

CORRELATIONS IN THE LOW-DIMENSIONAL ITINERANT FERROMAGNETS

Short visit grant reference: **2342**

Dr. Mikhail Zvonarev, DPMC, University of Geneva, Switzerland
to visit

Dr. Vadim Cheianov, Physics Department, Lancaster University, UK
from 24 April 2008 to 03 May 2008

1. Purpose of the visit

Joint work with Dr. Vadim Cheianov on the problem of correlations and excitations in one-dimensional (1D) itinerant (having both spin and charge degrees of freedom) ferromagnets.

2. Description of the work carried out during the visit

We studied the properties of interacting 1D systems consisting of Bose particles with an internal degree of freedom (“spin”). We analyzed the case of the ferromagnetic ground state, which implies a quadratic dispersion relation of the softest low-lying excitations. The presence of the quadratic mode makes a conventional (Luttinger Liquid type) description of the low-energy dynamics impossible and poses a fundamental question of finding an alternative theory.

3. Description of the main results obtained

By analyzing the analytic expressions for the dynamical correlation functions we demonstrated explicitly that 1D itinerant ferromagnets belong to a universality class which is neither a localized ferromagnet, nor a Luttinger liquid. It was demonstrated that a consistent treatment of the problem is possible using several analytic methods: first-quantized path integral, Bethe Ansatz, and effective field theory.

4. Future collaboration with host institution

Current projects has deep connections with other research areas in the field of strongly correlated low-dimensional systems, like the problem of a moving impurity in 1D quantum liquid, dynamics of a hole in the Mott-Hubbard insulator, and quantum mechanics in a dissipative environment. A collaboration with the host institution for further studies of the above mentioned problems is provisioned.

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

An article provisionally entitled “Dynamical correlation functions of one-dimensional itinerant ferromagnets” will be put in arXiv and submitted to a peer-reviewed journal to the middle of June, 2008.