# Black Hole Explosions: The Highest Temperatures in the Universe

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**Abstract**

Microscopic black holes explode by emitting Hawking radiation with a temperature varying inversely as their mass. Such explosions would lead to the highest temperatures in the present universe, all the way to the Planck energy. For example, about eight minutes before it expires, a black hole has a mass of $10^{10}$ grams, a Schwarschild radius of $1.6\times10^{-5}$ fm, and a temperature of 1 TeV. Whether or not a quasi-stationary shell of matter undergoing radial hydrodynamic expansion surrounds such black holes is controversial. This issue is approached by applying the equations of relativistic viscous fluid dynamics. It is shown that a self-consistent picture emerges of a fluid just marginally kept in local thermal equilibrium; viscosity is a crucial element of the dynamics. The spectra of photons, electrons and positrons, neutrinos, and other particles emerging in the black hole wind are calculated, and the possibility of observing them in high energy cosmic ray detectors is discussed.

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