



量子物理学・ナノサイエンス第 377 回セミナー

What is the gravitational energy inside an empty ball?

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概要

Gravity manifests itself as curvature of spacetime, and its strength can be measured by considering the variations of radius, area and volume of small balls with respect to their counterparts in flat spacetime. These variations can actually be put in relation, via the Einstein field equations, with the energy density of matter at the ball's centre. In this talk I will also consider what happens when the ball is empty, so that the matter energy density vanishes. The elementary geometric quantities still feel the effect of pure gravity, leading to variations that should be related to the pure gravitational strength or, in simple words, to the gravitational energy density. These variations now involve terms quadratic in the curvature that can be appropriately put in connection with the Bel-Robinson tensor. New estimations of quasi-local gravitational energy arise. Basic examples and possible applications will be discussed.

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