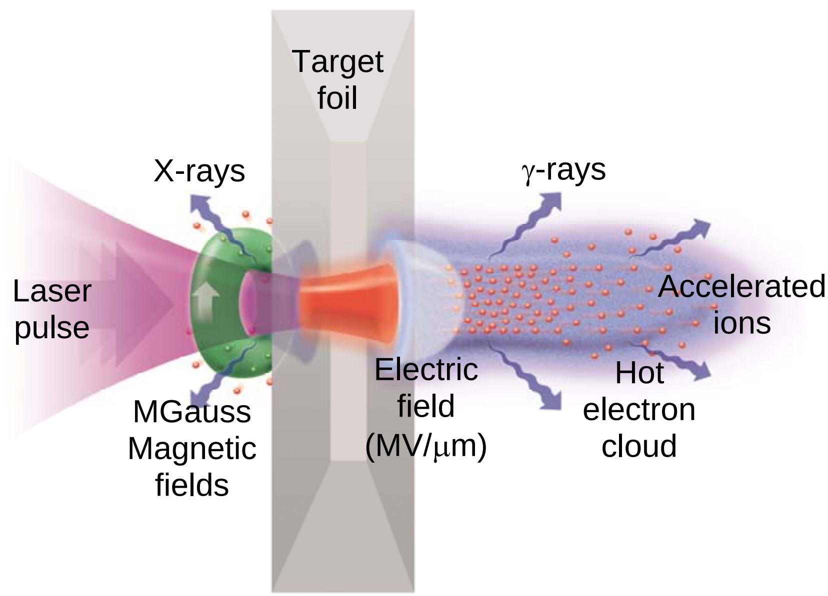
New advances towards laser-driven ion sources

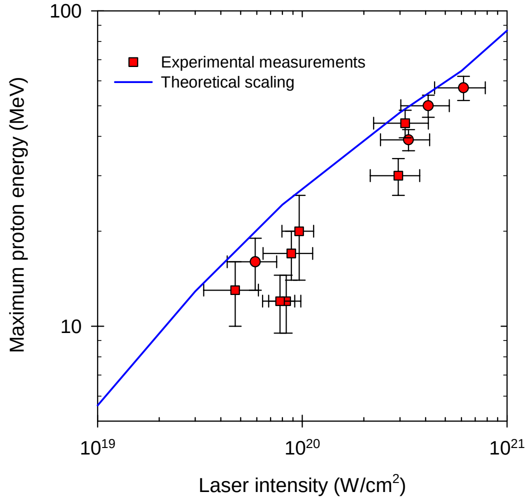
Scientists from Strathclyde and Paisley are amongst a consortium of eight UK institutions which has recently secured £4.6M funding from EPSRC under the Basic Technology scheme to develop high power laser driven ion sources. The LIBRA (Laser Induced Beams of Radiation and their Applications) project aims to develop ion production from high-repetition, ultrashort laser pulses as a reliable, generic technology. The joint Strathclyde-Paisley SUPA contribution is led by Dr. Paul McKenna and the team includes Dr. Wilfried Galster, Professor Dino Jaroszynski, Professor Ken Ledingham and Dr. Klaus Spohr. The project is headed by Queens University Belfast and the other partners in the collaboration are Rutherford Appleton Laboratory, Imperial College London, Surrey University Ion Beam Centre, University Hospital Birmingham and Southampton University.

The 4-year project will concentrate on developing high power laser-based sources of protons, heavier ions and gamma rays. The specific objectives are to develop the relevant technology for high-flux, high-repetition source delivery and characterisation. These will be achieved via a combination of innovative developments in target production and delivery, detector technology, beam property optimization and control.



Schematic illustrating ion acceleration driven by the interaction of a high power laser pulse with a thin foil target.

The possibility of using high power lasers to generate high-quality beams of energetic, multi-MeV, ions is attracting large global interest. In a recent study, published in *Nature Physics* 3, 58 (2007) Dr. Paul McKenna and co-workers use the presently most powerful laser in the world, the Vulcan Petawatt laser at the Rutherford Appleton Laboratory, to extend the energy and intensity range over which proton scaling is experimentally investigated. These are extended by an order of magnitude, compared to previous studies, up to 400 J and 6×10^{20} Wcm^{-2} respectively. The results provide important new understanding of the scaling of proton acceleration in this ultraintense laser pulse regime and are an important step towards potential applications of laser-driven proton sources.



Proton energy scaling with laser intensity. From Nature Physics 3, 58 (2007)

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