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ISTITUTO NAZIONALE DI FISICA NUCLEARE
Sezione di Perugia

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5. DOC. COD SOS-INFN-cleanroom_safety- inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

Contents

1	CLEAN ROOM POLICIES.....	3
2	CLEAN ROOM ETIQUETTE	4
3	SAFETY	5
4	CHEMICALS.....	5
5	ELECTRICAL	6
6	EMERGENCIES.....	6
7	POWER OUTAGE	6
8	FIRE OR EXPLOSION	7
9	CHEMICAL SPILLS.....	8
10	GOWNING	8
10.1	GOWNING PROCEDURE:	9
10.2	GLOVES	9
11	CLEAN ROOM EQUIPMENT	10
12	EQUIPMENT QUALIFICATION PREREQUISITES.....	10

1. LOGO 	2. TITLE Overview and general Safety	3. SECTION Clean Room	4. PAGE REF. 3 of 10
5. DOC. COD SOS-INFN-cleanroom_safety-inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri
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Overview and general Safety

Completion of Clean Room Orientation allows you to gain access to the clean room to become more familiar with the clean room environment and to receive further training from other clean room users. **It does not mean that you are immediately qualified to use any of the equipment without supervision.**

1 Clean Room Policies

Only people who have completed clean room orientation are permitted to enter the clean room. The clean room manager or the clean room staff must approve visitors. Visitors must be under the direct supervision of a qualified clean room user.

Clean Room Manager :**Roberto Battiston 2913**
Clean Room Technical Staff: **Gianluca Scolieri 2968**

Internal Emergency numbers: 2913-2968-2911

- Open hours of operation are Monday through Friday, 8:30 am to 17:30 pm, except university holidays. All entrance to the clean room outside these hours requires a qualified certificate from the INFN Director.
- Your badge is used to gain access to the SERMS laboratory and clean room. Because we need to know who is in the clean room during any emergency, you must never loan your personal badge card to another user. If you temporarily do not have your personal badge or it does not appear to be working, you may enter in the laboratory with another user after you have inform clean room manager with your name and the time you entered the clean room.
- Breaking equipment, not understanding how the equipment operates (including contamination issues), and/or continuous disregard for clean room etiquette contribute to an unsafe work environment and will be addressed as a safety violation, depending on the severity of the incidents.
- All clean room users are expected to follow standard clean room procedures (as outlined in the following text) while working in the clean room and to be properly qualified before using any equipment. Exceptions will be made by permission of the Clean room Manager only.

1. LOGO 	2. TITLE <p style="text-align: center;">Overview and general Safety</p>	3. SECTION <p style="text-align: center;">Clean Room</p>	4. PAGE REF. <p style="text-align: center;">4 of 10</p>	
5. DOC. COD SOS-INFN-cleanroom_safety-inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

- All persons entering the clean room will be properly attired: bunny suit has to be always used; gloves, eye protection and air mask are required if you have to use glue or chemical product. All equipment entering the clean room **will be cleaned** of contaminants. IPA and wipes are available in the gowning room. Wipe all incoming equipment until it is clean.

2 Clean Room Etiquette

- Report any problems to clean room manager;
- Clean up after yourself;
- Return things to where and how you found them, or better;
- If you must leave something sitting out, label it with your name, the date and what it is;
- Do not leave open containers of chemicals sitting out, make sure that they are covered and properly labeled (name, date, contact phone number, contents, hazards);
- Do not borrow other people's supplies without permission.
- Do not play with equipment;
- Do not work on or use equipment that you do not completely understand or that you are not qualified to use;
- Always sign in the logbook when you use a piece of equipment;
- Some equipment requires advance sign-up. When signing up for equipment, make sure your name is legible or your sign-up will be cancelled. Do not exceed the time limitations or sign up too far in advance or your sign-up will be cancelled as well;
- Never leave any equipment unattended while you are using it;
- Do not modify equipment;
- Smoking, eating, or drinking anything except water is prohibited;
- Only ballpoint pens may be used. Pencils, erasers or other writing implements are prohibited. Ballpoint pens are available for clean room use; do not take them out of the clean room;
- Permanent clean room documents must be copied onto non-linting clean room paper. Laboratory notes should be kept in a clean room notebook. Standard copy paper and textbooks are discouraged. No newspapers or cardboard;
- If you are unsure about anything related to using the clean room, ASK!

This list is far from complete. The intent is to provide the best research environment possible for you and other users. Please respect it and each other.

1. LOGO 	2. TITLE <p style="text-align: center;">Overview and general Safety</p>	3. SECTION <p style="text-align: center;">Clean Room</p>	4. PAGE REF. <p style="text-align: center;">5 of 10</p>	
5. DOC. COD SOS-INFN-cleanroom_safety-inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

3 Safety

- If you have any concerns about safety that the Clean room Manager or Technical Staff cannot address to your satisfaction, please call SERMS Emergency numbers **2913-2968-2911**. If you need immediate help call the **118** number for safety rescue or **115** for Firemen.
- Use common sense when thinking of safety. Think about how your actions will affect other users as well as yourself. Do not set a bad example for others.
- The rules for clean room use exist to protect you and your fellow users. Failure to follow them may result in losing clean room access. If you have any questions about safety please ask the clean room manager. There is no excuse for not following safety procedures.
- Report any safety problems or concerns you encounter to the clean room manager or a staff member. Your observations, concerns, and input are appreciated.

4 Chemicals

- You must inform the clean room staff of any chemicals you plan to bring into the clean room and provide a Material Safety Data Sheet for that chemical before bringing it into the clean room;
- Know where the eyewash are and how to use them;
- Do not use a chemical until you have familiarized yourself with its Material Safety Data Sheet (MSDS). The Material Safety Data Sheets are located in a folder in the Clean Room main entry. Please notify clean room staff if we do not have the MSDS for a chemical that has been in use. In particular, pay attention to its properties, handling procedures, disposal, health hazards and incompatibilities;
- Do not use a chemical or chemical procedure unless you are sure of the results. When in doubt, ask for help;
- Chemicals are to be stored in designated locations only. do not store chemicals in your lab box or locker;
- All chemicals transferred from their original containers must list the chemical name and the associated hazards as stated on the MSDS.

1. LOGO 	2. TITLE <p style="text-align: center;">Overview and general Safety</p>	3. SECTION <p style="text-align: center;">Clean Room</p>	4. PAGE REF. <p style="text-align: center;">6 of 10</p>	
5. DOC. COD SOS-INFN-cleanroom_safety-inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

5 Electrical

- All electrical wiring and electrical repair are to be done by staff only;
- Electrical disconnects for the equipment are located on the wall behind each piece of equipment;
- In the event of the electrocution of someone in the lab, **DO NOT GRAB THEM!** Disable the power immediately;
- Do not overload electrical circuits.
- Open toed shoes, shorts and dresses, and contact lenses are discouraged. Open clothing reduces your chemical protection in the event of an accident. Many contact lenses are permeable to water (and caustics) and may dissolve in solvents. This can dramatically increase the risk of permanent eye damage in the event of an accident.

6 Emergencies

- In the event of an emergency, clean room manager is first concerned with the safety of individuals; secondly with equipment and lastly with experiments. Experiments can always be repeated and equipment repaired, but lives cannot.
- You should call for help from the location of the problem, or evacuate the clean room, pulling the fire alarm as you leave if the situation warrants, and then call for help. **Call 113 for police, 115 for fire, and 118 for ambulance assistance.** Stay on the phone with the operator until they give you permission to hang up. Follow all their instructions.

7 Power Outage

- Emergency lights will come on;
- Building facilities may not reset when power is resumed;
- If you are working in a chemical hood, close the shields. You are no longer working in a safe, exhausted environment;
- If you are working with a hazardous gas system that is manually valved, close all gas valves;
- If the power remains off, leave whatever you are doing in as safe a condition as possible and exit the clean room;
- Do not resume your work until you have been given assurance that building facilities are back on;
- When in doubt, seek help to return process equipment to a safe status.

1. LOGO 	2. TITLE Overview and general Safety	3. SECTION Clean Room	4. PAGE REF. 7 of 10
5. DOC. COD SOS-INFN-cleanroom_safety-inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri
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8 Fire or Explosion

- Familiarize yourself with the use, capabilities and location of the various fire extinguishers inside the clean room and on the laboratory;
- In the event of a small fire, if it is safe and you feel comfortable doing so, use a fire extinguisher to extinguish the flames. If you do not feel able to use the extinguisher to extinguish the flames, get help immediately;
- In the event that you do successfully put out a fire, it must be reported to the clean room manager;
- In the event of a fire that is uncontrollable or the alarm goes off, leave clean room immediately. Do not finish what you are doing; do not try to save personal belongings; do not look for help, etc.... **There are many substances present in clean room that, once burning, quickly emit large volumes of toxic dense black smoke. Save yourself by leaving immediately.**

b. Gas Leaks

- i. ~~A digital control system constantly monitors hazardous gas levels at critical areas throughout the clean room. The sensors for this system are located near the equipment using a hazardous process gas and in the gas cabinets located in the chase housing the gas bottles. If a hazardous gas is detected, alarms and operational sequences are activated.~~
- ii. ~~TLV stands for Threshold Limit Value. It is the time weighted average concentration of an airborne substance that represents the condition under which it is believed nearly all workers may be exposed in a normal 8 hour day, 5 day work week without suffering adverse effects.~~
- iii. ~~A gas level greater than 1 TLV activates red beacons and audible alarms that can be seen and heard throughout the clean room. If your equipment has an emergency shut-off, activate it and immediately leave the clean room and then the building through the nearest exit. Clean room exit routes are posted on the gowning room entrance door. DO NOT exit the clean room through the chase housing the gas cabinets;~~
- iv. ~~Emergency shut-off valves are triggered at the gas cylinders to isolate the leak sources. The clean room make-up air handling unit and the recirculation air handling units shut down, and the scrubbed exhaust system increases exhaust velocity to obtain a negative clean room pressure with respect to the rest of the building. This air handling procedure reduces the chance of the spread of gas throughout the building and evacuates gas from the clean room out the scrubbed exhaust. Audible alarms activate throughout the building notifying all occupants to evacuate.~~

1. LOGO 	2. TITLE <p style="text-align: center;">Overview and general Safety</p>	3. SECTION <p style="text-align: center;">Clean Room</p>	4. PAGE REF. <p style="text-align: center;">8 of 10</p>	
5. DOC. COD SOS-INFN-cleanroom_safety- inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

9 Chemical Spills

- A small acid or base spill (<500ml) can be neutralized using available neutralizing powders located near the acid and base wet benches. Quick action can reduce the spread of hazardous fumes and reduce property damage;
- If a chemical spill is too large to handle on your own, block off the area to keep other clean room users away, evacuate the clean room through the nearest exit and inform clean room manager and staff;
- Report all chemical spills, no matter how small to the cleanroom manager;
- If bodily exposure of acids or bases occurs first aid must be administered immediately;
- Rinse the affected area with large amounts of water at a sink away from the spill area; use the eye wash station, if possible;
- Discard of all clothing that has been exposed to the chemical. Do not let modesty turn a minor chemical exposure into a more serious one.
- If you spill Hydrofluoric Acid on yourself, or if you are not sure what chemical exposure occurred, apply magnesium oxide cream to the effected area after rinsing with water. Hydrofluoric acid (HF) will not burn upon exposure like with other acids. Water does not neutralize the effects of HF. HF will migrate to the bone and destroy all tissue in its path. You probably won't feel pain until major tissue damage has occurred. HF can cause a chemical imbalance in your body that disrupts your heartbeat. Seek medical attention immediately after all Hydrofluoric Acid exposures.
- For other chemical exposures, follow the MSDS guidelines and notify emergency personnel.

10 Gowning

- Proper gowning can drastically reduce the contamination you impart to your samples and the clean room environment. It is your responsibility to learn and practice proper gowning techniques;
- About the Bunny Suits

The bunny suit does not offer any degree of chemical protection;

You are entering a class 10000 clean room which is certified to have less than 10000 particles of a 0.5 micron cross-section or larger per cubic foot of air. This level of cleanliness is necessary for the manufacture of high-density microstructures. The human body is constantly replacing skin cells, which are shed through normal processes. The bunny suit acts as a filter to prevent these particles from entering the clean room. In essence, the bunny suit protects the clean room from you;

Human skin oils and sweat contain large amounts of ionic materials such as sodium that can be deadly to semiconductor devices. The bunny suit and gloves help protect the manufactured devices from these substances;

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5. DOC. COD SOS-INFN-cleanroom_safety- inglese.doc	6. ISSUE DATE 04 dec 2009	7. VERSION/REVISION A01	8. ISSUED BY G.Scolieri	9. APPROVED BY

Bunny suits are collected weekly for laundering and a clean suit will be put in your locker. In the event you do not have a bunny suit in your locker or you have a defective suit, obtain a replacement through a clean room staff member. Yellow defect tags are available in the gowning area; use them to indicate tears, missing snaps, etc;

Some individuals are sensitive to chemicals used in laundering. See the clean room manager if you experience any rashes or other symptoms of discomfort from wearing a suit;

10.1 Gowning Procedure:

- Put on a bouffant cap containing as much hair as possible. Bouffant caps are disposable;
- Put on a bunny suit hood, snap side out, elastic on the inside. The hoods are packaged inside out;
- Put on a bunny suit coverall zipping the hood inside the coverall;
- Put on bunny suit boots over the coverall;

10.2 Gloves

- Latex gloves are tighter fitting than vinyl and do not allow moisture to evaporate as easily. In addition, some individuals may be allergic to the natural rubber latex of which these gloves are produced. Some symptoms of latex allergy may be: hives, runny nose, facial swelling, difficulty breathing, sudden drop in blood pressure, diarrhea, itching, watery eyes, abdominal cramps, nausea, rapid heart rate, dizziness, anaphylactic shock. If any of these symptoms occur that you believe may be related to the use of latex gloves, discontinue use immediately and consult a physician if necessary;
- Vinyl gloves are loose fitting and can be worn. Some individuals like to switch between latex and vinyl gloves. However, vinyl gloves will dissolve in acetone and other solvents; they rip easily, and make it difficult to handle small parts;
- Nitrile gloves are replacing the vinyl gloves. They are only slightly more resistant to solvents than vinyl. They provide a tighter fit than vinyl gloves, although they are not as stretchy as latex;
- Under-gloves are also available. These are optional and can be worn under either latex or vinyl gloves. They help keep your hands dry under the gloves. If you choose to wear the cotton gloves, please take them home, launder them weekly, and replace as necessary;
- **In addition to the normal clean room entrance gloves, special chemical resistant gloves must be worn when working with acids and bases.**

1. LOGO 	2. TITLE Overview and general Safety	3. SECTION Clean Room	4. PAGE REF. 10 of 10
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11 Clean room Equipment

Going through a clean room orientation allows a person access to the clean room to receive training before becoming qualified to use any equipment. You should receive training on the necessary equipment from people in your research group or from other clean room users who are familiar with that piece of equipment.

c. Ultrasonic cleaner to clean small part of metal to put inside thermo vaccum

d. HEPA Filters

- i. Laminar flow.
- ii. Return air.
- iii. Make up air.
- iv. Temperature control, humidity control.

12 Equipment Qualification Prerequisites

People wishing to become qualified on clean room equipment must first go through clean room orientation. No exceptions allowed.

Users are not qualified until completing all the steps below, then arranging for a qualification time with a member of the clean room staff. If they are unavailable, they will designate an appropriate qualifier. They will qualify the user upon successful completion of a qualification process.

Unqualified users are not allowed to operate a process tool unattended. If qualification requires a minimum number of process runs, a qualified user must be present at all times during all of the process runs. Unqualified users should arrange for training well in advance to accommodate everyone's schedules.

Luogo e data

Clean Room Manager

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INFN – Safety Service

INFN-DIRECTOR

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