Determination of the Magnetic Ground State in the Square Lattice S=1/2 Antiferromagnet Li_2VOSiO_4

Bombardi A.[1], de Bergevin F.[1], di Matteo S.[2], Paolasini L.[1], Rodriguez-Carvajal J.[3], Carretta P.[4], Millet P.[5], and Caciuffo R.[6]

[1]European Synchrotron Radiation Facility, B.P. 220, 38043 Grenoble Cedex 9, France, e-mail bombardi@esrf.fr
[2]Udr Roma III, via della Vasca Navale 142, 00100 Roma, Italy
[3]LLB, CEA- Saclay, 91191 Gif sur Yvette Cedex, France
[4]Dipartimento di Fisica, Università di Pavia, Via Bassi 6, I-27100 Pavia, Italy
[5]Centre d'Elaboration des Matériaux et d'Etude Structurales, CNRS, 31055 Toulouse Cedex France
[6]Dipartimento di Fisica e Ingegneria dei Materiali, Università Politecnica delle Marche, Via Brecce Bianche, I 60131 Ancona, Italy

Powder neutron diffraction and resonant X-ray scattering measurements from a single crystal have been performed to study the low-temperature state of the 2D frustrated, quantum-Heisenberg system Li_2VOSiO_4.

Both techniques indicate a collinear antiferromagnetic ground state, with propagation vector k=(1/2 1/2 0), and magnetic moments in the a-b plane. Contrary to previous reports, the ordered moment at 1.44 K, m= 0.62(3) μ_B, is very close to the value expected for the square-lattice Heisenberg model (~ 0.6 μ_B). The magnetic order is three dimensional, with antiferromagnetic a-b layers stacked ferromagnetically along the c-axis. Neither X-ray nor neutron diffraction show evidence for a structural distortion between 1.6 and 10 K.