Department of Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

MHV Graviton Scattering Amplitudes and Current Algebra on the Celestial Sphere

(Zoom Seminar)

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Zoom link shall be shared separately

The Cachazo-Strominger subleading soft graviton theorem for a positive helicity soft graviton is equivalent to the Ward identities for \overline{SL(2,C)} currents. This naturally gives rise to a \overline{SL(2,C)} current algebra living on the celestial sphere. The generators of the \overline{SL(2,C)} current algebra and the supertranslations, coming from a positive helicity leading soft graviton, form a closed algebra. We find that the OPE of two graviton primaries in the Celestial CFT, extracted from MHV amplitudes, is completely determined in terms of this algebra. To be more precise, 1) The subleading terms in the OPE are determined in terms of the leading OPE coefficient if we demand that both sides of the OPE transform in the same way under this local symmetry algebra. 2) Positive helicity gravitons have null states under this local algebra whose decoupling leads to differential equations for MHV amplitudes. An n point MHV amplitude satisfies two systems of (n-2) linear first order PDEs corresponding to (n-2) positive helicity gravitons. We have checked, using Hodges' formula, that one system of differential equations is satisfied by any MHV amplitude, whereas the other system has been checked up to six graviton MHV amplitude. 3) One can determine the leading OPE coefficients from these differential equations.

This points to the existence of an autonomous sector of the Celestial CFT which holographically computes the MHV graviton scattering amplitudes and is completely defined by this local symmetry algebra. The MHV-sector of the Celestial CFT is like a minimal model of 2-D CFT.

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