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Recent results of a laboratory astrophysics experiment performed to study Rayleigh-Taylor instabilities.

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The superposition of a dense fluid above a lighter one in a gravitational field is prone to the well-known RayleighâĂŞTaylor instability (RTI). Any modulation of the interface between the fluids will grow exponentially at the linear stage, then will saturate at the nonlinear stage when fingers of the heavier fluid start to sink in the more buoyant one. RTI and related processes have found applications in various astrophysical settings, such as the expansion of supernova remnants (Ribeyre X. et al. - 2004) (where inertial acceleration plays the role of the gravitational field), the interiors of red giants, subject to thermohaline mixing (Charbonnel C. et al. - 2010), or interstellar gas clouds pushed above the galactic plane. In SNe, where the second pic of luminosity is, according to the actual consensus, due to the mixing of the internal layers of the dying star with the photosphere thanks to RTI (Zweibel E. - 1991).
Following an experiment performed on the Sacla X-ray Free Electron Laser facility in June 2021 an investigation of RTI has been done. The utilization of foams with different densities have permitted us to study dynamics of RTI with different Atwood numbers with a spatial resolution never reached before. Several models of mixing zone are confronted. Moreover, compared to a previous experimental campaign and related publication (Rigon G. - 2021) a more precise study of the turbulence stage is now possible and is able to check observations made in the power spectrum.