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Seminar: Analytic Gravitational Waveforms: A Combined Fourier–Loop Amplitude Framework

Thursday 3 July 2025 15:45 (45 minutes)

Accurate modelling of gravitational-wave signals is essential for extracting masses, spins, and strong-field dynamics from detector data. Within the observable-based formalism, scattering waveforms are expressed as the Fourier transform of a five-point scattering amplitude in impact-parameter space. In this talk, I will introduce a novel approach to compute analytic waveforms, where we combine the Fourier integrals with loop integration. This allows us to apply scattering-amplitude techniques such as generalised unitarity and integration-by-parts identities in frequency domain. The method yields the first fully analytic, velocity-exact two-body waveform at second post-Minkowskian (one-loop) order and paves the way for systematic spin and higher-order extensions.

Presenter: BRUNELLO, Giacomo