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Title: Photon-plasma interactions in curved spacetime

Abstract: Astrophysical plasma may play a crucial role in the stability problem of black holes (BHs). In fact, within the context of General Relativity (GR) it is possible that spinning BHs could be affected by a plasma-driven superradiant instability. Electromagnetic waves scattering off a spinning BH can extract rotational energy from it through a phenomenon called superradiance. Interestingly, these modes can be naturally confined by astrophysical plasma in the vicinity of the BH, leading to an instability and a spin-down of the BH. This proposal could potentially explain the low values of the LIGO/Virgo BH spins, and has been also advocated as a possible explanation for the origin of fast radio bursts. Given the interesting phenomenological implications, a detailed understanding of this interaction is therefore crucial. In this talk, I will show how BHs surrounded by a tenous plasma are potentially unstable to plasma-driven superradiant instabilities at a linear level, but several mechanisms such as non-linear interaction and accretion hamper this instability and prevent the system to turn unstable.