Generation of Coherent Light by a Moving Medium

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ABSTRACT

We show that steady nonuniform motion of a medium through an optical resonator can yield light amplification at the resonator frequency. High gain can be achieved if at the generated frequency the medium refractive index is close to zero or the medium has a very strong frequency dispersion. We also discuss an analogy between light amplification by a moving medium and the generation of sound waves when gas flows along a tube with acoustically closed-open boundaries.

Figure: Dielectric medium flows in a tube with mirrors at the edges. Numerical solution of with refractive index \( n = 1.8 \) \( V_0 = 0.05c \) (a) and \( V_0 = -0.05c \) (b) and Gain per unit time \( G \) as a function of \( V_0 \) (c).

1 Generation of Coherent Light by a Moving Medium, A. Svidzinsky, F. Li, and X. Zhang, Phys Rev Lett118, 123902 (2017)