Black Holes as Laboratories for Testing Nonlinear Electrodynamics.

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Abstract: Maxwell's electrodynamics is the most successful classical field theory, accurately describing electric, magnetic, and optical phenomena in a unified manner. Nevertheless, it has been suggested that Maxwell's theory must be modified in order to correctly describe phenomena occurring at sufficiently strong electromagnetic fields, giving rise to the so-called nonlinear electrodynamic (NED) theories. When a NED is minimally coupled to General Relativity (GR), charged black hole (BH) solutions can be obtained. These charged BH solutions can serve as laboratories for testing novel NED effects that do not occur in Maxwell's electrodynamics. In the context of NED, photons follow null geodesics of an effective geometry that differs from the spacetime geometry itself. This property of NED gives rise to novel shadow and gravitational lensing results, when compared to those of the spacetime geometry. In this seminar, we discuss the light rings, shadows, and gravitational lensing of the electrically charged solution proposed by Irina Dymnikova which is a static and spherically symmetric spacetime with a NED source. We show that the shadow associated with the effective geometry can be almost 10% larger than the one associated with the standard geometry.