4th Super-PIRE - 26th REIMEI Workshop on Frontiers of Condensed Matter Physics

May 16 – 22, 2015

TRIUMF, Vancouver, Canada

Unconventional Superconductors
Quantum Critical Phenomena
Skyrmion / Itinerant Magnets
Ferromagnetic Semiconductors
Mott Transition systems

No Registration Fee for Visitors: Everybody Welcome

Organizers: Iain McKenzie (TRIUMF) and Tomo Uemura (Columbia)

FCMP Lectures

Ian Affleck (UBC) Atsushi Fujimori (Tokyo) Sadamichi Maekawa (JAEA)
Dimitri Basov (UCSD) Changqing Jin (Beijing) Ni Ni (UCLA)
Simon Billinge (Columbia) Hiroshi Kageyama (Kyoto) Abhay Pasupathy (Columbia)
Doug Bonn (UBC) Hugo Keller (Zurich) Elisa Saitovitch (CBPF Rio)
Collin Broholm (JHU) Gabi Kotliar (Rutgers) Qimiao Si (Rice)
Jak Chakhalian (Arkansas) Rob Kiefl (UBC) Oleg Tchernyshyov (JHU)
Pengcheng Dai (Rice) Philip Kim (Harvard) Tomo Uemura (Columbia)
Andrea Damascelli (UBC) Junichiro Kono (Rice) Shinichi Uchida (Tokyo)
Liang Fu (MIT) Alessandra Lanzara (Berkeley) Tonica Valla (BNL)
Masatoshi Imada (Tokyo) Graeme Luke (McMaster)

Hands-on MuSR training
4th Super-PIRE REIMEI FCMP Workshop at TRIUMF, Vancouver, May 16-22, 2015: Session Schedule

<table>
<thead>
<tr>
<th>May 16 Sat</th>
<th>9:00-9:55</th>
<th>9:55-10:55</th>
<th>CB</th>
<th>11:20-12:15</th>
<th>12:15-1:10</th>
<th>Lunch</th>
<th>2:50-3:45</th>
<th>3:45-4:40</th>
<th>CB</th>
<th>5:10-6:05</th>
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<td>May 17 Sun</td>
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<td>Broholm</td>
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<td>Lanzara</td>
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<td>Fujimori</td>
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<td>Basov</td>
<td>Kono</td>
<td>Kageyama</td>
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<td>May 19 Tue</td>
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<td>Keller</td>
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<td>May 20 Wed</td>
<td>Maekawa</td>
<td>Fu</td>
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<td>May 21 Thur</td>
<td>Pasupathy</td>
<td>Billinge</td>
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<td>Uchida</td>
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<td>Frandsen</td>
<td>Svanidze</td>
<td>Guguchia</td>
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<td>May 22 Fri</td>
<td>Conference Tour to Victoria and the Butchart Gardens with BC Ferry Rides: CND 130 per person</td>
<td>Kayaking at Jericho Beach: CND 59 per person</td>
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Grad / UG students participants:
- 17 Columbia
- 6 Rice
- 2 UC Berkeley
- 2 UCLA
- 2 UIUC
- 2 U Oregon Eugene
- 1 Washington U
- 1 Harvard
- 1 Berlin

Session Chairs: Brewer, Sonier, Yonezawa, Guguchia, MacDougall, MacFarlane, Nachumi
μSR Training Tutorial: May 18-20, FCMP Workshop, TRIUMF

Learning Activities

Hands-on Data Taking at the Beamlines:
- Tour of experimental area and counting room, including beamline elements, sample environment components, and counting electronics
- Controlling basic experimental parameters—temperature, field, etc.
- Viewing and understanding μSR spectra from the MUD server
- Deciding on a run plan based on the physics of interest in the given sample

Data Analysis using MusrFit
- Students will remotely log in to the TRIUMF computers to use the MusrFit data analysis software
- Hand-picked data from the MUD server to highlight the most common types of fits performed for condensed matter applications of μSR
  - Kubo-Toyabe function
  - 1/T1 analysis
  - ZF precession with temperature dependence
  - Multiple ZF precession frequencies
  - Drop in asymmetry due to magnetic transition
  - TF damping in type-II superconductors
  - LF decoupling
  - Global fits with global asymmetry, field, etc

Learning Groups (5-6 students each plus one tutor)

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<th>Group Number</th>
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<th>4</th>
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<tr>
<td>Tutor</td>
<td>Lian Liu</td>
<td>Sky Cheung</td>
<td>Ben Frandsen</td>
<td>Tim Munsie</td>
<td>Murray Wilson</td>
<td>Zurab Guguchia, Yipeng Cai</td>
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<td>Students</td>
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Daily Group Schedule

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<th>M15</th>
<th>Data 1</th>
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Samples to Measure

**M15**
- TiAu (itinerant ferromagnet)
- K$_2$Cr$_3$As$_3$ (new, possibly unconventional superconductor)

**M20**
- Sm$_{0.75}$Nd$_{0.25}$NiO$_3$ (Mott insulator showing metal-insulator transition)
- Sr$_2$IrO$_4$ (spin-orbit induced Mott insulator)
- BaFe$_2$As$_2$ with uniaxial strain device (superconductor with nematic order)
Excursions on Friday, May 22\textsuperscript{nd}, 2015:  Two possible choices

**Day trip to Victoria / Butchart Gardens**

This excursion is run by Landsea Tours and Adventures with a maximum of 24 people.  [http://vancouvertours.com/tour/victoria-tour/](http://vancouvertours.com/tour/victoria-tour/) The cost is $135 per person and includes the ferry tickets, Butchart Garden ticket and guide gratuity. It does not include any food or other activities in Victoria.

**Itinerary**

7:15 a.m. - Pickup from the UBC Campus – TRIUMF House  
8:15 a.m. - Arrive at Tsawwassen Ferry Terminal  
9:00 a.m. - Depart on BC Ferries for Victoria  
10:35 a.m. - Arrive at Swartz Bay Ferry Terminal on Vancouver Island  
11:30 a.m. - Arrive in downtown Victoria  
Tour around the downtown core, through Chinatown, Parliament Buildings, Dallas Road and Beacon Hill Park  
Free time for activities (possibly Afternoon Tea at the Empress or visit the Royal BC Museum) and Sightseeing around Victoria  
3:00 p.m. - Depart downtown Victoria  
3:45 p.m. - Arrive at Butchart Gardens (2 hour stop)  
5:45 p.m. - Depart Butchart Gardens  
6:15 p.m. - Arrive at Swartz Bay Ferry Terminal  
7:00 p.m. - Depart on BC Ferries for Vancouver  
8:35 p.m. - Arrive at Tsawwassen Ferry Terminal  
9:30 p.m. - Drop off at the UBC Campus – TRIUMF House
Kayaking at Jericho Beach
Two-person kayaking from Ecomarine at the Jericho Sailing Centre, 1300 Discovery Street (Northeast corner of the compound) ([http://ecomarine.com/contact/jericho.html](http://ecomarine.com/contact/jericho.html)). Participants are responsible for their own transportation between Gage Towers and Jericho beach.

The 2.5-hour tour costs $59. We will either paddle east in direction of Kitsilano or west in the direction of UBC, depending on the wind. This is a great opportunity for the workshop participants to see the beautiful shoreline below the UBC area.

Please dress appropriately. Please bring a sun hat, sunscreen, sunglasses with secured neck string and a change of clothes (including footwear). Please wear comfortable shoes for in the kayak (i.e. old running shoes or sport sandals) and remember they will get wet.