SEMPARIS – Séminaires en région parisienne

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Cours

Vendredi 29 Octobre 2021, 10 :00
IPHT, Amphi Claude Bloch, Bât. 774
Domaines : physics

Titre : *Celestial holography primer 5/5*

Orateur : **Andrea Puhm (CPhT, École Polytechnique)**

Résumé : *One of the most powerful tools for understanding quantum aspects of gravity is the holographic principle, which asserts a duality between a theory of quantum gravity on a given manifold and a field theory living on its boundary. A concrete realization in spacetimes with negative curvature is the AdS/CFT correspondence, but it remains an important open question if and how the holographic principle is realized for general spacetimes.*
Recently, the holographic dual of quantum gravity in asymptotically flat spacetimes has been conjectured to be a codimension-two conformal field theory which lives on the celestial sphere at null infinity, aptly referred to as celestial CFT. A first hint at such a duality is the equivalence between the action of the Lorentz group and global conformal transformations on the celestial sphere. Moreover, when recast in a basis of boost eigenstates, scattering amplitudes transform as conformal correlators of primary operators in the dual celestial CFT. These celestial correlators appear to have some, but not all, of the properties of standard CFT correlators. The goal of this course will be to give an introductory guide to recent advances in celestial holography.
From the CFT perspective 2D is special : the global conformal group gets enhanced to local conformal symmetries. Remarkably, this infinite dimensional enhancement also appears in the 4D S-matrix which will be a main protagonist in this course. Even more surprisingly, the symmetry structure is much larger : every soft factorization theorem gives a dual "current" thus yielding a rich celestial symmetry algebra. Clearly, the exploration of celestial holography has just begun !
Plan of the course :
1. Symmetries of asymptotically flat spacetimes : BMS supertranslations and Virasoro/Diff(S2) superrotations. Connection to soft theorems of the

S-matrix and memory effects.
2. Conformal primary wavefunctions, celestial amplitudes and their conformally soft and collinear (OPE) limits.
3. Shadows, light rays and conformal block expansion of celestial correlators.
4. Conformally soft sector of celestial CFT : current algebras, soft charges and dressings.
