

General relativistic mass and spin of a Kerr black hole in terms of redshifts

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In this talk we derive closed general relativistic formulas for the mass M and the spin parameter a of a Kerr black hole in terms of observational data: the red- and blue-shifts of photons emitted by massive particles (stars or gas) geodesically orbiting around the black hole, and their respective orbital radius. It turns out that given a set of two (three) stars revolving around the Kerr black hole, the aforementioned formulas involve just eight (twelve) observational data: the redshift in six (nine) positions and the corresponding two (three) orbital radii. We also analyze the case of a single star orbiting the black hole, for it we need a minimal set of four observational measurements to analytically determine both black hole mass and spin parameters in closed form. Applications to astrophysical systems are briefly discussed.

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