



# **CNS Nanofab COVID-19 Reopening Protocol Orientation**

(for 2<sup>nd</sup> wave expert users)

CNS-Nanofab Team

7/17/2020



# Agenda

1. General CNS Reopening Guidelines (CNS Admin)
2. CNS-Nanofab COVID-19 Reopening Protocol
  - A. General protocol and operation rules for Nanofab in COVID19 era (JD)
  - B. Social distancing control and special arrangement for each bay and labs  
(Nanofab staff)
3. Q/A



# **Announcement and Notes from CNS Admin Office**

**-Jim Reynolds**



# Operational Phases

## (General Guidelines-Dr. Bill Wilson)

### Phase 0: Ramp-up (6/8/2020, Complete)

1. Staff only
2. No Research (instrument re-boot/qualification)
3. Distancing protocols physically put into place (~TBD)

### Phase 1: (soft reopening, 6/24)

1. Staff (remote if possible)
2. SuperUser Access (low Density, A/B cohorts)  
Nanofab-6/24, Imaging-7/20
3. Some remote use (instrument /tool)
4. No on-site training  
(will re-evaluate after 3 weeks)

### Phase 2: (~TBD )

1. Staff (remote if possible)
2. Some remote use (instrument /tool)
3. More SuperUser Access (low Density, ? %)
4. Remote Experimental Consultation
5. No on-site training  
(~TBD weeks)

### Phase 3:

1. Staff (remote if possible)
2. Some remote use (TBD/instrument /tool)
3. SuperUser Access (low Density, ? %)
4. Resume training with new protocol / mostly on-line, Zoom (steady-state until Green)

All non-cleanroom spaces – single occupancy (HEPA added or ordered)

A team/ B team structure, for those coming in, with alternating pairs of days( i.e., 2 days on 2 days off). (*one option*) Staff; 3 days on/ 3 days off, Sunday cleaning for Fab.

HEPA filters in offices.



# Phase 0, Get the Lab, Staff and New Protocol Ready (Started in April)



## School guidance:

- EH&S and university guidance (training, PPE, lab reopening, access...)
- User access permission (5/20)

## Supplies and Hardware:

- Order and restock the lab supplies (since 5/6, 4 weeks)
- PPE and office/lab HEPA filter system
- Door access control through IT, CCURE and Siemens (since 4/30, 5-6 weeks)

## Protocol and new rules for COVID19 era- (lots of inputs from users and NNCI)

- New PPE protocol (since 4/21)
- Social distance control protocol (since 4/30),
- New training protocol (since 4/15)

## Equipment and lab rebooting

- Weekly lab check-in after shut-down (3/18)
- Equipment and lab rebooting, starting on 6/8.
  - 80% tool rebooting line on 6/19

## Phase 1: Soft-reopening of Nanofab

- The 1st wave reopening on 6/24: low-occupancy (Main CR, SMCR, B58, G27, G06, G56)
- The 2nd wave of reopening on 7/17/2020



# COVID-19 CNS-Nanofab Reopening Protocol



## Cleanroom is the safest lab during COVID-19 period, is it true?

- Air exchanges 3-5 times per minute,
- High grade HEPA filters block most of virus from the outside.

However, once people enters the CR,

- Aerosol still travels around with the air flow
- User will keep moving around, which increases the possibility of spreading
- All tools are shared, contamination will cause spreading

The safest place could be dangerous, if you drop your guard!

## 3 critical consideration and controls for CNS Lab reopening:

- ☐ Self-health evaluation,
- ☐ Social Distancing,
- ☐ PPE

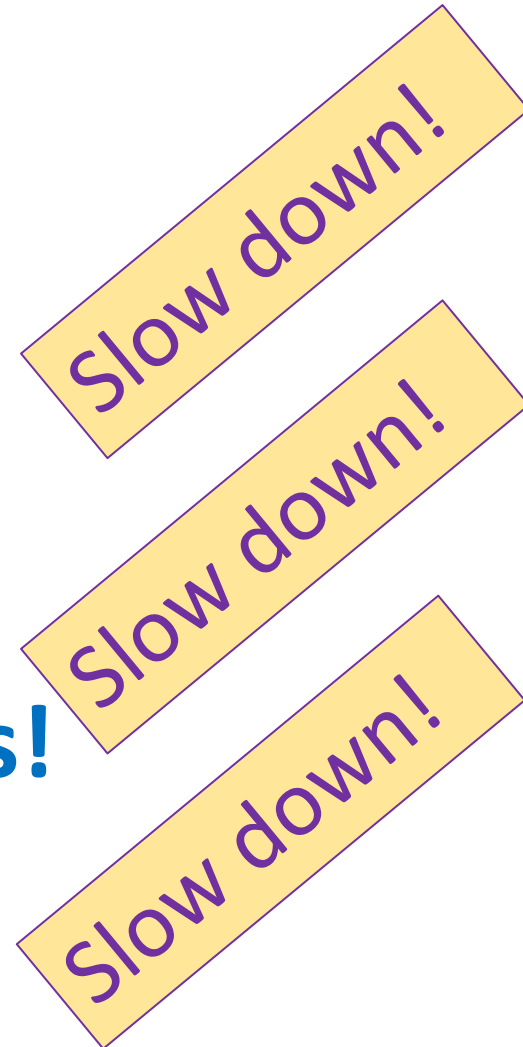
**Minimize the spreading as much as possible!**



**Safety is the Top Priority !!!**

**Responsibility, Patience, Respect,  
Communication, Understanding,  
Cooperation, and Compliance with Rules!**

**Zero Tolerance Policy!!!**





# COVID-19 CNS-Nanofab Reopening Protocol



1. User access approval
2. PPE requirement and protocol
3. Cleanroom occupancy and door access control
4. Tool arrangement and disinfection
5. CNS lab daily operation schedule
6. Staff work schedule
7. Training arrangement
8. Social distancing control and special arrangement for each bay/lab (Nanofab staff)
  - a. Floor sign/marks in CR (Ling)
  - b. Gowning room protocol (John/Malcolm)
  - c. EBL, Litho, and Metrology bay (Guixiong,/Yuan/Jason)
  - d. Window metrology bay (Jason/JD)
  - e. Wet and RIE bay (Ling/Mac)
  - f. Dry bay (Mughees/Kenlin)
  - g. PVD bay (Ed/Mughees)
  - h. LISE-G27 (Jason/Greg/Guixiong)
  - i. LISE-B58-AFM room (Jason/JD)
  - j. LISE-G56-computer room (JD/Guixiong)





# CNS Cleanroom User Access Criteria

- In Phase 1, only selected expert users will have the access
  - Nominated by PI,
  - Evaluated and selected by CNS top-management
  - Divided into two groups, A/B. (AAABBB)
  - CNS will start at a low number and will reevaluate it after 2-3 weeks periods.
- Require the EHS COVID-19 safety training and Crimson Clear Pass (everyday)
- Require Nanofab Covid-19 protocol training (through Zoom registration)
- CNS Nanofab will provide remote services, but only for some 'standard' process.



# PPE in cleanroom and other labs

- **Face mask:**
  - Face covering is required in the LISE at any time
  - Disposable 3-layer mask in CR
  - NO cloth face mask in CR.
- **Nitrile gloves:** provided in all CNS labs
- **Personal safety goggles/glasses:**
- **Garment box** in the gowning room:
- **Apron** for acid bench, one-time use, no sharing
- **Face shield**
  - Disposable face shield: not necessary in CR,
  - Chemical resistance face shield required for the bench process will be provided by CNS for sharing. User needs to follow the cleaning procedure thoroughly.

Or, user can bring their own.

[https://www.3m.com/3M/en\\_US/company-us/all-3m-products/?N=5002385+4294893650&rt=rud](https://www.3m.com/3M/en_US/company-us/all-3m-products/?N=5002385+4294893650&rt=rud)





# Cleanroom Occupancy and Door Access Control (1)

To meet the 'low density' requirement

1. **Cleanroom occupancy : 10 users + 4 staff (phase 1)**
  - A. Cleanroom scheduler:
  - B. Door Access Control:
2. **Cleanroom Bay occupancy: 2**



# Cleanroom Occupancy and Door Access Control (2)

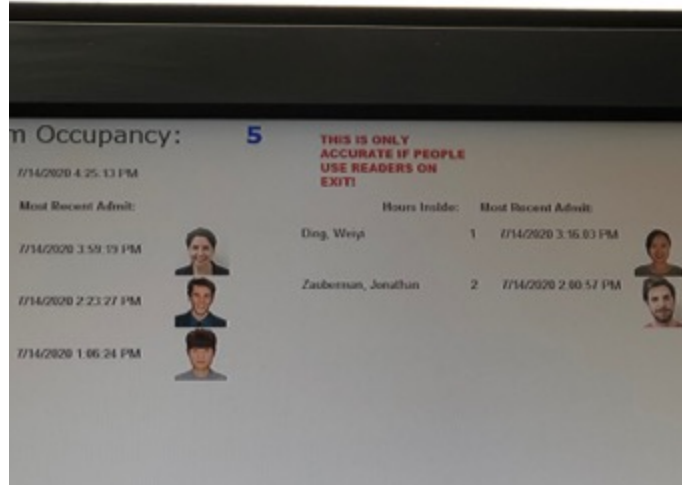
## 1. Cleanroom occupancy : 10 users + 4 staff on the sliding door

### A. Cleanroom scheduler:

- The user has to **book the "cleanroom" block first** before booking any tool.
- Only **10 cleanroom blocks** are available at the same time. (10 users)
- **Tool booking** should be within your cleanroom time block.
- Only allowed to reserve room/tool **in your group days**
  - Group A: Mon-Wed.
  - Group B: Thurs-, Sat.
- **STAY ON TIME.** Otherwise other users might have to wait in the hallway outside.
- **User cleanroom block limit:** 30 hours /week
- **Cleanroom daily schedule:** 6:00am -2:00am (Mon.- Sat.), **need to leave the lab before 2:00am**



# Cleanroom Occupancy and Door Access Control (3)



## 1. Cleanroom occupancy : 10 users + 4 staff on the sliding door

A. Cleanroom scheduler:

B. Door Access Control:

- Once CR occupancy is reached, the sliding door Iris Scan/swipe system won't accept any more entry,
- You have to wait outside in the hallway, till the CR occupancy is available.







# Cleanroom Occupancy and Door Access Control (4)

1. Cleanroom occupancy : 10 users + 4 staff on the sliding door

- A. Cleanroom scheduler:
- B. Door Access Control:

2. Cleanroom Bay occupancy: 2 (would be re-evaluated in phase 2)

- Including the Gowning room
- EBL is considered as 2 bays
- No digital control on bay occupancy, so, rely on communication and cooperation between users
- Watch out the floors signs:
  - Waiting spot box – Big red circle
  - Tool working spot (Yellow diamond and Red diamond)
  - Traffic flow sign- foot-print sign and arrows (green/yellow)





# Tool Arrangement and Disinfection (1)

## 1. De-densify the tool

- Some tools would be relocated (Metrology window area)
- some tools will be off-line
- Some rooms (AFM, SMCR, SEM B-room), only allow single occupancy.

## 2. Movable PVC divider/screen: for two adjacent tools (yellow and red working spot)

## 3. 2 occupancy each bay







# Tool Arrangement and Disinfection (2)

1. **Any personal stuff** (laptop, phone, notebook) brought into the CR need to be disinfected with 70% IPA wipe in the gowning room.
2. **Before and after any tool use**, 70% IPA wipe clean any surface you might touch (including the keyboard), or your gloves
3. **Lab cleaning service (Sunday)**
  - Work Table: 70% IPA wipe clean every Sunday by our cleaning staff
  - Garment box cleaning: 70% IPA wipe clean every Sunday







# CNS lab daily operation schedule

**1. CR open schedule:**

- 6:00am -2:00am (Mon-Sat.),
- Sunday, the lab is closed for lab/tool disinfection

**2. Toxic gases schedule:**

- 6:00am – 10:00pm (Mon-Sat), no gases on Sunday and holidays

**3. Staff work hours:**

- Mon. – Sat.
- Regular staff working schedule (7 hours)
- Split into 2 shift/week (A/B),

**4. During the after-hour,**

- User is required to follow the all protocols
- User needs to report any abnormal situation at anytime though CLEAN, email, or phone
- For emergency, follow the regular protocol, and call 55560
- For trouble shooting, staff may remotely access the tool through Teamviewer, zoom, **Robots**, or facetime.



# CNS Staff Work Schedule

## Nanofab staff working shift for CNS reopening (Phase 0,1,2)

Group A		Group B		Technical Coverage
Staff	office	Staff	office	
Steve	G50	David	G38	Equip (RIE, CVD)/facility
Ling	G52	Kenlin	G48	RIE
John	G44	Malcolm	G52	Gowning/general support
Jason	G46	Mac	G46	Metro/bench
Mughees	G38	Ed	G44	film (CVD, PVD, ALD)
Guixiong	G42	Yuan	G42	Litho (EBL, photo)
JD	G54	JD	G54	Oversee, Litho, Metro, general

- Note:
- 1) Start on Monday with group A, ABABAB and ABABBA, (Friday and Saturday will be alternate between A and B)
  - 2) Staff daily hours: Mon-Sat. regular working hour (9:00-5:00am)
  - 3) Toxic Gases hours: Mon.- Sat. 6:00am-10pm, not available on Sunday
  - 4) one occupancy in staff office
  - 5) Remote office hours and trouble shooting (through TeamViewer, zoom, Bots or Facetime)

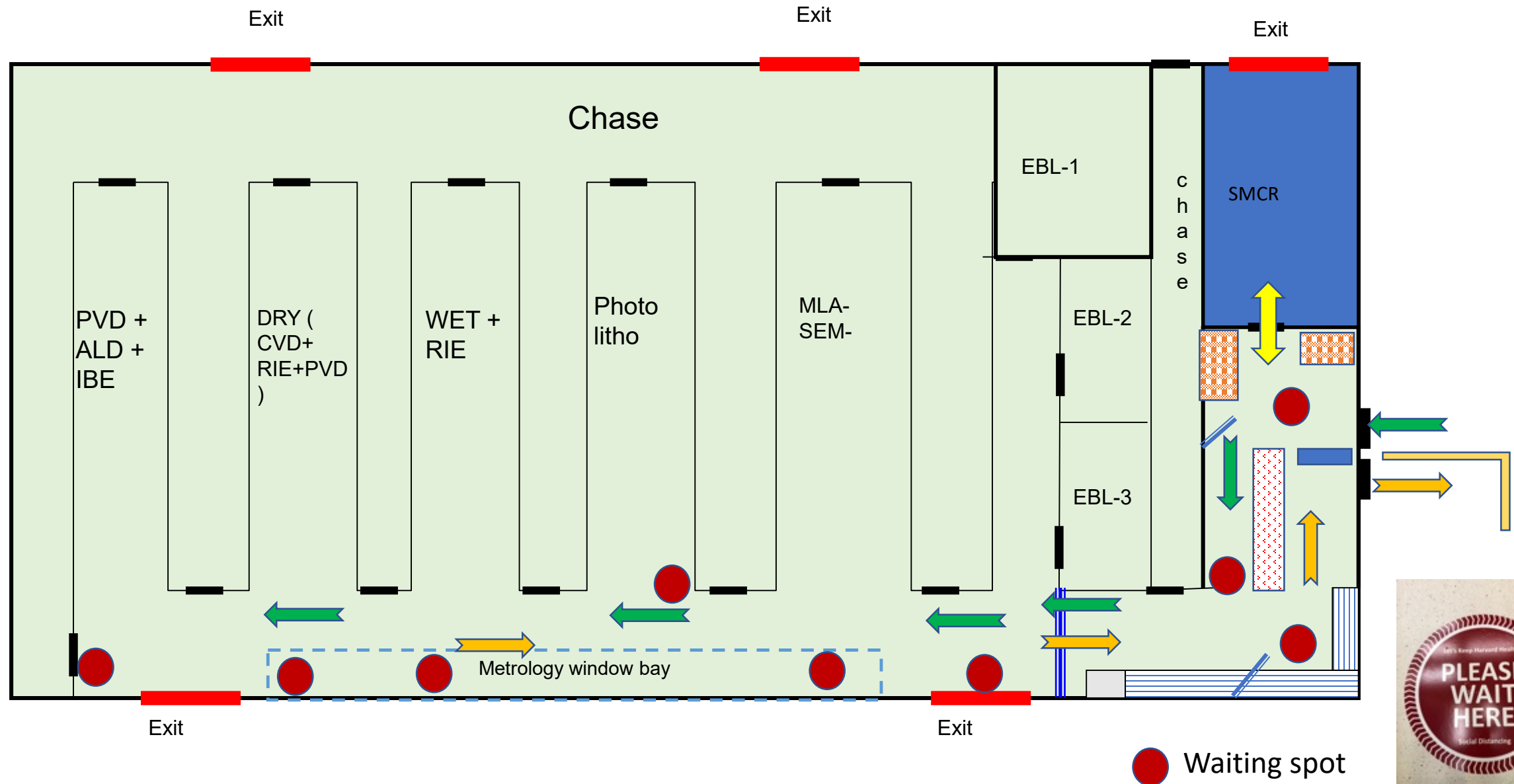


# Tool Training Protocol:

- In Phase 1 and 2, no on-site tool training available.
- In Phase 3, the tool training will be resumed, but with more on-line training portion
  - On-line training + on-site 1-to-1 certification
  - On-line training package: SOP, PPT video, quiz, video
  - On-line training software (Storyline), Zoom training, Teamviewer, robot assistance, vendor training videos.



# Cleanroom Layout and Traffic Flow

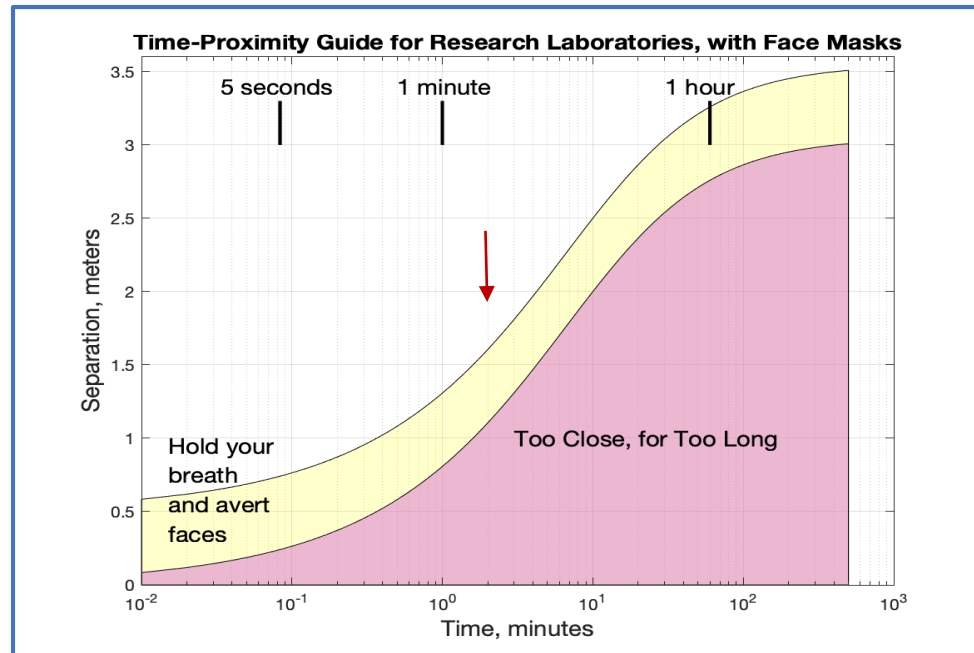




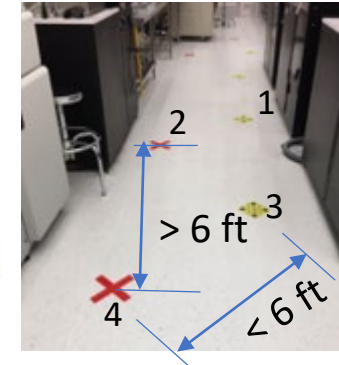
# Cleanroom Floor Signs for Social Distancing Control (Ling)

## Rules:

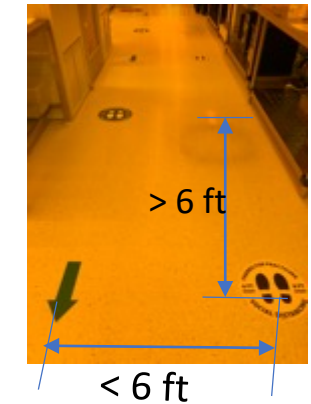
- Same color stations are at least 6 feet apart, **can be occupied at same times.**
- Different color stations that are next to each other are less than 6 feet apart, **cannot be occupied at same times for more than 2 min.**



## Color Marks for Tool Stations



## Hall Way

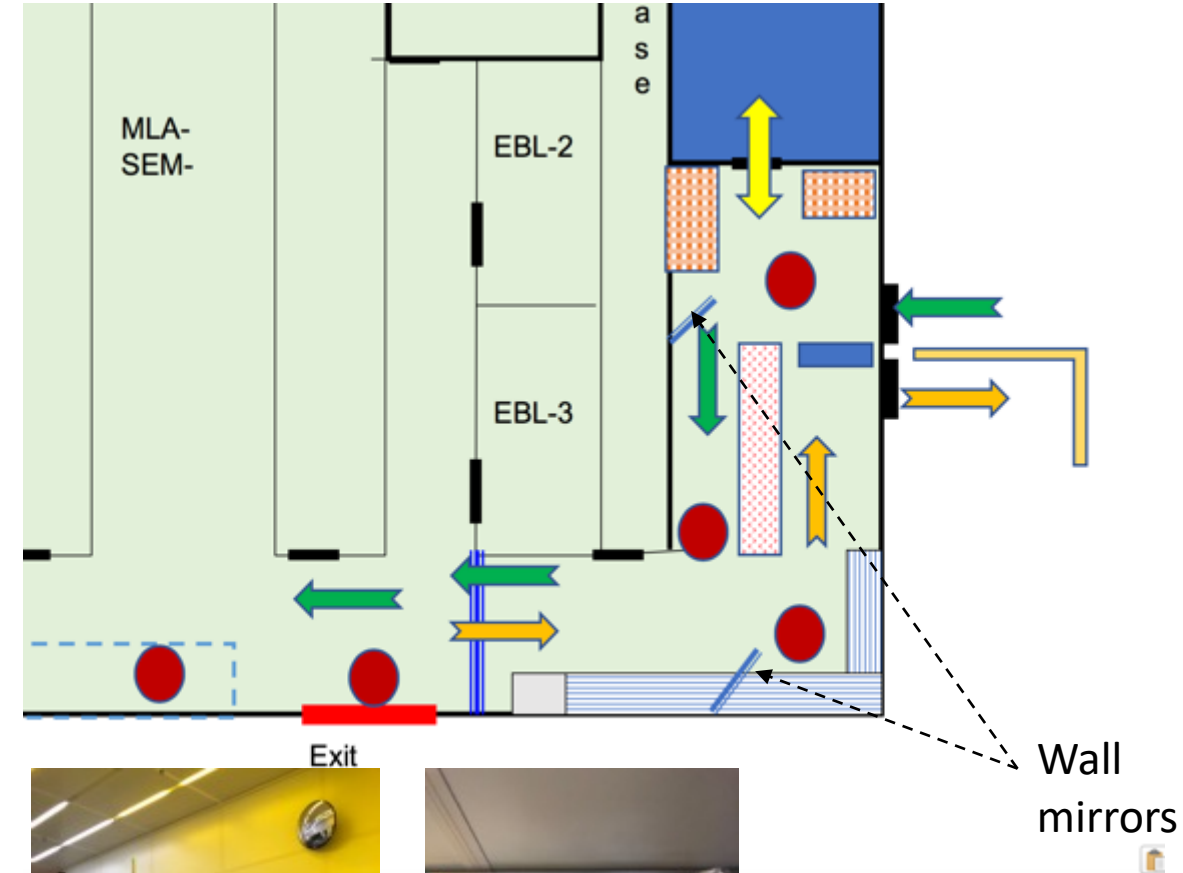


- Wait here until next tool station is available.
- Wait here if someone is passing by.



# Gowning Room Protocol: (John and Malcolm)

1. In the Cleanroom hallway, check the CR occupancy monitor and gowning room occupancy, then decide to go into the gowning room or wait out in the hallway.
2. **Gowning Room Occupancy, 2** (including the SCMR user)-
3. PPE: face mask, gloves, personal safety goggles,
4. Two way traffic flow split by the garment rack
5. Garment box for each user for garments (smock, boots, and hood) and personal goggles.
6. 45 deg. mirror on the wall for traffic watching

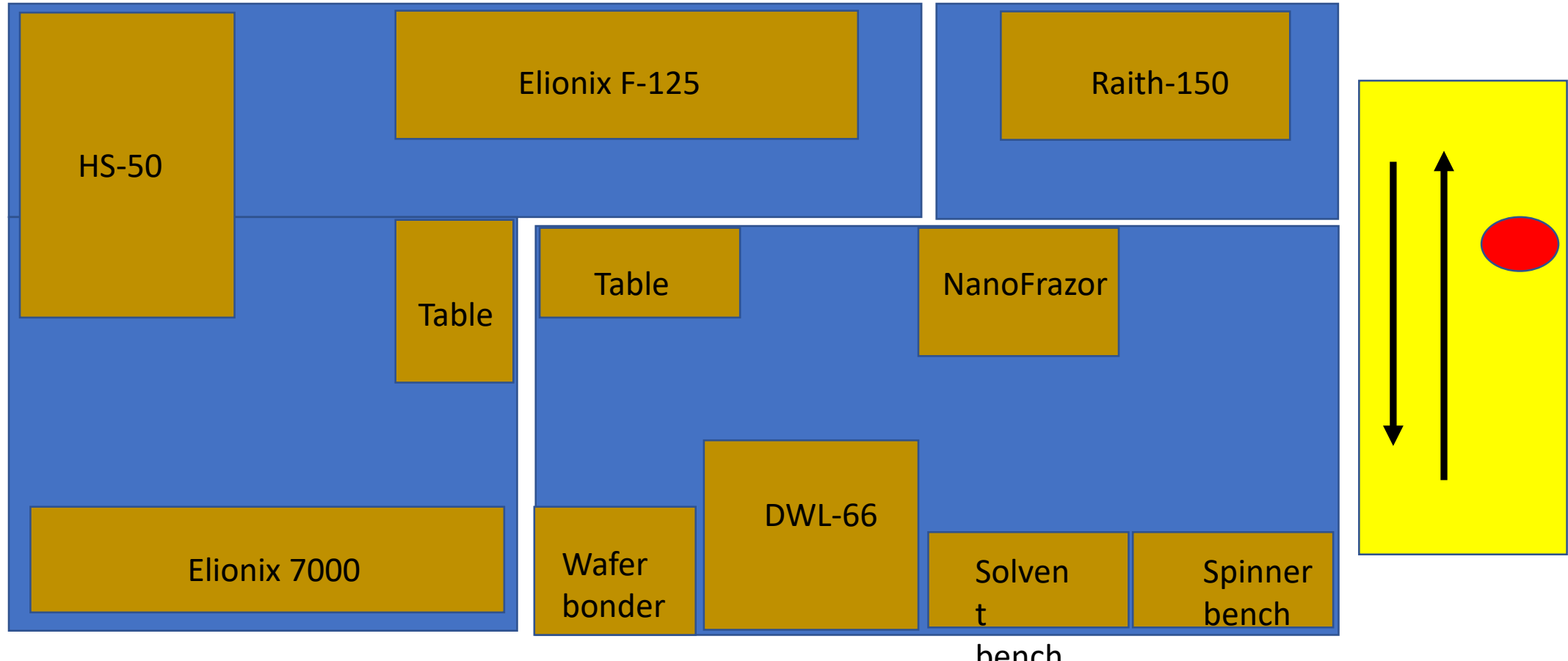


Gowning room  
protocol (video)



# Cleanroom EBL Bay (Guixiong/Yuan)

- Max 2 person in the Elionix room. Max 1 person in the solvent and spinner bench area. Max 1 person in the Raith-150 room.
- Red dot is the waiting spot.
- NanoFrazor and Wafer bonder will be off-line in Phase 1

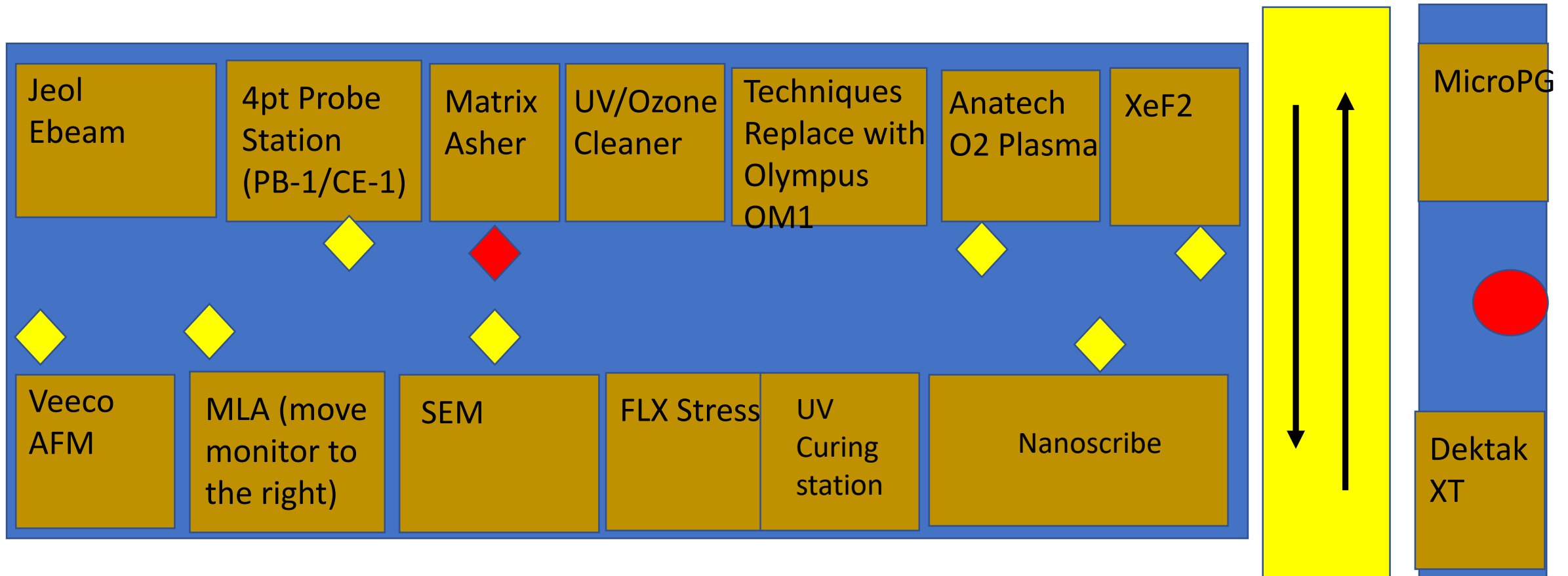






# Cleanroom Metrology Bay (Guixiong/Jason)

- Max 2 persons in the metrology bay. Please follow the social distancing sign rules.
- Movable PVC divider will be provided when 2 occupancy are neighboring.
- Jeol-700 will be off-line for time being.

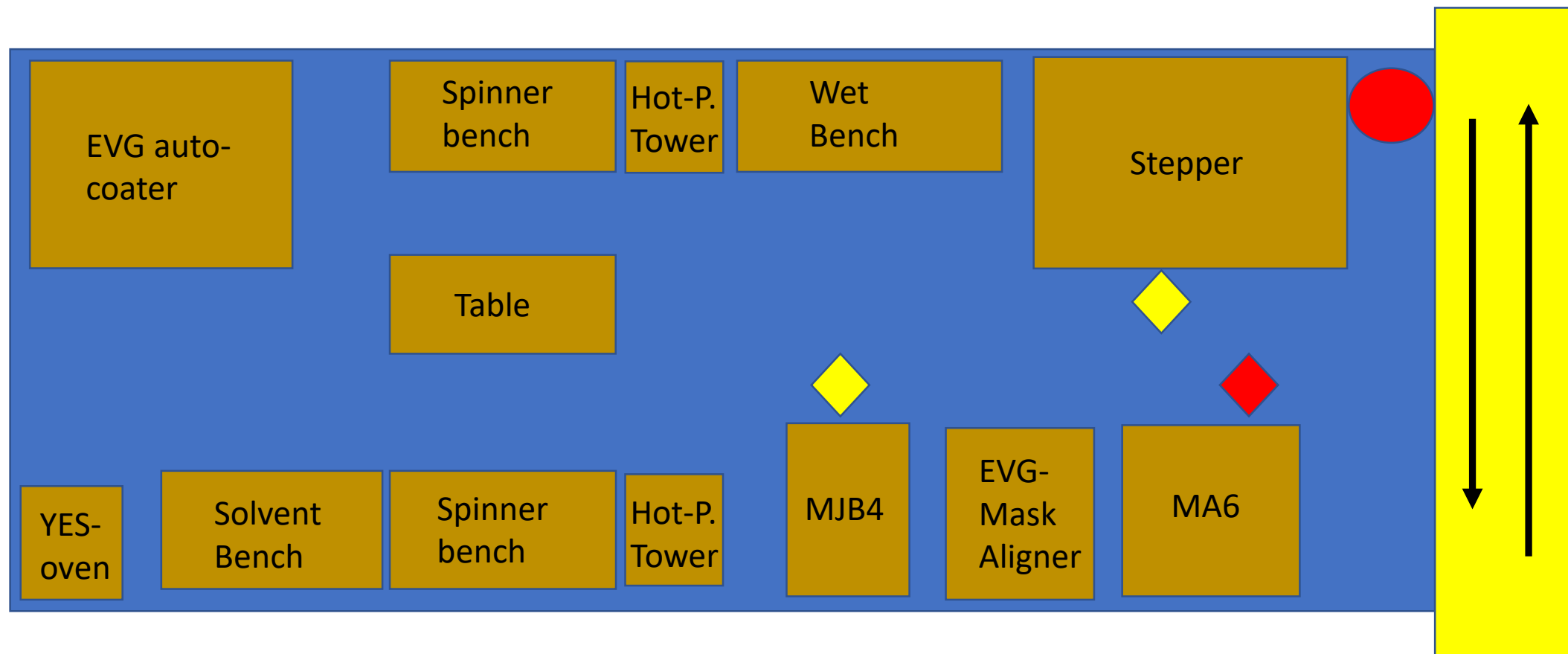






# Cleanroom Photo Bay (Guixiong/Malcolm)

- Max 2 persons in the photo bay.
- Movable PVC divider will be provided when 2 occupancy are neighboring.
- EVG mask aligner and auto-coater will be off-line



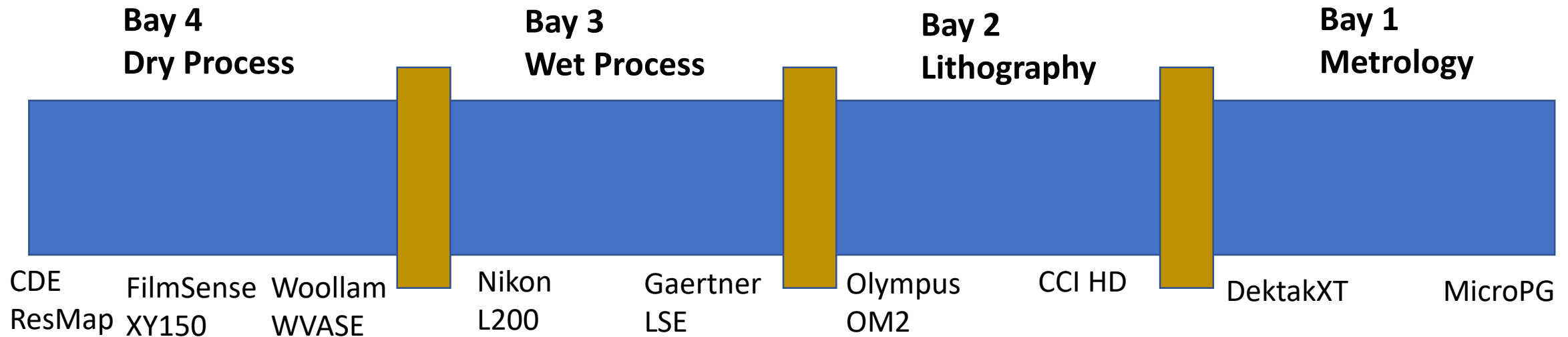


# Cleanroom Window Bays (Jason/JD)

- Limit 2 tools/Users per window bay
- Floor signs: red waiting spot/box , 6 ft signs (green and yellow), traffic arrows (G and Y)

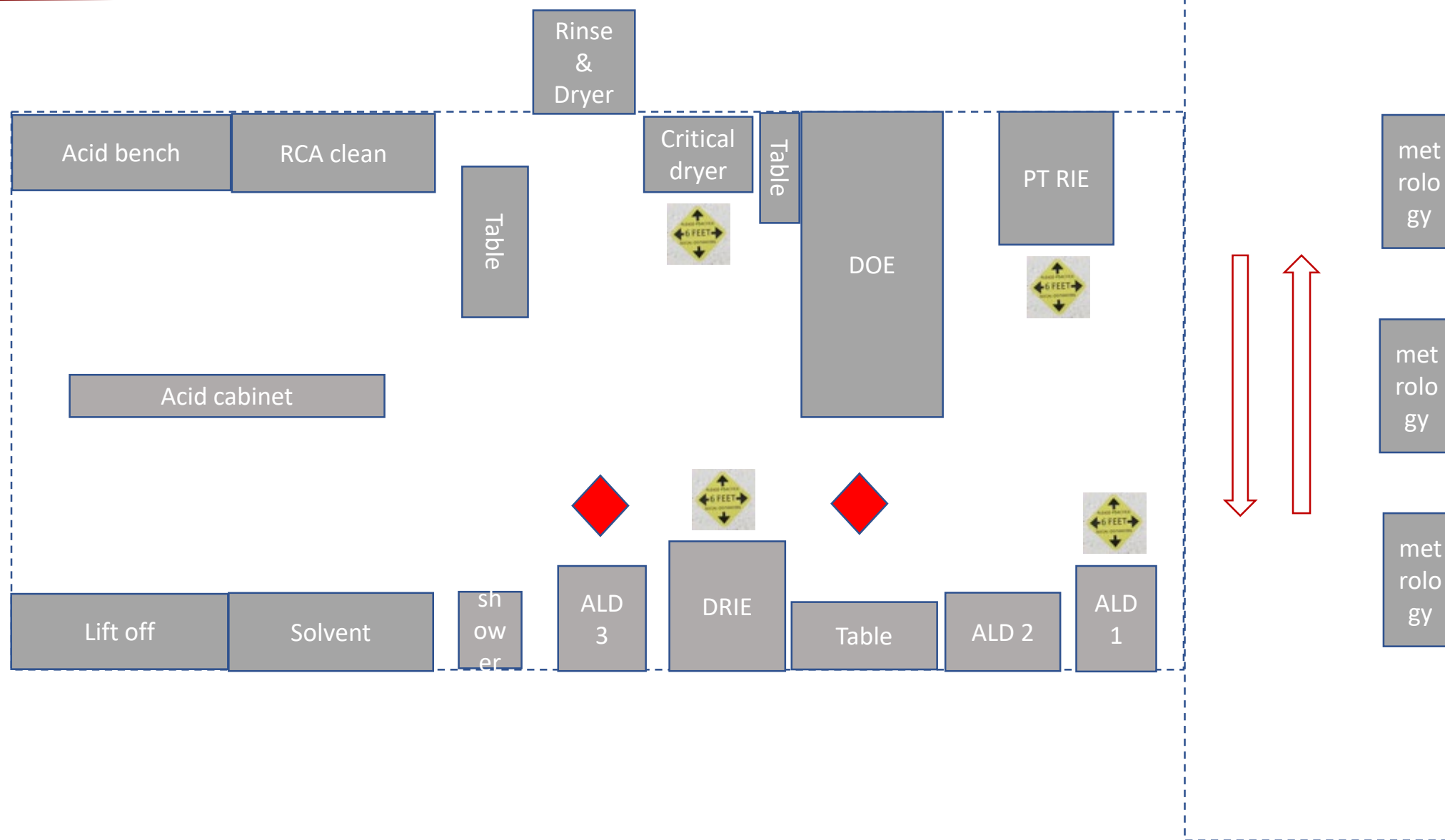
## **Tool arrangement (not finished, yet)**

- Bay 1 (MicroPG and Dektak XT)
- Bay 2 (CCI HD Optical Profiler and Olympus OM2)
- Bay 3 (Nikon L200 OM and Nikon Optiphot 150)
- Bay 4 (Woollam WVASE, FilmSense XY150, and CDE ResMap)





# Cleanroom Wet Bay (Ling/Mac)



Please wait



# Use of Face Shields at Wet Benches (Mac)

**We will be sharing Face Shields at CNS Acid and Spinner Benches.**

1. You **MUST** clean ALL STRAPS with 70% IPA before and after every use.
2. You are *allowed* to bring your own Face Shield, but it is *not necessary*. Cleaning with IPA will be sufficient.
3. If you bring your own Face Shield, it must be rinsed with water after use, and *brought home* with you after your cleanroom use. **Do not leave in your gowning box.**

Video for Face Shield cleaning



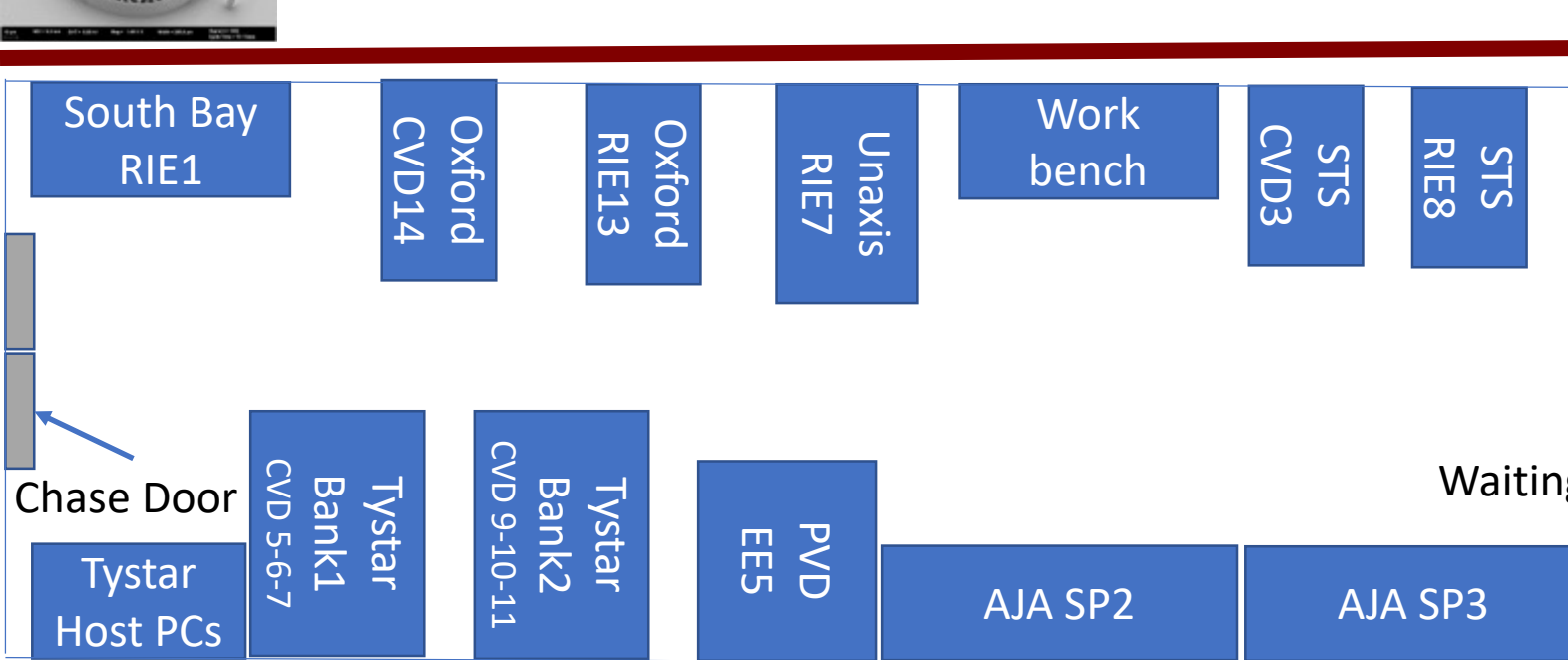
# Cleanroom Dry Bay (Mughees/Kenlin)



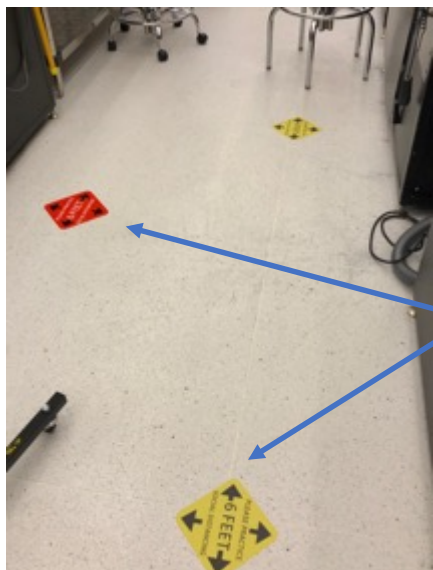
- User Occupancy = 2 (phase 1)
- Waiting Spot Location = 1 (see attached layout)
- In case there are already 2 users in the bay, please wait at the waiting spot sign and coordinate with each other. Ensure safe distancing and occupancy rules prior to starting work
- In case more than one user wants to access common spaces (glove station, trash bin or workbench) at the same time, kindly wait at a safe distance until the area is clear for usage
- Chairs/stools may be reduced to allow ease of movement
- Use moveable screen/divider between tools that are too close to each other (check for different colored signs)
- Tools that can have ONLY 1 user in front of them at the same time:
  - EE5 or RIE13 but not both (usable with screen/divider)
  - Tystar Bank1
  - Tystar Bank2



# Dry Bay Layout (Mughees and Kenlin)



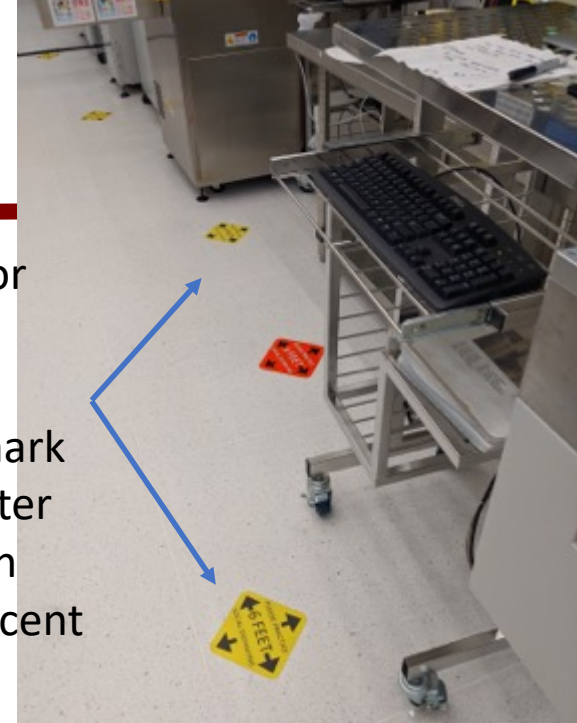
*(Layout not to scale)*



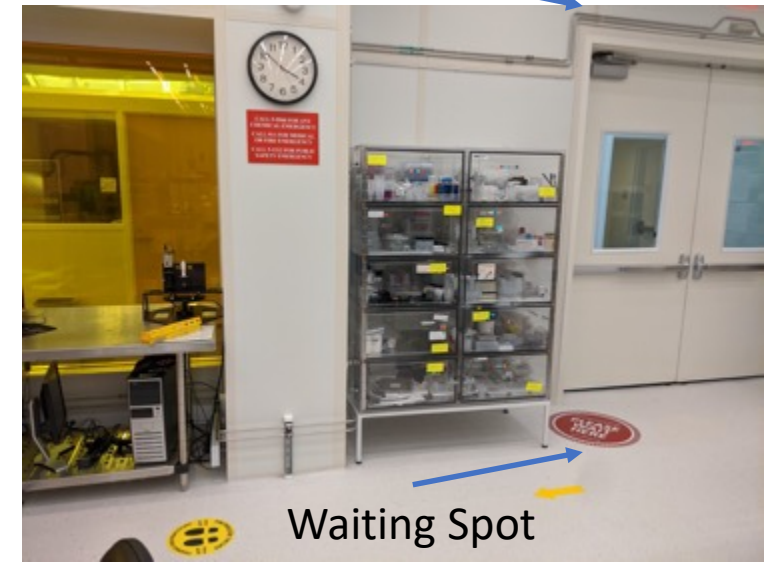
Different colored stickers mark **less than 6'** for occupancy if adjacent tools are occupied. Please coordinate with other user(s) and ensure sufficient distancing prior to using such areas or tools.



Same color diamond shaped stickers mark 6' or greater separation from adjacent tools



Hallway Door



Waiting Spot

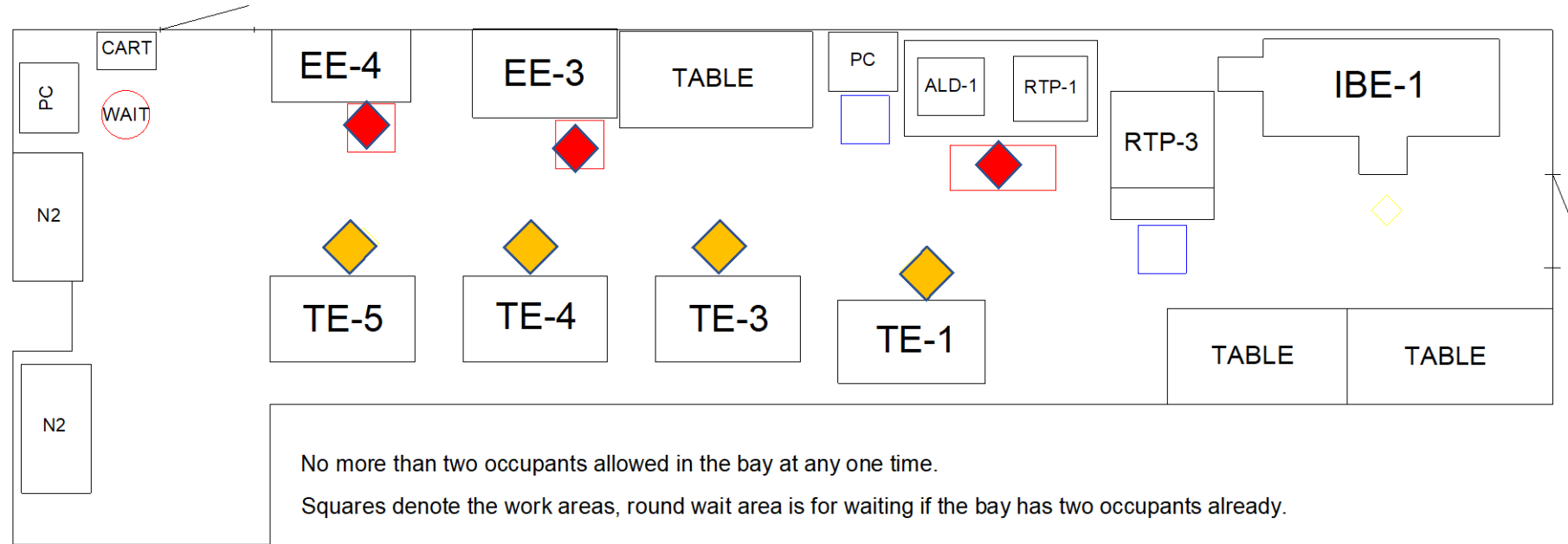
# PVD Bay

(Ed, John T,  
Mughees)

Maximum of 2 users at a time in the PVD Bay.

If two users are already present in the bay, wait in the designated waiting area until the user on the tool has exited the bay.

If users are on adjacent tools, use the screen shield between tools that are less than 6 feet, including across the isle.







# LISE G27: MicroCT, XPS, and Nanofab. Back-End Facilities (Jason/Greg/Guixiong)

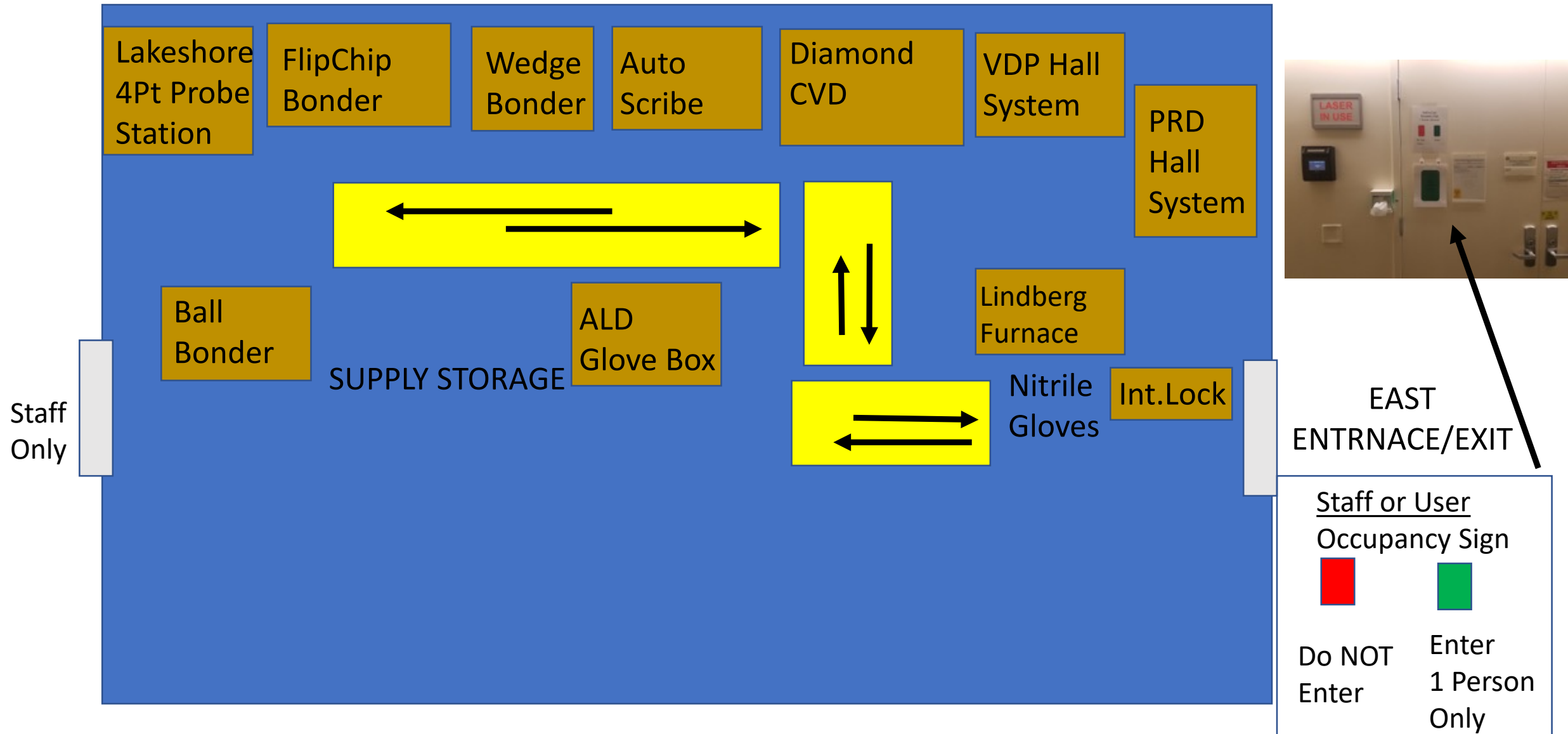


1. **Occupancy (2)** will be limited to 1 staff member and 1 back-end or metrology user or CNS staff (**Phase 1**)
2. Occupancy sign will be displayed on east entrance near IRIS scanner for single user or staff (red/green)
3. **Required PPE:** User supplied safety glasses, nitrile gloves, and disposable lab coat
4. Your HUID/iris scan has been programmed to work on the G27 door on the same days as your cleanroom/SMCR access group. If you are Group A, the same days apply for G27 back-end access and the same goes for the Group B. Please only plan on entering LISE G27 on one of your groups' days.
5. Please note that this ONLY for the Nanofab back-end tools within this lab space and designated LISE G27a in the scheduler. The Imaging/Materials tools within this space (Micro-CT, XPS, XRF, SLF-4 etc.) are all still not open for self-use.
6. The G27 Nanofab Back-end lab itself is now on the scheduling tool and requires a reservation in order to ensure single occupancy in this area. Please make a reservation for the lab itself instead of the individual tools within that space. The room can be found in the normal scheduling tool list under the tool id: LISE-G27A (under Nanofab). Since this part of the lab is single occupancy, you do not need to also reserve an individual instrument. Once you are in the room for your room reservation, you can just log into one of the back-end systems as a walk-up.





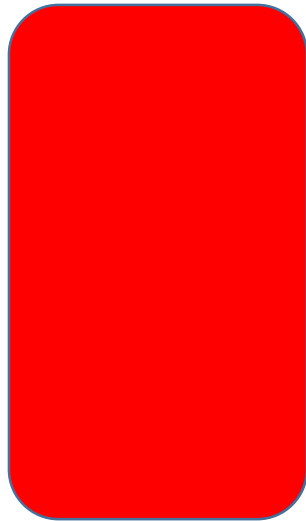
# LISE G27: Nanofabrication Back-End Facilities





# LISE G27: MicroCT, XPS, and Nanofab. Back-End Facilities

## Staff or User Occupancy Sign 1 Person Allowed



Do Not  
Enter



Enter



East  
ENTRANCE/EXIT



# Welcome Back to AFM at CNS! (LISE B58)



1. Your HUID has been programmed to work on the B58 door on the same days as your cleanroom/SMCR access group A/B. If you are Group A, the same days (mon-wed) apply for B58 access and the same for Group B (thurs-sat). Please only plan on entering LISE B58 on one of your groups' days.
2. The B58 lab itself is now on the scheduling tool and requires a reservation in order to ensure single occupancy. Please make a reservation for the lab itself first, then the individual tools within that space. The room can be found in the normal scheduling tool list under the tool id: LISE-B58 (under Nanofab). Since the lab is single occupancy, you do not need to reserve an individual instrument. Once you are in the room for your room reservation, you can just log into one of the AFM systems as a walk-up usage.
3. The total number of hours the B58 room and therefor AFM tools can be reserved at any given time is 8hrs. If you need more than 8hrs of reservation time, please email staff ([jtresback@cns.fas.harvard.edu](mailto:jtresback@cns.fas.harvard.edu)) to make larger reservations or S/ES scanner exchanges, request accessories, or remote assistance, etc.  
NEVER try to establish remote access to any CNS instrument computers without permission from a manager!

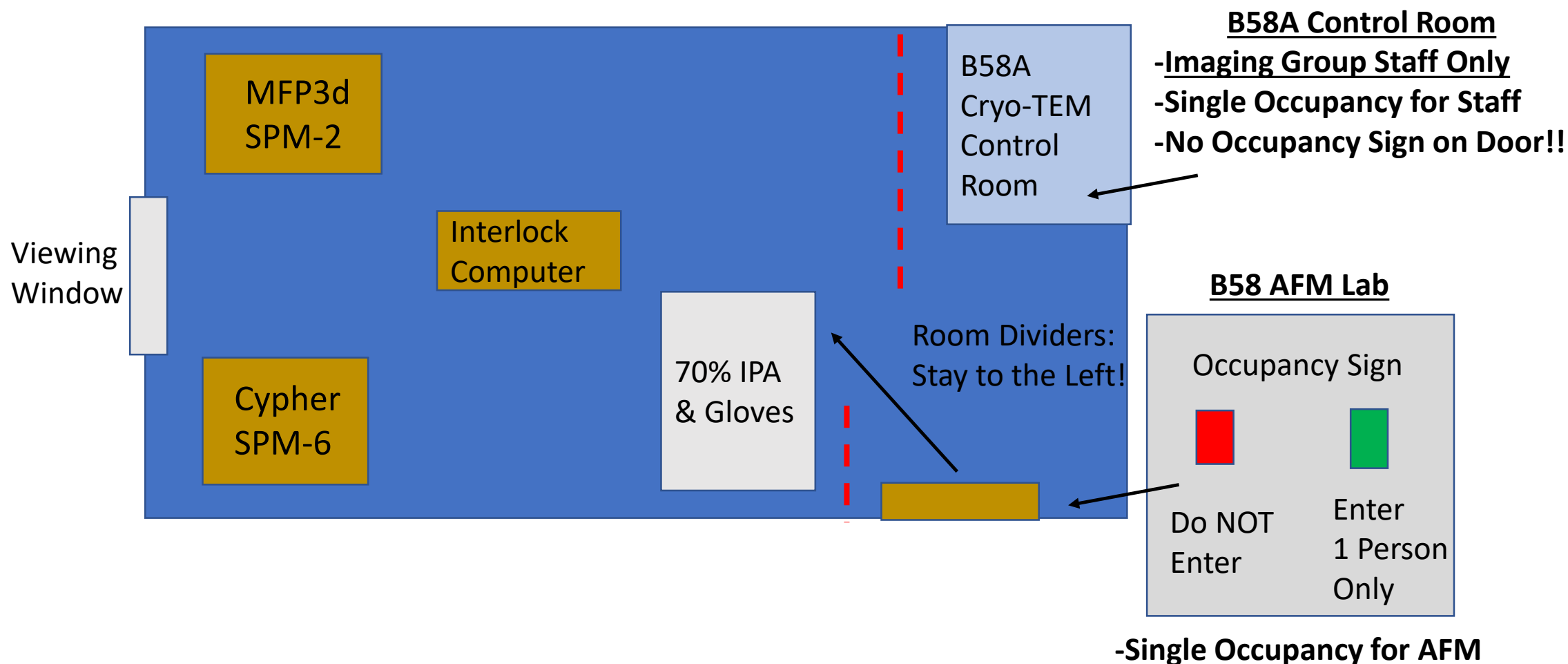
If you have any questions or concerns regarding the user program or associated issues, please feel free to contact James Reynolds ([Reynolds@cns.fas.harvard.edu](mailto:Reynolds@cns.fas.harvard.edu)). If you have any questions or concerns regarding the B58 Lab, its' safety protocols, or procedures, please contact JD Deng ([jdeng@cns.fas.harvard.edu](mailto:jdeng@cns.fas.harvard.edu)) or Bill Wilson ([wwilson@cns.fas.harvard.edu](mailto:wwilson@cns.fas.harvard.edu)). If you have any technical questions specifically relating to the AFMs, please contact Jason Tresback ([jtresback@cns.fas.harvard.edu](mailto:jtresback@cns.fas.harvard.edu))



# LISE B58 and LISE B58A

**LISE B58:** Limit 1 user or staff allowed at a time in LISE B58 (Single Occupancy)

**LISE B58A:** Limit 1 staff allowed at a time in LISE B58A (Single Occupancy)





# LISE B58: 1 User or Staff Allowed at a Time in LISE B58 (Single Occupancy)

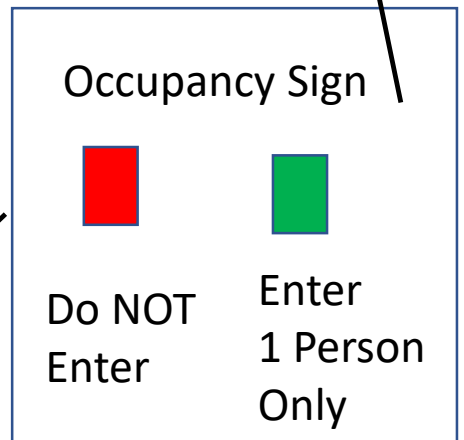
1. Reserve the room LISE B58 in the scheduler (under nanofabrication)
2. When you arrive at the room, use the viewing window to look inside and verify room is vacant
3. The occupancy sign on the door should be GREEN when you arrive, flip it to RED and scan your Harvard ID in the card reader to enter the room
4. **Required PPE:** User supplied safety glasses, nitrile gloves, and disposable lab coats
5. Stay to the left, wear nitrile gloves at all times, login to SPM-6 or SPM-2 using the interlock computer and/or walk-up usage, and then wipe any surfaces you touch with 70% IPA
6. Please remember to UPDATE the OCCUPANCY sign when you leave!!!





# LISE-G56- Computer Room (JD, Jason, Guixiong)

1. Reserve the room LISE G56 in the scheduler (should be available very soon)
2. PPE required: nitrile gloves and face mask at all times
3. 1 user or staff per room, please wipe down surfaces you touch with 70% IPA
4. The occupancy sign on the door should be GREEN when you arrive, flip it to RED and scan your Harvard ID in the card reader to enter the room
4. Remote access for some software (Beamer software, linkCAD, AFM, JAWoollam, Comsol...) through TeamViewer (will be ready in 1-2 weeks,)



Open Viewing  
Window







**Safety is the Top Priority !!!**

**Responsibility, Patience, Respect,  
Communication, Understanding,  
Cooperation, and Compliance with Rules!**

**Zero Tolerance Policy!!!**

