Imaging for proton therapy

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Proton Therapy is a sort of radiotherapy, which uses proton beams to irradiate cancerous tissues. The energy deposition in matter of a proton beam is characterised by a low entrance dose, a very energetic peak (the Bragg-peak) and a sharp distal fall-off, which has the potential of sparing healthy tissues after the tumour, as well as treat tumours closer to critical organs. For this reason, an accurate range estimation is crucial in proton therapy. Research on different imaging techniques has been the focus of many groups to improve range and dose distribution prediction and, in the future, to perform in-vivo range verification, by detecting photons that result from the nuclear interactions between protons and tissues.
This talk will cover the general aspects of proton therapy as well as different imaging techniques used for treatment planning, with special focus on the potential of Dual-Energy Computed Tomography for an accurate tissue segmentation. Moreover, the two main physics processes to perform in-vivo range verification - PET and prompt gamma emission - will be addressed.