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Accretion of the relativistic Vlasov gas onto a moving Schwarzschild black hole

Monday, 5 July 2021 18:30 (20 minutes)

I will discuss recent analytic results on the stationary accretion of the relativistic collisionless Vlasov gas onto a moving Schwarzschild black hole. The model assumes that the gas obeys the Maxwell-Juttner distribution at infinity. The Vlasov equation is solved formally in terms of suitable action-angle variables in the framework proposed originally by Rioseco and Sarbach. Depending on the asymptotic temperature, the results interpolate between two regimes: In the limit of infinite asymptotic temperature of the gas, we recover the qualitative picture known form the relativistic Bondi-Hoyle-Lyttleton accretion of the perfect gas with the ultra-hard equation of state, in which the mass accretion rate is proportional to the Lorentz factor associated with the black hole velocity. For low asymptotic temperatures, the mass accretion rate is not a monotonic function of the velocity of the black hole. The model can be applied in situations where the gas is not likely to be in thermal equilibrium in the vicinity of the black hole, for instance in the context of dark matter accretion. The talk is based on two papers written jointly with Andrzej Odrzywolek: Phys. Rev. Lett. 126, 101104 (2021) and Phys. Rev. D 103, 024044 (2021).

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