Inelastic Neutron Scattering studies of pure and Mo doped VO$_2$\(^1\)

ARNAB BANERJEE, GARRETT E. GRANROTH, Quantum Condensed Matter Division, Oak Ridge National Laboratory, Oak Ridge TN 37830 USA, YUEN YIU, Department of Physics, University of Tennessee, Knoxville TN 37996 USA, ADAM A. ACZEL, ALEXANDER I. KOLESHNIKOV, Quantum Condensed Matter Division, Oak Ridge National Laboratory, Oak Ridge TN 37830 USA, HUXIA LUO, ROBERT J. CAVA, Department of Chemistry, Princeton university, Princeton NJ 08544 USA, STEPHEN E. NAGLER, Quantum Condensed Matter Division, Oak Ridge National Laboratory, Oak Ridge TN 37830 USA, SEQUOIA TEAM, PRINCETON UNIVERSITY COLLABORATION — For the last half-century VO$_2$ has been viewed as an archetypal system for studying the metal-insulator transition (MIT). Moreover, there is currently intense interest in this material arising from its promising use in fast energy efficient electronic devices. There are key unresolved issues connected with the origin of the MIT, including the role of magnetism arising from the S=1/2 V$^{4+}$ ions. It is known that below 340 K in undoped VO$_2$ the V ions form structural dimers in the insulating M1 monoclinic phase. Here we report the results of new inelastic neutron scattering measurements of VO$_2$ and V$_{0.75}$Mo$_{0.25}$O$_2$. Using the SEQUOIA chopper spectrometer at the SNS possible lattice and magnetic excitations for energies up to 600 meV were investigated. We discuss the results in the context of current ideas concerning the MIT in VO$_2$.

\(^1\)The research at ORNL is supported by the DOE BES, Division of Scientific User Facilities. Work at Princeton University is supported by the DOE grant number DE-FG02-98ER45706.

Arnab Banerjee
Quantum Condensed Matter Division, Oak Ridge National Laboratory,
Oak Ridge TN 37830 USA

Date submitted: 15 Nov 2013
Electronic form version 1.4