



Application for outdoor laser operations

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Author

A handwritten signature in blue ink, appearing to read "Henrik Hoffman".

Henrik Hoffman, Laser Safety Officer
henrik@laserimage.se
+46 70 684 80 13

Checked and approved

A handwritten signature in blue ink, appearing to read "Johan Lindell".

Johan Lindell, CEO
johan@laserimage.se
+46 73 324 22 96

The laser calculations in this document are based on document
FAA 7140-1; published by US Department of Transportation

All calculations follows the directives given in document
AC No: 70-1; published by Federal Aviation Administration

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Revision Log

Revision	Date	Comment
	2024-06-24	First Release

SUMMARY

The goal of this summary is to highlight the most important information regarding an upcoming outdoor laser show. Laserimage is responsible for the laser calculations, set-up and control during the event.

On site responsible:

Emil Nyman: +46(0)76-209 03 37

Type and name of event:

Open air music festival: Retrobest

Time slots:

2024-06-27 - 2024-06-28 (19:00-04:00 UTC)

2024-06-28 - 2024-06-29 (18:00-04:00 UTC)

2024-06-29 - 2024-06-29 (18:00-23:00 UTC)

Location:

Ranna tee 3

67405 Otepää

Coordinates: 58° 02' 39" N 26° 28' 02" E

Sector affected by laser radiation (True azimuth N=0°): 33-93°

Magnetic declination: 10,03°

Minimum elevation: 0°

Maximum elevation: 30°

Nominal Ocular Hazard Distance (NOHD):

Horizontal distance: 3767 ft

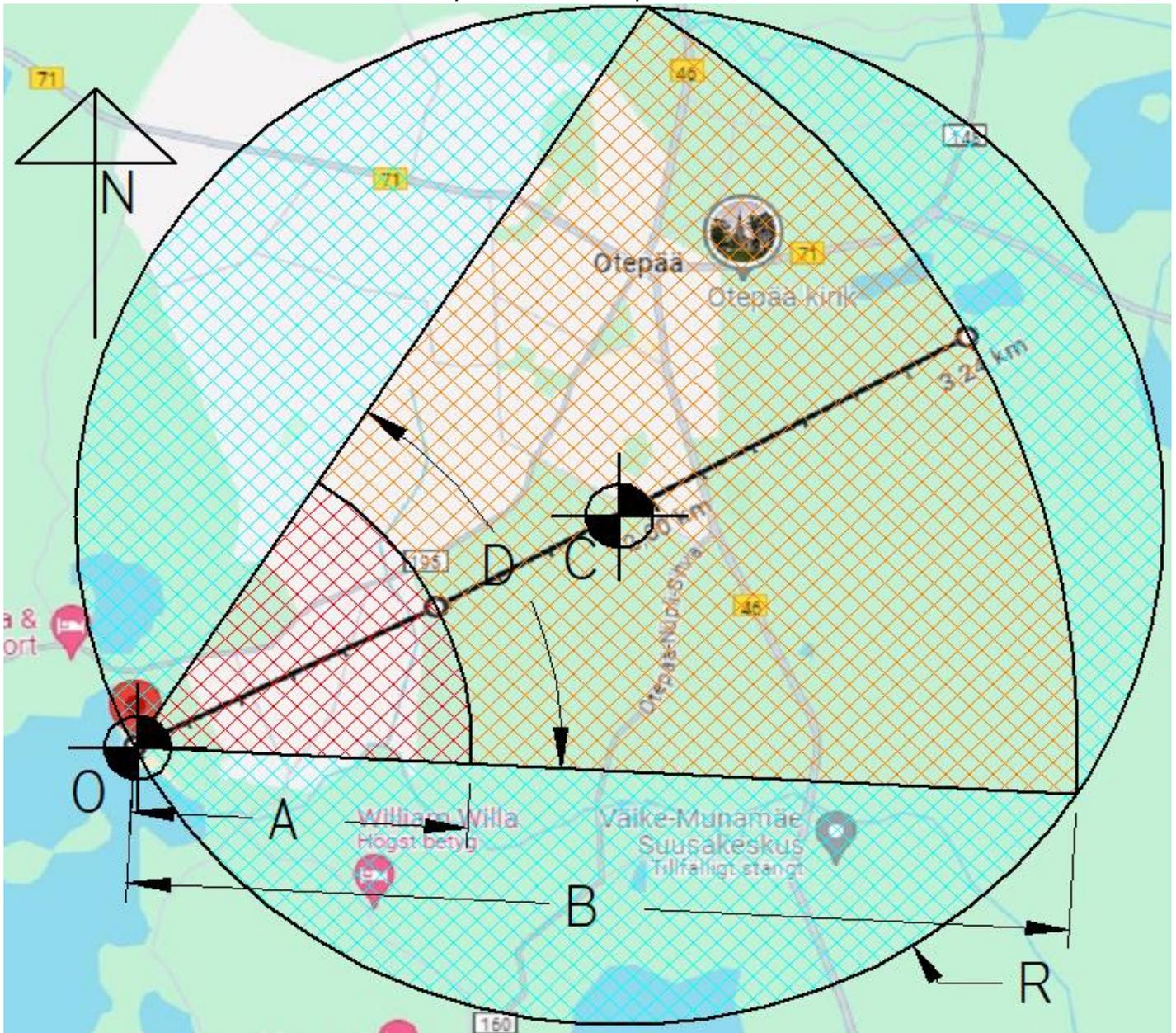
Vertical distance: 1884 ft

Sensitive Zone Exposure Distance (SZED):

Horizontal distance: 10578 ft

Vertical distance: 5289 ft

MAP: LOCATION, RADIATION AREA, PROPOSED NOTAM AREA



POI	Latitude	Longitude	Altitude /ft
Laser location (O)	58° 02' 39" N	26° 28' 02" E	430
Centre NOTAM-area (C)	58° 03' 06" N	26° 29' 46" E	430+5289=5719
Radius NOTAM-area (R)	1,01 NM		
NOHD (A)	3767 ft		
SZED (B)	10578 ft		
AZIMUTH (D)	33-93°		

FAA7140-1 – NOTICE OF PROPOSED OUTDOOR LASER OPERATION(S)

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

NOTICE OF PROPOSED OUTDOOR LASER OPERATION(S)

1. GENERAL INFORMATION

(a) To: <i>(FAA Regional Office)</i> EANS nof@eans.ee	(b) From: <i>(Proponent)</i> Laserimage AB Kyrkogatan 17 SE-632 20 ESKILSTUNA
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(c) Event or Facility Open air music festival	(d) Report Date: 2024-06-24
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(e) Customer Retrobest festival	(f) Site address Ranna tee 3 67405 Otepää
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2. DATE(S) AND TIME(S) OF LASER OPERATION

(a) Testing and alignment 2024-06-27 - 2024-06-28 (19:00-04:00 UTC)	(b) Operation 2024-06-28 - 2024-06-29 (18:00-04:00 UTC) 2024-06-29 - 2024-06-29 (18:00-23:00 UTC)
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3. BRIEF DESCRIPTION OF OPERATION

Outdoor music event where lasers are used as special light effect

4. ON-SITE OPERATION INFORMATION

(a) Operator(s) Emil Nyman	
(b) On-site phone #1 +46(0)76-209 03 37	(c) On-site phone #2

5. FDS CDRH LASER LIGHT SHOW VARIANCE (if applicable)

(a) Variance #	(b) Accession #	(c) Expiration date
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6. BRIEF DESCRIPTION OF CONTROL MEASURES

In case of malfunction; physical masking will prevent the laser radiation to reach unintended areas

7. ATTACHMENTS

(a) Number of laser configurations [fill out one copy of page 2 of this notice ("Laser Configurations Worksheet") for each configuration]	1
(b) List Additional attachments (including maps, diagrams, and details of control measures) Map showing location and beam directions	

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

(a) Name Henrik Hoffman	(b) Position LSO	
(c) Phone +46(0)70-684 80 13	(d) Fax	(e) E-mail henrik@laserimage.se

9. STATEMENT OF ACCURACY

To the best of my knowledge, the information provided in this Notice and attached worksheet(s) is accurate and correct.

(a) Name <i>(if different from contact person)</i>	(b) Position
(c) Signature	(d) Date

FAA7140-1 – LASER CONFIGURATION WORKSHEET

Please Type or Print on This Form

Form Approved OMB No. 2120-0662



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LASER CONFIGURATION WORKSHEET

1. CONFIGURATION INFORMATION		(b) Name of event/facility Retrobest	(c) Report date: 2024-06-24
(a) Configuration number <u>1</u> of <u>1</u>			
(d) Brief Description of Configuration The configuration consists of 12 laser sources (DL40RGB). In point 4 on this page it's stated that the minimum elevation is set to 0°, this angle is not fixed since every laser source is always adjusted in a way that people, buildings and road/railway/shipping-traffic are physically shielded against laser radiation.			
2. GEOGRAPHIC LOCATION		(d) Latitude <u>58</u> ° (deg.) <u>02</u> ' (min.) <u>39</u> " (sec.)	
(a) Site Elevation (ft. above Mean Sea Level) <u>420</u>		(e) Longitude <u>26</u> ° (deg.) <u>28</u> ' (min.) <u>02</u> " (sec.)	
(b) Laser Height Above Site Elevation (ft.) <u>10</u>		(f) Determined by: <input type="checkbox"/> GPS <input type="checkbox"/> Map (Quad) <input checked="" type="checkbox"/> Other <u>Google Maps & Earth</u>	
(c) Overall Laser Elevation (a + b) <u>430</u>		(g) Horizontal Datum: <input type="checkbox"/> NAD 27 <input type="checkbox"/> NAD 88	
		(h) Vertical Datum: <input type="checkbox"/> NGVD 29 <input 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"/> REPETITELY PULSED
Laser Type (lasing medium)	(not applicable)	DIODE	
Power Watts (W)		maximum power <u>38</u>	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)		<u>0,4</u>	
Beam Divergency 1/e @ full Angle Milliradians (mrad)		<u>1,2</u>	
Wavelength(s) Nanometers (nm)		<u>638; 520; 450</u>	
(a) MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS (will be used to calculate NOHD)			
MPE W/cm²	(not applicable)	<u>0,00254</u>	
MPE per pulse J/cm²		(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) <u>10; 12; 16</u>	Pulse Energy (J) x PRF (Hz) OR Average Power
Visual Correction Factor (VCF) (Enter "1.0" or use Table 5)		<u>0,2653; 0,7092; 0,038</u>	
Visually corrected Power PCP x VCF		<u>11,77</u>	
4. BEAM DIRECTION(S)			
Maximum elevation angle (degrees) <u>30</u>		Magnetic variation (degrees) <u>10,03</u>	
Minimum elevation angle (degrees, where horizontal = 0°) <u>0</u>		Azimuth <input checked="" type="checkbox"/> True <input type="checkbox"/> Magnetic	
		(degrees) <u>33-93</u>	
5. CALCULATED DISTANCES (fill in all three columns)			
	SLANT RANGE (ft.)	HORIZONTAL DISTANCE (ft.)	VERTICAL DISTANCE (ft.)
NOHD (based on MPE)	<u>3767</u>	<u>3767</u>	<u>1884</u>
*SZED (for 100 µ W/cm² level)	<u>10578</u>	<u>10578</u>	<u>5289</u>
*CZED (for 5 µ W/cm² level)	<u>47601</u>	<u>47601</u>	<u>23801</u>
*LFED (for 50 n W/cm² level)	<u>476010</u>	<u>476010</u>	<u>238005</u>
*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 type="checkbox"/> Commercial software (print product name)			
<input checked="" type="checkbox"/> Other [describe method (spreadsheet, calculator, etc.)] <u>Excel-spreadsheet</u>			

LASER CALCULATION REFERENCE

This sheet presents the different calculation steps that are needed to achieve the results in table 5, "LASER CONFIGURATION WORKSHEET". Some input data for the calculations can be found in "LASER CONFIGURATION WORKSHEET". The formulas can be found in the publication "Doc. 9815 MNL ON LASER EMITTERS AND FLIGHT SAFETY"

NOHD

Nominal Ocular Hazard Distance is determined by the following calculation:

$$SR_{NOHD} = \sqrt{\frac{1366 \cdot \Phi}{\varphi^2 \cdot MPE_E}} = \sqrt{\frac{1366 \cdot 38}{1,2^2 \cdot 0,00254}} = \sqrt{\frac{51908}{0,0036576}} \approx \underline{3767 \text{ ft}}$$

Where:

SR_{NOHD} = NOHD Slant range in feet

Φ = Power (W)

φ = Beam divergence (mrad)

MPE_E = MPE in W/cm²

1366 = Conversion factor (centimeter → feet & mrad → rad)

SZED

Safety Zone Exposure Distance is determined by the following calculation:

$$SR_{SZED} = \frac{3700}{\varphi} \cdot \sqrt{\Phi_{VCP}} = \frac{3700}{1,2} \cdot \sqrt{11,7} = 3083,33 \cdot 3,43 \approx \underline{10578 \text{ ft}}$$

Where:

SR_{SZED} = SZED Slant range in feet

Φ_{VCP} = Visually corrected power, from point 3b

φ = Beam divergence (mrad)

MPE_E = MPE in W/cm²

3700 = Conversion factor (centimeter → feet & mrad → rad)

CZED

Critical Zone Exposure Distance is determined by the following calculation:

$$SR_{CZED} = 4,5 \cdot SR_{SZED} = 4,5 \cdot 10578 \approx \underline{47601 \text{ ft}}$$

LFED

Laser Free Exposure Distance is determined by the following calculation:

$$SR_{LFED} = 45 \cdot SR_{SZED} = 45 \cdot 10578 \approx \underline{476010 \text{ ft}}$$

Horizontal and vertical distances

All horizontal and vertical distances are determined using the following formulas:

$HD = SR \cdot \cos(\text{Minimum elevation angle}), \text{ from point 4}$

$VD = SR \cdot \sin(\text{Maximum elevation angle}), \text{ from point 4}$

$$HD_{NOHD} = SR_{NOHD} \cdot \cos 0^\circ = 3767 \cdot 1 \approx 3767 \text{ ft}$$

$$VD_{NOHD} = SR_{NOHD} \cdot \sin 30^\circ = 3767 \cdot 0,5 \approx 1884 \text{ ft}$$

$$HD_{SZED} = SR_{SZED} \cdot \cos 0^\circ = 10578 \cdot 1 \approx 10578 \text{ ft}$$

$$VD_{SZED} = SR_{SZED} \cdot \sin 30^\circ = 10578 \cdot 0,5 \approx 5289 \text{ ft}$$

$$HD_{CZED} = SR_{CZED} \cdot \cos 0^\circ = 47601 \cdot 1 \approx 47601 \text{ ft}$$

$$VD_{CZED} = SR_{CZED} \cdot \sin 30^\circ = 47601 \cdot 0,5 \approx 23801 \text{ ft}$$

$$HD_{LFED} = SR_{LFED} \cdot \cos 0^\circ = 476010 \cdot 1 \approx 476010 \text{ ft}$$

$$VD_{LFED} = SR_{LFED} \cdot \sin 30^\circ = 476010 \cdot 0,5 \approx 238005 \text{ ft}$$