



TOHOKU FORUM for CREATIVITY

Tohoku Forum for Creativity Thematic Program 2015

Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information

International Workshop on Strings, Black Holes and Quantum Information

Super-Entropic Black Holes

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Schedule:

Wednesday, September 9, 9:30-10:30

Place:

TOKYO ELECTRON House of Creativity 3F, Lecture Theater
Katahira Campus, Tohoku University

Abstract:

Black Hole Chemistry is a new perspective on black hole thermodynamics, one that indicates that once vacuum energy is taken into account, black holes behave more like chemical systems. As a consequence mass becomes chemical enthalpy, the notion of a thermodynamic volume appears, and black holes exhibit a broad range of chemical phenomena, including liquid/gas phase transitions similar to a Van der Waals fluid, triple points similar to that of water, and re-entrant phase transitions that appear in gels. One conjecture to follow from this program is that the entropy of an AdS black hole is bounded above by a function of its thermodynamic volume via a relation known as the Reverse Isoperimetric Inequality. Here I construct a new class of rotating AdS black holes that provide counterexamples to this conjecture. They are formed by taking a new ultraspinning limit to the Kerr-AdS class of black holes, yielding objects whose event horizons are non-compact but have finite area. The structure of the spacetime is qualitatively changed since it is no longer possible to return to a frame that does not rotate at infinity. I shall present both the construction of these “super-entropic” black holes and their implications for black hole thermodynamics.