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Investigating the beam transport in a Linear Induction Accelerator for multi-pulse X-Ray flash radiography

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Radiographic sources based on Linear Induction Accelerators have successfully demonstrated multi-pulse radiography capabilities in order to achieve multi-frame measurement. In this framework, a new IVA "Mi2" was designed and built at CEA. This IVA delivers two 700 kV high power pulses across the diode gap in order to produce twice a 2.5 kA electron pulse of 80 ns FWHM from a velvet cold cathode. The delay between the two pulses was adjusted from tens of nanoseconds up to few microseconds. A multidimensional particle-in-cell simulation model was developed in order to quantify the influence of velvet plasma dynamics on the second pulse.

Based on this model, a new multi-pulse velvet diode was designed at 2.5 MV relevant to produce high quality intense beams. In this work, we simulate the beam properties (current, emittance, profile···) within the injector and their evolution with the delay between pulses. In addition, particle-in-cell and envelope codes were used in order to investigate the beam transport through the accelerator.

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