Contribution ID: **76** Type: **Oral Presentation**

Relativistic Quantum Mechanics On Non-commutative Space

Tuesday, 30 June 2015 11:50 (20 minutes)

Abstract content
   (Max 300 words)
Formatting &
Special chars

The Hilbert-Schmidt operator formulation of non-relativistic, non-commutative quantum mechanics is generalized to the relativistic setting of 4-dimensional non-commutative space-time. The generators of Lorentz transformations are derived in this formalism and compared with the commutative case. It is shown that the non-interacting, non-commutative Dirac equation is Lorentz invariant. Lorentz invariance can be maintained when electromagnetic interactions are included provided that the gauge and Dirac fields are composed through an appropriate star product. The non-commutative C, P, T symmetries of the interacting Dirac equation are investigated. The free Dirac equation and the interacting Dirac equation for the case of a constant background magnetic field are studied. Systems confined to a specific space-time volume, and the associated boundary conditions, are studied using appropriate projection operators. As a specific example the Dirac equation in an infinitely long cylinder is considered. An operator valued action, which yields the interacting Dirac equation as the equation of motion, is derived and evaluated in a coherent state basis. This establishes the link to the standard star product formulation of non-commutative quantum field theories.

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

Yes

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

Msc

Main supervisor (name and email)
and his / her institution

Prof Frederik Scholtz
Nithep
fgs@sun.ac.za

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

**Please indicate whether
this abstract may be
published online
(Yes / No)**

No

Primary authors: Prof. SCHOLTZ, Frederik (National Institute for Theoretical Physics); Mr WILLIAMS, Paul Henry (Stellenbosch University)

Presenter: Mr WILLIAMS, Paul Henry (Stellenbosch University)

Session Classification: TCP

Track Classification: Track G - Theoretical and Computational Physics