Extreme Optics: Ultra-Intense Laser-Matter Interaction Physics (Marjoribanks (Physics))

This project will provide an excellent opportunity for a very good physics-oriented Undergraduate to join us on our research in ultra-intense relativistic laser-matter physics. We use state-of-the art laser facilities around the world, typically producing a 30-femtosecond pulse and intensities on target up to 10^21 W/cm^2.

In April 2018, we will have experiments on the MEC end-station of the LCLS free-electron x-ray laser facility at SLAC (Stanford, USA). Our collaborators are from Univ. Oxford (UK), and our studies use special highly absorbing nanowire targets -- a hot topic in a field we started. We seek a USRA student who wants to help with experimental data analysis, and also with simulation modelling using codes we already have and are developing with the Oxford team.

The student on this project will be working on relativistic laser-matter interactions: attosecond pulse generation, high-energy-density physics, atomic physics and nonlinear optics. He or she will learn about high-power laser systems, assist in set-up of experiments at Toronto, learn ultrafast laser techniques, and assist in theoretical modelling of our interactions. It may be possible to spend up to two weeks collaborating at Oxford.

Computer programming skills in FORTRAN or C++ are an asset in the theory work, which will involve parallel computing on SciNet facilities. We already are running particle-in-cell (PIC) code modelling, essentially sophisticated relativistic numerical experiments to interpret real experiments. In experimental work, he/she will learn LabVIEW for data acquisition and analysis.

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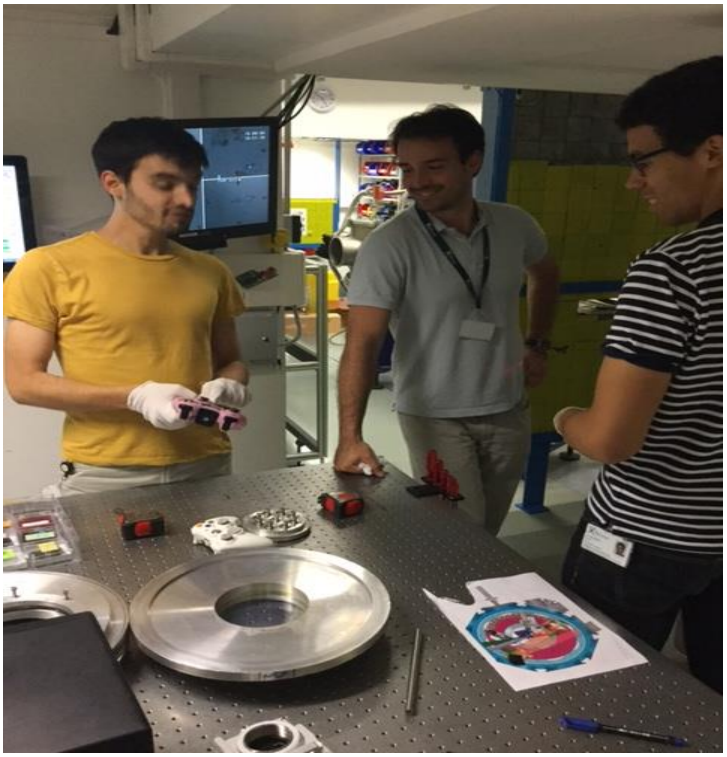
1. 

Photo 1: Researchers originally from France, Slovenia, and the Netherlands are part of our collaborative experiment with Oxford University, on the ELFIE ultra-intense laser facility at Ecole Polytechnique in Paris (summer 2017).