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# Quantum Field Theories in Finite Systems

*Wednesday, 5 July 2023 14:20 (20 minutes)*

We are interested in the effect of finite system size corrections to the QCD equation of state in heavy-ion collisions, to better understand the apparent formation of Quark Gluon Plasma in proton-nucleus and even proton-proton collisions. To do so, we need to build up the necessary understanding of Quantum Field Theories(QFTs) in finite systems.

To this end we derived for the first time the finite system size corrections to NLO $2 \to 2$ scattering in a scalar toy model (massive $\phi^4$ theory). In order to aid in this derivation we needed to develop multiple novel techniques, including denominator regularization, and an analytic continuation of the generalized Epstein Zeta function, and a direct generalization of a formula originally proposed by Ramanujan.

In this talk I discuss this derivation and more importantly the techniques developed, which we expect to be useful in the further study of finite system size corrections to QFTs. I will further discuss the numerical results for the derived scattering amplitude, as well as what it means for future investigations, including some observations about geometry-induced bound states.

## Apply to be considered for a student ; award (Yes / No)?

Yes

## Level for award;(Hons, MSc, PhD, N/A)?

MSc

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