

Report of the Users Committee Meeting October 28 and 29, 2005 at the University of Florida in Gainesville

Voting Committee Members attending: Arzhang Ardavan, Charles (Chuck) Agosta, James Brooks, W. Gilbert (Gil) Clark, Stephen Julian, Neil Kelleher, Lowell Kispert, Lia Krusin-Elbaum, Ayyalusamy Ramamoorthy, Steve Smith, Christopher Sotak, Timothy Stemmler, James (Jim) Valles, Ulrich Welp, Richard Wittebort, and Yue Wu.

Non-voting Committee Members elected for 2006-8 attending: Arthur (Art) Hebard, Vesna Mitrovic.

Introduction

This Users Committee (UC) meeting took place as the NHMFL is planning the re-proposal for the next 5 years to the NSF, and is redefining the long-term scientific, instrumentation and organizational priorities. The meeting included talks to and discussions with the entire UC on general issues affecting all users. More specialized issues were considered through meetings with the individual Users Advisory Committees (DC/Pulse, NMR, EMR, and ICR) and the relevant NHMFL staff.

Over the course of this two day meeting, the NHMFL staff presented details of their progress on bringing major new instrumentation capabilities to the users community, increasing the user base, statistics on usage and research productivity and visions of the future. The number and high profile of the scientific publications resulting from work at the NHMFL continues to grow and lead the world in high magnetic field science. Overall, the UC finds the NHMFL well positioned to make the technical developments and provide the user support necessary to further promote growth in their scientific profile in the coming five years.

The following summarizes the meeting by area and provides recommendations from the UC. Additional important details can be found in the attached NMR, EMR, and FT ICR MS Users Advisory Committee reports.

Users Committee Matters

In a closed door evening session on October 28, the UC elected its officers for the year 2006. The Chair, James Valles, and Secretary, Ulrich Welp were reelected to serve for January 1 – December 31, 2006. In addition, Arzhang Ardavan and Stephen Julian have agreed to serve on the executive committee of the UC, representing the High B/T, DC Magnet and Pulsed Magnet community with James Valles and Ulrich Welp. We thank them for accepting these responsibilities. The bylaws were amended so that the UC now consists of all the members of the Advisory Committees for DC/Pulse, NMR, ICR, and EMR. The Users Executive Committee (UEC) was created to handle communications between the NHMFL and the UC between annual meetings.

At the end of this year the terms of Gil Clark, Lia Krusin-Elbaum, Richard Wittebort, and Chuck Agosta expire. The UC thanks them for their service and diligence.

DC, Pulsed Magnets and High B/T Developments and UC Recommendations

Opening of Bay 2 of the High B/T Facility to Users - This facility at the University of Florida will provide users with magnetic fields up to 8 Tesla and sub millikelvin temperatures so that they can reach extremely high B/T ratios. The UC anticipates this opening will expand the user base by providing more opportunities at ultra low temperatures. Prof. Takano will submit to the Director a whitepaper detailing the request for an additional scholar scientist in support of bay 2 at the High B/T facility.

Split Gap Magnet - The MS&T group has created a Split Gap Magnet design that can be switched between a “scattering” geometry and a “rotator” geometry with relative ease. The switch requires the exchange of a high field insert. This advance will satisfy what had been conflicting desires of members of the users community interested in a high field split gap magnet. We encourage the laboratory to decide, within the next three months, which insert and hence, geometry, should be created first. This time frame is set by the schedule of tests laid out by Mark Bird.

Series Connected Hybrid Magnets - The users committee continues to view the SCH as the next generation workhorse for high field magnets as its energy efficiency will allow more user hours and higher continuous fields. It is an advance that is likely to capture the attention of the international magnet community. Progress toward the final design and fabrication of the first system has been rapid. It has reached a stage at which close coordination between the magnet designers and the instrumentation personnel seems critical. Issues associated with how the SCH design impacts the use and design of the experimental probes used within it and design restrictions that limit the number of magnetic field cycles per hour need to be addressed soon.

New DC Magnet Cryostats - The UC was pleased with the recent development of the new cryostat design for use in the DC magnets. The dewars will have an increased hold time, reducing the frequency of cryogen transfers, and will be more robust and thus, less likely to have icing issues which can delay experiments. Altogether, the design appears more user friendly and likely to facilitate more efficient use of magnet time.

Operations Schedule for the DC Magnet Facility Two issues regarding the operations schedule arose during the meeting. The first consisted of proposals for how to best structure a week of magnet users time so that staff could provide the most efficient support and magnet time could be used most efficiently. The second regarded the potential expansion of the professional staff at the NHMFL. The goal of an expansion would be to provide the professional staff with more time for their research and hence, professional development. Neither of these issues could be adequately addressed during the UC meeting and we encourage the NHMFL to consider them further at an upcoming retreat.

Pulsed Magnet Advances The Los Alamos pulsed magnet facilities continue to offer and develop new capabilities for users. They are making rapid progress toward their 300T goal for a single turn system having recently achieved a 175 T peak field. The UC was pleased to see that they are already accepting users proposals for this system and offering a range of experimental probes. In the coming year, the 100 T multi-shot and 60 T controlled waveform systems are slated to be tested. The design of the 100 T multi-shot pushes technological limits to substantially increase the time at peak field and to enable a large number of “shots”. These advances will increase the number of experimental probes available over existing one shot “destructive” technologies. Consequently, the

UC anticipates that this facility will be very appealing to users. The recent successful nanotube experiments using a 75 T prototype insert for this system constitutes an impressive step toward the final 100 T goal. The controlled waveform 60 T system is designed to enable users to customize their magnetic field pulses to optimize their magnetic field use and data collection. Users performing thermodynamic measurements that need to work at discrete field values will find this system particularly attractive.

NMR Developments and UC Recommendations

900 MHz NMR - The major achievement in magnetic resonance over the past year has been the commissioning of the 900 MHz instrument. The preliminary results that have been obtained in a short period of time demonstrate in an impressive fashion the capabilities of the instrument in the areas of micro-imaging, solution and solid-state NMR.

The overall recommendation of the UC is to use the 900 MHz instrument as the centerpiece in building the NMR component of the NHFML into a national resource for NMR spectroscopy and for imaging. In addition to suggesting that the NHMFL take a more proactive approach to expanding the external users community for this facility, the NMR Users subcommittee recommends increased personnel support for work in:

- Novel probe development - The advances that have been made in the development of NMR probes for biological solid-state NMR should be sustained and the development of new probes for whole body animal imaging should be pursued.
- Micro-imaging - The micro-imaging capabilities of the 900 MHz instrument should be exploited. Support for a staff scientist with imaging expertise and for associated equipment and infrastructure would greatly expand the imaging effort in Tallahassee.
- High Field Solid State NMR - There was enthusiasm for the recruitment of a scholar scientist who would drive the development of solid-state NMR methodology and applications for the proposed 35T magnet. This person would also increase the critical mass of technical/applications support on the 900 MHz instrument.

NMR Instrumentation - The UC has the following suggestions regarding NMR instrumentation:

- An annual budget is necessary for the routine upgrade, maintenance and replacement of the existing instrumentation (consoles, probes).
- The UC supports a suggestion to dedicate the 900 MHz instrument to solid-state and imaging applications, and to acquire state-of-the-art high field NMR instrumentation for solution applications. A dedicated solution NMR instrument could take advantage of HTS coils developed at the University of Florida for small sample volumes and provide access to user groups that do not otherwise have high field solution NMR capability. In addition, solution NMR instrumentation would serve to maintain a strong solution NMR group to support the proposed 30 T/1.3 GHz instrument that is being envisioned for the future. The committee felt that the development of a 30 T/ 1.3 GHz magnet has considerably more merit than last year's proposal for a 1.0 GHz magnet.

Magnetic Resonance at UF - At the University of Florida, the increased support from the NHMFL has catalyzed research in a number of exciting areas, particularly over the past year. New faculty members in physics and chemistry have nucleated a group in structural biology that complements the strong imaging community. Several areas were identified that would benefit from a resident Scholar Scientist. The area that would have the most impact from increased support is in molecular imaging.

EMR Developments and UC Recommendations

Advertisement of EMR user facilities - The committee suggested that the instruments potentially available to users might be better advertised. In particular, each instrument should be listed on the NHMFL website with its available field range, frequency range, temperature range, source type, and the classes of compatible sample types (aqueous solutions, powders etc., container type/tube size).

External Review of EMR Program - The Users committee was informed about the pending EMR program review and urged that an external review of the EMR group be made. It was felt that this process could be very valuable in helping to develop the EMR vision for the renewal proposal. The external review committee should be made up of world leaders in EPR. More details of the recommendation can be found in the accompanying EMR subcommittee report.

FT ICR MS Developments and UC Recommendations

21 Tesla ICR System - The UC lauds Alan Marshall's recent efforts in planning for this system and finding academic and corporate partners. PNNL (a DOE lab) and KBSI (in Korea) have become key partners. The UC sees that their affiliation provides an incentive for vendors to work with MS & T to support the development of this state of the art instrument.

FT ICR MS - The UC sees new research opportunities, such as in natural products, proteomics, microbiology, and human cancer biology, that can drive the expansion of the FT ICR MS facilities users base. As the site with the highest performance mass spectrometer in the world the NHMFL has the potential to drive the next phase of maturation in the field of large molecule mass spectrometry. The UC encourages the NHMFL to seek ways to develop this base. Members of the UC will be happy to help.

General User Topics

Users Instrumentation Proposals - A "consortia" model of teaming together outside users with common interests to develop new high magnetic field instrumentation was briefly discussed and frequently revisited during the meeting. The UC finds this concept attractive, especially for addressing the more specialized needs of the users community. The UC recommends that the magnet lab create guidelines and suggestions for how users can best submit multi-institutional proposals to external funding sources for the development of instrumentation for use at the magnet lab.

Housing and Travel

1. Tallahassee - The four bedroom condominium in Tallahassee has been a very popular housing solution for visitors to the NHMFL. Frequently, it cannot accommodate all the visitors who desire to take advantage of its low costs and conveniences. We encourage the NHMFL to consider leasing a second condominium to help reduce these pressures.

2. Gainesville - It has been pointed out that there is no housing for scientists who visit the high B/T facility to perform experiments that last a month or more. The UC is pleased that Director Boebinger and Professor Neil Sullivan at UF have declared that they will find a solution to this shortly.

3. We encourage the NHMFL to be generous in their support for users' travel costs. Like electricity for magnets, this is not a cost that is often supported in individual grants, and it is up to the NHMFL to fill this gap.

Closing Remarks

The UC feels that the NHMFL is on a good track in its preparations for the renewal proposal. The broad visions and possible future scientific directions as outlined by the Director are compelling. Finally, the UC supports a retreat in early 2006 that:

- Establishes the structure of the renewal proposal.
- Discusses points made by Kirby Kemper Vice President for Research Florida State University regarding how to address the findings of the COHMAG report within the proposal.
- Considers different modes of use of the DC facilities (e.g. 24/7 or 24/5 operation).
- Discusses the "consortia" scheme for funding major instrumentation.

Supporting Documents:

EMR Subcommittee Report 2005

NMR Subcommittee Report 2005

FT ICR MS Subcommittee Report 2005