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Counting degrees of freedom in open systems

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Cosmological systems involve unknown microphysics with which gravity interacts. To circumvent the lack of a precise description of all cosmic constituents, it is necessary to adopt an open-system approach, in which interactions between the fields of interest and an unspecified environment are modelled through dissipation and stochastic noise. Within this framework, the concept of physical degrees of freedom may appear to lose its meaning, since their conventional definition relies on the presence of a Hamiltonian. In my work, I adapted an algorithm that discriminates between physical and unphysical degrees of freedom to the path integral formulation of open theories, focusing on deriving the most general dissipative dynamics of the Proca field. This approach contributes to the systematic formulation of open theories of gravity, offering a model-independent framework for characterizing the dissipation and noise present in any realistic experiment.

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