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Reflection Symmetry in Higher Dimensional Black Hole Spacetimes[1] ROBERT WALD, JOSHUA SCHIFFRIN, University of Chicago — It is well known that for any 4-dimensional asymptotically flat, stationary, and axisymmetric vaccum solution of Einstein's equation, there exists a t-ϕ reflection isometry that reverses the direction of the timelike Killing vector field and the direction of the axial Killing vector field. However the proof of this result does not generalize to higher spacetime dimensions. Here we consider asymptotically flat, stationary, and axisymmetric (i.e., having one or more commuting rotational isometries) black hole spacetimes in vacuum general relativity in $d \geq 4$ spacetime dimensions such that the action of the isometry group is trivial. We prove that there exists a t-ϕ reflection isometry that reverses the direction of the timelike Killing vector field and the direction of each axial Killing vector field. The proof relies in an essential way on the first law of black hole mechanics.

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Robert Wald
University of Chicago

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