

Smoothness at null infinity and the structure of initial data

Helmut Friedrich

Gravitation and Geometric Analysis

Max-Planck-Institut fuer Gravitationsphysik

Am Muehlenberg 1

Potsdam, 14476

GERMANY

Abstract

We discuss the regular finite initial value problem at space-like infinity for the conformal vacuum field equations. It is shown that the regularity of the solutions at the critical sets I^\pm , at which the cylinder I at space-like infinity touches null infinity \mathcal{I}^\pm , implies conditions on the initial data which can be narrowed down as lying between two explicitly given geometric conditions. It is shown that there exists a large classes of data for which the fields extend on I smoothly to I^\pm up to a given or at all orders. These data are expected to lead to differentiability and conformal structures at null infinity of prescribed smoothness. They offer possibilities to calculate numerically entire space-times, including their asymptotics and their radiation fields, on finite grids.