Analyzing the Propagation of Electromagnetic Radiation for Plane-Symmetric, non-FRW Early Universe Cosmologies

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Abstract

The pre-homogenized very early universe generically experiences Mixmaster behavior as it approaches the Big Bang, featuring a sequence of expanding Kasner-like epochs. In previous work, this author has solved the Einstein-Maxwell equations exactly for certain special Kasner cases, and has derived a set of equations for electromagnetic propagation for all cases of the Kasner expansion power coefficients. It is known that a simple transformation connects the (2/3, 2/3, -1/3) Kasner case to a metric obtained by Kuang, Li, and Liang, which can easily be extended to inhomogeneous, plane-symmetric cosmological metrics that are filled with pure radiation. Such metrics are more representative of a realistic early-universe model than the vacuum Kasner cases. In this research, the formalism and wave propagation equations previously obtained by this author are studied analytically and numerically, in order to obtain an understanding of light wave propagation in these inhomogeneous but highly symmetrical cosmological metrics.