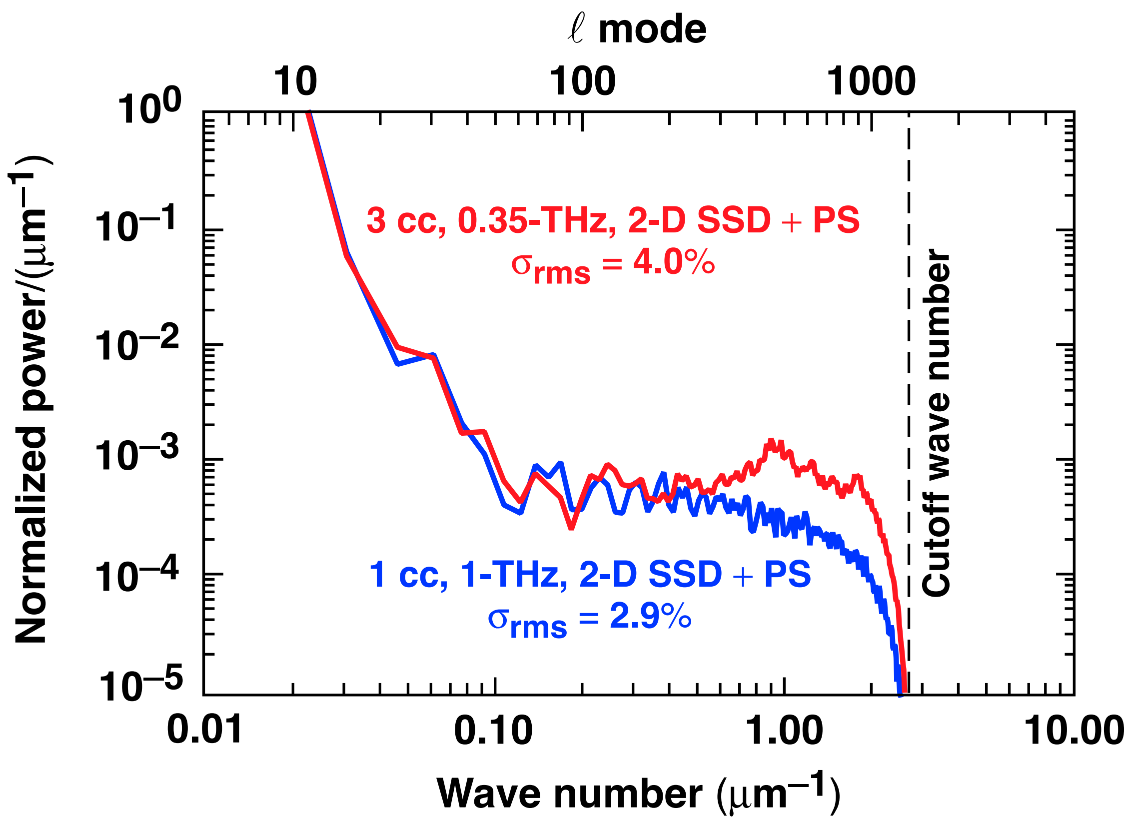
Comparison of the Effects of Different SSD Beam-Smoothing Configurations on Direct-Drive Capsule Implosions



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Summary

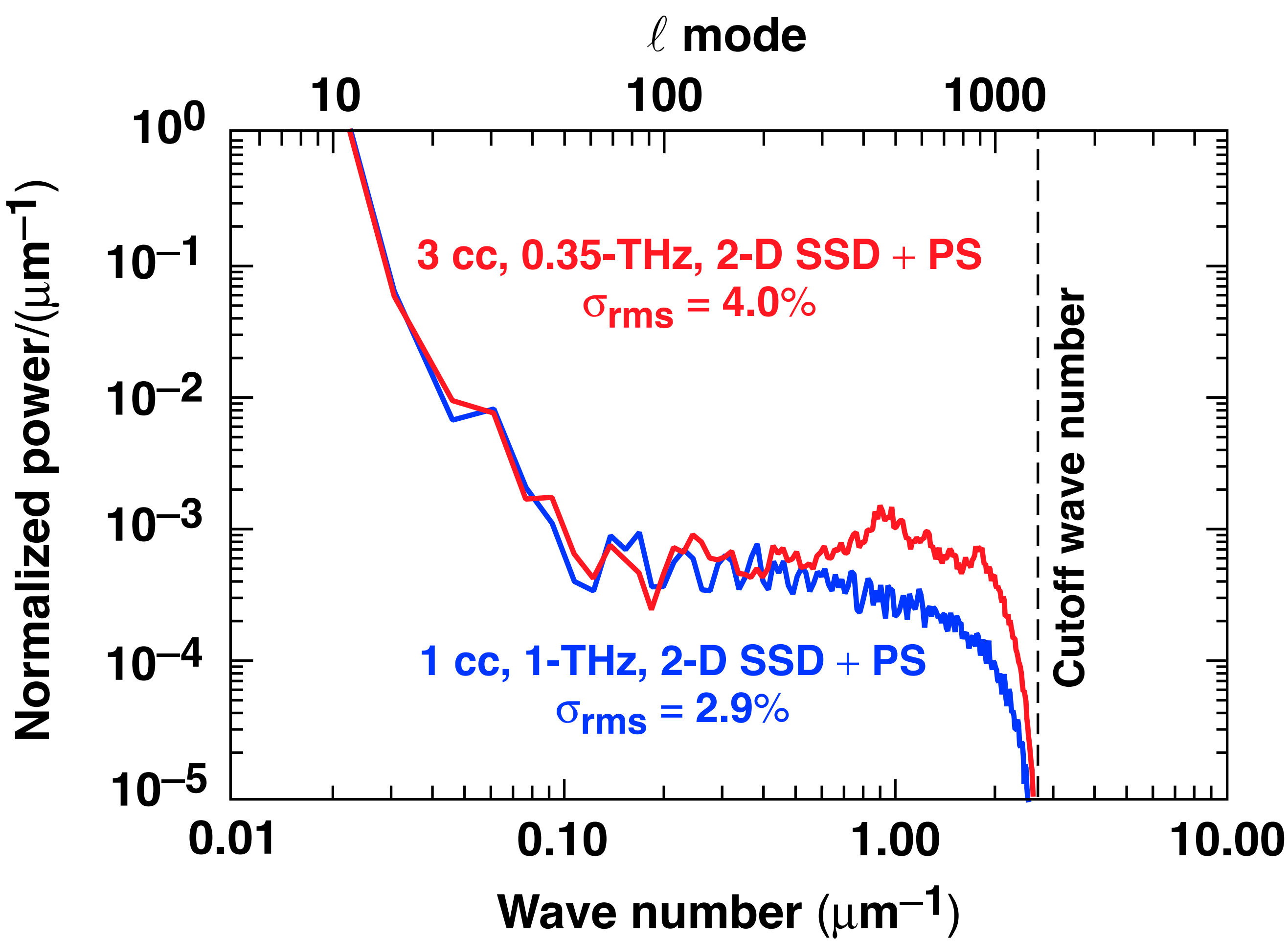
Reduction in the $\ell > 200$ nonuniformity increases fuel ρR (to ~ 90% of 1-D) but does not significantly increase neutron yield (~ 30% YOC)

- Implosion experiments were conducted with 3-cc, 0.35-THz, 2-D SSD with PS and with 1-cc, 1-THz, 2-D SSD with PS.
- Single-beam measurements show little difference in uniformity for $\ell < 200$ for these two cases, but a 2× reduction in the $\ell > 200$ modes for the 1-cc, 1-THz case.
- Implosion experiments show no difference in neutron yield (30% YOC) or shell ρR (~ 90% of 1-D); an increase in fuel ρR (to ~ 90% of 1-D) is observed for the 1-cc, 1-THz case.

Outline

- Uniformity measurements
- Neutron yield performance
- Areal density performance

1-color-cycle, 1-THz, 2-D SSD has a lower σ_{rms} than 3-color-cycle, 0.35-THz, 2-D SSD only for ℓ > 200



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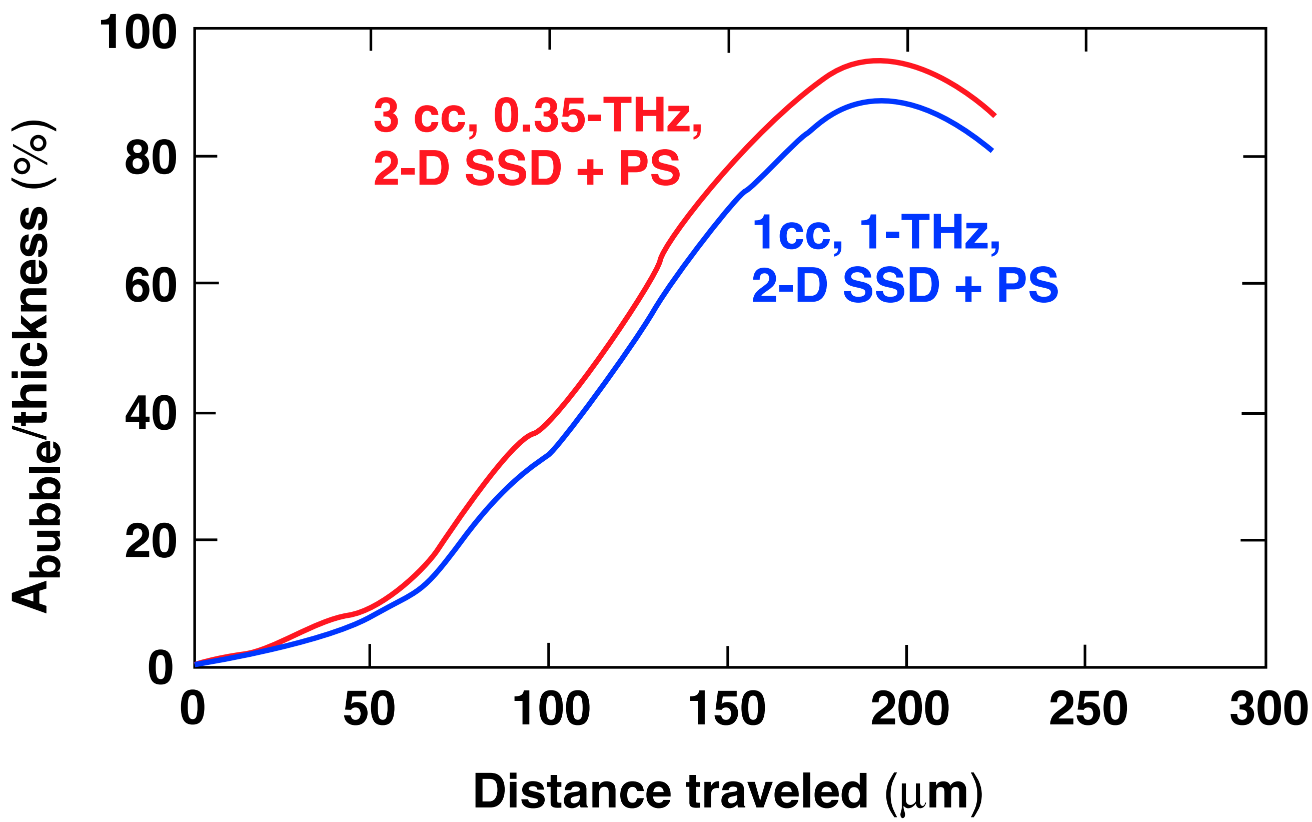
Calculations predict similar bubble evolution for 1-cc, 1-THz and 3-cc, 0.35-THz laser smoothing

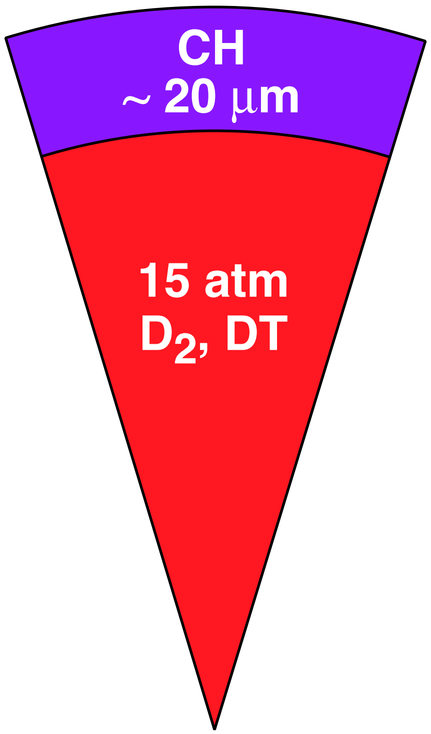


- Bubble amplitude is calculated using postprocessor[1] to LILAC code.
- Calculations include effects of outer surface roughness and laser input.

[1] V. N. Goncharov et al., Phys. Plasmas 7, 5118 (2000).

E11367

DT-D^3He and DD-filled CH shells were used in these experiments



Laser energy:	~ 23 kJ
Pulse width:	~ 1 ns
Target diameter:	~ 0.9 mm
Thickness:	~ 20 μm
Fill:	15 atm DD, DT or 18 atm D^3He
Smoothing:	(a) 1-cc, 1-THz, 2-D SSD + PS
	(b) 3-cc, 0.35-THz, 2-D SSD + PS
	(c) 3-cc, 0.35-THz,* 2-D SSD

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* D. D. Meyerhofer et al., Phys. Plasmas 8, 2251 (2001).

There is a significant improvement in YOC for implosions with PS

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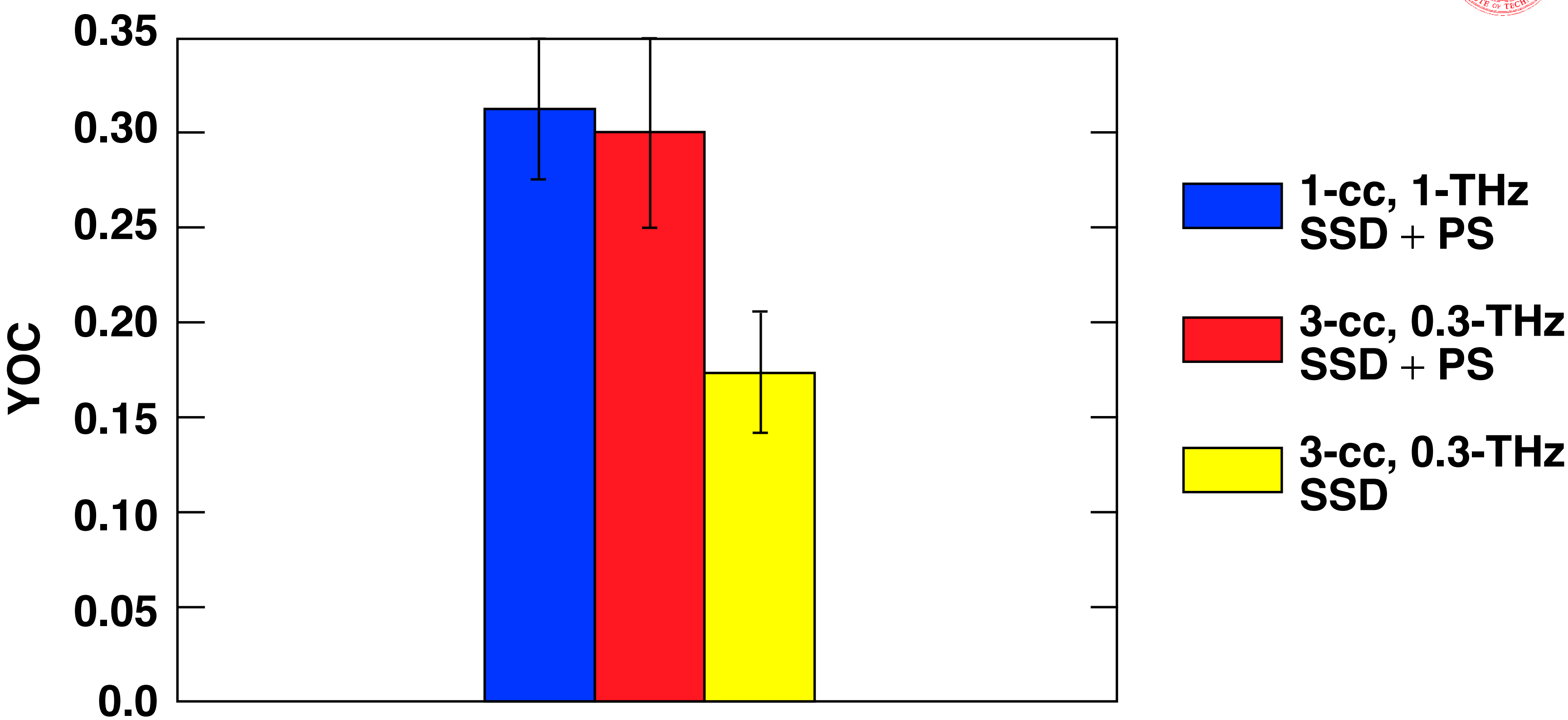
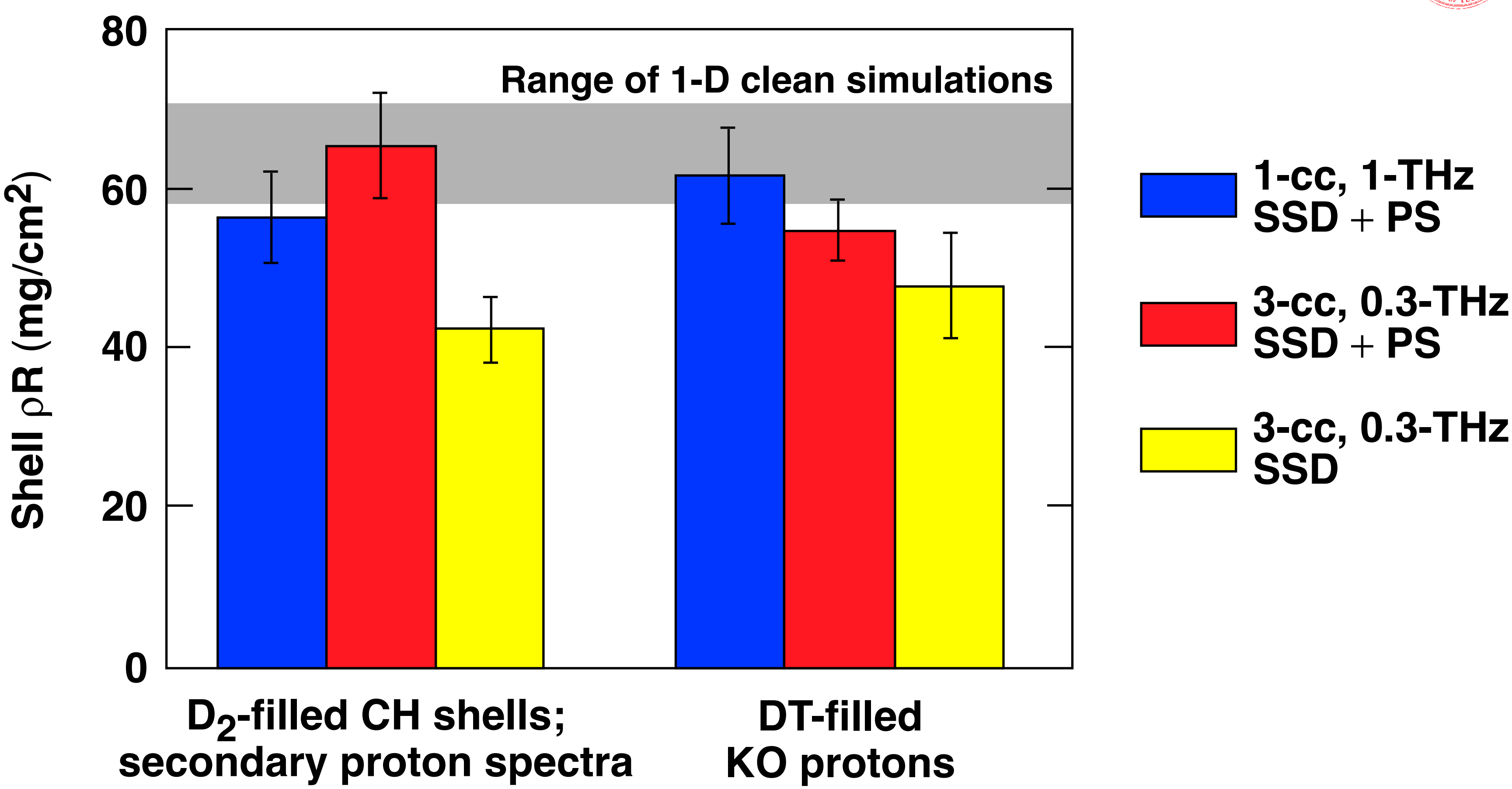


E11290

The shell areal density is very close to that of 1-D, clean simulations for implosions with PS



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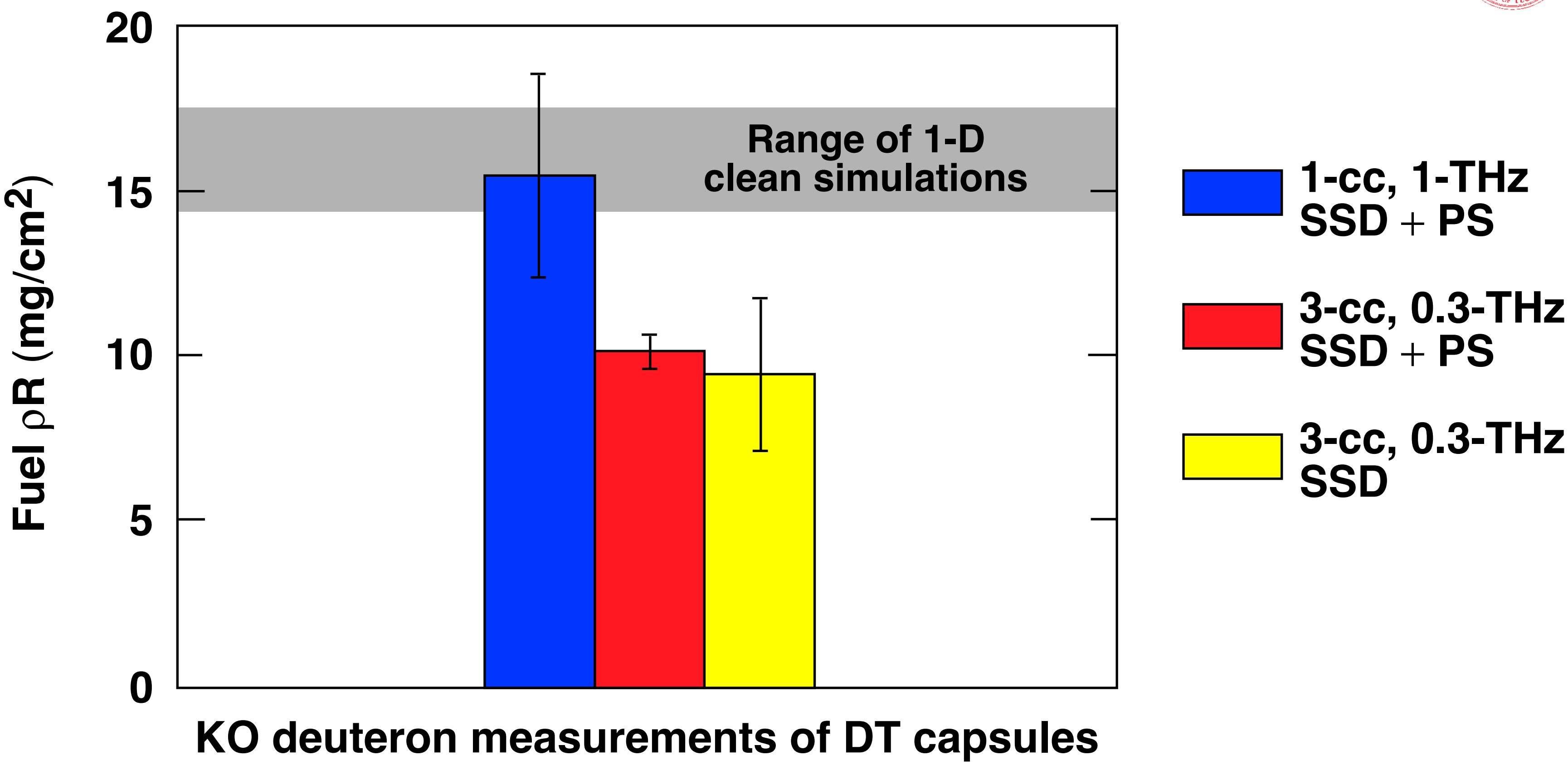
The measured fuel ρR is nearly equal to that of 1-D, clean simulations for implosions with full-beam smoothing (1 cc, 1 THz, PS)



E11184

Summary/Conclusions

Reduction in the $\ell > 200$ nonuniformity increases fuel ρR (to ~ 90% of 1-D) but does not significantly increase neutron yield (~ 30% YOC)

- **Implosion experiments were conducted with 3-cc, 0.35-THz, 2-D SSD with PS and with 1-cc, 1-THz, 2-D SSD with PS.**
- **Single-beam measurements show little difference in uniformity for $\ell < 200$ for these two cases, but a 2× reduction in the $\ell > 200$ modes for the 1-cc, 1-THz case.**
- **Implosion experiments show no difference in neutron yield (30% YOC) or shell ρR (~ 90% of 1-D); an increase in fuel ρR (to ~ 90% of 1-D) is observed for the 1-cc, 1-THz case.**