RECENT DEVELOPMENTS AT THE *INTENSE LASER IRRADIATION LABORATORY*

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The research activity of the Intense Laser Irradiation Laboratory (ILIL) at Istituto Nazionale di Ottica in Pisa is focused on fundamental studies of high-intensity laser interaction with matter and their applications. The Laboratory participates to the European Infrastructures EuPRAXIA, ELI and HiPER+ and is a member of the Laserlab-Europe AISBL. Fundamental studies include plasma formation and heating by intense laser beams, laser-induced instabilities and other non-linear processes, atomic physics of highly-ionised plasmas, ultrashort X-ray emission and acceleration of charged particles. In these areas the Laboratory has well established collaborations with many leading international High-Power Laser Laboratories and Facilities, as well as Academic Groups and features a long-term experience in the training of young scientists through several schemes including European Doctoral Networks.

Since 2022, the Lab is engaged in the implementation of the IPHOQS (Integrated Infrastructure in Photonics and Quantum Sciences) and EuAPS (EuPRAXIA Advanced Photon Sources) Infrastructures in the framework of the Italian Recovery and Resilience Plan (PNRR). ILIL is also part of the PNRR Tuscany Health Ecosystem “THE” for the development of novel radiation sources for Advanced Radiotherapy radiation sources. The implementation of these activities includes a major upgrade of the civil infrastructures and significant updates of the laser and diagnostics equipment geared towards high average power, high repetition rate operation and societal applications. A description of the current and soon-available instrumental and experimental capabilities will be given, also in view of collaborative and excellence based user operation.