

ICTS-String Theory Seminar

- Title** : Monte Carlo calculations of conformal dimensions of large charge operators
- Speaker** : Shailesh Chandrasekharan, Duke University – Durham, USA
- Date** : Thursday, July 4, 2019
- Time** : 4:00 PM
- Venue** : Emmy Noether Seminar Room, ICTS Campus, Bangalore
- Abstract** : In order to test the recent proposal for computing conformal dimensions using a large charge expansion, we explore Monte Carlo methods to compute them. We focus on the $O(2)$ and the $O(4)$ Wilson-Fisher fixed points as test cases. Unfortunately, traditional Monte Carlo methods suffer from a severe signal-to-noise ratio problem in the large charge sectors. To overcome this bottleneck we use worldline formulations. In the $O(2)$ case we show that conformal dimensions of charge q operators obey a simple formula predicted by the large charge expansion. In the $O(4)$ case, the charged sectors are labeled by the two $SU(2)$ representations (j_L, j_R) . Since the traditional model continues to be difficult to explore in the large (j_L, j_R) sectors, we study a drastically simplified alternate model, which we refer to as a "qubit" formulation. Such simpler formulations of quantum field theories have become interesting recently from the perspective of quantum computing. Here we find that while the (j, j) sector continues to show excellent agreement with the predicted large charge expansion up to small values of j , the behavior of the next subleading sector $(j, j-1)$ is far from satisfying.