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In work done several years, we showed that if an analytic spacetime satisfies Einstein's vacuum field equations and contains a compact Cauchy horizon with closed null geodesic generators, then the spacetime must admit a nontrivial isometry group. Further, the Cauchy horizon must be a Killing horizon, in the sense that there exists a Killing vector field tangent to the horizon generators. These results have been used by Chrusciel to prove that analytic stationary (non static) black holes must be axisymmetric, and their event horizons must be Killing horizons.

We are now completing work which shows that our results hold even if the horizon generators are not closed. Indeed, we find that if the generators are not closed, the isometry group must be at least two dimensional, and must contain a 2-torus subgroup acting freely. The same techniques used in proving this result can be used to show that the event horizons in higher dimensional stationary black holes and black rings must be Killing. (Received February 28, 2006)