Sufficient conditions for unbounded superradiance in black hole spacetimes sourced by nonlinear electrodynamics

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Recently, it has been reported that black holes (BHs) sourced by nonlinear electrodynamics (NED) can trigger unbounded superradiance, i.e., the total absorption cross section — the ratio between the absorbed flux and the incident flux of the wave — can be negative and unbounded from below. Considering the propagation of massive charged test scalar fields in the vicinity of electrically charged BH solutions based on the NED framework, we derive sufficient conditions to have an unbounded superradiant regime. Our results apply to a broad family of electrically charged BH solutions (regular and singular) derived in the framework of NED minimally coupled to general relativity.

Keywords: black holes; nonlinear electrodynamics; scalar fields; superradiance

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