SBS in Long-Scale-Length Plasmas for Direct-Drive ICF: Comparing Experiments with Simulations

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Summary

Seemingly contradictory SBS backscatter and sidescatter results find resolution in simulations

- SBS backscatter and sidescatter data show red- and blue-shifted components.
  - Simulations show the same feature provided EM seeding is included.

- Some data show early quenching of SBS while others do not
  - Hydro and LPI simulations show that plasma dynamics is the primary reason for these observations.

- Hot-spot origin of SBS is seen experimentally via polarization smoothing.
Outline

• Motivation

• LPI experiments
  – Experimental observations
  – 2-D hydrocode predictions
  – LPI simulations

• Discussion of results

• Summary
Multiple-beam experiments are a special case of single-beam experiments

- Multiple obliquely incident, high-\(f\)-number beams display some of the same features as single lower-\(f\)-number beams

- Multiple beams allow separation of EM seeding from symmetrically located beams via reflections from \(n_c\).

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Heating Beams

Formation beams

Interation beams
SBS at normal incidence with slowly evolving velocity “bump” exhibits blue-shifted SBS over the entire pulse that is sensitive to beam smoothing.
The fast-evolving velocity bump leads to early quenching of the blue SBS feature while the EM-seeded red feature disappears without seed.

- Red component is suppressed due to lack of EM seed.
- Blue component – pure backscatter in SBS underdense region.
SBS reflectivities with and without polarization smoothing indicate that SBS occurs primarily in the hottest speckles.
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