Electromagnetic wave collapse in a radiation background
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Abstract: The nonlinear interaction, due to quantum electrodynamical (QED) effects, between an electromagnetic pulse and a radiation background is investigated, by combining the methods of radiation hydrodynamics with the QED theory for photon-photon scattering. For the case of a single coherent electromagnetic pulse we obtain a Zakharov-like system, where the radiation pressure of the pulse acts as a driver of acoustic waves in the photon gas. For a sufficiently intense pulse and/or background energy density there is focusing and subsequent collapse of the pulse. The relevance of our results for various astrophysical applications are discussed.