



ICTS String Seminar

Title : Universal features of $2 \rightarrow N$ scattering in QCD and gravity from shockwave collisions

Speaker : Raju Venugopalan (Brookhaven National Lab)

Date : Wednesday, 07th February, 2024

Time : 03:00 PM (IST)

Abstract : A remarkable double copy relation of Einstein gravity to QCD in Regge asymptotics is $\Gamma_{\mu\nu} = 12C_{\mu}C_{\nu} - 12N_{\mu}N_{\nu}$, where $\Gamma_{\mu\nu}$ is the gravitational Lipatov vertex in the $2 \rightarrow 3$ graviton scattering amplitude, C_{μ} its Yang-Mills counterpart, and N_{μ} the QED bremsstrahlung vertex. In QCD, the Lipatov vertex is a fundamental building block of the BFKL equation describing $2 \rightarrow N$ scattering of gluons at high energies. Likewise, the gravitational Lipatov vertex is a key ingredient in a 2-D effective field theory framework describing trans-Planckian $2 \rightarrow N$ graviton scattering. We construct a quantitative correspondence between a semi-classical Yang-Mills framework for radiation in gluon shockwave collisions and its counterpart in general relativity. In particular, we demonstrate the Lipatov double copy in a dilute-dilute approximation corresponding to $R_{S,L}, R_{S,H} \ll b$, with $R_{S,L}, R_{S,H}$ the respective emergent Schwarzschild radii generated in shockwave collisions and b is the impact parameter. We outline extensions of the correspondence developed here to the dilute-dense computation of gravitational wave radiation in close vicinity of one of the black holes, the construction of graviton propagators in the shockwave background, and a renormalization group approach to compute $2 \rightarrow N$ amplitudes that incorporates graviton reggeization and coherent graviton multiple scattering.

Venue : Offline: Madhava Lecture Hall

Online: Please click on the below link to join the seminar

<https://icts-res-in.zoom.us/j/88092766911?pwd=R3ZrVk9yeW96ZmQ4ZG9KRzVhenRKZz09>

Meeting ID: 880 9276 6911

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