

Andreas Jung – Colloquium Seminar – February 6, 2025
Purdue University

Title: "Entangled Titans: unraveling the mysteries of Quantum Mechanics with top quarks"

Abstract:

In quantum mechanics, a system is said to be entangled if its quantum state cannot be described as a simple superposition of the states of its constituents. If two particles are entangled, we cannot describe one of them independently of the other, even if the particles are separated by a very large distance. When we measure the quantum state of one of the two particles, we instantly know the state of the other. The information is not transmitted via any physical channel; it is encoded in the correlated two-particle system.

The talk will discuss CMS results in the top quark production region with data provided by the Large Hadron Collider (LHC) at CERN. Results confirm the observation of entanglement in top quark events, even in presence of hypothetical top quark bound states, and providing a new quantum probe to the inner workings of the Standard Model and as a probe into new physics contributions. The talk concludes with perspectives into the future of quantum correlation measurements in high energy particle physics