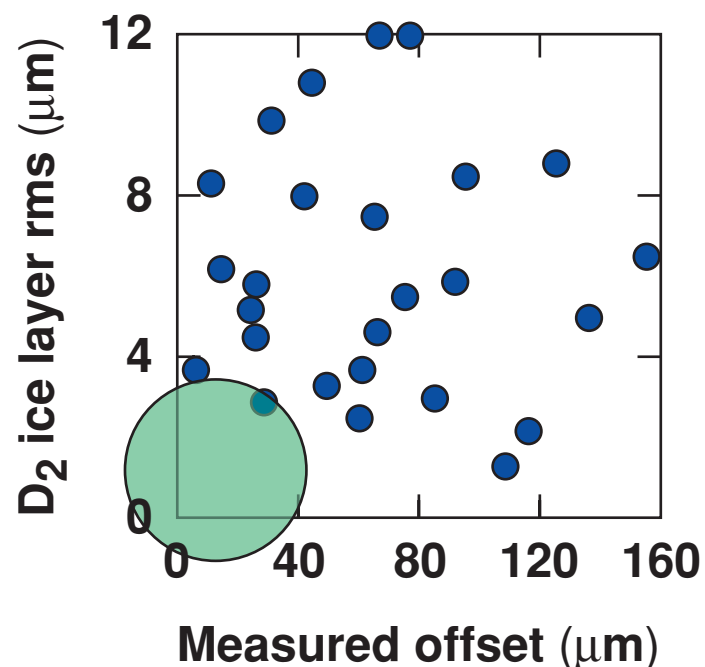
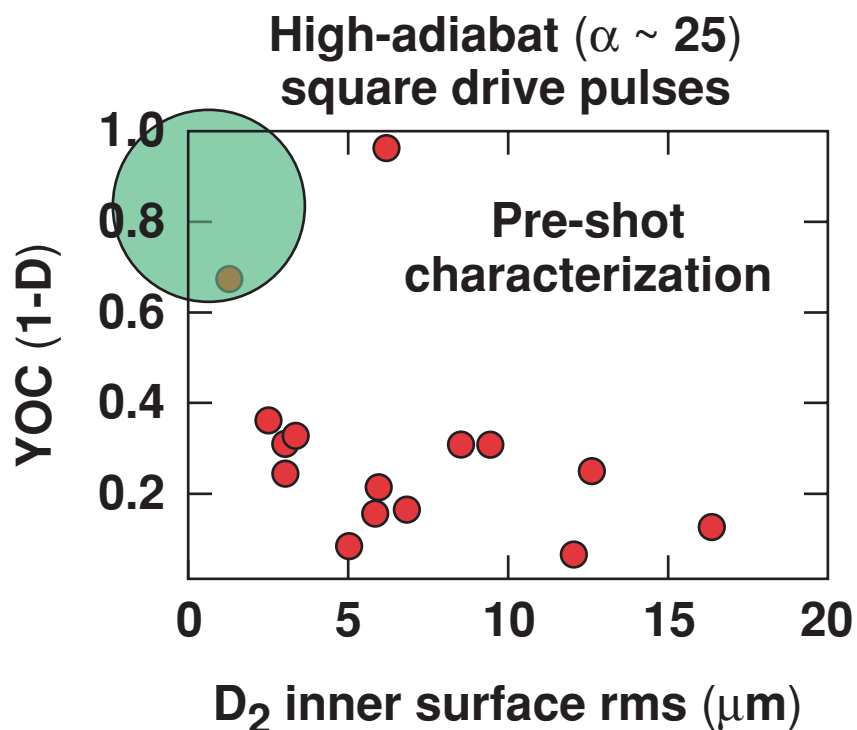


# Experimental Results from Cryogenic D<sub>2</sub> Implosions on the OMEGA Laser



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## Summary

# Cryogenic capsule alignment accuracy and stability at the OMEGA TCC have improved dramatically

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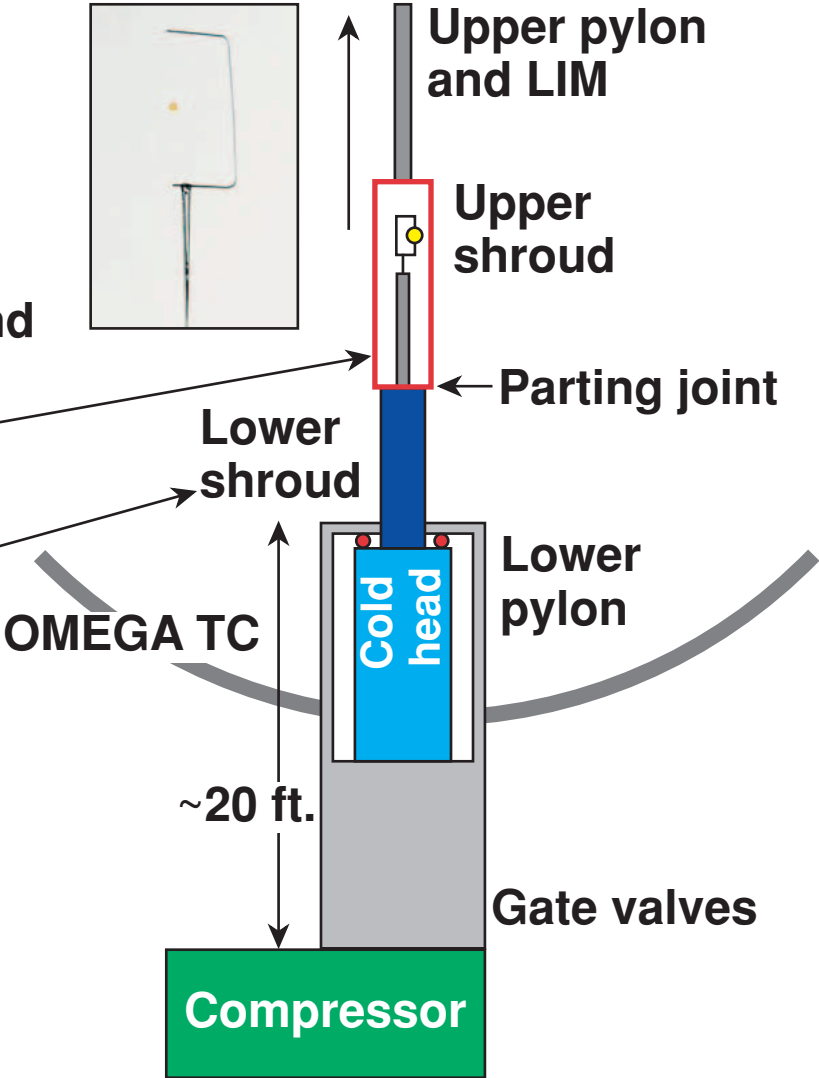
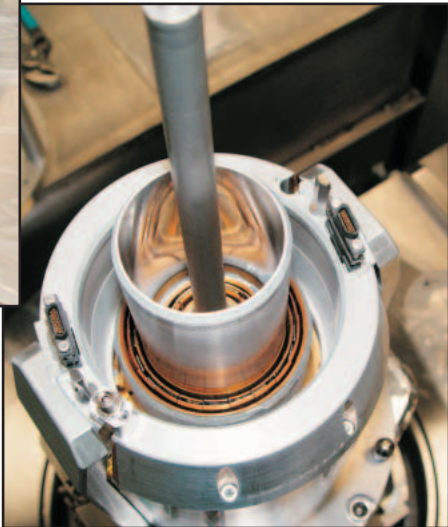


- **Alignment accuracy and stability at shot time requires control of both static (offset) and dynamic (vibration) sources.**
- **Stable alignment (<10- $\mu$ m goal) has required considerable re-engineering and careful attention to “tolerance buildup.”**
- **Performance with high-adiabat ( $\alpha \sim 25$ ) pulses approaches 1-D when the capsule is well-layered and properly aligned at TCC.**

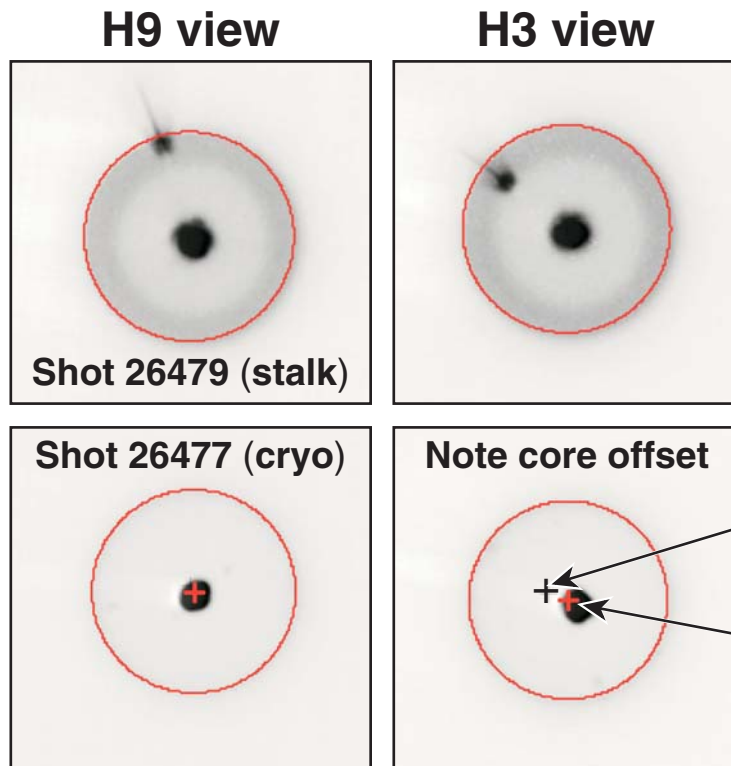
**Full analysis of recent shots will be presented by P. W. McKenty in session F12.022 (tomorrow morning).**

# All of the *identified* alignment issues have been addressed

- Static offset sources include
  - optical alignment,
  - docking rigidity, and
  - collet yield.
- Dynamic offset sources include
  - static vibrational coupling, and
  - induced vibrational coupling.



# At shot time, the state of the capsule is determined using a suite of imaging diagnostics



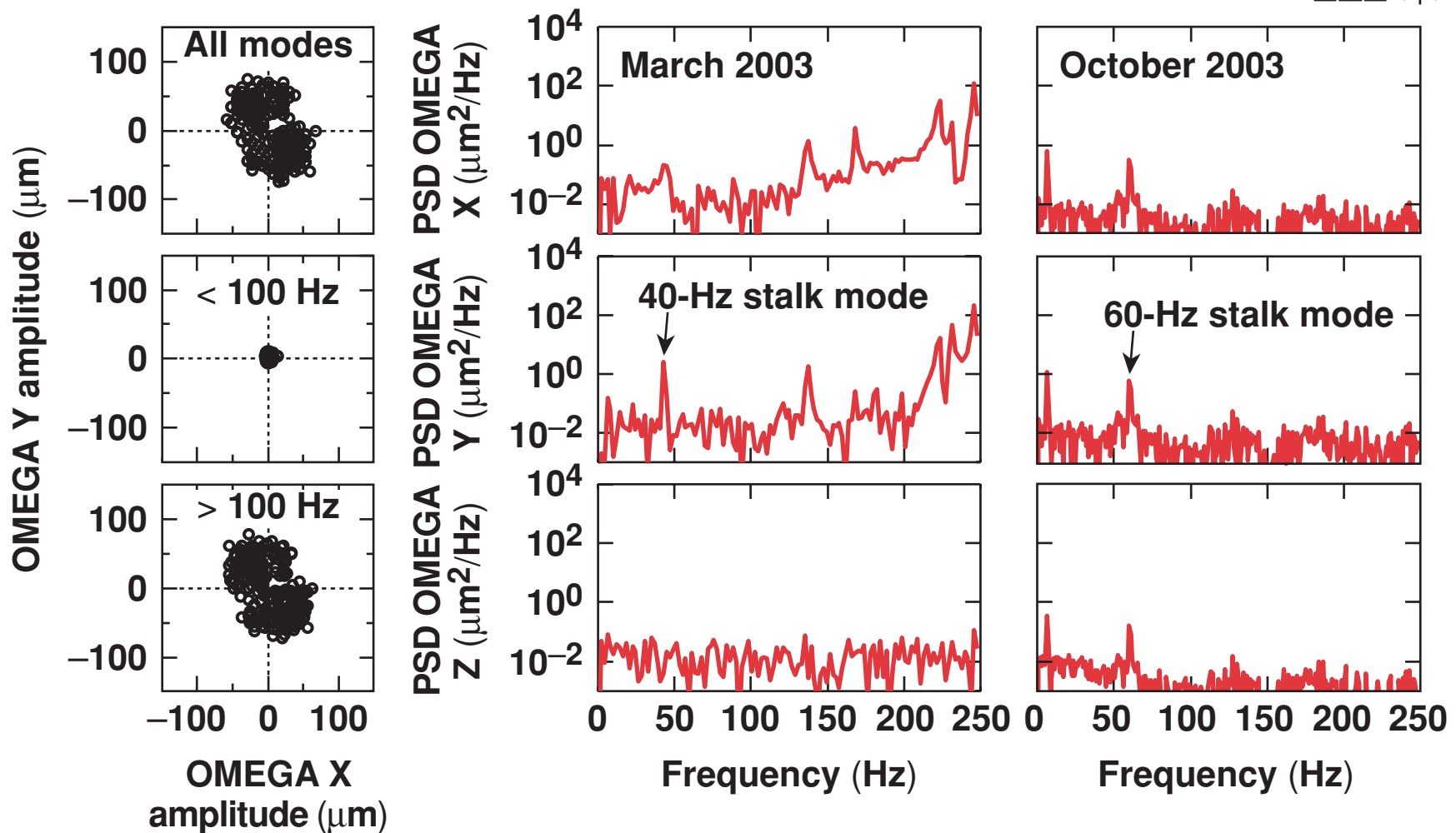
1. X-ray pinhole cameras
2. CTCD (cryogenic target characterization diagnostic)
3. Cryo-vibe
4. 500-ps fast video cameras

TCC defined by stalk-mounted target (26479)

Capsule center

**Measured offset:**  
 $r = 85 \mu\text{m}$   
 $(\theta, \varphi) = 99^\circ, 251^\circ$

# The fast camera data showed significant coupling between the MCTC and the C-mount target



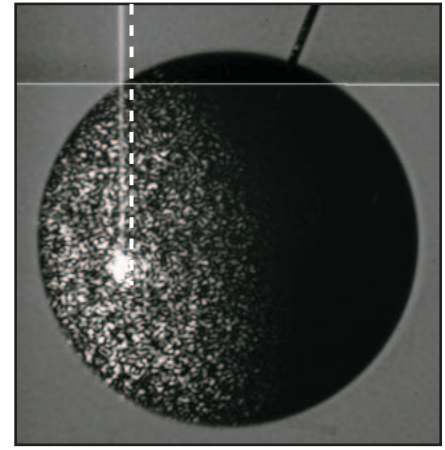
**A new four-axis control unit was developed to reduce coupling up the stalk; in addition, the stalk was redesigned to damp the primary modes.**

# Recent CTCD measurements show that the vibrational amplitudes are now very small ( $\sim 6 \mu\text{m}$ or less)



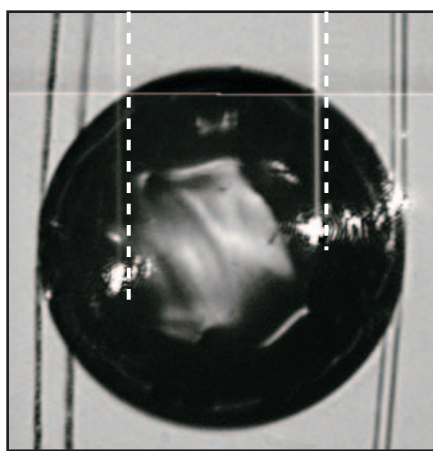
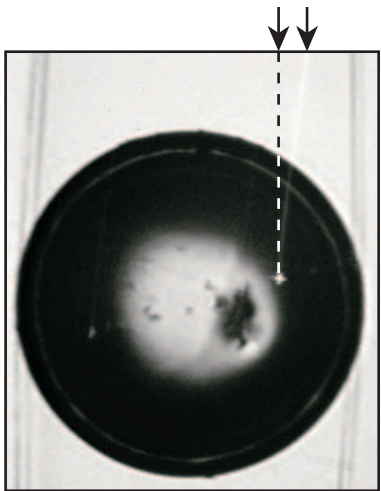
The TED illuminators remain on during the  $\sim 2$ -ms readout of the CTCD image, creating a trace that maps target motion.

TPS2 TCC reference:  
10/02/03



Capsule offset from TCC by  $108 \mu\text{m}$  at  $t_0$

No vibration

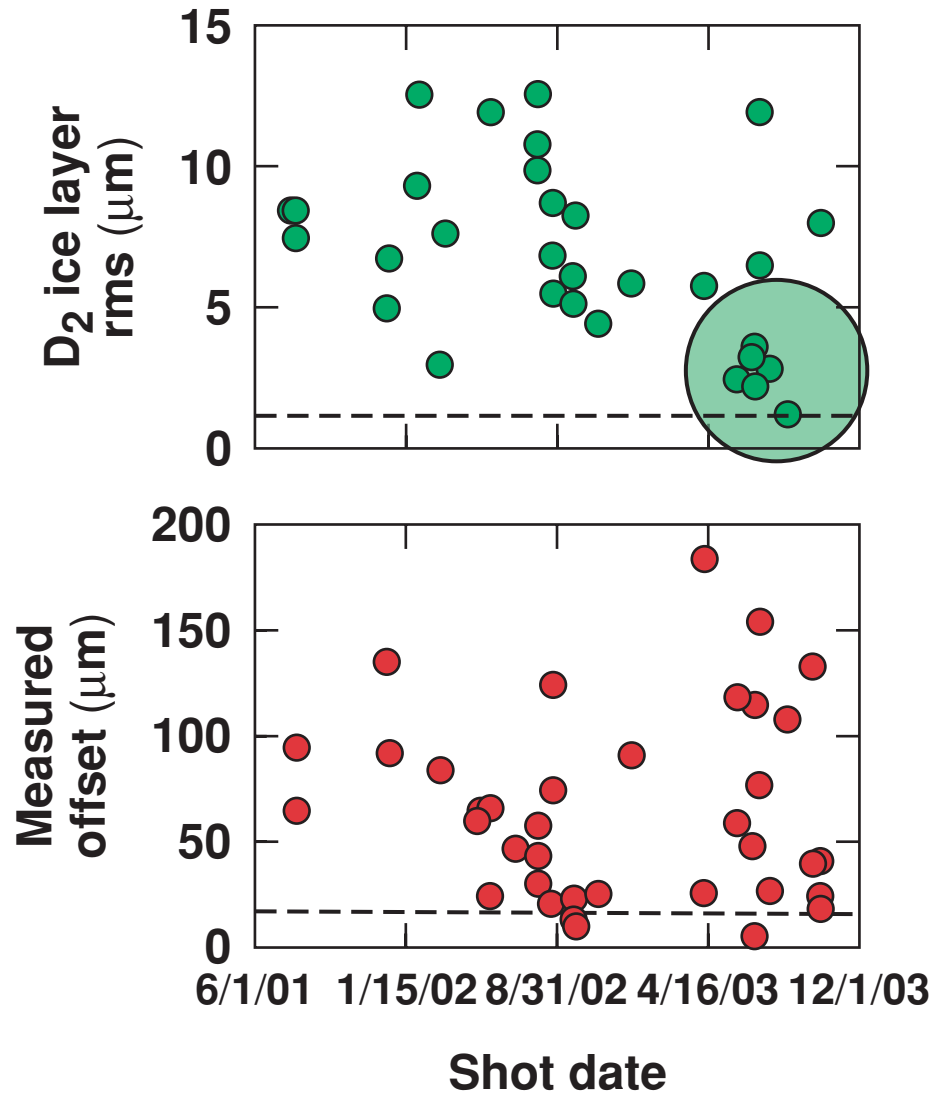
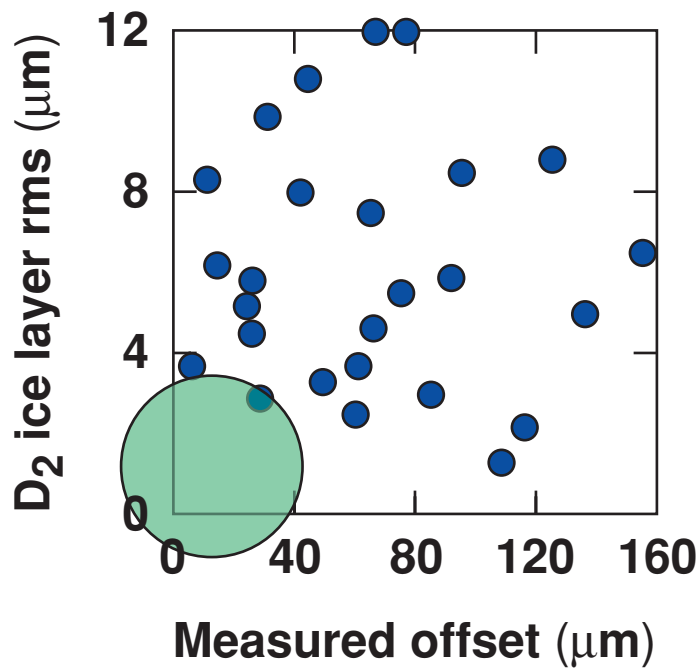


Cryogenic capsules on C-mounts are now as stable as stalk-mounted TPS2 capsules!

32845, 08/14/03

33413, 10/02/03

# Cryogenic D<sub>2</sub> target quality on OMEGA has improved with time as has alignment accuracy and stability



Data points represent OMEGA target shots and pre-shot ice-layer characterization.



# High- $\alpha$ ( $\sim 25$ ) performance is excellent when well-layered cryogenic capsules are close to TCC

