

Christiane Klein: Coupled Proca theories - Green-hyperbolicity and application to quantum polarization measurement

Thursday, May 7, 2026 3:40 PM (30 minutes)

The Proca equation describes a massive relativistic spin-1 particle, such as the Z-boson appearing in the Standard Model of particle physics. In this talk, we consider various extensions of the Proca equations on curved spacetimes, such as the equation of a charged Proca fields coupled to a background electromagnetic field or the one of a Proca field linearly coupled to a scalar field. We introduce an auxiliary field method to analyse the Green-hyperbolicity of these equations. With this method, we can show that all the variations of the Proca equation we consider are Green hyperbolic. As an application, we quantize the Proca field coupled to a Klein-Gordon scalar field. We use this theory to develop a measurement scheme sensitive to the Proca field polarization within the measurement framework of Fewster and Verch, using the scalar field as the probe. For suitable states of the Proca field, we find that the leading-order response agrees with Malus' law. This confirms that this scheme models a polarization-sensitive detector. This talk is based on joint work ArXiv:2511.11348 with Chris Fewster.