Abstracts

Propagation of Light Beam through Lens-Like Media with Complex Permittivity

S. Sawa. "Propagation of Light Beam through Lens-Like Media with Complex Permittivity." 1975 Transactions on Microwave Theory and Techniques 23.7 (Jul. 1975 [T-MTT]): 566-575.

Primary characteristics of the light beam propagation through a complex-permittivity lens-like medium are investigated in more detail than in previous papers, with the help of approximate wave theory. Explicit general expressions for the spot size and the curvature of the phase front of a Gaussian beam as well as the real-valued ray transfer matrix are derived, and detailed numerical investigations are presented. The existence of a new type of propagation, in which the light beam propagates with constant amplitude of undulation, neither converging nor diverging, is pointed out. Furthermore, precise conditions are given for the occurence of convergent, divergent, and critical propagation, and the corresponding profiles of the real and imaginary parts of the complex permittivity in the transverse cross section are illustrated. The results of this paper will be useful for the evaluation of the effects of loss distributions inherent in practical optical fibers consisting of lens-like media, and also for the analysis or synthesis of laser resonators or amplifiers including a loss or gain distribution.

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