HEDLA 2022
13th International Conference on High Energy Density Laboratory Astrophysics
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Jets at all scales: from the non-thermal sky to the laboratory

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Of all the processes in the Universe, the bipolar ejection of collimated plasma outflows from the inner regions of the accretion disc around a central object are among the most remarkable. The shocks that form in the highly supersonic jets are ideal sites for particle acceleration. By combining multi-wavelength observational data, numerical simulations and plasma physics we study diffusive shock acceleration, magnetic field amplification and high energy emission in jets from active galactic nuclei and protostars, as well as in supersonic outflows in classical novae. We show that the coexistence of an adiabatic and a radiative shock is very promising for particle acceleration and high-energy emission. Furthermore, the parameters for scaled laboratory experiments are very much in line with plasma conditions achievable in high-power laser facilities opening the door to new means for studying novae outflows never considered before.