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POST-NEWTONIAN GENERATION OF GRAVITATIONAL WAVES IN EINSTEIN-CARTAN THEORY

Monday, 16 September 2024 17:15 (1h 30m)

In this seminar, we investigate the topic of gravitational waves in the context of Einstein-Cartan theory by exploiting the Blanchet-Damour formalism.
Einstein-Cartan model has been formulated to extend the concepts of general relativity to the microphysical realm in order to establish a connection between gravity and the other fundamental interactions. In this framework, the quantum intrinsic spin carried by elementary particles is described geometrically by means of the torsion tensor, defined as the antisymmetric part of the affine connection.
On the other hand, the Blanchet-Damour approach has been devised in general relativity to deal with the radiation produced by compact binary systems during their early inspiralling stage. It employs two approximation techniques: the multipolar-post-Minkowskian scheme, which combines a post-Minkowskian algorithm and a multipolar decomposition, and the post-Newtonian method.
We demonstrate that the Blanchet-Damour pattern can be exploited in Einstein-Cartan model as well. This enables the solution of the so-called gravitational-wave generation problem, which consists in formally relating the asymptotic features of radiative gravitational fields, observed far away from their sources, to the structure and the motion of the sources themselves. Then, we show that Einstein-Cartan corrections, imprinted in the gravitational-wave signal of an inspiralling compact binary endowed with a quantum spin, can be potentially detected by means of the pulsar timing array technique. We conclude the seminar with a discussion regarding open problems and future perspectives.

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