Oxford ALP seminar on
Monday, March 1 at 12:30 CET

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Plasma accelerators for applications in health, photon science, and particle physics

Plasmas provide substantial miniaturization potential for sources of high-energy charged particle beams owing to their capability to sustain electric fields beyond GV/m, thereby outperforming state-of-the-art metallic radio-frequency accelerators by orders of magnitude. In recent years, substantial progress in beam quality and beam control from plasma-based accelerators has been demonstrated. This progress was accompanied by advances in the fidelity of beam characterization and often relied on combining novel plasma-based schemes with modern concepts from traditional accelerator science including intelligent feedbacks, high-resolution diagnostics, and advanced machine controls. As a consequence, plasma technology is on the verge of becoming a viable and attractive option to power first compact applications in photon science and health with potentially profound societal impact. At the same time, these developments are essential steps toward the ultimate goal: the construction of a plasma-based collider for particle physics, for which aspects such as acceleration efficiency, average power, and particle energies at the TeV frontier become critical challenges.

In this seminar, recent highlight results from the laser- and beam-driven plasma accelerator programme at DESY (Hamburg, Germany) will be presented and discussed in the context of the aforementioned target applications. This includes plasma accelerator R&D on the path to novel medical imaging modalities, compact free-electron lasers, and high-efficiency energy-booster modules suitable for upgrades of existing and future facilities in photon science and particle physics