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Scorpius: The development of a new multi-pulse radiographic system

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One of the original drivers behind the development of pulsed power was the need for short-pulse (flash) x-ray sources for hydrodynamic tests. These systems continue to be an important diagnostic for the evaluation of hydrodynamic phenomena. In the United States, three primary facilities provide this function: Flash X-Ray (FXR) at Lawrence Livermore National Laboratory (LLNL); the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility at Los Alamos National Laboratory (LANL); and Cygnus at the Nevada National Security Site (NNSS). FXR and DARHT provide highly penetrating radiographic capabilities but are limited in the types of hydrodynamic experiments that can be performed, while Cygnus can support a larger range of experiments, but does not provide the same penetrating capability.

To fill this gap in hydrodynamic experimental capability, the National Nuclear Security Agency (NNSA) has recently issued a set of high-level requirements describing a radiographic capability similar to that of DARHT, but located in a facility similar to Cygnus. In response to these requirements, a project called Scorpius has been developed as a joint partnership between LANL, LLNL, Sandia, and NNSS.

A key requirement is the ability to deliver multiple (2 or more) radiographic images along a single axis in a short time scale. This requirement effectively limits the possible system choices to a linear induction accelerator (LIA). However, there are several families of multi-pulse LIA architectures from which to choose.

This paper describes the high-level system requirements for Scorpius as well as the evaluation of technologies and systems that might meet those requirements. In addition, the current preferred option and the associated technology maturation activities are discussed.

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Author: CRAWFORD, Mark (Los Alamos National Laboratory)

Co-author: BARRAZA, Juan (Los Alamos National Laboratory)

Presenter: CRAWFORD, Mark (Los Alamos National Laboratory)

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