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On the Relationship between Two Notions of Compatibility for Bi-Hamiltonian Systems

Bi-Hamiltonian structures are of great importance in the theory of integrable Hamiltonian systems. The notion of compatibility of symplectic structures is a key aspect of bi-Hamiltonian systems. Because of this, a few different notions of compatibility have been introduced. In this talk we show that, under some additional assumptions, compatibility in the sense of Magri implies a notion of compatibility due to Fassò and Ratiu, that we dub bi-affine compatibility. There are at least two proofs of this fact. The first one uses the uniqueness of the connection parallelizing all the Hamiltonian vector fields tangent to the leaves of a Lagrangian foliation. The second proof uses Darboux-Nijenhuis coordinates and symplectic connections. In this talk we will attempt to outline both proofs.