

Transonic flow of light, sonic horizons and analogue gravity

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In 1981 W.G. Unruh predicted that a thermal spectrum of sound waves would be emitted from the sonic horizon in transonic fluid flow, in analogy to black-hole evaporation. Based on this idea, extended to the realm of nonlinear optics, we explore an optical analog of the Laval nozzle, in which light propagation through a suitably shaped waveguide, filled with a self-defocusing nonlinear medium, mimics the transonic acceleration of a real fluid expanding through a propulsive exhaust nozzle. Experimental demonstrations of transonic flow in prototype optical nozzles will be presented, and the prospect of observing fluctuations that are classical analogs of Hawking radiation will be discussed.