Hofie Sigridar Hannesdottir – HEP Seminar 3/24/2020 – via ZOOM

Title:
Infrared Finite Cross Sections and S-matrix elements

Abstract:
Quantum field theory (QFT) works remarkably well for making theoretical predictions in collider scattering experiments. One of the fundamental objects in these calculations, the scattering matrix (S-matrix), is inspired by a well defined operator in non-relativistic quantum mechanics, but is plagued with both ultraviolet (UV) and infrared (IR) divergences in QFT. The UV divergences are now understood through the program of renormalization, but IR divergences remain an active area of research. We have explored three approaches to ameliorate the problem of IR divergences, which will all be discussed in this talk: i) The cross section method, ii) modification of the S-matrix, and iii) the coherent state formalism. The minimal set of processes required for a finite cross section as dictated by the KLN theorem will be elaborated on, along with examining a new approach based on factorization to define finite S-matrix elements in theories with massless particles and its connection to coherent states.