Laser Acceleration of Protons and Ions at Salamanca

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A series of experiments aiming to accelerate protons and light ions with lasers of ultra-high intensity is currently under preparation at Salamanca (Spain).** The host institute, the Spanish Pulsed Laser Centre (CLPU), is a national facility providing several high-power lasers for research as well as industrial applications. Two of its VEGA lasers, with 20 and 200 TW pulsed power, are currently equipped for laser-plasma experiments. The third phase of VEGA with 1 PW pulsed power will be operative at the end of 2014. The Institute for Instrumentation in Molecular Imaging (I3M, Valencia) is contributing to the experiments with particle detectors for the characterisation of the accelerated ions as well as suitable laser targets. The third partner of our collaboration, the spin-off company Proton Laser Applications (PLA), is developing compact and innovative, high-power laser systems.

Our principal goal is to provide equipment for medical applications such as the production of radiopharmaceuticals. Many short-lived isotopes are currently produced at relatively large cyclotron facilities. Compact, laser-based ion accelerators are a promising alternative. Since this technology is expected to be cheaper and of smaller size, laser-driven devices may be installed in close vicinity to the treatment centre and allow for a cost-effective fabrication of a broad range of medically relevant isotopes. Their realisation requires the development and optimisation of many components of the setup. Our initial goal is to demonstrate the acceleration of large numbers of protons to sufficiently high energies (around 10 MeV). This basic research will be conducted at the CLPU lasers. In parallel, PLA is developing a novel laser source with high energy and repetition rate.

We present in detail our experimental setup, the contributions of the three collaborators, and first test results of our particle detectors.

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