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We present the status of plans to commission a short-pulse, quad of beams on the National Ignition Facility (NIF), capable of generating > 10 kJ of energy in 10 ps. These beams will initially provide an advanced radiographic capability (ARC) to generate brilliant, x-ray back-lighters for diagnosing fuel density and symmetry during ignition experiments.

A fiber, mode-locked oscillator generates the seed pulse for the ARC beam line in the NIF master oscillator room (MOR). The 200 fs, 1053 nm oscillator pulse is amplified and stretched in time using a chirped-fiber-Bragg grating. The stretched pulse is split to follow two separate beam paths through the chain. Each pulse goes to separate pulse tweakers where the dispersion can be adjusted to generate a range of pulse widths and delays at the compressor output. After further fiber amplification the two pulses are transported to the NIF preamplifier area and spatially combined using shaping masks to form a split-spatial-beam profile that fits in a single NIF aperture. This split beam propagates through a typical NIF chain where the energy is amplified to several kilojoules. A series of mirrors directs the amplified, split beam to a folded grating compressor that is located near the equator of the NIF target chamber. Figure 1 shows a layout of the beam transport and folded compressor, showing the split beam spatial profile. The folder compressor contains four pairs of large, multi-layer-dielectric gratings; each grating in a pair accepts half of the split beam. The compressed output pulse can be 0.7-50 ps in duration, depending on the setting of the pulse tweaker in the MOR. The compressor output is directed to target chamber center using four additional mirrors that include a 9 meter, off-axis parabola. The final optic, immediately following the parabola, is a pair of independently adjustable mirrors that can direct the pair of ARC beams to individual x-ray backlighter targets. The first mirror after the compressor leaks a small fraction of the light that is transported to a diagnostics station where detailed measurements of the spatial and temporal characteristics of the ARC pulse will be recorded for each shot.

A NIF quad of short-pulse beams will support up to eight, independently-timed, short-pulse beams, capable of producing an x-ray motion picture. Alternatively, the combined aperture of the quad can direct > 10 kJ of energy in 10 psec onto a single target, enabling research into fast ignition and high-energy-density science on the NIF. We will discuss modifications to the NIF to accommodate ARC, including features such as simultaneous NIF-ARC operation in the same NIF quad, protection against backward propagating pulses from the target and plans to coherently add split beams.

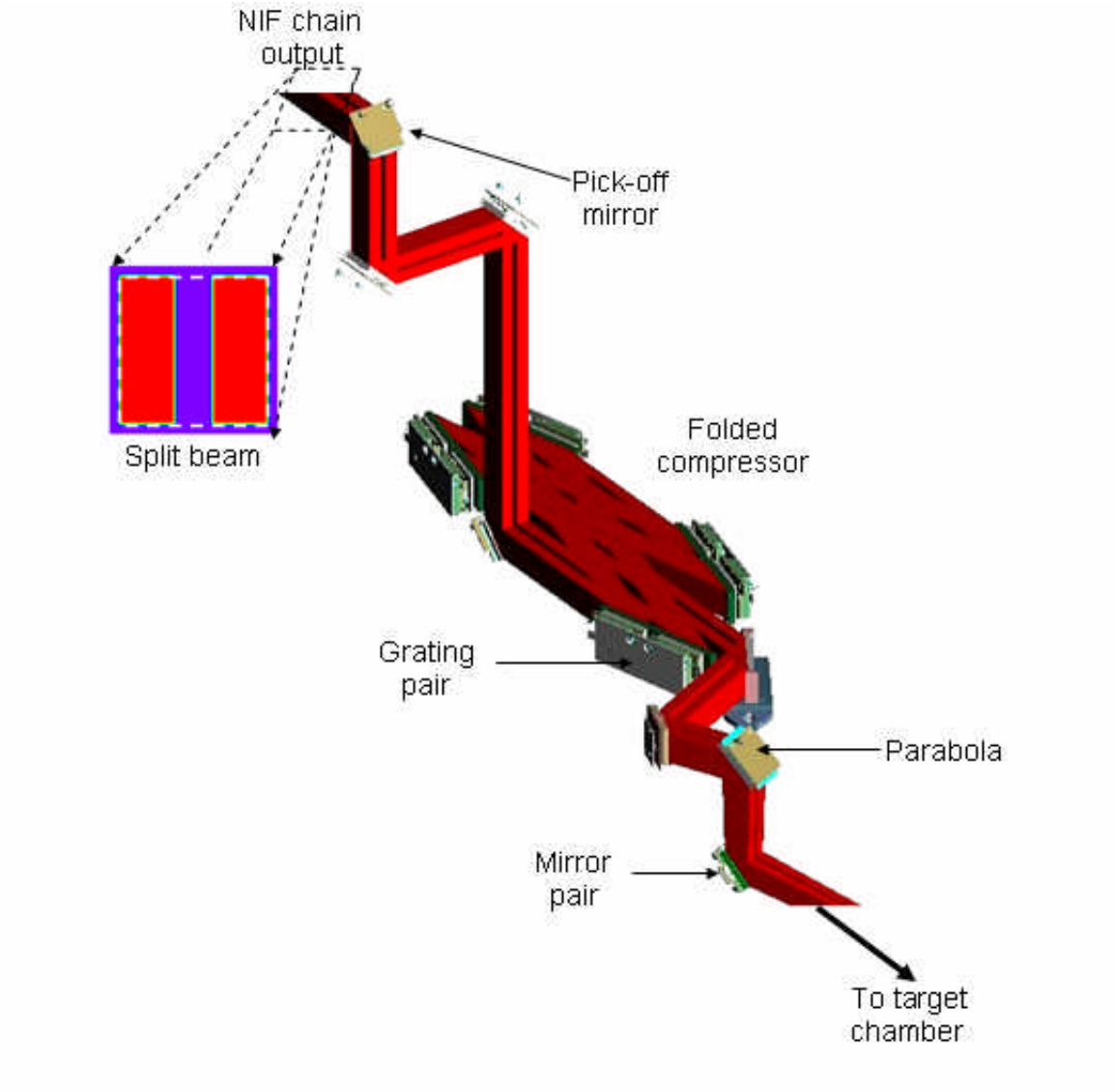

Figure 1. This figure shows a layout of a single ARC beam line starting at the pick-off mirror at the output of the NIF chain.

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