

Abstract Submitted
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Evolution of the ‘Orbital Peierls State’ with doping C. ULRICH, G. KHALIULLIN, B. KEIMER, Max-Planck-Institute FKF, Stuttgart, Germany, M. REEHUIS, HMI, Berlin, Germany, K. SCHMALZL, A. IVANOV, ILL, Grenoble, France, K. HRADIL, FRM II, Munich, Germany, J. FUJIOKA, Y. TOKURA, University of Tokyo, Japan — Orbital degrees of freedom play an important role in the physics of strongly correlated electron systems. Our extensive investigation of insulating vanadates by neutron scattering has led to the discovery of an unusual magnetic ground state. YVO_3 exhibits two magnetic phases, a C-type phase between 116 K and 77 K and a G-type phase below 77 K. While the magnetic properties of the G-type phase are in accordance with standard theories, the C-type phase shows highly unusual static and dynamic spin correlations. Based on the idea of orbital fluctuations we were able to identify this phase as a theoretically predicted ‘orbital Peierls state’ [1]. Neutron scattering experiments on $Y_{1-x}Ca_xVO_3$ show that the C-type phase, i.e. the ‘orbital Peierls phase’, is stabilized upon doping, while the orbitally ordered G-type phase is quite unstable and disappears at $x = 2\%$. Furthermore, with doping this phase also exhibits a highly unusual spin wave dispersion. These leads us to the conclusions, that the ‘orbital Peierls state’ becomes more robust with Ca-doping, whereas the formerly well defined G-type phase exhibits a more complex behaviour, probably as a consequence of an increase in orbital fluctuations.
[1] C. Ulrich et al., PRL **91**, 257202 (2003).

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