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Mass-angular momentum-charge inequality in minimal supergravity

Recently, the investigation of general relativity in higher dimensions ($D \geq 5$) has attracted a great deal of interest for a number of physical reasons, such as string theory. The minimal supergravity is the simplest supersymmetric generalization of general relativity in higher dimensions. In practice, string theories are often analyzed within the supergravity approximation. In this talk, I will give a brief review of geometric inequalities in higher dimensions. In particular, I will present a proof of mass-angular momentum-charge inequality for a broad class of maximal, asymptotically flat, bi-axisymmetric initial data within the context of 5-dimensional minimal supergravity. I further show that the extreme charged Myers-Perry black hole initial data are the unique minimizers. Finally, I will present a rigidity statement for the relevant BPS bound, and give a variational characterization of BMPV black holes (This is a joint work with Marcus Khuri and Hari Kunduri).