1 Scientific Report

We have proposed recently[1] a novel technique to treat commenly arising constraints. It was illustrated for the case of interacting magnons of the Heisenberg antiferromagnet on a square lattice. A non-perturbative continuous unitary transformation is used to derive an effective Hamiltonian conserving the number of magnons. In this way the main features of the one-magnon dispersion at low and high energies are obtained.

In contrast to the square lattice, geometric frustration is present for the triangular lattice. Despite the fact that the groundstate is still a long-ranged order Néel state, quantum fluctuations are enhanced and lead to strong renormalization effects when compared to conventional spin-wave theory as shown by series expansion techniques[2](corrections to linear spin-wave theory are 10% effects for the square lattice but 50% effects for the triangular lattice).

During the author's stay at the university of Dortmund with Prof. G.S. Uhrig, we have applied this novel technique to the case of the triangular lattice. There is a new class of processes present in the Hamiltonian for the triangular lattice, namely the decay of one magnon in two magnons and vice versa. So the flow equations and their proper initial conditions had to be derived which was done in the first days of my stay. Then everything was implemented numerically. Already the first runs on small lattices showed us that the renormalization and the interaction effects are much stronger than for the square lattice. Currently, we carefully investigate the behaviour of one- and two-triplon energies as function of system size and hardcore interaction.

Additionally, we started to transform also the relevant observable to calculate the dynamical structure factor. The corresponding flow equations were calculated and already implemented. The outcome of these calculations are currently under study. Already the spectral weights for the triangular lattice are not yet calculated in the liturature. So we are convinced to obtain in the near future interesting and novel results about the physical properties of the magnetic excitations on the triangular lattice.

References

[1] K.P. Schmidt and G.S. Uhrig, Phys. Rev. B. **73**, 172407 (2006).

[2] W. Zheng, J.O. Fjrestad, R.R.P. Singh, R.H. McKenzie, and R. Coldea, Phys. Rev. Lett. 96, 057201 (2006).

[3] Y. Shimizu *etal.*, Phys. Rev. Lett. **91**, 107001 (2003)