Edge exponent in the dynamic spin structure factor of the Yang-Gaudin model

Short visit grant reference: **2342**
Dr. Mikhail Zvonarev, DPMC, University of Geneva, Switzerland
to visit
Dr. Vadim Cheianov, Physics Department, Lancaster University, UK
from 25 April 2009 to 03 May 2009

1. Purpose of the visit

Joint work with Dr. Vadim Cheianov on the problem of the shape of the dynamic spin structure factor near threshold energy in the two-component integrable Bose gas model (Yang-Gaudin model).

2. Description of the work carried out during the visit

Using the integrability of the Yang-Gaudin model we identified the coupling constants of the underlying effective field theory describing the dynamics of excitations near the threshold energy for arbitrary transferred momentum and interparticle interaction strength. Using these results we investigated the shape of the dynamic spin structure factor $\mathcal{S}(k,\omega)$ near the threshold energy.

3. Description of the main results obtained

We demonstrated that $\mathcal{S}(k,\omega)$ exhibit a power-law singularity as a function of ω at the threshold frequency defined by the energy of a magnon at a given k. The corresponding critical exponent is found exactly by combining the integrability (Bethe Ansatz) and effective field theory approach. By analyzing the dependence of the critical exponent on the transferred momentum and interaction strength we got a set of constraints onto an effective theory describing the X-ray edge singularity of a mobile impurity problem.

4. Future collaboration with host institution

Given the success of the collaboration it is expected to be continued. In particular, it is planned to investigate the structure of the collective excitations away from the vicinity of the threshold energy.

5. Projected publications/articles resulting or to result from the grant

A preprint entitled "Edge exponent in the dynamic spin structure factor of the Yang-Gaudin model" was uploaded to arXiv (the reference is arXiv:0905.0598) and submitted to a peer-reviewed journal.