

VII Leopoldo García-Colín Mexican Meeting on Mathematical and Experimental Physics



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ALFREDO HERRERA: Estimation of mass and spin parameters of a Kerr black hole: Newton vs. Einstein

Monday, 17 February 2020 18:00 (30 minutes)

A new general relativistic method for estimating the mass and spin parameters of a Kerr black hole (BH) from observational data is presented, i.e. from the red/blueshift of photons emitted by certain bodies orbiting around the BH, and the parameters characterizing their orbits (the radius and the polar angle for generic elliptical trajectories). With this method one can predict, and eventually look for, new relativistic effects related to the curvature of spacetime generated by the mass and the spin of black holes (this is in contrast to the Newtonian approach that is usually used to estimate the mass, for instance). In addition, this method allows us to clearly visualize which Newtonian and general relativistic contributions enter in the expression for the redshifts, and therefore for the mass and the spin parameters. So far we have managed to obtain analytical formulas to calculate both quantities (M and a) in the case of circular orbits that lie in the equatorial or galactic plane. These formulas are relatively simple and can be used very easily in this case. We are currently working on the confrontation with observations of a system that presents the aforementioned characteristics. In the case of more realistic orbits (elliptical orbits that lie outside the equatorial plane), we need to develop the method further. This more refined version of our formalism could be used to make very precise estimations of the parameters that characterize a Kerr black hole hosted in the galactic center of the systems that have been studied so far with the Event Horizon Telescope, in particular that of the Milky Way.

Session Classification: SHORT TALKS

Track Classification: SYMPOSIUM ON BLACK HOLES AND GRAVITATIONAL WAVES