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# Magnetized accretion disks around Kerr black holes with scalar hair

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Testing the true nature of black holes – the no-hair hypothesis – will become increasingly more precise in the next few years as new observational data is collected in both the gravitational wave channel and the electromagnetic channel. In this talk we will consider numerically generated spacetimes of Kerr black holes with synchronised scalar hair and build stationary models of magnetized thick disks (or tori) around them. Our approach assumes that the disks are not self-gravitating, they obey a polytropic equation of state, the distribution of their specific angular momentum is constant, and they are marginally stable. Moreover, contrary to existing approaches in the literature, our models are thermodinamically relativistic, as the specific enthalpy of the fluid can adopt values significantly larger than unity. We study the dependence of the morphology and properties of the accretion tori on the type of black hole considered, from purely Kerr black holes with varying degrees of spin parameter. Comparisons between the disk properties for both types of black holes are presented. The sequences of magnetized, equilibrium disks models discussed in this study can be used as initial data for numerical relativity codes to investigate their dynamical (non-linear) stability and used in tandem with ray-tracing codes to obtain synthetic images of black holes (i.e. shadows) in astrophysically relevant situations where the light source is provided by an emitting accretion disk.

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