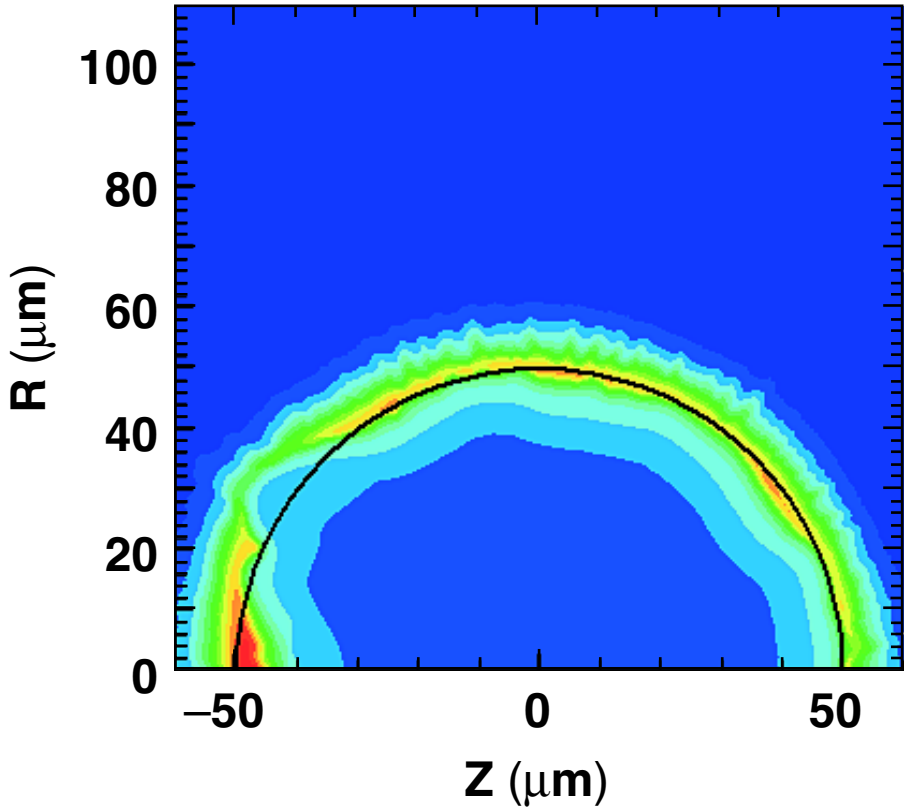
Simulations of the effect of power balance nonuniformity on shell conditions in implosions on the OMEGA laser



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Summary

Results of two-dimensional simulations of CH-shell implosions show some agreement with experiment for shell ρR distortions

UR LLE

- ORCHID simulations were carried out to study the effect of low-order modes from laser power balance on shell conditions at stagnation.
- Low-order modes grow at different rates at the ablation surface during the acceleration phase.
- The inner surface modes amplitude grows very little during deceleration and is set at shock rebound .
- ρR distortions show a complex behavior with no obvious trend during deceleration and between the three different targets.
- The computed percent ρR σ_{rms} agree qualitatively with in the experiment.

ORCHID simulations of imploding CH shells with an embedded Ti-doped layer were carried out

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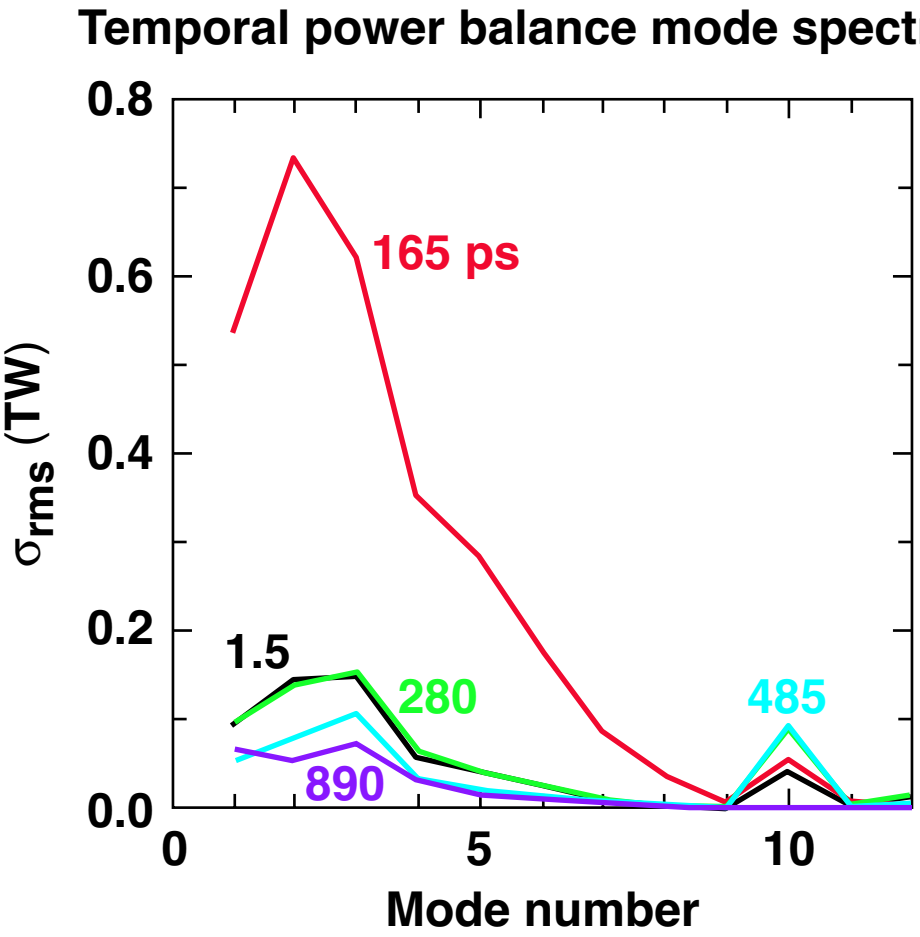
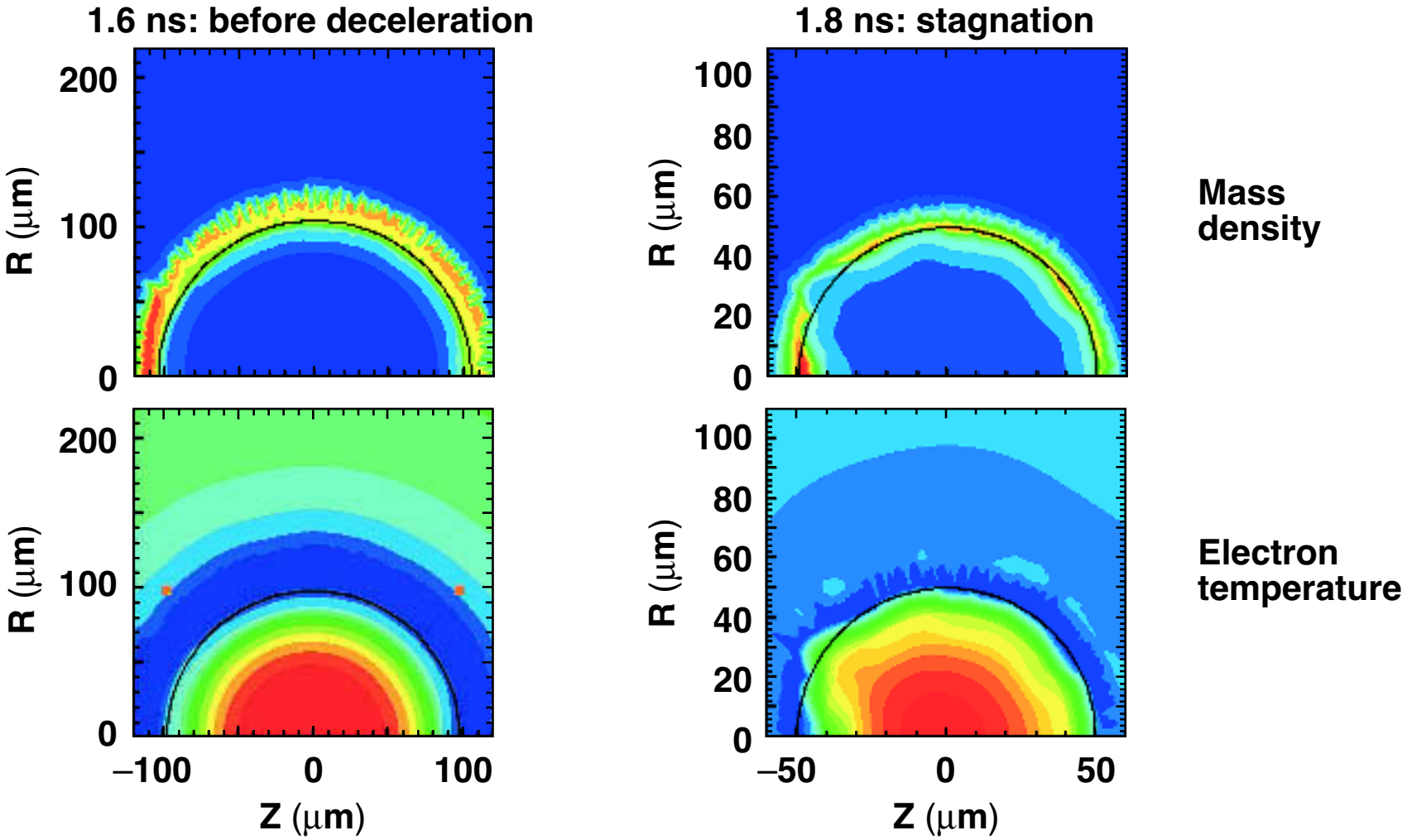
- Three targets were imploded with 1-ns square pulses:
  - 20-μm shells with 15-atm-D_2 fill; CR = 20
  - 24-μm shell with 3-atm-D_2 fill; CR = 41
  - 20-μm shells with 3-atm-D_2 fill; CR = 46
- Simulations included the laser power balance and the DPP spectrum with full smoothing: 1-THz SSD and polarization smoothing.
- The analysis of the simulation results concentrated on the shell behavior.
- Radial ρR perturbation modes were computed for temperature below 500 eV.

Laser power imbalance drives low-mode ($\ell < 6$) perturbations early in the pulse



- Laser power imbalance histories are generated using 60 azimuthally symmetric beam shapes propagating into spherically symmetric coronal profiles.
- Each of the 60 resulting absorption patterns is mapped onto a spherical grid. This pattern is decomposed into spherical harmonics, which are collapsed into the m = 0 term.

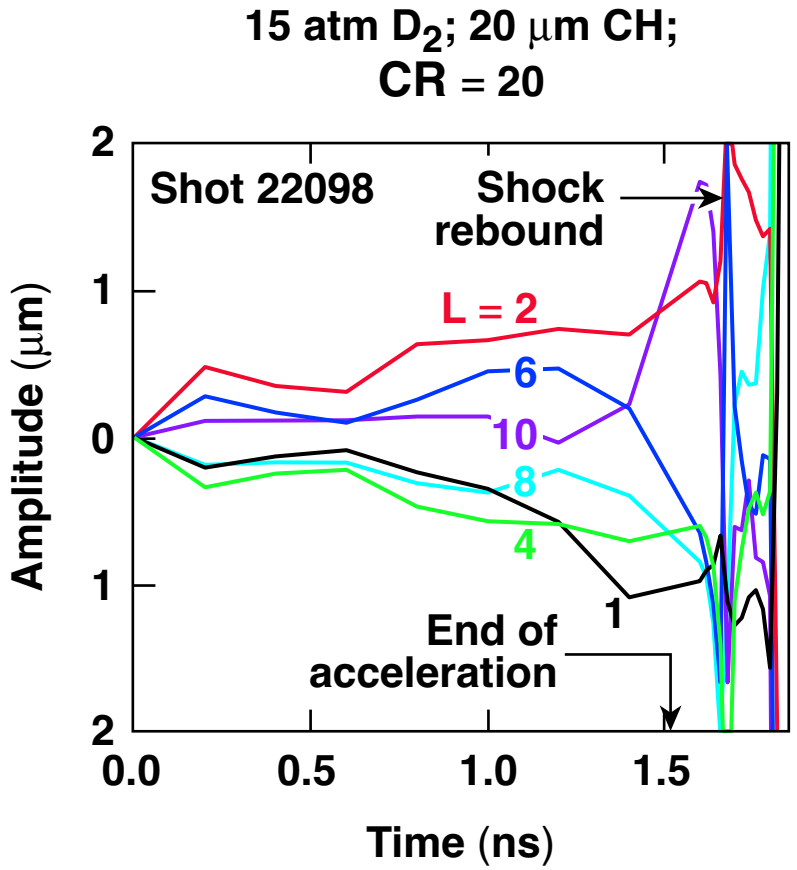
The effects of the low-mode perturbation occur after stagnation

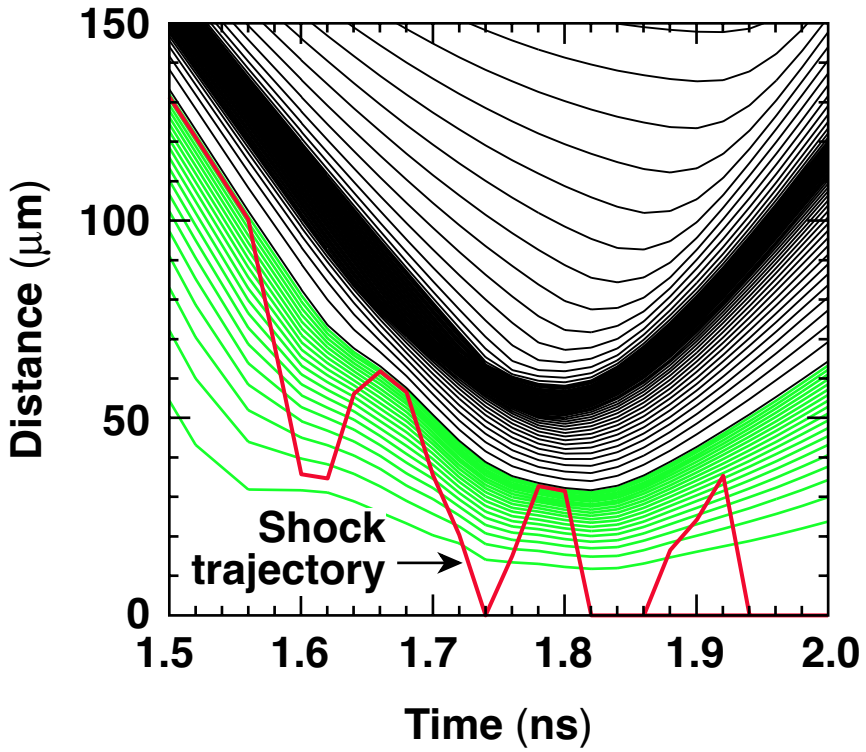


15-atm-D_2, 20-μm-CH shell; CR = 20

TC5827

Low-order modes grow at different rates during acceleration with some turning over before deceleration

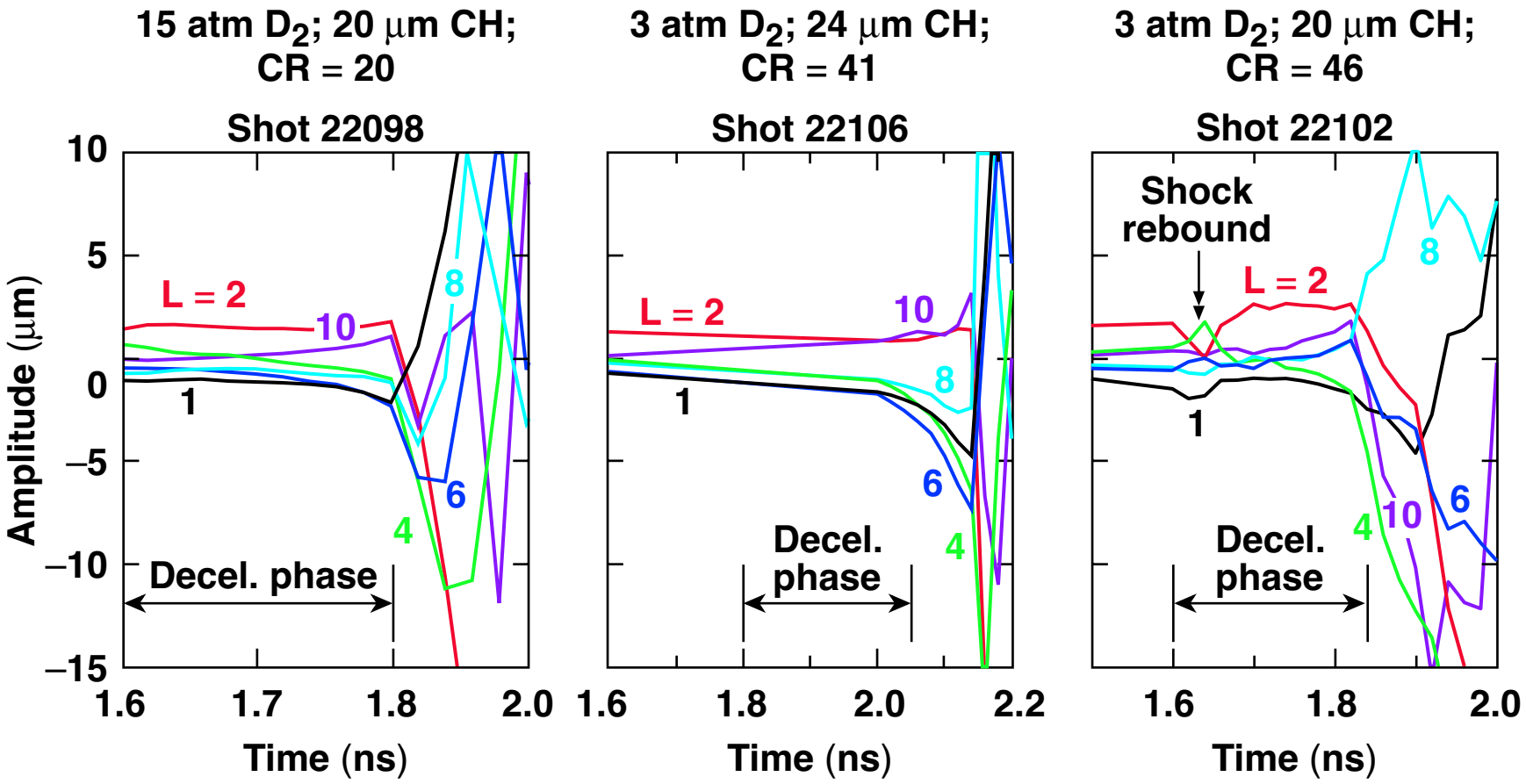




- Modes 8 and 10 seem to undergo Rayleigh–Taylor growth near the end of the acceleration phase.

TC5828

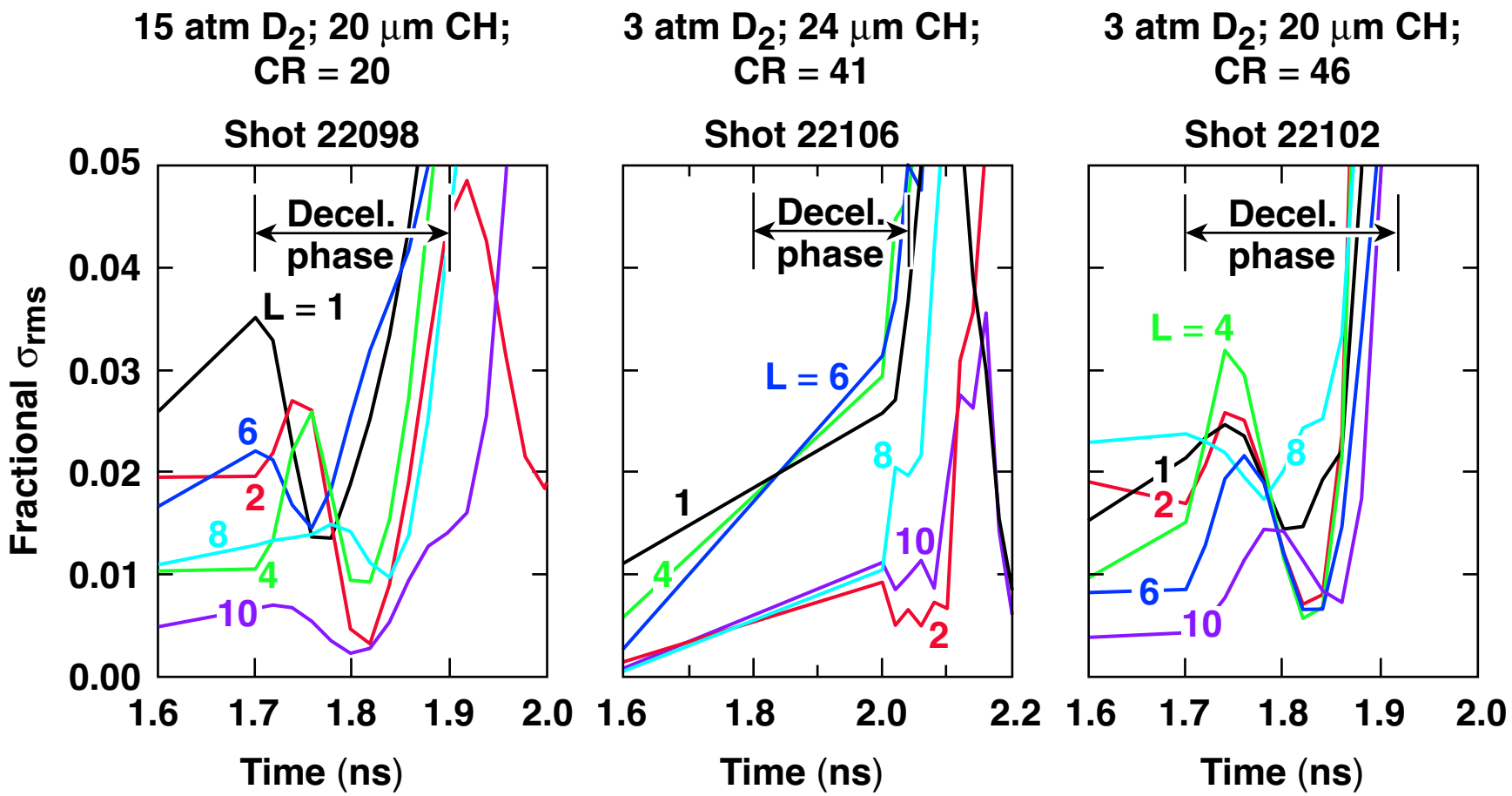
The modes at the inner surface do not grow much during the deceleration phase



- **The amplitude of the inner mode perturbation during deceleration is set at the end of the acceleration phase.**

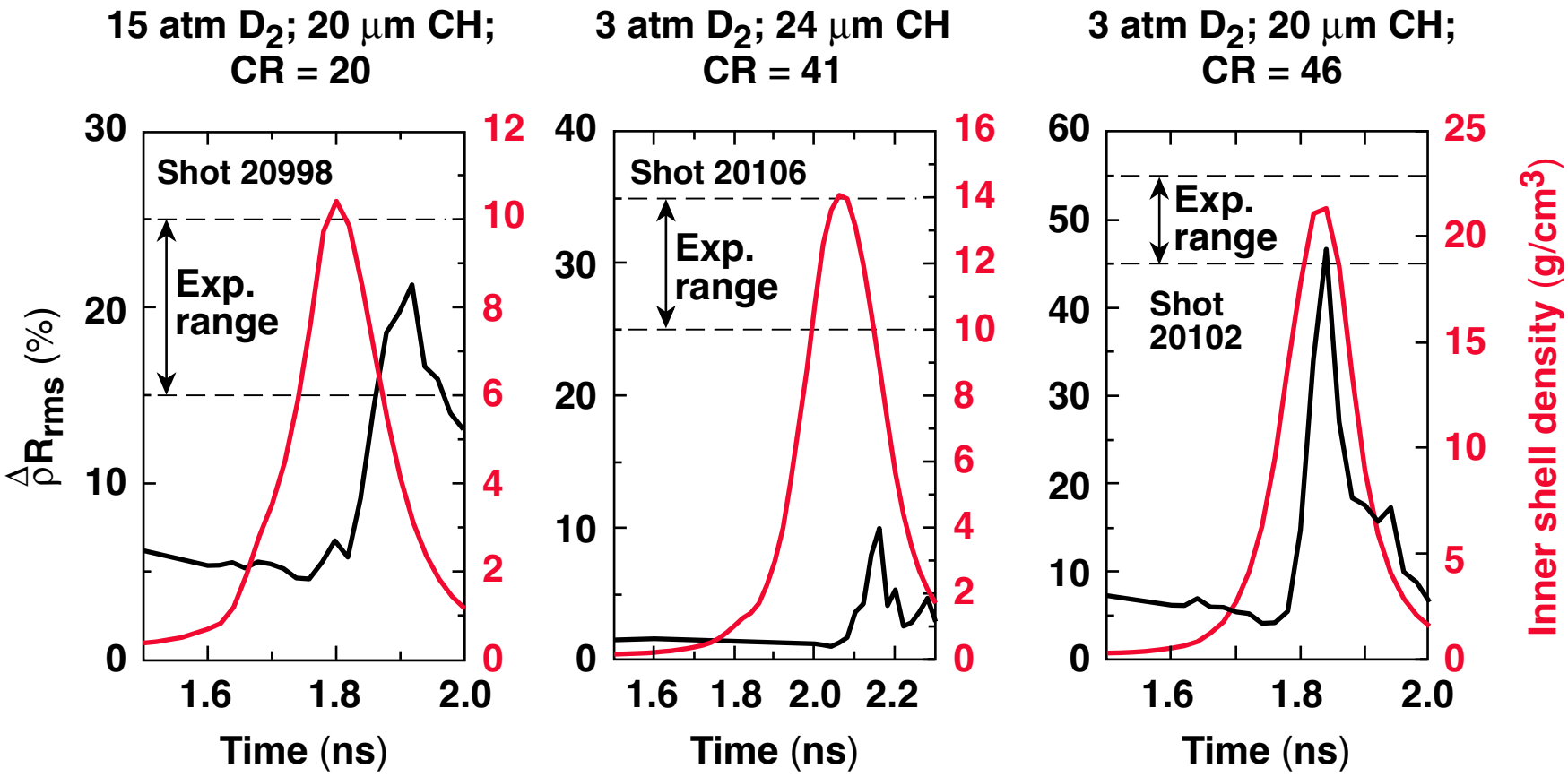
TC5850

The perturbation σ_{rms} of the radial cold $\rho\Delta R$ perturbation is complex during the deceleration phase



TC5851

The percent of cold $\Delta\rho R_{rms}$ agrees qualitatively with experiment



- ρR is measured for $T_e < 500$ eV; experimental observation occurs during peak inner shell electron temperature.

TC5829

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