

Radiological Open Issues

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Rare Dipole Faults

- Wrong polarity
- Wrong nending power
- Shorted (partial to full shorts)
- Combinations
- Assume 8,500 Watts of 25 MeV beam
- 3 dipoles of interest
- Assume “no orbit” restrictions
- Memo dated Nov. 12, 2015

Layout

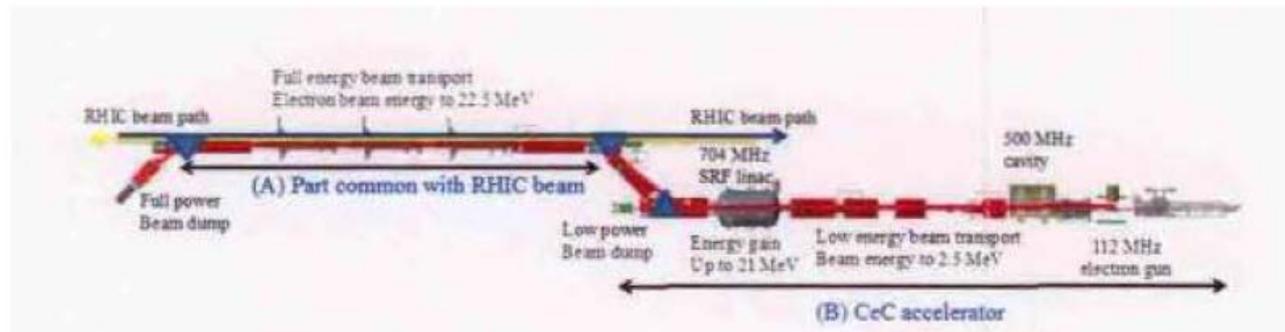


Figure 1: Layout of the CeCPoP in IR2. The three dipoles that bend the electron beam 45 degrees are shown as blue triangles.

Shielding and last dipole

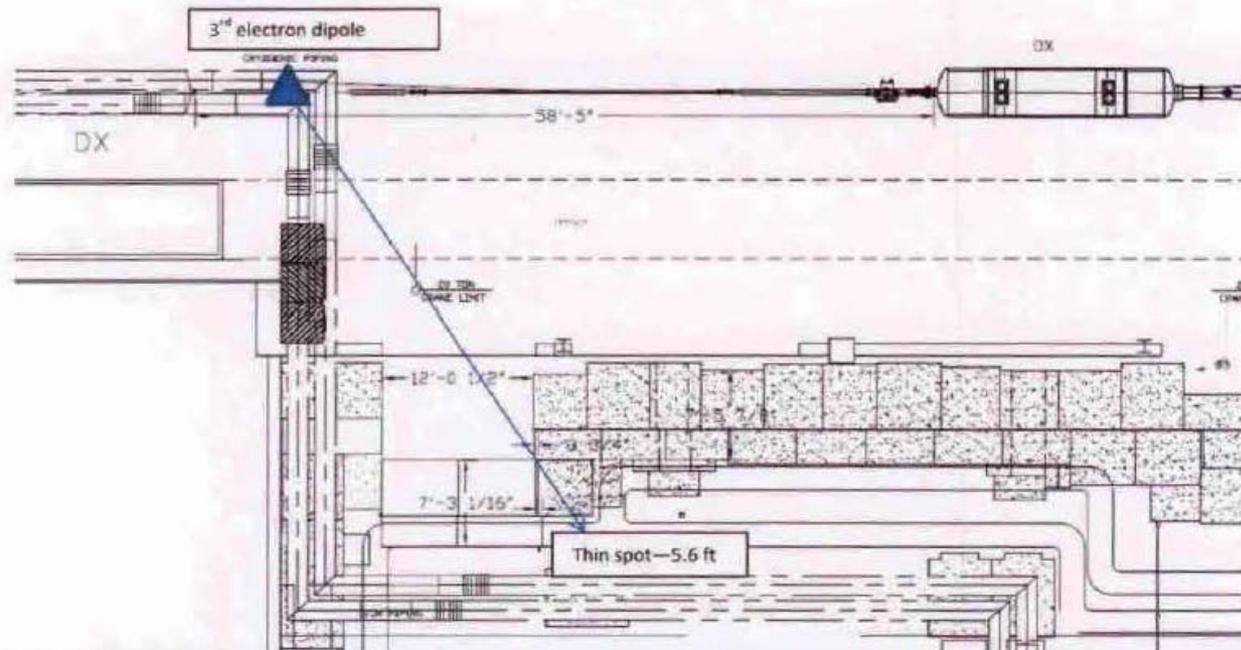
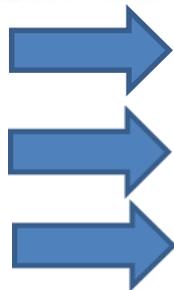


Figure 2: Truck door location relative to the third electron dipole. The arrow shows a location of a thin spot.



Shielding 8 feet light concrete

Truck door 7 feet light concrete

Weak spot for dipole three

Results of Dose Rate and Fault Dose

- Estimate for Dipole 1 → Wrong polarity and current
- Largest dose except weak spot from dipole 3

Table 1: Comparison of MCNPX and Thick Target Formula

Energy (MeV)	MCNPX Direct hit mrem/hr	Formula Direct hit mrem/hr	MCNPX Indirect hit mrem/hr	Formula indirect hit mrem/hr
25	34,000	49,000	1,800	1,200
15	3,600	5,200		115
5		10		0.04

Indirect hit has 1 foot light concrete by magnet

Direct hit has beam striking the shielding at 90 degrees

Assume a beam fault is terminated in 12 minutes—20% of hourly rate

Do not take credit for Machine Protection System (MPS)

Options

- Place 2 feet of light concrete equivalent in path
- Shielding spans to 45 degrees in forward direction
- Or Reduce possible beam energies by analysis of possible orbits
- Give “credit” for Polarity checks, low power testing of transport and defense in depth with MPS