

FDA variance application form

DEPARTMENT OF HEALTH AND HUMAN SERVICES Food and Drug Administration	APPLICATION FOR A VARIANCE FROM 21 CFR 1040.11(c) FOR A LASER LIGHT SHOW, DISPLAY, OR DEVICE													
Form Approved: OMB No. 0910-0025 Expiration Date: August 31, 2023 See Page 4 for PRA Statement. DOCKET NUMBER														
<p>NOTE: No laser light show, projection system, or device may vary from compliance with 21 CFR 1040.11(c) in design or use without the approval of this application in accordance with 21 CFR 1010.4.</p>														
INSTRUCTIONS														
<p>1. Check all applicable boxes, enter the requested information, and sign this form. 2. Enter docket number if assigned. 3. Submit this form, with the CDRH Variance Package Cover Sheet, and a laser light show report, by email to: RadHealthCustomerService@fda.hhs.gov.</p> <p>4. For more information regarding this form and to find digital copies of the CDRH Variance cover letter checklist and the laser light show report form, visit our website: https://www.fda.gov/radiation-emitting-products/home-business-and-entertainment-products/laser-light-shows</p>														
<p>1. NAME OF COMPANY</p>														
<p>2. ADDRESS OF COMPANY (Include ZIP Code)(If P.O. Box is used, include actual street address also.)</p>														
<p>3. NAME AND TITLE OF RESPONSIBLE PERSON</p>		<p>4.a. TELEPHONE NO. (Include area code)</p>												
<p>4.b. EMAIL ADDRESS</p>		<p>5. DATE OF SUBMISSION</p>												
<p>6. THE APPLICANT REQUESTS THE VARIANCE TO BE IN EFFECT FOR A PERIOD OF _____ YEARS FROM THE DATE OF ISSUE. (In general, the Agency will approve a variance for only two years. If a longer period is requested, a justification must be attached as part of the application.)</p>														
<p>7. PRODUCT DESCRIPTION AND USE</p>														
<p>a. LIST NAME AND/OR MODEL NUMBER(S) FOR THE LASER LIGHT SHOW(S) AND PROJECTOR(S)</p>														
<p>b. PRODUCT FOR WHICH A VARIANCE IS REQUESTED</p> <p><input type="checkbox"/> A laser display device <input type="checkbox"/> A projector for a laser light show <input type="checkbox"/> A laser light show <input type="checkbox"/> Other (Specify) _____</p>														
<p>c. <input type="checkbox"/> PROJECTORS ARE INTENDED FOR SALE, LEASE, OR LOAN TO OTHER LASER LIGHT SHOW PRODUCERS</p>														
<p>d. PRODUCT IS INTENDED FOR USE IN A</p> <p><input type="checkbox"/> Planetarium or other dome projection structure <input type="checkbox"/> Theater <input type="checkbox"/> Hotel/motel ballroom or meeting room <input type="checkbox"/> Store displays <input type="checkbox"/> Trade show or convention <input type="checkbox"/> Discotheque or night club <input type="checkbox"/> Pavilion <input type="checkbox"/> Indoor arena <input type="checkbox"/> Outdoor arena <input type="checkbox"/> Museum <input type="checkbox"/> Outdoor unenclosed area <input type="checkbox"/> Other (Specify) _____</p>														
<p>e. PRODUCT IS INTENDED TO BE USED</p> <p><input type="checkbox"/> At only one (Fixed) location <input type="checkbox"/> At a variety of (Tour) locations <input type="checkbox"/> Other (Specify) _____</p>														
<p>f. PRODUCT IS INTENDED TO BE USED AT ANY ONE LOCATION</p> <p><input type="checkbox"/> More than 15 days <input type="checkbox"/> More than 5 but not more than 15 days <input type="checkbox"/> Less than 5 days</p>														
<p>g. TOUR IS INTENDED TO RUN FOR</p> <p><input type="checkbox"/> More than 6 months <input type="checkbox"/> 1 - 6 months <input type="checkbox"/> Less than one month <input type="checkbox"/> Not applicable (Not a tour) <input type="checkbox"/> Other (Specify) _____</p>														
<p>h. PRODUCT UTILIZES THE FOLLOWING LASER EFFECTS</p> <p><input type="checkbox"/> Front screen projections <input type="checkbox"/> Rear screen projections <input type="checkbox"/> Holographic displays <input type="checkbox"/> Multiple reflection/diffraction effects <input type="checkbox"/> Audience scanning (Also includes scanning any accessible uncontrolled areas) <input type="checkbox"/> Reflections from stationary mirrors or mirrored surfaces (Beam Matrices) <input type="checkbox"/> Stationary irradiation of rotating mirror balls, etc. <input type="checkbox"/> Scanning irradiation of rotating mirror balls, etc. <input type="checkbox"/> Fiber optic projections <input type="checkbox"/> Fog, smoke, or other scattering enhancement effects <input type="checkbox"/> Other (Specify) _____</p>														
<p>8. LASER RADIATION LEVELS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">LASER MEDIUM (Ar, He-Ne, etc.)</th> <th style="text-align: left;">WAVE LENGTHS (nm)</th> <th style="text-align: left;">PEAK POWER (watts)</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>			LASER MEDIUM (Ar, He-Ne, etc.)	WAVE LENGTHS (nm)	PEAK POWER (watts)									
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<p>9. IF ANY LASER RADIATION IS PULSED OR SCANNED, GIVE THE PULSE DURATION AND RATE AND SCANNING FREQUENCY AND AMPLITUDE</p>														
<p>10. REASON FOR REQUESTING VARIANCE</p> <p><input type="checkbox"/> Compliance with the limits of 21 CFR 1040.11(c) would restrict the intended use of the product because compliance would limit the output power to the extent that the desired effects would not be sufficiently visible <input type="checkbox"/> Other or additional explanation (Specify) _____</p>														

11. MANNER IN WHICH IT IS PROPOSED TO DEVIATE FROM THE REQUIREMENTS OF THE APPLICABLE STANDARD

- It is proposed to deviate from the provisions of 21 CFR 1040.11(c) in that the accessible emission level would exceed the accessible emission limits specified in 21 CFR 1040.11(c).
- It is proposed to deviate from the provisions of 21 CFR 1040.11(c) as follows:

12. ADVANTAGES TO BE DERIVED FROM SUCH DEVIATION

- Laser light shows and displays are accepted popular media in entertainment and the arts. Use of power levels in excess of the limits imposed by 21 CFR 1040.11(c) is necessary to achieve the required effects in these media.
- Other or additional advantages (*describe and explain*).

13. EXPLAIN THE ALTERNATE MEANS OF RADIATION PROTECTION TO BE PROVIDED. (Check as many boxes as apply. In item 14 "Remarks," justify any boxes not checked, using additional sheets as necessary. State any other means of radiation protection that will be used.)

- a. All laser products, systems, shows, and projectors will be certified to comply with 21 CFR 1040.10 and the conditions of this variance and will be reported as required by 21 CFR 1002.10 AND 1002.11 using the reporting guides provided for such purpose. These actions will be accomplished prior to any introduction into commerce.
- b. Effects not specifically indicated in this variance application will not be performed. No other effects will be added until an amendment to the variance has been obtained and the required reports or supplements, as applicable, have been submitted.
- c. Scanning, projection, or reflection of laser and collateral radiation (*Light show radiation*) into audience or other accessible uncontrolled areas will not be permitted except for diffuse reflections produced by the atmosphere, added atmospheric scattering media, and target screens.
- d. Laser radiation levels in excess of the limits of Class I will not be permitted at any point less than 3.0 meters above any surface upon which persons other than operators, performers, or employees are permitted to stand or 2.5 meters below or in lateral separation from any place where such persons are permitted to be. Operators, performers, and employees will not be required or allowed to view radiation above the limits of Class I or be exposed to radiation above the limits specified in 21 CFR 1040.11(c).
- e. Any product which relies on scanning to meet access, exposure, or product class limits will incorporate a scanning safeguard system which directly senses scanner motion and which will react fast enough to preclude exceeding the applicable limit.
- f. All laser light shows shall be under the direct and personal control of trained, competent operator(s). The operator(s) will:
 - (1) Be an employee of the variance holder who will be responsible for the training and the conduct of the operator;
 - (2) Be located where all beam paths can be directly observed at all times; and
 - (3) Immediately terminate the emission of light show radiation in the event of any unsafe condition; or, for outdoor shows, upon request by any air traffic control officials.
- g. The maximum laser projector output power will not exceed the level required to obtain the intended effects.
- h. The projection system (*i.e., the projector and all other components used to produce the lighting effects*) will be securely mounted or immobilized to prevent unintended movement or misalignment. Beam masking will be provided as an inherent part of the system design to prevent overfilling of screens, beam stops, targets, etc.
- i. Laser projectors will not be delivered to any other party under an agreement of sale, lease, or loan unless and until the recipient demonstrates that they have a variance in effect at the time of delivery that permits them to produce laser light shows incorporating such projector(s).
- j. In addition to the requirements of 21 CFR 1040.10(h), the manufacturer of laser projectors/systems will provide to parties who purchase, lease, or borrow the equipment, adequate users' instructions for safe installation and operation which explain the responsibility of the recipient as an independent light show manufacturer to submit the required reports and apply for and obtain a variance from CDRH prior to introduction into commerce of any laser light shows.
- k. The requirements of 21 CFR 1002.30(a)(1) and (2) will be accomplished through the use of written procedures for setup, alignment, testing, and performance of each show. These procedures will be in sufficient detail to ensure compliance with 21 CFR 1040.10, the conditions of this variance, and the control of access to radiation areas using the procedures described in the ANSI/Z136.1 standard for the safe use of lasers (*Laser Institute of America (LIA), 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826*) or any other equivalent user consensus standard and, where applicable, state or local requirements. Laser radiation areas which can contain radiation levels above the limits specified in 21 CFR 1040.11(c) will be clearly identified by the posting of warning signs and/or restricting access through physical means (*such as pressure switches, photo cells, barriers, guards, etc.*). These requirements apply to temporary areas (*such as during set up and alignment procedures*) and to final or permanent areas. The variance holder will retain the records of these procedures and the results of all tests as required by 21 CFR 1002.31. A copy of the variance application, the approval letter, current procedures, and records relating to each particular show will be with the operator or other responsible individual and will be made available for inspection by FDA and other responsible authorities.

- I. Advance written notification will be made as early as possible to appropriate federal, state, and local authorities providing show itinerary with dates and locations clearly and completely identified, and a basic description of the proposed effects including a statement of the maximum power output intended. Such notifications will be made, but not necessarily be limited, to:
- (1) Information about particular laser shows will be maintained in the records for the show and will be provided upon request to the Center for Devices and Radiological Health, Office of In Vitro Diagnostics and Radiological Health, Division of Radiological Health, Magnetic Resonance Branch, Silver Spring, MD 20993. This information will provide the initial and closing dates for fixed installations and the itinerary for mobile shows. In addition, unless all aspects of each show have been reported and accession numbers clearly referenced, each notice will include detailed descriptions of each show and a listing of all effects to be performed in sufficient detail to confirm compliance with the regulations and this variance.
 - (2) The Federal Aviation Administration (FAA) for any projections into open airspace at any time (*i.e., including set up, alignment, rehearsals, performances, etc.*). If the FAA objects to any laser effects, the objections will be resolved and any conditions requested by FAA will be adhered to. If these conditions cannot be met, the objectionable effects will be deleted from the show.
 - (3) State and local radiation control offices/agencies for all shows to be performed within their jurisdictions. All requirements of state and local law will be satisfied and any objections raised by local authorities will be resolved or the effects deleted. (*A list of federal and state offices is available from the Center for Devices and Radiological Health upon request.*)

14. REMARKS

15. IF THE SUBMITTER IS DIFFERENT FROM THE APPLICANT, PLEASE ENTER THE FOLLOWING:

SUBMITTER NAME	ADDRESS		
CITY	STATE	ZIP CODE	COUNTRY, IF NOT US
PHONE NUMBER	EMAIL ADDRESS		

CERTIFICATION

I CERTIFY that all of the above information and statements are true, complete, and correct to the best of my knowledge and acknowledge that my variance application may be denied or my variance may be revoked if this application is found to be false, misleading or incorrect in any material way. I have submitted and will submit all reports required by 21 CFR 1002.10 and 1002.11 on the laser equipment and show(s). I further understand that I may be required by regulation or by the Director, Center for Devices and Radiological Health, to supply such other information as may be necessary to evaluate and act on this application.

16. APPLICANT'S SIGNATURE	17. NAME (<i>Type or Print</i>)	18. TITLE
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This section applies only to requirements of the Paperwork Reduction Act of 1995.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.

The burden time for this collection of information is estimated to average 0.5 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Operations
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

Example FDA variance approval letter

This is an actual FDA variance approval letter with some information redacted. This particular variance allows audience scanning when done with Pangolin's PASS system.



VIA USPS

June 23, 20

Re: FDA Docket Number: [REDACTED]
Accession Number: [REDACTED]

Dear [REDACTED]:

CDRH is approving, in accordance with 21 CFR 1010.4(c)(1), the petition of [REDACTED] dated March 27, 20[REDACTED], for a variance from 21 CFR 1040.11(c) of the performance standard for laser products.

This variance will allow the introduction into commerce of the laser light show products described in Section D below.

A. Variance Number

100

B. Effective Date

This variance shall become effective on the date of this letter in accordance with 21 CFR 1010.4(c)(1).

C. Termination Date

This variance shall be terminated after May 31, 20

D. Product(s) for Which Variance is Granted

This variance is granted for the Class IIIb and IV laser light shows assembled and produced by _____ that incorporate any of the following certified projector(s):

projectors.

The variance is also granted for laser light shows that include audience scanning assembled and produced by [REDACTED] with the firm's [REDACTED] System. These projectors incorporate the Pangolin Professional Audience Safety System (PASS™) controller to monitor and control audience scanning effects under the conditions specified in Attachment C of this variance.

The firm also may manufacture, report, and certify Class IIIb or IV laser light show projectors under this variance. Further, the firm may incorporate into their laser light shows any laser projection systems which have been certified and reported by the firm or by another manufacturer under an approved laser light show variance, except:

1. Projection systems designed or intended to produce visible effects by means of invisible laser emissions, or
2. Projection systems designed or intended to produce audience scanning effects other than certified projectors that incorporate the PASS™ controller.

The firm's laser light shows may be presented in planetariums, theaters, pavilions, indoor or outdoor arenas, and outdoor unenclosed areas for any contracted duration.

The effects employed may be front or rear screen projections, multiple reflection, refraction, diffraction effects, reflections from stationary mirrors, and enhanced scattering effects from any projector.

Audience scanning may be done only from the firm's [REDACTED] System projectors in accordance with the conditions in Attachment C of this variance.

E. Provisions From Which Variance is Granted

This variance is granted from 21 CFR 1040.11(c) of the performance standard for laser products which requires that each demonstration laser product shall comply with all of the applicable requirements of 21 CFR 1040.10 for a Class I, IIa, II, or IIIa laser product and shall not permit human access to laser radiation in excess of the accessible emission limits of Class I and, if applicable, Class IIa, Class II, or Class IIIa.

All other provisions of the applicable performance standard(s) remain applicable to the product.

F. Conditions Under Which Variance is Granted

In lieu of the requirement(s) referred to in Item E above, the conditions as specified below in Variance Attachment A, Variance Attachment B, and Variance Attachment C shall apply to the products and devices manufactured under this variance and to the shows assembled and produced under this variance.

G. Basis for Approval of Variance

In accordance with 21 CFR 1010.4(a)(2), it has been determined that the product is required to perform a necessary function or is intended for a special purpose which cannot be performed or accomplished with equipment meeting the requirements referred to in Section E. Suitable means of radiation safety and protection will be provided by constraints on the physical and optical design, and by warnings in the user/purchaser information.

H. Certification Label

The certification label required by 21 CFR 1010.2 shall be modified in accordance with 21 CFR 1010.4(d) to state:

This product is in conformity with performance standards for laser products under 21 CFR 1040, except with respect to those characteristics authorized by Variance Number [REDACTED] effective on June 23, 20[REDACTED].

This variance action is available for public disclosure in the Division of Dockets Management, Food and Drug Administration, and a notice of availability will be published in the FEDERAL REGISTER. The variance will remain in effect until the termination date unless the variance is amended or withdrawn, or the provisions of the standard from which the variance is granted are amended before the termination date.

Should you have any questions or comments pertaining to this letter, please contact Dale Smith by email at LDS@cdrh.fda.gov or by telephone at (301) 796-5868. In any follow-up correspondence, please clearly reference FDA Variance Number [REDACTED] and include a contact email address.

Sincerely,

A handwritten signature of "Robert Ochs" in black ink, with the letters "FDA" in blue ink to the right, all contained within a blue rectangular box.

Robert Ochs, Ph.D.
Director
Division of Radiological Health
Office of In Vitro Diagnostics and Radiological Health
Center for Devices and Radiological Health

cc: FDA Division of Dockets Management, Docket Number [REDACTED]

Enclosure(s): Attachments A, B, and C

Variance Attachment A

1. This variance is not transferable to any other firm or person and applies only to the specific products identified in Section D of the variance.
2. All laser products, systems, shows, and projectors shall be certified to comply with applicable requirements of 21 CFR 1040.10 and the conditions of this variance and be reported as required by 21 CFR 1002.10 and 1002.11 using the reporting guides provided for such purpose. These actions shall be accomplished prior to any introduction into commerce.
3. Effects not specifically indicated in this variance approval shall not be performed. Any additional effects require the submission of an amendment request (using Form 3147 or in accordance with 21 CFR 1010.4) and the filing of product reports or supplements as applicable.
4. Laser projection systems and light shows manufactured, assembled, produced, or distributed under this variance shall not be transferred to any other party until the recipient has demonstrated that they have a variance, as required, in effect that permits them to produce certified laser light shows incorporating these laser projection systems. A notation of the recipient's variance number and its effective date, as applicable, shall be entered and retained in the records of compliance test results required by 21 CFR 1002.30.
5. Scanning, projection, or reflection of laser and collateral radiation (light show radiation) into audience or other accessible, uncontrolled areas shall not be permitted except for:
 - a. Diffuse reflections produced by the atmosphere, added atmospheric scattering media, or target screens; or
 - b. Projections produced by the projectors identified for audience scanning in Section D of this variance that will be controlled and monitored by the PASS™ controller in accordance with the conditions of Attachment C of this variance.
6. Access to radiation levels in excess of the limits of Class I by any person other than operators, performers, or employees shall not be permitted at any point less than 3.0 meters above any surface upon which such persons are permitted to stand or 2.5 meters below or in lateral separation from any place where such persons are permitted. Operators, performers, and employees shall not be required or allowed to view radiation above the limits of Class I or be exposed to radiation above the limits of Class II.
7. Any product which relies on scanning to meet access, exposure, or product class limits shall incorporate a scanning safeguard system which directly senses scanner motion and which will react fast enough to preclude exceeding the applicable limit.
8. All laser light shows shall be under the direct and personal control of a trained, competent operator(s). The operator(s) shall:

- a. Be an employee of the variance holder who shall be responsible for the training and conduct of the operator;
 - b. Be located where all propagating beam paths, their terminations, and the audience can be directly observed at all times;
 - c. Be in communication with personnel assisting in surveillance of the laser display;
 - d. Immediately terminate (or designate the termination) of the emission of light show radiation in the event of any unsafe condition and, for open air shows, at the request of any air traffic control officials; and
 - e. Ensure one or more readily accessible controls are provided to immediately terminate laser radiation.
9. The maximum laser projector output power shall not exceed the level required to obtain the intended effects.
10. The projection system (i.e., the projector and all other components used to produce the lighting effects) shall be securely mounted or immobilized to prevent unintended movement or misalignment. In addition:
- a. Electronic controls and circuits shall be adequately shielded to prevent electromagnetic sources (e.g., walkie-talkies, headset radios, wireless microphones, cellular telephones, etc.) in the vicinity of the projector, its active projection heads, and control system(s) from causing the laser emissions to be misdirected from their intended target area.
 - b. Beam masking to prevent projections into prohibited areas or directions or overfilling of screens, beam stops, targets, etc. shall be incorporated as an inherent part of the system design. Such devices may be adjustable if the system's intended use environment requires such capability.
11. In addition to the requirements of 21 CFR 1040.10(h), the manufacturer of laser projectors/systems shall provide to parties who purchase, lease, or borrow the equipment, adequate user's instructions for safe installation and operation. These instructions shall also explain the responsibility of the recipient as an independent light show manufacturer to submit the required reports and apply for and obtain a variance from the Center for Devices and Radiological Health (CDRH) prior to the introduction into commerce of any laser light shows.
12. The requirements of 21 CFR 1002.30(a)(1) and (2) shall be accomplished through the use of written procedures for setup, alignment, testing, and performance of each show. These procedures shall be in sufficient detail to ensure compliance with 21 CFR 1040.10, the conditions of this variance, and any emergency shutdown requirements, and the control of access to radiation areas using the procedures described in the ANSI Z136.1:2007 Standard For The Safe Use of Lasers (available from The Laser Institute of America, 13501 Ingenuity Drive, Suite 128, Orlando, Florida 32826) or any other equivalent user consensus standard and, where applicable, State or local requirements.

- a. Laser radiation areas which can contain radiation levels above Class I or II as applicable, shall be clearly identified by the posting of warning signs and/or restricting access through physical means (such as pressure switches, photocells, barriers, guards, etc.). These requirements apply to temporary areas (such as during setup and alignment procedures) and to final or permanent areas.
 - b. The variance holder shall retain the records of these procedures and the results of all tests as required by 21 CFR 1002.31. A copy of the variance application, the approval letter, Laser Notice 55, the most recent annual report, CDRH acknowledgment of receipt for the annual report, current procedures, and records relating to each particular show shall be with the operator or other responsible individual and shall be made available for inspection by FDA and other responsible authorities.
13. The firm or person to whom this variance is issued shall maintain complete records of all show itineraries with dates, locations, operator name, and contact information clearly and completely identified. Records shall contain the specific equipment used, a basic description of proposed effects and a statement of the maximum power output used. These records shall be available to the Food and Drug Administration upon request.
14. Advance written notification shall be made as early as possible to appropriate Federal, State, and local authorities providing show itinerary with dates and locations clearly and completely identified, and a basic description of proposed effects including a statement of the maximum power output intended. Such notifications shall be made, but not necessarily be limited, to:
- a. The Federal Aviation Administration (FAA) and the Department of Defense (DOD) for any projections into open airspace at any time (i.e., including setup, alignment, rehearsals, performances, etc.). If the FAA or DOD objects to any laser effects, the objections shall be resolved and any conditions requested by FAA and DOD will be adhered to. If these conditions cannot be met, the objectionable effects shall be deleted from the show.
 - b. State and local radiation control offices/agencies for all shows to be performed within their jurisdictions. All requirements of State and local law shall be satisfied and any objections raised by local authorities shall be resolved or the effects deleted.

Variance Attachment B

This attachment provides the list of information to be provided to the Federal Aviation Administration (FAA) and the Department of Defense (DOD) in notifications of outdoor laser light shows (demonstrations) which cause projections into the sky. This information is required to permit FAA and DOD jointly to do the aeronautical study necessary to determine whether or not the proposed effects are objectionable.

SUBMISSION OF NOTIFICATIONS

1. All notifications are to be directed to the Air Traffic Division at the FAA regional office having jurisdiction over the area where the laser show will take place.
2. FAA needs at least 30 days advance notice to process a request and conduct an aeronautical study. The FAA recognizes that industry conditions may not always permit the advance notice desired. While FAA endeavors to accommodate all requests, proper conduct of the aeronautical study to determine airspace effects is essential to air safety. This is particularly true when the nature of the demonstration is in close proximity to an airport or would necessitate protection of large amounts of airspace. In these cases, it may be impossible for the FAA to respond to short-notice requests.
3. Notifications are required for all demonstrations in which laser light beams may be directed or reflected into airspace (including set-up, alignment, and rehearsals). Notifications should contain sufficient technical information to allow proper evaluation. The primary concern is the range and elevation from the source of the airspace which may be affected by the display.
4. A proponent wishing to provide supplementary information about measures which will result in a smaller actual danger area than that shown in the Laser System Power Range Table (Table 29-2-1, FAA Order 7400.2K, Chg. 1) should submit the data in advance to CDRH for review. CDRH will validate the information and issue a letter to the proponent to include with their notification to the FAA.

CONTENT OF NOTIFICATIONS

1. Notifications to the FAA regional office will include the following information on all proposed outdoor demonstrations:
 - a. Laser group/company (point of contact)
 - b. Business addresses
 - c. Telephone number
 - d. CDRH Variance number and expiration date
 - e. Date(s) and time(s) of setup and alignment
 - f. Date(s) and time(s) of shows(s)
 - i. Show length
 - ii. Running time

- g. Location of the show
 - i. Show place name and address
 - ii. Latitude and longitude of show place in Degrees, Minutes and Seconds
 - iii. Maps (USGS 7.5 Quadrangle or acceptable alternate)
- h. Class/Type of Laser (CW or Pulsed*)
- i. Maximum emitted power (watts)/repetition frequency (kHz) at the projector as certified to CDRH
- * Note: Repetitive pulsed laser data (e.g., equipment type, pulse duration, etc.) shall be validated by CDRH, and shall accompany submission to the FAA.
- j. Azimuth direction of beams
- k. Elevation of beams in degrees above the horizon
 - i. Maximum; and
 - ii. Minimum
- l. Beam divergence (milliradians)
- m. Maximum distance from source for irradiance of 2.6 mW/cm^2 , $100 \mu\text{W/cm}^2$, and $5 \mu\text{W/cm}^2$ based on maximum emitted power
- n. Maximum altitude above source for irradiance of 2.6 mW/cm^2 , $100 \mu\text{W/cm}^2$, and $5 \mu\text{W/cm}^2$ based on maximum emitted power
- o. A diagram depicting all beam arrays terminated/unterminated
- p. Laser safety officer/operator:
 - i. Local address and phone number, to include an operational telephone number at the site
 - ii. Additional safety procedures:
 - i. Communications procedures during the show;
 - ii. Visual aircraft spotters; and
 - iii. Other
- q. Quality Assurance Program, describing physical/procedural control of:
 - i. Laser power;
 - ii. Beam divergence;
 - iii. Azimuth and elevation of beam paths;
 - iv. Beam termination surfaces; and
 - v. Emergency shutdown procedures

2. Supplementary information if applicable. Include the CDRH letter validating the measures which result in a smaller affected area than that shown in the Laser System Power Range Table (Table 29-2-1, FAA Order 7400.2K, Chg. 1).

Variance Attachment C

This attachment is applicable only to those laser effects produced by the projectors and scanning safeguard system as identified in Section D, "Product(s) for Which Variance is Granted," for audience scanning.

1. Each of the firm's projection systems incorporated into the firm's laser light shows shall be operated with effective means to prevent any part of the audience from approaching closer than the Minimum Audience Distance from the front of that projector. The lateral clearance distance specified in Attachment A, Condition 6, shall also be met by any scanning that is below 3.0 meters at any distance less than the Minimum Audience Distance for the particular projector.
2. When the firm's projectors are incorporated into a laser light show for audience scanning, the effects produced shall be subject also to the following conditions in accordance with Condition 5(b) of Attachment A of this variance.
 - a. The emission levels of the scanned laser output shall not exceed the limits of Class I determined in accordance with 21 CFR 1040.10(d), Table I, for any emission duration up to 10 seconds at locations that are within the scan field of the projection system, less than 3.0 meters above the floor, and more than 10 meters from the front of the projection system.
 - b. The maximum exposure in the event of a scanning system failure shall be prevented from exceeding the Maximum Permissible Exposure (MPE) for ocular exposures determined in accordance with ANSI Z136.1:2007, Tables 5a, 8a, 8b, and 9 ("§" footnote) for any exposure duration possible within the total reaction time of the scanning safeguard system and at any one location less than 3.0 meters above the floor in the audience or in other unrestricted areas.
 - c. The PASS™ controller shall have a means necessary to monitor:
 - i. The power supply for the x-y scanner drivers;
 - ii. The instantaneous beam velocity caused by scanning action to determine that it is above the minimum preset value;
 - iii. The angular pattern size to determine that it is above the minimum acceptable size;
 - iv. The angular pattern size in a way that provides logically redundant monitoring of the instantaneous beam velocity;
 - v. The beam power in real time to determine that:
 1. Beam power does not exceed the maximum beam power that assures that the applicable MPE is not exceeded;
 2. Beam power is not emitting when it should be blanked; and
 3. The real time beam power monitor is functioning;

- vi. The beam position to determine if it is below the 3 meter horizon where the monitor control system must be enabled to limit the projections in accordance with c.2, c.3, and c.4; and
 - vii. The proper operation of the monitor control system or Monitor Control Board.
- d. In the event that any monitored parameters indicated above fail to meet their permitted limits, the system shall terminate all laser emissions.
 - e. The projection system shall be provided with the instrumentation necessary to perform the field calibration procedures:
 - i. Measuring and setting irradiance of the stationary beam at the audience barrier,
 - ii. Verifying beam termination reaction time,
 - iii. Setting maximum acceptable beam power, and
 - iv. Setting the projection system's horizon to meet the 3 meter clearance requirement, since the monitor control system does not limit the laser projection output levels for projections above the horizon.
 - f. The compliance test records required by Condition 12 of Attachment A of this variance for the laser light shows incorporating the [REDACTED] System shall record the results of the field calibration tests identified in paragraph 2.e. of this Attachment. The record shall record the values determined for the irradiance and the maximum acceptable beam power.
 - g. The Laser Safety Officer shall determine if, in accordance with ANSI Z136.1:2007, "there is a reasonable probability of accidental viewing with optics". This determination shall be based on the nature of the facility, the nature of the event, and whether effective security measures are taken to prevent the use of such optical aids. Assessment of the security measures, where warranted, for adequacy and effectiveness shall be based on a detailed review of audience entrance security (including physical searches of audience possessions), and review with operating staff, photographers, camera operators, and venue management of the laser operation.

If the LSO does not find these controls adequate then either:

- i. The LSO shall modify the MPE and related parameters for aided viewing conditions; or
- ii. Audience scanning shall be removed from the show.

FDA Form 7140-1 (July 2021)



**U.S. Department
of Transportation**
Federal Aviation
Administration

Note: Instructions on how to fill out this form are in FAA Advisory Circular AC70-1. Version AC70-1A dated 03/14/19 is in use as of October 2021. A significantly revised version AC70-1B should be released in late 2021 — use the "B" version if available online from FAA.

FAA Form 7140-1, Notice of Proposed Outdoor Laser Operation(s)

Who Should Complete and Submit This Form

Any person, entity, or proponent planning to conduct outdoor laser operations with a visible laser beam exceeding 50 nanowatts per square centimeter or with a (visible or non-visible) laser beam that exceeds the maximum permissible exposure in navigable airspace. FAA encourages proponents to contact the applicable FAA service center for guidance.

Instructions to Complete

Consult FAA Advisory Circular (AC) 70-1 for detailed instructions to assist with completing and submitting this form. Reference FAA Order JO 7400.2, Chapter 29 for additional background information. FAA provides public access to these documents via https://www.faa.gov/regulations_policies.

Please print or type on this form and complete all sections prior to submission to the appropriate FAA service center. To enhance clarity, use plain language and numbers, e.g., decimal notation (0.7277) instead of scientific notation (72.77x10-2 or 72.77E-02). Failure to provide all requested information may delay processing.

Paperwork Reduction Act Statement

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB control number. The OMB control number for this information collection is 2120-0662. Public reporting for this collection of information is estimated to be approximately 240 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing, and reviewing the collection of information.

The Federal Aviation Administration (FAA) requires all responses to this collection of information if the proponent wishes to obtain or retain benefits available per Title 21 Code of Federal Regulations Part 1010 if projecting into navigable airspace. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Federal Aviation Administration, 10101 Hillwood Parkway, Fort Worth, TX 76177-1524.

Print form

Form Approved OMB No 2120-0662
Expiration Date: 07/31/2024



U.S. Department of Transportation
Federal Aviation Administration

Notice of Proposed Outdoor Laser Operation(s)

<i>Please print or type on this form. Failure to provide all requested information may delay processing.</i>											
U.S. Department of Transportation Federal Aviation Administration											
Notice of Proposed Outdoor Laser Operation(s)											
1. General information <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">a. To: <i>(FAA Service Center)</i></td> <td style="width: 50%;">b. From: <i>(Proponent)</i></td> </tr> <tr> <td>c. Name of event or facility</td> <td>d. Report date</td> </tr> <tr> <td>e. Customer</td> <td>f. Site address</td> </tr> </table>						a. To: <i>(FAA Service Center)</i>	b. From: <i>(Proponent)</i>	c. Name of event or facility	d. Report date	e. Customer	f. Site address
a. To: <i>(FAA Service Center)</i>	b. From: <i>(Proponent)</i>										
c. Name of event or facility	d. Report date										
e. Customer	f. Site address										
2. Date(s) and time(s) of laser operation <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Testing and alignment</td> <td>b. Operation</td> </tr> </table>						a. Testing and alignment	b. Operation				
a. Testing and alignment	b. Operation										
3. Brief description of laser operation <div style="height: 100px; border: 1px solid #ccc; margin-top: 10px;"></div>											
4. On-site operation information <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Operator(s)</td> <td colspan="2"></td> </tr> <tr> <td>b. On-site phone #1 <i>(primary)</i></td> <td colspan="2">c. On-site phone #2 <i>(secondary)</i></td> </tr> </table>						a. Operator(s)			b. On-site phone #1 <i>(primary)</i>	c. On-site phone #2 <i>(secondary)</i>	
a. Operator(s)											
b. On-site phone #1 <i>(primary)</i>	c. On-site phone #2 <i>(secondary)</i>										
5. FDA/CDRH information (if applicable) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Variance #</td> <td>b. Variance expiration date</td> <td>c. Accession #</td> </tr> </table>						a. Variance #	b. Variance expiration date	c. Accession #			
a. Variance #	b. Variance expiration date	c. Accession #									
6. Brief description of control measures <div style="height: 100px; border: 1px solid #ccc; margin-top: 10px;"></div>											
7. Attachments <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Number of laser configurations: State the total number of configurations and complete a Laser Configuration Worksheet (page 2) for each configuration</td> <td>b. Attachments: List all attachments, e.g., maps, diagrams, control measure details, calculation details, or software printouts</td> </tr> </table>						a. Number of laser configurations: State the total number of configurations and complete a Laser Configuration Worksheet (page 2) for each configuration	b. Attachments: List all attachments, e.g., maps, diagrams, control measure details, calculation details, or software printouts				
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8. Designated contact person (if FAA requires further information) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Name</td> <td>b. Position</td> </tr> <tr> <td>c. Phone</td> <td>d. Fax</td> </tr> <tr> <td colspan="2">e. E-mail</td> </tr> </table>						a. Name	b. Position	c. Phone	d. Fax	e. E-mail	
a. Name	b. Position										
c. Phone	d. Fax										
e. E-mail											
9. Statement of accuracy <i>To the best of my knowledge, the information provided in this form (all pages) and corresponding attachment(s) is accurate and correct</i> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>a. Name</td> <td>b. Position</td> </tr> <tr> <td>c. Signature</td> <td>d. Date</td> </tr> </table>						a. Name	b. Position	c. Signature	d. Date		
a. Name	b. Position										
c. Signature	d. Date										

Print form

Form Approved OMB No 2120-0662
Expiration Date: 07/31/2024

Please print or type on this form. Failure to provide all requested information may delay processing.

Laser Configuration Worksheet			
10. Configuration information			
a. Configuration number _____ of _____ <i>(example: 7 of 9)</i>		b. Brief description of configuration	
11. Geographic location			
a. Site elevation, in feet: _____ mean sea level	d. Information determined by: <input type="checkbox"/> GPS <input type="checkbox"/> Map (topo) <input type="checkbox"/> Other _____		
b. Laser height above site elevation, in feet: _____ above ground level	e. Latitude: _____ degrees, _____ minutes, _____ seconds		
c. Overall laser elevation (a) + (b), in feet: _____ mean sea level	f. Longitude: _____ degrees, _____ minutes, _____ seconds		
12. Beam characteristics and calculations <i>(check only one mode of operation and fill in only that column)</i>			
MODE OF OPERATION	<input type="checkbox"/> Single pulse	<input type="checkbox"/> Continuous wave	<input type="checkbox"/> Repetitively pulsed
a. Laser and beam characteristics			
Laser type <i>(example: CO₂, diode, or Nd-YAG)</i>			
Laser hazard class <i>(example: Class 2, Class 3B, or Class 4)</i>			
Power Watts (W)	(not applicable)	(maximum power)	(average power)
Pulse energy Joules (J)		(not applicable)	
Pulse duration Seconds (s)		(not applicable)	
Pulse repetition frequency (PRF) Hertz (Hz)		(not applicable)	
Beam diameter at 1/e points Centimeters (cm)			
Beam divergence 1/e at full angle Milliradians (mrad)			
Wavelength(s) Nanometers (nm)			
b. Maximum permissible exposure (MPE) values <i>(use this value to calculate the NOHD)</i>			
MPE Milliwatts per square cm (mW/cm ²)	(not applicable)		
MPE per pulse Joules per square cm (J/cm ²)		(not applicable)	
c. Visual effect calculations			
<i>The following items are for lasers with visible wavelengths (400-700 nm). If the laser has no visible wavelengths, enter "N/A (non-visible laser)" in all blocks.</i>			
Pre-corrected power (PCP) Watts (W)	Pulse energy (J) x 4	Maximum power (W)	Pulse energy (J) x PRF (Hz)
Visual Correction Factor (VCF) Enter "1.0" or use FAA AC 70-1 Table 3			
Visually Corrected Power See FAA AC 70-1			
13. Beam direction(s)			
a. Minimum elevation angle (degrees, where horizontal = 0 degrees)	c. Azimuth (degrees)	<input type="checkbox"/> True north or <input type="checkbox"/> Magnetic north	
b. Maximum elevation angle (degrees)	d. Magnetic declination (degrees)		
14. Protection and visual interference distances <i>(fill in the entire NOHD row and the entire column for the applicable mode of operation)</i>			
	Slant range (feet)	Horizontal distance (feet)	Vertical distance (feet)
a. NOHD (based on MPE value)			
<i>The following items are for lasers with visible wavelengths (400 nm to 700 nm). If the laser has no visible wavelengths, enter "N/A (non-visible laser)" in all blocks.</i>			
b. SZED (for 100 μW/cm ²)			
c. CZED (for 5 μW/cm ²)			
d. LFED (for 50 nW/cm ²)			
15. Calculation method			
<input type="checkbox"/> Commercial software (product name and version) <input type="checkbox"/> Other (describe method such as a spreadsheet or calculator)			

Outdoor laser show example

This is an example show using a RGB diode projector with 20 watts total output. Below is a screenshot captured from Skyzan Online showing information that will be needed by FAA.

The next pages have filled-out FAA forms for this show. Although the FAA forms shown here are in older formats, the information is essentially the same as what would be put on the current (as of October 2021) FAA Form 7140-1.

SKYZAN Hazard Analysis

Fri 22 Feb, 2019
Version 6.0

Laser Information

Wavelength: Multiple
Laser Mode: Continuous Wave

Beam Information

Beam Diameter: 2 mm
Beam Divergence: 2 mrad
Min. Elevation Angle: 10 Degrees
Max. Elevation Angle: 30 Degrees
Visual Correction Factor: 0.26
Total Power: 20 Watts
Visually Corrected Power: 5.2 Watts
Absorption Factor (μ): 0

Continuous Wave Parameters

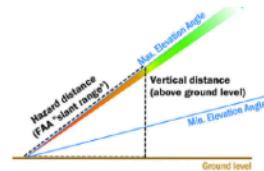
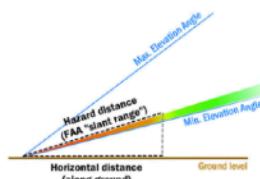
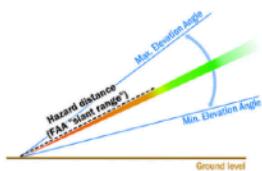
Average Power: 20 Watts
Exposure Time: .25 Seconds

Single/Multiple Pulse Parameters

Laser Output: N/A
Pulse Length: N/A
Pulse Rate: N/A
Total Exposure Time: N/A

Multiple Wavelength Parameters

	Wavelength	Power	VCF
Laser 1	450	8	0.038
Laser 2	520	5	0.7092
Laser 3	638	7	0.19314
Laser 4	N/A	N/A	N/A
Laser 5	N/A	N/A	N/A



What FAA calls "slant range" is simply the straight-line distance along the laser beam that it is a potential hazard. FAA also wants to know two other distances:
1) The farthest possible horizontal hazard distance, which is calculated when the beam is at its minimum elevation angle, and
2) the highest possible vertical hazard distance, which is calculated when the beam is at its maximum elevation angle.

Value Used for Calculations	Results in Feet		
	Distance from the laser. The FAA calls this the slant range. See diagrams above.	For angled beams, the maximum Horizontal Distance along the ground. See middle diagram above.	For angled beams, the maximum Vertical Distance (altitude) above the ground. See right-hand diagram above.

Eye and Skin Hazard Distances

NOHD	Maximum Permissible Exposure .00255 W/cm ²	1640.113	1615.196	820.056
SKIN	N/A			
FIRE	Coming Soon	Coming Soon	Coming Soon	Coming Soon

FAA Visual Interference Distances

SZED	Sensitive Zone Exposure Limit .0001 W/cm ²	4217.713	4153.636	2108.856
CZED	Critical Zone Exposure Limit .000005 W/cm ²	18869.445	18582.776	9434.722
LFED	Laser-Free Zone Exposure Limit .00000005 W/cm ²	188744.209	185876.761	94372.105

Form Approved OMB No 2120-0662

Expiration Date: 08/31/2021

See AC 70-1 for instructions and disposition of this form. Please print or type on this form. Failure to provide all requested information may delay processing of your notice.

**U.S. Department of Transportation
Federal Aviation Administration**

This area for FAA use only

NOTICE OF PROPOSED OUTDOOR LASER OPERATION(S)

1. GENERAL INFORMATION

(a) To: (FAA Service Center) Airspace Branch, ASO-520, FAA Southern Regional Office, PO Box 20636, Atlanta, GA 30320, (404) 555-5585, fax 555-5099	(b) From: (<i>Proponent</i>) DCC Laser Company, 2505 Yale Avenue, Seattle, WA 98102, (206) 555-0215, fax 555-1997, mail@dcclc.com
(c) Event or facility Music festival, Metropolis Outdoor Concert Pavilion	(d) Report date July 20, 2021
(e) Customer Concert Staging Lighting and Sound Co. 7654 Warehouse Drive Metropolis, IL 62960 (618) 555-0418, fax 555-1938	(f) Site address Metropolis Outdoor Concert Pavilion 100 American Way Metropolis, IL 62960

2. DATE(S) AND TIME(S) OF LASER OPERATION

(a) Testing and alignment August 9-10, 2021, 5 pm - 11 pm	(b) Operation August 11, 2021, 8 pm - 11:30 pm
---	--

3. BRIEF DESCRIPTION OF OPERATION

Full-color visible laser beams aimed from back of stage, over audience, into airspace

4. ON-SITE OPERATION INFORMATION

(a) Operator(s) Joe Schuster, Bob Kane	(b) On-site phone #1 (407) 555-1234	(c) On-site phone #2 (212) 555-5678
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5. FDA CDRH LASER LIGHT SHOW VARIANCE (if applicable)

(a) Variance # 81P-103	(b) Accession # 1756-2150	(c) Expiration date Dec. 31, 2021
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6. BRIEF DESCRIPTION OF CONTROL MEASURES

Laser operator plus two spotters, one on either side of stage, looking into airspace, in headset communication with laser operator and using binoculars throughout the 3.5 hour performance

7. ATTACHMENTS

- (a) Number of laser configurations *Fill out one copy of page 2 of this Notice (e.g., items 10-15 on the next page) for each configuration*
1
- (b) List additional attachments *(including maps, diagrams, details of control measures, and details of calculations or software printouts)*
Plan and elevation of pavilion, showing laser source and beam directions
Photograph of laser view of sky, taken from stage
Checklist and procedures with outdoor-relevant ones highlighted

8. DESIGNATED CONTACT PERSON (if further information is needed)

(a) Name Joe Schuster	(b) Position Laser Safety Officer, DCC Laser Co.
(c) Phone (407) 555-1234	(d) Fax (206) 555-1997

9. STATEMENT OF ACCURACY

To the best of my knowledge, the information provided in this Notice (both sides) and the attachment(s) is accurate and correct

(a) Name <i>(if different from contact person)</i> Jerry Siegel	(b) Position President, DCC Laser Co.
(c) Signature 	(d) Date July 21, 2021

FAA Form 7140-1

Page 1 of 2

12/30/04

AC 70-1
Appendix 1

Please Type or Print on This Form

Form Approved OMB No. 2120-0662

Failure To Provide All Requested Information May Delay Processing of Your Notice

FOR FAA USE ONLY

U.S. Department of Transportation
Federal Aviation Administration**LASER CONFIGURATION WORKSHEET**

1. CONFIGURATION INFORMATION		(b) Name of event/facility: Metropolis Outdoor Concert Pavilion	(c) Report date: July 20, 2020
(d) Brief Description of Configuration: Full-color visible laser beams aimed from back of stage, over audience, into airspace			
2. GEOGRAPHIC LOCATION		(d) Latitude 39 ° (deg.) 12 ' (min.) 33.29 " (sec.)	
(a) Site Elevation (ft. above Mean Sea Level) 470		(e) Longitude 76 ° (deg.) 51 ' (min.) 45.61 " (sec.)	
(b) Laser Height Above Site Elevation (ft.) 20		(f) Determined by: <input type="checkbox"/> GPS <input checked="" type="checkbox"/> Map (Quad) <input type="checkbox"/> Other	
(c) Overall Laser Elevation (a + b) 490		(g) Horizontal Datum: <input type="checkbox"/> NAD 27 <input checked="" type="checkbox"/> NAD 88	
		(h) Vertical Datum: <input type="checkbox"/> NGVD 29 <input checked="" type="checkbox"/> NAVD 88	
3. BEAM CHARACTERISTICS AND CALCULATIONS (check one Mode of Operation only, and fill in only that column)			
Mode of Operation	<input type="checkbox"/> SINGLE PULSE	<input checked="" type="checkbox"/> CONTINUOUS WAVE	<input type="checkbox"/> REPETITIVELY PULSED
Laser Type (lasing medium)	(not applicable)	Laser diodes	
Power Watts (W)		maximum power 20	average power
Pulse Energy Joules (J)		(not applicable)	
Pulse Width Seconds (s)	(not applicable)	(not applicable)	
Pulse Repetition Frequency Hertz (Hz)		(not applicable)	
Beam Diameter @ 1/e points Centimeters (cm)		2	
Beam Divergency 1/e @ full Angle Milliradians (mrad)		2	
Wavelength(s) Nanometers (nm)		450, 520, 638	
(a) MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS (will be used to calculate NOHD).			
MPE W/cm ²	(not applicable)	0.00254	
MPE per pulse J/cm ²		(not applicable)	
(b) VISUAL EFFECT CALCULATIONS (will be used only for visible lasers [400-700 nm] to calculate SZED, CZED, and LFED)			
Pre-Corrected Power (PCP) Watts (W)	Pulse Energy (J) x 4	Maximum Power (from above) 20	Pulse Energy (J) x PRF (Hz) OR Average Power
Visual Correction Factor (VCF) (Enter "1.0" or use Table 5)		0.26	
Visually corrected Power PCP x VCF		5.2	
4. BEAM DIRECTION(S)		Magnetic variation (degrees)	
Maximum elevation angle (degrees)	30	Azimuth (degrees)	True
Minimum elevation angle (degrees, where horizontal = 0 °)	10		Magnetic
45 to 135			
5. CALCULATED DISTANCES (fill in all three columns)			
NOHD (based on MPE)	1,640	HORIZONTAL DISTANCE (ft.)	VERTICAL DISTANCE (ft.)
*SZED (for 100 μ W/cm ² level)	4,218	1,615	820
*CZED (for 5 μ W/cm ² level)	18,869	4,154	2,109
*LFED (for 50 n W/cm ² level)	188,744	18,583	9,435
		185,877	94,372
*If the laser has no wavelengths in the visible range (400-700 nm), enter "N/A (non-visible laser)" in all blocks. For visible lasers, if the calculated SZED, CZED, and/or LFED is less than the NOHD, enter "less than NOHD." than NOHD."			
6. CALCULATION METHOD <input checked="" type="checkbox"/> Commercial software (print product name) Skyzan Online v. 6.0			
<input type="checkbox"/> Other [(describe method (spreadsheet, calculator, etc.])			

Canada Notice of Proposal



Transport
Canada Transports
Canada

NOTICE OF PROPOSAL TO CONDUCT OUTDOOR LASER OPERATION(S)

To: Select one	From (applicant)	Date of notice (yyyy-mm-dd)
SECTION 1 – GENERAL INFORMATION		
Event or facility		
Customer	Site Address	
GEOGRAPHIC LOCATION / AREA		
Latitude degrees (°) _____ minutes (') _____ seconds (")	Longitude degrees (°) _____ minutes (') _____ seconds (")	
Area of operation (if required for mobile or airborne configurations such as mounted on Remotely Piloted Aircraft Systems (RPAS), etc)		
Ground elevation at site (above mean sea level)(ft)	Laser elevation above ground (if on buildings, etc.)(ft)	
Determined by <input type="radio"/> GPS <input type="radio"/> Topographic Map <input type="radio"/> Other (specify): _____		
DATE(S) AND TIME(S) OF LASER OPERATION		
Testing and alignment	Operation	
SECTION 2 – DESCRIPTION OF OPERATION		
SECTION 3 – ON-SITE OPERATION INFORMATION		
Operator(s)		
On-site telephone number 1 (999-999-9999)	On-site telephone number 2 (999-999-9999)	

26-0754E (1806-04)

Page 1 of 4

Canada

SECTION 4 – DESCRIPTION OF CONTROL MEASURES**SECTION 5 – ATTACHMENTS**

Number of laser configurations (fill out one copy of page 3 of this notice ["Laser Configurations Worksheet"] for each configuration)

List any additional attachments needed to evaluate this operation (could include maps, diagrams, and details of control measures)

SECTION 6 – DESIGNATED CONTACT PERSON (if future information is needed)

Name	Position
Telephone number (999-999-9999)	Fax number (999-999-9999)

SECTION 7 – STATEMENT OF ACCURACY

To the best of my knowledge, the information provided in this Notice of Proposal is accurate and correct.

Name (if different from contact person)

Position

Signature

Date (yyyy-mm-dd)

26-0754E (1806-04)

Page 2 of 4

Canada

LASER CONFIGURATION WORKSHEET

Fill out one copy of this form for each laser or laser configuration used at the outdoor laser operations site.

SECTION A – CONFIGURATION INFORMATION

Name of Event or facility	This page is configuration Number _____ of _____	Date (yyyy-mm-dd)
---------------------------	---	-------------------

Brief description of configuration

SECTION B – BEAM CHARACTERISTICS AND CALCULATIONS (check only one Mode of Operation, and only fill in that column)

Mode of Operation	Single Pulse <input type="radio"/>	Continuous Wave <input type="radio"/>	Repetitively Pulsed <input type="radio"/>
Laser Type (lasing medium)			
Power Watts (W)	(not applicable)	Maximum power	Average power
Pulse Energy Joules (J)		(not applicable)	
Pulse Width Seconds (s)		(not applicable)	
Pulse Repetition Frequency (PRF) Hertz (Hz)	(not applicable)	(not applicable)	
Beam Diameter at 1/e points Centimetres (cm) (not mm)			
Beam Divergence 1/e at full angle Milliradians (mrad)			
Wavelength(s) Nanometres (nm)			

MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS (will be used to calculate nominal ocular hazard distance (NOHD))

MPE (W/cm ²)	(not applicable)		
MPE per pulse (J/cm ²)		(not applicable)	

VISUAL EFFECT CALCULATIONS (will be used only for visible lasers to calculate sensitive zone exposure distance (SZED), critical zone exposure distance (CZED) and laser-free exposure distance (OLFED))

Pre-Corrected Power (PCP) Watts (W)	Pulse Energy (J) * 4	Maximum Power (from above)	Average Power OR Pulse Energy (J) x PRF (Hz)
Visual Correction Factor (VCF) Enter "1.0" or use Table 5			
Visually Corrected Power PCP x VCF			

SECTION C – BEAM DIRECTION(S)

Azimuth (degrees)	<input type="radio"/> True <input type="radio"/> Magnetic	Magnetic variation (degrees)
Minimum elevation angle (degrees, where horizontal = 0°)		Maximum elevation angle (degrees)

SECTION D – DISTANCES CALCULATED FROM ABOVE DATA (fill in all three columns for NOHD. If a visible laser, fill in all three columns for SZED, CZED , LFED)

	Slant Range (ft)	Horizontal Distance (ft)	Vertical Distance (ft)
Nominal Ocular Hazard Distance			
NOHD (based on MPE)			

Visual Effects Distances (If the laser has no wavelengths in the visible range (400-700nm), enter "N/A (non-visible laser)" in all blocks below. For visible lasers, if the calculated SZED, CZED, and/or LFED is less (shorter distance) than the NOHD, you must enter "Less than NOHD".

SZED (for 100 μW/cm ² level)			
CZED (for 5 μW/cm ² level)			
LFED (for 50 nW/cm ² level)			

SECTION E – CALCULATION METHOD

Print product name <input type="radio"/> Commercial Software	Describe method (spreadsheet, calculator, etc.) <input type="radio"/> Other
---	--

**INSTRUCTIONS FOR COMPLETING
NOTICE OF PROPOSAL TO CONDUCT OUTDOOR LASER OPERATION(S) FORM AND
LASER CONFIGURATION WORKSHEET**

Note: A laser is a high concentrated light beam, which has the potential to cause significant damage to the human eye and skin, depending on its energy and wavelength. A laser does not need to be "visible" to cause damage. Laser operating in the Retinal Hazard Region, namely visible and near-infrared regions of the electro-magnetic spectrum (ie 400nm to 1400 nm), can cause significant damage to the retina. Furthermore, lasers operating beyond the Retinal Hazard Region, such as UV and infrared regions, can cause damage to the skin and to the cornea of the eye.

- (a) Purpose of Form: The purpose of this form is to assess submissions by any person planning to project or to cause to be projected a directed bright light source into navigable airspace in order to determine conformance to **Canadian Aviation Regulations** (CAR) for aviation safety.
- (b) When to Complete the Form: Completed electronic or paper forms are to be submitted at least 30 days prior to an event where lasers are planned to be used outdoors.
- (c) Proponents are requested to ensure the form is complete and as specific as possible in order for the Minister to determine if the lasers constitute a hazard to air navigation in accordance with CAR 601.20 - Projection of Directed Bright Light Source at an Aircraft.
- (d) Supporting Data and Documents, if required, can be submitted as attachments to this form.
- (e) This form neither constitutes nor replaces any approvals, permits or assessments required by other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval/assessment may be required.
- (f) Completed applications are to be forwarded to the applicable Transport Canada (TC) Regional office listed in the dropdown list on the front page of this form. For more contact information about the TC Regional offices, see <https://www.tc.gc.ca/eng/regions.htm>.

1. Notice of Proposal Form

Section 1 – The name of the event or the facility where the laser is going to be used as well as the name and address of the proponent (individual or organization) submitting the Notice of Proposal.

- (a) Geographic Location – Latitudes and longitudes must be geographic coordinates, to within the nearest second or to the nearest hundredth of a second if known. Ground elevation is above sea level and laser elevation is above ground in feet. Indicate the method used to determine coordinates. For accuracy measurements, refer to the International Civil Aviation Organization (ICAO) Annex 15 Aeronautical Information Services.
- (b) Date and Time of Operation – Enter date and time of any testing and alignment (if required) and of the actual day of planned laser operation.

Section 2 – Provide a detailed narrative description of the proposal.

Section 3 – Provide the name of the individual who will be operating the laser and include a primary and secondary phone number where this individual can be reached at. List any additional attachments needed to evaluate each laser configuration.

Section 4 – Provide a detailed narrative description of any control measure intended to mitigate hazardous emissions.

Section 5 – Indicate how many different laser configurations/ planned to be used during the event and complete a separate *Laser Configuration Worksheet* for each configuration.

Section 6 – Indicate the required contact information for the individual designated to provide any additional information regarding this proposal.

Section 7 – The individual responsible for the planned laser operation(s) is to provide a statement of accuracy by printing his/her name and position and by signing and dating this form.

2. Laser Configuration Worksheet

Section A – The name of the event or the facility where the laser is going to be used as well as a brief description of the Laser configuration. Indicate which configuration of the total number of configurations submitted as well as the date of the submission.

Section B – Complete each data box under the appropriate column for the mode of operation (ie SP, CW or RP), including the calculated MPE and visual effect calculations.

Section C – Indicate the azimuth (or range of azimuth) of the beam in degrees and whether the measurement is in reference to Magnetic or True North. If Magnetic, provide the local variation. Provide the minimum and maximum elevation angles of the beam.

Section D – Complete each box in this section, providing the calculated ocular hazard distances in feet.

Section E – Indicate the method used to determine the calculated data.

Simple laser safety checklist

This was provided as an example by an ILDA Member. It may not be complete or sufficient for all laser light shows. You may need to add items for regulatory compliance and/or for your own company's record-keeping.

Laser System Projector Safety/Setup Checklist

Initial Startup

- 0 Turn on control computer, start laser software, power up laser control electronics. Turn on main power to lasers (if applicable).
- 0 Remove any spectators from the area; caution all qualified technicians near the projector. Check that all shrouds and masking are in place.
- 0 Verify laser projector is secure.
- 0 Check key switch for proper operation by trying to start lasers with key in OFF position. Turn key to ON position.
- 0 Push "Laser On" button on each of the laser controller displays. Record time on: _____
- 0 Observe that emission indicator lights (on the laser head) come on.
- 0 Confirm "E-STOP" button operation.
- 0 Verify proper interlock/laser shutter operation.

Laser Alignment

- 0 Keep spectators and all unessential personnel away from both the projector and termination area.
- 0 Verify visual control of the entire projection space from the operation location.
- 0 Verify physical masking is in place to prevent any laser emissions from reaching public areas.
- 0 Alert personnel that the laser alignment is about to take place. Check each scanner set for proper operation and adjust offset as needed for alignment. Make sure that all surfaces on to which beams terminate are free from specular reflection.
- 0 Ensure that front of projector is properly masked. Mask off any unnecessary openings.

Final Setup Check

- 0 All beams must be a minimum 8'3" lateral distance and 9'10" vertical distance from the floor to the lowest beam over the audience. Ensure that markings and barrier is in place to prevent access to the projector.
- 0 Check and verify communication with all laser spotter personnel.
- 0 Check setup grids on the projection surface and adjust offset for differences. Eliminate sources of any stray light at high power.
- 0 Record the operating beam power at each projector and record these measurements here:

Laser #1: _____ Laser #2: _____ Laser #3: _____

During the Performance

- 0 Be constantly alert for audience unruliness during the performance. If any beam misalignment or stray light develops, and/or laser spotter personnel make a call – turn that beam position off.
- 0 If any equipment malfunction develops that affects safe performance, the operator must immediately terminate the performance until the problems are corrected and safety conditions fully restored.

Post Performance

- 0 Turn off the laser power supply and remove keys to the lock box. Turn off laser projectors first, control electronics, then computers. **Time Off:** _____
- 0 Note any equipment malfunction that may have developed during the show. All reasonable efforts should be made to repair any such malfunction by next show.

Operator Signature: _____ **Show Date/Time:** _____

Name of Show and Location: _____