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Can particle creation by a black hole be described in terms of more familiar laboratory processes?

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Abstract

Particle creation by a black hole is described in terms of temperature corrections to the Casimir effect. The results of Levin, Polevoy, and Ritov for spectral and total Poynting vector for a fluctuating electromagnetic field in a plane vacuum gap between two arbitrary media with different temperatures in flat spacetime are applied to clarify the situation that exists between the horizon of a nonrotating black hole and spatial infinity. This helps to reveal the mechanism of particle creation. The Hawking radiation is "born" inside the "bell" formed by a potential barrier of a black hole in all the region [2 M, ∞]. Its blackbody spectrum is due to the interaction of field fluctuations with the surface of the "bell." The particles between the "walls" are virtual ones. They can become real after passing through the [3 M, ∞] tail, appearing to an observer at future infinity J+ as "real" ones. The arguments for and against the present standpoint are discussed. © 1987 Plenum Publishing Corporation.

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