

# Theory: Exploring Conserved Charges in General Relativity Using Covariant Phase Space

*Monday, September 4, 2023 2:00 PM (15 minutes)*

In this talk, we delve into the application of the covariant phase space formalism to the study of conservation laws in General Relativity. Our focus is twofold: firstly, we demonstrate the association of the Carter constant with a genuine conserved Noether charge, utilizing the powerful tool provided by the covariant phase space. Secondly, we explore the dependence of the construction of Brown-York charges on the choice of conservative boundary conditions, including Dirichlet, Neumann, and York's mixed boundary conditions defined by holding fixed the conformal induced metric and the trace of the extrinsic curvature. The procedure also suggests a new integrable charge for the Einstein-Hilbert Lagrangian, different from the Komar charge for non-Killing and non-tangential diffeomorphisms. We study how the energy depends on the choice of boundary conditions, showing that both the quasi-local and the asymptotic expressions are affected.

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**Session Classification:** Parallel Sessions