

The 10th PUBLIC ExU COLLOQUIUM

Co-organized by Nagoya University Institute for Advanced Research (IAR) and
Kobayashi-Maskawa Institute for the Origin of Particles and the Universe (KMI)

February 6th (Fri.) ONLINE

TALK 11:30 - 12:30 (JST)

February 6th (Fri.) 2:30 - 3:30 (GMT)

Registration required (click [HERE](#))



Speaker

[Prof. Stefan Hollands](#)

University of Leipzig

Extreme Universe, JAPAN



MEXT -KAKENHI- Grant-in-Aid for Transformative Research Areas (A)
The Natural Laws of Extreme Universe

Negative Energy

Abstract

Ordinarily, the actual energy is not physically significant but only energy differences are. But in general relativity, the absolute energy (density) appears on the right side of the Einstein equations as a component of the stress tensor. In this colloquium I explore how negative energy densities are thereby related to exotic phenomena such as warp drive spacetimes or wormholes. I outline how quantum fluctuations enable negative energies and can be tiny, e.g. in the halos of black holes, or astronomical, e.g. inside black holes. In many interesting cases, the laws of physics limit the amount of possible negative energy. Such laws, such as the quantum null- or quantum dominant energy conditions, can be seen as a fundamental bridge between gravity and quantum information.

Extreme
Universe  2026