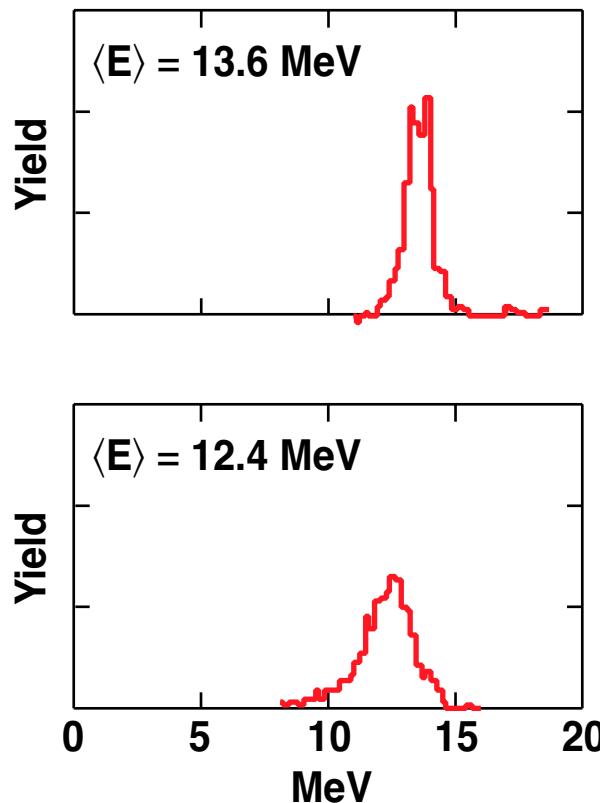
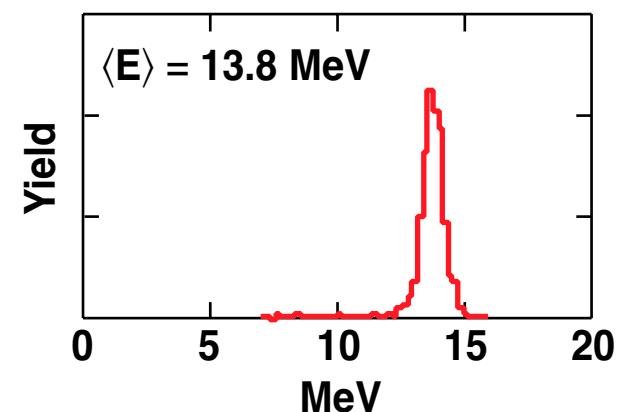
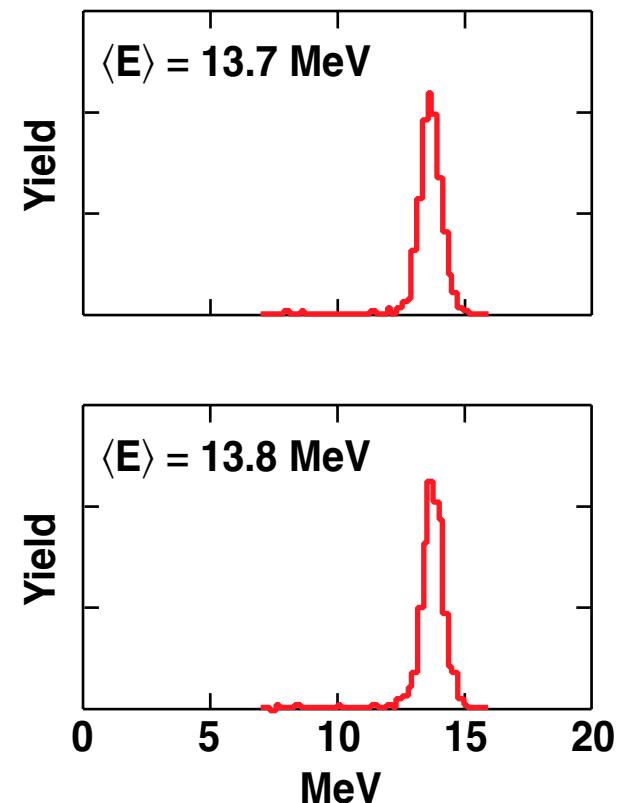
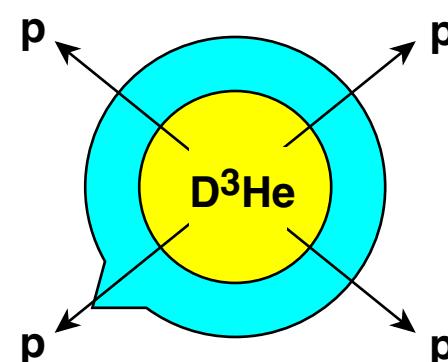


# Charged-Particle Measurements of Implosion Asymmetries at OMEGA



Shot 21240



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43rd Annual Meeting of the  
American Physical Society  
Division of Plasma Physics  
Long Beach, CA  
29 October–2 November 2001

# Collaborators

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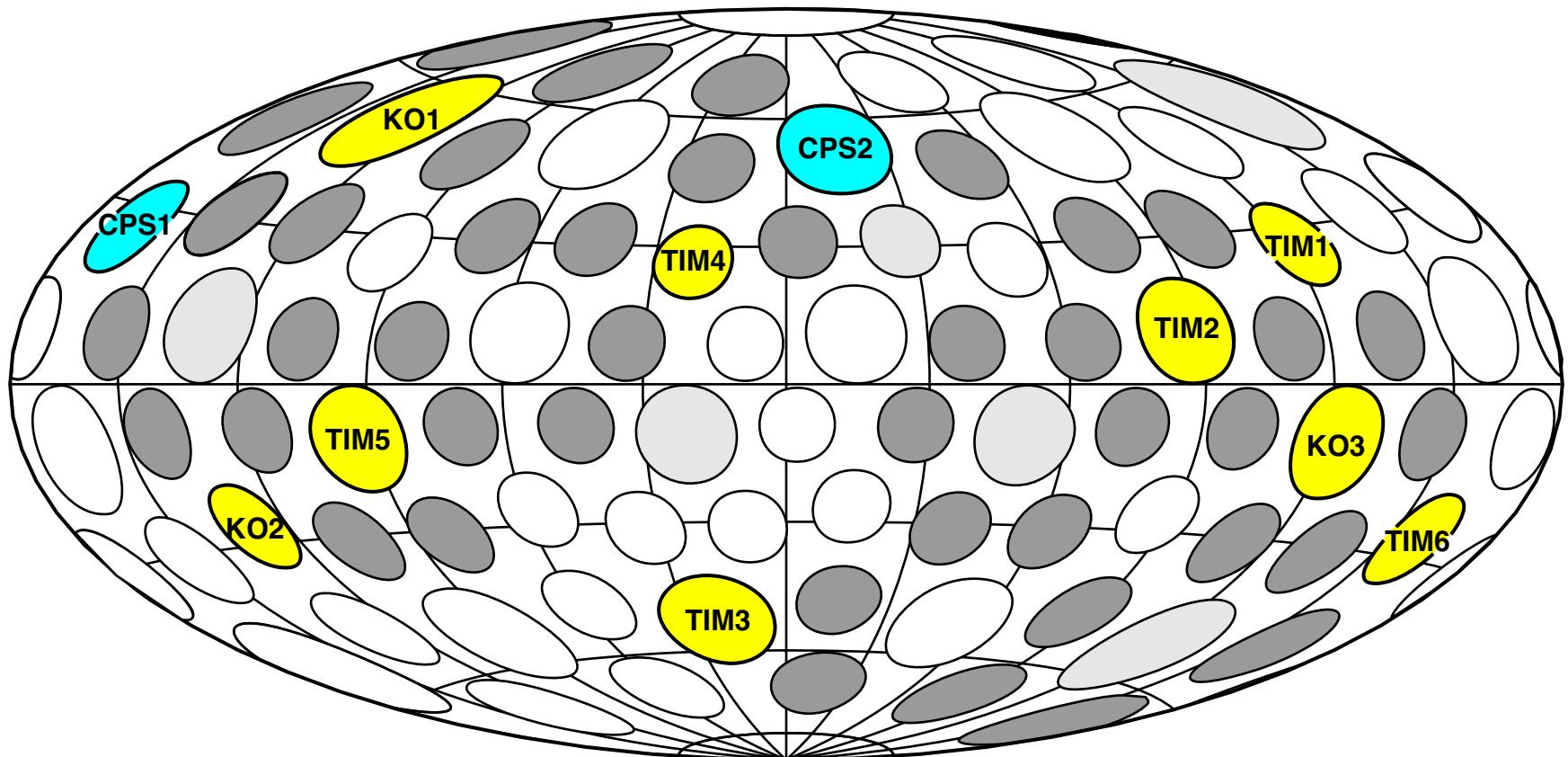
# Summary

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- Charged-particle spectra can be measured simultaneously from different directions during individual OMEGA implosions.
- Asymmetries are observed in the energies of primary protons from D<sup>3</sup>He capsules and secondary protons from cryogenic D<sub>2</sub> capsules\*
  - Indicate capsule structural asymmetries
- Asymmetries are often correlated from shot to shot and are related to laser beam balance.

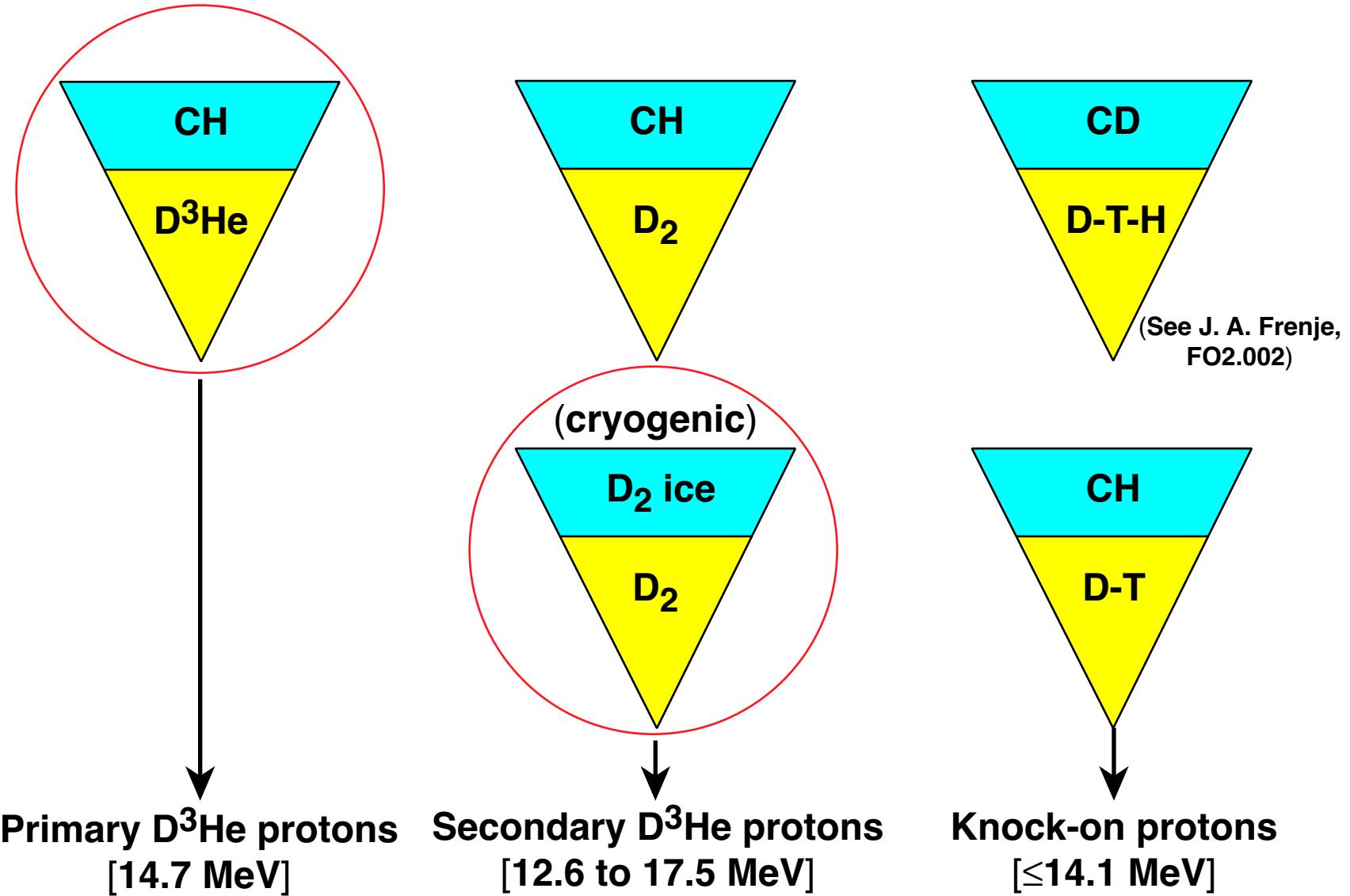
# Up to 11 ports can be used for charged-particle spectrometry on the OMEGA target chamber

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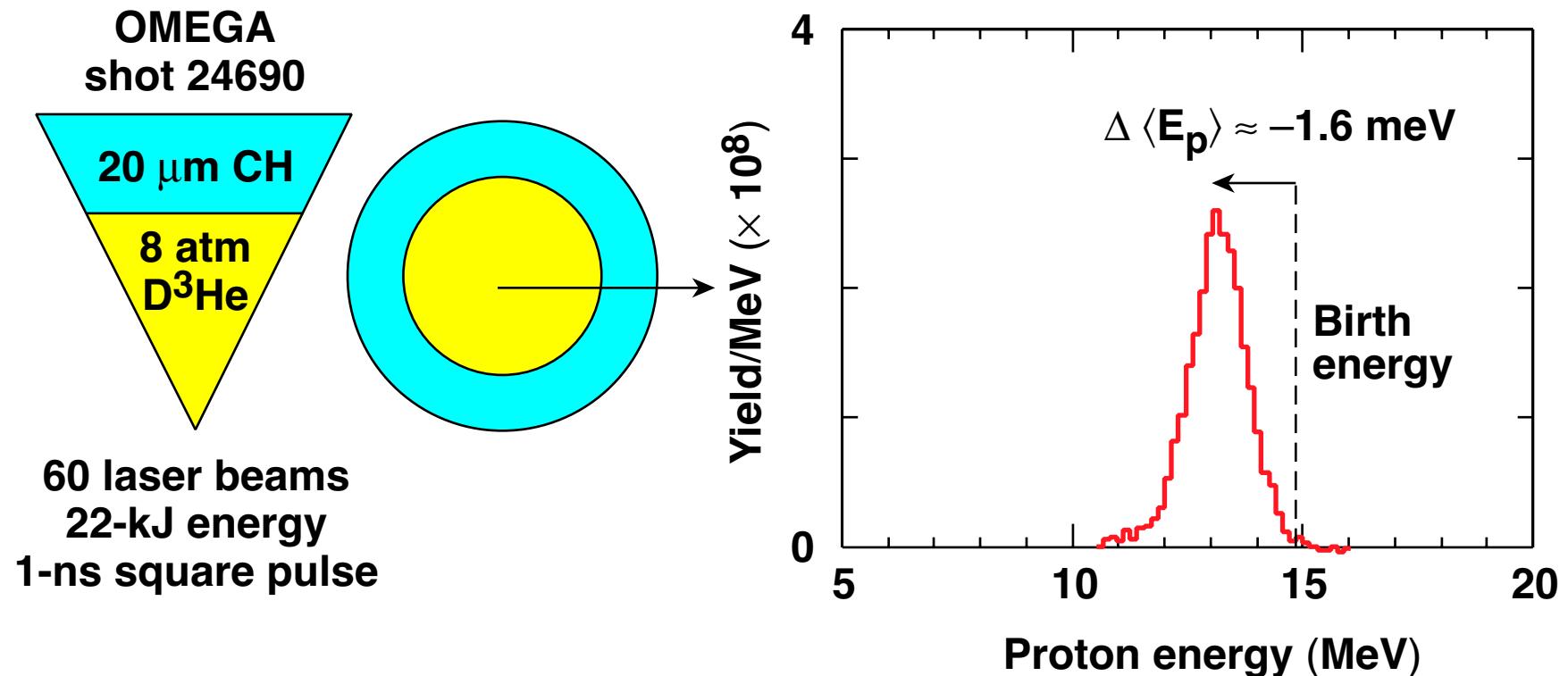


= WRF spectrometers  
 = Magnet-based CPS's

# Symmetry experiments use ~15-MeV protons



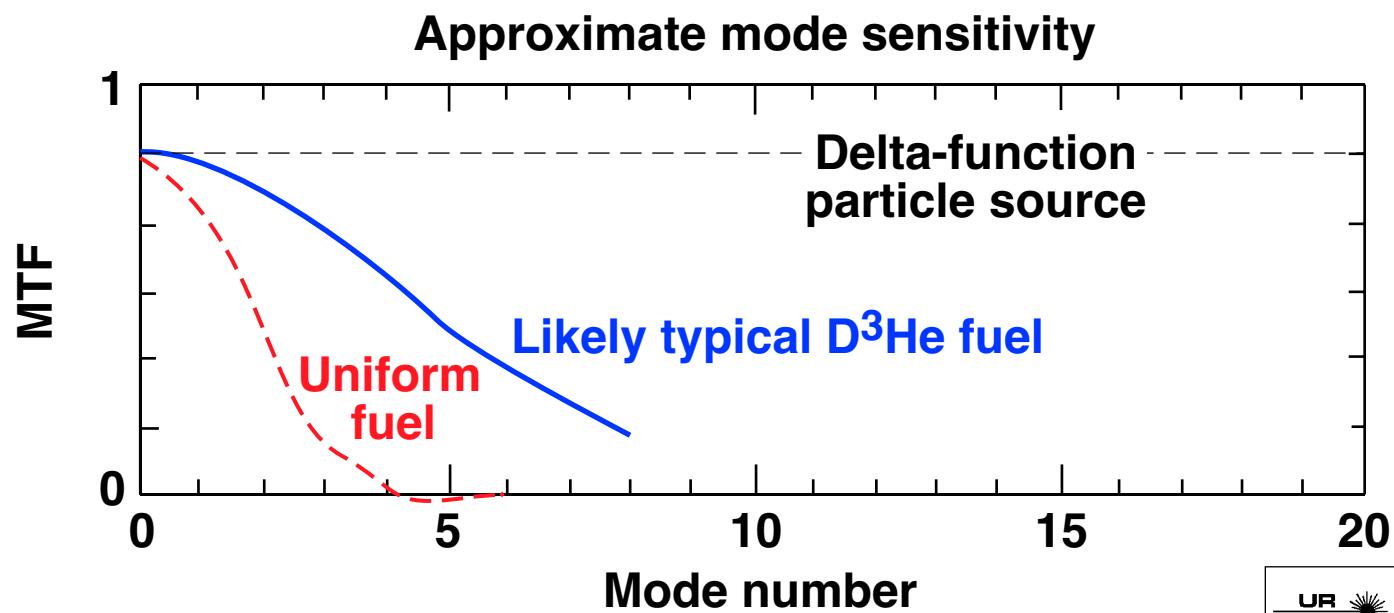
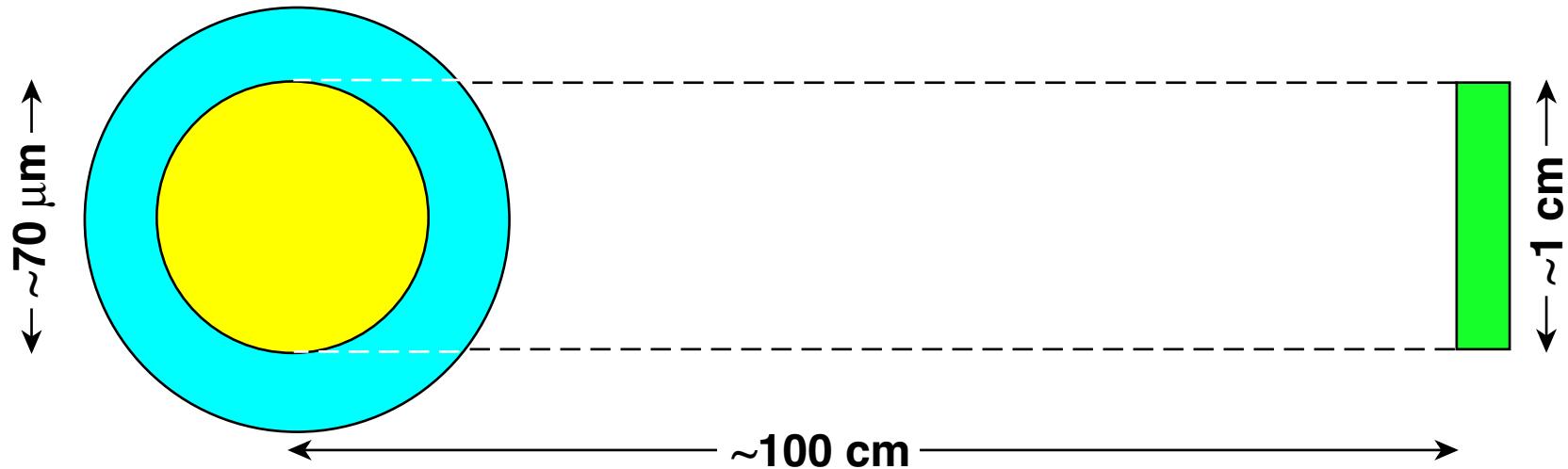
## Similar asymmetries are seen with secondary protons from cryogenic D<sub>2</sub> capsule



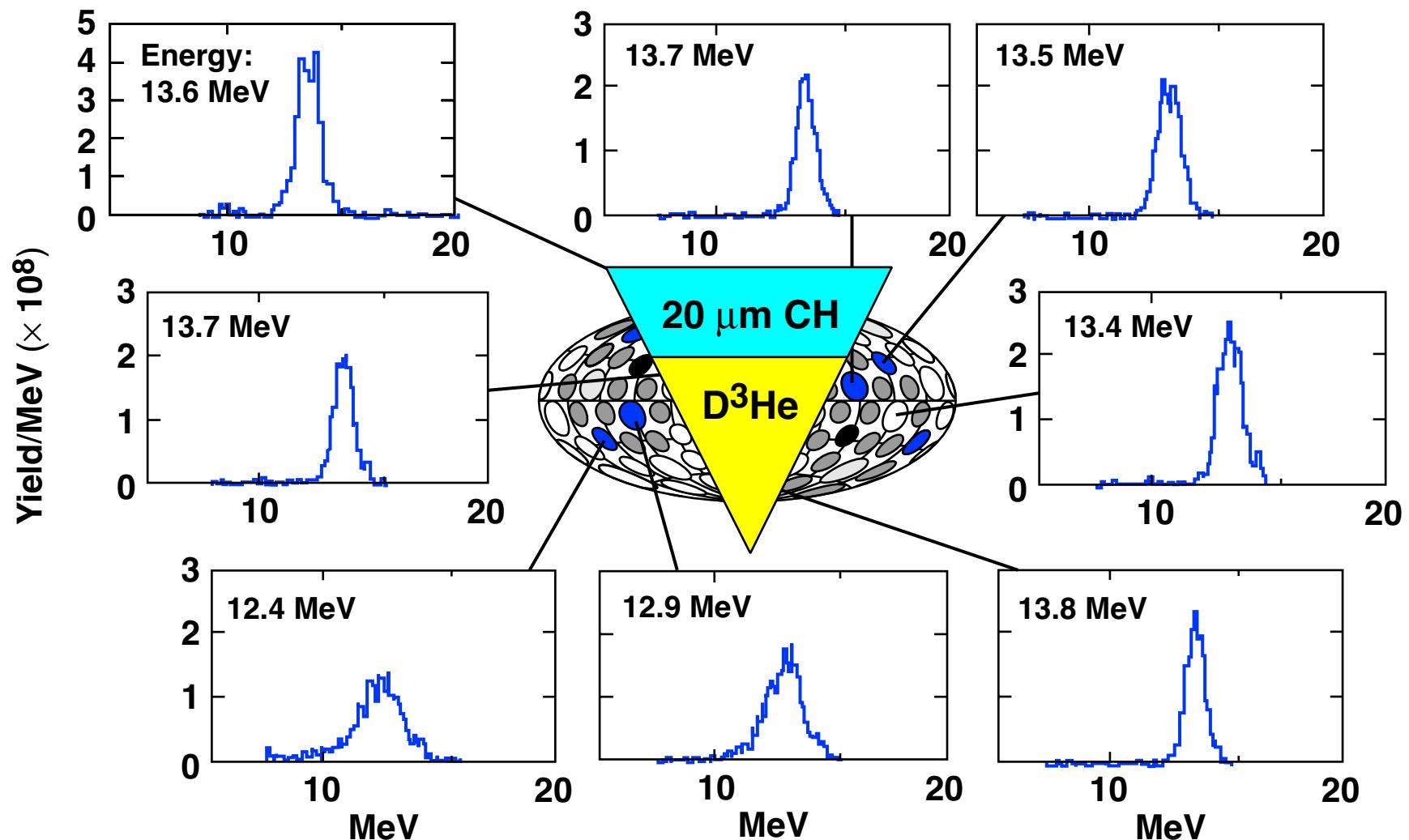
$$\Delta \langle E_p \rangle \approx -1.6 \text{ meV} \Rightarrow \rho R \approx 52 \text{ mg/cm}^2$$

(insensitive to shell temperature, density, and composition)

# Only low-mode asymmetries can be seen directly



# There are often substantial energy asymmetries

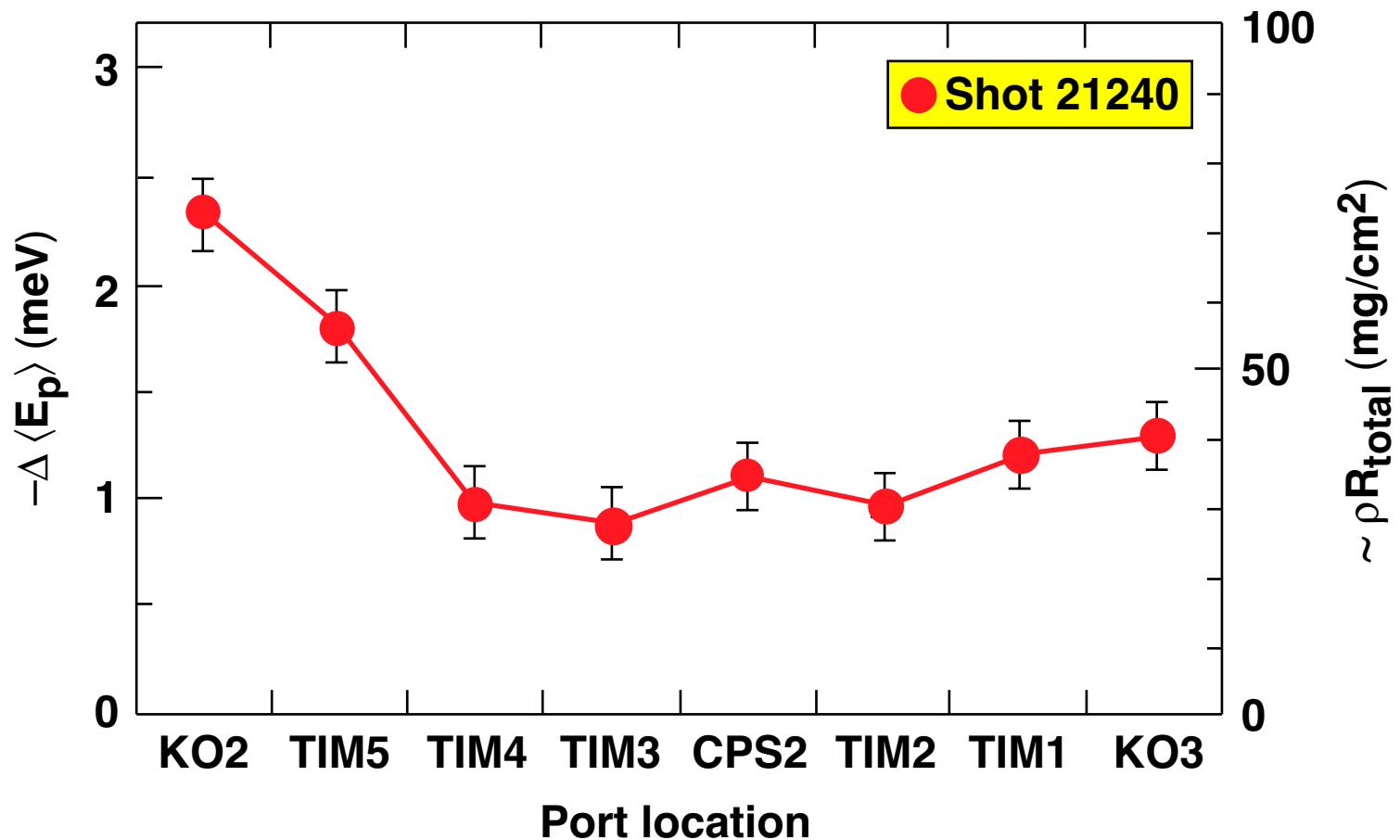


Shot 21240

E11206

$\rho R_{\text{total}}$  can be estimated from  $\Delta \langle E_p \rangle$

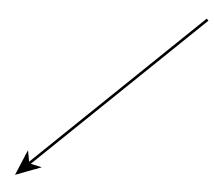
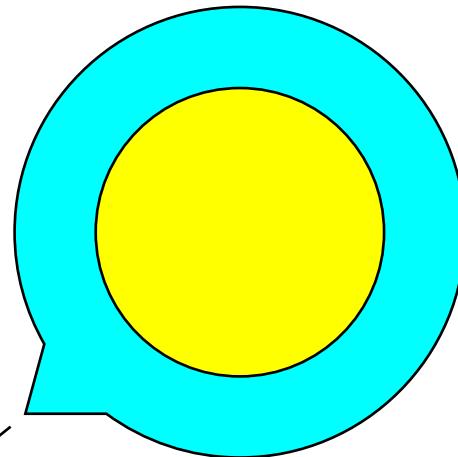
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# Possible structure in equatorial plane

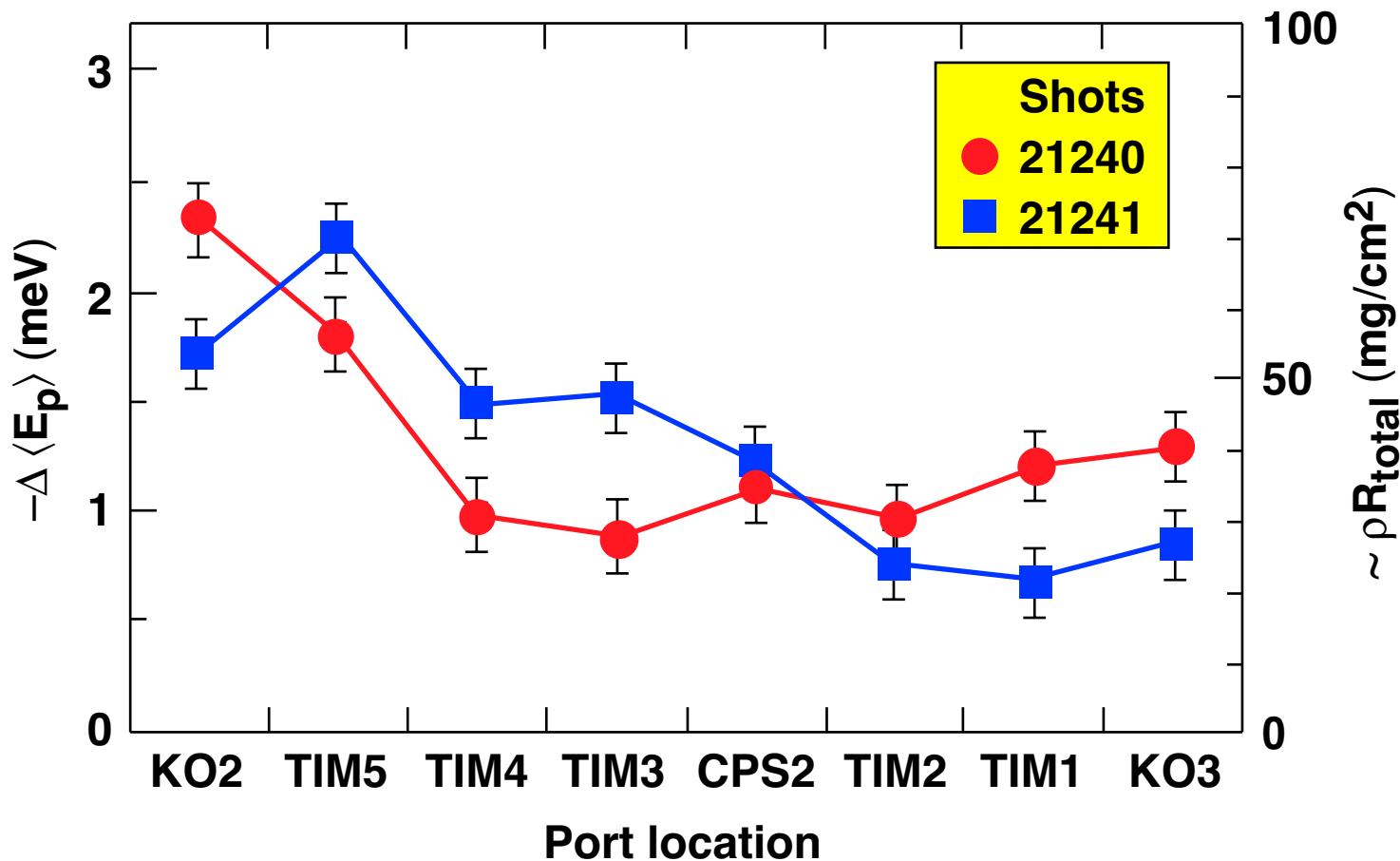
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Looking down from above



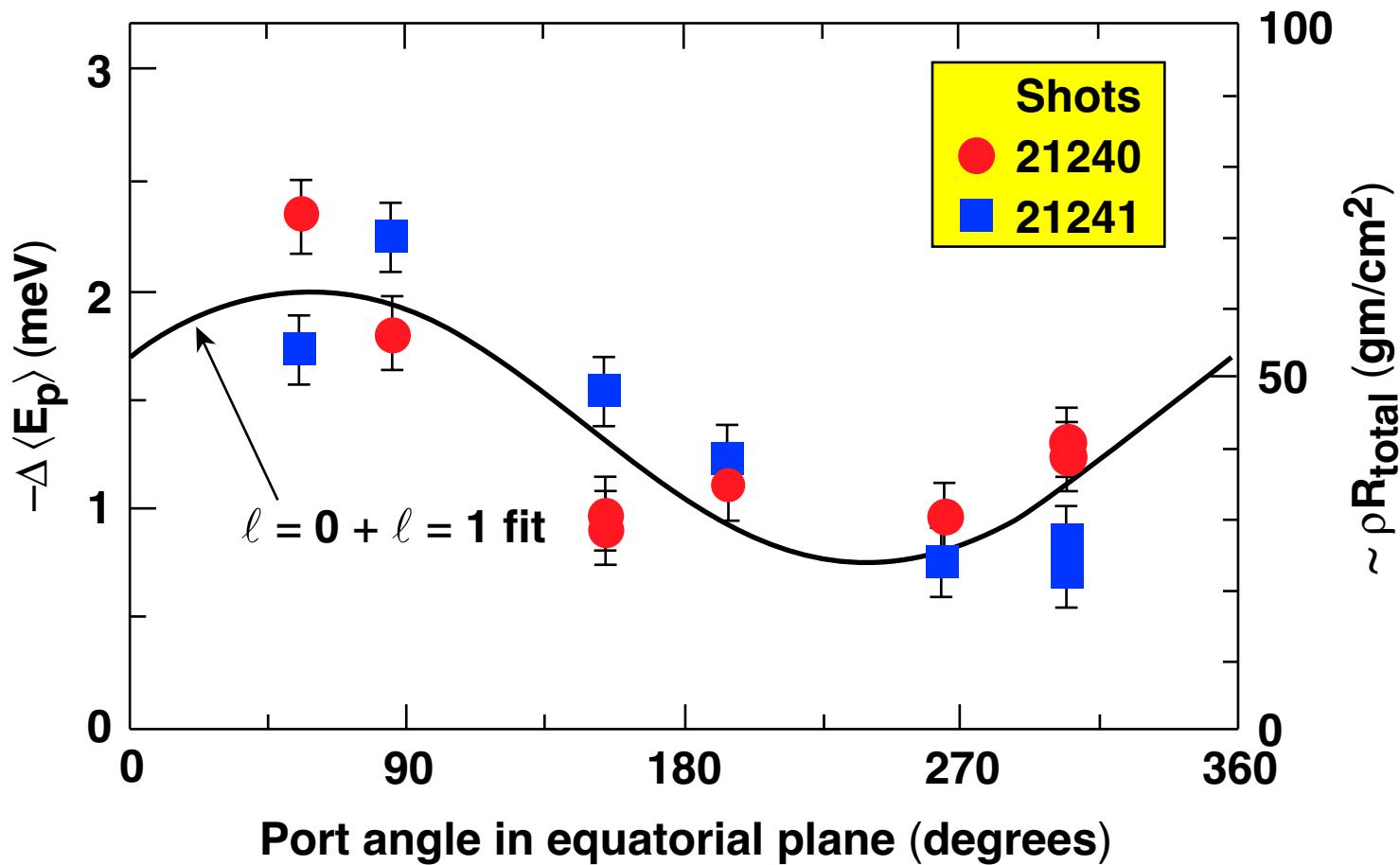
Direction of  
TIM5 and KO2

Sometimes there appear to be shot-to-shot correlations in asymmetries

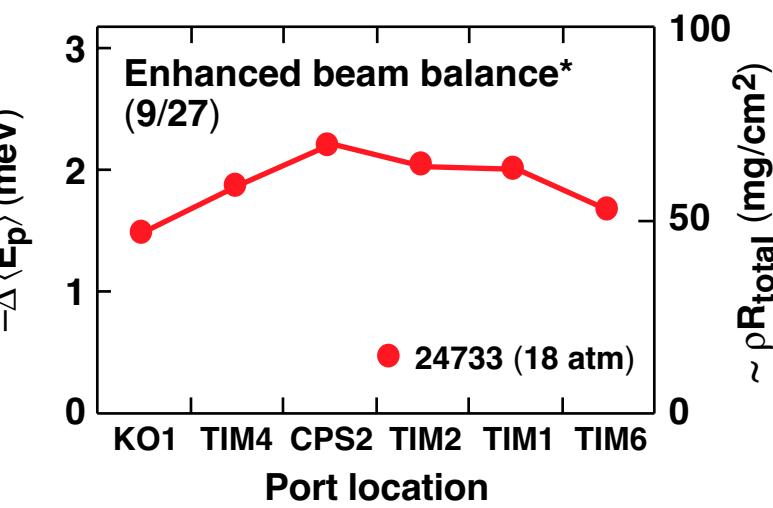
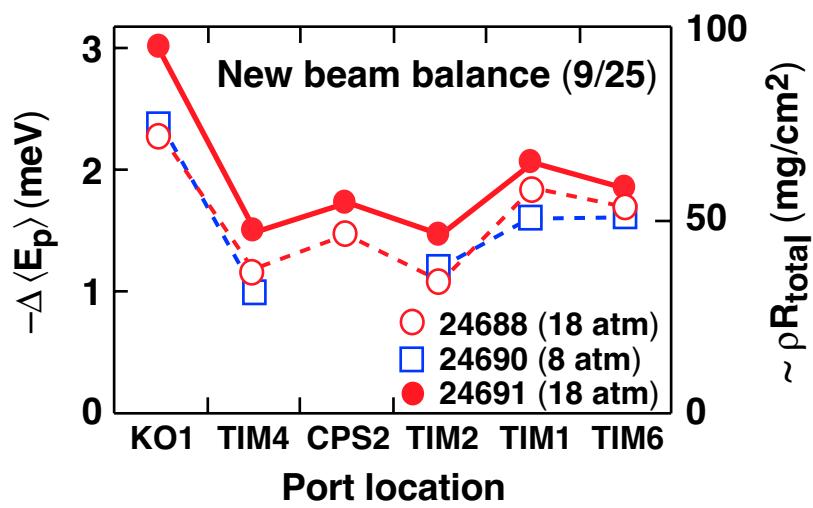
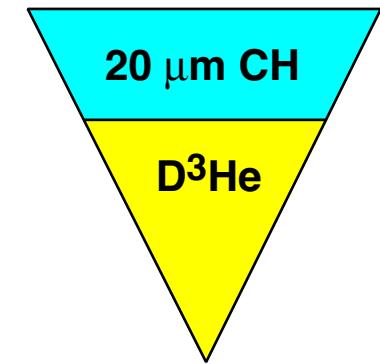
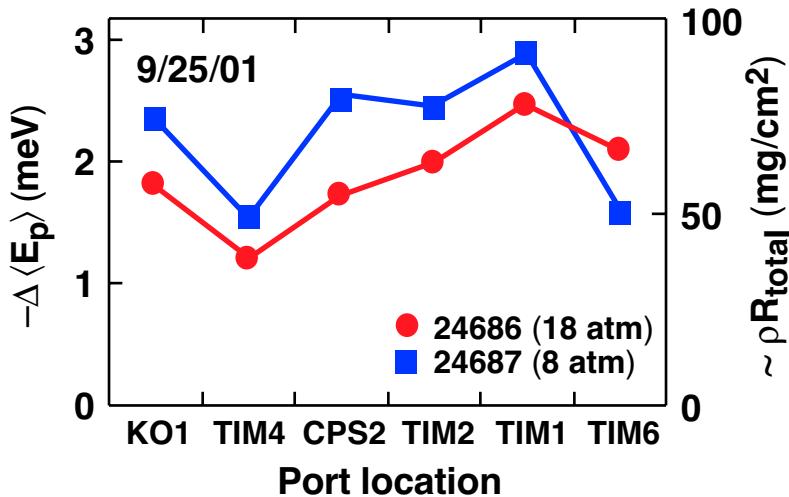


In this case, the dominant structure  
has mode number = 1

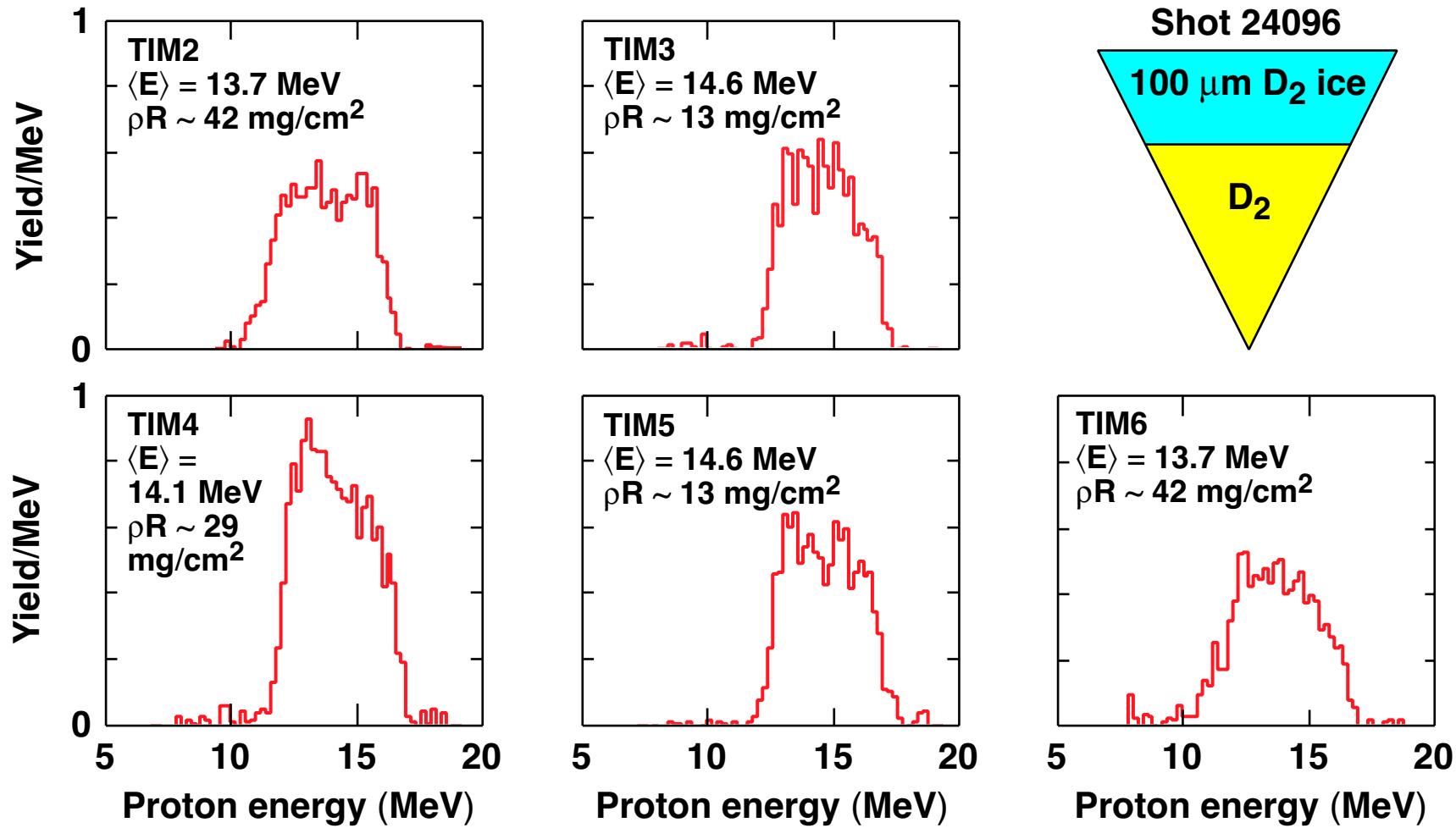
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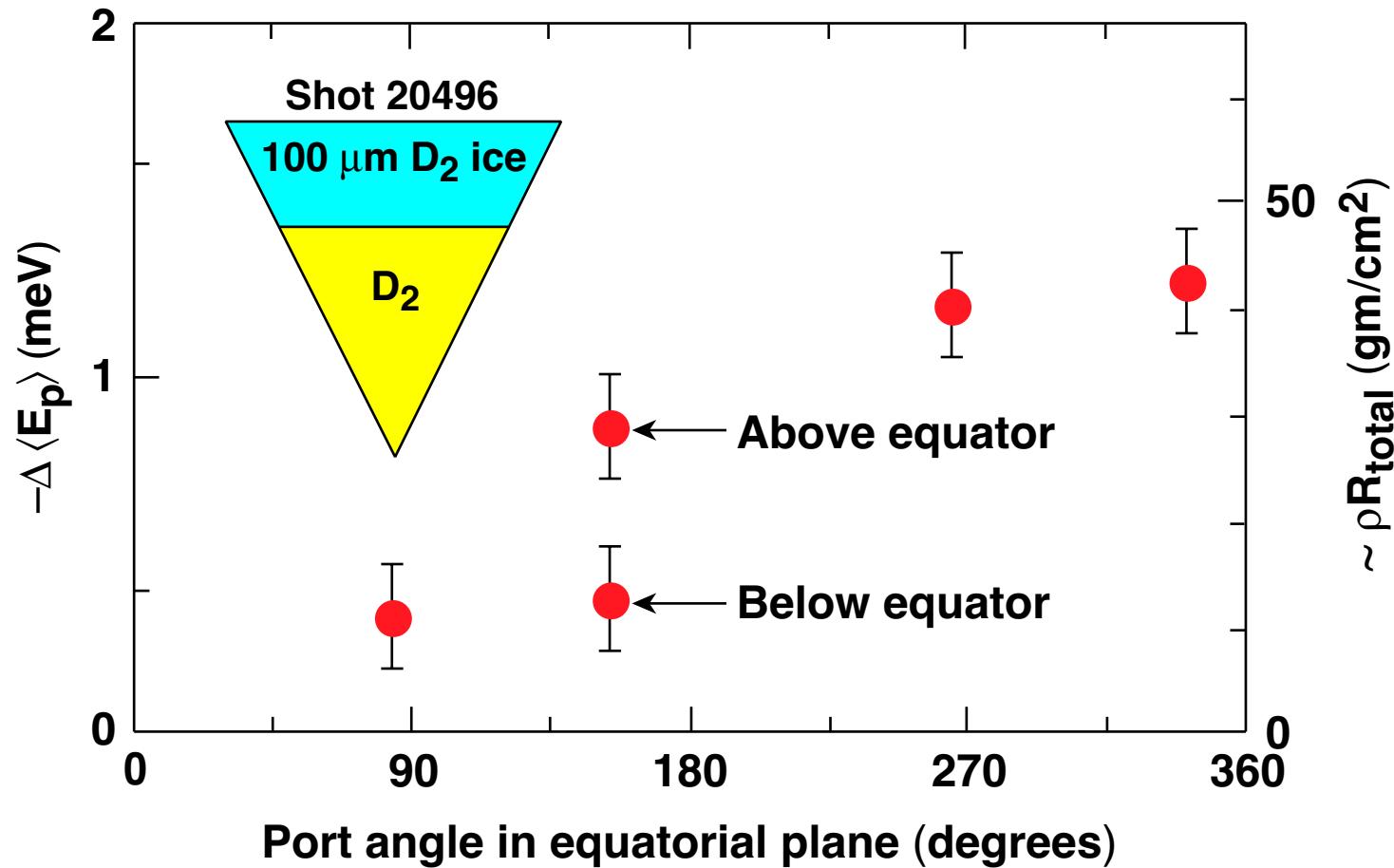
# The asymmetry changes when the laser beam balance is changed



# Similar asymmetries are seen with secondary protons from cryogenic D<sub>2</sub> capsules



# Similar asymmetries are seen with secondary protons from cryogenic D<sub>2</sub> capsules



# Summary/Conclusions

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- Charged-particle spectra can be measured simultaneously from different directions during individual OMEGA implosions.
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