LLNL researchers needed a new imaging capability that could help them understand how shockwaves and material features evolve under extreme conditions important to stockpile stewardship. While the ARC laser system was commissioned in 2015, developing the experimental platform capable of acquiring high-quality data for Complex Hydro took over a year, requiring the team to resolve numerous design and system integration problems.

**ARC on NIF**

- ARC has been integrated onto an existing set of four NIF aperture beams to facilitate use of the existing NIF main amplification system.
- ARC uses a split-beam configuration, propagating two short-pulse beams for each NIF aperture. Staggering the arrival of the eight ARC beamlets onto special back lighters (BL) with 60° phase difference creates a time-lapse “movie” with tens of frames per second.

**Platform Evolution**

- The first platform is a high energy backlighter (HEBL) target that is designed to test the performance of the silver micro wire and take an image of a calibrated mesh grid to establish resolution and background.
- The second experimental platform is hohlraum driven with a 2.5mm diameter copper foam sphere tented in the center that represents the image of the sphere.

**ARC Pre-Qualifier (PQ) Target**

- Back lighter standoff of 28mm from center of the hohlraum with .5m resolution grid on the plate.
- 100um Ag wire suspended on .5mm x .5mm Kapton mesh grid.

**ARC Backlighters**

- BL Type 1: 3mm x 2.5mm x .008mm Kapton sheet with 50um Ag wire centered.
- BL Type 2: 3mm x 2.25mm x .008mm Kapton sheet with 35um Ag wire centered.

**ARC Diagnostic Targets**

- There have been two diagnostic targets designed and built to evaluate the performance of the complex hydro ARC platform.
- The first platform is a high energy backlighter (HEBL) target that is designed to test the performance of the silver micro wire and take an image of a calibrated mesh grid to establish resolution and background.
- The second experimental platform is hohlraum driven with a 2.5mm diameter copper foam sphere tented in the center that represents the image of the sphere.

**Eliminating Extra X-Ray Sources**

- The first shot results showed 3 unwanted sources of x-rays contaminating the image.
- The second successful shot was fielded in December 2016 with a longer backlighter standoff. The longer standoff distance removed the backlighter from the unconverted light created when the main NIF beams are fired into the hohlraum. This target used the smaller backlighter and substrate and allowed ARC beams that missed the backlighter to travel out the exit cone without interacting with other materials. The 35mm standoff distance provided a lower resolution image than the 28mm standoff.