MRL SEF Operations During the Research Ramp-Up 2

MRL Staff
Materials Research Laboratory at MIT
8/4/2020
Usage in RR1 vs 2019?

- **Used Hours:**
  - RR1: 32%
  - 2019: 35%

- **Engagements:**
  - RR1: 35%
  - 2019: 35%

- **Users:**
  - RR1: 35%
  - 2019: 35%
### Phased plan for MRL SEFs (1)

<table>
<thead>
<tr>
<th>PPE requirement</th>
<th>MIT Phase RR1 (June 15th – July 27th) ≤ 25% capacity on campus</th>
<th>MIT Phase RR2 (July 27th – TBD) ≤ 50% capacity on campus</th>
<th>MIT Phase RR3 (Date range TBD) New normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All users must wear gloves in the facility, as well as facemasks that meet MIT guidelines.</td>
<td>1. All users must wear gloves in the facility, as well as facemasks that meet MIT guidelines.</td>
<td>1. PPE policy will conform to MIT recommendations and regulations.</td>
</tr>
<tr>
<td>2.</td>
<td>Used PPE must be properly disposed of in the designated trash bin.</td>
<td>2. Used PPE must be properly disposed of in the designated trash bin.</td>
<td>2. Safety glasses are not shared. PI’s required to issue individual safety glasses.</td>
</tr>
<tr>
<td>3.</td>
<td>Replace the plastic covering on the computer workstation peripherals after your session.</td>
<td>3. Replace the plastic covering on the computer workstation peripherals after your session.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Safety glasses are not shared. PI’s required to issue individual safety glasses.</td>
<td>4. Black misting bottles used to sanitize peripherals. No more plastic covering.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Replace gloves upon finishing tasks involving chemical residues to avoid contamination of equipment.</td>
<td>5. Safety glasses are not shared. PI’s required to issue individual safety glasses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Replace gloves upon finishing tasks involving chemical residues to avoid contamination of equipment.</td>
<td></td>
</tr>
</tbody>
</table>

### Cleaning policy and protocol

<table>
<thead>
<tr>
<th>Cleaning policy and protocol</th>
<th>MIT Phase RR1 (June 15th – July 27th) ≤ 25% capacity on campus</th>
<th>MIT Phase RR2 (July 27th – TBD) ≤ 50% capacity on campus</th>
<th>MIT Phase RR3 (Date range TBD) New normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Users must use provided alcohol to wipe down contacted surfaces on the instrument and inside the room before and after each session.</td>
<td>1. Users must use provided alcohol to wipe down contacted surfaces on the instrument and inside the room before and after each session.</td>
<td>1. Lab staff to wipe down high touch surfaces in morning upon arrival and afternoon before leaving.</td>
</tr>
<tr>
<td>2.</td>
<td>Lab staff to wipe down high touch surfaces in afternoon prior to leaving facility.</td>
<td>2. Lab staff to wipe down high touch surfaces in morning upon arrival and afternoon prior to leaving facility.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Periodic decontamination services will be scheduled to ensure clean high traffic areas.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Instrument training protocol

<table>
<thead>
<tr>
<th>Instrument training protocol</th>
<th>MIT Phase RR1 (June 15th – July 27th) ≤ 25% capacity on campus</th>
<th>MIT Phase RR2 (July 27th – TBD) ≤ 50% capacity on campus</th>
<th>MIT Phase RR3 (Date range TBD) New normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>In-person training must be suspended during RR1, except in cases of exceptional need (requiring pre-approval by the CF Leader, the user’s PI and their DLC head).</td>
<td>1. In-person training for MIT users of SEF instrumentation will be 2 people (lab manager and trainee). Remote instruction augmented by hands-on training with social distancing protocols.</td>
<td>1. Group training for new users of SEF instrumentation will be in small groups yet more often to minimize the close-contact interactions amongst users and staff.</td>
</tr>
<tr>
<td>2.</td>
<td>Efforts will be made to provide virtual instrument refresher training on a case by case basis for trained novice users.</td>
<td>2. Training sessions for data analysis software packages will continue as scheduled but will be performed using remote videoconferencing tools (Zoom).</td>
<td>2. Training sessions for data analysis software packages will continue as scheduled in small groups.</td>
</tr>
<tr>
<td>3.</td>
<td>Training sessions for data analysis software packages will continue as scheduled, but will be performed using remote videoconferencing tools.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Phased plan for MRL SEFs (2)**

| Phase RR1  
(June 15th – July 27th)  
≤ 25% capacity on campus | Phase RR2  
(July 27th - TBD)  
≤ 50% capacity on campus | Phase RR3  
(Date range TBD)  
New normal |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lab occupancy limits at any one time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASEF – Surface (2 rooms)</td>
<td>Max 2 users per room</td>
<td>ASEF – Surface (2 rooms)</td>
</tr>
<tr>
<td>ASEF – OTC (2 rooms)</td>
<td>Max 2 users per room</td>
<td>ASEF – OTC (2 rooms)</td>
</tr>
<tr>
<td>EMSEF (entire suite)</td>
<td>6 users (1 per bay) (+1 user in Bldg 24)</td>
<td>EMSEF (entire suite)</td>
</tr>
<tr>
<td>XRDSEF (one room)</td>
<td>Max 4 users</td>
<td>XRDSEF (one room)</td>
</tr>
<tr>
<td><strong>Reservation policies</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. High demand tools have limits on total reservation time in a 2 week horizon.  
2. 1 hour delays between users in electron microscope rooms  
3. No walk up usage. Must make reservations 24 hrs in advance.  
4. Reservations will be monitored by staff for spatial and temporal distancing. | 1. High demand tools limits lifted on total and prime time reservation time in a 2 week horizon  
 2. 1 hour delays between users in electron microscope rooms  
 3. No walk up usage. Must make reservations 24 hrs in advance.  
 4. Reservations will be monitored by staff for spatial and temporal distancing. | 1. High demand tools have limits on total reservation time in a 2 week horizon  
 2. 1 hour delays between users in electron microscope rooms  
 3. No walk up usage. Must make reservations 24 hrs in advance.  
 4. Reservations will be monitored by staff for spatial and temporal distancing. | |
| **Facilities schedule and accessibility** | | | | | |
| **9A-5P Mon-Fri** | | | | | |
| 1. Trained users. Staff will be on campus and on call via Zoom. All user interactions will be virtual except in exceptional circumstances. | 1. Trained users. Staff will be on campus and on call via Zoom. In-person user interactions will be limited based on social distancing guidelines. | 1. Trained users. Staff will be on campus and interactions will be guided by MIT policies. |
| **Afterhours, weekends, holidays** | | | | | |
| 1. Trained users with after hours access privileges. On call contact available for emergency safety situations. | 1. Trained users with after hours access privileges. On call contact available for emergency safety situations. | 1. Trained users with after hours access privileges. On call contact available for emergency safety situations. | |
| **Access restrictions** | | | | | |
| 1. No in-person assisted users.  
2. No external users. | 1. External user sample submission for data collection at assisted use rates  
2. No new external users. | 1. Access to all users subject to MIT policies. | | | |
## Instrument reservation policies in Phase RR2

<table>
<thead>
<tr>
<th>Lab specific reservation policy</th>
<th>XRDSEF</th>
<th>EMSEF</th>
<th>ASEF - Surface</th>
<th>ASEF - OTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users can only have one standing reservation at a time per tool. New reservations can be made after existing reservation is used. The maximum length of reservation is detailed below.</td>
<td>One hour delays between users in electron microscope rooms.</td>
<td>Users can only have one standing reservation at a time per tool. New reservations can be made after existing reservation is used. A daytime reservation cannot exceed 4 hours without permission from the lab supervisor.</td>
<td>No modification of Coral restrictions.</td>
<td></td>
</tr>
</tbody>
</table>

| Tool specific reservation total time limits in 2 week horizon | Smartlab thin film XRD: 4 hrs Panalytical PXRD: 4 hrs | Zeiss Merlin HRSEM: 3 hrs FEI Helios FIB/SEM: 5 hrs JEOL 2010 HRTEM: 4 hrs FEI Tecnai TEM: 4 hrs JEOL 2010F TEM: 4 hrs JEOL 2011 TEM: 8 hrs ION MILL: 8 hrs | No tools with specific total time limit restrictions. | SQUID MPMS VSM: 48 hrs |

| SEF-wide policies | 1. Only users currently engaging the instruments can be present inside the facility. 2. Users must indicate on the room's occupancy door board that they are in the room and remove that indication when they leave the room. 3. No walk up usage. Users must make reservations 24 hrs in advance. 4. Reservations will be monitored by staff for spatial and temporal distancing. | | | |
Instrument and data analysis training in RR2

**MIT affiliated users only** will be granted access to the SEFs after instrument training.

MRL will not accept new external users at this time for hands-on training.

External users are welcome to join instrument and data analysis training sessions via Zoom.

**Shared facility calendars** are embedded within the individual SEF websites: [http://mitmrsec.mit.edu/shared-facilities/instruments-labs#gsc.tab=0](http://mitmrsec.mit.edu/shared-facilities/instruments-labs#gsc.tab=0)
Remote instruction via Zoom augmented by hands-on training with social distancing protocols

Recordings made available for trainees shortly after training session

Supplemental 1-on-1 hands-on training where needed during users’ 1st independent instrument session

Data analysis workshops via Zoom only
MIT Visitor Policy

To maintain low building density, visitor access to campus will be significantly limited and discouraged through the end of the calendar year 2020.

<table>
<thead>
<tr>
<th>Campus visitor purpose</th>
<th>Approved access limited to these campus visitor subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducting or participating in research</td>
<td>• Research staff appointed or employed by neighboring research institutions (Broad, Whitehead, Ragon, Draper) as users of MIT research facilities</td>
</tr>
<tr>
<td></td>
<td>• External users of MIT research facilities, if deemed essential by DLC and consistent with MIT guidance on current building and campus density requirements, including users employed by other academic institutions, not-for-profit research organizations, or for-profit companies of any size</td>
</tr>
<tr>
<td></td>
<td>• Human research subjects approved by COUHES for MIT research projects</td>
</tr>
</tbody>
</table>

https://covid19.mit.edu/travelers-visitores

Piloting External User Sample Submission for Data Collection at Assisted Use Rates

• Sample submission
  – X-ray Diffraction SEF
  – Analytical SEF – OTC
  – As we receive feedback from this initial program, we will add other facilities and instrumentation where data collection by staff is viable.

• External users only!

• Sample submission for external collaborations setup in the shared facilities prior to March 2020

• SEF staff will not sign Non-Disclosure Agreements (NDAs).
  – If samples or data collection is proprietary, please make alternate plans for analytical services with a commercial lab.

• X-ray Diffraction SEF
  – Charles Settens, settens@mit.edu
  – Corey Fucetola, fucetolc@mit.edu

• Automated sample changer available:
  – Panalytical
  – Smartlab
  – Bruker GADDS
  – SAXSLAB

• Analytical SEF – Optical Thermal Characterization
  – Tim McClure, mtim@mit.edu

• Automated sample changer available:
  – ICP-OES
Procedure for External User Sample Submission

1. Submit sample submission form:
   2. ASEF-OTC: [https://mtim.mit.edu/work-request](https://mtim.mit.edu/work-request)

2. Have phone or Zoom conversation about:
   1. # of samples
   2. Drop off and pickup logistics (Building 13 Lobby)
   3. Data collection specifics
   4. Turn-around time

3. External user drops off sample (Building 13 Lobby).

4. Staff collect data (with external user on phone or Zoom if necessary).

5. Transfer data to external user via email or cloud service.

6. External user collects measured samples and (possibly drop off another set of samples).

---

### MATERIALS ANALYSIS SEF

<table>
<thead>
<tr>
<th>Service</th>
<th>Self-Users</th>
<th>Training</th>
<th>Assisted Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPS, AFM, FTIR, Auger</td>
<td>$44/hr</td>
<td>$81/hr</td>
<td>$87/hr</td>
</tr>
<tr>
<td>Most systems</td>
<td>$33-37/hr</td>
<td>$81/hr</td>
<td>$87/hr</td>
</tr>
<tr>
<td>SQUIDs</td>
<td>$240/day (weekdays)</td>
<td>$85/hr</td>
<td>$70/hr</td>
</tr>
<tr>
<td></td>
<td>$220/day (weekends)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICP-OES</td>
<td>$35/hr</td>
<td>$69/hr</td>
<td>$86/hr</td>
</tr>
</tbody>
</table>

### ELECTRON MICROSCOPY SEF

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Self-Users</th>
<th>Training</th>
<th>Assisted Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microscopes</td>
<td>$70/hr</td>
<td>$142/hr</td>
<td>$152/hr</td>
</tr>
<tr>
<td>Gatan PIPS, Fishcone 1010 Ion Mill</td>
<td>$9.26/hr</td>
<td>$129.47/hr</td>
<td>$138.20/hr</td>
</tr>
<tr>
<td>Helios FIB</td>
<td>$94/hr</td>
<td>$189/hr</td>
<td>$202/hr</td>
</tr>
</tbody>
</table>

### X-RAY DIFFRACTION SEF

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Self-Users</th>
<th>Training</th>
<th>Assisted Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray Equipment</td>
<td>$51/hr</td>
<td>$201/hr.</td>
<td>$120/hr</td>
</tr>
<tr>
<td>Night / Weekend Use</td>
<td>$17/hr</td>
<td>N/A</td>
<td>$120/hr</td>
</tr>
</tbody>
</table>

Commercial Use rate 3 times rate above
Coral server for MRL has been upgraded and renamed mrlms.mit.edu. It was formerly cmse-coral.mit.edu

The old domain name -- cmse-coral.mit.edu -- should continue to work backwards for compatibility, but the new name for running Coral, MUMMS, etc. should now be used.

Remote Coral (Java Webstart) https://mrlms.mit.edu/coral-remote-bundles

MRL User/Machine Management System http://mrlms.mit.edu/mumms

New features:

Coral in a web browser - https://mrlms.mit.edu/runcoral
The web browser Coral client feature should work more smoothly and now will allow up to 30 concurrent clients to run.

https://mrlms.mit.edu/costrecovery/login.html
Self users can now login to Cost Recovery and see just their charges for a given billing period. It allows users to see how much their month to date bill is for the current billing period as well as what cost object it will be charged to.
Interlocks for all MRL SEF’s – Fall 2020

- EMSEF microscopes interlocked in May 2018

- Impetus for interlocks in other shared facilities
  - Better contact tracing information through Coral lab management system
  - Accurate billing with less chance of confusion

- Subtle changes with interlocked instruments
  - Workstation computers will be strictly for data collection
  - Kiosks for logging into Coral in each facility
MIT MRL’s new Bruker Icon XR Scanned Probe Microscope

A reliable workhorse instrument with exciting new features and state-of-the-art capabilities
Bruker Icon XR SPM

Familiar AFM modes supported, with quicker set-up

• Contact Mode
• Tapping Mode
• Magnetic Force Microscopy

• Piezo Force Microscopy
• Conducting AFM

Plus PeakForce Tapping Mode with ScanAsyst
This feedback mode has much less potential for probe and sample damage, and opens up a world of fast and easy quantitative measurement.

• Electrical characterization from 80 fA to 1 uA with 10 nm spatial resolution
• Kelvin Force Probe Microscopy with amplitude or frequency feedback
• Pixel-by-pixel quantitative force characterization to probe material properties

- **Monday, August 10, 2 - 4 pm**
  Zoom session introduction to the Icon XR for self users of our older D3100 systems (Nanoscope IV and Nanoscope V).

- **Tuesday, August 11 – Friday, August 21**
  Two-hour, one-on-one hands-on sessions to bring self users up to speed on standard Icon XR operation.
  Email Libby: [elshaw@mit.edu](mailto:elshaw@mit.edu) to schedule

- **Starting in early September, dates TBD**
  Zoom introductions for new trainees and trainees in advanced techniques, followed by one-on-one hands-on training sessions.
Open discussion

- Questions about RR2 policies?
- How are MRL SEF’s currently working for you?
- Where can we help?
- Do you have safety concerns?