Dear quantum materials users of HFIR:

As the deadline approaches for the next ORNL neutron scattering proposal call, here are some quick updates about the quantum materials user program at the High Flux Isotope Reactor (HFIR):

1. Proposal deadline

IPTS is now open to accept proposals for cycle 2021-A, with a **Sept. 16 deadline at noon**. Please visit **ipts.ornl.gov** to submit a proposal. Note that we are only accepting remote access proposals in this call. More details about the proposal call and beamline-specific conditions for remote access proposals can be found here.

2. Sample alignments

We prefer pre-aligned single crystal samples for remote access experiments on the triple axis instruments, WAND^2, DEMAND in two-axis mode, and GP-SANS, although we are willing to perform simple sample alignments for users. If you need your single crystal sample aligned for an experiment at ORNL, please contact the relevant instrument team to discuss feasibility.

3. Sample environment

(i) **High Temperature Experiments** (> 400K): A high temperature checklist is required to perform a high temperature experiment at HFIR. It is ideal to fill out the checklist and return it as soon as it is received so that any issues can be addressed and mitigated quickly. Please consider the sample holder material in reference to the sample material for any reactions that may occur at the experimental temperatures. The high temperature equipment dimensions and temperature range information are available on the public sample environment webpage here. For more information, please contact Bekki Mills (millsra@ornl.gov).

(ii) **Ultra-low Temperature and/or Magnetic Field Experiments:** (< 1.5K): Please ensure that your sample is received by the instrument team at least a few days in advance so there is plenty of time to prepare your sample and pre-cool it for the experiment. The ultra-low temperature equipment dimensions and temperature range information are available on the public sample environment webpage here. Please note most dilution fridge experiments will not be supported by our current remote access mode. For more information, please contact Chris Redmon (redmoncm@ornl.gov).

(iii) **Applied Pressure:** If you want to apply pressure during your experiment, it is critical to begin communication as early as possible to ensure success of your experiment. Please contact the instrument team and/or the Sample Environment's High Pressure Group (Mark Loguillo, loguillomj@ornl.gov) to help with the experiment planning. If possible, this communication should commence from the proposal writing stage and continue until the experiment begins. Please note most applied pressure experiments will not be supported by our current remote access mode.

(iv) **Block Scheduling:** We schedule experiments requiring the same sample environment equipment on our instruments in blocks. For this reason, the impossible dates that you provide when submitting the proposal are **extremely important**. Please enter these dates into the IPTS system with as much accuracy as possible when you submit your proposal. We will accept changes to impossible dates up to **one week** after experimental approval notices are sent out to users. After this period, we will create the block schedule and we may not be able to accommodate additional change requests.

4. Instrument descriptions and available capabilities for remote access

(i) **HB-1A**: fixed incident energy thermal triple axis spectrometer. Excellent signal-to-noise ratio and large Q-coverage makes this instrument ideal for magnetic diffraction studies of small single crystals (mass > 5 mg), thin films, and polycrystalline samples at a variety of different temperatures (0.3 K – 1800 K) and vertical magnetic fields (0 - 8 T). The monochromator upgrade completed in 2019 resulted in a 3x flux increase at the sample position. For more information, please contact Wei Tian (tianwn@ornl.gov) or Adam Aczel (aczelaa@ornl.gov).

(ii) **HB-1**: polarized thermal triple axis spectrometer. This instrument is specifically designed for polarized beam measurements, but also highly efficient for general purpose unpolarized neutron scattering experiments. These measurements can be done at a variety of different temperatures (0.3 K – 1800 K) and vertical magnetic fields (0 – 8 T). A high-resolution neutron Larmor diffraction capability utilizing Wollaston prisms is now available to users at HB-1. This technique provides a $\Delta d/d$ resolution on the order of 10^{-6}, which is ideal to measure small lattices distortions or Bragg peak shifts [see F. Li et al, *High resolution neutron Larmor diffraction using superconducting magnetic Wollaston prisms*, Scientific Reports 7, 865 (2017)]. For more information regarding the Larmor diffraction capabilities contact Fankang Li (frankli@ornl.gov). For all other information regarding HB-1 please contact Masaaki Matsuda (matsudam@ornl.gov), Jaime Fernandez-Baca (fernandezbja@ornl.gov), or Travis Williams (williamstj@ornl.gov).

(iii) **HB-2A**: neutron powder diffractometer. This instrument is used for crystal and magnetic structure studies of powder samples at a variety of different temperatures (0.3 K – 1800 K) and magnetic fields (0 – 8 T). Half-polarized experiments are now feasible on the instrument. For more information, please contact Clarina dela Cruz (delacruzcr@ornl.gov), Stuart Calder (caldersa@ornl.gov), or Keith Taddei (taddeikm@ornl.gov).

(iv) **HB-2C WAND²:** wide-angle neutron diffractometer. This instrument has a two-dimensional 3He position-sensitive detector covering scattering angles of 120° and +/- 7.5° vertical coverage. This enables measurements of single-crystal diffraction patterns in a short time over a wide range of reciprocal space, making WAND² useful to search for fundamental magnetic propagation vectors or measurements of diffuse scattering in single crystals. WAND² is also a medium resolution powder diffractometer where the high flux allows fast data sampling for studies of kinetics in phase transitions. Finally, it can be used for time-resolved experiments of structural transformations with short time constants or in stroboscopic mode for reversible processes. These measurements can be done at a variety of different temperatures

(0.3 K - 1800 K) and vertical magnetic fields (0 - 6 T). For more information, please contact Matthias Frontzek (frontzekmd@ornl.gov), Keith Taddei (taddeikm@ornl.gov), or Yan Wu (wuy1@ornl.gov).

(v) **HB-3:** general purpose thermal triple axis spectrometer. This instrument is our most intense triple axis spectrometer and is designed for inelastic measurements on single crystals over a wide range of energy and momentum transfers. These measurements can be done at a variety of different temperatures (0.3 K – 1800 K) and vertical magnetic fields (0 – 8 T). For more information, please contact Songxue Chi (chis@ornl.gov), Jaime Fernandez-Baca (fernandezbja@ornl.gov), or Travis Williams (williamstj@ornl.gov).

(vi) **HB-3A DEMAND:** single crystal diffractometer. This instrument is equipped with a two-dimensional area detector. It can operate in a four-circle mode for measurements (both structural and magnetic) with a temperature range 4 – 800 K, electric fields up to 1100 V, or magnetic fields up to 1 T. A two-axis operation mode allows for an extended temperature range 0.3 K - 1800 K with vertical magnetic fields up to 6 T. For more information, please contact Huibo Cao (caoh@ornl.gov), Bryan Chakoumakos (chakoumakobc@ornl.gov), or Yan Wu (wuy1@ornl.gov).

(vii) **CG-4C:** cold triple axis spectrometer. This instrument is designed for inelastic measurements on single crystals, where low energy transfers between -2 to 5 meV are necessary. These measurements can be done at a variety of different temperatures (0.3 K – 1800 K), vertical magnetic fields (0 – 8 T), and horizontal magnetic fields (0 – 6 T). The Q-range of the horizontal field magnet is very limited, so please contact the instrument team in advance of submitting your proposal to properly assess feasibility. For more information, please contact Tao Hong (hongt@ornl.gov), Jaime Fernandez-Baca (fernandezbja@ornl.gov), or Travis Williams (williamstj@ornl.gov).

(viii) **GP-SANS**: general-purpose small angle neutron scattering diffractometer. This instrument is used to probe magnetic structures on the order of 0.5 nm to 200 nm length scales (q = 0.0007 $Å^{-1}$ to about 1 $Å^{-1}$). These measurements can be done at a variety of different temperatures (0.3 K – 1300 K), horizontal magnetic fields (0 – 11 T), and vertical magnetic fields (0 – 8 T). For more information, please contact Lisa DeBeer-Schmitt (debeerschmlm@ornl.gov).

More details for these instruments can be found here. We look forward to receiving your neutron proposals before the **Sept. 16 deadline**.

Regards,

Your quantum materials team at the HFIR