Gravitational waves, scattering amplitudes and BMS

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March 14th, 21st, 28th 10-12h15; March 31st 14:15—16:30, April 11th 10—12h15.
In person at IPhT and live online.

Scattering amplitudes offer a new strategy to calculate gravitational observables that reorganizes more traditional general relativity calculations in terms of gauge invariant, on-shell ingredients. The link between amplitudes and gravitational waves has led to several new results over the past few years and has stimulated a fruitful dialog with complementary approaches. Additional insight comes from universal constraints that govern the emission of low-frequency gravitational waves, soft theorems. The latter are closely related to the structure of infrared divergences, memory effects and symmetries that emerge at null infinity in asymptotically flat spacetimes.

The aim of this lecture series is to provide an introduction to these topics and to illustrate some of the key connections that link them together.

Topics:

- gravitational observables in the post-Minkowskian regime from scattering amplitudes
- eikonal phase and deflection angle in hyperbolic two-body encounters
- asymptotic symmetries of asymptotically flat spacetimes, BMS group
- memory effect and soft graviton theorem
- soft limit of the energy emission spectrum, static angular momentum loss
- gravitational waveforms beyond the soft limit
- radiated energy and angular momentum

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