



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

CNS-Nanofab Team

6/23/2020



# Agenda



1. General Guide from Dr. Bill Wilson
2. Announcement and notes from CNS Admin. Office
3. 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)
4. Q/A



# Operational Phases (General guide rails-Dr. Bill Wilson)

## Phase 0: Ramp-up (Complete)

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

## Phase 1:

1. Staff (remote if possible)
2. Some remote use (TBD/instrument /tool)
3. SuperUser Access (low Density, A/B cohorts)
4. No training  
(will re-evaluate after 3 weeks)

## Phase 2:

1. Staff (remote if possible)
2. Some remote use (TBD/instrument /tool)
3. SuperUser Access (low Density)
4. Knowledgeable users (possibly external)
5. Zoom Experimental Consultation
6. No training  
(~TBD weeks)

## Phase 3:

1. Staff (remote if possible)
2. Some remote use (TBD/instrument /tool)
3. SuperUser Access (low Density)
4. Knowledgeable users (possibly external)
5. limited training / 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.



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

**-Jim Reynolds**



# Phase 0, Get the lab, staff and new protocol ready (since 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 input 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



# 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 most dangerous, if you drop your guard!

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

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

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



**Safety is the top priority !!!**

**Responsibility, Patience, Respect,  
Communication, Understanding,  
Cooperation, Complying with rules**

**Zero Tolerance Policy!!!**



# COVID-19 CNS-Nanofab reopening protocol

- 1) User access approval
- 2) General PPE requirement
- 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 starts at a low number, and will reevaluate it after 2-3 weeks try-out.
- 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 Control in Cleanroom

- **Face mask:** disposable medical mask (3 layer) is required at any time. no cloth face mask in CR.
- **Nitrile gloves:** provided in the gowning room
- **Personal safety goggles/glasses:** provided by CNS
- **Garment box** in the gowning room:
- **Apron** for acid bench, one time use, no sharing
- **Face shield**
  - Disposable face shield: not necessary,
  - CNS will provide chemical resistance face shield 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**

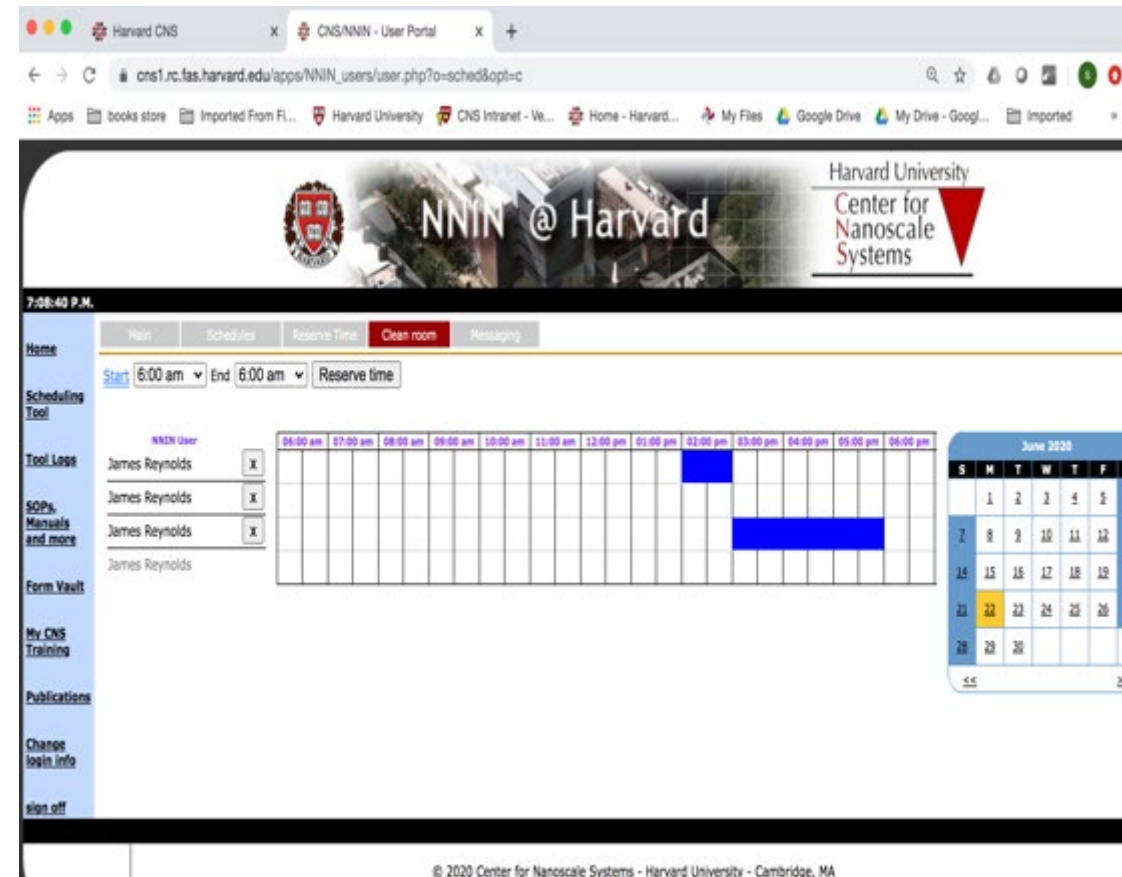


# Cleanroom Occupancy and Door Access Control (2)

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

### A. Cleanroom scheduler:

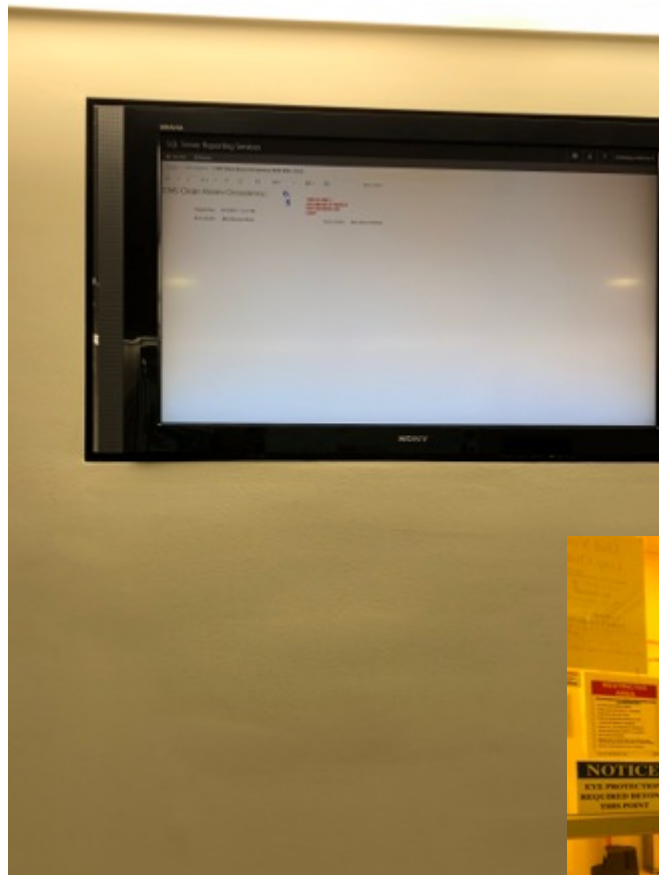
- The user has to book the "cleanroom" block first before booking any tool.
- 10 cleanroom blocks are available at the same time. (10 users)
- Tool booking should be within your cleanroom block period.
- You are only allowed to reserve your group days
  - Group A: Mon-Wed.
  - Group B: Thurs-, Sat.
- STAY ON TIME. Otherwise other users might have to wait in the hallway outside.
- **User cleanroom block limit:** 20 hours /week
- **Cleanroom daily schedule:** 6:00am -2:00am (weekday and weekend),



The screenshot shows the NNIN @ Harvard Cleanroom Scheduler interface. The top navigation bar includes links for Home, Schedules, Reserve Time, Clean room, and Messaging. The main content area displays a reservation form with a Start time of 6:00 am and an End time of 6:00 am. Below the form is a table showing the reservation status for James Reynolds, with columns for time slots from 06:00 am to 06:00 pm. A calendar on the right shows the month of June 2020. The footer indicates the copyright is © 2020 Center for Nanoscale Systems - Harvard University - Cambridge, MA.



# 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 2-3 weeks later)

- 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 cross)
  - Traffic flow sign- foot-print sign and arrows (green/yellow)





# Tool Arrangement and disinfection (1)

1. De-densify the tool in CR
  - Some tools would be relocated (Metrology window area)
  - some tools will be on-line alternatively with others tool in the same bay (Wet-bay, metrology bay)
  - Some rooms (AFM, SMCR, SEM B-room), one occupancy.
2. **2 occupancy each bay**
3. Movable PVC divider/screen: for two adjacent tools (yellow and red working spot)





# 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. **Acid Face shield**: use the 70% IPA wipe out thoroughly
4. **Lab cleaning service**
  - 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. Staff work hours:

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

## 3. Toxic gases schedule:

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

## 4. During the after-hour,

- User is required to follow the same protocol
- 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)

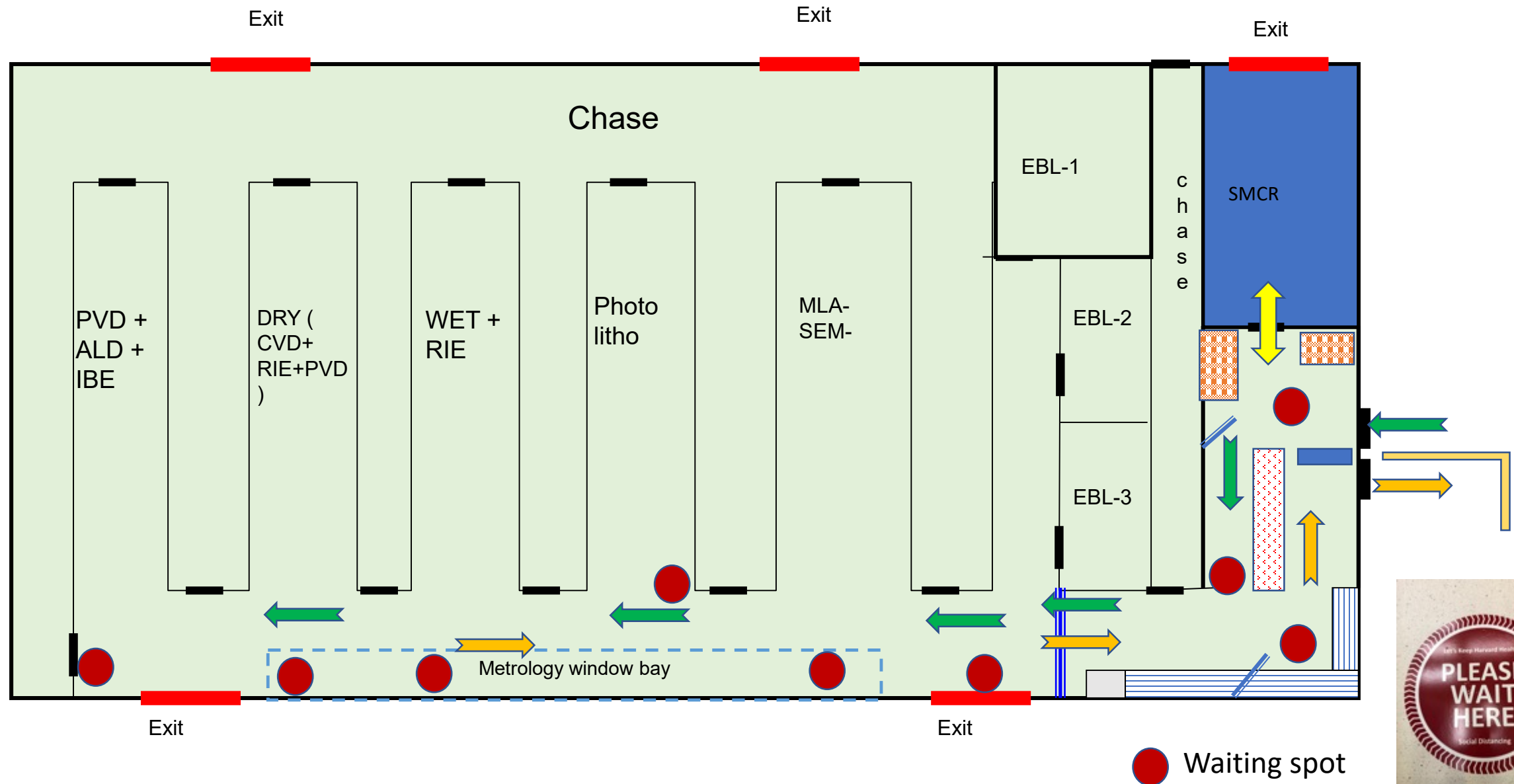


# Tool Training Protocol:

- In Phase 1 and 2, no 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

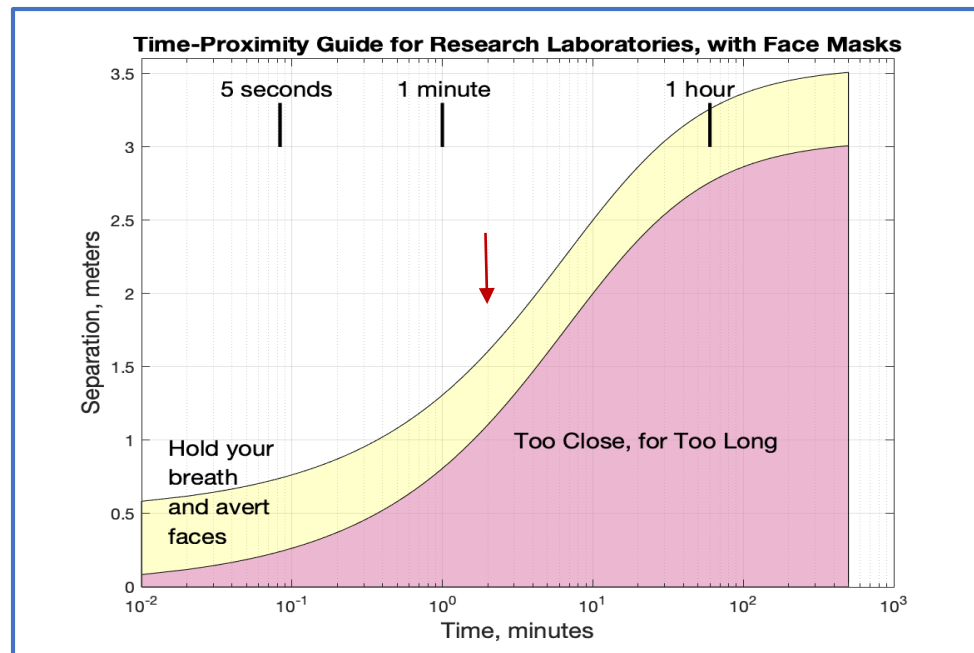




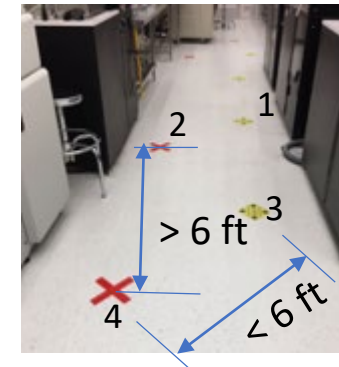
# Cleanroom Floor Signs for Social Distancing Control (Ling)

## Rules:

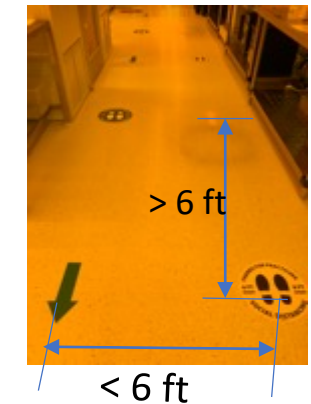
- Same color stations are at least 6 feet apart, **can be occupied at same times.**
- Different color stations that are next to each other are less than 6 feet apart, **cannot be occupied at same times for more than 2 min.**



## Color Marks for Tool Stations



## Hall Way

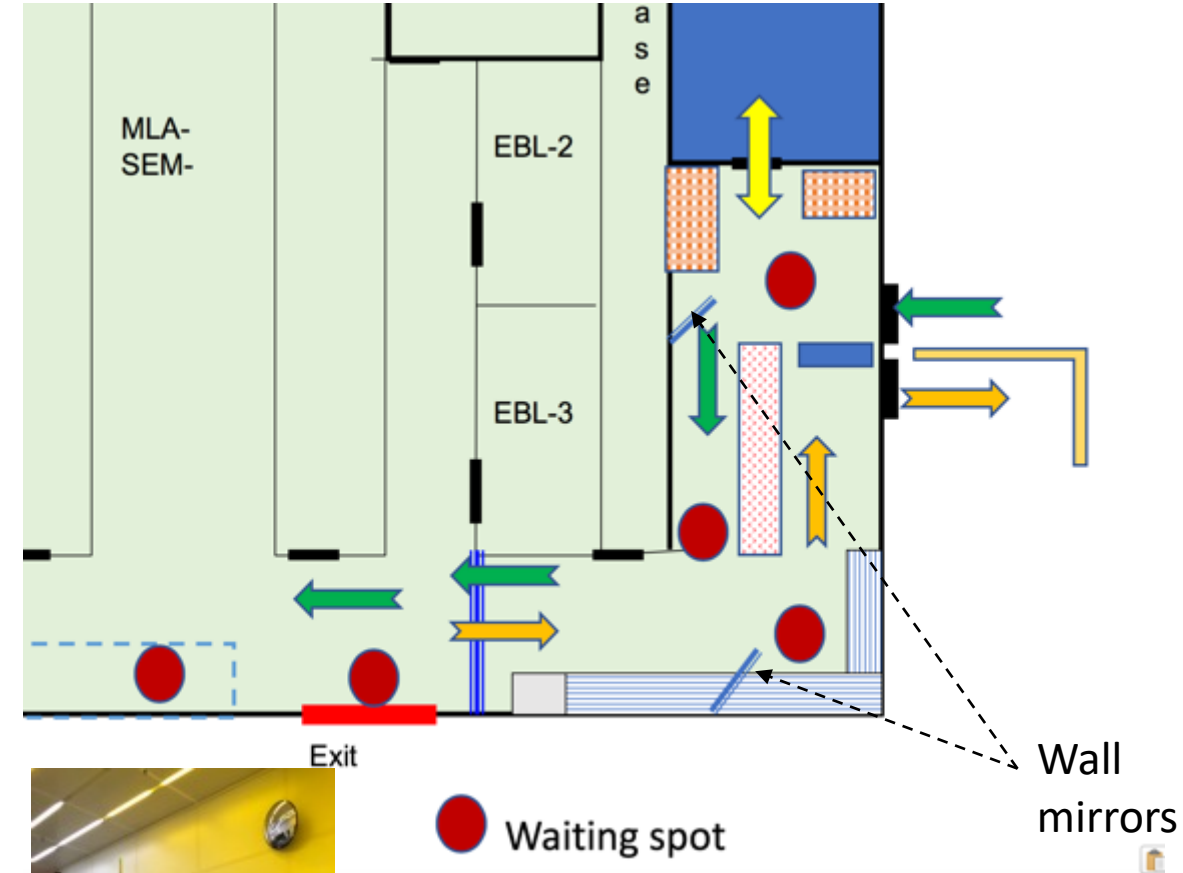


- Wait here until next tool station is available.
- Wait here if someone is passing by.



# 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

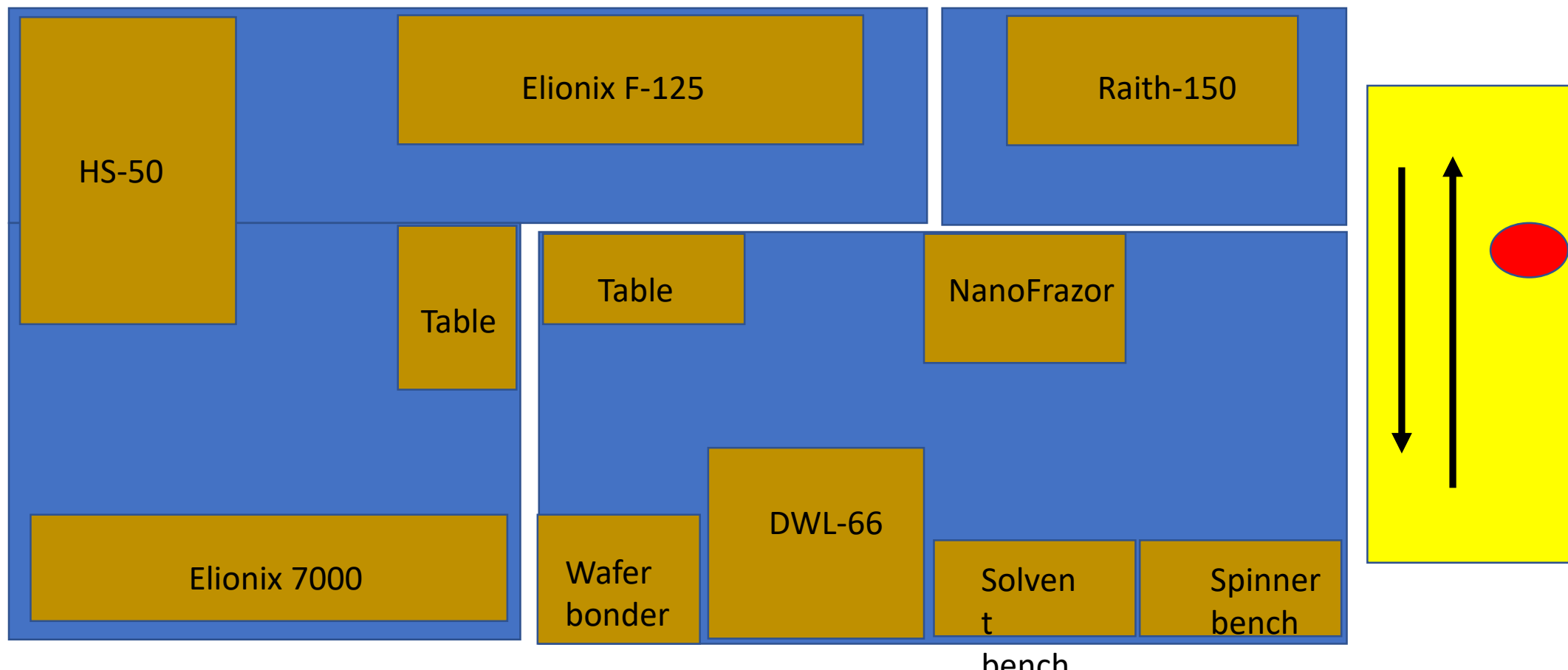


[Gowning room protocol \(video\)](#)



# 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

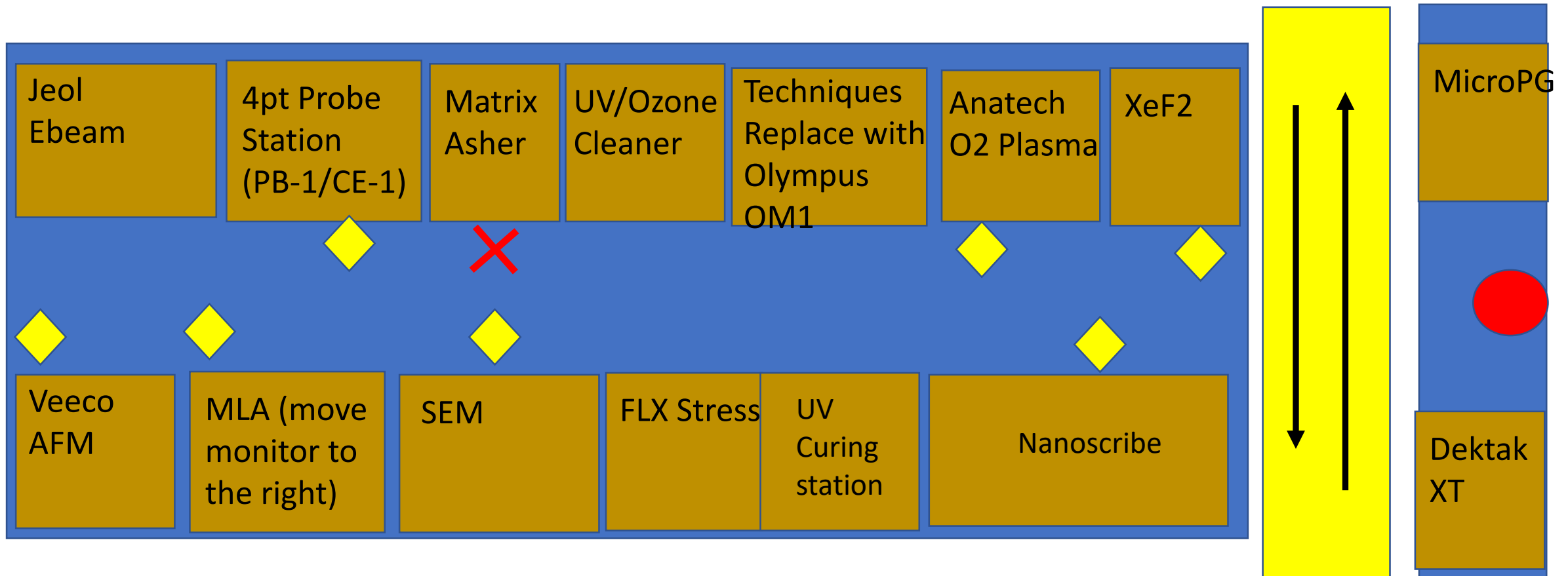






# Cleanroom Metrology bay (Guixiong/Jason)

- 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 beings

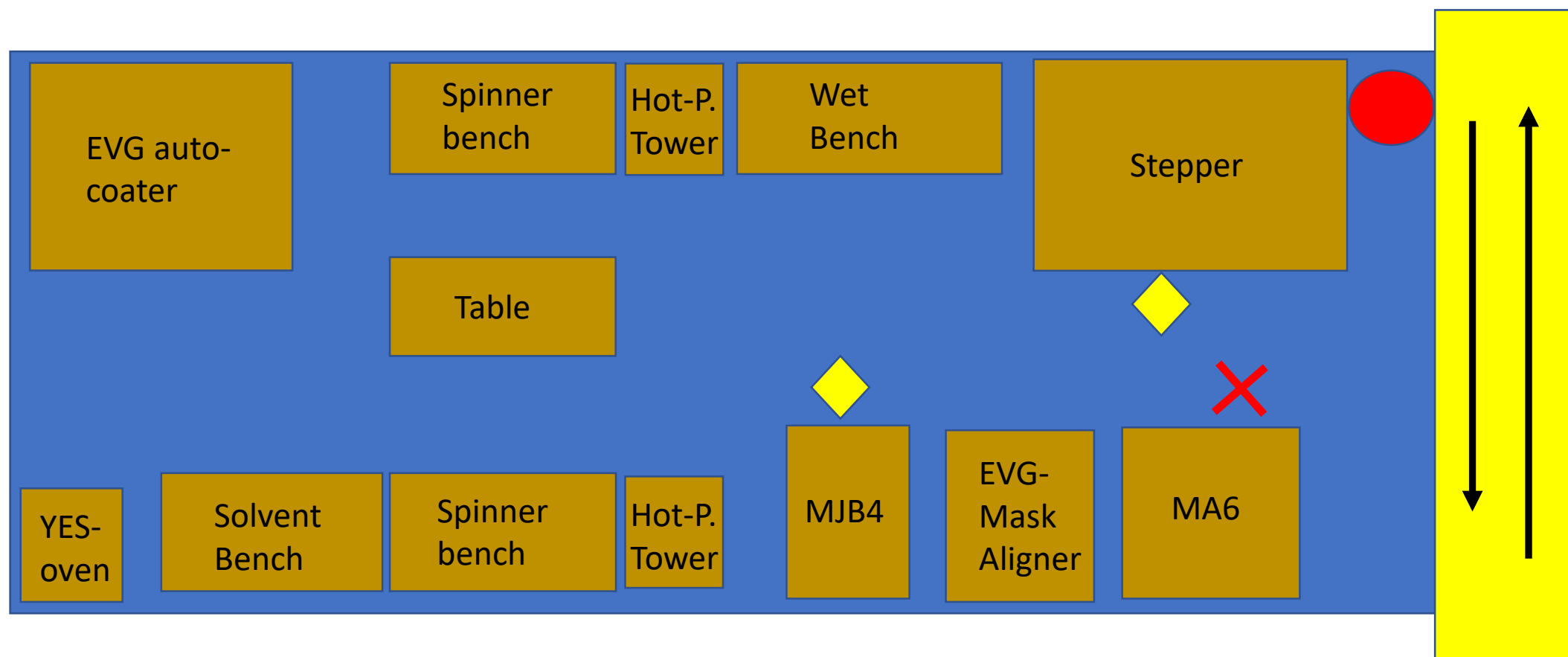






# Cleanroom Photo Bay (Guixiong/Malcolm)

- 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



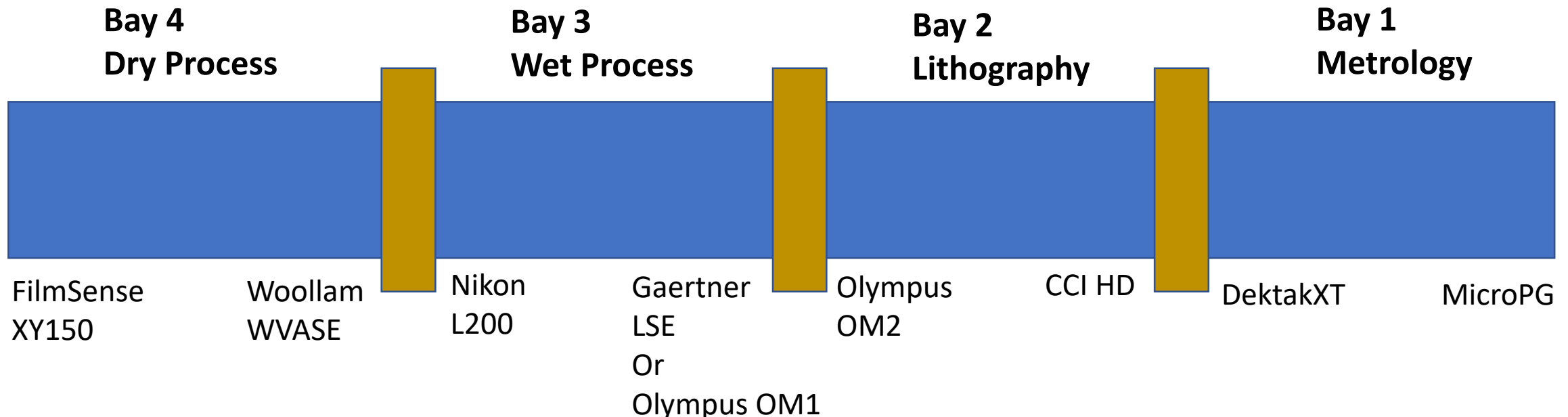


# Cleanroom Photo Bay (Jason/JD)

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

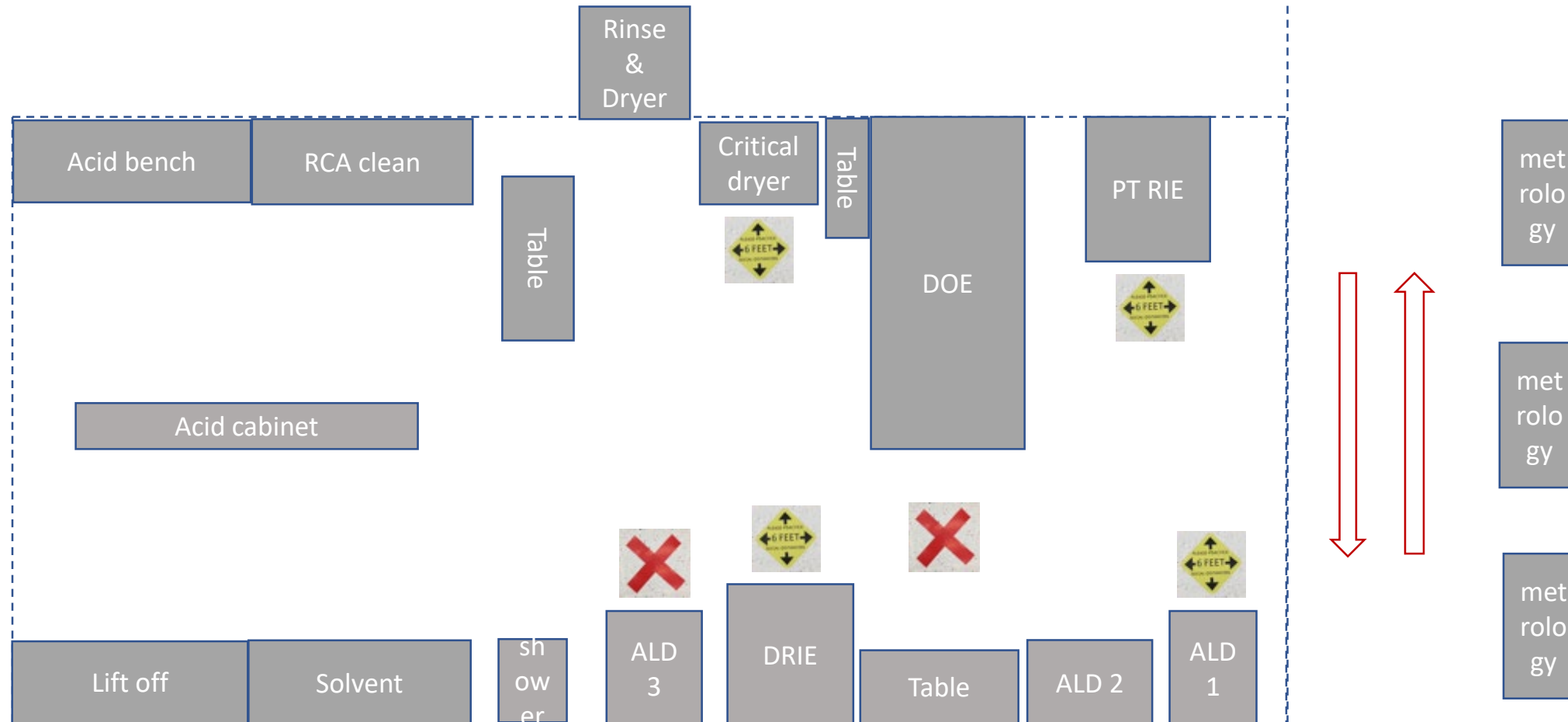
## Tool arrangement (not finished, yet)

- Bay 1 (MicroPG and Dektak XT)
- Bay 2 (CCI HD Optical Profiler and Olympus OM2)
- Bay 3 (Nikon L200 OM and Gaertner LSE or Olympus OM1)
- Bay 4 (Woollam WVASE and FilmSense XY150)





# Cleanroom Wet Bay (Ling/Mac)



Please wait

1. DOE and DRIE are interlocked on the scheduling tool.
2. DOE online time: M - W 6am – 2pm and Thu – Sat 2pm – 2am
3. DRIE online time: M – W 2pm – 2am and Thu – Sat 6am – 2pm



# 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.**



# Cleanroom Dry Bay (Mughees/Kenlin)

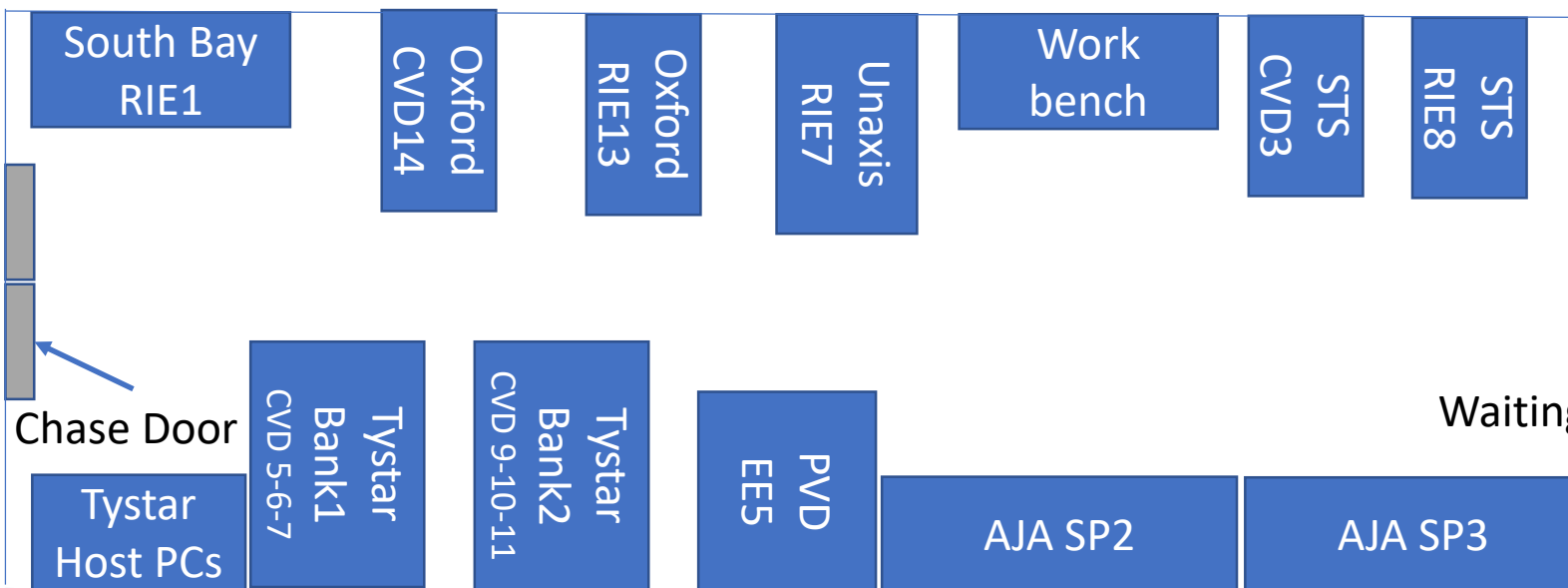


- User Occupancy = 2 (phase 1)
- Waiting Spot Location = 1 (see attached layout)
- In case there are already 2 users in the bay, please wait at the waiting spot sign and coordinate with each other. Ensure safe distancing and occupancy rules prior to starting work
- In case more than one user wants to 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

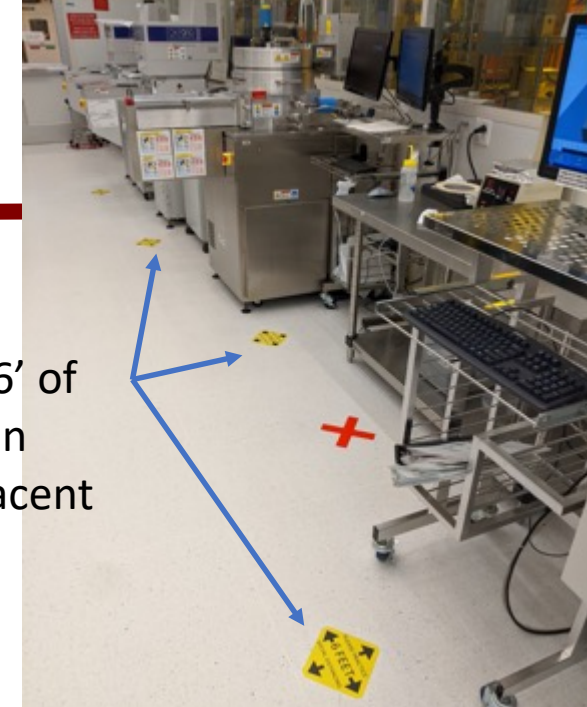


# Dry Bay Layout (Mughees and Kenlin)

*(Layout not to scale)*



Diamond shaped stickers marking 6' of separation from adjacent tools

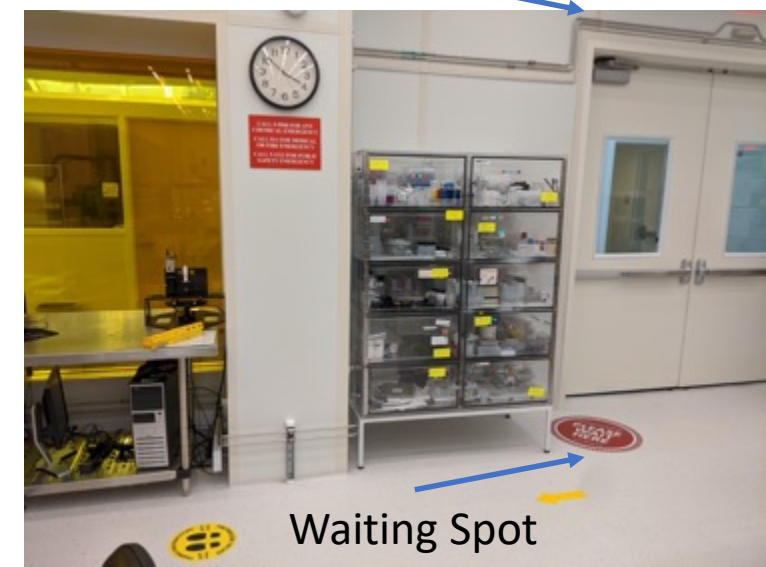
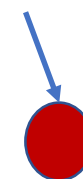


Waiting Spot

Hallway Door



Different colored areas are 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.



Waiting Spot

Squares denote the work areas, round wait area is for waiting if the bay has two occupants already.





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

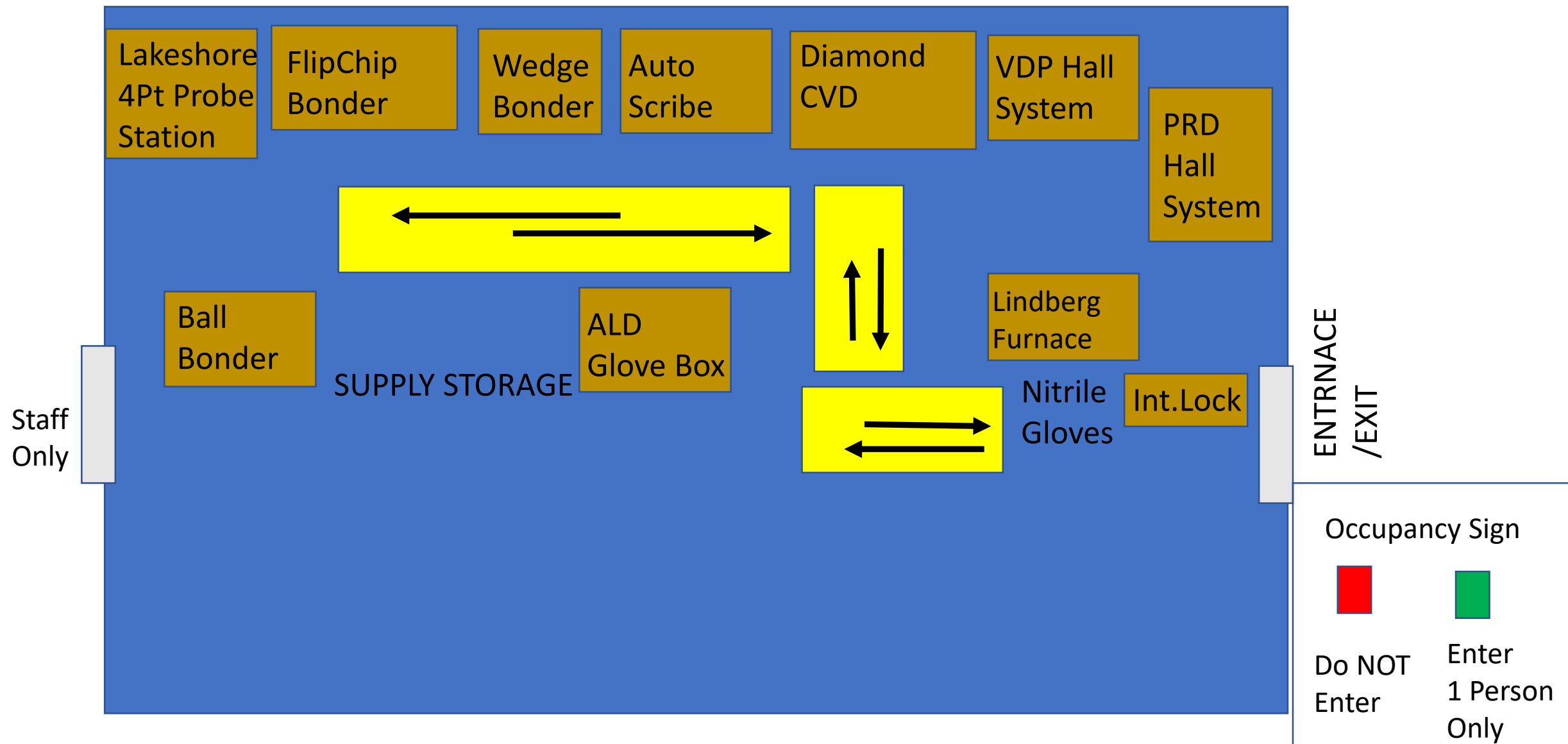


- **Occupancy (2)** can be limited to 1 staff member and 1 back-end or metrology user or CNS staff (**Phase 1**)
- **PPE in G27:** Face mask (FM), personal safety glasses (PSGs), nitrile gloves and Tyvex disposable lab coat
- **IRIS scan (East entrance) is only for staff or back-end users while the west entrance (swipe scan/loading dock elevator) is only used CNS staff.**
- **Occupancy sign** status will be displayed on west entrance for users and staff (red/green on the left)
- During service visits staff can block the reservations for any/all tools in G27 and both occupancy signs can be Occupied/Red for as long as needed so that the staff can join the service engineer if needed at anytime
- Air exchanges very fast in G27 (same as CR), extra 3 large HEPA filter systems are added in the room.
- Mobile room dividers or curtains can be positioned around various tools and interlock computer in G27





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

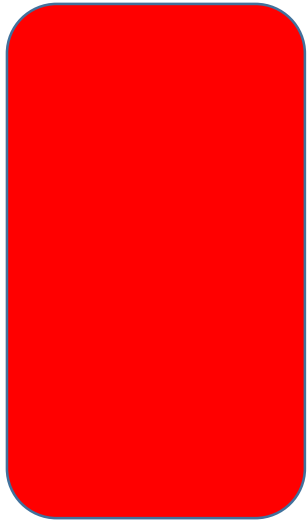




# LISE G27: MicroCT, XPS, and Nanofab. Back-End Facilities

Staff or User Occupancy Sign

1 Person Allowed



Do Not

Enter



Enter



## LISE-B58- AFM room User Access Plan (Jason, JD)

### LISE B58:

- Limit 1 user allowed in LISE B58 for use of Cypher (SPM-6)
- Door Occupancy Sign (GREEN/ENTER or RED/Do NOT Enter)
- Users can request MFP3d (SPM-2) reservations by emailing staff 24hrs in advance (SPM-6 Will be blocked by staff during those reservations)
- Vibration reducing panels will be removed from windows to help check tool status
- A room divider has been installed at the entry of the room to run along the wall



Open Viewing  
Window

Cypher  
S  
SPM-6

MFP3d  
SPM-2

Occupancy Sign



Do NOT  
Enter



Enter  
1 Person  
Only



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

1. PPE required, gloves, mask
2. 1 users per room. A door sign/board to mark the occupancy of the room
3. Remote access for some software (Beamer software, linkCAD, AFM, JAWoollam, Comsol...) through TeamViewer (will be ready in 1-2 weeks,)

Open Viewing  
Window



Occupancy Sign



Do NOT  
Enter



Enter  
1 Person  
Only