

Title: Quantum State Tomography and Entanglement Detection with Weak Measurements

Speaker: Debmalya Das

Affiliation: Indian Institute of Science Education and Research (IISER) Mohali

In projective quantum measurements, the state of a system collapses and cannot be reused for extracting further information about the system. Therefore, during state tomography using projective measurements, a fresh system is required each time and recycling is impossible. With a weak coupling strength between the quantum system and the measurement device, the state is disturbed insignificantly with small information gain, but giving the possibility of reusing the same member of the ensemble for further measurements and extracting more information. We study this option with a view to explore the possibility of increasing the efficiency of quantum state tomography and reducing the ensemble size requirements. Further, we propose to use the same idea in the problem of entanglement detection. The standard procedure of checking for Bell Inequality violation involves dividing the ensemble of states into parts and using the separate parts for checking separate correlations, by performing joint projective measurements. This, however, renders the members of the ensemble unusable and the testing is impossible with a small sized ensemble. Using weak measurements, again the disturbance can be reduced and a member can be reused to facilitate testing for the violation and thus entanglement even with a small ensemble.