

# Using Reduced Order Modeling to Understand the Physics of Injection in Laser Wakefield Acceleration\*

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Laser Wakefield Acceleration (LWFA) is a process by which plasmas are excited by a laser leading to the acceleration of electrons. The process is highly nonlinear, leading to difficulties in developing an accurate theoretical model for a priori prediction. Recent experiments at the Rutherford Appleton Laboratory's (RAL) Central Laser Facility (CLF) in the United Kingdom using the 20 TW, 5Hz repetition rate Astra-Gemini laser has produced new results in LWFA research, that can allow unprecedented exploration of the parameter-space of laser and target conditions. Experimental measurements can inform scaling laws for the creation of more robust prediction and control models. With the new data constraining previous scaling laws, models can be extended into new ranges. These data allow the construction of reduced order models that can make predictions without the need for full scale simulation.

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