

# HIGH -RESOLUTION X-RAY PHASE-CONTRAST IMAGING OF PLASMA HYDRODYNAMICS PHENOMENA WITH XFEL PROBE

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Using X -ray free electron laser (XFEL) and fluorescent crystal detection the development of plasma instabilities in laser generated plasma flows is studied with unprecedented resolution. For the first time a plasma turbulent spectrum is measured down to Kolmogorov scale. For the first time, the study of the dynamics of a plasma flow with micrometric resolution over a large field of view (several  $mm^2$ ). This work paves the way towards a better understanding of numerous systems, for instance star formation, large scale instabilities, or cosmic rays acceleration in astrophysics, as it allows one to directly compare experimental results to theory and numerical simulations.