Publicacions més rellevants de la línia de recerca:
Teoria Clàssica de Camps

Referència: Echeverría-Enríquez, A., de León, M., Muñoz-Lecanda, M.C. and N. Román-Roy, N. "Extended Hamiltonian systems in multisymplectic field theories". *J. Math. Phys.* **48**(11) (2007) 112901 (30 pp).

Abstract: We consider Hamiltonian systems in first-order multisymplectic field theories. We review the properties of Hamiltonian systems in the so-called restricted multimomentum bundle, including the variational principle which leads to the Hamiltonian field equations. In an analogous way to how these systems are defined in the so-called extended symplectic formulation of nonautonomous mechanics, we introduce Hamiltonian systems in the extended multimomentum bundle. The geometric properties of these systems are studied, the Hamiltonian equations are analyzed using integrable multivector fields, the corresponding variational principle is also stated, and the relation between the extended and the restricted Hamiltonian systems is established. All these properties are also adapted to certain kinds of submanifolds of the multimomentum bundles in order to cover the case of almost-regular field theories.

Referència: Román-Roy, N., Salgado, M. and Vilariño, S. "Symmetries and conservation laws in the Gunther k-symplectic formalism in field theory". *Rev. Math. Phys.* **19**(10) (2007) 1117-1147.

Abstract: This paper is devoted to studying symmetries of k-symplectic Hamiltonian and Lagrangianf first-order classical field theories. In particular, we define symmetries and Cartan symmetries and study the problem of associating conservation laws to these symmetries, stating and proving Noether's theorem in different situations for the Hamiltonian and Lagrangian cases. We also characterize equivalent Lagrangians, which lead to an introduction of Lagrangian gauge symmetries, as well as analyzing their relation with Cartan symmetries.

Referència: Gràcia, X., Martín R. and Román-Roy, N. "Constraint algorithm for k-presymplectic Hamiltonian systems. Application to singular field theories". *Int. J. Geom. Meth. Mod. Phys.*

Abstract: The k-symplectic formulation of field theories is especially simple, since only tangent and cotangent bundles are needed in its description. Its defining elements show a close relationship with those in the symplectic formulation of mechanics. It will be shown that this relationship also stands in the presymplectic case. In a natural way, one can mimick the presymplectic constraint algorithm to obtain a constraint algorithm that can be applied to k-presymplectic field theory, and more particularly to the Lagrangian and Hamiltonian formulations of field theories defined by a singular Lagrangian, as well as to the unified Lagrangian-Hamiltonian formalism (Skinner-Rusk formalism) for k-presymplectic field theory. Two examples of application of the algorithm are also analyzed.