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<b>Yvonne Teng Wai Bin</b>	<b>Saravanan S/O Gunaratnam</b>	<b>23 January 2009</b>	
Prepared By	Approved By	Review Date	

## 1.0 OBJECTIVE

This procedure provides guidance for personnel safety when working with lasers for research and teaching purposes. The purpose of this SOP is to standardize the safe use of lasers in National University of Singapore (NUS) and to protect researchers from potential harm cause by use of lasers.

## 2.0 SCOPE

The procedure is applicable to all NUS laboratories where lasers are used in the course of work. All staff and students are to adopt the practices in this procedure.

## 3.0 RESPONSIBILITIES

### 3.1 Principal Investigator

Principal Investigators (PI) shall be responsible for ensuring that this SOP is disseminated to all laboratory personnel and that they are aware of the procedures to take for safe use of lasers.


- PI, whom must be an N3 licence holder himself/herself are also responsible for the Direct supervision of use of lasers in the laboratory.
- Implement and enforce safety recommendations and requirements
- Supervising and training laser operators in standard operating procedures.
- Classifying and putting up adequate warning labels on all of their lasers and the immediate vicinity.
- Application of licences for possession of all Class 3b and Class 4 lasers as well as for the operators.
- Notifying department's safety committee immediately in the event of an exposure to a Class 3b or Class 4 laser. He is also responsible for reporting the exposure to OSHE via AIRS: [https://staffweb.nus.edu.sg/oshe/submit\\_airs.htm](https://staffweb.nus.edu.sg/oshe/submit_airs.htm)

### 3.2 Laser Operators/Users

All laboratory personnel (staff and students) working with lasers must be aware of potential hazards, and must be trained and proficient in the practices and techniques required to work with laser.

They are responsible for:

- Adhering to all standard operating procedures while operating lasers.

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- Principal Investigator to be informed of any inappropriate handling of lasers as well as immediate notification of an exposure incident occurrence.
- Attending the University's Laser Safety training program.
- Attending the medical surveillance program.

#### 4.0 DEFINITION

**Laser** - The term "**laser**" is an acronym for *Light Amplification by Stimulated Emission of Radiation*. A typical laser emits light in a narrow, low-divergence monochromatic (single-coloured, if the laser is operating in the visible spectrum), beam with a well-defined wavelength.

**Class 3b Laser** – These are medium power and moderate risk lasers. They operate in a power of 500mW or less.

**Class 4 Laser** – These are high power and high risk lasers. The average power output is greater than 500mW.

**Users** - Users refer to all staff, research fellows, post graduate and undergraduate students participating in Undergraduate Research Opportunities Programme (UROP) would need to obtain this licence.

**MPE** – Maximum permissible exposure.

#### 5.0 PROCEDURE


Any activity involving lasers should be subjected to a risk assessment. An effective risk assessment would identify the class of laser (Appendix A) being used, the probability and consequences of exposure (Appendix B) and the appropriate controls to prevent this exposure. Details on the control measures to be implemented for laser use is given below: -

##### 5.1 Engineering Safety and Control Measures

###### 5.1.1 Beam control

To minimize direct eye exposure, observe these precautions

- Do not intentionally look directly into the laser beam or at a specula reflection, regardless of its power.
- Terminate the beam at the end of its useful path.
- Locate the beam path at a point other than eye level when standing or when sitting at a desk.
- Orientate the laser so that the beam is not directed toward entry doors or aisles.
- Minimize specula reflections.

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- f. Securely mount the laser system on a stable platform to maintain the beam in a fixed position during operation and limit beam traverse during adjustments.
- g. Confine primary beams and dangerous reflections to the optical table.
- h. Clearly identify beam paths and ensure that they do not cross populated areas or traffic paths.
- i. When the beam path is not totally enclosed, locate the laser system so that the beam will be outside the normal eye-level range, which is between 1.2 to 2 meters from the door. A beam path that exits from a controlled area must be enclosed wherever the beam irradiance exceeds the MPE.

#### 5.1.2 Safety Interlocks


- a. Access doors to a controlled laser area in which a Class 3b or a Class 4 laser is being operated must be equipped with safety interlocks to prevent laser operation when the interlock circuit is broken.
- b. All protective enclosures that surround laser devices and high-voltage electrical sources must also be equipped with interlocks to prevent operation of the equipment.
- c. Interlocks should be tested quarterly to ensure that they are operational. A written record must be kept for each test in the log book.
- d. Interlocks must be designed so that after they are actuated, the capacitor banks, shutters, or power supplies cannot be re-energized except by manually resetting the system.
- e. If interlocks are not feasible, the Principal Investigator may consider the use of alarms or voice warnings.

#### 5.1.3 Master switches

- a. Lasers must have a master switch with a key or coded access that prevents use once the key has been removed or a code has been entered. The key must not be left in the control panel when the laser is not in use.

#### 5.1.4 Viewing portals

- a. Personnel must never look directly into any laser beam.
- b. The primary beam and specular reflections of Class 3 and Class 4 lasers are particularly hazardous. In those cases where it is necessary to directly view a beam from a Class 3 or a Class 4 laser, special provisions, such as filters, are mandatory.
- c. An SOP must be prepared for operations where the beam of a Class 3 or Class 4 laser must be viewed directly or

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where it is necessary to work with optical viewers in close proximity to the laser beam.

- d. Optical viewing aides – Using optical systems such as cameras, telescopes, microscopes, etc., to view laser beams may increase the eye hazard. Therefore, all collecting optics must incorporate suitable means (such as interlocks, filters, or attenuators) to prevent eye exposure above the MPE.

#### 5.1.5 Open or enclosed beam paths

- a. Laser must have a permanently attached beam stop or attenuator and emission delays.
- b. Beam enclosure: The entire beam path of Class 3 and Class 4 lasers, including the target area, should be surrounded by an enclosure equipped with interlocks that prevents operation of the laser system unless the enclosure is properly secured. When total enclosure of the laser beam path is not practical, both the non-enclosed laser beam and any strong reflections must be terminated at the end of their useful path using such devices as backstops, shields or beam traps.

## 5.2 Administrative and Procedural Control Measures

### 5.2.1 Licence Applications


Under the Radiation Protection Act (Non-ionizing) regulations, enforced by the **Centre for Radiation Protection and Nuclear Science (CRPNS)**, National Environmental Agency (NEA), a licence is required for the possession and use of Class 3b and 4 lasers.

Therefore PIs should ensure the following: -

- Their laser equipment should have an equipment licence by NEA, CRPNS - termed as “**N2 licence**”
- All users whose work involves any direct manipulation/alignment of Class 3b and 4 lasers should obtain a user licence issued by NEA, CRPNS – termed as the “**N3 licence**”.

*o Users refer to all staff, research fellows, post graduate and undergraduate students participating in Undergraduate Research Opportunities Programme (UROP) & final year honors would need to obtain this licence.*

*o A Class 3b or Class 4 laser which is fully enclosed is considered as a Class 1 exempt laser. No N3 license is necessary unless laboratory staff is to carry out maintenance and servicing job to the laser system.*

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*o Students exposed to Class 3b and 4 lasers in the course of teaching experiments in undergraduate modules need not be subjected to licensing procedures by NEA provided they are adequately supervised during the course of the experiment by an academic staff or laboratory supervisor.*

Licence applications should be sent to the Faculty Safety and Health Officer for review. Copies of the license application can be obtained from the website: [http://app.nea.gov.sg/cms/htdocs/category\\_sub.asp?cid=261](http://app.nea.gov.sg/cms/htdocs/category_sub.asp?cid=261)

(See Appendix C1 for **N2 licence** and Appendix C2 for **N3 licence**)

Part of the licence application would involve an eye examination, of which the form is as attached in Appendix D. In the event that the PI is unable to obtain funding from the granting body for the medical examination, they can request OSHE to fund this medical examination. Please see Appendix E for details.

#### 5.2.2 Standard operating procedures


- a. All Principal Investigators are required to write standard operating procedures (SOP) for all laser operations involving Class 3 and Class 4 lasers detailing alignment, operation and maintenance procedures. The SOP should be communicated to all laser workers and be made readily available in the laboratory.
- b. The SOP must include, but not limited to the following to address:
  - i) Use of eyewear, shields and access control are necessary
  - ii) Two or more Class 3 or Class 4 lasers will be used in the same area by different operators without permanent, intervening barriers
  - iii) A Class 3 or Class 4 laser will be used by non University personnel (e.g. contract personnel or visiting colleagues).

#### 5.2.3 Authorized personnel requirements

Laser controlled areas shall be established which have limited access, cover windows and doors and only diffuse reflective material. The facility must be a fully enclosed room or laboratory with floor-to-ceiling walls. Access to the area during laser operation requires the permission of the responsible operator.

#### 5.2.4 Required alignment procedures

- a. High power laser optical systems must never be aligned by direct beam viewing if the radiant exposure or irradiance exceeds the MPE.

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- b. Use low power lasers, diffuse reflectors, image-retaining screens, exposed Polaroid film, and other devices that will minimize eye exposure.

#### 5.2.5 Personnel Training and Qualification

- a. Only a qualified and authorized person is permitted to operate a laser. The principal investigator determines the employee's operational qualification from departmental or technical training or other acceptable learning experience.
- b. All staff and students operating lasers are required to attend the Non-ionizing Radiation Safety training course conducted by OSHE.


#### 5.2.6 Medical Surveillance

Laser operators or individuals who will work in areas where there may be exposure to laser radiation from Class 3b or Class 4 are required to have a baseline eye examination prior to using the laser.

- Required eye protection
  - a. Laser protective eyewear shall be worn whenever MPE levels may be exceeded.
  - b. However, it is a good practice to always wear eye protection when lasers are in use.
  - c. In general, eyewear provides protection over a narrow range of the laser spectrum. Eyewear designed for protection at one wavelength may afford little or no protection at another wavelength.
  - d. Consult eyewear manufacturers for proper selection of protective eyewear.
  - e. Laser protective eyewear must be approved and clearly labeled with optical densities and wavelengths for which protection is afforded. Eyewear must be inspected periodically by the user for pitting and cracking of the attenuating material, and for mechanical integrity and light leaks in the frame.
  - f. Protection for the skin may be afforded through the use of clothing to cover normally exposed skin areas.

#### 5.2.7 Other Special Control Measures

- Unattended equipment
  - a. When lasers are to be left unattended, de-energize the power supplies or capacitor banks and remove the keys

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from power switches or master interlocks to prevent unauthorized activation of the equipment.

- b. The operation of unattended lasers is only allowed when a specific SOP has been written and approved by the Principal Investigator.
- Local legislation requirement
    - a. Ensure all lasers and laser users are licensed as per requirement of NEA, CRPNS.
  - Warning signs, label and signal words in accordance with the appropriate standards.
    - a. Warning signs should be posted at each entrance to the operating area
    - b. If the manufacturer had not labeled the laser, attach a label on the laser with its classification and relevant warning information.
    - c. Warning Devices: Entrances to laboratories with a Class 3b or Class 4 laser shall have a lighted warning sign that is fail-safe interlocked with the laser to activate when the laser is energized. The sign must be tested monthly.
  - Undergraduate teaching module
    - a. The laboratory supervisor should communicate the potential health and safety hazards of using the laser to the students prior to conducting the experiment.
    - b. The laboratory supervisor should ensure the safety and health of all students under his care.
  - Management of contractor
    - a. The PI or his/her designate must ensure that all contractor working with Class 3b and Class 4 lasers possess the appropriate license from NEA, CRPNS.

### 5.3 Emergencies

#### Exposure incidents

- If an exposure incident occurs, the Principal Investigator or the person operating the laser must notify departmental Safety committee.
- Safety committee will then conduct an investigation, and an incident report will be written.

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- All accidents/incidents must be report centrally to OSHE via <https://staffweb.nus.edu.sg/oshe/notice.htm>


## 6.0 Records

Nil

## 7.0 References

- a. Laser Safety Programme, Department of Physics



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## Appendix A : Classification of Lasers

### 3. Laser classification

Class 1 : Low-power lasers and laser systems that cannot emit radiation levels greater than the Maximum Permissible Exposure (MPE). Class 1 lasers and laser system are incapable of causing eye damage and are therefore exempt from any control measures.


Class 2 : Visible, low power lasers or laser systems that are incapable of causing eye damage unless they are viewed directly for an extended period (greater than 1000 seconds).

Class 3 : Medium-power lasers and laser systems capable of causing eye damage with short duration (<0.25 s) exposures to the direct or specularly reflected beam. Includes Class 3a and Class 3b lasers.

Class 3a : Lasers or laser systems that normally would not produce a hazard if viewed for only momentary periods without using personal protective equipment (PPE). They may present a hazard if viewed using collecting optics.

Class 3b : Lasers or lasers systems that can produce a hazard if viewed directly. This includes intrabeam viewing of specular reflections.

Class 4 : High power lasers and laser systems capable of causing severe eye damage with short duration (<0.25 s) exposures to the direct, specularly reflected, or diffusely reflected beam. Class 4 lasers and laser systems are also capable of causing severe skin damage and igniting flammable and combustible materials.

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## Appendix B: Health Effects of Lasers


### Laser Radiation Effects on eye

Hazardous effects can occur to various parts of the eye depending on the wavelength of the laser radiation. Laser radiation may damage the cornea, lens or retina. The injuries can vary due to the variance in how tissues absorb energy. The following are some examples of hazards that can affect the eye:

1. Radiation at the visible and near-infrared wavelengths can cause damage to the retina resulting in scotoma (blind spot in the fovea).
2. Radiation at the near-ultraviolet and middle infrared wavelengths is absorbed and can injure the lens.
3. Corneal absorption and associated effects can occur with far-infrared and middle-ultraviolet wavelengths.
4. Corneal lesions and retinal lesions can occur from the heat resulting from the energy absorption and from photochemical reactions.
5. Some transitional wavelength zones can result in both corneal and retinal damages.

### Laser Radiation Effects on skin

Skin effects are generally considered of secondary importance except for high power infrared lasers. However with the increased use of lasers emitting in the ultraviolet spectral region, skin effects have assumed greater importance. Erythematic (sunburn), skin cancer and accelerated skin aging are produced by emissions in the 200 to 280 nm range. Increased pigmentation results from exposure to light with wavelengths of 280 to 400 nm. Photosensitization has resulted from the skin being exposed to light from 310 to 700 nm. Laser emitting radiation in the visible and infrared regions produce effects that vary from a mild reddening to blisters and charring. These conditions are usually repairable or reversible. However depigmentation, ulceration and scarring of the skin, and damage to underlying organs may occur from extremely high- powered lasers.

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## Appendix C1: APPLICATION FOR A N2 LICENCE

### RADIATION PROTECTION ACT 2007

#### APPLICATION FOR A LICENCE TO HAVE IN POSSESSION

#### A NON-IONISING RADIATION IRRADIATING APPARATUS

Every section of the application form **MUST** be duly completed. Incomplete forms will not be processed.

“N.A.” should be used when appropriate.

#### 1. Particulars of the organisation


Name:	
Address:	
Nature of Business:	
Contact Person:	Designation:
Tel No.:	Fax No.:

#### 2. Particulars of the Company from whom irradiating apparatus was bought

Name:	
Address:	
Contact Person:	Designation:
Tel No.:	Fax No.:

#### 3. Particulars of the irradiating apparatus for which licence is sought

Type:
Ultrasound
Magnetic Resonance Imaging
Lasers
Purpose:

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Medical Surgery	Dental	Industrial
Medical Diagnostic	Veterinary	Education
Medical Therapeutic	Entertainment	Others (Please specify)
Maker / Manufacturer:		
Model Number:		Serial Number:

## LASER

Type of Laser: (CO <sub>2</sub> , HeNe, Nd-YAG, etc.)	
Wavelength (in nm):	
Radiation Mode: Pulse / Continuous Wave	
State the maximum power for Continuous Wave Laser:	
State the following for Pulse Laser:  Pulse repetition rate:  Pulse width or Pulse duration:  Maximum Power:  Average Power or Average Energy:	
Classification of Laser: (Class 1, 2, 3a, 3b or 4)	

## ULTRASOUND

Ultrasound Frequency (in kHz or MHz):	
Maximum ultrasound intensity (in W/m <sup>2</sup> ):	
Radiation Mode:  a) CW / Amplitude modulated wave b) A-mode/B-mode/M-mode/Real-Time/Doppler-mode	

## MAGNETIC RESONANCE IMAGING




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Type: Superconductivity / resistive / permanent / hybrid	
Nuclei: Hydrogen / Phosphorus-31 / Sodium-23	
Static field strength (in Tesla):	
Rate of change of magnetic field (rms): dB/dt in T/sec	
Type of RF coil:	
RF frequency:	
Pulse width (in $\mu$ s):	
RF power deposition SAR : (average whole body specific absorption rate)	
Acoustic noise level in decibels (dB):	

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## Appendix C2: APPLICATION FOR A N3 LICENCE

### RADIATION PROTECTION ACT 2007

#### APPLICATION FOR A LICENCE TO USE LASERS

Every section of the application form **MUST** be duly completed. Incomplete forms will not be processed.

“N.A.” should be used when appropriate.

#### 1. Particulars of the Applicant


Name:		Recent passport size photograph of the applicant
Marital Status:	Sex:	
Date of birth:	Age:	
NRIC/Passport No.:	Nationality:	
Home Address:	Tel No.:	
Profession / Designation:		
Relevant Qualification:		
Experience in the use of Lasers (Type, Duration, etc.): (If no, please provide the information on the type of training to be provided.)		

#### 2. Particulars of the Employing Organisation

Name:	
Address:	Tel No.:
	Fax No.:
N1 / N2 licence No.:	

#### 3. Particulars of the lasers for which licence is sought

Application	Industrial	Medical	Entertainment
-------------	------------	---------	---------------

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<b>Purpose</b>		
Welding	Surgical	Static
Cutting	Dental	Mobile
Drilling	Therapeutic	Others (Please specify)
Marking	Diagnostic	
Engraving	Others (Please specify)	
Others (Please specify)		

Maker / Model:	Licence N1 / N2 No.:																				
Type of laser (CO <sub>2</sub> , HeNe, Nd-YAG, etc.):	Wavelength (in nm):																				
Classification of laser: (Class 1, 2, 3a, 3b or 4)																					
Radiation Mode: Pulse / Continuous Wave:																					
<table border="1" style="width:100%"> <tr> <th colspan="2">Pulse Laser:</th> <th colspan="2">Continuous Laser:</th> </tr> <tr> <td>Maximum Power:</td> <td></td> <td>Maximum Power:</td> <td></td> </tr> <tr> <td>Average Power or Average Energy:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pulse repetition rate:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pulse width or Pulse duration:</td> <td></td> <td></td> <td></td> </tr> </table>		Pulse Laser:		Continuous Laser:		Maximum Power:		Maximum Power:		Average Power or Average Energy:				Pulse repetition rate:				Pulse width or Pulse duration:			
Pulse Laser:		Continuous Laser:																			
Maximum Power:		Maximum Power:																			
Average Power or Average Energy:																					
Pulse repetition rate:																					
Pulse width or Pulse duration:																					

*A separate sheet to be used if more than one laser.*


4. I hereby apply for a licence to use the laser(s) specified above for a period of \*3/6/9/12/24 months and declare that all the particulars contained in this application are correct and true.

\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date

\* Delete as appropriate

Notes:

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1. Applicants wishing to be licenced should first undergo a medical examination by Medical Practitioner with Medical Certificate Form MC2.
2. The following application fees are payable for a licence to be issued for a period not exceeding:


<u>Months</u>	<u>Fees</u>
3	\$ 30/-
6	\$ 55/-
9	\$ 80/-
12	\$ 105/-
24	\$ 210/-

3. The completed application form should be submitted together with the prescribed fee to:

Director  
 Centre for Radiation Protection and Nuclear Science  
 NATIONAL ENVIRONMENT AGENCY  
 Basement 1, HSA Building  
 11 Outram Road  
 Singapore 169078

4. Cheques should be made payable to “National Environment Agency”.




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## Appendix D: APPLICATION FOR MEDICAL SURVILLANCE

### MEDICAL CERTIFICATE FOR LASER OPERATORS

Regulations 8 & 20(c) of the Radiation Protection (Non-Ionising Radiation)  
Regulations, 1991

<b>HISTORY*</b>	
Family :	
Medical :	
Occupational :	
<b>CLINICAL &amp; SPECIAL INVESTIGATION** (SATISFACTORY / UNSATISFACTORY) §</b>	
Dermatological :	
Others :	
<b>OPHTHALMOLOGICAL EXAMINATION*** (SATISFACTORY / UNSATISFACTORY) §</b>	
Date of Examination :	
Medical History of Eyes :	
Colour Vision :	
Visual Acuity	
Far :	Near:
Amsler Grid :	
Manifest Refraction :	
External Ocular Examination :	
Examination of the Ocular Fundus with an ophthalmoscope :	
Other Examinations :	
Optional :	
Examination by slit lamp:	
Tonometry:	
Photograph of Posterior Pole of the Fundus:	
<b>STATEMENT</b>	

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This is to certify that :

Dr/Mr/Ms/Mdm: \_\_\_\_\_

NRIC No.: \_\_\_\_\_

Employed by: \_\_\_\_\_

has undergone a medical examination by me and I am of the opinion that he / she § is fit / unfit § to engaged in laser work. In addition, I have the following comments to make :

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 Signature of Medical Practitioner

\_\_\_\_\_  
 Address of Hospital / Clinic

\_\_\_\_\_  
 Name of Medical Practitioner


MC-2 § Delete as applicable ; \* , \*\* , \*\*\* see overleaf

\* The patient medical history on the current and past medication use is reviewed. His general health status should be inquired about with special emphasis upon diseases which can give ocular or skin problems. Certain medical conditions may cause the laser worker to be at phenothiazine and psoralens, lower the threshold for biological effects in the cornea, lens and retina. Aphakic individuals would be subject to additional retinal exposure from near UV radiation. Unless chronic viewing of lower levels of laser radiation in these wavelengths is required, there should be no reason to deny employment to these individuals. With current laser systems, chronic exposure even to low levels of blue laser radiation is very unusual.

\*\* A dermatological examination is important for laser workers with history of photosensitivity or those working with ultraviolet lasers as well as for persons operating with or maintaining of high power lasers. Examination of the skin for presence of abnormal pigmentation of depigmentation, keratoses, malignancies, etc.

\*\*\* Examination Protocols

Medical history of eye  
 Medical history of eye is required for preplacement examinations of all laser workers. His past eye history and family eye history are reviewed. Any current complaints, which he now has about his eyes, are noted.

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### Colour Vision

Colour vision on eye is required for preplacement examination of all laser workers. His ability to perceive differences of colours must be examined and recorded.

### Visual Acuity

Required for preplacement examinations of all laser workers. Distance visual acuity should be tested both with & without corrective lenses to 20/15. Results should be recorded in Snellen figures. The visual acuity at near is tested at 35 cm and recorded in Jaeger-tested figures or Snellen figures with & without lenses. Visual acuity screening instruments may be used.

### Amsler Grid

The Amsler grid sheet is presented to each eye separately and any distortion of the grid is noted by the patient and drawn by him; it is part of a thorough ophthalmologic examination.

### Manifest Refraction

Required for preplacement examinations of all laser workers when indicated. This is to measure the patient's refractive error, and the new visual acuity of the patient must be noted if the visual acuity is improved over that achieved with the patient's old lens prescription, or if he has no lenses at the time of examination. This examination shall be carried in all personnel whose best corrected distance visual acuity in either eye is less than 20/20.

### External Ocular Examination


Required for preplacement examinations of laser workers using laser systems producing radiation below 350 nm or above 1400 nm. This includes examination of brows, lids, lashes, conjunctiva, sclera, iris and pupillary size, equality, reactivity and regularity.

### Examination of the Ocular Fundus with an Ophthalmoscope

Required for preplacement examinations of laser workers using laser systems producing radiation below 390 nm and 1400 nm and any aphakic worker. In the recording of this portion of the examination the points to be covered are: the presence or absence of opacities in the media; the sharpness of outline of the optic nerve; the size of the physiological cup; if present, the ratio of the size of the retinal veins to that of the retinal arteries; the presence or absence of a well-defined macula and the presence or absence of a foveolar reflex; and any retinal pathology that can be seen with a direct ophthalmoscope. Even small deviations from normal should be described and carefully localized.

### Other Examination

Further examinations should be done as deemed necessary by the eye specialist.

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A. Optional

I Examination by Slit Lamp

Required for preplacement examinations of laser workers using laser producing radiation below 429 nm or above 750 nm. The cornea, iris and lens are examined with a biomicroscope and described.

II Tonometry

This is the measurement of intraocular pressure; should be part of a thorough ophthalmologic examination.

III Photograph of the Posterior Pole of the Fundus


This includes the area of the macula and head of the optic nerve and should be taken in color, may be obtained by the examining physician to more fully describe retinal abnormalities. Appropriate techniques to reduce the patient's exposure to optical radiation should be employed.

Notes:

- a. This certificate should be given to the examining Medical Practitioner for completion and should be submitted together with the application form to:-

Director  
Centre for Radiation Protection and Nuclear Science  
NATIONAL ENVIRONMENT AGENCY  
Basement 1, HSA Building  
11 Outram Road  
Singapore 169078

- b Where the person examined is considered unfit to be engaged in laser work, please give the reasons.

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4. Location where the apparatus is to be installed and used:  
(Attach installation plan where applicable)

5. Particulars of Person who will be using the apparatus

Name:
Age:
Qualification:
Relevant Experience:
N3 licence Number: (applicable for laser users only)

*Use separate sheet if more than one person.*


6. Quality Assurance Instruments to be used:

7. Protective equipment to be used:

8. I hereby apply for a licence to have in possession the irradiating apparatus specified above for a period of \*3/6/9/12/24 months and declare that all the particulars contained in this application are correct and true.

\_\_\_\_\_  
Name of Applicant


\_\_\_\_\_  
Designation of Applicant

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\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date

\* Delete as appropriate

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Notes:

1. A separate application is required for each irradiating apparatus.
2. The following application fees are payable for a licence to be issued for a period not exceeding:

<u>Months</u>	<u>Fees</u>
3	\$ 40/-
6	\$ 80/-
9	\$120/-
12	\$155/-
24	\$310/-

3. The completed application form should be submitted together with catalogues, brochures, technical data and the prescribed fee to:

Director  
 Centre for Radiation Protection and Nuclear Science  
 NATIONAL ENVIRONMENT AGENCY  
 Basement 1, HSA Building  
 11 Outram Road  
 Singapore 169078

4. Cheques should be made payable to "National Environment Agency".







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### Section B: To Be Completed by Staff and Student Undergoing Medical Assessment or Treatment

Name of staff or student	Staff No./Student Matric No.	Contact email	Contact Number

### Section C: Approval by OSHE and/or Faculty/Institute/School Safety and Health Officer

The request for the above medical assessment/treatment is

- Approved (Reference Number: OSHE/51/05- )
- Not Approved

Subject to the following conditions:

\_\_\_\_\_

Name of OSHE staff or Faculty/School Safety and Health Officer

\_\_\_\_\_

Signature

\_\_\_\_\_

Date

### Section D: To Be Completed by UHWC Staff

To: OSHE staff

Cost of medical examination : \$

The cost of the medical examination includes additional investigation, the total cost is : \$

\_\_\_\_\_

Name of UHWC staff

\_\_\_\_\_

Signature

\_\_\_\_\_

Date