THE STRUCTURE OF SPLIT REGULAR HOM-POISSON ALGEBRAS

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The interest in the study of Poisson algebras has grown in the last years, motivated especially by their applications in geometry and mathematical physics. For instance, we can find them in gauge theories, being of special interest in the study of path integrals in quantum field theory. They can also be seen as a procedure for the quantization of physical systems with symmetries in the Lagrangian formalism. As another example, we note that Poisson algebras are the key to recover Hamiltonian mechanics from the coordinate space of the theory.

We introduce the class of split regular Hom-Poisson algebras formed for those Hom-Poisson algebras satisfying that their underlying Hom-Lie algebras are split. This class is the natural extension of the ones of split Hom-Lie algebras and of split Poisson algebras. We show that the structure theorems for split Poisson algebras can be extended to the, more general, setting of split regular Hom-Poisson algebras. That is, we prove that an arbitrary split regular Hom-Poisson algebra $\mathfrak{P}$ is of the form $\mathfrak{P} = U + \sum_j I_j$ with U a linear subspace of a maximal abelian subalgebra H and any I_j a well described (split) ideal of $\mathfrak{P}$, satisfying $\{I_j, I_k\} + I_j I_k = 0$ if $j \neq k$. Under certain conditions, the simplicity of $\mathfrak{P}$ is characterized and it is shown that $\mathfrak{P}$ is the direct sum of the family of its simple ideals.

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