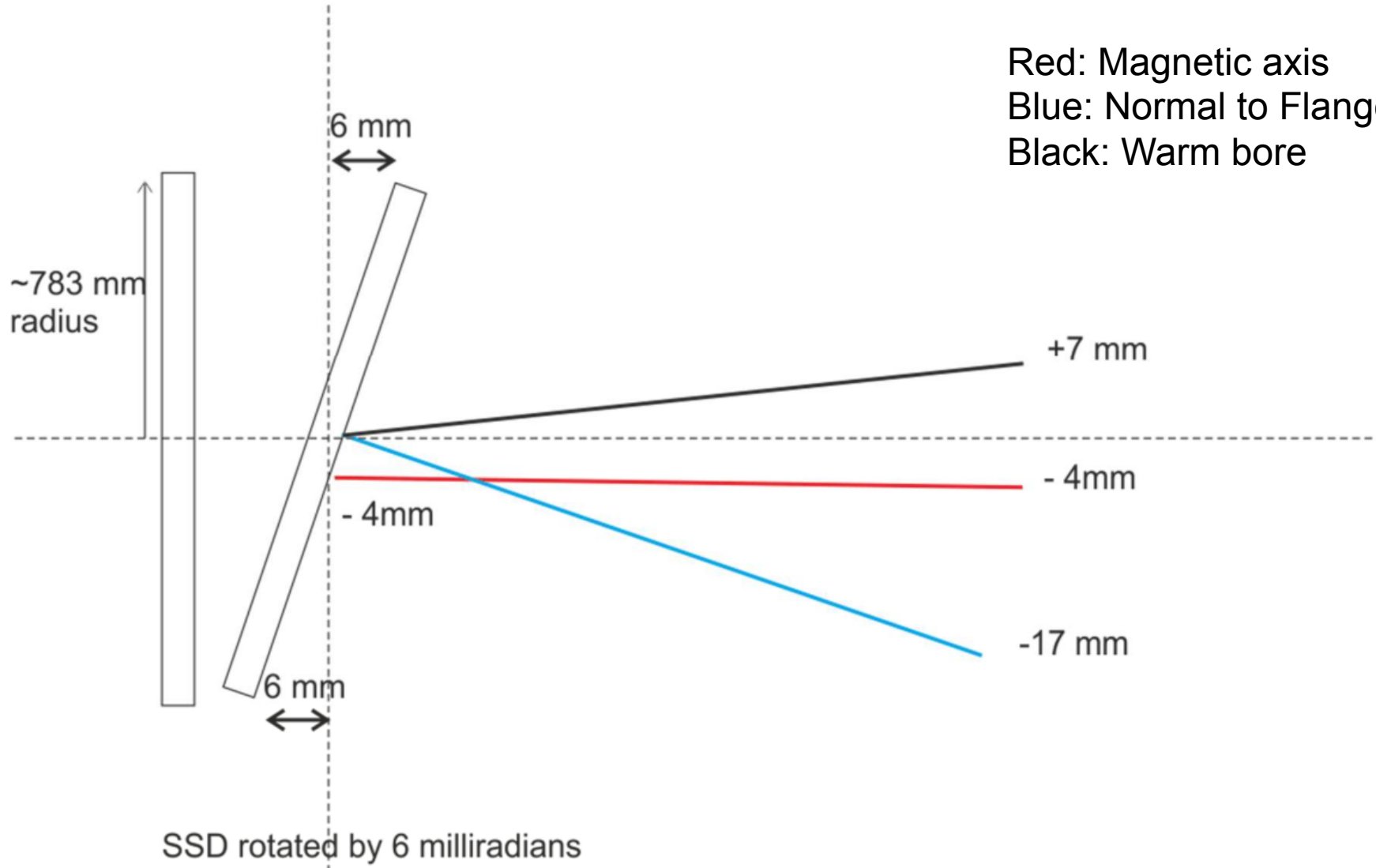


Magnetic measurement: Spectrometer misaligned?

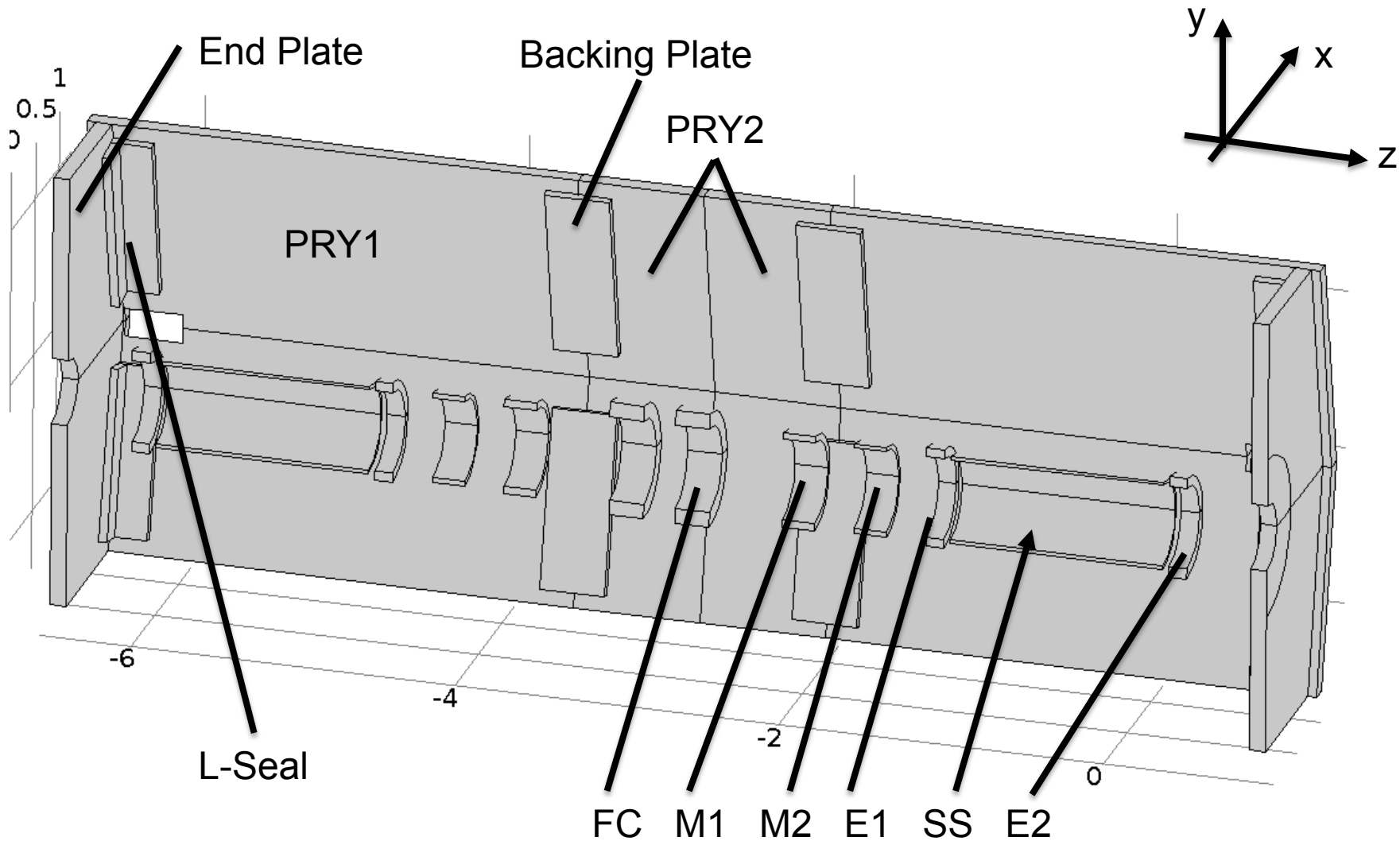


From: J. H. Cobb, Oxford University

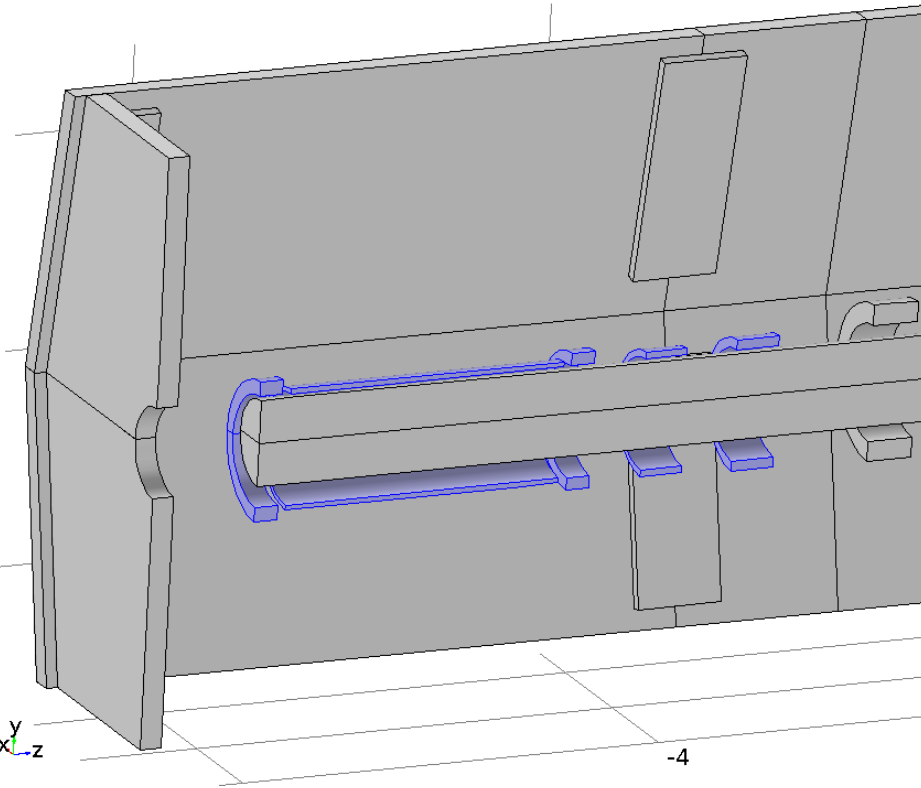
Better?



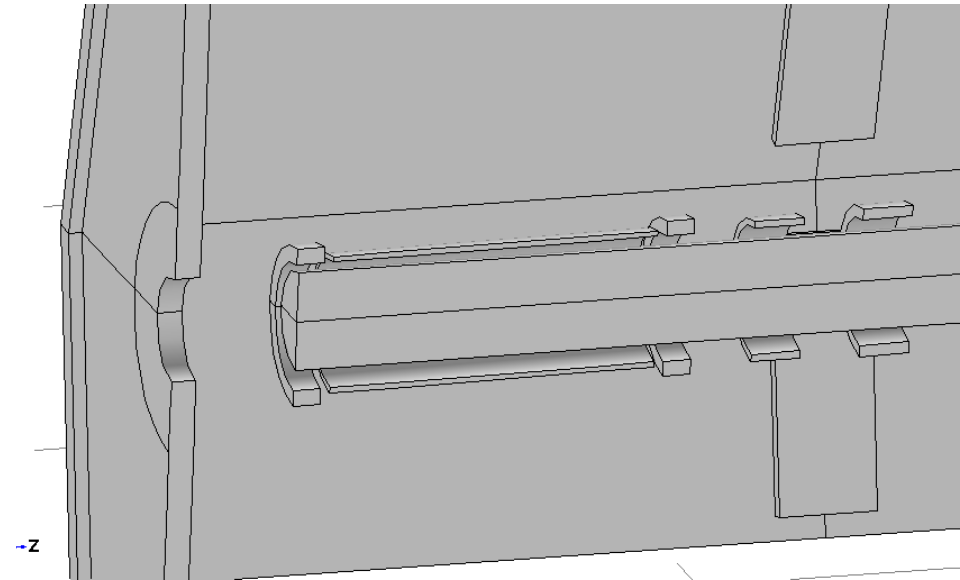
Force Evaluation



FEA Model



Shifted (x10)



Shifted + tilted

(Preliminary) Results



- Evaluated forces
 - In Newton
 - Table values are for geometry shown on slide 5 (not taking into account symmetry!)
 - F_x for solenoids will be 0 in all cases
 - F_y, F_z for solenoids will be twice as large
- Preliminary results
 - No significant force change on PRY
- Solenoids:
 - Largest change in longitudinal direction: 3.2% (M2)
 - Largest vertical force: $2 \times 5.5 \text{ kN} = 11 \text{ kN}$ (M2)

240 MeV Flip (Reference)



| | Fx | Fy | Fz |
|---------------------|-----------|---------|------------|
| PRY1 | -36606 | -7375.5 | 934.01 |
| PRY2 | -4088.5 | -526.26 | -1.5664 |
| LSeal1 | 23599 | 4803.2 | -8530.3 |
| LSeal2 | 159.05 | 25.53 | -14681 |
| End Plate | 4190.9 | -345.82 | 1.09E+005 |
| Backing Plate Inner | 10277 | 2064 | 198.15 |
| Backing Plate Outer | -10245 | -2083.8 | 0.4799 |
| FC | 2.19E+006 | 88.854 | -1.87E+006 |
| M1 | 1.15E+006 | 192.73 | -76039 |
| M2 | 7.60E+005 | -47.337 | -20978 |
| E1 | 7.80E+005 | -127.45 | -4.21E+005 |
| SS | 4.49E+006 | 13.373 | -34922 |
| E2 | 8.85E+005 | 333.45 | 6.69E+005 |

240 MeV Flip Spectrometer Shifted + Tilted



| | Fx | Fy | Fz |
|---------------------|-----------|---------|------------|
| PRY1 | -36386 | -7327.9 | 933.94 |
| PRY2 | -4071.9 | -528.66 | 0.3908 |
| LSeal1 | 23458 | 4774.6 | -8463.2 |
| LSeal2 | 159.94 | 25.844 | -14761 |
| End Plate | 5008.4 | -7.2378 | 1.10E+005 |
| Backing Plate Inner | 10271 | 2063.3 | 189.9 |
| Backing Plate Outer | -10245 | -2083.7 | 0.47993 |
| FC | 2.19E+006 | -2591.3 | -1.87E+006 |
| M1 | 1.15E+006 | -237.78 | -75786 |
| M2 | 7.59E+005 | 65.082 | -21766 |
| E1 | 7.80E+005 | -2545 | -4.21E+005 |
| SS | 4.49E+006 | -153.66 | -34961 |
| E2 | 8.85E+005 | 5434.2 | 6.69E+005 |

240 MeV Flip Spectrometer Shifted



| | Fx | Fy | Fz |
|---------------------|-----------|-----------|------------|
| PRY1 | -36546 | -7359.3 | 934.66 |
| PRY2 | -4072.2 | -508.72 | -2.6357 |
| LSeal1 | 23579 | 4799.7 | -8523.7 |
| LSeal2 | 156.54 | 25.749 | -14696 |
| End Plate | 4762.5 | 856 | 1.10E+005 |
| Backing Plate Inner | 10276 | 2046.6 | 187.55 |
| Backing Plate Outer | -10245 | -2083.9 | 0.48034 |
| FC | 2.19E+006 | -2220.4 | -1.87E+006 |
| M1 | 1.15E+006 | 1545.8 | -74707 |
| M2 | 7.59E+005 | -79.204 | -21515 |
| E1 | 7.80E+005 | 75.106 | -4.21E+005 |
| SS | 4.49E+006 | 271.53 | -34993 |
| E2 | 8.85E+005 | -242.73 | 6.69E+005 |

240 MeV Sol (Reference)



| | Fx | Fy | Fz |
|---------------------|-----------|---------|------------|
| PRY1 | -30957 | -6272.5 | 2385.6 |
| PRY2 | -2975.5 | -576.91 | -0.9056 |
| LSeal1 | 23974 | 4879.9 | -8816.3 |
| LSeal2 | 164.37 | 25.532 | -14688 |
| End Plate | 4687.3 | -346.48 | 1.10E+005 |
| Backing Plate Inner | 25241 | 5132.4 | 5.7649 |
| Backing Plate Outer | -25032 | -5093.2 | 0.37929 |
| FC | 1.43E+006 | 100.91 | 3.89E+005 |
| M1 | 1.19E+006 | 197.27 | -62635 |
| M2 | 6.43E+005 | -36.501 | -12922 |
| E1 | 6.43E+005 | -36.501 | -1.29E+004 |
| SS | 4.49E+006 | 13.495 | -37793 |
| E2 | 8.86E+005 | 333.51 | 6.69E+005 |

240 MeV Sol Spectrometer Shifted + Tilted



| | Fx | Fy | Fz |
|---------------------|-----------|---------|------------|
| PRY1 | -30795 | -6239.9 | 2384 |
| PRY2 | -2994.3 | -579.41 | -1.373 |
| LSeal1 | 23842 | 4851.8 | -8762.2 |
| LSeal2 | 162.11 | 25.87 | -14751 |
| End Plate | 5441.2 | 880.89 | 1.11E+005 |
| Backing Plate Inner | 25245 | 5132.6 | 4.9778 |
| Backing Plate Outer | -25036 | -5094.1 | 0.3772 |
| FC | 1.43E+006 | -338.93 | 3.89E+005 |
| M1 | 1.19E+006 | -1778.2 | -61655 |
| M2 | 6.42E+005 | -45.174 | -13233 |
| E1 | 7.79E+005 | -2871.4 | -4.34E+005 |
| SS | 4.49E+006 | 243.52 | -37874 |
| E2 | 8.85E+005 | 5456.3 | 6.69E+005 |

240 MeV Sol Spectrometer Shifted



| | Fx | Fy | Fz |
|---------------------|-----------|---------|------------|
| PRY1 | -30903 | -6260.5 | 2385.5 |
| PRY2 | -3001.9 | -582.49 | -0.80293 |
| LSeal1 | 23950 | 4874.7 | -8807.7 |
| LSeal2 | 161.37 | 25.152 | -14700 |
| End Plate | 5260.4 | 858.56 | 1.10E+005 |
| Backing Plate Inner | 25241 | 5131.1 | 5.1242 |
| Backing Plate Outer | -25029 | -5092.7 | 0.37012 |
| FC | 1.43E+006 | -1224.7 | 3.89E+005 |
| M1 | 1.19E+006 | 1264.7 | -61272 |
| M2 | 6.43E+005 | -67.064 | -13335 |
| E1 | 7.78E+005 | 81.252 | -4.34E+005 |
| SS | 4.49E+006 | 280.87 | -37864 |
| E2 | 8.85E+005 | -242.27 | 6.70E+005 |