

SYMMETRIES OF VACUUM SPACETIMES WITH A COMPACT CAUCHY HORIZON OF CONSTANT NON-ZERO SURFACE GRAVITY

We prove that any smooth vacuum spacetime containing a compact Cauchy horizon with surface gravity that can be normalised to a non-zero constant admits a Killing vector field. This proves a conjecture by Moncrief and Isenberg from 1983 under the assumption on the surface gravity and generalises previous results due to Moncrief-Isenberg and Friedrich-Rácz-Wald, where the generators of the Cauchy horizon were closed or densely filled a 2-torus. Consequently, the maximal globally hyperbolic vacuum development of generic initial data cannot be extended across a compact Cauchy horizon with surface gravity that can be normalised to a non-zero constant. Our result supports, thereby, the validity of the strong cosmic censorship conjecture in the considered special case. The proof consists of two main steps. First, we show that the Killing equation can be solved up to any order at the Cauchy horizon. Second, by applying a recent result of the first author on wave equations with initial data on a compact Cauchy horizon, we show that this Killing vector field extends to the globally hyperbolic region.