CUPhysics

Physics Theory Seminar

Monday, September 18, 2017 / Pupin Hall Theory Center, 8th Floor / 2:10 PM

"What's inside a BH? Probing the interior of black holes with gravity waves"

The detection of gravitational waves from black hole (BH) mergers provides an inroad toward probing the interior of astrophysical BH's. The view in general relativity of the interior of a BH as a region of empty space except for a possibly singular core appears to be in contradiction with the laws of quantum mechanics and so cannot be correct. I will describe a simple method for answering the following question: Does the BH interior contain some distribution of matter or is it mostly empty? The proposal is premised on the idea that any BH-like object whose interior has some matter distribution should support fluid modes in addition to the conventional and universally present spacetime modes. The fluid modes oscillate at a lower frequency, decay at a slower rate and produce weaker gravitational waves than do those of the standard BH spacetime modes. Hence, they imprint a distinct signature of the interior in the gravitational-waves emitted from a BH merger. We find that interesting bounds can already be placed by current gravitational-wave observations and that future observations with Advanced LIGO's design sensitivity may allow the detection of the imprint of the interior modes.

Ram Brustein, Ben-Gurion University