NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Reg. No. 200604393R

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Title :	CINTRA Safety Rules	
Audience :	All Staff & Students in CINTRA	

1. Aim

This document spells out the basic safety rules and requirements for working in CNRS International-NTU-Thales Research Alliance (CINTRA) where total compliance is expected by all persons.

CNRS International-NTU-Thales Research Alliance commits to take all reasonably practicable means to provide a safe and healthy environment to all staff, partners, students and visitors.

As each work area in CNRS International-NTU-Thales Research Alliance may have other specific safety requirements, laboratory users shall check with the respective Laboratory Safety Representative (LSR) for details.

2. Scope

This document is developed by the CINTRA Safety Committee to give full and precise details of operational and safety procedures required for compliance. This document is applicable for all CINTRA workplaces where CINTRA is the occupier. Every staff, students and contractors within CINTRA must read and understand the information in this document with regard to safety and emergency procedures prior to using the Centre's facilities and equipment. No personnel shall work at any workplace in the Centre premise without having read this document.

While effort has been made to address situations that may pose a hazard in the workplace, the information and instructions provided are not limited to and cannot be considered exhaustive and all-inclusive.

3. Definition

3.1 **CINTRA** – refers to the CNRS International-NTU-Thales Research Alliance

3.2 **Person-in-Charge** – refers to appointed persons responsible for the particular areas or functions

3.3 **Safe Work Procedure (SWP)** - refers to the procedure developed after conducting a risk assessment, for the purpose of carrying out work safely.

3.4 **Shall** - indicates an essential requirement

3.5 **Should** - indicates a recommendation

3.6 **Workplace** - refers to any place within NTU premise where a workplace activity is being performed or any place where NTU's intended business is being carried out.

4. Responsibilities

4.1 CINTRA Safety Committee will establish and oversee the implementation of the safety rules on behalf of the Centre, including the disciplinary actions to be taken.

4.2 All Principal Investigators/Supervisors will assist the Centre in the enforcement of the safety rules in CINTRA.

4.3 All staff and students shall abide by the safety rules at all times and when in doubt, ask.

4.4 **Responsibility of Principal Investigator/Supervisor**

Principal Investigators/Supervisors have a duty of care to the staff, students and visitors under their supervision. They also have a number of other obligations. Principal Investigators/Supervisors are required to fulfill the following criteria (failure to do so may result in closure of the laboratory or work area):

- Satisfied that user(s) under his supervision making electrical connection is / are not impaired by colour vision deficiency (sometimes called partial colour blindness).
- Ensure all new staff and students are instructed on general safety measures by asking them to take the elearning safety courses; or
- Provide specific safety instruction peculiar to their laboratory requirements. Basic instructions to be given by the Principal Investigator/Supervisor should include the following:
  - What are the emergency phone numbers?
  - Where medical help can be obtained?
  - What is the fire alarm and what to do when it sounds?
  - Where fire extinguishers, fire blankets, medical assistance (in the Centre and campus medical centre) and web-based safety information can be found, and how to use these items. For the fire extinguishers, point out the different kinds and when they are to be used
  - What the general laboratory rules are

- The Centre's glove policy and laboratory coat policy
- The need to ask for exact instructions on the use of new procedures or unfamiliar equipment
- The need to have permits, approvals, and/or training for importing statutory equipment, using of high powered lasers, etc.

4.5 Responsibility of Staff & Students

4.5.1 It is mandatory, according to the Workplace Safety & Health Act 2006, that everybody working in laboratory (workplace) have the responsibility to take care of themselves by observing safety rules and guidelines and procedures adopted.

4.5.2 As much as the Person-in-Charge can brief or train staff to observe safety rules, eventually, everybody working in the laboratory must know how to carry out work safely, how to identify hazards and how to minimize risks.

4.5.3 Lab users with colour vision deficiency may have to undergo a test to determine their suitability to make electrical connection and/ or termination only if they are able to correctly identify red and green wires.

4.5.4 As we are working with hazardous chemicals, high powered lasers and biological agents, we would need to know the hazards and the control measures to prevent accident.

4.5.5 Everybody must know the hazards of every chemical or biological agent that they are using by reading the Safety Data Sheet (SDS).

4.5.6 Staff and research students should be trained on **RISK ASSESSMENT** to identify the hazards.

4.5.7 Staff and student failed to observe and repeatedly violate safety rules may have to face expulsion from Centre and/or penalty from the government agencies.

5. Safety Rules and Regulations

5.1 THE NORMAL WORKING OFFICE HOURS IN CINTRA (office and experimental & characterization rooms) ARE FROM 8:30 A.M. TO 5.30 P.M. FROM MONDAY TO THURSDAY, FROM 8:30 A.M. TO 5.15 P.M. ON FRIDAY. DURING WEEKDAYS,

AFTER NORMAL OFFICE HOURS, WORKING IN THE OFFICE IS ALLOWED UNTIL 11.00 P.M AND FROM 8.30 A.M. TO 1 P.M ON SATURDAY.

5.2 HOWEVER, WORKING IN THE EXPERIMENTAL AND CHARACTERIZATION ROOMS (laser, optical fiber, FCVA and RF areas) AFTER NORMAL OFFICE HOURS, UNTIL 11.00 P.M AND FROM 8.30 A.M. TO 1 P.M ON SATURDAY IS AUTHORIZED ONLY IF A PERSON IN CHARGE (PIC) IS PRESENT:

- Optical fibers area: Dr Wu Zhifang
- Lasers area: Dr Shuwen Zeng or Dr Danang Birowosuto
- FCVA area: Dr Tan Chong Wei or Mr Etienne Rodriguez
- RF room: Dr ZhiHong Liu

Otherwise, permission must be granted from the Security Office to stay after the stipulated time. Failure to adhere to the above stated rule may result in alerting the Security Office. In this case, a security violation would be filed. Disciplinary action may be taken against the personnel involved. All activities at CINTRA are recorded by a 24 HRS CCTV SURVEILLANCE.

5.3 ENSURE THAT ALL THE ENTRANCES ARE PROPERLY CLOSED. Objects should not CLOSED be used to prevent or obstruct the closure of the main door. Failure to close the door will result in alerting the Security Office.

5.4 DO NOT BRING IN ANY UNAUTHORIZED PERSONS IN CINTRA WITHOUT PRIOR PERMISSION FROM SUPERVISORS. ONLY CINTRA AUTHORIZED USERS AND MEMBERS WITH SECURITY ACCESS CARDS ARE ALLOWED TO ACCESS CINTRA DURING AND AFTER NORMAL WORKING OFFICE HOURS.

5.5 You must tap your own matric card to gain access to the labs during this period. FYP students and non CINTRA users are not allowed to access the labs after office hours.

5.6 For equipment installation, the user responsible for the new equipment must comply with the requirements as stipulated in the SOP on Contractor Management.

5.7 Please KEEP THE WORKING AREAS CLEAN and wear proper attire (do not wear slippers or sandals in the lab). All users are required to put on trousers or long pants in research and teaching wet laboratories. Always wear closed toed shoes in the laboratory.

5.8 DO NOT EAT AT YOUR DESK and do not throw leftover food in CINTRA food garbage bins, as this will cause encourage infestations of rats in the laboratories. PLEASE GO TO DEDICATED AREAS (COFFEE ROOM) TO EAT.

5.9 Do not work when you are feeling extremely sick as to not infect others

5.10 REPORT ANY FAULTY EQUIPMENT to the secretary (Jing Fei, Tiffany) or person-in charge (PIC) immediately, Never meddle with someone else's setup If you need to borrow any component/equipment from others, you will need to ask the user before taking any item from the experimental setup.

5.11 Log-in and Log-out each time you use a piece of equipment, A log file is provided for each equipment, Equipment Authorization Form is required to be completed by applicants and necessary approvals are required before a staff or student is allowed to be trained to use the equipment.

5.12 EVACUATE WHEN THERE IS AN ALARM. The evacuation and meeting point plans are pinned in different places in CINTRA.

5.13 Good common sense is needed for safety in a workplace. It is expected that each staff will work in a responsible manner, exercise good judgments, takes necessary precautions and application of common sense.

5.14 Do not do anything that cause annoyance to others.

5.15 Be sensitive to others by not bringing pets, animals, birds, fish, insects or any creature into the laboratory that may cause allergy or a nuisance to others.

5.16 If at any time, you are not sure how to handle a particular situation, ask your laboratory safety representative for advice.

5.17 **DO NOT TOUCH ANYTHING WITH WHICH YOU ARE NOT COMPLETELY FAMILIAR**!!!

5.18 It is always better to ask questions than to risk harm to yourself or damage to the equipment. It is better to be safe than sorry.

6. General Safety Rules

6.1 Keep all emergency exits and corridor free from obstruction at all times.

6.2 Do not abuse or cause obstruction to emergency items such as fire extinguishers, eye wash/shower station, fire call points, AED, first aid boxes or chemical spill kits.

6.3 Observe and comply all safety signs / regulations in laboratories.

6.4 Use only approved electrical plugs or adapters with the Singapore ‘Safety Mark’.

6.5 Keep your cubicle or space allocated clean and organized.

6.6 Maintain good housekeeping.

6.7 Never do unauthorized experiments or projects.

6.8 Do not leave an on-going experiment unattended.

6.9 Always inform your laboratory staff of any faulty equipment. Failure to report will be attributed to you.

6.10 Never use open flames in laboratory unless instructed by laboratory staff or under supervision.

6.11 Do not use corridors for storage or work areas.

6.12 Do not store heavy items above table height. Any overhead storage of supplies on top of cabinets should be limited to lightweight items only. Also, remember that a 1m diameter area around all fire sprinkler heads must be kept clear at all times.

6.13 Areas containing lasers, biohazards, radioisotopes, and carcinogens should be posted accordingly. However, do not post unnecessarily and be sure that the labels are removed when the hazards are no longer present.

6.14 Be careful and adopt proper posture when lifting heavy objects.

6.15 Check and clean your laboratory bench and equipment, and lock the door before you leave the laboratory.

7. Workplace Emergency

7.1 It is your responsibility to read safety and fire alarm posters and follow the instructions during an emergency.

7.2 Know the location of the fire extinguisher, eye wash, and safety shower (or the nearest toilet) in your laboratory/office and know how to use them. If in doubt, ask the Laboratory Safety Representative / Person-in-Charge.

7.3 Notify laboratory staff / Person-in-Charge immediately after any injury, fire or explosion, or spill.

7.4 For workplace emergency within the Centre premise, we have Emergency Response Team (ERT) and Emergency Coordination Team (ECT) to assist staff or students. For Emergency Evacuation of the laboratory, please follow PIC in charge:

- Ms Jing Fei, secretary of CINTRA
- Professor Phillipe Coquet, Director of CINTRA

7.5 Before seeking their assistance, injured staff or students should look at the seriousness of the injuries and perform self–treatment, if possible. First Aid box is available in every laboratory or administrative unit.

7.6 Help can be obtained from the University Fault Reporting Centre (x4777) or Campus Security (x5200) at all times round the clock.

7.7 Try to dial 999 or 995 only when the situation is beyond self- control.

7.8 Emergency contact numbers are as below:

Emergency Services	Phone Number	Purpose of Contact
Fire Brigade	995	When a fire is unable to be extinguished using Centre safety facility
Ambulance	995	When someone is seriously injured and need immediate medical aid (for life threatening cases)
Police	999	To handle suspicious or threatening person or article
Campus Security	6790 5200	When suspicious person or article is observed or when there is an alarm raised
Fault Reporting Centre	6790 4777	For assistance in remedy building faults related to electrical and architectural issues
NTU Medical Centre	6793 6828	When in need to seek immediate medical aid (like big cut, sprained ankle, etc.)

8 Reporting of Accidents & Incidents

8.1 The Centre is required to keep a register of all accidents, however slight, that result or had the potential to result in an injury or an unsafe situation. The Centre is to ensure the implementation of the incident reporting and investigation procedures according to the CINTRA SOP on Incident Reporting.

8.2 It is the responsibility of all staff and students to report any accidents, near miss, unsafe condition, unsafe act, dangerous occurrence or occupational disease using the online Incident & Investigation Reporting Form (IIRF).

http://www.ntu.edu.sg/ohs/Pages/default.aspx

8.3 *Incident Reporting Procedures:*

- Staff/Student involved in the Incident reports **on-line (OHS Website)** - within 24 hours (copy of report will be send to Chair)
- OHS IIRF system receives report and informs CINTRA Safety Officer
- CINTRA Safety Officer and PI shall form an investigation team to investigate. OHS will assist, if necessary
- Investigation Team submits investigation report.
- Review risk assessment, and develop new safe work procedure.

8.4 If the accident occurs after office hours and weekends, staff should exercise common sense and discretion on the seriousness of the injury. Proceed to seek professional medical aid if necessary, followed by informing any staff and the Centre Safety Committee.

8.5 Report any incident within 24 hours to the Centre or lab in-charge or via the NTU IIRF reporting tool.

9. Safety Training Requirements

9.1 Lab users are to attend lab safety induction or briefing provided by the laboratory safety representative or trained researcher. Trainings on laboratory equipment will be conducted for staff working in the laboratories. Approach the Person-in-Charge to arrange for specific equipment training.

9.2 Principal investigator (PI) shall determine the necessary safety training for the users at the beginning of a new assignment or when a new hazard is introduced into the workplace.

9.3 All lab users are to complete their safety training requirement as indicated by the CINTRA Training Matrix before commencement of their work. Failure to fulfill the safety training requirements may result in barring from gaining lab access.

9.4 The attendance for the following courses are COMPULSORY FOR ALL STAFF, UNDERGRADUATE AND POSTGRADUATE STUDENTS:

9.4.1 EEE Safety Induction for Lab Users

9.4.2 NTU Safety Induction for Laboratory Users

9.4.3 View a SAFETY VIDEO on the following link:
http://www.eee.ntu.edu.sg/aboutus/Services/Pages/Home,aspx

EEE Safety

9.4.4 A safety briefing in CINTRA

10. Authorization of Laboratory Facilities Usage after Office Hour

10.1 The official operating hours for CINTRA is: Monday to Thursday is 8.30 am to 5.30 pm and Friday is 8.30 am to 5.15 pm (for actual operation hours refer to each laboratory or workshop).

10.2 During weekdays, after normal office hours, working in the office and cubicle areas is allowed until 11.00pm and from 8.30am o 1.00pm on Saturday.

10.3 However, working in the experimental and characterization rooms (laser, optical fibre, FCVA and RF areas) are full of potential hazards that can cause serious injury, disability, death and or damage to the equipment. Therefore, after normal office hours, working until 11.00pm and from 8.30am to 1.00pm on Saturday it is authorized only if the Person-in-Charge is present:

- Optical Fibres Area: Dr Wu Zhifang
- Laser Areas: Dr Zeng Shuwen or Dr Muhamad Danang Birowosuto
- FCVA Area: Dr Tan Chong Wei or Mr Etienne Rodriguez
- RF Room: Dr Liu Zhihong

10.4 There shall be at least two people should be present so that one can shut down equipment and call for help in the event of an emergency. Carrying out experimental laboratory work alone after hours is strongly discouraged.

10.5 It is mandatory to conduct Risk Assessment (RA) on work processes and projects to be carried out. Please refer to the CINTRA SOP on Risk Management.

10.6 The RA is to be approved by Principal Investigator before the commencement of any practical work. Safe Work Procedures (SWP) written for processes must be observed at all times.

10.7 If experiments are to be continued unattended overnight, place paste a note next to experimental apparatus indicating the chemicals involved, your name and a number where you can be reached in case of an emergency.

10.8 Small children and pets are not permitted in laboratories at any time.

10.9 After office working hours, testing is PROHIBITED. However, with specific permission and written approval from your supervisor, you may proceed when all necessary safety measures are in place. It is your responsibility to appoint a qualified buddy to be around during the whole period of your testing. Refer to CINTRA SOP on Working Office After Hours.

11 Undergraduate Student Attachment & FYP Student Policy

11.1 The policy for new staff safety briefing applies to the undergraduates under attachment and conducting final year project in the laboratories.

11.2 Undergraduate students are not allowed to carry out any experimental work or operate any laboratory equipment without supervision. Training on the use of equipment must be carried out by the staff in the laboratories that they are attached to. They are also discouraged to work alone in the laboratories at any time.

11.3 All Principal Investigators must assign “BUDDY” to these students.

11.4 If there is not staff to take care of the undergraduates, the Principal Investigators may become the “BUDDY” of these students.

11.5 It is the responsibility of the Principal Investigator to ensure that these students work safely in the laboratories.

12 Laboratory Safety Rules

12.1 Strictly no cooking or consumption of intoxicating beverage in the laboratory is allowed. Possession of any intoxicating or alcoholic beverage shall constitute a major violation of safety rules unless it is related to your research project or experiment.

12.2 No eating & drinking in the laboratory. Consumption of food or beverage shall constitute a major violation of safety rule.

12.3 No personal audio player is allow while working in the laboratory as the use of earphones to listen to audio music hampers the hearer’s ability to hear any audible warning / alarm.

12.4 Do not bring in anyone with non-official business into the laboratory.

12.5 No smoking or littering is allow in the laboratory.

12.6 At all times, only authorized Staff/students are allow to work alone in a laboratory.

12.7 Do not operate equipment/machine unless you are trained and/or approved by your Principal Investigator.

12.8 No sleeping is allow in the laboratory and research offices. Sleep, herein, is define as laying horizontally on a mattress, hammock, stools, chairs, tables, benches, or any structure.

12.9 No horseplay in the laboratory.

12.10 Report all equipment failure while being used, fault or safety issue to the person-in-charge (PIC) immediately. Never try to fix the problem yourself because you could harm yourself and others.

12.11 Risk Assessment shall be conducted prior to commencement of any work activity in the laboratory / workshop.

12.12 Read SWP, Safety Data Sheets (SDS), instructional labels, manuals or posters carefully before commencement of practical work.

12.13 Staff/students should have sufficient knowledge of the test before carrying out the experiment. When in doubt, always ask.

12.14 Appropriate attire must be worn while in the lab, as follows:

- Work shirt that covers the upper torso and arms.
- Lower body clothing that covers the entire leg.
- Closed-toe shoes that cover the top of the foot.

12.15 Rubber sole shoes are to be worn when working on electrical experiment or project. Where necessary, wear appropriate mask or respirator.

12.16 Long hair or loose clothing must be tied back, secured or confined before commencing work.

12.17 Stack materials in a safe manner to prevent causing tripping / falling object hazard.

12.18 Keep the work area tidy and clear of all materials except those needed for your work.

12.19 Carry out regular housekeeping and cleaning at your work areas.

12.20 Disposal - You are responsible for the proper disposal of used material if any in appropriate containers.

12.21 When leaving a laboratory unattended, check and turn off all ignition sources and lock the doors.

12.22 Check and clean up your work area before leaving.

12.23 Wash hands before having food.

13 Electrical Safety

13.1 NEVER work with electricity higher than 50V AC or 120V DC volts without specific permission, training and /or written procedures. Notify your project supervisor immediately if you have any doubt.

13.2 Obtain permission before operating any high voltage equipment.

13.3 Maintain an unobstructed access to all electrical panels.

13.4 Wiring or other electrical modifications must be referred to the Person-in-Charge.

13.5 Do not modify, attach or otherwise change any high voltage equipment without prior permission.

13.6 Always make sure all capacitors are discharged (using a grounded cable with an insulating handle) before touching high voltage leads or the "inside" of any equipment even after it has been turned off. Capacitors can hold charge for many hours after the equipment has been turned off.

13.7 Never touch an electrical appliance and metal structures/parts at the same time. When you are adjusting any high voltage equipment or a laser which is powered with a high voltage supply, USE ONLY ONE HAND. Your other hand is best placed in a pocket or behind your back. This procedure eliminates the possibility of an accident where high voltage current flows up one arm, through your chest, and down the other arm.

13.8 Be aware of all electrical safety hazards in your work area.

13.9 Electrically operated equipment must be de-energized before work on it may commence.

13.10 Always follow lockout/tag-out procedures when working on high voltage electrical equipment. Refer to NTU SOP on Lock Out Tag Out (LOTO).

13.11 Wear appropriate attire and use personal protective equipment (PPE) such as safety glasses, rated rubber gloves and insulated boots when necessary. Refer to NTU SOP on the Use of Personal Protective Equipment.

13.12 Never override safety devices such as electrical interlocks.

13.13 Remove all rings, bracelet, necklace, key chains or other metal objects when working with electricity.

13.14 Never plug in cords that are wet or touch electrical equipment with wet hands.

13.15 Never work on “live” or energized equipment unless it is necessary to conduct equipment troubleshooting.

13.16 Do not connect too many pieces of equipment to the same circuit or outlet as it could become overloaded. Do not daisy chain extension socket outlets.

13.17 Be sure that residual current circuit breakers (RCCB with leakage current sensitivity (I_{Δ}) of 30 mA) are used in high-risk areas such as wet locations. RCCB are designed to shut off electrical power within 0.1 second.

13.18 Inspect all equipment periodically for defects or damage.

13.19 All electrical cords that are worn, frayed, abraded, corroded or otherwise damaged must be replaced.

13.20 Keep all electrical cords away from heat, oil and sharp edges.

13.21 Always follow the manufacturer's instructions for usage and maintenance of all electrical tools and appliances.

13.22 Always unplug electrical appliances before attempting any repair or maintenance.

13.23 All electrical devices must be properly grounded with approved three wire plugs unless they are "double insulated". Grounding provides a safe path for electricity to the ground, preventing leakage of current in circuits or equipment.

13.24 All electrical equipment and extension socket used in the laboratory should be of approved type comply BS1363 or SS145.

13.25 Keep electrical cords out of the way of foot traffic so that it would not become tripping hazards or become damaged by traffic.

13.26 Never use electrical equipment in wet areas or run cords across wet floors.

13.27 Ensure energized parts of electrical equipment operating at 50 AC or 120V DC volts or more are provided with guard or cover to prevent accidental contact.

13.28 Never turn on DC source onto circuits with full load on, turn on load incrementally and slowly.

13.29 Know how to response to emergencies such as electric shock incidents or fires.

13.30 If in doubt, seek clarification with your supervisor/ Principal Investigator or technical staff in the laboratory.

13.31 Check and switch off all equipment/computers before leaving the laboratory.

14 Mechanical Safety

14.1 Guards on machinery must be in place during operation.
14.2 Exercise care when working with or near hydraulically- or pneumatically-driven equipment. Sudden or unexpected motion can inflict serious injury.
14.3 Personal protective equipment (PPE) issued must be worn at all time when operating machinery.

15. Compressed Gas Safety

15.1 Only persons trained in handling of compressed gas cylinders are authorised to transport cylinders and change regulators.

15.2 Gas cylinders must not be allowed to become completely empty before replacing them.

15.3 If you smell a gas leak, alert everyone in the vicinity and evacuate the lab immediately. The source should later be traced and action taken by the appropriate safety personnel.

15.4 Gas cylinders must always be transported secured to the trolleys designed for the purpose and when located, the cylinders must always be chained to a wall or bench to prevent them from falling. If unsecured, a tilt of a few degrees will cause the cylinder to fall with sufficient force to crush a foot or break a leg of anyone standing in the way. In addition, if the valve breaks off, the escape of gas will turn the cylinder into an unguided rocket.

15.5 Cylinders must not be stored near heat sources (eg. ovens), as heating can cause a rise in the internal pressure. They should always be stored in a well ventilated area.

15.6 Cylinders have colour coded bodies, labels or tags. Always read the cylinder label before connecting it to ensure that it contains the gas that you require. If a cylinder is supplied with an unreadable label, do not use.

15.7 Gas regulators must be recommended for the particular gas by the manufacturer.

15.8 The hosing and connections must also be compatible with the gas being used.

15.9 Do not use oil or grease on gas regulators.

15.10 Only those cylinders required for the work at hand shall be kept in the laboratory.

15.11 Cylinders not in use shall be kept in the storage facility.

16 Radiation Safety

16.1 Radiation Protection

The Radiation Protection Act, 1991 regulates, by means of licensing and penalty, the importation, manufacture, sale, transport, keeping and use of irradiating apparatus. The devices under control are high power lasers and entertainment lasers (class 3b and class 4), ultrasound, microwave ovens, sunlamps, X-ray machine and radioactive materials. The activities requiring licences include manufacture, sale, keep, use, importation and exportation of devices.

16.2 Ionising Radiation Safety

16.2.1 All new radiation workers must report to Centre's Radiation Administrator, Dr Xu Zhilin, for registration. This includes staff, graduate and undergraduate students.

16.2.2 Only registered and trained users are permitted to use radiation equipment. Registered users are provided with a badge for monitoring radiation exposure. The film in the badge is changed monthly.

16.2.3 The issued radiation badge must be worn at all times when working with radiation equipment. It is recommended that radiation workers fix the radiation badge to their lab coat and wear all the time to avoid taking badge off and on before and after radiation work.

16.2.4 Only registered and trained laboratory users are allowed to make use of the X-ray generator for X-ray diffraction experiments. Registered users should wear a badge when they are doing X-ray diffraction experiments.

16.3 Non- Ionising Radiation Safety

16.3.1 Following registration, N3 licensed workers must complete their safety training requirements and read CINTRA SOP on Handling of High Powered Laser before proceeding to work with lasers.

16.3.2 Do not enter the room when "LASER IN OPERATION" sign is on. There are many high power lasers and lasers in the invisible spectrum in the lab.

16.3.3 EACH LASER HAS A N2 LICENSE DELIVERED BY THE NATIONAL ENVIRONMENT AGENCY (NEA) AS SAME AS THE USER HAS TO OBTAIN A N3 LICENSE FROM THE NEA IN ORDER TO USE THE LASERS.

16.3.4 You cannot use a non registered laser in CINTRA. You need to ask for license via the NEA. You must get your eyes examined for working with Class 3b & 4 lasers, authorized and be trained before you are allowed to use the laser. When you get the N2 license for laser or N3 license as a user, please print out and give to the secretary for record.

16.3.5 Never look directly into the laser beam path no matter how low power or "eye safe" you may think it is as some light might also be in the invisible range such as UV or IR.

16.3.6 Always wear safety goggles of the corresponding level to the laser equipment when a laser is in operation or when entering the laser room.

16.3.7 The most common injury using lasers is an eye injury resulting from scattered laser light reflected off mountings, sides of mirrors or from the "shiny" surface of an optical table. DO NOT WEAR JEWELERY OR WATCH DURING YOUR EXPERIMENT, as the scattered light may damage your eye.

16.3.8 The best way to avoid these injuries is to always wear your safety goggles and NEVER LOWER YOUR HEAD TO THE LEVEL OF THE LASER BEAM! The laser beam should always be at or below chest level.

16.3.9 Always use "beam stops" to intercept laser beams. Never allow them to propagate into the laboratory. Never walk through a laser beam. Some laser beams of only a few watts can burn a hole through a shirt in only a few seconds.

16.3.10 Laser radiation workers should be instructed on potential eye hazards and the importance of limiting unnecessary exposure. They should receive pre-employment, periodic and final eye examinations.

16.3.11 Binoculars or aiming telescopes should not be used to view direct beam or reflected beam from mirrors unless the beam intensities are greatly below the safe levels. If necessary, a filter having sufficient optical density should be placed in the optical path of telescope for such situations or adequate laser protective eye wear is worn by the operator.

16.3.12 If you suspect that you have suffered an eye injury, notify your laboratory staff or supervisor IMMEDIATELY! Your ability to recover from an eye injury decreases the longer you wait for treatment.

16.4 Ultrasonic Bath

16.4.1 EACH ULTRASONIC BATH HAS N2 LICENSE DELIVERED BY THE NEA. You cannot use a non registered ultrasonic bath in CINTRA. You need to ask for license via the NEA. When you get the N2 license for the bath, please print out and give to the secretary for record

16.4.2 Equipment training request - Please see the following staff if you want to be trained on an equipment:

- Optical fibres set-up: Dr Wu Zhifang
- Photoluminescence set-up: Dr Danang Birowosuto or Mr Umar Saleem
- Femto-Laser set-up: Mr Ange Maurice
- RF characterization: Dr Zhi Hong Liu

17 Loan of equipment from the laboratory

17.1 DO NOT MOVE ANY EQUIPMENT IN AND/OR OUT OF THE LAB WITHOUT INFORMING AND PERMISSION THE PIC AND THE SECRETARY.

17.2 EVERY EQUIPMENT MOVED IN CINTRA for a certain period has to be registered in CINTRA via our log documents and NEA documents for lasers and ultrasonic bath (N2 license).

17.3 Consumable item may be loaned out through the technician, from 9.00 a.m. to 11.00 a.m. daily except Sunday.

18 Purchase of item

18.1 Purchase requisition form is available with the secretary. Fill up the Purchase Requisition form and pass it to the secretary. On the form, approval is required from your Project supervisor, Lab supervisor and Head of Division.

18.2 Fill in the item required to purchase on the item descriptions, your Final year Project number on the remark's column and pass it to the secretary.

18.3 Prior to purchasing some items and claiming for petty cash, please ask your supervisor for authorization, If he agrees, let your supervisor sign on the purchased item's receipt and attached it with the petty cash claim form. Please go to the following link on NTU website http•//vvww.ntu.edu.sg/ and go to.
For Staff:
Stafflink — Financial Services - Integrated Claims System — New Claim
You can ask the secretary to help you for filling the form.

19 **Safety Violation and Penalty**

19.1 It is the duty of all staff and students working within CINTRA's premise to fully comply with the safety rules and regulations stipulated in this document.

19.2 The Centre's Safety Officer and/or members of CINTRA Safety Committee shall conduct regular checks to enforce these safety rules.

19.3 In the event of non-compliance, CINTRA Safety Committee reserves the right to impose disciplinary action(s) in accordance to the number and seriousness of offences as shown in the Table 1.

19.4 Authorized person(s) may issue of a Safety Violation Record Log Sheet to those who contravene any of these rules herein and/or established lab safety rules, as follows:

Severity of Offence	Penalty
1st Offence (Yellow Code)	• Immediate action by lab person-in-charge - Written warning to the offender • Offenders' Project Supervisors Principal Investigators and Managers will be notified • Removal of privileges to laboratory and/or workshop for a period of ONE week or SEVEN Working days may be imposed
Serious (Red Code) or **Repeated Offence** (Yellow Code)	• Immediate escalate to Safety Committee for further disciplinary action(s). • Penalty to be decided by Dy Chairman / Management Representative This may include debarment from all CINTRA facilities for a period of THREE weeks or more; • Offender to retake both the University's and School's Safety Induction Package plus any other safety training courses as determined by the Safety Committee; • Offender may be asked to make a presentation on preventive measures to the Safety Committee;

Severity of Offence	Penalty
	• Offender to review his or her risk assessments and safe work procedures and submit to Safety Committee before allowed to resume work
For Severe Unsafe Act (Black Code)	• Immediate escalate to Director. • Offender may be referred to a Disciplinary Committee for further disciplinary action(s) which may include dismissal of the offender from the Centre. • Penalty decided by Director of CINTRA.

Table 1

Version History

This Table below reflects the summary of changes made to the document. The full change information is indicated with yellow highlight in the document content.

Revision	Section	Details of Change	Author	Effective Date	Approved By
00	-	Initial Release	Dr Muhammad Danang	10 Oct 2017	Dr Dinh Xuan Quyen

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