

High-Power Optical Vortices – From Generation to Application (HiPOVor)

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Marie Skłodowska-Curie Actions, Doctoral Network

(2026-01-01 - 2029-12-31)



**Finansowane przez
Unię Europejską**

The use of high-power optical vortex beams has been predicted to provide substantial benefits to many applications ranging from more precise material processing to advanced particles accelerators. However, progress has been hampered by the absence of approaches for their generation while maintaining their unique properties during propagation and/or interaction with matters. The overall aim of HiPOVor is to train 15 ESRs to be the first generation of a workforce skilled in all aspects concerning the generation of optical vortices with high power and high modal purity and its application as a key enabling technology widely in light-matter interaction aspects. Through the completion of interconnected individual projects in topics all together covering the full development chain, ranging from components suitable for their generation and fundamental aspects of their physical properties, to amplification, propagation in different environments and applications, the doctoral candidates will develop expert skills and knowledge to drive forward the field of high-power optical vortices. The HiPOVor network will address gaps both in terms of technology and applications, and in terms of personnel through the innovative research approaches. The interdisciplinary and intersectoral consortium consists of 8 leading academic institutions in the field of structured light and high-power laser development, the world's most powerful laser infrastructure ELI-NP, as well as 9 industrial partners, highlighting the high potential of and interest in our project for rapid market uptake. The results of our project promise significant impacts in strengthening Europe's scientific excellence. It will enable new products and improved processes, e.g. optical components and nanofabrication, and environmental benefits through building of a circular economy, reduction of harmful chemical, and reduction of size and power cost of hardware via advanced technologies predicting by high power vortices.