

Spatio-Spectral deconvolution of dosimetric film detectors

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Project Background:

Laser-driven proton acceleration is one of the most active areas of research given the recent development of short-pulse, high-intensity lasers [1]. The properties, such as high brightness, laminarity and short pulse duration, have made the laser-driven ion beams highly suitable for a wide range of applications in science, industry and healthcare (for instance, proton therapy). Among the diagnostics available for characterisation of the laser-driven protons beams, Radiochromic film (RCF) stack detectors [2] are most widely deployed in experiments due to their unique ability to provide, simultaneously, the spatial and spectral properties of the incident beam with high resolution.

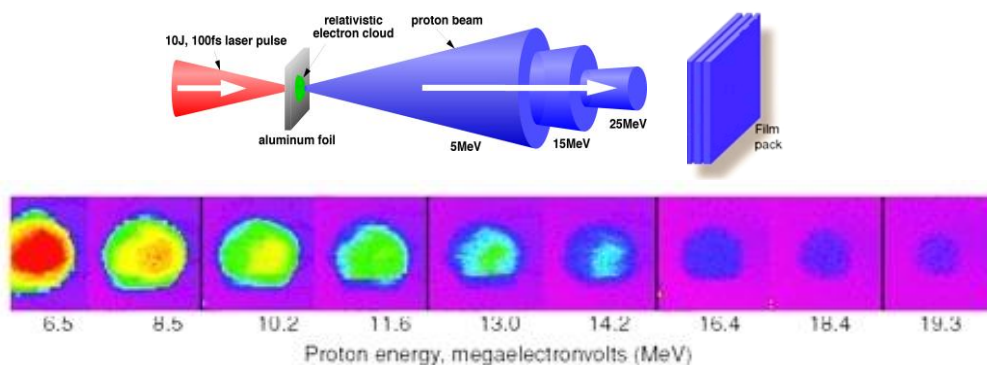


Figure 1 – Typical RCF data showing the spatio-spectral dose distribution of multi-MeV, broadband proton beams obtained in laser-plasma experiments.

Project Description:

The project aims to develop a Matlab program with Graphical user interface (GUI) to perform dosimetry and spectral deconvolution of the data obtained by the Radiochromic film detectors. The code will incorporate algorithms already developed by the group, and integrate into a user-friendly kit in order to enable accurate and rapid analysis.

Physics skills/knowledge gained

Laser-plasma interaction, particle beam characterisation, Matlab programming

References

- [1] A. Macchi *et al.*, "Ion acceleration by superintense laser-plasma interaction", *Review of Modern Physics*, **85**, 751 (2013)
- [2] F. Nurnberg *et al.*, "Radiochromic film imaging spectroscopy of laser-accelerated proton beams", *Review of Scientific Instruments*, **80**, 033301 (2009)