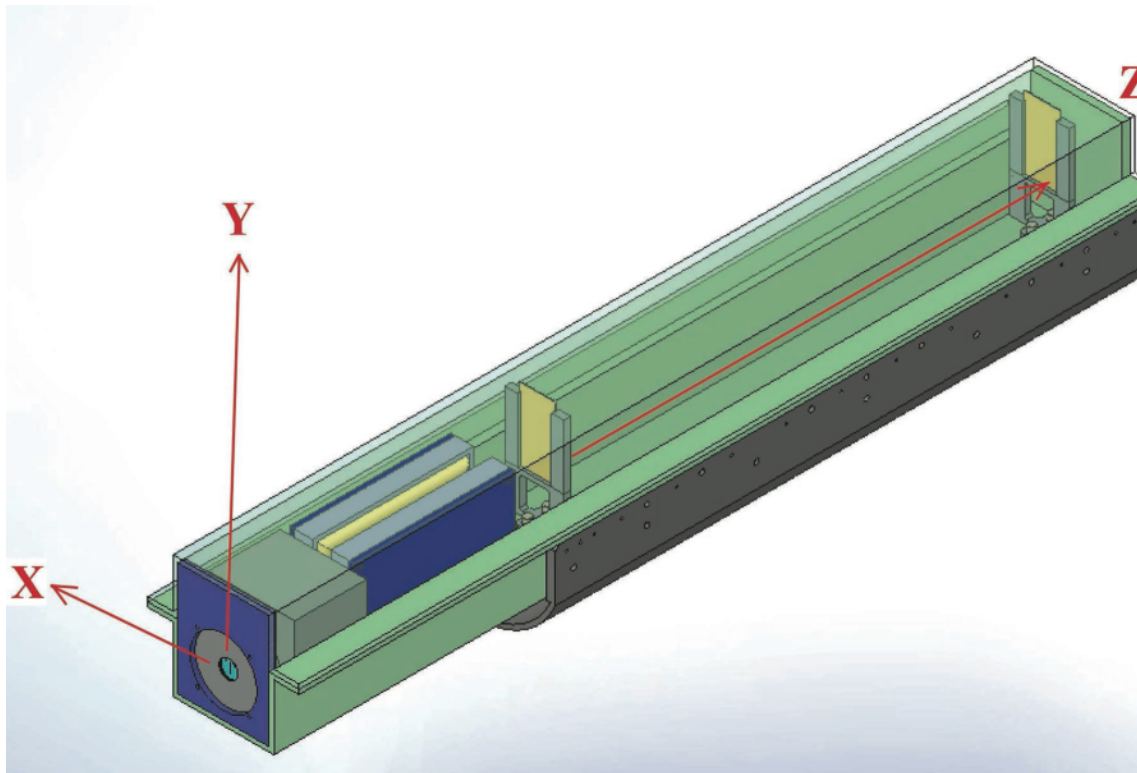


# Utilization of Thomson Parabola on OMEGA for characterizing implosion ion-loss channels and for studying nucleo-synthesis reactions in OMEGA implosions

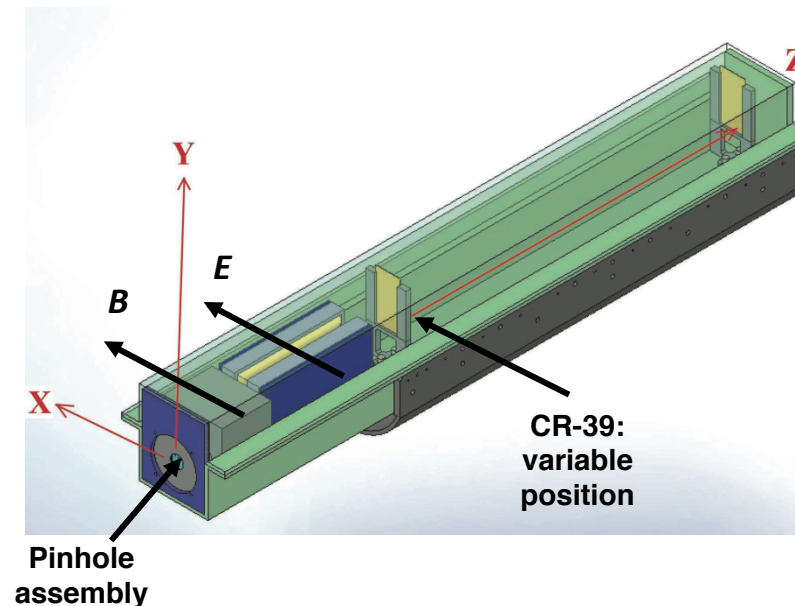
## Thomson Parabola Ion Energy (TPIE) Analyzer



LANL's Thomson Parabola will be used, with modifications, to measure the fusion alpha spectra in the presence of ablator ions on OMEGA



LANLs TP Analyzer system on OMEGA and OMEGA-EP



- The TP will break the degeneracy ablator protons and fusion alphas for a 'high contrast' measurement
- With proper calibration, the TP can measure the ablator ion spectra and total energy to an accuracy of ~10% (important measurements of ion energy loss channel in implosions)

Motivation: The *total* energy loss to ablator ions in OMEGA implosions has not been measured. In addition, distinguishing these ablator ions from fusion products is essential for the study of important nucleo-synthesis reactions

---

**1. Total ablator ion energy loss in OMEGA implosions**

- CPS has been used to measure lighter ions (protons and deuterons).
- It is estimated that the *total* energy loss (all ions) can be significant (5% of laser energy).
- TPIE will be used to measure the total energy ion loss.

**2.  $T + T \rightarrow 2n + \alpha$**

- TPIE, CPS can measure spectra at high  $T_i$  ( $\geq 4$  keV)

**3.  $T + {}^3\text{He} \rightarrow \alpha + n + p$**



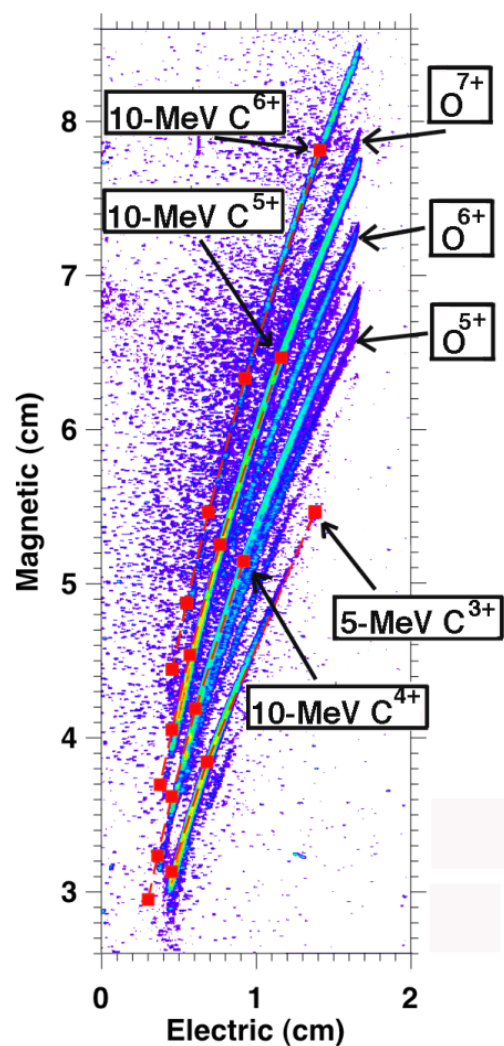
- TPIE, CPS capability can measure spectra at high  $T_i$  ( $\geq 7-8$  keV)

**Groups interested in these capabilities:**

MIT, LLNL, LLE,  
LANL, IU

*CPS = Charged Particle Spectrometer*  
*WRF = Wedge Range Filter*

TPIE has already been demonstrated on OMEGA-EP



Data taken using TPIE on OMEGA-EP

**A new magnet for probing lower energies and a new CR-39 holder with filtering capability are currently being implemented**

Qualification of TPIE on OMEGA will continue in early 2012, with full operations by mid 2012.