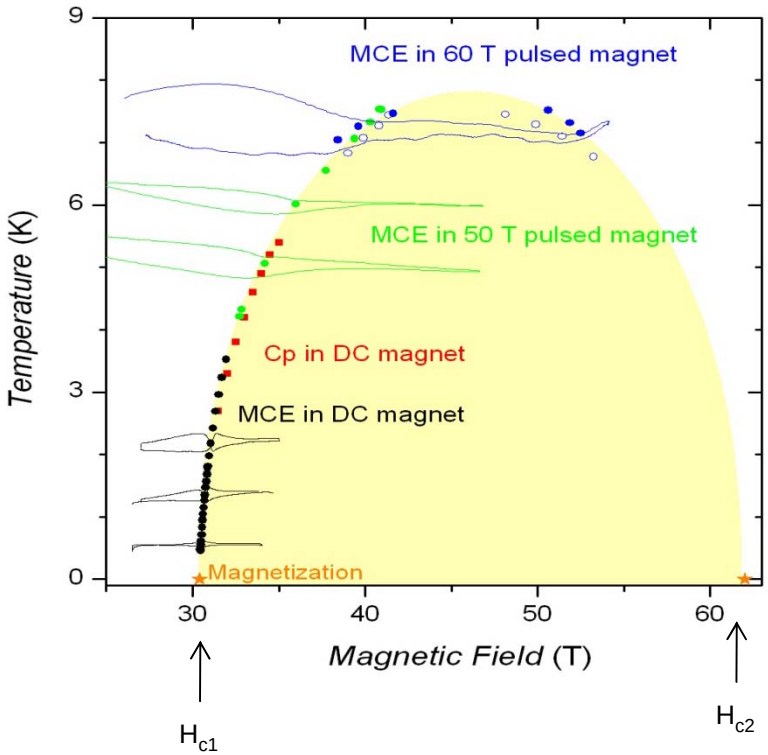
Field-Induced Bose-Einstein Condensation of Triplons up to 8 K in $Sr_3Cr_2O_8$

A. A. Aczel,[1] Y. Kohama,[2] C. Marcenat,[3] F. Weickert,[4] M. Jaime,[2] O. E. Ayala-Valenzuela,[2] R. D. McDonald,[2]
S. D. Selesnic,[1] H. A. Dabkowska,[5] and G. M. Luke[1,5,6]

[1]Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, Canada, L8S 4M1
[2]MPA-CMMS, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA
[3]CEA-Grenoble, Institut Nanosciences et Cryogenie, SPSMS-LATEQS, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France
[4]Max Planck Institute for Chemical Physics of Solids, 01187 Dresden, Germany
[5]Brockhouse Institute for Materials Research, McMaster University, Hamilton, Ontario, Canada, L8S 4M1
[6]Canadian Institute of Advanced Research, Toronto, Ontario, Canada, M5G 1Z8



Physical Review Letters **103** 207203 (2009)

- Researchers from LANL-NHMFL , McMasters University, CEA-Grenoble, and the Max Planck Institute are studying quantum magnets in high magnetic fields. Magnetization, heat capacity, and magnetocaloric effect data up to 65 T reveal magnetic order between applied fields of H_{c1}= 30.4 T and H_{c2} = 62 T in single crystals of the quantum magnet system $Sr_3Cr_2O_8$. This field-induced order persists up to T_c^{max} = 8 K at H = 44 T, the highest observed in any quantum magnet where H_{c2} is experimentally accessible. We fit the temperature field phase diagram boundary at H_{c1} using the expression $T_c=A(H-H_{c1})^{\nu}$. The exponent ν = 0.65(2), obtained at temperatures much smaller than T_c^{max}, is that of the 3D Bose-Einstein condensate (BEC) universality class. This finding strongly suggests that $Sr_3Cr_2O_8$ is the newest realization of a triplon BEC where the universal regimes corresponding to both H_{c1} and H_{c2} are accessible at ^{4}He temperatures.

Los Alamos NATIONAL LABORATORY EST. 1943

NHMFL portion supported by DOE, NSF, and State of Florida

NATIONAL HIGH MAGNETIC FIELD LABORATORY FSU • UF • LANL