The Syllabary

Issue 1, February 2016

This is a brief newsletter distributed by email to update SEQUOIA, Spallation Neutron Source beam line 17 at Oak Ridge National Laboratory, users and enthusiasts regarding the status of the instrument. We would like to share with the SEQUOIA user community the ongoing upgrades occurring at the instrument as well as the peer-reviewed publications and theses resulting from measurements at SEQUOIA. We are considering this to be an annual newsletter.

Please also feel free to share feedback with the User Office or your local contact regarding your experience as a user at the SNS facility. This feedback can be done through the survey forms sent out by the User Office after experiments, or by contacting your local contact or the User Office directly. Please do not hesitate to contact the beam line instrument scientists for any assistance in preparing beam time proposals or if you are having difficulties with data-reduction or analysis.

Experiments and Publications

The 2015-A and 2015-B run cycles were packed with great experiments. We ran approximately 48 experiments in 2015 at SEQUOIA. We expect to run between 20 and 25 experiments in cycle 2016-A. The accelerator has been operating well recently with power outputs greater than 800 kW and great reliability. We are looking forward to 2016-A and 2016-B. Let us know how we can help your experiment be a success.

2015 was a good year for SEQUOIA's publication output. Five Ph.D. dissertations included SEQUOIA measurements this year and 13 peer reviewed publications were accepted. These included several high profile publications from the beam line. Congratulations to all of the authors. The 2015 APS March Meeting also had a large number of presentations that featured SEQUOIA results. We know of a few other publications that are currently in review, and we expect 2016 to be another productive year for the instrument. A list of SEQUOIA publications is available at http://neutrons.ornl.gov/sequoia/publications.

Please let us know if your SEQUOIA publication or thesis is not listed.

SEQUOIA team supported experiments during Neutron and X-Ray Scattering School in 2015.

2015 SEQUOIA Publications

1| K.W. Plumb, K. Hwang, Y. Qiu, L.W. Harriger, G.E. Granroth, A.I. Kolesnikov, G.J. Shu, F.C. Chou, Ch. Rüegg, Y.B. Kim, and Y.-J. Kim. "Quasiparticle-continuum level repulsion in a quantum magnet." *Nature Physics*, (Accepted in-press).

2| Calder, J. H. Lee, M. B. Stone, M. D. Lumsden, J. C. Lang, M. Feygenson, Z. Zhao, J.-Q. Yan, Y. G. Shi, Y. S. Sun, Y. Tsujimoto, K. Yamaura, and A. D. Christianson, "Giant, spin-phonon-electronic coupling in a 5d oxide." *Nature Communications* (Accepted in-press).

3| J. Gaudet, D.D. Maharaj, G. Sala, E. Kermarrec, K.A. Ross, H.A. Dabkowska, A.I. Kolesnikov, G.E. Granroth, and B.D. Gaulin, "Neutron spectroscopic study of crystalline electric field excitations in stoichiometric and lightly stuffed $Yb_2Ti_2O_7$." *Physical Review B* 92, 134420 (2015).

4| T. J. Williams, A. A. Aczel, M. D. Lumsden, S. E. Nagler, M. B. Stone, J.-Q. Yan, and D. Mandrus, "Magnetic Correlations in the Quasi-2D Semiconducting Ferromagnet $CrSiTe_3$." *Physical Review B*, 92, 144404 (2015).

5| B. D. Gaulin, E. Kermarrec, M. L. Dahlberg, M. J. Matthews, F. Bert, J. Zhang, P. Mendels, K. Fritsch, G. E. Granroth, P. Jiramongkolchai, A. Amato, C. Baines, R. J. Cava, and P. Schiffer, "Quenched crystal-field disorder and magnetic liquid ground states in $Tb_2Sn_{2-x}Ti_xO_7$." *Physical Review B* 91 245141 (2015).

6| A. E. Taylor, T. Berlijn, S. E. Hahn, A. F. May, T. J. Williams, L. Poudel, S. Calder, R. S. Fishman, M. B. Stone, A. A. Aczel, H. B. Cao, M. D. Lumsden, and A. D. Christianson, "Influence of interstitial Mn on magnetism in room-temperature ferromagnet $Mn_{1+x}Sb$." *Physical Review B* 91, 224419 (2015).

7| S. Wakimoto, K. Ishii, H. Kimura, M. Fujita, G. Dellea, K. Kummer, L. Braicovich, G. Ghiringhelli, L. M. Debeer-Schmitt, and G. Granroth, "High-energy magnetic excitations in overdoped $La_{2-x}Sr_xCuO_4$ studied by neutron and resonant inelastic X-ray scattering." *Physical Review B* 91, 184513 (2015).

8| D. E. McNally, J.W. Simonson, J. J. Kistner-Morris, G. J. Smith, J. E. Hassigner, L. DeBeer-Schmidt, A. I. Kolesnikov, I. A. Zaliznyak, and M. C. Aronson, "$CaMn_2Sb_2$: Spin waves on a frustrated antiferromagnetic honeycomb lattice." *Physical Review B* (Rapid Communications) 91, 180407(R) (2015).

9| E. C. Spencer, N. L. Ross, R. E. Olsen, B. Huang, A. I. Kolesnikov, and B. F. Woodfield, "The thermodynamic properties of α Fe_2O_3 and Fe_3O_4 nanoparticles." *Journal of Physical Chemistry C* 119, 9609 (2015).

10| E. Kermarrec, C. A. Marjerrison, C. M. Thompson, D. D. Maharaj, K. Levin, S. Kroeker, G. E. Granroth, R. Flaceau, Z. Yamani, J. D. Greedan, B. D. Gaulin, "Frustrated fcc antiferromagnet $Ba_2YO_sO_6$: Structural characterization, magnetic properties, and neutron scattering studies." *Physical Review B* 91, 075133 (2015).

11| G. E. Granroth and S. E. Hahn, "Monte Carlo simulation of the resolution volume for the SEQUOIA spectrometer." *EPJ Web of Conferences* 83, 03006 (2015).

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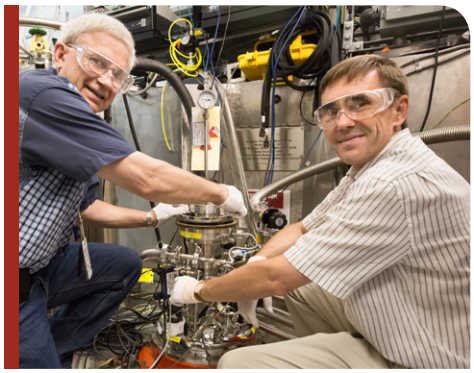

Sasha Kolesnikov (left) and Andrey Podlesnyak testing new pressure cells at SEQUOIA.

12 | J. Ma, J. H. Lee, S. E. Hahn, T. Hong, H. Cao, A. A. Aczel, Z. Dun, M. B. Stone, W. Tian, Y. Qiu, J. Copley, H. Zhuo, R. S. Fishman, M. Matsuda, "Strong competition between orbital-ordering and itinerancy in a frustrated spinel vanadate." *Physical Review B, Rapid Communications* 91 020407(R) (2015).

13 | W. T. Fuhrman, J. Leiner, P. Nikolic, G. E. Granroth, M. B. Stone, M. D. Lumsden, L. DeBeer-Schmitt, P. A. Alekseev, J.-M. Mignot, S. M. Koohpayeh, P. Cottingham, W. Adam Phelan, L. Schoop, R. J. Cava, T. M. Mcqueen, and C. Broholm, "Spin-exciton and topology in SmB6." *Physical Review Letters* 114, 036401 (2015).

2015 SEQUOIA theses

1 | Y. Yiu, "Studies Of Strongly Correlated Electron Systems Using Neutron Scattering." Ph.D. Dissertation, University of Tennessee (May 2015).

2 | H.Silverstein, "The Dugganites: A New Potentially Multiferroic Te_{6+}-containing Subclass of the Langasites." Ph.D. Dissertation, University of Manitoba (June 2015).

3 | O. Mashtalir, "Chemistry of Two-Dimensional Transition Metal Carbides." Ph. D. Dissertation, Drexel University (June 2015).

4 | J. J. Wagman, "Neutron scattering studies of strong dynamic correlations in unconventional superconductors: Looking through the hour-glass to hybridization and a superconducting spin resonance." Ph.D. Dissertation, McMaster University (2015).

5 | G. Romanelli, "On the quantum contributions to phase transitions in water probed by inelastic neutron scattering." Ph.D. Dissertation, University of Rome (2015).

Upgrades

In the Fall of 2015, the SEQUOIA team and the DAS group at SNS commissioned a new data acquisition system (DAS) for the beam line. The team is still developing some of the applications and fine tuning the user interface for this DAS, but the process has been very successful. We had fewer detector issues in 2015-B and fewer data acquisition problems. Please feel free to make suggestions concerning the DAS to your local contact at the SNS or with any survey questionnaires you may receive from the User Office.

During the beam outage of January 2016, SEQUOIA had improvements made to its detector electronics. A newer generation of communication modules was installed by the detector group, and the latest firmware is was installed on the detectors.

Also in the Fall of 2015 the SEQUOIA team was asked to prioritize upgrades to the instrument. Our first priority was to upgrade the vacuum system. A portion of this work has already been completed, and the Neutron Sciences Directorate has awarded funds to finish this work in 2016 and 2017. This project is primarily to improve the reliability of this instrument component, to add pumping redundancy to the sample vacuum chamber, and to upgrade and standardize the vacuum control system. The sample vacuum chamber currently has no pumping redundancy, and a failure of the cryopump would lead to significant instrument down-time.

We are also working on adding a third Fermi chopper to the chopper pit enclosure. The plan is to have three choppers installed: a fine resolution chopper optimized for 100 meV neutrons, a fine resolution chopper optimized for 1000 meV neutrons, and a coarse resolution chopper (sloppy) optimized for approximately 700 meV neutrons. We currently operate with two Fermi choppers installed, most often the 100 meV fine chopper and the 700 meV sloppy chopper. Other items on the SEQUOIA upgrade path include a scattered beam radial collimator to reduce the background from complicated sample environments, an incident collimator to reduce the beam divergence for experiments that are looking for signal at very low scattering angles, adding detectors to begin populating the top and bottom rows of the detector bank. SEQUOIA has room for five rows of detectors, and currently only has three of these populated with detectors. SEQUOIA is also considering placing detectors within the beam-stop of the instrument. These would be useful for measurements at very small scattering angles, but would likely require the incident beam collimator mentioned earlier to reduce the beam divergence.

Staff

The SEQUOIA team has a new veteran. Lisa Debeer-Schmitt left the team in 2015 to become the lead instrument scientist for the General Purpose SANS instrument at HFIR. Lisa made great improvements to the operation of SEQUOIA, and she will be missed. We congratulate her and wish her the best at GP-SANS. We are grateful for the Scientific Associate support from Lacy Jones and Harley Skorpenske during the transition. A new Scientific Associate will be joining the SEQUOIA team in the spring of 2016.

Future Experiments

Thanks for making 2015 a great year at SEQUOIA. The next proposal call for run cycle 2016-B beam time will close on April 13, 2016. December 2016 through May 2017 is being considered for a long shutdown at SNS to replace components around the target and moderators. Please be aware of this schedule contstraint when planning your beam time applications.

Sincerely,

The SEQUOIA team

Matthew B. Stone
Sasha Kolesnikov
Lisa Debeer-Schmitt
Harley Skorpenske
Lacy Jones

neutrons.ornl.gov/sequoia