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3D polarisation of a structured laser beam and prospects for its application to charged particle acceleration

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A Structured Laser Beam (SLB) is a type of optical beam with spatially inhomogeneous 3D polarisation structures. Generating SLBs from vector beams allows the creation of Hollow Structured Laser Beams (HSLB) with a dark central core. In this way, atypical electric and magnetic field vectors, which are purely longitudinally polarized in the dark zones of the beam, are obtained. The SLB spatial distribution can also include regions with both the electric and magnetic fields longitudinally polarized and oriented in the same or opposite directions. The SLB has a transverse distribution similar to that of a Bessel beam but can theoretically propagate to infinity, therefore giving the potential to generate strong, longitudinally oriented electric fields over long distances, which could possibly allow the acceleration of charged particles. The results of the study of this phenomenon, including simulations of the spatial distribution of the electromagnetic field components, are presented in this paper.

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Footnotes

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Yes

Primary author: POLAK, Krystof (European Organization for Nuclear Research)

Co-authors: GAYDE, Jean-Christophe (European Organization for Nuclear Research); SULC, Miroslav (Technical University of Liberec)

Presenter: POLAK, Krystof (European Organization for Nuclear Research)

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