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Validating and correcting paraxial representations of real light[1]
ALEXANDER WEAVER, University of Florida, GUDRUN WANNER, Albert Einstein Institute, PAUL FULDA, GUIDO MUELLER, University of Florida — Paraxial mode decompositions of a beam are a powerful tool to circumvent classical diffraction integrals for the propagation of a light distribution. Hermite Gauss modes provide a complete basis of functions to build any planar light distribution out of, and paraxial propagation of these modes is as simple as updating a modes q-factor. These modes are widely used in the laser community as they are also eigenfunctions of many optical resonators. They can even be used to, for example, accurately model light transmitted from one spacecraft to the next within the constellation of the upcoming Laser Interferometer Space Antenna (LISA) mission, as well as modeling the effects of wavefront aberrations to these beams. We discuss the validity of the paraxial wave approximation in the far field as a function of the diffraction angle or waist size. We go on to discuss the proper propagation matrix through free space between these modes as a correction to the paraxial propagation matrix i.e. the Identity.

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