With the advent of tunable XUV light sources such as the free electron laser FERMI studying resonant light scattering by small particles has become possible. In particular, He nanodroplets can serve as model systems to investigate plasma formation as well as plasma dynamics by extracting the complex refractive index from scattering patterns obtained in a single-shot single-particle experiment.

Recently, such kind of experiment has been started at the FERMI free electron laser’s low density matter beamline [1]. In order to measure single-cluster scattering patterns, a cluster source was set up using an Even-Lavie-valve to generate a stable pulsed He cluster beam. Scattering patterns of large He nanodroplets (<*N*> = 3 x 109 atoms per cluster) have been recorded at photon energies ranging from 19 eV to 37 eV giving an insight into the droplets’ optical properties as well as a direct measure of their size distribution.

[1] Lyamayev, V. et al., *A modular end-station for atomic, molecular, and cluster science at the low density matter beamline of FERMI@Elettra*, J. Phys. B, **46** (2013)