Contributed Talk

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Title: On the Light Rays Propagating in Plasma Medium around Relativistic Objects

Abstract: When starting from distant galaxies, light rays propagate also through regions with matter (usually plasma) of various densities, not only through vacuum. A precise description of such a transfer is important since the medium through which rays propagate may affect substantially their form. If the rays are at the same time passing near a strongly gravitating compact object, both plasma and gravitational effects have to be taken into account. The impact of refractive and dispersive media around compact objects typically manifests itself in problems related to gravitational lensing. In our work we focus on how the regions allowed for propagation of rays are modified due to the presence of refractive and dispersive media with various density profiles. Specifically, we investigate the form of allowed regions in the equatorial plane of a Kerr black hole. We show that in the medium with the density distributions corresponding to typical profiles of lensing galaxies (exponential or power-law distributions), as well as with the density distribution of a nonsingular isothermal sphere, allowed regions are substantially reduced in comparison with corresponding regions in vacuum. We also study allowed regions as seen by observers freely falling from the rest at infinity onto the black hole, and discuss the propagation of rays near the axis of rotation of the hole and near the equatorial plane.