Department of Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

Loop Level Soft Photon Theorem as a Ward Identity

Sayali Bhatkar

IISER Pune

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Soft theorems are statements about low energy limit of amplitudes. Interestingly, tree level soft theorems can be related to asymptotic conservation laws. The leading soft photon theorem is an exact quantum statement but subleading soft theorems receive non-trivial loop corrections. An interesting question to probe is whether these corrections originate from loop corrected asymptotic charges. In this spirit, Laddha and Campiglia proposed a new conservation law corresponding to the (loop level) Sahoo-Sen soft photon theorem. Our aim is to study construct these charges for massless scalar QED in presence of dynamical gravity. The terms in the loop level asymptotic charge are directly related to the dressing of fields due to long range forces. In presence of gravity, the new feature is that the soft photon also acquires a dressing due to long range gravitational force and contributes to the charge. We finally show that the corresponding Ward identity is equivalent to the Sahoo-Sen soft photon theorem.

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