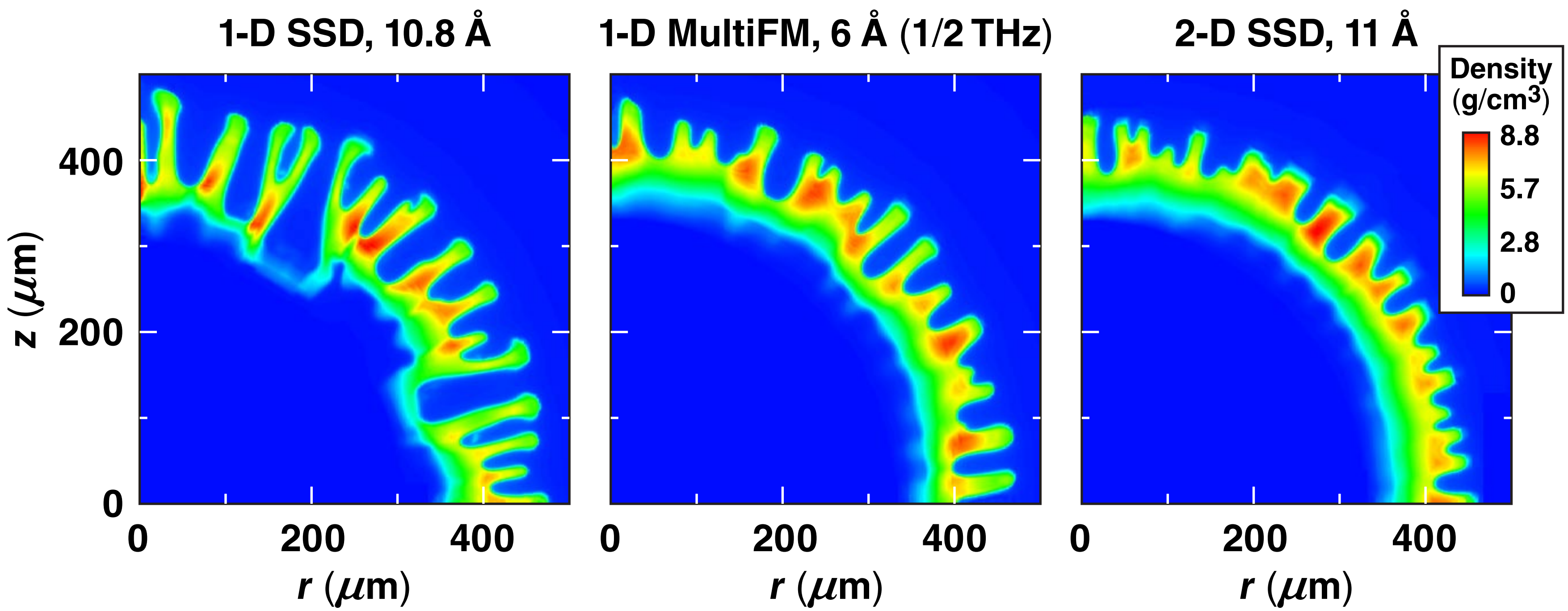
1.0-MJ CH-Foam Ignition Targets on the NIF Using 1-D MultiFM SSD with 0.5 THz of Bandwidth

UR LLE

1.0-MJ CH-foam target; end of acceleration



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Summary

DRACO simulations of 1.0-MJ CH-foam targets using 1-D MultiFM SSD achieve ignition on the NIF

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- Can be designed for a bandwidth of $\Delta\nu_{UV}$ = 0.5 THz ($\Delta\lambda_{IR}$ = 6 Å).
- Only a single frequency-conversion crystal is needed.
- Takes advantage of multiple color cycles without detrimental resonant features that are present in single modulator systems.
- The 1-D MultiFM SSD system could be installed in the NIF fiber front end within a small rack-mounted unit.

This concept will be tested on OMEGA EP.

Collaborators

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J. D. Zuegel

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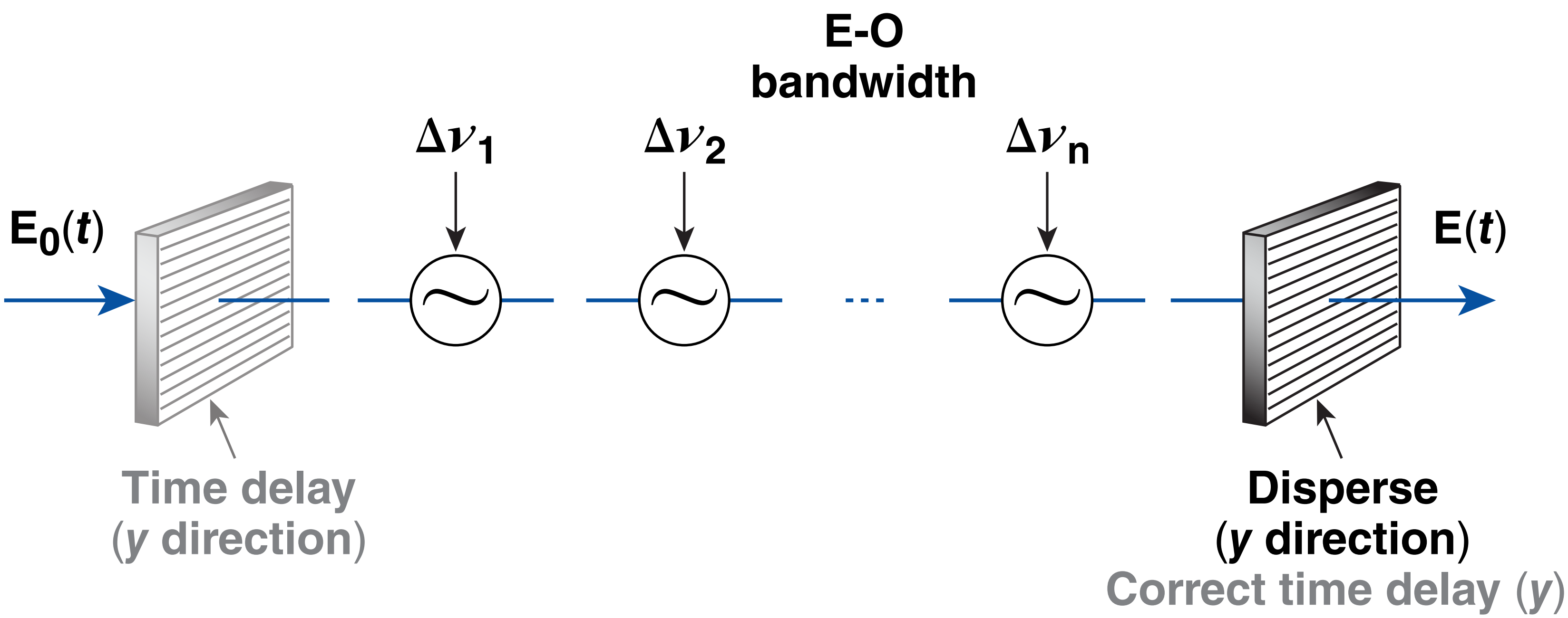
MultiFM is produced by applying multiple FM modulators in a single dimension



- **Total bandwidth and divergence are distributed across the modulators.**

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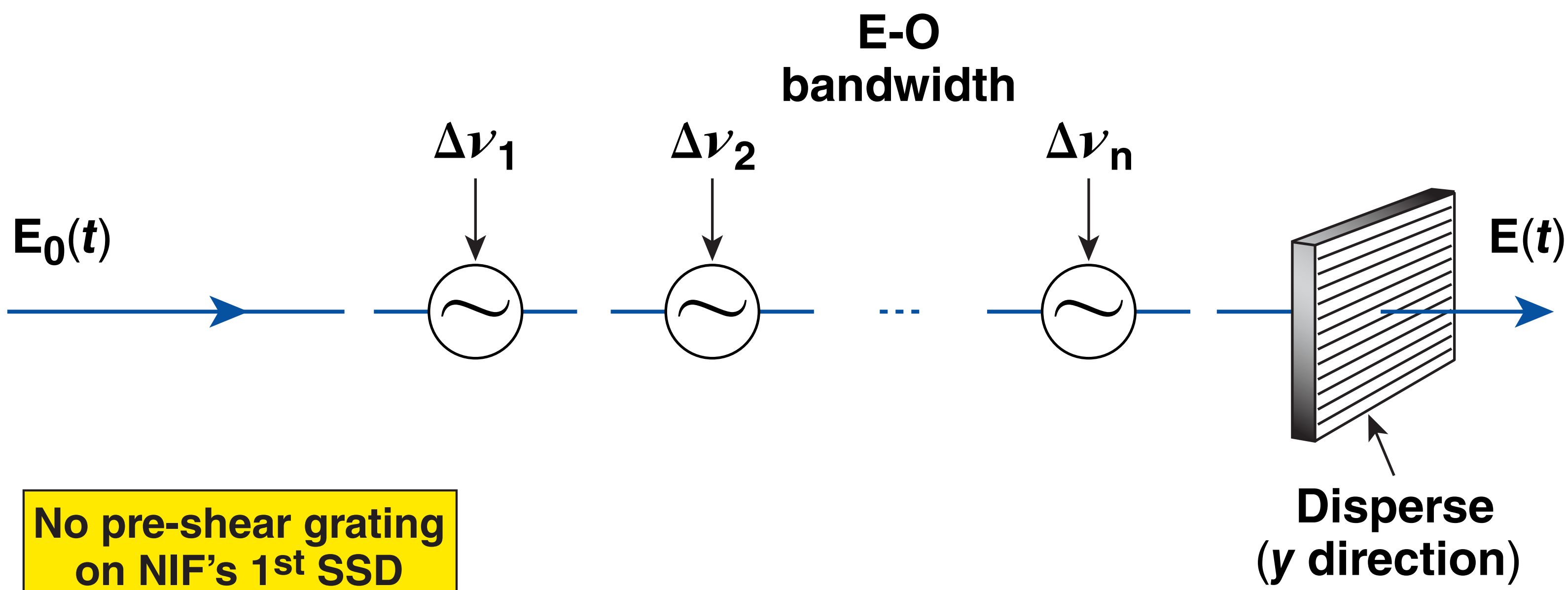


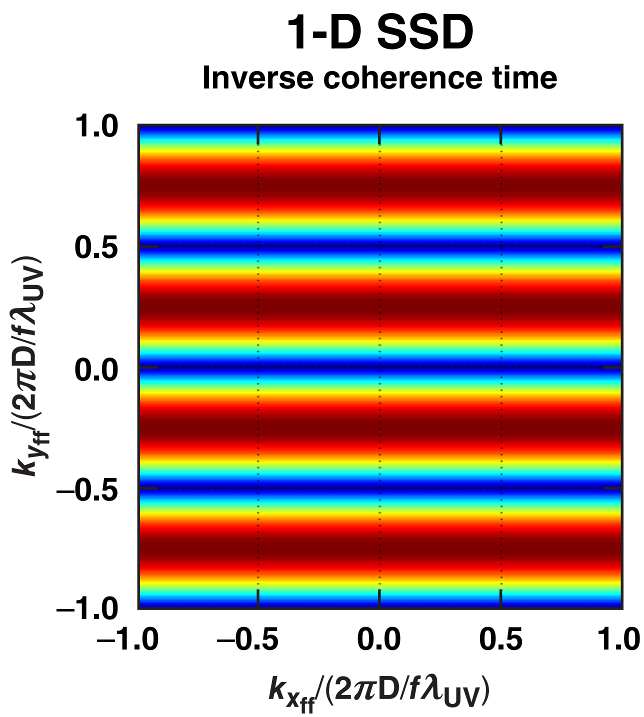
No pre-shear grating on NIF's 1st SSD dimension

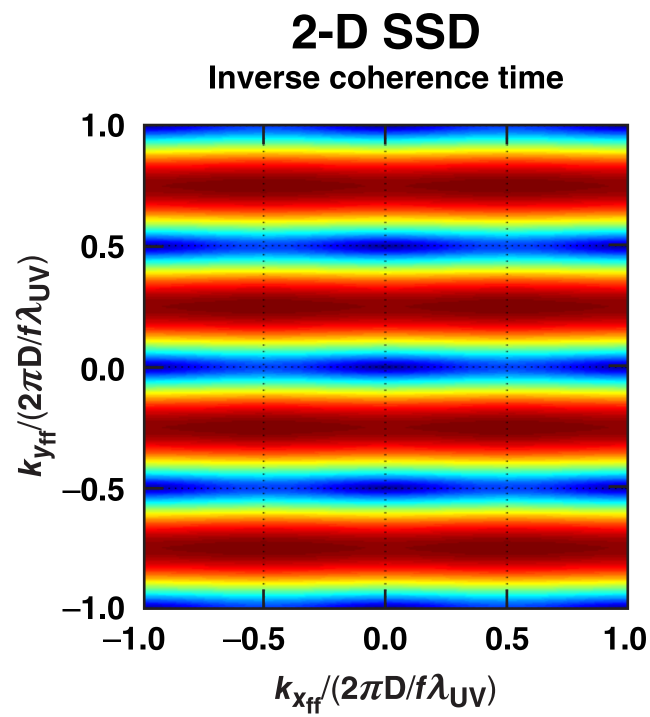
- Total bandwidth and divergence are distributed across the modulators.
- MultiFM could be implemented in the NIF fiber front end.

TC8327

The inverse coherence time is a 2-D function of the far-field spatial frequency

UR LLE





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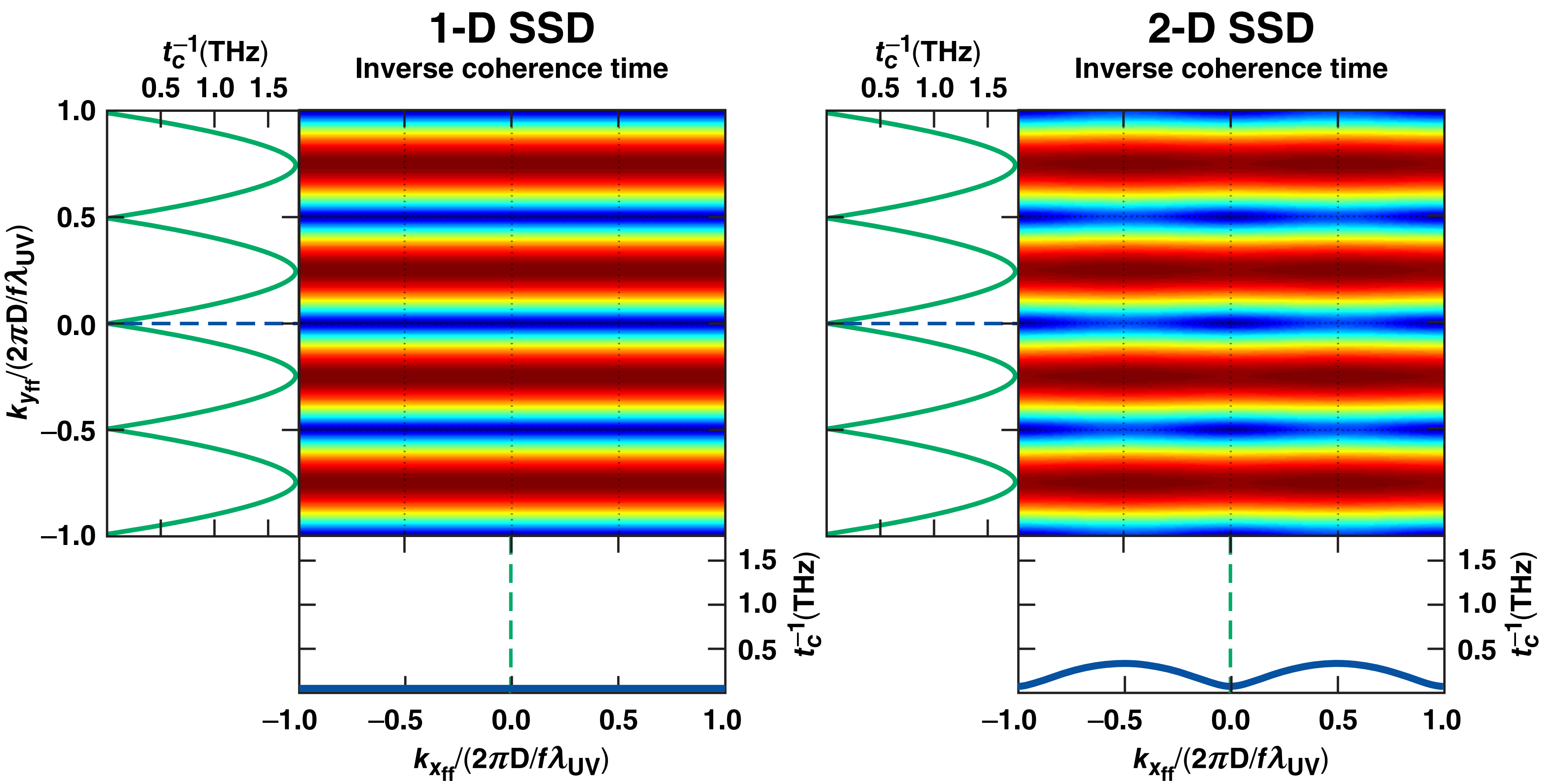
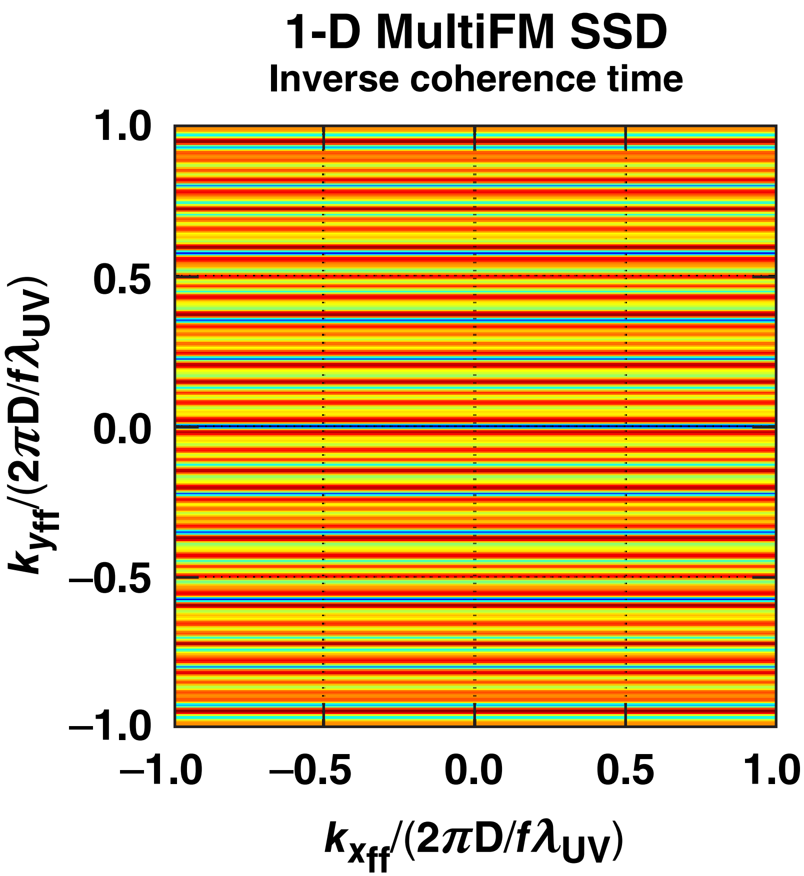


- The traditional SSD systems have large regions with very low values of t_c^{-1}.

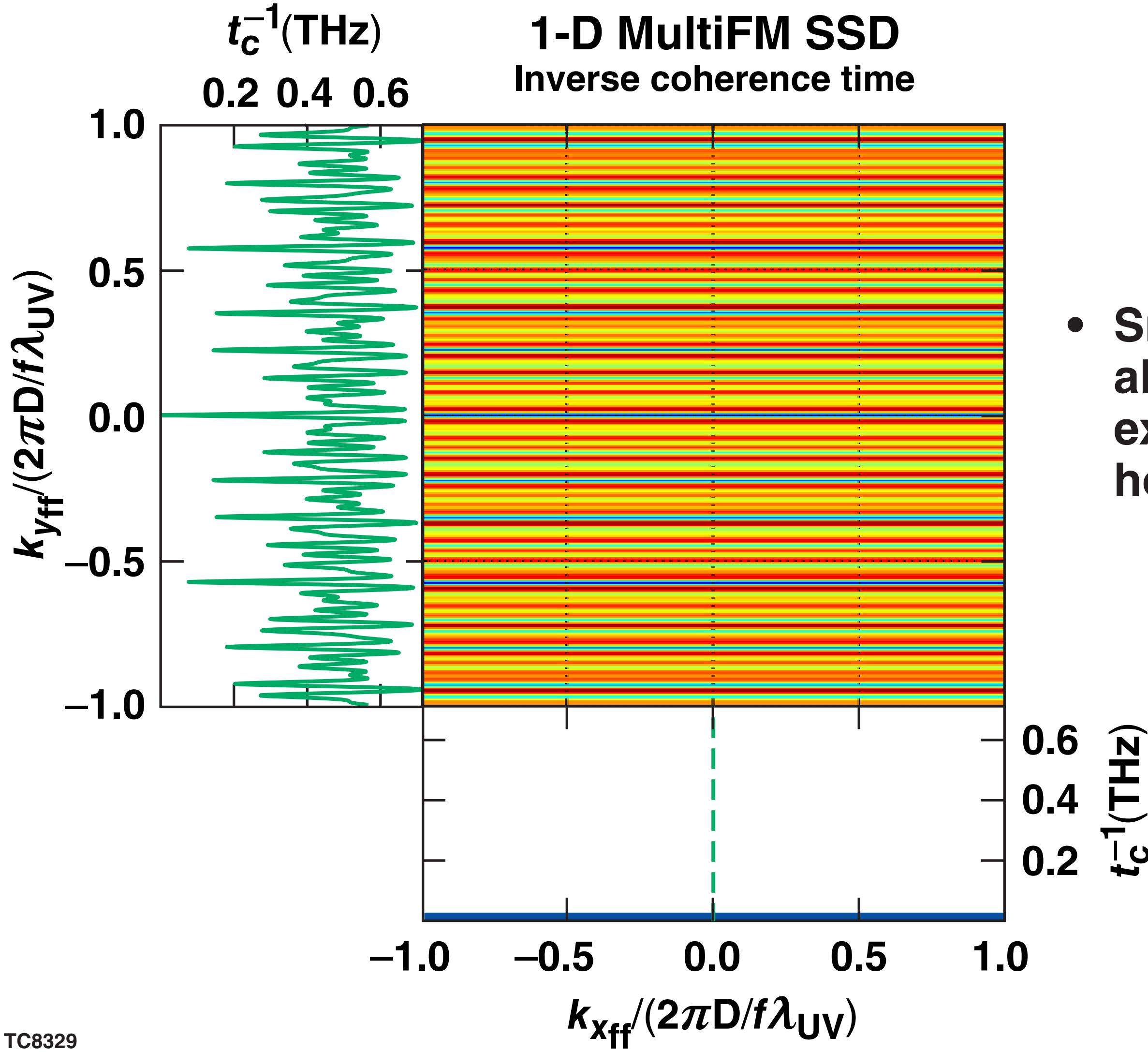
TC8328

The inverse-coherence-time distribution for MultiFM does not go to zero (except along the central horizontal axis)



TC8329

The inverse-coherence-time distribution for MultiFM does not go to zero (except along the central horizontal axis)

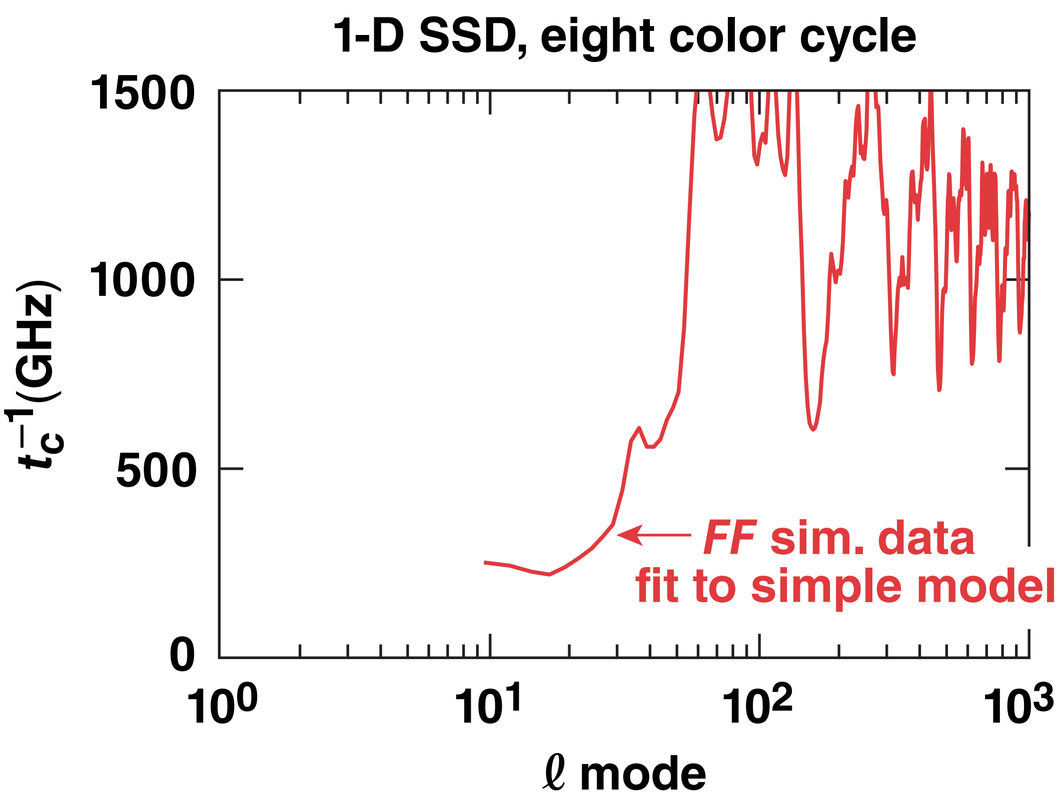


- Smoothing results at all spatial wavelengths except along the central horizontal axis.

TC8329

The inverse-coherence-time model used in *DRACO* accurately mimics the results of far-field simulations

- The resultant time dependent power spectra from far-field simulations are fit to a simple model of the nonuniformity, psd ~ $psd_0\ t_c/t$.

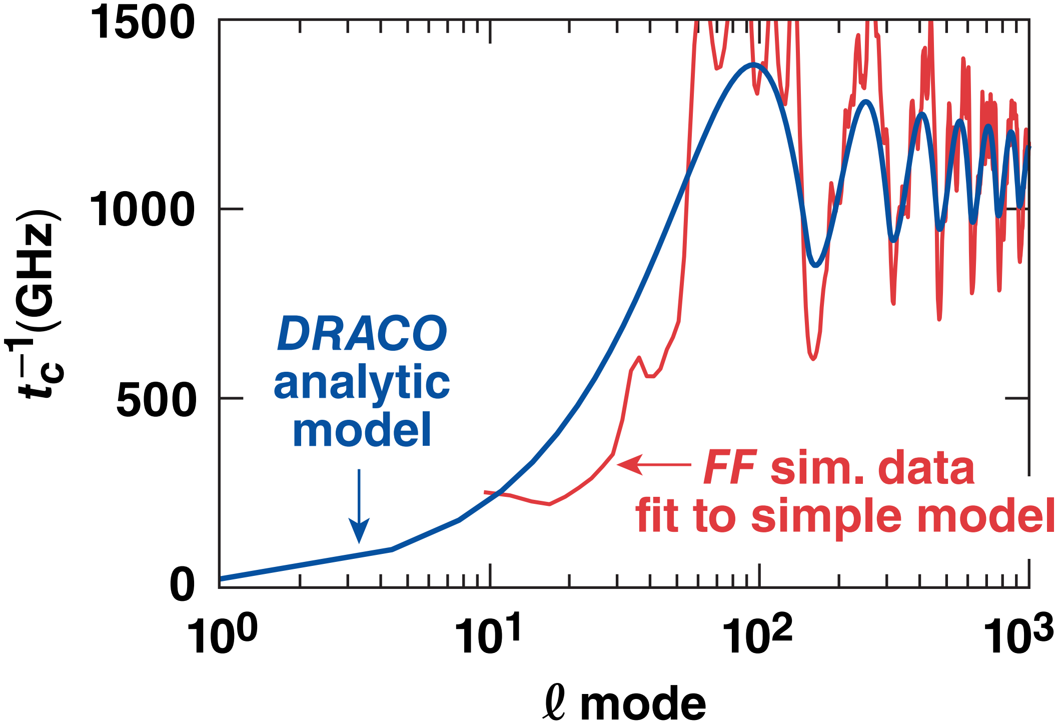


TC8330

The inverse-coherence-time model used in *DRACO* accurately mimics the results of far-field simulations

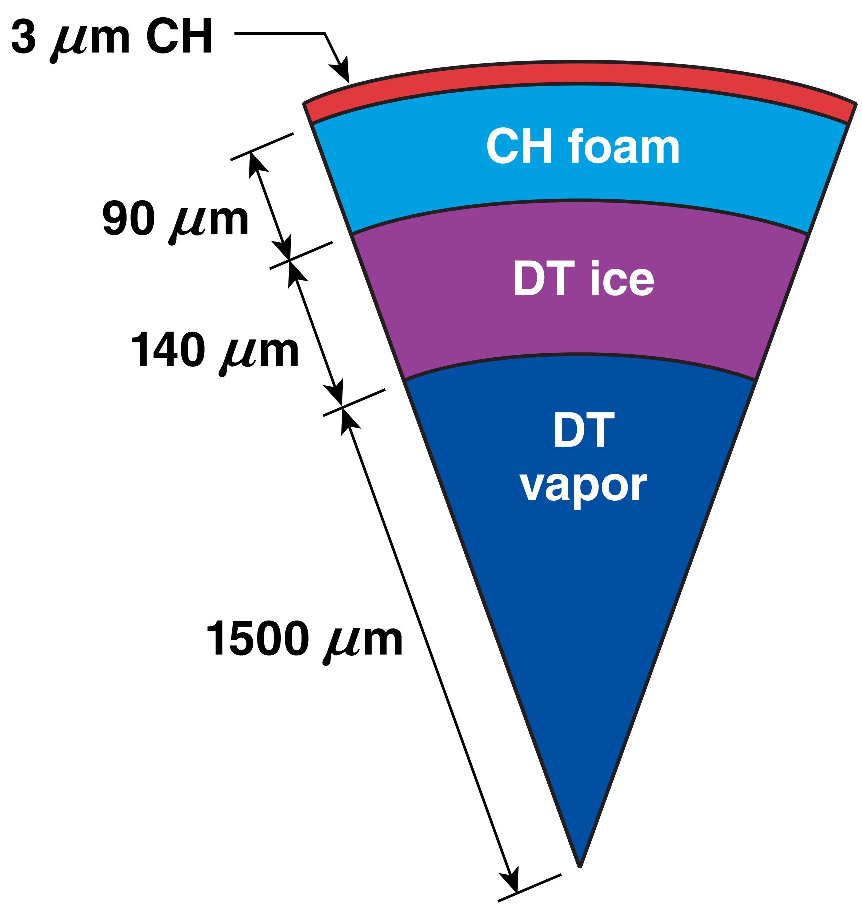
- The resultant time dependent power spectra from far-field simulations are fit to a simple model of the nonuniformity, psd ~ $psd_0\ t_c/t$.
- *DRACO* employs an analytic model that accurately estimates the inverse coherence time for each ℓ mode as a function of time.

1-D SSD, eight color cycle



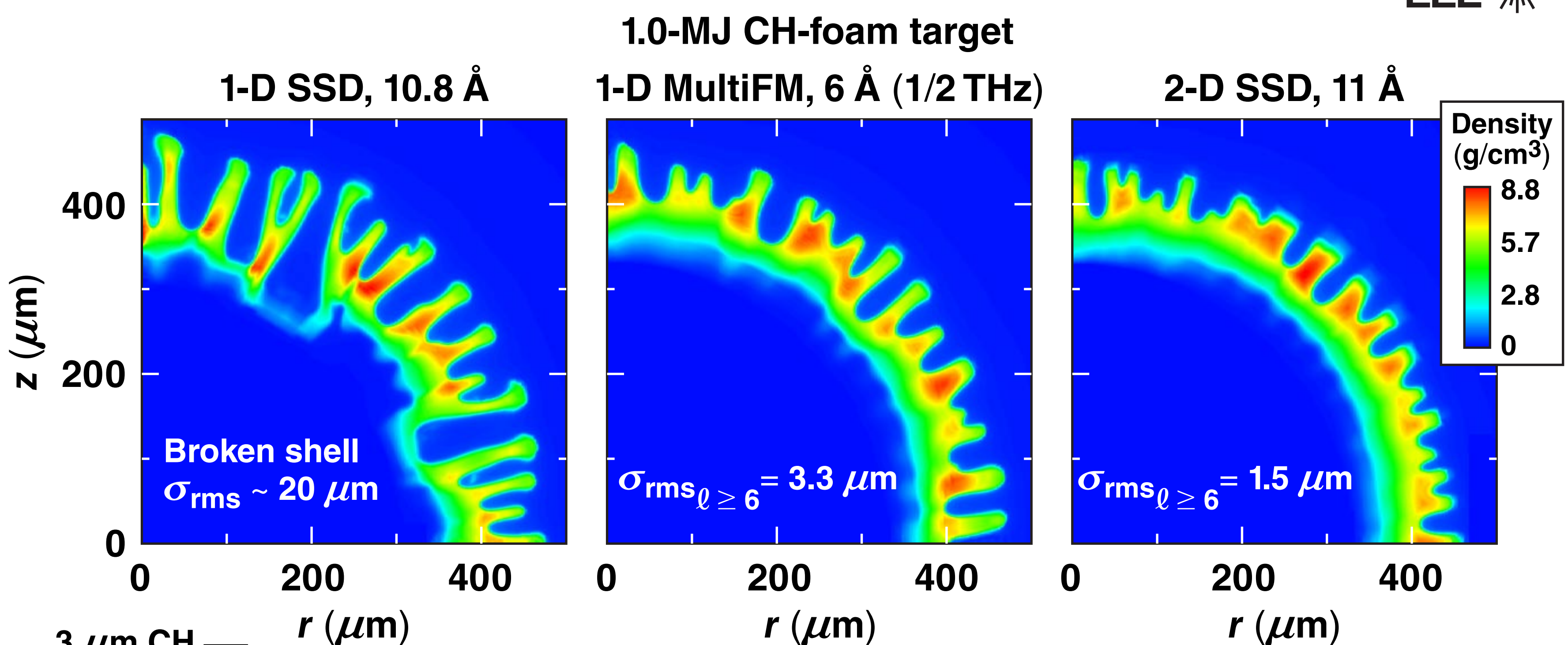
TC8330

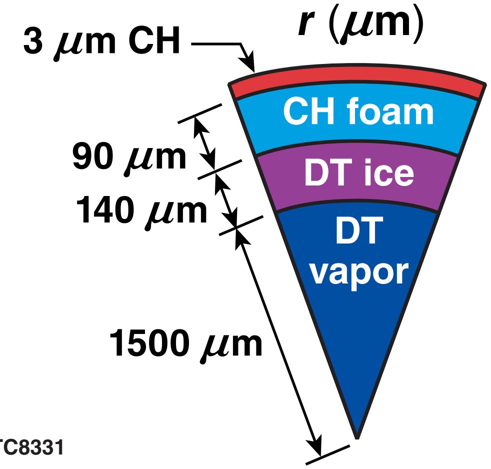
DRACO simulations show that 1-D MultiFM SSD significantly reduces imprint using less bandwidth



TC8331a

DRACO simulations show that 1-D MultiFM SSD significantly reduces imprint using less bandwidth

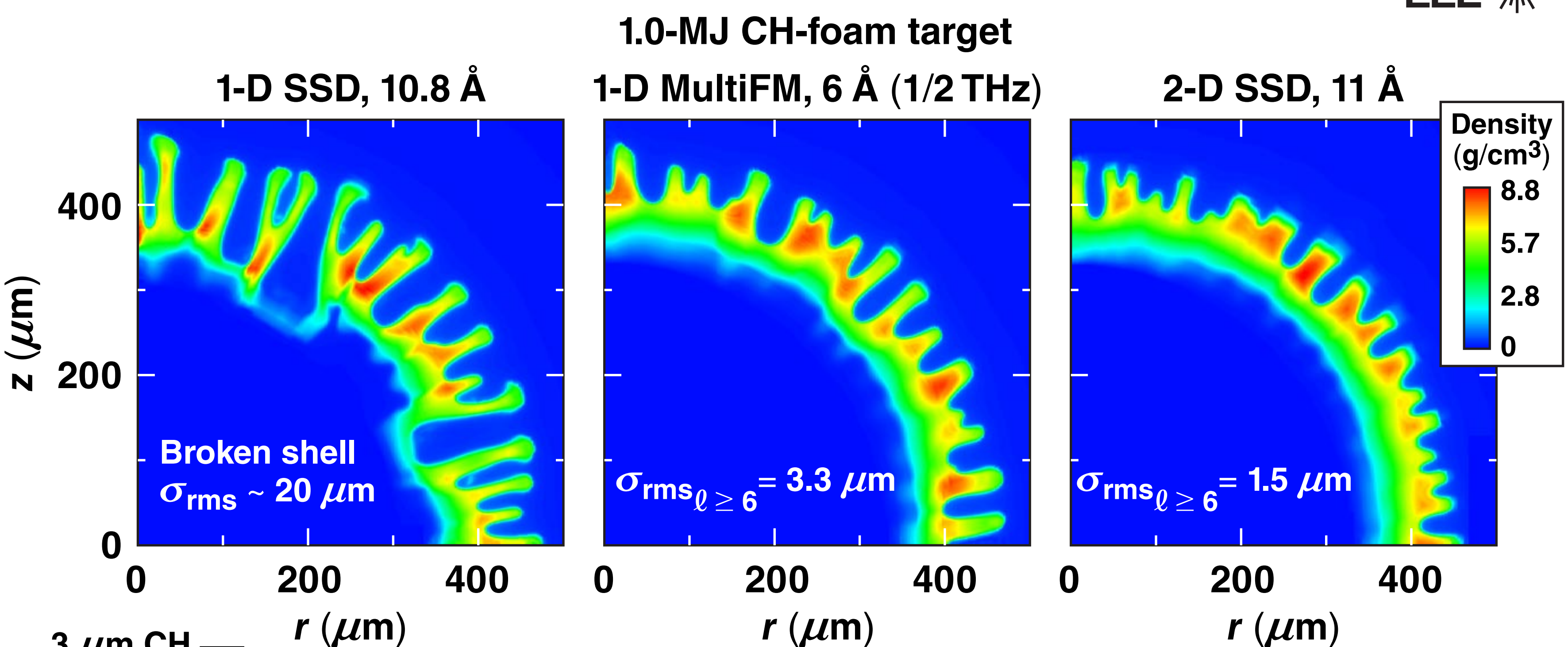


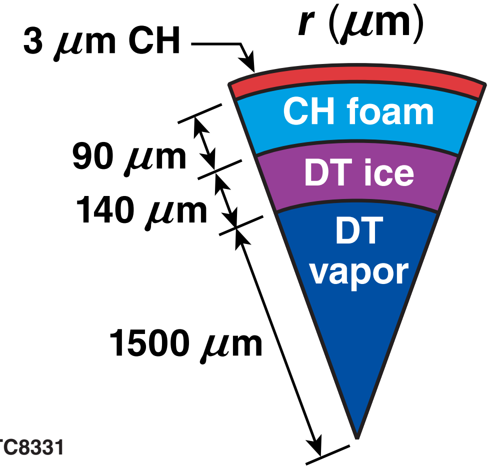


- End of acceleration phase, t = 8.25 ns

TC8331

DRACO simulations show that 1-D MultiFM SSD significantly reduces imprint using less bandwidth



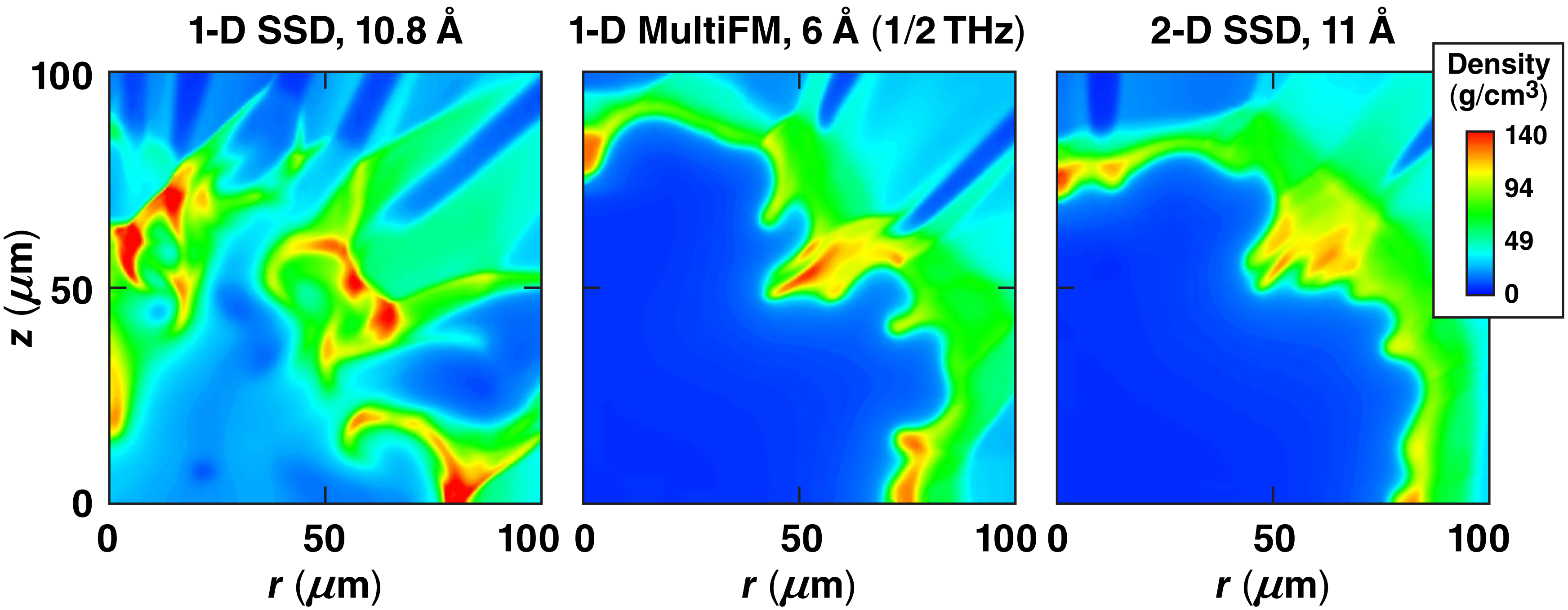


- End of acceleration phase, *t* = 8.25 ns
- Includes sources of nonuniformity
  - imprint $\ell = 2{:}100$
  - inner/outer shell roughness
  - mistiming 30-ps rms
  - power imbalance 8%

TC8331

The 1-D MultiFM case achieves a gain of seven, whereas the 1-D SSD case fails to ignite

1.0-MJ CH-foam target; near peak compression, t = 8.9 ns



Gain = 0

Gain = 7
ℓ = 6 dominates

Gain = 33

TC8332

Summary/Conclusions

DRACO simulations of 1.0-MJ CH-foam targets using 1-D MultiFM SSD achieve ignition on the NIF

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