Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Stability for the Positive Mass Theorem and the Penrose inequality

By

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Let (M^3, g) be a complete, smooth, asymptotically flat 3-manifold which has nonnegative scalar curvature, ADM mass $m(g)$, and an outermost minimal boundary with area A. The Riemannian Penrose inequality states that $m(g) \geq \sqrt{\frac{A}{16\pi}}$, and the equality holds if and only if (M^3, g) is isometric to the Schwarzschild 3-manifold of mass $m(g)$. In particular, this implies the Positive Mass Theorem, which states that $m(g) \geq 0$, and $m(g) = 0$ if and only if (M^3, g) is isometric to the Euclidean 3-space $(\mathbb{R}^3, g_{\text{Eucl}})$. We show that when $m(g)$ is almost zero, (M^3, g) is close to the Euclidean 3-space in the pointed measured Gromov-Hausdorff topology modulo negligible spikes; when $m(g)$ is almost equal to $\sqrt{\frac{A}{16\pi}}$, (M^3, g) is close to the Schwarzschild 3-manifold in the pointed measured Gromov-Hausdorff topology modulo negligible spikes and boundary area perturbations.

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