Seminar

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Wednesday, August 22, 2 p.m., HH3017

Uniqueness of Extremal Kerr-Newman Isolated Horizons: Quasilocal Intrinsic Structure, Near-Horizon Geometry and Distortion of Extremal Horizons

Abstract:

Our work begins with ref.[14] in which Lewandowski and Pawlowski obtained the unique solutions to the field equations restricting axisymmetric and electrovacuum extremal isolated horizons (IHs). After reviewing the boundary conditions and generic geometry of IHs, we construct the on-horizon data using the local uniqueness solutions. Subsequently, we extend the adapted tetrad on an IH to cover the external regions and develop the method to reconstruct the near-horizon geometry of extremal IHs embedded in electrovacuum. This quasilocal method is applied to rebuild the near-horizon metrics of extremal Reissner-Nordström and Kerr horizons, which prove to be equivalent with those derived from the near-horizon limit of the corresponding global metrics. These results confirm that the local solutions describe the intrinsic structure of extremal Kerr-Newman-family horizons. The solutions lead to the first uniqueness theorem from quasilocal definitions of black holes, and this theorem implies that the intrinsic structure of extremal Kerr-Newman horizons cannot be distorted by external energy-matter distribution. This conjecture is examined and verified in confor- mastatically distorted extremal Reissner-Nordström spacetime.