



Goddard Procedural Requirements (GPR)

DIRECTIVE NO. GPR 1860.2C **APPROVED BY Signature:** *Original signed by*
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EXPIRATION DATE: September 26, 2016 **TITLE:** Director

COMPLIANCE IS MANDATORY

Responsible Office: 350/Occupational Safety & Health (OS&H) Division

Title: Laser Radiation Protection

TABLE OF CONTENTS

1.0 ROLES AND RESPONSIBILITIES

- 1.1 Non-ionizing Radiation Safety Committee (NIRSC)
- 1.2 Radiation Safety Officer (RSO)
- 1.3 Laser Safety Officer (LSO)
- 1.4 Occupational Safety & Health (OS&H) Division
- 1.5 Management
- 1.6 Supervisors
- 1.7 Laser Custodians
- 1.8 Approved Users
- 1.9 Ancillary Personnel
- 1.10 Wallops Flight Facility's (WFF) Safety Office
- 1.11 Contractor and Guest Professional Operations
- 1.12 Environmental Planning and Impact Assessment for Laser Projects

2.0 LASER RADIATION OPERATIONS APPROVAL REQUIREMENTS

- 2.1 Authorization to be an Approved User and/or Custodians of Laser Sources or Devices
- 2.2 Obtaining Approval for Laser Operations
- 2.3 Obtaining Approval to Purchase Laser Sources or Devices

3.0 OUTDOOR LASER OPERATIONS

4.0 OFFSITE LASER OPERATIONS

5.0 LASER RADIATION PROTECTION REQUIREMENTS

6.0 CAUTION SIGNS, SYMBOLS, LABELS, AND POSTING

APPENDIX A – DEFINITIONS

APPENDIX B – ACRONYMS

APPENDIX C – TRAINING REQUIREMENTS

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APPENDIX D – ACCIDENT OR INCIDENT REPORTING REQUIREMENTS

PREFACE

P.1 PURPOSE

This directive describes the Goddard Space Flight Center (GSFC) Radiation Protection Program for laser radiation, which contains guidance on administrative and procedural requirements essential to the safe use of LASER (Light Amplification by the Stimulated Emission of Radiation) radiation. Other types of radiation are addressed in other documents

P.2 APPLICABILITY

This directive is applicable to all GSFC personnel, facilities, and activities, including all permanent and temporary sites. This directive shall also apply to all GSFC tenant organizations, contractors, grantees, clubs and other persons operating on GSFC property as required by law and as directed by contractual, grant, and agreement documents.

P.3 AUTHORITY

NPR [1800.1C](#), NASA Occupational Health Program Procedures

P.4 APPLICABLE DOCUMENTS

- a. American National Standard Safe Use of Lasers (American National Standards Institute (ANSI) Z136.1).
- b. American National Standard Safe Use of Lasers Outdoors (ANSI Z136.6).
- c. American National Standard Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and Light-Emitting Diode (LED) Sources (ANSI Z136.2).
- d. [GSFC Form 23-6L](#), Goddard Space Flight Center Request for Non-Ionizing Radiation Safety Committee Action – Laser Radiation Source Approval.
- e. [GSFC Form 23-28L](#), Laser Radiation Source Questionnaire.
- f. [GSFC Form 23-35LU](#), Laser Radiation Source – Personnel Approval.
- g. [GSFC Form 23-75](#), Environmental Checklist, R&D Projects
- h. [FAA Form 7140](#), LASER Configuration Worksheet.
- i. [FAA Form 7140-1](#), Notice of Proposed Outdoor LASER Operation(s)

P.5 CANCELLATION

GPR 1860.2B, Laser Radiation Protection

P.6 SAFETY

Safety requirements and numerous safety-related procedures are identified throughout this directive. Specific requirements applicable to procedures resulting from this GPR are described where appropriate.

P.7 TRAINING

Users and custodians shall be appropriately trained in the safe use of lasers (see Appendix C, Table 1 and Table 2). Documentation of training and certification for the use of Laser systems rated below a Class 3B level is the responsibility of the appropriate management organization.

P.8 RECORDS

Record Title	Record Custodian	Retention
Inspection and Inventories of Class 3B and 4 lasers	Radiation Protection Office (RPO) keeps original; custodians maintain a copy	* <u>NRRS 8/38A</u> . Retire to Federal Records Center when 6 years old. Destroy when 75 years old.
GSFC Form 23-6L (Approved)	RPO keeps original; custodians maintain a copy	* <u>NRRS 8/38A</u>
GSFC Form 23-35LU (Approved)	RPO keeps original; users maintain a copy	* <u>NRRS 1/130A</u> Records are kept active until the employee does not renew, the record is removed and placed in an inactive file. Records are retained until destroyed. Destroy when 75 years old.
GSFC Form 23-28L	RPO	* <u>NRRS 8/38A</u>
FAA Form 7140-1	RPO maintains a copy; original sent to the FAA	* <u>NRRS 8/38A</u>

**NRRS – NASA Records Retention Schedules ([NPR 1441.1](#))*

P.9 MEASUREMENT/VERIFICATION

Metrics will include the number of employees injured by lasers and the number of laser incidents. This data will be reported quarterly to the NIRSC.

PROCEDURES

In this document, a requirement is identified by “shall,” a good practice by “should,” permission by “may” or “can,” expectation by “will,” and descriptive material by “is.”

1.0 ROLES AND RESPONSIBILITIES

1.1 Non-ionizing Radiation Safety Committee (NIRSC)

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

The NIRSC is responsible for the development of non-ionizing radiation policies and procedures regarding the safe use of these types of radiation in locations where GSFC operates. The NIRSC will consist of representatives identified by their directorates as having varying areas of expertise, including a representative from Wallops Flight Facility (WFF). NIRSC shall:

- a. Meet at least quarterly, and as often as necessary to accomplish its responsibilities;
- b. Ensure that non-ionizing radiation sources used at GSFC or under GSFC programs are managed so as to minimize the health and safety risks to Government and contractor employees and the public;
- c. Ensure that GSFC and other Federal regulations, professional standards, and sound health physics practices are met;
- d. Approve Class 3B and Class 4 laser operations and, if necessary, prescribe conditions and requirements to minimize radiation hazards by reviewing the Laser Safety Plans submitted with a GSFC Form 23-6L;
- e. Approve the qualifications of personnel as responsible users and custodians of laser radiation producing devices by reviewing their completed GSFC Form 23-35LU;
- f. Approve safe operating procedures; and
- g. Suspend any approval not in compliance with GSFC's Radiation Protection Program.

1.2 Radiation Safety Officer (RSO)

The RSO has administrative responsibility for the Center's Radiation Protection Program and is supported by the Radiation Protection Office (RPO) staff, which includes the Laser Safety Officer. The RSO shall:

- a. Provide notification to the NASA Senior Environmental Health Officer (SEHO) regarding any unintended personnel laser exposure; and
- b. Coordinate all matters regarding outdoor laser safety coordination with other agencies with the SEHO.

1.3 Laser Safety Officer (LSO)

The LSO can be either a Contract or Civil Service employee who is a member of the RPO and works directly with the RSO. The LSO shall:

- a. Survey by inspection, at least annually, all areas where lasers are used and stored;
- b. Audit laser source records and evaluate use programs to assure compliance with NIRSC requirements;
- c. Maintain appropriate records of inspections and evaluations;
- d. Have the authority to suspend, restrict or terminate the operation of a laser or laser system if it is deemed to pose an imminent threat to personnel safety;
- e. Provide consultation on Class 3B and Class 4 laser operations as requested;
- f. Review and approve Laser Safety Operating Procedures, alignment procedures, and any other procedures as may be required for personnel safety;
- g. Review all laser installations (regardless of Laser Class) which involve use in navigable air space;

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- h. Review all Class 3B and Class 4 laser installations prior to startup of operations and after each approved alteration, and conduct periodic surveys and evaluations;
- i. Issue a certification card that will be kept in the user's possession at all times while using Class 3B or Class 4 laser systems;
- j. Provide a report to the Chief, OS&H regarding an unintended personnel laser exposure or any objection to propagation of any laser beam by any organization within one hour of notification;
- k. Develop and maintain an inventory of all Class 3B and Class 4 lasers and any lasers that are used outdoors; and
- l. Obtain Federal Aviation Administration (FAA) forms for outdoor laser use.

1.4 Occupational Safety & Health (OS&H) Division

OS&H is responsible for the oversight of safety program at GSFC facilities in matters specific to the health and safety of personnel. The Chief, OS&H, shall ensure a qualified individual is assigned as the RSO and that there are adequate Contractual personnel available to support the radiation protection program.

1.5 Management

GSFC line management has primary responsibility for the physical safety of personnel working under their jurisdiction and for designating users and custodians of sources of laser radiation. The line manager shall:

- a. Ensure that laser sources are used only by individuals approved by GSFC's NIRSC and that all procedures and requirements are met;
- b. Ensure that hazard warning signs required by this directive are procured and posted by the user organization under the guidance of the LSO; and
- c. Ensure that laser custodians and users have adequate education, training, and experience for the responsibilities of a custodian or user.

1.6 Supervisors

Supervisors are responsible for employees and projects. Supervisors shall ensure that all facilities and equipment are properly maintained and that employees, where appropriate, are trained and knowledgeable in the proper use of lasers.

1.7 Laser Custodian

The laser custodian is not an administrative person but an active user who has the responsibility to ensure that all laser systems or devices that fall under them are used in a safe manner and meet the requirements of this directive. The Laser Custodian shall:

- a. Be authorized by the NIRSC as an Approved User of Class 3B and Class 4 laser sources;
- b. Be accountable for sources of lasers under his/her control;

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

- c. Ensure the proper use and storage of all sources of laser radiation under his/her custodianship;
- d. Post written safeguards on or near the laser control panel or at the entrance to the laser controlled area;
- e. Classify all lasers according to their greatest normally accessible level of radiation and in accordance with the ANSI Z136.1 (latest edition), i.e., Class 1, 1M, 2, 2M, 3R, 3B, or 4;
- f. Write Safe Operating Procedures if so designated;
- g. Submit all forms for laser use and approval to the LSO at a minimum of 2 weeks prior to need or expiration date of current approved authorization(s); and
- h. Submit immediate reports to the LSO if any departure from laser procedures has occurred (eye or skin exposures greater than the Maximum Permissible Exposure (MPE) limit, any injuries from laser support equipment, and/or any uncontrolled outdoor radiation of a laser beam). See Appendix D for report format required.

1.8 Approved Users

Approved Users are individuals that have received approval from the NIRSC to use Class 3B and Class 4 Laser systems or devices. Approved Users shall:

- a. Obtain certification from the line management responsible for the operations;
- b. Submit a GSFC Form 23-35LU to the LSO as stated in section 2.1;
- c. Have a baseline eye exam approved by their employer, which will be documented on an *Eye Exam Form for Contractor or Civil Servant Users*. Additional exams will be administered after any suspected exposure and are recommended upon stopping work with lasers. A baseline or termination eye exam must consist of:
 - 1. Ocular history
 - 2. Visual acuity test
 - 3. Macular Function
 - 4. Color Vision test

NOTE: If results of any of the above tests are abnormal, a more in-depth evaluation may be required if determined necessary by the medical provider.

1.9 Ancillary Personnel

Ancillary personnel involved in non-ionizing radiation activities shall:

- a. Know and follow GSFC radiological safety requirements, environmental statutes, and operations-specific policies and procedures; and
- b. Report immediately all unsafe conditions or operations to their supervisor, Facilities Operations Manager, and/or OS&H, Greenbelt, or the Wallops Safety Office.

1.10 Wallops Flight Facility's (WFF) Safety Office

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

Wallops Flight Facility Code 803 shall designate a Wallops Laser Safety Officer (WLSO) who will review and preliminarily approve laser radiation activities at or managed by Wallops. The Wallops LSO must provide a list of preliminary approvals that have been granted at the quarterly NIRSC meetings.

1.10.1 Wallops Laser Safety Officer (WLSO) shall:

- a. Keep the records for Wallops laser safety;
- b. Provide for the inspection of laser radiation use and storage areas, audit laser source records, and evaluate use programs to assure compliance with NIRSC requirements relating to laser radiation at that facility;
- c. Provide all outside coordination for Wallops projects;
- d. Review and approve safe operating procedures;
- e. Provide notification to the NASA Senior Environmental Health Officer (SEHO) and GSFC’s RSO regarding any unintended personnel laser exposure; and
- f. Coordinate all matters regarding outdoor lasers safety coordination with other agencies with the SEHO.

1.11 Contractor and Guest Professional Operations

Contractors and other personnel operating laser systems or devices at GSFC facilities are subject to all provisions of this GPR. Contractors operating at contractor-operated facilities but in conjunction with GSFC programs shall be required to develop a plan to address the hazards of working with laser radiation sources in accordance with ANSI Z136.1 and ANSI Z136.6 as identified in their contracts.

1.12 Environmental Planning and Impact Assessment for Laser Projects

Environmental planning provides a process to identify environmental impacts, issues, and requirements associated with a project and to incorporate them into project planning and decision making. Environmental planning shall be integrated early into the planning process for proposed GSFC laser projects and activities. This facilitates compliance with National Environmental Policy Act (NEPA) and other environmental laws, minimizes impacts to the environment, and avoids cost and schedule impacts to the project.

GSFC uses the NEPA process as a framework for balanced and integrated environmental planning. NEPA is Federal legislation that establishes our national environmental policy. This law requires Federal agencies to consider the environmental impacts of actions in their planning and decision-making processes. While NEPA does not apply abroad, EO 12114 does, and requires Federal agencies to also consider the environmental impacts of their actions outside the United States. GSFC implements NEPA and EO 12114 in accordance with the procedures and guidelines of NPR 8580.1 and GPR 8500.1A: *Environmental Planning and Impact Assessment*.

The Principle Investigator, Project Manager or the Branch Head shall contact the Code 350 NEPA Program Manager who will direct them to fill out Form 23-75: Environmental Checklist, R&D Projects. Additional planning and coordination between the project Codes, Laser Safety Officer and the Code 350 Environmental Team will be required to ensure the appropriate documentation is completed and approved prior to project commencement. It is imperative that projects allow enough time to complete

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

the GSFC forms used in review of your experiments. This will include any experiment requiring the use of any class of laser or laser system used outdoors.

2.0 LASER RADIATION OPERATIONS APPROVAL REQUIREMENTS

This section defines the requirements for obtaining NIRSC approval of users, custodians, devices, and operators involved with laser radiation sources. Approval procedures and methods are established to assure that work with sources of laser radiation is performed with due regard for personnel safety.

2.1 Obtaining Authorization to be an Approved User and/or Custodian of Laser Sources or Devices

The procedure for obtaining authorization is as follows (*NOTE: Proposed users shall only be allowed to work for up to 30 days under the supervision of a currently Approved User until formal NIRSC approval has been granted*). The proposed individual shall:

- a. Complete a GSFC Form 23-35LU, listing his/her training and experience working with laser sources and/or devices, listing the laser sources and/or devices he/she will be using, and listing the name(s) of the Custodian(s) for whom he/she will be working; and
- a. Submit the form to his/her appropriate manager/supervisor for concurrence. If satisfied with the request, the manager/supervisor shall forward the request to the LSO for NIRSC approval. The LSO shall review the request to ensure that the individual has the education, training, and experience necessary as described in Appendix C;

The NIRSC shall approve or disapprove the request and the LSO must notify the individual by providing a copy of the approved or disapproved GSFC Form 23-35LU. This approval shall be renewed every three (3) years. Interim approval for a request may be granted by the RSO between NIRSC meetings and then finalized at the next NIRSC meeting.

Civil service and contract employees are allowed to be either an Approved User or Custodians of laser sources or devices at GSFC or GSFC-approved locations.

2.2 Obtaining Approval for Laser Operations

Requests for laser operations shall be received by the LSO at least 2 weeks prior to the work date for adequate processing. Complicated systems, procedures, flight projects, or extremely hazardous operations will take longer to acquire final approval. These systems should be coordinated with the LSO in the early planning stages to assure that there is no impact to mission schedule.

Requests for approval to use laser sources or devices are initiated by submitting a GSFC Form 23-6L (which describes the who/what/where/why of using the source) and a GSFC Form 23-28L (which is a description of the source) to the LSO.

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

The procedure for obtaining authorization for laser operations is as follows:

- a. For new laser sources; the originator shall prepare a GSFC Form 23-28L describing the source involved and identifying their nominal output. For established laser source, the originator shall list the assigned Docket Number(s) in the appropriate section of the GSFC Form 23-6L;
- b. The originator shall prepare the GSFC Form 23-6L describing the intended use of the source along with a laser safety plan. The laser safety plan shall address (at minimum) the following items: Potential Hazards, Controls to be Used, Operating and Emergency Procedures, Training, Medical Approval, Alignment Procedures, Listing of Authorized Users, Listing of Approved Laser that will be used, Type of Safety Observer that will be used if conducting outdoor laser operation, and a diagram of laser lab area. All operations shall be in compliance with GSFC and other applicable regulations. The originator submits the above forms to the LSO for NIRSC approval;
- c. When the LSO receives the request, he/she shall perform a review to determine the adequacy of the equipment, facilities, and location of the particular use of the laser source. Operating procedures must be discussed and evaluated. On the basis of the evaluation, the LSO may impose additional conditions to ensure safe operation;
- d. The NIRSC shall approve or disapprove the request for the laser operation, and the LSO must notify the originator by providing a copy of the approved or disapproved GSFC Form 23-6L. The NIRSC may also impose additional requirements; and
- e. The procedures approved in the request become the conditions under which the Custodian and his/her personnel are approved to use the laser system. Any subsequent change in procedure shall be reviewed and approved in writing by the NIRSC prior to instituting the change.

NOTE: Approvals for operations and approved users are only valid for a maximum of 3 years.

2.3 Obtaining Approval to Purchase Laser Sources or Devices

The individual requesting the laser source or device shall be an Approved User. Prior to the purchase of a Class 3B or Class 4 laser the requesting individual shall complete a GSFC Form 23-28L and submit it to their appropriate manager/supervisor for concurrence. If satisfied with the request, the manager/supervisor forwards the request to the LSO. The LSO shall review the form to see what additional requirements are to be met prior to purchase. The LSO shall direct the requesting individual to purchase the item(s) after this review by email correspondence. The initiator shall also submit a GSFC Form 23-59 to the Safety Team in the OS&H office on this request.

If the new laser is added to an existing NIRSC approved GSFC Form 23-6L the custodian shall send an updated laser safety plan to the LSO.

NOTE: Class 3B laser pointers are not permitted for use at GSFC or its supported facilities.

Users of fiber optics communications systems will follow guidance provided in ANSI Z136.2. Since these systems may contain Class 3B or Class 4 lasers, custodians of open-ended optical fibers and LEDs containing Class 3B or 4 lasers shall seek approval by the NIRSC through the LSO.

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

3.0 OUTDOOR LASER OPERATIONS

- a. All aviation protective systems determinations shall be supported by qualitative and quantitative safety/hazard analysis. Unless otherwise noted, all ANSI Z136.6 requirements are incorporated by reference as requirements, and will take precedence over any less rigorous requirement in this document. Proposed protective systems must be submitted to the NIRSC for approval (GSFC Form 23-6L). All supporting documentation will be included. It should be noted that ALL classes of lasers, i.e., 1, 1M, 2, 2M, 3R, 3B, and 4, used outdoors must be approved by the NIRSC since even Class 1 laser systems may present a hazard to aircraft operators.
- b. Laser systems directed towards outer space (which might disrupt orbiting satellites) should have an approval from the Laser Clearing House (LCH), Joint Functional Component Command for Space (JFCC SPACE) on file with the NIRSC. Contact the LSO for Coordination with the JFCC SPACE. See ANSI Z136.6 for information on which outdoor laser systems require approval from the Laser Clearing House. Information sheets for submission to the Laser Clearing House are available from the LSO.
- c. Federal Aviation Administration (FAA) coordination is required for all operations that will transmit laser energy through navigable air space controlled by the FAA. Coordination with the FAA shall be accomplished by submitting an FAA Form 7140-1 to the LSO. The person submitting the FAA Form 7140-1 to the LSO must do so at least 60 days in advance of the expected date of operation. This will include any operation requiring a letter of non-objection from the FAA for their flight approval.
- d. Special Requirements: If any Federal, state or local Government agency objects to outdoor propagation of a laser beam, operational and notification requirements shall be followed as shown in Appendix D.
- e. Evaluations of outdoor laser operations are the responsibility of the user organization.

4.0 OFFSITE LASER OPERATIONS

Offsite operations will also be subject to the requirements and regulations of the use site. Approval of offsite operations may take an extended time. Offsite laser operations project managers shall appoint a site laser safety officer for the project. This individual will have the authority and the experience to ensure that safe operations are conducted and local regulations met.

5.0 LASER RADIATION PROTECTION REQUIREMENTS

- a. Requirements for control of hazards presented by lasers are located in section 4 of ANSI Z136.1 and are incorporated by reference. The application of control measures for the individual laser classes is shown in table 10 of the aforementioned ANSI publication. Alternate control measures may be approved by the NIRSC. Adequate justification for alternate control measures shall accompany the NIRSC request for approval.

DIRECTIVE NO.	<u>GPR 1860.2C</u>
EFFECTIVE DATE:	<u>September 26, 2011</u>
EXPIRATION DATE:	<u>September 26, 2016</u>

- b. Protective eyewear will be relied upon only after all engineering efforts to eliminate the hazard have been attempted. Eye protection for laser hazards shall be reviewed and approved by the LSO. ANSI Z136.1 should be consulted when identifying and selecting laser eye protective equipment.
- c. Associated Hazards (Non-Beam Hazard) – This aspect of laser technology is seldom encountered outside of the research and engineering laboratory and is associated with high-power lasers almost exclusively. Non-beam hazards may include electrical, laser generated air contaminants, collateral and plasma radiation, fire, explosions, compressed gas, laser dyes, mechanical, noise, hazardous wastes, confined space, and ergonomics hazards. When these hazards are present, other requirements not addressed by this GPR are likely to apply. ANSI Z136.1 provides requirements and guidance related to these hazards.

6.0 CAUTION SIGNS, SYMBOLS, LABELS, AND POSTING

- a. Except as otherwise authorized by the LSO, signs, symbols, and labels shall use the design and colors described in ANSI Z136.1;
- b. In addition to the contents of signs, symbols, and labels prescribed by this section, a user may provide on or near such signs, symbols, and labels any additional information that may be appropriate in aiding individuals to minimize exposure to laser radiation or any associated hazards;
- c. Laser warning signs and labels shall be posted as required and in accordance with ANSI Z136.1; and
- d. Standard operating procedures for Class 3B and Class 4 lasers approved by the NIRSC and submitted with GSFC Form 23-6L shall be posted on or near the laser control panel or at the entrance to laser facility.

Appendix A – Definitions

- A.1 Approved User** – A person designated by management who is approved by the NIRSC to use Class 3B or Class 4 sources of laser radiation or approved by management for sources below Class 3B.
- A.2 Aviation protection requirements** – Requirements to all outdoor laser systems that have a nominal ocular hazard distance greater than 500 feet above sea level (ASL) or have levels in the visible spectrum in excess of those permitted in Laser Free/High Intensity Light/Flight Zone (LF/HIL/FZ) as defined in FAA Order 7400.2 (series), Part 6, Miscellaneous Procedures, Chapter 29, Outdoor Laser Operations.
- A.3 Critical Zone Exposure (CZE)** – 5 microW/cm^2 ; will not produce significant visual impairment.
- A.4 Custodian** – An approved laser user who has been designated by the appropriate management (section head or higher) and approved by the NIRSC to assume the responsibility of accountability for sources of hazardous laser radiation.
- A.5 Laser Free/High Intensity Light/Flight Zone (LF/HIL/FZ)** – Effective 50 nW/cm^2 ; indistinguishable from background ambient light.
- A.6 Navigable Air Space** – Is defined as any height greater than 500 feet above sea level (ASL).
- A.7 Laser Safety Plan** – A Plan written to protect personnel from exposure of the eye and skin to hazardous levels of laser radiation and to other hazards associated with the operation of laser devices during operation and maintenance. The plan shall address (at minimum) the following items: Potential Hazards, Controls to be Used, Operating and Emergency Procedures, Training, Medical Approval, Alignment Procedures, Listing of Authorized Users, Listing of Approved Laser that will be used, Type of Safety Observer that will be used if conducting outdoor laser operation, and a diagram of laser lab area.
- A.8 Nominal Ocular Hazard Distance (NOHD)** – The distance along the axis of the laser beam beyond which the appropriate maximum permissible exposure per ANSI Z136.1 is not exceeded.
- A.9 Outdoor laser operations** – All uses of lasers in operations that involve the laser illumination of any area that is not enclosed by a physical structure. Outdoor laser operations include fixed ground-based systems, mobile ground-based systems, lasers fired through structure openings into outdoor areas, and flight systems (aircraft, balloons, and rocket payloads).
- A.10 Safety Observer** – May be any trained person or an individual using any mechanical/optical device approved by the Radiation Protection Office.
- A.11 Safe Operating Procedures** – A local-level procedure document describing safeguards for laser use. Written safeguards are posted on or near the laser control panel or at the entrance to the laser-controlled area. Class 1, 1M, 2, 2M and 3R systems as defined in ANSI Z136.1 are excluded from this requirement unless they are used in navigable airspace.
- A.12 Sensitive Zone Exposure (SZE)** – 100 microW/cm^2 ; will begin to produce afterimage or flash-blindness effects.

Appendix B – Acronyms

ANSI	American National Standards Institute
FAA	Federal Aviation Administration
GPR	Goddard Procedural Requirements
GSFC	Goddard Space Flight Center
JFCC	Joint Functional Component Command for Space
LASER	Light Amplification by the Stimulated Emission of Radiation
LED	Light-Emitting Diode
LSSC	Laser Safety Subcommittee
LSO	Laser Safety Officer
MPE	Maximum Permissible Exposure
NEPA	National Environmental Policy Act
NIRSC	Non-ionizing Radiation Safety Committee
NPR	NASA Procedural Requirements
OS&H	Occupational Safety & Health Division
RPO	Radiation Protection Office
SEHO	Senior Environmental Health Officer
WFF	Wallops Flight Facility

Appendix C – Training Requirements

Users and custodians shall be appropriately trained in the safe use of lasers (see Table 1 and Table 2). The following are training objectives:

Table 1 Laser User Training and Experience Requirements			
Laser Class	Training	Experience*	Approval Authority
1, 1M	None	None	Management
2, 2M, 3R	<ul style="list-style-type: none"> • Basic understanding of laser principles and hazards; • Understanding of manufacturers’ warnings, hazards, and use instructions 	Hands-On Instruction	Management
3B	<ul style="list-style-type: none"> • Basic understanding of laser principles and hazards; • Understanding of manufacturers’ warnings, hazards, and use instructions; • Understanding of the requirements of this GPR; • Know user responsibilities and basic GSFC laser use approval procedures; • Understand principles and properties of laser light; • Understand laser exposure bio-effects; • Recognize hazards and understand hazard controls for laser radiation; • Understand exposure control methods (engineering vs. administrative); • Understand the NIRSC-imposed requirements; • Know basic procedures and methods of handling laser approvals; • Know responsibilities of users and custodians; • Know the inspection and survey requirements 	8 Hours of documented Hands-On-Training	NIRSC
4	<ul style="list-style-type: none"> • Same training as a Class 3B Laser User 	40 Hours of documented Hands-On-Training	NIRSC

* Other requirements may be substituted for experience as determined appropriate by the NIRSC.

**Table 2
Laser Custodian Training and Experience Requirements**

Laser Class	Course	Experience*	Approval Authority
3B	<ul style="list-style-type: none"> • Basic understanding of laser principles and hazards; • Understanding of manufacturers' warnings, hazards, and use instructions; • Understanding of the requirements of this GPR; • Know user responsibilities and basic GSFC laser use approval procedures; • Understand principles and properties of laser light; • Understand laser exposure bio-effects; • Recognize hazards and understand hazard controls for laser radiation; • Understand exposure control methods (engineering vs. administrative); • Understand the NIRSC-imposed requirements; • Know basic procedures and methods of handling laser approvals; • Know responsibilities of users and custodians; • Know the inspection and survey requirements 	8 Hours of documented Hands-On Training	NIRSC
4	<ul style="list-style-type: none"> • Same training as a Class 3B Laser Custodian 	40 Hours of documented Hands-On-Training	NIRSC
Outdoor Laser Operations	<ul style="list-style-type: none"> • Same training as a Class 3B Laser Custodian • Gain in-depth knowledge of laser safety, including non-damaging visual effects, emission calculations, and engineering controls required for their safe operation; • Understand specific operating procedures and safety requirements of the laser installation. 	8 Hours of documented Hands-On-Training in addition to the class 4 requirements	NIRSC

* Other requirements may be substituted for experience as determined appropriate by the NIRSC.

Appendix D – Accident or Incident Reporting Requirements

Supervisors shall ensure that all individuals, including outside service technicians, understand and follow all controls and procedures as specified by the Center LSO or NIRSC. Mishaps are to be reported in accordance with [GPR 8621.1 Reporting of Mishaps, Incidents, and Close Calls](#). Supervisors or lead experimenters should not intentionally depart from established safety procedures. The laser operators should keep the supervisor or lead experimenter fully informed of any unintended departure from established safety procedures and of any request to perform unsafe tasks.

All departures from established laser procedures shall be reported to the LSO and/or the NIRSC immediately. This includes all laser eye or skin exposures (greater than the MPE), any injuries from laser support equipment, and any uncontrolled outdoor radiation of a laser beam. Information required in the report includes:

- The nature of the accidental radiation occurrence;
- The location at which the accidental radiation occurred;
- The manufacturer, type and model number of the electronic product or products involved, reference ANSI Z136.6;
- The circumstances surrounding the accidental radiation occurrence, including causes;
- The number of persons involved, adversely affected, or exposed during the accidental radiation occurrence, the nature and magnitude of their exposure and/or injuries and the names of the persons involved;
- The actions, if any, which may have been taken to control, correct or eliminate the causes and to prevent reoccurrence; and
- Any other pertinent information with respect to the accidental radiation occurrence.

Reporting of Objections to Propagation of Laser Beam by Any Organization or Entity

Laser operators who are requested to stop using their laser in outdoor locations by any Federal, state, or local Government agency must comply with the request and immediately provide a report of the incident to the LSO.

The LSO will, in turn, notify the Chairman of the NIRSC and a telephone notification shall be made to the NASA Senior Environmental Health Officer (SEHO). In no case can this notification exceed 2 hours from the time the objection is raised. A written report (email or fax) will be prepared as a follow-up to the telephone notification. If the NASA SEHO is unavailable, notification must be to the Office of the Chief Health and Medical Officer (OCHMO) in Washington, DC, (202-358-1794 or 202-358-2329).

An objection to the use of a specific outdoor laser by the FAA of the U.S. Military shall be honored until the NASA SEHO, in conjunction with other NASA organizations, reviews the complaint and authorizes continuation of operations.

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	06/29/04	Initial Release.
A	01/26/05	<p>Modified to clarify all requirements in accordance with NASA Rules Review Committee recommendations.</p> <p>P.4 added references i, j, and k.</p> <p>P. 9 changed “harmful employee exposures” to “employees injured by lasers”</p> <p>P. 10 added definitions for custodian, user, and Safe Operating Procedure.</p> <p>1.1 Moved “Safe Operating Procedure” to P.10</p> <p>Reorganized Section 1 Roles and Responsibilities, from alphabetical listing to a top-down hierarchy.</p> <p>1. RSC, added the Laser Safety Subcommittee to the RSC.</p> <p>2.a Classification of lasers, moved to custodian responsibility</p> <p>2.c Laser Radiation Source approval moved to 1.0 RSC and 1.0 Custodian to better define the process.</p> <p>2.d Laser Radiation Source Personnel Approval moved to 1.0 RSC and 1.0 Custodian to better define the process.</p> <p>2.e User Certification moved to 1.0 User section</p> <p>3.0 Training Requirements moved to Appendix A</p> <p>4.0 Baseline and Termination Eye Examinations moved to 1.0 User</p> <p>5.a deleted</p> <p>5.b moved to 1.0 LSO</p> <p>Section 6 renumbered Section 3</p> <p>Section 8 renumbered Section 4</p> <p>Section 9 renumbered Section 5</p> <p>Section 10 renumbered Section 6</p> <p>Added Appendix B, Mishap reporting requirements</p>

DIRECTIVE NO. GPR 1860.2C
EFFECTIVE DATE: September 26, 2011
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B	04/02/10	<p>Administratively revised to update the Responsible Office Code, Organization Title and organization name within the document.</p> <p>Administratively extended for 1 year from original expiration date.</p>
C	09/26/11	<p>Table of Contents was added with each section numbered.</p> <p>References: Removed FAA internal documents that have no authority over GSFC operations</p> <p>Added GSFC Form 23-75 Environmental Checklist</p> <p>P.8 Updated Records custodian information to clarify the custodian</p> <p>Section 1: Established the Non-ionizing Radiation Safety Committee (NIRSC) and clarified their roles and responsibilities</p> <p>Section 1: Approved Users – updated the eye examination requirements</p> <p>Section 1: Environmental Planning and Impact Assessment for Laser Projects – added this section to identify requirements to coordinate with the Medical & Environmental Management Division, Code 250</p> <p>Section 2: Updated information on the process to get approval for users and uses of lasers on GSFC</p> <p>Section 3: Outdoor Laser Operations – clarified coordination requirements with organizations outside GSFC (i.e. the FAA or Space Command)</p> <p>Appendix C – Training: Clarified training requirements and responsibilities.</p>