Contribution ID: **93**                                              Type: **not specified**

# Symplectic mechanics of a spinning particle around a Schwarzschild black hole

*Friday, 7 July 2023 09:00 (20 minutes)*

I will present a new Hamiltonian analysis of the motion of a spinning particle orbiting a Scwharzschild black hole. First I will reduce the Mathisson-Papapetrou equations at linear order in spin to a Poisson system. Second, I will present a reduction of this system to a 6 degrees-of-freedom (dof), constrained Hamiltonian system. Third, specialising to the Schwarzschild spacetime, a reduction by invariants and by SSC constraints will be performed, using a new set of symplectic variables adapted to the underlying SO(3) and SO(1,3) symmetries in the problem. The whole dynamics are then showed to be governed by a very simple, integrable and decoupled 2 dofs system: the radial dynamics are solvable in terms of elliptic functions (as for the non-spinning case), while the rotational dynamics (orbital+spin) combine nicely into a single Hill's equation. All these results do not rely on any assumptions of circularity, spin-alignment and/or planarity, the latter cases being fixed points of the general dynamical system.

**Presenter:**   RAMOND, Paul (Paris Observatory)

**Session Classification:**   Friday Morning