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Doctor of Philosophy

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Image created with Andy Hazi, Hui
Chen, Jackson Williams, Jaebum Park,
and Sabrina Nagel at the Jupiter
Laser Facility, Lawrence Livermore
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A Proton Flower from the Titan Laser

Semi-finalist

When an ultra-intense laser hits a solid target, jets of particles stream off in all directions. Hydrogen, as the lightest element, gets preferentially accelerated, resulting in proton beams. These beams have many potential applications, from medical radiotherapy to fusion energy. The study of their dynamics and optimization has been the focus of my degree. In this false colour image, a beam of protons has been recorded by radiochromic film. The protons were moving at 10% the speed of light. The intense fields of the laser, along with the magnetic fields generated by expanding plasma, lead to a distinctive ring structure. Meanwhile, magnetic field instabilities cause filamentation of the particle beam and the clearly visible line features. The colour set chosen, “fire,” is the standard used by experimentalists in the field to highlight features in data.