Scientific Report on trip to UVA of R. Weston: October 6-11, 2008

Purpose of the visit:

The purpose of the visit was to push forward the ongoing work of the visitor R. Weston (Heriot-Watt, Edinburgh), the host J-S. Caux (Amsterdam) and their collaborators H. Konno (Hiroshima) and M. Sorrell (Heriot-Watt). This work concerns exact form-factors and dynamical structure factors of the massless XXZ model.

Description of the work carried out during the visit/main results obtained:

During this highly productive visit, R. Weston and J.-S. Caux finalized their exact integral formulae for form factors of the massless XXZ model and applied them to compute both longitudinal and transverse dynamical structure factors. They numerically computed an unevaluated integral occurring in the two particle form-factor relevant to the longitudinal dynamical structure factor. They also computed the two particle contribution to the transverse dynamical structure as an exact expression involving no integrals. They used this latter result to analyze the singularity at the lower threshold of the transverse dynamical structure factor and compared these exact results with existing literature studies based on the nonlinear Luttinger liquid model of the XXZ chain.

Future Collaboration:

The collaboration of R. Weston, J-S. Caux, H. Konno and M. Sorrell will continue, both on the very final steps of the current project and on the application of infinite-volume exact form-factor results to other quantum spin chains.

Projected publications:

There will be at least two publications appearing as a direct result of the work carried out during the visit. The first will be a short Physics Reviews Letters article specifically concerning the lower threshold of the transverse dynamical structure factor. This will be a significant paper that should resolve, once and for all, the current debate in the literature on this topic. The second article will be a lengthier description of the general exact form factor expressions and a detailed analysis of the exact two particle contributions to both the longitudinal and transverse dynamical structure factors.