



General Relativity and Quantum Cosmology

The Wave Equation in a General Spherically Symmetric Particlelike Geometry

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We consider the Cauchy problem with smooth and compactly supported initial data for the wave equation in a general class of spherically symmetric geometries which are globally smooth and asymptotically flat. Under certain mild conditions on the far-field decay, we show that there is a unique globally smooth solution which is compactly supported for all times and $\lim_{t \rightarrow \infty} \text{decays in } L^{\infty}_{\text{loc}}$ as t tends to infinity. Because particlelike geometries are singularity free, they impose additional difficulties at the origin. Thus this study requires ideas and techniques not present in the study of wave equations in black hole geometries. We obtain as a corollary that solutions to the wave equation in the geometry of particle-like solutions of the SU(2) Einstein/Yang-Mills equations decay as $t \rightarrow \infty$.

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