

Short visit grant

Visitor: M. Haque

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Noethnitzer Strasse 38, 01187 Dresden, Germany.

Host Institute: University of Amsterdam, Institute for Theoretical Physics.

Grant reference number: 2860.

Started from Dresden April 08, 2009, returned April 16, 2009.

Total 9 days

Purpose of the visit

The purpose of my visit was to make progress on collaborative work with Professor K. Schoutens and his student O. S. Zozulya, on the topic of *particle partitioning entanglement*.

This is defined by expressing the wavefunction in first-quantized form, so that one can meaningfully partition particles (rather than space or sites), and calculate entanglements between subsets of particles. Since each particle has a label in first-quantized wavefunctions, indistinguishability does not preclude well-defined subsets of particles. Particle partitioning is only defined in itinerant systems where the particles hop, and thus has no meaning for pure spin models. Particle entanglement provides a novel and unique perspective on the structure of itinerant many-particle wavefunctions.

The primary purpose of this particular visit was to write an invited review on this emerging topic. A second aim was to use an existing Bethe ansatz solution for the one-dimensional continuum boson-fermion mixture with suitably tuned contact interactions, to calculate particle-partitioning entanglement in this model.

Description of the work carried out during the visit + main results obtained

Review. During the visit, we settled on the details of the review article we are writing, and produced an early draft. The article will survey all available results known to us from the literature.

Bethe ansatz (Boson-fermion mixture). By reviewing and partially re-doing the analogous particle-entanglement calculation for a simpler Bethe-ansatz-solvable continuum model, we have taken first steps toward this calculation.

Future collaboration with host institution

Collaboration with the host institution is very likely to continue.

Projected publications/articles resulting from grant

At the time of writing this report, the review article is at its final stages of preparation. We expect this will have significant influence in the study of entanglement between novel partitions, and also provide a new perspective on the structure of itinerant-system wavefunctions.

ESF funding for this visit is of course acknowledged in this article.

Other comments

I thank the ESF and the INSTANS program for funding this research visit.