PITT PACC Workshop: Exploring Quantum Mechanics in High Energy Physics

Report of Contributions

https://indico.global/e/806

Contribution ID: **1** Type: **not specified**

Welcome and Workshop Overview

Thursday 7 March 2024 09:00 (5 minutes)

Presenters: LOW, Matthew (University of Pittsburgh); HAN, Tao

Session Classification: Talks

Contribution ID: **2** Type: **not specified**

A Welcome Story

Thursday 7 March 2024 09:05 (35 minutes)

Presenter: HAN, Tao

Session Classification: Talks

Contribution ID: **3** Type: **not specified**

Quantum Mechanics in Field Theory: Quantum? Field Theory

Thursday 7 March 2024 09:45 (35 minutes)

Presenter: MUNOZ DE NOVA, Juan Ramon

Session Classification: Talks

Contribution ID: **4** Type: **not specified**

Observation of Quantum Entanglement in ttbar pairs at ATLAS

Thursday 7 March 2024 10:55 (35 minutes)

Presenter: Dr HOWARTH, James William (University of Glasgow (GB))

Session Classification: Talks

Contribution ID: **5** Type: **not specified**

Perspectives on Quantum Entanglement

Thursday 7 March 2024 11:35 (35 minutes)

Presenter: JUNG, Andreas Werner (Purdue University (US))

Session Classification: Talks

Contribution ID: **6** Type: **not specified**

Quantum Information with Electroweak and Higgs Bosons

Thursday 7 March 2024 14:00 (35 minutes)

Presenter: BARR, Alan (University of Oxford (GB))

Session Classification: Talks

Contribution ID: **7** Type: **not specified**

When Theory Becomes Reality: Measuring Quantum Information Concepts with $t\bar{t}$

Thursday 7 March 2024 14:40 (35 minutes)

Presenter: AFIK, Yoav (University of Chicago (US))

Session Classification: Talks

Contribution ID: **8** Type: **not specified**

Probing new physics through entanglement

Thursday 7 March 2024 15:50 (35 minutes)

Presenter: AOUDE, Rafael

Session Classification: Talks

Contribution ID: **9** Type: **not specified**

Three-body Entanglement in Particle Decays

Friday 8 March 2024 09:00 (35 minutes)

Tentative Title

Presenter: SAKURAI, Kazuki (University of Warsaw)

Session Classification: Talks

Contribution ID: **10** Type: **not specified**

Isolating Semileptonic H->WW* decays for Bell's inequality test

Friday 8 March 2024 09:40 (35 minutes)

Presenter: FABBRI, Federica (Universita e INFN, Bologna (IT))

Session Classification: Talks

Contribution ID: **11** Type: **not specified**

Quantum tests with entangled B meson pairs at the Belle and Belle II Experiments

Friday 8 March 2024 10:50 (35 minutes)

Presenter: VAHSEN, Sven (University of Hawaii (US))

Session Classification: Talks

Contribution ID: **12** Type: **not specified**

Shut Up and Calculate: The Many Worlds of Quantum Mechanics

Friday 8 March 2024 13:45 (35 minutes)

Presenter: RAJENDRAN, Surjeet

Session Classification: Talks

Contribution ID: **13** Type: **not specified**

Nonlinear Quantum Mechanics

Friday 8 March 2024 14:25 (35 minutes)

Presenter: KAPLAN, David

Session Classification: Talks

Contribution ID: **14** Type: **not specified**

Resonances in ttbar with quantum observables

Friday 8 March 2024 15:35 (35 minutes)

Resonances in ttbar with quantum observables [2401.08751]
The recent observation of entanglement between top and anti-top quarks at the LHC opens the way to interpreting collider data with quantum information tools. In this talk I will investigate the relevance of quantum observables in the top sector, for searches of resonances coming from hidden SM effects or new physics. I will show how QM-inspired observables provide complementary information and, in several notable cases, also the additional leverage necessary to detect new effects.

Presenter: SEVERI, Claudio (University of Manchester)

Session Classification: Talks

Contribution ID: **15** Type: **not specified**

Real-time non-perturbative dynamics of jet production in the Schwinger model: from quantum entanglement to thermalization

Saturday 9 March 2024 09:00 (35 minutes)

The production of jets should allow the testing of the real-time response of the QCD vacuum disturbed by the propagation of high-momentum color charges. Addressing this problem theoretically requires a real-time, non-perturbative method. As a step in developing such an approach, we report on fully quantum simulations of a massive Schwinger model coupled to external sources representing quark and antiquark jets as produced in e+e−e+e− annihilation. It is well known that the Schwinger model [QED in (1+1) dimensions] shares many common properties with QCD, including confinement, chiral symmetry breaking, and the existence of vacuum fermion condensate. This allows us to study, for the first time, the modification of the vacuum chiral condensate by the propagating jets and the quantum entanglement between the fragmenting jets. Our results indicate robust entanglement between the fragmentation products of the two jets. We also discuss how this entanglement manifests itself in terms of potentially measurable correlations. It also gives us unique opportunities to investigate how such systems thermalize.

Presenter: FLORIO, Adrien

Session Classification: Talks

Contribution ID: **16** Type: **not specified**

Quantum-probabilistic Hamiltonian learning for generative modelling and anomaly detection

Saturday 9 March 2024 09:40 (35 minutes)

Presenter: ARAZ, Jack Y. (Jefferson Lab)

Session Classification: Talks

Contribution ID: **17** Type: **not specified**

Entanglement Suppression, Enhanced Symmetry and a Standard-Model-like Higgs Boson

Saturday 9 March 2024 11:30 (35 minutes)

Presenter: WAGNER, Carlos E.M.

Session Classification: Talks

Contribution ID: **18** Type: **not specified**

Quantum Entanglement and Bell Inequality Violation in Semi-Leptonic Top Decays

Saturday 9 March 2024 10:50 (35 minutes)

Presenter: WU, Arthur

Session Classification: Talks