

Layer Beams and their prospect for long-range alignment

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As part of the study on using structured laser light for alignment, an innovative technique is proposed for generating symmetrical pseudo-non-diffracting layers of caustic optical beams, known as Layer Beams (LB). The state of the art for producing similar beams consists of using spatial light modulators. Our approach is based on the design of a generator with a specific arrangement of cylindrical lenses that shapes the wavefront to create an LB. The intensity distribution of the LB in a plane transverse to the direction of propagation, shows parallel lines whose number varies with the distance from the generator. Our experiments, conducted in a 140-meter-long optical laboratory facility, demonstrated successful propagation over the entire available distance, with the thickness of the transverse lines in the order of a millimetre. This approach considerably reduces the complexity and cost of such a system compared to LBs generated using spatial light modulators. This paper summarises the main aspects of this research, highlighting the potential of using LBs for aligning accelerator components over long distances.

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