

Clean Room Standard operating rules in the Laboratory of Micro and Nanofabrication (LMN)

version 2020-1



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1. Introduction

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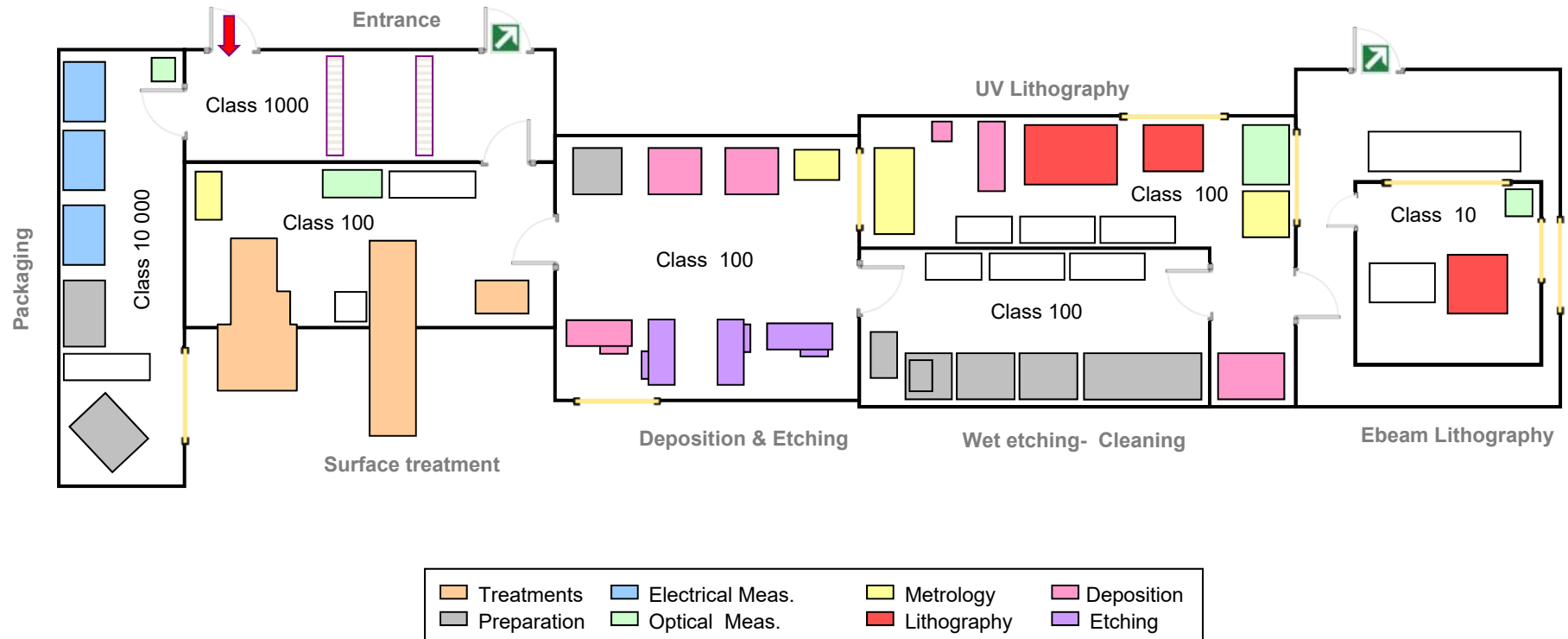
- **What is a CLEANROOM:**
 - Ambient air is filtered to eliminate as many particles as possible (HEPA Filter).
 - System of city water filtration producing deionized water (DI Water) at 18MΩ.
 - Controlled Temperature and Moisture.
 - The cleanroom is under positive pressure relative to outside (air is blown outside).

Class 100:

An environment is told Class 100 if the air contains fewer than 100 particles larger than 0.5µm per cubic foot

- LMN cleanroom**

Area : 250 m² / 2 500 ft²



2. General rules of operation

General rules of operation :

1. Work safely and orderly.
2. Be aware of the emergency procedures.
3. Follow the dressing procedures.
4. Follow the procedure for entering an object /sample in the cleanroom.
5. Acquire the necessary training before using equipment in clean room.
6. Seek help if any doubt.
7. Inform the cleanroom staff of any defects or abnormal functioning of a tool or a manipulation.
8. Inform cleanroom staff at the approach of a lack of supplies.
9. Notify a colleague forgetfulness, mistake or violation of these rules.
10. It is strongly recommended for pregnant women to stay outside the cleanroom.
11. It is recommended to not wear contact lenses inside the cleanroom.

• Integrity of the Cleanroom

- Clean your work station after use.
- No food, drink or chewing gum.
- No makeup, mascara, powder or perfume.
- Bring only the necessary.
- Clean everything you get in a clean room with the vacuum cleaner and then with a wet cloth. **Any object coming from outside (box, sample, chemical product, ...) will need to be authorized by one of the LMN staff prior to entering.**
- Avoid the cleanroom if you're sick.
- For smokers, wait at least 30 min after smoking before entering.

• Dressing

In order to limit the contribution of particles from users and avoid as much as possible the contamination of processes.

You Must:

- Wear the suit of the clean room.
- Avoid wearing of fluffy clothes.
- Do not go in the clean room with shorts or sandals.
- **Have a clean indoor pair of shoes for the cleanroom.**
- Leave your belongings (bag, jacket, box, ...) at your office rather than in the entrance.

• Entrance/exit procedure

The clean room entry is done in two steps :

1. Entering the gowning room (walk on the sticky carpet).
2. Entering the cleanroom from the gowning room (by passing on the sticky carpet).

Here is the dressing procedure:

- Put the white hair cover.
- Thread blue cover shoes passing the first bench one foot at a time (you can sit on the bench).
- Put the hood and the suit (the base of the hood inside the collar of the suit).
- Thread cleanroom boots, passing the second bench one foot at a time (you can sit on the bench).
- Put on the gloves.
- Verify in the mirror if the suit is well fitted.
- Enter the cleanroom.

3. LMN Rules

LMN RULES

- The user must follow the LMN cleanroom rules.
- Any user breaking the standard operating rules and jeopardizing the proper running of the laboratory might be temporary or permanently (after second offense) refused any access to the laboratory.
- **Working Hours**
 - Open from 8:30am to 5pm, Monday to Friday.
 - Permission is required to stay outside working hours (must be a minimum of 2 authorized persons).

- **LMN rules (next)**

To access the cleanroom, you need to:

- Have had a valid Workplace Hazardous Materials Information System (WHMIS) training.
- Have had a « Safety and Orientation » training in the cleanroom by someone from the LMN staff.
- Have given back a signed copy of the « user charter » (see at the end of this document) to the LMN coordinator.

To use one of the tools in the cleanroom, you need to:

- Have followed training on this equipment with a LMN staff member.
- Have obtained the authorization from this person.
- Hold a reservation on this tool.
- Register on the computer at the entrance to access the laboratory.

- **Specific rules for the sputtering deposition system**

To use the sputtering tool you must:

- Have everything you need to do your experiments (conditions of deposition, substrates, targets, ...) before reserving the tool.
- Reserve online a week before your deposition(s) and mention which target you need to the staff.
- Clean your substrates in advance.

Regular conditions of use:

- A maximum of 3 consecutive days is allowable (authorization required by the LMN staff).
- Respect the starting time of reservation otherwise it will be cancelled. If you finish sooner advise the LMN staff.

- **Reservations:**

The reservation software for the equipment of the cleanroom is available on the following link :

<http://reservation-lmn.emt.inrs.ca/>

- Charged fees are based on the greatest time between the time reserved on a tool and the real time spent in the clean room.

- **The LMN staff**

Director of the infrastructure:
Prof. Mohamed Chaker

Technical team:

Boris Le Drogoff (boris.ledrogoff@emt.inrs.ca, ext: 6867) - *Manager*

Étienne Charette (charette@emt.inrs.ca, ext: 6964)

Amine Zitouni (zitouni@emt.inrs.ca, ext: 6984)

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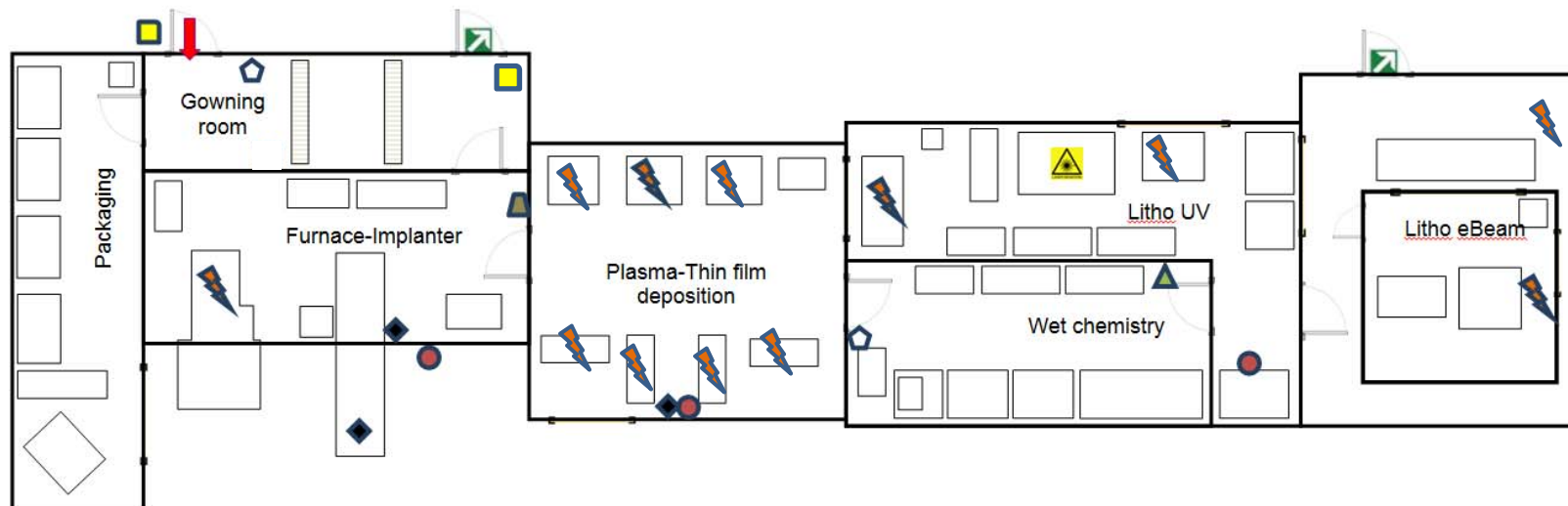
For any technical request, the whole LMN staff could be contacted by email at :
stafflmn@emt.inrs.ca

In the cleanroom, the whole staff could be contacted by phone by pressing the
shortcut key « Contact LMN »

- **A few words from the LMN staff**
- The LMN staff is ‘at your service’ (it means that we are here to help you ... not to serve you!).
- If you need assistance on a project, training, furniture or anything else, **plan it in advance**. In other words, there is a minimum and reasonable time to expect before having a response from the LMN staff.
- You’ll have to adapt the way you are working to the way the lab is functioning ... not the other way around.

4. Safety, Security and Health

Safety & Security in the LMN



MSDS of chemicals (qt : 2)		Shower body/eyes (qt: 1)	
Extinguisher (qt: 2)		Toxic gas detectors (qt: 2x3)	
Strobe/Alarm (qt: 3)		Emergency Shut-Off toxic gas (qt: 1)	
Emergency Exit(qt: 2)		High Voltage, RF (qt: 12)	
Laser (qt: 1)			

- **Dangers in the Cleanroom**

- **Furnace room**

Toxic Gases | High Voltage | High Temperature (Furnace)

- **Plasmas room**

Toxic Gases | High Voltage

- **Lithography room**

UV radiation (Mask-Aligner and Laser-Writer) | Mercury Vapor
(in case of a problem with the mask aligner lamp)

- **Cleaning room**

Chemical products

- **E-Beam room**

High Voltage (forbidden area)

- **Working Method ... just common sense:**
 - Work calmly, show user-friendliness.
 - Be careful in presence of colleagues around you, especially during the manipulation of dangerous products.
 - Do not scatter your stuff and tidy up everything once work is done.
 - Do not touch your skin with your gloves.
 - Working with precise movements. When in doubt, stop and ask for advice.
 - Wear anti-acid gloves, anti-acid apron and visor of protection for any manipulation of chemicals contained in the acids and bases shelves.
 - Seize bottles by the body and not by the cap.
 - Rinse thoroughly with DI water, containers after use (rinse at least 3 times during use of acids or bases) and let dry the glassware on the appropriate rack (**all glassware identified with a red tape is dedicated to the ebeam lithography only**).
 - Wear goggles in the identified rooms (i.e. wet chemistry and lithography rooms).
 - Take breaks after every 4hrs and get well hydrated.

- **Accessories for personal protection**

Protection goggles

- Must wear anytime you manipulate chemicals and in the identified rooms (i.e. wet chemistry and lithography rooms)
- Recommended for any other activities in the cleanroom.

Visor

- Mandatory when handling acids and bases in the wet benches.

Acid Protective gloves

- Mandatory when handling acids and bases in the wet benches
- Rinse thoroughly with DI water and wipe with clean room tissue before removing.

Apron

- Mandatory when handling acids and bases in the wet benches.

• Usage of chemical products

- Read material safety data sheet (MSDS) before use of chemicals.
- Always wear appropriate protection equipment.
- Always identify chemicals in a container.
- Use appropriate chemical bench (solvent: metallic bench, acid/base: plastic bench).
- Empty used chemicals in identified waste bottles (one for each chemical product).
- **Do not mix Solvent with acid or base.**

« Acid in water = Better, Water in Acid = Suicide »

- **MSDS (Material Safety Data Sheet)**
- They are regrouping all the safety issues of a chemical product.
- MSDS are located beside the entrance door of the cleanroom, and close to the emergency exit of the gowning room (or on any computer connected to the internet).
- For all chemicals that you intend to bring inside the cleanroom, you must provide the corresponding MSDS (any chemicals will need to be identified and receive entrance authorization by the LMN coordinator).

In the case of:

⇒ **Chemical Spill**

- Get out of the Cleanroom.
- Contact the LMN staff.

⇒ **Leak of toxic Gas**

The strobe lights and alarm sounds :

- **Get out immediately of the cleanroom by one of the two emergency doors (do not waste time to remove your suit).**
- Warn the LMN staff.

⇒ **EVG620 (mercury lamp of the mask aligner)**

- Do not look at radiation emitted from the lamp.

In case of explosion of the Mercury Lamp:

- **Get out immediately of the cleanroom (do not waste time to remove your suit).**
- Warn the LMN staff.

- **In case of an accident in cleanroom ...**
- **Warn LMN staff or the first-aid team at INRS.**
- **First aid (a first-aid kit is available in the gowning room):**
 - Burns (Acid, base, solvent, flames, ...) :
 - Rinse in water for at least 30 min.
 - Burns with HF :
 - Rinse in water for at least 5 min.
 - Apply Calcium gluconate 2.5% available in the cleaning room.
 - See a doctor in emergency while applying Calcium gluconate regularly.
 - Splash in the eyes
 - Rinse in water for at least 15 min.
- **Report the accident to the Health & Safety Committee.**
- **Complete a report of accident.**



User charter of the clean room facility at the Micro and Nanofabrication Laboratory (“LMN”)

For the purpose of increasing the efficiency of the laboratory activities, a working procedure in a clean room environment has been established in order to comply with the clean room standards as well as with the accounting standards and the requirements of auditors.

The purpose of the present charter is to inform the users of the LMN infrastructure of their responsibilities regarding the current procedure and therefore allowing, among others:

- Maintaining the cleanliness of laboratories.
- Controlling the arrivals and departures of the internal and external users.
- Charging in an effective way the hours of use of the tools in order to evaluate the real cost of every project.
- Managing INRS Assets (as defined below)

Reminder of some important rules:

- ◆ Prior to have access to the laboratories, every user will beforehand be required to follow “orientation and safety” training in the clean room and also will have had to have read the “Standard operating rules in the LMN clean rooms” document.
- ◆ No visitors will be allowed into the clean room without having had the authorization from one of the LMN managers.
- ◆ It is mandatory to log in and out on the computer at the entrance of the clean room AND to reserve in advance the time you plan to use for each tool (Online reservation of the clean room equipment: <http://reservation-lmn.emt.inrs.ca>).
- ◆ For any training request on a tool, please contact the LMN staff (stafflmn@emt.inrs.ca). You will get online access to the reservation of each tool only after the training and with the agreement of the person who trained you.
- ◆ It is forbidden to enter the clean room without the proper clothing or with objects or make-up that can generate particles (paper, computer, cell phone, facial make-up or perfume, etc.). Any object brought into the LMN from outside (box, sample, chemical product, etc.) will need to be authorized by one of the LMN managers prior to entering.
- ◆ Any user breaking the standard operating rules and jeopardizing the proper running of the laboratories may be temporarily refused any access to the laboratories (or permanently refused access after another offense).
- ◆ Note that the amount (user fees) will be charged according to the longer of the two following periods: the amount of time reserved and the actual time spent in the clean rooms (refer to the user fees of the tools).
- ◆ No right, license or title is granted or transferred by INRS in relation to the existing processes, techniques or inventions at the LMN, held or controlled by INRS («INRS Assets») and used by a user to carry out his or her work. Any improvement made to INRS Assets, developed by the LMN staff to carry out work, remains the property of INRS.

I undersigned certify to have read the « Standard operating rules in the LMN clean rooms – *version 2020_v1*” document and make a commitment to respect without any restrictions the working rules which are described there and the terms of the present charter.

Last name, First name:

Date :

Signature :