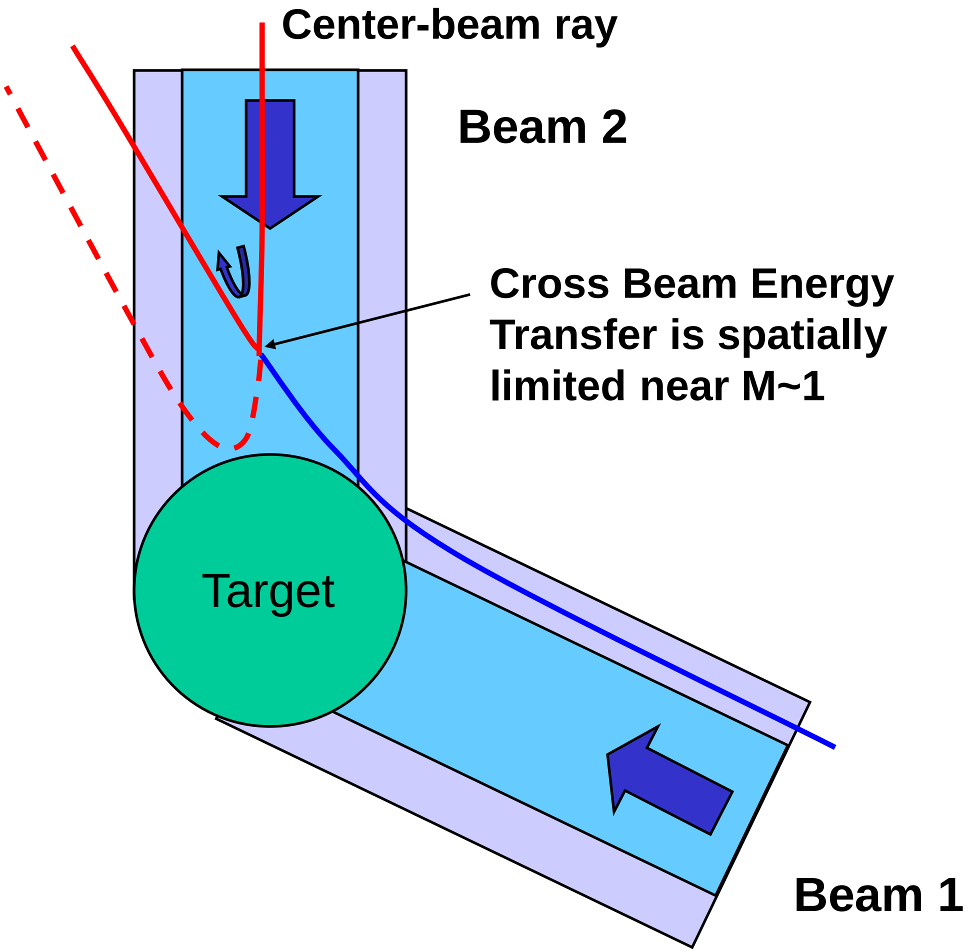
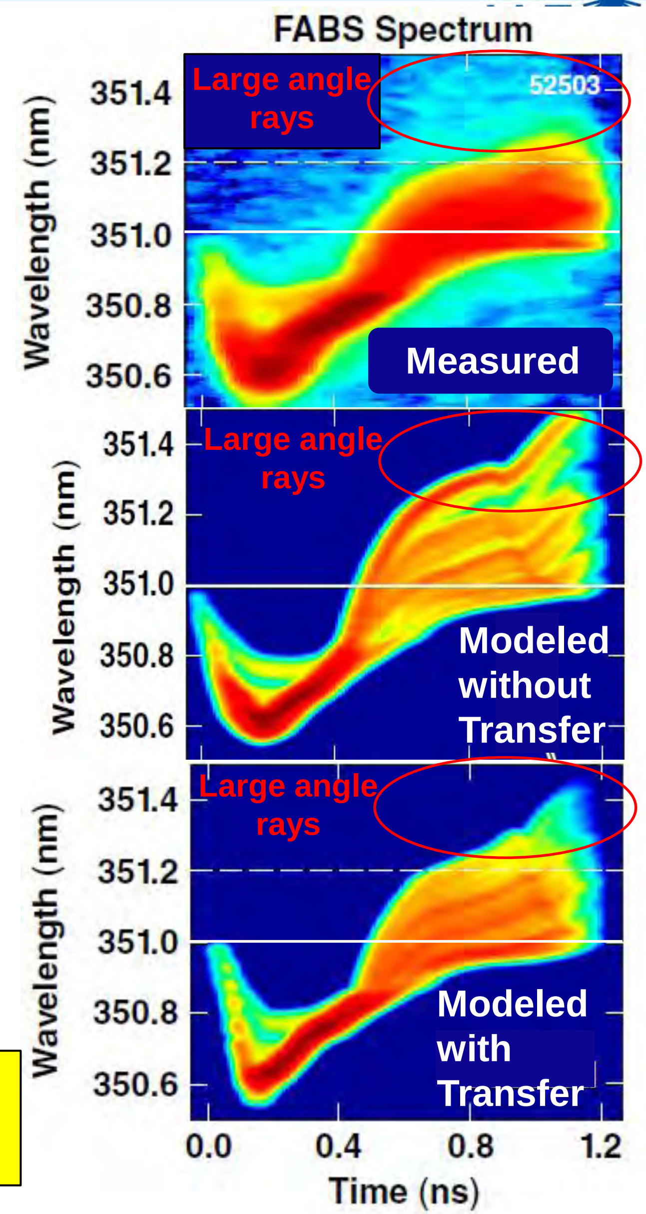
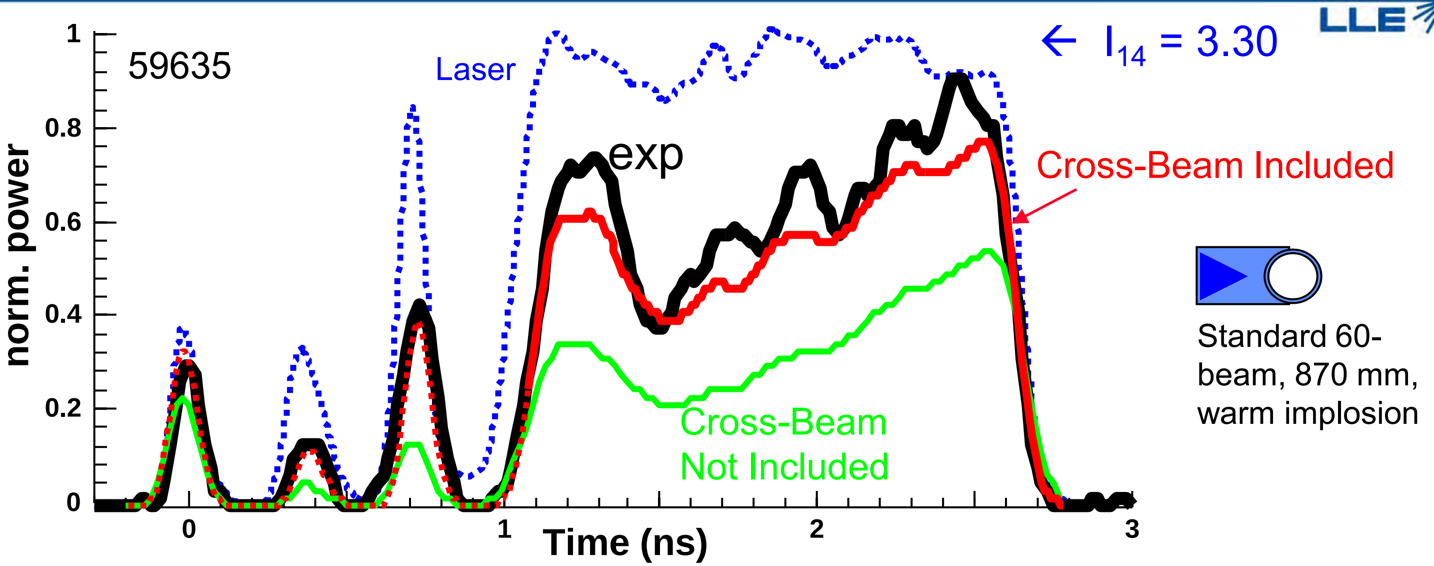
The scattered spectra from direct drive targets indicated that the hydrodynamic modeling was missing essential physics





Energy is extracted from the shallow angle rays and transferred to the larger angle rays

Cross beam energy transfer is required to match the measure scattered light from standard OMEGA direct drive implosions



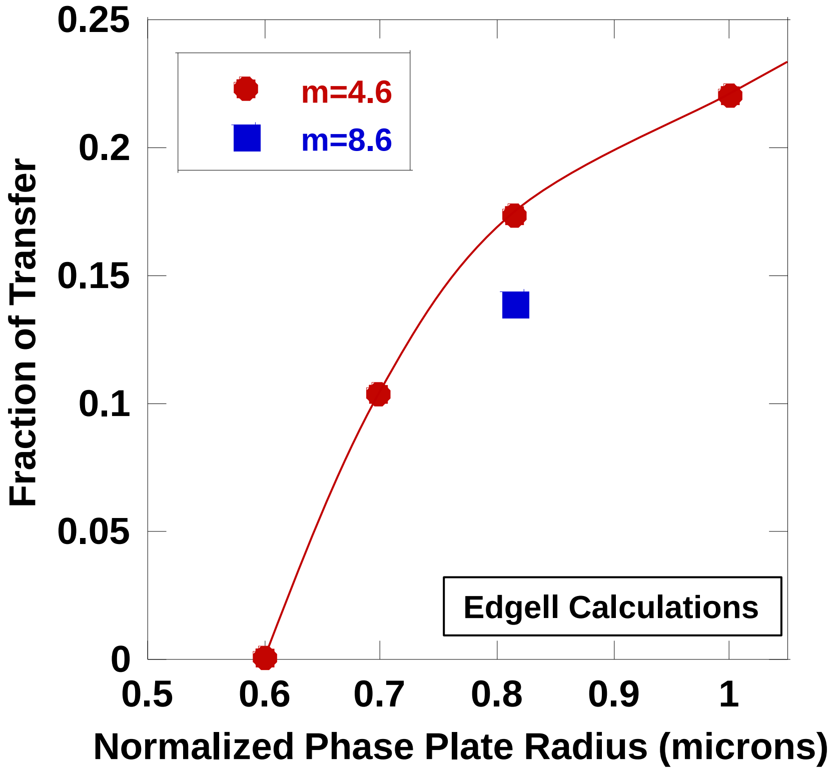
- **Light that is not absorbed by the target is measured by a series of diagnostics around the chamber**
- **A model is implemented in LILAC (1D hydro-code) that calculates the beam-to-beam resonant coupling of laser light through the ion-acoustic waves**
- **A clamp* on dn/n is required when ion-acoustic wave amplitude exceed dn/n=10^{-3}**

Cross-beam energy transfer model agrees with experiments over a large range of intensities and pulse shapes

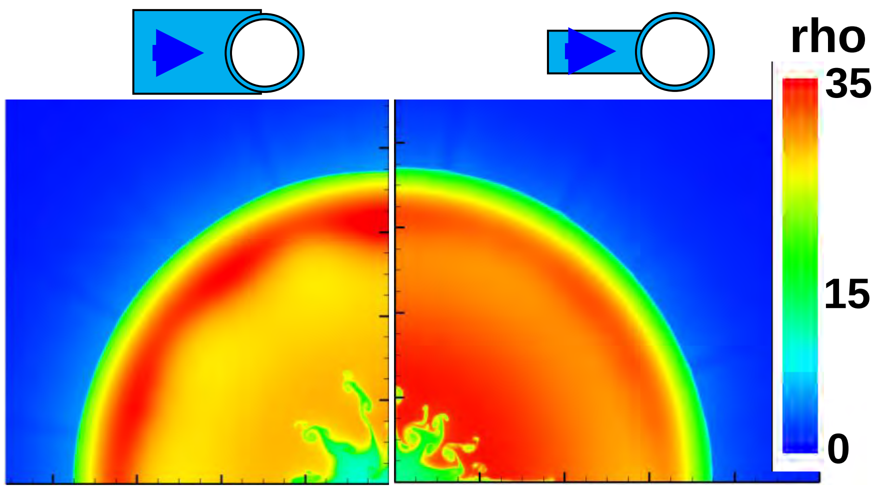
*** dn/n=2×10^{-3} NOVA CO_2 Thomson scattering measurements**
Physical Review Letters 86(12) (2001)

The cross beam energy transfer model predicts that reducing the energy in the wings of the laser spots will eliminate the transfer

Cross-beam energy transfer in standard OMEGA direct drive implosions reduces the 1-D neutron yield by a factor of 2 to 4



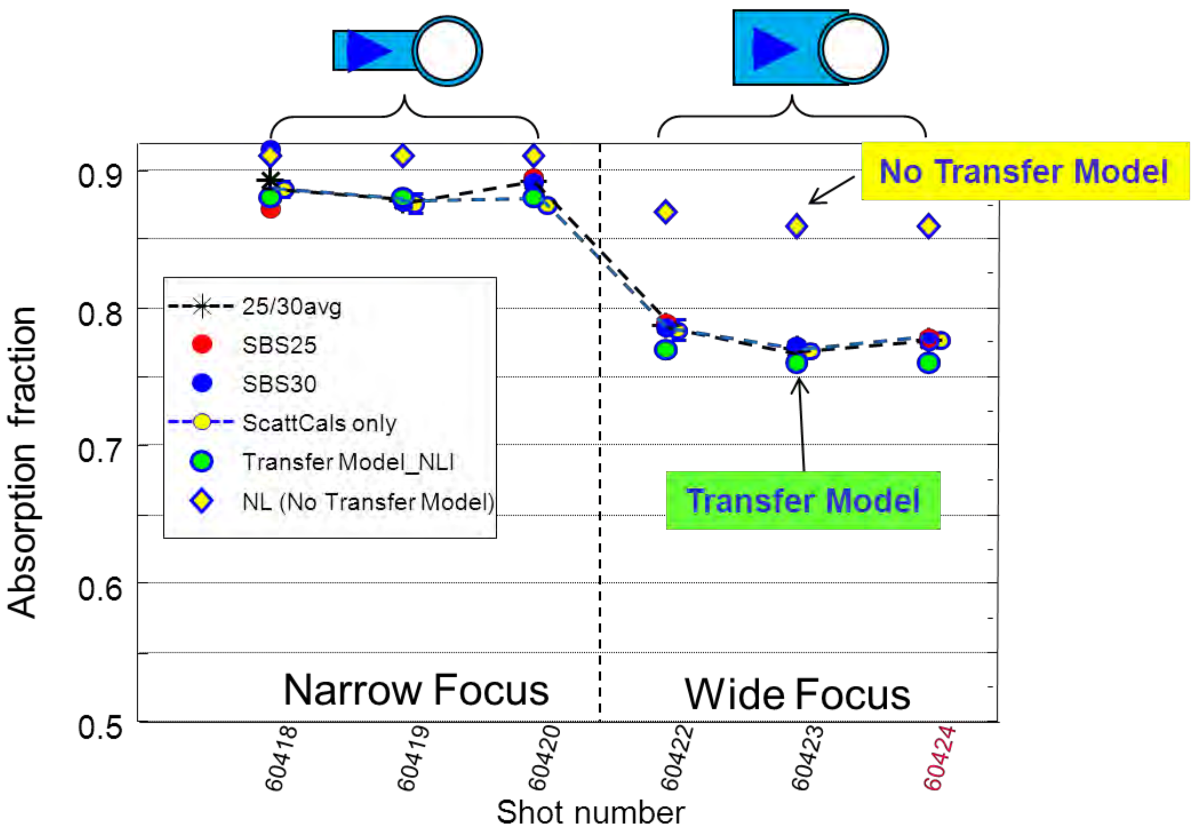
Narrow beams produce more short-wavelength perturbations and less long-wavelength perturbations

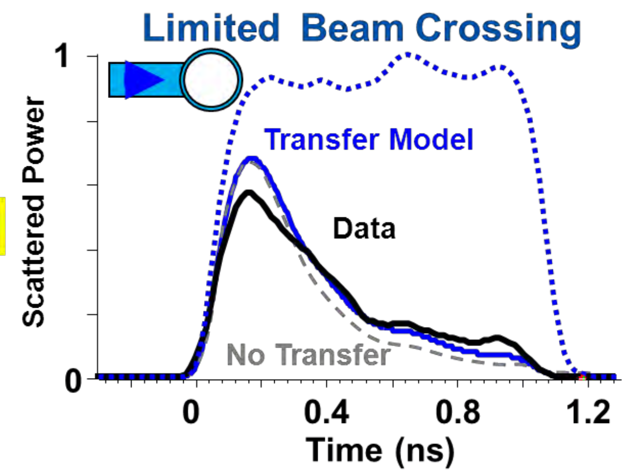


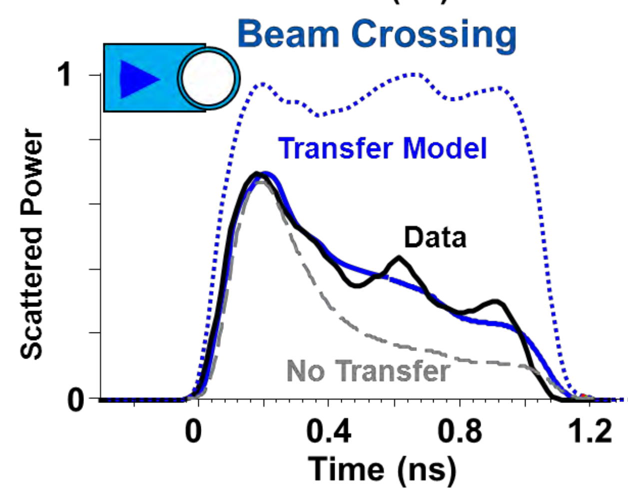
Igumenshchev Calculations

An optimal hydro-design that includes cross-beam energy transfer will trade-off uniformity with reduced beam transfer

Reducing the energy in the high angle rays, increased the absorbed fraction in direct drive implosion experiments







Reducing the focal radius relative to the target diameter to 60% eliminated cross-beam transfer and increased the measured absorption