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General Relativity and Quantum Cosmology

The Wave Equation in a General Spherically Symmetric Black Hole Geometry

Matthew P. Masarik

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We consider the Cauchy problem for the wave equation in a general class of spherically symmetric black hole geometries. Under certain mild conditions on the far-field decay and the singularity, we show that there is a unique globally smooth solution to the Cauchy problem for the wave equation with data compactly supported away from the horizon that is compactly supported for all times and \emph{decays in L^{∞}_{loc} as t tends to infinity}. We obtain as a corollary that in the geometry of black hole solutions of the SU(2) Einstein/Yang-Mills equations, solutions to the wave equation with compactly supported initial data decay as t goes to infinity.

Comments: Editorial revisions made to first version; this version contains no substantive changes

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