The OLUG community would benefit from the ability to independently use each Omega beam leg via three independent laser drivers. Some examples of the benefits to the user community are the overall increased flexibility in beam/driver configuration, the ability to use 2 beam legs on the Backlighter Driver, 3 independent pulse shapes, beams delays longer than current PLAS limitations and increased energy performance on the Backlighter Driver. Due to space and resource limitations this request is difficult for the Facility to undertake. The Facility has indicated that there are options to make the current leg/driver configuration more flexible in the short term, but that 3 independent drivers cannot be achieved in the short term. We believe that this short-term option would be useful to many members of the community and the benefits include a subset of the examples given above. For the long term we request the ability to use the three beam legs independently, but believe that the short-term option in the short term would be beneficial.

The current driver configuration is as follows. Either of 2 drivers (SSD or Main) can be used to feed all 3 legs (60 beams) or 2 legs (40 beams) with the Backlighter Driver feeding 1 leg (20 beams). Also, the Backlighter Driver has a lower energy performance than the other two drivers. These conditions set some limitations on the experiments that can be performed at the Omega Laser Facility. For the long term, we propose that each of the 3 Omega beam legs have an independent driver and an addition of a 64 mm amplifier to the Backlighter Driver (this is required to obtain full energy). In the near term, it is possible to reconfigure the drivers so that, in addition to the present configurations, a single leg could be used on the SSD driver and 2 beam legs can be used on the higher-energy Backlighter Driver. This short-term option would still provide overall increased flexibility in beam/driver configuration, the ability to use 2 beam legs on the Backlighter Driver, and increased energy performance on the Backlighter Driver. Examples of experiments benefiting from both the long and short-term options follow.

The need for bright x-ray sources in high-energy-density physics experiments is increasing as diagnostic techniques, such as, x-ray radiography and x-ray Thomson scattering, are continuing to develop. An example of a target and data from a radiative shock experiment that used the x-ray Thomson scattering technique is shown in Figure 1. Also, creating higher energy x-ray sources using high-Z materials is being explored and requires a high-irradiance laser pulse. Experiments utilizing these techniques and materials will benefit from the ability to use 2 beam legs on the Backlighter Driver. They will also benefit from increased energy performance on the Backlighter Driver. Many experiments that use x-ray sources for diagnostic techniques create multiple x-ray sources (in multiple locations) during an experiment. The time delay between these sources is typically limited by the current PLAS delays. Independent beam legs would add flexibility to the timing of x-ray sources, which is specifically useful in hydrodynamics experiments performed by LANL, AWE and University of Michigan.

The long-term driver reconfiguration would allow 3 pulse shapes to be used for a single experiment. This is particular beneficial for EOS experiments where pulse shape is critical. Ramp-compression EOS experiments of iron require a 9 ns pulse-width. Under the current conditions these experiments use 2 drivers (with 2 different pulse shapes) with a delay in time to approximate the needed pulse shape. An additional pulse shape from a third driver could be used to tune the pulse shape needed to transit the phase transition. An additional pulse would also help with x-ray diffraction and EXAFS experiments, which also uses combinations of pulses to create the needed drive.

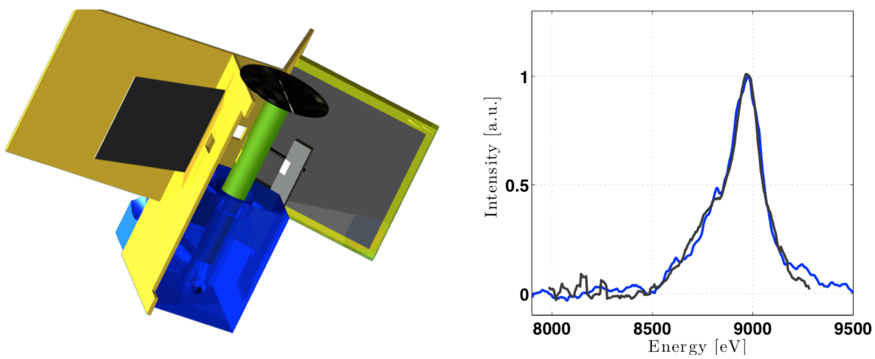

Figure 1. (left) A raditive shock target that uses the x-ray Thomson scattering technique. A Be disk (black) caps a Xe-filled shock tube (green). An acrylic superstructure (blue) provides support, shielding (gold) and diagnostic components. (right) The scattered spectrum collected with the zinc spectrometer (ZSPEC) for one shot is shown in blue. Fitting with a model dynamics structure factore S(ω,k) (black) indicate a weighted average electron temperature of ~35 eV. The proposed driver reconfiguration would improve data using this technique and open up a new class of experiments using bright x-ray sources.